AN ASSESSMENT OF DISASTER RISK MANAGEMENT IN A WORLD HERITAGE SITE IN TURKEY: THE CASE OF BERGAMA

A THESIS SUBMITTED TO
THE GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES
OF
MIDDLE EAST TECHNICAL UNIVERSITY

BY

ASLI AYGÜN GÜRSOY

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR
THE DEGREE OF MASTER OF SCIENCE
IN
CONSERVATION OF CULTURAL HERITAGE IN ARCHITECTURE

DECEMBER 2019

Approval of the thesis:

AN ASSESSMENT OF DISASTER RISK MANAGEMENT IN A WORLD HERITAGE SITE IN TURKEY: THE CASE OF BERGAMA

submitted by **ASLI AYGÜN GÜRSOY** in partial fulfillment of the requirements for the degree of **Master of Science in Conservation of Cultural Heritage in Architecture Department, Middle East Technical University** by,

Prof. Dr. Halil Kalıpçılar
Dean, Graduate School of **Natural and Applied Sciences** _____

Prof. Dr. F. Cânâ Bilsel
Head of Department, **Architecture** _____

Assoc. Prof. Dr. Ayşe Güliz Bilgin Altınöz
Supervisor, **Architecture, METU** _____

Dr. Sibel Yıldırım Esen
Co-Supervisor, **Rep. of Turkey, Ministry of Cult. and Tourism** _____

Examining Committee Members:

Prof. Dr. Neriman Şahin Güçhan
Architecture, METU _____

Assoc. Prof. Dr. Ayşe Güliz Bilgin Altınöz
Architecture, METU _____

Assist. Prof. Dr. Meltem Şenol Balaban
City and Regional Planning, METU _____

Prof. Dr. Deniz Özkut
Turkish and Islamic Archeology, İzmir Katip Çelebi University _____

Assoc. Prof. Dr. Mert Nezih Rifaioğlu
Architecture, Hatay Mustafa Kemal University _____

Date: 04.12.2019

I hereby declare that all information in this document has been obtained and presented in accordance with academic rules and ethical conduct. I also declare that, as required by these rules and conduct, I have fully cited and referenced all material and results that are not original to this work.

Name, Surname: Aslı Aygün Gürsoy

Signature:

ABSTRACT

AN ASSESSMENT OF DISASTER RISK MANAGEMENT IN A WORLD HERITAGE SITE IN TURKEY: THE CASE OF BERGAMA

Aygün Gürsoy, Aslı
Master of Science, Conservation of Cultural Heritage in Architecture
Supervisor: Assoc. Prof. Dr. Ayşe Güliz Bilgin Altınöz
Co-Supervisor: Dr. Sibel Yıldırım Esen

December 2019, 195 pages

The number of disasters in the world is increasing each year due to various natural, human-induced, and climate change-induced hazards such as earthquakes, floods, fires, and many others. Hence, cultural heritage sites, which are unrenewable resources, are under destructive effects of such disasters. In order to safeguard heritage places that are threatened, international studies have been accelerated in recent years. A manual entitled 'Managing Disaster Risks for World Heritage' was prepared by UNESCO, ICCROM, ICOMOS and IUCN in 2010 in order to define disaster risk management process for World Heritage Sites.

Due to its historical and cultural richness, Turkey possesses cultural heritage places, including UNESCO World Heritage Sites. However, since the country is prone to disasters, these cultural assets are exposed to various natural, human-induced, and climate change-induced threats. Risks threatening cultural heritage have to be managed through effective management strategies in order to safeguard the cultural richness of the country. Accordingly, a thorough assessment of disaster risk management in a world heritage site in Turkey based on international standards in the above-mentioned manual is crucial for understanding areas that need to be strengthened for effective disaster risk management of cultural heritage.

Following the approaches of the manual for World Heritage Sites, this study aims to test the applicability of the manual in the context of Turkey through assessing the disaster risk management in a World Heritage Site; Bergama and Its Multi-Layered Cultural Landscape. Within the scope of the study, risks threatening the case study area are identified and existing systems, tools and mechanisms of the cultural heritage disaster risk management processes (identification, prevention, mitigation, preparedness, response and recovery) are examined. Addressing the roles and responsibilities of public institutions in Turkey, the integration of disaster risk management for cultural heritage in the existing disaster risk management systems is proposed. As risk assessment and effective risk management requires collecting and processing extensive amount of data related to hazards, and vulnerabilities of cultural assets, risk databases should be developed through the collaboration of responsible organizations in Turkey.

Keywords: Disaster Risk Management, DRM, World Heritage Site, Bergama, UNESCO

ÖZ

TÜRKİYE'DEKİ BİR DÜNYA MİRAS ALANINDA AFET RİSKİ YÖNETİMİNİN DEĞERLENDİRİLMESİ: BERGAMA ÖRNEĞİ

Aygün Gürsoy, Aslı
Yüksek Lisans, Kültürel Mirası Koruma
Tez Danışmanı: Doç. Dr. Ayşe Güliz Bilgin Altınöz
Ortak Tez Danışmanı: Dr. Sibel Yıldırım Esen

Aralık 2019, 195 sayfa

Dünyadaki afet sayısı, deprem, sel ve yangın gibi doğal, insan ve iklim değişikliği kaynaklı etkenler nedeniyle her yıl artmaktadır. Bu sebeple, yenilenemeyen kaynaklar olan kültürel miras alanları da afetlerin yıkıcı etkisi altındadır. Tehdit altındaki bu alanlarının korunmasına ilişkin uluslararası çalışmalar son yıllarda artmıştır. 2010 yılında UNESCO, ICCROM, ICOMOS, IUCN tarafından afet risk yönetimi sürecini dünya miras alanları için tanımlamak amacıyla 'Dünya Mirası için Afet Risklerini Yönetme' başlıklı bir el kitabı hazırlanmıştır.

Türkiye, tarihi ve kültürel zenginlikleri nedeniyle UNESCO dünya miras alanları da dahil olmak üzere çok sayıda miras alanına sahiptir. Ancak Türkiye'nin bir afet ülkesi olması nedeniyle, söz konusu alanlar doğal, insan ve iklim değişikliği kaynaklı çeşitli afet türlerine maruz kalmaktadır. Kültürel mirası tehdit eden risklerin, etkili yönetim stratejileri ile yönetilmesi, ülkenin kültürel zenginliğinin korunması için zorunludur. Dolayısıyla, Türkiye'deki bir dünya miras alanının afet risk yönetiminin yukarıda değinilen el kitabında yer alan uluslararası standartlar çerçevesinde değerlendirilmesi, kültürel miras için afet riski yönetiminde güçlendirilmesi gereken alanların anlaşılması açısından önemlidir.

Dünya Miras Alanları için hazırlanan el kitabındaki uluslararası yaklaşımları izleyen bu çalışma, el kitabının Türkiye bağlamında uygulanabilirliğini, bir dünya miras alanı olan Bergama Çok Katmanlı Kültürel Peyzaj Alanı'nın afet risk yönetimini değerlendirerek test etmeyi amaçlamıştır. Çalışma kapsamında, çalışma alanını tehdit eden riskler tanımlanmış ve kültürel miras için afet riski yönetim süreçlerinin (tanımlama, önleme, azaltma, afetlere hazırlıklı olma, müdahale, iyileştirme) mevcut sistem, araç ve mekanizmaları incelenmiştir. Türkiye'deki kamu kuruluşlarının görev ve sorumlulukları değerlendirilerek, kültürel miras için afet riski yönetiminin mevcut risk yönetimi sistemlerine entegrasyonu için öneriler geliştirilmiştir. Risk değerlendirme ve etkili risk yönetimi, doğal ve insan kaynaklı afetlere ve kültür varlıklarının hasar görebilirliklerine ilişkin önemli miktarda verinin toplanmasını ve işlenmesini gerektirdiğinden, Türkiye'deki sorumlu kuruluşların iş birliği ile risk veri tabanları oluşturulması önerilmiştir.

Anahtar Kelimeler: Afet Riski Yönetimi, Dünya Miras Alanı, Bergama, UNESCO

To the World Heritage Sites damaged by disasters..

ACKNOWLEDGEMENTS

Foremost, I wish to express my sincere gratitude to my supervisor Assoc. Prof. Dr. A. Güliz Bilgin Altınöz for her invaluable guidance and endless encouragements throughout to research. She is always, ever since I first met with her in undergraduate courses, promoting me with her positive attitude. Also, I would like to express my sincere appreciation to my co-supervisor Dr. Sibel Yıldırım Esen for her advice, criticism and guidance from 2.800 km away. It was a challenging and enlightening journey for me with their support.

I also would like to thank to the jury members, Prof. Dr. Neriman Şahin Güçhan, Assist. Prof. Dr. Meltem Şenol Balaban, Prof. Dr. Deniz Özkut, Assoc. Prof. Dr. Mert Nezih Rifaioğlu for their time to listen me and their valuable comments and suggestions. I should add that I am thankful for Assoc. Prof. Dr. Eren Uçkan for his support and guidance.

I am indebted to Fatih Kurunaz from Bergama Municipality for his guidance and sharing his archive and knowledge with me and all other people that answering my questions sincerely during my site visit to Bergama.

I would like to express my thanks to my colleagues in United Nations Development Programme, Aslı, Büşra, Deniz, Ebru, and Shams and my friends Fethiye and Kaan for their understanding and encouragements.

I wish to acknowledge the support and great love of my family, especially my parents Sevim, and Sadık and my sisters Özge, and Özlem for supporting me in my every decision.

Finally, I would like to express my deepest gratitude to my love Bahadır Gürsoy for his encouragement, respect, endless patience and loving care.

TABLE OF CONTENTS

APPENDICES

LIST OF TABLES

TABLES

LIST OF FIGURES

FIGURES

LIST OF ABBREVIATIONS

ABBREVIATIONS

AFAD - Disaster and Emergency Management Presidency

DGoCHM – Directorate General of Cultural Heritage and Museums

DGoF –Directorate General of Foundations

DGoFor – Directorate General of Forestry

DGoGIS – Directorate General of Geographical Information Systems

DGoEIAPI – Directorate General of Environmental Impact Assessment, Permit and Inspection

DGoLA – Directorate General of Local Administrations

DGoM - Directorate General of Meteorology

DGoPNA – Directorate General of Protection of Natural Assets

DRM – Disaster Risk Management

DGSHW – Directorate General of State Hydraulic Works

GAI - German Archaeological Institute

GFDRR - Global Facility for Disaster Reduction and Recovery

ICOM – International Council of Museum

ICOMOS – International Council on Monuments and Sites

ICORP – International Committee on Risk Preparedness

ICCROM - International Centre for the Study of the Preservation and Restoration of Cultural Property

IUCN – International Union For Conservation of Nature And Natural Resources

MoAF - Ministry of Agriculture and Forestry

MoCT – Republic of Turkey Ministry of Culture and Tourism

MoENS – Republic of Turkey Ministry of Energy and Natural Resources

MoEU – Republic of Turkey Ministry of Environment and Urbanization

MoIA – Republic of Turkey Ministry of Internal Affairs

MM – Metropolitan Municipality

NGOs – Non-governmental Organizations

OUV – Outstanding Universal Value

SOC – State of Conservation

TAMP – Turkey National Disaster Response Plan (Türkiye Afet Müdahale Planı)

UDSEP – National Earthquake Strategy and Action Plan (Ulusal Deprem Stratejisi ve Eylem Planı)

UNESCO – United Nations Educational, Scientific and Cultural Organization

WH – World Heritage

WHC - World Heritage Center

WHCo – World Heritage Committee

WHF – World Heritage Fund

WHS – World Heritage Site

CHAPTER 1

INTRODUCTION

Artifacts have always been under the destructive effects of time. These effects are crueler for cultural heritage that is defined as tangible artifacts or intangible attributes that "are inherited from past generations, maintained in the present and bestowed for the benefit of future generations[1]" because it is not a renewable source of humankind's effort. It contains all the details that are unique to its creation time; construction techniques, structural systems, functional systems, ability to overcome disasters, building materials, and ornaments. All these have been created with traditional knowledge that provides the best harmony with and adaptation to the environment with the knowledge accumulated through centuries.

Contributions of cultural heritage are more important than heritage itself. It has numerous values (Figure 1.1) that touch different sides of life, and it is a pillar of sustainable development, plays an important part in social cohesion, well-being, creativity, and economic appeal, and it is a factor in the promotion of understanding between communities[2]. It is emphasized that "many people, especially the ones living in poor conditions, depend directly on ecosystems for their livelihoods, their economic, social and physical well-being and their cultural heritage[3]". Therefore, cultural heritage is the driver of inclusive economic development by creating decent job opportunities for local people like in the fields of tourism, handicrafts, food production, and accommodation facilities.

[1]UNESCO. Tangible Cultural Heritage. Retrieved from http://www.unesco.org/new/en/cairo/culture/tangible-cultural-heritage/

[2] ICOMOS (2011) The Paris Declaration On heritage as a driver of development Adopted at Paris, UNESCO headquarters, on Thursday 1st December 2011

[3] UN (2012) Resolution adopted by the General Assembly on 27 July 2012. The Future We Want. A/Res/66/288:6

Reigl (1902)	Lipe (1984)	Burra Charter (1998)	Frey (1997)	English Heritage (1997)
Age	Economic	Aesthetic	Monetary	Cultural
Historical	Aesthetic	Historic	Option	Educational and academic
Commemorative	Associative-symbolic	Scientific	Existence	Economic
Use	Informational	Social (including spiritual,	Bequest	Resource
Newness		political, national, other	Prestige	Recreational
		cultural)	Educational	Aesthetic

Figure 1.1 *Values of cultural heritage defined by various scholars and organizations. (The Getty Conservation Institute, 2002:9)*

The cultural and natural heritage of the world is invaluable – representing our collective progress over generations; capturing important milestones in history; and illustrating the incredible diversity and fragility of our environment. As the world faces increasing challenges ranging from the global economic crisis to climate change, it is crucial to identify, protect and preserve this heritage for it to outlast [4].

The time that passed over the life of an heritage includes not only the slow process of decay that caused by dampness, soluble salts, bio-deterioration, air pollution but also some sudden, unexpected phenomena that caused by earthquake, flood, fire, mass tourism, war which can caused by both nature, human-induced and climate change reasons[5].

Although the importance of cultural heritage and the severity of the effects of disasters all around the world are widely known, in practice, measures taken at WHS for disaster risk prevention and mitigation are limited, and WHS are still being damaged as a result of hazards. As recent examples, "Site of Palmyra" from Syria which was inscribed on the World Heritage List in 1980, has been destroyed partly because of Syrian war started in 2011; Notre-Dame Cathedral in Paris which was inscribed in 1991 as a part of "Paris, Banks of the Seine" was destructively affected by fire in 2019;

[4] UNESCO (2014) Background Guide. Strengthening Disaster Risk Reduction Strategies in Order to Protect UNESCO World Heritage Sites
[5] UNESCO, ICCROM, ICOMOS, IUCN . (2010). Managing Disaster Risks for World Heritage:59,60

"Venice and Its Lagoon" which was inscribed in 1987 was flooded as affecting the whole city in 2019.

1.1. Definition of the Problem

During the past 20 years, disaster frequency is increasing mainly due to climate-related events like urban and river floods[6]. When uncontrolled development related to urbanization in disaster-prone areas happen together with poor governance and ecosystem failures, people and assets begin to be exposed more risks[7] (Figure 1.2). Global statistics and studies about disaster risks show that, although heritage sites are not usually considered, irreplaceable cultural sites, some of them have OUV as WHS, are increasingly affected by the disasters that are caused by natural, human-induced and climate change caused hazards[8].

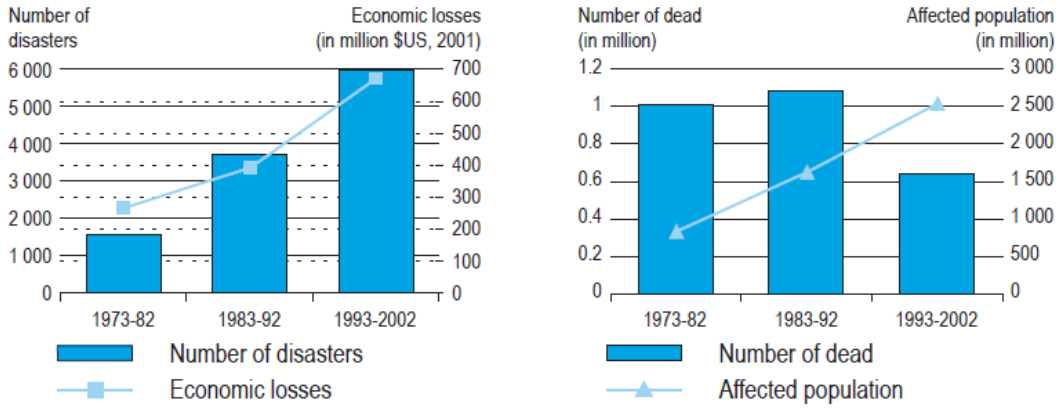


Figure 1.2 *Increasing the number of disasters and their increasing impact on human and economy. (as cited in UN/ISDR (2004) Living with Risk. A Global Review of Disaster Reduction Initiatives. Geneva, Volume 1:3)*

[6] Centre for Research on the Epidemiology of Disasters CRED (2015). The Human Cost of Natural Disasters, A Global Perspective:7-10

[7] UN/ISDR, (2009). Global Assessment Report on Disaster Risk Reduction Risk and poverty in a changing climate, Invest today for a safer tomorrow. Retrieved from; https://www.unisdr.org/we/inform/publications/9413

[8] UN/ISDR, Marsh, ICCROM, ICOMOS-ICORP, and UNESCO (2013) Heritage And Resilience; Issues and Opportunities for Reducing Disaster Risks:15

In recent years, while international studies have been increasing about managing risks for cultural heritage, the studies are limited in Turkey[9] although it is both a land of cultural heritage and risks like an earthquake (Figure 1.3), flood, fire and landslide. Fortunately, the topic is a growing trend nowadays with the help of internationally funded projects[10] but there are not any comprehensive DRM plans and policies regarding WHS in Turkey. There is a lack of a formulated approach that addresses the concept of DRM for the sustainability of Turkey's WHS.

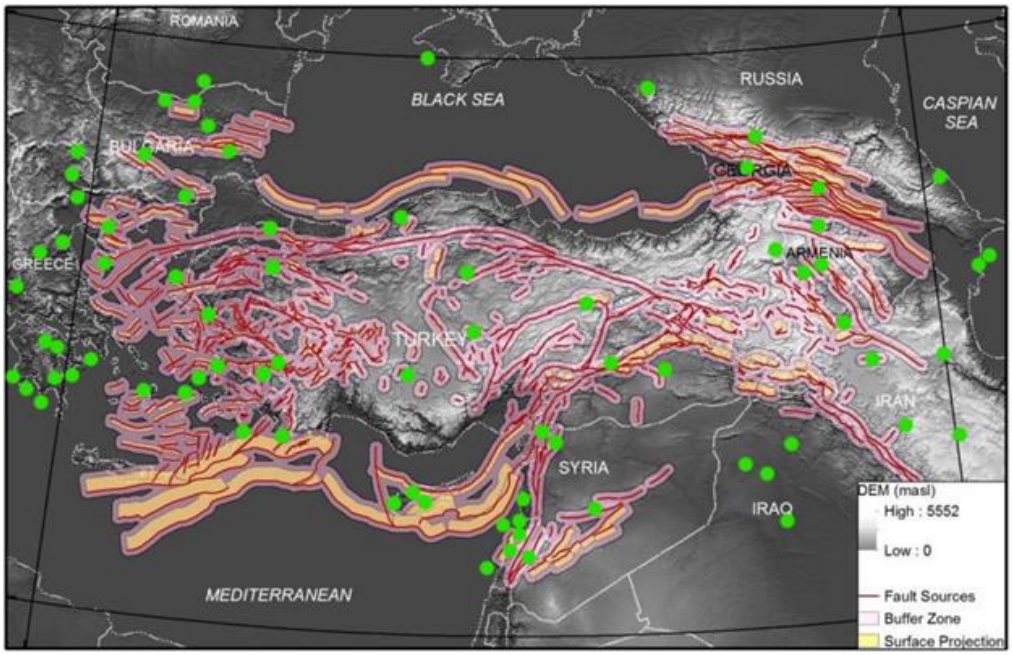


Figure 1.3 *Turkey fault line and seismicity map and WHS. (Prepared by the author using Akkar et al., 2017 & UNESCO WHS List)*

1.2. Aim and Scope of the Study

State Parties, the Advisory Bodies, and the World Heritage Centre have been encouraged to add risk management components to Site Management Plans of WHS and to integrate WHS to their national DRM plans according to the meeting held at

[9] See page 30-31 under the title '2.4. National Context of Disaster Risk Management for Cultural Heritage' for related studies.
[10] See page 32-33 under the title '2.4. National Context of Disaster Risk Management for Cultural Heritage' for related internationally funded studies.

Vilnius by WHCo in 2006[11]. Therefore, each WHS should be identified in terms of disaster risks and should have prevention and mitigation regulations, so each should have a "Disaster Risk Management Plan" (Figure 1.4). When a cultural heritage site is declared as a World Heritage Site, a "Site Management Plan" has to be prepared for the site, and the plan should include regulations regarding disaster risk management.

According to Feilden and Jokilehto (1993) after a site inscribed as WHS, only a few numbers of States Parties have adapted their administrative and city planning processes procedures by realizing this new title and its new challenges as tourism and new development bring to the site[12]. In spite of there are DRM plan and regulations for limited numbers of WHS[13], most of the WHS, especially for those located in developing countries, do not have a DRM[14] plan.

The concept of DRM needs to be addressed for sustainability of Turkey's WHS. The approach should include definitions of risk management terms and concepts, identification, assessment and mitigation of risks and implementation of these decisions that will make WHS resilient to risks with a proactive approach within a multidisciplinary organization and multi-institutional governance.

The manual "Managing Disaster Risks for World Heritage" prepared by UNESCO, ICCROM, ICOMOS, IUCN in 2010 gives an overall approach to manage risks based on DRM literature, however, to develop a comprehensive DRM approach for a WHS, specific needs and conditions of that WHS should be assessed. These needs may be related to the WHS itself, its environment, inhabitants, management and availability of relevant data.

---

[11] UNESCO. WHC-06/30.COM/7.2 Retrieved from https://whc.unesco.org/en/decisions/1047/

[12] Feilden B. M. & Jokilehto J. (1993). *Management guidelines for world cultural heritage sites*. ICCROM, UNESCO, ICOMOS. 1998 edition :x

13 i.e. Disaster Risk Management Plan for the Petra Archaeological Park; Safeguarding Venice and its Lagoon, Integrating Technical Flood Protection and Heritage; Conservation Planning for Grimma, Saxony; Risk Management for the Recovery Project of Bam's Cultural Heritage; Identifying and assessing risk associated with climate events for Italy, Ancona; Flood Plan of Bonn etc.

[14] UN/ISDR, Marsh, ICCROM, ICOMOS-ICORP, and UNESCO (2013) Heritage And Resilience; Issues and Opportunities for Reducing Disaster Risks:22

Figure 1.4 *Main Components of Disaster Risk Management Plan (UNESCO, et al., 2010:16)*

This study aims to focus on formulating the DRM framework for a WHS based on the manual that has been prepared to guide management authorities of the sites on creating and implementing the main principles of a DRM by the leading conservation institutions: UNESCO, ICCROM, ICOMOS and IUCN. However, the manual should be tested first to assess its applicability within the context of Turkey; relevant data availability, legal context and specific conditions of the site that a DRM framework wanted to be create.

The Multi-Layered Cultural Landscape of Bergama was selected as the case study area due to its multi-layered cultural landscape[15] which is exposed to multiple natural and human-induced hazards. Bergama is a unique site with its multi-layered structure that was declared as a WHS in 2014 based on the criteria i, ii, iii, iv, vi[16], and it is exposed to the earthquake, fire, urban/river flood, dam, and mining-induced hazards. Although Bergama Site Management Plan has a specific target regarding disasters as "preparing Disaster Risk Management Plan for Everyone", there is not any realized action to reach the target.

[15] Multi-layered landscape is defined as the landscapes "which has been inhabited continuously throughout different eras and where habitation still continues" by Bilgin Altınöz G. A. (1996)
[16]UNESCO. Inscription Criteria for Pergamon and its Multi-Layered Cultural Landscape https://whc.unesco.org/en/list/1457

1.3. Structure and Methodology of the Thesis

The thesis consists of two phases; the first phase is focusing on summarizing the international and national DRM literature for cultural heritage and definition of basic concepts of DRM for cultural heritage beginning from the definition of risk, historical development of DRM for cultural heritage, risks that WHS are facing, how can they be managed; what are the legislative documents, approach and projects of DRM regarding cultural heritage of Turkey; as DRM for WHS how UNESCO is structuring the administrative site of DRM for WHS as a leading agency and what is the approach of the manual.

The second phase is focusing on the case study to answer the following research questions:

- Can the manual be effectively used to prepare a DRM plan for WHS?
- Does the necessary data exist to follow the steps of the guide?
- How can the manual be followed, and a framework of DRM can be developed in the case of Bergama?

All cultural assets of Bergama and all types of hazards, that can be identified through available data, are included within the scope of this study to test the applicability of the manual, addressing all related public institutions working in the fields of cultural heritage conservation, and disaster and emergency management.

As this study aims to test the applicability of the manual to create a framework for managing disaster risks with a proactive approach for a WHS; The Multi-Layered Cultural Landscape of Bergama, a research has been conducted for both DRM concept and the case study site. Literature review regarding the concept includes fundamental terms of the disaster risk and DRM, national and international recommendations and charters, and the archive scanning for Bergama to identified its historical development, so layers of the site, current DRM measures of Bergama, past disasters of the Bergama and existed data to assess disaster risks were completed. These were compiled through

the processes defined by the guide manual ("Managing Disaster Risks for World Heritage") (Figure 1.5).

Within the defined aim, a qualitative research paradigm is adopted for the thesis. For the first phase, a literature review has been compiled via the desk review on general concepts of DRM via related charters, institutions and projects. For the second phase, the dynamics of the case study area, Bergama has defined via reviewing related literature and site survey finding that conducted in summer 2019, the manual that is compatible with the international and national DRM literature has been used for creating a DRM framework for Bergama. The data regarding Bergama as requested to use by the manual has been gathered by the help of national institutions and the Bergama UNESCO World Heritage and Site Management Unit, site analysis maps prepared within the scope of Conservation Master Plan of Bergama have been used.

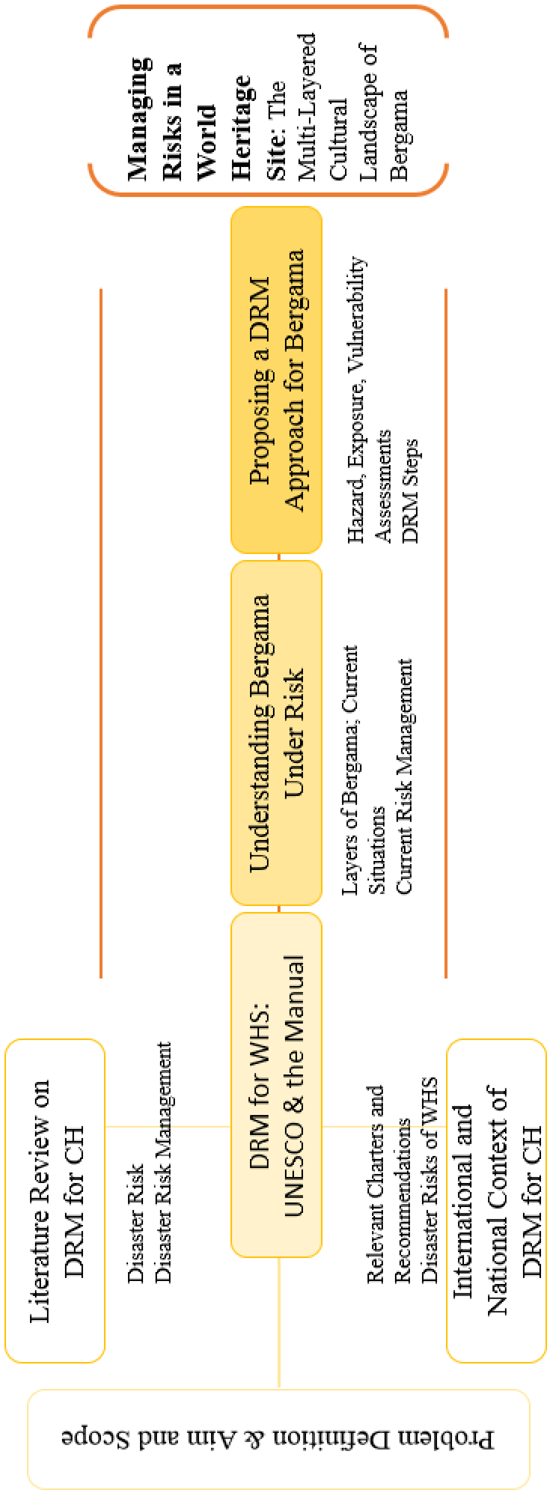


Figure 1.5 *The methodology of the thesis. (Prepared by the author)*

CHAPTER 2

MANAGING DISASTER RISKS FOR WORLD HERITAGE SITES

It is generally thought that disasters are not under human control, they just originated because of natural reasons. However, disasters are a combination of hazards, exposure and vulnerabilities that composed of a complex interaction of several interlocking factors[17]. For the built environment, these are very much within human control. Exposures and vulnerabilities that turn a hazard into a disaster with their presence can be avoidable or at least abatable via a comprehensive disaster risk management. Each type of disaster affects each type of artifact differently according to its vulnerabilities. Therefore, each of them requires unique identification, assessment and prevention measures.

In this chapter, fundamental DRM terms, national and international context regarding DRM were identified in order to analyze the effectiveness of the manual in Bergama case in detail.

2.1. Concept of Disaster Risk for Cultural Heritage

Risk exists in every single part of daily life. Risks should be perceived and be aware for risk management. Focusing on risk management, rather than a catastrophic event itself after it is present, reflects a proactive attitude to deal with potential threats to social and tangible assets before they are lost.

Definition of risk is the first step to create risk awareness. Risk[18] is the potential of loss or injury in general term. In other words, definitions of risk have the possibility,

[17] UNESCO, ICCROM, ICOMOS, IUCN . (2010). Managing Disaster Risks for World Heritage:2

[18] Risk is defined as: "The probability of harmful consequences, or expected losses (deaths, injuries, property, livelihoods, economic activity disrupted or environment damaged) resulting from interactions between natural or human-induced hazards and vulnerable conditions." UN/ISDR (2004) Living with Risk:36

so, in order to elaborate the definition some other terms are needed; hazard and vulnerability. Hazard[19] means any event or situation, that has the potential to cause destructive effects on people, their properties and living environment and urban/rural facilities like physical and social infrastructure. Vulnerability[20] means the susceptibility (exposure) and resilience (existing control) of the community and environment to hazards. Therefore, risk is the product of hazard and vulnerability. To mention risk, there should be a hazard and assets vulnerable to that hazard.

RISK = HAZARD x EXPOSURE x VULNERABILITIY[21]

Disaster means "a serious disruption of the functioning of a community or a society causing widespread human, material, economic or environmental losses which exceeds the ability of the affected community or society to cope using its own resources"[22].

Disaster risk management is applications of strategies and policies regarding to reduce or prevent disaster risks by making people and assets resilience to these risks[23].

In light of the definition of the essential terms, disaster risk can be formulated as a product of hazard, vulnerability, and exposure (Figure 2.1). According to the Hyogo Framework for Action, disaster risk arises when hazards interact with physical, social,

[19] Hazard is defined as: "A potentially damaging physical event, phenomenon or human activity that may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation. Hazards can include latent conditions that may represent future threats and can have different origins: natural (geological, hydro meteorological and biological) or induced by human processes (environmental degradation and technological hazards)" UN/ISDR (2004) Living with Risk:16

[20] Vulnerability is defined as: "The conditions determined by physical, social, economic, and environmental factors or processes, which increase the susceptibility of a community to the impact of hazards". UN/ISDR (2004) Living with Risk:16

[21] UN/ISDR (2004) Living with Risk. A Global Review of Disaster Reduction Initiatives. Geneva, Volume 1:16

[22] UNESCO, ICCROM, ICOMOS & IUCN. (2010). Managing Disaster Risks for World Heritage

[23] UNISDR (2016). Report of the open-ended intergovernmental expert working group on indicators and terminology relating to disaster risk reduction.

economic and environmental vulnerabilities[24]. To refer a disaster risk, the event that named as hazard should occur at a place in which there are vulnerable creatures exposed to the hazard. Therefore, these risks can be managed with creating an appropriate environment.

The same concept of risk is valid for cultural heritage. An event can happen that will have a negative impact on heritage; buildings, monuments, sites, and their use and conservation, the people lives and livelihoods around. Therefore, disaster risk for cultural heritage can be defined as the "*expected loss of value to the heritage asset caused by hazards"*[25].

Disasters, that do not discriminate the assets based on historic or architectural relevance, can be prevented if vulnerabilities, that can be controlled easily than natural hazards which are harder to foresee, can be eradicated. Vulnerabilities are related with the current conditions of an asset determined by the environment it is located in. Therefore, it is very important to work on managing disaster risks for WHS properties, that are generally vulnerable to hazards due to destructive effect of time, in order to mitigate the possible impact of each type of hazards on these remarkable resources.

[24] Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disaster World Conference on Disaster Reduction 18-22 January 2005, Kobe, Hyogo, Japan:1
[25] Canadian Conservation Institute & ICCROM. (2016) A Guide to Risk Management of Cultural Heritage:10

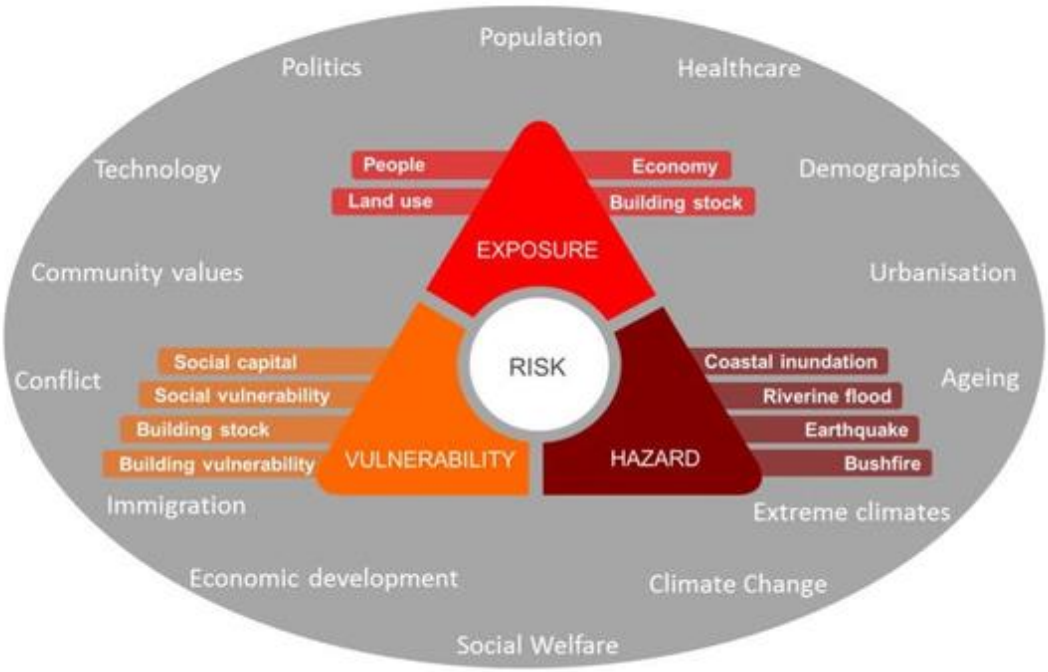


Figure 2.1 *Concept of risk. (Maier H.G., Riddell G. and Delden H., 2017)*

Main types of hazards that may cause disasters can be grouped according to its origin as nature and human. There are some types of hazards, which become frequent, are originating from climate change as well.

Natural hazards are categorized as "meteorological, hydrological, geological / geomorphological, biological, astrophysical" (Table 2.1) while human-induced hazards are "fire, pollution, violence-conflict, gas flaring, infrastructure failure and mining induced" (Table 2.2) and climate change caused hazards are "sea-level rise, desertification and rainfall pattern change" etc. (Table 2.3)[26].

