

THE ANALYSIS OF THE ECOLOGICAL INNOVATION POTENTIAL OF THE  
FINANCE SECTOR IN THE DIGITAL TRANSFORMATION PROCESS AND A  
POLICY PROPOSAL: A MIXED METHOD STUDY

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## **ABSTRACT**

### **ANALYSIS OF THE ECOLOGICAL INNOVATION POTENTIAL OF THE FINANCE SECTOR IN THE DIGITAL TRANSFORMATION PROCESS AND A POLICY PROPOSAL: A MIXED METHOD STUDY**

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In recent years, resource efficiency and climate crisis have been on the agenda of countries due to the global impact of environmental pollution and the rapid depletion of limited and scarce natural resources. The concept of eco-innovation is a more global innovation concept than other types of innovation due to its connection with the environment and its dynamics. Eco-innovation has the potential to play an important role in sustainable transition. However, lack of financial resources is one of the most important obstacles to eco-innovation. Turkey is one of the countries that can be most exposed to the negative effects of climate change due to its complex climate structure. It needs to take careful measures against these negative effects. The main purpose of this study is to design the policies to increase the ecological innovation capacity of the financial sector by examining the dynamics of the sector from the perspective of the sector actors and within the framework of the finance-centered platform innovation system approach designed within the scope of this study. Based on this purpose, 31 online interviews were conducted using the semi-

structured interview method, covering all the defined roles of the financial sector actors. In addition, in the quantitative part of the study, a scale was developed to measure the perceived eco-innovation awareness of the financial sector players, and data was collected with an online survey. In this study, the convergent parallel design pattern was used, and quantitative and qualitative data were collected independently but simultaneously. The collected data were analyzed independently and the results were interpreted together. Based on the results obtained, 10 policy recommendations and 49 policy tools that may enable the realization of these recommendations were designed by using the newly developed policy design methodology within the scope of this study.

**Keywords:** Eco-innovation, finance centered platform innovation system, policy design, green digital transformation, finance sector

## ÖZ

### DİJİTAL DÖNÜŞÜM SÜRECİNDE FİNANS SEKTÖRÜNÜN EKOLOJİK İNOVASYON POTANSİYELİNİN ANALİZİ VE POLİTİKA ÖNERİSİ: BİR KARMA YÖNTEM ÇALIŞMASI

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Son yıllarda çevre kirliliğinin küresel etkisi, sınırlı ve kıt doğal kaynakların hızla tükenmesi nedeniyle kaynak verimliliği ve iklim krizi ülkelerin gündeminde yer almaktadır. Eko-inovasyon kavramı, çevre ile olan bağlantısı ve dinamikleri nedeniyle diğer yenilik türlerine göre daha küresel bir yenilik kavramıdır. Eko-inovasyon, sürdürülebilir geçişte önemli bir rol oynama potansiyeline sahiptir. Ancak, finansal kaynakların yetersizliği, eko-inovasyonun önündeki en önemli engellerden biridir. Buna ek olarak, Türkiye, karmaşık iklim yapısı içerisinde iklim değişikliğinin olumsuz etkilerine en fazla maruz kalabilen ülkelerden biridir. Bu nedenle Türkiye, iklim değişikliğinin olumsuz etkilerine karşı dikkatli önlemler alması gereken bir ülkedir. Bu çalışmanın temel amacı finans sektörünün ekolojik yenilik kapasitesinin artırılmasına yönelik politikalarını, sektör aktörlerinin bakış açısından ve bu çalışma kapsamında tasarlanan finans merkezli platform yenilik sistemi yaklaşımı çerçevesinde sektörün dinamiklerini inceleyerek tasarlamaktır. Bu amaçla yarı yapılandırılmış mülakat yöntemiyle, finans sektörü aktörlerinin tanımlanan tüm rollerini kapsayacak biçimde 31 adet çevrimiçi mülakat gerçekleştirilmiştir. Ayrıca çalışmanın nicel kısmında finans sektörü oyuncularının algılanan eko-inovasyon farkındalıklarını ölçmek



amacıyla ölçek geliştirilmiş ve online anket ile very toplanmıştır. Bu arařtırmada yakınsak paralel tasarım deseni kullanılmış, nicel ve nitel veriler birbirinden bağımsız ancak eşzamanlı toplanmıştır. Toplanan veriler bağımsız olarak analiz edilmiş, sonuçlar ise birlikte yorumlanmıştır. Elde edilen sonuçlara göre bu çalışma kapsamında yeni geliştirilen politika tasarım metodolojisi kullanılarak 10 politika önerisi ve bu önerilerin gerçekleştirilmesini sağlayacak 49 politika aracı tasarlanmıştır.

**Anahtar Kelimeler:** Eko-inovasyon, finans merkezli inovasyon sistemleri, politika tasarımı, yeşil dijital dönüşüm, finans sektörü

*“...fear knocked the door, courage opened and looked that nobody was there. “  
“ I dreamed...”  
“so I achieved...”*

*This dissertation is dedicated to my dear daughter Gizem Eylül ULAŞ, in whose presence I found the meaning and purpose of my life, and my husband Mehmet ULAŞ, my companion, who trusts and supports me every day and does not let go off my hand, despite those who say I cannot do it.*

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*With endless love...*

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## LIST OF ABBREVIATIONS

AGFI	Adjusted Goodness of Fit Index
ANOVA	One-Way Analysis of Variance
BDDK	Banking Regulation and Supervision Agency
BIS	BASEL Committee Bank for International Settlements
BIST	Bank for International Settlements
BKM	The Interbank Card Center
BSc	Bachelor of Science
CAR	Capital Adequacy Ratio
CDB	Caribbean Development Bank
CDP	The Carbon Disclosure Project
CEO	Chief Executive Officer
CFA	Confirmatory Factor Analysis
CFI	Comparative Fit Index
CO <sub>2</sub>	Carbon Dioxide
CPI	Climate Policy Initiative
CSD	Central Securities Depository
CSR	Corporate Social Responsibility
CVR	Coverage Validity Rate
D&O	Directors and Officers
EBRD	European Bank for Reconstruction and Development
EFA	Exploratory Factor Analysis
EGD	European Green Deal
EGM	Pension Monitoring Center
EMRA	Energy Market Regulatory Authority
ENRM	Energy and Natural Resources Ministry
ER	Integrated Reporting Turkey
ERTA	Integrated Reporting Turkey Network
ESG	Environmental Social and Governance
EU	The European Union

FCP	Finance Centered Platform
FC-PIS AF	Finance Centered Platform Innovation System Analytic Framework
FC-PIS	Finance Centered Platform Innovation System
GCC	Global Climate Change
GEF	The Global Environment Facility
GFI	Goodness of Fit Index
GHG	Greenhouse Gas
GIS	Global Innovation System
IA	Independent Audit
IAIS	International Association of Insurance Auditors
ICT	The Information Communication Technology
IFC	International Finance Corporation
IMF	International Monetary Fund
IPBES	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
IS	Innovation Systems
KGK	Public Oversight Accounting and Auditing Standards Authority
KKB	Credit Registration Office
KMO	Kaiser-Meyer Olkin
LIIBA	International Insurance Brokers Association
METU	Middle East Technical University
MEUCC	Ministry of Environment, Urbanisation and Climate Change
MKK	Central Registry Agency
MSc	Master of Science
MTF	Ministry of Treasury and Finance
NFI	Normed Fit Index
NGOs	Non-governmental organizations
NIS	National Innovation System
NNFI	Non-normed Fit Index
OECD	Organisation for Economic Co-operation and Development
OM	Oslo Manual
OPIC	Overseas Private Investment Corporation
PEA	Personal Environmental Awareness



PEI	Personal Eco-Innovativeness
PEIS	Perceived Eco-Innovativeness Scale
PhD	Doctor of Philosophy
PSI	Principles for Sustainable Insurance
R&D	Research and Development
RIS	Regional Innovation Systems
RMSEA	Root Mean Square Error of Approximation
SA	Sustainability Academy Turkey
SBEDDK	Insurance and Private Pension Regulation and Supervision Agency
SBM	Institutions, FC-PIS, Insurance Information and Monitoring Center
SEDDK	Insurance and Private Pension Regulation and Supervision Agency
SEFIA	Sustainable Finance Association
SIBs	Systemically important banks
SIS	Sectoral Systems of Innovation
SKD	Business Council for Sustainable Development Turkey
SME	Small and Medium Enterprise
SPK	The Capital Markets Board
TAKASBANK	Incorporation of Istanbul Settlement and Custody Bank Inc.
TBB	The Banks Association of Turkey
TCMB	Central Bank of the Republic of Turkey
TFCR	Financial Reporting Task Force Reporting on Climate Risks
TFKB	The Financial Institutions Association of Turkey
TUSİAD	Turkish Industry& Business Association
TIS	Technological Innovation Systems
TKBB	The Participation Banks Association of Turkey
TMNF	Tokio Marine & Nichido Fire
TOBB	The Union of Chambers and Commodity Exchanges of Turkey
TODEB	The Payment and Electronic Money Institutions Association of Turkey
TSB	The Insurance Association of Turkey
TSPB	The Capital Markets Association of Turkey
TUIK	Turkish statistical institute
TURMEPA	Turkish Marine Environment Protection Association

UN	United Nations
UNEP FI	The United Nations Environment Program Finance Initiative
UNNZIA	UN Net-Zero Insurance Alliance
UNSDG	United Nations Agenda for Sustainable Development
WB	The World Bank
WWF	World Wildlife Fund for Nature

## CHAPTER 1

### INTRODUCTION

#### 1.1. Background Information

According to the Living Planet Report 2018 of the World Wildlife Fund (WWF), the Earth is estimated to have lost about half of its shallow water corals in the past 30 years. Nature provides services worth around \$125 trillion a year, while also helping ensure the supply of fresh air, clean water, food, energy, medicines, and much more. Populations of mammals, birds, fish, reptiles, and amphibians have, on average, declined by 60% between 1970 and 2014, which is the most recent year with available data. We will need the resources of nature to sustain modern human society (Living Planet Report, 2018).

Climate change has created a global impact due to the increase in world population, rapid development in industrialization, and increase in energy consumption. The health impacts of climate change will affect the majority of the population in the coming years, and people's lives and welfare will be at increasing risk.

Sustainability-oriented innovation and technology research have grown during the past 10-15 years. In particular, a new field dealing with “sustainability transitions” has gained momentum (Markard et al., 2012). It is important to conceptualize industries such as energy water supply, finance or transportation as socio-technical systems. According to Markard et al. (2012), “*Such systems consist of (networks of) actors (individuals, firms, and other organizations, collective actors) and institutions (societal and technical norms, regulations, standards of good practice), as well as material artifacts and knowledge*”. The various elements of the system interact and provide specific services to society together. The theory of system emphasizes the

fact that a wide range of components are strongly interrelated and reliant on one another (Markard et al., 2012). In this sense, socio-technical transition can be defined as “A socio-technical transition is a set of mechanisms leading to a major shift in socio-technical systems”. Transitions, however, also apply to shifts in other systems including techno-economic, socio-ecological, systems of technological innovation, social practices, resilience, human geography, material, organizational, political, and socio-cultural (Markard et al. 2012, Naidoo, 2019).

The area of sustainability transitions is a subset of studies on innovation that classifies finance as a resource and function within innovation systems (Naidoo 2019). As defined by Organisation for Economic Co-operation and Development (OECD), “*An innovation is a new or improved product or process (or combination thereof) that differs significantly from the unit’s previous products or processes and that has been made available to potential users (product) or brought into use by the unit (process)*”(OECD, 2018). Another definition for innovation concerning natural resources is that “*When the modern notion of innovation was formalized by Schumpeter and his followers, it was defined in terms of the expansion of capitalism and its capacity to manipulate the natural environment*” (Pansera, 2011).

In recent years, resource efficiency and climate crisis have been on the agenda of countries due to the global impact of environmental pollution, and the rapid depletion of limited and scarce natural resources. Innovation has a potential to play a key role in sustainable economic development. For today and for the future, it is necessary to take eco-innovative steps in order to give a new direction to the unsustainable development of our world, to prevent global climate changes, to protect biodiversity, to regulate finance and resource management models, and to ensure more efficient, rational and environment-friendly production and consumption. As we cannot continue like this, we need to adopt a new plan and order.

Eco-innovation, sometimes called as environmental innovation, green innovation or sustainable innovation, has been used to identify the innovations that contribute to a sustainable environment through the development of ecological improvements

(Xavier et al., 2017). Eco-innovation can also be defined as *“the creation of novel and competitively priced goods, processes, systems, services, and procedures designed to satisfy human needs and provide a better quality of life for all, with a life-cycle minimal use of natural resources (materials including energy, and surface area) per unit output, and a minimal release of toxic substances”* (INNOVA, 2006). In this dissertation, I define eco-innovation as an innovation that is more environmentally benign than relevant alternatives.

The context of eco-innovation becomes broader and more challenging with the evolution of technology (Kuoand Smith, 2018). The notion of eco-innovation itself is linked with the concept of sustainable development (Pansera, 2011). Eco-innovation is perceived in the business sector as an important direction to sustainable development (Kuoand Smith, 2018). There is no doubt that the sustainability debate has a strong technological dimension in both environmental economics, which is based on the concept of environmental externalities, and ecological economics (Pansera, 2011). There is no common definition regarding the characteristics of eco-innovations despite a high academic interest in eco-innovation (Kiefer et al., 2017).

Although supply-side policies are more frequently used for environmental policies, when it comes to ecological innovation policies, mixed policy approaches are used, as a mix of supply-side and demand-side policies. Nevertheless, the main driving force of eco-innovations is the design and implementation of new technologies (Kuoand Smith, 2018). Technological change has always been associated with the desire of humans to control the natural world since the early moments of the industrial revolution (Pansera, 2011). Sustainability has become a goal that can be achieved through modern industrial society's social and technological transformation (Pansera, 2011).

Economic growth cannot continue indefinitely because of the earth's limited carrying capacity, and technology cannot solve the problems raised by constant material growth on a finite planet (Pansera, 2011). In the new economic and social system resulting from climate change, ecological innovation has a much more inclusive meaning and role. It is now understood that ecological innovations are not limited to

sectors directly related to the environment. In various industries or economic sectors, such as manufacturing services, organizations management styles, urban and rural planning and design, agriculture and many other areas, eco-innovations can be introduced. Therefore, an important characteristic of eco-innovation is that it can take place in any economic activity and is not unique to technology or industry (Hojnik, 2017).

The explanations which eco-innovation provide tend to be quite common and thus, numerous forms of innovation can be described as eco-innovations (Kiefer et al., 2017). Eco-innovation is a relatively new concept for the world. It is thought that many innovations that have already been made can actually be ecological innovations. However, it needs to be discovered whether these ecological innovations are ecological components.

Research on the service sector may still be very limited in the ecological innovation literature. Xavier et al. (2017) pointed to the inadequacy of studies on ecological innovation, especially in the service sector. They also emphasized the need for more models related to the structural factors of a company (specific skills, environmental capacity, culture, leadership), models linked to social aspects of sustainability, and models focusing on service sector (Xavier et al., 2017). The same study showed that the research methods of the studies in the ecological innovation literature are mostly only qualitative or only quantitative, while studies using mixed methods are very limited (Xavier et al., 2017).

The interest in eco-innovation in research and practice has grown, mainly due to the adverse environmental impacts of businesses, which, on the other hand, have resulted in severe global environmental issues and increased global concern for the environment (Hojnik, 2017).

The Paris Climate Agreement, Sustainable Development Goals, and the Addis Ababa Action Agenda call for a “consistent and integrated financial system in its reaction to sustainability and climate breakdown” (Naidoo, 2019). The global commitment scope indicates a large-scale approach to changing economic development towards

sustainability beyond incremental or quick-fix approaches. Major solutions require finance as the financial system has an undisputed role in adapting to sustainability and climate change (Naidoo, 2019).

In the literature, financial resources are one of the most significant barriers to ecological innovation (Naidoo, 2019). Research and development costs of technology, risk-related costs of system changes in terms of market adoption and quality of the product, non-comprehensive cost-benefit analysis and cost-benefit estimation approach, lack of understanding and uncertainty in predicting future risks of liabilities (e.g. removal of waste), and short-term profitability calculations resulting in low tolerance for more extended payback periods of equipment investment can be given as examples of financial barriers (Kemp, 2009). Many businesses have yet to be able to integrate environmental sustainability into their business models (Kuo and Smith, 2018).

The target sector of this study is finance. In recent years, digital transformation has gained momentum in finance sector, and it is critical to understand the ecological innovation potential of this sector and to design a roadmap in this direction. The reasons for the choice of the finance sector can be expressed as follows; (i) The sector is an important actor in the service sector and is an active player in individual, corporate and public; (ii) It has a multi-faceted role both in the field of sustainability and in funding the institutions and companies working on sustainability; (iii) The sector has been working for many years on sectoral policies and published sustainability reports each year; and (iv) The sector is also relatively homogeneous internationally and can contribute to the studies carried out in the related field or mediate the use of foreign funds at national, regional or local level for the studies carried out in the related field. As explained in detail in the following sections of the study, the financial sector has a different structure from other service sectors. In addition, due to the finance sector's function of providing funds to all other sectors, it has a different and important position in terms of ecological innovations compared to all other sectors.

The concept of ecological innovation is a more global innovation concept than other types of innovation due to its connection with the environment and its dynamics.

Therefore, sustainability transition studies offer prospects for the necessary transnational research in an increasingly globalized world (Markard et al., 2012). Today, climate change and the economic and social transformation experienced due to climate change cannot be considered independent of the digital transformation process. In this holistic transformation process, the financial sector, which serves as an intermediary in accessing the necessary funding resources, requires strategies and policies to uncover its potential for ecological innovation, and the ecological innovation potential of the sector can be increased by determining a strategic roadmap that includes ecological digital handicaps. Within the scope of this study, the importance, potential and role of ecological innovations in the financial sector are analyzed in detail, and a policy proposal is made for the near future of the financial sector in the context of ecological innovation. The policy proposal to be put forward within the framework of this design can also be considered as a financial ecological innovation system proposal.

## **1.2. Statement of the Problem**

Today, we are confronted with fundamental sustainability challenges in several areas. For instance, the energy sector is confronted with a rapid depletion of natural resources; issues related to air pollution, greenhouse gas emissions, and nuclear power; uncertainties in short-term and long-term supply protection, and energy poverty (Kemp, 2011). In addition, water supply and sanitation systems must tackle a broad range of problems related to water scarcity, insufficient access in low-income countries, extreme events (flooding, earthquakes), and micro-pollutants (Charles et al., 2010). Congestion (especially road traffic), local air pollution, depletion of fossil fuel and CO<sub>2</sub> emissions, and the risk of accidents threaten the transportation sector. Resource management, pollution control and climate change are all problems that cross geographical boundaries and, thus, make sustainability challenges a priority, shared by countries and communities worldwide (Hojnik, 2017). Similar challenges are faced in other industries (e.g., farming and food system). While most of these problems contribute to environmental and social concerns, there are also urgent economic issues (Markard et al., 2012). Many regions around the world try to meet significant financial requirements for the reconstruction and expansion of existing



infrastructure systems. These needs become particularly challenging during periods of economic crisis and when government budgets are overrun (Markard et al., 2012).

Eco-innovation is a new term not only in innovation studies literature but also in the service sector. It provides more environmental-friendly solutions than relevant alternatives, even if the environmental component is not planned (Hojnik, 2017). Hojnik (2017) states that eco-innovation can be defined as innovation that focuses on reducing environmental impact, regardless of whether this impact is deliberate or not. Therefore, eco-innovation encompasses not only environmentally motivated innovations but also the unintentional reduction of environmental impact. In addition, eco-innovations do not always occur as a result of conscious efforts. They can sometimes emerge unexpectedly. There are some services or products in the finance sector which can be both innovative and eco-innovative. However, the sector may not be aware that they are eco-innovative.

In brief, sustainability transition is a global and strategic issue. In this study, which technologies should be preferred and how these technologies can be supported in order to understand and analyze research and develop the ecological innovation potential of finance sector during the digital transformation process are investigated, and a policy recommendation is made to improve the eco-innovation capacity of the finance sector.

The study addresses the following research question and the sub-question:

- 1) What type of policy targets should be set, and what policy instruments are used to improve the ecological innovation capacity of the financial sector?

Which digital technologies can help to achieve the twin transformation in the financial sector and what needs to be done to develop these digital technologies?

### **1.3. Purpose and Significance of the Study**

Research on finance in the context of sustainability transition is still in its early stages (Naidoo, 2019). However, there are significant deficiencies in the literature not only regarding sustainability transition, but also in the specific area of “financial

innovations". Surprisingly, there is no financial innovation definition, classification and commonly accepted financial innovation measurement method in the literature yet. Another shortcoming is that the question of why financial innovations occur remains unanswered although many studies have tried to explain the causes of financial innovations.

The planet we live on does not belong only to us. We have caused significant damage to this universe since the industrial revolution, perhaps in a way that we did not foresee at that time. This damage was initially called climate change, but due to its visible and tangible impacts that affect everyone in the world, it was then referred to as a crisis that requires urgent management. The effect of climate crisis on the economies with high financial, economic and social vulnerability is much deeper. Turkey is one of the countries that can be most exposed to the negative effects of climate change within this complex climate structure. As a result of global warming, Turkey may face environmental problems such as decreasing water resources, forest fires, drought and desertification. This may bring along various environmental and socio-economic problems. Due to the northward shift of climate zones, Turkey may be affected by hotter and drier climatic conditions. This situation may further deepen the problem of water resources and may increase drinking and utility water problems. The semi-arid and semi-humid regions of Turkey, Central Anatolia, Southeastern Anatolia, Aegean and Mediterranean regions, are under the threat of desertification, and climate change may have more negative consequences for agriculture, forestry and water resources in these regions. Tree drying, pest outbreaks and fires, which have increased in recent years, may accelerate with climate change. This may lead to serious impact on forest ecosystems and loss of natural resources. In addition, the potential for agricultural production may change and, accordingly, terrestrial ecosystems and agricultural systems may be damaged by increased pests and diseases. The increase in temperature may have negative effects on human and animal health.

For these reasons, Turkey is a country that needs to take careful measures against the negative effects of climate change. Sustainability of water resources, adaptation of agricultural production and forestry activities are areas where important steps should

be taken to mitigate the effects of climate change. It is also important to strengthen fire risk management and environmental protection efforts.

Climate crisis can become one of the invisible causes of the financial crises for countries with high exposure. Thus, this crisis should be addressed and solved multidimensionally, and the precautions related to the crisis should be taken within this scope.

It is not possible to explain the main concern of green transformation and sustainability only with concepts such as economic transformation, income models, growth and profitability. If we evaluate the green transformation only on this basis, this transformation will again be a transformation that harms the nature. At this point, it is very meaningful to talk about green digital transformation, not digital transformation. The reason being that green transformation necessitates a digital approach, and the two concepts must intertwine as they are twins.

Basically, green transformation is related to repositioning energy and resources in a way that does not harm the world we live in. Within twin transformation, it is necessary to question how innocent digital transformation is. Despite being a technical matter, there exist nuances within this domain. Considering these aspects collectively, it can be affirmed that individuals, businesses, and the global community must redesign their way of doing business and their operational practices, following both green and digital principles. At this point, it may be useful to refer to the Kondratieff wave as this twin transformation may start the sixth wave. Considering that every economic crisis presents an opportunity, especially developing countries like Turkey have an important position to capitalize on the advantages that lie ahead.

We live in a system, and those who can keep up with change and transformation with a simple evolutionary approach will survive. While meeting the needs of people today, it is necessary to act without destroying the resources that will be required for future generations, by making long-term planning and considering the limited natural resources. Climate change and environmental degradation pose an existential threat

to the World. The smart use of clean digital technologies, climate action and environmental sustainability must not be only an elitist endeavor. Twin transformation can serve this purpose. The digital transformation and smarter and greener use of technologies may provide the biggest support for Europe to be the first climate neutral continent by 2050, which is the main goal of the European Green Deal (EGD). Technology can improve energy and resource efficiency, facilitate the circular economy, enable better allocation of resources, and reduce emissions, pollution, biodiversity loss and environmental degradation. In addition, the information communication technology (ICT) sector can ensure the environmentally responsible design and distribution of digital technologies.

Considering the research question and the sub-question the dissertation addresses, it can be stated that in today's new global order, it does not seem possible to separate the boundaries of innovation systems as in the past and to make an evaluation in this way. If researchers want to analyze an innovation system that indirectly affects many sectors and has completely disappeared, as in this study, they need a new framework. If they also want to make a policy proposal for an innovation system, they must first understand the current structure and dynamics of the relevant innovation system. However, understanding the current structure and dynamics is not an easy task. There is a need for a general guiding framework, which can no longer be presented as a recipe for today's complex ecosystems. Based on this need, the first aim of this study was to make a policy proposal on eco-innovation for the near future of the financial sector. In order to do this, a new innovation system that focuses on finance and a framework that could analyze this innovation system have been designed to investigate the current situation of the eco-innovation system in the finance sector.

Many scientists believe that only a small fraction of eco-friendly behavior can be directly linked to environmental knowledge and awareness of the environment (Kollmuss and Agyeman, 2002). Although subsequent studies have revealed that knowledge and awareness do not necessarily turn into behavior, environmental knowledge may foster environmental awareness and concern, which in turn can promote green behavior (Üstündağlı and Güzeloğlu, 2015). Therefore, it is important to measure the awareness of the sector in terms of ecological innovation before

developing policy recommendations to increase the ecological innovation capacity of the financial sector. In this dissertation, a perceived eco-innovativeness scale (PEIS) was designed to measure the awareness of eco-innovation in the finance sector.

With the designed scale, answers to the following questions were sought:

- What are the perceived ecological innovativeness levels of the participants of the research?
- Do the perceived ecological innovativeness levels of the research participants differ significantly according to the variables of gender, age, year of experience, level of education, status of being a manager, institution type, bank type, and type of insurance company?
- What is the level of personal environmental awareness of the participants?
- Does the personal environmental awareness of the participants differ significantly according to the variables of gender, age, year of experience, level of education, status of being a manager, institution type, bank type, and type of insurance company?
- Is there a significant relationship between the perceived ecological innovativeness levels of the participants and their environmental awareness?

The ambition is to promote the adoption of new ideas and lines of thinking developed elsewhere to expand and question the current theoretical foundation for eco-innovation in the service sector innovation system literature and sustainability transition science.

The finance literature still needs to build on the perspectives from the literature on sustainability transitions, which provides a comprehensive understanding of sustainability transitions at the system level (Naidoo, 2019). The main contribution and one of the novel aspects of this study is that it is the first attempt to define and evaluate eco-innovation in the finance sector with a new integrated platform innovation system framework for policymaking. The literature indicates that finance research is embryonic in the field of sustainability transitions, and researchers generally agree that further theoretical and quantitative research is needed to

understand the role of finance at a system level (Naidoo, 2019), and there is a strong need to establish and define the conceptual frameworks and analytical underpinnings for understanding both historical and ongoing transitions. This involves questioning current conceptual frameworks with regard to where and how they can be applied, their limits, their ontological premises, and so on (Markard et al., 2012).

This study empirically contributes to the literature on innovation systems (IS), finance, and sustainability transition studies. There are several aspects to this contribution. First, in the literature, studies on ecological innovation are predominantly related to the manufacturing industry. The fact that this research is related to the service sector is a new example of ecological innovation. While there is a growing body of research in IS studies on the finance sector, the number of studies on ecological innovation systems in the service sector using an integrated analysis framework remains limited.

Moreover, this integrated framework evolved from empirical studies on developed countries. Therefore, applying this framework to the service sector in a developing country enriches the applicability of this framework for policy-making purposes. It may also allow cross-country comparisons. The thesis strives to fill the gap by empirically testing an integrative framework for eco-innovation, which integrates transition management, strategic niche management, the multi-level perspective on socio-technical transitions, and technological innovation systems. The integration is important because of the nature of eco-innovation and finance; using one of these frameworks is not suitable. Ecological innovation is naturally a transformation process, not only in technological aspects but also in socio-technical aspects. Like all other innovation systems, it should be evaluated from a system perspective. Some eco-innovations can be thought of as niches, and also, at the same time, they should be assessed in a multi-perspective framework. Thus, an integrated framework is essential to evaluate eco-innovation systems.

The developed PEIS can be used in many other sectors. A contribution can also be made to society and humanity by encouraging financial institutions to prioritize activities taking into account ecological innovation in their business and operations,

such as new product development and process improvement. In the context of ecological innovation, the number of studies conducted in the service sector using both quantitative and qualitative research methods is quite limited (Xavier et al., 2017). Therefore, in this context, the study is novel and original. The analysis of the drivers of and barriers to eco-innovation has been a subject of empirical research, giving rise to a diverse range of literature that emphasizes the significant position of public policies in this context (Costantini et al., 2017). The last contribution is that this study tries to build on the knowledge stock of eco-innovation system perspective in sustainable transition science.

Following the chapter giving background information on the problem and explaining the significance of the study, the study proceeds as follows. The second chapter makes a review of the literature on innovation, eco-innovation, and eco-innovation in the finance sector. The third chapter elaborates on the finance centered platform innovation system, with a specific focus on the finance sector. Chapter 4 discusses the need for a new functional structural analysis framework. Chapter 5 shares the research methodology followed. Chapter 6 reveals the findings, and the thesis ends with policy recommendations and conclusion in Chapter 7.

## CHAPTER 2

### LITERATURE REVIEW

This chapter consists of three parts. In the first part, the concept of innovation and innovation types are explained. Then, the transition from innovation to ecological innovation is explained and the ecological innovation definition adopted in the study is shared with the readers. In the second part, innovation and innovation system approaches and theoretical frameworks related to innovation systems are given. The last part is about eco-innovations in the finance industry.

#### **2.1. Innovation to Eco-innovation**

The phenomena of innovation and invention are not new. They may be as old as mankind. Invention and innovation are often closely related to each other to the point that it is difficult to distinguish between them. In its purest sense, “invention” can be defined as the creation of a product, the introduction of a process, or the occurrence of an idea for the first time. On the other hand, we can define innovation as the commercialization of an idea. Innovation involves implementation, either by being placed into practical use or made available for use by other groups, businesses, individuals or organisations (Oslo Manual, 2018). Furthermore, innovation is a dynamic and pervasive activity that occurs in all sectors of an economy; it is not the advantage of only the business enterprise market (Oslo Manual, 2018).

There are different attributes of radical, disruptive and incremental innovation. They basically refer to the different characteristics of innovation used to describe the innovation process. In addition, innovation is associated with various policy grounds, including competition policy, intellectual property rights, regulation, education and human capital formation, science policy, employment policy, trade and foreign direct



investment policy, and even macroeconomic policies (Erdil et al., 2016). Innovation is, by essence, a systemic phenomenon since it is the product of continuous interaction between multiple actors and organizations (Fagerberg, 2009).

It is central to improving living standards and can affect individuals, institutions, entire economic sectors, and countries in multiple ways.

Since 1992, the Oslo Manual (OM) has been the international standard of reference for conceptualising and measuring innovation (Oslo Manual, 2018). The OM is the international reference guide for collecting and using data on innovation. In the first version of the OM, innovation was only addressed in the manufacturing industries. In the second version, released in 1997, several industries were also discussed in addition to the manufacturing industry. For the first time, non-technological innovations were also mentioned as an addition. In the third version, released in 2005, it was updated as "the innovation framework", and "organisational innovation" and "marketing innovation" were added to innovation types. The third edition extended the concepts of "industrial innovation" and "service innovation". Still, it did not go so far as to include the concept of "social" innovation", which is also used today. The OM 2005 for innovation identifies four main types of innovation. The first type is product innovation, which involves introducing a new or significantly improved good or service in terms of its characteristics or intended uses. This can include improvements in technical specifications, components and materials, user-friendliness, or other functional characteristics. The second type is process innovation, which involves implementing a new or significantly improved production or delivery method, with the aim of reducing unit costs, increasing quality, or producing new or improved products. The third type is marketing innovation, which involves implementing a new marketing method that involves significant changes in product design or packaging, product placement, product promotion, or pricing, with the aim of better addressing customer needs, opening new markets, or positioning the firm's product differently in the market to increase sales. The fourth type is organizational innovation, which involves implementing a new organizational method in the firm's business practices, workplace organization, or external relations, with the aim of increasing performance, reducing administrative

or transaction costs, improving workplace satisfaction or gaining access to external knowledge (Oslo Manual, 2018).

In 2018, the fourth edition of the OM was released with substantial extensions and improvements in the types of innovation. According to the 4<sup>th</sup> edition of the OM, innovation has two types, product innovation and business process innovation. “Product innovation” is a new or improved good or service that differs significantly from the firm’s previous goods or services. Product innovation can encompass two broad categories of products: goods and services. Goods refer to physical objects and knowledge-based products that can be owned, transferred through market transactions, and have well-defined ownership rights. On the other hand, services are intangible activities that are produced and consumed simultaneously (Oslo Manual, 2018).

“A business process innovation is a new or improved business process for one or more business functions that differ significantly from the firm’s previous business processes, and that has been brought into use by the firm.” (Oslo Manual, 2018). The OM 2018 identifies six functional categories for business process innovation. The first category is production of goods or services, which involves transforming inputs into goods or services through technical testing, analysis, and certification activities. The second category is distribution and logistics, which includes transportation, warehousing, and order processing. The third category is marketing and sales, which covers marketing methods, pricing strategies, and sales and after-sales activities. The fourth category is information and communication systems, which encompasses the maintenance and provision of hardware, software, data processing, and database activities. The fifth category is administration and management, which involves strategic and general business management, corporate governance, accounting and financial activities, human resources management, procurement, and external relationship management. Finally, the sixth category is product and business process development, which includes activities to scope, identify, develop, or adapt products or a firm's business processes, and can be conducted within the firm or obtained from external sources.

Following the types of innovations, we can also examine degree of novelty of innovations. An innovation can consist of a single major change (radical innovation) or a series of more minor gradual changes, which constitute a major change (incremental innovation). Alternative measures of novelty, “innovativeness”, and economic impacts are whether an innovation is new to the firm only, new to the firm’s market, or new to the world (OSLO Manual, 2018). In addition to the European Union (EU), the importance of a more comprehensive perspective on innovation to address societal needs is evident in other frameworks such as the green economy (Gibbs and O’Neill, 2015), social innovation (Shier and Handy, 2015), and in the 2030 United Nations Agenda for Sustainable Development (UNSDG).

Following these theoretical and practical definitions, it is necessary to touch on some concepts to explain why it is no longer just about innovation but ecological innovation. Especially in the last ten years, sustainability is attracting increasing public attention and media scrutiny. However, most individuals still need clarification as to how it is represented, whether it is beneficial, or how it can be accomplished (Ayers, 2017).

The concern for environmental protection emerged as a reaction from the movement to the industrial revolution. It was expressed in various ways across different periods in different parts of the world. However, most of the debates at the time concentrated only on one aspect of sustainability, namely the environment, lacking other important subject areas (El-Haggar, 2019).

Sustainability is defined as “the environmental management of natural resources to suit the needs of the current generations without altering those of the future and upcoming ones” (El-Haggar, 2019). It has three components which are social, economic, and environmental (Ayers, 2017). Institutional sustainability has also become an important concept, as it assigns a central role to institutions as a tool for the implementation of the concept of sustainable development. In the context of governance for sustainable development, institutional sustainability refers to the activities of a particular institution that facilitate decision-making and the implementation of sustainability policies (Pfahl, 2005). Institutional sustainability

aims to balance economic responsibilities with social and environmental ones (Forcadell et al., 2019).

The primary obstacle to achieving sustainability is perhaps posed by the phenomenon of global climate change (GCC). The combustion of fossil fuels results in the emission of carbon dioxide (CO<sub>2</sub>), a widely recognized greenhouse gas, into the atmosphere. As a consequence, there has been a continuous increase in the atmospheric concentration of carbon dioxide, which in turn has contributed to the global rise in surface temperatures (Ayers, 2017). To highlight the severity and urgency of the situation, the term "climate crises" is now employed to refer to the detrimental effects and pressing nature of natural disasters and climate change resulting from global warming, formerly known as climate change. When it is referred to as climate change, it sounds like there is no need to act, so using the term climate crisis aims to raise awareness about the impending danger. The planet is in crisis, and humanity's future relies on making drastic improvements to how people live on earth sustainably and in balance with the planet (Wright and Liang, 2019). It has long been known that the world's natural resources are not limitless, so growth will be limited. However, if we do not raise awareness and continue to consume all resources of nature, we will not be able to prevent the climate crisis from being a significant public health problem that will negatively affect future generations. Ecological innovations are of great importance to ensure both the financial sustainability of businesses and environmental sustainability. In this study, ecological innovation is defined as an innovation type which is more environmentally benign than relevant alternatives. It can be radical or incremental and new to the firm only, new to the firm's market, or new to the world or technological or non-technological.

## **2.2. A Retrospect on Innovation and Innovation System Approaches, Frameworks and Theories**

The neoclassical guidance for policy is the market failure approach, but market-failure-based climate policies are not enough to stimulate sustainability transitions (Jacobsson and Bergek, 2011). Hence today, it is not acceptable to use the market

failure approach to analyse innovation systems. In the literature, there are many arguments that the market failure approach is flawed and inadequate (Bergek et al., 2008). The concept of a systems approach to innovation is frequently regarded as a better option for this purpose (Bergek et al., 2008). The most important contribution of innovation system analyses to the study of sustainability transitions is that they provide policymakers with a tool for identifying system weaknesses. It, thus, promises to inform policymakers about the problems that an intervention must solve in order to promote the growth of a specific system or influence its direction (Jacobsson and Bergek, 2011).

Waldo Tobler's view that “everything is related to everything and objects that are closer to each other are more related” can be accepted as the fundamental starting point of the system concept (Sözen and Basım, 2012). While defining the system concept, it should be remembered that many different definitions can be made within different perspectives. For example, according to Sözen and Basım (2012), system is any entity that includes physical or conceptual mutual parts and they point to physical and conceptual structures. They further define a system as a whole that functions for a common purpose and interacts with each other continuously over time (Sözen and Basım, 2012).

System and system approaches are interdisciplinary concepts. Aristotle's statement that “whole is greater than the parts that make up it” reveals the definition that underlies the fundamental system problem and is still valid today. Historically, Gottfried Wilhelm Leibniz's “hierarchy of monads”, Rene Descartes' idea of “dividing each problem into its smallest possible part”, and Charles Darwin's “natural selection approach” can be considered as some of the processes that played a role in the emergence of general systems theory (Sözen and Basım, 2012).

According to Fagerberg (2009), the journey of innovation is a collaborative achievement that involves vital roles in both the public and private sectors from multiple entrepreneurs, and the “social system for innovation development” was used to characterize this “collective achievement”. The notion of innovation systems is a heuristic approach designed to examine all the various societal subsystems, actors,

and institutions that contribute, either directly or indirectly, intentionally or unintentionally, to the emergence or generation of innovation (Wieczorek and Hekkert, 2012). This concept was used for the first time in Freeman's "National Innovation System (NIS)" study in 1987 (Freeman, 1987). After that, several different concepts for innovation systems have been proposed in the literature, including national systems of innovation (NIS), regional innovation systems (RIS), sectoral systems of innovation (SIS), and technological innovation systems (TIS). One key approach was delineating systems based on technological, industrial or sectoral characteristics. Another important approach in innovation-system literature was based at the spatial level and used national or regional boundaries to differentiate between various structures (Fagerberg, 2009). The globalisation of innovation activities is a well-established fact in recent innovation studies. Harnessing resources from trans-local networks is critical for innovation success, particularly in addressing societal challenges such as climate change, urbanisation, inequality, and migration. As a result, studies on innovation and transition have increasingly recognised that socio-technical transformation processes are not limited by national borders but frequently span across places and even scales (Heiberg and Truffer, 2022). For this reason, the Global Innovation Systems (GIS) concept has recently been added to the IS literature.

The technological innovation system approach is widely used in the sustainable transition literature to examine system barriers and driving forces in ecological innovations. In research on sustainability transitions, the TIS approach became the most well-known because it focuses on new industry dynamics in clean tech sectors like photovoltaics, wind, biogas, organic food, electric cars, and urban water (Heiberg and Truffer, 2022).

TIS is an analytical framework, in which technological development is a process that is driven by the efforts of many people involved in generation, diffusion, and using new technologies. Actors can include firms along the value chain, universities, governmental bodies, industry associations, non-governmental organizations, individual entrepreneurs, and users who are engaged in activities related to the technology at hand. These actors establish networks for the exchange of information,

beliefs, and perspectives through commerce, cooperation, competition or lobbying. Institutions are the regulations, norms, and practices that govern the behavior of the actors (Heiberg and Truffer, 2022).

The presence of seven fundamental procedures, also known as “system functions”, is necessary for the efficient operation of a TIS: (F1) *The development of knowledge* exemplifies both the breadth and depth of the knowledge base, and it is an essential component of the system that facilitates *the diffusion of knowledge*. The acceptance or rejection of a particular technological development trajectory is determined by *the guidance on the search direction* (F2). The investigation and exploitation of business opportunities that are based on new technologies and applications is what is meant by the function *"entrepreneurial experimentation"* (F3). During this stage, a learning process is also unfolded. *Resource mobilization* (F4) is the degree to which actors operating within the TIS are able to mobilize human and financial capital in addition to complementary assets such as network infrastructure. The last three functions involve *the formation of markets* (F5), the extent of *resource mobilization* (F6), and the capacity to establish *legitimacy* (F7) for the new technology (F7) (Jacobsson and Bergek, 2011).

Many researchers have developed various analysis tools and conducted empirical research to investigate the existing structures, performances, and internal dynamics of innovation systems. However, since innovation systems are generally accepted as open systems, external factors in these systems can sometimes be more effective than factors arising from the system’s internal dynamics (Dalitz et al., 2012). Therefore, focusing only on the system’s internal dynamics may mislead policymakers. As a solution to this situation, it is recommended in the literature to analyze how actors interact or integrate between different types of systems and how different innovation systems help or hinder each other’s development (Dalitz et al., 2012). The dynamics and overall performance of innovation occur in the interaction of, at least, the national, regional, technological, and sectoral domains, from the perspective of distributed innovation over time. There needs to be more research linking TIS to the geographic domain of the NIS and RIS frameworks or the economic domain of the SIS framework (Dalitz et al., 2012). The question that needs to be answered is: how

can interactions of this kind be understood? Analyzing the interplay between different types of innovation systems and how actors can effectively incorporate the work and knowledge of external systems involves examining how a specific innovation system interacts with others through the recombination of knowledge. This approach enables the creation of variety and facilitates the generation of increasing returns. By exploring how a particular innovation system relates to others in terms of knowledge recombination, we can gain a deeper understanding of their interconnections (Dalitz et al., 2012). The existence of combinatorial knowledge base eases the functioning of innovation systems.

The technological systems framework is defined as “networks of agents interacting in each specific area of technology under a particular institutional infrastructure.” The TIS framework begins the analysis by placing a technology area at its center. It is mostly used as a framework in the manufacturing industry. However, it can also be used in a variety of industries. The assumption that problem-solving among diverse actors is coordinated by networks and a particular set of institutions serves as the rationale for the TIS framework, which was developed on the basis of this assumption. However, many significant contemporary technologies have converged and are, now, included in platform technologies. This suggests that the coordination and regulation of activities by the market and various forms of spillover do not align well with the traditional technological innovation systems (TIS) framework. As a result, the boundaries and definitions of a TIS are likely to be a topic of debate. The preceding overview of innovation systems frameworks and their critiques is concise. However, we argue that each of these frameworks represents a significant aspect of innovation and has its own advantages and disadvantages. The NIS and RIS frameworks primarily focus on institutional aspects, while the SIS framework emphasizes inter-firm competition in product markets. On the other hand, the TIS framework centers around networks for technology development and exploitation (Dalitz et al., 2012). Global innovation system focuses on the generation of resources in multi-locational subsystems and the establishment of structural couplings among them in a GIS (Binz and Truffer, 2017).



### **2.3. Eco-Innovation in the Finance Industry**

Since the Paris Agreement was signed in 2015, climate change and sustainability have become the most important agenda item in the financial services sector. The financial services sector, which plays a critical role in transition to a sustainable economy, ensures the long-term integration of environmental, social and governance issues into business life with the financing activities it offers. Monitoring the progress made in this area is important in terms of seeing how close we are to building a sustainable future both in countries and around the world.

The global climate crisis and the transition to a low-carbon economy have increased the strategic importance of sustainable finance issuances. The financial system aims to use finance in the most efficient way. While the traditional financial system focuses on creating profits in the short and medium term, green finance focuses on creating value in the long term. Green finance offers appropriate solutions to the problems caused by rising energy demand, depleted fossil fuels and natural resources. The increase in environmental awareness in the world and the support of governments for clean energy will make green finance even more popular in the future (Browne, 2011).

Due to the general neglect of control of polluting emissions, environmental pollution is getting serious, global temperature is rising and the ecological environment is greatly threatened (Sun et al., 2019). To prevent catastrophic climate change, governments have begun to take various economic measures by promoting sustainability adaptation actions (Lin et al., 2015). The concept of low carbon economy, which is based on “low energy consumption and low pollution”, has quickly become the general principle guiding the economic development of various countries (Nassani et al., 2017). The low-carbon economy and the threat of climate change echo each other, providing a new direction for the innovation of traditional financial theory; that is, traditional financial theory and practice need to adapt to the development of the low-carbon economy (Marchand et al., 2015).

By mobilizing capital to enter the green market, green finance has an indisputable role in responding to climate disruption and sustainability (Geels, 2013). Green finance stands for “financing investments that provide environmental benefits” (IFC, 2017). On the one hand, it initiates proactive, environmental-friendly behaviors such as promoting public transport, developing renewable energy or recycling used goods (Lam and Law, 2016). On the other hand, it is about avoiding the expansion of any business or activity that may be harmful to the environment (Scarpellini et al., 2018). For this reason, green finance has been frequently included in the reports of national governments and international organizations since its emergence.

Many financial organizations, especially banks, aim to produce effective and comprehensive market-oriented solutions that will address a large part of environmental problems such as climate change, deforestation, air quality and biodiversity reduction in addition to their routine work (UNEP FI, 2007). Banks play an intermediary role in collecting and distributing funds within the society to ensure economic development. Today, banks have the potential to use the allocation of financial resources for environmental protection, clean energy, green building, climate change and corporate governance in all their sectors. Therefore, the traditional banking paradigm is shifting towards the provision of environmental-friendly products (Dikau and Volz, 2020).

At the “One Planet Summit” in Paris in December 2017, central banks around the world and key players in the banking industry pledged to support the promotion of environmental-friendly financial products (Kim, 2017). The World Bank also decided not to support companies and nations that care less about protecting the environment (Urban and Wójcik, 2019). Banks such as Societe Generale, HSBC, Deutsche Bank, BNP Paribas, and Credit Agricole have embedded environmental-friendly products into their strategic corporate policies. They stated that they will stop funding individuals and organizations that harm the environment. Some central banks have developed regulations to guide green finance operations in the banking sector. However, interest in green finance is still very low worldwide. The pace of transition is likely to increase if the financial sector finances sustainable projects and companies.

In terms of the banking sector, we can summarize green finance products under the following headings.

**Green Loans:** A green loan is a type of financial support that allows borrowers to utilize the funds specifically for projects that significantly contribute to achieving environmental goals (World Bank, 2023). Green loans provide financial support for environmental initiatives like residential solar panel installations, electric vehicle purchases, energy efficiency projects, and similar endeavors. Typically, green auto loans offer favorable terms such as lower interest rates and extended repayment periods specifically designed for electric or fuel-efficient vehicles (Persofoni, 2023). At present, developing nations represent a mere \$1.6 billion of the total estimated value of \$33 billion in outstanding green loans. Nevertheless, the market for green loans in these countries is experiencing rapid expansion, surpassing the growth rate of the green-bond market in the short run (World Bank, 2023). In summary, green loans focus on the sustainable behaviour of the customer rather than the physical infrastructure.

**Green Mortgages:** Through green mortgages, financial institutions have the opportunity to provide more favorable conditions to prospective homeowners who purchase houses with a notable environmental sustainability rating or who commit to enhancing the eco-friendly attributes of their properties. As an example, Natwest, a bank in the United Kingdom, offers borrowers lower interest rates when purchasing homes with an Energy Performance Certificate rating of A or B.

**Green Credit Cards:** Green credit cards such as Aspirations' Zero card plant a tree every time users make a purchase. Usually, these cards operate in one of three ways (Leaf Score, 2023):

- (1) They are issued by a banking institution that funds green energy and sustainable initiatives (and does not fund fossil fuels). Examples of this approach include Amalgamated Bank, which issues the Green America Visa.
- (2) Offsetting carbon emissions associated with your purchases, usually through tree planting, although it can take 18 months or so from purchase

to planting in some cases. For example, the Aspiration Zero card plants a tree for every purchase over \$1.50 and more if you select certain options.

- (3) Promoting behavior change, i.e., getting consumers to switch to more sustainable products. For example, Future Card offers up to 6% cash back on purchases from more sustainable brands, helping to cut your carbon footprint at its root.

**Green Deposit:** Green deposits are time-bound investment options designed for individuals and businesses seeking to allocate their excess cash reserves towards environmentally sustainable initiatives. As the demand for green banking solutions continues to rise, several financial institutions, including HSBC and HDFC, have introduced green deposit schemes in India, catering to both corporate and individual investors (Energy World, 2023). Provided that customers keep their money in green deposits, they earn interest below the market interest rates. However, this gain adds a power to the bank to support environmentally friendly investments through credit.

**Green Bonds:** Green bonds are a category of bonds issued by either corporations or governments. The issuer pledges to allocate the raised funds exclusively towards environmentally friendly initiatives and projects (Persofoni, 2023). In particular, green bonds provide funding for projects that focus on enhancing energy efficiency, preventing pollution, promoting sustainable practices in agriculture, fishery, and forestry, preserving aquatic and terrestrial ecosystems, advancing clean transportation, ensuring clean water access, and facilitating sustainable water management (Investopedia, 2023). Green bonds are primarily categorized into two types: proceeds bonds and project bonds. In the case of proceeds bonds, the funds raised from the bonds are specifically allocated for financing green projects, such as energy efficiency initiatives or animal conservation efforts. On the other hand, project bonds involve the segregation of proceeds for particular projects, such as the development of a wind farm (Persofoni, 2023). In response to the request of a consortium of Swedish pension funds seeking to invest in climate change mitigation projects, the World Bank (WB) introduced the inaugural green bond in 2008. Since then, green bonds have gained significant prominence in the realm of green finance, comprising 93.1% of the green finance market from 2012 to 2021. Notably, in 2021,

Iberdrola, a multinational renewable energy company, issued the largest green bond ever recorded, amounting to €2 billion, with the specific purpose of financing offshore wind farm projects (Persofoni, 2023).

As the impact of climate change on the global economy grows more significant, there is a growing demand for central banks and regulators to assess its effects and take appropriate action in line with their public institution responsibilities. In fulfilling their role of imposing specific restrictions on certain lending activities, central banks and regulators should consider limiting financial flows and bank lending to borrowers engaged in carbon-intensive and environmentally detrimental practices to address potential credit market failures. It is crucial for central banks and regulators to establish a comprehensive, long-term strategy for addressing climate change and provide clear market signals to investors who play a crucial role in funding the extensive investments required for a transition to a low-carbon economy (Park and Kim, 2020).

Since the banking sector is subject to extensive regulations, the collective green banking initiatives undertaken by central banks and regulators are aimed at influencing the behavior of commercial banks. The goal is to encourage these banks to progressively transition their business practices towards more environmentally and climate-friendly approaches. This shift can benefit the banks themselves by allowing them to better manage their risk exposure. Additionally, it can help countries fulfill their climate objectives. Some banks perceive green banking as an activity related to corporate social responsibility (CSR). They recognize the increasing expectations from their clients to adopt greener and more sustainable practices and also anticipate potential reputational risks associated with not meeting these demands (Park and Kim, 2020).

Since the existing IS's do not satisfactorily explain the finance sector, we need a new IS finance centered platform innovation system (FC-PIS). The next chapter elaborates on this new initiative that can be used to explain the finance sector.

## **CHAPTER 3**

### **FINANCE CENTERED PLATFORM INNOVATION SYSTEM**

#### **3.1. Features distinguishing the financial sector from other sectors**

As stated in the introduction, the finance sector has a different structure from other service sectors. In fact, considering the dynamics of the finance sector alone, it becomes open to debate whether finance is a sector or not. In order to gain an in depth understanding of the subject, first of all, it is necessary to explain how the finance sector is different from all other sectors and its role in innovation systems. The features that distinguish the financial sector from all other sectors can be listed as follows;

- multiple deposit creation mechanism,
- taking the risk of intermediation
- reducing informal economy function
- the obligation of the resource structure to be based on foreign resources
- obligation to trade in all convertible currencies
- liquidity creation
- the situation where the insurance system does not provide tangible benefits
- the inability of all sectors in the economy to operate without the financial sector

These features are explained in detail below.

#### **3.2. Multiple deposit creation mechanism**

The deposit money is the general name given to the money created by banks, one of the biggest players in the financial system. Only the Central Bank can create

banknote, and only banks can create deposit money (Othman et al., 2020). To explain with an example, as given in Table 1, let us assume that there is only one 100 TL banknote in a market. Let us assume further that this 100 TL banknote is also deposited in X Bank. Let the required reserve ratio applied in the market be 15% (Hazar and Babuşçu, 2016).

**Table 1.** Example Calculation of Fund Creation Mechanism

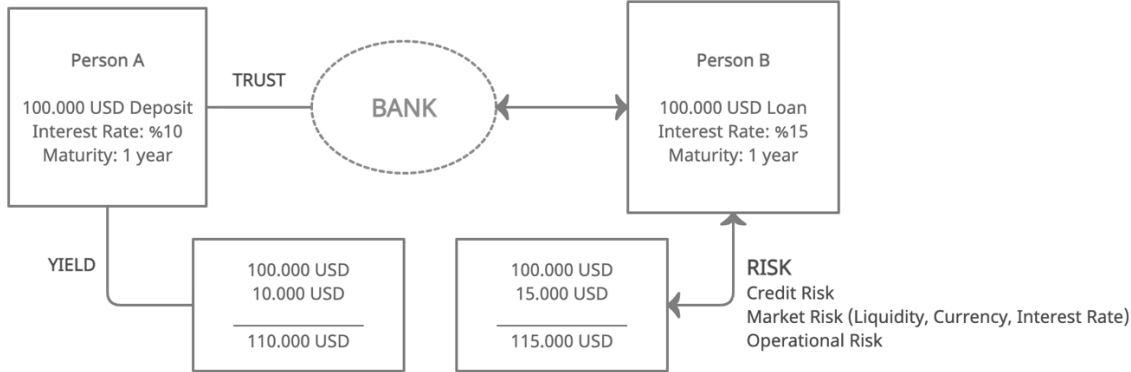
<b>Deposit</b>	<b>Required Reserve</b>	<b>Loan</b>
100 TL	15,00 TL	85,00 TL
85,00 TL		
72,25 TL		
61,41 TL		
52,20 TL		
44, 37 TL		
.....	.....	.....
.....	.....	.....
0,01 TL	0,00 TL	0,01 TL
<b>TOTAL</b>		
666,6 TL	100,00 TL	566,66 TL

(Source: Hazar and Babuşçu, 2016).

With the multiplier effect of a banknote of 100 TL deposited in the bank, the fiduciary money created in volume is brought back to the economy through the credit channel. Thus, it allows the formation of larger volumes of economic activities, much higher than the physical money printed by the Central Bank (Othman et al., 2020). According to the Central Bank of the Republic of Turkey (TCMB) data for September 2022, the TCMB physically printed 1,736,411 TL to represent the volumetric size contributed to the economy through the dematerialized money creation function. The volume of fiduciary money created through the financial system is 7,476.512,862 TL. Apart from the financial system in the economy, no player, except banks, has such a function in any sector (Kale, 2017).

**3.3. Taking the risk of intermediation**

The intermediary function has been the most basic function of banks in the past and today (Kale, 2017). Unlike other sectors, only the financial sector assumes all risks arising from its main function, intermediary services. In other words, it does not share any risks that may arise from its ordinary activities (Hazar and Babuşçu, 2016). To illustrate with an example, as given in Figure 1, Person A deposits 100,000 USD from his customer with 10% interest in the bank for one year. The bank lends this \$100,000 to Person B as a one-year loan with 15% interest. Theoretically, if Person B cannot repay the loan with interest, it should not be possible for the Bank to return the deposit to Person A with interest.



**Figure 1.** Banks’ risk of intermediation (Source: Author’s own figure)

To give an example of a service sector whose function is also an intermediary, Producer A gives the cheese it produces to an intermediary grocery store for 100 USD as shown in Figure 2.



**Figure 2.** Service sector intermediary function example with 0 risk (Source: Author’s own figure)



The intermediary grocery also sells the cheese to Customer B for \$125. If there is a problem with the product, the customer returns the product B to the grocery store and gets 125 USD back. The broker returns the faulty product to the manufacturer at the grocery and takes back 100 USD. In other words, grocery, which is an intermediary, does not take any risk arising from its intermediary activity. However, the Bank takes on the possible credit risk arising from the brokerage service it has performed here. Even if Person B does not repay his loan through various mechanisms, Person A can receive his deposit with interest. In summary, the finance sector takes on all possible risks (credit risk, market risk, liquidity, currency, interest rate)) that may arise from intermediary activities (Hazar and Babuşçu, 2016). In this way, economic activities can continue without any disruption in the market. There is no other player in the economy that operates in this way. The fact that it contains risks with its intermediary function distinguishes banks from other service sector enterprises (Kale, 2017).

### **3.4. Reducing Informal Economy Function**

Via the financial system, by ensuring that all kinds of monetary transactions are recorded, the tax of the income of the parties is deducted at the source, and this tax is transmitted to the state on time. As the financial system of a country develops, the diversity of financial instruments and the efficiency and transparency of financial institutions increase, and the motivation of economic actors or taxpayers to use the financial system may increase. This may reduce potential informal transactions by taxpayers, as well as make it easier for the government to know more about their taxable income and assets. Thanks to the advanced financial system, obtaining clearer information about taxpayers and detecting incomplete or erroneous declarations can facilitate the follow-up of taxes and increase tax revenues. Therefore, underdeveloped financial systems in most developing countries can lead to tax avoidance, a narrowing of the tax base, and ineffectiveness in tax collection. In some studies, it is emphasized that the informal economy may be associated with high financial costs (Gerxhani, 2004). Financial development can reduce the size of the informal economy by reducing the cost of loans and providing loans primarily to financially limited economic actors (Topuz, 2021). The financial system has a vital

importance in increasing the efficiency of the tax policies of the state. By developing a financial system, countries can increase their tax revenues (Pata and Ela, 2020).

Relationships established by the financial sector with its stakeholders are basically carried out on the basis of trust. The fact that the audit mechanisms regarding the financial sector are strict and that there are special regulations regarding both the institutions and activities of the said institutions is also an indication of how important the system is. As a matter of fact, it is not possible to tax all kinds of earnings that are not recorded in the economy. However, within the framework of the regulations made by taking into account the unique characteristics of the financial system, since all gains from intermediary transactions are recorded, these gains are taxed and transferred to the state as soon as they arise. Since developments that reduce informal economic activities are very likely to increase tax revenues, a relationship can be established between the development of the financial system and the size of the informal economy (Topuz, 2021) If there is a gain outside the financial system, one of the parties bears the cost while the other earns income, and there is no tax in these unregistered transactions. Naturally, the tax loss of the state arises. Effectiveness and efficiency of the tax collection mechanism are crucial since tax revenues are required to fund government development and non-development expenditures (Akram, 2016).

Businesses and taxpayers will employ a nation's financial institutions to execute their transactions if those institutions are well developed, transparent, and efficient (Othman et al., 2020). In return, the authorities responsible for collecting taxes are able to obtain useful information from these institutions regarding the assets and income of taxpayers. However, when financial institutions are not expanded to their full potential, the size of the shadow economy grows, and it becomes increasingly difficult to obtain correct information for tax purposes. As a result, the growth of the financial sector is also an essential factor in determining the amount of tax income collected (Akram, 2016).

For this reason, states try to reduce informal transactions as much as possible, thus minimizing tax revenue losses. At this point, the function should be performed by the

financial system. The Banking Sector is differentiated from other service sector enterprises due to its basic intermediation function as well as the tax dimension of the transactions. Banks are an important taxpayer and responsible for the taxes they pay such as corporate tax, bank and insurance transactions tax. Considering other taxes paid by banks, it is seen that banks are important institutions in terms of tax revenues (Sümer, 2013).

For example, income tax is deducted from the interest income obtained by individuals or companies from deposits collected by banks. In addition, Banking Insurance Transaction Tax deductions are made on the loans that banks place on the market, and finally, corporate tax is paid on the profits obtained by the banks as a result of their own activities. For this reason, if the banks that take the largest share in the financial system go bankrupt, there will be a serious decrease in the efficiency of the government's tax policy and in the tax revenues of the government. In addition, today's new digital platform economies have embedded financial payment instruments at the core of their ability to operate. In addition to banks, other financial payment instruments also play a role in indirectly creating tax revenue for the government and reducing informality by ensuring that all monetary activities in the system are recorded.

### **3.5. The obligation of the resource structure to be based on foreign resources**

Banks mediate the transfer of national and international idle funds in the economy to those in need. The increase in production, economic growth, and employment plays an important role in many economic activities. In this respect, it is aimed to prevent situations that may endanger financial structures by subjecting them to strict supervision by the supervisory and surveillance authorities during their establishment and operation. In fact, the state plays a primary role in the survival and healthy functioning of banks. The existence of banks leads to the realization of the economic policies of the state by providing the economic resources in a healthy way and transferring them to the relevant places. It also provides a very important support to the budget revenues by allowing the taxation of all kinds of earnings realized in the banking system. Unlike other businesses, this function undertaken by banks naturally

obliges them to engage in foreign resource-based activities. The main purpose of banks to continue their activities is generating income from fund intermediary services, unlike the use of the capital they have put in and the expectations of generating income due to this. In this framework, the activities of banks are mainly focused on borrowing resources from economic units and lending them. This situation ensures that the resource structure is foreign resource-weighted. The choice of liability structure is an integral part of a bank's decision on capital structure. It is different from the capital decision of non-financial firms because these firms do not have deposits on balance sheets. The selection of a bank's capital structure includes consideration of its liability structure. Because non-financial firms do not have deposits on their balance sheets, it differs from the capital decision made by those companies (Gambacorta et al., 2021).

The liabilities of the bank balance sheets show the resources of the bank. Equity has an important place in the resource structure of a normal business enterprise. However, unlike other businesses, banks' foreign resources take up much more than their own funds. For example, according to the Banking Regulation and Supervision Agency (BDDK) end of period data for December 2021, while the share of deposits and non-deposit resources in liabilities is 92%, the share of equities is 8% (BDDK, 2021).

As a matter of fact, it is not possible to see a zero foreign resource situation in a bank, while other examples of businesses that can continue their activities without any foreign resources can be found. Banks have to take place in international financial markets in order to access foreign resources. For this reason, banks, which are one of the most important parts of the financial system, are actually a player of the global financial system.

### **3.6. Obligation to trade in all convertible currencies**

Convertibility typically refers to the act of transforming one form of value into another, along with the specific criteria governing this conversion process. In the context of currency, convertibility refers to the ability to exchange a country's

currency for gold or other currencies, as determined by an established exchange rate or parity system. In practical terms, if you visit a bank within a particular country and can obtain a foreign currency in exchange for the domestic currency by adhering to the prescribed exchange rate, it indicates that the currency of that country is deemed convertible (Eğilmez, 2014).

In the case of convertibility, if the person wants to bring the TL in his hand and convert it to dollars, for example, the Central Bank undertakes to make this change at the current exchange rate. This commitment of the Central Bank allows other banks or exchange offices to do the same. What is important in convertibility is that a country accepts its own money in exchange.

If the currency of a country is accepted as a means of payment by banks or individuals and institutions of other countries, that currency is not only convertible but also reserve currency. The dollar and the euro are examples of both convertible and reserve currencies. Partially Yen, Pound, Swiss Franc can also be accepted in a similar position. If a foreigner wants to pay the price of a good purchased in Turkey in Dollars or Euros, the seller can accept this because both the dollar and the euro are not only convertible but also ubiquitous reserve currency. On the other hand, if you make a similar application with TL in the United Kingdom, it will not be possible to accept it except in some exceptional cases. This situation shows that TL is convertible but not in the reserve currency position.

The bank is obliged to fulfill the request of the customer, who approves the exchange rates determined by the bank and brings a convertible currency to the bank and wants to receive another currency in return. For example: customer A brought £100 to the bank and asked for TL in return. If the bank rate is  $1 \text{ £} = 20 \text{ TL}$ , the bank takes the dollar from the customer and gives 2.000 TL in return. In this case, the bank will have a different currency in its vault. If the bank does not request a loan in this currency, the bank has to dispose of this money somehow. The solution has to be produced by the bank itself. Similarly, if a customer brings Swedish krona and wants to open a deposit account, the bank cannot ignore it by saying that it does not need this currency. He has to get the Swedish krona and open the account. After this stage,

the bank has to come up with a solution in which it will evaluate or somehow dispose of the Swedish krona in the vault. All these types of transactions require banks to operate in all kinds of convertible currencies, and they constantly have to bear the exchange rate risk. As a result of this necessity, the financial system is naturally a global player. In other words, the boundary of the financial sector cannot be limited on a regional or national scale. The financial sector is a global player by nature.

### **3.7. Liquidity Creation**

According to modern financial intermediation theory, one of the important roles of banks in the economy is creating liquidity (Bryant, 1980; Diamond and Dybvig, 1983). Banks create liquidity by providing their customers with the right to withdraw their deposits on demand, in other words, by converting illiquid assets into liquid liabilities. Meanwhile, banks are exposed to funding liquidity risk due to maturity mismatch. The basis of the liquidity creation theory goes back to Adam Smith (1776). The view that banks' liquidity creation is vital for economic growth is the main subject of Adam Smith's famous book "The Wealth of Nations" written in 1776 (Smith, 1776). Banks retain loans that cannot be sold quickly and at high prices, and provide demand deposits that allow their customers to withdraw their savings whenever they want. If the bank's liabilities are more liquid than its assets, it creates a liquidity mismatch and puts the bank in financial distress if savers demand their deposits at the same time. Except for the finance sector, no sector creates liquidity arising from intermediation activities.

### **3.8. The situation where the insurance system does not provide tangible benefits**

Unlike many other sectors, the insurance industry is one of the unique sectors that does not provide tangible benefits. With the insurance transaction, the insured gets a piece of paper called a policy for a certain fee. In many service sectors such as health, tourism, logistics, benefits are quite tangible. For example, we can define tangible benefits for individuals as receiving healthcare services at a hospital, taking a vacation at a hotel and benefiting from the various facilities of that hotel, or going to the courier and providing the transfer we need. However, the same situation does

not apply to the insurance system. You buy an intangible assurance for the price you pay. The only tangible item you have is the policy. It is also unclear whether tangible benefits will be realized. In order for the tangible benefit to occur, a damage situation covered by the insurance will have to occur. In this way, it is aimed to have the insured's economic situation before the damage. Compensating the economic loss is a tangible benefit and it is difficult to compensate for the moral loss caused by the damage. However, the insurance system is a system that supports the recovery of moral as well as material peace. It is there for people in their most difficult times. With this structure, it would not be wrong to define insurance as a unique service sector in the world.