[26] UNESCO, ICCROM, ICOMOS, IUCN . (2010). Managing Disaster Risks for World Heritage:59-60

Table 2.1 Natural hazards (produced by author using UNESCO, et al., 2010)

Meteorological	Storm	high precipitation
		strong wind
		cyclone/ hurricane/ typhoon
		tornado/hail storm
		ice storm
		dust storm
		wave action (at sea/lake)
	fire induced by lightning / static, spontaneous coal /peat combustion	
	drought	
	heatwave	
	high sea-surface temperature	
Hydrological	Flood	precipitation flood – inadequate drainage or infiltration
		flash flood
		river or lake flood
		mass movement dam
		storm surge
	Tsunami	
Geological/ Geomorphological	volcanic	
	seismic	
	mass movement (land and see)	
	erosion (river bank/coast line/reef)	
Biological	epidemics (human, animal, or plant and human-animal transferable diseases)	
	pest infestations	

Table 2.1 *(continued)*

	algal blooms
	rapidly spreading weeds or nuisance plants
	coral bleaching event
Astrophysical	space weather
	meteorite impact

Table 2.2 Human-induced hazards (produced by author using UNESCO, et al., 2010)

Fire (land clearance, arson, accident, drainage of peat soils)		
Pollution (health, e.g. food poisoning, disease)	nuclear/ radioactive accident	
	waste mass movement (unstable spoil heap)	
	air pollution toxic fire or explosion or leak	
	water pollution failure or leak/spill	toxic
		radioactive/nuclear
		organic waste
		sediment
Violence and conflict induced human and wildlife mortality and ecosystem	disease	rapid-acting (SARS, H5N1)
		gradual capacity loss and social disintegration (HIV)
	human wildlife / conflict	poaching, wildlife massacres, species extinction
		wildlife stampedes, predator attacks
	large-scale population dislocation or relocation	rapid loss of vegetation cover (flood, mass movement)
		soil or water contamination
		heavy hunting/ poaching
	illegal activities and violence, e.g. illegal drug trade	

Table 2.2 *(continued)*

	warfare	explosives (nuclear or other)
		biological warfare agents
		firearm use
		landmines
Gas flaring		
Infrastructure failure	water pollution	
	dam or levee failure, flood	
	coastal protection (wall, artificial beach) failure flood and erosion	
	mass movement (e.g. waste slumps)	
Mining-induced	seismic activity and mass movement	
	volcanic activity and mud volcano	
	mass movement	
	climate change and rainfall variation, e.g. mountain-top mining	

Table 2.3 Climate change-induced hazards (produced by author using UNESCO, et al., 2010)

Sea-level rise
Melting permafrost
Rainfall pattern change
Increased storm severity or frequency
Desertification

2.2. Concept of Disaster Risk Management for Cultural Heritage

The damage from disasters is increasing every year with unfortunate results for people, their physical settings and livelihoods[27]. In 2010, the economic loss risk to floods in the OECD, which concentrates about 53% of the global GDP exposed per year, is about 170% more than in 1990[28]. According to Sendai Framework, disaster risks can be significantly reduced by well-planned disaster risk management that consist of

[27] UN/ISDR (2004) Living with Risk. A Global Review of Disaster Reduction Initiatives. Geneva, Volume 1:3

[28] UNISDR. Building cities' resilience to disasters: protecting cultural heritage and adapting to climate change. https://www.unisdr.org/we/inform/events/25027

understanding of risk components, securing the disaster risk governance, creating international-national-local level interconnected platforms, defining stakeholders and their roles, resilience of health infrastructure, cultural heritage and work-places through partnerships, and risk-informed donor policies and programs, including financial support and loans from international financial institutions[29].

DRM aims to prevent new disaster risks, mitigate existing disaster risks, and manage residual risks, as the application of disaster risk reduction policies and strategies[30].

Disaster risk management distinguished into 5 titles by UNISDR[31];

Prospective DRM: managing the occurrence of new or increased disaster risks in case there will not be a disaster risk reduction policies. (focuses future)

Corrective DRM: eliminating or reducing disaster risks which are already present and which need to be managed and reduced now. (focuses present)

Compensatory DRM: strengthening the social and economic resilience of individuals and societies for risk that cannot be effectively reduced. (preparedness, response, and recovery activities)

Community-based DRM: promoting potentially affected communities' involvement in disaster risk management at the local level. (community involvement in the identification, assessment, prevention, and implementation steps)

Local and indigenous peoples' approach to DRM: using traditional, indigenous and local knowledge and practices to complement scientific knowledge in disaster risk assessments and for the planning and implementation of local disaster risk management.

[29] Sendai Framework for Disaster Risk Reduction 2015 – 2030
[30] UN-SPIDER Disaster Risk Management. http://www.un-spider.org/risks-and-disasters/disaster-risk-management
[31] UNISDR (2016). Report of the open-ended intergovernmental expert working group on indicators and terminology relating to disaster risk reduction.

As the number of exposed objects to a disaster increased over time, there was an increasing recognition of disaster risk reduction by countries. Sendai Framework for Disaster Risk Reduction 2015-2030 which is built on Hyogo Framework for Action 2005-2015 prioritizes steps for action as;

1. Understanding disaster risk,

2. Strengthening disaster risk governance to manage disaster risk,

3. Investing in disaster risk reduction for resilience,

4. Enhancing disaster preparedness for effective response and to "Build Back Better" in recovery, rehabilitation, and reconstruction.

The willingness of building resilience of nations to disasters is requiring to follow a well-planned way. Two-sided thinking system should be adopted to understand both the event that will affect the object and the object itself that will be exposed to that event (Figure 2.2).

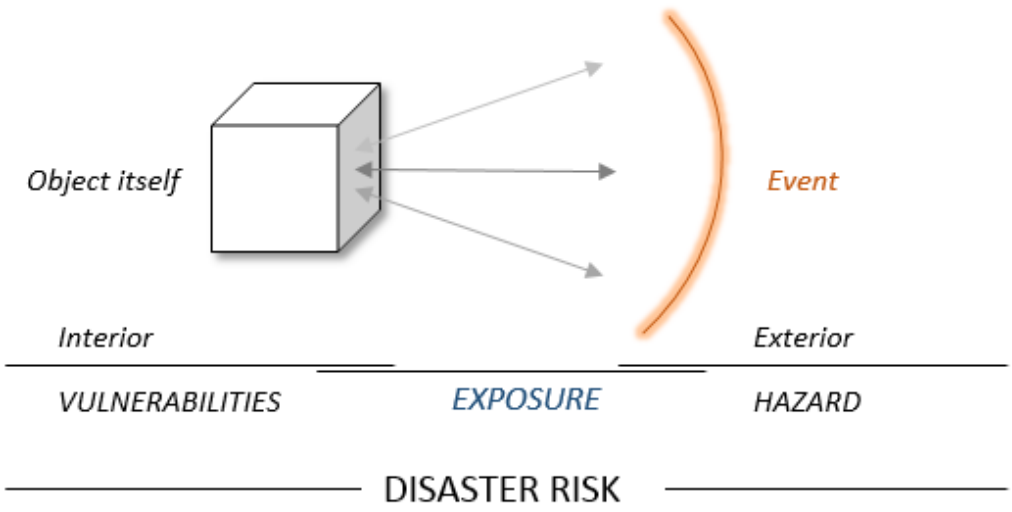


Figure 2.2 *Disaster Risk as a product of vulnerability, exposure and hazard. (Prepared by the author)*

The fundamental aim of the conservation of the object, cultural heritage, is preserving its value and contributions. Even if there is not a sudden case such as disasters, conservation is already a challenge because artifacts are kind of living mechanism that grow old year by year. However, there are always disaster risks that threat to cultural properties.

Although "Hyogo Framework for Action" only covers DRM for cultural heritages under "Social and Economic Development Practices" title by emphasizing the importance of protecting and strengthening culturally important lands as critical public facilities and physical infrastructures[32], it is important to highlight that "Sendai Framework" recognized the importance of cultural heritage for community resilience by underlying the urgency and criticality of planning for and reduce disaster risk in order to protect persons more effectively, communities and countries, their livelihoods, health, cultural heritage, socioeconomic assets and ecosystems, and thus strengthen their resilience under lessons learned and gaps identified from Hyogo Framework[33]. Therefore, DRM for cultural heritages found its place under all titles as a universal concern.

In 1987, first years of recognizing cultural heritage need a DRM, Sir Bernard Feilden published a book "Between Two Earthquakes" defines risk as to the probable loss, combining the hazards of location and the vulnerability of buildings and their contents. Risk can be removed, transferred, shared, accepted, or accommodated[34]. In other words, the risk is an abstract term and it should be predicted at the built environment to intervene. Therefore, DRM policies and practices should be based on an understanding of disaster risk in all aspects of vulnerability, exposure to persons and assets, hazard characteristics and the environment[35]. The first step of a DRM should be the identification of risk factors according to the context of the object (Figure 2.3)

[32] Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disaster World Conference on Disaster Reduction 18-22 January 2005, Kobe, Hyogo, Japan:13
[33] Sendai Framework for Disaster Risk Reduction 2015 – 2030
[34] Feilden, B. M. (1987) Between Two Earthquakes. Cultural Property in Seismic Zones
[35] Sendai Framework for Disaster Risk Reduction 2015 – 2030. *Priority 1: Understanding disaster risk:14*

after setting objectives, scope, target, and responsible partners[36]. Prevention and mitigation, preparedness and response, recovery plan, implementation are the next steps as DRM for all branches.

Figure 2.3 *Heritage within its context. (Canadian Conservation Institute & ICCROM. (2016) A Guide to Risk Management of Cultural Heritage)*

Essentially a DRM plan for heritage sites should be made from 3 phases[37] (Figure 2.4);

Preparedness: Focusing the hazards and reduction of the related risk, strengthening the society and property to reduce their vulnerabilities, using the required early warning system, organizing a community-based respond team with professionals. (before disaster)

Response: Mobilizing the conservation team. (first 72 hours after the disaster)

[36]UNESCO, ICCROM, ICOMOS, IUCN. (2010). Managing Disaster Risks for World Heritage:16
[37] Stovel H. (1998). Risk Preparedness: A Management Manual for World Cultural Heritage. ICCROM, UNESCO, ICOMOS, WHC

Recovery: Mitigating the negative impacts, treatment, enhancing preparedness measures.

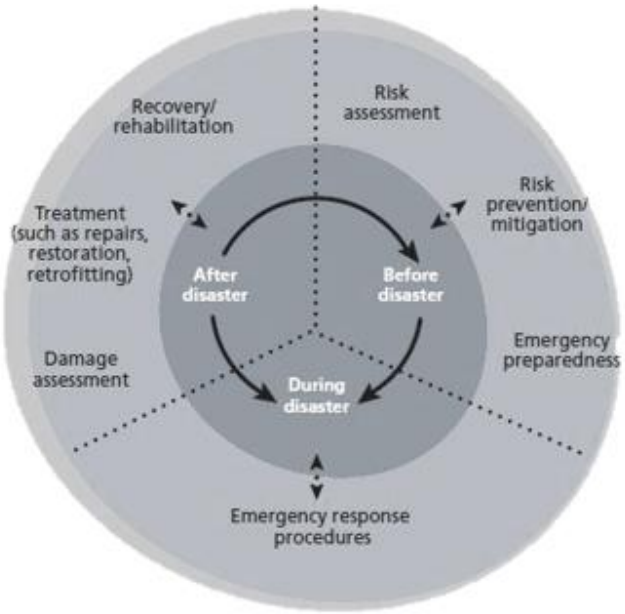


Figure 2.4 *Disaster Risk Management Cycle. (UNESCO, et al., 2010:13)*

A comprehensive DRM plan should define processes for different cases for a heritage property, their environmental settings and with all concerned parties at the urban level and it should be integrated the site management plan.

According to the manual[38]; hazards are an external source of a disaster, but vulnerabilities of heritage properties are inherent weakness of them due to both internal and external characteristics like their location and managerial weaknesses. DRM for WHS aims to prevent or mitigate the destructive effects of disaster on properties; reducing risks to the authenticity, sustainability, and integrity of them together with human lives, environmental settings, and livelihoods. There should be an indissoluble bond between the management plan of WHS and DRM. Also, DRM should be connected to disaster management system at all three levels; local, regional and national. It should not be forgotten that each different scale of heritage such as

[38] UNESCO, ICCROM, ICOMOS, IUCN . (2010). Managing Disaster Risks for World Heritage

historic buildings, historic towns or urban sites, archeological sites, cultural landscapes) has its own dynamics and so needs for DRM.

2.3. International Context of Disaster Risk Management for Cultural Heritage

DRM for cultural heritage is focusing on the protection of artefact or site besides all concern for human lives and livelihoods. The main aim of DRM for WHS is survival of an artifact that is unique to its creation time with its environment.

Settlements have been faced with disasters since the agricultural revolution dated back 10000 BC. As societies were exposed to disasters, they improved the ability to overcome and developed solutions to them. Now, the solutions are named as 'traditional knowledge'. Disasters have created a common language all over the world with the way that people deal with them. To illustrate that common language, two different geographies at two different times developed same techniques to make their structure resistance to earthquake; *pombalino* (armature crosswall) in Portugal at and *hımış* (half-timbered) in Turkey. Thanks to these methods, even the earthquake-prone areas have preserved the artifacts on it until today.

While the conservation of cultural heritage is started to be an international topic first with the "Athens Charter"[39] in 1931 by defining the basic principles for the conservation of historic monuments, it includes one statement related with the external causes of loss that is slow decay which is expected for them all; *"in the conditions of present day life, monuments throughout the world were being threatened to an ever-increasing degree by atmospheric agents*". After World War I and II, a need to establish an international regulatory framework to protect natural and cultural heritage has emerged and steps have been taken in this regard internationally (Table 2.4). In 1965 a "White House Conference" was held at Washington D.C. to motivate working together globally to conserve "the world's superb natural and scenic areas and historic

[39] ICOMOS (2011) The Athens Charter for the Restoration of Historic Monuments – 1931 (Carta del Restauro) . Adopted at the First International Congress of Architects and Technicians of Historic Monuments, Athens 1931. Retrieved from https://www.icomos.org/en/167-the-athens-charter-for-the-restoration-of-historic-monuments

sites for the present and the future of the entire world citizenry"[40]. Next year IUCN proposed to constitute "A Trust for the World Heritage" by stating the importance of natural and cultural heritage as 'all should take the survival of these areas as major concern. Some of the areas, however, are in danger of being damaged or destroyed because of inadequate planning; because of the lack of knowledge of the value of the resources; or because of the cost of management and protection.' at Ninth General Assembly in 1966[41]. In light with the suggestion of these two statements, in 1972 the "Convention concerning the Protection of the World Cultural and Natural Heritage (World Heritage Convention)" was accepted with the agreement of all concerned parties. It is the first international movement to conserve them against all kind of disaster that begins with the statement of *"the cultural heritage and the natural heritage are increasingly threatened with destruction not only by the traditional causes of decay, but also by changing social and economic conditions which aggravate the situation with even more formidable phenomena of damage or destruction"*.

"Washington Charter" sets the scope of the DRM for historic towns by emphasizing "*historic towns (and their settings) should be protected against natural disasters and nuisances such as pollution and vibrations in order to safeguard the heritage and for the security and wellbeing of the residents*" and state the necessity of taken preventive and repair measures regarding the specific requirements of the historic towns[42]. "Valetta Principles" add the climate change and its making frequent effect for the occurrence of hazards to this statement.[43]

Besides the documents such as conventions and charters like "World Heritage Convention" and "Washington Charter" that emphasize the importance of

[40] UNESCO. About World Heritage, The Convention. https://whc.unesco.org/en/convention/
[41] IUCN (1967) Ninth General Assembly, 25 June-2 July 1966, Proceedings. IUCN Publications New Series, Switzerland:73
[42]Charter For The Conservation Of Historic Towns And Urban Areas (Washington Charter 1987) Adopted by ICOMOS General Assembly in Washington, DC, October 1987.
[43]The Valletta Principles for the Safeguarding and Management of Historic Cities, Towns & Urban Areas. Adopted by the 17th ICOMOS General Assembly on 28 November 2011 :5

conservation of cultural heritages and also highlight the vitality of protecting them against natural and human-induced disasters, there are documents that directly focus on DRM for cultural heritage like “Kyoto Declaration” and DRM. The ones that focus on the DRM in general manner can be a road map to understand the framework and implement the general approach on DRM for cultural heritage like “Hyogo Framework for Action” and “Sendai Framework for Disaster Risk Reduction”. All related steps that can be used as guidelines for creating a DRM for cultural heritages and for assessing the current situation of DRM for WHS of Turkey are listed (Table 2.4).

Table 2.4 List of Related Steps

▪ 1954 Hague Convention for the *Protection of Cultural Property in the Event of Armed Conflict* (after a lot of cultural property had destructed during the Second World War [1])
▪ Convention concerning the Protection of the World Cultural and Natural Heritage (*World Heritage Convention*), UNESCO, 1972.
▪ Final Recommendations of the International Course on Preventive Measures for the Protection of *Cultural Property in Earthquake Prone Regions*, Skopje, Yugoslavia, 1985.
▪ Conclusions and Recommendations of the International Workshop on Structural and Functional Rehabilitation of Housing in *Historic Buildings in Seismic Regions*, Mexico City, 1986.
▪ Charter For The *Conservation Of Historic Towns And Urban Areas* (Washington Charter 1987)
▪ The Blue Shield Movement 1992, ICOMOS

Table 2.4 (continued)

▪ Council of Europe, Committee of Ministers, Recommendation No. R(93)9 of the Committee of Ministers to the Member States on the Protection of the *Architectural Heritage against Natural Disasters*, adopted by the Committee of Ministers on 23 November 1993 at the 503rd Meeting of the Ministers' Deputies.
▪ Declaration of Quebec, 1st National Summit on *Heritage and Risk Preparedness*, Quebec City, Canada, 1996.
▪ The Kobe/Tokyo Declaration on *Risk Preparedness for Cultural Heritage*, Kobe/Tokyo International Symposium on Risk Preparedness for Cultural Properties, 1997.
▪ Declaration of Assisi. ICOMOS Scientific Committee for the *Analysis and Restoration of Structures of Architectural Heritage*, Assisi, 27-28 February 1998.
▪ Radenci Declaration, Blue Shield Seminar on the Protection of *Cultural Heritage in Emergencies and Exceptional Situations*, Radenci, Slovenia, 12–16 November 1998.
▪ International Cultural Tourism Charter. *Managing Tourism* at Places of Heritage Significance. Adopted by ICOMOS at the 12th General Assembly in Mexico, October 1999.
▪ Torino Declaration. Resolutions of the First *Blue Shield* International Meeting, Torino, Italy, 2004.
▪ Kyoto Declaration 2005 on the Protection of Cultural Properties, Historic Areas and their Settings from *Loss in Disasters* (adopted at the Kyoto International Symposium 2005 "Towards the Protection of Cultural Properties and Historic Urban Areas from Disaster" that held at Kyoto Kaikan on 16 January 2005)
▪ Hyogo Framework for Action 2005-2015: Building the *Resilience of Nations and Communities to Disaster,* World Conference on Disaster Reduction 18-22 January 2005, Kobe, Hyogo, Japan
▪ Recommendations of the UNESCO/ICCROM/Agency for Cultural Affairs of Japan –Thematic Meeting on Cultural Heritage *Risk Management*, World Conference on Disaster Reduction, Kobe, 2005.
▪ UNESCO / WHC. 2006. Strategy Document for *Reducing Risks from Disasters* at World Heritage Properties. World Heritage Committee, 30th Session, Vilnius, Lithuania, 8–16 July 2006.
▪ Declaration on the *Impact of Climate Change* on Cultural Heritage, International Workshop on Impact of Climate Change on Cultural Heritage, New Delhi (India), 22 May 2007.
▪ UNESCO. International Workshop On *Disaster Risk Reduction at World Heritage Properties*. Olympia, Greece 6th-7th November 2008
▪ Strengthening *Disaster Risk Reduction at World Heritage Properties*: The Olympia Protocol for International Cooperation. UNESCO World Heritage Centre 2009

Table 2.4 (continued)

▪ Strengthening *Disaster Risk Reduction at World Heritage Properties*: The Olympia Protocol for International Cooperation. UNESCO World Heritage Centre 2009
▪ The Valletta Principles for the *Safeguarding and Management of Historic Cities, Towns, and Urban Areas*. Adopted by the 17th ICOMOS General Assembly on 28 November 2011
▪ Sendai Framework for Disaster Risk Reduction 2015 - 2030
▪ International Symposium on *Earthquake Risk Management* of Historical Structures: With a Focus on Turkish Guideline. October 2017

First international step of forming a risk management mechanism for WHS is started in light with the World Heritage Convention. "The List of World Heritage in Danger" established through the suggestion of the Article 11 [44]. For both natural and cultural heritage, properties should be listed as in danger in case of ascertained and potential danger (Table 2.5 and Table 2.6)[45].

Table 2.5 Ascertained Danger for cultural properties (produced by author using UNESCO (2005) Basic Text of the 1972 World Heritage Convention: para.179.a)

Ascertained Danger: *Specific and proven imminent danger*	serious deterioration of materials
	serious deterioration of structure and/or ornamental features
	serious deterioration of architectural or town-planning coherence
	serious deterioration of urban or rural space, or the natural environment
	significant loss of historical authenticity
	important loss of cultural significance

[44] UNESCO (2005) Basic Text of the 1972 World Heritage Convention: Article 11.4
[45] UNESCO (2005) Basic Text of the 1972 World Heritage Convention: para. 179,178

Table 2.6 Potential Danger in case of cultural properties (produced by author using UNESCO (2005) Basic Text of the 1972 World Heritage Convention: para.179.b)

Potential Danger: *Could have deleterious effects on its inherent characteristics*	modification of juridical status of the property diminishing the degree of its protection
	lack of conservation policy
	threatening effects of regional planning projects
	threatening effects of town planning
	outbreak or threat of armed conflict
	gradual changes due to geological, climatic or other environmental factors

An analysis[46] of threats to WHS was carried out between 1994 and 2004 reported 1570 threats for 614 sites from all continents. According to analysis, common threats are[47];

*Urban pressure

* Inadequate/lack of management strategies/priorities/plan/ monitoring/mechanisms

*Natural disasters

* Lack of financial and human resources

*Unclear boundaries

*Natural deterioration

*Over-visiting/tourism pressure

UNESCO reports the conservation status of each WHS since 1979. The World Heritage Center and the Advisory Bodies have prepared 2.642 SOC reports so far. 469

[46] ICOMOS (2005) Threats to World Heritage Sites 1994-2004: An Analysis
[47] ICOMOS (2005) Threats to World Heritage Sites 1994-2004: An Analysis:19,20

properties from 130 party states have been identified in terms of their status conservation by these reports[48]. The "State of Conservation Reports" (SOC reports) evaluates each site with its threads also. The list of threats can be evaluated as risks that WHS suffer all over the world. These are categorized in different areas that may have the possibility of negative impact on WHS (Table 2.7).

[48] UNESCO (2014) State Of Conservation Of World Heritage Properties. A statistical analysis (1979-2013):11

Table 2.7 The list of threats (UNESCO, State of Conservation Information System. List of Threats retrieved from https://whc.unesco.org/en/soc/)

Buildings and Developments	Commercial development, Housing, Industrial areas, Interpretative and visitation facilities, Major visitor accommodation and related infrastructure.
Transportation Infrastructure	Air transport infrastructure, Effects arising from use of transportation of infrastructure, Ground transport infrastructure, Marine transport infrastructure, Underground transport infrastructure.
Services Infrastructures	Localized utilities, Major linear utilities, Non-renewable energy utilities, Renewable energy utilities, Water infrastructure
Pollution	Air pollution, Ground water pollution, Input of excess energy, Pollution of marine waters, Solid waste, Surface water pollution
Biological Resource Use /Modification	Aquaculture, Commercial hunting/ wild plant collection , Crop production, Fishing/collecting aquatic resources, Forestry/wood production, Land conversion, Livestock farming/grazing of domesticated animals, Subsistence hunting/ wild plant collection

Table 2.7 (continued)

Physical Resource Extraction	Mining, Oil and gas, Quarrying, Water
Local Conditions Affecting Physical Fabric	Dust, Micro-organisms, Pests, Radiation/light, Relative humidity, Temperature, Water (rain/water table), Wind
Social/Cultural Use of Heritage	Changes in traditional life/ knowledge system, Identity/ social cohesion changes in local population and community, Impacts of tourism/visitor/recreation, Indigenous hunting, gathering and collection, Ritual/spiritual/religious and associative uses, Society's valuing of heritage
Other Human Activities	Civil unrest, Deliberate destruction of heritage, Illegal activities, Military training, Terrorism, War
Climate Change and Severe Weather Events	Changes to oceanic water, Desertification, Drought, Flooding, Storms, Other climate change impacts, Temperature changes
Sudden Ecological or Geological Events	Avalanche/landslide, Earthquake, Erosion and deposition, Fire (wildfires), Tsunami/tidal wave, Volcanic eruption
Invasive/Alien Species or Hyper-Abundant Species	Hyper-abundant species, Invasive/alien freshwater species, Invasive/alien marine species, Modified genetic materials, Trans-located species

Table 2.7 (continued)

Management and Institutional Factors	Financial resources, Governance, High/low impact research/monitoring activities, Human resources, Legal framework, Management activities, Management systems/management plan

According to a research[49], although the reporting mechanism has listed the threats as a well-documented way, defined disaster risks at SOC reports are not being included the sites management plans (Figure 2.5).

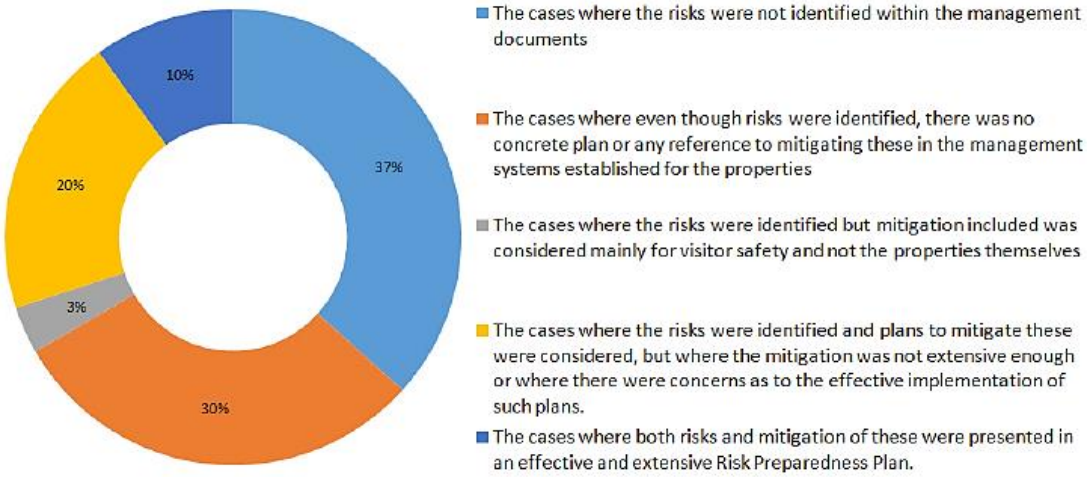


Figure 2.5 *Management plan responses of the WHS according to the risks that were defined at 2012 SOC reports. As cited in UN/ISDR, Marsh, ICCROM, ICOMOS-ICORP, and UNESCO (2013) Heritage and Resilience; Issues and Opportunities for Reducing Disaster Risks:23*

[49] Antoniou, P. (2012) 'Concern for Disaster Risk Reduction in the management of World Heritage Properties: A research through the archives of the World Heritage Centre', UNESCO.

2.4. National Context of Disaster Risk Management for Cultural Heritage

Anatolia has been a settlement through ages with its rich nature and fertile lands. Civilizations that have valuable contributions to history have lived in these lands that today Turkey has a magnificent tangible and intangible cultural heritage. What these communities left behind is an expression of their ways of living and some of them, that have outstanding universal value, have been selected as WHS. These are; "Aphrodisias" (the city of Aydın), "Archaeological Site of Ani" (the city of Kars), "Archaeological Site of Troy" (the city of Çanakkale), "Bursa and Cumalıkızık: the Birth of Ottoman Empire" (the city of Bursa), "City of Safranbolu" (the city of Karabük), "Diyarbakır Fortress and Hevsel Gardens Cultural Landscape" (the city of Diyarbakır), "Ephesus" (the city of İzmir), "Göbekli Tepe" (the city of Şanlıurfa), "Göreme National Park and Rock Sites of Cappadocia" (the city of Nevşehir), "Great Mosque and Hospital of Divriği" (the city of Sivas), "Hattusha: the Hitit Capital" (the city of Çorum), "Hierapolis-Pamukkale" (the city of Denizli), "Historic Areas of İstanbul" (the city of İstanbuk), "Mount Nemrut" (the city of Adıyaman), "Neolithic Site of Çatalhöyük" (the city of Konya), "Pergamon and its Multi-Layered Cultural Landscape" (the city of İzmir), "Selimiye Mosque and its Social Complex" (the city of Edirne), "Xanthos-Letoon" (the city of Antalya).

Accompanied by numerous cultural and natural heritage, Turkey is the land of both natural and human-induced hazards because of its tectonic, seismic, topographic, climatic, and political nature. All these hazards can become a disaster with the vulnerabilities of exposed objects. According to GFDRR[50], Turkey is a river flood, urban flood, coastal flood, earthquake, landslide, tsunami, volcano, cyclone, water scarcity, extreme heat, and wildfire area (Figure 2.6). Also, cultural and natural heritage of Turkey suffer from urban pressure, lack of management and tourism pressure.

[50] Global Facility for Disaster Reduction and Recovery. Turkey, https://www.gfdrr.org/turkey

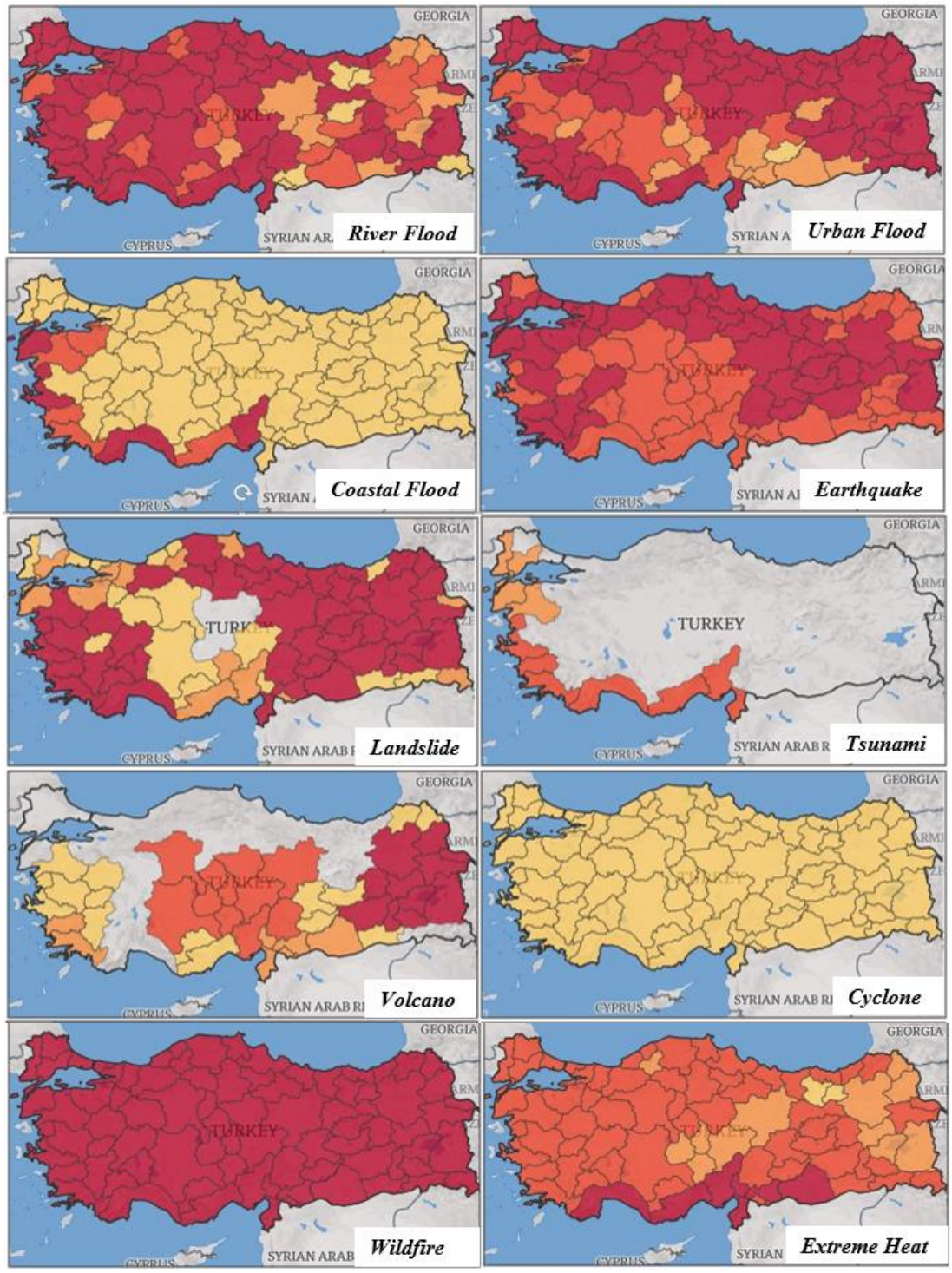


Figure 2.6. *Natural hazards and hazard level classification maps of Turkey. (Retrieved from http://thinkhazard.org/en/report/249-turkey/FL)*

Turkey has following a progressive process in the field of DRM. First policies regarding disasters have been dated back to 1939 after City of Erzincan Earthquake which approximately 33.000 people killed, and 100.000 people left injured[51]. Until 1958, policies were focusing on relieving the impacts of disasters which were occurred in a certain place; for example "Relocation of Kale District of Tavas Province that was exposed to Landslide" in 1954 (Code No: 6409)[52]. The national legal gap has been filled in the field of 'damage reduction after disaster' with the "*Law on Precautions to be Taken due to Disaster Affecting Public Life and Assistance to be Provided"* (Code No: 7269) in 1959. Legal reforms have been continued with the "*Principles of the Organization and Planning of Emergency Assistance Regarding Disasters"* in 1988. However, the 1999 Marmara Earthquake constituted the milestone of these regulations. The earthquake devastated the region and demonstrated the urgent need for disaster management planning. In order to respond the need and to develop more comprehensive disaster management approach, the government established the "Disaster and Emergency Management Presidency" (AFAD) in 2009. AFAD has shifted the disaster management model from 'Crisis Management' to 'Risk Management' and so introduced 'Integrated Disaster Management System'. This new system that was introduced to Turkey, has been already offering internationally accepted steps for DRM for Turkey. AFAD prepared two plans regarding DRM;

*__National Earthquake Strategy and Action Plan__ (Ulusal Deprem Stratejisi ve Eylem Planı (UDSEP)) 2012-2023 was completed in 2011. Goals of the plan are[53];

- Goal A: Learning about earthquakes
- Goal B: Earthquake safe settlement and construction
- Goal C: Coping with the consequences of earthquake

[51] AFAD (Disaster and Emergency Management Presidency). AFAD Hakkında. https://www.afad.gov.tr/tr/2211/AFAD-Hakkinda

[52] Tercan, B. (2018). Koruma Politikaları: Tarihi, Kültür ve Doğa Varlıklarının Afetlere KArşı Korunması. Sosyal Bilimler Enstitüsü Dergisi, The Journal of Social Sciences Institute Sayı/Issue: 40 – Sayfa / Page: 299-318: 305
ISSN: 1302-6879 VAN/TURKEY

[53] AFAD (2011) Ulusal Deprem Stratejisi ve Eylem Planı (UDSEP)

Objective B.2: Protection of the Historic and Cultural Heritage from Earthquakes that is under Goal B highlighted the safeguarding measures of masonry - timber structures and museum object. Masonry, timber structures and the structures constructed with the combination of these two techniques are defined as the most common type of historic buildings. For these structures, the actions of the objective states that 'a complete inventory should be assembled, their earthquake safety assessed and those without adequate safety should be strengthened in ways that will preserve their historic qualities and with international requirements'. Also, for museum artifacts, the action states that vulnerability of them should be reduced by developing convenient methods. The Commission of *Protection of the Historic and Cultural Heritage from Earthquakes* have been formed within the scope of the plan.

***Turkey National Disaster Response Plan** (Türkiye Afet Müdahale Planı (TAMP)) was launched in 2015 to guide all disaster and emergency response. The plan aims to[54];

- Save lives,
- Restore daily life activities as soon as possible,
- Carry out response activities in a fast and planned manner,
- Maintain and sustain public health,
- Protect property, environment, and ***cultural heritage***,
- Minimize economic and social losses,
- Prevent or reduce the effects of secondary disasters,
- Ensure the efficient use of resources.

When all related legislative documents of Turkey are analyzed within the scope of DRM for cultural heritage, it is seen that there is not a strong or direct relationship between them (see Appendices A). In addition to these documents, "*Law on Transformation of Areas under Disaster Risk"* (Code No: 6306) which has been

[54] AFAD (2015) Türkiye Afet Müdahale Planı (TAMP)

enacted in 2012 overrides the provisions and regulations of "*Protection and Usage of the Eroded Immovable Cultural Assets through Renovating and Sustaining"* (Code No: 5366) and "*Law on the Conservation of Cultural and Natural Property"* (Code No: 2863) for conservation of cultural heritages that are under disaster risk and conservation responsibility of these properties have been given to MoEU while they should be given MoCT according to the 5366 and 2863 coded laws[55].

As summarized above, although Anatolia has been facing disasters through ages, DRM is a newly emerging concept for Turkey, and it is focusing on earthquake related measures mainly. DRM for cultural heritage is a newer concept and safeguarded with laws for the last five years (see Appendices A). Fortunately, it is a trending concept nowadays and making realized and applied by internationally funded projects. In addition to legislative regulations, projects related to conservation of cultural heritage against disaster are begun to be developed.

SARAT ("Safeguarding Archeological Assets of Turkey")

With the partnership of British Institute at Ankara (BIAA), ANAMED (Koç University Research Center for Anatolian Civilizations), The International Council of Museums, United Kingdom (ICOM UK)

The project is aiming to contribute to the safeguarding of Turkey's archaeological assets through people-oriented approaches that enhance capacity and awareness. One of the objectives of the project is 'Increase risk-management knowledge and experience about how to deal with potential emergencies in the museums housing Turkey's vast store of archaeological assets'[56].

[55] See Appendices A for related regulations of these laws for DRM regarding CH.
[56] https://www.saratprojesi.com

ISMEP ("Istanbul Seismic Risk Mitigation and Emergency Preparedness Project")

With the partnership of World Bank, Republic of Turkey Ministry of Treasury and Finance,) the Istanbul Project Coordination Unit (IPCU) under Istanbul Special Provincial Administration (ISPA)

The aim of the project is to make the city ready for a possible earthquake. Cultural heritage buildings are being assessed in terms of risks under the supervision of the "Ministry of Culture and Tourism" (MoCT) and "Istanbul Directorate of Surveying and Monuments" (IDSM) to assist the Government of Turkey in order to mitigate the destructive effects of the seismic risks on heritage properties that are located in Istanbul. Within the scope of the project '*Earthquake Risks Management Guide for Historical Buildings*' was prepared. Also, '*Conservation of Cultural Heritage*' is one of the eight guidebooks prepared[57].

Earthquake Risks Management Guide for Historical Buildings; is the first guide that has a comprehensive approach in risk management for historical artifacts. The guide scans the risk management topic broadly by starting from the basic definitions and concept regarding cultural heritage, disaster risk management, and construction materials/structural engineering. The guide also highlights the importance of documentary sources, site studies (from the scale of experiments for materials and structural system of the building to survey of seismicity and ground) and structural modeling/assessment according to the type of the structure. The guide recommends selecting the related intervention method/s after the described identification methods and lists them within a focus of an earthquake[58].