We can expand the subject a little more. Insurance companies create huge sums of money for this intangible benefit. These funds collected from insurance and pension systems in developed countries are of critical importance for the macroeconomic structure. It would not be wrong to say that insurance companies and banks are the two business groups in the world that have this fund raising privilege. The negative or erroneous evaluation of the collected funds in the financial markets or the operation of insurance companies that are not financially strong will trigger global economic crises or recessions. In this context, the International Association of Insurance Auditors (IAIS) has recommended the implementation of Solvency Financial Adequacy Criteria for the insurance system to all world states, especially EU member states. In summary, both insurance companies and banks are actors that have the ability to collect funds and have official permission in this regard. Therefore, we can define these two business lines as platforms of critical importance for the global economic system.

### **3.9. The inability of all sectors in the economy to operate without the financial sector**

All of the actors in the economy have to use money for all kinds of economic activities. It is the Central Banks that produce money on a limited scale. However, it is known that fiduciary money is used more than physical money during the execution of monetary activities in the economy. As stated before, the volumetric

size of the money brought into the economy with the multiple deposit creation function is approximately 430 times the physical money printed, according to September 2022 TCMB data. It is only the financial system that creates this money. Without the financial system, the capital needs of the investors would not be met, and the savers would not be able to utilize their funds. By assuming all kinds of risks related to the transactions within the scope of the intermediary function, it makes a positive contribution to many macroeconomic indicators such as the increase in production, employment, and the growth of the economy by regaining the idle funds in the global economy in an environment of trust.

The financial system eliminates the distances related to the positions of buyer-seller or supply-demand parties in monetary transactions, and ensures that transactions are carried out in a short time and completely under the record. In this way, it also eliminates the difficulties and risks of physically moving money in the global market.

To summarize, all actors in the economic system are dependent on the financial system while showing their activities. It is not possible for any sector to carry out sustainable economic activities without being included in the financial system in today's conditions. The financial system in an economy is formed as a result of the combination of certain people and institutions, markets, tools and organizations to perform various functions together. The overall economic success seems to depend to a large extent on the efficiency of the financial system. On the other hand, within the framework of the systems approach, it is also known that the efficiency of the financial system ensures the stability and effectiveness of both the general economic system and other sub-systems.

### **3.10. Need for the Finance Centered Platform Innovation System**

If we go back to the purpose of this research within the framework of the difference between the finance sector and the other sectors, the aim of this thesis is to make a policy proposal to increase the ecological innovation capacity of the financial sector. In this context, the significant barriers and drivers of ecological innovations in the finance sector are investigated.



The first obstacle to ecological innovation is that the unique dynamics of the finance sector (banking and insurance) are different from all other sectors. When a classification is made according to the business line, that is, the nature of the economic activities, the sectors are divided into four as primary, secondary, tertiary and quaternary sectors. The primary sector is the sector that directly utilizes natural resources in the economy. This sector includes agriculture, forestry, fishing and mining. Most of the products obtained in the sector are used as raw materials for other industries. The secondary sector is the sector where natural resources or raw materials are transformed into products that will be used to meet consumer needs. The secondary sector (or industrial sector) is the economic sector that defines the role of production. It is provided outputs by the primary sector (the sector in which raw materials are produced) and creates final products suitable for sale to consumers with local businesses and for export (through the tertiary sector's distribution routes). The tertiary sector is characterized by the production of products which are not particularly tangible goods but also known as services that help meet people's needs. Lastly, the quaternary sector of the economy encompasses economic activities that are centered around the intellectual or knowledge-based aspects. This sector includes fields such as information technology, media, research and development, information-based services involved in generating and sharing information, as well as knowledge-based services such as consulting, education, financial planning, blogging, and design. If we accept finance as a sector, according to these classifications, the first analytical framework that we come across is sectoral innovation systems approaches. Sectoral systems are characterized by three elements that influence the invention and adoption of new technologies, as well as the organization of innovation and production at the sectoral level: knowledge (and its associated boundaries), actors and networks, and institutions (Malerba, 2004). The focus on knowledge and the technological domain, within dynamic approach, places the question of sectoral borders at the center of analysis, which are usually not fixed but fluctuate over time. Knowledge and fundamental technologies impose significant limits on the whole range of variation in the behavior and organization of industrial enterprises in a sectoral system. Accordingly, when the financial sector is evaluated according to the nature of the work done, it is evaluated in the tertiary sector category.

Dynamically, the focus on knowledge and technology also places the issue of sectoral boundaries, which are often not fixed but change over time, at the center of the analysis. Information and basic technologies place great constraints on all the diversity in the behavior and organization of firms active in a sectoral system. However, the financial sector is not a sector that focuses only on certain basic technologies in the first place. At this point, all operations of the financial sector absolutely center on the developments in information technologies. However, when an evaluation is made in the context of the intermediary function of the finance sector affecting all other sectors, it should be considered that it includes different technologies that connect all sectors. When considered in this context, it is not possible to set a limitation in the context of basic technology. In summary, it is not possible to determine the boundaries of the financial sector, which has compulsory interaction with all sectors, only in the context of the financial sector. The financial sector primarily differs from the sectoral innovation system approach primarily in terms of its boundaries. Sectors and sub sectors (including product groups and product segments) constitute the boundaries of SIS. However, the boundaries of the financial sector are multi scalar, multi sectoral, and technology embedded. In other words, it cannot be geographically limited as it interacts with many sectors. Technology, on the other hand, is an element embedded in the financial system.

In this case, no matter how it is evaluated, there are some features that distinguish the finance sector from all other sectors. There is no other sector in which these features are found as a whole. Therefore, the SIS framework is not the right choice to evaluate the financial system.

When we consider the TIS framework, we are expected to choose a central focus technology and evaluate the innovation system in this context. In addition, the majority of the examples using the TIS framework in sustainable transition studies are examples from the manufacturing industry. However, when it comes to the financial sector and ecological innovations, it is not possible to put a single technology at the center. Not all ecological innovations are technological, and the financial sector does not operate in the manufacturing sector.

### **3.11. Finance Centered Platform Innovation System**

The field of innovation systems has been shaped by the work of several pioneers who have contributed to different perspectives. As stated in Moallemi et al., 2014, Freeman, Lundvall, and Nelson are associated with the National Innovation System (NIS). Cooke et al. (1997) and Saxenian (1998) are the pioneers of the Regional Innovation System (RIS). Breschi and Malerba are known for their work on the Sectoral Innovation System (SIS), while Carlsson and Stankiewicz are associated with the Technological Innovation System (TIS). Ogutcu Ulas is the founder of the Finance Centered Platform Innovation System (FC-PIS). In terms of “Boundary”, the perspectives are NIS (country-level boundary), RIS (regional boundary), SIS (sector-level boundary), TIS (technology-based boundary), and FC-PIS (multi-scalar, multi-sectoral, technology-embedded boundary). Each of these perspectives offers a unique way to define and analyze boundaries, whether they are geographic, sectoral, or technological in nature.

For “Purpose”, NIS focuses on comparing the innovative performance of countries, analyzing the role of technology in economic growth, and determining policies for stimulating innovation in a country (Moallemi et al, 2014). RIS is concerned with determining a region's economic performance and regional innovation policies. SIS analyzes innovation in different sectors and develops industrial policies and strategies. TIS analyzes technological development from a structural and functional perspective, identifying drivers and barriers of development, and making technological development policies. Finally, FC-PIS focuses on analyzing finance-centered global eco-innovation performance, stakeholder mapping, identifying drivers and barriers of development, policy making, and determining strategies for stimulating eco-innovation in a finance-centered platform innovation system. Similar approaches are used in analyzing innovation from various perspectives. The approaches include neoclassic economic growth models, Porter's diamond model, and triple helix for NIS. RIS uses industrial districts, technopoles, innovative milieu, and learning regions. For SIS, industrial economics, transition costs, sunk costs, and game theoretical models are utilized. TIS adopts competence bloc and large technological systems. FC-PIS relies on evolutionary economics, complex adaptive

systems, social network analysis, and actor-network theory. As for “Structural analysis”, NIS takes a broad view and considers all social, economic, technological, and political components of a country, while RIS is narrower and focuses on the actors and relations directly involved in innovation within a region. SIS emphasizes knowledge and learning processes, actors and networks, institutions, and demand, while TIS analyzes actors, institutions, technologies, relations, and networks. FC-PIS, on the other hand, shares a similar focus with TIS, analyzing actors, institutions, technologies, relations, and networks within a finance-centered platform innovation system. In terms of “Functional analysis”, NIS views the development, diffusion, and utilization of innovation as the major sub-functions of the innovation system. RIS focuses on the internal dynamics of interactive learning, knowledge production, proximity, and social embeddedness. SIS emphasizes the generation of dynamics in two processes, variety creation, and selection. TIS identifies seven functions of knowledge development, knowledge diffusion, entrepreneurial activities, guidance of the search, resource mobilization, market formation, and legitimacy. Lastly, FC-PIS defines six functions of knowledge development, knowledge diffusion, resource mobilization, market formation, legitimacy, and positive externalities (Moallemi et al., 2014).

From the perspective of “Transitional analysis (evolution)”, the analysis of institutions and firms formation and their integration in a country is the focus of NIS. RIS, on the other hand, examines the development of networks among firms within a specific region, emphasizing interactive learning in three categories: knowledge production, proximity, and social embeddedness. SIS delves into the industry life cycle and long-term evolution, exploring dynamics through two processes: variety creation (via R&D and innovation) and selection (through market and non-market selection processes). TIS assesses the system's evolution based on the succession model of innovation, which includes four stages: Science technology policy motor, entrepreneurial motor, system building motor, and market motor. FC-PIS examines the system's evolution based on the succession model of eco-innovation, incorporating stakeholder analysis, system functions, and transformation.

The main property of the perspectives is their emphasis on different aspects of innovation and economic growth. The NIS perspective highlights the significance of technological advances, while the RIS perspective emphasizes the importance of regional clusters. The SIS perspective considers the sectoral dependency of innovation-affecting factors, whereas The TIS perspective focuses on the economic competence of developing and exploiting new business opportunities and system dynamics. Finally, the FC-PIS perspective emphasizes the twin transformation, exploiting externalities and adopting a holistic approach to system dynamics and evolution (Moallemi et al., 2014). All this information is summarized in Table 2.

The final quarter of the 20th century witnessed significant events that had a profound impact on international economic developments. These events included the adoption of liberal economic practices, increased collaboration among countries, specific capital flows to developing nations, technological innovations, the growing significance of the energy sector, and rapid advancements in financial markets. Notably, this period also saw the emergence of significant crises that affected the performance of both developed and developing economies. The global economy faced challenges due to heightened international economic collaboration, the climate crisis, and the swift movement of capital between countries, leading to the transmission of risks like a contagious syndrome. Consequently, the financial sector experienced crises in recent years, highlighting the need for restructuring and strengthening. This has prompted accelerated efforts for international collaboration and a particular emphasis on establishing, adopting, and implementing standards related to the regulation and supervision of the banking system and other sectors that inherently carry risks (Özince, 2008).

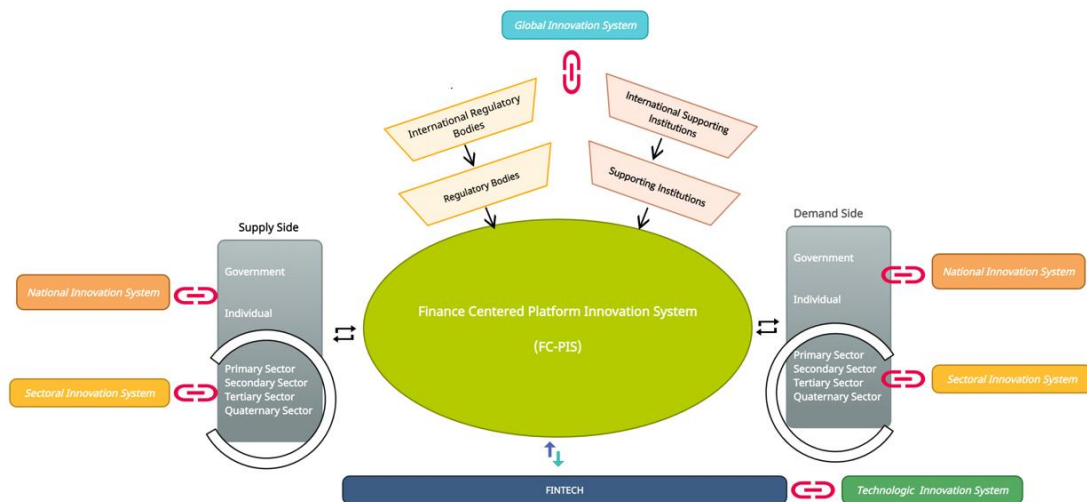
To make a simple definition, the financial sector transfers the resources it obtains from real and legal persons to users according to certain rules through its intermediation function. In fact, the real owner of the resource subject to the brokerage service is not the broker itself. It borrows this resource, which is the subject of the intermediation, for a certain period of time and lends it for a certain period of time. It receives an income from the people and institutions it gives as a resource usage fee for that period. It also transfers a certain part of this income to

**Table 2.** Differences of FC-PIS (Source: Adopted from Moallemi et al., 2014)

	NI2	KI2	SI2	II2	FI-PIS
<b>Founder/year Boundary</b>	Freeman, Lundvall, Nelson Geographical boundary: a country	Cooke et al., Saxenian Geographical boundary: a region (inside or among countries)	Breschi and Malerba Sectors, sub sectors (including product groups and product segments)	Carsson and Stankevicz Technology as a knowledge field, product, set of related products aimed at satisfying a particular function (competence bloc)	Ogutu Ulas Multi sectoral, Technology embedded
<b>Purpose</b>	Comparing innovative performance of countries; analyzing the role of technological advances in economic growth; determining the socio-economic policies and strategies for stimulating innovation in a country	Determining a region's economic performance: regional innovation policy	Analysis of innovation in different sectors; development of industrial policies and strategies	Analyzing technological development from structural and functional perspective; identifying drivers and barriers of development; technological development policy making	Analyzing Finance Centered Global Eco-Innovation Performance: Stakeholder Mapping, and functional perspective; identifying drivers and barriers of development policy making; determining policies and strategies for stimulating eco-innovation in a finance centered platform innovation system.
<b>Similar approaches</b>	Neoclassic economic growth models; Porter's diamond model; triple helix	Industrial district; Technopoles; Innovative milieu; Learning region	Industrial economics (structure, conduct, performance); transition costs approach; sunk costs model; game theoretical model of industrial economics literature; econometrics studies	Competence bloc; Large technological systems	Evolutionary Economics, Complex Adaptive Systems, Social Network Analysis, Actor-Network Theory
<b>Structural analysis</b>	Broad: All social, economic, technological, and political components of a country	Narrow: actors and relations interacting directly with innovation Four components of firms, institutions, knowledge infrastructures, and policy-oriented regional innovation	Knowledge, learning processes, actors and networks, institutions, demand	Actors, institutions, technologies, relations, and networks	Actors, institutions, technologies, relations, and networks
<b>Functional analysis</b>	Several sub functions defined in the domain of three major ones: development, diffusion, and utilization of innovation	Classification of internal dynamics in three categories of interactive learning, knowledge production, proximity, and social embeddedness	Generation of dynamics in two processes: variety creation (by R&D and innovation) and selection (by market and non-market selection process)	Seven functions of knowledge development, knowledge diffusion, entrepreneurial activities, guidance of the search, resource mobilization, market formation, and legitimacy	Six functions of knowledge development, knowledge diffusion, resource mobilization, market formation, legitimacy, and Positive Externalities (entrepreneurial activities; guidance of the search)
<b>Transitional analysis (evolution)</b>	The formation of institutions and firms in the country; integration of systems' components	Classification of internal dynamics in three categories of interactive learning, knowledge production, proximity, and social embeddedness The development of networks among firms located in a region	Generation of dynamics in two processes: variety creation (by R&D and innovation) and selection (by market and non-market selection process) The life cycle of industry, and long-term evolution of industries	System's evolution based on the succession model of innovation including four stages of STP motor, entrepreneurial motor, system building motor, market motor [78]	System's evolution based on the succession model of eco-innovation including stakeholder analysis, system functions and transformation.
<b>Main property</b>	Emphasis on innovation and technological advances as a factor affecting the economic growth of countries	Emphasis on regional clusters as important factors in the innovation process	The dependency of innovation affecting factors on sector	Emphasis on economic competence: the ability to develop and exploit new business opportunities, emphasis on system dynamics and system evolution	Emphasis on twin (Eco-Digital) transformation, the ability to externalities to exploit new business opportunities, emphasis on system dynamics and system evolution as a holistic approach

resource owners. In summary, the financial system is in fact a platform that brings together those who supply funds and those who use funds.

When we re-evaluate the finance sector in the light of all this information, we can see that finance is more of a system than a sector. In this context, according to the system approach, financial intermediation services are not a sector, but a platform system that centers finance (money) and even technology. It is a platform that has different dynamics and features not found in any other sector, and on which all sectors operate. Dictionary meaning of the word platform is “a flat raised structure or area, usually one which something can stand on or land on”. If we start from here, actually platform creates value by facilitating exchanges between two or more interdependent groups, usually supply side and demand side. Financial system is a money-centered, technology-embedded platform that brings together funders and fund users. This platform refers to a large system consisting of financial markets, financial institutions and financial transactions and in which many financial technologies and digital platforms are included. In Figure 3, all players of the FC-PIS (Finance Centered Platform Innovation System) and their connections with other innovation systems are schematically visualized.



**Figure 3.** Finance Centered Platform Innovation System (FC-PIS)

(Source: Author’s own figure)

Within the scope of this study, the term “Finance centered platform (FCP)” will be used instead of the term “Finance Sector”. FCP supports or facilitates transactions and interactions across a large number of participants. The FC-PIS actually refers to a redesign of the financial system in which ecological innovations are included within the framework of global agreements and digital transformation under the pressure of the climate crisis. In other words, it is a redefinition of a large platform innovation system that expands its scope by including ecological innovations, not independent of technology and other innovation systems.

Today, variables such as the climate crisis and the Paris Climate Agreement should be added to innovation system approaches as an external factor. The Paris Climate Agreement and similar agreements are important to force governments to take eco-actions, but the reality of the climate crisis does not change. The capitalist system continues to harm nature. In fact, these agreements, in a sense, mean a sanction to stop this damage. Here, the most indispensable part of the system, the funding system, necessitates such a systemic innovation structuring, including ecological innovations, under the reality of the climate crisis. Since the current innovation system approaches do not meet these needs and funding is an indispensable system for anyone, we need to define a new system.

According to the evolutionary approach, the main variables in explaining economic growth are technology, capital, knowledge and labor. The financial sector plays an important role in the economic growth process because capital accumulation is an important part of both the collection and utilization of resources and the creation of new technologies (Özince, 2008). The financial system plays a crucial role in the process of capital accumulation, which involves saving and investing a portion of current income to enhance future production and income levels. It serves as a means of financing investments by facilitating the allocation of savings from individuals who participate in financial markets. These savings are pooled together in the financial markets and subsequently transferred to individuals or entities seeking to undertake investment projects that exceed their available resources, typically through the provision of loans. Samples in this stream of literature typically exclude the financial sector because of its limited direct environmental impact. However, banks



have an important responsibility when allocating funds to companies that pollute and produce unsafe products. Due to banks' function as economic intermediaries, their evolution toward sustainable banking serves as a lever for sustainability in other industries and overall sustainable development (Forcadell et al., 2019).

The FC-PIS is basically in a mandatory organic bond with all sectors, both on the supply side and on the demand side. As explained in detail before, all sectors have to interact with the FC-PIS while continuing their activities. The FC-PIS refers to a structure that mediates between supply and demand by putting ecological innovations at the center. It transfers the resource surplus of the primary, secondary, tertiary and quaternary sectors to those who need resources in the same sectors by taking the risk. When evaluated in this context, it has the ability to directly or indirectly affect all sectors and even direct these sectors to become green with the appropriate conditions (interest, maturity, collateral, etc.)

The FC-PIS interacts directly with national innovation systems. It assumes an important function in the provision of this resource for businesses that need resources for their activities and cannot increase their activities, that cannot grow or renew them due to the lack or insufficiency of their own resources, and that cannot benefit from new technologies. With the supply of the necessary resources, the increase in the use of labor and the decrease in unemployment, and in terms of macroeconomic indicators, an increase in income per capita with the increase in production is possible.

At the same time, the FC-PIS has a serious function in issues such as selling some produced goods and services abroad after the domestic needs are met, that is, the increase in exports, the entry of more foreign currency into the country with the increase in exports, thus reducing the current account deficit and even causing the country to have a current account surplus. Taking this function into account, the state supports, closely monitors and supervises the banking sector, and ensures the formation of financial structures that will prevent banks from failing because the existence of the FC-PIS is necessary for the economy. The FC-PIS is an important national actor in this context. Their relationship with the state is basically formed in

the context of politics. Green government policies should be designed to support the green transition of the FC-PIS, which also plays an important role in financing the national budget deficit. The government cannot directly sell bonds. Government borrowing is also realized through the FC-PIS.

In summary, the FC-PIS is an important national actor due to many operations such as regulations, tax collection, and resource transfer. Financial resources have an important place in the context of ecological innovations. As a result of international agreements and global change, the FC-PIS can be considered as the first system that needs to realize the green transformation in order to access international funding sources because international funding sources force these funds to be used only in green works while being transferred to the financial system. Banks, which are the most important players of the FC-PIS, must first access low-cost and low-risk financial resources to ensure their own financial sustainability. This naturally forces the sectors in need of resources to green transformation. This indicates the interaction of the FC-PIS with other sectoral innovation systems in the context of ecological innovations.

The interaction between the FC-PIS and global innovation systems has many dimensions. Developments in the field of communication and transportation, with the contribution of technology, the desire of developing countries to participate in economic cooperation, and applications for free movement of capital have led to some changes in financial markets. In this process, financial markets were fully integrated with rapidly growing digital technology, and a global market was formed (Özince, 2008). Geographical borders are nostalgically left on the maps, while economic borders have almost disappeared. International rules and institutions have gained importance in the regulation of international economic relations. Economic and financial issues have started to be investigated with a universal approach.

Another important development in the new economic structure was the change in the supply structure. International banking activities have grown significantly since the 1960s, depending on the increase in international trade flows and foreign direct investment activities. Thus, the international economic integration of developing

countries was not only limited to the movement of goods and services. The capital movements also followed a remarkable course. Liberalization policies implemented in many countries in the 1990s and regulations allowing foreign banks to open branches and establish banks, banking crises in developing countries, international capital flows, and technological innovations, especially in developing countries, led to a significant increase in the share of foreign banks in the sector. Opportunities such as the approaches that open domestic markets to the competition of foreign banks, changes in international standards regarding the regulation and supervision of banks in developing countries, the development potential that foreigners see in developing countries, and higher profitability have affected the banking activities in these countries (Özince, 2008). The FC-PIS does not only receive funding from national funding sources but also trades in all convertible currencies. This makes the FC-PIS a direct global actor.

On the other hand, climate actions affect individuals closely. One of the reasons why individuals interact with the FC-PIS is that customers are actually an integral part of this service process. In the production sector, a clear distinction exists between the production and consumption processes, resulting in limited direct interaction between businesses and customers except at the point of purchase. Production activities typically remain hidden from the customer's view, with the focus primarily on the end product. On the other hand, services are consumed immediately upon production, and their production and delivery occur simultaneously. Consequently, businesses and customers engage in ongoing interaction throughout the entire process of service provision, with customers actively participating in the production process. This dynamic yields two significant implications: Firstly, the service provider and seller are often the same individual, with the person delivering the service being an integral part of the service itself. That is, the service cannot be distinguished from the one that produces the service. Another important consequence of simultaneous production and consumption is the involvement of the customer in the service production process. In financial services, the customer must be present personally and participate in the production process (Sayım and Aydın, 2011). Depending on the climate crisis, the world also has to deal with an energy crisis. In the case of the FC-PIS, the second dimension of the interaction of individuals with

the FC-PIS is the applied energy policy tools. For example, due to factors such as electricity pricing tariffs, individuals also need financing to access clean energy resources. At this point, individuals who want to access the advantageous fund resources provided by banks are also in direct interaction with the FC-PIS. The third dimension of the interaction of individuals with the FC-PIS is the platform where individuals with surplus funds evaluate their funds.

The fourth aspect is related to the deterioration of the natural environment, leading to a heightened environmental consciousness among consumers. As a result of this awareness, there is a growing demand for environmentally friendly products and services within the industry. Additionally, governmental bodies have implemented environmental regulations, placing additional obligations on companies to safeguard the environment (Gürlek and Köseoğlu, 2021). Considering that social awareness has a very important place in the fight against the climate crisis, the FC-PIS here forces individuals to become green, with its function of being an awareness-raising information center.

For all these reasons, the FC-PIS is in direct interaction with the NIS, SIS and GIS systems. On the other hand, the most important and indispensable part of the FC-PIS is digital transformation technologies, namely FinTechs. The FC-PIS is a platform system built directly on digital technologies, in which these technologies are embedded. All developments in digital technologies, namely TIS, directly affect the FC-PIS. When we consider all these together, it is seen that the FC-PIS interacts directly with the SIS, TIS, NIS, and GIS.

The following chapter dwells on the Functional Structural Analysis Framework, which is a scheme for eco-innovation analysis.

## **CHAPTER 4**

### **FINANCE CENTERED PLATFORM INNOVATION SYSTEM: A SCHEME OF ANALYSIS IN THE CONTEXT OF ECO-INNOVATION AND A FUNCTIONAL STRUCTURAL ANALYSIS FRAMEWORK**

#### **4.1. Need for a new Functional Structural Analysis Framework**

Although the technological innovation systems (TIS) approach provides a valuable framework for the analysis of innovation processes, it has limitations in evaluating the financial sector in the context of ecological innovations. The TIS approach may not adequately address the inter-sectoral interactions and linkages of the financial sector with other sectors (Bergek et al., 2008; Wieczorek and Hekkert, 2012; Kemp et al., 2007). In particular, the financial sector plays a critical role in financing ecological innovations, and incomplete analysis of such interactions may prevent us from fully understanding the potential of the sector (Bolton and Hannon, 2016; Schaltegger and Wagner, 2011). In addition, the TIS approach may not adequately assess the specific structures and dynamics of the financial sector and areas such as risk management and regulation (Bergek et al., 2008; Laperche and Lefebvre, 2011; Busch et al., 2016). These factors can significantly influence the decisions and strategies of financial institutions on the adoption and financing of ecological innovations (Volberda et al., 2011).

Providing the financing needed to develop, commercialize and expand ecological innovations, the financial sector supports ecological innovations through the development and delivery of green finance products and services (Ehlers and Packer, 2017; Bolton and Hannon, 2016; Clarkson et al., 2008). Therefore, a more comprehensive and integrated approach should be adopted for financial sector analysis, which considers the specific structures and dynamics of the sector and

evaluates the interactions between sectors, together with the TIS approach (Kemp et al., 2007; Geels, 2013).

In order to fill the gap in the literature, a new analytical framework was developed in this study. The newly developed analytical framework addresses the shortcomings of the TIS and considers global innovation systems (GIS) interconnections. GIS is defined as a worldwide innovation network that enables the dissemination and application of knowledge and technologies through collaborations and interactions between countries and sectors and that mitigates grand societal challenges (Cagnin et al., 2012). The connection of ecological innovations with global innovation systems is important for the diffusion and implementation of these innovations. The adoption and diffusion of ecological innovations on a global scale increases environmental and social impacts that contribute to sustainable development goals (Truffer and Coenen, 2012).

The new framework supports the integration of ecological innovations with global innovation systems by contributing to the adoption and diffusion of ecological innovations by the financial sector. The financial sector, as a global player, plays an important role in the adoption and financing of ecological innovations (Schoenmaker and Schramade, 2018). Global financial institutions can reshape their policies and strategies to support sustainable finance and the implementation of ecological innovations (Ehlers and Packer, 2017). In this context, the FC-PIS considers the finance sector as a supra-industrial superstructure, as previously announced.

International collaborations and financial regulations can help the financial sector adopt and disseminate ecological innovations more quickly and effectively (Bolton and Hannon, 2016). Therefore, the impact and responsibilities of the financial sector at the global level have a critical impact on the diffusion and implementation of ecological innovations within global innovation systems.

The newly developed framework offers a more effective and comprehensive analysis, taking into account the global impact and responsibilities of the financial sector. In this way, financial institutions and policy makers can make more informed

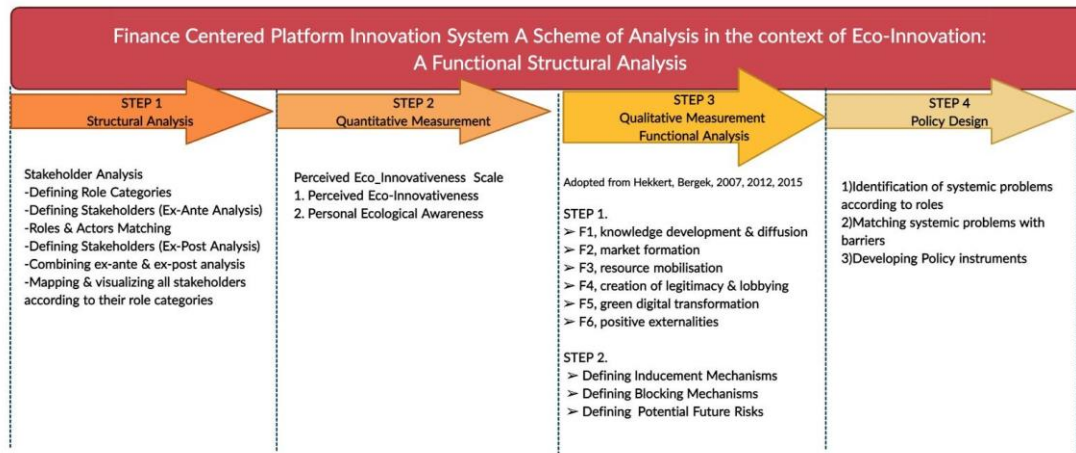
and strategic decisions about the diffusion and implementation of ecological innovations within global innovation systems (Stirling, 2014). Furthermore, the new framework emphasizes the importance of international collaborations and regulations in order to increase the financial sector's capacity to support sustainable finance and ecological innovations (Campiglio et al., 2018). This may help optimize the industry's potential to manage environmental and social impacts worldwide and contribute to sustainable development goals.

In summary, the newly developed framework, while eliminating the shortcomings of technological innovation systems approach in the context of finance sector and ecological innovations, also takes into account the links with global innovation systems and the importance of the finance sector as a global player. This can make a significant contribution to achieving sustainable development goals by providing a comprehensive and integrated analysis for more effective adoption and diffusion of ecological innovations within the financial sector. Thanks to this framework, financial institutions and policy makers can make more informed and strategic decisions about the diffusion and implementation of ecological innovations within global innovation systems. Moreover, this integrated approach, which takes into account the inter-sectoral interactions and especially the links of the financial sector with other sectors, emphasizes that the financial sector plays a key role in promoting and financing ecological innovations. Therefore, the new analytical framework can contribute to taking an important step towards achieving sustainable development goals by enabling a more accurate analysis of the financial sector's strategies and decisions towards ecological innovations.

The new framework was named as finance centered platform innovation system: A scheme of analysis in the context of eco-innovation. In the rest of the study, the abbreviation finance centered platform innovation system analytic framework (FC-PIS AF) will be used to denote the analytical framework. The steps of the FC-PIS AF are shown in Figure 4.

The FC-PIS AF offers policymakers a four-stage analysis framework. In the first step, stakeholder analysis is performed, actors and their roles in FC- PIS are defined.

The main purpose of the new framework is to analyze FC-Platform Innovation System for make policy design.



**Figure 4.** The steps of the FC-PIS AF

Source: Author's own construction

In the second step, the FC-PIS employees, who are not evaluated within the TIS framework but have an important role in the context of ecological innovations, are analyzed within the framework of the research. In the third step, important functions of the TIS approach are included in the analysis of the FC-PIS. In the final step, policy designs and tools are developed. All these steps, reasons of their importance and the analysis methods of the steps are explained in detail below.

#### 4.2. FC-PIS AF Stakeholder Analysis

Stakeholder analysis is important in studies of ecological innovations in the financial sector because the roles, expectations and interactions of stakeholders are critical to the successful implementation and diffusion of ecological innovations. Stakeholder analysis helps to develop effective strategies for achieving sustainability goals in the industry by evaluating the perspectives and resources of different actors (Freeman, 1987). Although Hekkert and Bergek's technological innovation system (TIS) approach provides an important framework to understand innovation processes and dynamics, they contain some shortcomings in terms of stakeholder analysis. The TIS approach generally focuses on technological developments, sector structures and policy tools (Hekkert et al., 2007; Bergek et al., 2008). Therefore, the emphasis on the roles, expectations and interactions of stakeholders falls short. While the TIS

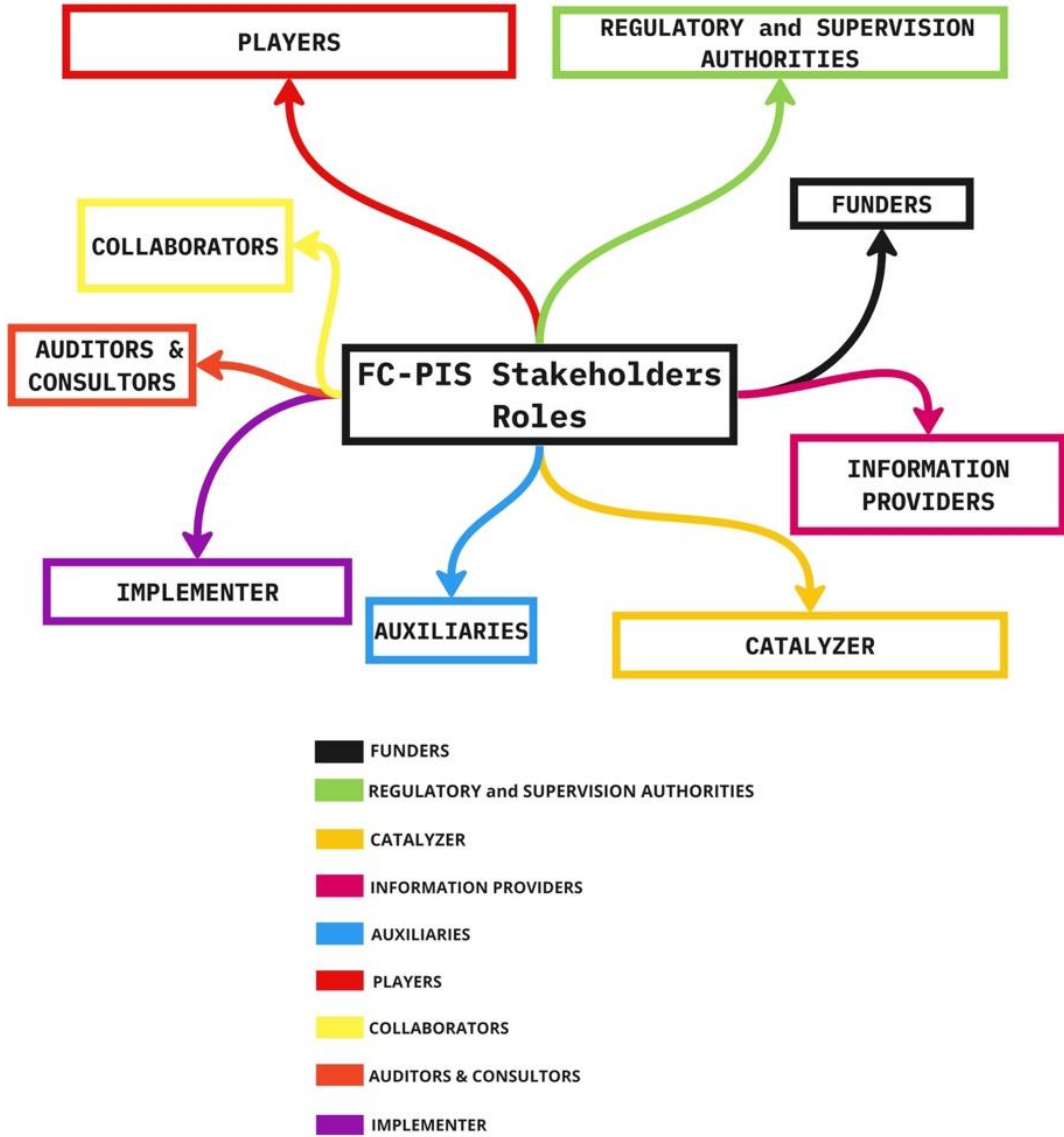


approach often address the key actors and structures, it fails to adequately assess the diversity of stakeholders. The influence of wider stakeholder groups such as non-governmental organizations, funders and global stakeholders, who are important stakeholders of a system such as the FC-PIS, can be ignored in the TIS approach. Perrini and Tencati (2006) stated that in order for businesses to adopt sustainability and be successful, they should be sensitive to the environmental and social values of all their stakeholders. Similarly, Freeman's (1984) stakeholder approach requires businesses to consider all their stakeholders, namely employees, suppliers, customers, shareholders and other interested parties such as society. Each of these stakeholders has different motivations and plays a critical role in the sustainability of businesses. For example, suppliers can help businesses reduce their environmental impact when they are encouraged to provide goods and services with environmental and social responsibility (Carter and Rogers, 2008). Likewise, the adoption of work practices in line with the environmental and social values of the employees is important for the sustainability of the enterprises and can increase the motivation of the employees (Brammer and Millington, 2008). Therefore, the adoption and implementation of ecological innovations by businesses and the financial sector is closely related to the values and motivations of the stakeholders. Since the TIS approach does not adequately take these values and motivations of businesses and financial sector stakeholders into account, it may miss an important potential resource for the adoption and implementation of ecological innovations. To complement these shortcomings, the FC-PIS AF has put stakeholder analysis at the center of its work to better understand the diversity of stakeholders and their impact.

### **4.3. Defining Role Categories and Defining Stakeholders (Ex-Ante Analysis)**

Ex-Ante meetings were held with 5 people to identify all stakeholders of the FC-PIS. Three of these people are financial experts and 2 of them are experienced experts in the field of insurance. These interviews were held between 01 June 2021 and 01 July 2021. Initially, interviews with financial experts were given priority; then, insurance experts were interviewed, and finally, extensive meetings were held with 31 interviews whose details were presented in Appendix C. As a result of these interviews, first of all, all the actors of the FC-PIS were tried to be determined

without any grouping. First, the actors were listed randomly. Then, in order to group the determined actors, their roles in the context of ecological innovations were tried to be defined in the FC-PIS. Accordingly, it has been seen that the FC-PIS actors for Turkey can be divided into 9 different groups with respect to their roles (player, regulator, collaborator, information provider, catalyzer, auditor, implementer, funder, auxiliaries). These roles represent the function of each actor group in developing ecological innovation capacity within the FC-PIS. Each role and its functions within the FC-PIS are described in detail in Figure 5.



**Figure 5.** Roles of FC-PIS Actors (Source: Author’s own figure)

### **4.3.1. Player**

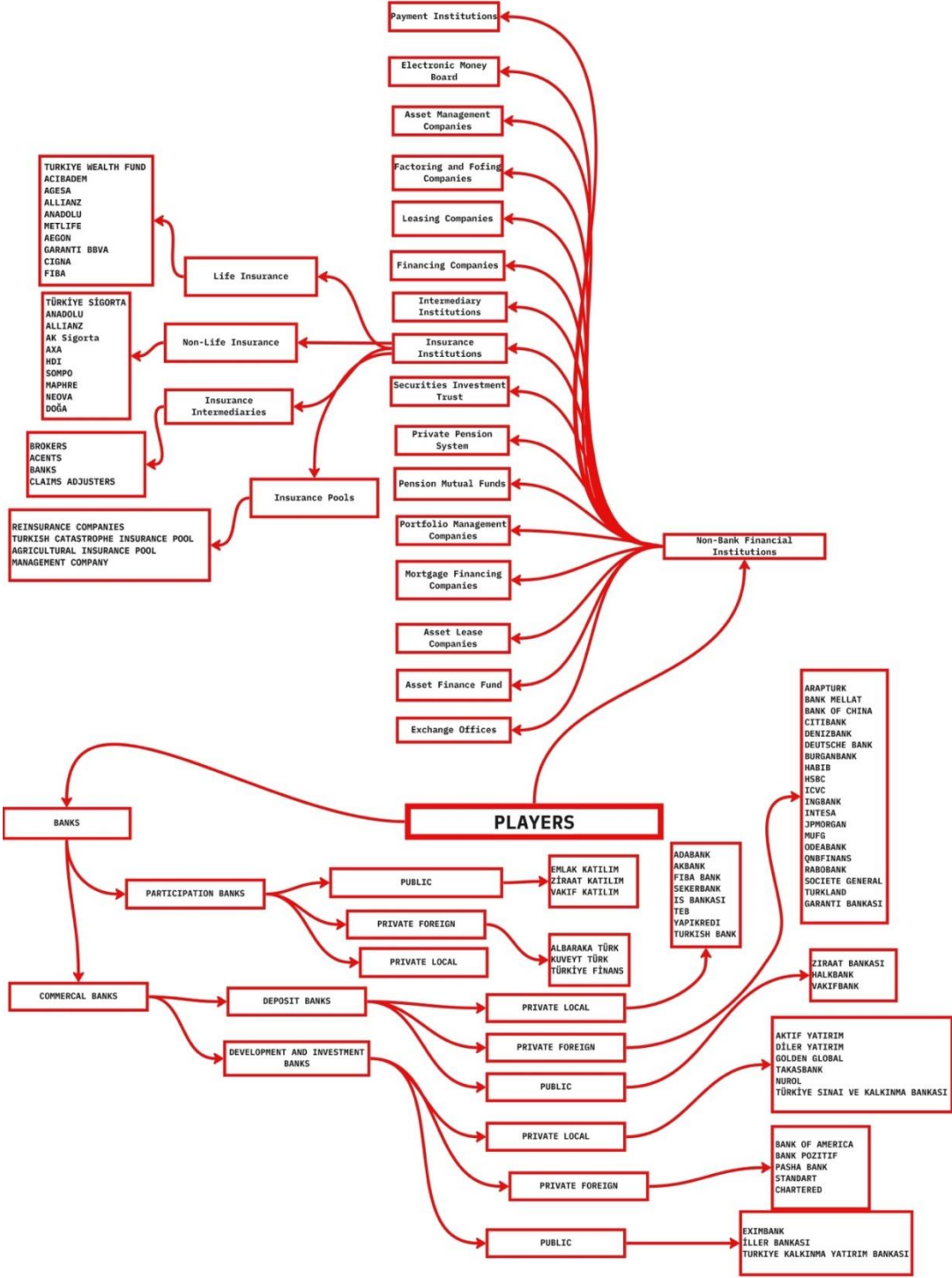
Player role refers to the role of the actors who have the function of operating the FC-PIS. As seen in Figure 6, within the FC-PIS, banks and non-bank financial institutions, which fulfill the fund needs of people by utilizing the funds of those who have surplus funds, that is, undertake the intermediary function in the system, are the players of the FC-PIS. These organizations perform a number of functions such as collecting savings, making loans, investing and transferring money. They also perform important functions such as providing liquidity in financial markets, managing risk, and providing information and advisory services on financial instruments. Among the non-bank players of the FC-PIS, one of the most important players in the context of ecological innovations is insurance companies, which are important financial institutions that provide financial assurance against the risks that individuals and institutions may encounter. These services are offered in various areas such as life, health, property and liability insurance. Insurance companies provide financial support by making indemnity payments against unexpected losses and damages faced by the insured, through funds created by premiums paid by policyholders. At the same time, they provide risk management and advisory services, helping their customers to more effectively protect against risks. In this context, the services offered by insurance companies play an important role in minimizing the financial uncertainties and risks that individuals and institutions may encounter in their lives. Banks and non-bank financial institutions are vital for the healthy functioning of the financial system. Moreover, insurance companies provide financial capital for the banking system in the form of financial investments.

#### **4.3.1.1. The Role of the Banking Industry in Enabling the Net Zero Transition**

Banks carry out many different applications and projects in the context of ecological innovations. These include:

**Green loans:** Banks offer green loans to finance environmentally responsible projects such as energy efficient homes or sustainable transportation. These loans encourage environmental-friendly investments by offering advantages such as low interest rates and favorable repayment terms (McKinsey Company, 2019).

**Green bonds:** Green bonds are another tool used to finance sustainable projects. Banks meet the financing needs of investors who want to invest in environmental-friendly projects through green bonds (HSBC Global Asset Management, 2020).



**Figure 6.** Players of FC-PIS (Source: Author’s own figure)

**Social and environmental risk analysis:** Banks analyze the environmental and social impacts of the projects they will invest in and evaluate the compliance of the projects with the sustainability criteria.

**Energy efficiency investments:** Banks provide financing for investments made to increase energy efficiency. These investments enable buildings to consume less energy and become more environmentally-friendly (European Investment Bank, 2021).

**Environmentally-friendly practices:** Banks adopt environmentally-friendly practices for their business activities and try to reduce their carbon footprints. These applications include the use of renewable energy sources, the use of environmental-friendly materials, water conservation, and waste management (Ross, 2015).

**Sustainability reporting:** By reporting their sustainability activities, banks increase investors' interest in sustainability. These reports also show the environmental and social impacts of banks.

**Environmentally-friendly training programs:** Banks organize different training programs to help increase environmental awareness in society and contribute to the dissemination of sustainability criteria (Ross, 2015).

All these practices are performed by banks that support sustainability and encourage environmentally-friendly investments. In addition to these practices, banks also contribute to ecological innovations using innovative technologies to minimize their environmental impact and adopting environmental-friendly practices in their business activities (Ross, 2015).

As a result, banks carry out many different practices and projects in the context of ecological innovations. The purpose of these practices and projects is to provide financing by considering environmental and social criteria in order to support sustainability and encourage environmentally-friendly investments. In this way, banks contribute to increasing ecological awareness both in their own business activities and in society at large.

#### **4.3.1.2. The Role of the Insurance Industry in Enabling the Net Zero Transition**

The insurance industry plays a crucial role in facilitating the transition of the broader economy to net zero and mitigating the risks associated with climate change. To achieve this, innovation in insurance products is essential. While progress is being made in the insurance industry regarding climate change, it still falls short of the level required to support the development and scaling of low carbon technologies and the necessary infrastructure. There is a need for new insurance products and risk mitigation offerings that can support the expansion of these technologies and infrastructure, allowing capital to be effectively deployed. The industry must act swiftly to meet the risk transfer and reduction requirements of clients' decarbonization strategies, anticipate evolving demands, and drive their transition to net zero, even in the face of limited customer awareness. Additionally, clients' own transition strategies are still in the early stages, lacking clarity in terms of evolving risk transfer and advisory needs. To accelerate insurance product innovation, a more collaborative approach is necessary—within insurance firms, across the industry value chain, with clients, and with the broader financial services sector—to effectively shift the economy towards net zero (Climatewise, 2021).

Achieving, and possibly surpassing, the emissions reduction goals outlined in the Paris Agreement necessitates significant and transformative actions (Finance24, 2021). Every industry and sector will experience significant impacts. According to the OECD, meeting the goals of the Paris Agreement will necessitate an annual investment of around EUR 6.35 trillion globally by 2030. The business community will play a central role in driving these substantial changes, supported by consumer engagement and participation (OECD, 2018). The insurance industry will play a crucial role in facilitating the transition by ensuring the efficient flow of capital to support climate change mitigation efforts and global emission reduction actions (Climatewise, 2021). The extent and magnitude of transition risks can vary depending on the nature, speed, and specific objectives of the changes. These risks can potentially expose organizations to financial and reputational vulnerabilities. As a key player in managing risks for society, the insurance industry holds a crucial responsibility in facilitating measures to mitigate and adapt to the challenges posed

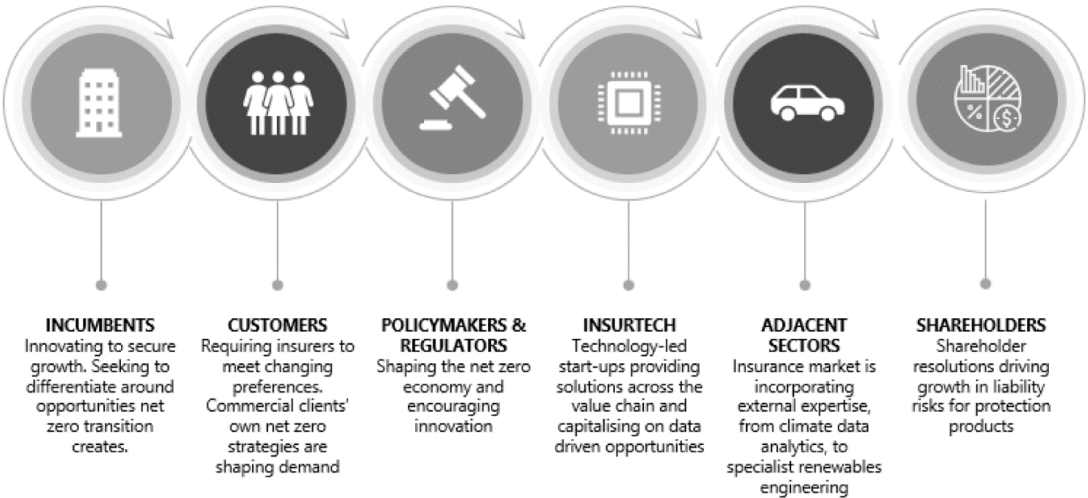
by climate change (EIOPA, 2021). The insurance industry has the potential to contribute to building a sustainable future by offering risk services that assist clients in reducing transition risks and by creating incentives that encourage a shift towards a lower carbon economy. This presents an opportunity for the industry to play a role in fostering sustainability through the insurance products it provides to customers (Policy, 2021).

Insurers have a crucial role in supporting the innovation of net zero technologies by providing underwriting services, which help manage and mitigate the high risks associated with early-stage start-ups and technology. By offering underwriting support, insurers enable the development, implementation, and scaling of low carbon industries and companies. This not only helps de-risk these opportunities but also instills confidence in investors, banks, and project developers, encouraging them to explore and invest capital in net zero technologies and companies (Climatewise, 2021). Underwriters have the ability to ensure that their risk models do not hinder the scalability of new technologies, despite challenges arising from the lack of historical data for assessing risk. By doing so, the insurance industry plays a direct role in facilitating the transition to a net zero economy through underwriting support for emerging net zero products and services. Leveraging their extensive expertise in risk management, insurers can also help mitigate risks associated with the development and implementation of net zero technologies, ranging from innovative construction methods to novel manufacturing processes. This is particularly crucial considering the substantial increase in global investments required in the clean energy sector alone, with projections indicating a need for more than tripling current investment levels by 2030 to achieve net zero emissions by 2050 (IEA, 2021). As low carbon technologies progress, there is a need to phase out outdated technologies that are not aligned with nationally determined contributions and sectoral decarbonisation pathways. In this context, underwriting plays a significant role in facilitating the decommissioning of infrastructure and assets related to fossil fuels, as well as the restoration of sites to their original or improved environmental conditions (Climatewise, 2021).

Insurers and brokers are increasingly exploring the concept and ramifications of achieving net zero emissions. Many of them have made independent and public commitments, often setting more ambitious timelines than government policies. Aviva, for instance, became the first major insurer to announce a net zero target of 2040, surpassing the goals outlined in the Paris Agreement. Similarly, the AHJ Group recently attained the status of becoming the first “Climate Neutral” Lloyd’s Broking House, when working with Climate Partner (LIIBA, 2021).

The members of the UN Net-Zero Insurance Alliance (UNNZIA) have pledged to align their insurance and reinsurance underwriting portfolios with net-zero greenhouse gas (GHG) emissions by 2050. This commitment is in line with the goal of limiting the temperature rise to 1.5°C above pre-industrial levels by 2100, as outlined in the Paris Agreement on Climate Change, and aims to contribute to its effective implementation (Climatewise, 2021). In order for the industry to effectively fulfill its crucial role in driving innovation during the transition, there is a greater potential for collaboration across the entire insurance value chain, encompassing brokers, loss adjusters, modellers, and legal firms.

As seen in Figure 7, there are a number of drivers shaping the demand and opportunity for product innovation for net zero across the industry (Climatewise, 2021):



**Figure 7.** Stakeholder drivers of net zero product innovation in insurance

Source: Climatewise (2021)



Considering these factors that drive stakeholders and acknowledging the crucial role of insurance in facilitating the transition of the broader economy, Climatewise (2021) has identified nine key areas where insurance product innovation can contribute to climate mitigation. This includes aspects such as underwriting policy design, pricing strategies, and claims processes, which present opportunities for influence and positive impact. In this thesis, nine areas have been modified under six areas:

### **Promoting The Transition to Low Carbon with Insurance Products**

In recent years, it has been observed that insurance companies offer insurance products with various advantages to low carbon options. This new approach of insurance companies may have an impact on customers' changing behavior on environmental sustainability. Insurers have the ability to raise awareness and stimulate the demand for low carbon products by incorporating policy options and pricing mechanisms. Additionally, in order to fulfill the objectives outlined in the Paris Agreement, it is imperative to gradually eliminate the use of fossil fuels. Studies indicate that global coal phase-out should be achieved by 2040 to effectively honor the commitments established in the Paris Agreement (Coal Phase-Out, 2021). Within the framework of the energy transition and the gradual elimination of fossil fuels, insurance offerings can play a crucial role in facilitating the decommissioning of infrastructure and assets, as well as the restoration of sites.

For example, Zurich Insurance Company is actively promoting climate awareness and mitigation by offering environmentally friendly options within their personal insurance services (Zurich, 2020). As part of their efforts, Zurich Insurance Company offers personal travel insurance with the option to offset carbon emissions. They also provide opportunities for policyholders to support green initiatives by making company donations during years with no insurance claims (Zurich, 2020). RSA Insurance Group is encouraging customers to decrease their personal vehicle usage by designing motor policies and pricing options that offer lower insurance rates for individuals who use their cars infrequently or have low mileage. This serves as an incentive for policyholders to reduce their reliance on personal vehicles (RSA, 2021a). The Hartford Insurance company promotes the adoption of electric vehicles

over petrol or diesel cars by offering premium discounts on motor policies (Frankel, 2021).

Aviva's surety business plays a crucial role in supporting the energy transition by providing guarantees for the reclamation work involved in removing oil pipelines and restoring the land to its original condition. Aviva ensures the completion of these reclamation projects by holding corporate guarantees or collateral as security. This commitment is essential in facilitating the transition towards sustainable energy practices (Aviva, 2021).

### **Use of Environmentally-Friendly/Recycled Equipment in Damage Repair**

Considering that buildings are responsible for around 40% of energy consumption and 36% of CO<sub>2</sub> emissions in Europe, the inclusion of retrofitting measures in insurance coverage is crucial. Zurich Insurance Company's Commercial Insurance Property has integrated retrofitting into their claims process by offering coverage that includes the use of sustainable building materials and reinstatement. Through their "green endorsement," they cover the extra expenses associated with reinstatement using products or building materials from sustainable manufacturers. Similarly, RSA Insurance Group provides personal customers with the opportunity to make environmentally friendly choices by recommending energy-efficient replacements for damaged goods as part of the claims process (Climatewise, 2021).

On the other hand, the claims servicing process in the insurance industry contributes significantly to emissions and waste within the insurers' supply chains. By implementing environmentally sustainable practices in claims servicing, such as promoting repair instead of replacement, reducing waste and improving waste management, or encouraging the use of recycled parts, insurers can effectively reduce carbon emissions associated with the claims process at minimal or no additional cost (CISL, 2010).

- **Encouraging 'repair over replace':** RSA Insurance Group collaborates with its suppliers to promote a "repair instead of replace" approach, actively

encouraging sustainable claims solutions for customers to consider (RSA, 2021b). In 2019, RSA Insurance Group successfully implemented a repair over replace approach for motor insurance claims, resulting in the repair of 40,000 windscreens. This initiative not only saved 1,500 tonnes of carbon emissions but also prevented 540 tonnes of glass waste from ending up in landfills. Additionally, as part of the repair process, customers were encouraged and incentivized to opt for electric vehicles, further promoting sustainable transportation (Climatewise, 2021).

- **Giving policyholders recycled options:** Tokio Marine and Nichido Fire Insurance company actively encourages their personal motor insurance customers to opt for repair services rather than complete replacements, as well as to consider using recycled automobile parts when necessary (Tokio Marine Holdings, 2020).

### **Supporting Green Enterprises/Startups with New Insurance Products**

The potential for green financing in the transition to a zero-carbon future is being widely acknowledged in capital markets, with numerous investors, asset managers, and banks committing to expanding their green financing efforts. In this context, the insurance industry plays a vital role by developing innovative underwriting products that help mitigate risks associated with green financing opportunities. By doing so, the insurance industry facilitates the flow of capital towards sustainable solutions that might have been considered too risky without appropriate risk management measures (Climatewise, 2021).

- **Double triggers insurance:** Traditional insurance products do not offer coverage to more than one party in the policy. Double triggers insurance policies are developed specifically for climate risks and offer coverage to multiple parties. For example, Munich Re has developed a unique insurance product that offers protection for both parties involved in a solar panel performance warranty. The insurance operates on a double trigger mechanism, meaning that claims can be filed in two scenarios. Firstly, if the

manufacturer makes excessive payments, and secondly, in the event of the manufacturer's insolvency. In the latter case, the insurance coverage is transferred to the solar farm.

- **Parametric insurance:** It is an insurance product that provides protection from the indirect economic effects of the event, even if there is no direct loss in the business in case of risk. In the event that a parameter in the policy (such as climate risks) arises, insurance compensation is paid regardless of whether your company is damaged or not. For example, AXA Turkey has started to offer insurance coverage by associating indices of weather events such as sunlight, wind and rain with the loss of turnover of the insured (Climatewise, 2021). In this policy, if the annual average sunlight of solar power plants falls below a certain level, the coverage comes into effect. Moreover, parametric products can greatly expand the pool of capital available to protect against climate risks by tapping capital markets. A growing number of institutional investors are investing in catastrophe bonds designed around parametric triggers.
- **Providing packaged programs of insurance to renewable technologies:** Tokio Marine and Nichido Fire (TMNF)'s Mega-Solar Package Program combines insurance coverage across property, liability and warranty, with risk consulting services, for solar power plant facilities. This packaged protection program provides confidence throughout the lifecycle of renewable technology, from development, testing and commissioning, construction, distribution and operation, to support their scaling (Tokio Marine Holdings, 2020).
- **Use of index-based insurance products to support renewables scaling where there's volatility in generation linked to weather-based factors:** Swiss Re has developed customised, index-triggered protection products for wind and solar energy that safeguard against loss of income due to adverse high or low wind conditions, lack of solar irradiation, or variations in water levels. The Solar Irradiation Index, an annual insurance product, provides

protection for photovoltaic plant operators if solar irradiation levels fall below expected (Swiss Re, 2019a). Furthermore, innovation opportunities exist to provide tailored protection products for more nascent renewable technologies such as hydrogen, and battery storage.

### **New Insurance Products Protecting the Nature**

Nature-based solutions have the potential to facilitate carbon removal through sequestration. The insurance industry can play a crucial role in supporting climate mitigation by safeguarding natural capital resources. This contribution also aids in the expansion of the supply side of voluntary carbon markets for carbon offsets. Although there are innovative instances of nature-based protection, they have not yet been implemented on a large scale:

- **Mangrove restoration insurance:** AXA XL has been engaged in assessing the viability of utilizing insurance as a cost-effective means to support the restoration of mangrove forests following severe weather events. Mangroves serve as vital nature-based solutions, enhancing resilience and providing protection against coastal flooding. A parametric insurance policy that factors in wind speed has been identified as the most practical option and can be combined with a traditional indemnity policy to cover both immediate and long-term restoration efforts.
- **Coral reefs and carbon sequestration:** Swiss Re has developed a groundbreaking natural capital solution for the preservation of coral reefs in the Yucatan Peninsula. This innovative approach combines the carbon sequestration advantages of protecting natural capital with the physical resilience benefits of coral reefs. The solution guarantees swift funding disbursement, empowering skilled community members to promptly address reef damage. As a result, it marks the world's inaugural nature-based solution aimed at safeguarding Mexico's coral reef (Swiss Re, 2019b).

## Providing Risk Consultancy Services on Climate Risks

The insurance industry, leveraging its extensive risk expertise, has various avenues to support the transition towards sustainable practices. Risk advisory services can be utilized to mitigate risks associated with the development and implementation of net zero technologies, encompassing areas such as innovative construction methods and novel manufacturing processes. Additionally, the industry offers risk data, analytics, and modeling solutions to assist clients in identifying and effectively managing climate-related risks:

- *Providing risk solutions to help clients identify measure and respond to transition risks and opportunities:* Willis Towers Watson supports the finance industry, corporations, and governments in effectively managing the transition to a net-zero and climate-resilient future. They offer a comprehensive range of climate data and analytical tools called Climate Quantified™, which utilizes the EF CVaR platform developed by the Climate Policy Initiative (CPI)(Willis Towers Watson, 2020). Climate Quantified offers a range of support services to financial institutions, assisting them in various aspects of transition risk management. These services include portfolio analysis, financial hedging, and the application of strategic risk evaluation tools.
- *Risk advisory services to support the scaling of low carbon technologies through insight on how to reduce, manage and mitigate risk:* Aon operates a specialized Renewable Energy Practice, offering professional risk advisory and broking services to assist in risk management for renewable energy assets at every stage of their lifecycle. This includes a wide range of renewable energy technologies such as tidal, biofuel, and small-scale hydro. Munich Re provides risk consulting and engineering expertise specifically targeted at minimizing risks for manufacturers involved in renewable energy technology. Their aim is to enhance efficiency in the innovation process and mitigate risk during construction and development phases (Munich Re, 2021).

## Protecting Environmental Legal Risks Through Insurance

Climate change litigation is on the rise (University of Cambridge, 2021). Climate litigation encompasses various types of legal actions, including administrative cases filed against governments and public entities, lawsuits targeting corporations believed to contribute to climate change, and claims brought by investors against companies for their inadequate consideration of risks associated with carbon-intensive assets or their failure to disclose climate-related risks in financial reporting, which can impact business models and value chains (Clyde & Co., 2019; Willis Towers Watson, 2019). There is a need for innovation in the field of legal liability insurance products to address the evolving risks associated with climate liability. The insurance industry is proactively exploring updates to existing climate legal protection products and enhancing its provision of specialized legal services to meet the changing needs of the wider economy in managing climate-related risks (Climatewise, 2021):

- *Considering updates to Directors and Officers (D&O) liability insurance policies from climate change:* Willis Towers Watson has provided valuable insights into the potential effects of pending cases and litigation threats on D&O insurance. Their analysis highlights the potential impact on pricing and coverage of D&O policies, emphasizing the importance of considering additional protection to address long-term claims (Cleantech's Global Balancing, 2021). RSA has revised its D&O liability insurance coverage by implementing exclusions specifically for the fossil fuels industry.
- *Providing focused climate legal liability protection support to net zero technology innovation companies:* Chubb has formed a partnership with Cleantech, a leading sustainable technology innovation company, to develop customized insurance solutions for legal liability. These solutions address the specific needs of Cleantech as it expands, with a particular focus on areas such as intellectual property rights and environmental liability (Deloitte, 2021).

## Roles of Stakeholders on Innovating for Net Zero

Each segment of the insurance value chain must take action to fulfill the industry's role in developing new products and services that support the transition and adapting existing ones (Climatewise, 2021):

- **Insurers:** Innovation in underwriting, products, claims, and risk advisory services is necessary to facilitate the transition and support the scaling of low carbon solutions. There is a need for innovative risk transfer solutions to drive and expedite the broader transition of the economy. Additionally, leveraging and commercializing insurers' risk advisory services can enhance clients' understanding and approach to climate mitigation. Aviva took a significant step in this direction by becoming the first major insurer globally to commit to achieving net zero carbon emissions by 2040 in March 2021 (Swiss Re, 2019a).
- **Reinsurers:** Providing support to direct insurers, also known as direct writers, in developing and expanding innovations, primarily by offering reinsurance capacity and expertise in risk management. Reinsurance creates stability through transition and enables sustainable economic growth. Given their position in the value chain, reinsurers have a uniquely broad view of transitional climate risk. Swiss Re is committed to ambitious carbon reduction targets across its investment portfolio and a net zero greenhouse gas emissions by 2050 (Schoenmaker and Zachmann, 2015).
- **Brokers:** Understanding the client challenges and demands, their specific transition risks and risk transfer or wider risk service needs, co-developing products with insurers to meet current and evolving demand, using their network to increase penetration for existing products and services that support net zero, and raising awareness of these risk transfer and advisory solutions. As aggregators of risks across industries, brokers are in a unique position to create facilities that can 'crowd in' the insurance capital needed to



scale the transition. The London and International Insurance Brokers Association (LIIBA) has recently published a paper on the role of brokers in the industry's push towards net-zero (LIIBA, 2021). As one of the largest brokers, Aon is committed to net-zero carbon emissions by 2030 in March 2021 (Aviva, 2021).

- **Loss adjustors:** Confirming the claim circumstances, the extent of any damage caused, and assessment of claims coverage by policies, including claims pay-out. Loss adjustors have a role to play in leveraging the claims process to incentivise and improve the environmental sustainability of any repair and reinstatement. As claims emerge in relation to emerging low carbon technologies, evolving skillsets are required to investigate, research and predict the frequency of claims.
- **Governments:** While it is challenging from a co-ordination perspective, there are certainly clear opportunities for governments and supranational institutions, such as the WB and EU, to collaborate on risk pools that explicitly consider climate risks. Just as governments have created 'bad banks' for poorly performing assets in the aftermath of financial crises, governments could also pool risks for carbon-intensive industries that the industry may no longer want to insure, with provisions around decommissioning attached.

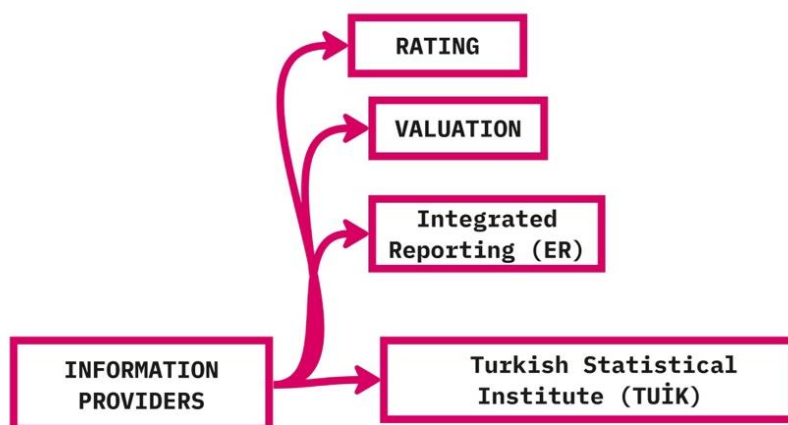
#### **4.3.2. Information Providers**

As detailed in Figure 8, information providers analyze the risk levels and business practices of the main actors and inform other market players. They prevent asymmetric information by determining the values of the assets on which loans are given and taken as collateral. Those who assume this role within the FC-PIS are the rating and valuation institutions. Due to their role in preventing asymmetric information, rating and valuation firms play an important role in the financial sector and contribute to the proper functioning of financial markets.