[57] https://www.ipkb.gov.tr/ismep

[58] T.C. İstanbul Valiliği, T.C. Başbakanlık Vakıflar Genel Müdürlüğü, T.C. Kültür ve Turizm Bakanlığı, İstanbul Proje Koordinasyon Birimi & ICOMOS Türkiye (2017). Tarihi Yapılar için Deprem Risklerinin Yönetimi Kılavuzu.

STORM ("Safeguarding Cultural Heritage through Technical and Organizational Resources Management")

With the partnership of Boğaziçi University, Kandilli Observatory And Earthquake Research Institute and Republic of Turkey MoCT, Directorate General of Cultural Assets and Museums. (for Turkey[59])

The project provides critical decision-making tools to all stakeholders face climate change and natural hazards. The project improves existing processes related to three identified areas: Prevention, Intervention and Policies, Planning, Processes. The case studies are in five different countries: Italy/Diocletian Baths, United Kingdom/ Mellor Heritage Project, Portugal/Roman Ruins of Tróia, Greece/Rethymno Historical Centre and Turkey/Ephesus. The type of managed risks is the most prevalent in each site and region, contributing to building a European risk map[60]. Within the scope of the project a platform was launched and the sites has been integrated to this platform with their up to date information about current situation, legal status, previous interventions, sensors that were added to the sites regarding expected hazards and legal environment

[59] The project is composed of twenty partners:
One Large Industry: Engineering Ingegneria Informatica (ENG).
Six Academic/Research Partners: Instituto de Novas Tecnologias (INOV); Foundation for Research and Technology (FORTH); Piraeus University of Applied Sciences (Technological Educational Institute of Piraeus – TEIP); Università degli Studi della Tuscia (TUSCIA); University of Stuttgart (USTUTT); University of Salford (USAL).
Four SMEs: ResilTech (RESIL); KPeople (KP); Sparta Digital (SPA); Nova Conservação (NCR).
Five Cultural Sites: Soprintendenza Speciale per il Colosseo, il Museo Nazionale Romano e l'Area archeologica di Roma (SSCOL); Mellor Archaeological Trust (MAT); Troia Resort (TRO); Ephorate of Antiquities of Rethymno (EFARETH); Bogazici University (BU).
Two Governmental Institutions: Direçaõ-Geral do Património Cultural (DGPC); Zentralanstalt für Meteorologie und Geodynamik (ZAMG).
Two Rescue Organizations: Corpo Nazionale dei Vigili del Fuoco (CNVV); Municipio de Grãndola (SMPC).
Seven European Countries are represented: Italy, Greece, Portugal, UK, Germany, Austria, Turkey.
Two are the Associated Partners:
ICCROM (International Centre for the Study of the Preservation and Restoration of Cultural Property).
Pompei (Soprintendenza di Pompei Ercolano e Stabia).
[60] http://www.storm-project.eu

of the countries etc. in order to monitor and assess each site and to inform all stakeholder in case of an emergency about the disaster and its possible affect.

2.5. Disaster Risk Management in World Heritage Sites

WHS that have outstanding universal value and must be protected under laws and international conventions can be exposed to one or more types of disaster[61].

Disasters, of course, do not only affect the physical attributes of the World Heritage that gain them values but they are also endangering for those who live in, work for and visit these sites (Figure 2.7).

Regarding the literature on DRM for cultural heritage, UNESCO is the leading institution to introducing WHS and conserving them against disaster risks. Definition of disaster risks has been started in the nomination processes of a WHS and continued to be supported after inscription at management and monitoring phases via specified tools. In addition, as respectfully to another conventions and charters the manual defines DRM steps to create a plan for WHS. Under this title, administrative structure of UNESCO for DRM and the approach of the manual has been examined.

[61] UNESCO, ICCROM, ICOMOS, IUCN . (2010). Managing Disaster Risks for World Heritage:10

Figure 2.7 *Possible Loses and Interactive Relation between them. (Produced by the author with using UNESCO et. al., 2011)*

2.5.1. Administrative Structure of UNESCO for DRM

Cultural and natural heritage are seen as common and unreplaceable living and inspiration resources for humanity and the whole world can benefit from them. In order to conserve and pass them to future generations, "Convention concerning the Protection of the World Cultural and Natural Heritage" was prepared by UNESCO in 1972 based on the reasons that heritage is being under threat of destruction progressively. This progressive destruction is not only caused by the effects of time but also other conditions that can be caused by the environment of the heritage which can be more destructive.

According to a survey conducted by UNESCO, *"96% of World Heritage sites are potentially exposed to at least one type of natural hazard that may turn into a disaster and threaten the integrity of a site. This represents more than 1500 cultural and natural sites in 144 countries. In terms of population, it was estimated that more than 400 million inhabitants of local communities, living both in largest urban areas and*

in small island communities, are vulnerable to natural hazards at these sites"[62] (Figure 2.8).

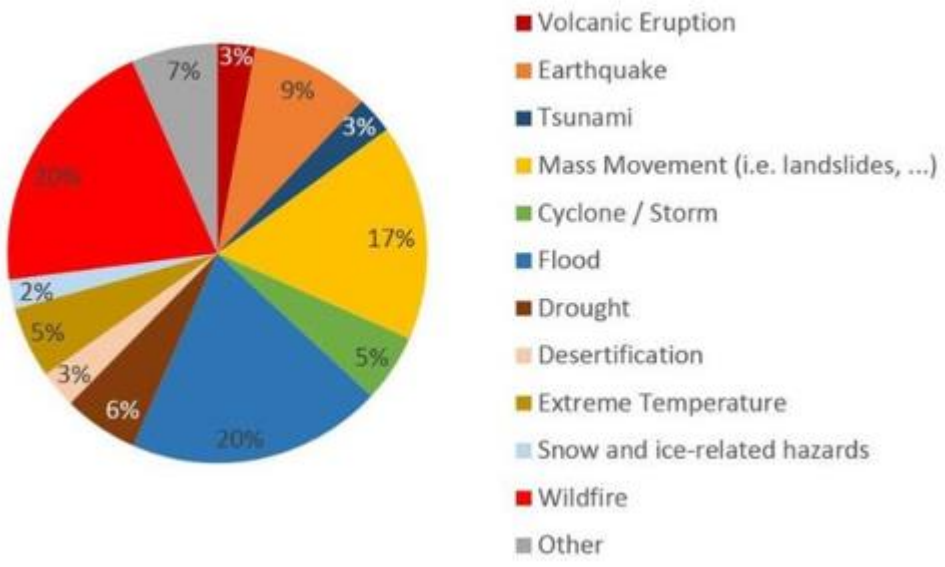


Figure 2.8 *Natural Hazards in UNESCO designated sites, based on the survey addressed to UNESCO designated sites managers in 2015. (UNESCO. Disaster Risk Reduction in UNESCO designated sites. http://www.unesco.org/new/en/natural-sciences/special-themes/disaster-risk-reduction/disaster-risk-reduction-in-unesco-designated-sites/)*

The WHCo ("Intergovernmental Committee for the protection of the World Cultural and Natural Heritage") is in charge of keeping up to date "the list of World Heritage in Danger" in order to take necessary actions and give assistance that has been requested under the convention to diminish the effect of disasters and vulnerabilities of properties[63]. This list should define the estimated cost of the operations and may include only the cultural and natural heritage that is endangered by following risks;

- accelerated/progressed deterioration that may result in total loss,
- mass investments to accelerate urbanization and tourism,

[62] UNESCO. Disaster Risk Reduction in UNESCO designated sites. http://www.unesco.org/new/en/natural-sciences/special-themes/disaster-risk-reduction/disaster-risk-reduction-in-unesco-designated-sites/

[63] UNESCO (2005) Basic Text of the 1972 World Heritage Convention, Article 11.

- use/ownership profile changes of the property that may be resulted in destruction,
- major changes due to unknown reasons,
- abandonment,
- the threat of armed conflict,
- natural disasters.

In order to nominate a property to enter on the World Heritage List, the property should be defined with its "present state of conservation (4.a)" and factors affecting the property (4.b) under "State of Conservation and factors affecting the Property (4)". The pressures on the property is expected to be specified and itemized under the title of "the factors affecting the property" regarding:

i. Development: any kind of possibility that may affect the items' existence, integrity and authenticity like rapid and mall managed urbanization and tourism, unplanned agriculture and mining investments etc.
ii. Environmental: reasons of deterioration that may affect structure pattern and its natural setting.
iii. Natural disasters and risks: identification and assessment of risks for the item with methods of management and mitigation their impacts.
iv. Tourism: description of the "carrying capacity", identifying destructive effects that may be caused by visitors and how to manage these.
v. Dweller number: population estimation for the nominated property within its buffer zone.

"The Hyogo Framework for Action 2005-2015" is the key international framework for disaster risk management and it has provided support to progress "*Strategy for Risk Reduction at World Heritage Properties"* by WHCo. The purposes of the strategy are;

1. Enhancing the conservation of World Heritage properties and creating linkages between them and national DRM policies, plans and their management plans.

2. Integrating DRM to management and planning of WHS and also advising them to use "Emergency Assistance" under WHF when necessary by assisting State Parties, WHCo, the Advisory Bodies (ICCROM, ICOMOS and IUCN) and WHC[64].

"World Heritage Fund" that is developed through the Convention is to provide financial assistance for DRM within the scope of Protection of Heritage. With **"*World Heritage International Assistance Programme"*** under WHF funds can be provided in the fields of emergency assistance, conservation and management and preparatory assistance[65]. UNESCO has also created "List of World Heritage in Danger" that being that list leads to the possibility of the WHC to allocate the assistance through WHF. There is also **"*Rapid Response Facility"*** emergency fund to provide grants for UNESCO natural WHS during sudden crises like disasters[66].

After the "Hyogo Framework", "Sendai Framework for Disaster Risk Reduction 2015-2030" was adopted. This framework defines the 2030 international agenda for disaster risk management and UNESCO is committed to operating in line with it and with the Sustainable Development Goals (SDGs[67]) and the "Paris Agreement" in 2015, to promote a culture of safety and resilience[68].

[64] UNESCO (2007). Convention Concerning The Protection Of The World Cultural And Natural Heritage. WHC-07/31.COM/7.2

[65] UNESCO, International Assistance https://whc.unesco.org/en/intassistance

[66] The Rapid Response Facility. Retrieved from http://www.rapid-response.org/

[67] Sustainable Development Goals are a universal call to action to end poverty, protect the planet and ensure that all people enjoy peace and prosperity, and these are aiming to be achieved by the end of 2030.
SDG 11:Sustainable Cities and Communities. ***Target 11.4:*** Strengthen efforts to protect and safeguard the world's cultural and natural heritage. ***Target 11.B:*** By 2020, substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, and develop and implement, in line with the Sendai Framework for Disaster Risk Reduction 2015-2030, holistic disaster risk management at all levels

[68] UNESCO (2016). Disaster Risk Reduction. UNESCO's contribution to a global challenge.

As a part of the reporting and monitoring mechanism of UNESCO for WHS, State of Conservation Reports (SOCs)[69] are required with the Periodic Reporting[70]. SOCs examine the factors affecting the property (including threads) of properties through processes of Reactive Monitoring. The report shall include[71]:

a) since the last report submitted to WHCo, what are the threats and important enhancement regarding conservation of the property;

(b) reviews about former decisions of the WHCo that indicated at SOC of the property;

(c) indication of if there are any kind of threats that may affect OUV, authenticity and integrity of the property and if there are any damage or loss.

The identification, monitoring, and safeguarding of disaster risks in WHS and their communities by integrating them to and in line with management plans of the sites is highly supported by UNESCO (Figure 2.9). In many places that are identified by UNESCO, there are community and school educational programs for awareness rising about source of natural hazards and how to reduce their effect including "disaster response strategies"[72].

UNESCO recommends establishing a site commission that acts as a guardian of the WHS in a proper manner to national administrative procedures and processes[73]. If the commission has a budget, it can manage the above-mentioned awareness raising activities beside conserving and managing the site that is the primary duty of it.

[69] Since 1979, the reports provide data on "state of conservation" about the threats that WHS suffered or suffers from.
[70] It is a monitoring tool used by *World Heritage Convention* and expected to be submitted by the State Parties at every six years to the WHCo.
[71] UNESCO (2005) Basic Text of the 1972 World Heritage Convention. *Operational Guidelines for the implementation of World Heritage Convention*: 78. Decision 27 COM 7B.106.2
[72]UNESCO. Disaster Risk Reduction in UNESCO designated sites. http://www.unesco.org/new/en/natural-sciences/special-themes/disaster-risk-reduction/disaster-risk-reduction-in-unesco-designated-sites/
[73] Feilden B. M. & Jokilehto J. (1993). *Management guidelines for world cultural heritage sites*. ICCROM, UNESCO, ICOMOS. 1998 edition :3

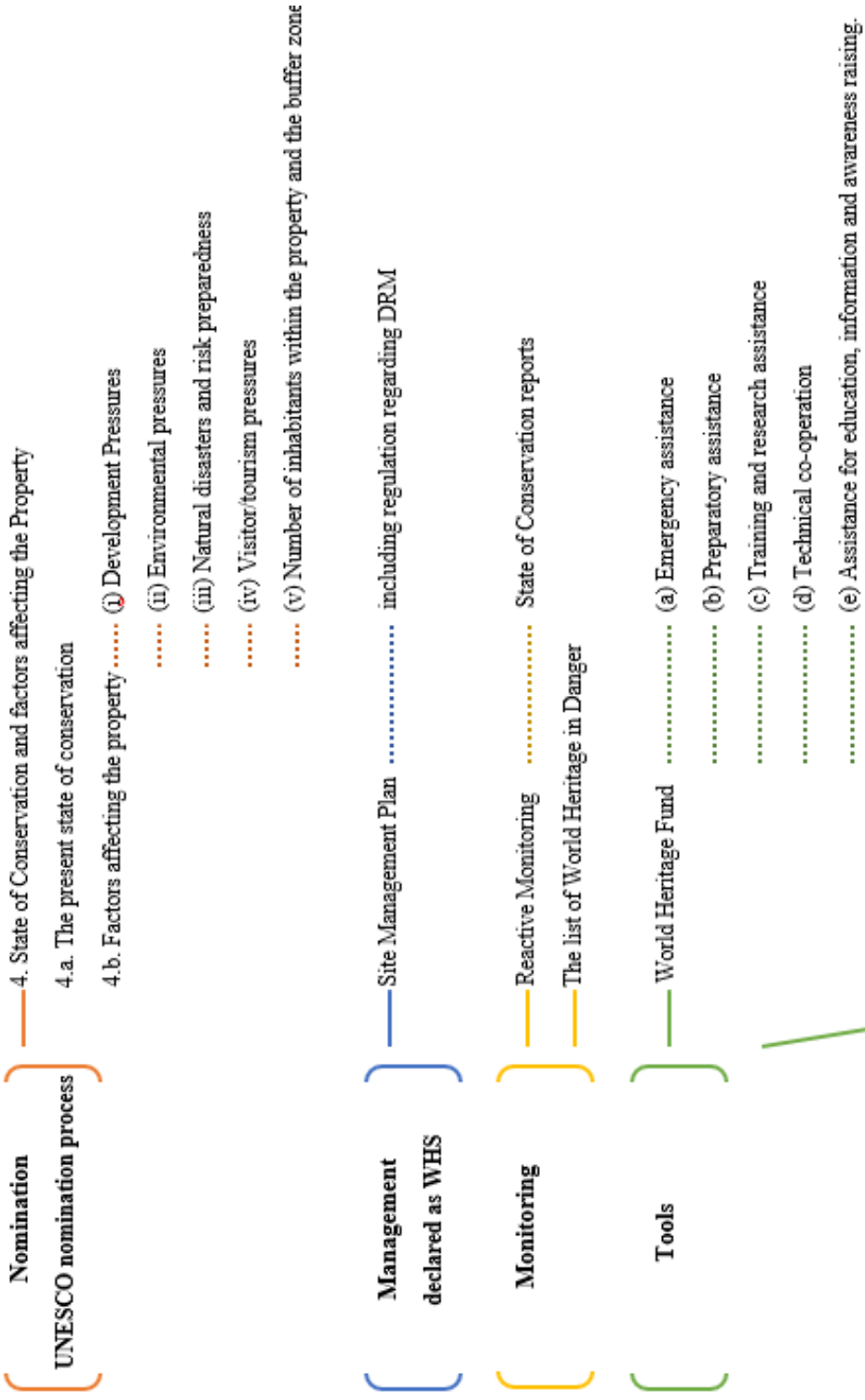


Figure 2.9 *DRM in UNESCO WHS processes (produced by author using UNESCO (2005) Basic Text of the 1972 World Heritage Convention)*

2.5.2. The Approach of the Manual

The manual, "Managing Disaster Risks for World Heritage", prepared by the partnership of UNESCO World Heritage Center, ICCROM, ICOMOS and IUCN has a conceptual approach to define DRM for WHS as a response to need for implementation of World Heritage Convention 1972 and has built on "*Management Guidelines for World Cultural Heritage Sites"* in 1993[74] and "*Risk Preparedness: A Management Manual for World Cultural Heritage"* in 1998[75]. It provides a methodology for identifying, assessing, mitigating the risks associated with disasters to preserve WHS for future generations to States Parties, national and local governments, site managers, citizens and non-governmental organizations linked to WHS and all other stakeholders on the basis of the implementation of the Convention. It explains the necessity and main principles of DRM, relation and integration with national and regional plans, roles of related parties together with the definition of DRM terms, hazards typology, the list of related charters and recommendations and relevant organizations (Figure 2.10).

The guide expresses the importance of heritage structures and the conservation of them as "*The progressive loss of these properties as a result of floods, mudslides, fire, earthquakes, civil unrest, and other hazards has become a major concern, partly because of the significant role that heritage plays in contributing to social cohesion and sustainable development,* ***particularly at times of stress.[76]"***.

[74] Feilden B. M. & Jokilehto J. (1993). *Management guidelines for world cultural heritage sites*. ICCROM, UNESCO, ICOMOS. 1998 edition
[75] Stovel H. (1998). Risk Preparedness: A Management Manual for World Cultural Heritage. ICCROM, UNESCO, ICOMOS, WHC
[76] UNESCO, ICCROM, ICOMOS, IUCN (2010). Managing Disaster Risks for World Heritage :2

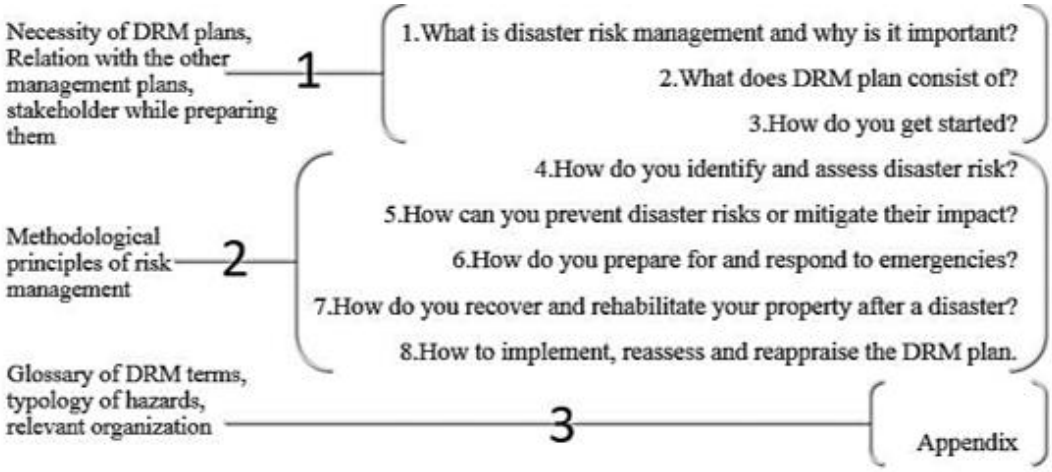


Figure 2.10 *The structure of the manual. (Prepared by the author based on UNESCO, ICCROM, ICOMOS, IUCN (2010). Managing Disaster Risks for World Heritage)*

Cultural and natural heritages can contribute to DRM itself by representing knowledge systems of their times. They cope with the disaster as well as post-disaster phases. To illustrate the importance of the traditional knowledge system, the manual lists that physical planning and construction methods, local management and cooperation system and ecology of the settlement can help to prevent and to mitigate the effect of disasters and post-disaster situations[77]. Therefore, while preparing a DRM plan for a site, traditional knowledge systems should be taken into consideration.

Disaster is defined as "*serious disruption of the functioning of a community or a society causing widespread human, material, economic or environment losses which exceeds the ability of the affected community or society to cope using its own resource"* by the guide including its impact on WHS and its ecosystem in addition to impacts on people and properties. Disaster risk is produced by hazard and vulnerability together.

According to the manual, "all WH properties can be affected by at least one kind of disaster" and, it categorized the hazards that may generally resulted with a disaster as; "meteorological, hydrological, geological, astrophysical, biological, human-induced

[77] UNESCO, ICCROM, ICOMOS, IUCN (2010). Managing Disaster Risks for World Heritage :8

and climate change" (Table 2.1, Table 2.2, Table 2.3)[78]. In addition, the manual explains the relationship of "natural and human-induced" hazards (Figure 2.11). There is always human factor when a hazard turns in to a disaster. Natural disasters are often the result of human activities like building structures in earthquake prone areas. Also, the same hazard can be caused by both nature or human e.g. there can be a flood because of high rainfall or failure of a dam.

Global climate change has both direct and indirect effects on heritage sites; direct one is that it increases the probability of hazards and indirect one is that it increases the vulnerability of them against another hazards. Therefore, while the site is being observed in terms of climate, the process should be monitored to understand the alternating effect of climate change.

[78] as cited in UNESCO et. al., 2010

	Natural	Human-induced	Indirect / secondary
Meteorological	Hurricane Lightning Heavy precipitation		Flooding (coastal / rivers) Fire Mass movement
Hydrological (caused by high rainfall)	Flash flood Landslide / volcanic ash / lava / ice damming of a river Tsunami	Hydrological infra-structure failure (dams, levees, reservoirs, drainage systems) Coastal protection failure (sea walls)	Disease epidemic Pollution
Volcanic	Lava flows Pyroclastic flows Ash and block falls Gases	Mining-induced (e.g. mud volcano)	Lahars (mudflows) Landslides Tsunami Fire
Seismic	Faulting Transient shaking Permanent deformation (e.g. folds) Induced movement (liquefaction and mass movement)	Dam- and reservoir-induced mass movement Mining-induced Explosion / nuclear induced	Mass movement Fire Flood
Mass movement (of snow, ice, rock, soil mud, etc.) (induced by slow-acting erosion or one of the above)	Falls Slumps Slides Flows	Unstable mining / construction waste spoil heaps	

Figure 2.11 *Relationship of natural and human-induced hazards. (UNESCO, ICCROM, ICOMOS, IUCN (2010). Managing Disaster Risks for World Heritage :9)*

WHS can provide livelihoods for people therefore the population growth is becoming much higher than the any other rural regions that do not have a WHS in that country.[79] It means higher disaster risk for more population that covers citizens, visitors and staff. Therefore, although the main aim of a DRM for WHS is to prevent or mitigate the effect of disaster on property, DRM should cover all parts of the site including the human lives, their livelihoods and physical assets.

DRM should concentrate on for which criteria WHS was inscribe on in order to take purpose oriented emergency response actions and for recovery activities. In addition,

[79] as cited in UNESCO, ICCROM, ICOMOS, IUCN (2010). Managing Disaster Risks for World Heritage:1

DRM plan should be concerned with progressive factors like slow decay and inadequate maintenance beside major hazards that may turn a hazard to disaster.

The risks to heritage may originate inside or surrounding environment so buffer zones of WHS should be included in DRM.

Traditional knowledge and management systems of the community should be taken into consideration. It cannot be expected that they develop an emergency response by themselves however they may act collectively within a specific organization to respond disasters[80]. Also, the natural heritage and ecosystem of the cultural heritage may have capacity to absorb risks.

All these concerns as a part of DRM should be engaged in management plan of WHS with detailed assessment of each property has their own specific needs for (tangible / intangible; movable / immovable; living / uninhabited; protected / unprotected) and DRM for WHS should be linked to all level disaster plans.

In brief DRM should[81];

- focus on not only heritage but also human lives, their livelihoods and physical environment
- consider natural and human-induced hazards as well as their secondary and indirect effects
- concern both progressive and sudden factors
- be aware of that disaster may originated inside the item and/or surrounding environment
- monitor the effect of global climate change with its direct and indirect effects on heritage
- take into consideration the inscription criteria of WHS
- be covered by management plans of WHS

[80] UNESCO, ICCROM, ICOMOS, IUCN (2010). Managing Disaster Risks for World Heritage:12
[81] Summarized based on UNESCO, ICCROM, ICOMOS, IUCN (2010). Managing Disaster Risks for World Heritage

- pay regard to traditional knowledge and management systems
- regard that each heritage has its own specific need

DRM that concerns all above mentioned, has three mains steps (Figure 2.12); before, during and after disasters.

- *Before disaster* step has preparedness actions like risk identification and assessment; mitigation and prevention measures for defined hazards like maintenance and monitoring for heritage; emergency preparedness via composing an emergency response team, preparing an evacuation plan, warning systems, and drills; creating/implementing DRM policies with the emergency preparedness actions.
- *During disaster* step that lasts for "first 72 hours after the disaster" covers implementation of emergency response actions and procedures that planned, developed and practiced before disaster to save human lives and safeguarding the value of heritage.
- *After disaster* step has damage assessment and treatment of these damages by appropriate intervention such as repairing, restoration, retrofitting, and recovery. This cycle should be reviewed after a disaster or by drill and it should be available at the heritage and for local people.

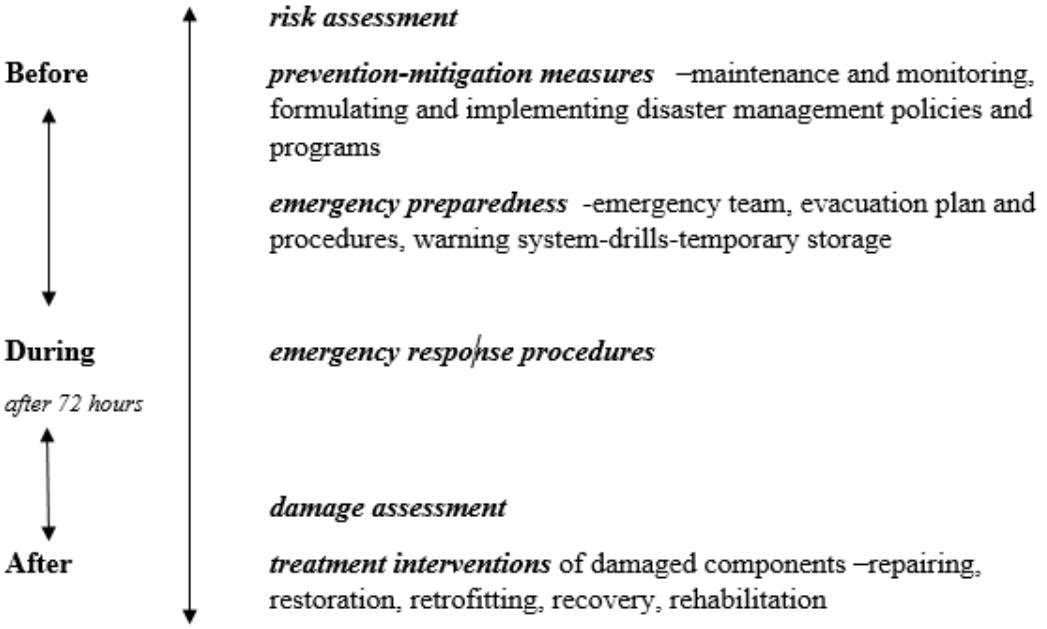


Figure 2.12 *DRM steps (produced by author based on UNESCO, et al., 2010)*

DRM plan should[82];

- define the main aims and scope of the plan and the responsible parties for the implementation of the plan
- identify tools, techniques and implementation strategies in line with before, during and after steps
- define processes for all different situation that followed by responsible authors
- provide timeline for periodic reviews
- be comprehensive in terms of scale and inclusive in terms of municipality, fire, police etc. departments
- raise public awareness
- be linked with the current site management plan, systems and upper scale disaster risk reduction plans (DRM plan for WHS should be integrated both the DRM system for all levels and the management plan for WHS)

[82] Summarized based on UNESCO, ICCROM, ICOMOS, IUCN (2010). Managing Disaster Risks for World Heritage

In order to integrate DRM to site management plan, DRM should be based on the statement of OUV and the boundaries defined as a WHS in terms of assessing the risk. The "*geology, hydrology, climate, land use, human population characteristics, transport and new developments (particularly infrastructure, industry, mining)"*[83] of the site should be investigated to reduce the existing and potential risks.

Before beginning to prepare a DRM, key working team should be defined with their responsibilities regarding the dynamics of the WHS.

Key stakeholders of DRM plan in terms of formulating and implementing are[84];

- The core team:
    - The state party (primarily responsible for conserving and managing a WHS)
    - The site manager
    - Staff members (who are responsible for administration, maintenance, monitoring, security etc.)
    - Local authorities
    - Opinion leader of the community
    - Local specialists
    - Responsible agency for disaster management
    - Emergency response teams (firefighters, mountain rescue etc.)
    - Police
    - Health services
    - Local community groups
    - Professionals (seismic engineers, hydrologists etc.)
    - Related agencies
    - National hazards warning system (meteorology, seismic monitoring agencies etc.)

[83] UNESCO, ICCROM, ICOMOS, IUCN (2010). Managing Disaster Risks for World Heritage :18
[84] UNESCO, ICCROM, ICOMOS, IUCN (2010). Managing Disaster Risks for World Heritage :20

- Volunteer groups

- At international level:
  - The UNESCO World Heritage Center (key partner)
  - Research and academic institutions such as ICOMOS, ICCROM, ICOM, IUCN, the Blue Shield

- Supporting resources:
  - DRM professionals, and conservation experts, and other related specialized in terms of structures and citizens as *human resources* to support to the core team
  - Tools and equipment to assess and reduce the disaster risks to WHS as *technical resources*
  - Local and national/international funding facilities that covers necessary budget for interventions and other additional funds as *financial resources*

As 1st step of the manual defines "how disaster risks can be identified and assessed".

Related *with WHS itself*; attributes that make give WHS outstanding universal value and criteria WHS inscribed on and its authenticity and integrity statements and the geographical information (its boundaries, buffer zone, surrounding, topography etc.) and geological, hydrological, meteorological information (climate, soil, fault lines, surface water etc.) are the basis point to identify disaster risks to this property. Physical planning like land use plan, master plan, regional plan and thematic maps (such as hazards vulnerability maps) and specialized maps (cultural heritage risk map) that covers the WHS, condition of the roads (for evacuation) and related institutions and communities around the site should be known to identify both risks that may be caused by the environment of the site and to response better.

Related with disaster and its effects, the possible hazards and their probability, history of different disasters that affect the site, inventories and current management systems, disaster preparedness facilities and equipment in the property should be known. Also,

it is important to know if there is any "local and traditional knowledge system" related to DRM.

In order to analyze the factors that may cause disaster risk to WHS, all natural and human-induced hazards including sudden (primary) and progressive (secondary; ones that increase disaster vulnerability) within underlying risk factors that can be exposed should be listed. In addition, processes that should be surveyed to understand their impact when they are combined with hazards are current DRM systems and preparedness mechanism; deterioration patterns, potential negative impacts of existing damage, irreversible interventions, activities and physical planning; underlying risk factor related with surrounding environment (physical, social, economic, institutional or attitudinal); potential negative effect of poor restoration done.

After identifying all data about WHS itself and possible disasters within an analyze of the factors listed above, different scenarios should be developed for prediction processes and assessing different possibilities and their impact on WHS.

Disaster risk can be estimated by rating the level of risk by using "ABC risk assessment scale". Level of risk can be expressed quantitatively.

"Level of risk: probability (A) + consequences (B) + loss of value (C)"[85]

A represents the probability of disaster and defined as ratio, for example the probability of a heavy rainfall is high while the probability is low for an earthquake that happens once in every fifty years.
B represents the severity of consequences for WHS and its components, landscapes, including human lives and their physical environment with livelihoods and it is defined as scale of 0 to 1, for example 0 stands for no consequence while 1 stands for severe results.

[85] UNESCO, ICCROM, ICOMOS, IUCN (2010). Managing Disaster Risks for World Heritage :29-30

C represents the consequences in terms of "loss of value". While some consequences can be easily restored, others may affect outstanding universal value of the WHS irreplaceably. C defined as ratio, for example 100 percent is for total or almost total loss of value, while 0.01 percent for miniscule loss of value.

As 2nd step of the manual defines "how disaster risks can be prevented, and their impact can be mitigated".

DRM plan Disaster risk can be prevented or at least mitigated by means of preventing hazards, mitigating their impacts, reducing the vulnerability of WHS and training the staff (Figure 2.13). They require a coordinated work of staff members and responsible departments though available resources.

Figure 2.13 *Disaster risks mitigation and prevention options. (produced by author using UNESCO, et al., 2010)*

It is expected that interventions for mitigation and prevention are not supposed to be affect the WHS values, authenticity and integrity. However, in reality, some interventions like installing fire hydrants against fire or widening narrow street may affect them destructively. Therefore, site managers should involve in every strategic decision during emergency response.

Traditional knowledge systems should be investigated for integration of them to disaster risk mitigations responses. The forms of the systems for disaster mitigation:

- *Indigenous management system*
- *Indigenous monitoring system*
- *Traditional skills and techniques*

- *Local ecological relationship and indigenous planning systems*

As 3rd step of the manual defines “how can be prepared for and respond to emergencies”.

First 72 hours after the disasters are crucial to respond emergencies. However the risks that may initiated because of this emergency period should be addressed such as theft of movable objects, inappropriate damage assessment and interventions.

The emergency response team should undertake these tasks by its members; coordination of the actions that planned before, seeking human lives, their livelihoods and environments, maintenance the integrity of cultural and natural heritage, financing the action by using available tools, representation of the situation for media. The operational effectiveness of the team should be tested via drill and exercises. The linkage between the team and emergency response systems (municipality, local government, fire services, police, health services etc.) to encourage them to undertake special measures and between the team and the local community to raise awareness before and during the emergency are important.

In order to improve emergency preparedness for the WHS in addition to responsibilities of the emergency response team;

- Develop an evacuation plan: directing people out of the property or site that both can damaged by and damage them or collect them in the place that defined before depending on the condition of the site; identify the shortest and has least impact on the property exit route for pedestrians and possible route for emergency vehicles; ensure the people and heritage property security.
- Install general emergency equipment for identified and assessed risks.
- Prepare maps of the property to indicate places of emergency features.
- Inform the staff, visitors and local community about the emergency plan.
- Create a directory of contacts.
- Train a team in salvage for cultural heritage.

The WHS can contribute to emergency response itself. Temporary shelter area can be provided in through defined areas for emergency evacuation. Traditional knowledge system may be existing for emergency warning and response. A voluntary team for emergency response can be formed with existing social networks in the community. Also, there can be other opportunities that should be surveyed by site manager and if there are, they should be integrated to DRM plan of the site.

As 4th step of the manual defines "how WHS can be recovered and rehabilitated after a disaster".

In order to assess the damage after disaster period, a systematic process should be followed, and these questions should be asked;

- What is the number of people that are at the disaster location?
- Which parts and components of the WHS and which aspect of them should be surveyed for damage? (for example, historic buildings of the site will be surveyed for their structural stability)
- Which tools should be used? (a format can be prepared for documentation or recording etc.)
- Who will be responsible for the audit?
- Which emergency action should be taken to prevent further damage? (scaffolding, cutting gas and electricity supply etc.)
- Which recovery activities should be undertaken in short-term and in what order of priority?

In addition, it should be kept in mind that after a disaster, WHS may face new risks caused by emergency situation and secondary hazards. In general terms, WHS can be damaged due to emergency response activities. To illustrate this situation, fire extinguishing may cause deterioration of paintings of the property. Displaced people may cause damage or pressure because of their exceeding usage of infrastructure. WHS may be exposed to encroachment. These risks and their duration should be taken into consideration by formulating the DRM plan.

As in other steps, traditional knowledge and heritage property can also play proactive role for after disaster steps. Traditional skills and capacities can contribute post disaster rehabilitation by using local coping mechanism. WHS can contribute to psychological recovery of people affected. Also, sources of livelihood and local/ traditional lifestyle and should be taken into consideration during reconstruction process.

As 5th step of the manual defines "how DRM plan can be implemented, reassessed and reappraised".

In order to sustain long-term success and protect WHS from future disasters, lessons learnt from DRM process should be reviewed. Site management system, DRM plan of the site, cultural heritage legislation and policy within the focus of disaster management, human resources available and emergency response team, stakeholders and local community involvement and approaches to each conservation methods of the property and need for awareness raising activities of the local community should be reviewed. Therefore, a monitoring system should be formulated. Also, some other situations that up to the site should be taken into consideration. To illustrate, visitors can continue to come after disaster so rehabilitation measures and surrounding area of the property should be linked for an effective recovery process.

An action plan that covers; activities and projects with their time-frame for implementation, human resources and agencies available and their responsibilities and financial resources is needed to implement the DRM plan. The effectiveness of the plan should be monitored regarding if there are emergency experiences. In order to build local capacity and awareness raising, training on the use of emergency equipment should be undertaken and drills should be performed. According to results, DRM plan should be reviewed for effectiveness.