Rating and valuation firms play many different roles in the finance industry. These firms provide financial analysis and reporting services to help investors, lenders, governments, and other stakeholders assess financial risks. In addition, these firms evaluate the financial performance of the companies, enabling investors and other stakeholders to invest or lend to companies. Rating firms are used to assess the credit risk of companies and governments. These firms help investors decide which company or government bonds to invest in by making credit risk assessments. Rating companies help investors and other stakeholders understand financial risks by evaluating the financial performance of companies and governments. Valuation companies, on the other hand, determine the price of the stocks or other assets of the companies by valuing the companies. These firms calculate the value of the companies by evaluating the financial performances of the companies and estimating their future cash flows. Valuation firms help investors decide in which companies to invest.

Rating and valuation firms also play many roles in the financial sector in the context of ecological innovations. These firms help investors make environmentally-friendly investment decisions by considering the environmental, social and governance (ESG) factors. In addition, these companies evaluate the environmental performance of companies and encourage them to adopt environmentally-friendly practices. Rating firms are used to assess environmental and social risks. These companies evaluate the environmental performance of companies, determine the effects of environmental risks on financial performance and provide information to investors on this subject. In addition, rating companies evaluate companies' environmentally-friendly practices so that investors can make environmentally-friendly investment decisions. Valuation companies, on the other hand, evaluate companies by taking into account the environmental performance of companies. These firms determine the value of the companies by calculating the impact of the environmental practices of the companies on the future cash flows. In addition, valuation companies encourage companies in this regard by stating that the market values of companies that adopt environmentally-friendly practices may increase.

These companies also support the development of ecological innovations in the financial sector by contributing to the adoption of environmentally-friendly investment decisions and the adoption of environmentally-friendly practices. For this reason, rating and valuation companies' financial analysis by considering environmental and social impacts contributes to the spread of sustainability criteria and diffusion connected technologies.



**Figure 8.** Information Providers of FC-PIS(Source: Author’s own figure)

### 4.3.3. Auxiliaries

They assume key functions and operations in the process of initiating and completing key interlayer transactions within the FC-PIS. They work on improving the system, facilitating, accelerating and diversifying transactions. They provide infrastructure services. In the absence of auxiliaries, it is not possible to provide financial services in today's conditions. All financial technologies that the FC-PIS works on play this role. In addition, in Turkey, Interbank Card Center (BKM), Credit Registration Office (KKB), Istanbul Settlement and Custody Bank Inc. (TAKASBANK), Central Registry Agency (MKK), Central Securities Depository Institutions (CSD), and Insurance Information and Monitoring Center (SBM) undertake this role (Figure 9).

The Interbank Card Center (BKM) is a platform established to perform credit card, debit card and other payment systems transactions between banks in Turkey, to standardize payment systems between banks, and to perform transactions in a safe,

fast and effective manner. The BKM securely transmits all these transactions between banks and ensures that the transactions are correct, transferred to the correct accounts and carried out on time. The BKM also monitors the transactions of banks and takes the necessary measures to prevent fraud and other abuses. It securely monitors all transactions in the financial system and, when any fraud is detected, it cooperates with the relevant banks and solves the problem. It plays many different roles in the financial sector in the context of ecological innovations. It works to digitize payment transactions and adopt environmental-friendly practices (BKM, 2021).

The functions of the BKM in the context of ecological innovations can be summarized as follows: It works to accelerate the e-transformation process, which is an important dimension of green transformation. It reduces paper usage by increasing digitized transactions such as digitization of payment transactions and digitization of bill payment transactions via the e-invoice system, which contributes to the protection of forests, energy savings, and reduction of carbon footprint (BKM, 2021). In this way, BKM contributes to the sustainability of the financial system.

Credit Registry Office (KKB) stores customer information that financial institutions use in their lending decisions and helps prevent fraudulent incidents by sharing this information (KKB, 2021). In this context, financial institutions can evaluate the credit payment histories and credit risks of customers applying for credit. KKB accelerates the lending decisions of financial institutions, thus enabling customers to be given loans more quickly. This helps customers to perform their financial transactions more quickly and ensures the security and sustainability of the financial system. KKB plays many different roles in the financial sector in the context of ecological innovations. It works to digitize loan application processes and adopt environmentally-friendly practices. It provides digitalization of application processes. It also takes cyber security measures to protect data security and thus helps prevent risks of data loss and data abuse. Due to these roles, KKB aims to reduce paper use, protect forests, save energy in the context of ecological innovations within the FC-PIS and contributes to reducing the carbon footprint.

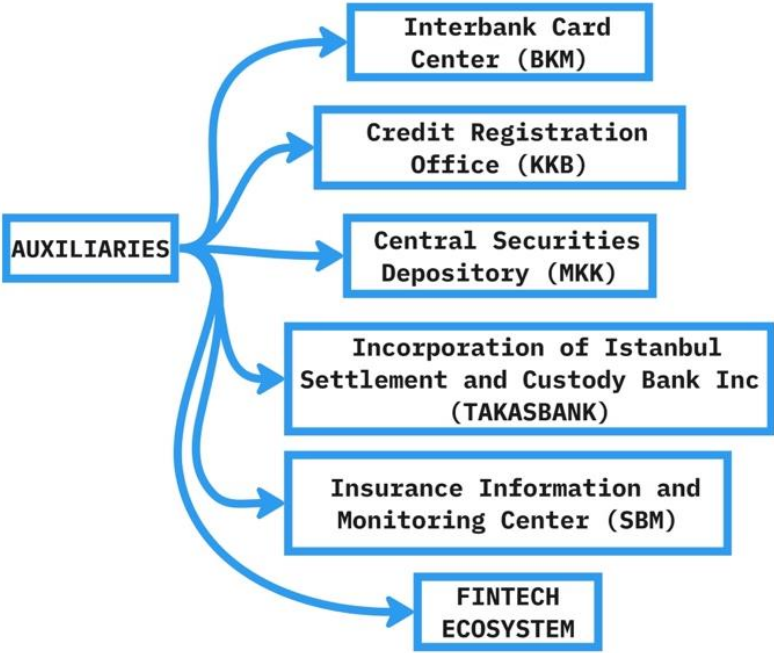
Istanbul Settlement and Custody Bank (TAKASBANK) enables investors to minimize the risks in exchange transactions by performing clearing and custody transactions and enables investors to perform collateral transactions in exchange transactions more securely and quickly by managing the collateral required for exchange transactions. It also acts as a risk-reducing intermediary between the parties through the central counterparty service it provides (TAKASBANK, 2021). TAKASBANK's practices such as digitized transactions, electronic collateral management, and data security encourage the adoption of environmentally-friendly practices. In addition, in line with TAKASBANK's sustainability strategy, studies such as the development of environmentally-friendly investment instruments and the transformation of financial products towards a green economy are carried out (TAKASBANK, 2021). In this way, TAKASBANK fulfills its environmental and social responsibility by contributing to the sustainability of the financial system.

The Central Registry Agency (MKK) provides services for the registration, storage, clearing, trading and secure transfer of capital market instruments. In this context, investors' information regarding capital market instruments are securely recorded, and their storage and transfer transactions of investors' capital market instruments are carried out safely and quickly. In addition, the MKK provides services in the management of capital market data. In this way, investors can easily access data on capital market instruments and analyze this data to make more accurate investment decisions (MKK, 2021).

The MKK's environmentally-friendly practices include digitalization of transactions, electronic capital market transactions and data security. These services offered by the MKK in the context of ecological innovations contribute to the sustainability of the financial system and fulfill its environmental and social responsibility (MKK, 2021).

The Insurance Information and Monitoring Center (SBM) is an organization operating in the insurance sector in Turkey. It was established to increase transparency in the sector and improve risk management by providing information and data sharing between insurance companies, agencies and customers operating in the insurance sector (Insurance Information and Monitoring Center, 2021). It

conducts risk assessments between insurers and customers. In this way, insurance companies can charge higher premiums to risky customers, while offering more favorable premiums to low-risk customers. In the context of ecological innovations, it is in a position to contribute to the development of different premium applications for companies that produce high carbon through this function. In addition, the SBM provides services tailored to the needs of insurance companies and customers by analyzing data on the insurance industry. Similar to other institutions, it contributes to the adoption of environmentally-friendly practices by reducing paper usage with digitalized processes (Insurance Information and Monitoring Center, 2021).



**Figure 9.** Auxiliaries of FC-PIS (Source: Author’s own figure)

**4.3.4. Collaborators**

Collaborators actively participate in the regulation and development of the sector within the FC-PIS. As seen in Figure 10, associations operating in Turkey include the Banks Association of Turkey (TBB), the Participation Banks Association of Turkey (TKBB), the Capital Markets Association of Turkey (TSPB), the Financial Institutions Association of Turkey (TFKB), the Insurance Association of Turkey (TSB), and The Payment and Electronic Money Institutions Association of Turkey

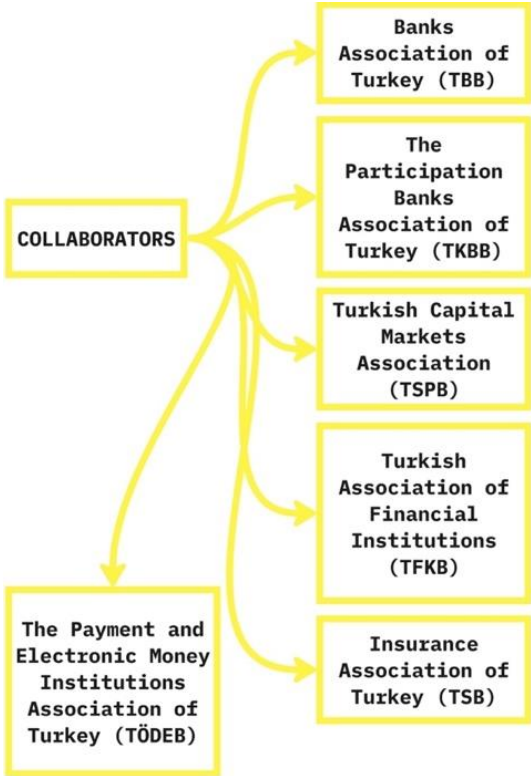
(TODEB). These associations protect the sustainability and stability of the sector by ensuring cooperation among their members in the financial system. In addition, associations fulfill important duties such as producing solutions to sectoral problems and introducing regulations according to the needs of the sector. TBB was established to protect and develop the interests of the banks in Turkey. TKBB provides services to protect and develop the interests of participation banks in Turkey. TSB is an association working for the development, regulation and improvement of capital markets in Turkey. TFKB was established to protect and develop the interests of financial institutions in Turkey. TSB is an association working for the development and regulation of the insurance industry in Turkey. TSB, on the other hand, provides services to protect and develop the interests of payment and electronic money institutions in Turkey.

The roles and importance of financial associations operating in Turkey in the context of ecological innovations are important in terms of the reflections of sustainability in the financial sector. By establishing cooperation among the members of these associations, they contribute to the adoption of environmentally-friendly practices and help to maintain sustainability in the sector.

For example, a series of regulations have been made by the Turkish Capital Markets Association (TSPB) to evaluate environmental, social and governance (ESG) factors for investors and to make valuations of companies in line with these factors. These regulations contribute to the development of sustainable investments and to reduce the impact of the financial system on environmental and social dimensions (Finansal Sektör Komitesi, 2021). The Association of Financial Institutions of Turkey (TFKB), on the other hand, supports the adoption and implementation of sustainability principles by financial institutions. In this context, the TFKB has a guide named “Sustainable Financial Sector Principles”. In the guide, it is stated that financial institutions should manage their sustainability risks, develop products and services in line with their sustainability goals, report and share (Finansal Sektör Komitesi, 2021). The Association of Payment and Electronic Money Institutions of Turkey (TODEB) also provides sustainability-oriented services in the context of ecological innovations. In particular, it carries out studies on the adoption of environmentally

friendly methods that reduce paper use in order to minimize the impact of electronic payment and money transfer transactions on the environment.

The activities of these associations in the context of ecological innovations increase awareness of the sustainability of the financial sector and its impact on the environment and contribute to the development of sectoral practices (Ercan, 2021).



**Figure 10.** Collaborators of FC-PIS(Source: Author’s own figure)

**4.3.5. Auditors**

It is the role of independent audit firms to ensure the transparent operation of the system within the FC-PIS. They are obliged to inform the audit and supervisory authorities directly in case of risky situations in the process.

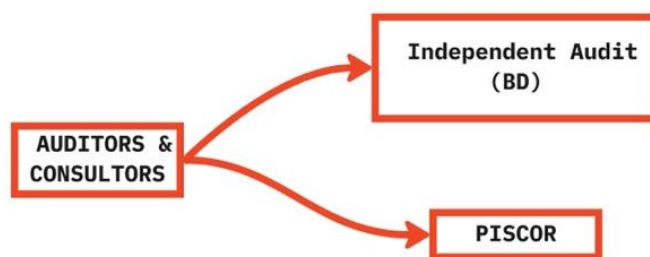
As seen in Figure 11, the auditors and consultants of FC-PIS are IA and PISCOR. Independent Audit (IA) companies check the accuracy of any numerical information shared by the main players with the public. They prepare a report by checking the compliance of the activities with the legislation and shares the report they have prepared with the public. This verification helps the decision-making processes of



investors and other interested parties by demonstrating that the financial statements of organizations are reliable. IA firms increase transparency and reliability in the financial management of businesses and organizations by checking the appropriateness of financial reporting and disclosures. In addition, they provide information on the effectiveness and efficiency of businesses' internal control systems, helping business management make improvements in their financial reporting processes. They also play an important role in preventing financial scandals and fraud, and try to detect financial irregularities or fraudulent acts of enterprises by evaluating the financial statements of enterprises in an impartial and independent manner. In this way, investors and other interested parties are protected against financial fraud.

IA firms play an important role in increasing environmental sustainability in the financial sector. They report by evaluating the environmental impacts and sustainability strategies of businesses. In addition to financial information, they also evaluate information regarding the environmental and social responsibilities of businesses and monitor the sustainability performance of businesses. Through reporting, they can increase the visibility of the steps taken by the main actors of the FC-PIS to reduce carbon emissions and help them set carbon reduction targets.

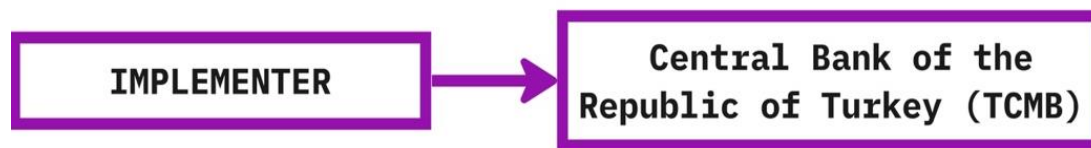
Another role of IA firms in the context of ecological innovations is to help the FC-PIS key players identify and manage their environmental risks. IA firms contribute to the early detection and management of environmental risks by assessing the environmental performance of the FC-PIS key players. In this way, the main actors of the FC-PIS can reduce environmental risks and increase environmental sustainability.



**Figure 11.** Auditors and Consultors of FC-PIS(Source: Author's own figure)

#### 4.3.6. Implementer

The implementer of the FC-PIS is TCMB (Figure 12). As the founder and executive of the FC-PIS, it plays an important role in monetary policy, financial stability and the functioning of payment systems (Ercan, 2021). Its main tasks include ensuring price stability, maintaining the stability of the financial system, and supporting the functioning of effective payment systems (Ercan, 2021). Financial stability is critical to the sustainability of economic growth and development. In order to ensure financial stability, the TCMB adopts policies and regulations that support the smooth functioning of financial markets (Ercan, 2021). These tasks show that the TCMB is of great importance for the sustainability of economic growth and development. Due to its important role in the Turkish financial sector, the policies and regulations of the TCMB have a great impact on the healthy maintenance of economic growth and development (Ercan, 2021).

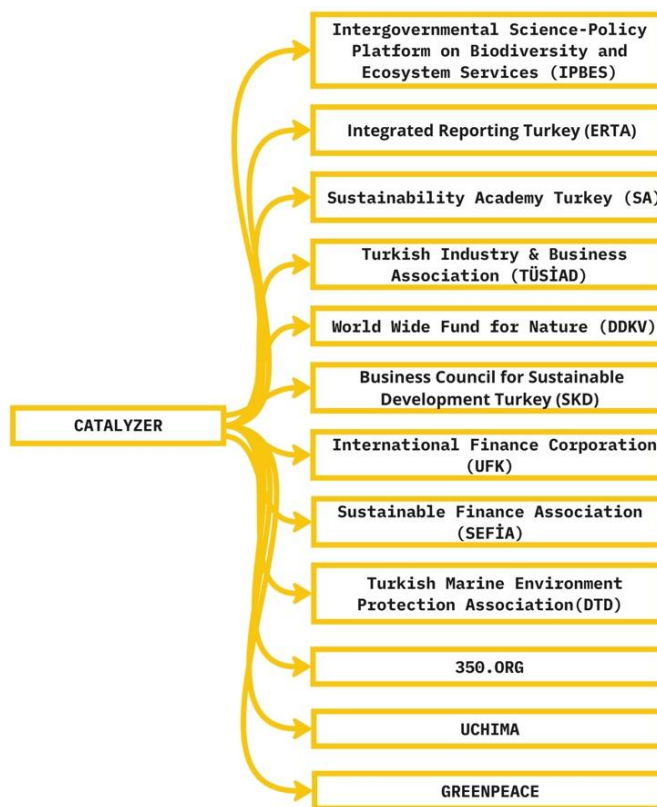


**Figure 12.** Implementer of FC-PIS(Source: Author’s own figure)

All these duties and policies enable TCMB to assume a key role in the Turkish financial sector and to support the healthy functioning of economic growth and development. Therefore, the TCMB's adoption of effective monetary and financial policies is of great importance in ensuring Turkey's economic stability and sustainable development. In order to limit the risks stemming from climate change, the TCMB decided to support sustainable finance practices as a long-term policy without changing the main objectives of the monetary policy. Establishing a “Green Economy and Climate Change Directorate” within its body, the TCMB aims to take the necessary steps to identify the vulnerabilities and opportunities that climate change may create in the financial system and to reduce the related risks.

### 4.3.7. Catalyzers

This role is assumed by those who directly or indirectly accelerate the development and awareness of ecological innovations within the FC-PIS. They are the actors that cause certain formations or accelerate an event, by transferring non-sector information within the system. All national and international non-governmental organizations (NGOs) within the FC-PIS undertake this role. The catalyzers of the FC-PIS are shown in Figure 13.



**Figure 13.** Catalyzers of FC-PIS(Source: Author’s own figure)

### 4.3.8. Regulators

There are various regulatory and supervisory institutions that play important roles in the Turkish financial sector. These institutions include the Capital Markets Board (SPK), Banking Regulation and Supervision Agency (BDDK), Public Oversight Accounting and Auditing Standards Authority (KGK), Pension Monitoring Center (EGM), Insurance and Private Pension Regulation and Supervision Agency

(SBEDDK), Turkey Union of Chambers and Commodity Exchanges (TOBB), Bank for International Settlements (BIS), and Borsa İstanbul (BIST) (Figure 14). The roles of these institutions in the Turkish financial sector and their importance in the context of ecological innovations are as follows:

**Capital Markets Board of Turkey (SPK):** The SPK is an institution that carries out regulatory and supervisory activities in order to ensure the reliable and stable functioning of Turkish capital markets and to protect the rights and interests of investors (Ercan, 2021). The importance of the SPK in the context of ecological innovations stems from its development of regulations and practices for promoting green finance and sustainable investments.

**Banking Regulation and Supervision Agency (BDDK)** The BDDK is an institution that carries out regulatory and supervisory activities to ensure the safe and stable functioning of the Turkish banking sector (BDDK, 2021). The importance of the BDDK in the context of ecological innovations stems from the fact that it develops regulations and policies for banks to adapt to sustainable development goals and to increase green financing resources.

**The Public Oversight, Accounting and Auditing Standards Authority (KGK).** The KGK is an institution that sets and supervises the accounting and auditing standards in the Turkish financial sector (KGK, 2017). The importance of the KGK in the context of ecological innovations stems from the fact that companies develop reporting and auditing standards regarding environmental, social and governance (ESG) factors. In this way, the sustainability performances of companies and their contributions to ecological innovations become more transparent and comparable.

**Pension Monitoring Center (EGM):** The EGM is an institution responsible for the regulation and supervision of the private pension system in Turkey (EGM, 2001). The importance of the EGM in the context of ecological innovations stems from its development of regulations and policies that contribute to the channeling of pension funds into sustainable investments.

Insurance and Private Pension Regulation and Supervision Agency (SEDDK): The SEDDK is an institution responsible for the regulation and supervision of the insurance and private pension sectors in Turkey (Insurance and Private Pension Regulation and Supervision Agency, n.d., 2023). The importance of the SEDDK in the context of ecological innovations stems from the fact that it develops regulations and policies for the dissemination of green finance and sustainability practices in the insurance and private pension sectors.

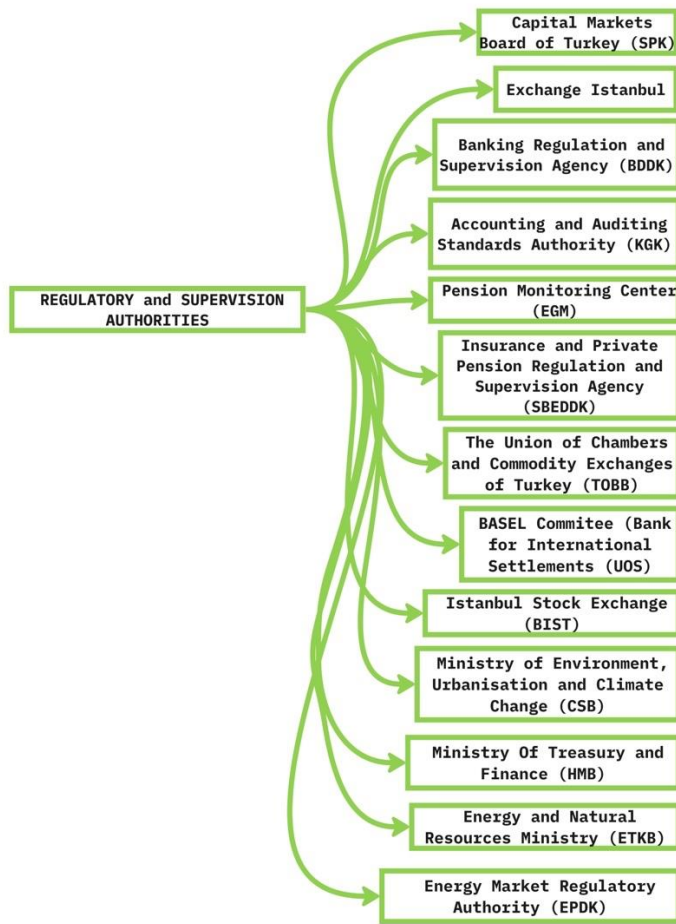
The Union of Chambers and Commodity Exchanges of Turkey (TOBB). The TOBB is an institution that represents the interests of chambers of commerce and industry and stock exchanges in Turkey and contributes to the development of the business world (T.C. Resmî Gazete, 2004). The importance of the TOBB in the context of ecological innovations stems from the fact that it organizes events that increase the awareness of member enterprises on sustainability and ecological innovations and that encourage cooperation and information sharing on these issues.

BASEL Committee (BIS): BIS is an institution working to ensure global financial stability and strengthen cooperation between central banks (Basel Committee on Banking Supervision, 2023). The importance of the BIS in the context of ecological innovations stems from the fact that it guides the central banks of member countries by providing policy recommendations on green finance and sustainability issues and by sharing best practices on these issues.

Istanbul Stock Exchange (Borsa Istanbul-BIST): As Turkey's leading financial market, the BIST offers a platform where companies and investors can trade stocks, bonds and other financial instruments (Borsa Istanbul, 2021). The importance of the BIST in the context of ecological innovations stems from the fact that it develops and promotes financial products and services that take into account ESG factors such as sustainability indices and green bond markets.

#### **4.3.9. Funders**

They are the national and international actors providing financial resources to the system (Figure 15). They play an important role in financing ecological innovations.

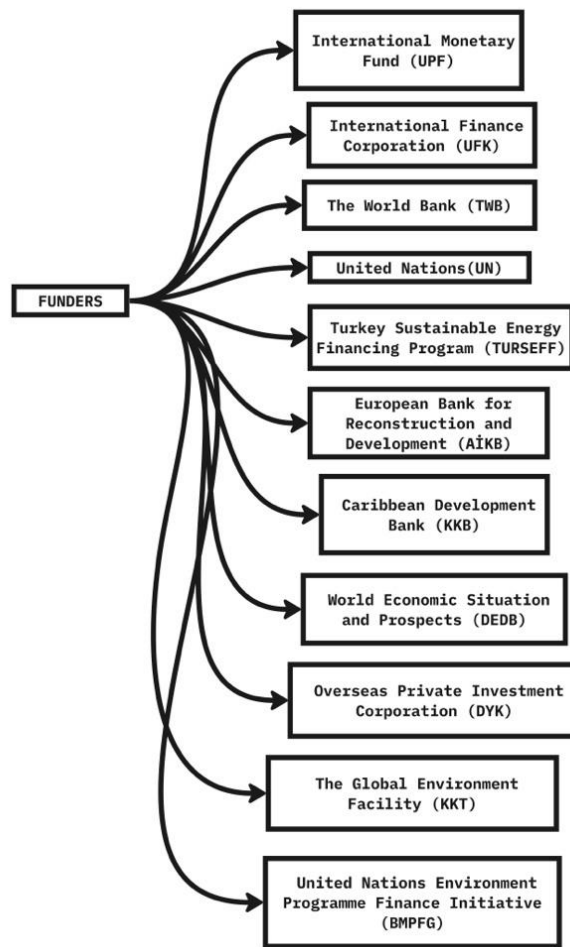


**Figure 14.** Regulators and Supervisors of FC-PIS (Source: Author’s own figure)

In this context, funds from both public and private sources contribute to supporting ecological innovations in areas such as renewable energy, energy efficiency, waste management, and sustainable agriculture (Buchner et al., 2011). At the international level, international organizations such as the European Union (EU) and the United Nations (UN) are important funders that contribute to the financing of ecological innovations. These funds support the dissemination of ecological innovations by financing low-emission and climate-resilient development projects in developing countries (Buchner et al., 2011).

#### 4.4. Ex-Post Analysis of Stakeholders

Within the scope of the research, ex-post stakeholder analysis was conducted in order to expand the scope of the ex-ante stakeholder analysis, to examine the issue in



**Figure 15.** Funders of FC-PIS (Source: Author’s own figure)

The context of ecological innovations, and to confirm the accuracy of the ex-ante analysis results. In this context, in the interviews, the participants were asked which actors come to their mind when the finance sector and ecological innovations are considered together, and what kind of a stakeholder relationship they have with those actors in order to define their roles. As a result of the analyses, the actors to be added to the Ex-Ante analysis results were found to be the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (Catalyzer), TUIK (Information Provider), Ministry of Environment, Urbanization and Climate Change (Regulator), Ministry of Treasury and Finance (Regulator), Ministry of Energy and Natural Resources (Regulator), Energy Market Regulatory Authority (EMRA) (Regulator), Overseas Private Investment Corporation (funder), and PISCOR (Auditors and Consultants). It has been observed that these newly added institutions do not have a role other than the defined roles.

The most important finding of the Ex-Post stakeholder analysis is that PISCOR's place and importance in the FC-PIS has been captured. In the analysis, most of the participants stated that PISCOR has a leading position in the field of ecological innovations and sustainability in the financial sector, and that the institution, unlike other financial institutions in the sector, focuses on the realization of financial services in harmony with nature and the environment, leading green finance and sustainable investment projects.

PISCOR contributes to the achievement of sustainable economic growth targets by providing loan and financial consultancy services to FC-PIS players for projects that provide protection of natural resources, energy efficiency and low carbon emissions. PISCOR's role in the FC-PIS appears to be advisory. However, unlike other consulting companies such as KPMG, PISCOR specializes in areas such as energy efficiency, low carbon emissions and conservation of natural resources, focusing only on sustainability and ecological innovations. Global consulting firms such as KPMG, on the other hand, offer a wider range of services and operate in various sectors. While these companies provide services on issues such as financial audit, tax, consultancy and risk management, they also provide consultancy services in the field of sustainability. However, their services in the field of sustainability are only considered as a part of their wide range of services.

In this context, PISCOR's most important difference from other consulting companies such as KPMG is that it offers a special focus and expertise on sustainability and ecological innovations. In this way, PISCOR distinguishes itself from other actors in the sector by offering its customers more in-depth and comprehensive solutions in the field of sustainability. The analyses revealed that the FC-PIS is a very critical information producer, as stated by its participants. The most important reason for this seems to be the fact that PISCOR was established as a subsidiary of TUSCO, a development and investment bank, and its mission is entirely to support the sustainable development of the Turkish economy.

Ex- ante and ex-post stakeholder analysis results are combined and given as an appendix. The next chapter focuses on the methodology followed in the study,



including the mixed method research design, data collection procedure, and validity and reliability analyses.

## CHAPTER 5

### RESEARCH METHODOLOGY

#### 5.1. Mixed Method Research Design

This chapter aims to explain the research methodology of the dissertation. The method is one of the most critical elements of research. Scientific research can be carried out in many ways (Baki and Gökçek, 2012), and methodology has three main approaches, which are quantitative method using numerical data, the qualitative method using verbal data, and the mixed method using both numerical and verbal data (Alkan et al., 2019).

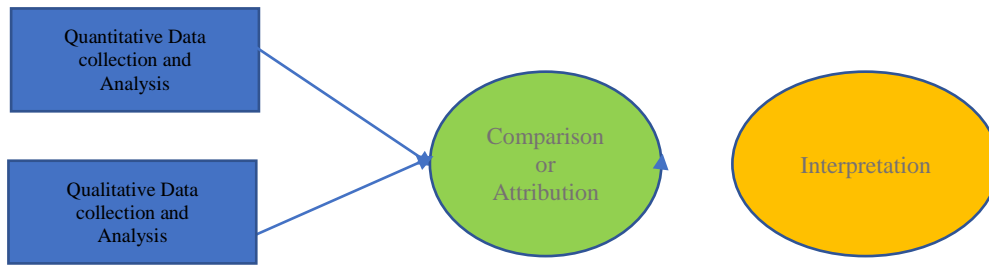
Ecological innovation, as a relatively new concept, has attracted growing attention from scholars in recent years. However, most studies in this field have employed qualitative methods and focused on the manufacturing industry, while research on the service sector, particularly the financial sector, remains limited (Bergek et al., 2015; Truffer and Coenen, 2012).

The technological innovation system (TIS) approach has been widely used in the manufacturing context, but the application of this approach to the service sector and financial sector has been less prevalent (Binz and Truffer, 2017). Additionally, a sectoral innovation approach has been more commonly employed in the literature than the TIS approach, highlighting the need for more comprehensive and generalizable research on ecological innovation in the financial sector (Hekkert et al., 2007). Furthermore, the importance of examining the financial sector from a broader perspective, which includes not only managers but also all employees, is evident, supporting the adoption of a mixed-methods approach to provide a more comprehensive understanding of the phenomenon (Creswell and Clark, 2017).

Mixed methods research has indeed gained popularity in social sciences as a result of the increasing acceptance and advancement of the integration of qualitative and quantitative research methods (Creswell, 2021; Johnson et al., 2007). As a concise term, “mixed methods research” refers to studies that combine both quantitative and qualitative analyses within a single investigation (Creswell and Clark, 2017). Mixed methods are not merely the collection of multiple qualitative data types (e.g., interviews and observations) or quantitative data types (e.g., survey data, empirical data), but rather, they involve the intentional and systematic integration of these different types of data in order to address research questions more comprehensively (Tashakkori and Teddlie, 2021).

Mixed methods research necessitates the collection, analysis, and integration of both qualitative and quantitative data. As Creswell (2021) states, *“using quantitative and qualitative approaches together provides a better understanding of research problems than using either approach alone.”* The strengths of mixed methods research include the following: compensating for the weaknesses of both qualitative and quantitative research, expressing qualitative data in numeric terms, augmenting numeric data with qualitative insights, answering research questions with perspectives unattainable through a single method, and enhancing the generalizability of the findings (Creswell, 2021; Johnson et al., 2007; Tashakkori and Teddlie, 2021).

Upon examining the literature, it is evident that numerous prominent scholars have contributed to the field of mixed-methods research, including Creswell, Morse, Johnson, Onwuegbuzie and Leech, and Plano Clark (Creswell and Sözbilir, 2017). These authors have not only conducted studies on mixed-method designs but also developed their own unique designs. In mixed-method research, the researcher can employ various research designs to address their research questions. For instance, Creswell and Plano Clark propose six fundamental mixed-methods research designs (Creswell and Sözbilir, 2017). In the context of this study, as shown in Figure 16, the convergent parallel design was selected from these designs.



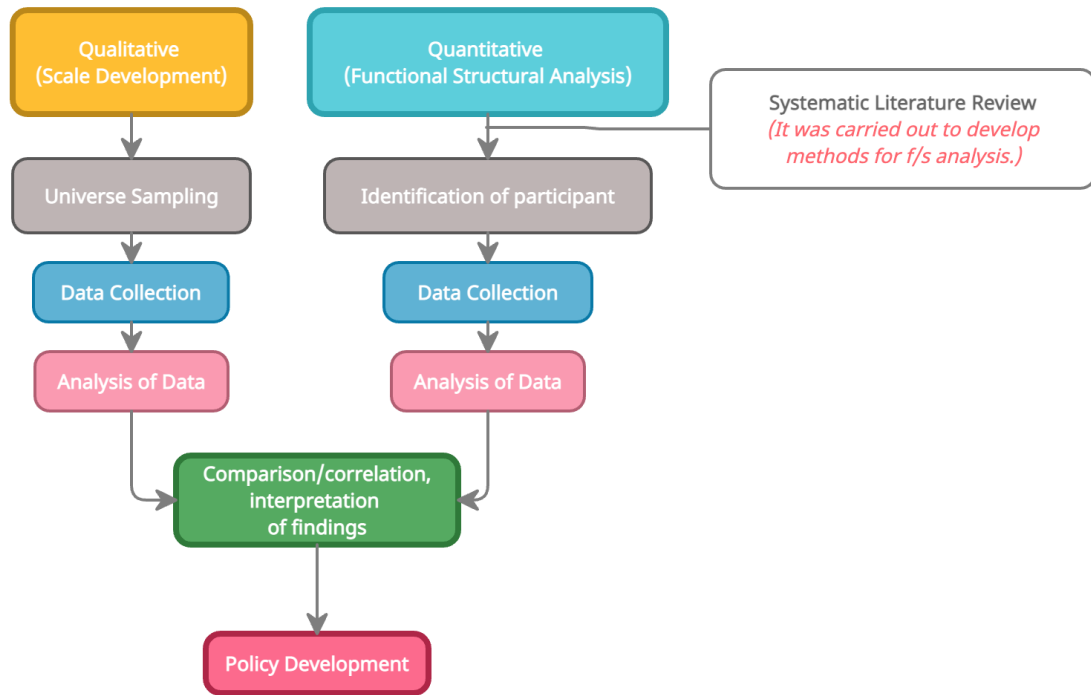
**Figure 16.** Convergent Parallel Design Model

Source: Creswell and Sözbilir (2017), (Özdemir et al., 2021)

As shown in Figure 16, in the convergent parallel design, quantitative and qualitative data are gathered concurrently and independently, as illustrated in the aforementioned framework. Correspondingly, the collected data are subjected to separate analyses. Upon completion of the analytical process, the results derived from the analyses are integrated and correlated. Ultimately, the data are jointly interpreted, providing a comprehensive understanding of the research problem through the synthesis of both quantitative and qualitative insights. The convergent parallel design is the design in which qualitative and quantitative research methods are used concurrently. In this study, data were collected through scale development and questionnaire within the scope of the quantitative method, and in-depth interviews were conducted within the scope of the qualitative method. The simultaneous use of both methods primarily provided quantitative data on ecological innovations, as well as gaining an in-depth perspective with the structural and functional analysis of FC-PIS.

## 5.2. Research Population and Sample

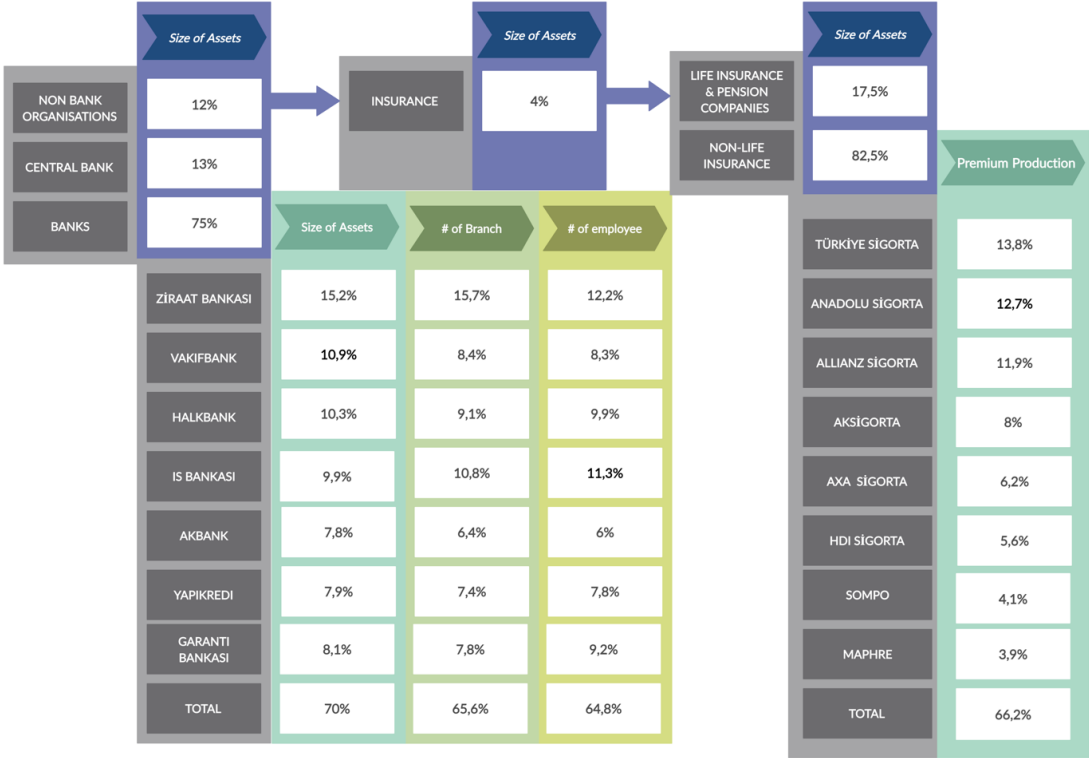
One crucial step in data collection is the selection of appropriate units to which the data relate (Bryman and Bell, 2003). In this study, the population of interest is comprised of employees within the Turkish Finance Sector. To select a representative sample, three metrics related to banking, as well as one metric related to insurance, were employed. Specifically, the banking metrics used were asset size, number of bank branches, and number of bank employees, respectively.



**Figure 17.** Convergent Parallel Design Model of the Dissertation  
(Source: Author’s own figure)

These metrics were expressed as percentages, with the values calculated based on the data reported by the Banks Association of Turkey in September 2021. As illustrated in Figure 18, banks account for 75% of the total asset size of the finance sector, while non-bank financial institutions and the Central Bank account for 12% and 13% of the total asset size, respectively. Additionally, insurance companies comprise 4% of the asset size of non-bank financial institutions. To determine the sample, the banks with the largest share in the asset size, number of branches, and number of employees were examined. Accordingly, the banks that constitute 75% of the asset size of the finance sector, and 70% of this 75% asset size, are presented in Figure 18 based on their respective percentages of asset size, number of branches, and number of employees. Of this 70%, 36.4% is comprised of public deposit banks, 25.6% is comprised of private domestic deposit banks, and the remaining portion is composed of private foreign deposit banks. Upon examination of the insurance sector, it was found that 4% of the asset size is made up of 17.5% life insurance pension companies and 82.5% non-life insurance companies. The asset size calculation for the insurance sector was based on the premium size generated by insurance

companies. Accordingly, Figure 18 displays the companies that make up 66.2% of the asset size in the insurance sector and their corresponding premium production values.



**Figure 18.** Metrics of Sampling(Source: Author’s own figure)

As a result, the sample was comprised of banks and non-life insurance companies. This selection was based on the fact that banks constitute 75% of the total financial size of the finance sector, while non-life insurance companies account for 82.5% of the total size of insurance companies. By focusing on these units, the study could better capture the characteristics and behaviors of the most prominent entities within the relevant population.

Cochran (1977) recommends a sample size of at least 30 for descriptive studies and a sample size of at least 100 for more complex inferential studies. Similarly, Bryman (2016) notes that sample sizes of 50 to 200 are sufficient for most social science research, while larger sample sizes may be necessary for studies that require greater statistical power or greater precision in the estimates. With regard to scale

development studies, DeVellis (2017) suggests that a sample size of at least 200 is desirable for EFA. Thus, it is generally agreed that a sample size of 30 to 500 is appropriate for social science research, with larger sample sizes typically necessary for more complex studies or those that involve EFA.

In addition, sample size can be calculated with a formula. Since there is no similar study on this subject, in this study, the rate of responding to any questionnaire questions was taken as 0.5, and the variance was taken as  $\sigma^2=0.25$  under the assumption of a heterogeneous distribution. When an error of (d)0.05 is tolerated in revealing the difference between a ratio estimate to be estimated from a question in the questionnaire and the actual ratio value, the initial sample size for parameter estimates made with 95% confidence probability is calculated as follows.

$$n_0 = \frac{z_{\alpha/2}^2 PQ}{d^2} = \frac{(1.96)^2 (0.5)(0.5)}{(0.05)^2} = 384.16$$

Following an assessment of the factors mentioned above, a minimum sample size of 384 at 95% confidence interval was determined based on the established formulae. To select the sample, a non-random sampling technique known as snowball sampling was employed. This method involves establishing a connection with one unit within the target population, after which that contact person helps identify additional individuals to participate in the study, thus enlarging the sample in a chain-like manner. As such, contact was made with banks and insurance companies, which constitute the majority of the finance sector, as outlined in the Figure 18. The survey instrument was initially shared with senior managers, who were then asked to disseminate it to their employees. Additionally, experts within the sector who meet the relevant criteria were also invited to share the survey with individuals in their immediate network. By utilizing this snowball sampling approach, the study could access a diverse range of participants with varying experiences and perspectives within the targeted population.

### **5.3. Data Collection Process**

The prepared questionnaire was shared online via Google forms. First of all, the form link was shared with the relevant experts for the scale development study. To collect data regarding the scale development phase, the Form was made available online on March 1, 2022, and May 1, 2022. The data of 200 people collected between these dates were used in the scale development phase. These 200 people formed Study Group 1. After the scale development phase was completed, the final version of the questionnaire was created online again via Google forms.

It was ensured that the form was shared with the relevant experts through snowball sampling at this stage. Data continued to be collected through Google forms between 1 May 2022 and 1 July 2022. In addition, two insurance companies, one national and one multinational company shared the scale with their employees from their internal systems. Then, they conveyed the data to the researcher in Excel format. In this process, to expand the scope of the research, TBB and the TCMB, which are important stakeholders in the sector, were also contacted. However, no positive response was received. During the scale development and research processes, 850 people responded to the questionnaire. Of the 850 people who responded to the survey, 627 people whose answers were valid were named Study Group 2. Accordingly, more than the minimum number of observations determined was reached. In addition, participation was voluntary, and the participants were asked to answer the items sincerely and carefully before the administration of the scale.

### **5.4. Quantitative Research Process**

In this thesis, a scale development study was conducted to measure the perceived eco-innovativeness of the Turkish finance sector, with the aim of investigating the ecological innovation capacity of the financial sector. The importance of measuring finance sector employees' ecological innovation awareness has been highlighted in the literature, as it plays a crucial role in enhancing the sector's environmental performance and sustainability (Dangelico and Pujari, 2010; Schaltegger and Wagner, 2011).



To address this aim, a qualitative research component was designed, in which interviews were conducted with senior executives of important stakeholders in the financial sector. To include other employees of the sector in the research, a relevant scale was prepared. A literature review was conducted prior to drafting the scale questions to determine whether there was a scale that measures the level of perception of service sector employees as eco-innovative. However, no similar scale was found in the literature.

Instead, studies measuring ecological innovation performance, firm innovativeness, personal ecological footprint awareness, and personal environmental awareness were found (Bansal and Roth, 2000; Nidumolu et al., 2015; Testa et al., 2012). These studies were examined in detail, but since none of them fully answered the research question, the scale items were prepared collaboratively by the researcher and field experts during the scale development process.

By integrating the insights from previous studies on ecological innovation awareness, firm innovativeness, and personal environmental awareness, this study contributes to the literature by developing a new scale that specifically measures the level of perception of service sector employees as eco-innovative, particularly in the Turkish finance sector. This scale can be utilized to assess the ecological innovation capacity of the financial sector and may help in the development of effective policies and strategies to improve environmental performance and sustainability within the industry.

### **5.5. The Perceived Ecological Innovativeness Scale (PEIS)**

Understanding the components of ecological innovativeness is crucial for firms to develop effective strategies and initiatives that address environmental challenges and promote sustainability. By leveraging these components, firms can create a culture of ecological innovation and drive positive change within their organizations and industries.

Firms' ecological innovativeness consists of various components, including innovation capacity, technology, business processes, regulations, environmental

awareness, stakeholder collaboration, employee engagement, resource efficiency and monitoring and reporting (Bansal and Roth, 2000, Bocken et al., 2016, Clarkson et al., 2008, Dangelico and Pujari, 2010; Daub, 2007, Nidumolu et al., 2015; Schaltegger and Wagner, 2011; Testa et al., 2012; Yuan, G., Ye and Sun, 2021, Hart and Milstein, 2003, Benn et al., 2014, Horbach et al., 2012, Aguilera et al., 2007, Kuckertz and Wagner, 2010)

These components play a crucial role in enhancing companies' environmental performance and their ability to achieve sustainable development goals.

**Innovation capacity:** A firm's ability to develop and implement ecological innovations is dependent on its innovation capacity (Dangelico and Pujari, 2010). This capacity encompasses both technological and process innovations that aid firms in reducing their environmental impacts.

**Technology:** As a component of ecological innovation, technology enables firms to optimize energy and resource usage, as well as adopt waste reduction strategies, thereby improving their environmental performance (Nidumolu et al., 2015, Horbach et al., 2012.).

**Business processes:** Ecological innovations in business processes can enhance a firm's environmental performance and sustainability through non-technological innovations (Schaltegger and Wagner, 2011).

**Regulations:** Environmental regulations, in particular, encourage firms to develop and implement ecological innovations (Bansal and Roth, 2000). These regulations support firms in achieving their sustainability goals and gaining a competitive advantage.

**Environmental awareness:** An increase in individual and organizational environmental awareness can accelerate the adoption and implementation of ecological innovations (Testa et al., 2012), contributing to firms' efforts to reduce their environmental footprints and achieve sustainable development goals.

**Stakeholder collaboration:** Collaborating with stakeholders such as suppliers, customers, governments, and NGOs can help firms access diverse perspectives, expertise, and resources to drive ecological innovation (Hart and Milstein, 2003). Such collaborations can lead to the co-development of innovative products, services, and business models that address pressing environmental issues (Benn et al., 2014). Partnerships foster knowledge and resource sharing among stakeholders and facilitate the development and implementation of ecological innovations through collaboration.

**Employee engagement:** Engaging employees in sustainability initiatives and fostering a sense of ownership and responsibility for the environment can lead to increased motivation and commitment to ecological innovation (Aguilera et al., 2007). Providing training and development opportunities related to sustainability can further enhance employee competence and involvement in green initiatives (Kuckertz and Wagner, 2010).

**Resource efficiency:** Firms can focus on improving resource efficiency by minimizing material, energy, and water consumption in their operations and supply chains (Horbach et al., 2012). By adopting eco-design principles and incorporating circular economy practices, they can reduce waste generation, increase recycling rates, and extend product lifecycles (Bocken et al., 2016).

**Monitoring and reporting:** Establishing systems for monitoring and reporting on environmental performance can help firms track their progress towards sustainability goals and demonstrate their commitment to ecological innovation (Daub, 2007). Transparent reporting can also foster trust and credibility among stakeholders, paving the way for further collaboration and support (Clarkson et al., 2008).

While developing the scale, the five-stage scale development method explained by Cohen and Swerdik (2009) was applied. According to this method, first of all, the conceptual structure of the scale was determined. While trying to create the conceptual design of the scale, the literature related to the research topic was reviewed in detail. Moreover, it is clearly stated what the scale measures, whether the

scale is needed, and what the purpose of the scale is. After the literature review was done, an item pool was created. After the analysis was conducted to identify the main themes within the research domain, subsequent questions were developed for each theme. The questions pertaining to personal environmental awareness were regarded as a distinct, independent factor, while the questions from the other themes were collectively assumed to measure the perceived ecological innovativeness of the institution. To prepare the item pool of the PEIS, studies related to the subject were examined in the related literature. In addition, considering the inputs from the interviews with field experts, the scale and survey questions in these studies were reviewed in detail, and the items were written.

A questionnaire comprising 56 items was developed through expert consultation. The 56-item questionnaire was subsequently evaluated by five scholars with diverse disciplinary backgrounds, namely finance, informatics, statistics, organizational behavior, and economics. Based on the expert feedback, 16 items were deemed unsuitable for inclusion in the scale due to various reasons. Accordingly, 40 scale items were created to measure Perceived Ecological Innovativeness. While writing the items, attention was paid that an item measures only one feature. In addition, after the item pool was created, expert evaluation forms were made, and the content validity of the scale was calculated.

After the item pool was created, the scale was configured. Constructing the scale is deciding on the type of scale (classification, order, range, and ratio) and the scaling technique. It was decided that the measurement method of the scale would be the Likert type. "The score obtained from a scale suitable for the Likert type or grading totals technique generally consists of the sum of the weights given to the responses to the items in its scope or, in technical terms, the sum of the scores" (Tezbaşaran, 2008, p.5-6). The items were graded as "Strongly Disagree (1)", "Disagree (2)", "No Idea (3)", "Agree (4)", and "Strongly Agree (5)" in accordance with the Likert type. After the draft form of the scale was created, the third stage was started, and the scale was administered. Although there is no definite rule, the scale should be applied to at least five times the number of items (Cohen and Swerdik, 2009). After the scale was administered, the validity and reliability studies were carried out in the fourth stage.

In the fifth stage, the scale was reviewed and the instruction for scale administration was prepared. The results obtained during the scale development stages are presented in Table 3.

**Table 3.** Scale Items

#	Items	Subject
1	Our firm priorities developing new environmentally friendly products and services by allocating additional financial resources.	Innovation capacity
2	Our customers find our services and products environmentally friendly.	Environmental awareness
3	Our firm uses technological opportunities to develop environmentally friendly products and services.	Technology
4	Our firm offers environmentally friendly products and services through innovative technologies.	Technology, Innovation capacity
5	Our firm cares about energy efficiency during its operations.	Resource efficiency
6	Our firm pays attention to the fact that the services it provides save energy/can be possible with less energy consumption.	Resource efficiency
7	By improving the products and services we offer, we transform them into products and services that do not harm the environment.	Environmental awareness
8	Our firm considers environmental impacts while developing new products/services.	Environmental awareness
9	We take care to be environmentally friendly in advertising and marketing activities.	Environmental awareness
10	I think we are more environmentally friendly than other firms in advertising and marketing activities.	Environmental awareness
11	Our firm often incorporates new technologies and/or equipment into its business processes to save energy.	Resource efficiency, Technology
12	Our firm has the capacity to adapt easily to environmentally friendly and new ways of doing business.	Environmental awareness
13	At our firm, the factors that hinder environmentally sensitive innovation are monitored and improved.	Monitoring and reporting
14	The importance given to new environmentally friendly practices in our firm is increasing day by day.	Environmental awareness
15	Organizational and managerial factors that hinder environmentally sensitive innovation have been minimized in our firm.	Innovation capacity
16	Our firm monitors environmental law standards and updates its activities within this framework.	Regulations
17	Ecological innovation has an important role/share in our firm's innovation approach.	Innovation capacity
18	Our firm follows current developments and innovations in environmentally friendly financial products and services.	Environmental awareness

Table 3. continued

19	Our firm shares current developments and innovations about environmentally friendly financial products and services with its employees.	Employee engagement
20	Our firm has a management approach that is aware of the climate crisis and its effects.	Employee engagement
21	Our firm investigates and improves the negative environmental impacts of its operations.	Monitoring and reporting
22	Our firm carries out research and development activities for environmentally friendly innovations.	Innovation capacity
23	Our firm is a stakeholder/partnership with public institutions for activities aimed at environmentally friendly innovations.	Stakeholder collaboration
24	Our firm cooperates with non-governmental organizations for activities aimed at environmentally friendly innovations.	Stakeholder collaboration
25	Our firm is well-versed in international environmental regulations.	Stakeholder collaboration, Regulations
26	Our firm works for the use of solution-oriented new technologies against environmental problems.	Environmental awareness, Technology
27	Our firm is knowledgeable about international environmental regulations.	Regulations
28	Our firm encourages the use of new clean (green) technologies to find solutions to environmental problems.	Environmental awareness, Technology
29	Our firm attaches importance to the recycling of wastes generated as a result of its activities.	Environmental awareness,
30	Our firm produces technology-oriented solutions for the sorting of wastes generated as a result of its activities.	Environmental awareness, Technology
31	Our firm offers the industry new or significantly improved products ahead of our competitors.	Innovation capacity
32	In recent years, we have introduced products and services available in the industry but new or significantly improved for our firm.	Innovation capacity
33	While our firm follows the innovations, it examines and follows the use cases of that innovation of other firms in the sector.	Innovation capacity
34	Our firm has developed many new management systems in the last 3 years.	Innovation capacity
35	The gradual warming of the earth may cause catastrophes in the future.	Environmental awareness,
36	Rapid consumption of natural resources is an important problem for our future.	Environmental awareness,
37	The climate crisis is a result of human activities.	Environmental awareness,
38	I think climate change will lead to a bigger crisis than the COVID-19 pandemic.	Environmental awareness,
39	I think that irregular weather events such as floods, storms, extreme temperatures, and droughts have increased in Turkey in recent years.	Environmental awareness,
40	Since the environment is constantly renewing itself, I am not worried about climate change.	Environmental awareness,

Source: Author's own scale

## 5.6. Validity and Reliability Analysis of the Quantitative Research

In this section, the validity and reliability findings of the perceived ecological innovation scale developed within the scope of the research are shared.

### 5.6.1. Validity Analysis of the Quantitative Research

The validity study of the “Perceived Ecological Innovativeness Scale” (PEIS) developed within the scope of the research was carried out in two stages. Exploratory Factor Analysis (EFA) was performed to determine the factor structure of the first developed scale. For this, a data set of 200 people named “Study Group 1” was used. The scale development phase started with 40 items. Therefore, when determining the number of subjects in Study Group 1, the rule of applying the number of items in the scale to at least five times the number of issues was considered. (Cohen and Swerdlik, 2009). In the second stage, Confirmatory Factor Analysis (CFA) was performed to evaluate the confirmation of the factor structure of the scale revealed by the EFA in another sample. A dataset of 627 people, named "Study Group 2", was used for the CFA as explained below.

#### Study Group 1

There are 200 subjects in the Study Group 1, where the EFA was performed. Descriptive statistics obtained for the people in this group are presented in Table 4.

**Table 4.** Descriptive Statistics of the Participants in Study Group 1  
(Source: Author’s own table)

<i>Variables</i>	<i>Categories</i>	<i>n</i>	<i>Percent (%)</i>
<i>Gender</i>	<i>Male</i>	<i>94</i>	<i>47</i>
	<i>Female</i>	<i>106</i>	<i>53</i>
	<i>Total</i>	<i>200</i>	<i>100</i>
<i>Administrator</i>	<i>Yes</i>	<i>34</i>	<i>17</i>
	<i>No</i>	<i>166</i>	<i>83</i>
	<i>Total</i>	<i>200</i>	<i>100</i>
<i>Company Type</i>	<i>Bank</i>	<i>90</i>	<i>45</i>
	<i>Insurance</i>	<i>110</i>	<i>55</i>

	<i>Total</i>	<i>200</i>	<i>100</i>
<i>Age</i>	<i>18-24 Age</i>	<i>4</i>	<i>2</i>
	<i>25-34 Age</i>	<i>72</i>	<i>36</i>
	<i>35-44 Age</i>	<i>86</i>	<i>43</i>
	<i>45-54 Age</i>	<i>37</i>	<i>18,5</i>
	<i>55-64 Age</i>	<i>1</i>	<i>0,5</i>
	<i>Total</i>	<i>200</i>	<i>100</i>
<i>Education Status</i>	<i>High School</i>	<i>7</i>	<i>3,5</i>
	<i>College</i>	<i>12</i>	<i>6</i>
	<i>Undergraduate</i>	<i>130</i>	<i>65</i>
	<i>Post Graduate</i>	<i>51</i>	<i>25,5</i>
	<i>Total</i>	<i>200</i>	<i>100</i>

Table 4 shows that 47% (n=94) of the people in Study Group 1 are male, and 53% (n=106) are female. In addition, 17% (n=34) of the participants work in the relevant institution in managerial status, and 83% (n=166) work in a non-managerial position. Of the respondents, 45% (n=90) work in banks, while 55% (n=110) work in insurance companies. Considering the ages of the individuals, 2% (n=4) are 18-24 years old, 36% (n=72) are 25-34 years old, 43% (n=86) are 35-44 years old, 18.50% (n=37) are 45-54 years old, and 0.5% (n=1) are 55-64 years old. Finally, of the individuals in Study Group 1, 3.50% (n=7) have a high school degree, 6% (n=12) have an associate degree, 65% (n=130) have an undergraduate degree, and 25.5% (n=51) have a graduate degree.

## **Study Group 2**

To verify the factor structure of the scale form obtained by the EFA, the CFA was performed on the Study Group 2 data. The scale obtained as a result of the EFA was administered to a total of 627 people. The descriptive statistics of the participants are presented in Table 5.

As seen in Table 5, 52.30% (n=328) of the participants in Study Group 2 male and 47.70% (n=299) are female. In addition, 14.70% (n=92) of the participants work in the relevant institution in managerial status, and 85.30% (n=535) work in a non-managerial position.



**Table 5.** Descriptive Statistics of the Participants in Study Group 2  
(Source: Author's own table)

<i>Variables</i>	<i>Categories</i>	<i>n</i>	<i>Percent (%)</i>
<i>Gender</i>	<i>Man</i>	328	52,3
	<i>Women</i>	299	47,7
	<i>Total</i>	627	100
<i>Administrator</i>	<i>Yes</i>	92	14,7
	<i>No</i>	535	85,3
	<i>Total</i>	627	100
<i>Company Type</i>	<i>Bank</i>	279	44,5
	<i>Insurance</i>	348	55,5
	<i>Total</i>	627	100
<i>Age</i>	<i>18-24 Age</i>	13	2,1
	<i>25-34 Age</i>	217	34,6
	<i>35-44 Age</i>	295	47
	<i>45-54 Age</i>	95	15,2
	<i>55-64 Age</i>	7	1,1
	<i>Total</i>	627	100
<i>Education Status</i>	<i>High School</i>	19	3
	<i>College</i>	28	4,5
	<i>Undergraduate</i>	439	70
	<i>Postgraduate</i>	141	22,5
	<i>Total</i>	627	100

44.50% (n=279) of the participants work in banks, while 55.50% (n=348) work in insurance companies. Considering the ages of the individuals, 2.10% (n=13) are 18-24 years old, 34.60% (n=217) are 25-34 years old, and 47.00% (n=295) are 35-44 years old, 15.20% (n=95) were 45-54 years old, and 1.10% (n=7) were 55-64 years old. Finally, of the individuals in Study Group 2, 3% (n=19) had a high school degree, 4.50% (n=28) had an associate degree, 70% (n=439) had an undergraduate degree, and 22.5% (n=141) had a post-graduate degree.

#### **5.6.1.1. Content Validity of the PEIS**

Content validity is related to whether the items in the measurement tool represent the structure to be measured (Fraenkel et al., 2011, s. 150). Expert opinions are generally

sought to test the content validity of the scale. In this direction, first of all, expert evaluation forms were created. The expert evaluation form was prepared in the form of a triple rating scale "Unnecessary (1)", "Needs to be corrected (2)", and "Necessary (3)" and arranged in accordance with the scoring of each item. Checking the unnecessary option means removing the item from the scale. In addition, in the expert evaluation form, the bottom of each item was left blank to enable the experts to add the items and their opinions if necessary.

In content validity analysis, first of all, the scale was presented to two academicians, who are experts in Turkish education, to check the compliance of the items with language and spelling rules. In line with the feedback of the Turkish experts, necessary corrections were made to the items in terms of language and spelling rules. Then, the scale items were presented to 4 academicians who are experts in the field of finance, and they were asked to evaluate them. The expert evaluation form was also sent to an academician, who is an expert in the field of measurement and evaluation. She was asked to examine whether the items and categories were created appropriately.

In brief, opinions from a total of 7 experts were received. The Lawshe analysis technique was used while calculating the content validity of the item evaluations made by the experts. Lawshe analysis is a technique that provides evidence for the content and construct validity of the scale by determining whether the items that affect the validity of the measurement tool are understandable, whether they are suitable for the target group, and the concordance and inconsistency between expert opinions in terms of other required features (Yurdugül, 2005).

In the Lawshe technique, the number of experts varies between 5 and 40. Experts examine each item separately and evaluate them using the triple rating scale. Content Validity Ratio (CVR) is calculated for each item. While calculating the CVR, the number of experts who choose the "necessary" opinion are divided by the total number of experts. Content validity rates should be minimum 0.99 at  $\alpha=0.05$  significance level for 7 experts (Veneziano and Hooper, 1997). Items with a CVR value below 0.99 are excluded from the scale. Accordingly, it was decided that the

developed scale would consist of 30 items as ten items whose CVR value was below 0.99 were removed from the scale.

SPSS 21.0 and LISREL 8.8 package programs were used in data analysis. In the two-stage data collection process, the data obtained from the individuals were transferred to the SPSS 21.0 program and it was checked whether there were any missing and incorrectly entered data.

The use of Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) as statistical methods for evaluating construct validity is well-established in the literature (Fabrigar et al., 1999; Kline, 2011). EFA is typically employed when a theoretical model or hypothesis about the factor structure of the scale is lacking, and there is a need to identify the underlying factor structure through data analysis (Fabrigar et al., 1999; Kline, 2011). On the other hand, CFA is used when a theoretical model or hypothesis exists, and the researcher seeks to confirm the factor structure of the scale (Kline, 2011).

In this study, EFA was selected as the primary analysis method to explore the factor structure of the newly developed scale. This decision was made due to the lack of an established theoretical model or hypothesis to support the factor structure. The factor structure was then confirmed through the use of CFA, which provided additional evidence for the validity of the scale. By utilizing both EFA and CFA, this study could establish and confirm the factor structure of the scale, thus enhancing the credibility of the study's findings.

It has been determined that there are no missing and incorrectly entered data. Exploratory Factor Analysis (EFA) was conducted in SPSS 21.0 program in order to determine the factor structure of the scale developed with the Study Group 1 dataset and to provide evidence for its construct validity. In cases where there is no criterion to compare the construct, construct validity is tested (Karakoç and Dönmez, 2014). Through EFA, the factors of the scale to be developed are tried to be revealed. In EFA, firstly, it is checked whether the data structure is suitable for factor extraction. Accordingly, the Kaiser-Meyer Olkin (KMO) coefficient was calculated, and the

Barlett Test of Sphericity was performed for the suitability of the Study Group 1 data for factor analysis.

After it was determined that the data set was suitable for factor analysis, EFA was started. Principal component analysis was utilized as a factor extraction method in EFA. Direct Oblimin technique was used as the factor rotation method. In addition to EFA, item analyses such as item-scale correlations and upper-lower unrelated sample t-tests were also carried out to provide evidence of validity in the Study Group 1 data. For scale reliability, Cronbach's Alpha reliability coefficient was calculated for the whole scale and its factors using the Study Group 1 data.

After the factor structure of the scale was determined, the final form of the scale was administered to Study Group 2. Confirmatory Factor Analysis (CFA) was performed to provide additional evidence for the scale's validity. In addition, fundamental analyses within the scope of the research were also carried out on this data set. LISREL 8.8 package program was used for the CFA. The compatibility of the previously created scale model with the data is tested with the CFA. The model is expected to be compatible with the data. In CFA, many goodness of fit indices and error indices are used to test the model-data fit. In order to have a high model-data fit, goodness of fit index values are expected to be close to 1, and error-index values should be close to 0. In this study, the RMSEA (Root Mean Square Error of Approximation) values were used as error-index values to test the model data fit in the CFA research, while indices such as GFI (Goodness of Fit Index), AGFI (Adjusted Goodness of Fit Index), NFI (Normed Fit Index), NNFI (Non-normed Fit Index), and CFI (Comparative Fit Index) were used as the goodness of fit indices.