The appendices part of the guide gives;

- Typology of hazards (Table 2.1, Table 2.2, Table 2.3),
- Relevant charters and recommendations,
- International organizations and research institutions (such as ICCROM, ICBS, ICOMOS, ICOM, IUCN and UNEP-WCMC)
- Key references and publications (on DRM and heritage properties, on DRM, early warning)
- Lists of the definitions of key disaster management terms (climate change[86], disaster[87], emergency[88], hazard[89], mitigation[90], prevention[91], recovery[92], response[93], risk[94], vulnerability[95], Word Heritage property[96]

[86] "A change in climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods" (as cited in UNESCO, ICCROM, ICOMOS, IUCN (2010). Managing Disaster Risks for World Heritage: 58)

[87] "A serious disruption of the functioning of a community or a society causing widespread human, material, economic or environmental losses which exceeds the ability of the affected community or society to cope using its own resources" (as cited in UNESCO, ICCROM, ICOMOS, IUCN (2010). Managing Disaster Risks for World Heritage: 58)

[88] "An unforeseen combination of circumstances or the resulting state that calls for immediate action" (as cited in UNESCO, ICCROM, ICOMOS, IUCN (2010). Managing Disaster Risks for World Heritage: 58)

[89] "Any phenomenon, substance or situation, which has the potential to cause disruption or damage to infrastructure and services, people, their property and their environment" (as cited in UNESCO, ICCROM, ICOMOS, IUCN (2010). Managing Disaster Risks for World Heritage: 58)

[90] "Taking action in the timeframe before a disaster to lessen post-event damage to lives and property. In risk management, many hazards such as earthquakes cannot be reduced, but the risk from that hazard can be reduced, or mitigated, for example by constructing earthquake-resistant buildings, or shelves that prevent objects from sliding off. The former is structural mitigation, the latter is non-structural."

[91] "Measures taken to reduce the likelihood of losses. Ideally, these measures would seek to reduce losses to zero, but this often is not possible. Key question: How much prevention do you need to undertake?"

[92] "The process of returning the institution to normal operations, which may also involve the repair and restoration of the building or site."

[93] "The reaction to an incident or emergency to assess the damage or impact to the site and its components, and actions taken to prevent people and the property from suffering further damage."

[94] "The chance of something happening that will have an impact upon objectives" (as cited in UNESCO, ICCROM, ICOMOS, IUCN (2010). Managing Disaster Risks for World Heritage: 58)

[95] "The susceptibility and resilience of the community and environment to hazards. 'Resilience' relates to 'existing controls' and the capacity to reduce or sustain harm. 'Susceptibility' relates to 'exposure' "(as cited in UNESCO, ICCROM, ICOMOS, IUCN (2010). Managing Disaster Risks for World Heritage: 58)

[96]" World Heritage properties are those defined in Articles 1 and 2 of the World Heritage Convention and inscribed on the World Heritage List on the basis of their outstanding universal value, which is

In all DRM steps, the importance of traditional knowledge, local community involvement, linkages between DRM plan and site management plan of WHS and other national and upper scale plans are highlighted. The guide expresses the importance of the focuses of DRM plan that it should not be focus on just the heritage, it should concern human lives, their livelihood and physical environment also. In addition, the boundaries of the DRM plan should cover the buffer zones of the WHS and secondary and indirect effects of hazards and the effect of global climate change should be taken into consideration. It cannot be forgotten that each property has their own needs and requirements.

fulfilled through meeting one or more of criteria (i)–(x) in the *Operational Guidelines for the Implementation of the World Heritage Convention*."

CHAPTER 3

BERGAMA AND ITS MULTI-LAYERED CULTURAL LANDSCAPE UNDER RISK

The fundamental starting point to manage risks for WHS is recognizing the importance of them and protecting them from damage by decay and all sort of disasters in order to extend the lifetime and secure the value of their contribution to global culture. The willingness of conservation of cultural heritage has been raised by the way of understanding their value.

"Bergama and Its Multi-Layered Landscape" is chosen to assess the manual because the situation should be handled more comprehensively for 'multi-layered cultural landscapes'. These landscapes are defined as the places that have been settled continuously through different periods and still a settlement place. In these cities, cultural and physical values that have been created by different periods are stratified and create different layers. The layers may superimpose or be juxtaposition[97]. Therefore they need a different approach/or a framework that take into account values, hazards, exposures and vulnerabilities of each layer and attribute for each risk factor with relevant institutions by following the steps of the manual.

The starting point must be understanding of values and general characteristics of the settlement and its location and how each layer is differentiated and interact with each other together with their current DRM system.

[97] Bilgin Altınöz, A. G. (2002) Assessment of Historical Stratification in Muti-Layered Towns as a Support for Conservation Decision-Making Process; A Geographic Information Systems (GIS) Based Approach Case Study: Bergama. (Doctorate Thesis, METU):1

3.1. Understanding Bergama and Its Multi-Layered Cultural Landscape

Whole land of Bergama located on 1st degree earthquake zone, and has the probability of occurrence urban flood, landslide, tsunami, cyclone, water scarcity, extreme heat and wildfire due to its geographic, hydrologic settings and climatic condition. Bergama has the possibility to turn a hazard into disaster with vulnerabilities of physical setting, population dynamics, localization of managerial and legal context of Turkey in Bergama. Therefore "Bergama and Its Multi-Layered Cultural Landscape" was analyzed with its general and historical context and their structural reflection.

3.1.1. General Context of Bergama

Bergama (with its ancient Greek name; Pergamon or Pergamos that means castle or fortified land[98] due to its 331 m altitude) is located in western side of Turkey and in northern side of the Aegean Region as the largest province of the city of İzmir with its 1688 km^2 land coverage and number of villages (Figure 3.1, Figure 3.2, Figure 3.3). It located approximately 100 km away from the city of İzmir, Manisa and Balıkesir The city is located on the shore of the graben valley, where the Kaikos (Bakırçay) River lies in the east-west direction and it is surrounded by Pindasos (Kozak, Madra) in the north, Asperdenon (Yunt) Mountains volcanos in the south which are extinct, Selinos Brook lies to the west and Kestel Brook to the east[99]. Southern and eastern part of Bergama is located on alluvial land, while northern (acropolis) is located on volcanic and western is on andesite rock (Figure 3.4) [100].

[98] Radth, W. (2001) Pergamon, Antik Bir Kentin Tarihi ve Yapıları. YKY :21
[99] T.C. Bergama Kaymakamlığı. İlçemizin Tarihçesi. Retrieved from http://www.bergama.gov.tr/ilcemizin-tarihcesi
[100] MTA. Jeoloji Haritaları.

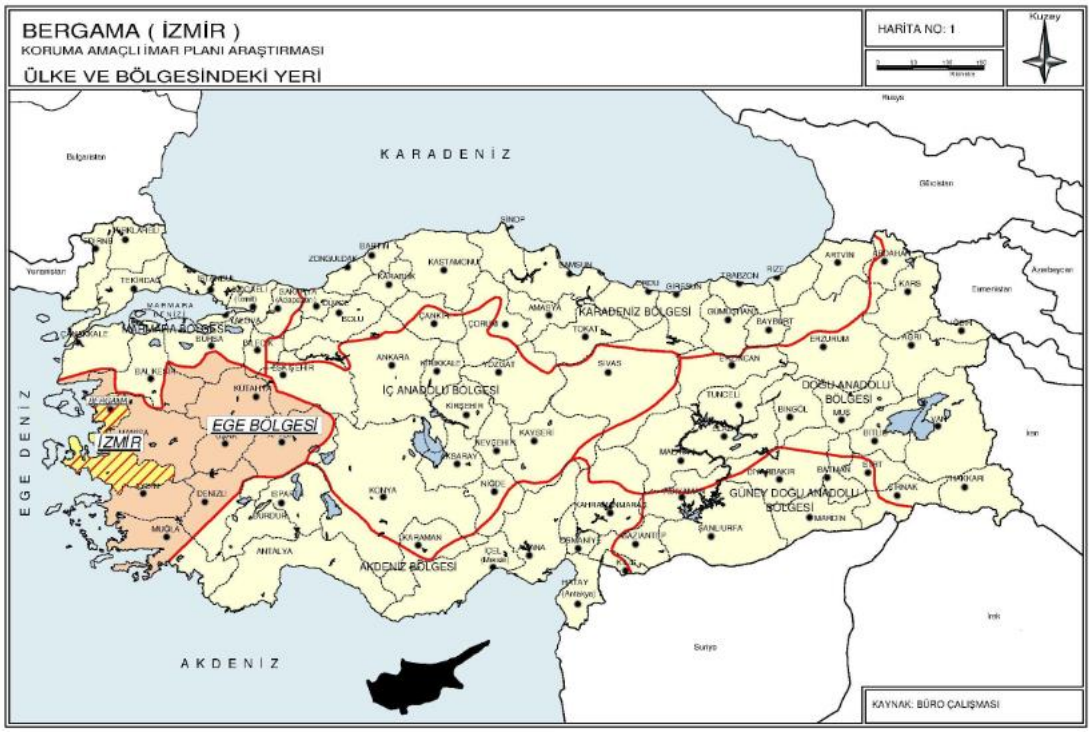


Figure 3.1 *Location of Bergama in Turkey (Bergama Belediyesi (2012). Koruma Amaçlı İmar Planı (Conservation Master Plan)*

Mediterranean climate is seen in Bergama, average temperature in winter time is 10.7°C while 26° C in summer time and average precipitation amount is 600 kg/m^2 [101].

Total population is 106.536 while central population is 52.173 people and it is increasing slightly[102]. There is Vocational Schools of Dokuz Eylül University and Ege University. Accommodation facilities (pensions and hotels) have 905 beds pace. Therefore population is varying through the year.

State hospital has 200 bed space. Student number is 16.917 in total. Car number is 47.205.

[101] BERTO: Bergama Chamber of Commerce. (2018). 94. Faaliyet Raporu. Bergama Dikili, Kınık:3
[102] TUİK: Turkish Statistical Institute (2018). Address based population registration system.

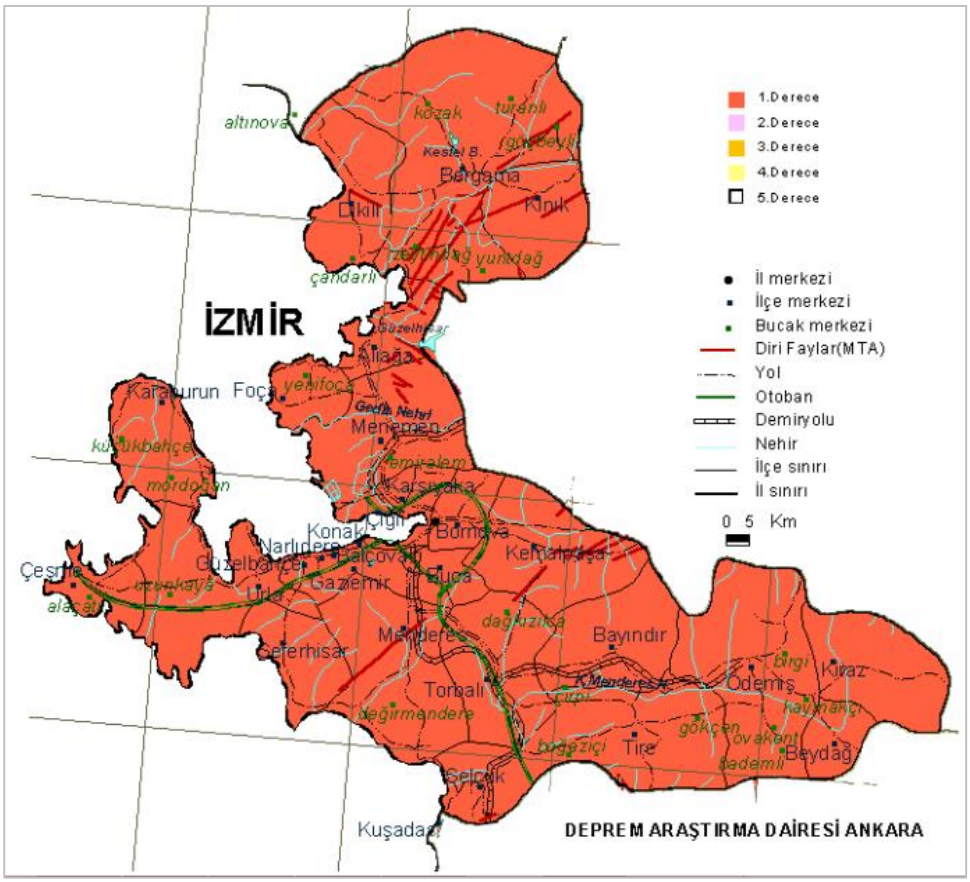


Figure 3.2 *Location of Bergama on fault lines map (AFAD fka Ministry of Public Works and Settlements, Earthquake Research Department)*

Figure 3.3 Geographical setting of Bergama (Retrieved from Google Earth)

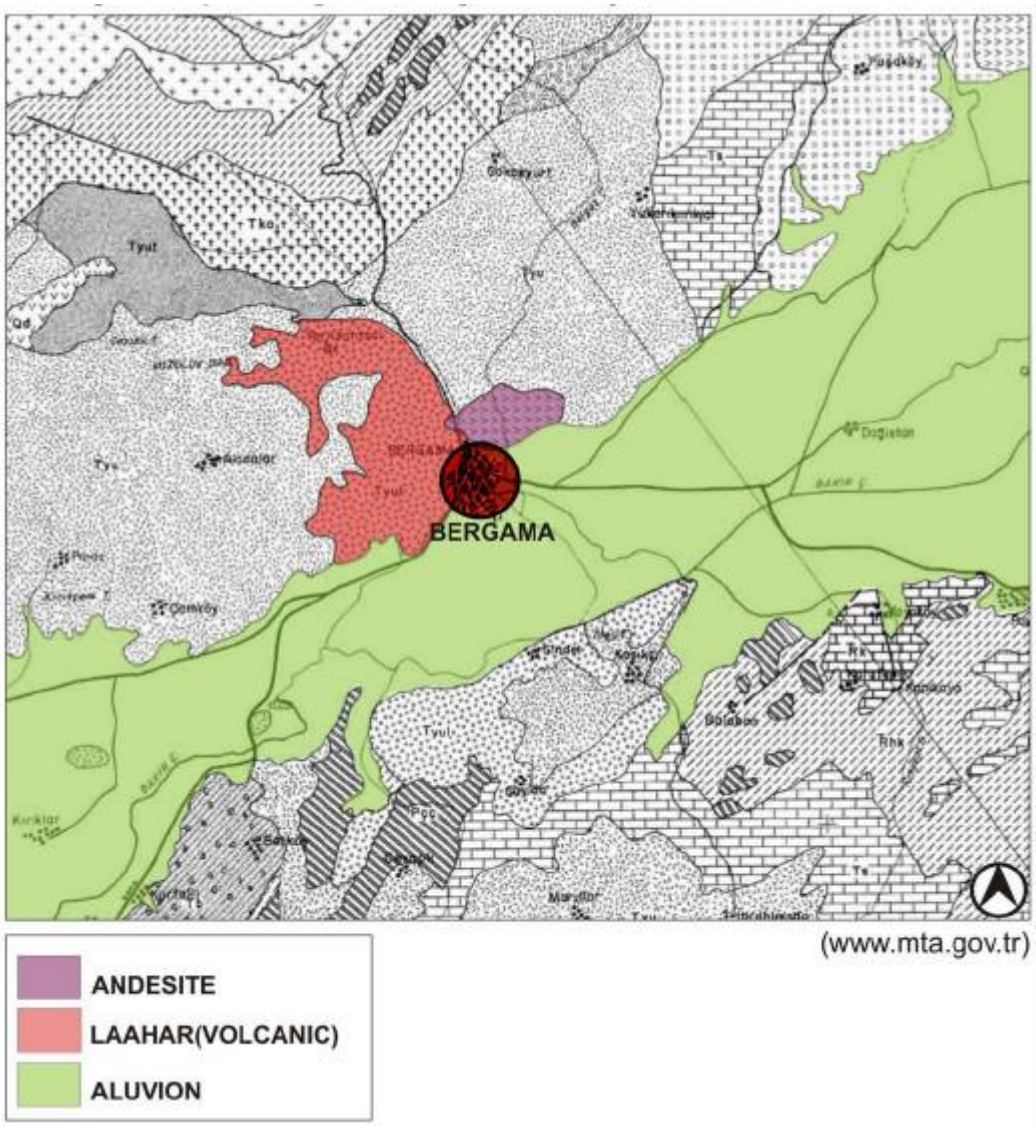


Figure 3.4 *Geological context of Bergama (Produced by METU-Graduate Program in Restoration (2008). A Project for Preparation of Bergama Conservation and Management Plan within the scope of REST 507 based on MTA)*

3.1.2. Historical Context of Bergama

From prehistoric ages to today, Bergama and its territory have been subjected to inhabitation[103]. Kale (means *castle* in Turkish) or Kent (means *city* in Turkish)) Hill that is the core of the settlement provides the city a natural protection with its 330 meters high. Therefore the city was subjected to a lot of settlements but there is no clue about certain date of the first settlement, because the settlements of the city was repeated one after the other, by eliminating the structures of previous civilizations partially or completely[104] (Figure 3.5).

Still, according to the written sources and the remains of the city walls, it is thought that Kale Hill has been settled since the Archaic and Classical Eras[105]. After Hellenistic Period, the settlement has been enlarged from hill to the lower city in the direction of Bakırçay River (with its ancient name *Kaikos*) [106] throughout Late Hellenistic, Roman Era, Byzantine Era, Principalities Era, Ottoman Period through ages and Turkish Republican Era since 1923. The structures of these periods "sometimes exist on top of each other and sometimes near to one another[107]" through time. In Attalid Dynasty Era, Hellenistic Period (280-133 BC) Bergama became prominent with its city planning and begun to be a cultural, scientific and political center[108]. Bergama represents the most magnificent example of Hellenistic city planning (grid plan called as Hippodamian) with its monumental architecture that planned with the best use of topography. "The Temple of Athena", the steepest theater of the Hellenistic period, "the Library", "Heroon", "the Altar of Zeus", "the Temple of Dionysus", "the Demeter Sanctuary", the Palaces, the Stoas, the Agora, the Gymnasium, "Serapis Temple (*Red Hall*)" and the Peristyle buildings are the most

[103] Bilgin Altınöz, A. G., Pirson, Felix, Bachmann, M., Binan, D., Kaptı, M. (2014). Pergamon and Its Multi-Layered Cultural Landscape, UNESCO Booklet.
[104] Radth, W. (2001) Pergamon, Antik Bir Kentin Tarihi ve Yapıları. YKY :21
[105] Bilgin Altınöz, A. G., Pirson, Felix, Bachmann, M., Binan, D., Kaptı, M. (2014). Pergamon and Its Multi-Layered Cultural Landscape, UNESCO Booklet:3
[106] Radth, W. (2001) Pergamon, Antik Bir Kentin Tarihi ve Yapıları. YKY :55
[107] Bilgin, A. G. (1996) Urban Archeology: As the Basis for the Studies on the Future of the Town Case Study: Bergama. (Master's Thesis, METU) :121
[108] Bergama Belediyesi. Bergama Çok Katmanlı Kültürel Peyzajı Alan Yönetim Planı 2016-2020 :11

outstanding examples of this planning system and architecture of the Hellenistic and Roman period[109]. During Late Roman Period, Christianity was accepted, and the temples of the city were transformed to churches and at Byzantine Period the city sustained itself as Bishopric. Turkish-Islamic era has been started with the Turks and Karesi Principality reign, and continued through Ottoman Period and the settlement was centralized on the riverbank. The city has been continued to enlarge through the valley at Turkish Republican Period[110].

Bergama was developed by following the axis that passes through Acropolis, Temple of Asclepion and south western side of the Selinos Brook (Bergama Çayı) that designated as the development region of the city at Hellenistic Era, Roman Era and Byzantine Era and developed in an organic city pattern at Principalities Era and Ottoman Era[111].

Since the beginning of its history, Bergama consists of two main parts. These are the castle with its own wall that is placed at the top of the hill and the lower city on a softer and sloping slope, also surrounded by city walls during Roman Period. While it is almost impossible to change the dimensions of the castle, the actual city in other words the residential area, has undergone many changes according to political and economic conditions in terms of both size and span[112].

The nested settlement and culture developed through periods provide historical continuity and conservation of structures and also losses due to re-functioning them according to changes and material need. Therefore, Bergama become an "outstanding evidence"[113] of its continual inhabitation through history and its reflection to the architecture and culture that also shaped by the effect of the nature and geography. In

[109] Bergama Belediyesi. Bergama Çok Katmanlı Kültürel Peyzajı Alan Yönetim Planı 2016-2020 :11
[110] Bilgin Altınöz, A. G., Pirson, Felix, Bachmann, M., Binan, D., Kaptı, M. (2014). Pergamon and Its Multi-Layered Cultural Landscape, UNESCO Booklet:3,4
[111] Baç, S. (2012) Tarihsel Bir Kentin Morfolojisi: Bergama Kent Örgütlenmesi. Aegean Geographical Journal, VOL. 21 (1), 23-38, (2012) :24
[112] Radth, W. (200) Pergamon, Antik Bir Kentin Tarihi ve Yapıları. YKY :53
[113] Bilgin Altınöz, A. G., Pirson, Felix, Bachmann, M., Binan, D., Kaptı, M. (2014). Pergamon and Its Multi-Layered Cultural Landscape, UNESCO Booklet:4

1899, the population of Bergama was consisted of 17.139 Turkish, 3.581 Greek, 281 Armenian, 495 Jewish and 74 from other nationality people[114].

The first excavation was started at 1878 by German Archeologist Carl Humann[115]. With its multilayered structure formed its multicultural background, Bergama has been subjected to planning with the efforts of cultural researcher and conservationist Osman Bayatlı since 1930s[116]. He established the Bergama Archeology Museum and identified and registered the intangible values of Bergama. Within the importance given to archeological sites in urban area of Bergama by 1943 and 1968 construction plan that conserve traditional fabric as it is that located over Hellenistic and Roman Period remains and open new construction areas for urban development and registration of the areas as archeological and urban first and then urban archeological and finally 3rd degree archeological + urban site, the traditional fabric of the city has been reached today as authentic but in moderate structural situation[117]. After the excavation and planning processes, urban and archeological heritages of Bergama have been conserved. Also, with the efforts of NGOs, intangible heritages of Bergama has reached today beside its tangible heritages.

[114] BERTO: Bergama Chamber of Commerce. (2018). 94. Faaliyet Raporu. Bergama Dikili, Kınık:3
[115] Ulusoy Binan, D. (2013) Türkiye'de Çok Katmanlı Yerleşimlerde Tanımlama-Koruma Yaklaşımı ve Öneriler: Bergama Örneği. Tasarım+Kuram Dergisi, Mimar Sinan Güzel Sanatlar Üniversitesi, Mimarlık Fak. Yay., Sayı 16, İstanbul, 1-26.:3
[116] Bergama Belediyesi. Bergama Çok Katmanlı Kültürel Peyzajı Alan Yönetim Planı 2017-2021 :4
[117] Ulusoy Binan, D. (2013) Türkiye'de Çok Katmanlı Yerleşimlerde Tanımlama-Koruma Yaklaşımı ve Öneriler: Bergama Örneği. Tasarım+Kuram Dergisi, Mimar Sinan Güzel Sanatlar Üniversitesi, Mimarlık Fak. Yay., Sayı 16, İstanbul, 1-26.:9

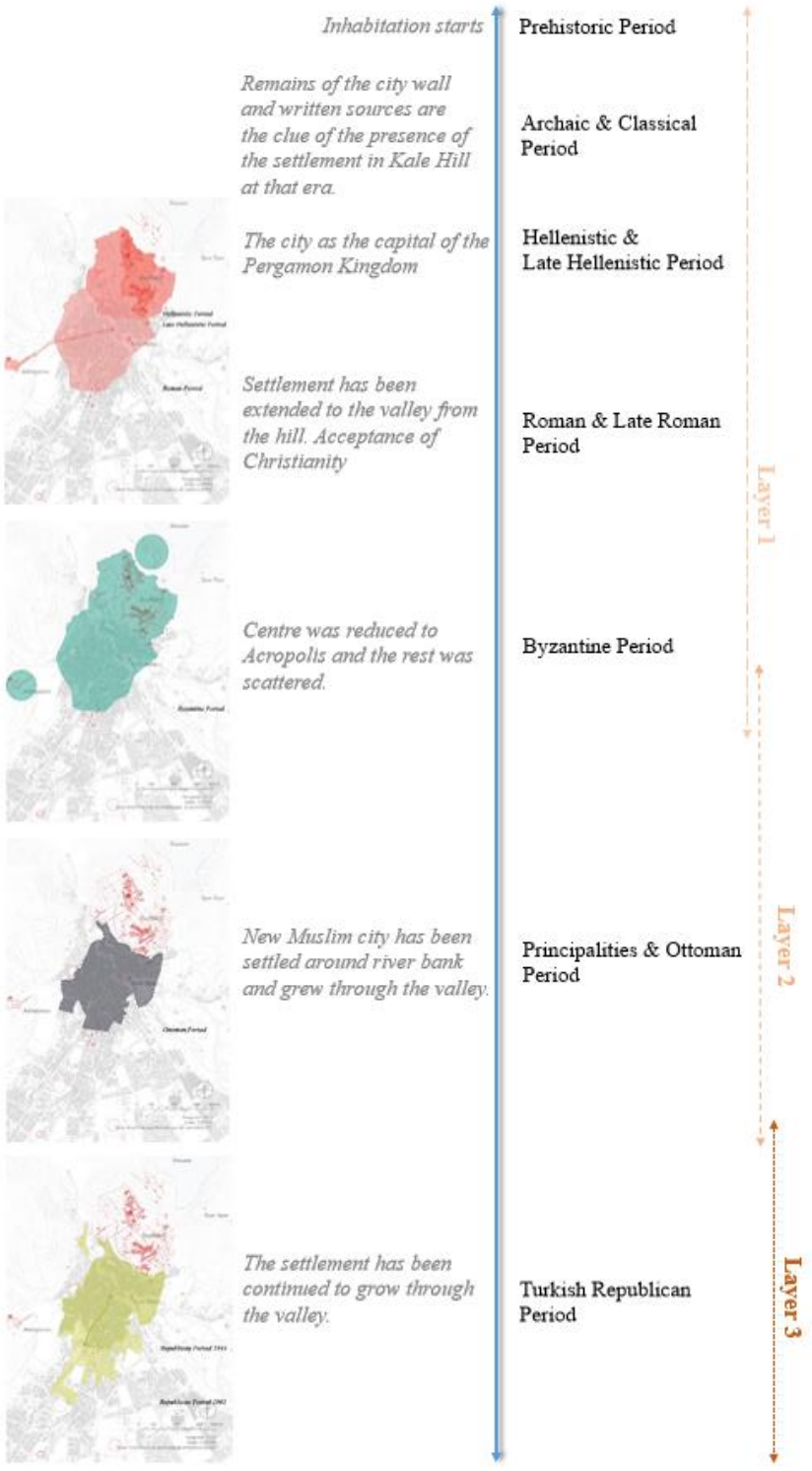


Figure 3.5 *The settlement of the Bergama through ages and the identification of the layers.. (prepared by the author based on as cited in Bilgin Altınöz, A. G., Pirson, F., Bachmann, M., Binan, D., Kaptı, M. (2014). Pergamon and Its Multi-Layered Cultural Landscape, UNESCO Booklet)*

Bergama has been inscribed on UNESCO World Heritage List at 2014 with its 9 components as a result of studies begun at 2011 with its multilayered structure belonging to different cultures and its outstanding universal values that have been composed of multilayers. These 9 components are[118];

- Bergama, Multi Layered City: It includes Acropolis (Kale Hill) within Aqueducts, "Kale Neighborhood", "the Serapis Temple (Roman Sanctuary dedicated to Egyptian Gods)" and the area around it, Selinos Brook, Arasta (Ottoman Bazaar) and "Asclepion".
- "A Temple Dedicated to the Mother Goddess: Kybele Rock-Cut Santuary"
- Tumuli: Death in Ancient Era, Respect to Ancestors and Secret Subjects of the Bergama Landscape: "Maltepe Tumulus, Yigma Tepe Tumulus, Tavsan Tepe Tumulus, Ilyas Tepe Tumulus, Ikili Tumulus and X Tepe Tumulus and A Tepe Tumulus" are the 7 of the nine heritage areas.

These areas and the buffer zone are accepted as a whole and create the WHS Management Area boundary (Figure 3.6). Also these sites as defined in UNESCO[119] "Kale Hill (the Acropolis), the aqueducts, the Asclepion, the Serapis Temple, Kybele rock-cut Sanctuary, the Musalla Cemetery Roman Pleasure district, and the tumuli" is registered as first degree archaeological sites and the urban sites that cover mostly the Ottoman neighborhoods and its trading areas are registered as second/third degree archaeological site and urban and 3rd degree archeological site (Figure 3.7). Therefore, all these areas are under the protection of "Law on the Conservation of Cultural and Natural Property No. 2863".

[118] Bergama Belediyesi. Bergama Çok Katmanlı Kültürel Peyzajı Alan Yönetim Planı 2017-2021 :10-11-12

[119]UNESCO. Pergamon and its Multi-Layered Cultural Landscape, Protection and management requirements. Retrieved from https://whc.unesco.org/en/list/1457

Bergama has archeological, urban, natural and intangible heritages with its Hellenistic, Roman, Byzantine and Ottoman structures that reflects "Paganism, Christianity, Judaism and Islam"[120]. Monumental and civil structures built at 14th-19th centuries is almost completely conserved and reached to today. However, the natural, archeological and urban values of the city have begun to be destroyed because of the multi-layered structures and squatter houses that increased due to accelerated tourism and development of the city after 1960s[121].

[120] UNESCO. Pergamon and its Multi-Layered Cultural Landscape, Outstanding Universal Value, Brief synthesis. Retrieved from https://whc.unesco.org/en/list/1457

[121]Tunçer, M. (2009) Bergama Koruma Politikaları. Milliyet. Retrieved from http://blog.milliyet.com.tr/bergama-koruma-politikalari--4-/Blog/?BlogNo=173956

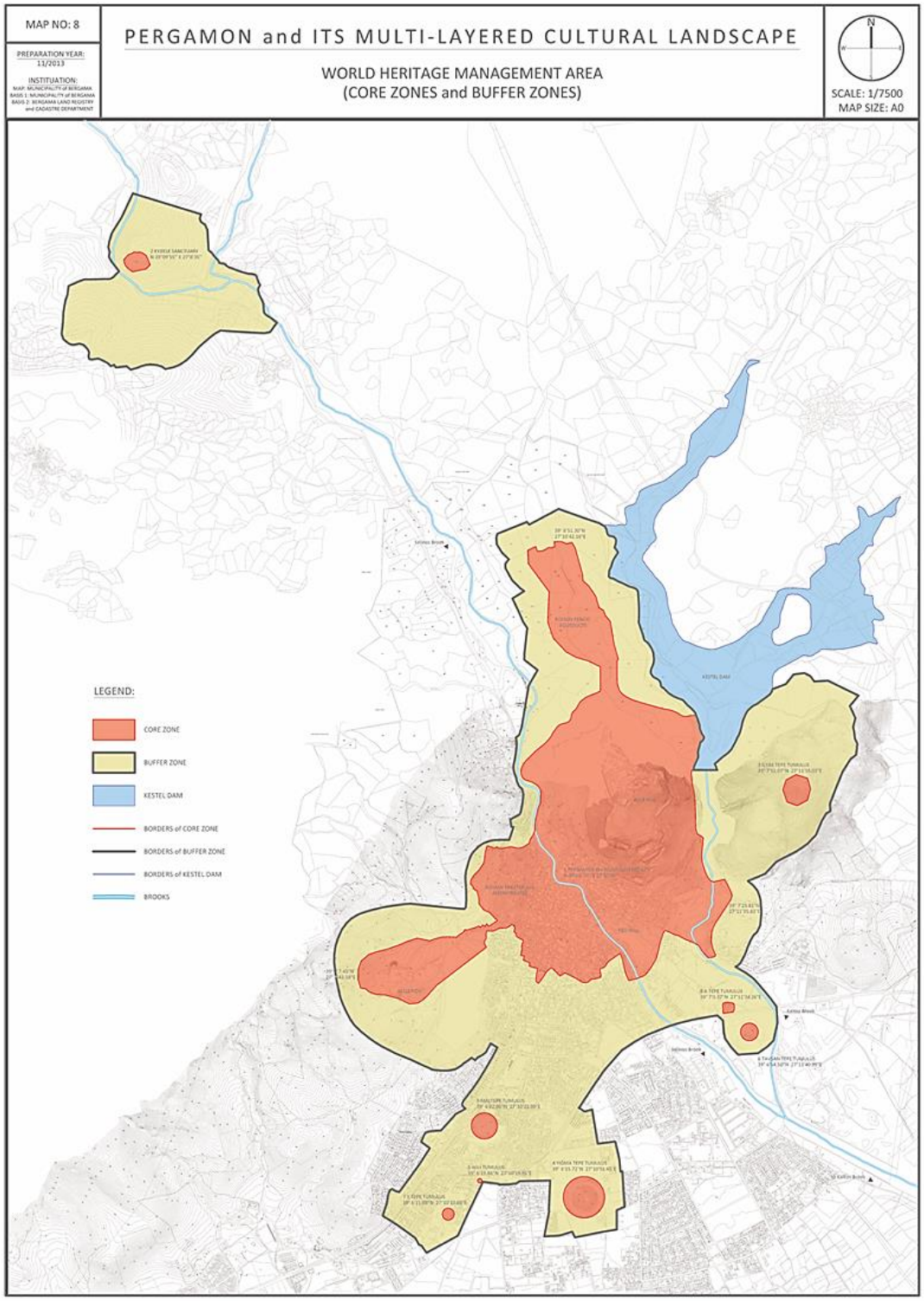


Figure 3.6 *World Heritage Management Area with core zones and buffer zones. (Bergama Municipality, 2013)*

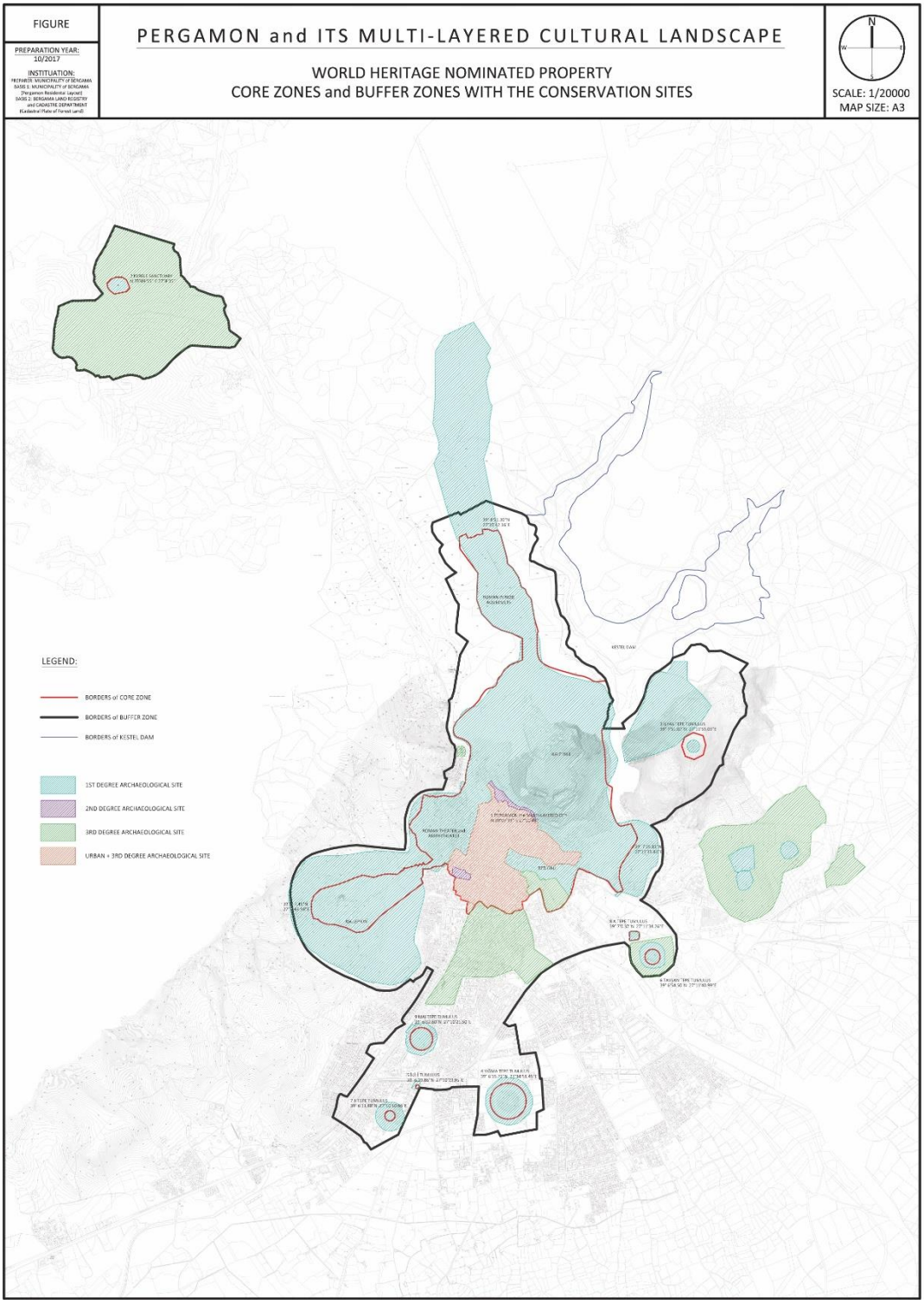


Figure 3.7 *World Heritage Management Area with core zones and buffer zones with registered areas. (Bergama Municipality, 2017)*

3.1.3. Layer 1: Antiquity and Late Antiquity Period

The Layer 1 is consisted of Archaic, Classical, Hellenistic, Roman and Byzantine Periods structures. Structures of the following periods were built on or near the structures of this layer. Now, it covers several monumental structures which are archaeological excavations are still ongoing and/or buried archeology that each of them is a tourist visit area. The layer is not inhabited continuously but there are visitors and staff in day-time.

The structures of the Layer 1 are "Temple of Athena, Asclepion, Demeter Sanctuary, Kybele Rock Cut Sanctuary and the Tumuli, the theater and its terraces and Temple of Dionysos, the gymnasium, Gurnellia, the Zeus Altar, Temple of Hera from Hellenistic Period; Aqueducts, Trajaneum, Serapis Temple, Roman Theater, amphitheater, stadium and Viran Kapı" (not excavated yet) from Roman Period and several churches and fortification walls from Byzantine Period (Figure 3.8).