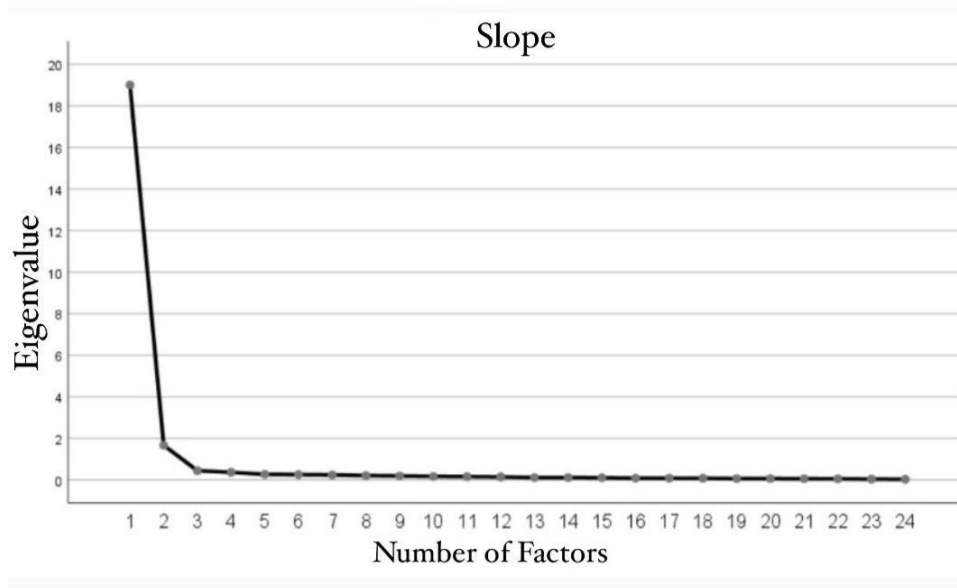
#### **5.6.1.2. Exploratory Factor Analysis (EFA) Findings**

Prior to the EFA, Kaiser-Meyer Olkin (KMO) and Bartlett Sphericity test values were calculated to test the suitability of the data for factor extraction. As a result of the analyses, the KMO coefficient was found to be 0.970 and Bartlett Sphericity test was significant at  $\chi^2=8253,834$  ( $p<0.01$ ). The KMO value must be at least 0.50 for the dataset to be factored. In addition, if the KMO value is between 0.50-0.60, it is

considered to be bad, if it is between 0.60-0.70, it is moderate, if it is between 0.70-0.80, it is good; and if it is 0.80 and above, the suitability of the data for factor analysis is excellent. Accordingly, it can be said that the factorisation of the data in this study is at an excellent level. In addition, the significance of the Barlett test of sphericity indicates a sufficient level of relationship between the variables, and further shows that the data come from a multivariate normal distribution (Field, 2009). According to these results, it is appropriate to make the factor analysis of the sample that constitutes Study Group 1.

When the scale was developed, the draft scale, which was created with 40 items, was reduced to 30 items after the validity of the scope was ensured by the experts. The EFA started with 30 items. First, unrotated principal components analysis was performed without limiting the number of factors. As a result of the analysis, two factors with an eigenvalue greater than 1.00 were determined. The total variance explained by the two factors was found to be 86.14%. Factor loads for scale items were also calculated. Factor loads reflect the power of representation of the relevant structure of those items (Kline, 2011). Higher factor loads indicate higher representation power of the material for the structure. In this study, the minimum factor load of an item was determined as 0.32, and items with a factor load below this value were excluded from the analysis (Çokluk et al., 2012). In addition, 0.32 is considered weak, 0.45 is moderate, 0.55 is good, 0.63 is very good, and 0.71 is excellent (Tabachnick and Fidell, 2012). Statistically, when deciding which items will remain on the scale, another technique used in addition to the factor load is overlapping items. Equivalence is when the difference between the factor loads of two items is less than 0.10. Accordingly, the difference between the factor loads of two items should be above 0.10 (Büyüköztürk et al., 2012). Overlapping items are excluded from the scale. When the analyses were examined, 4 items were excluded from the analysis because their loads were below 0.32, and 2 items were found to be overlapping items. After a total of 6 items were excluded from the analysis, the EFA was performed again with 24 items. At this stage, the factor number was fixed at 2 in order to see more clearly under which factor the items are placed, and the Direct Oblimin rotation method, one of the vertical rotation methods, was used. The Direct Oblimin method allows factors to be related to each other (Çokluk et al., 2012,

p.205). As a result of the analysis, a total of 24 items were grouped under two factors. The KMO coefficient was found to be 0.970 using the Direct Oblimin rotation method, and the Barlett Sphericity test  $\chi^2=8253.834$  ( $p<0.01$ ) was significant. In addition, as a result of rotation, when the eigenvalue was taken as 1 according to the slope graph, it was seen that the items gathered under two factors (Figure 19).



**Figure 19.** Slope Graph

(Source: Author's own calculation)

When the slope graph in Figure 19 is examined, it is seen that the scale consists of two factors. The factors under which the scale items are grouped, the eigenvalues of the factors, and the variance they explain are shown in Table 6.

When Table 6 is examined, it is seen that a two-factor measurement model with an eigenvalue greater than 1 was obtained. The total variance explained in the two-factor model is 86.146%. It is considered sufficient that the explained variance is between 40% and 60% in studies in social sciences (Tavşacı, 2014, p.48). Accordingly, it can be said that the variance explained by the two-factor measurement model in this study is quite high. In addition, the eigenvalue of the first factor consisting of 19 items is 19.007 and the variance explained is 79.197%. When the factor loads of the items were examined, it was seen that the loads of the items under the first factor vary between 1.000 and 0.755, and the loads of the second

factor vary between 1.000 and 0.803. The first factor was named as “Perceived Ecological Innovativeness of the Institution” (PEI), and the second factor was named as “Personal Environmental Awareness” (PEA).

**Table 6.** The EFA Results for the PEIS<sup>1</sup> (Source: Author’s own calculation)

Items	Factor 1	Factor 2
I_11	1.000	
I_31	1.000	
I_32	0.986	
I_34	0.964	
I_38	0.953	
I_44	0.952	
I_45	0.947	
I_23	0.927	
I_21	0.920	
I_8	0.896	
I_20	0.895	
I_42	0.887	
I_14	0.881	
I_17	0.880	
I_3	0.874	
I_18	0.872	
I_26	0.864	
I_41	0.770	
I_43	0.755	
I_52		1.000
I_51		0.965
I_54		0.935
I_53		0.915
I_50		0.803
Eigenvalue	19.007	1.668
Explained Variance (%)	79.197	6.949
Total Explained Variance (%)		86.146

Source: Author’s own calculations

<sup>1</sup> In Table 6, factor loads below 0.80 were suppressed, and the distribution of factor loads above 0.80 in the relevant factors was shown.

### 5.6.1.3. Validity Findings

Correlations between the scores obtained from each item and the total score obtained from its factors were calculated to provide evidence for the validity of the scale. In addition, the mean scores for each item between the 27% group with the highest score (upper group) and the 27% group with the lowest score (lower group) to determine the distinctiveness features of each item are unrelated samples. T-test was performed. The item-total correlation values calculated for each item and the upper-lower group t-test results are shown in Table 7.

**Table 7.** Item Total Correlations and Upper-Subgroup T-Test Results

Factor 1 (PEI)			Factor 2 (PEA)		
Items	r	Upper-Subgroup t-Test	Items	r	Upper-Subgroup t-Test
I_1	0.91**	14.84**	I_29	0.94**	7.93**
I_2	0.91**	12.15**	I_21	0.97**	7.86**
I_3	0.94**	14.29**	I_22	0.96**	8.45**
I_4	0.89**	13.87**	I_23	0.93**	8.99**
I_5	0.92**	13.83**	I_24	0.94**	7.96**
I_6	0.93**	12.52**			
I_7	0.93**	12.72**			
I_8	0.95**	12.19**			
I_9	0.93**	14.04**			
I_10	0.95**	12.76**			
I_11	0.95**	14.34**			
I_12	0.92**	13.85**			
I_13	0.91**	15.44**			
I_14	0.92**	13.76**			
I_15	0.87**	12.74**			
I_16	0.88**	14.50**			
I_17	0.89**	11.98**			
I_18	0.95**	12.67**			
I_19	0.93**	12.43**			

\*\* p<0.01

Source: Author's own calculations



As seen in Table 7, the item-scale correlation values of the items under Factor 1 vary between 0.87-0.95. It is seen that the item scale correlation values of the items under Factor 2 vary between 0.93-0.97. According to Büyüköztürk (2012, 171), the fact that the item-scale correlation values are higher than 0.20 is a proof of the validity of the scale items (Büyüköztürk et al., 2012). Thus, it is understood that the scale items serve the purpose of measuring the desired feature to be measured. According to Table 7, in the 24-item scale, the results of the upper-lower independent samples t-test performed to determine the discrimination of each item were found to be significant for all items ( $p \leq 0.01$ ). Accordingly, it can be said that the items have a high level of distinctiveness.

### 5.6.2. Reliability

In order to provide evidence for the reliability of the scale obtained as a result of the EFA, Cronbach's Alpha coefficients were calculated on the entire scale and its factors. The reliability coefficients obtained are shown in Table 8.

**Table 8.** Cronbach's Alpha Coefficients Obtained for the Entire Scale and Each Factor

Factor	# of Items	Cronbach's Alpha Internal Consistency Coefficient ( $\alpha$ )
1. PEI	19	0.99
2. PEA	5	0.97
Total	24	0.98

(Source: Author's own calculations)

As seen in Table 8, the Cronbach's Alpha reliability coefficient for the "Perceived Ecological Innovativeness of the Institution" factor is 0.99, and the Cronbach's Alpha reliability coefficient for the "Personal Environmental Awareness" factor is 0.97. In addition, the Cronbach's Alpha for the entire scale is 0.98. According to Büyüköztürk (2012), a Cronbach's Alpha coefficient above 70 is considered to be sufficient. It can be said that the reliability of the scale developed within the scope of this research is quite high.

### 5.6.2.1. Confirmatory Factor Analysis (CFA)

The CFA was performed on Study Group 2 data to investigate whether the two-factor measurement model was validated in a different sample. Before starting the CFA, it was tested whether there was a multivariate outlier in the data set. Mahalanobis distance was calculated for multivariate outlier detection. According to the obtained Mahalanobis distance, it was seen that there was no multivariate extreme value in the data set. Then, it was examined whether there was a multicollinearity problem among the scale items. The multicollinearity problem is a problem based on the linear relationship between variables. If the correlation between the items is between 0.70 and 1.00, it is assumed that there is a multicollinearity problem. Accordingly, for the inter-item multicollinearity problem, inter-item correlations were calculated. The simple correlations between the scale items were examined and it was seen that there was no value above 0.70. Hence, there is no multicollinearity problem between the items.

After testing the assumptions, the CFA was performed. The maximum likelihood method was used for parameter estimation in the CFA. As a result of the CFA, model-data compatibility was first evaluated. The most frequently used statistics on model-data fit are  $\chi^2/sd$ , RMSEA, GFI, AGFI, NFI, NNFI and CFI. For a good model-data fit, the calculated  $\chi^2/sd$  ratio should be less than 5, the GFI and AGFI values should be higher than 0.90, and the RMSEA value should be less than 0.05 (Jöreskog and Sörbom, 1993; Marsh and Hocevar, 1988). In addition, NFI, NNFI and CFI index values range from 0 to 1, and when these values approach 1, the model-data fit is considered to be very good (Raykov and Marcoulides, 2006; Schumacker and Lomax, 2010). In addition, an RMSEA value lower than 0.10 is an acceptable lower limit for model data compliance (Anderson and Gerbing, 1984; Cole, 1987; Marsh et al., 1988). The index values obtained from the CFA regarding the suitability of the model established for the PEIS are shown in Table 9.

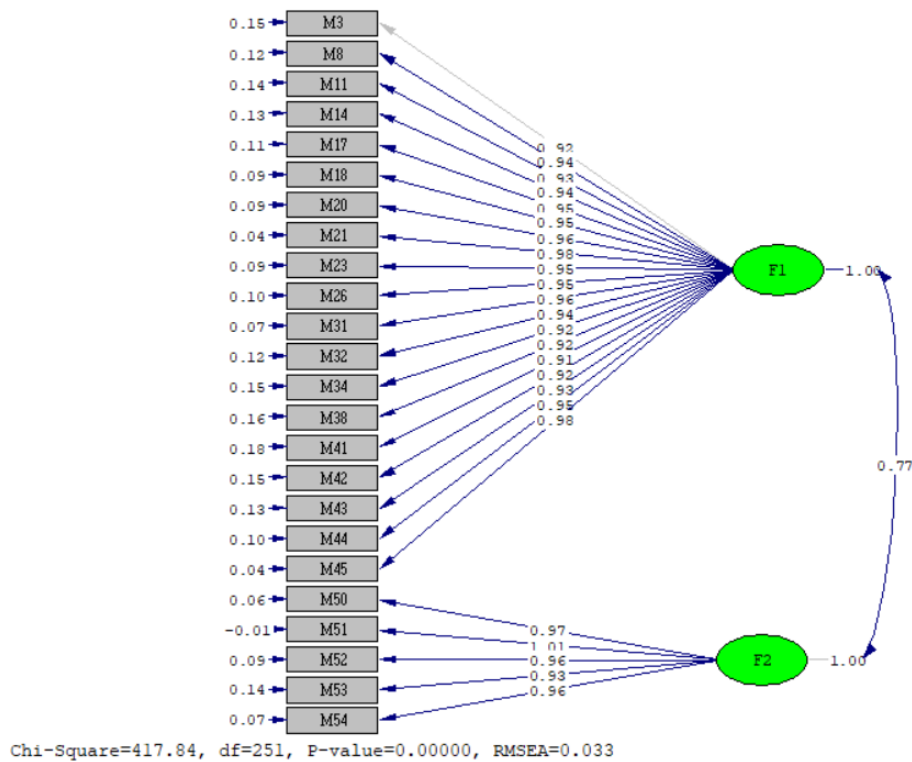
When Table 9 is examined, it is seen that the CFA model data compliance index values obtained for the two-factor measurement model meet the criterion values.

**Table 9.** Confirmatory Factor Analysis Model Data for the PEIS Fit Index Values

Model	$\chi^2/sd$	RMSEA	NFI	NNFI	CFI	GFI	AGFI
Two-Factor Model	1.66	0.033	1.00	0.99	1.00	0.99	0.98

Source: Author's own calculations

First of all, the fact that  $\chi^2/sd$  is less than 3 indicates that the model adapts well to the data. In addition, the values of NFI, NNFI, CFI, GFI and AGFI are very close to 1, indicating that the model is very well adapted to the data. A path diagram representation of the model resulting from the CFA is presented in Figure 20.



**Figure 20.** Path Diagram for the Two-Factor Measurement Model

Source: Author's own result

Figure 20 shows the standard factor loads and error variances for the items. It is seen that the loads of the "PEI" factor, which is the first factor, are between  $\lambda=0.91-0.98$ , and the error values are between  $\varepsilon=0.04-0.18$ . On the other hand, the factor loads of "PEA", which is the second factor, are between  $\lambda=0.93-1.01$ , and error values are

between  $\epsilon=0.01-0.14$  The fact that the factor loads of the items obtained as a result of the CFA are higher than 0.32 and the error variances are lower than 1.96 indicate that the validity of the items is high (Çokluk et al., 2012). According to these results, it can be said that the measurement model fits the relevant data well and adequately and that the items in the model represent the relevant structures well. The CFA revealed that the model data compatibility of the two-factor model was achieved. Thus, the two-factor structure of the scale was found to be valid.

Table 10 presents the final version of the 24-item PEIS, including what aspect of eco-innovation each item measures.

**Table 10.** Perceived Ecological Innovation Scale

#	Items	
1	Our bank gives importance and priority to the development of new environmentally friendly products and services by allocating additional financial resources.	Innovation capacity
2	Our bank cares about energy efficiency during its operations.	Resource efficiency
3	By improving the products and services we offer, we transform them into products and services that do not harm the environment.	Environmental awareness, Innovation capacity
4	We take care to be environmentally friendly in advertising and marketing activities.	Environmental awareness
5	Our bank often incorporates new technologies and/or equipment into its business processes to save energy.	Resource efficiency, Technology
6	Our bank has the capacity to adapt easily to environmentally friendly and new ways of doing business.	Innovation capacity
7	At our bank, the factors that hinder environmentally sensitive innovation are monitored and improved.	Monitoring and reporting
8	The importance given to new environmentally friendly practices in our bank is increasing day by day.	Innovation capacity
9	Our bank monitors environmental law standards and updates its activities within this framework.	Regulations
10	Our bank shares current developments and innovations about environmentally friendly financial products and services with its employees.	Employee engagement

Table 10. (continued)

11	Our bank carries out research and development activities for environmentally friendly innovations.	Innovation capacity
12	Our bank is a stakeholder/partnership with public institutions for activities aimed at environmentally friendly innovations.	Stakeholder collaboration
13	Our bank is well-versed in international environmental regulations.	Regulations
14	Our bank is knowledgeable about international environmental regulations.	Regulations, Stakeholder collaboration
15	Our bank encourages the use of new clean (green) technologies to find solutions to environmental problems.	Resource efficiency, Technology
16	Our Bank attaches importance to the recycling of wastes generated because of its activities.	Technology, Environmental awareness
17	Our bank produces technology-oriented solutions for the sorting of wastes generated as a result of its activities.	Resource efficiency, Technology
18	Our bank offers the industry new or significantly improved products ahead of our competitors.	Innovation capacity
19	While our bank follows the innovations, it examines and follows the use cases of that innovation of other banks in the sector.	Innovation capacity
20	The gradual warming of the earth may cause catastrophes in the future.	Environmental awareness
21	Rapid consumption of natural resources is an important problem for our future.	Environmental awareness
22	The climate crisis is a result of human activities.	Environmental awareness
23	I think climate change will lead to a bigger crisis than the COVID-19 pandemic.	Environmental awareness
24	I think that irregular weather events such as floods, storms, extreme temperatures, and droughts have increased in Turkey in recent years.	Environmental awareness

### 5.7. Qualitative Research Process

This chapter outlines the qualitative approach employed for data generation to address the research questions of the dissertation. A phenomenological design was

utilized in the qualitative part of the study. Phenomenology emphasizes exploring phenomena that are known, but require further investigation and understanding. At the core of this research lies the phenomenon of enhancing the eco-innovation capacity of the Turkish FC-PIS.

Data generation involved qualitative semi-structured interviews with key actors from the FC-PIS in Turkey. The study's population was determined through a comprehensive stakeholder analysis, which identified all relevant actors within the FC-PIS. The stakeholder analysis revealed the following components of the Turkish FC-PIS: player, regulator, collaborator, information provider, catalyzer, auditor and consulter, implementer, funder, and auxiliaries.

Firstly, as discussed in the stakeholder analysis part of the study, banks constitute a significant portion of the FC-PIS. According to the stakeholder analysis, banks are classified into various types. The analysis provides a comprehensive overview of the roles of different financial sector stakeholders. The sampling strategy employed is purposive sampling, which focuses on selecting participants who are likely to possess the information relevant to the research field.

Critical actors were chosen from the group of stakeholders in collaboration with field experts to generate the most valuable data to address the research questions and achieve the objective of technology policy design.

## **5.8. Data Collection Process**

Within the scope of the research, semi-structured in-depth interviews were conducted by selecting the stakeholders who could be most effective in increasing the ecological innovation capacity of the Turkish FC-PIS.

Before the interviews, according to the scope of this dissertation, some question sets were developed as a pool. These questions were divided to the functions of the TIS. A comprehensive set of questions was carefully curated from a pool of potential inquiries, taking into consideration time constraints for the interviews. Initially, a

pilot interview was carried out, after which the questions were re-evaluated with the assistance of experts. Based on the feedback and insights from the initial interviews, additional questions addressing topics such as the taxonomy problem and digital carbon footprint, which were frequently emphasized by the participants, were incorporated into the subsequent interviews. In general, all participants were asked a core set of questions. Table 11 presents the questions posed to the participants, as well as their corresponding functions.

**Table 11.** Interview Questions and Their Functions (Source: Author’s own table)

Questions	Related Functions
What are the general activities of your institution related to ecological innovations and sustainability? What do you think are the most remarkable practices in the financial sector in the context of ecological innovation? What are the organizational environmental innovations realized in your institution? What are your ecological innovative financial products?	Market Formation
When did sustainability start to be talked about so much in Turkey? What are the drivers of ecological innovation for the financial sector? What are the driving forces?	Drivers
When the finance sector and ecological innovations are considered together, who are the actors that come to mind? What are the differences between stakeholders? Is there an entrepreneur in the context of sustainable innovation? Who are your partners? Who are the key stakeholders in the supply chain? Who are the institutions we work with? Who do you think are the most influential actors in this industry? Do you cooperate with any educational institution or international organizations?	Stakeholder Analysis
How do you measure your digital carbon footprint? Can you evaluate your institution in the context of digital transformation carbon footprint?	Green Digital Transformation
What are the barriers to innovative ecological practices? What is the biggest obstacle to ecological innovation you see in the financial sector?	Barriers
Where do you get the knowledge? Who is the main producer of scientific and technological knowledge? In this context, what is the source of scientific knowledge production? Do you cooperate with the university? From whom does the financial sector learn about sustainability? Who do you think is the main producer of the academic and scientific knowledge you follow for the finance sector?	Knowledge Creation and Diffusion, Stakeholder
What are the practices of financial authorities other than your institution in this context?	Creating Legitimacy
What are your practices to reduce your carbon footprint? What are you doing about sustainability to reduce the carbon footprint of your own operational processes? Do you have an evaluation agreement with your suppliers in this context?	Green Digital Transformation

Table 11. (continued)

Are there lobbying activities in the context of ecological innovation?	Creating Legitimacy
Does it have a budget for sustainable innovative eco-innovative digital transformation technologies or for R&D investments defined for sustainability? Are you investing in R&D? What is your budget? Have you ever had a product that came out as a result of R&D investment? What are the support and budget opportunities we receive from abroad? Do you have R&D investments?	Knowledge Creation and Diffusion, Green Digital Transformation, Resource Mobilisation
To what extent did you take environmental impacts as criteria in your operations? What are the driving forces and obstacles in this context?	Drivers, Barriers
How do you position the financial sector? What kind of transformation is there in this context? What should be the place and role of the finance sector in solving environmental problems in Turkey?	Market Formation
What are your thoughts on the taxonomy problem?	Knowledge Creation and Diffusion,
What information technologies are prone to ecological innovation?	Green Digital Transformation,

According to the ex-ante stakeholder analysis, we reached the relevant stakeholders via the Internet and with the references of the field experts. In this context, a total of 45 people were contacted. There were participants who refused to participate in the study for various reasons. For example, implementers refused to have an interview because of their corporate policies and privacy concerns. Some players disapproved of attending the meeting due to the intense work schedule. As a result, in-depth interviews were conducted with a total of 31 people. Before starting the field study of the research, the METU Human Research Ethics Committee (IAEK) was consulted. Ethics committee approval was given to the study with protocol number 177-ODTU-2021 on 20 May 2021. Ethics committee approval certificate is given in Appendix A. Ethical information was given to all participants during the interviews, and permission was requested to record the interview. Detailed information about the dates of the interviews, the duration of the interviews, the institutions and the positions of the relevant persons are given in Appendix B. As seen in Appendix B, second meetings were held with some institutions, with the participation of people in different positions. The names of the participants were coded and indicated, considering the ethical principles. Accordingly, the total interview time is 1482 minutes (24.7 hours). Interviews were held between 28.05.2021 and 20.06.2022. Interview date, interview duration, communication tool used, institutional and position information of the participants are given in Appendix B.



The selection of a research method and data collection technique is influenced by the researcher's stance on the justification of knowledge and understanding of reality (Creswell and Sözbilir, 2017). In this dissertation, the fundamental research motivation is to reveal the barriers and drivers of eco-innovation in the FC-PIS. Qualitative data of this nature can be gathered using interviews, as they allow for open-ended questions and probes that elicit detailed responses about individuals' experiences, perspectives, opinions, emotions, and knowledge. For this purpose, semi-structured interview is used as the data collection technique. This interviewing technique is valuable as it enables us to contextualize these various perspectives, experiences, and approaches within the broader cultural and social framework (McCracken, 1988), which is implicitly or explicitly referred to by the actors during the interview or whose relation to the data can be analyzed by the researcher, and understand the overall picture from the worldviews of key actors. Furthermore, among the interviewing strategies proposed by Silverman (2011), this approach is considered the most suitable. During the process of conducting semi-structured interviews, it is important for the researcher to establish a rapport with the interviewee and ensure that they have a clear understanding of the research objectives (Silverman, 2011). Within our research domain, employing the method of semi-structured interviews allowed us to establish a connection with participants and gather diverse viewpoints, thus facilitating a comprehensive understanding of the fundamental dynamics of FC-PIS eco-innovation capacity. This multi-faceted and substantial data is particularly valuable for shaping policies that aim to support the FC-PIS.

## **5.9. Validity and Reliability Analysis of Qualitative Research**

There are different perspective systems at the root of qualitative research. Two of these perspectives are positivism and post-positivism. These perspectives led to the development of qualitative research designs. In addition, according to positivism and post-positivism, it is certainty that ensures the quality of a research (Lincoln and Guba, 1986).

An approach arguing that the research design should have a structure that is flexible to allow new inquiries as in-depth knowledge of the subject is obtained is the social constructivism-interpretation system of thought. For this reason, the concept of reliability is suggested instead of the concept of certainty (Lincoln and Guba, 1986). Exploring these conditions with the development of new conditions, rather than a rigid and structured research design, expresses a more appropriate approach to the nature of qualitative research (Patton, 2014). In the critical approach, the quality of the research is ensured by considering the social, political, cultural or socioeconomic, ethnic and gender context of the researched subject (Lincoln and Guba, 1986). Based on all these, the validity and reliability of this research was handled according to the trustworthiness criteria proposed by Lincoln and Guba (1986), which adopts the social constructivism-interpretation paradigm. Lincoln and Guba (1986) consider quality enhancing criteria in qualitative research as "credibility", "transferability", "reliability" and "validity". Table 12 presents the steps followed in the research regarding the trustworthiness criteria are given.

**Table 12.** Steps followed regarding the trustworthiness criteria of the research

Trustworthiness Criteria	The Steps Followed
<b>Persuasiveness</b>	
Use of well-known research methods	The data collection form was created in line with the literature, and the recommendations of the thesis follow-up jury were received. In line with the purpose of the study, it was deemed appropriate to use the individual in-depth interview technique.
Interaction	Interview appointments were planned at the most appropriate time for the participants, and the interviews were conducted in a chat environment so that they could fully express their views.
Participant honesty	It was stated to the participants that their participation in the study was based on voluntariness, they were encouraged to be frank during the interview, it was stated that there were no correct answers to the questions, and that the personal opinions of the participants were important. It was explained to the participants that they could withdraw from the study at any time without giving any reason.
Repetitive inquiry	In order to get to the core of the data during the interview, the previous questions were expressed in different ways by returning to the topics previously expressed by the participants.

Table 12. (continued)

Researcher's background, qualifications and experiences	These are given in the Appendix.
<b>Transferability</b>	
Detailed descriptives	Accurate and detailed information about the research population, sample, data collection forms, interview durations and all stages is given in the method section. The statements of the participants were presented by direct quotation without changing them.

Table 12. (continued)

Purposeful Sampling	Interviews were conducted in a sample suitable for the purpose of the research.
<b>Confirmability</b>	
Confirmation review	Ethics committee approval forms of the research, participant consents, voice recordings, raw data transferred to the computer, data coding and all records related to the creation of themes are kept for the approval of the research.

Source: Arastaman et al., 2018; Creswell, 2020; Creswell and Miller, 2000; Morrow et al., 2015.

The following chapter presents the findings of all the analyses conducted within the framework of the study.

## CHAPTER 6

### RESULTS

#### 6.1. Results of the PEIS in the FC-PIS

The quantitative part of the study aimed to find answers to the following research questions:

- What are the perceived ecological innovativeness levels of the participants?
- Do the perceived ecological innovativeness levels of the participants differ significantly according to the variables of gender, age, level of education, status of being a manager, Institution type, bank type, and type of insurance company?
- What is the level of personal environmental awareness of the participants?
- Does the personal environmental awareness of the participants differ significantly according to the variables of gender, age, level of education, status of being a manager, institution type, bank type, and type of insurance company?
- Is there a significant relationship between the perceived ecological innovativeness levels of the participants and their environmental awareness?

SPSS 23.0 and LISREL 8.8 package programs were used to analyse the data. After the collected data was transferred to the SPSS 23.0 program, it was first checked whether there were any missing or incorrectly entered data. In the frequency analysis, it was observed that there was no missing data and no incorrectly entered data. Then, factor scores were calculated. Outliers were determined based on these obtained scores. In order to detect univariate outliers, the z-standard scores of the

factors were calculated, and histograms and box-line graphs were examined. The z-standard scores calculated for the factors range from -3 to +3. Accordingly, it can be interpreted that there is no outlier in the data set. In addition, when histograms and box-line graphs were examined, it was seen that there were no outliers (Büyüköztürk, 2012).

After it was observed that there were no outliers, various tests were carried out to test the normality of the data. For normality tests, skewness and kurtosis values of factor total scores were calculated. In addition, the Kolmogorov-Smirnov test was performed as the normality test because the number of data was greater than 50. The skewness and kurtosis values between -1 and +1 indicate that the data are normally distributed, while the Kolmogorov-Smirnov test is not significant, indicating that the data set is normally distributed (Büyüköztürk, 2012). The results are shown in Table 13.

**Table 13.** Normality Test Results Regarding Factors

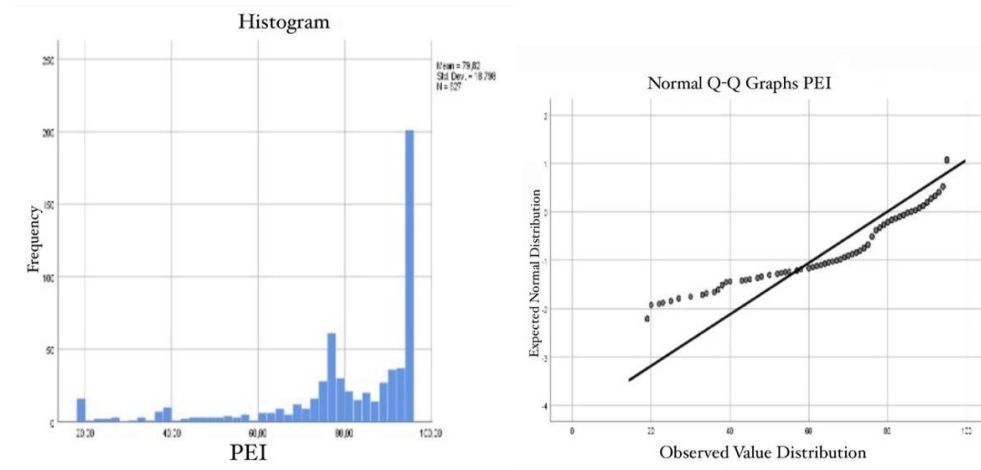
Kolmogorov-Smirnov Test				
Factors	Statistics	P	Skewness Coefficient	Kurtosis Coefficient
PEI	0,21	,000*	-1,659	2,326
PEA	0,305	,000*	-2,471	5,354

\*  $p \leq ,05$

Source: Author's own calculations

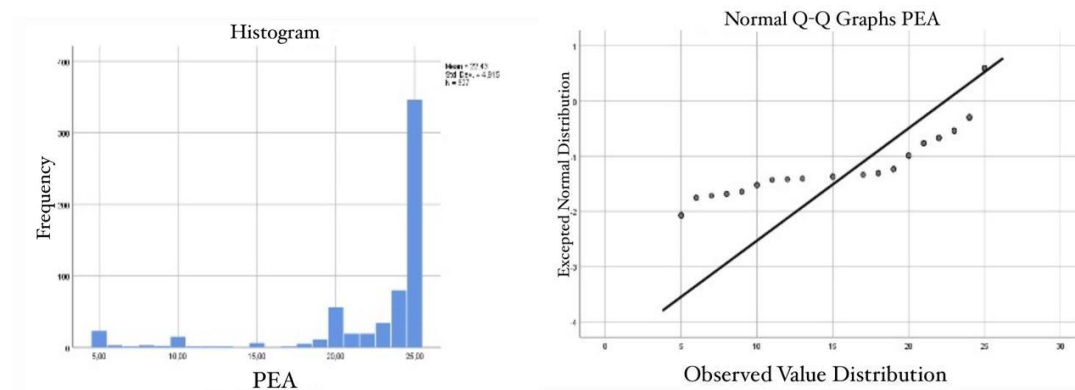
The Kolmogorov-Smirnov test showed that both factors are significant ( $p \leq ,05$ ). In addition, the skewness and kurtosis coefficients indicated that the results obtained for both factors are outside the range of -1 to +1. In addition, the normal Q-Q pilot plot and the box line plot were also examined. When all the findings were evaluated, it was seen that the data did not exhibit a normal distribution. As the data did not indicate normal distribution, it was decided to use non-parametric tests in the analysis. In addition, the level of statistical significance was set at  $p=0.05$ . Accordingly, if the p-value of the statistical result obtained is below 0.05, it is interpreted that there is a significant difference between the variables. If it is above

0.05, there is no significant difference between the variables. In addition, histograms and box-line graphs were examined to test the normality of the data. The results are shown in Figure 21.



**Figure 21.** Histogram and Q-Q Charts for PEI Factor (Source: Author’s own results)

When Figure 21 is examined, it is seen that the data do not exhibit normal distribution according to the histogram and Q-Q graphs obtained for the PEI factor. The histogram and Q-Q graphs obtained for the PEA factor are shown in Figure 22.



**Figure 22.** Histogram and Q-Q Charts for PEA Factor (Source: Author’s own results)

When Figure 22 is examined, it is seen that the data do not exhibit a normal distribution according to the histogram and Q-Q graphs obtained for the PEA factor. Despite the large sample size, it is believed that the deviation from normal

distribution occurs due to the tendency for positive responses or the similar and high perceptions of the sample.

The data analysis was performed with the data obtained from 627 participants. If the data set is larger than 30, it can be assumed that the data exhibit a normal distribution. Thus, it is stated that parametric tests can also be used in the analysis of the data. For this reason, non-parametric and parametric tests were performed together for the analysis in this study. Within the scope of the second and fourth research questions, an independent sample t-test and One-Way Analysis of Variance (ANOVA) test were used to examine whether PEI levels and PEA levels differ significantly according to the demographic characteristics of the participants. In cases where the ANOVA test was significant, the Tukey test was performed to determine between which groups there was a significant difference. Non-parametric and parametric test results were compared, and it was seen that there was no difference between the results. For this reason, only non-parametric analysis results are included in the study.

To address the first research question, the mean, standard deviation, minimum and maximum values for the factor of "Perceived Ecological Innovativeness" were calculated to determine the perceived ecological innovativeness levels of the participants in the research.

To address the third research question, the mean, standard deviation, minimum and maximum values for the factor of "Personal Environmental Awareness" were calculated to determine how the participants in the study were.

Within the scope of the second and fourth research questions, the Mann Whitney U-test and the Kruskal Wallis-H-test were used to examine whether individuals' perceived ecological innovativeness levels and personal environmental awareness levels differ significantly according to their demographic characteristics. Accordingly, the Mann-Whitney U-test was used to compare two groups, while the Kruskal Wallis-H-test was used to compare more than two groups. In cases where

the Kruskal Wallis H-test was significant, the Mann-Whitney U test was used to determine between which groups there was a significant difference.

Within the scope of the fifth research question, the Spearman Correlation coefficient was calculated between the "PEI" factor and the "PEA" factor in order to examine whether there is a significant relationship between the individuals' perceived ecological innovativeness levels and their environmental awareness. Correlation coefficients below 0.30 are interpreted as low; while coefficients between 0.30-0.70 refer to medium level of correlation, and coefficients greater than 0.70 point to a high-level correlation. (Çokluk et al., 2012).

## 6.2. Analysis Results and Findings of the PEIS in the FC-PIS

In this section, the results derived from the data analysis conducted to address the research problem and research questions are presented alongside corresponding tables and explanations. The findings are organized according to the sequence of the research questions, and the results are interpreted.

**Table 14.** Frequency Table Obtained for the PEIS Items

Item Number and Question	Strongly Disagree		Disagree		No Idea		Agree		Absolutely Agree	
	f	%	f	%	f	%	f	%	f	%
11. Our firm gives importance and priority to the development of new environmentally friendly products and services by allocating additional financial resources.	27	4.3	32	5.1	53	8.5	174	27.8	341	54.4
12. Our firm cares about energy efficiency during its operations.	25	4.0	31	4.9	50	8.0	180	28.7	341	54.4
13. By improving the products and services we offer, we transform them into products and services that do not harm the environment.	27	4.3	32	5.1	65	10.4	187	29.8	316	50.4
14. We take care to be environmentally friendly in advertising and marketing activities.	25	4.0	34	5.4	52	8.3	184	29.3	332	53.0
15. Our firm often incorporates new technologies and/or equipment into its business processes to save energy.	28	4.5	36	5.7	42	6.7	215	34.3	306	48.8
16. Our firm has the capacity to adapt easily to environmentally friendly and new ways of doing business.	30	4.8	33	5.3	38	6.1	191	30.5	335	53.4
17. At our firm the factors that hinder environmentally sensitive innovation are monitored and improved.	29	4.6	31	4.9	51	8.1	199	31.7	317	50.6
18. The importance given to new environmentally friendly practices in our firm is increasing day by day.	29	4.6	29	4.6	26	4.1	188	30.0	355	56.6
19. Our firm monitors environmental law standards and updates its activities within this framework.	26	4.1	29	4.6	56	8.9	193	30.8	323	51.5



Table 14. (continued)

I10. Our firm shares current developments and innovations about environmentally friendly financial products and services with its employees.	23	3.7	47	7.5	39	6.2	182	29.0	336	53.6
I11. Our firm carries out research and development activities for environmentally friendly innovations.	25	4.0	41	6.5	46	7.3	186	29.7	329	52.5
I12. Our firm is a stakeholder/partnership with public institutions for activities aimed at environmentally friendly innovations.	27	4.3	31	4.9	67	10.7	191	30.5	311	49.6
I13. Our firm engages in international partnership/partnership for activities aimed at environmentally friendly innovations.	23	3.7	37	5.9	63	10.0	192	30.6	312	49.8
I14. Our firm is knowledgeable about international environmental regulations.	32	5.1	40	6.4	61	9.7	186	29.7	308	49.1
I15. Our firm encourages the use of new clean (green) technologies to find solutions to environmental problems.	26	4.1	38	6.1	54	8.6	214	34.1	295	47.0
I16. Our firm attaches importance to the recycling of wastes generated because of its activities.	31	4.9	31	4.9	55	8.8	204	32.5	306	48.8
I17. Our firm produces technology-oriented solutions for the sorting of wastes generated as a result of its activities.	26	4.1	32	5.1	51	8.1	205	32.7	313	49.9
I18. Our firm offers the industry new or significantly improved products ahead of our competitors.	26	4.1	31	4.9	49	7.8	189	30.1	332	53.0
I19. While our firm follows the innovations, it examines and follows the use cases of that innovation of other banks in the sector.	25	4.0	34	5.4	31	4.9	174	27.8	363	57.9
I20. The gradual warming of the earth may cause catastrophes in the future.	27	4.3	22	3.5	17	2.7	112	17.9	449	71.6
I21. Rapid consumption of natural resources is an important problem for our future.	31	4.9	20	3.2	8	1.3	99	15.8	469	74.8
I22. The climate crisis is a result of human activities.	27	4.3	23	3.7	18	2.9	118	18.8	441	70.3
I23. I think climate change will lead to a bigger crisis than the COVID-19 pandemic.	30	4.8	23	3.7	21	3.3	118	18.8	435	69.4
I24. I think that irregular weather events such as floods, storms, extreme temperatures, and droughts have increased in Turkey in recent years.	28	4.5	21	3.3	12	1.9	114	18.2	452	72.1

Source: Author's own calculations

The frequency table for the PEIS items presented in Table 14 provides insights into the participants' views on various aspects of environmental practices and concerns within their respective organizations, as well as their perspectives on broader environmental issues and eco-innovations.

The majority of the participants agreed or strongly agreed that the banks they work for give importance and priority to the development of environmental-friendly products and services (82.2%), care about energy efficiency during operations (83.1%), and transform their offerings into environmental-friendly products and services (80.2%). These responses indicate a strong awareness and commitment to environmental considerations in the banking sector.

Furthermore, most participants concurred that their banks are incorporating new technologies and equipment to save energy (83.1%), adapting easily to environmental-friendly and new ways of doing business (83.9%), and monitoring factors that hinder environmentally sensitive innovation and working to improve them (82.3%). These responses reflect the banks' proactive approach to embracing sustainable practices and addressing potential obstacles.

In terms of environmental law standards, international regulations, and collaboration with public institutions and international partners, the majority of the respondents agreed that their banks are actively engaged in these aspects, signifying a commitment to staying informed and collaborating to achieve environmentally friendly innovations.

The majority of participants also agreed that climate change and the rapid consumption of natural resources are critical issues for the future. Most respondents concurred that the climate crisis is a result of human activities (89.1%) and may lead to a larger crisis than the COVID-19 pandemic (88.2%). Additionally, a significant majority of participants (90.3%) agreed that irregular weather events such as floods, storms, extreme temperatures, and droughts have increased in Turkey in recent years.

Overall, the frequency table for the PEIS items reveals a strong awareness and commitment to environmental practices and concerns within the banking sector. The participants acknowledge the importance of addressing environmental challenges and are actively engaged in incorporating sustainable practices and innovations in their organizations.

### **6.3. PEI Factor Results**

The results pertaining to the PEI factor are presented below for each research question separately.

**Research Question 1: *What are the perceived ecological innovativeness levels of the participants of the research?***

In order to examine the PEI levels of the participants, the descriptive statistics for the factor of PEI was calculated. The results obtained are shown in Table 15.

**Table 15.** Descriptive Statistics of PEI Scores of the participants

<b>Factors</b>	<b>n</b>	<b>Min</b>	<b>Max</b>	<b>Mean</b>	<b>SD</b>
PEI	627	19	95	79.8	18.79

Source: Author's own calculations

Table 15 shows that the mean (79.81) and standard deviation (18.79) of the scores for the PEI factor of the finance sector employees in the research.

The minimum score of the participants for the PEI factor is 19, and the maximum score is 95. This result indicates that FC-PIS employees perceive the institutions they work for as largely ecologically innovative.

**Research Question 2:** *Do the perceived ecological innovativeness levels of the participants differ significantly according to the variables of gender, age, year of experience, level of education, status of being a manager, institution type, bank type, and type of the insurance company?*

Non-parametric tests were performed to compare the scores of the participants for the "PEI" factor according to demographic variables. The statistical results obtained are explained below, respectively.

In groups that do not exhibit a normal distribution, the Kruskal-Wallis H test was used to test the significance of the differences between the means of three or more groups. For testing the significance of the differences between the means of two independent groups that do not exhibit a normal distribution, the Mann-Whitney U-test was used.

#### **a. Gender**

The Mann-Whitney U-test revealed the "PEI" factor scores of the participants showed no significant difference according to gender (see Table 16).

**Table 16.** The Mann-Whitney U-Test Results for PEI Scores by Gender

Factor	Gender	n	X	sd.	Rank Avg.	Rank Sum	U	p
PEI	Male	328	80.5	18.2	319.21	104701	47327	0.45
	Female	299	79.1	19.5	308.28	92177		

Source: Author's own calculations

As seen in Table 16, the scores of participants on the "PEI" factor do not show a significant difference according to gender ( $U=47327.00$ ;  $p>0.05$ ). Accordingly, for this research, it can be stated that gender does not affect individuals' PEI scores.

### b. Age

The Kruskal Wallis H-test was conducted to examine whether the perceived ecological innovativeness levels of the participants showed a significant difference according to their age. The results obtained are shown in Table 17.

**Table 17.** Kruskal Wallis H-Test Results pertaining to PEI Levels by Age

Factor	Age Range	n	X	sd.	Rank Avr.	X <sup>2</sup>	p
PEI	(1) 18-24 age range	230	79.5	18.4	306.6	0.62	0.73
	(2) 25-34 age range	295	79.6	19.6	318.5		
	(3) 41-50 age range	102	81.1	17.4	317.6		

Source: Author's own calculations

When Table 17 is examined, it is seen that the scores of individuals on the "Perceived Ecological Innovative Level" factor do not differ significantly according to age ( $\chi^2=.621$ ;  $p>0.05$ ). Accordingly, for this research, it turns out that age does not affect individuals' perceived ecological innovativeness levels.

### c. Level of education

The Kruskal Wallis H-test was conducted to examine whether the perceived ecological innovativeness level scores of the participants differed significantly according to their education level. The results are shown in Table 18.

**Table 18.** Kruskal Wallis H-Test Results pertaining to PEI Levels According to Education Levels

Factor	Education Level	n	X	sd.	Rank Avg.	X <sup>2</sup>	p
PEI	(1) High School	19	74,1	26,26	287,47	18,2	,000*
	(2) College	28	85,5	16,42	389,3		
	(3) Undergraduate	439	80,8	18,5	326,23		
	(4) Postgraduate	141	76,5	18,53	264,55		

\*p ≤ ,05

Source: Author's own calculations

As seen in Table 18, the scores of the participants on the "Perceived Ecological Innovation Level" factor differed significantly according to their education level ( $\chi^2=18.18$ ;  $p \leq 0.05$ ). Accordingly, the level of education was found to have a significant effect on the Perceived Ecological Innovation Scores of individuals. According to the results of the non-parametric multiple comparison made to determine between which groups the significant difference was observed, the mean rank of individuals with a bachelor's degree (326.23) was found to be higher than the mean of individuals with a master's degree (264.55). In addition, the Ecological Innovative Level factor mean score of individuals with a bachelor's degree ( $n = 80.77$ ) is higher than the average of individuals with a graduate degree ( $n = 76.47$ ). According to the non-parametric multiple comparison results, the mean rank of individuals with an associate degree (389.30) is higher than the average rank of individuals with graduate degrees (264.55). In addition, the Ecological Innovative Level factor mean score of the associate degree graduates ( $n = 85.46$ ) is higher than the mean of the postgraduate graduates ( $n = 76.47$ ). When all these results are evaluated together, it can be said that as the education level of FC-PIS employees increases, they see the institution they work for less ecologically innovative.

#### **d. Status of being a manager**

The Mann-Whitney U-test was conducted to examine whether the "Perceived Ecological Innovative Levels" factor scores of the participants showed a significant

difference according to their status of being a manager. The results are shown in Table 19.

**Table 19.** The Mann-Whitney U-Test Results According to the Scores of the participants from the Factor of PEI Levels

Factor	Manager	n	X	sd.	Rank Avg.	Rank Sum.	U	p
PEI	Yes	92	79.1	17.1	283.29	26063	21785	0,08
	No	535	79.9	19.1	319.28	170815		

Source: Author's own calculations

Table 19 shows that the scores of participants on the factor of "Perceived Ecological Innovative Level" do not show a significant difference according to their status as managers ( $U=21785.00$ ;  $p>0.05$ ). Accordingly, for this research, being a manager has not affected individuals' ecological innovativeness levels.

#### e. Type of institution

The Mann-Whitney U-test was conducted to examine whether the "Perceived Ecological Innovative Levels" factor scores of the participants showed a significant difference according to the type of institution they work for (bank/insurance company). The results are shown in Table 20.

**Table 20.** The Mann-Whitney U-test results pertaining to the scores of the participants from the Factor of PEI according to the type of institution they worked for

Factor	Institution Type	n	X	sd.	Rank Avg.	Rank Sum.	U	p
PEI	Bank	279	80	16.3	301.13	84016	44956	0.11
	Insurance company	348	79.7	20.6	324.32	112862		

Source: Author's own calculations

As seen in Table 20, the scores of the participants on the "Perceived Ecological Innovative Level" factor do not show a significant difference according to the type of

institution they work for ( $U=44956.00$ ;  $p>0.05$ ). Accordingly, the type of institution they work for (Bank/Insurance Company) for this research could be more effective on individuals' ecological innovativeness levels.

#### **f. Bank type**

The Mann-Whitney U-test was conducted to examine whether the "Perceived Ecological Innovative Levels" factor scores of the participants showed a significant difference according to the type of bank they work in (Public/Private Bank). The results are shown in Table 21.

**Table 21.** The Mann-Whitney U-Test Results of the Scores of the participants from the PEI Level According to the Type of Bank They Worked for

<b>Factor</b>	<b>Institution Type</b>	<b>n</b>	<b>X</b>	<b>sd.</b>	<b>Rank Avg.</b>	<b>Rank Sum.</b>	<b>U</b>	<b>P</b>
PEI	Public Bank	170	79.4	16.3	135.38	23015	8480	0.23
	Private Bank	109	80.9	16.3	147.2	16045		

Source: Author's own calculations

When Table 21 is examined, it is seen that the scores of individuals on the "Perceived Ecological Innovative Level" factor do not show a significant difference according to the type of bank they work for ( $U=8480.00$ ;  $p>0.05$ ). Accordingly, it can be said that the type of bank (Public Bank/Private Bank) they worked for was not effective on individuals' perceived ecological innovativeness.

#### **g. Type of insurance company**

The Mann-Whitney U-test was conducted to examine whether the "Perceived Ecological Innovative Levels" factor scores of the participants showed a significant difference according to the type of insurance company they worked for (Local Insurance Firm /Multi National Insurance Firm). The results are shown in Table 22.

**Table 22.** The Mann-Whitney U-Test Results of the Scores of the participants from the PEI Level According to the Type of Insurance Company They Worked for

Factor	Type of Insurance Company	n		sd.	Rank Avg.	Rank Sum.	U	p
PEI	Local	213	77,2	22,6	166,91	35552	12761	0,07
	Multinational	135	83,5	16,3	186,47	25174		

Source: Author’s own calculations

As seen in Table 22, the scores of participants on the “Perceived Ecological Innovation Level” factor do not show a significant difference according to the type of insurance company they work for ( $U=12761.00$ ;  $p>0.05$ ). Accordingly, it can be said that the type of insurance company they work for (Local Insurance Firm /Multi National Insurance Firm) does not have an effect on individuals' ecological innovativeness levels.

#### **h. Gender as a manager**

The Mann Whitney U-test was conducted to examine whether the “Ecological Innovative Levels” factor scores of the participants do not show a significant difference according to the gender of the managers. The results are shown in Table 23.

**Table 23.** The Mann-Whitney U-Test Results of the Scores of the participants from the PEI Level According to their Gender as Managers

Factor	Gender	n		sd.	Rank Avg.	Rank Sum.	U	P
PEI	Male	68	79.9	16.68	48.32	3286	692	0.27
	Female	24	77	18.58	41.33	992		

Source: Author’s own calculations

Table 23 indicates that the scores of participants on the “Ecological Innovative Level” factor do not differ significantly according to the gender of the managers ( $U=692.00$ ;  $p>0.05$ ). Accordingly, for this research, it can be said that the gender of the managers does not have an effect on the ecological innovativeness of individuals.



**Research Question 3: *What is the level of personal environmental awareness of the participants?***

The descriptive statistics for the "Personal Environmental Awareness" factor scores were calculated to examine the level of personal environmental awareness of the participants. The results are shown in Table 24.

**Table 24.** Descriptive Statistics for the PEA Scores of the Participants

<b>Factor</b>	<b>n</b>	<b>Min</b>	<b>Max</b>	<b>Avg.</b>	<b>sd.</b>
PEA	627	5	25	22.4	4.91

Source: Author's own calculations

Table 24 shows the mean (avg=22.43) and standard deviation (sd=4.91) of the scores of the participants from the Personal Environmental Awareness factor. The minimum score of the participants on the Personal Environmental Awareness factor is 5, and the maximum score is 25. Considering the average score of the participants for PEA, it is seen that the participants' personal environmental awareness is quite high.

**Research Question 4: *Does the personal environmental awareness of the participants differ significantly according to the variables of gender, age, year of experience, level of education, status of being a manager, institution type, bank type, and type of insurance company?***

Non-parametric tests were conducted to compare the scores of the participants on the "Personal Environmental Awareness" factor according to demographic variables. The statistical results for each demographic variable are explained below, respectively.

**a. Gender**

The Mann-Whitney U-test was performed to examine whether the "Personal Environmental Awareness" factor scores of the participants showed a significant difference according to their gender. The results are displayed in Table 25.

**Table 25.** Mann-Whitney U-Test Results pertaining to the relationship between the scores of participants on the PEA and gender

Factor	Gender	n	X	sd.	Rank Avg.	Rank Sum	U	p
PEA	Male	328	22.5	4.69	307.95	101006.5	47051	0.34
	Female	299	22.4	5.15	320.64	95871.5		

Source: Author’s own calculations

As seen in the Table 25, the scores of the participants on the “Personal Environmental Awareness” factor do not show a significant difference according to their gender ( $U=47050.50$ ;  $p>0.05$ ). Accordingly, for this research, it can be said that gender does not affect individuals' environmental awareness.

**b. Age**

The Kruskal Wallis H-test was conducted to investigate whether the ecological innovativeness levels of the participants showed a significant difference according to their age. The results are shown in Table 26.

**Table 26.** Kruskal Wallis H-Test Results pertaining to the relationship between the scores of the participants on PEA and age

Factor	Age range	n	X	sd.	Rank Avg.	X <sup>2</sup>	p
PEA	(1) 18-24years old	230	22.5	4.9	315.72	2.9	0.24
	(2) 25-34years old	295	22.1	5.3	304.78		
	(3) 41-50years old	102	23.2	3.6	336.8		

Source: Author’s own calculations

As seen in Table 26, the scores of the participants on the “Personal Environmental Awareness” factor did not differ significantly according to their age ( $\chi^2=2.89$ ;  $p>0.05$ ). Thus, it can be said that age has no effect on individuals' personal environmental awareness.

**c. Level of Education**

The Kruskal Wallis H-test was conducted to examine whether the “Personal Environmental Awareness” scores of the participants showed a significant difference according to their level of education. The results are shown in Table 27.

**Table 27.** Kruskal Wallis H-Test Results pertaining to the relationship between the scores of the participants from the PEA and their level of education

Factor	Education level	n	X	sd.	Rank Avg.		p
PEA	(1) High School	19	19.3	6.9	213.63	7.9	.048*
	(2) College	28	22.1	5.1	306.46		
	(3) Graduate	439	22.5	4.9	320.43		
	(4) Postgraduate	141	22.6	4.6	309		

\*  $p \leq .05$

Source: Author’s own calculations

As Table 27 displays, the scores of the participants on the "Personal Environmental Awareness" factor differed significantly according to their education level ( $\chi^2=7.89$ ;  $p \leq 0.05$ ). Accordingly, the level of education has a significant effect on individuals' personal environmental awareness. The results of the non-parametric multiple comparison tests conducted to determine the significant difference between groups revealed that the mean rank of the participants with a bachelor's degree (320.43) is higher than the mean rank of those with a high school degree (213.63). In addition, the Personal Environmental Awareness factor mean score of those with a university degree (=22.53) was found to be higher than the mean of the high school graduates (=19.31). According to the non-parametric multiple comparison results, the mean rank of the participants with a postgraduate degree (309.00) is higher than that of the participants with a high school degree (213.63). In addition, the Personal Environment Awareness factor mean score of the participants with a postgraduate degree (=22.59) is higher than the mean score of the participants with a high school degree (=19.31). This result emphasizes that as the level of education increases, environmental awareness also increases.

#### d. Status of being a manager

The Mann-Whitney U-test was conducted to examine whether the "Personal Environmental Awareness" factor scores of the participants showed a significant difference according to the status of being a manager. The results are shown in Table 28.

**Table 28.** The Mann-Whitney U-Test Results pertaining to the relationship between the Scores of the participants from the PEA Factor and Their Status of Being a Manager

Factor	Manager Status	N		sd.	Rank Avg.	Rank Sum	U	p
PEA	YES	92	22.9	4.19	318.99	29347	24151	0.75
	NO	535	22.3	5.02	313.14	167531		

Source: Author's own calculations

Table 28 indicates that the scores of individuals from the "Personal Environmental Awareness" factor do not show a significant difference according to their status of being a manager ( $U=24151.00$ ;  $p>0.05$ ). Thus, it can be stated that, for this research, being a manager is not effective on individuals' environmental awareness.

#### e. Type of institution

The Mann-Whitney U-test was conducted to investigate whether the "Personal Environmental Awareness" factor scores of the participants showed a significant difference according to the type of institution they work for (bank/insurance company). The results are displayed in Table 29.

**Table 29.** The Mann-Whitney U-Test Results pertaining to the relationship between the scores of the participants on the PEA and the Type of Institution They Work for

Factor	Institution Type	n	X	sd.	Rank Avg.	Rank Sum.	U	p
PEA	Bank	279	23	3,38	311,87	87012,5	47953	0,77
	Insurance	348	22	5,82	315,71	109865,5		

Source: Author's own calculations

As seen in Table 29, the scores of individuals from the "Personal Environmental Awareness" factor do not show a significant difference according to the type of institution they work for ( $U=47952.50$ ;  $p>0.05$ ). Therefore, it can be stated that the type of institution (Bank/Insurance Company) they work for does not affect individuals' environmental awareness.

#### **f. Bank type**

The Mann-Whitney U-test was conducted to investigate whether the "Personal Environmental Awareness" factor scores of the participants showed a significant difference according to the type of bank they work in (Public/Private Bank). The results are shown in Table 30.

**Table 30.** The Mann-Whitney U-Test Results pertaining to the relationship between the scores of the participants on the PEA and the Bank Type They Work for

Factor	Bank Type	N	X	sd.	Rank Avg.	Rank Sum.	U	p
PEA	Public Bank	170	23.2	3.33	142.93	24297.5	8768	0.41
	Private Bank	109	22.7	3.46	135.44	14762.5		

Source: Author's own calculations

When Table 30 is examined, it is seen that the scores of the participants from the "Personal Environmental Awareness" factor do not show a significant difference according to the type of bank they work for ( $U=8767.50$ ;  $p>0.05$ ). Accordingly, it can be said that the type of bank (Public Bank/Private Bank) the participants work for is not effective on individuals' personal environmental awareness.

#### **g. Type of insurance company**

The Mann-Whitney U-test was conducted to examine whether the "Personal Environmental Awareness" factor scores of the participants showed a significant difference according to the type of insurance company they work for (Local Insurance Firm /Multi National Insurance Firm). The results are shown in Table 31.

**Table 31.** The Mann-Whitney U-Test Results pertaining to the relationship between the scores of participants on the PEA Factor and Type of Insurance Company They Work for

Factor	Insurance Firm Type	n	X	sd.	Rank Avg.	Rank Sum.	U	p
PEA	Local	213	21.6	6.31	174	37062.5	14272	0.9
	Multi-national	135	22.6	4.9	175.29	23663.5		

Source: Author's own calculations

When Table 31 is examined, it is seen that the scores of the participants on the "Personal Environmental Awareness" factor do not show a significant difference according to the type of insurance company they work for ( $U=14271.50$ ;  $p>0.05$ ). Accordingly, the type of insurance company they work for (Local Insurance Firm /Multi National Insurance Firm) is not effective on individuals' environmental awareness.

#### **h. Gender of the manager**

The Mann Whitney U-test was conducted to investigate whether the "Personal Environmental Awareness" factor scores of the managers showed a significant difference according to their gender. The results are displayed in Table 32.

**Table 32.** The Mann-Whitney U-Test Results pertaining to the relationship between the scores of the participants on the PEA and the gender of the manager

Factor	Gender	N	X	sd.	Rank Avg.	Rank Sum.	U	P
PEA	Male	68	23	4.17	46.36	3152.5	807	0.93
	Female	24	22.8	4.36	46.9	1125.5		

Source: Author's own calculations

As seen in Table 32, the scores of the managers from the "Personal Environmental Awareness" factor do not show a significant difference according to their gender ( $U=806.50$ ;  $p>0.05$ ). Accordingly, it can be said that gender does not have an effect on the personal environmental awareness of the participants who were managers.

**Research Question 5: *Is there a significant relationship between the perceived ecological innovativeness levels of the participants and their environmental awareness?***

Within the scope of the fifth research question, the Spearman correlation was calculated between the “Ecological Innovative Levels” factor and the “Personal Environmental Awareness” factor in order to reveal whether there is a significant relationship between the ecological innovativeness levels of the participants and their personal environmental awareness. The results are shown in Table 33.

**Table 33.** Results of the Correlation Analysis Between PEI and PEA of the Participants

Factor	PEI
PEA	.0051*

\*  $p \leq .05$

Source: Author’s own calculations

Table 33 shows a moderately positive and significant relationship between the personal environmental awareness of the participants and their ecological innovativeness levels ( $r=.51$ ;  $p \leq .05$ ).

Due to the high socio-demographic and “phenomenon” awareness of the sample, there may have been a positive bias in sample selection. Despite the sample size, it is possible that it does not exhibit a normal distribution due to a positive response tendency or the similar and high perception within the sample. In this case, the lack of normal distribution and related constraints are factors that need to be carefully considered when evaluating the data in statistical analyses.

The observed positive correlation signifies that as individuals' personal environmental awareness increases, their ecological innovativeness level also increases. Accordingly, individuals with high personal environmental awareness have high ecological innovativeness levels.

With the developed PEIS scale, it was investigated how ecologically innovative the FC-PIS employees perceive the institutions they work for, the level of individual environmental awareness of the employees, whether there is a significant difference between the groups, and finally, whether there is a significant correlation between individual environmental awareness and the perception of ecological innovation. Differences between groups were analyzed according to gender, age, year of experience, level of education, status of being a manager, institution type, bank type, type of insurance company, and the gender of the manager.

The analysis revealed that the FC-PIS employees perceive the institutions they work for as ecologically innovative to a large extent with 79.81%. The reason for this can be seen as the awareness created by the sustainability efforts of the FC-PIS, which has been on the agenda for a long time.

Environmental sustainability has become a part of the corporate culture and values of financial institutions. As a result, financial institutions train and inform their employees on environmental sustainability issues. In this way, employees become more knowledgeable about this issue and become more competent in areas such as green finance and sustainable investments. In the finance sector, with the integration of environmental sustainability elements into business processes, employees are encouraged to adopt their environmental responsibilities and sustainable practices and include them in their own business processes. Environmental sustainability studies increase cooperation and communication within and outside the company. By collaborating with different departments and stakeholders, employees work together to implement sustainable practices, develop new and creative solutions, and achieve environmental goals. These reasons are thought to explain why FC-PIS employees perceive the institutions they work for as ecologically innovative.

As for the second research question (Do the perceived ecological innovativeness levels of the participants differ significantly according to the variables of gender, age, year of experience, level of education, status of being a manager, institution type, bank type, and type of the insurance company?), the findings revealed that there was only a negative correlation between the education level variable and the



perceived ecological innovativeness. As the level of education increases, employees perceive their organizations as less ecologically innovative. As the reason for this situation, it can be said that individuals with higher education levels may evaluate the ecological innovation levels of their institutions more objectively. According to the results of the analyses made to determine the personal environmental awareness levels of the participants, it can be stated that the personal environmental awareness of the participants is quite high. This can be explained by the fact that the vast majority of finance sector employees have a high level of education.

As for the fourth research question (Does the personal environmental awareness of the participants differ significantly according to the variables of gender, age, year of experience, level of education, status of being a manager, institution type, bank type, and type of insurance company?), the findings revealed that there was a positive correlation only between the education level variable and individual environmental awareness. As the level of education increases, environmental awareness of individuals increases as well. This result supports the result for the previous research question.

Finally, it has been determined that there is a positive and significant relationship between the perceived ecological innovativeness levels of the participants and their personal environmental awareness. The fact that the correlation value is positive indicates that as the personal environmental awareness of individuals increases, their ecological innovativeness level also increases.

#### **6.4. Results of the Qualitative Analysis**

In the study, the data collected through interviews were first transcribed. Then, the transcripts were coded under the relevant questions. The MAXQDA software was used for the analysis of qualitative data. The first section is a descriptive analysis of the interviewees. This section introduces the interviewees and gives the profile of the key actors in FC-PIS in Turkey.

#### **6.4.1. Descriptive Analysis of the Interviewees**

In the field research, 31 interviews were conducted with the key actors in the FC-PIS. This part of the study gives information about these interviewees and the organizations of the interviewees. The codes derived in this section are divided into two sub-categories as “Personal Information” and “Organizational Information. To obtain personal information, I asked interviewees about their level of education, experience in finance sector, and expertise in sustainability and eco-innovation. To obtain organizational information, I asked the participants about their role in the financial sector of their institution. This section aimed to categorize the interviewees according to the defined roles of the FC-PIS, which are player, regulator, collaborator, information provider, catalyzer, auditor, implementer, funder, auxiliaries.

In the field research I conducted 23 interviews with the players of the FC-PIS. These players were divided into sub-groups: 4 interviews with Deposit Bank (Private Foreign), 2 interviews with Deposit Bank (Private Local), 3 interviews with Deposit Bank (Public), 1 interview with Deposit Investment Bank (Private Local), 2 interviews with Deposit Investment Bank (Public), 4 interviews with Life Insurance Company (Non-Bank-Foreign), 1 interview with Non-Bank Financial Institution, 6 interviews with Life Insurance Company (Non-Bank-Local).I conducted 1 interview with a collaborator, 1 interview with a funder, 2 interviews with catalyzers, 2 interviews with entrepreneurs, and 2 interviews with regulators. The role of the institutions where the participants work, gender of the participants, the positions of the participants, the education levels of the participants, and their years of experience are given in Table 34.

As illustrated in Table 34, the gender distribution of the participants in the study consisted of 12 females and 19 males. The educational background of the participants is diverse, with 13 (41.9%) holding a Bachelor of Science (BSc) degree, 11 (35.5%) holding a Master of Science (MSc) degree, and 7 (22.6%) with a Doctor of Philosophy (PhD) degree. The distribution of educational attainment indicates a

**Table 34.** Interviewee Information

<b>FC-PIS Roles</b>	<b>Organization Type</b>	<b>Gender</b>	<b>Position</b>	<b>Education</b>	<b>Years of Experience</b>
Player	Deposit Bank- Private Foreign	Female	Executive Vice President (Sustainability)	B.Sc.	23
Player	Deposit Bank- Private Foreign	Female	Sustainability Specialist	M.Sc.	11
Player	Deposit Bank- Private Foreign	Male	Branch Manager	B.Sc.	25
Player	Deposit Bank- Private Foreign	Male	Board Member	PhD	26
Player	Deposit Bank- Private Local	Female	Sustainability Manager	M.Sc.	9
Player	Deposit Bank- Private Local	Male	Regional director	PhD	27
Player	Deposit Bank- Public	Male	Human Resources Senior Manager	PhD	25
Player	Deposit Bank- Public	Male	Senior Vice President, International Banking and Investor Relations	B.Sc.	10
Player	Deposit Bank- Public	Male	Department Manager	M.Sc.	31
Player	Deposit Investment Bank-Private Local	Female	Manager	PhD	15
Player	Deposit Investment Bank-Private Local	Male	Development Finance Institutions Manager	M.Sc.	25
Player	Deposit Investment Bank-Public	Male	Sustainability Manager	MBA	12
Player	Non-Bank- Life Insurance- Foreign	Female	Sustainability Specialist	M.Sc.	3
Player	Non-Bank- Life Insurance- Foreign	Male	Chief Legal, Compliance and Corporate Responsibility Officer	B.Sc.	19
Player	Non-Bank- Life Insurance- Foreign	Male	Corporate Communications Director	B.Sc.	26
Player	Non-Bank- Life Insurance- Foreign	Male	Corporate Responsibility, Sustainability and Communication Director	PhD	39
Player	Non-Bank Financial Institution	Male	Manager	B.Sc.	23

Table 34. (continued)

Player	Non-Bank- Insurance- Local	Life	Female	Human Resources and Sustainability Assistant General Manager	B.Sc.	19
Player	Non Bank- Insurance- Local	Life	Male	Talent Management Department Manager	B.Sc.	15
Player	Non-Bank- Insurance- Local	Life	Male	President Corporate Strategy and Performance Management	B.Sc.	19
Player	Non-Bank- Insurance- Local	Life	Male	Sustainability Specialist	B.Sc.	-
Player	Non-Bank- Insurance- Local	Life	Female	Sustainability Specialist	B.Sc.	-
Player	Non-Bank- Insurance- Local	Life	Male	Deputy General Manager	MBA	13
Collaborator	Collaborator Association		Male	Research and Statistics Director	B.Sc.	21
Funder	International Institution	Finance	Female	Senior International Consultant	M.Sc.	25
Catalyzer	NGO- Local		Female	Founding Director	M.Sc.	16
Catalyzer	NGO- Local		Female	Secretary General	B.Sc.	26
	Entrepreneur		Female	Owner	PhD	25
Advisor	Advisor		Male	CEO	PhD	25
Regulator	Regulator _Local		Male	Senior Banking Specialist (Sustainability)	M.Sc.	20
Regulator	Regulator _Local		Female	Deputy Head of Department	M.Sc.	23

Source: Author's own table

Well-balanced range of expertise among the participants. The variety of educational backgrounds may contribute to a richer and more comprehensive understanding of the research topic, as the participants can offer different perspectives based on their respective levels of academic training. The participants involved in the research represent a diverse range of professional roles and seniority levels within their respective organizations. Key positions include Executive Vice President (Sustainability), Branch Manager, Senior Vice President of International Banking and Investor Relations, Chief Legal, Compliance and Corporate Responsibility Officer, and Corporate Communications Director, among others.

Other participants hold management positions in areas such as human resources, talent management, corporate strategy, performance management, sustainability, research and statistics, and development finance institutions. Furthermore, the research involves participants at executive level, including founding directors, board members, regional directors, and CEOs.

This broad spectrum of professional expertise and experience contributes to a comprehensive understanding of the research topic, as participants can offer valuable insights from their diverse organizational perspectives.

The participants in the research exhibit a wide range of professional experience, with their years of experience spanning from minimum of 3 years to a maximum of 39 years, with an average of approximately 20.7 years. This extensive experience contributes to the richness of the research, as it captures valuable insights and perspectives from individuals at various stages of their careers.

## **6.5. Results of the Functional Analysis of the FC-PIS**

### **6.5.1. Functional Analysis of the FC-PIS**

The data obtained from the actors (banks, insurance companies, associations, unions, funders, regulators and entrepreneurs) determined within the scope of the functional analysis of the ecological innovation capacity of the finance sector were analyzed. The data were categorized according to the FC-PIS analytical scheme. Accordingly, within the scope of the FC-PIS analysis scheme functions, 6 main themes and sub-themes related to the main themes were determined. These were presented in Table 35 in a systematic way.

### **6.5.2. Knowledge Development and Diffusion**

In the global economic system, where competition is at a high level and is shaped based on knowledge, the main determinant of development and competition is that actors access information through various learning processes and transform this

**Table 35.** Main Themes Related to the Structural Analysis of the Ecological Innovation Capacity of the Finance Sector (MAXQDA 22-Hierarchical Code-Sub Code Model)

<b>Main Theme I Knowledge Development &amp; Diffusion</b>	<b>Main Theme II Market Formation</b>	<b>Main Theme III Resource Mobilisation</b>	<b>Main Theme IV Legitimisation</b>
<ul style="list-style-type: none"> <li>• International Information Resources</li> <li>• National Information Resources</li> <li>• The Special Role of TUSCO and PISCOR</li> <li>• R&amp;D in the context of knowledge production</li> </ul>	<ul style="list-style-type: none"> <li>• Green Fund and Bonds</li> <li>• Sustainable Agriculture and Livestock Financing</li> <li>• Renewable Energy Financing</li> </ul>	<ul style="list-style-type: none"> <li>• Financial Resources</li> <li>• Human Resources</li> </ul>	<ul style="list-style-type: none"> <li>• Education and Awareness Levels Related to Ecological Innovations and Social Acceptance</li> <li>• Regulatory support</li> <li>• Financial resources</li> <li>• Market adoption and growth</li> <li>• Collaboration and partnership</li> <li>• Intra-sector practices</li> <li>• Transparency and reporting</li> <li>• Lobbying</li> </ul>
<b>Main Theme V Green Digital Transformation</b>	<b>Main Theme VII Blocking Mechanisms</b>	<b>Main Theme VIII Inducement Mechanisms</b>	
Electronic Waste Digital Applications Driving Forces and Barriers	Lack of Regulation No Common Taxonomy Lack of Awareness Lack of Funding Source Green Washing Insufficient Human Resources Profit Focused Perspective Culture Public banks perception Failure to follow academic studies	International Initiatives & Global Change Stakeholder Expectation The climate crisis and ESG Resource requirement Manager awareness and support	

Source: Author’s own table

These main themes and sub-themes are explored below in detail.

Information into innovation by producing new information. While learning is seen as a tool in the dissemination of knowledge, innovation is also considered as an output of the learning process. In this context, learning and innovation are processes that are closely related to each other (Altuğ, 2020). According to Lundvall (1992), the most basic resource in modern economy is knowledge, and accordingly, the most important process is learning (Lundvall, 1992). The increasing importance of information requires increased investments in the acquisition, distribution and use of knowledge. There are different understandings of the classification of information.

For example, we can categorize knowledge in 4 different ways according to the traditional knowledge classification (Yanık, 2017);

- i) Congenital or Acquired,
- ii) Intellectual or Sensory,
- iii) Learned, Experiential, Intuitive,
- iv) Everyday, Religious, Technical, Scientific, Cognitive, Philosophical and Artistic.

In another approach, information is handled in two separate categories in terms of accessibility. It is the method that actors use to access information, which is considered essential regarding the accessibility of information. In this framework, the first category is implicit (tacit) knowledge, first expressed by Polanyi. Implicit knowledge is difficult to communicate and formulate, is individual in nature, and is context-dependent. It can also be expressed as the emergence of know-how (skill and/or skill) knowledge obtained through informal learning of tacit knowledge, behaviors and processes, in certain contexts. The second category is codified/explicit knowledge. Explicit or codified information can be transferred in formal systematic language, codified, produced and digitized in the form of books, reports, documents, reports, catalogues, presentations, patents, and thus is easy to transmit. Explicit knowledge is also possible to produce and reproduce effectively because it is easy to copy. The ease of copying and accessing accelerates the circulation of this information. In this way, it is not embedded in certain contexts, people, institutions and regions, and its dependence is eliminated (Altuğ, 2020).

In the literature, there are four types of learning that deal with knowledge in the context of learning. The first is expressed as learning by doing, learning by using, and learning by interacting, which are related to the production, distribution and consumption functions of the firm. The second one is learning by searching, which is essential in formalized learning activities in companies' R&D laboratories and marketing departments. The third one is learning by exploring, which includes research activities carried out in academic and scientific organizations outside the private sector. Lundvall's (1992) definitions cover organizational and institutional learning processes (Koç and Mente, 2007). While the factor that provides knowledge

is learning by searching in developed countries, learning by doing is dominant in developing countries (Erdil et al., 2016). The learning by searching process refers to the technological learning and talent acquisition obtained as a result of R&D activities carried out at the national level. Learning by doing means that companies specialize in the goods and services they produce as a result of their production and provide learning. The learning by doing process can turn into a learning process by researching after a certain period of time, depending on the technological assimilation and technological ability capacity of the countries (Erdil et al., 2016).

As stated by Bergek (2008), knowledge development and diffusion is placed at the heart of a TIS as it is related to the knowledge base of the TIS (globally) and how well the local TIS performs in terms of its knowledge base and, of course, its evolution. Knowledge development and diffusion “*captures the breadth and depth of the current knowledge base of the TIS, and how that changes over time, including how that knowledge is diffused and combined in the system.*” (Bergek et al., 2008).

In the TIS literature, R&D and knowledge development are also prerequisites for the innovation system. Three typical indicators used to map this function over time, which includes learning by searching and learning by doing, are listed as follows: (i) R&D projects, (ii) patents, and (iii) R&D investments. While these indicators map the effort spent on knowledge development, they can also map the increase in technological performance through learning curves (Bergek et al., 2008). However, considering that the knowledge base of the FC-PIS is quite complex and its field of activity is the service sector, it was thought that it would be insufficient to deal with the issue only in terms of R&D, patent and R&D expenditures. Therefore, regarding learning and knowledge production, answers to the questions of “Who is the main producer of the academic and scientific knowledge you follow for the financial sector? Do you cooperate with the university? Where and from whom does the financial sector learn about sustainability?” were sought.

In addition, when the relationship of the FC-PIS with the TIS is evaluated through the embedded FinTech’s that FC-PIS is working on, an indicator has been adopted to analyze the knowledge development function of R&D, patent and R&D expenditures



in the knowledge development bases of FC-PIS actors regarding digital technologies. In this context, it was tried to reach the data related to the relevant indicators by asking the following questions to the participants: “Does your organization have a budget for sustainable innovative eco-innovative digital transformation technologies or for R&D investments defined for sustainability? Have you ever had a product that came out as a result of R&D investment? Do you have any patents?”.

In addition, the main producers of information on ecological innovations and sustainability in the finance sector, in which ways they produce information, and where most information comes from were analyzed. In this context, information resources in the finance sector were divided into 3 sub-themes as international information resources, national information resources and, the special role of TUSCO and PISCOR. In addition, the questions asked about R&D in the context of knowledge production were examined as the third sub-theme.

#### **6.5.2.1. International Information Resources**

According to the results of the analysis of the knowledge development function within the scope of the functional analysis of the ecological innovation capacity of the finance sector, the majority of the participants stated that the main producers of knowledge on sustainability and ecological innovation are international stakeholders. In this context, some participants stated that international initiatives have various programs; their employees and managers try to integrate the knowledge they have gained by participating in these programs; the sector stakeholders mostly access information by following the international agenda; and especially foreign financial institutions transfer information to the sector. For example, P4 stated that unfortunately, there is no knowledge base in Turkey yet, they have not reached that maturity, and the European banking authority published a new statement only a few weeks ago. P16 stated that they have not yet seen a public knowledge base that will guide the industry anywhere. The majority of the participants emphasized that national information resources on ecological innovations and sustainability are insufficient. Both banks and insurance companies stated that they participated in the Study Groups of the United Nations Environment Program Finance Initiative (UNEP

FI), they paid to obtain information from this group, and they reported and shared the information they obtained from this group with national stakeholders. In this context, insurance companies stated that they follow the principles of “a global framework for the insurance industry to address environmental, social and governance risks and opportunities” offered by the UNEP FI Principles for Sustainable Insurance (PSI). These highlights and UNEP-FI appear to be a catalyst for the FC-PIS knowledge base, as expressed in its mandate. It has also been stated that the Global Compact under the UN umbrella provides information to the industry through the Carbon Disclosure Project (CDP) Turkey representations. When these statements of the participants are evaluated, it is seen that the FC-PIS "learns by doing", by interacting with international catalysts. In addition, it is seen that as an output of the learning by doing process, they try to make the know-how they have learned, i.e., the implicit knowledge they internalized, explicit by turning them into reports. With the acceleration of the circulation of the information that has become open in the FC-PIS, they ensure that it spreads without being embedded in certain contexts, people, institutions and regions.

P22 stated that in a world where there are no borders anymore, they have access to information through foreign collaborations. This statement highlights FC-PIS's relationship with global innovation systems. P12, on the other hand, stated that the World Bank has technical teams working on sustainability and they cooperate with these teams and follow their agenda and work with the Task Force Climate Related Financial Disclosures on the inclusion of climate risks in the bank risk model. P10 stated that international stakeholders such as the World Bank, EBRD, German Development Bank, and Japanese Development Bank guide the sector because they know the green financing requirements of banks, and they share information by holding workshops with International financial institutions. In other words, it is seen that funders are very important in sharing information in the FC-PIS. As P16 and P15 stated, main information comes from global connections for foreign-financed financial institutions as they comply with the regulations in Europe and this information directs the sector. The following statement of P15 highlights the international university stakeholder of these links:

*“This information comes especially from companies with foreign capital because these companies do not only have goals and tasks that they give us. Through the resources they provide, there are both innovative partnerships and material know-how resources, as well as the research carried out with international academicians and the reports produced as a result of the research.*

#### **6.5.2.2. National Information Resources**

Within the scope of the functional analysis of the ecological innovation capacity of the finance sector, national resources were determined as another sub-theme of the knowledge development function. Most of the participants emphasized that banks themselves are generally knowledge producers, their own internal applications are mostly looked at while producing information, data is compared with other companies, and PISCOR, an institution of TUSCO, is a very critical information producer for TR FC-PIS. Particularly and strikingly, it was emphasized that university-sector cooperation is also weak.

P8 said, *“The source of information is the bank itself. It is the same with almost all banks. It is about practice, not theory. Comparisons with other companies are being looked at”*. As can be understood from this expression, banks actually perform organizational learning by doing and living.

P10 said, *“We come together with our customers who use green loans every 3 to 6 months. We hold workshops. We try to collect as much feedback from customers as possible. According to this feedback, we try to improve our processes as much as possible and our practices in future similar studies.* “This expression indicates that learning also takes place within the FC-PIS through interaction with customers.

The statements of P2 emphasize the important position of banks in the context of sustainability and ecological innovations, especially in the dissemination function of knowledge:

*“As banks, we are a very important information center because we both borrow ourselves and have relationships with our correspondents abroad. We follow their investments. We are open to public, we have international*

*investors, there are some criteria they expect from us. We also learn with their questions and guidance. We say we should reflect all this information and what we have learned to other sectors and take action.”*

Within the FC-PIS, banks are in a position to provide information primarily to the sector and then to other sectors, by accessing information through international interactions and then reporting this information. This relationship provides evidence for the existence of this previously described relationship between the FC-PIS and the SIS.

### **6.5.2.3. The Special Role of TUSCO and PISCOR in Knowledge Development and Diffusion Function in FC-PIS**

Almost all of the participants were asked, “How do you learn about sustainability and ecological innovations in the sector, in Turkey in particular?”. As the answer, they talked about TUSCO and PISCOR. As stated by P6, the factor that strengthens this function of TUSCO and distinguishes it from other banks is the consultancy service it provides to other institutions for sustainable transformation through the bank's initiative, PISCOR (Consulting Firm).

*Similarly, P12 stated; “We should not delay the transfer of technology. Diffusion is important for us in technology transfer. Do you keep what you know to yourself or do you spread it? Maybe knowledge diffusion or innovation diffusion is more limited when the goal is profit only. But when you are a development bank or a development bank venture, your main goal is diffusion. You want to disseminate the work you do and the knowledge you produce. There is a difference between development banks and non-development banks. Therefore, we are all similar, but our priorities are different.”*

It is seen that development banks and development bank initiatives undertake a different mission than other banks in the dissemination of information function. The following statement of P6 also supports this idea.

*“When there is such an infrastructure, we call it a consultancy company, but they do very detailed studies such as efficiency studies and these are all about supporting the bank's activities. Because it is so, there is a serious technical infrastructure, which I think is a very critical issue. In this case, they both see*

*the opportunities better and if a risk is to be taken, the bank can better evaluate that risk and provide more active financing. TUSCO is already one of the big banks that international financial institutions work primarily with. Of course, since they are investment banks, it is necessary to separate them as TUSCO and PISCOR. They are at a different point, and other local banks are at a different point.”*

As an important information provider within the FC-PIS, TUSCO's internal access to information, with whom it is a stakeholder, and what information sharing channels it uses have been analyzed. Accordingly, TUSCO has an economic research department, and it has been seen that the most important task of this department is to follow the world and Turkey agenda and to identify possible investment themes or themes that will provide resources according to developing trends. This fact shows that TUSCO learns by learning by searching, unlike other banks. It was stated by P12 that this department prepares at least 4-5 theme reports annually, that these reports have technical details and are shared with the relevant stakeholders. It was stated that among the theme reports they prepared, Green Deal, sustainable age culture, and gender equality were also discussed. Thus, it is seen that TUSCO accelerates the information diffusion by producing explicit information on the subject more intensely than other banks.

However, P12 said, *“There are 4 new themes that we have determined this year. I can talk about one or two of these new themes, but it is not possible for me to mention the others because they are competitive”*. Although the prepared theme reports are shared with the stakeholders, it is also seen that the relevant institution has to consider the elements of competition in order to ensure its financial sustainability, unlike other banks. P12 also said, *“We pay money to be able to obtain information from the group. We translate what we learn here into a report.”* This statement also indicates that the institution has to consider the elements of competition while disseminating the information they obtain by paying a price.

Similar to other institutions, TUSCO has accessed its knowledge base in the financial sector through international collaborations. However, it was noted that these collaborations mostly included learning by searching:

*“The World Bank has its own teams investigating these issues, and it is possible to talk about various examples in the world. Therefore, we follow their agenda. We are in close contact with their technical teams. Therefore, we can discuss all kinds of innovative themes together. Then, with the convenience of our ministry, we can use these ideas within the framework of that theme. The World Bank does not give the money and withdraw. For example, if there is a need for energy efficiency in Turkey, we discuss it. We take money that is fully dedicated to energy efficiency, and we finance it. We finance investments in them. Therefore, we think that we are innovative in this respect, that we can follow the trends in the world and be a pioneer in bringing those trends to Turkey.” (P9)*

There are some differences between development banks and commercial banks in Turkey. The main purpose of development banks is to provide economic development and social progress. Therefore, they usually operate in areas such as infrastructure projects, regional development and sectoral support. Commercial banks, on the other hand, are private for-profit organizations that provide general banking services to customers. In terms of financing, commercial banks are financed by deposits, loans and other financial instruments, while development banks receive funding from government support, international financial institutions, and the private sector. While the lending strategy of development banks aims to achieve economic growth and development goals, commercial banks focus on minimizing credit risk and making profits. In line with this mission, it is true that TUSCO has a special position that prioritizes ecological innovations and environmental sustainability. Therefore, its role in knowledge dissemination, sectoral innovation systems, national innovation systems, and for FC\_PIS should be addressed as an important issue for policy makers. The following statements of P9, P12, and P8 support this notion.

*“We did not only allow companies to use the loan, but also made use of it through some banks. Therefore, we try to follow all kinds of new trends developing in the world as much as possible and provide financial support for the correct implementation of those trends in Turkey. One of the current issues is the harmonization of the Turkish industry with the European Green Agreement, which also includes the circular economy. And in this regard, we are trying to support the Turkish industry, which needs investment, as much as possible.” (P9)*

*“What is primary is agriculture. In other words, it is critical to determine the investment needs in this chain from product production to the delivery of the product and to provide financing for these investment needs. Correct storage,*

*correct transportation, and correct irrigation are important because all of these are shaped within the framework of energy efficiency. For example, very basic topics such as the application of solar energy in agriculture have sub-topics. Therefore, we have created a concept by including all these and we are trying to obtain financing from abroad. This is one of the most important themes.” (P12)*

*“As I said, if there is an innovation in agriculture, especially on the credit side, it can either be developed by the Ministry of Agriculture or it may be developed by techno parks. They have to be used.” (P8)*

*“Without producing this knowledge and disseminating it, what would you be consulting anyway? In addition, PISCOR is our subsidiary. When we look at the subsidiary, we see that it is the subsidiary of a development bank. Development banks, as the case all over the world, stand somewhere between the public and the academy. Therefore, when you are a subsidiary of an organization that stands somewhere between the public and the academy, you naturally provide consultancy and information production. For this reason, one of PISCOR's duties is to make that information flow instantaneously, not to delay it at all.” (P12)*

The participants stated that they cooperate with universities mostly in the context of TIS, but they do not cooperate in the context of eco-innovations and sustainability. P10 stated that PISCOR tries to fill the gap here. However, it was emphasized that the capacity of PISCOR is not large enough to meet all the needs of the sectors and that the number of PISCOR-like structures should be increased. In addition, one of the issues that should be noted is that PISCOR has cooperation with universities at the level of academics and students. As P24 states below, these collaborations are not limited to the financial sector, but rather focus on cooperation in other sectors. This statement once again shows how FC-PIS interacts with other industry innovation systems.

*“These collaborations are not specific to the financial sector. For example, we do green finance consulting, which has several dimensions. We understand and transform some things financially, and some require sectoral expertise. For example, we find an expert academician in agricultural economics or an expert in international organizations we work with. An analysis needs to be made in the language we understand. In this way, we can easily state what the outputs should be and what we expect. They write, and we integrate it into the text. However, we do not have a cooperation to develop the financial sector in particular.” (P24)*

It is seen that PISCOR interacts with universities through "Sustainability Workshops", but the main purpose of this cooperation is to spread awareness about sustainability, especially to university students in Anatolia.

Finally, many participants stated that they do not have cooperation with universities in the context of knowledge production, but they cooperate by providing funds for some projects from universities.

#### **6.5.6. Research and Development**

R&D indicators were examined within the scope of the functional analysis of the ecological innovation capacity of the finance sector, and R&D budgets came to the fore among the results obtained. In this context, P17 stated that, when looking at the standards, sustainable innovation budgets have a share in the R&D budget, but such a budget is not available in their own institutions. However, the same participant added that the general budget spent on the production of financial products creates a social impact and this budget can indirectly express the sustainable innovation budget. P17 also emphasized that there are steps financial players should take in this regard and the shares of sustainable R&D and eco-innovation budgets, which are included in the total R&D budgets of financial institutions, should be allocated. Within the scope of sustainable innovation budgets, most of the participants stated that the institutions they work for do not have direct R&D departments, but there are departments related to innovative collaborations, which actually carry out various R&D studies.

Finally, some participants stated that separate budgets are allocated to the departments within their structure, the procedures and principles on how to manage these budgets are determined, and in this context, start-ups that produce solutions within the scope of ecological innovation and sustainable contribution are supported:

*“We have budgets for all of these platforms, and our procedures and principles on how to manage those budgets have been determined internally. We are talking about the vie framework supporting start-ups that are innovative, environmentally sensitive, focused on ecological innovation or*



*making sustainable contributions. We do not write R&D directly in the budget item. We fund such studies from within a general investment budget of the platform.” (P22)*

*“There are also R&D investments. Since the technology side also depends on us, we have a separate technology unit for Fintech from there. For example, you can maintain the software development processes of technology with the same energy level, without making any extra investments and without consuming carbon. R&D investments have a very important share in this. There is a team that does R&D all the time and investigates what can be done.” (P7)*

The above statements of P22 and P7 confirm that when the relationship of the FC-PIS with the TIS is evaluated via the embedded FinTechs it can be stated that FC-PIS actors make R&D expenditures on knowledge development bases related to digital technologies. However, all of the participants emphasized that they did not have a patent as a result of any R&D.

#### **6.5.7. Market Formation**

The market formation function shows that technological innovations and developments are related to commercialization processes. In this process, demand for innovative technologies and markets are created (Hekkert et al., 2007). This function draws attention to the fact that the existing structural and regulatory conditions in the market affect the adoption and diffusion of technological innovations (Bergek et al., 2008). Market formation is especially important in the early stages of new and innovative technologies because in this period, uncertainties and risks for technologies are high and there may be difficulties in commercialization due to insufficient market demand (Markard et al., 2012). In this context, the market formation function can help policy makers and other actors develop appropriate policies, incentives and regulations to support the diffusion of technological innovations (Jacobsson and Bergek, 2011).

It should be noted that in the context of FC-PIS, it is meaningful to reiterate that the focus is not on “technology”, but instead on ecological innovations and sustainability elements associated with ecological innovations. This function draws attention to the

interaction of technological innovations with commercialization processes and the way structural and regulatory conditions in the market affect these processes. However, within the scope of FC-PIS analysis, the development of green financial products, green digital applications and green sustainability elements were evaluated instead of "commercialization processes of technological innovations". In the context of FC-PIS, the market formation function refers to the processes of creating demand for innovative green financial products and green sustainability elements and developing markets.

Within the scope of the functional analysis of the ecological innovation capacity of the finance sector, the activities of the players towards innovative green financial products were examined.

The analysis revealed that the main theme of green financial products has three sub-themes: Green fund and bonds, sustainable agriculture and livestock financing, and renewable energy financing.

#### **6.5.7.1. Green Fund and Bonds**

The first sub-theme of green financial products is green funds and bonds. Some participants focused on this sub-theme as follows:

*“As I said, there is an agenda that starts with the bond issuance and continues with the creation of the index and the sustainability index in the stock market indices. Green bond issuances continue in Turkey as well.”* (P13)

*“XXX Investment, one of the subsidiaries of the bank, has issued 2 funds. One of them is a fund where companies that invest in green energy (wind and solar) collect their assets.”* (P1)

#### **6.5.7.2. Sustainable Agriculture and Livestock Financing**

Most of the participants stated that they produced products for the agriculture and livestock sector, which is one of the areas that will be most affected by the climate crisis. All of the participants stated that there is a huge potential in the field of

agriculture and animal husbandry, and if this potential is not financed, the sector is doomed to die. In this context, it has been examined what kind of green financing tools are available for the agriculture and livestock sector.

*As P8 stated, "There are modern irrigation techniques loans, smart fertilization loans, hybrid tractor loan, and efficient meat loan. We have products that will not harm the environment. Our employees go and inform the farmers about these products."* This statement draws attention to the areas seen as the important sub-dimensions of sustainable agriculture. As P12 stated above, what is primary is agriculture and it is critical to determine the investment needs in this chain from product production to the delivery of the product and to provide financing for these investment needs. Correct storage, correct transportation, and correct irrigation are important because all of these are shaped within the framework of energy efficiency. A very basic topics such as the application of solar energy in agriculture have sub-topics. Therefore, it is necessary to create a concept including all these and to obtain financing from abroad. P12 expresses that the subject should be supported by a comprehensive and holistic approach, considering its interaction with other fields.

*P22 stated that "Private banks offer many loans to farmers, but in fact, the more effective institutions in this field are public banks and Agricultural Cooperatives. The government delivers its agricultural grants to farmers through public banks and Agricultural Cooperatives."*

P22 draws attention to the fact that the Agricultural Cooperatives, which are not mentioned in the stakeholder analysis, are an important actor in this context, and public banks play an important role in agriculture financing. Other participants also stated that there are insurance companies that undertake the risks of agricultural loans and insurance companies operating privately in this field have various important products.

Finally, the participants also stated that apart from green financing instruments, they have products to support sustainable development principles such as employment of immigrants and financing of women entrepreneurs. However, although such products

support sustainability, they were excluded from the evaluation because the main focus of the study was limited to environmental sustainability.

### **6.5.7.3. Renewable Energy Financing**

Most of the participants stated that they have renewable energy and energy efficiency loans and they have many different thematic credits for renewable energy and energy efficiency.

*“We have green housing loans as we want more houses with A and B licenses in Turkey as part of the green housing project. Of course, their requirements are standard and compliant with the European Union standards. However, there is an additional cost for contractors because a house with a type A license is a much more environmentally friendly house and this means an additional investment for the contractor. Extra investment means additional cost. The additional costs make it necessary for the contractor to ask the question “Why should I bear this?”. For example, we apply a more favorable interest rate for the sale of A and B licensed houses compared to normal houses.” (P10)*

This statement of P10 draws attention to the fact that the target audience of these thematic products is extremely wide, and that there are both individual products and sectoral products. However, P10 emphasized that the use of thematic products related to renewable energy financing and energy efficiency should be encouraged by the Ministry of Environment, Urbanization and Climate Change. P10 also stated that the Ministry of Treasury and Finance has great duties to provide tax advantages to such financial instruments. It is thought that macro-scale regulations are needed in order to increase the use of such products. In the context of these products, it was noted that development and investment banks are also pioneers as they provided the first private sector renewable financing in 2006 and they also actively participated in the exit process of the regulation on supporting renewable energy investments.

In addition, the participants of the research stated that in addition to the renewable energy financing products of the banks, they have electric vehicle insurances, solar energy systems insurances, and wind power plant insurances in the insurance sector. It has been observed that an effective system has been established by encouraging

the use of renewable energy by banks by offering renewable energy financing, and the insurance sector supporting the incentives provided by banks by managing the risks of investments in this field. This process significantly contributes to the widespread use of sustainable energy in both the banking and insurance sectors. All of the participants also stated that they follow the ESG principles in the loans they extend. Among the three tools analyzed, the most significant seems to be renewable energy financing.

#### **6.5.8. Resource Mobilisation**

As Bergek (2008) states, it is necessary to mobilize different resources for the development of an innovation system. For this reason, it is necessary to understand the financial resources, infrastructures, complementary products and services that an innovation system needs in order to develop, and to what extent human capital is mobilized through education in scientific and technological fields (Bergek et al., 2008). Resources, both financial and human capital, are required as a basic input for all activities within the innovation system. It is necessary to allocate sufficient resources to enable the knowledge generation necessary for the innovation system to work properly. In this context, this function can be accepted as an input for the knowledge development and diffusion function (Hekkert et al., 2007). In the literature, examples of this activity are expressed in the form of funds for long-term R&D programs established by industry or government to develop specific technological knowledge, and funds to allow testing of new technologies in niche experiments. However, as Hekkert (2007) states, it is difficult to map this function over time through certain indicators. Therefore, the most appropriate method to generate insights in fulfilling this function is to determine, through interviews, whether the inner core actors perceive access to adequate resources as problematic (Hekkert et al., 2007). Analyzing this function under FC-PIS has different challenges. The first reason for this is that the FC-PIS currently analyzed is in the role of financial resource provider to all innovation systems. This fact shows that problems in this function of FC-PIS can prevent all other innovation systems from working. In this context it is clear that analyzing this function for FC-PIS cannot be done in the same way as analyzing TIS sources. When an evaluation is made

specifically for FC-PIS, it is appropriate to collect the resources that need to be analyzed under the main headings of human resources, digital technologies and infrastructure, and financial resources. However, unlike other innovation systems, FC-PIS's dependence on digital technologies made us think that this element should be analyzed as a function on its own. On the other hand, human resources and financial resources for FC-PIS have been evaluated under this title.

In their study, Wieczorek and Hekkert, (2012) gave examples of questions that can be asked in interviews for the analysis of this function. These questions are as follows.

- Are there sufficient financial resources for system development and are these resources appropriate for the system's needs?
- What are these resources mainly used for?
- Do companies have easy access to resources?

#### **6.5.8.1. Financial Resources**

To examine the resource mobilization function particular to the FC-PIS, responses to the aforementioned questions were pursued. This analysis aims to establish a foundation for better understanding the system's characteristics and impacts. With the analysis, it was examined to reveal which resources are mobilized for the promotion of ecological innovations, which resources have problems, and what are seen as resources. In this context, the participants stated that the fund structure in Turkey is short-term, but eco-innovation investments require long-term lending, and therefore, they try to obtain funds from international markets in order to access cheap funding sources. They stated that since the climate crisis affects the whole world, global actors offer many different sources of funds to overcome this issue, but the use of these funds is bound to certain rules by international agreements, and they have difficulty in meeting the necessary conditions due to the inadequacy of the current regulations in Turkey.

Additionally, the majority of participants have expressed that the reporting processes required by national and international stakeholders to access international funding sources impose additional costs on them. Consequently, they have emphasized the need for resources not only for the financing they will provide but also to render their internal processes more sustainable in terms of cost management.

P 20 stated that, *"For instance, the mere creation of an integrated report incurs additional expenses for an organization, as supplementary budgets need to be allocated for the preparation of such reports."* This statement supports the requirement.

As stated early, regarding the R&D budgets, which were examined in detail under the knowledge development and diffusion heading above, most of the participants stated that sustainable innovation budgets have a share in the R&D budget allocated by the companies within the scope of sustainability, but there is no such R&D budget in their own institutions. Some participants, on the other hand, stated that separate budgets are allocated to the departments within their structure, the procedural principles are determined on how to manage these budgets, and in this context, start-ups that produce solutions in terms of ecological innovation and sustainable contribution are supported. As explained above, this supports the fact that problems in this function of FC-PIS may prevent the operation of all other innovation systems. FC-PIS actors engage in R&D on their knowledge development bases regarding digital technologies. However, as stated by the participants, they do not receive any incentives for these R&D expenditures, which suggests that there is a disconnection between FC-PIS and public incentives in the context of ecological innovations; FC-PIS cannot find resources and cooperate with the public in this context. The participants were asked whether they receive any R&D incentives, and they stated that they do not. The responses of the participants support that the actors need resources and the available resources are insufficient.

In summary, the participants emphasized that the lack of financing negatively affects sustainable transformation, that the transformation will not be possible unless the

resources are increased, and that Turkey's lack of resources affects the diversity of projects negatively.

#### **6.5.8.2. Human Resources**

The analysis on the human resource element, which is another resource, revealed that according to most of the participants, human resource trained in this field in Turkey is very limited; the existing ones go abroad, the people working in the financial sector on sustainability-related issues are not competent, and the people working on sustainability and ecological innovations are not competent. They also stated that the number of academicians is not sufficient, they cannot come together with academicians working on the subject due to weak connections, and therefore they cannot benefit from academic human resources. P10 highlighted that the finance sector in Turkey faces a challenge in training the qualified personnel required for its operations:

*"Unfortunately, there is a significant disconnection between academia and the real sector. Universities are not able to train qualified personnel to meet the needs of the business world. I am horrified when I see new graduates starting a job as a mid-level manager."*

As can be understood from the above statement of P10, it is seen that the disconnection between academia and the real sector has increased the concerns of the professionals in the sector, as the new graduates who have started to work cause the sector to perform well below the expectations of the sector.

As detailed in the analyses made to determine the external factors affecting the internal dynamics of the institutions in the research, it was seen that the two biggest obstacles to ecological innovations for FC-PIS are the lack of human resources and insufficient financial resources. In order to avoid repetition, the results of the analysis are given in detail in the relevant section, not here. These obstacles, which are seen as an external factor, are actually closely related to the resource mobilization function. In the analyses made for this function, it is seen that the lack of trained human resources and the problems of accessing funds are a big problem for FC-PIS.



### **6.5.9. Legitimation**

According to Hekkert et al. (2007) and Bergek et al. (2008), technological innovation system (TIS) approach is an analytical framework used to explain the development and diffusion of technological innovations. The TIS analyses examine the interactions between various "system functions". One of these functions, the "legitimacy" function, refers to the social and political acceptance of technological innovations. The legitimacy function encompasses processes to ensure that technological innovations and related technological systems are acceptable and supported by various stakeholders (e.g., politicians, investors, consumers) (Hekkert et al., 2007; Bergek et al., 2008). These processes may include elements such as aligning innovations and technological systems with social values and norms, providing political and regulatory support, and creating positive perceptions of relevant stakeholders (Bergek et al., 2015). The legitimacy function is critical for the successful diffusion and market penetration of technological innovations. If a technology or technological system fails to gain legitimacy, it may lack financial resources, face regulatory barriers, and may not be adopted by consumers (Hekkert et al., 2007).

In summary, the legitimacy function represents the processes for achieving social and political acceptance of technological innovations and systems in technological innovation system approaches. This function is considered an important factor for the successful diffusion of innovations and market penetration. As widely accepted in organizational theory, legitimacy is a prerequisite for the formation of new industries (Bergek et al., 2015). Suchman (1995) defined legitimacy as the desired, appropriate and acceptable actions of an existing economic entity in line with the norms, values, beliefs and explanations structured by social systems. However, Bergek supports Suchman's definition with the statement that legitimacy is not given, but is created through conscious actions by various organizations and individuals in a dynamic process of legitimation. According to Bergek (2008), these conscious actions can eventually help the new TIS overcome its "innovation responsibility". However, this process can be very time consuming and often complicated by the competition of adversaries advocating existing TISs and their associated institutional frameworks.

Hekkert (2012) states that the following questions can be asked in the analyses to be made within the scope of the TIS analytical framework: Is investment in the technology seen as a legitimate decision? Is there much resistance to change? Where is resistance coming from? How does this resistance manifest itself? What is the lobbying power of the actors in the system? Is coalescence forming?

When an evaluation is made on the FC-PIS analytical framework, it is seen that the focus of the creation of legitimacy is on eco-innovations and sustainability practices within FC-PIS. For this reason, the general legitimacy of the sector was excluded from the evaluation.

In the context of the FC-PIS analytical framework, the following elements have been analyzed in order to identify the deficiencies in this function, to understand whether FC-PIS has gained legitimacy in the context of sustainability and ecological innovations, and to develop policy recommendations. These elements have been newly developed within the scope of this thesis, since there is no similar study in the literature.

• **Education and Awareness Levels Related to Ecological Innovations and Social Acceptance:** To understand social acceptance, it is necessary to investigate whether sustainable and ecological innovations in the financial sector are supported by politicians, investors and consumers. This can be judged by information found in policy documents, regulations and industry reports. In order to understand the level of education and awareness about ecological innovations, the knowledge and skills of those working in the financial sector on sustainability and ecological innovations are an indicator of legitimacy. This can be measured by training programs, conferences and seminars organized in the sector.

• **Regulatory support:** The existence of policies, incentives and regulations for sustainable and ecological innovations in the financial sector by governments and regulatory agencies is an indicator of legitimacy.

- **Financial resources:** The amount and growth rate of investments in sustainable and ecological innovations can be a sign of legitimacy. This can be observed in the distribution of financial resources such as mutual funds, venture capital and government subsidies.

- **Market adoption and growth:** Market penetration and growth rates of sustainable and ecological innovations in the financial sector are indicators of legitimacy. This can be judged by increases in product and service use, entry into new markets, and market share changes in the industry.

- **Collaboration and partnership:** The level of cooperation and partnership of sustainable and ecological innovations in the financial sector with actors outside the sector (e.g., academia, non-governmental organizations, other industries) is an indicator of legitimacy.

- **Intra-sector practices:** The prevalence of practices for sustainable and ecological innovations within the financial sector is a sign of legitimacy. This can be evaluated with examples such as sustainable investment strategies, green bonds, ESG (environment, social and governance) integration and corporate social responsibility practices.

- **Transparency and reporting:** An indication of legitimacy is that companies in the financial sector report their performance on sustainability and ecological innovations transparently and share them with stakeholders. This can be assessed through documents such as companies' sustainability reports, ESG ratings, and carbon footprint reports.

- **Lobbying:** In the framework of TIS, the lobbying function refers to the process by which actors (companies, research institutions, non-governmental organizations, etc.) interact with policy makers and other decision makers to influence the formation and implementation of policies and regulations for particular technologies or sectors. Lobbying can influence the success of technological innovation systems by being actively involved in shaping policies and regulations.

By examining each of these elements, it can be evaluated whether the financial sector has gained legitimacy in the context of sustainability and ecological innovations. Areas with high legitimacy indicate that the industry is more open to sustainable and ecological innovations and that these innovations can be successfully deployed.

#### **6.5.9.1. Education and Awareness Levels Related to Ecological Innovations and Social Acceptance**

Under this heading, it has been evaluated whether sustainable and ecological innovations in the financial sector are supported by politicians, investors and consumers. According to the results of the analysis, it was emphasized that customers, who are the FC-PIS stakeholders, demand eco-innovative applications with increasing awareness and question the relationship of products with sustainability. However, some participants stated that, contrary to the above discourse, the awareness of the elderly population and consumers with low education levels is very low. The results of the PEIS within the scope of this research also support this discourse. In addition, according to the PEIS results, it has been observed that both the personal environmental awareness of the sector employees, who are the internal stakeholders, and the perception of ecological innovation about the institutions they work for are high. In addition, according to the results of the analysis made within the scope of the study, it was seen that especially the investors forced the sector to transform due to their high awareness. Considering the relationships of FC-PIS with global innovation systems, it is thought that global social acceptance is also important and affects this function. The analyses made in this context revealed that the global social acceptance of the subject is very high. The existence of agreements such as European Green Deal and Paris Climate Agreement can be considered as a natural consequence of this high acceptance. Most of the participants stated that they have developed various studies and practices, including water awareness, in order to eliminate lack of awareness, which they see as an obstacle to the development of this issue and to reduce their carbon footprints.

While emphasizing that employees are trying to be included in the processes through in-house practices, P17 said, “*First of all, we gave information to the employees*

*within the company. Afterwards, we switched to the green office application within the company and included the employees.”* In addition, P12 said, *“We designed a modular training program within our own bank. We want all personnel to go through this training program.”* and added that, *“We provide trainings to increase the awareness of our employees on these issues. We organize awareness campaigns on Instagram for both our employees and our customers. We segment our own customers and provide training to them. It's not just about selling products. First of all, it is necessary to inform them about these issues. We particularly focus on this issue in SME banking.”* These statements indicate that apart from in-house practices, they try to raise awareness among employees with trainings, and in addition, they carry out various marketing activities so that customers can participate in the process. P25 stated, *“For example, the SME customer is actually at the heart of this issue.”* This expression draws attention to SMEs, which play an important role in achieving sustainable transformation. These activities of banks are considered to be highly valuable, especially considering the size of SMEs in the Turkish economy. Finally, while the participants emphasized that financial literacy is important within the scope of awareness raising activities, they also stated that various banks have established “Agricultural Academies” in order to raise awareness especially in the field of agriculture.

#### **6.5.9.2. Regulatory Support**

The existence of policies, incentives and regulations for sustainable and ecological innovations in the financial sector by governments and regulatory bodies has been analyzed as an indicator of legitimacy. Since the results of the related analysis are explained in detail under the title of *“Blocking Mechanisms”* on the following pages, a summary is included here. In the current study, it was seen that the biggest barrier to ecological innovations in the context of FC-PIS is regulation deficiencies. According to the statements of the participants supporting this situation, efforts to eliminate these deficiencies with the initiatives of the companies are limited and although the legislation is binding, improvements are needed by the rule makers for incentive purposes. In addition, while drawing attention to the regulations and legislation developed at the international level, it was stated that there are difficulties

in complying with the regulations in Turkey and this situation poses a significant obstacle in the context of the circular economy. In particular, it was emphasized that there is a great lack of regulation in the insurance context and that foreign-insured insurance players gain competitive advantage by adapting to international regulations. At this point, it was emphasized that the regulations should be linked with the business partners in a common understanding and should be coordinated with the development plans in terms of sectoral priorities. In conclusion, it is emphasized that the lack of regulations causes FC-PIS not to function properly in the context of ecological innovations, and this may adversely affect the competitive environment in the long run.

### **6.5.9.3. Financial Resources**

The amount and growth rate of investments in sustainable and ecological innovations can be a sign of legitimacy. Participants drew attention to the lack of financing as one of the biggest obstacles to ecological innovations in Turkey. This situation shows that sustainable transformation is negatively affected and transformation cannot be achieved unless an increase in resources is achieved. In addition, the lack of resources in Turkey negatively affects the diversity of projects. The short-term nature of the fund structure in Turkey is insufficient to meet the long-term financing needs of investments in eco-innovations. For this reason, efforts are made to obtain funds from international markets in order to access cheap funding sources. However, due to the inadequacy of existing regulations, they have difficulty in using funds in accordance with the rules determined by international agreements. In this context, both disconnections in public incentives, R&D expenditures and lack of cooperation are seen as the factors that negatively affect the financing of ecological innovations. However, when considered on a global scale, it is seen that there are many sources of funds, with global development banks being the pioneers. For FC-PIS, this problem makes us think that while the issue is gaining legitimacy in the world, it is still at the stage of gaining legitimacy in Turkey.

#### **6.5.9.4. Industry Applications**

The prevalence of sustainable and ecological innovations within the financial sector is a sign of legitimacy. This can be evaluated with examples such as sustainability practices and strategies, ESG (environment, social and governance) integration, and corporate social responsibility practices.

The participants stated that they are trying to identify the possible effects of climate risks on the sector and to adapt some approaches to their business processes to minimize these risks, since they are becoming more and more aware of the risks that the climate crisis will create in the sector. In this context, they stated that they have been working on P8 climate scenarios, and they have tried to make calculations about how sensitive the banking sector is to these risks and how much possible losses it may face, especially through stress tests and scenario analyses in the P4 world, but this has not yet been done in a healthy way, even on a global scale.

Most of the participants stated that they removed the trash cans within the organization to encourage recycling, organized sweater days, on which all the employees wear sweaters and turn off the heaters to increase energy efficiency, transferred a certain percentage of their company income to various associations within the scope of social responsibility, established sustainability departments within the company, and reduced their own carbon footprint. They stated that they are trying to conserve energy by using renewable energy sources, adopt green office practices, measure their carbon footprints, and try to reduce the damage they cause to the environment by renewing company vehicles with hybrid vehicles.

#### **6.5.9.5. Market Adoption and Growth**

Market adoption and growth is an important indicator of the success and legitimacy of sustainable and ecological innovations in the financial sector. According to the statements of the participants in the analysis, the finance sector in Turkey has taken important steps in the field of green finance and has grown in recent years in parallel with the increasing sustainability and environmental awareness around the world.

The penetration of green financial products has increased in Turkey, especially in the last few years. Financial products and services such as green bonds, sustainability loans and green finance projects are gaining increasing attention and adoption in the industry. This trend has accelerated due to the increasing demand to support sustainable and environmentally friendly projects, especially in areas such as energy, construction and infrastructure projects.

However, as emphasized by the participants, despite the penetration and growth rates of green financial products, there is still more growth potential in this area in Turkey. Particularly, the participants drew attention to the need to strengthen local and international regulations in the field of green finance, to increase the cooperation between the public and private sectors and to support the growth in this field. In addition, the participants stated that they thought it would be possible for Turkey to attract more investments in green finance, to achieve economic growth and sustainable development goals, and to comply with international environmental and climate change agreements.

#### **6.5.9.6. Transparency and Reporting**

It is an important indicator of legitimacy that companies in the financial sector report their performance on sustainability and ecological innovations in a transparent way and share them with stakeholders. Banks' reporting activities are aimed both at sharing the requirements of regulatory and supervisory authorities and sharing their performance on sustainability and ecological innovations with stakeholders. These reports vary according to the areas in which banks operate and the legislation. In this context, some important reports published by banks and their objectives are explained below.

**Activity Reports:** These are the reports that summarize the annual financial and operational performance of banks. These reports provide detailed information on the strategic objectives, activities and financial results of the banks.



**Sustainability Reports:** These are the reports that summarize the performance and activities of banks in the field of sustainability and social responsibility. These reports provide information on banks' environmental, social and governance (ESG) practices and strategies.

**Integrated Reports:** These are the reports that present financial and sustainability performances together. These reports describe the value creation processes and sustainable growth strategies of banks.

**ESG Reports:** These are the reports that evaluate the performance of banks according to ESG factors. These reports show the banks' policies and practices on ESG issues.

**CDP Reporting (Carbon Disclosure Project Reporting):** These are the reports that evaluate the performance of banks on carbon emissions and climate change. These reports provide information on banks' strategies to manage climate change risks and opportunities.

**TFCR Reporting (Financial Reporting Task Force Reporting on Climate Risks):** It is the financial reporting of banks on climate risks. These reports provide information on the measures and strategies taken by banks against climate risks.

**Compliance with the BIST Index:** These are the reporting activities carried out by banks in order to comply with BIST. These reports show the sustainability performance of banks and monitor their compliance with the index criteria.

**BASEL Compliance Reports:** These are the reports prepared by banks to monitor and evaluate their compliance processes with the capital adequacy standards determined by the Basel Committee. These reports provide information on banks' capital and risk management practices and differ according to the role of institutions in the financial system. While some of the reports are prepared as required by the legislation, others are prepared on a compulsory or voluntary basis in line with the expectations of international initiatives.

With their reporting activities, it is believed that banks increase their legitimacy and reliability by transparently sharing their performance on sustainability and ecological innovations. In addition, reports are important to comply with the requirements of regulatory and supervisory authorities and to provide access to international funding sources. It is understood that the regulations and expectations of international initiatives guide the reporting activities of FC-PIS actors. All of the participants stated that all reports prepared are open and accessible to relevant stakeholders.

Apart from this, unlike other sectors, the players in the finance sector sign commitments created by various international initiatives in order to provide access to international funding sources. In this context, companies are required to prepare various reports to demonstrate their compliance with these commitments. However, it was stated by the participants that there were difficulties in the reporting processes due to common taxonomy problems, measurement problems and missing data. Such problems complicate reporting processes and analyses and prevent industry players from making more effective and accurate reports.

Overcoming these challenges may pave the way for healthier and more reliable reporting processes. For this purpose, it is important that national and international cooperation and standardization studies continue. Banks and regulators should collaborate to improve reporting standards and taxonomies and increase the transparency and accountability of the industry towards sustainability goals.

#### **6.5.9.7. Cooperation and Partnership**

The level of cooperation and partnership of sustainable and ecological innovations in the financial sector with actors outside the sector (e.g., academia, non-governmental organizations, other industries) has been analyzed in detail. Since the stakeholders and their roles are explained in detail in the stakeholder analysis section of the study, the details of the analysis are not shared in this section. It has been observed that FC-PIS actors have many different stakeholders from outside the sector. In this context, their partnership with FC-PIS catalysts draws attention. National and international stakeholders of FC-PIS outside the sector include;

- World Wildlife Fund (WWF)
- International Finance Corporation (IFC)
- Sustainability Academy (SAT)
- Sustainable Finance Association (SEFIA)
- Deniz Temiz Association (DTD)
- Turkish Marine Environment Protection Association (TURMEPA)
- 350.org
- Greenpeace
- Turkish Industry and Business Association ( TÜSİAD)
- Business Council for Sustainable Development Turkey (SKD)
- Integrated Reporting Turkey Network (ERTA) - Integrated Reporting Turkey (ER)
- Intergovernmental Science on Biodiversity and Ecosystem Services Policy Platform (IPBES)
- UCHIMA

Considering the diversity of the relevant institutions, it is seen that FC-PIS is in intensive cooperation with non-sector actors. It is seen that this diversity has experienced significant developments in the context of FC-PIS's legitimacy in the context of ecological innovations and sustainability.

#### **6.5.9.8. Lobbying**

The answers given to the question of “*Are there lobbying activities in the context of ecological innovation?*”, point to why the finance sector lobbies, deficiencies in lobbying activities or what might be the driving forces leading to lobbying activities. The sub-themes identified within the scope of this analysis are grouped as lack of interest unity, lobbying activities for access to financial resources, and the role of associations. However, the results of the analysis revealed that lobbying activities are very weak since there is no common interest in the finance sector in Turkey. P2 exemplifies this issue as follows:

*“There is no lobbying activity in the financial sector, as there is no team that plans to focus on the climate crisis and make business on it. Lobbying requires a common interest, but there is no common interest in the financial sector.” (P2)*

P18 also says, *“I can't say that we act very collectively here. We do not have any lobbying activities.”*. This statement underlines that, as an exception, professional associations undertake lobbying activities with legislators, especially in order to raise awareness. In addition, some participants stated that there are no firms that provide lobbying consultancy in Turkey, as in the USA or Europe, and such firms support them in the projects determined by some international agencies related to sustainability with a lobbying focus.

With the same approach, P12 and P30 stated that they established a Study Group in the early 2010s to evaluate social and environmental issues in their professional associations, that there is a big difference between the number of banks that initially showed interest in these studies and the number of banks that are now interested, and that all banks now attend the meetings and express their opinions. Therefore, these participants emphasized that the banking sector in Turkey is at a much higher level of environmental and social awareness compared to 10 years ago and the awareness of banks about international connections is higher on this issue.

In line with the comments of the participants, it is seen that the European Green Consensus will make the need to accelerate the green transformation of exporting companies even more important. Parallel to this, the participants emphasized that, with the border carbon regulation brought about by the European Green Agreement, exporting companies that will be directly affected by this situation have started lobbying activities, as export companies in Turkey may be subject to additional taxes depending on the carbon content of the products they export to Europe. The following statement from P2 is an example of this discourse.

*“Except for the finance sector, exporting companies will be directly affected by the new regulations brought by the European Green Deal, and therefore they will have to adapt to the measures that the public should take. However,*

*it is difficult to say that the financial sector will be directly affected by these regulations. Therefore, these companies have started lobbying now." (P2)*

Although it is thought that the mentioned lobbying activities will not have a direct impact on the financial sector, it should be taken into account that these companies will need resources to comply with the EU Green Deal. In this context, it is foreseen that the financial sector can realize financial innovations in order to meet this need. P30 stated that the international loans of the bank he is affiliated with are based on negotiations at the diplomatic level, and in this context, people who have been working in the field of sustainability for many years meet in certain periods to evaluate their experiences and how they manage the processes. In this context, it has been seen that sector employees come together and carry out various lobbying activities by exchanging information. It was also emphasized by P30 that these studies created international recognition.

P14, on the other hand, stated that the international funding sources they work with provide various supports on the background of an anti-fossil fuel work in Turkey, and stated that if Turkey supports fossil fuel investments, it will not be able to find financing due to the increasing costs. It has been stated that financing can only be obtained from China in this regard. For this reason, he emphasized that the institution he worked for was engaged in some anti-fossil fuel lobbying activities. P1 stated that he was engaged in lobbying activities in areas such as executive remuneration, bribery and corruption in the governance policies of the institution he worked for.

*P2 "After the European Green Deal, the demand for products with environmentally friendly production processes and low carbon emissions is expected to increase. Therefore, Turkish exporting firms will need to adapt their products and production processes to green transformation to remain competitive in the European market. In order for companies to be able to manage this transition process, we need to teach them how the developments here will affect their own sectors. In fact, we, the banks, are a very important information centers. We have relationships with our correspondents abroad and follow their investments. We are also open to the public and have investors. We are interested in the questions and referrals of international investors. With this information, we are involved in many sectors. We are talking about five critical sectors that affect the environment at the moment, but these regulations will be related to different sectors in the coming period.*

*That's why, we will transfer what we learned now to these sectors and say, "Look, you also need to take action here."*

When the above statements of P14, P30, P1 and P2 are evaluated together, it is seen that there are efforts of the financial sector to transfer the information they have learned as a result of international lobbying activities to other sectors. Although the participants stated that there is no national lobbying activity in the sector because there is no common interest yet, it can still be stated that there is an unsystematic lobbying activity here.

Finally, P23 stated that positive developments have been experienced in this context in Turkey, that they are working with public institutions on the creation of a roadmap for climate problems, that they have expressed their opinions on this issue, and that this issue is too important to be left to personal sensitivities.

Recalling that the legitimacy function means that social and economic systems become accepted and supported by various stakeholders, the analyses show that the financial sector has gained significant legitimacy in terms of sustainability. In particular, the growth of the Green Bond Market and the spread of Green Finance demonstrate the financial sector's efforts to finance sustainable development. In this context, the increase in investments based on environmental, social and governance (ESG) factors can be interpreted as a sign that the sustainability goals of the financial sector have gained legitimacy. However, it is thought that if the financial sector continues to invest in carbon-intensive energy and resources in the current period, it may undermine its legitimacy in terms of sustainability. In addition, similarly, it was stated by many participants that Green Washing would cast a shadow over the legitimacy of the financial sector. As a result, although the financial sector has gained considerable legitimacy in terms of sustainability, it needs more effort to be considered a fully legitimate sector. In particular, it is thought that the sector should move away from carbon-intensive investments, spread awareness, and systematic lobbying activities should be carried out.

### **6.5.10. Green Digital Transformation**

Green digital transformation is gaining more and more importance in the financial sector. This transformation refers to technological and operational changes aimed at reducing the environmental impact of financial services. The importance of green digital transformation in the financial sector can be explained by various factors such as economic and social development, transition to a low-carbon economy and supporting sustainability.

First, the financial sector plays a key role in the transition to a low-carbon economy (Şimsek and Tunalı, 2022). Green finance is a financial discipline that evaluates the environmental impact of investments in sectors such as energy, transportation, construction and agriculture and develops strategies to reduce these impacts. Green digital transformation helps financial institutions reduce their carbon footprint and achieve their sustainable development goals by providing technologies and business models that make it easier to achieve these goals.

Second, the green digital transformation in the financial sector is of great importance in terms of transparency and accountability. Digital technologies allow financial institutions to more accurately and effectively measure, report and manage their environmental and social impacts. In this way, investors and regulators can be better informed about sustainability performance and ensure that financial resources are allocated correctly.

Third, green digital transformation in the financial sector is a great opportunity to meet customer demands. More and more consumers and investors are turning to financial services that support sustainability. Therefore, financial institutions that adopt green digital transformation have the potential to expand their customer base and gain competitive advantage.

Fourth, the green digital transformation in the financial sector allows for better management of climate risks. Digital technologies and data analytics help financial institutions more accurately assess and adapt to climate-related risks. In this way, it

is ensured that the sector becomes more resistant to damages that may occur due to climate change.

Fifth, the green digital transformation contributes to the optimization of business processes in the financial sector. Thanks to innovative technologies, financial institutions can increase their operational efficiency and reduce their costs by reducing energy and resource consumption. This allows green financial services to become more widespread and accessible.

Sixth, the green digital transformation promotes collaboration and coordination in the financial sector. Collaboration between financial institutions, regulators, technology providers and other stakeholders enables the industry to achieve sustainability goals more quickly and effectively. In this process, stakeholders can develop common standards, policies and best practices, thereby contributing to the growth of the sustainable finance ecosystem.

In summary, green digital transformation in the financial sector is extremely important for reasons such as social and economic development, transition to a low-carbon economy, transparency, accountability, meeting customer demands, managing climate risks, optimizing business processes, and promoting cooperation and coordination across the industry. For these reasons, it is of great importance to adopt and support the green digital transformation in order to create a sustainable and successful vision for the future of the financial sector.

When all these factors are evaluated together, it is thought that green digital transformation should be considered and analyzed as a function in itself in order to develop a policy proposal to increase the ecological innovation capacity of FC-PIS within the scope of this study. Just as it is thought that successful green digital transformation will lead to the healthy operation of the innovation system, it should be considered that otherwise it will prevent the system from working.

In this context, the analyses regarding the green digital transformation of FC-PIS revealed that the green digital transformation function has 3 sub-themes: Electronic Waste, Digital Applications, Driving Forces and Barriers.



### **6.5.10.1. Electronic Waste**

Electronic waste is a sub-theme of the green digital transformation function, and it is the type of waste that occurs as a result of the end of life of electrical and electronic equipment or its disposal. These wastes can originate from equipment commonly used in the financial industry, such as computers, telephones, fax machines, printers, and other electronic devices. Recycling of electronic waste is an important issue in terms of its environmental, economic and social impacts and is a critical component of the green digital transformation process (Balde et al., 2015).

There are several reasons why electronic waste recycling is important in the financial sector. First, improper management of electronic waste can result in the release of toxic and harmful substances into the environment. This has the potential to disrupt ecosystems and have adverse effects on human health (Puckett, 2003). In line with the financial sector's responsibility to reduce the environmental impact of its operations and achieve sustainable development goals, recycling of electronic waste is of great importance.

Second, the recycling of electronic waste can help businesses in the financial sector use natural resources and energy more efficiently. Materials recovered from electronic waste can be used in the production of new products in production processes, thereby reducing natural resource consumption (Baldé et al., 2017). Also, recycling of electronic waste through energy recovery can play an important role in reducing energy consumption.

Third, the recycling of electronic waste in the financial sector is important for companies to fulfill their social responsibilities and strengthen their reputations. A transparent and effective electronic waste management practice can contribute to financial institutions gaining the trust of their stakeholders and leading them in the field of sustainability. This creates great value for investors and customers, especially those who care about sustainability issues.

In summary, in the context of the financial sector, recycling of electronic waste is of great importance for reasons such as reducing environmental impacts, efficient use of natural resources and energy, fulfilling social responsibilities and strengthening the reputation of companies. In the green digital transformation process, the adoption of effective strategies by financial institutions on electronic waste management and the review of their practices will contribute to the sector's achievement of its sustainability goals.

As a positive externality of this function, the financial sector can also fulfill its responsibilities in this regard by promoting and financing best practices for the recycling of electronic waste. For example, the sector can contribute to the spread and effectiveness of the recycling of electronic waste by providing loans to electronic waste management projects or by supporting such projects with sustainability bonds.

In this context, P17 stated that they have external stakeholders to manage their processes related to electronic waste and that the electronic wastes they produce are followed. P28 stated that they work with IT teams on the disposal of electronic waste, and P4 reported that electronic waste management is an important issue; the issue is becoming increasingly important as per EU agreements, and financial players have stated that it will affect them. P18 and P25 stated that they developed a system to manage toner wastes and that if toner waste is not sent to their headquarters, no new toner is sent. They stated that they can directly decompose the wastes as soon as they are produced.

P8 stated that they made reports on how they converted electronic waste to reduce their carbon footprint within the scope of CDP, and they established material tracking systems.

Most of the participants stated that their awareness of waste management was improved by the relevant legislation, and they had to improve their processes in order to comply with the relevant legislation.

Considering all the analyses together, it was emphasized that the legislation on waste management is an important driving force for the healthy performance of this function. According to the comments from the participants, it was stated that there are important studies on the management of electronic waste and there are national regulations regarding these; however, the number of companies operating in the recycling of electronic waste is insufficient.

#### **6.5.10.2. Digital Applications**

It must be recalled that one sub-research question aims to determine what technologies are prone to ecological innovation. The answer to this question and which technologies support green digital transformation are evaluated under this sub-theme. In this context, it has been determined that the focal points are information technologies that will provide paperless, efficiency-enhancing applications, artificial intelligence issues.

When the results obtained from the evaluation of the ecological innovation capacity of the finance sector within the scope of policy are examined, it has been observed that digital applications have been developed in the financial sector to ensure sustainability and reduce carbon footprint. In this context, most of the participants stated that digitalization is very important for them, they are trying to move all their possible operations to digital, and the pandemic has accelerated this process.

Almost all of the participants emphasized that they are trying to eliminate paper consumption in their operations as much as the regulations allow. They reported that they produced many innovative digital products while moving their processes to digital platforms due to the effort to become paperless.

*As P20 stated, "We have been reducing our paper consumption figures significantly over the years. For example, in 2020, our greenhouse gas emissions per employee decreased by 27% compared to the previous year. Likewise, our energy consumption per employee decreased by 30%. We reduced it from 5 kilos to 2 kilos per head. Our products included policies and offers, which were often printed on paper. Now we encourage them to be sent via email and we try to motivate the whole company and our agents to do*

*so. We also do claims and legal files. We are trying to get documents such as questionnaires sent by our customers to our insurances in digital forms so that they are not printed on paper. For this purpose, we are adding new functions to our mobile applications."* This statement supports the above statements.

Some participants stated that they have developed various digital applications to increase efficiency, and that they aim to reduce their carbon footprints thanks to these new applications. Examples of these applications are various optimization tools developed to reduce energy consumption, applications that measure metrics that will provide data for their reporting activities, development of new platforms, and software that measures user experience.

*P15 stated, "For example, we have an early climate warning system structure that we have implemented in cooperation with Klima.co. By informing our customers of severe climate events in advance, we try to ensure that they manage their risks well, minimize their damage, and secure themselves and their goods. We developed this app in innovative collaboration with a start-up."*

This statement of P15 shows that actors have partnerships with start-ups especially while developing productivity-enhancing applications, and they have to manage the effects of the climate crisis, which leads to new technological innovations. The participants also stated that various artificial intelligence applications are also adapted into the processes. Finally, most of the participants stated that digital applications do not only aim to reduce their carbon footprint, but also to expand their market share by increasing customer satisfaction.

### **6.5.10.3. Drivers and Barriers**

In order to identify the factors that prevent this function from working properly, the participants were asked what the obstacles are in front of green digital transformation. The analyses of the responses showed that cryptocurrency mining is a big problem. It has been stated that, unlike digital applications aimed at reducing carbon footprint, cryptocurrency mining increases carbon footprint as it is a process involving energy-intensive computational processes. This process relies on solving

complex mathematical problems using processor power and electrical energy. The use of this mechanism called Proof of Work (PoW) for the security of cryptocurrencies, especially Bitcoin and the like, increases the carbon emissions due to the energy consumption of the mining processes. Although energy consumption differs according to the source of electrical energy used during mining operations, energy obtained from fossil fuels causes significant carbon dioxide (CO<sub>2</sub>) and greenhouse gas emissions, making global warming and climate change problems worse. As a result, cryptocurrency mining can significantly increase carbon footprint, which contradicts the goals of sustainable energy systems and reduction of carbon emissions. Therefore, it is stated that the development and regulation of mining technologies and infrastructure in a way that promotes energy efficiency and use of renewable energy is critical in terms of reducing future economic and environmental impacts.

The digital carbon footprint problem, on the other hand, has been seen as an important problem in the context of the digital transformation of the industry. Most of the participants emphasized that technology creates a dilemma in the context of the environment. On the one hand, they drew attention to the fact that the carbon footprint they produce has become a problem due to the increasing intensity of use of digitalized processes in order to reduce their carbon footprint. It has been emphasized that digitalization and remote working have a positive effect on reducing the carbon footprint by reducing transportation, while it can also turn into an element that increases the carbon footprint due to the increase in consumed energy. However, it has also been stated that the players are trying to meet their energy needs from renewable energy sources in order to reduce this effect. It has been stated that the biggest problems in this regard are the lack of sufficient technical knowledge, guidelines and common taxonomy on how to calculate the digital carbon footprint. It has been stated that institutions must calculate their digital carbon footprints in order to reach their net zero targets.

Among our participants, P28 stated, *“Calculating our digital carbon footprint is one of the problems we face. So in the group, we didn't share too many referrals or a point of view like 'if you calculate it this way, you'll get that'.”* This statement of P28

also draws attention to the fact that there is no global knowledge base on digital carbon footprint calculation.

P29 supported the views of P28 by stating that the issue of digital carbon footprint calculation is a subject that is followed, that they have to reduce carbon emissions in line with the global targets set for them, and therefore they are working on the issue, but there is no global guidance in this context.

*As P24 stated, the fact that the issue has too many stakeholders and requires technical knowledge makes these calculations difficult: "As for how to calculate the digital carbon footprint, we can calculate the electricity used by computers and the associated emissions. But for example, if you use Gmail, it is Google's infrastructure, or if you are using Outlook, it is Microsoft's infrastructure. There are 1 billion Gmail users around the world and what kind of mechanism do they have to operate all the infrastructure and how much emissions do they generate? We cannot do the calculation per email; bigger digital players need to do this. For example, what kind of footprint they can leave when operating these systems and they have very large servers. Although it is not the topic of today, I think it will be on the agenda in a few years."*

As another obstacle, it has been observed that technology literacy is not yet at the expected level in Turkey. It has been noted that especially the elderly population is a handicap in this regard. The majority of the participants stated that the usage rates of digital products are lower than expected due to the fact that the technology literacy of the industry stakeholders, especially the customers, is not at the expected level.

The last hurdle is information security issues. Most of the participants stated that their customers have intense concerns about information security when using digital platforms, and sometimes they even refuse to use these platforms for this reason.

P16's statement shows that the sector has various activities to overcome this obstacle:

*"We have a digital security platform. It is a platform where we try to raise awareness of the society against cyber risks."*

The participants pointed out that they allocate an R&D budget to develop digital technologies, and that there are structures within the IT departments that follow

innovative practices in their field of activity, develop collaborations and support start-ups. In fact, P26 pointed out that many players have established structures similar to incubation centers in universities within their own structure and pointed out that this issue is becoming more and more widespread. They added that they have developed various mechanisms to implement the ideas coming from them, especially in order to increase the innovation capacity of company employees, and they also open these mechanisms to ideas coming from outside the company. This discourse can actually be seen as a result of the lack of development of FC-PIS and academia collaborations. Unsuccessful university-sector cooperation and the desire to evaluate the innovation potential within the sector pushed the sector to find a solution in this regard.