Most of the structures are located at Acropolis; "Demeter Sanctuary, the theater, Temple of Athena, Temple of Dionysos, the gymnasium, Temple of Hera, and Trajaneum while Kybele Rock Cut Sanctuary" is in a distant place to today's city centre. Asclepion that is named as "suburban sanctuary"[122] is located at west and connected to the city with colonnaded Roman Road. The Tumuli are located at different areas of the city among the modern city settlement and agricultural land. Serapis Temple that was turned church at Byzantine Period and has been used as mosque at Ottoman and the Republican Period is located at the end of the commercial areas of the city. The registered areas and the boundary of the WHS is arranged according to the settlement area of Layer 1 (Figure 3.9, Figure 3.10, Figure 3.11,Figure 3.12). Also, Pergamenian sculpture culture and the invention of parchment remained from Hellenistic Period to today[123].

[122] Bilgin Altınöz, A. G., Pirson, Felix, Bachmann, M., Binan, D., Kaptı, M. (2014). Pergamon and Its Multi-Layered Cultural Landscape, UNESCO Booklet:14
[123] Bilgin Altınöz, A. G., Pirson, Felix, Bachmann, M., Binan, D., Kaptı, M. (2014). Pergamon and Its Multi-Layered Cultural Landscape, UNESCO Booklet:11

Prehistoric Period

Archaic & Classical Period

7th-6th -5th cen. BC; archaic city walls at Acropolis

Hellenistic & Late Hellenistic Period

4th cen. BC; Temple of Athena, the oldest sanctuary of Acropolis that is still visible.

Asclepion

3rd cen. BC; Demeter Sanctuary

Kybele Rock Cut Sanctuary at Kapıkaya and Hellenistic Tumuli

2nd cen. BC; the theatre, its terraces and Temple of Dionysos

the gymnasium, upper and lower agora

Figure 3.8 *(continued)*

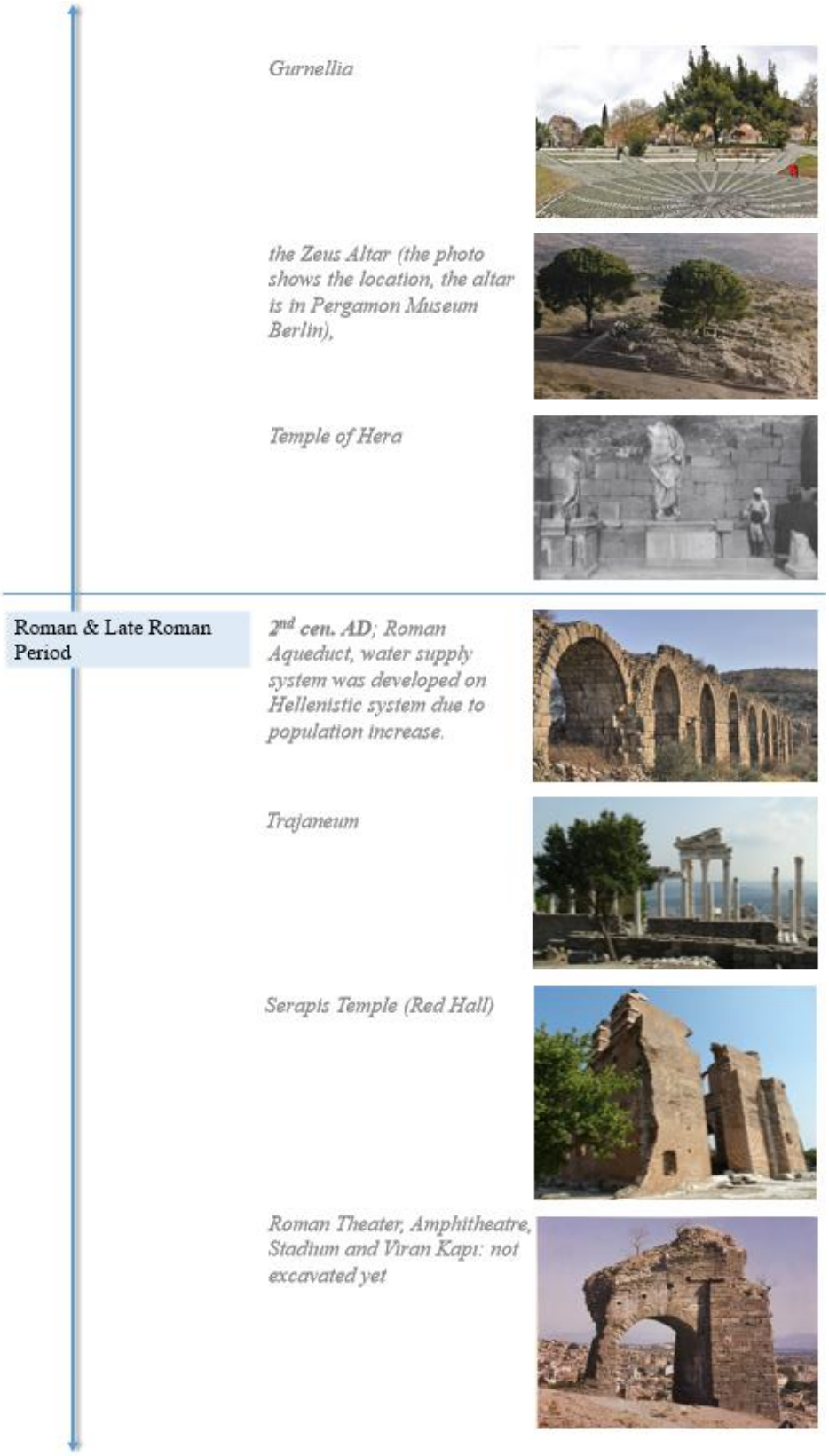


Figure 3.8 (continued)

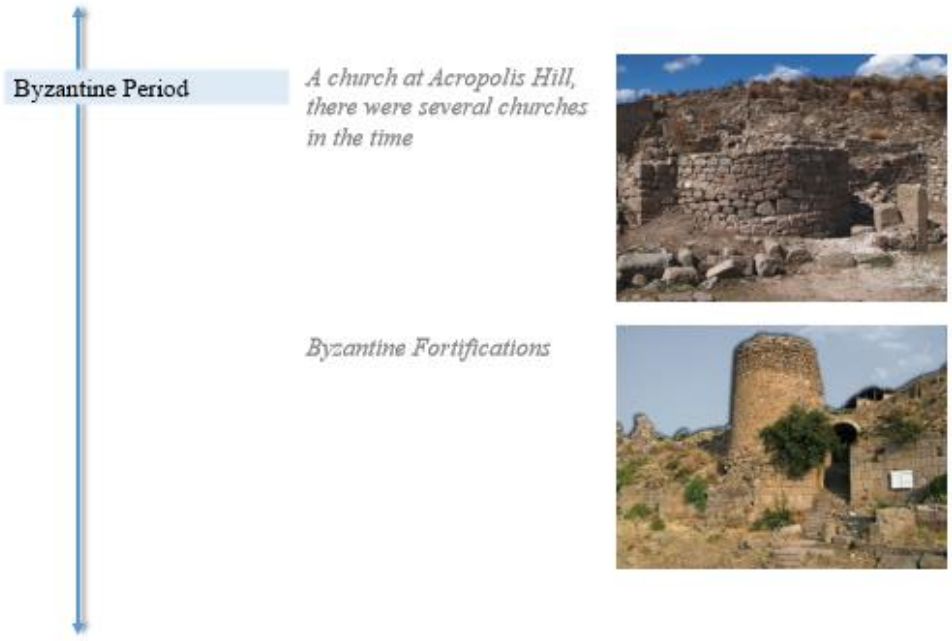


Figure 3.8 *Structures of Layer 1 (Produced by the author based on (photos orderly) Radt (2002):51,157 Bergama Municipality (2017-2021):23, the author, Radt (2002)114, Bergama Municipality (2017-2021):12, Bergama Municipality, Radt (2002):170,185, Bergama Municipality (2017-2021): 24, the author, the author, Radt (2002): 226, Felix Pirson (2014):18)*

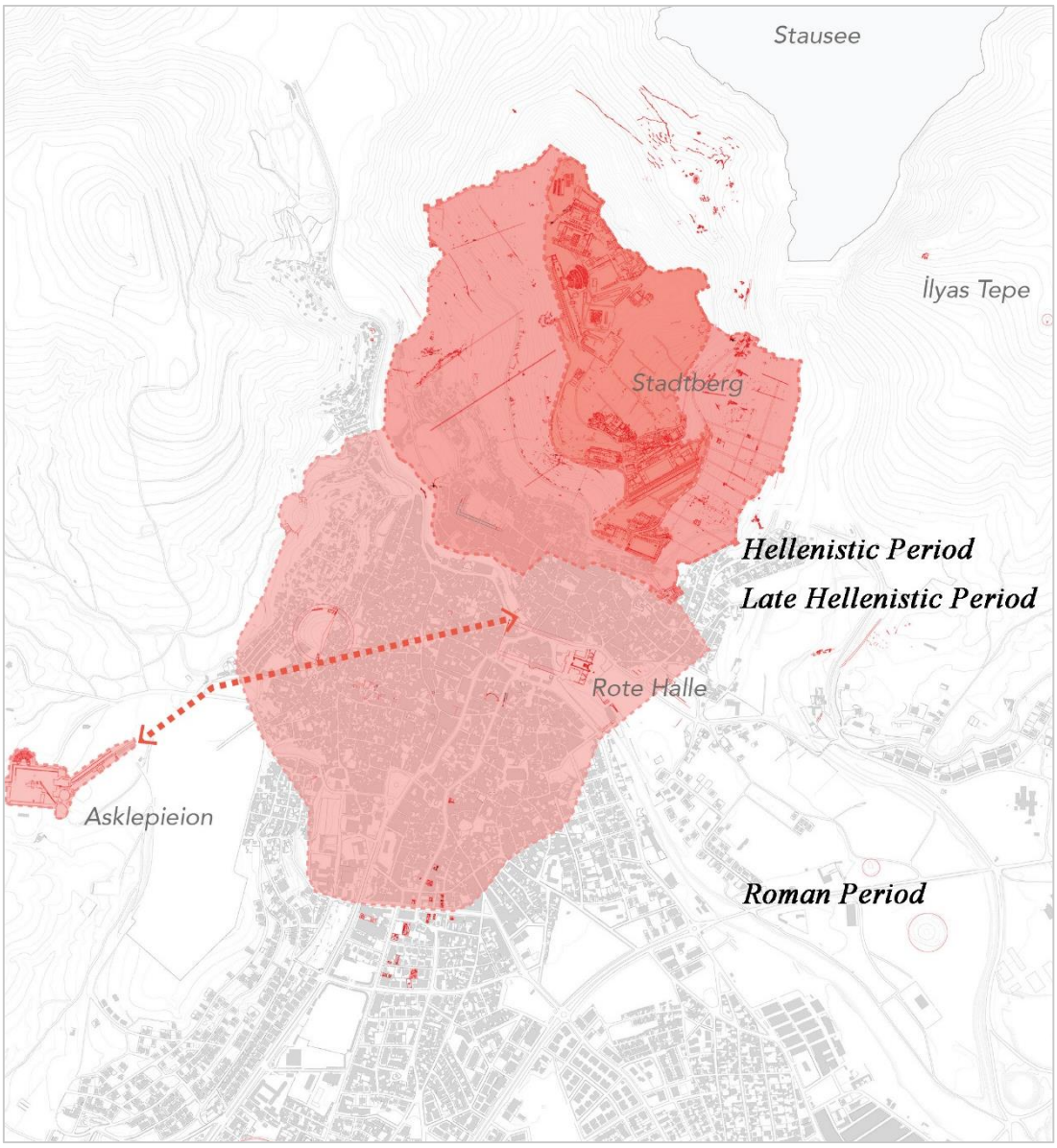


Figure 3.9 *The settlement of Hellenistic, Late Hellenistic and Roman Period (produced by the author based on as cited in Bilgin Altınöz, A. G., Pirson, Felix, Bachmann, M., Binan, D., Kaptı, M. (2014). Pergamon and Its Multi-Layered Cultural Landscape, UNESCO Booklet)*

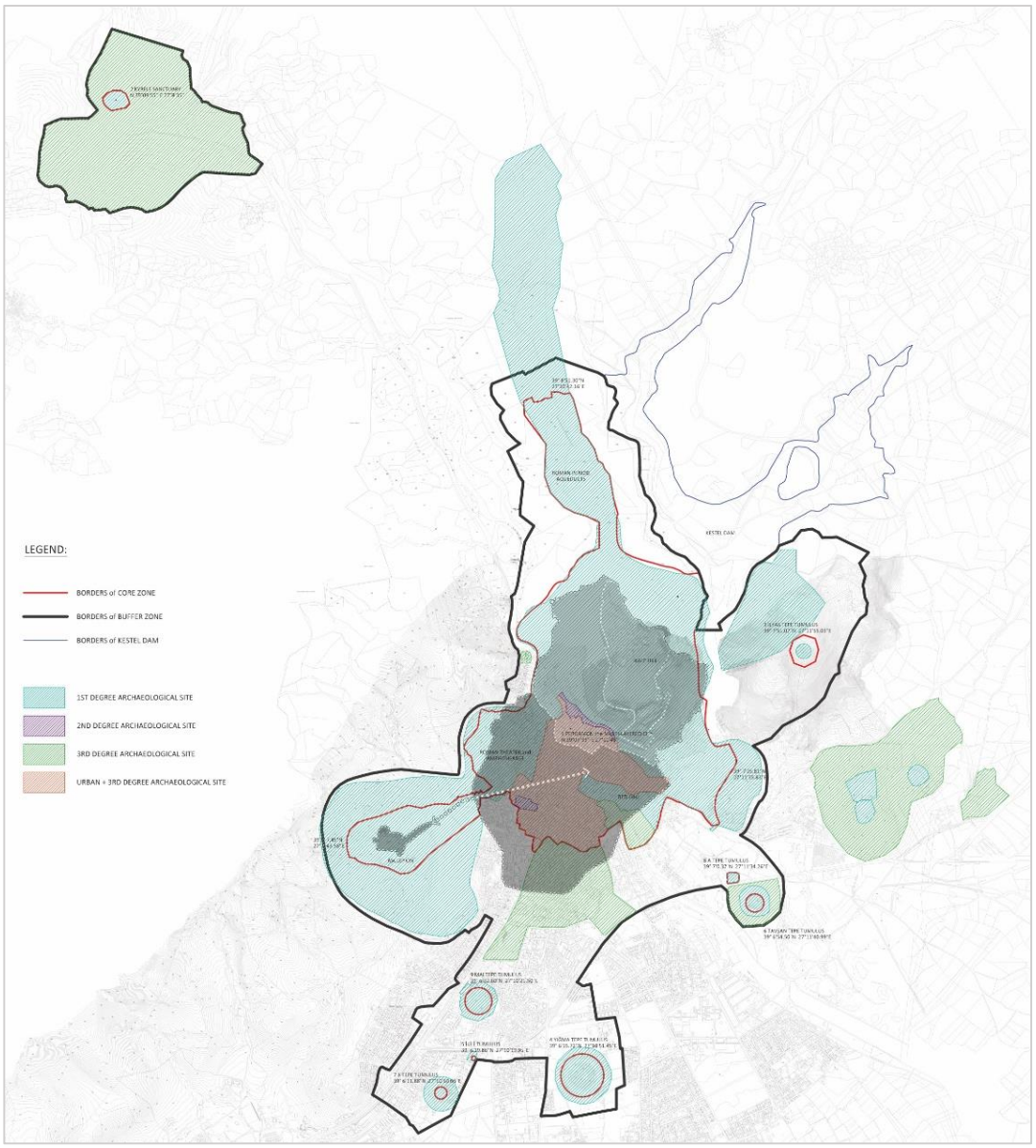


Figure 3.10 *The traces of Hellenistic, Late Hellenistic and Roman settlement with the WHS management boundary and the current registered areas (produced by the author based on Bergama Municipality (2017)).*

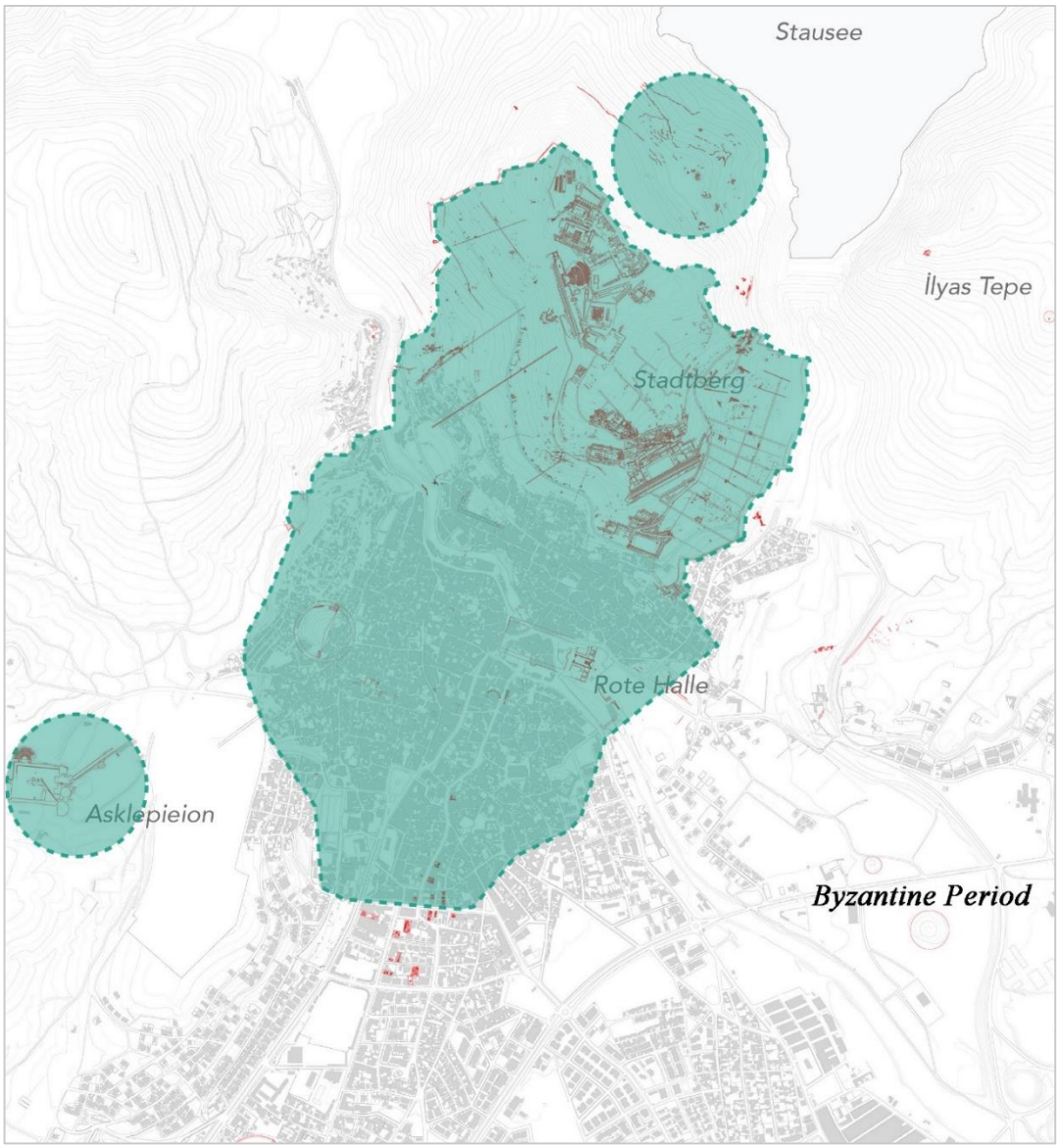


Figure 3.11 *The settlement of Byzantine Period (produced by the author based on as cited in Bilgin Altınöz, A. G., Pirson, Felix, Bachmann, M., Binan, D., Kaptı, M. (2014). Pergamon and Its Multi-Layered Cultural Landscape, UNESCO Booklet)*

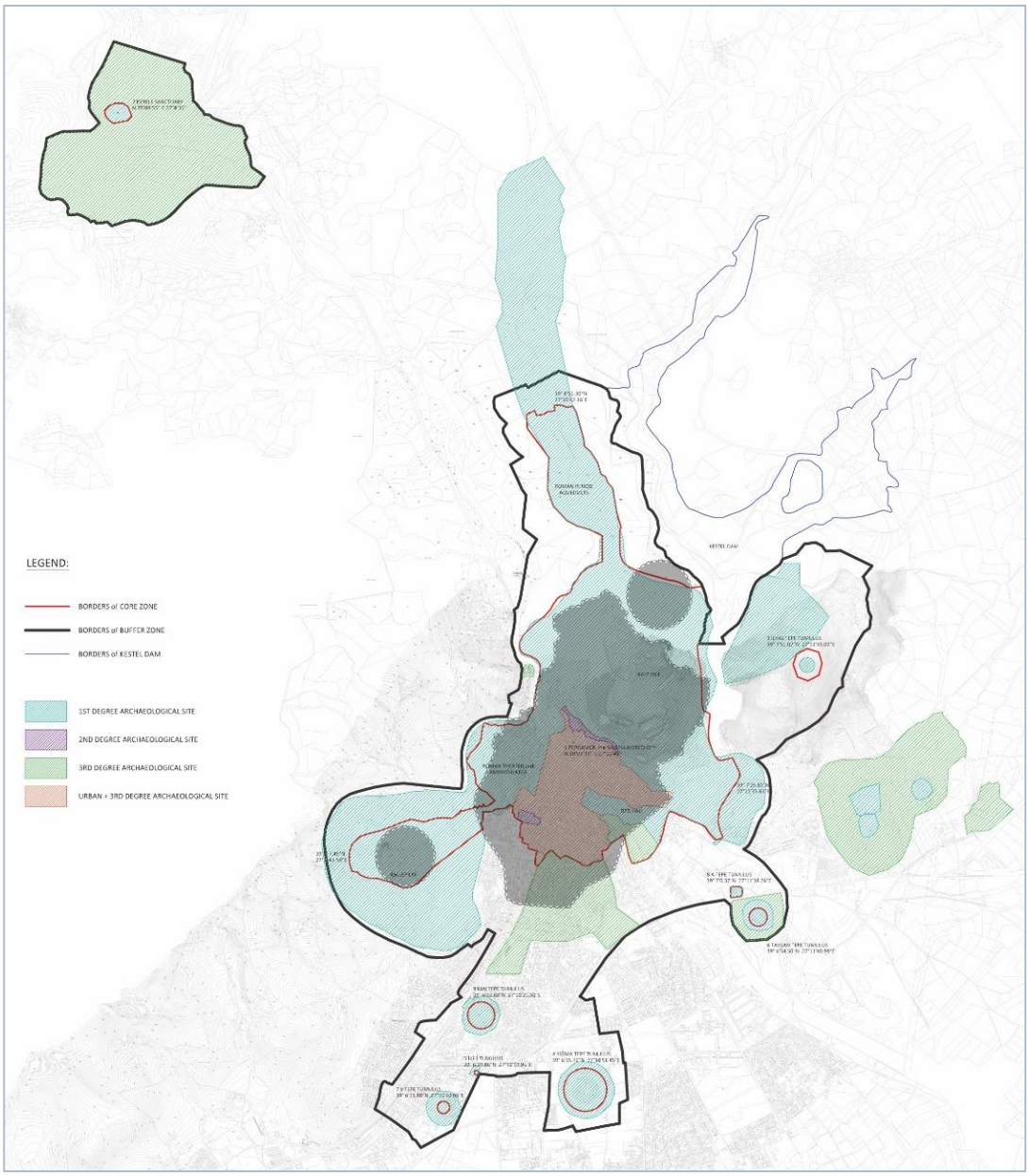


Figure 3.12 *The traces of Byzantine Period settlement with the WHS management boundary and the current registered areas.(produced by the author based on Bergama Municipality (2017))*

3.1.4. Layer 2: Turkish-Islamic Period

The Layer 2 is consisted of Turkish Principalities and Ottoman Periods structures. Structures of the periods were built on or near the structures of Layer 1, generally by using its material. Now, it covers several monumental structures which are mainly mosques, baths and khans and civil structures; Rum and Ottoman houses that are inhabited continuously although there are many vacant and ruins among them. Also, daily life of Bergama citizens that cover residential, commercial, educational, religious, cultural and administrational activities takes place in the layer.

The oldest Bergama House that still exists is dated back to 18th century[124]. Traditional Ottoman houses were generally built by using mixed system as masonry and timber frame and western style Rum houses were built as masonry[125] (Figure 3.13). Layer 2 has a lot of monumental structures that have been built as a result of Islam that is the common religion beside Judaism and Christianity (Figure 3.14).

The layer that has been built on the settlement of Late Hellenistic and Roman Period of Layer 1 is registered as both 3rd degree archeological and urban site (Figure 3.15, Figure 3.16).

[124] Bergama Municipality (n.d.). Tarihi Kentsel Doku. Retrieved from http://www.bergama.bel.tr/Home/Page/369

[125] Bilgin Altınöz, A. G., Pirson, Felix, Bachmann, M., Binan, D., Kaptı, M. (2014). Pergamon and Its Multi-Layered Cultural Landscape, UNESCO Booklet:29

Figure 3.13 *Traditional houses of Layer 2 (above left and below left taken by the author; above right retrieved from http://www.bergama.bel.tr/ Bergama Municipality)*

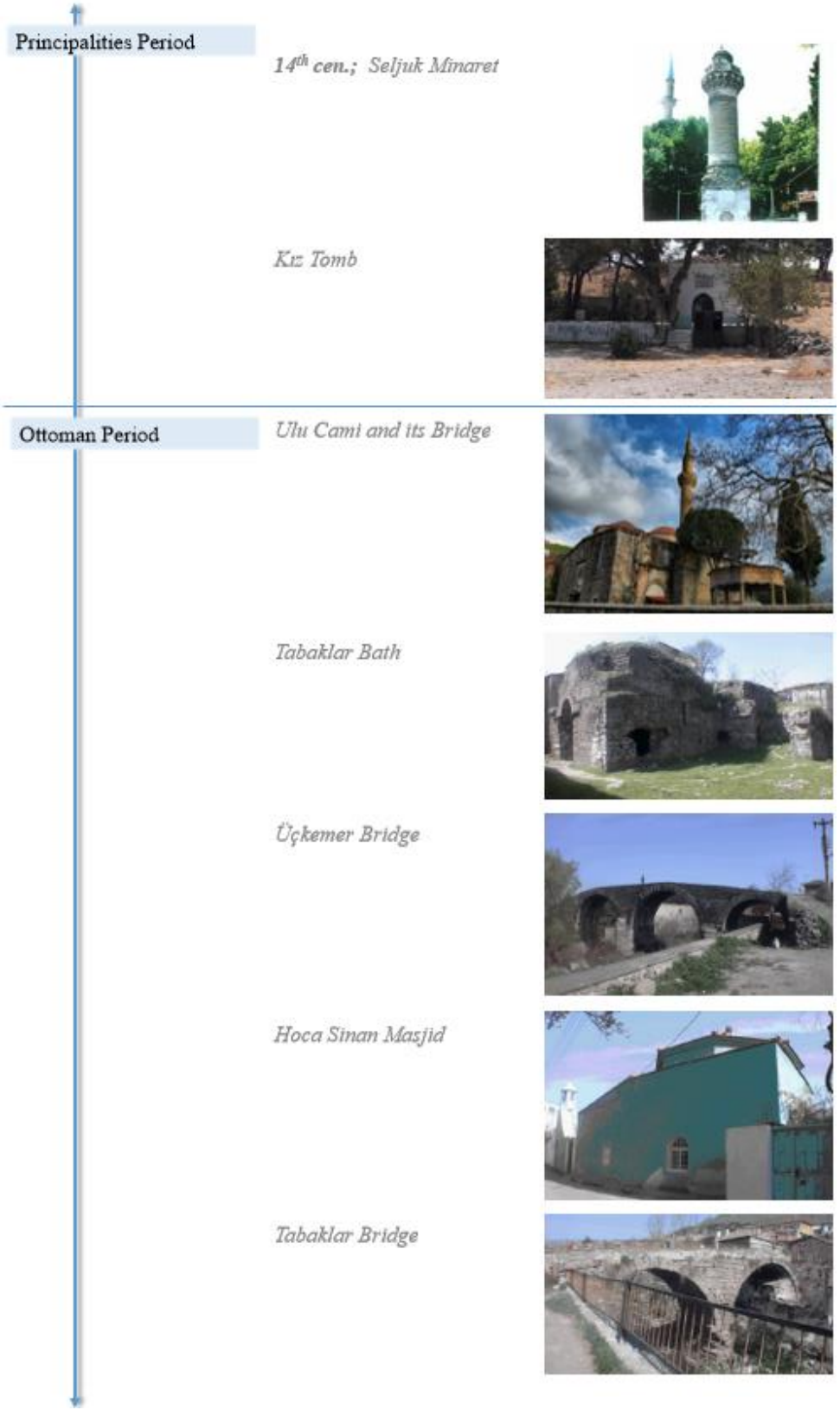


Figure 3.14 (continued)

15th cen.; Çukurhan

Küplü Bath

Taşhan

Kurşunlu Mosque

Lonca Masjid and
İncirli Masjid

Mescid Altı Masjid

Çınarlı Bath

Figure 3.14 (continued)

16th cen.; Hacı Hekim Bath

Şadırvan Mosque

Bedesten

Ansarlı Mosque and
Laleli Mosque

19th cen.; Kulaksız Mosque

Yeni Mosque

Figure 3.14 (continued)

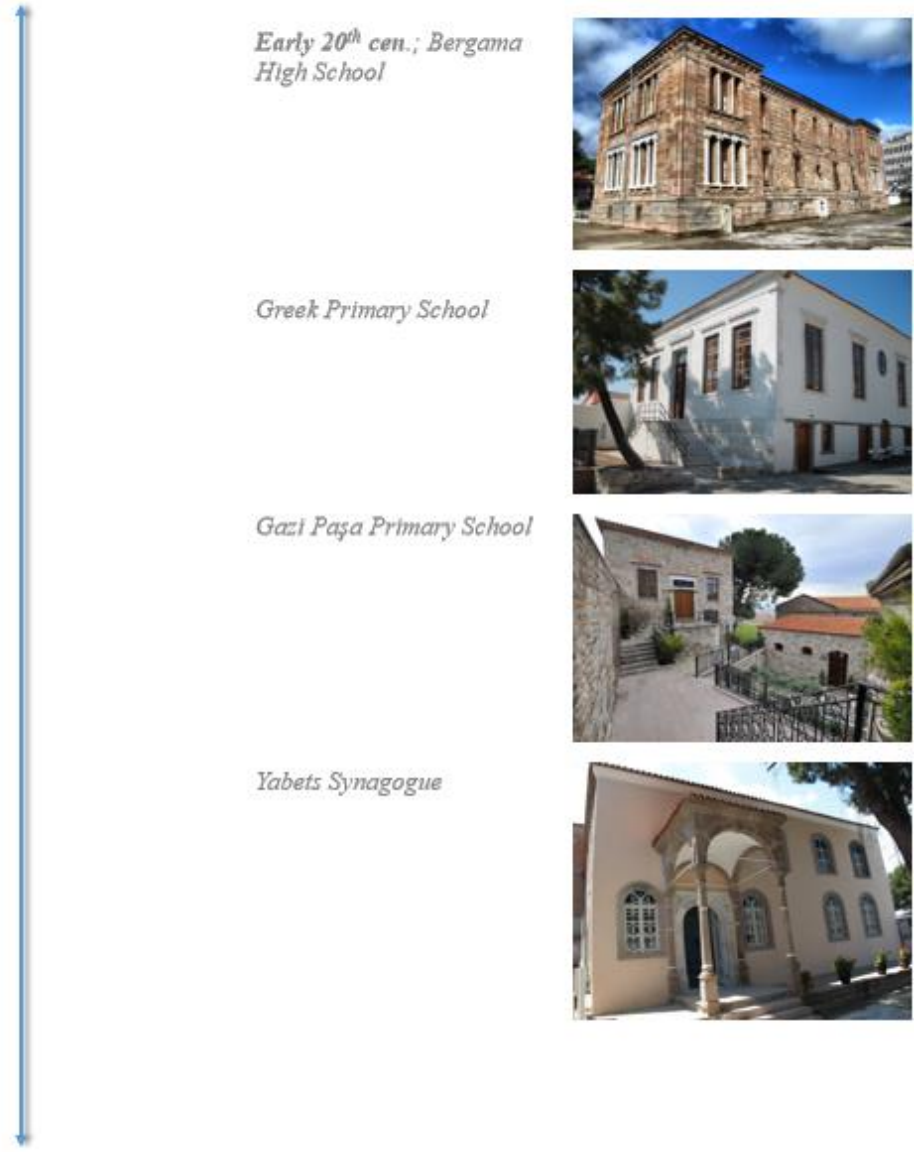


Figure 3.14 *Structures of Layer 2 (Produced by the author based on METU (2008), UNESCO (2016) World Heritage in Turkey, Bilgin, G. (1996), Bergama Municipality http://www.bergama.bel.tr/Home/Page/369)*

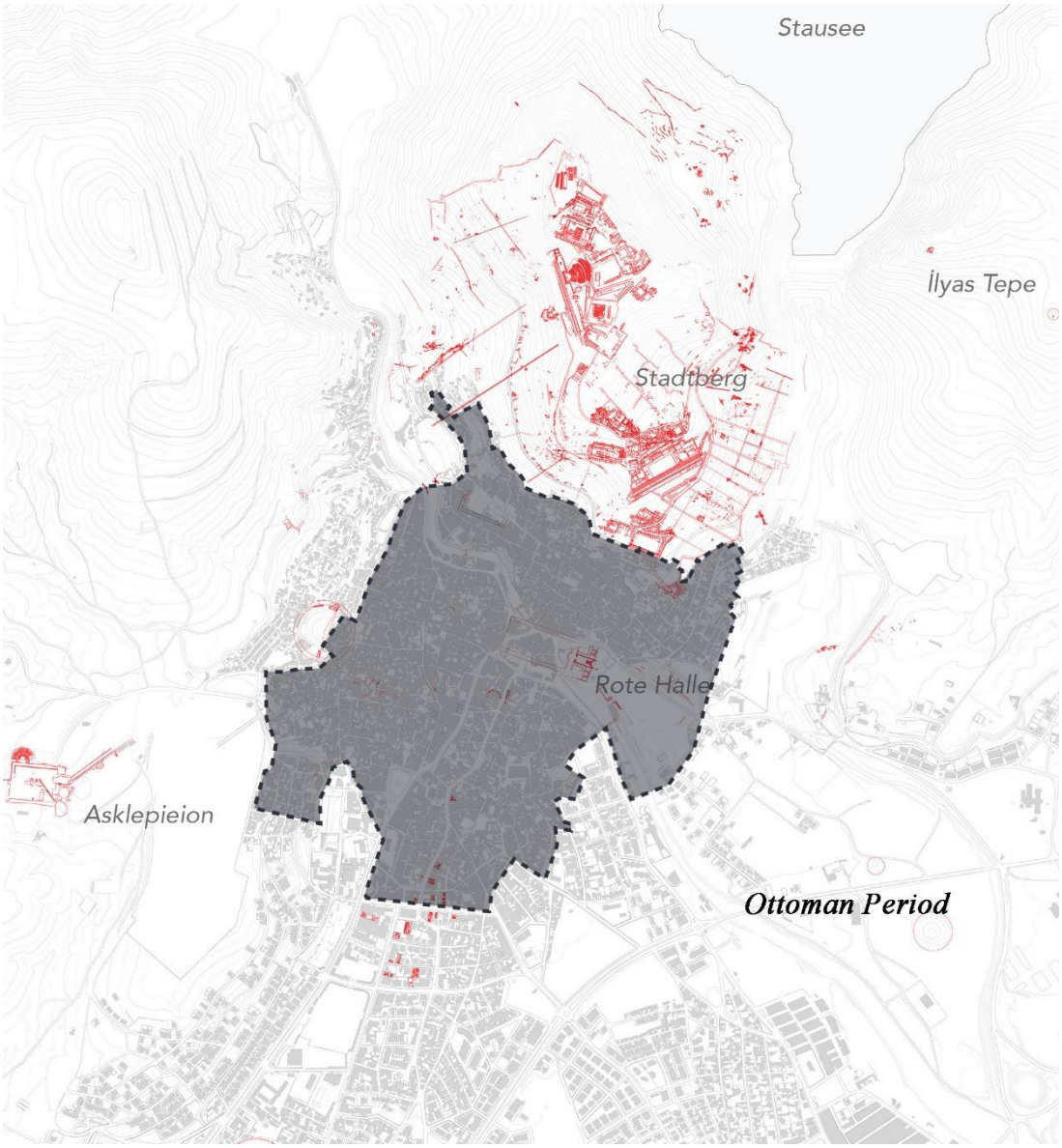


Figure 3.15 *The settlement of Ottoman Period (produced by the author based on as cited in Bilgin Altınöz, A. G., Pirson, Felix, Bachmann, M., Binan, D., Kaptı, M. (2014). Pergamon and Its Multi-Layered Cultural Landscape, UNESCO Booklet)*

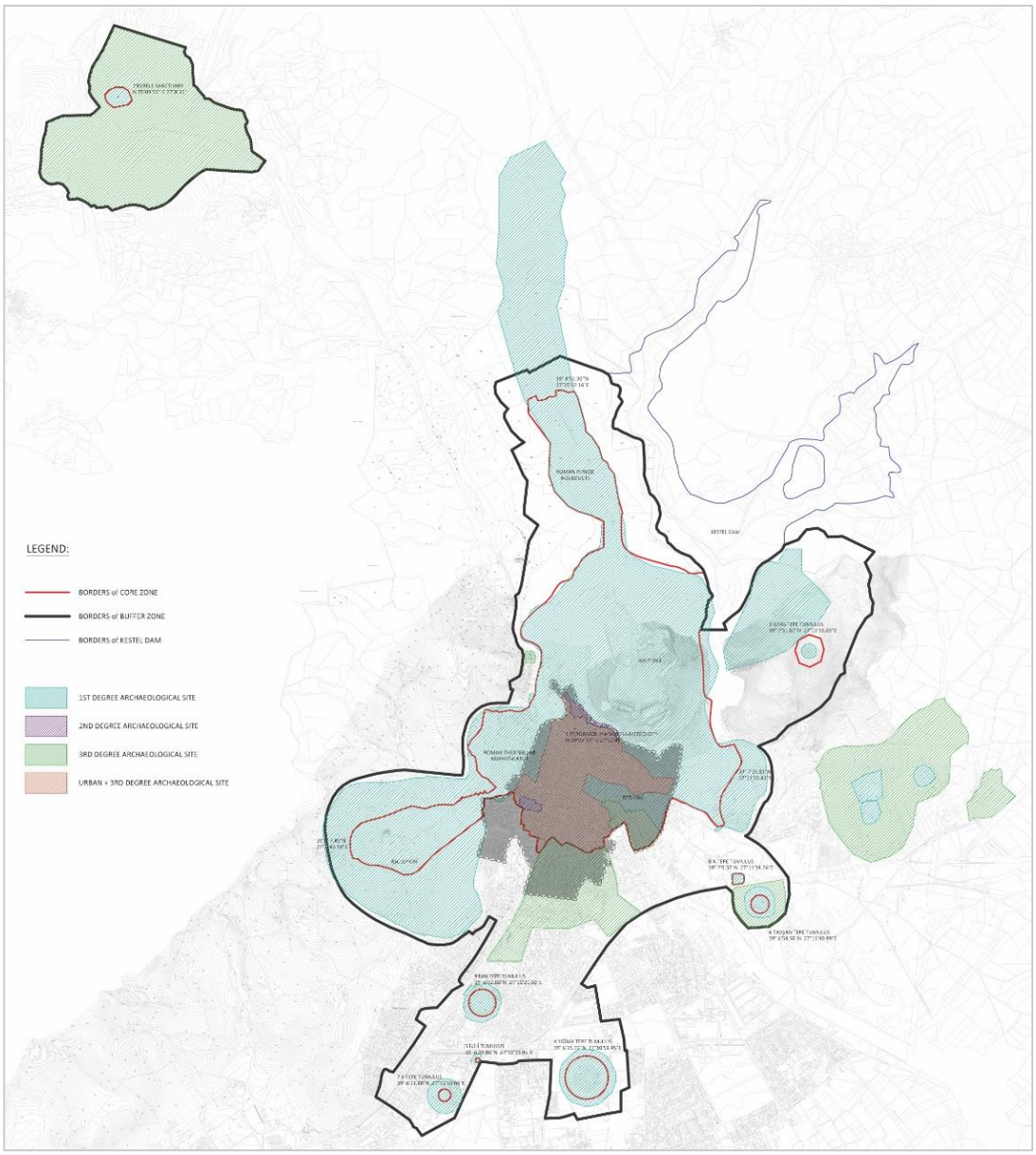


Figure 3.16 *The traces of Ottoman Period settlement with the WHS management boundary and the current registered areas.(produced by the author based on Bergama Municipality (2017))*

3.1.5. Layer 3: Modern Period

The Layer 3 is consisted of Early Republican and Contemporary Republican Periods' structures. Although Republican Period houses were built among the texture of Layer 2 that is traditional layer, structures of the Contemporary Republican Period were built on mainly new development areas through the valley[126]. The public structure of the Ottoman Period such as bridges, roads, houses, religious structures are still in use. Daily life of Bergama citizens take place in the layer together with Layer 2.