Also, for this function, most of the participants stated that the human resources in the field of information technologies are strong. They pointed out that, unlike other functions, human resources are qualified in the context of IT; however, the increased brain drain in recent years may pose a risk in this context in the future. In addition, most of the participants also emphasized that having sufficient infrastructure and human resources in the context of Fintechs is their greatest strength. The fact that Fintechs were not included in the analysis within the scope of this study is an important limitation. However, it is thought that this constraint contributes to the necessity of examining the field by pointing to an important gap for future studies.

#### **6.5.11. Blocking Mechanisms**

The purpose of this research is to design a policy to increase the capacity of FC-PIS. As Bergek(2008) stated, it is particularly important to understand the driving forces and inhibition mechanisms that shape the nature of the dynamics of FC-PIS in the context of policy design (Bergek et al., 2008). While structural analysis is mostly aimed at understanding the internal elements of FC-PIS, it is very meaningful to determine the external factors that affect these internal dynamics and to establish the relationship between these functions. For this reason, in this part of the research, the questions asked to the participants were analyzed in order to identify the drivers and inhibitors of FC-PIS in the context of ecological innovations. The results of the

analysis revealed that the obstacles faced by FC-PIS in the context of ecological innovations are grouped under 10 main headings. In Table 36, the sub-themes and the frequency of the themes are given according to the results of the analysis, and then they are explained in detail one by one.

**Table 36.** Blocking Mechanism Sub-Themes

Sub Themes	Frequencies
Lack of Regulation	78
Lack of Awareness	22
No Common Taxonomy	46
Green Washing	14
Lack of Funding Source	18
Insufficient Human Resources	14
Profit Focused Perspective	14
Culture	7
Failure to follow academic studies	7
Public bank perception	7

#### **6.5.11.1. Lack of Regulation**

The most emphasized issue in all interviews is that the biggest obstacle in front of FC-PIS in the context of ecological innovations is “Regulatory Deficiencies”.

*As P4 stated, "Infrastructure is not formed. There has not been enough work on regulations in Turkey. I think that the infrastructure will be formed in time, but we are at the zero point right now. But there is intent, of course."*

The above statement of P4 confirms the existence of regulatory deficiencies in Turkey. In this context, some of the participants stated that these deficiencies are tried to be eliminated by the companies' own initiatives. However, it has been emphasized that the expected developments have not been realized yet, that the legislation is binding, but that improvements are needed to encourage the regulators. The participants stated that development efforts continue outside of these elements, but such efforts can only be carried out within the existing possibilities.



The participants stated that they have expressed their concerns about this issue to the relevant stakeholders in all the meetings they attended, but that a full consensus has not been reached yet despite the existence of very advanced regulations and legislations on this issue in international media. As can be understood from P17's statement, there is a great lack of regulation especially in the context of insurance: *“The requirements in the TCMB's general directorate forces them to explain what companies do in these matters, whether they have a policy or a management framework, or whether they have goals. Or it forces you to state why it wasn't disclosed. In other words, there is a legislative obligation on the Finance side. However, a framework for ecological issues has not yet been formed in the insurance legislation.”* Insurance players stated that they try to fulfill the requirements of these regulations because they are signatories on certain issues depending on international regulations, but national regulations are not compatible with them. At this point, they added that foreign-insured insurance players have developed much more effective green products due to their compliance with advanced international regulations and thus they gain competitive advantage in this context.

In addition, it has been observed that the institutions that assume the role of collaborator in FC-PIS have requests from the players to convey their demands on this issue to the regulators in the relevant meetings. It has been noted that the collaborators work with the players to raise awareness of the regulators on this issue.

P17 emphasized that *“Due to global warming and because environmental disasters are impending, legislators need to take precautions in every aspect. These measures should include regulating companies operating in their own markets, setting relevant rules and guidelines, allocating budgets, and establishing special units or divisions.”*

As can be understood from this statement, arrangements to be made should not only bind financial institutions but also all business partners with a common understanding. At this point, P28 also emphasized that insurance players should work together with the Ministry of Environment, Urbanization and Climate and the Ministry of Customs in order to regulate their relations with suppliers. It has been stated that due to the inadequacy of the existing regulations in this regard, the system unfortunately proceeds in an optional way, not depending on the rules in terms of

supplier relations, and therefore this is a major obstacle, especially in the context of the circular economy.

Regulators participating in the research stated that the biggest reason for the shortcomings in this context and Turkey's inability to perform at the level of its counterparts in the world is the macroeconomic uncertainties and financial sustainability that Turkey has not been able to overcome for decades. P4 states that TR FC-PIS has a short-term funding structure, while financing environmental problems requires longer-term investments, and no institution can solve this structural problem alone.

In addition to these, P8 emphasized that the regulators in Turkey have prepared an action plan; the collaborators are working intensively on the legislation; they are trying to involve all the players in the process by forming Study Groups, and in this context, it is a supportive environment in terms of regulation. P8 added that studies have been carried out in Turkey to prepare regulations that will harmonize with the European Green Deal. In addition, P12 drew attention to the fact that these regulations should be compatible with the development plans in terms of sectoral priorities in order to work in a healthy way. The participants also stated that the FC-PIS implementer is currently only in a spectator position on regulations and legislation.

It is seen that the mentioned regulation and legislation deficiencies cause FC-PIS not to function properly in the context of ecological innovations.

P10 emphasized that the lack of uniformity due to regulatory deficiencies may deteriorate the competitive environment between FC-PIS actors in the long run:

*“Customers have become accustomed to very easy loan terms in Turkey. Making environmental and social impact analyses, asking questions here, and setting certain criteria will of course create additional dissatisfaction on the customer's side. If we, as XXX bank, are doing environmental and social analysis in the loan allocation process, if another bank does not do this, the customer will prefer the bank that does not want this, and if there is not a big difference in the interest rate of the loan, it will be easier for the customer.*”

*Here, too, regulators have a lot of work to do. Regulatory institutions should set a certain timetable and make it compulsory for Turkish banks. Otherwise, if there is an asymmetry between the banks, this will put some banks at a disadvantage compared to their competitors.”*

#### **6.5.11.2. No Common Taxonomy Problem**

The second most emphasized issue in all interviews in the context of ecological innovations was lack of a common taxonomy.

In this context, some participants stated that they generally accepted the EU Taxonomies as a guide for themselves, but the standards are constantly changing in the international context as the field is very dynamic in terms of taxonomy. They further argued that many measurements should be made due to the Net zero targets of the institutions they work with, but that there is no common taxonomy for these measurements and there is no accountability. They emphasized that their metrics are not yet clear. P18 reported that *“None of the 25 companies that have committed to zero carbon emissions and set a Net zero target have been able to meet their zero carbon targets. The difference between goal and result is incredible. In the context of the circular economy, some of the concepts in the ecosystem we are talking about are not fully settled. The world is actually questioning this. As stated in the statement, “They cannot calculate”.* Due to this situation, the companies had difficulty in adapting to the rules set for them at the international level. It has been noted that the most advanced taxonomy in this field is the Integrated Reporting taxonomy. Many of the participants stated that while developing a common taxonomy, all definitions should be remade, starting from the most basic concepts, and the absence of a common understanding even in concepts such as sustainability and green finance may cause measurement problems. They added that although the work of international stakeholders is followed, all international and national stakeholders of FC-PIS should support the common taxonomy work. In addition, most of the participants pointed out that the lack of a common taxonomy in the context of sustainability caused this concept to become obsolete over time, and stated that the reports produced under this heading, unfortunately, do not allow benchmarking between institutions.

As can be seen from P4's statement below, the taxonomy problem affects not only Turkey but also all global FC-PIS actors:

*“As a matter of fact, there is no full progress on this issue in the European Union yet. They are just learning, in fact, everyone is trying to rediscover America.”*

P4 emphasized that one of the reasons for the common taxonomy problem is that there are no theoretically formed common definitions and taxonomies even in the academy, and pointed out that there is a need for guidelines such as the generally accepted OSLO Guidelines for innovation, and mentioned the importance of university-FC-PIS cooperation in this context. P4 added that almost every institution is currently trying to make their own definitions. P5 stated that the public should make definitions related to the field, and then legislation should be developed in accordance with international criteria according to the definitions developed by the public.

As a result of the analysis, it has been seen that there are various difficulties in developing a common taxonomy. P6 said, *“For example, whether plastic bags are more environmentally friendly or paper bags, even this can be a matter of debate. Of course, we call it a paper bag, but at that point, life cycle analyses are performed and factors such as the energy used in producing the paper bag, water and trees cut down are considered. Looking at the entire life cycle, it's actually decided whether something is ecological or not. This is where eco tags and similar things are considered. You can't decide on the carbon footprint by looking at a single point anyway.”* This expression indicates that the subject is complex and multidimensional by its nature. For this reason, it has been seen once again that in addition to all the actors of FC-PIS, it is necessary to work with other system actors in order to create a common taxonomy, as stated by most of the participants.

Based on the responses of the participants, the areas with common taxonomy problems were tried to be determined. Accordingly, the taxonomy problem regarding measurement metrics has been a remarkable area.

Another issue evaluated under this title is the fact that climate and environmental issues also affect the risks of the banking sector as stated by P4: *“Now, the search in the world is to make calculations and analyses about how sensitive the banking sector is to these risks and how much potential losses it may face, and to make this routine, especially through stress tests scenario analysis. In fact, even the most advanced financial systems in the world cannot do this, both on an institutional basis and on a sectoral basis.”* As understood from the statement, how to integrate climate risks into FC-PIS is also a problem. It is seen that there is no common international or national taxonomy regarding the climate risks specific to FC-PIS.

As P24 states, another issue is the problems in *“Digital Carbon Footprint Calculation”* since there is no common taxonomy. It has been stated that those who develop the relevant technologies should be included in the process, since the digital carbon footprint calculation is not similar to the carbon footprint calculation that the institutions produce directly. It was also emphasized that digital carbon footprint is not on the agenda yet, but it will be one of the most talked about topics in the future. The statement of P26 on the subject is remarkable.

*“The thing is, we don't know these calculation methods. We have a team of environmental engineers, and they calculate it. But carbon footprint calculation can be more technical. In other words, it is not something that ordinary people can calculate. It requires technical staff.”(P26)*

This statement supports that both taxonomy creation and taxonomy-related account metrics should be handled with a more holistic approach, not only with FC-PIS stakeholders.

As can be deduced from P23's expression, the related concepts are new to financial markets, which is a reason for not forming a common taxonomy.

*“It is not so easy to regulate a market according to new concepts such as green project, green analysis, blue bond, sustainability bond, and environmental impact reporting.”*

P6 stated that worldwide funders such as the World Bank and Development Banks are discussing the issue of common taxonomy a lot and these institutions should

provide financing for green projects, but they are still working on how to create the relevant criteria and fit them into the financial framework.

P13 said that there are some developments in this regard in Turkey and BIST has created an index related to sustainability. P4 identified the sectors that will support the EU's transition to a low-carbon circular economy in June 2021 and stated that a regulation called "*green taxonomy*" has been published, which has a system that largely overlaps with the NACE classification in Turkey. Based on this development, P9 said that The European Banking Authority (EBA) made a recommendation and the European Commission accepted this recommendation. Accordingly, as of 2022, European Banks stated that they are obliged to calculate the place of green finances they provide within the EU in their current portfolios according to the EU Green Taxonomy. P9 stated that they are working to implement the recommendation of The European Banking Authority (EBA) in Turkey, but a common taxonomy could not be developed due to the lack of regulation.

*“As Turkish banks, we said let's do it, but there is a problem here. When we delved into the depth of the green taxonomy, we saw that the legislation in Turkey does not allow us to classify exactly according to the green taxonomy. The reason for this is the lack of regulation in Turkey. For example, the EU says that in order to define even a wind project as a green asset, a life cycle assessment must be made for all equipment used in that project. But at the same time, the same green taxonomy says that not only a cycle assessment, but also an environmental and social assessment according to international standards, a biodiversity analysis, and a cumulative impact analysis should be made. But the legislation in Turkey cannot meet this. Which wind tower life cycle assessment was made in Turkey? No such thing. Unfortunately. To do this, you need this data. At the very least, companies should have the infrastructure ready to produce this data.”(P9)*

P4 supports P9's statements by saying, *“This is out of the question for us. For example, within the scope of reports coming from banks and banks, how much of the loan portfolio in the BDDK serves these areas? We don't know this. There is no such labeling. Our loan database is very detailed. We access data on an individual customer basis. However, we cannot objectively label where and for what purpose this customer is using the financing received by this company.”*

To summarize the results of the analysis on the common taxonomy sub-theme, most of the participants stated that the common taxonomy problem is an international

problem, that this problem has not been solved anywhere in the world yet, but some studies have been carried out in this direction. In the case of Turkey, they pointed out that common taxonomies could not be developed due to deficiencies in legislation and regulation, and as a result, there were great difficulties in adapting to global regulations. It was also stated that the calculations made within the scope of sustainability vary from institution to institution and do not have a standard, due to the lack of a common taxonomy and regulations to support the taxonomy. Finally, the participants draw attention to the fact that the subject is in the process of development since it is new and does not have a common ground in the literature, and that all national and international institutions that have an indirect or direct effect on this development process should participate and support this development process.

#### **6.5.11.3. Lack of Awareness**

The analyses made to explore the obstacles to increasing the ecological innovation capacity of the finance sector revealed that the third most emphasized issue was the lack of awareness. P16 said, *“First of all, we all need to be clearly aware that we share the same planet. A social awareness needs to be developed. Sustainability education should be given starting from pre-school.”* P16 added while emphasizing the need to raise awareness that not only of financial players but also of the whole society should be educated. P17 highlighted that this may contribute to the transformation of the sector by creating demand-based pressure on financial institutions. Similarly, P19 emphasized the importance of stakeholders by stating that awareness should be raised in all business partners of the financial sector; otherwise, it would not be possible to work in harmony. In addition, most of the participants stated that awareness has begun to be formed in the sector, that there are studies on this subject, but since these studies have not been carried out systematically, the level of impact is not yet at the expected level. P4, on the other hand, stated that the institutional capacity related to awareness has not yet been formed in the banks. The reasons for this are the main field of activity of the banks is not this subject and the workload is excessive. Finally, cooperation with collaborators should be developed in this regard. P4 points out that the awareness of bank collaborators is higher than that of insurance collaborators. Supporting the above statements, P18 stated that the

importance of the insurance sector for sustainable transformation should be understood, and the public should support this sector in this context. P18 further emphasized that awareness on sustainable transformation should go far beyond addressing it in a shallow context such as reducing paper consumption; the scope of awareness should be expanded, and a common understanding should be developed on this issue.

P30, on the other hand, stated that there were good developments in this regard, and that they could not tell anyone about climate change until a few years ago, but with the addition of the subject to international reporting standards, awareness began to increase. In addition, most of the participants stated that manager awareness is very effective in this regard, adding that managers should be persuaded first and consultancy companies should make efforts to raise awareness in this area. P3, P10 and P13, on the other hand, pointed out that the biggest problem faced by managers while raising awareness is that individuals with a high average age, who are accustomed to traditional business models, are in management positions. They mentioned that FC-PIS implementers are only spectators at the moment, unlike world examples, which negatively affects other stakeholders of the financial sector.

P5 said that the issue of awareness is different between institutions and global connections have a significant impact on this issue: *“The rate of spread of awareness within bank groups can be different. The stronger the foreign connections of a bank, the faster it realizes this situation. The more funds it needs from abroad, the more swaps it makes, and the more syndicated loans it uses abroad, the more contacts it has with other foreign investors. However, the development of this awareness will be slower in banks with few channels.”*

As stated by P9, due to the low awareness in the manufacturing industries on the demand side of FC-PIS, they can not achieve the expected results because they do not work long-term with a holistic approach: *“I think the investments in the manufacturing industry are made to save the day. In other words, I do not believe that long-term plans are made and that an integrated perspective is acted upon. They're just trying to fix problems with workarounds.”*



When the comments of the participants are evaluated together, the most important result is that it will not be meaningful to develop awareness only within the sector. In this context, this obstacle can only be solved if social awareness is created.

As P12 emphasized, climate diplomacy has a very important effect on awareness and the most fundamental agent that can do climate diplomacy is the public, namely regulatory and supervisory authorities. Thus, cooperation should be developed in this context.

#### **6.5.11.4. Lack of Financial Sources**

When the results of the analysis are examined, it has been revealed that the need for financing, which is one of the biggest obstacles to ecological innovations, is also a serious problem for FC-PIS, which is a source of financing, supporting the findings in the literature review section of the study. Most of the participants stated that the lack of financial resources of FC-PIS negatively affected the sector. P16 stated that unlike the players in Europe, most institutions do not allocate budgets for eco-innovation because as P4 stated, the macroeconomic problems in the country negatively affect these budgets and it is important to have a long-term fund structure for sustainable finance, but there is a short-term fund structure in Turkey.

The following statement of P24 shows that one of the obstacles to innovative project financing is that financial institutions have to ensure their own financial sustainability, and in this context, mechanisms to take the financing risk and institutional deepening are needed:

*“Exclusive project finance to Turkey is not very developed. They have corporate roots, but since there are not many companies over 100 years in Turkey, banks want to secure themselves when they give loans .In addition, the legislation changes frequently in Turkey. For this reason, they ask for a lot of collateral, they define responsibilities. Innovative ideas, however, often come from three-person companies that don't already have big money. This is one of the important shortcomings in Turkey.”*

P24 further stated that *“As the financial market in Turkey does not get very deep, cross alternatives do not emerge very often. For example, I am*

*considering a project that both reduces emissions and increases efficiency by adding microorganisms to hydroelectric power plants, cleaning the accumulated structures and using the resulting gas as an additional energy source. There is a Start Up that has already developed this project. If you were a bank, would you provide financing for this Start Up? There are things you need to pay attention to in the BDDK regulations in order to provide financing. You'll look at the balance sheet size, the asset structure, and their collateral. That person does not have these, the person is already an inventor. We have a deficit in this regard.”*

The above statement of P24 shows that the regulations to be complied with when obtaining financing in Turkey do not support the innovation ecosystem. P30 and P6 stated that the industry in Turkey needs cheap resources for green transformation, but the industry has difficulty in accessing foreign resources due to regulations and measurement problems; therefore, they have to use resources with higher interest rates and avoid such investments. *“Most of our funding comes from Europe, our investments and funds come from companies originating from Europe. But at the moment, companies in Turkey cannot meet the criteria they demand from us.”* This statement also supports the situation. P2 stated that they are in search of funds in international markets in order to overcome this problem and to provide players with green loans: *“We are trying to encourage customers to use green financing; we are trying to access international funding sources in order to provide the low interest loans that the customer expects from us because the first priority of the customer is not the environment, but to ensure its financial sustainability in the macro-economic context.”*

P6 emphasized that local banks are aware of this problem, they create some financing opportunities using different sources, they develop green financing products especially related to energy efficiency, and it is possible to provide financing for innovative projects when they cannot access international funding sources.

The following statement of P13 suggests that the financing roles of actors in the context of FC-PIS should be re-evaluated: *“We see that brokerage houses in Turkey only give authorization in stock trading and public offerings. Investment banks, such as the ones in America and Europe, cannot provide financing for projects. This*

*opportunity has been provided by the very newly enacted law, but when we look at their capital, they do not have a large capital structure, therefore they are not effective.”*

P9, on the other hand, argued that participation banks are in a different position at this point as they started to provide green financing in the early 2000s and even they played an active role by working with regulators during the design of the regulations related to supporting renewable energy investments. As seen, P9 emphasizes the role and importance of Development Banks in the context of ecological innovations.

In summary, the participants emphasized that the lack of financing affects sustainable transformation negatively, transformation will not be possible unless the resources are increased, and the current lack of resources in Turkey also negatively affects the diversity of projects.

#### **6.5.11.5. Green Washing**

It has been determined that an obstacle to the development of the ecological innovation capacity of the financial sector is green washing in the financial sector. Greenwashing was first introduced in 1986 by activist Jay Westerveld, when hotels began requesting that visitors reuse towels under the guise of a water conservation strategy, despite the fact that there were no other environmental actions with a greater environmental impact. Greenwashing has reached epidemic proportions in recent decades, according to advertising agency Ogilvy and Mather. With the growth of green markets, followed by greenwashing, a trust issue has evolved as customers struggle to recognize a legitimate green claim (de Freitas Netto et al., 2020).

de Freitas Netto defines greenwashing as; *“the act of misleading consumers regarding the environmental practices of a company or the environmental performance and positive communication about environmental performance”* (de Freitas Netto et al., 2020)

As it can be understood from its definition, green washing causes a confusion of concepts related to ecological innovations. P19 stated that the actors operating in

Turkey organize advertising campaigns within the scope of sustainability activities on climate change, nature protection, etc. in order to raise awareness in the sector; however, there are no regulations to control these advertisements on a global level, and thus, these advertisements sometimes turn into greenwashing. P24, on the other hand, stated that they have seen not only financial institutions but also many sectors with foreign stakeholder engaged in greenwashing to show that they meet global expectations, adding that greenwashing is actually beginning to be seen in all sectors. P11 and P18 drew attention to the fact that financial institutions, which succumbed to their marketing ambitions, carry out many greenwashing activities under the name of “social responsibility” in order to gain competitive advantage by influencing customer perception. For example, they said that they changed the logo colors of the institutions to green. P23 states that one of the most concerned issues in corporate governance in recent years is green washing.

P18 stated that the signatory institutions in international agreements comply with the rules instead of doing greenwashing activities, banks are structures based on the element of trust, and greenwashing is a problem that will negatively affect this trust. Finally, many of the participants also pointed out that the reason for green washing is actually the lack of information due to the lack of a common taxonomy, the need to improve the knowledge base on this subject, and the need to put various restrictions on the regulations and advertising budgets of financial institutions.

#### **6.5.11.6. Insufficient Human Resources**

The results of the analysis conducted for the development of the ecological innovation capacity of FC-PIS revealed that the problems related to human resources are an important sub-theme in FC-PIS. P4 stated that the awareness of bank employees on sustainability and ecological innovations is not fully formed and that a full-time workforce should be developed in banks to work on these issues. In support of these statements, P5 added that the workforce in the financial sector is scarce, so everyone can only fulfill their duties, but only units with specific duties should be established in order to follow up on a multidimensional issue such as sustainability. P12, on the other hand, stated that the rate of youth employment is very low in

Turkey and that they are carrying out a thematic study for the employment of young people who will work in this field.

P24, on the other hand, stated that there are no technical teams working on issues such as carbon emission, ESG risks in project finance, and integration of climate risks into the finance sector, while those working on sustainability look at the issue more from a financial point of view. The same participant also added that the stakeholders of the sector also have a qualified human resource problem, and this problem negatively affects FC-PIS: *“TUSCO is the only bank with an engineering unit in Turkey. Since it was established in 1950 with the financing of the World Bank, the technical, financial and economic analysis structure there was established in 1961 with the arrival of the people working at the World Bank.”*

P24 states that due to the lack of technical human resources in the financial sector, the subjects and areas that are open to development die out before they can be translated into a language and platform that bankers can understand, and therefore many innovative opportunities are missed.

P30 points out that the human resources trained in this field are very limited in Turkey, the existing ones go abroad, the people working in the finance sector are not competent in matters related to sustainability, and it is not enough to know only economics and finance. The following statement from the participant draws attention to this complexity.

*“Whether he is an engineer or an environmental engineer, it is such a ridiculous system that there is a very perceptual pollution here, and someone needs to clear the perception problem” (P30)*

P9 stated that, *“If financial analysts are employed by the banks considering that they will benefit, they should also employ technical teams who can work on environment, sustainability and ecological innovation. Banks do not see the employment of technical personnel as a direct income generating investment, but this employment will reduce their environmental risks and increase their innovation capacity.”* P9 stated that they should consider it as an important investment. P12, on the other

hand, looked at the issue from a different perspective and drew attention to the fact that the finance sector is in a leading position not only in Turkey but also in the world in terms of trained human resources, and that very few institutions employ both economics, engineering, philology and sociology graduates at the same time. There is no interdisciplinary approach.

P30 stated that, apart from the finance sector, the number of academicians working on sustainability and ecological innovations is not sufficient, they cannot get together with academicians working on the subject due to weak connections, and therefore they cannot benefit from academic human resources. P10 mentioned the macro dimension of the problem as follows:

*“I think there is an important gap in terms of universities in Turkey. Unfortunately, there is a disconnection between academia and the real sector, not just in terms of sustainability, environmental and social impact, but in general. On the one hand, we complain that youth unemployment rates are high. On the one hand, we cannot train qualified personnel in line with the needs of the business world. As a mid-level manager personally, I am horrified when I see kids starting new jobs. These students feel unbelievably bad. Compared to the past, unfortunately, this larger macro problem is not only related to sustainability, which is very serious.”*

#### **6.5.11.7. Profit-Driven Perspective**

The analysis revealed that the profit-oriented perspective dominates the institutions in the finance sector, as expected. It is a fact that institutions in the financial sector have to make a profit in order to ensure their financial sustainability. However, unfortunately, when the risks of climate crisis come into play, it is seen that this perspective has a negative impact on the sector. P30 states that the financial sector naturally looks at the issue with a profit-oriented approach and with the perspective of growth, not development, the balance sheet target of banks is to increase their profits, but they have ecological sensitivities, and it is important to bring this working style together with a development perspective.

P28 indicates that the uncertainties in the emerging green technologies force themselves when they think from a profit-oriented perspective: *“Insuring electric*

*vehicles is actually not as simple as it sounds because it is a new technology; parts are expensive; it is not clear how the damage will be managed. In fact, paying attention to these is an ecological approach in itself, let alone offering insurance coverage for an electric vehicle. But it is quite difficult to do so.”*

P24 emphasizes that ecological innovations should be financed from a development perspective and the importance of development banks in this regard:

*“We prefer to work with large holding structures in the real sector. Our experience in the real sector is the import of iron, steel, glass, textile, food and machinery. In the meantime, what we have learned provided some benefits; I am an engineer, this is one of the important shortcomings I see in the finance sector. When the project comes, they always look at it with the eye of profit, however, if you understand the technical dimension of the business well, it brings that development perspective. Sometimes, when you sacrifice profit, you can actually make a great contribution to the country as a financial institution.”*

According to P5, complying with the sustainability criteria brings additional costs to the banks, banks should have a serious initiative in sustainability in order to bear this additional cost, collaborators have various activities to raise awareness of banks on this issue, and banks are also interested in this issue, and regulators are also working on various activities to support this. P5 pointed out that there are promising developments in this regard in Turkey.

#### **6.5.11.8. Culture**

According to the results of the analysis conducted to improve the ecological innovation capacity of FC-PIS, it has been revealed that the existing culture is an obstacle to the development of ecological innovations. In this context, some participants emphasized that the change in culture would take a long time due to the differences in the profiles of the customers, but all the projects to be carried out would remain in the air and would not have the expected effect unless they adapt to the sustainable culture. P8 stated that the disposable culture in the country should be replaced by a recycling culture that will support the circular economy, and this issue is important especially in terms of supplier relations of insurance players. It was

emphasized by the participants that the fact that foreign capital companies have different cultures affects the sector positively; thanks to the collaboration, the recycling culture has started to spread rapidly within the sector, but these must be supported by current regulations. In addition, it has been seen that this cultural change cannot be achieved only with in-house practices such as the abolition of the use of paper cups in the company and IT practices to use less energy. It is important to create a change in the whole society at the individual level.

P22 argues that the whole system should change in this context: *“The biggest obstacle is “culture”, because to innovate is to change the existing. The current culture was formed with the accumulation of years. So, the problem here is that the parties do not think together. We are all part of a greater whole. It is important to push all stakeholders to think responsibly and to demonstrate the long-term benefit of this cultural change, especially among stakeholders.”*

#### **6.5.11.9. Public banks perception**

The analyses showed that FC-PIS players have a perception that public banks negatively affect the sector in the context of sustainability and ecological innovations, and private banks have expectations from public banks.

P2 said, *“Private banks have high awareness and efforts on this issue. However, we need to bring public banks to the same level. As you know, there are international agreements we signed as eight private banks in order to access international green resources. Unfortunately, no public bank other than the development bank has signed these contracts. When we asked them to be involved, they stated that it was not very possible for them to make such a commitment in their business processes. However, the transformation will be with them. In fact, the first priority of all of us should perhaps be to include them in these processes.”*

P26 similarly stated that the awareness of private banks, especially private banks with foreign capital, on the subject is high, but public banks are not at the same point.

P22 stated that they are already working with public banks on some projects. The more stakeholders they bring together, the greater the impact they will have, but this process is very difficult.



P10 stated that it is difficult to be a public bank, especially in terms of cooperation with catalysts, they have to reject such cooperation in principle because of the high sensitivity of public banks in this regard, and in this context, there is political pressure on public banks. P10 also stated that public banks offer new technological financial products and services similar to private banks, but that they may not be preferred due to the negative perception of customers as a public bank.

P20 indicated that public banks have a negative perception not only among FC-PIS stakeholders but also on the customer side:

*“Exactly the same card, same campaigns, valid for the same usage, but when XXX private bank offers something, people can say it's good. But, as a public bank, we offer the same product or we do the same campaign, but unfortunately, negative feedback may come as everyone already provides it. I think it's all about the negative perception of being a public bank. I think this is our biggest problem.”*

#### **6.5.11.10. Failure to follow academic studies**

The analyses conducted to develop the ecological innovation capacity of the finance sector showed that the lack of academic studies and the weak link between the university and the sector are obstacles.

P30's statement reveals the weak connection problem between the sector and the academia:

*“Unfortunately, we still cannot find anyone to cooperate with at the academic level. Everyone says there is global warming up, but no one tells us what we will do in the Finance Sector to prevent this.”* While this discourse of P30 emphasizes the inadequacy of academicians working on the subject in academia, P18's statement draws attention to the importance of insurance sector: *“Nobody understands the value of the insurance sector in the context of climate change, we need to change this, but there are perceptual problems in relations with the academic world.”*

P26 stated that apart from university finance sector cooperation, cooperation with industry and university, which are the most important stakeholders of FC-PIS, could not be achieved:

*“If it works like this, the system is super, sometimes it is an industrial product, sometimes it is a software, sometimes it can be a service process. University-Industry cooperation cannot be established because we cannot establish this mechanism correctly. Even organized industrial zones in Turkey, which are customers of the financial sector, are trying to solve this problem by establishing their own universities.”*

P8 emphasized that one of the reasons for the lack of university cooperation in the finance sector is that the sector does not follow academic studies:

*“Actually, the problem is, as I said, we do not follow academic studies. These are very valuable works. Unfortunately, we lag behind in practice. When you put the work in the academy into practice, that academic work is actually successful.”*

In summary, the participants stated that the number of academicians working on the field is low, the industry has no perception of working with universities, the university-industry cooperation is weak for their customers, but these collaborations must be developed for the development of the industry. Finally, the participants pointed out that there are no regulations to encourage this mechanism, but it should be developed.

### **6.5.12. Driver Mechanisms**

In this part of the analysis, the driving forces of FC-PIS in the context of ecological innovations are evaluated. According to the results of the analysis, it has been seen that the driving forces of FC-PIS in the context of ecological innovations are gathered under 5 main headings. The themes and subject frequencies according to the results of the analysis are given in Table 37.

**Table 37.** Driver Mechanism Sub Themes

Inducement Mechanisms	Frequencies
International Initiatives and Global Change	55
Stakeholder Expectations	27
The climate crisis and Environmental Social Governance	42
Resource Requirements	23
Manager’s awareness and support	11

Table 37 shows that the most important driving force in the development of FC-PIS's ecological innovation capacity is international initiatives and global change. The second driving force is the climate crisis and environmental social governance. Other drivers are manager's awareness and support, resource requirements, and stakeholder expectations.

#### **6.5.12.1. International Initiatives**

Within the scope of the functional analysis of the ecological innovation capacity of the finance sector, the main theme of international initiatives has been examined.

P20, P23 and P27 are signatories of the UN Global Compact, and international initiatives demand a lot of information from them in this context. These institutions have various expectations. P30 Carbon Disclosure Project (CDP Worldwide) initiative provides trainings for the financial sector in Turkey in the context of sustainability. They stated that they were monitored by the Integrated Reporting institution, and they were the signatories of the TFCR initiative. In this context, they disclosed their climate-related financial risks within the scope of TFCR, and they also participated in United Nations Environment Programme Finance Initiative (UNEPFI) workshops. The participants stated that by participating in these initiatives, they developed themselves by accessing academic knowledge and other practices through their work, and thus they could access international know-how, which increased the ecological innovation capacity of the institutions.

P17 indicated that agreements will have an impact on the credibility of both companies and financial institutions: *“With international agreements such as the Paris climate agreement, sustainability studies have become a very important element for the credibility of countries. We learn through these agreements, and the more we learn, the more eco-innovative we begin to be.”*

While this statement of P17 emphasizes the impact of sustainability activities on the country's credibility, P11's statement focuses on the effect on the banks: *“.....Is the related activity an activity that prevents carbon emissions? Accordingly, perhaps*

*there will be a factor that can affect the credibility of these companies, and in that sense, these developments and regulations in this carbon market will also affect the banks.”*

In the context of international initiatives, all of the participants emphasized that the European Green Deal is a huge impetus to transform the sector. In this context, they pointed out that there are very important regulations in the memorandum that will affect the financial sector in particular, and the goal of the agreement is to create a Net Zero Europe in 2050. With the adoption of the law proposal on the ratification of the Paris Climate Agreement by the Turkish Grand National Assembly and its publication in the Official Gazette dated 7 October 2021, Turkey officially became a party to the agreement. P24 stated that the fact that Turkey is a party to this agreement and the Paris Climate Agreement creates climate sensitivity in almost all of the players that provide funds from abroad in terms of the financial sector. In addition, it was especially noted that these agreements are driving forces not only in the financial sector, but also for the entire automotive industry and automotive supply industry, the energy sector, the construction sector, and the entire manufacturing industry.

P2 emphasized the transformative power of the financial sector in the context of sustainable innovations as follows: *“For example, we go to the Organized Industrial Zone (OIZ) unions directly in regions where carbon-intensive sectors in Anatolia are more concentrated, because the green agreement is a very serious agenda at the moment and we have a mission to spread this change to the grassroots, we can reach these people, whether they are our customers or not, and give them the green light. We tell them what to expect in relation to reconciliation or other legal regulations, and how they should change their business practices after these expectations, and then we create a flow to inform you and introduce our products, so that we, as a bank, can support your transformation with the time-limited financial products we have. We are taking action within this framework.”*

P25’s statement is a concrete example of how international initiatives trigger the development of ecological innovation capacity of the sector: *“We are in a position to calculate the footprint of the SMEs we lend, we are currently trying to open a platform for them, the application of carbon tax at the border brought by the Paris Climate Agreement and the European Green Agreement points exactly here.”*

Most of the participants emphasized that participating in these initiatives and committing as a signatory would accelerate this transformation.

#### **6.5.12.2. Stakeholder Expectations**

Within the scope of the structural analysis of the ecological innovation capacity of the finance sector, it has been revealed that stakeholder expectation is a driving force in the context of sustainability and ecological innovations. In this context, some participants stated that since sustainability has become a direct valuation criterion in investor relations, the expectations of the shareholders of corporations about sustainability put pressure on them.

P2's expression indicates the pressure created by the expectations of international investors: *"We are in debt ourselves and we have relationships with our correspondents abroad. We follow their investments. We have investors who are open to the public, and they and international investors have expectations from us."* Similarly, P21 emphasized that the pressure on them is increasing day by day, and especially that the expectations of global investors compel the institutions to take action.

It was mentioned that the banned sectors, which have high environmental impacts or do not comply with sustainability principles in line with the stakeholder expectations, could no longer be accepted as stakeholders, especially on the project finance side, and it was stated that this pressure forced the system to transform. Players stated that they are trying to create a roadmap for themselves by working with independent auditing and consultancy companies in order to meet stakeholder expectations. Most of the participants stated that due to the increasing awareness on the subject, especially among highly educated individuals, the expectations of the customers forced them to transform.

P24 also supports the above statements: *"Individual and small investors should no longer focus only on making a profit while evaluating their money, but should also aim to make positive contributions to the world we live in."*

*These two factors are candidates to be the driving force and opposition force of great change in the financial sector.”*

Similarly, the participants pointed out that employees with high awareness are also a driving factor in the transformation of business processes. For example, P17 drew attention to the fact that institutions that can not keep up with this change, that is, cannot meet stakeholder expectations, may lose their competitive advantages and face various financial risks: *“As awareness increases in society, this will become a commercial decision for companies. In other words, in this context, companies will either prefer to transform themselves by keeping up with this change or will be doomed to disappear from the market.”*

P29 argued that the players in the investor position in the sector also create pressure as a player:

*“We manage large funds and as investors, we have certain rules in the selection of the investments we direct. There are guidelines that comply with these rules, both at the global and local level. Therefore, as investors, we avoid investing in harmful activities as I just mentioned.”*

P25 stated that they wanted national and international regulators to report from them as internal stakeholders, while P4 stated that various countries in the world such as the G20 countries asked them for statistical data on a macro scale, and institutions were forced to transform in order to provide these data.

P24's statement draws attention to the fact that the issue is not limited to the stakeholders of the sector, and even the SMEs, which are customers of FC-PIS, have expectations in this direction:

*“Don't look only at financial institutions, a small investor in Konya prefers to turn to companies that operate more sustainably in those countries while investing their money in foreign exchanges because the collective consciousness pushes both individual investors and institutional investors to take positions.”*

P13 drew attention to the fact that especially young investors attach importance to the subject: *“In the event of an IPO operating in the field of renewable energy,*

*especially due to pressure from younger generation investors, it will certainly attract great interest.”*

In summary, most of the participants stated that particularly investor relations, shareholder expectations, employee and finally customer expectations forced them to transform both internally and externally.

### **6.5.12.3. The climate crisis and Environmental Social Governance**

Climate crisis is a driving force that compels the world to transform, as emphasized in the introduction of the study. In this context, as a result of the analyzes of the interviews, it was seen that the climate crisis is also an important driving force for FC-PIS. It was determined that the other themes that attracted attention under the heading of climate crisis were the energy problem, infectious diseases and the transformation in agriculture. In addition, the ESG sub-theme was examined under this title. The impact of the climate crisis and ESG (environmental, social and governance) risks on the financial sector is an increasingly important issue. Factors such as climate change and the reduction of natural resources, increased environmental and social impacts, and corporate governance and transparency deficiencies are thought to affect the business models, asset values and investment portfolios of financial institutions. Therefore, banks need to revise their decision-making processes and risk management approaches by taking into account ESG risks. Thus, it is important for them to adopt strategies aimed at minimizing social and environmental impacts while achieving their goals of sustainable growth and value creation. In addition, it is critical for the stability and sustainability of the sector that banks develop proactive policies towards climate crisis and ESG risks in line with the developments occurring at the global level and the expectations of the stakeholders. In this context, some participants stated that ESG reports have gained importance in recent years and that ESG performance is taken into consideration when investing in international funds. The participants think that the reason why the climate crisis is such a big driving force is that it will affect all players equally. They also added that the EU 2050-Net Zero targets are of great interest to them.

P4 and P8 indicated that with the understanding of climate crisis, risks related to the climate crisis can be understood; however, the expected development in practice has not yet been achieved. P8 attributed the failure to achieve this development to the lack of sufficient awareness in Turkey and taxonomy problems. P2 pointed out that the biggest problem in the world at the moment is climate change, and P8 pointed out that this problem started to be understood more clearly after the COVID-19 pandemic, which is seen as one of the possible consequences of climate change, and the industry began to transform in the context of adapting to climate change. Most of the participants stated that they started to create new financial products, especially regarding sustainable agriculture finance, within the scope of the risks related to climate change, and this is actually the concrete result of the climate crisis being a major driving force.

In addition, most of the players pointed out that one of the stakeholders that will be most affected by the possible risks posed by climate change is “non-life insurance companies”, and pointed out that all companies will have to re-evaluate all their products and services in this context. The climate crisis brings with it effects such as the frequency and severity of natural disasters, extreme weather events, and sea level rise. These effects may also directly affect the insurance industry.

P12 pointed out that the issue that triggered the awareness of the financial sector about the climate crisis was the payments that players would not receive if the companies they financed were affected by the climate crisis. In addition, according to the results of a survey conducted among vice general managers responsible for risk and board members in banks around the world, it was determined that climate change was not perceived as a risk a year ago, but was perceived as one of the four major risks only 1 year later. As can be understood from these statements, the COVID-19 pandemic is thought to have a major role in raising global awareness of climate change.

While one of the participants stated that the state and academics has limited capability in what they can do about the climate crisis in the financial sector, and that infectious diseases will increase in the next few years due to migrations. Due to the



climate crisis, another participant stated that the agricultural sector and banks in Turkey are the sectors most affected by climate change. The participants emphasized that they implement applications that combine innovative and digital options in the field. In addition, the participants pointed out that there is a multidimensional relationship between the climate crisis and technology, that technology can offer solutions to drought, water and energy problems at certain points, and how to finance these technologies is a very important and innovative area for the sector at the moment. Finally, the participants stated that the fight against the climate crisis cannot be considered independently of digital technologies in the energy context, therefore, the climate crisis is also a driving force on the digital transformation processes of institutions. In this context, the analysis results of this dissertation's appears to support the statement of Hekkert (2008) given below.

*“Understanding technological transition involves having insight into the relationship between the incumbent technology and the incumbent (innovation) system in relation to the new technology and the emerging system of innovation”* (Hekkert et al., 2008).

#### **6.5.12.4. Resource requirements**

Within the scope of the functional analysis of the ecological innovation capacity of the finance sector, the resource requirements sub-theme was examined. The main reason for the high cost of investments in clean technologies is the complexity and innovative nature of the development and implementation of these technologies. Research and development (R&D) activities of clean technologies often focus on high-tech and engineering areas that require a high level of knowledge and skills. This requires the use of significant financial and time resources, especially depending on the pace of competition and technological advances in the industry. In addition, implementing and scaling clean technologies may require large capital investments and infrastructure improvements. These factors lead to high-cost investments in clean technologies and a slower adaptation compared to more traditional energy sources. However, given the long-term economic and environmental benefits of clean technologies, these investments are essential for a sustainable future. Businesses need loans for various reasons, especially capital

needs. Factors such as lack of capital, expansion of businesses, willingness to invest in new projects, providing working capital and financial flexibility increase the demand for credit. In this context, banks play an important role and offer different types of loan and financing services to meet the financial needs of businesses. Credit and financing opportunities provided by banks support businesses to reach their growth targets, to be competitive in the market and to contribute to the economy by providing employment. Especially in developing sectors and innovative areas such as clean technology, the financing opportunities provided by banks are of vital importance for businesses to realize high-cost investments. In this way, banks operate as a key stakeholder for business success and economic development. Banks constantly need resources to increase their financing capacity and to offer loans to businesses. In order to meet this need for resources, banks often implement strategies to raise funds through borrowing from global financial markets and raising capital. In this way, the financial stability of banks and their ability to provide loans are closely related to both local and global economic dynamics. As most of the participants stated, the FC-PIS players' search for cheap resources from foreign markets forces them to produce new ecological financial products and to transform from the context of sustainability. P30 stated that international funders such as the EBRD and the World Bank no longer provide financing to projects operating in prohibited sectors, and this directly affects all prohibited sectors and financial institutions, and in this case, these sectors, which national financial institutions cannot provide financing, are forced to transform. P2 stated that they signed a lot of commitments in order to raise funds from international investors, they took a series of actions to fulfill these commitments, and these actions necessarily transformed them.

P6's statement draws attention to the fact that SMEs in need of resources are also forced to change for similar reasons, and different institutions provide resources under different themes, which suggests that financial institutions are specializing in certain areas and this expertise will become more evident in the future:

*“Turkey's Sustainable Energy Financing Program (TurSEFF), especially recently, has included the issue of resource efficiency in its scope of work. In this context, especially SMEs are financed through banks. While making investments, technical analyzes and studies are also carried out. It not only*

*benefits companies but also enables the implementation of emerging opportunities.”*

P7 adopted a different dimension and pointed out that financial institutions can take part in the supervision of the loans extended, which makes us think that the sector will be forced to branch out: *“I am a bank and I can decide according to the reports. However, funders demand that it be audited. But how can the employees at the bank know about issues such as how much it pollutes the environment? This is an area of expertise. So, in such cases, I think there are differences of opinion.”*

P10 stated that the more financial institutions realize the green transformation, the more resources they can find. P12 stated that they are subject to certain conditions when using the funds they access from international source; they will not be able to access the funding sources unless they meet these conditions, and in this case their own financial sustainability will be at risk.

#### **6.5.12.5. Manager’s awareness and support**

Within the scope of the functional analysis of the ecological innovation capacity of the finance sector, it has been seen that managerial awareness and support is a sub-theme. According to the results of the analysis, it has been determined that manager’s awareness and support is a driving force for ecological innovations, supporting the literature on the subject.

The following statements of P26 and P14 supports this issue.

*P26 stated that “The encouragement and support of executives at the CEO or general manager level is very important. In every innovation, if the manager of the organization supports the work and internalizes it with the new term, the project is successful.”*

*P14 drew attention to the fact that it can be a driver: “Somebody has to foresee this. In other words, unfortunately, we always say let's see in Turkey, but the climate crisis we are facing will not allow us to wait, so the foresight of senior executives on this issue is very valuable”.*

P17 stated that the highly educated managers in financial institutions create an advantage here, because the awareness of the educated managers is high, and in this context, the participation of the employees in the innovation process in line with the goals set by the managers is an important driving force. In the analysis of the data on the education levels of the senior managers participating in this research, a result supporting these statements was reached. It has been observed that most of the senior managers have master's or doctoral degrees.

P23, on the other hand, approaches the issue from a different perspective and draws attention to the fact that the awareness of not only the managers of the institutions, but also the regulators can be an important driving force, because top-down approaches may be a driving force due to the greater enforcement power.

**6.6. Concluding Remarks**

Systemic problems and barriers defined through prominent functions such as Knowledge development & diffusion, market formation, resource mobilisation, green digital transformation and legitimisation and the results caused by these obstacles are given in detail in Table 38.

**Table 38.** Summary of Systemic Problems & Barriers

Function	Systemic Problems & Barriers	Results
Knowledge Development & Diffusion	Lack of FC-PIS National Knowledge Base Insufficient level and range of data from TURKSTAT or Central Bank Information Systems	Companies with foreign capital gain competitive advantage, national actors are left behind, the problem of access to open information, a common understanding cannot be developed, time, money and labor losses, repetitive efforts
	Weak FC-PIS focused University Collaboration	Failure to follow academic developments, problem of access to open information, A gap between sector needs and academic curriculum
	The fact that FC-PIS actors have not defined a field-specific R&D budget	Failure to develop ecological innovations specific to FC-PIS
	No common Taxonomy	Difficulty in accessing international and alternative funding sources
	The very limited number of consulting companies that produce and disseminate information, such as PISCOR	The problem of FC-PIS players accessing accurate information and advice
	Weak public international cooperation	Access to clear and accurate information

Table 38. (continued)

Market Formation	Regulatory Shortcomings Lack of awareness (farmer, SME) Profit-oriented perspective Public Banks perception	Low diversity of green financial products, Low penetration of available resources
Resource Mobilisation	Lack of financial resources - Short-Term Fund Structure - Inability to access long-term international funding sources due to regulatory deficiencies	Ineffective or delayed transformation
	Lack of Human Resources - Information and Brain Drain - Universities are unable to train the human resources needed by the industry. - Inability to benefit from academic human resources due to weak university connections and lack of academicians working in the field - Risk of brain drain of human resource in IT field - Lack of technical staff in the context of ESG	Knowledge and skill gap Limited academic and open knowledge obtained from the sector Ineffective or delayed conversion
Green Digital Transformation	Digital Carbon Footprint issue Inadequacy of companies working on the recycling of electronic waste Cryptocurrencies Regulatory shortcomings to support de-paperization Information security issues Low technology literacy	Negative impact on efforts to meet and mitigate international carbon targets Delayed emergence and low penetration of digital ecological innovations
Legitimisation	Low level of education and awareness about social acceptance and ecological innovations Low awareness of the elderly population Low financial literacy Green Washing Inadequate regulations and regulations that are not compatible with and interact with development plans Regulatory deficiencies specific to the insurance industry Low access to global funding sources Failure to determine the effects of climate risks on the financial sector Lack of standard in in-house applications Lack of joint advocacy and lobbying mechanisms and collaborations Data access problem for international reporting International cooperation of public banks that is not strong enough	Waste of Resources Ineffective or delayed conversion Negative impact on efforts to meet and mitigate international carbon targets Lack of legitimacy, problem of access to international funding sources

Source: Author's own results

One of the most critical barriers for this function is the lack of FC-PIS information and database at the point of producing and disseminating information on the transformation of the sector, and the intermittent data contained in the databases of TURKSTAT or Central Bank, which are the best possible alternatives to be defined in this framework. The fact that university and industry cooperation is not achieved in an ideal way at this stage, as in almost every stage, prevents the reflection of the knowledge produced at this point in the academy to the industry, and also delays the formation and development of the above-mentioned database. However, it is possible to talk about obstacles such as the fact that the R&D budget is not allocated for these activities and the very limited number of sector expertise and consultancy firms.

As for market formation, the lack of awareness of customers such as farmers and SMEs, the lack of regulation and the focus only on profitability cause green financing products to be scarce and the penetration of these products to be very low.

In terms of resource mobilization, the main problem is classified as lack of human and financial resources. Access to international funds, which is hindered by short-term funding structure and regulatory deficiencies, indicates a lack of financial resources. Information and brain drain, the inadequacy of university education in meeting the needs of the industry for human resources, and the lack of technical personnel in the field of ESG stand out as problems related to the lack of human resources.

When the obstacles to the provision of green digital transformation are examined, the lack of knowledge and awareness about the digital carbon footprint, the few and limited capacities of the companies working on the transformation of electronic waste, and the almost absence of regulations to support paperless transformation come to the fore. However, it should be underlined that the most important problem regarding this process is the issue of information security. Failure to adequately prioritize cultural values, habits and the requirement of digital transformation ultimately has a negative impact on efforts to meet and mitigate international carbon targets.

For Legitimation, where systemic problems and obstacles are encountered most intensely, the low level of education and awareness about social acceptance and ecological innovations, low financial literacy, low awareness of the population above a certain age at this point, and those who do not interact with the development plans, and lack of regulation come to the fore. Problems such as lack of regulations specific to the insurance sector, low access to global funding sources, inability to determine the effects of climate risks on the financial sector, lack of standardization in internal practices, lack of joint advocacy and lobbying mechanisms and collaborations, and the problem of accessing data for international reporting also come to the fore. When these problems are considered holistically, results such as waste of resources and inability to reach targets are inevitable.

## CHAPTER 7

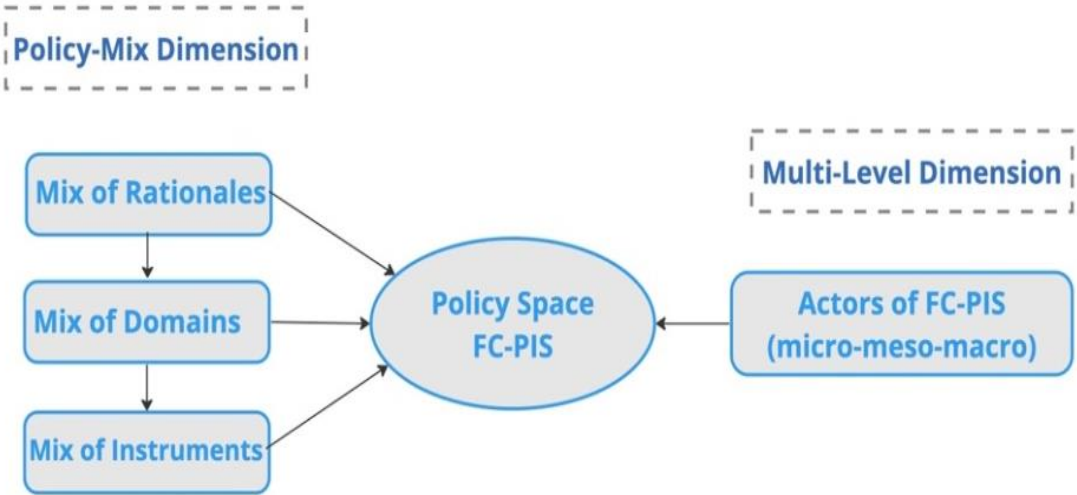
### POLICY IMPLICATIONS and CONCLUSIONS

In this chapter, the main findings of the analysis chapter are summarized and interpreted. Then, in line with these findings and overall conclusions, policy implications of the study are determined to support the increase in the ecological innovation capacity of the FC-PIS in Turkey.

Over the past few decades, there has been a growth and evolution in the range of policies aimed at promoting and facilitating innovation. This expansion has led to an increase in the diversity of policy rationales. Alongside the established neoclassical rationales that focus on enhancing investments in science and technology, there has been the emergence of evolutionary-systemic rationales that highlight the significance of institutions and learning through interactions within complex systems. As a result, the policy landscape has become more complex, with multiple innovation policies coexisting within the same country or region, each rooted in different rationales, utilizing various instruments, and pertaining to distinct policy domains. This has given rise to the notion of an innovation “policy mix”, which has gained popularity in time (Magro and Wilson, 2013). Policymakers and scholars have emphasized the need for effective policy combinations to tackle pressing global issues like climate change, the transition to sustainable energy, and the preservation of biodiversity. As Bouma et al. (2019) emphasize, *“Policy mixes are defined as combinations of independent instruments for addressing one or more policy targets.”* The policy mix that defines a particular innovation system is accompanied by a variety of policy instruments, each aimed at different actors within the system.

This research reveals the major systemic problems that hinder the development and functioning of the ecological innovation capacity of TR FC-PIS. Behind some of the

observed problems are common macroeconomic systemic problems that hinder the development of FC-PIS. Therefore, the policy recommendations proposed in this section do not aim to overcome macroeconomic problems, but aim to solve the main systemic problems in the FC-PIS. Considering this fact, a policy mix has been prepared for the current systemic problems of FC-PIS identified in the research. To this end, policy recommendations are proposed and detailed by a policy design model built on three pillars: policy objective, policy tool, and policy type. In addition, a new framework has been developed for the policy design method, which is the last step of the FC-PIS analytical scheme developed within the scope of this study. This analytical framework is illustrated in Figure 23. The policy-mix dimension shown in Figure 23 consists of mix of rationales, domains, and instruments.



**Figure 23.** Dimensions of FC-PIS policy system.

Source: Inspired from Magro and Wilson (2019)

The term “rational” means “policy recommendations”. The term “domain” means types of policy area. Within the scope of the research, policy types were determined drawing on the study of Costantini et al. (2017). Six different policy types and instruments are shown in Table 39.



**Table 39.** Policy Types and Instruments

Policy Type	Policy Instruments
Economic	Fiscal / Monetary Instruments
Information and Education	Human Resource Development Green Digital Transformation
Policy Support	Regulations and practices that support policy tools
Research and Development	R&D Budgets
Voluntary Approach	Tools that are not required by the regulations but required for the healthy operation of the system
Regulatory	Fiscal / Non-Monetary regulations

Source: Inspired from Costantini et al. (2017)

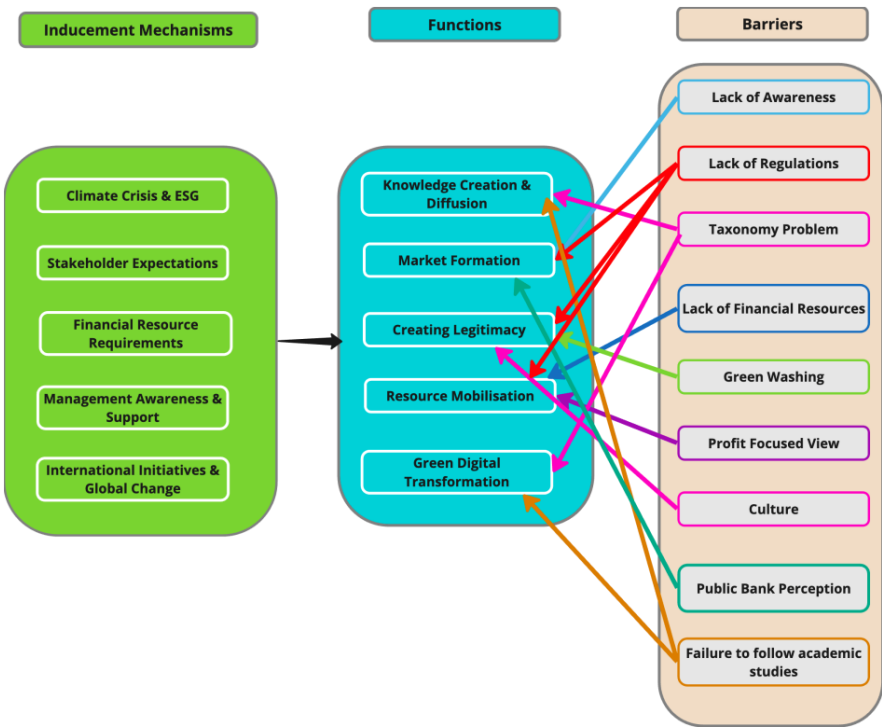
The policy space means the type of innovation system shown in Figure 23. In this study, the policy space is Finance Centered Platform Innovation System. The last dimension, the multi-level dimension, refers to the actors responsible for the policy tool. In the policy mix, the actors responsible for the relevant policy instrument are specified according to their roles. These roles are specified as micro, meso, and macro according to the multi-level dimension.

Table 39 shows the classification of policy types. Economy Policy refers to fiscal and monetary policy instruments. The second type, information and education, includes systemic instruments that aim to develop sectoral human resources and ensure, develop and spread green digital transformation. The third policy pillar refers specifically to soft and systemic tools that address issues related to the better functioning of other proposed policy tools for enhancing eco-innovative capacity in FC-PIS. The fourth policy pillar refers specifically to soft and systemic tools for Research and Development to increase eco-innovative capacity in FC-PIS. The fifth pillar of policy refers to the soft and systemic tools that are not required by regulations but are required for the healthy functioning of the system. The final policy pillar refers to fiscal and non-monetary regulation.

### **7.1. Conclusions derived from the Analysis of the Current Situation of FC-PIS: Summary of Systemic Problems and Barriers**

With the analyses made, first of all, the systemic problems of FC-PIS were tried to be determined. Then, the functions that were associated with the detected systemic

problems were investigated. In addition, FC-PIS barriers detected in the analysis were associated with functions and systemic problems. Figure 24 presents a summary of the relevant pairings. Accordingly, based on the results of the analysis, five themes were identified as the important driving forces of FC-PIS. These themes are International Initiatives and Global Change, Stakeholder Expectation, The climate crisis and ESG, Resource requirement, and Manager awareness and support. When the relationship between these themes and FC-PIS functions is evaluated, it is thought that all themes have separate driving forces for each FC-PIS function as seen in Figure 24.



**Figure 24.** Functional relations of drivers and barriers

Source: Author’s own drawing

**7.2. A Snapshot of the existing regulations and studies supporting eco-innovations for FC-PIS in Turkey**

Before developing policy tools for the problems arising from the analysis results, a study was conducted on the current regulations and studies in Turkey. In this context, especially regulations and activities of regulatory institutions were evaluated.

Important developments in the field of sustainability in the Turkish banking sector are summarized.

In 2014, the “Sustainability Guide for the Banking Sector” was published by the Banks Association of Turkey (TBB). The guide was updated in March 2021. The “BIST Sustainability Index” was created by Borsa Istanbul (BIST) in 2014. Currently, there are 9 banks within the scope of the Index, with a total sector share of 63%. In 2016, the first green bond issuance at international standards was carried out by banks residing in Turkey. The “Global Compact Turkey Sustainable Finance Statement” was signed by 8 UN Global Compact member banks in 2017 (BDDK, 2022-a). Since 2017, 5 more banks have become the supporters of the TCFD Recommendations. Since 2020, 8 banks have published an integrated report that includes both financial and sustainability perspectives. Sustainable subordinated lease certificates and partnership-based green lease certificates were issued for the first time by banks in 2021. In 2021, the first independent "Climate Risks Report" was published in line with the TCFD recommendations. In 2020, the SPK prepared the “Sustainability Principles Harmonization Framework” report (BDDK, 2022-a). In 2021, BDDK developed the "Guideline on Credit Allocation and Monitoring Processes", and the Ministry of Treasury and Finance developed the document titled "Sustainable Finance Framework Document". In 2021, the CMB prepared the “Green Debt Instrument, Sustainable Borrowing Instrument, Green Lease Certificate, Sustainable Lease Certificate Guide” (BDDK, 2022-a). In addition, the study titled “Financing Opportunities and Challenges of Green Transformation” was published by the BDDK in 2022. In this study, the financing of green transformation, the transition to green economy, the opportunities and challenges that this transformation will bring, the function and sources of green finance, the situation of green finance in Turkey and potential difficulties and advantages are evaluated. Accordingly, some challenges such as green transformation, carbon tax and other additional financial burdens, export and import opportunities and limitations, production quotas, abandonment of some business lines, reputation risks, green transformation investment costs, need for new qualified personnel, financing constraints, and asset value decreases are addressed (BDDK, 2022-a). In this context, it can be stated that green finance has two functions in the green transformation process: forcing the real

sector to transform and providing financial resources for green economic transformation. Green financing sources are grouped under 6 main headings (BDDK, 2022-a).

1. Banks and Other Financial Institutions
2. Green Capital Market instruments
3. European Union Funds (IPA, Horizon, EIC, etc.)
4. Public Loans and Grants
5. International Development Organizations (EBRD, EIB, IFC, AFD)
6. International Markets (Institutional Investors)

It has been stated that for the development of green finance, it is necessary to develop the legislative infrastructure, develop taxonomy, make arrangements for measurement verification and reporting, and determine risk management studies and data requirements. It has further been stated that National Taxonomy development studies have started and are aimed to be completed by the end of 2023. It was reported that with the improvement of measurement, verification and reporting, preventing green painting, verifying carbon and water footprint calculation by taking second-party opinion, and green transformation will be included in integrated reporting. In the context of risk management, it has been stated that the approach of the BASEL committee is to associate the green support ratio with the green asset ratio. It has been observed that they have expectations to establish a risk management framework, to identify and address the data gap, and to apply them in the risk assessment of financial institutions.

Within the scope of the taxonomy study, climate data (on the basis of province - temperature and extreme weather events), carbon emission values (on the basis of enterprise), Trade loss data for transition risks (according to activity areas), Financial loss data (by activity area and regions) are missing. While it was stated that the biggest obstacle to the development of green finance in Turkey is the macroeconomic conditions, it was further emphasized that the effective transformation power of the banking sector, its high adaptability capacity and the strong will and rapid development of the sector are the driving forces. In addition,

the studies in all areas are still in the early stages, and the resources provided by green credit and capital market instruments are limited (BDDK, 2022-a). As a result, for the realization of green transformation, it is necessary to establish the trust of domestic and foreign investors in order to define green financial activities and create a taxonomy, to manage climate-related financial risks effectively, to establish the reputation of the financial sector in the fight against climate change, and to increase green investments (BDDK, 2022-a). In this context, coordination between sectors and institutions, preparation of detailed plans on the basis of sector, awareness of the real sector, and green transformation financial plan should be prepared. However, it was pointed out that studies on green financing incentives should be differentiated according to carbon emission reduction; the cost of the incentive to the public should be kept low, and it should not disrupt the market mechanism and cause wealth transfer. Following this study, the BDDK sustainable banking strategic plan 2022-2025 was prepared. It was stated in the relevant plan that, despite the practices in the sector and the steps taken by the authorities, sustainable finance in Turkey could not develop in parallel with the level of development, diversity and weight of the sector (BDDK, 2022-b). Structural problems that hinder development mainly include issues such as uncertainties in the macroeconomic environment, low national savings rate and short-term funding structure of the banking sector. These problems enable banks to build sustainability-oriented institutional capacity, access to long-term funds, and thus long-term investments that are essential for sustainable investments. It has been stated that these problems significantly limit the opportunities to provide term financing (BDDK, 2022-a). As the initial institutional problem, the absence of a green classification (taxonomy) for economic activities prevents the labeling of assets and liabilities and financial instruments in terms of green sustainability and the production of consistent and healthy data in the field of sustainability, making it difficult to conduct evaluations and produce policies (BDDK, 2022-a). Parallel to the classification problem, the lack of a standard reporting practice on sustainability in the real sector, especially in SMEs, and the fact that carbon emission data cannot be produced creates an important data gap for the financial system, which is a very important challenge for financial institutions in terms of risk management, financing, and product development practices (BDDK, 2022-a). Another issue in the context of the classification and transparency problems is that the verification system is not

sufficiently developed; therefore, the absence of widespread, reliable (accredited) and accessible second-party opinion providers who will verify the reporting to be made by real sector and financial sector institutions on the basis of a national green classification systematic will affect the functioning of the system. It has been pointed out that these practices reduce the international comparability and acceptability of the applications (BDDK, 2022-a).

One of the significant challenges highlighted is the adoption and assimilation of emerging and evolving advanced approaches and methodologies in the field of risk management at a global level. This presents a crucial issue that requires banks and regulatory authorities to establish the necessary internal capabilities to effectively implement these approaches and methodologies (BDDK, 2022-a). Finally, the absence of a regulation and supervision framework on sustainability prevents the formation of a minimum standard in practices, increases uncertainties and information pollution, and causes the emergence of approaches that can be called green painting (BDDK, 2022-a).

When the current regulations in Turkey, the studies conducted by the sector, and the data from the interviews are evaluated together, it has been observed that the FC-PIS analytical scheme prepared for the investigation of the FC-PIS ecological innovation capacity correctly determines the faults and driving forces in the system. The possibility of using this scheme to evaluate similar structures is thought to be one of the important theoretical contributions of the study. In this context, an inclusive policy mix has been prepared in the following section.

### **7.3. Policy Recommendations**

In this study, ten policy recommendations have been developed to increase the ecological innovation capacity of the FC-PIS. The policy tools required to implement these recommendations, their objectives and the types of policy tools are explained in detail. Each policy recommendation is explained in detail.

### 7.3.1. Policy Recommendation No 1. Developing and Extending Sustainable Finance

Increasing sustainable finance plays a central role in promoting ecological innovations and thus achieving sustainable development goals. Increasing sustainable finance and directing these resources correctly is of critical importance in ensuring environmental sustainability and in the fight against global ecological crises. Since the FC-PIS is also in a position to provide resources for other innovation systems, it is clear that its increasing sustainable financial resources will increase the capacity of all innovation systems. The analysis revealed that one of the obstacles to increasing the ecological innovation capacity of the FC-PIS is the need for financing. In this context, it is thought that some arrangements should be made in order to provide more resources to the market. Therefore, one of the most important elements to increase the ecological innovation capacity of the FC-PIS is the development and dissemination of sustainable financial resources. In this context, various policy tools have been developed for the effective operation of the green credit system. The actors to be involved in the development of each tool, the target and type of each tool is summarized in Table 40.