After 1940s, the floor number of new structures of the city was limited with two to sustain compatibility of them with Ottoman Period's and to conserve Roman Period archeology that buried under the city. These structures were built by using mixed system as masonry and timber frame firstly and then with masonry and reinforced concrete (Figure 3.17). Also 3 to 4 floors apartments were built in same period on new development areas. After 1980s high rise buildings have been started to be built in the city centre[127]. Also, there are monumental structures that were built at the period or built at previous periods but using in daily life for public and commercial purposes (Figure 3.18).

The layer that has been built on new development areas and the settlement of Layer 1, and Layer 2 is mainly located on 1st degree archeological, 2nd degree archeological, 3rd degree archeological + urban site (Figure 3.19 and Figure 3.20).

[126] Bilgin Altınöz, A. G., Pirson, Felix, Bachmann, M., Binan, D., Kaptı, M. (2014). Pergamon and Its Multi-Layered Cultural Landscape, UNESCO Booklet:29
[127] Bilgin, A. G. (1996) Urban Archeology: As the Basis for the Studies on the Future of the Town Case Study: Bergama.:135

Figure 3.17 *Residences of Republican Period of Layer 3 (Bilgin Altınöz, A. G., Pirson, Felix, Bachmann, M., Binan, D., Kaptı, M. (2014). Pergamon and Its Multi-Layered Cultural Landscape, UNESCO Booklet:28)*

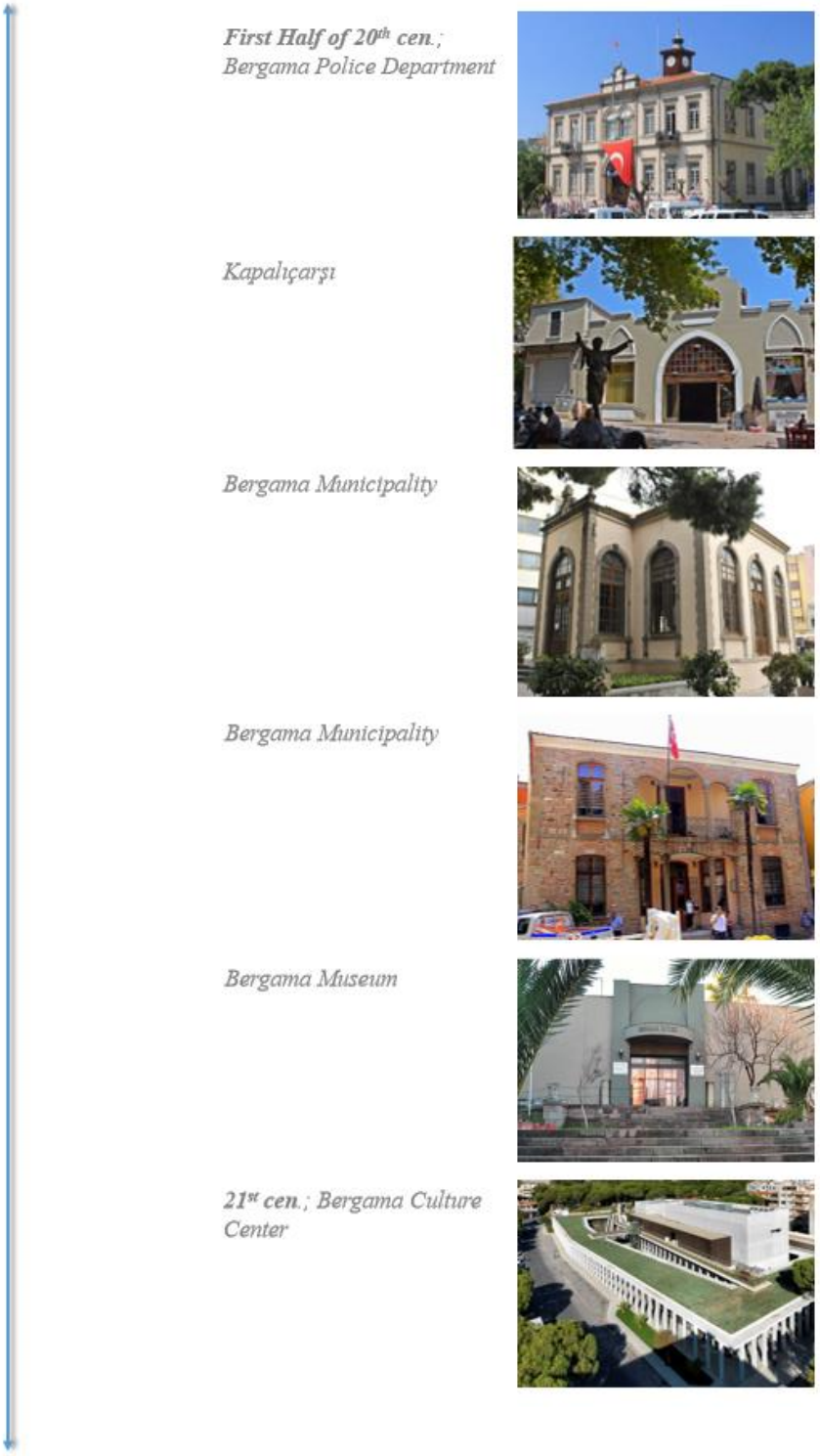


Figure 3.18 *Structures of Layer 3. (Produced by the author based on Bilgin Altınöz, A. G., Pirson, Felix, Bachmann, M., Binan, D., Kaptı, M. (2014). Pergamon and Its Multi-Layered Cultural Landscape, UNESCO Booklet, Bergama Municipality http://www.bergama.bel.tr/Home/Page/1202, Erol Şaşmaz https://www.erolsasmaz.com/?oku=1746)*

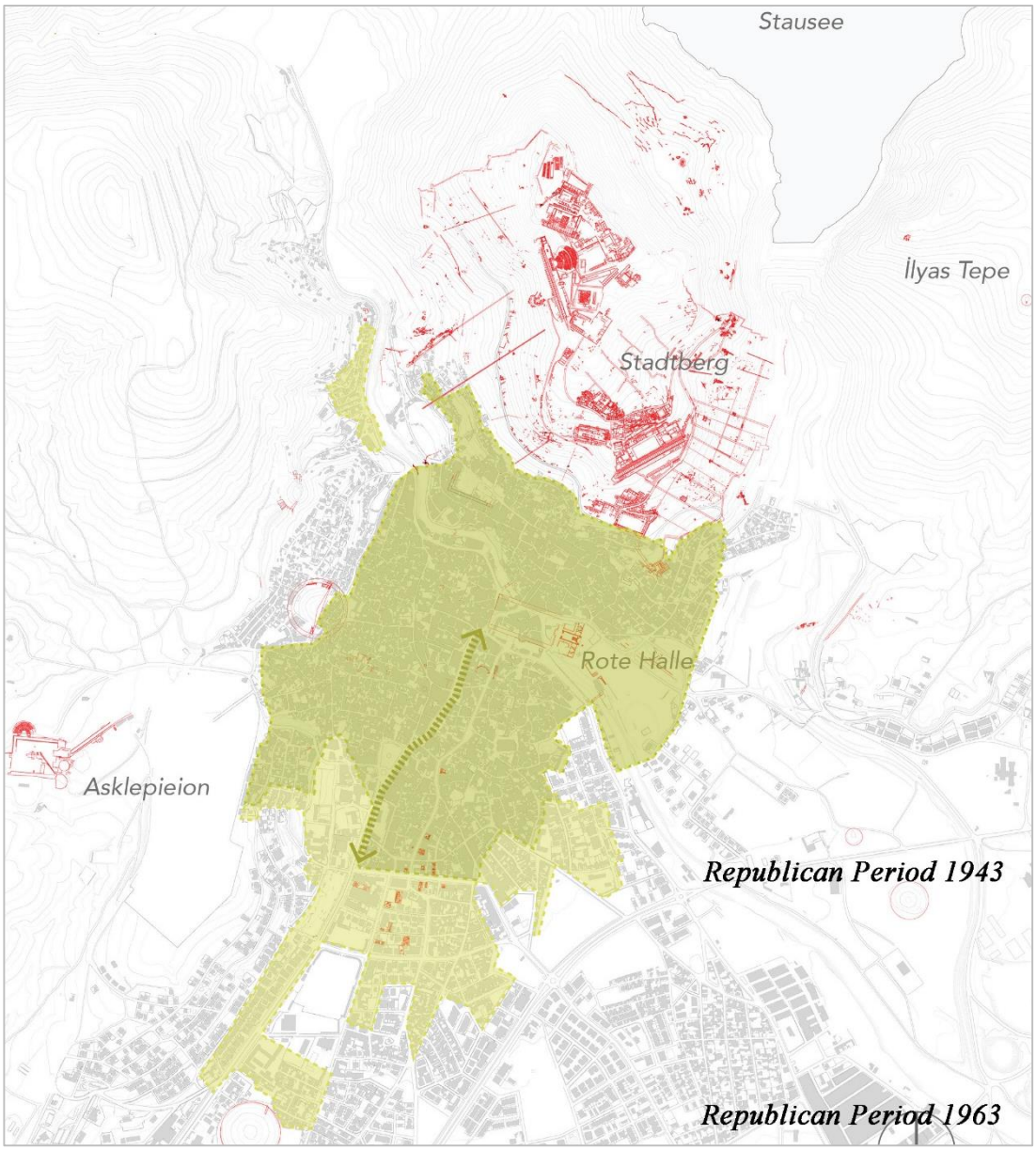


Figure 3.19 *The settlement of Modern Period (produced by the author based on as cited in Bilgin Altınöz, A. G., Pirson, Felix, Bachmann, M., Binan, D., Kaptı, M. (2014). Pergamon and Its Multi-Layered Cultural Landscape, UNESCO Booklet)*

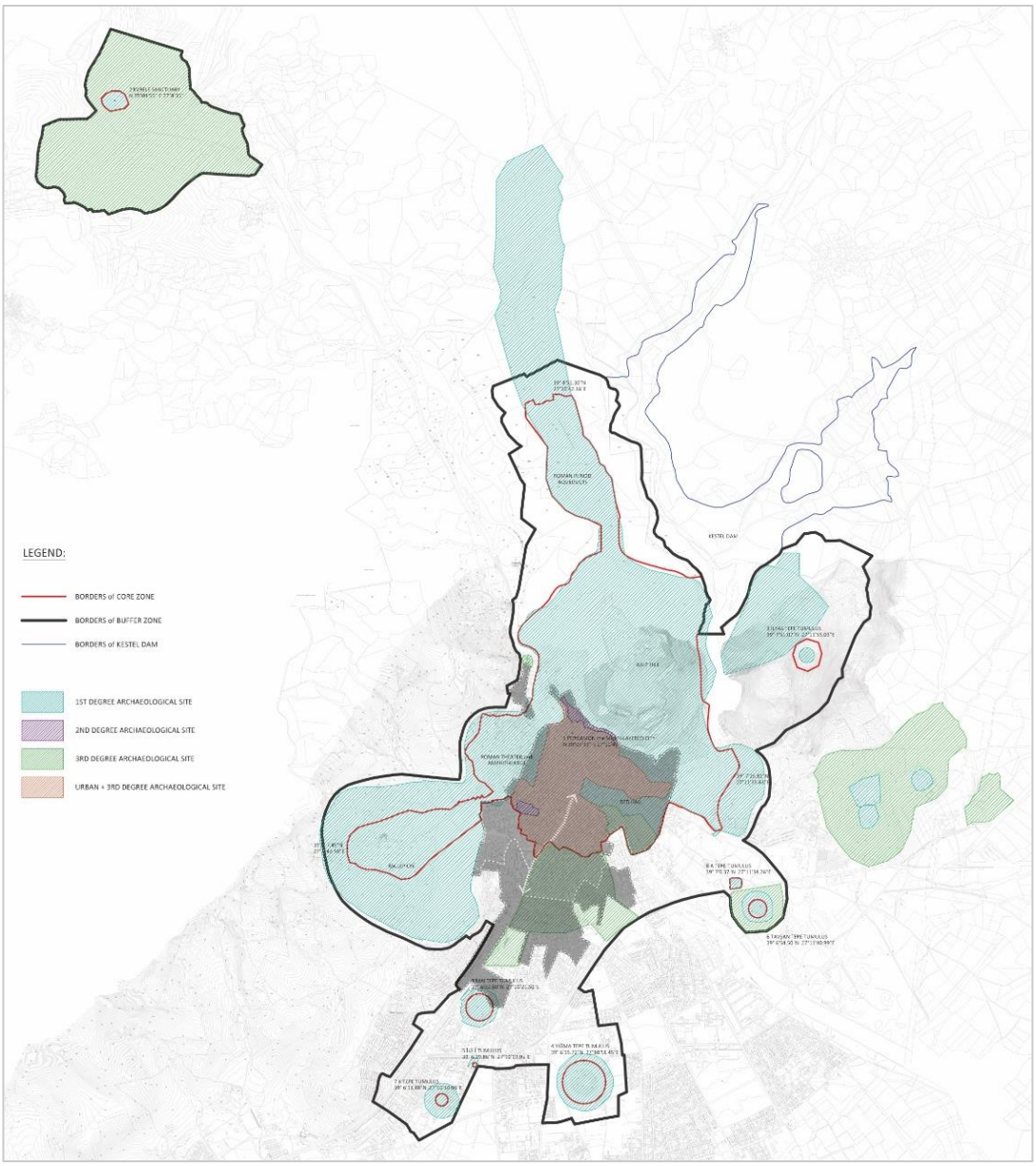


Figure 3.20 *The traces of Modern Period settlement with the WHS management boundary and the current registered areas.(produced by the author based on Bergama Municipality (2017))*

3.2. Understanding Current Risk Management for Bergama as a WHS

Bergama is the best and the first example of 1940s urban conservation and planning. It shows how Republican Period settlement can be created in accordance with historical urban fabric and the city within the all periods' structures can be conserved with the archeological remains. These can be achieved through the 1943 and 1968 construction plans that are the first examples of planning a city with its cultural heritage[128]. These plans did not allow the construction of more than two stories structures in order not to damage Roman Period Bergama that is located under the city[129].

The 'site' concept has been introduced first via the "1710 numbered Ancient Monuments Law" at 1973 for Turkey and the council of Ancient Work and Monuments declared archeological sites of Bergama as registered at 1976[130].Bergama has registered areas as of 1st Degree Archeological, 2nd Degree Archeological and 3rd Degree Archeological and both Urban and 3rd Degree Archeological Registered Areas and these areas are conserved within the scope of the "Law on the Conservation of Cultural and Natural Property" No. 2863. The law has required the preparation of 'Conservation Plan' for registered areas.[131] The law has no expression about risk management for cultural heritage, so Conservation Plans (2006, 2012) of Bergama has no regulation about risks except for new development areas. Regional Conservation Council-2[132] is responsible for approval of all decision and intervention of conservation, preservation or construction works related to these registered sites.

[128] Bilgin Altınöz, A. G., Ulusoy Binan, D. and Pirson, F. (2016) Pergamon and Its Multi-Layered Cultural Landscape. UNESCO World Heritage in Turkey:363,364
[129] Bilgin Altınöz, A. G., Ulusoy Binan, D. and Pirson, F. (2016) Pergamon and Its Multi-Layered Cultural Landscape. UNESCO World Heritage in Turkey:366
[130] Ulusoy Binan, D. and Binan, C. Ş. (2005) An approach for defining, assessment and documentation of cultural heritage on multi-layered cities, case of Bergama (Pergamon) - Turkey. In: 15th ICOMOS General Assembly and International Symposium: 'Monuments and sites in their setting - conserving cultural heritage in changing townscapes and landscapes', 17 – 21 oct 2005, Xi'an, China. Retrieved from http://openarchive.icomos.org/275/
[131] Law no 2863, (8) (Added:14/07/2004 – 5226/1 article)
[132] İzmir 2 Numaralı Kültür Varlıklarını Koruma Bölge Kurulu Müdürlüğü

Bergama first included at "UNESCO Tentative List" and "Bergama Municipality" established a "UNESCO World Heritage Site Management Office" in 2011, and the "Advisory Body" and "Coordination and Supervision Body". Then it is inscribed as World Heritage Site within criteria of i, ii, iii, iv, vi[133] in 2014. After becoming WHS, Bergama Municipality prepared Site Management Plan of Bergama Multi-Layered Cultural Landscape. The "Advisory Body" and "Coordination and Supervision Body" are responsible for approving and implementing the plan and also the bodies represent "the state and local administrative institutions, universities, NGOs and representative of muhktars"[134]. The plan (first version that covers 2016-2020 and with it revised version that covers 2017-2021) aims at preparing "Disaster Management Plan for Everyone" under the "Strategic Goal 1: Holistic Preservation and Management of Bergama Cultural Landscape". Listed actions are[135]:

i. Developing a comprehensive risk management plan for citizens, visitors and cultural heritage that focuses on natural disasters and other risks. Organize workshops and meetings to ensure the participation of the public, NGOs and related public institutions in the development of the plan.

ii. Informative publication about what should be done in case of disasters such as fire, earthquake, and flood, etc. Building a team of researchers for the creation of informative materials.

[133] Bergama criteria for selection;
i: to represent a masterpiece of human creative genius
ii: to exhibit an important interchange of human values, over a span of time or within a cultural area of the world, on developments in architecture or technology, monumental arts, town-planning or landscape design
iii: to bear a unique or at least exceptional testimony to a cultural tradition or to a civilization which is living or which has disappeared
iv: to be an outstanding example of a type of building, architectural or technological ensemble or landscape which illustrates (a) significant stage(s) in human history
vi: to be directly or tangibly associated with events or living traditions, with ideas, or with beliefs, with artistic and literary works of outstanding universal significance. (The Committee considers that this criterion should preferably be used in conjunction with other criteria)
[134]UNESCO. Pergamon and its Multi-Layered Cultural Landscape, Protection and management requirements. Retrieved from https://whc.unesco.org/en/list/1457
[135] Bergama Belediyesi. Bergama Çok Katmanlı Kültürel Peyzajı Alan Yönetim Planı 2016-2020:96,97

iii. Carrying out studies on how citizens and cultural heritage will be affected by disaster scenarios and sharing the results with the public.

iv. To inform disabled people and public institutions about the needs of the citizens with special needs and disabilities in possible disaster scenarios.

v. Preparing hand brochures and informative boards, placing these boards in areas that will attract the attention of citizens and visitors.

vi. Bringing together citizens and public institutions responsible for disaster and risk management on special days and weeks to increase awareness about cultural heritage and citizens' protection.

vii. To create a section in which the natural heritage, in particular, is addressed in the Disaster and Risk Management plan for all. (included at revised plan[136])

In addition, the plan[137] aims monitoring of the plan and the site under the Strategic Goal 1 and includes seismic monitoring by "Bogazici University Kandilli Observatory and Research Institute" and "Yıldız Technical University" to assess the effect of seismic waves on the properties.

It is a precious innovation that the actions include protection of cultural and natural heritage beside citizens. However, there are no realized actions for this aim.

Although conservation of cultural heritage has been included to TAMP and UDSEP, and data flow is expected from MoCT to AFAD regarding realized actions, there is not any notification made by MoCT for Bergama.

Also, Bergama was included "World Heritage and Disaster Risk Mitigation: For Sustainable Heritage Tourism in Asia" project granted by "Japan Society for the Promotion of Sciences" recently besides the WHS of Japan, Indonesia, China and Nepal. Via the project a proposal will prepared for DRM for sustainable heritage tourism and also raising awareness for disaster risk in sustainability of tourism in WHS

[136] Bergama Belediyesi. Bergama Çok Katmanlı Kültürel Peyzajı Alan Yönetim Planı 2017-2021
[137] Bergama Belediyesi. Bergama Çok Katmanlı Kültürel Peyzajı Alan Yönetim Planı 2017-2021:86

for local people is aiming. Within this scope the international workshop on ““World Heritage and Disaster Risk Mitigation: For Sustainable Heritage Tourism in Bergama.” in 12-16th February 2019 was held by the academicians of “Teikyo Heisei University”, “University of Tokyo”, “Tokyo University of Science”, “Tama University” and “Toyo University” hosted by “Bergama Municipality” and disaster risk consciousness of citizens for “sustainable heritage tourism” was discussed.

UNESCO reports the conservation status of each WHS since 1979. These reports named as State of Conservation (SOC) can be accessible for 9 of all 18 WHS of Turkey that are; “Archaeological Site of Ani”, “Diyarbakır Fortress and Hevsel Gardens Cultural Landscape”, “Ephesus”, “Göreme National Park and Rock Sites of Cappadocia”, “Historic Areas of İstanbul”, “Hierapolis-Pamukkale”, “Neolithic Site of Çatalhöyük”, “Xanthos-Letoon”, and “Pergamon and its Multi-Layered Cultural Landscape”.

Cultural heritage sites of Bergama with its WHS name, as “Pergamon and its Multi-Layered Cultural Landscape” is threatened by effects caused by the use of “transportation infrastructure and management systems” according to SOC report. Bergama is needed to improve the monitoring system of the management plan “by specifying which organization is responsible for monitoring each indicator and include seismic monitoring”[138]. In order to prevent floods, the “Selinos Brook Amelioration Project” and the “Heritage Impact Assessment Report” are being prepared as stated in 2017 SOC report[139] (see appendices C).

According to UNESCO[140] at 2016, “the State Party” has identified the organizations that are responsible for each ‘monitoring indicator’ within the scope of improvement of the monitoring system. The Republic of Turkey MoCT is the primary responsible

[138] UNESCO (2016) State of conservation of properties inscribed on the World Heritage List WHC/16/40.COM/7B: 106,107
[139] UNESCO (2017) Summary of the State of Conservation Report by the State Party, Pergamon and Its Multi-Layered Cultural Landscape
[140] UNESCO.State of conservation. Pergamon and its Multi-Layered Cultural Landscape
Analysis and Conclusion by World Heritage Centre and the Advisory Bodies in 2016 https://whc.unesco.org/en/soc/3435

party for monitoring and evaluation of Bergama Site Management Plan in conformity with "*Law on the Conservation of Cultural and Natural Property*" No. 2863 and the Bergama Municipality is responsible to conduct actions of the plan and for the sustainability of the plan with the Ministry[141].

Bergama has been a settlements place all through Archaic-Classical Ages, Hellenistic Era, Roman Era, Byzantine Era, Principalities Era, Ottoman Era, and Turkish Republican Era are still ongoing. The city has shaped with nature and the culture along these ages. Although the history of the region goes back to the Bronze Age, the earliest finding on the Kale Hill belongs to the archaic period[142]. It has archeological, natural, urban heritage sites. Therefore, the need of preparing a DRM for Bergama can be clearly seen after defining its values and current DRM mechanisms.

[141] Bergama Belediyesi. Bergama Çok Katmanlı Kültürel Peyzajı Alan Yönetim Planı 2017-2021:6
[142] Bergama Belediyesi. Bergama Çok Katmanlı Kültürel Peyzajı Alan Yönetim Planı 2016-2020

CHAPTER 4

ASSESSING THE MANUAL ON THE CASE STUDY TO PROPOSE A DRM APPROACH FOR BERGAMA AND ITS MULTI-LAYERED CULTURAL LANDSCAPE

It is vital to recognize the importance of safeguarding Bergama as a WHS against damage by disasters in order to prolong the lifetime and enhance the value of their contribution to global culture, heritage and socioeconomic growth of communities. Because of the ever-changing nature of the site, it is important to recognize many different situations in which these sites can be affected in a destructive manner; each type of disaster requires unique prevention and protection measures according to the type of assets and their vulnerabilities. Under this title, effectiveness of the manual on Bergama case was assessed with following the steps defined in the manual as titles of it, with the available data and information. In each title data need and related institution to develop or collect them regarding the dynamics of the site was proposed.

The aim of the DRM plan for Bergama is preventing and/or mitigating the impact of disaster risks for assets that have OUV firstly, then all cultural assets of Bergama and all physical environment, its communities; inhabitants, visitors and staff, and livelihoods. The target audience of the DRM plan and so the responsible partners that are implying it to Bergama case are the management team of the site and related agencies and organizations. The key stakeholders to prepare the plan should be; at local level: site manager (MoCT), "UNESCO World Heritage and Site Management Office (Bergama Municipality)", "Bergama Municipality", "Bergama District Governorship", "İzmir Provincial Directorate of AFAD", mukhtars, NGOs of Bergama, volunteers, inhabitants, "Bergama Fire Department", "Bergama Police Department", "Bergama Health Department", academicians from related departments, professionals (according to cultural assets of Bergama: archeologists, conservation

architects, city planners, seismic engineers, civil engineers, hydrologists, art historians, and technicians); at international level: "UNESCO World Heritage Center" as the key partner and other institutions ICOMOS, ICORP, ICOM and ICCROM.

In order to develop the proposed approach that formulated within the available data and information (Table 4.1) following (the steps that the manual defines, there is a need to list required data and information for all layer of Bergama regarding each DRM steps. Therefore, the chapter also analysis the data, information, relevant institutions that should be responsible to produce them and governance need to prepare a comprehensive DRM for Bergama under each title.

Table 4.1 Available data and information for Bergama that can be used to prepare the DRM framework. (prepared by the author)

Institution	***Data and Information***
AFAD	Earthquake hazard may of Turkey
AFAD	Distribution map of landslide of Turkey and Bergama during 1950-2008
AFAD	Distribution map of all kind of hazards caused disaster between the years 1950-2008
MoAF, Directorate General of Meteorology	Average precipitation amounts according to water and agricultural basins
MoAF, Directorate General of Meteorology	Average temperature anomalies map
GFDRR	Probability of occurrence of each possible hazard (It is a world-wide data includes Turkey)
UNESCO	Bergama WHS information: WHS boundary, inscription criterion, tangible and intangible attributes of Bergama that has OUV
UNESCO	SOC reports
Compiled by using different sources via archive scanning: Bayatlı (1957)[143], AFAD, Boğaziçi University Kandilli Observatory and Earthquake Research Center,	Disaster history

[143] Bayatlı, O. (1957) Bergama'da Yakın Tarih Olayları 19. -20. Yüzyıl. Bergama Belediyesi

Table 4.1 (continued)

METU-Graduate Program in Restoration (2008)[144]	
TÜBA-TÜKSEK "Bergama Urban Cultural Inventory Project", METU-Graduate Program in Restoration (2008)	Inventory data (partially for layer 2)
Bergama Municipality and MoCT	1/100 scaled Implementation Plans, Bergama Site Management Plan, Bergama Conservation Master Plan, 1/25.000 and 1/100.000 scaled Regional Plan
Bergama Municipality	Analysis maps of Bergama Conservation Master Plan: Topography, geological survey, boundaries of registered areas, land-use, urban density, road pavement, ownership, lots, structural systems, floor numbers, structural conditions, registered structures
Bergama Municipality	Cultural Heritage Impact Assessment for Selinos Amelioration Project
Bergama Municipality	Emergency assembly areas
Bergama Chamber of Commerce (BERTO)	Compiled up-to-date population, education, superstructure, livelihood data

4.1. Identifying and Assessing Risks

As a basis for and the first step of creating DRM for Bergama, hazard assessment, exposure assessment and vulnerability assessment of Bergama (Figure 4.1), in other words disaster risks will be identified. These assessments were carried out within the limits of available data on Bergama that has been gathered from different institutions (see Table 4.1). In this process, also, relevant institutions that are responsible to collect necessary missing data will be listed within the focus of defined layers.

[144] A Project for Preparation of Bergama Conservation and Management Plan within the scope of REST 507

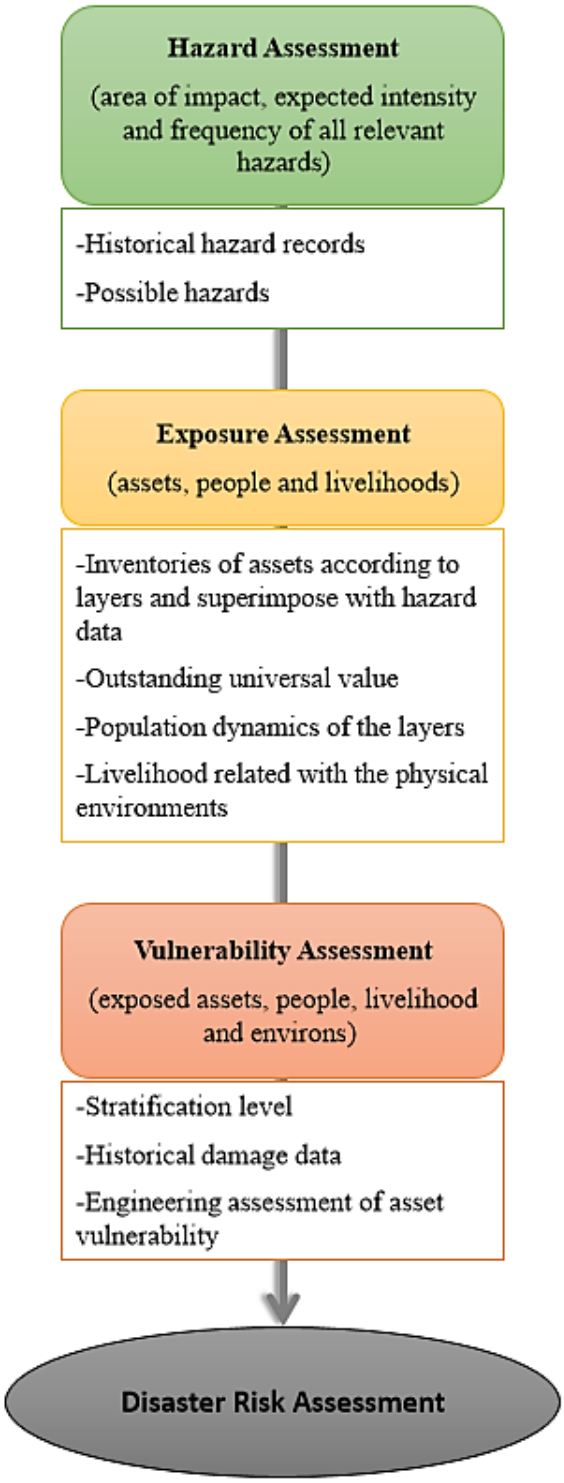


Figure 4.1 *Data requirements for identification and assessment of disaster risks for Bergama. (Prepared by the author using Asian Development Bank (2017). Disaster Risk Assessment for Project Preparation. A Practical Guide:8)*

4.1.1. Hazard Assessment

For hazard assessment that covers identification of historical data records and possible hazards of Bergama, data has been collected from different institutions and sources: AFAD, "Boğaziçi University Kandilli Observatory and Earthquake Research Institute", GFDRR and Bayatlı (1957). According to the sources, there is the possibility of occurring many natural hazards in Bergama and so the city is a hazard prone area.

Each type of possible hazards that may affect the properties and the probability of them should be assessed. Thematic maps of the region or the area that WHS placed on can be found at national, regional, and local authorities. For Bergama there is not any hazard vulnerability map, but there is only earthquake hazard map (Figure 4.2), precipitation level map (Figure 4.3), temperature anomalies map (Figure 4.4), distribution of landslide and the distribution of all kind of hazard caused disaster map (these maps prepared by using disaster history data and does not indicate the vulnerability of area and hazard occurrence probability) in Turkey scale prepared by AFAD and "Directorate General of Meteorology". According to these maps, Bergama is an earthquake prone area, receiving more than average precipitation amount so that may cause urban and river flood and average temperature in summer time is above normal so that can cause wildfire.

According to GFDRR[145] modelling which covers more comprehensive hazard assessment, Bergama is a land of;

- High level of ***wildfire*** hazard; The chance of weather conditions that can lead to a major fire is more than 50% in any given year and the hazard can cause both life and property loss.

[145] GFDRR. Think Hazard. Retrieved from http://thinkhazard.org/en/report/27921-turkey-izmir-bergama

- High level of ***landslide*** hazard; Bergama has precipitation patterns, terrain slope, geology, soil, land cover and earthquakes (potentially) that make landslides a frequent phenomenon (there is no specific percentage).
- Medium level of ***river flood*** hazard; The probability of potentially harmful and life-threatening river floods over the next ten years is more than 20%.
- Medium level of ***extreme heat*** hazard; Over the next five years there is a greater than 25% chance of prolonged exposure to extreme heat that results in heat stress of at least one period.
- Medium level of ***earthquake*** hazard; The chance of earthquake that will has a damaging potential is 10% in the next fifty years.
- Low level of ***urban flood*** hazard; The probability of potentially damaging and life-threatening urban floods in the next 10 years is more than 10%.
- Low level of ***coastal flood*** hazard; The possibility of coastal flood waves that has damaging potential in next ten years is 10%.
- Low level of ***tsunami*** hazard; A potentially damaging tsunami that could occur in the next 50 years has more than 2% chance.
- Low level of ***water scarcity*** hazard; There is 1% chance of drought will occur in the next 10 years.
- Very low ***cyclone*** hazard; There is less than 1% chance of cyclone-strength winds that has damaging effect on the city in the coming ten years.
- No risk of ***volcano***.

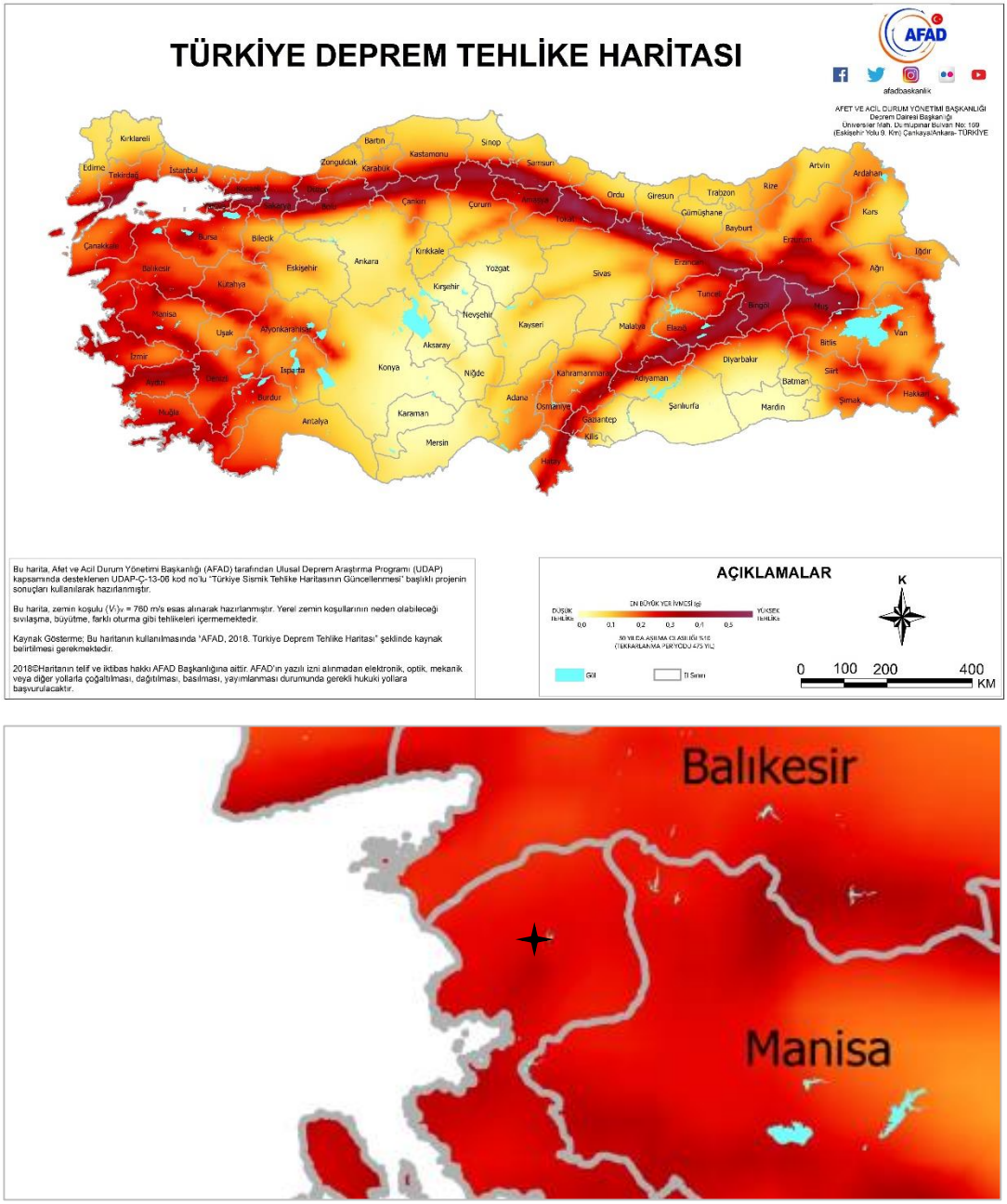


Figure 4.2 *Turkey Earthquake Hazard Map. (AFAD, 2018 Retrieved from https://deprem.afad.gov.tr/deprem-tehlike-haritasi)*

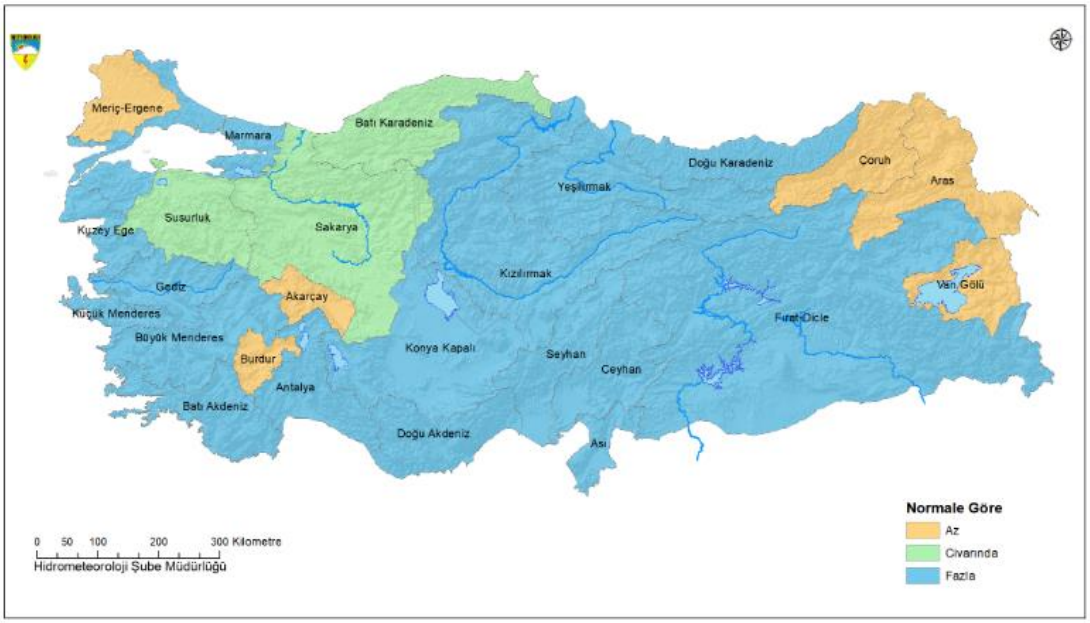


Figure 4.3 *Comparison of average precipitation amount according to water and agricultural basins, October 2018-September 2019 (blue indicates more than average precipitation) (MoAF, Directorate General of Meteorology, 2019 Retrieved from https://mgm.gov.tr/veridegerlendirme/havzalara-gore-yagis.aspx?y=k)*

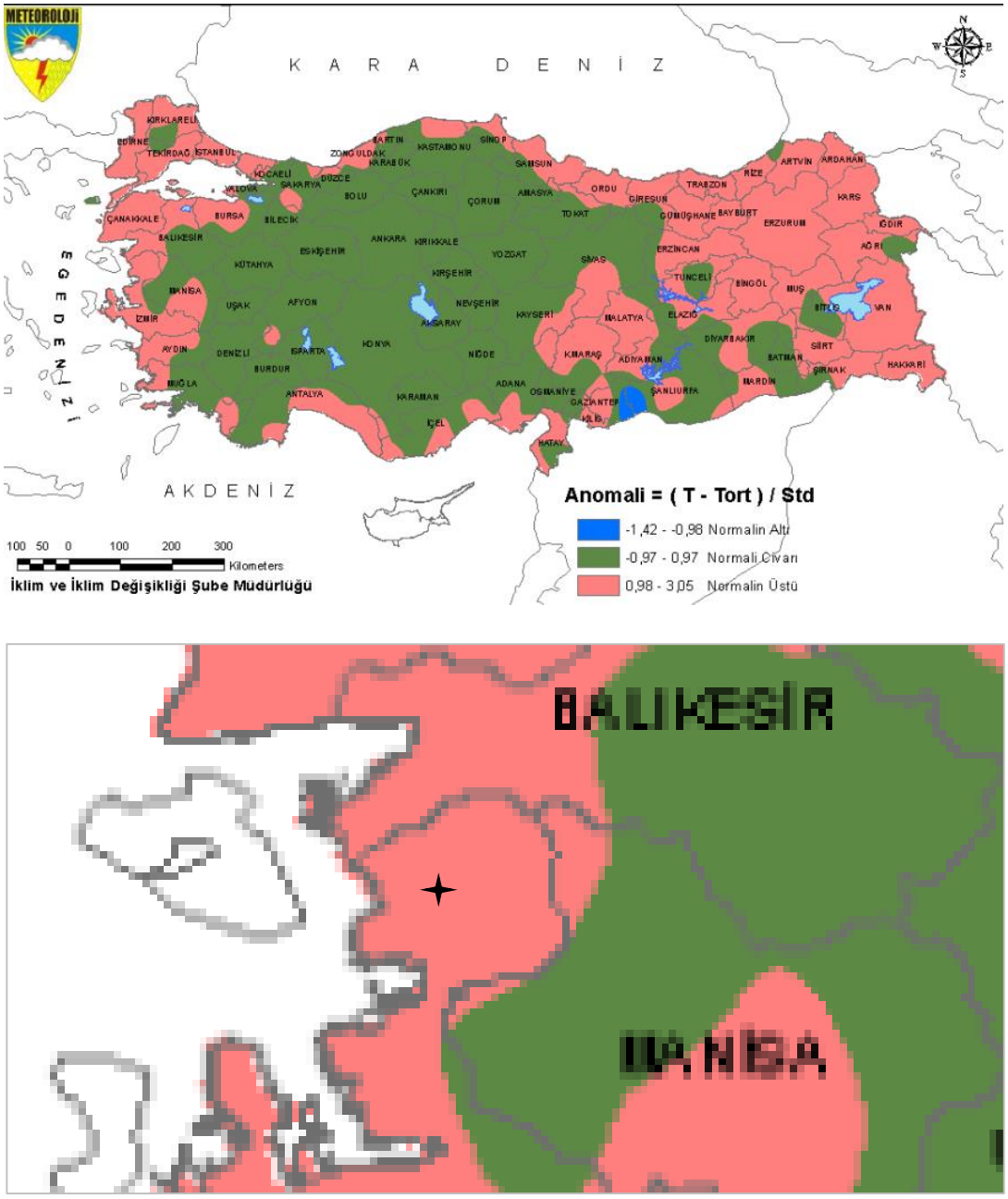


Figure 4.4 *Summer average temperature anomalies map,2019. (Pink indicates that temperature is above seasonal normal) (MoAF, Directorate General of Meteorology, 2019 Retrieved from https://mgm.gov.tr/veridegerlendirme/sicaklik-analizi.aspx?s=m#sfB)*

Disaster history is another point to assess in order to identify possible hazards. Historical record of earthquake produced by AFAD and "Boğaziçi University" and data regarding other hazards can be gathered by historical sources like travelogue. AFAD have prepared distribution map of hazards occurred between giving years (Figure 4.6, Figure 4.7). Both AFAD and the university is providing historical earthquake data in their websites for Turkey. Bayatlı (1957) has listed disasters of Bergama in his book named "Recent History Events of Bergama".

Through history, Bergama suffered from a lot of floods, drought, fires and earthquakes (Figure 4.8). Even, it is said that the Hellenistic Period was over by an earthquake in Bergama by citizens. They affected the human life, livelihoods and structures severely. To illustrate their effect, poetries was written to narrate 1842 flood by local people. One of them is "*Destan-ı Şehri Bergama*" (which means 'Epic of Bergama City') consist of 28 stanza and it explains the destructive effect of the flood on the city like[146];

"..

Mihnetlere daldı, bu nice insan,	*'*A lot of people are wandering,
Tekke köprüsünün, bir gözü ahsan	An eye of Tekke Bridge is blind
Kazancı köprüsü, yer ile yeksan,	Kazancı Bridge was completely fallen down
Tabaklar köprüsü simüzere muhtaç	Tabaklar Bridge is in need of silver and gold'
	(for repair).."

It is known that the Kazancı Bridge was fallen down by the flood via the poet (Reconstruction was started by the help of gravure by the Bergama Municipality (Figure 4.5).).

[146] Bayatlı, O. (1957) Bergama'da Yakın Tarih Olayları 19. -20. Yüzyıl. Bergama Belediyesi:141

Figure 4.5 *The place of Kazancı Bridge that was fallen down by the flood (ÇEKÜL (2013) An example of Urban Conservation: Bergama. retrieved from https://www.cekulvakfi.org.tr/haber/kentsel-korumada-ornek-bergama)*

Also after flood, an inscription placed on the tannery explains the severity of the flood by giving its date[147];

"Cihane gelmemiş bunun misali,	'There is no example of this in the world
Ve illa geldiyse Nuh'un Tufanı,	If there is, it was something like Noah's Flood
Ramazan-I şerifin onuncu günü.	The tenth day of Ramadan
1842"	1842'

[147] Bayatlı, O. (1957) Bergama'da Yakın Tarih Olayları 19. -20. Yüzyıl. Bergama Belediyesi:138

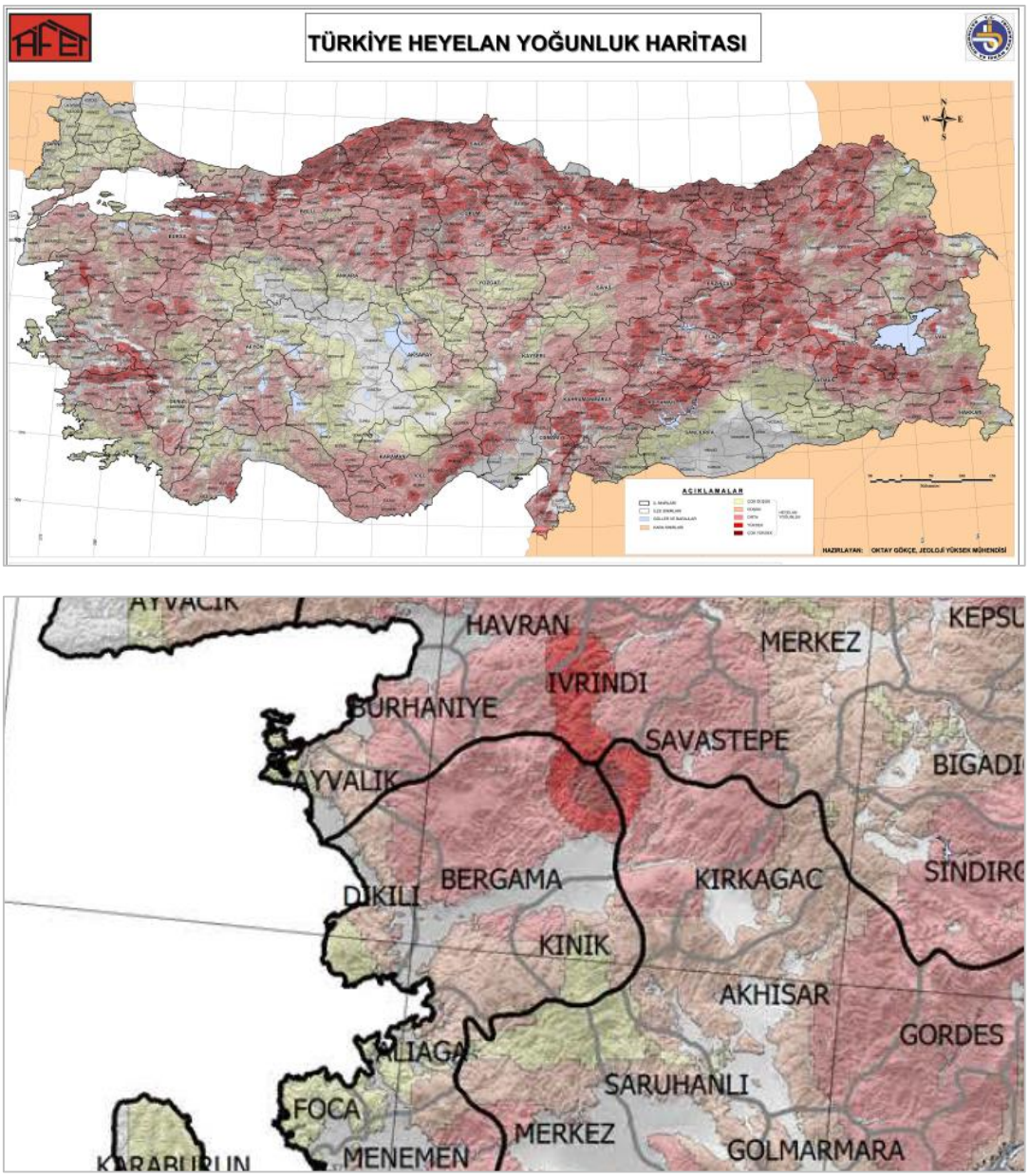


Figure 4.6 *Distribution map of landslide of Turkey and Bergama during 1950-2008. (AFAD, 2008 Retrieved from https://www.afad.gov.tr/afet-haritalari)*

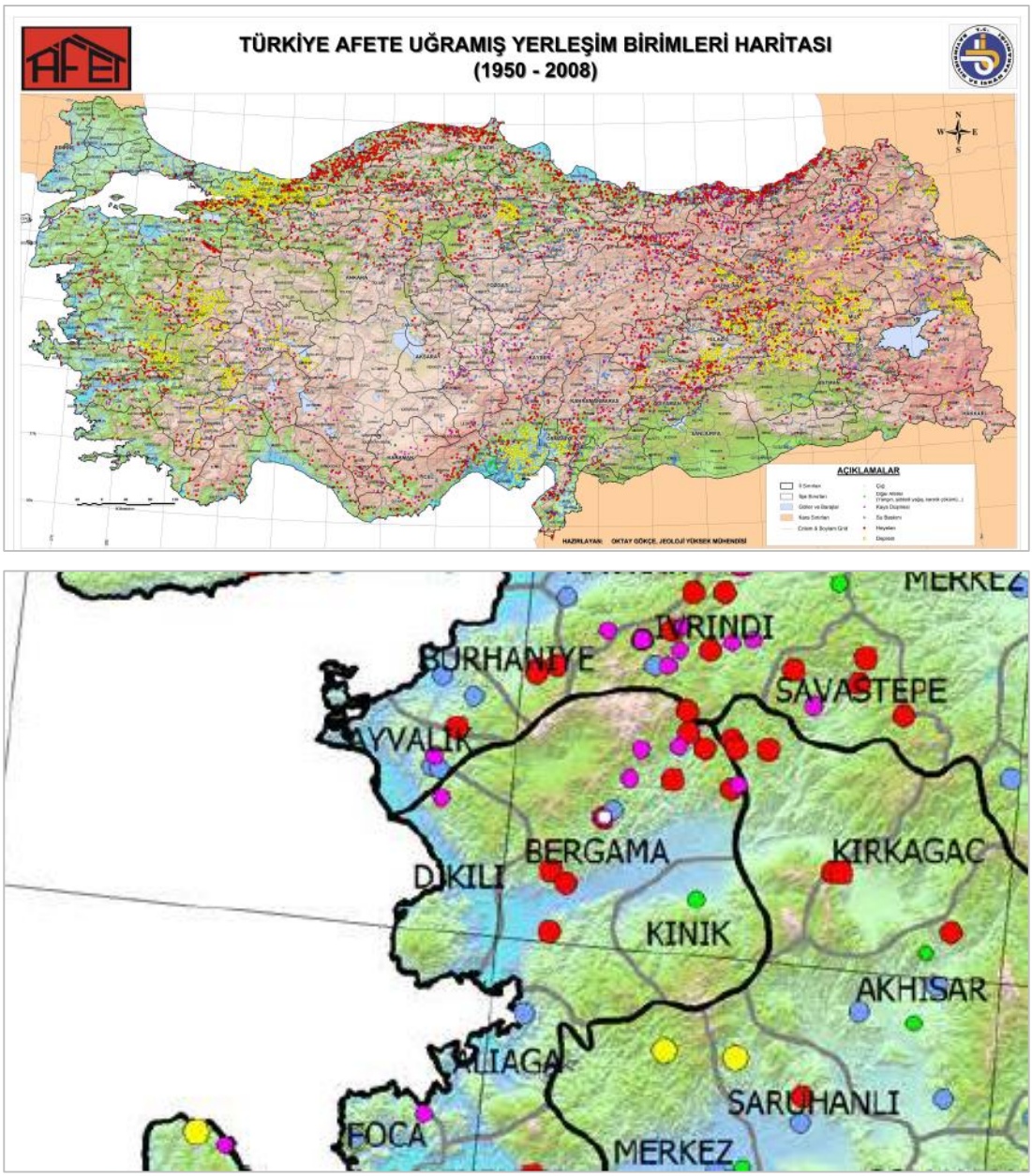


Figure 4.7 *Distribution map of all kind of hazards caused disaster between the years 1950-2008. Red dot represent landslide and blue dot represent flood. (AFAD, 2008 Retrieved from https://www.afad.gov.tr/afet-haritalari)*

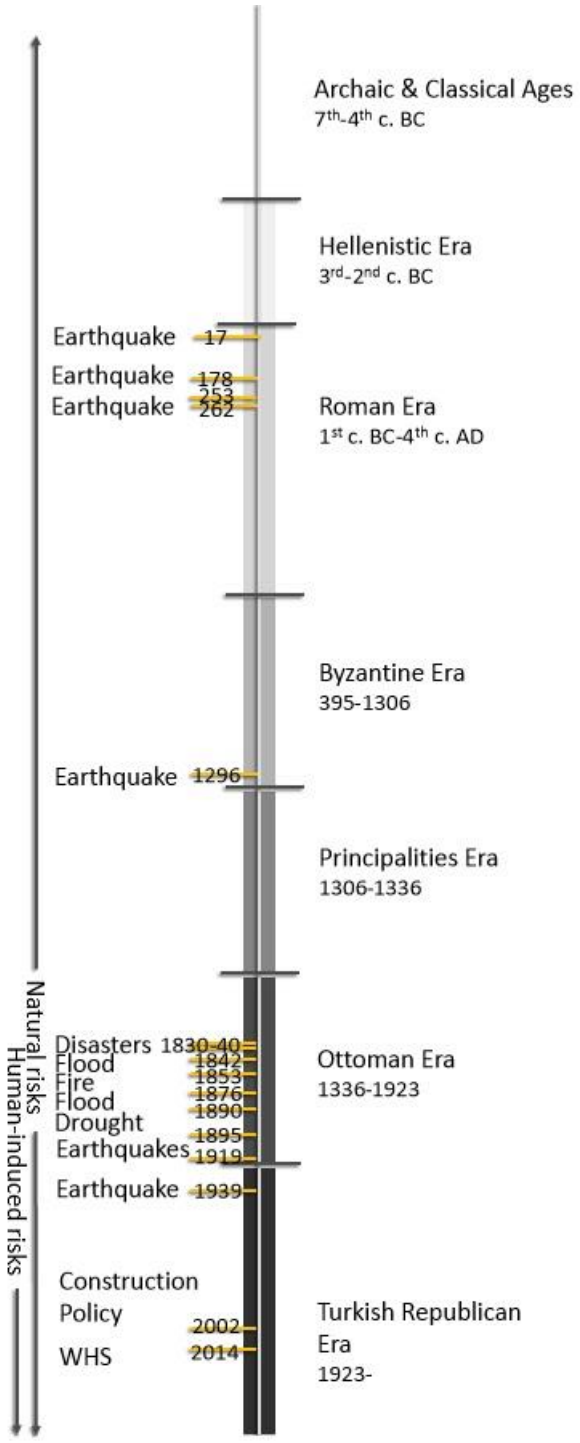


Figure 4.8 *Known hazards of Bergama through the eras. (Prepared by the author based on AFAD Historical Earthquakes, Boğaziçi University, Kandilli Observatory and Earthquake Research Institute Historical Earthquakes, ODTÜ (2008-2009) Rest 507 and Bayatlı, O. Bergama'da Yakın Tarih Bayatlı, O. (1957) Bergama'da Yakın Tarih Olayları 19. -20. Yüzyıl)*

Generally, institutions just work on and map natural hazards, however there is a need to assess also human-induced hazards as defined in the manual[148] (see Table 2.1, Table 2.2, Table 2.3).

There are many mining fields around Bergama. The existence of gold, silver and copper mining is affecting the nature of Bergama. These can cause 'infrastructure failure' and 'mining-induced' hazards.

In addition, Ovacık Goldmine that processes gold via cyanide has been opened incompliantly to public opinion and also the "environmental impact assessment report" (*ÇED Raporu*) and the report prepared by TUBİTAK regarding that mining. The reports are highlighted the seismicity and hydrology of the area as reasons not to establish the mining facility[149].

In addition, these mining fields are establishing by destructing the natural environment and destruction of environment will cause climate change in long-run and climate change can trigger more and more hazards like rainfall pattern change and so floods and abnormal air temperature that may cause drought and forest fire.

In addition to defined hazards of Bergama, hazards that developed as a secondary effect of the primary hazards should be identified also by creating cause and effect relationship (Table 4.2).

[148] UNESCO, ICCROM, ICOMOS, IUCN (2010). Managing Disaster Risks for World Heritage: Appendix II

[149] TMMOB, Jeoloji Mühendisleri Odası. (2005) Bergama Gerçeği ve Siyanürlü Altın Madenciliği. Retrieved from https://www.jmo.org.tr/genel/bizden_detay.php?kod=30#.Xatj0ZIzbIU

Table 4.2 Relationship of possible hazards of Bergama according to their types. (Prepared by the author based on UNESCO, ICCROM, ICOMOS, IUCN (2010). Managing Disaster Risks for World Heritage:9,59,60 and defined hazards via related institutions.)

Type of Possible Hazards of Bergama	Natural	Human-induced	Secondary
Meteorological	High precipitation	Infrastructure failure (dam, drainage system)	Urban flood
	Drought/heat wave	Fire	Fire
Hydrological	River flood		
Geological /Geomorphological	Earthquake	Fire, mining-induced pollution, dam-induced flood	Fire, flood, landslide
	Landslide		
Human-induced	Fire, pollution, mining-induced hazards		
Climate change	Rainfall pattern change		Flood, drought, landslide, fire

Generally, within the hazard assessment and historical hazard records gathered by using the AFAD, Boğaziçi University, GFDRR's analyses and Bayatlı's recording, Bergama is a land of earthquake, landslide, river flood, wildfire and extreme heat. However, there is not any detailed assessment in Bergama scale. In order to assess in detail, all scale plans should be integrated to the step from implementation plans, Bergama Conservation Master Plan, 1/25.000 and 1/100.00 scaled regional plans and also current land-use map (see Appendices B, C and D). "Cultural Heritage Impact Assessment" for new development project (infrastructure and superstructure) should be taken into account.

In order to identify hazards (both to produce new data and information and band together existing but scattered data among different institutions) and use the identification as a basis for DRM for Bergama, there is a need of multi-institutional cooperation according to hazard typology (Table 4.3). As an output for the

cooperation, there should be dataflow from the relevant institutions to Bergama Municipality UNESCO WH and Site Management Office through MoCT and AFAD, the leading DRM agency to produce necessary data and to take action regarding analyses.

Table 4.3 Institutions responsible to produce necessary data to assess each possible hazard of Bergama.(Prepared by the author according to duties and responsibilities of related institutions.)

Type of Possible Hazards of Bergama		***Related Institution (with collaboration of AFAD)***
Meteorological	Flood, fire, drought	MoAF-Directorate General of Meteorology
Hydrological	Flood	MoAF-Directorate General of State Hydraulic Works
Geological /Geomorphological	Earthquake, landslide	MoENS-Directorate General of Mineral Research and Exploration
Human-induced	Fire, pollution, mining-induced hazards	MoEU-Directorate General of Environmental Management MoEU-Directorate General of Environmental Impact Assessment, Permit And Inspection MoEU-Directorate General of Infrastructure and Urban Transformation Services
Climate change	Rainfall pattern change	MoAF-Directorate General of Meteorology MoEU-Directorate General of Environmental Management

4.1.2. Exposure Assessment

According to Feilden and Jokilehto (1993) '*Management planning should focus on values, using them as an explicit basis for decision making'*[150]. The manual[151] also highlighted the importance of the values as;

"*The values for which the property was inscribed on the World Heritage List should be the foundation on which all other plans and actions are based. This will help to reduce the possibility of emergency response and recovery activities having unintended negative consequences for the property"*.

Therefore, in order to begin assessing the exposure of Bergama to hazards, it will be an appropriate starting point to assess in which criteria Bergama has been inscribed on WHS List at 2014 (see Figure 4.18). This information is available at https://whc.unesco.org/en/list/1457 and explained below.

Criterion (i): The erection of "Bergama with ***manmade terraces and grand monuments*** as a masterpiece" of Hellenistic and Roman periods at the top of Kale Hill and into the slopes. Although the city developed during Byzantine and Ottoman periods, ***the acropolis*** is still remained.

Criterion (ii): "The cumulative background of Anatolia" is reflected with the urban planning with architectural and engineering works. "***The Kybele Sanctuary****"* and the "***Serapis Temple****"* represents the connection of human values and cultures with continual use.

Criterion (iii): The city "bears unique and exceptional testimony" with the "***Asclepion, Serapis Temple, Kybele Sanctuary and Tumuli****"* to Hellenistic urban planning.

Criterion (iv): The city is "an outstanding historic urban landscape reflecting important stages of human being in the geography to which it belongs" with the acropolis from

[150] Feilden B. M. & Jokilehto J. (1993). *Management guidelines for world cultural heritage sites*. ICCROM, UNESCO, ICOMOS. 1998 edition:x
[151] UNESCO, ICCROM, ICOMOS, IUCN (2010). Managing Disaster Risks for World Heritage :11

Hellenistic period and "***the Asclepion, Serapis Temple and Sanctuary, aqueducts and amphitheater***" from Roman period.

Criterion (vi): Bergama is a settlement that can "be directly or tangible associated with events or living traditions with ideas, beliefs and works" as; The Bergama sculpture school, "***the Kybele Cult***" (continuous belief), "***the Temple of Serapis"*** (continuous usage for religious purposes (temple in Roman period, church and synagogue in late Roman and Byzantine period, mosque from 13th century onwards), production of Bergama parchment and training place of surgeon Galen that is a pioneer in treatments.

In addition to these criteria, Bergama is keeping it integrity and authenticity with conserving its natural and physical environment with its intangible cultural heritage. Therefore, they should be the first focus area to keep safe the value of Bergama which are defined by management plan.

Assets carrying OUV (the ones that are defined within criterion) and conservation areas of Bergama are intersecting with the defined hazards areas.

Whole area of Bergama is defined as 1st degree earthquake area, therefore structures of Layer 1, Layer 2 and Layer 3 can be exposed to damage in case of an earthquake. Urban and river flood is an expected phenomenon to effect Bergama according to topographic position of each assets.

According to topography, urban flood is expected to affect the lowest level elevated area most, that is the most stratified area, the neighborhoods of "Ulucami, Talatpaşa, Kurtuluş, Selçuk, Barbaros, İslamsaray, Turabey, Gazipaşa, Atmaca, İnkılap and Ertuğrul" (Figure 4.9 and Figure 4.10) (intersection areas of Layer1, Layer2 and Layer 3, see figure 4.18).

For human-induced hazard, for example in case of the failure of Kestel Dam that is adjacent to a 1st degree archeological site of Bergama, the area will be exposed to flood. The artefacts that salvaged during Kestel Dam construction is exhibiting in the

Bergama Museum is the evidence of depredation of some ancient site due to dam construction (Figure 4.11).

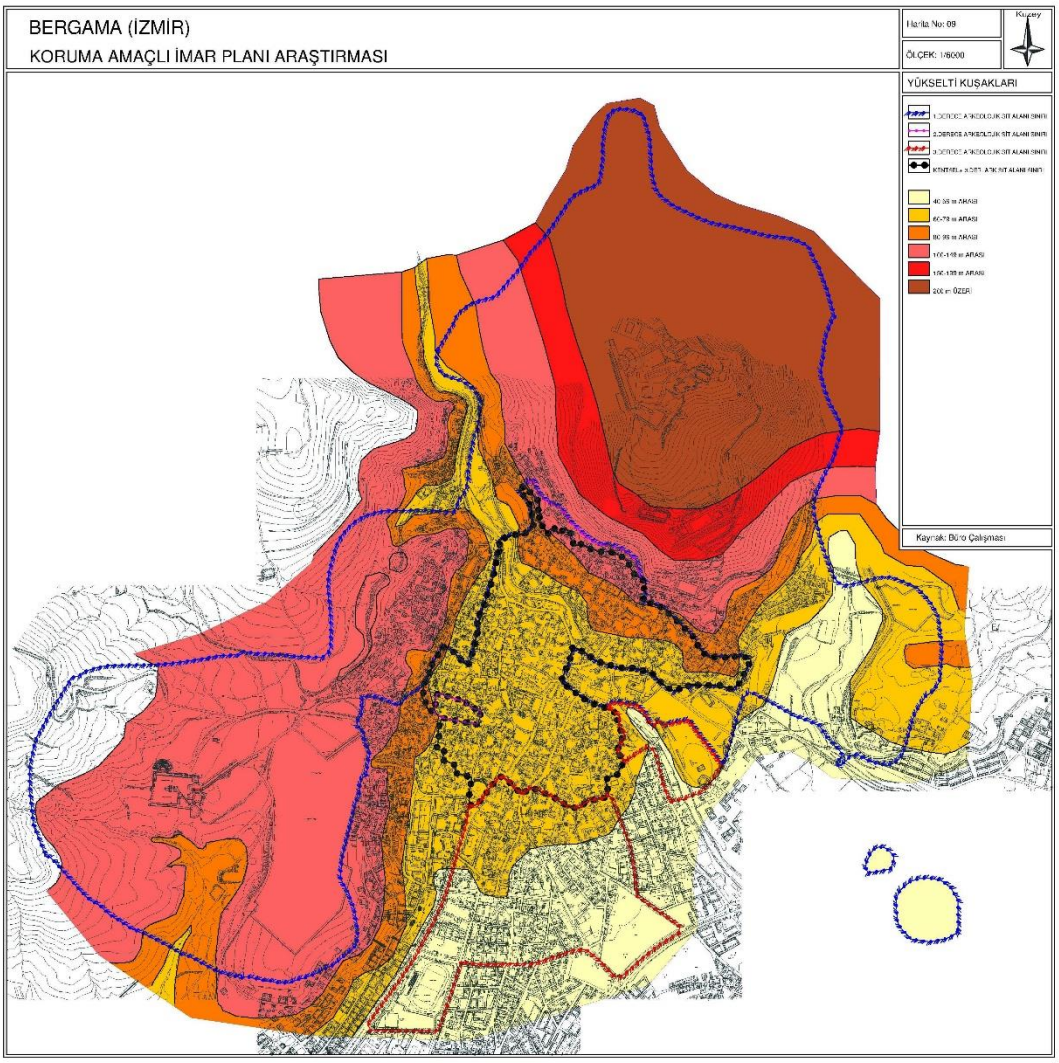


Figure 4.9 *Topography of Bergama. (Bergama Belediyesi (2012) Bergama Koruma Amaçlı Eylem Planı Analizleri (Analyses for Conservation Master Plan of Bergama)*

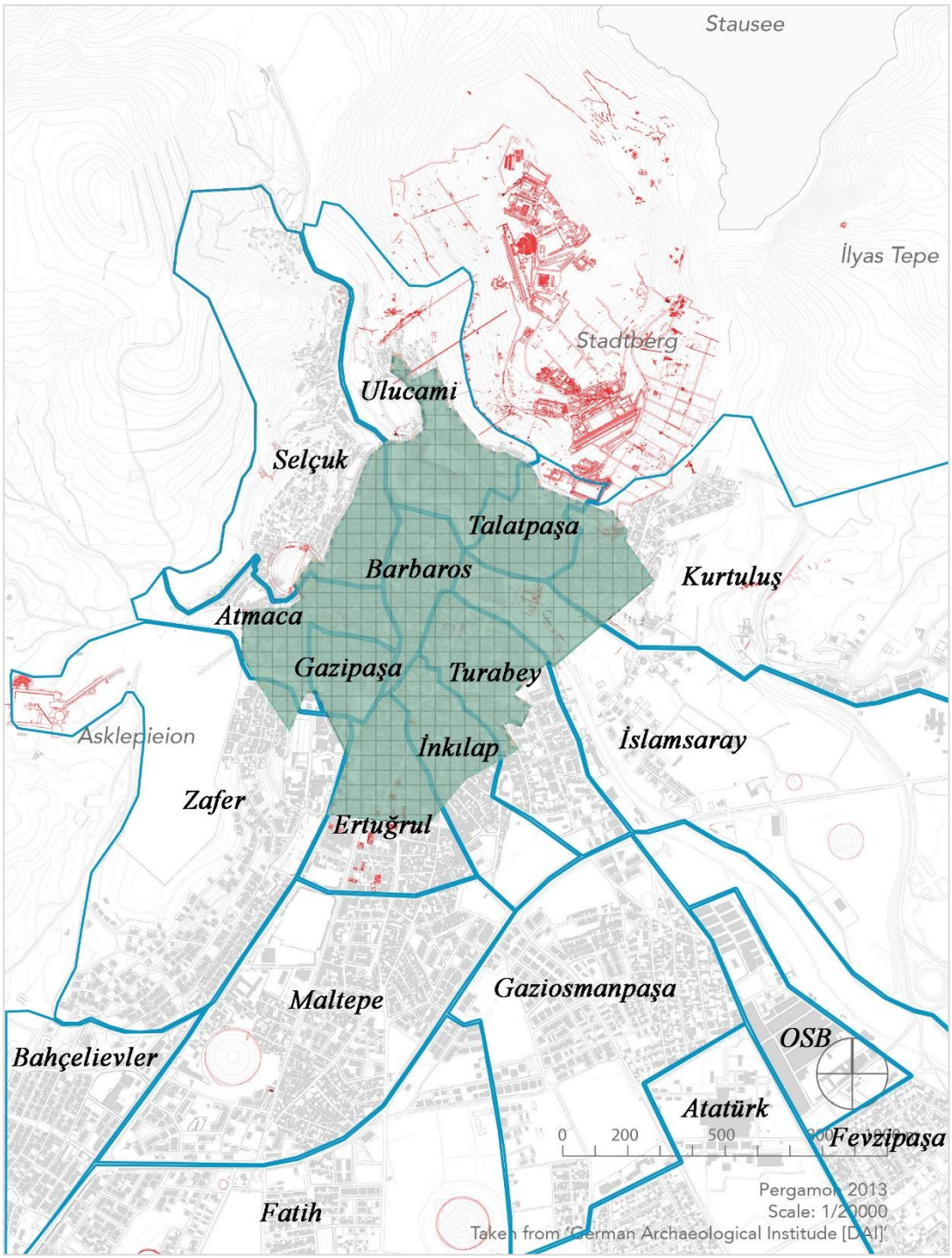


Figure 4.10 *Central neighborhoods of Bergama with the most stratified area (intersection of Layer 1, Layer 2 and Layer 3). (Prepared by the author based on Google Earth data and base map as cited in Bilgin Altınöz, A. G., Pirson, Felix, Bachmann, M., Binan, D., Kaptı, M. (2014). Pergamon and Its Multi-Layered Cultural Landscape, UNESCO Booklet)*

Figure 4.11 *A sarcophagus from Kestel Dam Salvage Excavation (taken by the author at Bergama Museum, 2019).*

Communities of Bergama are also exposed to hazards. Total population of Bergama (2018) is 106.536 while the population of central neighborhoods is 52.173 and %23 of the total population is below 18 years old while %14 is above 65 years old[152]. According to 2018 data, tourist number is 305.710 and Bergama has 905 bed space for the accommodation of tourists[153]. Mostly visited areas are Acropolis, Asclepion and Bergama Museum by tourists[154]. Therefore, both local people and visitor can be exposed to any defined hazard.