**Table 40.** Developing and Extending Sustainable Finance Policy Mix (Source: Author's own table)

<b>ROLES</b>	<b>POLICY INSTRUMENT</b>	<b>POLICY TARGET(S), POLICY TYPES</b>
Implementer <b>TCMB</b>	PI-1. Creating an advantage in the required reserve application through an association with green credit	Increasing penetration of green financing sources <i>(Monetary Policy)</i>
Regulator <b>BDDK</b>	PI-2. Regulation on the issue of green finance instruments	Increasing the diversity of green finance products <i>(Monetary Policy)</i>
	PI-3. Creating an advantage in the arrangement of loan provisions to encourage the use of green loans	Increasing penetration of green financing sources <i>(Monetary Policy)</i>
	PI-4. Determining the minimum share for green credit in total loans	Increasing penetration of green financing sources <i>(Monetary Policy)</i>
	PI-5. Regulation on creating an advantage in the capital adequacy ratio required for green loans	Increasing penetration of green financing sources <i>(Monetary Policy)</i>

	PI-6. Requirement regulation for systemically important banks to be signatories to international agreements	Increasing access to international cheap and long-term financing resources <i>(Regulatory)</i>
	PI-7. Being a member of international financial, economic and professional organizations in which domestic and foreign equivalent institutions participate, signing memoranda of understanding with the competent authorities of foreign countries on matters falling within its scope of duty, determining strategies for the development of the financial services sector	Increasing access to international cheap and long-term financing resources <i>(Policy Support)</i>
	PI-8. Reviewing the currently implemented policies of the supervisors of the leading countries and adapting and even cooperating with the appropriate ones.	Increasing resource access through compliance with international regulations <i>(Policy Support)</i>
	PI-9. If the subsidiary to which banks will put capital outside the financial sector is "eco-innovative", the reorganization of the capital investment limit	Promoting ecological innovations <i>(Monetary Policy)</i>
	PI-10. Regulation on making the income and expenses of banks related to green activities with sub-details when accounting	Increasing resource access through compliance with international regulations <i>(Policy Support)</i>
Regulator <b>Ministry of Treasury and Finance</b>	PI-11. Making a regulation regarding the transfer of a certain percentage of the resources obtained through internal and external borrowing to green jobs.	Promoting ecological innovations <i>(Monetary Policy)</i>
Regulator <b>Ministry of Treasury and Finance</b>	PI-12. Tax Incentives on green financial products	Increasing penetration of green financing sources <i>(Fiscal Policy)</i>
Information Provider <b>Rating firms</b>	PI-13. In addition to the credit and corporate governance rating as the main category for the existing rating categories, the regulation for the grading of the companies that serve the green transformation by opening a third rating area with this perspective.	Increasing resource access through compliance with international regulations <i>(Policy Support)</i>
Regulator <b>KGK</b>	PI-14. In cooperation with the SPK/BDDK, while valuing eco-innovative green assets, taking into account the role of this feature that adds extra value, making arrangements to ensure that it is calculated as an added value in the valuation report.	Increasing resource access through compliance with international regulations <i>(Policy Support)</i>



Regulator <b>KGK</b>	PI-15. Regulation for the development of a new green reporting standard	Increasing resource access and preventing green washing through compliance with international regulations <i>(Policy Support)</i>
Auxiliaries <b>KKB</b>	PI-16. Regulation regarding the separation of data regarding the percentages of green credit risks among credit risks	Increasing resource access through compliance with international regulations <i>(Policy Support)</i>
Auxiliaries <b>MKK</b>	PI-17. Regulation on keeping the records kept by the customer considering green products	Operation of the green accreditation system <i>(Policy Support)</i>

**Policy Instrument No 1: Creating an advantage in the application of required reserves through an association with green credit (Monetary Policy)**

The Central Bank of the Republic of Turkey (TCMB) has a reserve policy that requires banks to keep a certain percentage of their deposits and/or equities at the TCMB. Required reserves are often used to limit excessive credit expansion by banks and to maintain the overall stability of the financial system.

The TCMB regularly adjusts the required reserve ratios depending on the economic situation and the general objectives of the monetary policy. For example, when the economy is overheated and inflation risk is high, the TCMB may increase required reserve ratios. This limits banks' ability to lend and cools economic activity. Conversely, when the economy slows down and inflation risk is low, the TCMB can lower required reserve ratios. This increases banks' ability to lend more and stimulates economic activity. Required reserve ratios are also used as a monetary policy tool. The TCMB can affect the money supply and interest rates by adjusting the reserve requirement ratios. This is a method used to achieve general economic goals. One of these regulations is that the TCMB creates an advantage in the required reserve ratios for green loans. If the TCMB provides the banks with an advantage in the application of required reserves in green loans, they will gain a cost advantage in the loans they will extend in the same amount, if they extend green loans. In this case, banks will naturally give priority to extending more green loans. As a result, the resources allocated to ecological innovations will increase. In addition, thanks to this regulation, banks will try to launch new thematic loan products that can fall into

the "green" category in order to increase their profitability by gaining more cost advantages, thus increasing the diversity and penetration of green financial products. With this arrangement, the market formation function will be able to work more effectively.

### **Policy Instrument No 2: Regulation on the issuance of green financial instruments (Monetary Policy)**

One aspect of the common taxonomy problem is the lack of a definition of whether financial products are green or not. In addition, banks that want to issue green financial products seem to have difficulties as there is no regulation developed in this context. There are two actions defined in the action plan of the BDDK regarding the development of sustainable finance.

Action 1. Incentive mechanisms for funding in sustainability areas will be explored in the light of international standards and trends and maintaining the effectiveness of the micro-prudential regulatory framework.

Action 2. Studies will be carried out to standardize the policies implemented by banks to reduce activities with high greenhouse gas emissions, taking into account national and international regulations.

In support of these two actions, together with the data coming from the results of the analysis, it is thought that the BDDK should first make an arrangement to develop a common taxonomy for the issue of green finance instruments. With this regulation, it is aimed to create standard definitions of green financial products and uniformity in bank applications with the standards to be determined for the issuing of these products. In addition, since this regulation is compatible with international regulations, it will be easier to increase the diversity of green finance products and to access international funding sources.

### **Policy Instrument No 3: Creating an advantage in arranging credit provision to encourage green credit use (Monetary Policy)**

Credit provision is the amount of money that banks have to set aside for the loans they extend and to cover possible losses. These provisions help maintain the financial soundness and liquidity of the bank. If a loan is not repaid, these provisions are used to cover that loss. The BDDK determines the amount of loan provisions. These rates generally vary according to the type of the loan, its maturity, and the level of risk. It makes recommendations to banks to promote environmentally sustainable lending in the good practice guide on loan allocation and monitoring processes published on 29 June 2021. In this context, it is thought that the BDDK's special regulation for green loans in the loan provision regulation, in order to encourage banks to extend such loans, will create a cost advantage for banks, which will increase the penetration of such loans.

**Policy Instrument No 4: Determining the minimum share for green credit in total loans (Monetary Policy)**

In order to encourage ecological innovation by increasing the penetration of green financing products, it is thought that a regulation should be made regarding the determination of the minimum share for green loans within the loans extended by banks. This policy tool is already in use in some countries. For example, the Bangladesh Bank insists on a mandatory loan quota of 5% of the total loan repayment for banks. Since January 2016, a minimum direct green financing target of 5% of total loan origination has been set for all banks and NBFIs. With this arrangement, they stated that the amount of green loans increased from 1580700 million Bangladesh clearings in 2014 to 2242757.8 million Bangladeshi swaps in 2016 (Khan et al., 2017). It is thought that the penetration of green financing resources can be increased with this regulation by determining a context-specific rate in Turkey.

**Policy Instrument No 5: Regulation regarding the recalculation of the capital adequacy ratio to be kept for green loans by including climate risks (Monetary Policy)**

The capital adequacy ratio (Capital Adequacy Ratio - CAR) is a critical indicator that measures banks' financial soundness and resilience to risks, and is closely monitored by regulators. This ratio is obtained by dividing the bank's capital (equity and some subordinated debt) by risk-weighted assets (loans, investments, etc.). Banking regulators require banks to maintain a certain minimum CAR rate. This ensures that banks have a certain amount of capital and use that capital to cover potential losses. According to international norms (Basel III regulations), banks' capital adequacy ratio should generally be a minimum of 8%. However, this minimum level can vary from country to country and even from bank to bank. For example, for Turkey, this rate is minimum 12%. Regulators may require a higher minimum CAR rate based on economic conditions or the bank's unique risk profile. For example, a bank with a riskier loan portfolio may require a higher CAR. The risk weight of assets is calculated by taking into account the market and credit risks faced by the assets: the higher the risks, the higher the capital banks must hold against these assets. However, the risk models currently used to estimate capital requirements do not explicitly include environmental risks. Environmental risks include both transition risks (risks associated with a sudden transition to an ecologically sustainable economy) and physical risks (risks to the financial system from climate-related events and other environmental issues such as biodiversity loss). It is recommended to include climate risks in the risk calculation of the crediting to be made on this subject in the CAR calculations and to establish a disadvantageous calculation system in the calculation of the risk weight, that is, to increase the risk weight. In addition, it is recommended to develop regulations for the introduction of an advantageous calculation system in the risk weight calculation for reverse green loans. In this way, considering the effects of climate risks, in the financial sector, it will be possible for the system to function properly, and the penetration of green credit products will be increased.

**Policy Instrument No 6: Requirement regulation for systemically important banks to be signatories to international agreements (Regulatory)**

Systemically important banks (SIBs) can cause significant damage to the economy and financial system in the event of failure, usually due to their role in the financial

system, size, complexity and other factors. In addition to the definition of the BDDK, such banks have also been defined by international financial regulators. Basel III regulations identify such large banks that could threaten financial crises and the stability of the system. The importance of these banks is due to both their economic size and activities and their potential impact on the overall health and stability of the financial system. Systemically important banks often play a decisive role in the financial system and provide substantial loans and services. Moreover, in many cases, the failure of these banks can cause significant and widespread disruption to the wider financial system and economy. There are additional regulations and requirements for systemically important banks. These often include higher capital requirements, tighter regulatory oversight and tighter risk management requirements. These requirements aim to reduce the likelihood of these banks failing and to minimize the impact of such a situation on the financial system and the economy. The BDDK identifies the SIBs in Turkey and imposes stricter controls and regulations on these banks. These banks are generally identified by considering the size, complexity, interactions and other unique characteristics of the bank. This usually includes an evaluation process that takes into account the overall impact of each bank on the financial system and the economy. According to the research results, one of the driving forces is international initiatives and global change. In this context, the regulation to be made regarding the obligation of these systemic banks to be signatories to international initiatives, which is important in the FC-PIS, will greatly contribute to the green transformation of the FC-PIS. In this way, compliance with international regulations will increase and the legitimacy of the sector will improve.

**Policy Instrument No 7: Being a member of international financial, economic and professional organizations (Policy Support)**

One of the important findings of the study is that there is difficulty in adapting to international regulations. By being a member of international financial, economic and professional organizations in which domestic and foreign equivalent institutions participate, a memorandum of understanding can be signed with the competent authorities of foreign countries on matters falling within its scope, and strategies for

the development of the financial services sector can be determined. In this context, it is thought that FC-PIS regulators should benefit from the international knowledge base in order to accelerate the harmonization process and thus facilitate their access to international funding sources. It will be possible to develop TR FC-PIS by cooperating with international initiatives, which is an important driving force in the study.

**Policy Instrument No 8: Reviewing the currently implemented policies of the supervisory authorities of the leading countries (Policy Support)**

One of the most crucial points of evolutionary theory is that policy designs are context-specific. In the neo-classical theory, most of the policy designs are bound by certain rules. The government applies uniform regulations to all companies, regardless of their sector or size. However, according to the theory of evolution, it is not appropriate to implement a policy based on standardized rules, as companies differ from one another and operate within an ever-changing environment. Inspired by this information, considering the global innovation links of the FC-PIS in the context of ecological innovations, it should be considered that not all policies developed by international authorities will be applicable for the TR FC-PIS. Therefore, it would not be appropriate for the TR FC-PIS to directly adopt the currently implemented policies of the supervisory authorities of the leading countries. However, it is thought that international compliance of the FC-PIS can be achieved, and national FC-PIS can be developed by reviewing these policies and ensuring the adaptation of those that are appropriate for the context, and even by collaborating in this context.

**Policy Instrument No 9: Rearrangement of the capital limit in case the subsidiary to which banks will put capital outside the financial sector is “eco-innovative” (Regulatory)**

The spread of risks in the institutions in which banks participate outside the financial sector to the bank's own structure may weaken the effectiveness of the internal control, risk management and consolidated audit system and cause risk

concentration. For this reason, “Restrictions on Shares of Shares” is included within the scope of Article 56 of the Banking Law No. 5411. Article 56 states that “The share of a bank in a partnership excluding credit institutions and financial institutions cannot exceed fifteen percent of its own funds, and the total amount of its shares in these partnerships cannot exceed sixty percent of its own funds”. With these ratios, it is aimed to prevent banks from taking too much risk and to make their contribution to the economy long-term. In this context, as an additional element to the capital limit that banks will set outside the financial sector, it is suggested that a new regulation be made regarding the capital limit if the company to which the capital will be invested is eco-innovative. In this way, it is thought that the number of eco-innovative initiatives can be increased.

**Policy Instrument No 10: Regulation regarding the sub-detailing of income and expenses related to green activities while accounting for banks (Policy Support)**

Effective monitoring and evaluation of transactions made by banks is of great importance for banks, supervisory authority, and the individuals and institutions in contact with them. For this reason, recording, accounting and reporting of the transactions made are bound to definite procedures and principles (Yıldırım, 2008).

Article 37 of the Banking Law No. 5411 states that, *“To implement a single order in accounting systems in accordance with the procedures and principles to be determined by the Board, by obtaining the opinion of the Banks, Public Oversight, Accounting and Auditing Standards Authority and their associations; In accordance with the accounting and financial reporting standards published by the Public Oversight, Accounting and Auditing Standards Authority, accounting for all transactions in accordance with their real nature and financial reports in a form and content that can meet the need for information, understandable, reliable and comparable, convenient for auditing, analysis and interpretation, on time and accurately. must be arranged accordingly.”*

This article aims to determine the financial status of banks correctly and to ensure that the information and records produced in the accounting system are realistic and

understandable. Due to the fact that banks' activities and transactions are accounted for within the scope of International Financial Reporting Standards (IFRS), arrangements must be made at an international level, within the scope of accounting for activities that encourage environmentally-friendly practices as a part of green banking. In other words, International Financial Reporting Standards will need to be revised and regulated taking into account green banking activities. Following this arrangement, it will be possible to eliminate the data deficiencies that FC-PIS actors need to access international funding sources by updating the accounting standards specific to Turkey.

**Policy Instrument No 11: Making a regulation regarding the transfer of a certain percentage of the resources obtained through domestic and foreign borrowing to green jobs (Monetary Policy)**

Within the framework of the 2023 foreign financing program, the Treasury issued a green bond with a maturity of 2030 in USD. The green bond in question is the first ESG (Environmental, Social and Governance) bond issued by our country's Treasury in international capital markets. With this bond issuance, a total of USD 7.5 billion financing was obtained from international capital markets in 2023. It is seen that there is no definition regarding the areas where this financing could be used. In this context, if an arrangement is made to transfer a certain percentage of these financing resources to green jobs, the funding source of the FC-PIS to support ecological innovations will increase. In this way, support will be provided for the need for resources, which is one of the obstacles to the development of the FC-PIS.

**Policy Instrument No 12: Tax Incentives on Green Financial Products (Fiscal Policy)**

In the analysis, most of the participants stated that tax regulations regarding sustainable finance instruments should be made. In this context, it will be possible to create a cost advantage for these tools and increase the penetration of the related products by rearranging the taxes on green products through joint taxonomy studies and issuing the necessary regulations.



### **Policy Instrument No 13: Regulation on rating companies serving the green transformation (Policy Support)**

The scope of the rating activity is classified as credit rating and rating for compliance with corporate governance principles. Article 34 of the Banking Law No. 5411 states that *“The valuations and ratings stipulated in this Law and the regulations issued pursuant to this Law are made by valuation and rating institutions within the framework of the procedures and principles to be determined by the Board”*. Based on this article in the *“Regulation on Principles Regarding the Authorization and Activities of Rating Agencies”* published on 17.04.2012, the scope of the rating activity is defined as *“the process of determining the credit worthiness of the customers and therefore the rating score based on the results of the examination and analysis to be made”*. It is the determination of the credit worthiness, the measurement of the ability of the customer to repay the loan to be used, and the determination of the risk of not fulfilling the obligations in due time and assigning the rating.

The rating of compliance with corporate governance principles is discussed in the Annex to the *“Corporate Governance Communiqué”* published by the Capital Markets Board. In the rating of compliance with corporate governance principles, it is obligatory to give a grade between 1 and 10, separately for the main sections of the shareholders (25%), public disclosure and transparency (25%), stakeholders (15%), and the board of directors (35%).

The rating of compliance with the Corporate Governance Principles is made by rating agencies authorized by the TCMB. In addition, the BIST Corporate Governance Index has been calculated since 2007. The Index consists of the shares of companies traded in the Star Market, Main Market and Sub-Market with a corporate governance compliance rating of at least 8 out of 10 and at least 7 out of 10 for each main heading mentioned above.

In addition to the two rating categories mentioned above, it is thought that grading companies that serve green transformation and giving these institutions a green rating will increase access to international funding sources.

**Policy Instrument No 14: Making arrangements to ensure that the eco-innovative green assets are calculated as a plus value in the valuation report (Regulatory)**

As in every field in the contemporary world, there have been important changes in the finance function with the subjects covered by finance. Although the main task of the finance manager until the 1950s was to keep the accounting records, prepare financial reports at the end of certain periods and provide the funds needed by the company, today the finance function is gaining more and more importance in the general management of a company. The aim of finance is to determine and increase value.

In modern finance, the primary aim of companies is to maximize market value rather than profit maximization. According to this approach, companies that maximize their market value, not the ones that make the most profit, achieve their goals. Maximizing the net present value of the company is possible by using each of the company's assets effectively and managing them in a way that will contribute the most to the stated purpose.

There is no generally accepted standard formula for company valuation, which is one of the most studied subjects in the finance literature because the concepts of value and valuation contain subjective judgments (Yalçın, 2022). Modern finance theory, on the other hand, has introduced a general definition of financial asset pricing. Accordingly, the price of the financial asset is determined by discounting the future cash flows of the asset with a certain discount rate (İvgen, 2003). Discounted cash flow asserts that future profits and expenses are worth less than the same amount of income and expenses incurred today. This is because the cash available today can be channeled into investments that have the capacity to generate additional income (Dulman, 1989).

In today's financing approach, companies can allocate their resources to areas that provide more return than the cost of capital and generate value by providing cash flow for their future (Koller et al., 2010: 17). At this point, when valuing eco-innovative green assets, taking into account the extra value-adding role of this feature, calculating it as a plus value in the valuation report will also increase the value created. Value concerns all stakeholders who have a relationship with a company. In this case, access to green financing resources will increase.

### **Policy Instrument No 15. Regulation on the development of a new green reporting standard**

This policy involves increasing resource access and preventing green washing through compliance with international regulations. It aims to address two key objectives. Firstly, it seeks to enhance resource access, ensuring that businesses and organizations have the necessary tools and information to accurately measure and report their environmental impact. By implementing a standardized reporting framework, this policy enables companies to track their sustainability performance consistently, thereby promoting transparency and accountability in their green practices.

Secondly, this policy aims to prevent "greenwashing," which refers to misleading or false environmental claims made by companies. Through compliance with international regulations, the policy sets clear guidelines for businesses to follow when reporting their environmental efforts, ensuring that their claims are accurate and reliable. This helps to build trust among consumers and stakeholders, ensuring that sustainability claims are substantiated and contribute to genuine environmental progress.

Overall, the Regulation on the development of a new green reporting standard combines increased resource access with robust regulations to support accurate and transparent reporting of environmental performance, while also combatting greenwashing practices. By promoting consistency, credibility, and accountability in

green reporting, this policy contributes to the broader goal of advancing sustainable practices and environmental protection.

**Policy Instrument No 16. Regulation (support) on the separation of data regarding the percentages of green credit risks within credit risks (Regulatory)**

Article 45 of the Banking Law No. 5411 is related with Capital Adequacy: *“Having sufficient equity against the losses that may occur due to the risks incurred in the implementation of this Law means capital adequacy. Banks are obliged to calculate, achieve, maintain and report the capital adequacy ratio to be determined as not less than eight percent in accordance with the procedures and principles stipulated in the regulation to be issued by the Agency. The Board is authorized to increase the minimum capital adequacy ratio by taking into account the internal systems, asset and financial structures of the banks, to differentiate them on the basis of banks, and to make arrangements in determining the risk weights of assets whose source is participation accounts, taking into account the characteristics of these accounts.”*

The second part of the *“Regulation on Measurement and Evaluation of Capital Adequacy of Banks”* published on the basis of the aforementioned article includes *“Amount and Calculation Based on Credit Risk”*: *“The amount subject to credit risk consists of the sum of on-balance sheet assets and risk-weighted amounts related to non-cash loans, commitments and derivative financial instruments. The amount subject to credit risk is calculated using either the standard approach or the internal rating-based approach.”*

In case the risk-weighted amounts are calculated within the scope of the Standard Approach, first, risks are classified under the Standard Approach. As stated in Article 6 of the Regulation, risks are classified as follows within the scope of the Standard Approach:

- a) Receivables from central governments or central banks,
- b) Receivables from regional or local governments,
- c) Receivables from administrative units and non-commercial enterprises,
- d) Receivables from multilateral development banks,
- e) Receivables from international organizations,
- f) Receivables from banks and intermediary institutions,

- g) Corporate receivables,
- h) Retail receivables,
- i) Receivables secured by real estate mortgages,
- j) Overdue receivables,
- k) Receivables determined as high risk by the Board,
- l) Collateralized securities,
- m) securitization positions,
- n) Short-term receivables from banks and intermediary institutions and short-term corporate receivables,
- o) Investments in the nature of a collective investment institution,
- p) Stock investments,
- q) Other receivables.

After the classification, risk-weighted amounts are calculated. When calculating these amounts, risk weights are applied to risk amounts. While applying risk weights, the class in which the relevant risk item is grouped and the credit quality level are taken into account. In the Annex-1 of the Regulation, four basic risk weights to be applied to receivables are determined as 20%, 50%, 100% and 150%.

In this context, if green loans are added to the classes in which the risk item is grouped, data in accordance with international standards will be produced and an environment will be created to create a cost advantage for green loans with the regulation to be made in this context.

**Policy Instrument No 17. Regulation regarding keeping the records of the customer considering green products (Policy Support)**

In the current regulations, there is no distinction in the records of financial institutions' customers regarding whether the financial products used by the customers are green or not. It is thought that stakeholder expectations, which have been identified as an important driving force in the analyses, will gain more importance with the increasing ecological awareness and will create pressure on the system for transformation. In this context, keeping the data on the financing

instruments used on an individual basis by separating the green instruments will enable to create an advantage for these instruments on an individual basis in the future. In this way, in order to benefit from this advantage, social awareness will increase and it will be easier for people to adapt to green transformation.

**7.3.2. Policy Recommendation 2. Institutionalization of green capital markets**

One of the most important elements for increasing the ecological innovation capacity of FC-PIS is the development of green capital markets. Institutionalization of green capital markets is important to regulate and supervise the procedures and principles regarding new capital market institutions and instruments. In this way, it will be possible to develop and expand green financial resources. In this context, various policy tools have been developed to institutionalize green capital markets. The actors that should be involved in the development of each tool, the target and type of each tool is summarized in Table 41.

**Table 41.** Institutionalization of green capital markets Policy Mix (Source: Author’s own table)

ROLES	POLICY INSTRUMENT	POLICY TARGET(S)
Regulator SPK/BIST	PI-18. Enacting a regulation regarding the application of discounts on commission and expense fees received in public offering transactions of ecologically innovative, green institutions	Ensuring the development of green capital markets and increasing resources <i>(Regulatory)</i>
	PI-19. Establishment of BIST green index similar to corporate governance index	Operation of the green accreditation mechanism <i>(Policy Support)</i>
	PI-20. To shorten, support, encourage and encourage the issuance processes of innovative green capital market instruments, to make all kinds of consultancy and arrangements that create cost advantages.	Operation of the green accreditation mechanism <i>(Policy Support)</i>
	PI-21. Regulation on diversification of Sustainability Indices for green digital transformation and transition to index calculation	Access to international funding sources <i>(Policy Support)</i>

	PI-22. Regulation on obligating banks to issue green securities and keeping them in their portfolios and using the resources from these funds in lending green SMEs	Spread of capital to the base <i>(Monetary Policy)</i>
Auxiliaries <b>TAKASBANK</b>	PI-23. Regulation to reduce the costs of transactions related to green products (bonds, accreditation and stocks, public offering processes)	Increasing penetration of green financing sources <i>(Regulatory)</i>

**Policy Instrument No 18. Enacting a regulation regarding the application of discounts on commission and expense fees received in public offering transactions of ecologically innovative, green institutions (Regulatory)**

Thanks to the green accreditation system proposed within the scope of this research, it will be possible to determine whether the institutions are green or not. In this way, it will be possible to apply a discount on the commission and expense fees received in the public offering transactions of green institutions. Green companies will try to go public in order to benefit from these advantages. In this way, the awareness of companies will increase and an important driving force will be created in the context of green transformation.

**Policy Instrument No 19. Establishment of BIST green index similar to corporate governance index (Policy Support)**

The corporate governance index is a benchmark system used to evaluate the corporate governance performance of companies. These indices generally provide comparisons between companies traded on a particular stock exchange or market and evaluate companies' compliance with corporate governance principles, transparency, accountability and protection of shareholder rights. A corporate governance index usually ranks companies based on a specific methodology. The purpose of these indices is to identify companies that perform well in their corporate governance practices, to enable investors and shareholders to make comparisons between companies, and to encourage companies to achieve better corporate governance standards. Corporate governance indices are an important tool for investors, fund

managers and other stakeholders to evaluate the corporate governance quality of companies and make decisions. It also creates a performance benchmark for companies, promoting better corporate governance practices and increasing transparency.

Corporate governance indices use a variety of criteria to measure and rate companies' corporate governance practices. These criteria may include elements such as the structure of the board of directors, audit processes, transparency and openness of information, compliance with ethical rules, risk management, rights and interests of shareholders.

With this tool proposed within the scope of the study, as an important part of the green transformation, a green index should be created similar to the corporate governance indices. In this way, it will be possible to measure and rate the green practices of companies. In addition, the green accreditation system will be an important driving force at this point. Financial institutions that wish to enter the green rating will first be green accredited, so it will be easier for them to enter the green indices. In this case, access to international funding sources will increase and it will be possible for FC-PIS to gain legitimacy in the context of ecological innovations.

**Policy Instrument No 20. To shorten, support, encourage and encourage the issuance processes of innovative green capital market instruments, to make all kinds of consultancy and arrangements that create cost advantages (Policy Support)**

Capital market instruments are tools that companies use to obtain financing and to evaluate the savings of investors. Bonds, derivatives, etc. instruments play an important role in the financial system. Companies obtain financing to expand their businesses, finance new projects or restructure their debts through capital market instruments. Individuals and organizations evaluate their savings by investing in capital market instruments and have the opportunity to benefit from the returns of capital markets. Capital market instruments support economic growth by providing



companies with access to finance and the opportunity for investors to earn returns. The growth of companies and the earnings of investors stimulate economic activity. In this context, making all kinds of consultancy and arrangements that create cost advantages to shorten, support, encourage and encourage the issuance processes of innovative green capital market instruments can create important resources to meet the green financing needs, which are the biggest obstacles.

**Policy Instrument No 21. Arrangement for the diversification of the Sustainability Indices for green digital transformation and the transition to index calculation(Policy Support)**

Sustainability indices are a benchmark system used to evaluate the environmental, social and governance (ESG) performance of companies. These indices include criteria and indicators used to measure, compare and report the sustainability performance of companies. Sustainability indices help investors and stakeholders identify and evaluate companies focused on sustainability issues. Sustainability indices help investors make investment decisions by considering sustainability factors. Investors may prefer to invest in companies with high sustainability performance and may use sustainability indices as a criterion. The current index regulations address environmental, social and governance performance criteria. Environmental performance criteria measure and evaluate the environmental impact of a company. These criteria include factors such as energy efficiency, carbon footprint, water management, waste management, compliance with environmental licenses. However, the digital carbon footprint is not currently considered in this context. In this context, the issue of digital carbon footprint, which is pointed out as an important problem within the scope of the research, will gain more and more importance. With the inclusion of the digital carbon footprint, which may be an obstacle to the carbon footprint reduction targets of financial institutions, within the scope of sustainability indices, knowledge and awareness will increase and it will be easier for companies to reach their sustainability goals.

**Policy Instrument No 22. Regulation on obligating banks to issue green securities and keeping them in their portfolios and using the resources from these funds in lending green SMEs (Monetary)**

Banks can issue various securities in financial markets. They obtain financial resources through the securities they issue. These resources help banks meet their borrowing needs and maintain their credit activities. The issuance of securities can support banks' liquidity management and provide the necessary capital for expansion or growth. In this context, if banks are obliged to issue green securities and keep them in their portfolios in order to meet the green financing needs, financing for green businesses can be created. In addition, with the regulation to be made regarding the use of the resources from these funds in lending green SMEs, direct resources will be provided for the green transformation of SISs by spreading the capital to the base.

**Policy Instrument No 23. Regulation to reduce costs of transactions related to green products (bonds, accreditation and stocks, public offering processes) (Regulatory)**

After the joint taxonomy studies are completed, companies will try to produce more green vehicles in order to benefit from these advantages by reducing the transaction costs of the green category instruments from the capital market instruments. In this case, a step may have been taken to eliminate the lack of funding, which is one of the biggest obstacles. At the same time, it will be possible to operate the green label system, which is one of the policy tools of the study, the awareness of companies will increase and an important driving force in the context of green transformation will be created.

**7.3.3. Policy Recommendation 3. Development of a Green Accreditation System in the Financial System**

The green accreditation defined within the scope of this study refers to a process that evaluates the principles of environmental sustainability and social responsibility in the financial sector. These accreditations aim to measure and evaluate the policies, practices and performances of financial institutions in reducing their environmental impact, increasing resource efficiency, providing social benefits and managing risks

related to sustainability. The actors of the green accreditation system are indicated in Table 42.

**Table 42.** Developing a Green Accreditation System in the Financial System  
(Source: Author’s own table)

<b>ROLES</b>	<b>POLICY INSTRUMENT</b>	<b>POLICY TARGET(S)</b>
<b>BDDK, SPK, TÜRKAĞ, SEDDK</b>	PI-24. Developing a science-based, green accreditation system for the finance and insurance sectors and promoting green accreditation of FC-PIS actors	Prevention of Green Washing, National and international trust and legitimacy <i>(Voluntary Approach)</i>

**Policy Instrument No 24. Developing a science-based, green accreditation system for the financial and insurance sectors and promoting green accreditation by FC-PIS actors (Voluntary Approach)**

Green accreditation requires the development of a set of standards and guidelines to measure and manage environmental and social impacts in the financial sector. These standards may include measures such as carbon footprint, water use, waste management to evaluate environmental performance. At this point, it is thought that it is important to include universities in the process while developing the green accreditation system. The purpose of green accreditation is to measure the sustainability performance of financial institutions in a science-based and rational way, integrate them into their decision-making processes and help them manage sustainability-related risks. These accreditations will encourage financial institutions to reduce their environmental and social impacts and adopt a more sustainable approach to their financial decisions. Green accreditation will help the financial sector achieve its sustainability goals, while at the same time contributing to increasing corporate reputation, gaining investor confidence and gaining competitive advantage. In the results of the research, it was seen that the importance of FC-PIS gaining legitimacy in the context of ecological innovations was emphasized. Currently, there are no standards for determining how green a financial institution is in current regulations. In this context, by developing a rational and holistic system regarding how green a financial institution really is, it will facilitate access to international funding resources and the green rating of financial institutions. In

addition, it is thought that green accreditations will help investors make investment decisions that take environmental and social impacts into account, and will help ensure a sustainability-oriented transformation in the financial sector. Finally, in this way, green washing will also be prevented. For this reason, it is recommended to establish an independent green finance accreditation institution in cooperation with TÜRKAK, specifically for FC-PIS.

**7.3.4. Policy Recommendation 4. Ensuring a Green Label Standardization of Financial and Insurance Products and Services**

“Eco-label” is a labeling system used to evaluate the environmental impact of a product or service and to inform the consumer about its environmental performance. It is thought that it is possible to apply the eco-label approach, which is currently used for created products, to financial products and services. Table 43 shows the policy tools developed for this purpose.

**Table 43.** Ensuring Green Label Standardization of Financial and Insurance Products and Services (Source: Author’s own table)

<b>ROLES</b>	<b>POLICY INSTRUMENT</b>	<b>POLICY TARGET(S)</b>
<b>Ministry of Environment, Urbanization and Climate, Universities, International Institutions and Organizations</b>	PI-25. Reorganization of financial and insurance services to meet green transformation-oriented standards	Establishment and implementation of national and institutional regulations and legal infrastructure together with sector stakeholders <i>(Voluntary Approach)</i>
	PI-26. Reorganization of digital financial and insurance products and services to meet green transformation-oriented standards	

**Policy Instrument No 25. Reorganization of financial and insurance services to meet green transformation-oriented standards (Voluntary Approach)**

“Eco-label” is a labeling system used to evaluate the environmental impact of a product or service and to inform the consumer about its environmental performance. It is thought that it is possible to apply the eco-label approach, which is currently used for products produced, to financial products and services. When associated with

the financial sector, the eco-label can be thought of as a tool to be used to measure and demonstrate the environmental impact of financial products and services. Eco-labeling can help financial institutions identify and offer consumers environmentally sustainable financial products such as green investments, sustainable loans or energy efficiency projects. These labels will be based on criteria set to measure the environmental performance of products or services and will often be audited by third-party certification bodies. In the BDDK's strategic action plan, it is stated that a third-party opinion should be obtained for green financial products. However, no definition has been made on how this assessment will be made. In this context, it is thought that independent certification bodies should be established for FC-PIS to green-label financial products and services. In addition, in order for the green accreditation for FC-PIS to function properly, a standard should be developed regarding whether the products and services offered by financial institutions are green. The proposed green label system will also ensure that the green accreditation system works. In addition, many new entrepreneurs will be established in FC-PIS.

**Policy Instrument No 26. Reorganization of digital financial and insurance products and services to meet green transformation-oriented standards (Voluntary Approach)**

FC-PIS cannot be considered independent of digital technologies. In order to solve the digital carbon footprint problem, digital financial and insurance products and services need to be reorganized to carry green transformation-oriented standards. In this context, it is suggested that the green label system should also label digital technologies. Thus, it will be possible to support FC-PIS to achieve its sustainability goals.

**7.3.5. Policy Recommendation 5. Establishment of FC-PIS National Knowledge Base**

The roles to be played and the policy instruments to be used for the establishment of FC-PIS knowledge base and the policy targets are given in Table 44.

**Table 44.** FC-PIS Ensuring the Establishment of a National Knowledge Base  
(Source: Author’s own table)

ROLES	POLICY INSTRUMENT	POLICY TARGET(S)
All Players	PI-27. Definition of R&D Budget	To ensure the effective formation and dissemination of correct information, to encourage ecological innovations, to commercialize and disseminate <i>(Research and Development)</i>
YÖK, Universities	PI-28. Supporting the establishment of climate change and sustainable development practice and research centers and facilitating the process	To ensure the systematic production of information Contributing to the production of open knowledge Facilitate the flow of information between actors Increasing advocacy activities <i>(Information Provision and Education)</i>
Players, Regulators, Collaborators	PI-29. Collaborating with newly established climate change and sustainable development practice and research centers PI-30. Collaborating with newly established climate change and sustainable development practice and research centers in studies on the effects of climate change risks on the financial sector.	
All Actors, YÖK, Universities	PI-31. Accelerating the inclusion of universities in common taxonomy studies	Providing academic and technical knowledge Accelerating the process of creating, compiling and sharing the data to be obtained as a result of academic and technical knowledge. <i>(Information Provision and Education)</i>

**Policy Instrument No 27. Defining R&D Budget (Research and Development)**

According to the results of the analysis, it is seen that banks do not allocate any R&D budget in the context of ecological innovations. After the departmental arrangement specified in this study, it is recommended to allocate an R&D budget to support the ecological innovations specific to the relevant department.

**Policy Instrument No 28. Supporting the establishment of climate change and sustainable development practice and research centers and facilitating the process (Information Provision and Education)**

The main purpose here is “to contribute to the development of scientific, realistic and reliable climate and sustainable development strategies and policies that our

*country and society will need at national and international level.*” It is thought that the newly established “Climate Change and Sustainable Development Application and Research Centers” may be significant for FC-PIS and the green transformation of the whole of Turkey. For this reason, it is very important to increase the number of these centers, which are currently only within the body of Istanbul Technical University and Middle East Technical University. In this context, it is necessary to support the establishment of climate change and sustainable development practice and research centers and to facilitate the process, and to define special budgets for these centers.

**Policy Instrument No 29. Collaborating with newly established climate change and sustainable development practice and research centers (Information Provision and Education)**

According to the results of the research, unfortunately, one of the biggest obstacles in the development of the ecological innovation capacity of FC-PIS is the inability to cooperate with universities and not following academic publications. A concrete example of the accuracy of this information coming from the interview results is that no university is among the stakeholders identified in the action plan prepared by the BDDK. The concepts of sustainability and ecological innovation are multidisciplinary issues. In this context, new research center structures such as the "Climate Change and Sustainable Development Application and Research Center", one of which was newly established in METU, have begun to be established in universities. The main purpose of these centers is "to contribute to the development of scientific, realistic and reliable climate and sustainable development strategies and policies that our country and society will need at national and international level."

In this context, an active participation in policy making is vital for efficient cooperation with research centers. Especially with regard to finance-centered eco-innovation, it is very important to develop a cooperation to promote knowledge exchange and harmonize efforts towards common goals. This collaboration will require building strong collaborative relationships that include joint research projects, knowledge sharing sessions and potentially staff exchanges. Action points

are to hold regular meetings with the heads of centers to discuss opportunities for cooperation, to design joint research projects focused on eco-innovation in the financial sector, and to create a platform for information exchange for continuous dialogue and sharing of research findings. In this way, a national knowledge base, which does not exist now, will be created.

**Policy Instrument No 30. Collaborating with newly established climate change and sustainable development practice and research centers in studies on the effects of climate change risks on the financial sector (Information Provision and Education)**

Knowing the effects of climate change risks on the financial sector is important for several reasons.

**Financial Stability:** Climate change creates significant risks on the financial system. Climate change impacts such as extreme weather events, sea level rise, and water scarcity can affect companies' asset values, supply chains, business operations and financial performance. This poses a risk to the stability of the financial system and the soundness of financial institutions. Therefore, it is critical for the financial sector to understand the risks of climate change and take precautions against them in order to ensure financial stability.

**Investment Evaluation:** Climate change is an important factor affecting the long-term performance of companies and industries. Climate risks can affect companies' operational efficiency, cost structure, supply chain security, reputation and competitive advantage. This becomes an important evaluation criterion for investors. By providing investors with information on climate risks, the financial sector can encourage sustainable investments and increase demand for climate-adapted companies.

**Risk Management:** Climate change affects the risk management processes of financial institutions. It includes different risk categories such as climate risks, credit risk, operational risk, market risk and reputation risk. Banks, insurance companies



and other financial institutions should assess and manage climate risks and develop appropriate risk management strategies against these risks. Establishing an early warning system and conducting stress tests on climate risks enable financial institutions to be resilient and sustainable.

**Long-Term Planning:** Climate change is a factor to be considered for long-term planning and strategic decisions. The financial sector should understand the risks of climate change and develop policies and strategies accordingly to promote investments in the energy transition, green finance and sustainable projects. In addition, following developments such as climate-related regulatory changes, climate policies and international agreements helps financial institutions maintain their competitive advantage and seize new opportunities.

Understanding the effects of climate change risks on the financial sector is of great importance in terms of ensuring financial stability, encouraging sustainable investments, risk management and long-term planning. By improving its knowledge and strategic approaches to climate change, the financial sector can support the transition to a sustainable and resilient economy. Calculations on climate risks require technical knowledge. It is neither possible for the finance sector to produce this know-how, nor is it the duty of the finance industry to create this know-how. At this point, failure to cooperate with universities on such an important issue as ensuring financial stability will seriously affect the functioning of the system in the long run. For this reason, it is necessary to cooperate with climate change and sustainable development practice and research centers and to include these structures in studies on the effects of climate risks on the financial sector.

**Policy Instrument No 31. Accelerating joint taxonomy studies by including universities in the process (Information Provision and Education)**

It is seen that universities are not included in common taxonomy studies that require technical knowledge, similar to the previous policy tool. In addition, the target date for the completion of the joint taxonomy studies in the strategic action plan is December 2022. However, as of May 2023, it is seen that these works have not been

completed yet. At this point, it is thought that cooperation with climate change and sustainable development practice and research centers will accelerate this process.

### 7.3.6. Policy Recommendation 6. Enabling, Developing and Disseminating Green Digital Transformation

The ways to develop and disseminate green digital transformation, the roles adopted by different actors, and policy targets are given in Table 45.

**Table 45.** Ensuring, Developing and Spreading Green Digital Transformation  
(Source: Author’s own table)

<b>ROLES</b>	<b>POLICY INSTRUMENT</b>	<b>POLICY TARGET(S)</b>
<b>BDDK, SPK</b>	PI-32. Reviewing the regulatory gaps to support de-paperization	Developing cooperation and communication mechanisms with stakeholders Carrying out advocacy activities <i>(Regulatory)</i>
	PI-33. Strengthening university-industry cooperation	Providing the workforce needs of the sector accurately and effectively Providing the academic information needs of the sector accurately and effectively Implementation of early employment and workplace training mechanisms <i>(Information Provision and Education)</i>
<b>BDDK, KGK, Universities</b>	PI-34. Development of digital carbon footprint calculation methodologies in cooperation with relevant departments and centers of universities	Standardization of digital footprint calculation Compilation and sharing of data on digital footprint calculation Compiling and sharing the said data increases legitimacy Increasing access opportunities and alternatives to international funding sources Supporting access to national carbon footprint reduction targets
<b>BDDK, KGK</b>	PI-35. Regulation on the inclusion of digital carbon footprint calculation data in sustainability reports <i>(Regulatory)</i>	
<b>All Actors and Universities of the Joint Taxonomy Study</b>	PI-36. Inclusion of digital carbon footprint calculation methodologies as a separate heading in the common taxonomy <i>(Policy Support)</i>	
<b>Players, Fintechs,</b>	PI-37. Encouraging the development of digital ecological innovations through	Increase, dissemination and development of digital

<b>Funders, Universities</b>	cooperation between players, fintechs and universities in the green digital transformation process ( <i>Voluntary Approach</i> ) PI-38. Supporting the process with national support and incentive mechanisms, designing sectoral support and incentive mechanisms for the process ( <i>Fiscal Policy</i> )	ecological innovations Digital ecological innovations provide positive externalities Creating, compiling and sharing alternative data on digital ecological innovations
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**Policy Instrument No 32. Review of regulatory gaps to support de-paperization (Regulatory)**

All of the participants in the study stated that they ensured paperlessness to the extent allowed by the regulations. However, they stated that due to the regulations that still bind them, many operations that would be possible without using paper could not be performed with digital technologies. For this reason, it is recommended that the relevant regulations of FC-PIS be reviewed and reorganized to meet this need.

**Policy Instrument No 33. Strengthening University-Industry Cooperation (Information Provision and Education)**

Strengthening university-industry cooperation is one of the critical points for effective green transformation. In the analysis, it is seen that there is no FC-PIS university cooperation in the context of ecological innovations. Universities and research centers established under universities constitute an important resource for innovative and creative technologies to create a capacity to meet academic and sectoral needs. The development and commercialization of climate-friendly technologies has become remarkable, especially in technoparks and start-ups in Turkey. It is thought that the collaborations to be developed between the technopolises of universities and FC-PIS, especially in technology-based subjects, have a potential to create innovation in the context of Fintechs, which are of vital importance for FC-PIS.

**Policy Instrument No 34. Development of digital carbon footprint calculation methodologies in cooperation with relevant departments and centers of universities (Information Provision and Education)**

Within the scope of the research, the participants stated that they unfortunately had a great difficulty in calculating the digital carbon footprint and that the subject had too many technical details. In this context, it is very important to include the academic and technical knowledge already formed in universities in this process. The development of digital carbon footprint calculation methodologies in cooperation with the relevant departments and centers of universities will accelerate FC-PIS's achievement of its sustainability goals.

**Policy Instrument No 35. Regulation regarding the inclusion of digital carbon footprint calculation data in sustainability reports (Regulatory)**

While sustainable reporting has become a fundamental activity for companies, reporting standards are also changing day by day and are updated depending on current developments. Lobbying with nationally leading institutions and organizations regarding reporting is of critical importance for the inclusion of these data in reporting standards. In this way, the legitimacy of FC-PIS actors will increase and it will be easier for them to reach their carbon targets.

**Policy Instrument No 36. Inclusion of digital carbon footprint calculation methodologies as a separate heading in the common taxonomy (Policy Support)**

In the current joint taxonomy studies, it is seen that there is no separate study on the digital carbon footprint. However, considering how important a problem digital carbon footprint may cause in the future, it is very important to include them as a separate topic in these studies. Similarly, lobbying and advocacy activities are critical for adding a separate heading to the common taxonomy. It should not be forgotten that this point is especially based on awareness raising.

**Policy Instrument No 37. Encouraging the development of digital ecological innovations through cooperation between players, Fintechs and universities in the green digital transformation process (Voluntary Approach)**

Encouraging the development of digital ecological innovations in collaboration between players, Fintechs (financial technology companies) and universities in the green digital transformation process is important for several FC-PIS. Green digital transformation requires the development of innovative technologies and solutions to achieve environmental sustainability goals. Fintechs play a leading role in the development and implementation of innovative financial technologies. Universities can produce new technological solutions through research and development activities. Therefore, collaboration between Fintechs and universities ensures that the innovation and technological development necessary for green digital transformation are encouraged. Fintechs can facilitate green finance, present green investment opportunities, and develop digital tools to measure and report environmental performance through financial technologies. Universities can conduct research on sustainable finance and green investments, create training programs and make policy recommendations. Collaboration between Fintechs and universities encourages the development of green finance and green investments. Data analytics and management are of great importance in the green digital transformation process. Fintechs can analyze environmental data and provide digital platforms to monitor environmental performance using technologies such as big data analytics, artificial intelligence, and machine learning. Universities can offer expertise in data analytics and management, create databases and conduct research on data security. Collaboration between Fintechs and universities fosters the development of data-driven environmental innovations. Trained human resources are needed for green digital transformation. Fintechs need skilled professionals to develop innovative financial technologies. Universities train graduates specialized in green finance and digital technologies. Collaboration between Fintechs and universities ensures the development of trained human resources through activities such as training programs, internship opportunities, research projects and knowledge sharing. This network mechanism can only be designed by considering university-industry cooperation. Universities and technopolis companies operating in universities will need to be guided and supported for their activities for the sector with similar aims and high awareness. For these reasons, the development of digital ecological innovations in cooperation between Fintechs and universities will accelerate the green digital transformation process.

**Policy Instrument No 38. Supporting the process with national support and incentive mechanisms, designing sectoral support and incentive mechanisms for the process (Fiscal Policy)**

In order to establish a support and incentive mechanism at the sectoral level, there must be a cooperation with the actors of the sector and they be integrated into the national and sectoral learning system. The design of these mechanisms depends on the leadership of the public authority. A policy of comprehensive national support and incentive mechanisms is required to accelerate the green digital transformation process. The strategy may include designing and implementing a range of incentives such as grants, subsidies, tax breaks and recognition schemes. Actions to implement this strategy will include identifying areas where support is needed, designing appropriate incentive mechanisms, and effectively communicating these opportunities to all stakeholders.

**7.3.7. Policy Recommendation 7. Improving Advocacy and Lobbying Activities**

Table 46 presents how to develop advocacy and lobbying activities and what roles the actors play for this purpose, what policy instruments they use, and what policy targets they have.

**Table 46.** Developing Advocacy and Lobbying Activities (Source: Author’s own table)

<b>ROLES</b>	<b>POLICY INSTRUMENT</b>	<b>POLICY TARGET(S)</b>
<b>TBB</b>	PI-39. Awareness studies focused on sectoral-strategic priorities necessitated by the green financial transformation	To increase the awareness of the parties focused on sectoral priorities regarding the process and transformation. To determine the priority common issues in line with the needs of the sector ( <i>Voluntary Approach</i> )
<b>Players</b>	PI-40. Increasing national sustainability consulting firms like PISCOR to cover the finance and insurance sectors	Accelerating green accreditation processes Facilitating access to international financial resources ( <i>Voluntary Approach</i> )

**Policy Instrument No 39. Awareness studies, collaborations and partnerships focused on sectoral-strategic priorities necessitated by the green financial transformation (Voluntary Approach)**

According to the results of the analysis, one of the biggest obstacles to FC-PIS in the context of ecological innovations is the lack of awareness. It is seen that financial institutions carry out many awareness studies in this context. However, these efforts can only have an impact on the people and institutions that financial institutions come into contact with. As a result of the research, it was seen that personal environmental awareness has a positive effect on ecological innovations. For this reason, it is important to carry out awareness studies that cover the whole society. In the case of FC-PIS, awareness activities, collaborations and partnerships focused on sectoral-strategic priorities required by the green financial transformation are prioritized. Climate crisis awareness enables the financial sector to take steps towards green financial transformation, manage climate risks, respond to demands and support policy adjustments. This awareness is a key driver for action against the climate crisis and is a critical step towards building a sustainable financial system. Climate change impacts have a significant impact on the environment, economy, society and human health. Awareness of the climate crisis highlights this emergency, allowing society and the financial sector to focus on it. Increasing general awareness of the severity and urgency of the climate crisis encourages financial institutions and investors to take steps towards green financial transformation. Climate crisis awareness enables the financial sector to better understand climate risks. This allows financial institutions to strengthen their risk management processes and develop strategies that assess climate risks. In addition, it increases the demand of society and consumers for green and sustainable products and services. Consumers may want to do business with environmentally conscious and sustainable companies. This encourages the financial sector to develop solutions to meet the demand for green finance and sustainable investments. Awareness of the climate crisis leads to increased interest in green financial products and services. Considering all these elements together, it is imperative to develop awareness studies, collaborations and partnerships focused on sectoral-strategic priorities necessitated by the green financial transformation.

**Policy Instrument No 40. Increasing national sustainability consulting firms like PISCOR to cover the finance and insurance sectors (Voluntary Approach)**

Within the scope of the research, it was stated that PISCOR company is a very important actor for FC-PIS, but its capacity is not enough to meet all the sector's needs. In this context, it is recommended that national sustainability consultancy firms such as PISCOR be increased to cover the finance and insurance sectors so that institutions can receive the consultancy services they need during the green accreditation process.

**7.3.8. Policy Recommendation 8. Development of Sectoral Human Resources, Development of Policies and Strategies for Closing the Knowledge and Skills Gap**

The way to develop sectoral human resources and policies and strategies to close the gap between knowledge and skills are presented in Table 47.

**Table 47.** Development of Sectoral Human Resources

<b>ROLES</b>	<b>POLICY INSTRUMENT</b>	<b>POLICY TARGET(S)</b>
<b>Players, BDDK</b>	PI-41. Reshaping the structures of the Sustainability Department, regulation regarding the definition of job authorizations	Establishing and standardizing the sustainability department structure Clear job descriptions and goals <i>(Voluntary Approach)</i>
<b>Universities</b>	PI-42. Designing and disseminating multidisciplinary graduate programs focusing on sector needs in line with the workforce needs of the banking, finance and insurance sectors	To ensure that the sector's transformation process is carried out effectively by determining the workforce need at the right time and method. <i>(Information Provision and Education)</i>
<b>All Players</b>	PI-43. Determination of personnel strategies to reintegrate the trained workforce into the sector with brain drain on the contrary.	Ensuring the need for labor and the re-inclusion of trained labor in the sector <i>(Information Provision and Education)</i>
	PI-44. Determination of personnel strategies to prevent the loss of the workforce, especially trained in IT, with brain drain.	Advocating for improvements in the workforce that will prevent the migration of skilled labor. <i>(Information Provision and Education)</i>



**Policy Instrument No 41. Reshaping the structures of the Sustainability Department, regulation regarding the definition of job authorizations (Voluntary Approach)**

The results of the interviews revealed that there is no standard departmental structure regarding sustainability and green transformation activities in neither insurance companies nor banks. However, almost all of the participants stated that this issue is a problem, technical staff should be employed especially in the sustainability departments of the banks, and this department should be directly reporting to the CEO. Considering that managerial awareness is a driving force for ecological innovations according to the results of the analysis, it is thought that a new departmental structure should be established in banks and insurance companies, reporting directly to the CEO, with clear standards, duties and responsibilities. First of all, the training and experience of the personnel who must be employed in this department should be defined. It must be ensured that the department structure is of the same standard among all FC-PIS actor groups.

**Policy Instrument No 42. Designing and disseminating multidisciplinary graduate programs focused on sector needs in line with the workforce needs of the banking, finance and insurance sectors (Information Provision and Education)**

According to the results of the analysis of the human resources element within the scope of the research, most of the participants stated that the human resources trained in this field in Turkey are very limited, the existing ones go abroad, the people working in the finance sector on sustainability-related issues are not competent, and the number of academicians working on sustainability and ecological innovations is few. They also stated that they could not meet academics working on the subject due to weak connections, and therefore they could not benefit from academic human resources.

In this context, it is thought that with the development and transformation of the university curriculum in line with the needs of the sector, the contribution of the

awareness to be created on this subject towards meeting the human resource needs of the sector can be increased. Focusing on education and skills development, this policy requires the design and dissemination of multidisciplinary graduate programs that respond to the workforce needs of the banking, finance and insurance sectors. The strategy includes collaboration with universities and industry experts to ensure the curriculum is aligned with current and future industry needs. Actions will require performing industry needs assessments, developing new graduate programs or adapting existing ones, and promoting these programs to potential students and employers.

**Policy Instrument No 43. Determination of personnel strategies to reintegrate the trained workforce into the sector with reverse brain drain (Information Provision and Education)**

An important finding of the results of the analysis was that especially new graduates from universities in Turkey were not qualified to meet the needs of the sector, and the trained workforce was lost due to brain drain. Changes and innovations to be made in education will give results in the long-run. At this point, FC-PIS actors need to work together to develop various strategies for the return of qualified FC-PIS employees who have already trained with national resources and started to live abroad in order to meet the human resource needs in the sector. A policy of establishing sound personnel strategies is required to reintegrate trained workers into the industry and to combat the brain drain. The strategy should focus on creating attractive working conditions, competitive pay packages and opportunities for continuing learning and career development. Actions to implement this strategy may include conducting a study to understand the causes of the brain drain, consulting with HR professionals to develop staffing strategies, and regularly evaluating and adjusting these strategies based on feedback and changing circumstances. In this way, the lack of human resources, which is one of the obstacles to the development of FC-PIS, will be solved more quickly and in a qualified manner.

**Policy Instrument No 44. Determination of personnel strategies to prevent the loss of the workforce, especially trained in IT, due to brain drain (Information Provision and Education)**

The results revealed that lack of human resources, which is seen as an obstacle to FC-PIS, is not a problem only in the field of ICT. All the participants stated that ICT personnel also have brainstorming potential and they are concerned about this situation. Especially considering that FC-PIS is a system that works embedded in Fintechs, it is very clear that any loss of human resources in this area will have a very negative impact on the industry. For this reason, it is important to develop a different human resources strategy for human resources working in this field.

### 7.3.9. Policy Recommendation 9. Determination of Regulatory and Restrictive Rules by Identifying Prohibited Sectors

Some sectors carrying out activities that harm the environment and contribute to climate crisis are banned from the sector. Table 48 shows how these banned sectors are identified through regulatory and restrictive rules.

**Table 48.** Determination of Regulatory and Restrictive Rules by Identifying Prohibited Sectors (Source: Author’s own table)

<b>ROLES</b>	<b>POLICY INSTRUMENT</b>	<b>POLICY TARGET(S)</b>
<b>BDDK, SPK</b>	PI-45. Regulation and supervision of financial authorities regarding financial and insurance products and services offered to prohibited sectors.	Ensuring uniformity in financial products and services by identifying prohibited sectors <i>(Regulatory)</i>

#### **Policy Instrument No 45. Regulation and supervision of the financial authority regarding financial and insurance products and services offered to prohibited sectors (Regulatory)**

The banned sector refers to the sectors in which activities that harm the climate crisis and sustainability goals are carried out. These sectors often contain activities that cause problems such as high carbon emissions, environmental destruction or consumption of natural resources. In this context, as expressed in the results of the analysis, one of the common taxonomy problems and accordingly lack of regulation is the undefined banned sectors. While banks with foreign capital and/or signatories to international agreements do not provide resources to the prohibited sectors defined

within the framework of the EU, the remaining banks can still provide resources to these sectors since there is no national regulation. Similarly, multinational insurance companies do not assume risk in prohibited sectors, while national companies can. This situation also causes a lack of uniformity in practices within the sector. For this reason, in accordance with international regulations, the relevant regulators must first decide on the definitions of prohibited sectors and which sectors will be included in this category, and rank the categories of prohibited sectors. According to subsequent ratings, it is necessary to set a standard for the way the financial sector works with these sectors. For example, if a high-risk prohibited sector is defined, all banks should be able to give loans under the same conditions to a company operating in this field, and maybe even not. In this way, while contributing to the reduction of the country's carbon footprint within the scope of the fight against the climate crisis, the transformation of these sectors will also become necessary. Transforming banned sectors and promoting alternative solutions are part of sustainability efforts. This indicates the potential of FC-PIS to transform other SISs as a natural consequence of the interaction between FC-PIS and SISs.

**7.3.10. Policy Recommendation 10. Supporting and Accelerating the Green Transformation of the Insurance Industry**

This policy focuses on the insurance industry and states the ways of supporting and accelerating the green transformation in this industry. The roles to be taken by the actors, policy instruments that could be used, and policy target are presented in Table 49.

**Table 49.** Supporting and Accelerating the Green Transformation of the Insurance Industry (Source: Author’s own table)

ROLES	POLICY INSTRUMENT	POLICY TARGET(S)
SEDDK	PI-46. Making regulations that will ensure the green transformation of the insurance industry	Ensuring the transformation of the insurance sector to adapt to the green transformation of the financial sector. <i>(Regulatory)</i>

## **Policy Instrumentation No 46. Making regulations that will ensure the green transformation of the insurance industry (Regulatory)**

According to the research findings, especially the insurance sector is at the beginning of green transformation, and multinational companies gain competitive advantage over national actors as they have started to access international information resources and adapt to international regulations. In addition, the insurance sector, which insures all financial risks, including climate risks, is considered as vital as financial institutions to ensure green transformation in the context of eco-innovations for FC-PIS. It is important that banks and insurance companies, which are two important players of FC-PIS, can progress in an integrated and harmonious manner in the context of green transformation. For this reason, regulations regarding banks should be developed for insurance companies as well. SEDDK needs to quickly issue regulations in cooperation with the BDDK. These regulations need to be adapted to the sector rapidly and in accordance with international regulations. Regulations regarding compliance with green transition in the insurance sector will also support the achievement of environmental sustainability targets by encouraging the adoption of green policies. For example, just as a policy tool was designed to set a minimum share for green loans in loans given to banks, insurance companies can set a minimum share for green insurance products within the insurance products they offer. Similarly, insurance companies, like banks, may be required to report on sustainability. This will increase the legitimacy of insurance companies and attract the attention of foreign investors. In addition, the penetration of green insurance products will increase. Finally, one of the most important actors in studies on the effects of climate risks on the financial sector is insurance companies. Since they also take on the risks of financial institutions, it is also important that they participate in the studies carried out in this context and develop university cooperation.

### **7.4. Concluding Remarks**

In this study, a policy mix was prepared to increase the FC-PIS ecological innovation capacity. This research has various contributions to the IS literature as well as social studies.

The main contribution and one of the novel parts of this study is that it is the first attempt to define and evaluate eco-innovation in the finance sector with a new integrated platform innovation system framework for policymaking. This new innovation system, called FC-PIS, is a new approach that centers finance in the context of ecological innovations.

In the second study, an analytical scheme was designed for the newly developed FC-PIS. With this analytical scheme, it will be possible to make structural and functional analyzes of FC-PIS-like innovation systems.

Third, within the scope of this study, the PEIS scale was developed to measure people's Perceived Ecological Awareness. This scale can be applied in all service sectors except finance FC-PIS.

Fourth, a policy mix framework has been designed specifically for eco-innovations. This framework provides a multidimensional perspective on systemic issues, which can be used to create engaging and inclusive policy recommendations.

In addition to these theoretical contributions, it is aimed to increase the ecological innovation capacity of FC-PIS with the policy recommendations developed. The policy mix developed addresses systemic problems from a multi-dimensional perspective and includes elements to support the development of FC-PIS. In addition, FC-PIS stakeholder analysis is the first and most comprehensive stakeholder analysis in the context of ecological innovations.

This research has two important limitations and, thus, suggestions for further research. The first is that Fintechs are not included in the research sample. Fintechs, where FC-PIS is embedded, must be evaluated in the context of green digital transformation. For this reason, it is thought that a study should be conducted to prepare a policy proposal to increase the ecological innovation capacity of Fintechs. Another limitation of the study is the number of observations in the sample used in which the developed PEIS scale was applied. In this context, replicating the study with a larger sample in the future may contribute to the robustness of the study.

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## APPENDICES

### A. APPROVAL OF THE METU HUMAN SUBJECTS ETHICS COMMITTEE

UYGULAMALI ETİK ARASTIRMA MERKEZİ  
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20 Mayıs 2021

Konu : Değerlendirme Sonucu

Gönderen: ODTÜ İnsan Araştırmaları Etik Kurulu (İAEK)

İlgi : İnsan Araştırmaları Etik Kurulu Başvurusu

**Sayın Prof. Dr. Erkan Erdil**

Danışmanlığını yaptığınız Gizem Öğütçü'nün "DİJİTAL DÖNÜŞÜM SÜRECİNDE FİNANS SEKTÖRÜNÜN EKOLOJİK İNOVASYON POTANSİYELİNİN ANALİZİ VE POLİTİKA ÖNERİSİ" başlıklı araştırması İnsan Araştırmaları Etik Kurulu tarafından uygun görülmüş ve **177-ODTU-2021** protokol numarası ile onaylanmıştır.

Saygılarımızla bilgilerinize sunarız.

Dr.Öğretim Üyesi Şerife SEVİNÇ  
İAEK Başkan Vekili

## B. INTERVIEWS DETAIL TABLE

Role	Code	Organisation	Position	Date	Duration	Record Type	Channel
Player	P_1	DB_PL_1	Regional Manager	03.06.2021	36 Min.	Video	Zoom
Player	P_2	DB_PF_1	Deputy Director General (Sustainability)	27.01.2022	47 Min.	Video	Zoom
Player	P_3	DB_PF_1	Sustainability Expert	27.01.2022	47 Min.	Video	Zoom
Regulator	P_4	R_1	Senior Banking Specialist (Sustainability)	18.06.2021	75 Min.	Video	Zoom
Catalyser	P_5	C_1	Research and Statistics Director	07.06.2021	33 Min.	Video	Zoom
Funder	P_6	F_1	Senior International Advisor	11.06.2021	61 Min.	Video	Zoom
Player	P_7	DB_PUB_1	Human Resources Director	13.08.2021	40 Min.	Audio	Office
Player	P_8	DB_PL_2	Sustainability Manager	22.01.2022	116 Min.	Video	Zoom
Player	P_9	DB_PUB_1	Development Finance Institutions Manager	24.06.2021	61 Min.	Video	Zoom
Player	P_10	DB_PUB_2	International Banking & Investor Relations Senior Vice President	15.02.2022	51 Min.	Video	Zoom
Entrepreneur	P_11	ENT_1	Owner	8.02.2022	44 Min.	Video	Zoom
Player	P_12	DB_PL_1	Manager Economic Research	24.03.2022	49 Min.	Video	Zoom
Player	P_13	NB_1	Manager	15.06.2021	40 Min.	Video	Zoom
Catalyser	P_14	CAT_1	Founding Director	28.05.2021	52 Min.	Video	Zoom
Player	P_15	NLI_F_1	Chief Legal, Compliance and Corporate Responsibility Officer	03.02.2022	38 Min.	Video	Zoom
Player	P_16	NLI_L_1	Human Resources and Sustainability Assistant	01.02.2022	55 Min.	Video	Zoom
Player	P_17	NLI_L_1	General Manager	03.02.2022	33 Min.	Video	Zoom
Player	P_18	NLI_F_2	Talent Management Division Manager	10.02.2022	27 Min.	Video	Zoom
Player	P_19	NLI_L_2	Corporate Communications Director	17.02.2022	93 Min.	Video	Zoom
Player	P_20	NLI_L_2	Chairman and Performance Strategy and Corporate Management	02.02.2022	57 Min.	Video	Zoom
Player	P_21	NLI_L_2	Sustainability Expert	02.02.2022	57 Min.	Video	Zoom
Player	P_22	NLI_L_3	Sustainability Expert	02.02.2022	57 Min.	Video	Zoom
Regulator	P_23	R_2	Executive Vice President	1.02.2022	50 Min.	Video	Zoom
Entrepreneur	P_24	ENT_2	Deputy Head of Department CEO	20.06.2022	35 Min.	Audio	Office
Player	P_25	DB_PUB_3	Department Manager	03.03.2022	52 Min.	Video	Zoom
Player	P_26	DB_PF_2	Board Member	18.03.2022	36 Min.	Video	Zoom
Catalyser	P_27	CAT_2	Secretary General	09.02.2022	60 Min.	Video	Zoom
Player	P_28	NLI_F_1	Manager, Extended Corporate Responsibility, Sustainability and Communication	15.02.2022	34 Min.	Video	Zoom
Player	P_29	NLI_F_1	Manager, Extended Corporate Responsibility, Sustainability and Communication	16.02.2022	47 Min.	Video	Zoom
Player	P_30	DB_PUB_1	Sustainability Manager	16.02.2022	47 Min.	Video	Zoom
Player	P_31	DB_PF_3	Branch Manager	09.02.2022	120 Min.	Document	Office
Player	P_31	DB_PF_3	Branch Manager	09.02.2022	120 Min.	Document	Office

## C. EX-ANTE STAKEHOLDER ANALYSIS

ACTORS OF FC-PIS	
<b>ROLES OF ACTORS</b>	
Player	Banks, Non-Bank Financial Institutions
Regulatory and Supervision Authorities	Capital Markets Board of Turkey (CMB), Exchange Istanbul, Banking Regulation and Supervision Agency (BRSA), Accounting and Auditing Standards Authority (POA), Accounting and Auditing Standards Authority (POA), Pension Monitoring Center (PMC), Insurance and Private Pension Regulation and Supervision Agency (IPPKSA), The Union of Chambers and Commodity Exchanges of Turkey (TUCCEK), BASEL Committee (Bank for International Settlements (BIS), Istanbul Stock Exchange (ISE), Ministry of Environment, Urbanisation and Climate Change (MEUCC), Ministry of Treasury and Finance (MTEF), Energy and Natural Resources Ministry (ENRM), Energy Market Regulatory Authority (EMRA)
Collaborator	Banks Association of Turkey (BAT), The Participation Banks Association of Turkey (PBAT), Turkish Capital Markets Association (TCMA), Turkish Association of Financial Institutions (AFI), Insurance Association of Turkey (AT), The Payment and Electronic Money Institutions Association of Turkey (TPEMIAT)
Information Provider	Rating, Valuation, Integrated Reporting (IR), Turkish Statistical Institute (TURKSTAT)
Catalyzer	World Wide Fund for Nature (WWF), International Finance Corporation (IFC), Sustainability Academy Turkey (SAT), Sustainable Finance Association (SFA), Turkish Marine Environment Protection Association (TURMEPA), 350.org, Greenpeace, Turkish Industry & Business Association (TIBA), Business Council for Sustainable Development Turkey (BCSDT), Integrated Reporting Turkey (IRT), Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), UCHIMA
Auxiliaries	Interbank Card Center (ICC), Credit Registration Office (CRO), Central Securities Depository (CSD), Incorporation of Istanbul Settlement and Custody Bank Inc. (ISCBI), Insurance Information and Monitoring Center (IMC), FinTech Ecosystem
Auditors & Consultants	Independent Audit (IA), Escamus TSKB Sustainability Consultancy
Funders	International Monetary Fund (IMF), The World Bank (W/B), United Nations (UN), Turkey Sustainable Energy Financing Program (TSEFP), European Bank for Reconstruction and Development (EBRD), Caribbean Development Bank (CDB), United Nations Environment Programme Finance Initiative (UNEP FI), World Economic Situation and Prospects (WESP), Overseas Private Investment Corporation (OPIC), The Global Environment Facility (GEF), International Finance Corporation (IFC)
Implementer	

## D. CURRICULUM VITAE

### PERSONAL INFORMATION

Surname, Name: Öğütçü Ulaş, Gizem

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### EDUCATION

Degree	Institution	Year of Graduation
MS	Başkent University Information Technologies and System Management	2010
BS	Baskent University Management Information Systems	2008
High School	Çankaya Anadolu High School, Ankara	2003

### WORK EXPERIENCE

Year	Place	Enrollment
2014- Present	Başkent University	Lecturer
2008-2014	Başkent University	Research Assistant

### FOREIGN LANGUAGES

Advanced English

## PUBLICATIONS

### Articles published in international refereed journals:

1. Kırkbeşoğlu, E., Ögütçü, G., J Impact of Interoperational Networks on Adoption Process of Information Technology Process, Volume -2, No. 3, P: 19 - 28, June 2012  
Number of Citations: 10
2. Ogutcu, G, Testik M, Chouseinoglou, O. Analysis of personal information security and computer security, Volume 56, February 2016, Pages 83-93, ISSN 0167-4048, <http://dx.doi.org/10.1016/j.cose.2015.10.002>. (SCI)
3. Gizem Ogutcu, Okan Cem Cirakoglu, Serpil Cula, "Information Security in the World of Digital Natives: Volume 1, Volume I, International Journal of Management and Applied Science (IJMAS) Issue-9, Special Issue-1, pp 79-84, 2016, IRAJ DOI Number - IJASEAT-IRAJ-DOI-5811
4. Ögütçü G, Ergüner Özkoç E. Information Security Strategies in Turkey: Current Status, Government Policies & Recommendations. International Journal of Management and Applied Science (IJMAS), 2017; 3 (7): 70-73. (Google Scholar)
5. YILMAZ, D., ÖZKOÇ, E. E., & ÖĞÜTÇÜ, G. (2021). ELEKTRONİK SAĞLIK KAYITLARINDA FARKINDALIK. Hacettepe Sağlık İdaresi Dergisi, 24(4), 777-792.

### Papers presented at international scientific meetings:

1. Kırkbeşoğlu E., Ögütçü G., s Impact of Inter-Organizational Networks on Adoption Process of Information Technology The, The 5th European Conference on Information Management and Evaluation, Università Dell'Insubria, 8-9 September 2011, Como, Italy (Presenter)
2. Ögütçü G., Çırakoğlu O., Cula S., And Information Security In The World Of Digital Products: How Internet Addiction, Sensation Seeking And Information Security Behaviors Are Related “, International Conference on Advances, Business Management and Information Technology (ICABMIT) 14th-15th July, 2016, Zurich, Switzerland, (Presenter)
3. Ögütçü G., Ergüner E., 93 Information Security Strategies In Turkey: Current Status, Government Policies & Recommendations The, 104 th The IIER International Conference, Helsinki, Finland, 17th May 18th 2017, ISBN: 978-93-86291-88 -2, (Presenter)
4. Ergüner E., Ögütçü G., A Systematic Mapping Study on Technology Transfer, 104 th The IIER International Conference, Helsinki, Finland, 17th -18th May 2017, ISBN: 978-93-86291-88-2
5. Ögütçü G., Ergüner E., Uysal M., 14 A Systematic Mapping Study on Mobile Information Systems And Security th 11th The International Conference Information Systems, 14th-16th April, 2018, Lisbon, Portugal, (Presenter).

### Papers presented at national scientific meetings:

1. Özbilgin G., İ., Ögütçü, G., Firm Investigation of the Internet Service of Bus Companies Under the Law No. 5651 51, 77-79, 27th National Informatics Congress, 22-25 September 2010, Ankara

2. Yarařlı Y., Ögütçü, G., ü The Effects of Viral Marketing and Scorching Electronic Messages on Product or Brand Use and Purchase Behavior: An Empirical Study., 2010
3. Ögütçü G., Gürel N., Cula S., Fark The Content, Sensitivity and Evaluation of Awareness and Expectations for Electronic Health Records İç, 88-96, VIII. National Congress of Medical Informatics, 17-20 November 2011, Antalya.  
Number of Citations: 10
4. Güngörmüş G, Ögütçü G, "Electronic Clipboard Academician Student Automation System Satisfaction and Usability Survey: Başkent University Case", 2. Management Information Systems Congress, 8-9-10 October 2015, Erzurum.
5. Kaya Bengşir T, Ögütçü G., Erguner Özkoç E, Güngörmüş G., A Study On Career Orientation: Graduated Students (2004-2015) At Başkent University, Management Information Systems Undergraduate Program. 4. International Management Information Systems Congress: İSTANBUL; 17/10/2017 - 20/10/2017
6. Bilir MO, Ergüner Özkoç E, Ögütçü G. QR CODE SECURITY: ATTACKS AND COUNTERMEASURES. International Conference on Advences in Business Management and Information Technology: 07/11/2019 - 08/11/2019

**Book Chapters:**

1. Ögütçü G, Çifci H. Kriz Yönetiminde Geleceğin Teknolojileri. In:Kıvılcım Romya Bilgin, F. Senem Güngör editors. Kriz Yönetimi: Kaçınılmazı Anlamak. Ankara: Gazi Yayınevi; 2020. p.129-152.
2. Ögütçü Ulaş G. Ekolojik Yenilik, Teknoloji ve Finans. In:Adalet Hazar, Üstün Özen editors. Dijital Dönüşüm ve Finans: Gelecek sandığınızdan Daha Yakın.. Ankara: Akademi consulting and Training; 2021. p.279-285.



## E. TURKISH SUMMARY / TÜRKÇE ÖZET

Her ülkenin farklı şekillerde ve Türkiye'nin ise geriden geldiği dijital dönüşüm sürecinde, ekolojik yenilik potansiyelini anlamak ve bu yönde bir yol haritası belirlemek kritik önem arz etmektedir. Yakın geçmişte yüz yüze geldiğimiz iklim değişikliği küresel bir tehdittir ve küresel ölçekte ele alınması gerekir. Eko-yenilik sadece inovasyon çalışmaları literatüründe değil hizmet sektörü için de yeni bir terimdir. Eko-yenilik, kaynakların optimal kullanımına katkıda bulunmayı, çevresel etkileri azaltmayı veya önlemeyi amaçlayan eko-yenilikçi ürünler, hizmetler, teknikler ve süreçler olarak tanımlanmaktadır. Bu çalışmanın birinci amacı, finans sektörünün yakın geleceği için ekolojik yenilikçilik ile ilgili bir politika önerisi tasarlamaktır. Bunu yapabilmek için öncelikle finans sektöründe eko-yenilik ekosisteminin mevcut durumu analiz edilmiştir. Finans sektörünün ekolojik inovasyon potansiyelinin artırılmasının diğer sektörlerin ekolojik inovasyon kapasitesini de artırabileceği düşünülmektedir. Finans sektörünün ekolojik inovasyon kapasitesini artırmak için politika önerileri geliştirmeden önce sektörün ekolojik yenilik farkındalığının ölçülmesi önem arz etmektedir. Bu nedenle bu tez kapsamında finans sektörünün eko-yenilik farkındalığını ölçmek için bir eko-yenilik farkındalık ölçeği geliştirilmiştir. Bu çalışma ampirik olarak mevcut inovasyon sistemi yaklaşımlarına (IS) ve sürdürülebilir dönüşüm çalışmaları literatürüne katkıda bulunmaktadır. Bu katkının birkaç yönü bulunmaktadır. Birincisi, literatürde ekolojik yenilik çalışmaları ağırlıklı olarak üretim endüstrisi ile ilgilidir. Bu araştırmanın hizmet sektörü ile ilgili olması, ekolojik yenilik bağlamında yeni bir örnektir. Finans sektörü konusundaki inovasyon sistemine ilişkin çalışmalar her geçen gün artmaktadır, ancak hizmet sektöründe entegre analiz çerçevesi kullanılarak ekolojik yenilik sistemleri üzerine yapılan çalışmaların sayısı oldukça azdır. Ayrıca, literatürdeki mevcut yaklaşımlar gelişmiş ülkelerin ampirik çalışmalarına dayanarak geliştirilmiştir. Ayrıca ekolojik yenilik literatüründe yapılan çalışmaların çoğunlukla ya yalnızca nitel ya da yalnızca nicel yöntemlerin kullandığı çalışmalar olduğu, hem

nicel hem de nitel yöntemlerin birlikte kullanıldığı karma yöntem çalışmalarının çok sınırlı olduğu görülmüştür.

Çalışmanın hedef sektörü finans sektörüdür. Bu sektörün belirlenmesinin sebepleri şu şekilde ifade edilebilir; (i) hizmet sektörünün önemli bir aktörü olan bu sektör hem bireysel hem kurumsal hem kamusal düzende bir oyuncu olarak yer almaktadır, (ii) Bankacılık ve Finans sektörü hem kendisi sürdürülebilirlik alanında çalışmalar yürüten hem de sürdürülebilirlikle ilgili çalışan kurum ve firmaları fonlayan, çok yönlü bir role sahiptir, (iii) Türkiye özelinde uzun yıllardır sektörel sürdürülebilirlik politikaları üzerinde çalışmakta ve her yıl bu konuda raporlar yayımlamaktadırlar, (iv) sektör aynı zamanda uluslararası olarak görece homojenlik göstermekte ve ilgili alanda çalışmalara katkı sağlayabilmekte ya da ilgili alanda yapılan çalışmalar için yabancı fonların ulusal, bölgesel veya yerel düzeyde kullanılmasına aracılık edebilmektedir.

Hem özellik arz eden bir sektör olması itibarıyla hem de diğer sektörlerin fonlanmasında rol alması itibarıyla bankacılık ve finans sektörü yenilikçi yaklaşımlar açısından önem ve özellik arz etmektedir. Ekolojik yenilikler açısından bakıldığında ise bu sektörün çok daha özellikli bir rol üstlendiği görülmektedir. Türkiye de iklim değişikliği ve iklim değişikliğine bağlı olarak yaşadığı ekonomik ve toplumsal dönüşümü dijital dönüşümle birlikte bir fırsata dönüştürebilmek için ekolojik yenilik konusunda potansiyelini harekete geçirecek strateji ve politikalara ihtiyaç duymaktadır. Bu çerçevede, çalışma kapsamında bankacılık ve finans sektörü özelinde ekolojik yeniliklerin önemi, potansiyeli ve geleceği hakkında ayrıntılı bir mevcut durum analizi yapılarak, ülkenin yakın geleceğine ilişkin bir politika önerisi tasarlanmıştır. Bu tasarım çerçevesinde ortaya konulmak istenen politika önerisi, esasında bir ekolojik yenilik sistemi önerisi olarak da anlaşılabilir.

Çalışmanın giriş bölümü, iklim krizi ve iklim krizinin olası etkilerini vurgulayarak ekolojik inovasyonun önemini açıklamaktadır. Bu tez kapsamında eko-inovasyon, alternatifleri arasında çevreye zarar vermeyen her türlü yeniliği ifade etmektedir. Çalışmanın amacı, finans sektöründeki eko-inovasyonun mevcut durumunu ve potansiyelini analiz etmek, politika hedefleri ve araçları önermek ve finans-merkezli

platform inovasyon sistemi anlayışı geliştirmektir. Bölüm, çalışmanın önemini ve inovasyon sistemleri, finans ve sürdürülebilirlik geçiş çalışmaları alanındaki literatüre katkılarını tartışarak sonuçlanır. Çalışmanın ardışık bölümleri, bir literatür taraması, araştırma yöntemi, bulgular ve politika önerileri üzerine yoğunlaşacak, finans sektöründeki ekoinovasyonun kapsamlı bir analizini sunacak ve politika yapımcılar ve araştırmacılar için görüşler sunacaktır.

Bu çalışmada, finans sektöründe ekolojik yenilik kavramını tanımlamak, değerlendirmek ve politika oluşturmak için yeni bir entegre platform yenilik sistemi çerçevesi sunmaktır. Literatürde finans araştırmalarının sürdürülebilir geçiş alanında hala gelişme aşamasında olduğu görülmektedir ve finansın sistem düzeyindeki rolünü anlamak için daha fazla teorik ve nicel araştırmaya ihtiyaç olduğu kabul edilmektedir. Bu çalışma, finans sektöründeki ekolojik yenilik kavramını belirlemek ve değerlendirmek için yeni bir entegre bir platform yenilik sistemi çerçevesi sunarak bu açığı doldurmayı amaçlamaktadır. Ayrıca, bu çalışma gelişmiş ülkelerde yapılan deneysel çalışmalardan gelişen bir entegre bir çerçevedir. Bu çerçevenin bir gelişmekte olan ülkedeki hizmet sektörüne uygulanması, bu çerçevenin politika oluşturma amaçlı kullanılabilirliğini zenginleştirebilir ve uluslararası karşılaştırmaların yapılmasına olanak sağlayabilir. Ayrıca, bu çalışma, ekolojik yenilik sistemlerini değerlendirmek için bir entegre çerçevenin gerekliliğine vurgu yapmaktadır. Geliştirilen algılanan ekolojik yenilik düzeyi ölçeği, finans sektöründeki ekolojik yenilik farkındalığını ölçmek için kullanılabilir ve finansal kurumları, iş ve işletme faaliyetlerinde ekolojik yeniliği göz önünde bulundurmaya teşvik ederek topluma ve insana katkı sağlayabilir. Bu çalışma, sürdürülebilir geçiş bilimindeki bilgi birikimine dayanarak ekolojik yenilik sistemi perspektifini kullanma çabasında da bir katkı sunmaktadır.

Literatür Taraması bölümü, araştırmanın farklı yönlerine odaklanan üç bölüme ayrılmıştır. İlk bölüm, inovasyon kavramını tanıtır ve farklı inovasyon türlerini tartışır. İcadı ve inovasyonu ayırt eder ve inovasyonun yeni fikirlerin ticarileştirilmesi ve uygulanmasıyla ilgili olduğunu açıklar. Oslo El Kitabı'nı vurgular, bu kitap inovasyonu kavramlaştırmak ve ölçmek için bir çerçeve sunar ve ürün, süreç, pazarlama ve organizasyonel inovasyon olmak üzere dört ana tür

belirler. İkinci bölüm, inovasyon sistemleri yaklaşımlarını ve teorik çerçeveleri ele alır. Piyasa başarısızlığı yaklaşımını eleştirir ve inovasyonun çoklu aktör ve kurumların işbirliği gerektiren işbirlikçi doğasını tanıyan sistemler yaklaşımını keşfeder. Ulusal inovasyon sistemleri, bölgesel inovasyon sistemleri ve teknolojik inovasyon sistemleri gibi çeşitli çerçeveler tartışılır. Teknolojik inovasyon sistemi (TIS) yaklaşımı, farklı sistemler içinde yeni teknolojilerin geliştirilmesi, yayılması ve kullanımına odaklanarak ekolojik inovasyonları analiz etmek için değerli bir araç olarak vurgulanır.

FC-PIS, fon sağlayıcıları ve fon kullanıcılarını bir araya getiren bir platform olarak tanımlanır ve finans merkezli ve teknoloji entegreli bir sistem olarak hizmet verir. FC-PIS'in etkin çalışması ekonomik büyüme, sermaye birikimi ve yatırımlara finansman sağlama gibi alanlarda kritik bir rol oynar. FC-PIS, ulusal ve küresel inovasyon sistemleriyle etkileşimde bulunur ve ekolojik inovasyonlar yoluyla sürdürülebilir finansa ve yeşil dönüşüme katkıda bulunur. Bölüm ayrıca FC-PIS'in uluslararası işbirliği, düzenleme, denetleme ve finansman kaynaklarıyla ilgili rolünü vurgular. Ayrıca, bölüm, bireylerin FC-PIS ile etkileşimini, hizmet üretim sürecine katılımlarını, temiz enerji kaynaklarına erişimi ve çevre dostu ürün ve hizmetlere yönelik artan talebi tartışır. FC-PIS aynı zamanda FinTech gibi dijital dönüşüm teknolojileriyle de ilişkilidir. Genel olarak, bölüm, FC-PIS'in, ekolojik inovasyonları entegre eden kapsamlı bir platform inovasyon sistemi olarak, finans sektörünü şekillendiren ve diğer sektörlerle ve küresel sistemlerle etkileşimini etkileyen önemini vurgular. İkinci bölüm finans sektörünü eko-inovasyon bağlamında değerlendirmek için teknolojik inovasyon sistemleri (TIS) yaklaşımının sınırlamalarını ele alan Finans Merkezli Platform İnovasyon Sistemi Analitik Çerçeve (FC-PIS AF) adlı yeni bir analitik çerçeve sunar. FC-PIS AF, finans sektörü ile küresel inovasyon sistemleri (GIS) arasındaki bağlantıları dikkate alır ve sektörün küresel etkisini ve sorumluluklarını vurgular.

Bölüm, finans sektörünün yeşil finans ürünleri ve hizmetlerinin geliştirilmesi ve sunulması yoluyla ekoinovasyonları finanse etme ve desteklemenin önemini vurgular. Sektörün özel yapılarını, dinamiklerini ve sektörler arası etkileşimlerini dikkate alan kapsamlı ve entegre bir yaklaşımın finans sektörünün analizi için gerekli

olduğunu savunur. FC-PIS AF, politika yapıcılara dört aşamalı bir analiz çerçevesi sunar. İlk adım, FC-PIS içindeki farklı aktörlerin rollerini, beklentilerini ve etkileşimlerini anlamak için paydaş analizini içerir. İkinci adım, ekoinovasyon bağlamında FC-PIS içinde önemli bir rol oynayan çalışanların analizine odaklanır. Üçüncü adım, TIS yaklaşımının önemli işlevlerini FC-PIS analizine entegre eder. Son olarak, dördüncü adım, politika tasarımı ve araç geliştirme işini içerir. Bölüm ayrıca bankalar ve banka dışı finansal kuruluşlar gibi FC-PIS aktörlerinin, aracılık, risk yönetimi ve likidite sağlama gibi çeşitli işlevleri olduğunu ve FC-PIS içinde farklı aktörleri tanımlamak ve sınıflandırmak için paydaş analizi yapıldığını sunar. Bölüm 3, finans merkezli platform inovasyon sistemi üzerinde odaklanır ve finans sektörünü diğer sektörlerden ayıran belirgin özellikleri vurgular.

Finans sektörünü diğer sektörlerden ayıran özellikler, kaydi para yaratma mekanizması, aracılıktan doğan riskini üzerine alması, her türlü parasal işlemin kayıt altına alınmasını sağlayarak, tarafların elde ettiği gelirin vergisinin kaynaktan kesilmesini ve bu verginin zammında devlete iletilmesini sağlaması, kaynak yapısının yabancı kaynak ağırlıklı olma zorunluluğu, kovertible tüm para birimleri cinsinden işlem yapma zorunluluğu, likidite yaratması şeklinde özetlenebilir.

Bölüm, bu özelliklerle finans sektörünün ekonomide benzersiz bir rol oynadığını vurgular. İnovasyon sistemlerini analiz ederken ve genel inovasyon ekosistemindeki rolünü anlarken finans sektörünün farklı karakteristiklerini anlamının önemini vurgular. Riskleri üstlenerek ve mevduat para yaratımını kolaylaştırarak, finans sektörü ekonomik faaliyetlerin kesintisiz bir şekilde devam etmesini sağlar.

Bu özellikler, finans merkezli platform inovasyon sisteminin anlaşılmasına katkıda bulunur ve inovasyon ve yeşil ekonomik kalkınmayı yönlendirmedeki finans sektörünün rolüne ışık tutar.

Bir ülkenin finansal sisteminin gelişimi, kayıt dışı işlemlerin azalmasına ve vergi gelirlerinin artmasına katkıda bulunur. Finansal kurumlar çeşitlendikçe, daha verimli ve şeffaf hale geldikçe, ekonomik aktörlerin ve vergi mükelleflerinin resmi finansal sistemleri kullanma motivasyonu artar, bu da vergi mükelleflerinin kayıt dışı

işlemlerinin azalmasına yol açar. Gelişmiş finansal sistem, vergi mükellefleri hakkında daha iyi bilgi sağlayarak vergi tahsilatını kolaylaştırır ve vergi kaçırma oranını düşürür. Gelişmekte olan ülkelerdeki yetersiz finansal sistemler ise daha büyük bir kayıt dışı ekonomiye ve vergi tahsilatındaki etkinlik kaybına neden olabilir.

Finansal sektör, vergi politikalarının etkinliğini artırma ve vergi gelirleri oluşturma konusunda kritik bir rol oynar. Bankalar, önemli vergi mükellefleri olarak vergilerle ilgili belirli düzenlemelere ve sorumluluklara sahiptir. Banka mevduatlarından elde edilen faiz gelirlerinden gelir vergisi kesintisi yapılır ve bankalar tarafından bankacılık ve sigorta işlemleri vergisi ve kurumlar vergisi gibi diğer vergiler ödenir. Bankaların iflası, vergi politikalarının etkinliğini ve hükümetin vergi gelirlerini önemli ölçüde etkileyebilir.

Bankalar, milli ve uluslararası düzeydeki boşta bulunan kaynakların ihtiyaç sahiplerine aktarılmasında başlıca bir rol oynar. Faiz kaynaklı üretim, ekonomik büyüme ve istihdam birçok ekonomik faaliyette önemli bir rol oynar. Bu bağlamda, finansal yapıları tehlikeye sokabilecek durumların sıkı denetim altına alınmasıyla finansal yapıların sağlıklı işlemesi amaçlanır. Aslında devlet, bankaların varlığının ve sağlıklı işleyişinin temelinde önemli bir rol oynar. Bankalar, ekonomik kaynakları sağlıklı bir şekilde temin ederek ilgili yerlere aktararak devletin ekonomi politikalarının gerçekleştirilmesini sağlar. Ayrıca bankacılık sisteminde elde edilen kazançların vergilendirilmesine izin vererek bütçe gelirlerine çok önemli bir destek sağlar. Diğer işletmelerin aksine, bankaların faaliyetlerini sürdürme amacı, kendi sermayelerini kullanmak ve buna bağlı olarak gelir elde etme beklentilerinden ziyade fon aracılık hizmetlerinden gelir elde etmektir. Bu çerçevede, bankaların faaliyetleri büyük ölçüde kaynakları ekonomik birimlerden borç almak ve bunları kredi olarak sağlamak üzerine odaklanmıştır. Bu durum, kaynak yapısının yabancı kaynaklar üzerine ağırlık verilmesini sağlar. Bir bankanın sermaye yapısıyla ilgili kararı verirken, sorumluluk yapısını da göz önünde bulundurması gerekir. Çünkü finansal olmayan şirketlerin bilançolarında mevduat bulunmazken, bankalar mevduatlarına sahiptir. Bir bankanın sermaye yapısı seçimi, mevduat yapılanmasını da içerir.

Finansal olmayan şirketlerin bilançolarında mevduat bulunmadığı için, bu şirketler tarafından alınan sermaye kararıyla farklılık gösterir.

Bankaların bilanço yükümlülükleri, bankanın kaynaklarını gösterir. Öz kaynaklar bir normal işletme kuruluşunun kaynak yapısında önemli bir yere sahiptir. Ancak diğer işletmelerin aksine, bankaların yabancı kaynakları kendi fonlarından daha fazla yer tutar. Örneğin, Aralık 2021 sonu dönemi için Bankacılık Düzenleme ve Denetleme Kurumu (BDDK) verilerine göre, yükümlülüklerde mevduat ve mevduat dışı kaynakların payı %92 iken öz kaynakların payı %8'dir (BDDK, 2021).

Gerçekte, bir bankada sıfır yabancı kaynak durumu görülmesi mümkün değildir, diğer işletmelerin ise herhangi bir yabancı kaynak olmadan faaliyetlerine devam edebildikleri örnekler bulunabilir. Yabancı kaynaklara erişim için bankaların uluslararası finansal piyasalarda yer almaları gerekmektedir. Bu nedenle, finansal sistemin en önemli unsurlarından biri olan bankalar aslında küresel finansal sistemin bir parçasıdır.

Konvertibilite, bir değer formunu başka bir forma dönüştürme yeteneğini ve bu dönüşüm sürecini belirleyen belirli kriterleri ifade eder. Para birimleri bağlamında dönüştürülebilirlik, bir ülkenin para birimini altın veya diğer para birimleriyle, belirlenen bir döviz kuru veya kur sistemi tarafından belirlenen şekilde değiştirme yeteneğini ifade eder. Pratikte, belirli bir ülke içinde bir bankayı ziyaret ederseniz ve yerel para birimini belirlenen döviz kuruyla değiştirerek yabancı bir para birimi elde edebilirsiniz, bu ülkenin para biriminin konvertible olduğunu gösterir (Eğilmez, 2014).

Konvertibilite durumunda, bir kişi elindeki Türk Lirasını getirip dolarla değiştirmek istediğinde, Merkez Bankası bu değişimi geçerli döviz kuru üzerinden gerçekleştirme taahhüdünde bulunur. Merkez Bankası'nın bu taahhüdü, diğer bankaların veya döviz bürolarının da aynı işlemi yapmasına olanak tanır. Konvertibilitede önemli olan, bir ülkenin kendi parasını takas aracı olarak kabul etmesidir.

Bir ülkenin para birimi, diğer ülkelerin bankaları veya bireyleri ve kurumları tarafından ödeme aracı olarak kabul ediliyorsa, o para birimi sadece dönüştürülebilir değil, aynı zamanda rezerv para birimi olarak kabul edilir. Dolar ve euro, dönüştürülebilir ve rezerv para birimleri örnekleridir. Kısmen Yen, Sterlin, İsviçre Frangı da benzer bir konumda kabul edilebilir. Bir yabancı'nın Türkiye'de satın aldığı bir malın bedelini dolar veya euro cinsinden ödemek istemesi durumunda, satıcı bunu kabul edebilir çünkü hem dolar hem de euro, yalnızca dönüştürülebilir değil, aynı zamanda yaygın rezerv para birimleridir. Öte yandan, İngiltere'de TL ile benzer bir başvuru yaparsanız, bazı istisnai durumlar dışında bunun kabul edilememesi mümkün olmayacaktır. Bu durum, TL'nin dönüştürülebilir olmasına rağmen rezerv para birimi konumunda olmadığını gösterir.

Banka, dönüştürülebilir para birimleriyle takas yapma isteğini onaylayan müşterinin talebini yerine getirmekle yükümlüdür. Örneğin: Müşteri A, bankaya £100 getirip karşılığında TL almak istediğinde, eğer bankanın kuru  $1 \text{ £} = 20 \text{ TL}$  ise, banka müşteriden poundu alır ve karşılığında 2.000 TL verir. Bu durumda bankanın kasasında farklı bir para birimi olacaktır. Bankanın bu para birimine ihtiyacı olmadığı durumda, bankanın bu parayı bir şekilde elden çıkarması gerekmektedir. Çözümü bankanın kendisi üretmek zorundadır. Benzer şekilde, bir müşteri İsveç kronu getirirse ve bir mevduat hesabı açmak istiyorsa, banka bunu reddedemez ve İsveç kronunu almak ve hesabı açmak zorundadır. Bu aşamadan sonra banka, kasada bulunan İsveç kronunu değerlendirecek veya bir şekilde elden çıkaracak bir çözüm üretmek zorundadır. Tüm bu işlemler, bankaların her türlü dönüştürülebilir para biriminde faaliyet göstermelerini gerektirir ve sürekli olarak döviz kuru riskini taşımalarını gerektirir. Bu zorunluluk sonucunda, finansal sistem doğal olarak küresel bir oyuncudur. Başka bir deyişle, finansal sektörün sınırları bölgesel veya ulusal ölçekte sınırlı olamaz, doğası gereği küresel bir oyuncudur.

Bankalar, likidite oluşturarak illikit varlıkları likit yükümlülöklere dönüştürür ve müşterilerin talep üzerine mevduatlarını çekmelerine izin verir. Ancak, vadesi uyumsuzluk nedeniyle bankalar da fonlama likidite riskiyle karşı karşıyadır. Bankaların likidite oluşturma kavramı Adam Smith'e kadar uzanır ve ekonomik büyüme için hayati öneme sahiptir.



Diğer birçok sektörün aksine, sigorta sektörü somut faydalar sağlamaz. Müşteriler, bir poliçe şeklinde somut olmayan bir teminat alır. Sigortada somut faydalar, kapsanan bir zarar durumu ortaya çıktığında gerçekleşir. Sigorta şirketleri, fon toplayarak makroekonomik yapıda kritik bir rol oynar ve faaliyetleri küresel ekonomik istikrarı etkiler.

Ekonomideki tüm sektörler, para işlemleri ve sermaye ihtiyaçları için finansal sektöre bağımlıdır. Finansal sistem, aracılık fonksiyonuyla para oluşturur ve ekonomik faaliyetleri kolaylaştırır. Finansal sistem, para taşımanın zorluklarını ve risklerini küresel piyasada ortadan kaldırır.

Finansal sektör, dinamikleri açısından diğer sektörlerden farklı ve benzersizdir. Sektörel inovasyon sistemleri (SIS) ve teknolojik inovasyon sistemleri (TIS) çerçeveleri, çok sektörlü ve teknolojiye entegre yapıları nedeniyle finansal sektörü değerlendirmek için uygun değildir. Finansal sektör, ekolojik inovasyon kapasitesini artırmak ve ekolojik inovasyonların engellerini ve iticilerini ele almak için bir politika önerisine ihtiyaç duyar.

Finans Odaklı Platform İnovasyon Sistemi (FC-PIS), inovasyon sistemleri alanında çok ölçekli, çok sektörlü ve teknoloji entegreli finans sektörüne odaklanan bir perspektiftir. Oğutcu Ulas tarafından geliştirilmiştir. FC-PIS, küresel ekolojik inovasyon performansında finansın rolünü, paydaş haritalamasını, gelişme faktörlerini ve engellerini, politika oluşturmayı ve ekolojik inovasyonu teşvik etme stratejilerini inceler. Evrimsel ekonomi, karmaşık adaptif sistemler, sosyal ağ analizi ve aktör-ağ teorisi gibi yaklaşımlardan yararlanır. FC-PIS, finans odaklı platform inovasyon sistemi içinde bilgi geliştirme, yayılma, kaynak mobilizasyonu, pazar oluşturma, meşruiyet ve pozitif dış etkileri vurgular. İnovasyon ve ekonomik büyüme konusunda benzersiz bir perspektif sunar, ikiz dönüşüm üzerine odaklanır ve sistem dinamiklerine ve evrimine bütüncül bir yaklaşım benimser.

Teknolojik inovasyon sistemleri (TIS) yaklaşımı, inovasyon süreçlerinin analizi için değerli bir çerçeve sunmasına rağmen, ekolojik inovasyonlar bağlamında finansal sektörün değerlendirilmesinde sınırlamalara sahiptir. TIS yaklaşımı, finansal

sektörün diğer sektörlerle olan ara sektörel etkileşimlerini ve bağlantılarını yeterince ele almamış olabilir (Bergek vd., 2008; Wieczorek ve Hekkert, 2012; Kemp vd., 2007). Özellikle, finansal sektör, ekolojik inovasyonların finansmanında kritik bir rol oynamaktadır ve böyle etkileşimlerin eksik analizi, sektörün potansiyelini tam olarak anlamamızı engelleyebilir (Bolton ve Hannon, 2016; Schaltegger ve Wagner, 2011). Ayrıca, TIS yaklaşımı, finansal sektörün özel yapılarını ve dinamiklerini ve risk yönetimi ve düzenleme gibi alanları yeterince değerlendiremeyebilir (Bergek vd., 2008; Laperche ve Lefebvre, 2011; Busch vd., 2016). Bu faktörler, finansal kurumların ekolojik inovasyonların benimsenmesi ve finansmanı konusundaki kararlarını ve stratejilerini önemli ölçüde etkileyebilir (Volberda vd., 2011).

Ekolojik inovasyonların geliştirilmesi, ticarileştirilmesi ve genişletilmesi için gereken finansmanı sağlayan finansal sektör, yeşil finans ürünleri ve hizmetlerinin geliştirilmesi ve sunulması yoluyla ekolojik inovasyonları desteklemektedir (Ehlers ve Packer, 2017; Bolton ve Hannon, 2016; Clarkson vd., 2008). Bu nedenle, TIS yaklaşımı ile birlikte sektör analizi için özel yapılar ve dinamiklerin dikkate alındığı daha kapsamlı ve entegre bir yaklaşım benimsenmelidir (Kemp vd., 2007; Geels, 2013).

Literatürdeki bu boşluğu doldurmak amacıyla bu çalışmada yeni bir analitik çerçeve geliştirilmiştir. Yeni geliştirilen analitik çerçeve, TIS'nin eksikliklerine cevap vermektedir ve küresel inovasyon sistemleri (GIS) arasındaki bağlantıları dikkate almaktadır. GIS, ülkeler ve sektörler arasındaki işbirlikleri ve etkileşimler yoluyla bilgi ve teknolojilerin yayılmasını ve uygulanmasını sağlayan, büyük toplumsal sorunları hafifleten küresel bir inovasyon ağı olarak tanımlanır (Cagnin vd., 2012). Ekolojik inovasyonların küresel inovasyon sistemleriyle bağlantısı, bu inovasyonların yayılması ve uygulanmasına yönelik önemlidir. Ekolojik inovasyonların küresel ölçekte benimsenmesi ve yayılması, sürdürülebilir kalkınma hedeflerine katkıda bulunan çevresel ve sosyal etkileri artırır (Truffer ve Coenen, 2012).

Yeni çerçeve, finansal sektörün ekolojik inovasyonların benimsenmesine katkıda bulunarak ekolojik inovasyonların küresel inovasyon sistemleriyle entegrasyonunu

desteklemektedir. Finansal sektör, küresel bir oyuncu olarak, ekolojik inovasyonların benimsenmesi ve finansmanında önemli bir rol oynamaktadır (Schoenmaker ve Schramade, 2018). Küresel finansal kurumlar, sürdürülebilir finansı desteklemek ve ekolojik inovasyonların uygulanmasını sağlamak için politika ve stratejilerini yeniden şekillendirebilirler (Ehlers ve Packer, 2017). Bu bağlamda, FC-PIS, finans sektörünü bir supra-endüstriyel süper yapı olarak ele alır.

Uluslararası işbirlikleri ve finansal düzenlemeler, finansal sektörün ekolojik inovasyonları daha hızlı ve etkili bir şekilde benimsemesine yardımcı olabilir (Bolton ve Hannon, 2016). Bu nedenle, finansal sektörün küresel düzeydeki etkisi ve sorumlulukları, küresel inovasyon sistemleri içinde ekolojik inovasyonların yayılması ve uygulanmasına kritik bir etkiye sahiptir.

Yeni geliştirilen çerçeve, finans sektörünün küresel etkisini ve sorumluluklarını dikkate alarak daha etkili ve kapsamlı bir analiz sunmaktadır. Böylelikle, finansal kurumlar ve politika yapıcılar, finans sektörü içinde ekolojik inovasyonların yayılması ve uygulanması konusunda daha bilinçli ve stratejik kararlar alabilirler (Stirling, 2014). Ayrıca, yeni çerçeve, finansal sektörün sürdürülebilir finansı ve ekolojik inovasyonların uygulanmasını destekleme kapasitesini artırmak için uluslararası işbirlikleri ve düzenlemelerin önemini vurgulamaktadır (Campiglio vd., 2018). Bu, endüstrinin çevresel ve sosyal etkileri küresel düzeyde yönetme potansiyelini optimize etmeye yardımcı olabilir ve sürdürülebilir kalkınma hedeflerine katkıda bulunabilir.

Özetle, yeni geliştirilen çerçeve, TIS yaklaşımının finans sektörü ve ekolojik inovasyonlar bağlamındaki eksikliklerini ortadan kaldırırken, finans sektörünün küresel bir oyuncu olarak önemini ve küresel inovasyon sistemleriyle bağlantılarını dikkate almaktadır. Bu, finansal sektörün stratejilerini ve ekolojik inovasyonlara yönelik kararlarını daha doğru bir şekilde analiz etmek suretiyle sürdürülebilir kalkınma hedeflerine ulaşma yolunda önemli bir adım atmayı sağlayabilir. Yeni çerçeve, Ekolojik İnovasyon Bağlamında Analiz Şeması olarak adlandırılmıştır.

Tezin 5. bölümü, çalışmada kullanılan araştırma metodolojisine odaklanmaktadır. Bölüm, araştırma metodolojisinin önemini ve üç ana yaklaşımını - nicel, nitel ve karma yöntemleri - tartışarak başlar. Yazar, özellikle karma yöntemler kullanılarak finans sektöründeki ekolojik inovasyonlar konusundaki sınırlı araştırmalara vurgu yapmaktadır. Bölüm, ardından çalışma için seçilen karma yöntem araştırma tasarımını, özellikle yakınsak paralel tasarımını açıklar. Bu tasarım, hem nicel hem de nitel verilerin aynı anda ve bağımsız olarak toplanması, ayrı ayrı analiz edilmesi ve sonuçların araştırma sorununun kapsamlı bir şekilde anlaşılması için birleştirilmesini içerir. Daha sonra, bölüm araştırma popülasyonu ve örnekleme tartışır. İlgilenilen popülasyon Türk Finans Sektörü çalışanlarıdır ve bankacılık ve sigortacılıkla ilgili ölçütler kullanılarak temsili bir örneklem seçilir. Örneklem büyüklüğü, sosyal bilim araştırmaları için öneriler temel alınarak belirlenir ve örneklemin genişletilmesi için kar topu örnekleme yöntemi kullanılır.

Veri toplama süreci daha sonra açıklanır ve anket Google Forms aracılığıyla çevrimiçi olarak paylaşılır. Veri toplama iki aşamada gerçekleştirilir: ölçek geliştirme ve nihai anket. Bölüm, veri toplamanın Google Forms aracılığıyla nasıl gerçekleştirildiğini ve çeşitli katılımcılara ulaşmak için kar topu örnekleme yönteminin kullanımını açıklar. Bölüm ayrıca, nicel araştırma sürecini sunar, bu süreçte Türk finans sektörünün algılanan ekolojik yenilikçiliğini ölçmek için bir ölçek geliştirme çalışması yapılır. Algılanan Ekolojik Yenilikçilik Ölçeği'nin (AEYÖ) geliştirilmesi açıklanır ve önceki çalışmalardan elde edilen bilgilerin, ekolojik inovasyon farkındalığı, firma yenilikçiliği ve kişisel çevresel farkındalık konularındaki içgörülerin entegrasyonuna vurgu yapılır.

Son olarak, bölüm nicel araştırmanın geçerlik ve güvenilirlik analizini tartışır. Ölçeğin faktör yapısını belirlemek ve başka bir örneklemede doğrulamak için Keşfedici Faktör Analizi (AFA) ve Doğrulayıcı Faktör Analizi (DFA) yapılır.

Genel olarak, 5. Bölüm, çalışmada kullanılan araştırma metodolojisini, araştırma tasarımını, örneklem seçimini, veri toplama sürecini ve ölçek geliştirmeyi detaylı bir şekilde açıklamaktadır. Tezin 5. bölümü, çalışmada Türk finans sektörünün algılanan ekolojik yenilikçiliğini ölçmek için kullanılan ölçek maddelerini içeren 3. Tabloyu

sunmaktadır. Tablo, inovasyon kapasitesi, çevresel farkındalık, teknoloji, kaynak verimliliği, düzenlemeler, paydaş işbirliği, çalışan katılımı ve izleme ve raporlama gibi çeşitli konuları kapsayan 40 madde içermektedir.

Bölüm ardından, çalışma için geliştirilen Algılanan Ekolojik Yenilikçilik Ölçeği (AEYÖ) dahilinde yapılan nicel araştırmanın geçerlik analizini tartışır. Geçerlik çalışması iki aşamada gerçekleştirildi. İlk aşamada, ölçeğin faktör yapısını belirlemek için 200 katılımcının (Çalışma Grubu 1) veri seti kullanılarak Keşfedici Faktör Analizi (AFA) yapıldı. Çalışma Grubu 1'deki katılımcıların cinsiyet, yönetici statüsü, şirket türü, yaş ve eğitim durumu gibi açıklayıcı istatistikleri sunulur. İkinci aşamada, Keşfedici Faktör Analizi (AFA) ile ortaya çıkan faktör yapısının doğrulanması için başka bir 627 katılımcının (Çalışma Grubu 2) veri seti üzerinde Doğrulayıcı Faktör Analizi (DFA) gerçekleştirildi. Çalışma Grubu 2'deki katılımcıların açıklayıcı istatistikleri de sunulur. Bölüm, Çalışma Grubu 2'deki cinsiyet, yönetici statüsü, şirket türü, yaş ve eğitim durumunun yüzde dağılımına dikkat çeker.

Tezin 5. bölümü, Algılanan Ekolojik Yenilikçilik Ölçeği (AEYÖ) için yapılan nicel araştırmanın geçerlik ve güvenilirlik analizine odaklanmaktadır. Bölüm, ölçeğin içerik geçerliliğini tartışarak başlar. İçerik geçerliliği, ölçüm aracındaki maddelerin doğru bir şekilde ölçülecek yapıyı temsil edip etmediğini ifade eder. Ölçeğin içerik geçerliliğini test etmek için 7 uzmandan geri bildirim alınmıştır. Her bir madde için İçerik Geçerlilik Oranı (CVR) hesaplamak için Lawshe analiz tekniği kullanılmış ve CVR değeri 0.99'un altında olan maddeler ölçekten çıkarılmıştır. Sonuç olarak, nihai ölçek 30 maddeden oluşmaktadır.

Bölüm daha sonra, yapı geçerliliğini değerlendirmek için kullanılan istatistiksel yöntemleri, özellikle Keşfedici Faktör Analizi (AFA) ve Doğrulayıcı Faktör Analizi (DFA) açıklar. Teorik bir modelin veya hipotezin olmaması nedeniyle AFA, ölçeğin faktör yapısını keşfetmek için temel analiz yöntemi olarak seçilmiştir. Faktör yapısı daha sonra DFA ile doğrulanmış ve ölçeğin geçerliliği için ilave kanıtlar sunmuştur.

AFA'nın bulguları, verilerin faktör çıkarmaya uygunluğunu gösteren Kaiser-Meyer Olkin (KMO) katsayısı ve Bartlett Sferisite testi de dahil olmak üzere sunulmaktadır. AFA, ölçeğin iki faktörlü bir yapıya sahip olduğunu ortaya koymuştur ve bu faktörler "Kurumun Algılanan Ekolojik Yenilikçiliği" (KA EY) ve "Kişisel Çevresel Farkındalık" (KÇF) olarak adlandırılmıştır. Ölçeğin madde yükleri, her bir faktör içindeki temsil gücünü göstermektedir. AFA analizi, iki faktörlü ölçüm modeli için toplam varyansın %86,146'sını açıklamıştır.

Bölüm, veri analizi için SPSS 21.0 ve LISREL 8.8 paket programlarının kullanıldığından ve öge öz analizi, öge-ölçek korelasyonları ve üst-alt ilişkisiz örneklem t-testi gibi öge analizlerinin uygulandığından bahsederek sona ermektedir. Ölçeğin güvenilirliği ve faktörlerinin güvenilirliği, Cronbach Alfa güvenilirlik katsayısı kullanılarak değerlendirilmiştir.

Genel olarak, 5. Bölüm, Algılanan Ekolojik Yenilikçilik Ölçeği (AEYÖ) için yapılan geçerlik ve güvenilirlik analizinin kapsamlı bir genel bakışını sunmaktadır ve ölçüm aracının Türk finans sektöründe algılanan ekolojik yenilikçiliği değerlendirmede doğruluk ve etkinlik sağlamak için yürütülen titiz süreci sergilemektedir.

Tezin 5. bölümü, özellikle 5.6.1.3 bölümü, Algılanan Ekolojik Yenilikçilik Ölçeği (AEYÖ) için geçerlik bulgularına odaklanmaktadır. Ölçeğin geçerliliğini belirlemek için her madde puanı ile her faktörden toplam puanlar arasındaki korelasyonlar hesaplanmıştır. Ayrıca, üst ve alt gruplar için ortalama puanlar bağımsız örneklem t-testi kullanılarak karşılaştırılmış ve her bir maddenin ayırt ediciliği belirlenmiştir. Sonuçlar, tüm maddeler için anlamlı ölçek-madde korelasyonlarını göstererek geçerliklerini ortaya koymaktadır.

Ölçeğin güvenilirliği, Cronbach Alfa katsayıları kullanılarak değerlendirilmiştir. Kurumun Algılanan Ekolojik Yenilikçiliği (KA EY) faktörü için elde edilen güvenilirlik katsayısı 0,99, Kişisel Çevresel Farkındalık (KÇF) faktörü için ise 0,97'dir. Her iki faktörü de içeren genel ölçeğin güvenilirliği ise 0,98'dir. Bu yüksek Cronbach Alfa katsayıları, ölçeğin güvenilirliğini ve tutarlılığını göstermektedir.

Ölçeğin iki faktörlü ölçüm modelini doğrulamak için Çift Doğrulayıcı Faktör Analizi (DFA) ölçeğin İkinci Çalışma Grubu verileri üzerinde gerçekleştirilmiştir. DFA model-veri uyum indeksleri, modelin veriyle uyumluluğunu değerlendirmek için incelenmiştir. Sonuçlar, modelin veriyle iyi uyum sağladığını göstermektedir.  $\chi^2/sd$ , RMSEA, NFI, NNFI, CFI, GFI ve AGFI değerleri, iyi uyum için kriter değerlerini karşılamaktadır. DFA'dan elde edilen faktör yükleri ve hata varyansları, maddelerin yüksek geçerliliğini göstermektedir.

Bölüm, 24 maddeden oluşan son sürümüyle Algılanan Ekolojik Yenilikçilik Ölçeği'nin (AEYÖ) sunumuyla sona ermektedir ve her bir madde tarafından ölçülen ekolojik yenilikçilik alanını belirtmektedir. Bu bulgular, AEYÖ'nün Türk finans sektörü bağlamında algılanan ekolojik yenilikçilik ve kişisel çevresel farkındalığı değerlendirmek için bir ölçme aracı olarak geçerlilik ve güvenilirliği için güçlü kanıtlar sunmaktadır.

Araştırmanın sonuçları, katılımcıların finans sektöründeki kurumlarını yüksek düzeyde ekolojik yenilikçi olarak algıladıklarını göstermektedir, Algılanan Ekolojik Yenilikçilik (PEI) faktörü için 79.81 ortalama puanı vardır. Bu, katılımcıların kurumlarının çevresel sürdürülebilirlik konusundaki çabalarını olumlu bir şekilde algıladıklarını göstermektedir. Standart sapma 18.79 ise yanıtlar arasında çeşitli perspektifleri yansıtan bir değişkenlik olduğunu göstermektedir.

Ayrıca, katılımcılar kişisel çevresel farkındalık konusunda güçlü bir farkındalık sergilemişlerdir ve ortalama puanı, göreceli olarak yüksek bir farkındalık düzeyini işaret etmektedir. Bu, finans sektöründe çalışan bireylerin çevresel konuları iyi anladıklarını ve kişisel çevresel sorumluluklarını yerine getirme konusunda bağlılık gösterdiklerini göstermektedir.

Demografik özelliklerin analizi, algılanan ekolojik yenilikçilik düzeyleri veya kişisel çevresel farkındalık açısından cinsiyet, yaş, yönetici statüsü, kurum tipi, banka tipi veya sigorta şirketi tipi temelinde anlamlı farklılıklar ortaya çıkarmamıştır. Bu bulgular, bu demografik faktörlerin bireylerin finans sektöründeki ekolojik

yenilikçilik algılarını veya kişisel çevresel farkındalıklarını anlamlı bir şekilde etkilemediğini göstermektedir.

Ayrıca, algılanan ekolojik yenilikçilik düzeyleri ile kişisel çevresel farkındalık arasında anlamlı bir pozitif ilişki bulunmuştur. Bu, kurumlarını daha ekolojik yenilikçi olarak algılayan bireylerin aynı zamanda daha yüksek düzeyde kişisel çevresel farkındalığa sahip olduklarını göstermektedir.

Genel olarak, araştırmanın sonuçları, finans sektöründe çalışan bireylerin ekolojik yenilikçilik ve kişisel çevresel farkındalık konularındaki olumlu tutumlarını ve algılarını vurgulamaktadır. Bulgular, bireylerin algıları, farkındalıkları ve finansal kurumların çevresel çabaları arasındaki ilişkiyi anlama açısından katkı sağlamaktadır.

Sonuçları özetlemek gerekirse:

Araştırma, katılımcıların finans sektöründeki kurumlarını ekolojik yenilik açısından yüksek düzeyde yenilikçi olarak algıladığını göstermiş ve bu da katılımcıların kurumlarının çevresel sürdürülebilirlik çabalarına olumlu bir algıya sahip olduklarını işaret etmektedir.

Katılımcılar, kişisel çevresel farkındalık konusunda güçlü bir bilinç düzeyi sergilemiştir, yani katılımcılar çevresel konuları iyi anlamakta ve kişisel çevresel sorumluluk göstermektedir.

Cinsiyet, yaş, yönetici statüsü, kurum tipi, banka tipi ve sigorta şirketi tipine dayalı olarak algılanan ekolojik yenilikçilik düzeyi veya kişisel çevresel farkındalık üzerinde anlamlı farklılıklar ortaya çıkmamıştır. Bununla birlikte, eğitim düzeyi hem algılanan ekolojik yenilikçilik düzeyleri hem de kişisel çevresel farkındalık üzerinde önemli bir etkiye sahiptir.

Algılanan ekolojik yenilikçilik düzeyleri ile kişisel çevresel farkındalık arasında ılımlı derecede pozitif ve anlamlı bir ilişki bulunmuştur, yani kurumlarını daha fazla



ekolojik yenilikçi olarak algılayan kişiler aynı zamanda daha yüksek bir kişisel çevresel farkındalık düzeyine sahip olma eğilimindedir.

Araştırmanın sonuçları, finans sektöründe çalışan bireylerin ekolojik yenilikçilik ve kişisel çevresel farkındalık konularında olumlu tutum ve algılara sahip olduklarını vurgulamaktadır. Bulgular, finans sektöründeki bireylerin çevresel yenilikçilik ve sürdürülebilirlik konularındaki çabaları hakkında bilgi sağlamaktadır.

Çalışma, algılanan ekolojik yenilikçilik düzeyleri ve kişisel çevresel farkındalık üzerinde eğitimin önemini vurgulamaktadır, bu da finans sektöründe çevresel farkındalığı ve sürdürülebilirlik uygulamalarını teşvik etmek için eğitim müdahalelerine ihtiyaç olduğunu göstermektedir.

Sonuçları genelleştirmek için örneklem seçimi ve büyüklüğünün sonuçları etkileyebileceği unutulmamalıdır.

Araştırma, katılımcıların algılanan ekolojik yenilikçilik düzeylerinin ve kişisel çevresel farkındalık düzeylerinin arasında pozitif ve anlamlı bir ilişki olduğunu belirlemiştir.

TUSCO ve PISCOR gibi girişimler, FC-PIS içinde bilgi geliştirme ve yayma konusunda önemli bir rol oynamaktadır. TUSCO, Türkiye'deki sürdürülebilirlik ve ekolojik yenilikler konusunda bilgi ve öğrenme sağlamaktadır ve diğer bankalardan ayrılmaktadır.

TUSCO, uluslararası kuruluşlar ve üniversitelerle işbirliği yaparak küresel trendlerden haberdar olmakta ve Türkiye'ye yenilikçi fikirler getirmektedir. Bununla birlikte, ekolojik yenilik ve sürdürülebilirlik alanında akademi ile daha fazla işbirliği yapılması gerekmektedir.

Araştırma, FC-PIS'nin araştırma ve geliştirme (R&D), pazar oluşturma ve kaynak harekete geçirme gibi diğer işlevlerini de belirlemiştir. R&D bütçeleri sürdürülebilir yeniliklere odaklanırken, bazı kuruluşlar için özel bütçelerin eksikliği vardır. Pazar

oluřturma, yeřil finansal rnlerin geliřimi ve talebi etrafında dnmekteyken, kaynak harekete geirme ise kısa vadeli fon yapıları ve sınırlı R&D teřvikleri gibi zorluklarla karřı karřıyadır.

Analiz, Trkiye'deki srdrlebilirlik alanında eēitimi insan kaynaklarının eksikliēini ve akademi ile endstri arasındaki baēlantısızlıēı vurgulamıřtır. Daha nitelikli uzmanlara ve akademi ile finans sektr arasında daha iyi iřbirliēine ihtiya vardır.

Teknolojik yeniliklerin sosyal ve siyasi kabul olan meřruiyet, teknolojik yenilik sistemi (TIS) yaklařımı baēlamında tartıřılmıřtır. Eēitim ve farkındalık, dzenleyici destek, finansal kaynaklar, endstri uygulamaları, pazar benimseme ve byme, Őeffaflık ve raporlama, iřbirliēi ve ortaklık meřruiyet iin nemli unsurlar olarak belirlenmiřtir.

Ortak bir taksonomi ve ekolojik yeniliklerle ilgili farkındalık eksikliēi, kurumların srdrlebilirlik abalarının lmn, hesap verebilirliēini ve karřılařtırmalarını engellemektedir. Toplumsal farkındalıēın ve srdrlebilirlik eēitiminin artırılması, finansal kaynak eksikliēinin ele alınması, yeřil yıkama sorununun ele alınması ve iřbirliēinin teřvik edilmesi, finans sektrnn ekolojik yenilik kapasitesini artırmak iin temel unsurlardır.

Genel olarak, bu engellerin ele alınması, finans sektrnde srdrlebilir dnřm teřvik etmek ve Trkiye'de ekolojik yenilikleri gerekleřtirmek iin hayati neme sahip olacaktır.

zetle, Trkiye'deki finans sektrnn ekolojik yenilik kapasitesinin analizi, birkaç nemli bulguyu ortaya koymuřtur. Bunlar arasında ayrılmıř insan kaynaklarına ve disiplinlerarası yaklařımlara ihtiya duyulması, kar odaklı yaklařımlar ile srdrlebilirlik arasında denge kurulması, geri dnřm kltrnn dnřtrlmesi, kamu bankalarının algısı ile ilgilenilmesi ve akademik-sanayi iřbirliklerinin glendirilmesi bulunmaktadır.

Finans sektöründeki ekolojik yenilikleri tetikleyen etkenler arasında uluslararası girişimler, paydaş beklentileri, iklim krizi ve ESG faktörleri, kaynak gereksinimleri ve yönetsel farkındalık ve desteği yer almaktadır. Yatırımcılar dahil paydaşların beklentileri, sürdürülebilirlik eylemleri için baskı oluşturmaktadır. İklim krizi ve ESG riskleri finansal kurumları etkilemekte ve sosyal ve çevresel etkileri en aza indirmeye yönelik stratejileri gerektirmektedir. Kaynak gereksinimleri zorluklar yaratırken, bankalar finansal destek sağlama rolü üstlenmektedir. Yönetsel farkındalık ve destek, ekolojik yenilikleri teşvik etmek ve gerekli değişiklikleri uygulamak için önemlidir.

Sistemik problemlerin ve engellerin aşılması, bilgi geliştirme, pazar oluşturma, kaynakların harekete geçirilmesi, yeşil dijital dönüşüm ve meşruiyet konularında finans sektörünün dönüşümü ve ekolojik yenilik kapasitesi için önemlidir. Bu bulgular, finans sektöründe sürdürülebilirlik uygulamalarının etkinleştirilmesinin sürdürülebilir büyümeyi mümkün kılmak ve küresel zorluklara cevap vermek açısından önemini vurgulamaktadır.

Çalışmanın 7. bölümü, önceki bölümlerde yapılan analizlerden çıkarılan politika önerilerini ve sonuçları kapsamlı bir şekilde sunmaktadır. Bölüm, bir yenilik "politika karışımı" kavramını tanıtır ve küresel ekolojik zorlukları ele almak için etkili politika araçlarının kombinasyonlarına ihtiyacın altını çizer. Politika önerileri, Türkiye'deki Finans Merkezli Platform İnovasyon Sistemi'nde (FC-PIS) belirlenen sistemik sorunlara dayanarak geliştirilmiştir.

FC-PIS'nin ekolojik yenilik kapasitesini artırmak için on politika önerisi sunulmuştur. Bu öneriler sürdürülebilir finans, yeşil finansal araçların düzenlenmesi, yeşil krediler için minimum paylar, yeşil krediler için risk ağırlık hesaplarının yeniden hesaplanması, uluslararası anlaşmalara uyum, uluslararası kuruluşlara katılım, uygun politikaların benimsenmesi, sermaye sınırlarının yeniden düzenlenmesi, yeşil bankacılık faaliyetlerinin şeffaf raporlanması, yeşil finansal ürünlere vergi teşvikleri, yeşil dönüşüme dahil olan derecelendirme şirketleri, yeşil inovatif varlıkların değerlendirilmesi, standartlaştırılmış yeşil raporlama, yeşil kredilerin kredi riski hesaplamalarına dahil edilmesi ve yeşil enstrümanlar için ayrı kayıtlar

şeklinde sıralanmaktadır. Bu öneriler, finans sektöründe belirlenen engellerin ele alınmasını ve ekolojik yeniliklerin benimsenmesini teşvik etmeyi amaçlamaktadır. Çalışmanın bu politika araçlarını uygulayarak, kaynak tahsisi, şeffaflık, hesap verebilirlik ve yeşil finansmana erişimi artırmayı hedeflediği görülmektedir. Önerilen politikalar, FC-PIS içinde ekolojik yeniliklerin geliştirilmesi ve uygulanmasına destekleyici bir ortam oluşturmayı ve Türkiye'de sürdürülebilir bir ekonomiye geçişte katkıda bulunmayı amaçlamaktadır.

Çalışmanın 7. bölümü, Türkiye'deki finans sektörünün ekolojik yenilik kapasitesini artırmak için politika önerilerini ve sonuçları özetlemektedir. Politika önerileri, politika amacı, politika aracı ve politika türü olmak üzere üç temelden oluşan bir politika tasarım modeli kullanılarak geliştirilmiştir.

1. Politika Önerisi, yeşil sermaye piyasalarının kurumsallaşmasına odaklanmaktadır ve yeni sermaye piyasası kurumları ve enstrümanlarıyla ilgili prosedürler ve prensiplerle ilgili düzenlemelerin ve denetimlerin yapılmasını önermektedir. Önerilen politika araçları arasında yeşil kuruluşların halka arz işlemlerinde komisyon ve masraf ücretlerinde indirim sağlanması, BIST yeşil endeksinin oluşturulması, yeşil sermaye piyasası enstrümanlarının ihraç süreçlerinin kolaylaştırılması, sürdürülebilirlik endekslerinin çeşitlendirilmesi ve bankaların yeşil menkul kıymet ihraç etme yükümlülüğünün düzenlenmesi yer almaktadır.

2. Politika Önerisi, finansal kuruluşların çevresel sürdürülebilirliğini ve sosyal sorumluluğunu ölçmek ve değerlendirmek için Yeşil Akreditasyon Sistemi'nin geliştirilmesini önermektedir. Önerilen politika aracı, finans ve sigorta sektörleri için bilime dayalı bir yeşil akreditasyon sistemi geliştirmek, yeşil yıkama faaliyetlerinin önlenmesini sağlamak ve güven ve meşruiyeti teşvik etmektedir.

3. Politika Önerisi, finansal ve sigorta ürünleri ve hizmetleri için yeşil etiketlerin standartlaştırılmasının önemini vurgulamaktadır. Önerilen politika aracı ile, bu hizmetleri yeşil dönüşüm odaklı standartlara uygun hale getirmek ve ulusal ve kurumsal düzenlemeleri ve yasal altyapıyı oluşturmak hedeflenmektedir.

4. Politika Önerisi, FC-PIS Ulusal Bilgi Tabanı'nın oluşturulmasına odaklanmaktadır ve AR-GE bütçelerinin belirlenmesi, araştırma merkezlerinin kurulmasının desteklenmesi, merkezler ile finansal kuruluşlar arasında işbirliğinin kolaylaştırılması ve üniversitelerin ortak taksonomi çalışmalarına dahil edilmesi gibi politika önerileri içermektedir.

5. Politika Önerisi, finans sektöründe yeşil dijital dönüşümün olanaklı kılınmasını, geliştirilmesini ve yaygınlaştırılmasını hedeflemektedir. Önerilen politika araçları arasında düzenleme boşluklarının gözden geçirilmesi, üniversite-sanayi işbirliğinin güçlendirilmesi, dijital karbon ayak izi hesaplama metodolojilerinin geliştirilmesi ve dijital karbon ayak izi verilerinin sürdürülebilirlik raporlarına dahil edilmesinin düzenlenmesi yer almaktadır.

7. Politika Önerisi, finans sektöründe savunuculuk ve lobicilik faaliyetlerinin geliştirilmesini, farkındalık çalışmalarını artırılmasını ve ulusal sürdürülebilirlik danışmanlık firmalarının sayısının artırılmasını önermektedir.

8. Politika Önerisi, finans sektöründeki bilgi ve beceri açığını kapatmak için sektörel insan kaynaklarının geliştirilmesine ve stratejilerin oluşturulmasına odaklanmaktadır.

9. Politika Önerisi, yasaklı sektörlerle sunulan finansal ürün ve hizmetlerle ilgili olarak düzenlemeler ve denetimler yapılmasını önermektedir.

10. Politika Önerisi 10 özellikle sigorta sektörüne yönelik olup, yeşil dönüşümünün kolaylaştırılması için düzenlemeler yapılmasını önermektedir.

Bu politika önerileri sürdürülebilir finans, yeşil sermaye piyasalarının oluşturulması, yeşil akreditasyon sistemi geliştirilmesi, yeşil etiketlerin standartlaştırılması, ulusal bilgi tabanı oluşturulması, yeşil dijital dönüşümün mümkün kılınması, savunuculuk ve lobiciliğin geliştirilmesi, sektörel insan kaynaklarının geliştirilmesi ve sigorta sektörünün yeşil dönüşümünün kolaylaştırılması üzerine odaklanmaktadır. Bu politikaların uygulanmasıyla, çalışma Türkiye'deki finans sektörünün ekolojik

yenilik kapasitesini artırmayı ve daha sürdürülebilir bir ekonomiye katkıda bulunmayı amaçlamaktadır.

Bu çalışmada, FC-PIS ekolojik yenilik kapasitesini artırmak için bir politika karması hazırlanmıştır. Bu araştırmanın sosyal bilimler literatürüne olduğu kadar IS literatürüne de çeşitli katkıları bulunmaktadır. Bu çalışmanın ana katkısı ve yeni bölümlerinden biri, finans sektöründe eko-inovasyonu politika belirleme için yeni bir entegre platform inovasyon sistemi çerçevesi ile tanımlamaya ve değerlendirmeye yönelik ilk girişim olmasıdır. FC-PIS olarak adlandırılan bu yeni yenilik sistemi, finansmanı ekolojik yenilikler bağlamında merkeze alan yeni bir yaklaşımdır. İkinci olarak çalışmada, yeni geliştirilen FC-PIS için analitik bir şema tasarlanmıştır. Bu analitik şema ile FC-PIS benzeri inovasyon sistemlerinin yapısal ve fonksiyonel analizlerinin yapılması mümkün olacaktır. Üçüncüsü, bu çalışma kapsamında insanların Algılanan Ekolojik Farkındalıklarını ölçmek için PEIS ölçeği geliştirilmiştir. Bu ölçek finans YP-PIS hariç tüm hizmet sektörlerinde uygulanabilmektedir. Dördüncüsü, özellikle eko-inovasyonlar için bir politika karması çerçevesi tasarlanmıştır. Bu çerçeve, ilgi çekici ve kapsayıcı politika önerileri oluşturmak için kullanılabilir, sistemik konulara ilişkin çok boyutlu bir bakış açısı sağlar.

Bu teorik katkılara ek olarak geliştirilen politika önerileri ile FC-PIS'in ekolojik inovasyon kapasitesinin artırılması hedeflenmektedir. Geliştirilen politika bileşimi, sistemik sorunları çok boyutlu bir bakış açısıyla ele alır ve FC-PIS'in gelişimini destekleyecek unsurları içerir. Ayrıca FC-PIS paydaş analizi, ekolojik yenilikler bağlamındaki ilk ve en kapsamlı paydaş analizidir.

Bu araştırmanın iki önemli sınırlılığı ve dolayısıyla ileri araştırmalar için önerileri vardır. Birincisi, Fintech'lerin araştırma örneğine dahil edilmemesidir. FC-PIS'in gömülü olduğu Fintech'ler yeşil dijital dönüşüm bağlamında değerlendirilmelidir. Bu nedenle Fintech'lerin ekolojik inovasyon kapasitesini artırmaya yönelik bir politika önerisi hazırlamak için bir çalışma yapılması gerektiği düşünülmektedir. Araştırmanın bir diğer sınırlılığı ise geliştirilen PEIS ölçeğinin uygulandığı

örneklemeindeki gözlem sayısıdır. Bu bağlamda çalışmanın gelecekte daha geniş bir örnekleme ile tekrarlanması çalışmanın sağlamlığına katkı sağlayabilir.

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