Bergama is also known for its weaving, quilting, parchments[155], leather shoemakers, tailors, wattling and clarinet players that can be categorized as intangible cultural heritage that creates livelihoods for communities of Bergama that another important

[152] BERTO: Bergama Chamber of Commerce. (2018). 94. Faaliyet Raporu. Bergama Dikili, Kınık:4
[153] BERTO: Bergama Chamber of Commerce. (2018). 94. Faaliyet Raporu. Bergama Dikili, Kınık:7,8
[154] Emekli, G. (1996). Bergama'nın İzmir İli Turizmindeki Yeri. Bergama Belediyesi Turizm Brifing Raporu.
[155] Parchments: charta pergamena, pergament (Bergama Paper) is invented as a result of putting an embargo to papyrus by Ptolemaios because of library competition between the king of Bergama, Eumenes and the king of Ptolemaios Dynasty, Ptolemaios. Also The Library of Pergamon was established by parchment written books as one of the biggest and most important one in that era.

category to conserve in case of an emergency. Also, Bergama subsists on agriculture, husbandry, mining and tourism mostly[156]. Therefore, livelihood sources of the city are exposed to hazards.

For example, in case of a failure in mining activated operated by using cyanide, it may affect agriculture and livestock. *Pinus Pinea* that is most common source of income for the Kozak Highland's villages is affected by cyanide and productivity of the trees decreasing. Therefore, beside the effects of the mine on environment of the Bergama, human life is also under risk in terms of both health and their livelihoods. Moreover, when local people started to leave Bergama for these reasons, the heritage sites will stop to live. Therefore, built and natural environment, communities and livelihoods will be exposed to a possible mining-induced hazard (Table 4.4).

Table 4.4 Types of the hazards and assets of Bergama that can be exposed to these hazards. (Prepared by the author)

Type of Hazard	**Assets Exposed to Hazards**	
Earthquake	Natural and built environment	Structures of Layer 1, Layer 2, Layer 3 and new settlement areas, Bergama Museum Objects
	Community	Citizens, Visitors, Staff
	Livelihood	Tourism, Agriculture,
River Flood	Natural and built environment	River-side structures (Layer 2)
	Community	Citizens, Visitors, Staff
	Livelihood	Agriculture
Urban Flood	Natural and built environment	The most stratified area (3rd degree archeological + urban site)
	Community	Citizens, Visitors, Staff
	Livelihood	Tourism, commerce
Fire	Natural and built environment	Acropolis, timber frame structures (Layer 2), museum
	Community	Citizens, Visitors, Staff
	Livelihood	Agriculture, husbandry

[156] BERTO: Bergama Chamber of Commerce. (2018). 94. Faaliyet Raporu. Bergama Dikili, Kınık:8

Table 4.4 (continued)

Mining / dam failure	Natural and built environment	1st degree archeological site and Ilyas Tepe Tumulus adjacent to the Dam, and Kurtuluş Neighborhood.
	Community	People whom Kozak Plateau creates a livelihood.
	Livelihood	Agriculture, tourism, husbandry

Superimposition map of the properties and hazard data should be prepared to analyze their vulnerability and to take further action according to results. Although there are structure inventories prepared by "TÜBA-TÜKSEK"[157] and "METU"[158] for some parts of the city, there is no any comprehensive or up-to-date inventory data. Documentation of Bergama should be updated and completed immediately to secure the protection of all layers and it should be cover previous disasters effects on properties and also all types of intangible cultural heritage at least within WHS boundary. Also, except earthquake hazard map, there are not any other hazard map. These maps should be prepared for detailed exposure assessment that creates fundamental base point for a DRM plan with a multidisciplinary work (Table 4.5).

[157] "Bergama Urban Cultural Inventory Project" that was prepared as a part of "Turkish Inventory Project" by the Turkish Academy of Science and Cultural Sector (TÜBA-TÜKSEK) within the support of by Bergama Municipality and Mimar Sinan Fine Arts University and Turkish Academy of Science (TÜBA)

[158] METU-Graduate Program in Restoration (2008). A Project for Preparation of Bergama Conservation and Management Plan within the scope of REST 507

Table 4.5 Related Institutions to prepare exposure mapping (prepared by the author according to duty and responsibilities of institutions)

Exposure Mapping	**Related Institutions to cooperate with AFAD, MoCT, Bergama District Governorship and Bergama Municipality**
Earthquake	MoCT-DGoCHM-İzmir Directorate of Surveying and Monuments, Directorate of Bergama Museum, Regional Conservation Council-2, Implementation and Inspection Offices (KUDEB); MoCT-DGoF Branch Office of WHS; GAI Bergama Head of Excavation
River Flood	MoCT-DGoCHM- İzmir Directorate of Surveying and Monuments, Directorate of Bergama Museum, Regional Conservation Council-2, Implementation and Inspection Offices (KUDEB) ; and DGoF, MoAF-DGoSHW
Urban Flood	MoCT-DGoCHM and DGoF, MoAF-DGoSHW
Fire	MoCT-DGoCHM and DGoF; GAI Bergama Head of Excavation
Mining/Dam Failure	MoAF-DGoSHW

Structures, especially the ones having OUV, people including visitors, staff and citizens and livelihoods that depends on exposed environment like tourism, agriculture and mining are potentially exposed to hazards.

4.1.3. Vulnerability Assessment

After natural and human-induced hazards and exposure of assets to them are identified, vulnerabilities of properties should be assessed. Different parts of the city may be vulnerable to different risks and some process/attributes may increase the vulnerability of them to the hazards.

According to SOC reports[159] that prepared as a monitoring tool by UNESCO for Bergama, the factors that are affecting Bergama are;

- Unsuitable use of transportation infrastructure to the area,
- Poor management systems,
- Incomplete management plan (it is identified at 2016 but it is completed now),
- Insufficient/inefficient monitoring system for each indicator and also for seismic monitoring.

Also, according to UNESCO[160], the city pattern of Bergama that created in Ottoman time is conserved, however the authenticity of its setting is affected by the urbanization that accelerated during 20th century's the last quarter.

Each layer can be exposed to different types of hazards but the more stratification means more vulnerability (Table 4.6) due to existence of various type of assets (Figure 4.18). In these areas there are continuous settlement through Hellenistic, Roman, Byzantine, Ottoman and Republican Periods. Therefore, these areas are vulnerable to different kinds of hazards with their structures (including archeological areas under city), community and livelihoods. Also, the most stratified area is 3rd degree archeological + urban site and 1st degree archeological site.

Structural condition of the area is generally poor[161] (Figure 4.12). Therefore, they are vulnerable to all kind of hazards.

[159] UNESCO, State of Conservation, Pergamon and its Multi-Layered Cultural Landscape. Retrieved from https://whc.unesco.org/en/soc/3435/
[160] UNESCO. Pergamon and its Multi-Layered Cultural Landscape, Authenticity. Retrieved from https://whc.unesco.org/en/list/1457
[161] Bergama Belediyesi (2012). Koruma Amaçlı İmar Planı (Conservation Master Plan)

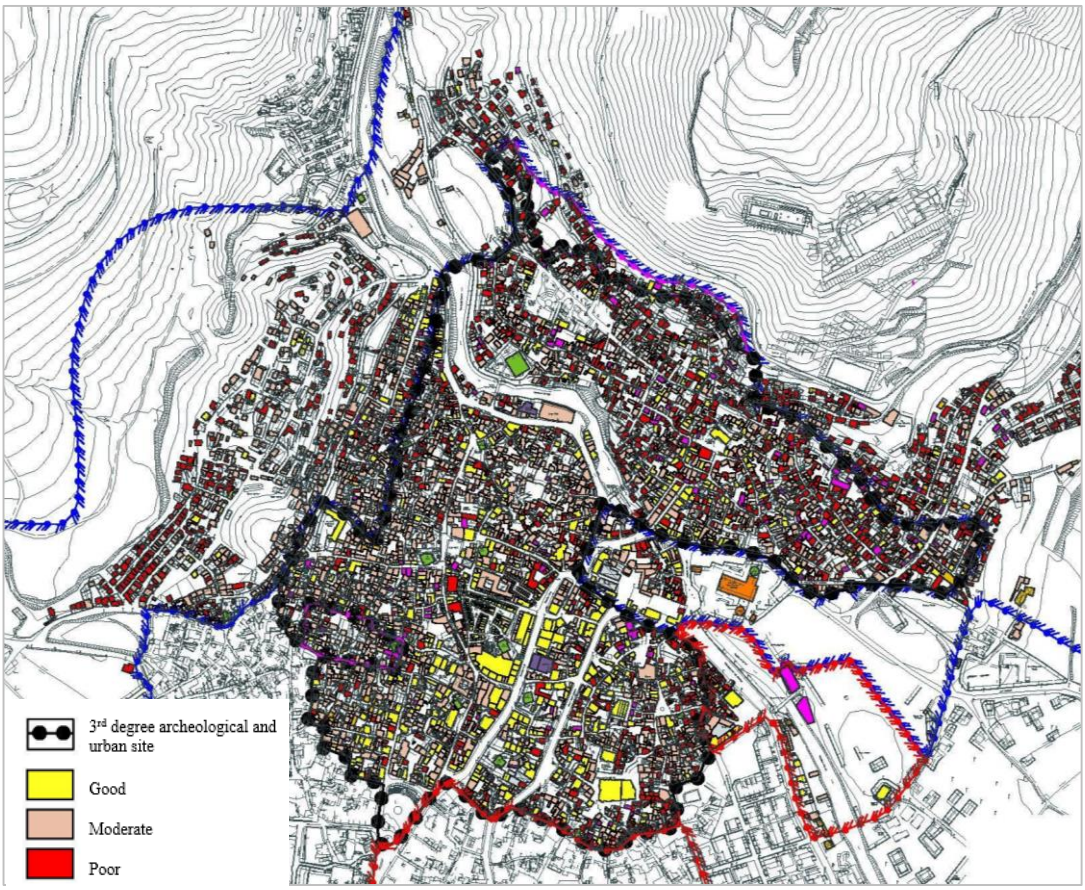


Figure 4.12 *Structural condition of the most stratified area. (Bergama Belediyesi (2012). Koruma Amaçlı İmar Planı (Conservation Master Plan)*

Roads of the site have been built by using cobblestone pavement and rain water drainage channels were added to major ones so these can decrease vulnerability of the site in case of a urban flood by absorbing the excessive amount of storm water (Figure 4.13 and Figure 4.14). However, drainage system of the structures were built according to prevailing climate conditions of their structure time so their coping mechanism with current conditions regarding climate change should be assessed to reveal related vulnerability.

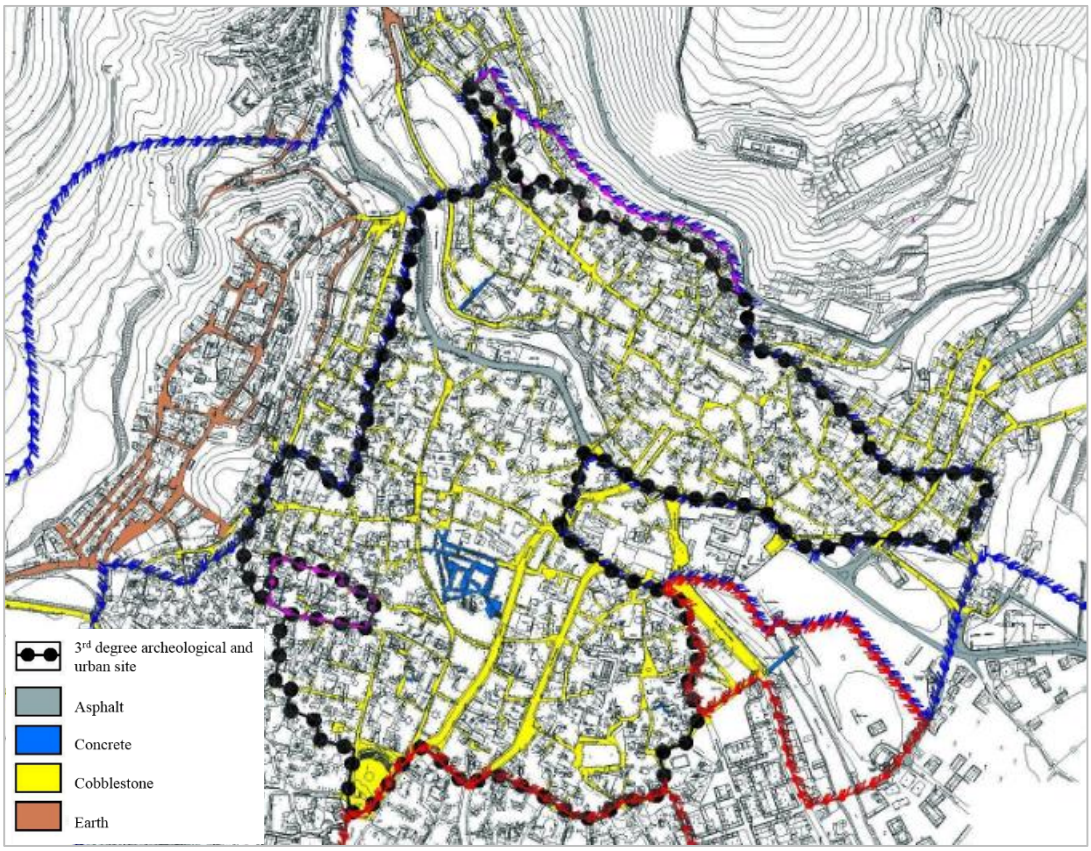


Figure 4.13 *Road pavement types of the most stratified area. Bergama Belediyesi (2012). Koruma Amaçlı İmar Planı (Conservation Master Plan)*

Figure 4.14 *Cobblestone pavement and rain water drainage channel in Bergama (taken by the author in Bergama, 2019)*

Structures of the site (Layer 2) were generally built by using mixed system as masonry and timber frame (Traditional Ottoman houses) and masonry (Rum houses). Therefore, masonry structures are more vulnerable than timber frame structures to earthquake due to their inflexibility[162]. The site has been predominated masonry structures (Figure 4.15). Also, modern period's structures (Layer 3) were generally built by using reinforced concrete system need to be monitored to follow their structural stability progressively to measure their vulnerabilities mainly for earthquake.

[162] UNESCO. Reducing Disaster Risk at World Heritage Properties. Retrieved from https://whc.unesco.org/en/disaster-risk-reduction/

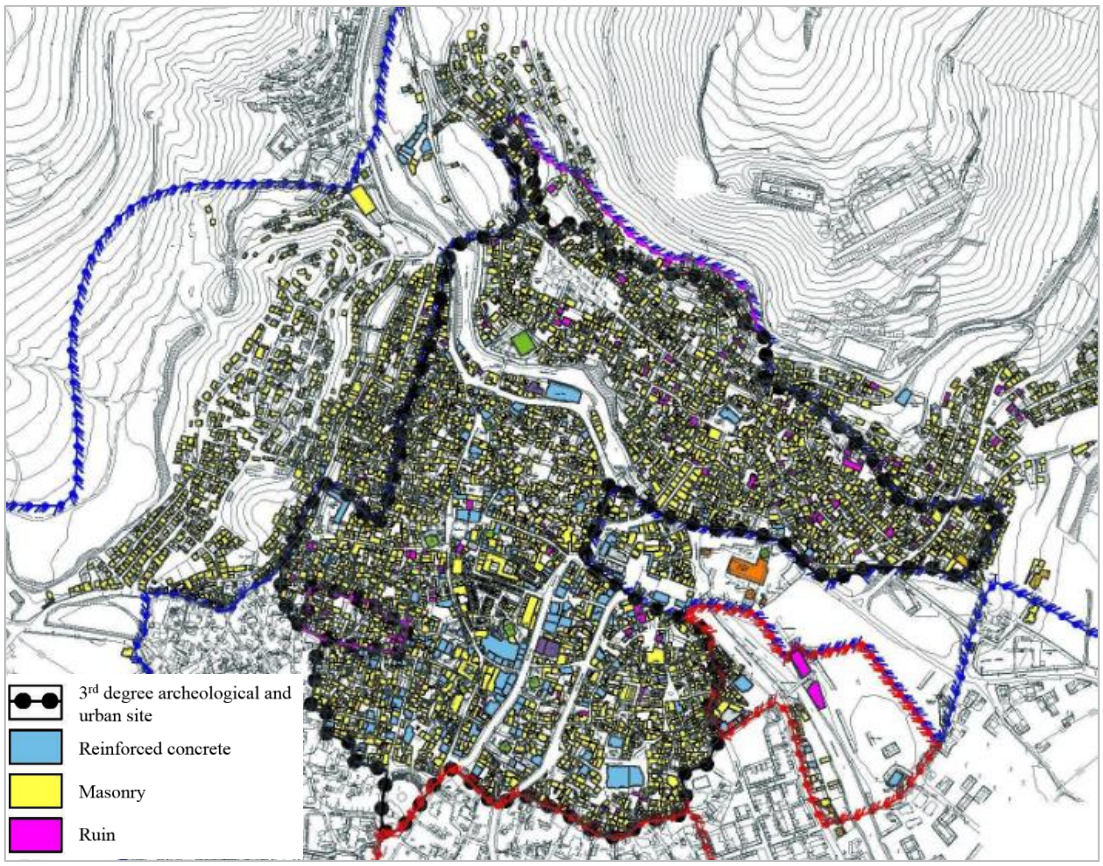


Figure 4.15 *Construction technique of the structures of the most stratified area. Bergama Belediyesi (2012). Koruma Amaçlı İmar Planı (Conservation Master Plan)*

Deterioration map of structures should be prepared to analyze their vulnerability to each hazard for structures of Layer 1 especially. Because the effects of deterioration factors on structures increase the vulnerability by weakened their structural resilience.

Restoration interventions should also be analyzed. If there are wrong or poor restoration methods, they may increase the properties vulnerabilities. If rainwater or wastewater drainage system affected by restoration, non-drained water may cause increase in vulnerability of the structures by weakened them.

Environmental factors can increase an asset's vulnerability. For example, the increase in humidity level because of Kestel Dam built at 1989 is causing to increase of

moisture of the air[163] and so it may lead to changes in micro-climate of the city and so archeological remains and structures become vulnerable in terms of microbiological or plants growth on wooden and stone structures[164]. Vibration due to unlimited traffic that emphasized at the SOC reports, buildings may become vulnerable to earthquakes.

Furthermore, especially in summer, the ancient site of Bergama is vulnerable to fire, the municipality has placed signboards 'fire hazard, call 177' signboards along the roads to the site.

Museums of the Bergama should be included while assessing the vulnerability. In current situation Bergama Museum is well-equipped in terms of fire. It is learnt that Directorate of Bergama Museum is coordinating fire drills one in each year with the help of "Bergama Fire Authority" and fire instructions were hanged on the outer wall of the museum near fire equipment (Figure 4.16). The instruction defines the extinguishing team members (includes a two archeologists), the recovery team members (does not include anyone has specialized in museum objects), the conservation team members (includes one archeologist) and first response team members (includes one archeologist and one art historian) beside how to use fire equipment, but there is no instruction specialized for museum objects. There is also fire alarm system and fire extinguishers inside the museum (Figure 4.16) and artefacts have been fixed to the ground which they were placed on to stabilize them in case of an earthquake (Figure 4.17). Fire drills are also performing for the "Asclepion, Serapis Temple and Acropolis" that managed by the Museum Directorate.

[163] UN/ISDR, Marsh, ICCROM, ICOMOS-ICORP, and UNESCO (2013) Heritage and Resilience; Issues and Opportunities for Reducing Disaster Risks: 19 emphasizes that "changing level of moisture constitute underlying risk factors can affect heritage"

[164]Tunçer, M. (2009) Bergama Koruma Politikaları. Milliyet. Retrieved from http://blog.milliyet.com.tr/bergama-koruma-politikalari--4- /Blog/?BlogNo=173956

Figure 4.16 *Fire instructions and equipment on the outer wall of the museum and fire alarm system in the museum (taken by the author at Bergama Museum, 2019)*

Figure 4.17 *The artefacts has been fixed on the wall to stabilize them in case of an earthquake (taken by the author at Bergama Museum, 2019)*

Table 4.6 Vulnerable Assets and their vulnerability reasons according to hazards of Bergama. (Prepared by the author)

Type of Hazard	**Assets Exposed to Hazards**		**Vulnerable Assets with Their Vulnerability Reasons**
Earthquake	Natural and built environment	Structures of Layer 1, Layer 2, Layer 3 and new settlement areas, Bergama Museum	Masonry and reinforced concrete structures (*structural inflexibility and in poor structural condition*), All type of structures in poor structural condition
	Community	Citizens, Visitors, Staff	More than 1/3 of citizens (*children and elderly people*) are the most vulnerable group
	Livelihood	Tourism, Agriculture	*Decreased visitor number*, and agricultural field can be affected from *secondary effects like flood*.
River Flood	Natural and built environment	River-side structures	Ulucami, Talatpaşa, Selçuk, Barbaros Neighborhoods' sturctures of Layer 2 and 3 that are *adjacent to the river*. (new areas developed regarding river catchment area)
	Community	Citizens living at Ulucami, Selçuk, Barbaros, Talatpaşa, and İslamsaray neighborhoods	More than 1/3 of citizens (*children and elderly people*) are the most vulnerable group
	Livelihood	Agriculture	Agricultural production
Urban Flood	Natural and built environment	The most stratified area (3rd degree archeological + urban site)	The most stratified area also the *low elevation zone.*
	Community	Citizens, Visitors, Staff	More than 1/3 of citizens (*children and elderly people*) are the most vulnerable group
	Livelihood	Tourism, Commerce, Trade	Decreased number of visitor

Table 4.6 *(continued)*

Fire	Natural and built environment	Acropolis, all layers' structures, museum	timber frame structures (*flammable and in poor structural condition*),
	Community	Citizens, Visitors, Staff	More than 1/3 of citizens (*children and elderly people*) are the most vulnerable group
	Livelihood	Tourism	Decreased number of visitor
Mining / Dam failure	Natural and built environment	1st degree archeological site and Ilyas Tepe Tumulus adjacent to the Dam, historical bridges	Structures (*dampness increase*)
	Community	People whom Kozak Plateau creates livelihood	Loss of livelihood
	Livelihood	Agriculture, tourism	Agticultural production

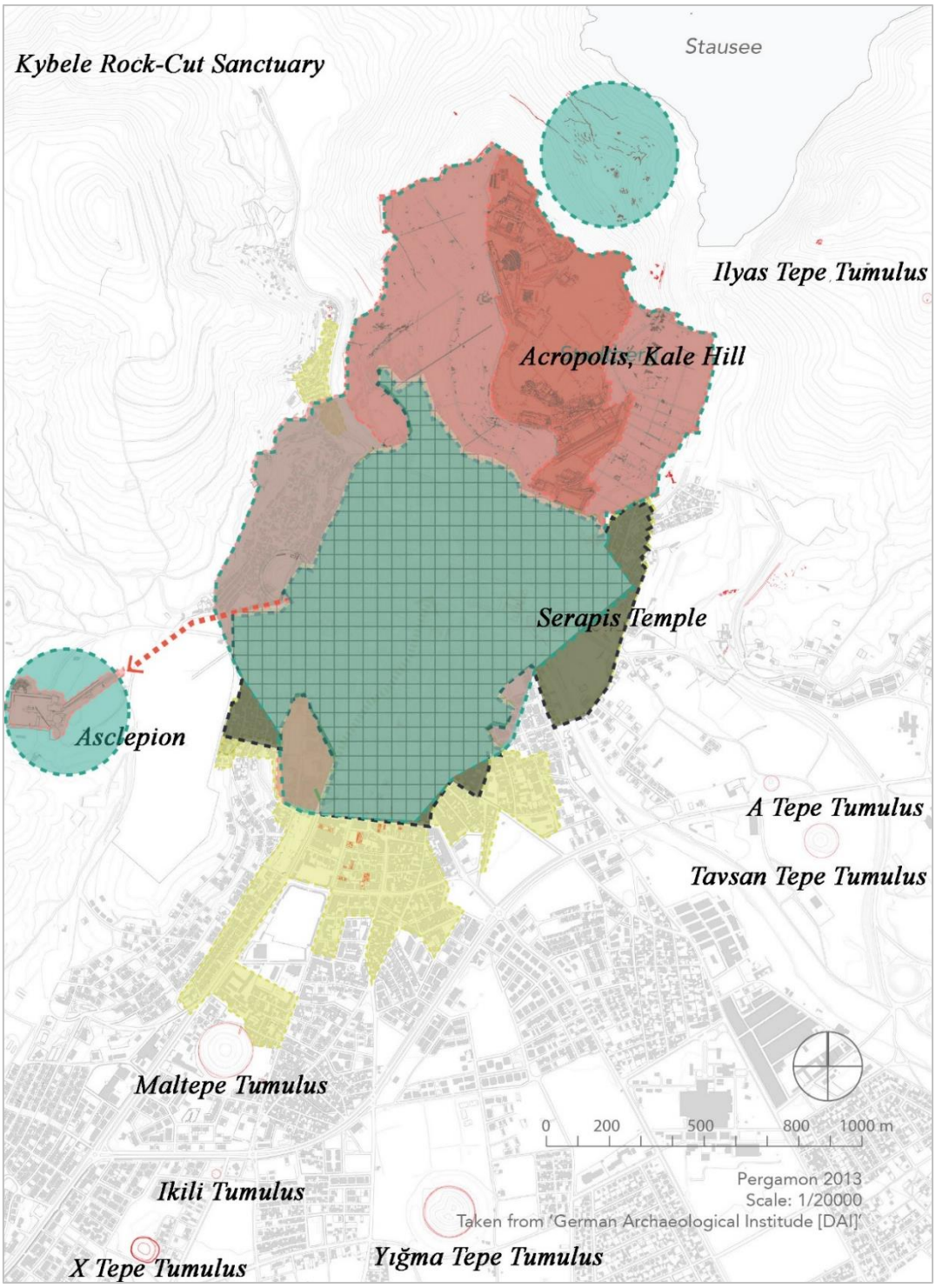


Figure 4.18 *OUV of Bergama and the area with the most stratification (grid indicated). (Produced by the author based on as cited in Bilgin Altınöz, A. G., Pirson, F., Bachmann, M., Binan, D., Kaptı, M. (2014). Pergamon and Its Multi-Layered Cultural Landscape, UNESCO Booklet)*

4.1.4. Disaster Risks of Bergama as Results of Hazard, Exposure and Vulnerability Assessments

Hazards defined for Bergama will be possibly turned disasters according to hazard, exposure and vulnerability assessments made by using available data. However, to assess disaster risks more accurately, there is a serious need to collect data to assess hazards, exposure and vulnerability of Bergama. Disaster risks were defined according to assessment made at previous titles.

Disasters affect natural and built environment, people and livelihood of Bergama. There are deterioration of material, structure, integrity and authenticity of the city, natural environment risks; loss or injury of people (citizens, staff and visitor) life and loss or damage of livelihood caused by earthquake, river flood, urban flood, fire and mining/dam failure.

According to hazard, exposure and vulnerability assessments regarding stratification, population distribution and types of livelihoods, disaster risks are higher at the area defined as 3rd degree archeological + urban site.

In order to imagine disaster effects and predict timing for next DRM steps, disaster scenarios should be written. There may be a disaster that originated one hazards (just earthquake), or two or more (earthquake and fire at the same time) and a disaster with secondary hazard (earthquake may cause flood by destructing Kestel Dam afterwards). Scenarios should include these options and predict how the city, its OUV and integrity will be affected.

Disaster scenarios can be written to elaborate all kind of disaster risks by defining possible outcomes regarding hazard characteristics, exposed objects and vulnerabilities of them. For example: In case of an earthquake, whole settlement area of Bergama within its people and livelihoods will be exposed to it. As the most stratified area, 3rd degree archeological + urban site will be the most vulnerable area to earthquake. Children, elderly people and disable people among the inhabitants, visitors and staff will be the most vulnerable people group to earthquake. Tourism and

trade that located mostly at the site will be affected. Moreover, as defined (Table 4.1), earthquake as a natural hazard may trigger human-induced hazards like mining induced pollution, dam induced flood, fire due to electricity. Therefore, although timber frame structures not categorized as very vulnerable to earthquake can be categorized as vulnerable to fire. Agriculture and natural environment will be exposed to these secondary hazards also. Disaster scenarios like the one created for earthquake should be created according to each hazard to take necessary measure following defined DRM steps.

For risk evaluation and then to decide accordingly how to prioritize strategies regarding risk management and risk reduction the level of risk can be measured. For comparison among different hazards occurred in different places in changing scales (it may be for earthquake in the whole city or just for a museum or for flood in the whole city or just for a museum), the equation can be defined as;

"Level of risk: probability (A) + consequences (B) + loss of value (C)"[165]

To obtain the level of risk for ***earthquake***[166] (*the magnitude of earthquake risk to all over the city*), the probability of earthquake (A) is 10% (according to GFDRR calculations); the consequences (B) is expected to be severe in terms of human lives, their livelihoods (for example in tourism and commerce), their physical environment

[165] As mentioned under the title "2.5.2. The Approach of the Manual";

A represents the probability of disaster and defined as ratio, for example the probability of a heavy rainfall is high while the probability is low for an earthquake that happens once in every fifty years.

B represents the severity of consequences for WHS and its components, landscapes, including human lives and their physical environment with livelihoods and it is defined as scale of 0 to 1, for example 0 stands for no consequence while 1 stands for severe consequences. (quantitative impact)

C represents the consequences in terms of 'loss of value'. While some consequences can be easily restored, others may affect outstanding universal value of the WHS irreplaceably. C defined as ratio, for example 100 percent is for total or almost total loss of value, while 0.01 percent for miniscule loss of value. (qualitative impact)

[166] According to literature and site observations.

(infrastructure, living places etc.), cultural heritage sites (including acropolis), so the city will be affected socially, physically and economically; the loss of value (C) is the rate of irreversible damages that is expected to be high because it is a heritage place that has OUV (the core zone of WH management area covers approximately more than half of the city).

Level of risk = 0.1 + 0.8 + 0.6 = 1.5

To obtain the level of risk for ***river flood***[167] (*the magnitude of river flood risk to all over the city*), the probability of river flood (A) is 20% (according to GFDRR calculations); the consequences (B) is expected to be mild in terms of human lives, their livelihoods (for example in tourism and commerce), their physical environment, cultural heritage sites located in the buffer zones of the river (for example, acropolis will not be affected due to its position); the loss of value (C) is the rate of irreversible damages that is expected to be high because it is a heritage place that has OUV (the core zone of WH management area covers approximately more than half of the city).

Level of risk = 0.2 + 0.3 + 0.6 = 1.1

According to the results; although the probability of occurring an earthquake in Bergama is lower than a river flood, the level of risk for earthquake is higher than river flood. This calculation should be done with accurate data and for all defined hazards for all layers in Bergama. Therefore, while preparing DRM plan, intervention priority should be taken into consideration[168].

[167] According to literature and site observations.

[168] In order to calculate "the level of risk", the equation that given by the manual has no methodology to define B ("the severity of consequences") and C ("loss of value") numerically. Also, saying "the level of risk" may be understood as the risk calculation that defined as "Hazards x Vulnerability", therefore getting the result by addition rather than multiplying should be named differently; the risk index is proposed. The index can only be used for comparison the possible impact of hazards to prioritize DRM interventions.

In order to assess the risks in a more detailed manner, geographical information (as covering the boundary of the site with its buffer zone), geological, meteorological, hydrological information of the area should be assessed. In addition, as each property's needs are different regarding its vulnerabilities against disasters, they should be identified and assessed individually by taking into consideration their social, economic, managerial and physical environment that they can change through time.

4.2. Preventing Disaster Risks and Mitigating Their Impact

There are three ways to prevent or mitigate disaster risks of Bergama (Table 4.7);

1. Regarding the identified hazards; by preventing them and by mitigating their effects;
2. Regarding the properties; by diminishing the vulnerabilities of them against hazards;
3. Regarding the community; by raising disaster awareness among local people, establishing and training the emergency response team.

For the first one, for example, urban flood that has the probability of occurring in is more than 10% following 10 years can be prevented by enhancing drainage system or its effect can be mitigated by creating / using early warning system, creating a communication network via local radio channels in urban planning level. If prevention and mitigation strategies relate to another area out of buffer zone of a WHS, then the related areas should be included in disaster risk management zone.

For the second one, vulnerability of properties can be eliminated by analyzing and monitoring their structural health and so they can be strengthened against earthquake. Also, while strengthened a property, minimum effect on its integrity, authenticity and OUV should be aimed.

For the third one, a community based DRM can be built by raising awareness among local people for both the values of WHS and risks of the sites.

In order to sustain these three ways, a multidisciplinary work is needed; enhancing drainage system by civil engineers, creating an early warning system for flood by meteorologists, to integrate all level decision to different scale plans by urban planners.

If the frequency and intensity of hazards especially the ones that defined as meteorological and hydrological hazards like urban and river flood are increasing for Bergama due to climate change (there is an increase in average temperature and precipitation amount[169]) and they return disasters due to existence of exposed and vulnerable assets to them, so in order to prevent the disaster and mitigate their impact, ecosystem should be restored also. Settlement area that is sprawling through the agricultural land and retention area of the rivers in the management area of WHS may cause more disaster risks caused by river flood. Therefore, urban development axis should be planned according to natural thresholds.

Non-destructive methods should be used to protect the properties from the negative impact of risk mitigation and prevention methods. For example, while creating an emergency access routes to response a disaster immediately in terms of both to protect WHS and human lives, the OUV, integrity and authenticity of the site should be considered. Alternative routes and new traffic regulations to eliminate congestion should be utilized rather than creating new routes by destructing properties. It is known that at the time of first excavation of the Serapis Temple, approximately 30 structures like houses and shops have been demolished at 1930s although they represent the intersection points of civil architecture and archeological monument. Also, at 1960s-70s, while the Cumhuriyet Street was opening as the main axis of the city, a lot of historical structures including mosques have been demolished[170].

[169]MoAF, Directorate General of Meteorology, 2019 According to data available at https://mgm.gov.tr/veridegerlendirme/sicaklik-analizi.aspx?s=m#sfB and https://mgm.gov.tr/veridegerlendirme/havzalara-gore-yagis.aspx?y=k (see Figure 4.3 and Figure 4.4)
[170] Ulusoy Binan, D. and Binan, C. Ş. (2005) An approach for defining, assessment and documentation of cultural heritage on multi-layered cities, case of Bergama (Pergamon) - Turkey. In: 15th ICOMOS General Assembly and International Symposium: 'Monuments and sites in their setting - conserving

Because Bergama has suffered from disaster through its time, it developed some local and traditional way to manage disaster risks like earthquake, fire and flood. While creation a DRM, it is vital to identified and add these methods to plan and linking them to modern construction techniques. For example, Roman Potteries that Gaius Plinius Secundus mentioned were placed on out of the city wall, in the Kestel Valley to protect the city from fire and ancient aqueducts which is used to carry water from Bakırçay Brook to hill and distribute it to all fountains were also used to discharge surplus water to brook in order to prevent flood that was caused by excessive amount of storm water at Kale Hill[171].

Some methods are still in use like the vaulted tunnels passed under Serapis Temple. The tunnels prevent river flood caused by overflowing of Selinos Brook[172]. Moreover, there are retaining walls that are reaching 4 meters in conformity with the depth around Selinos Brook and these walls have been started to be constructed at Hellenistic Period and restored during Roman and Ottoman Periods (according to its materials). These walls prevent river flood to reach settlement areas [173].

cultural heritage in changing townscapes and landscapes', 17 – 21 oct 2005, Xi'an, China. Retrieved from http://openarchive.icomos.org/275/

[171] Bergama Museum, Kestel Dam Salvage Excavation Information Board

[172] WHL Nomination Dossier (2013) Pergamon and Its Multi-Layered Cultural Landscapes:119

[173] WHL Nomination Dossier (2013) Pergamon and Its Multi-Layered Cultural Landscapes:137

Table 4.7 Necessary measures that should be taken in order to prevent disaster risks and mitigate their impacts according to defined hazards; related experts and institution indicated with italic. (Prepared by the author based on UNESCO, ICCROM, ICOMOS, IUCN (2010). Managing Disaster Risks for World Heritage and Stovel H. (1998). Risk Preparedness: A Management Manual for World Cultural Heritage. ICCROM, UNESCO, ICOMOS, WHC)

Identified Hazards / Measures Taken	Earthquake	River Flood	Urban Flood	Fire	Mining/Dam Failure
Preventing hazards* *and / or*	N/A	National-regional level strategic decisions, ecosystem recovery (for climate change induced) *AFAD*	National-regional level strategic decisions, ecosystem recovery (for climate change induced)	National-regional level strategic decisions, ecosystem recovery (for climate change induced), controlling fire causing usage like bakeries, restaurants or kitchens and electrical wiring	National-regional level strategic decisions, Cultural Heritage Impact Assessment
Mitigating their effects**	Integrating the site in upper level plans, traditional DRM methods, Locating vibration sensor at archeological sites. *AFAD, MoCT,*	Early-warning systems, traditional DRM methods,	Early-warning systems, enhancing drainage system, traditional DRM methods,	Signboards, Electrical wiring control, fire equipment (hydrants), using fire separator, fire alarms, fire sensors and sprinklers	Early-warning systems, enhancing drainage system

Table 4.7 *(continued)*

Diminishing the properties vulnerability	Structural consolidation of properties, *structural engineers, conservation architect, under the supervision of the Site manager*	Structural retrofitting, *structural engineers, conservation architect, under the supervision of the Site manager*	Structural retrofitting - *structural engineers, conservation architect, under the supervision of the Site manager,* controlling roof and gutter of structures	Using fire-retardant chemicals	Structural retrofitting, *structural engineers, conservation architect, under the supervision of the Site manager*
Strengthening the community	Rising awareness on both the value of WHS and disasters effects on properties, communities and livelihoods, Establishing emergency response team				

*Preventing hazards is achievable only for human-induced or climate change induced hazards.

**The only thing achievable for natural hazards.

All proposed intervention must not affect the OUV, authenticity, integrity of the site. They should be all listed and implied a committee consists of experts under the supervision of the site manager and Bergama Municipality Branch Office of WHS.

4.3. Preparing for and Responding to Emergencies

The 3rd step defines organizational structure to be prepare for a disaster before it occurs and how to respond emergencies in first 72 hours.

The first 72 hours after a disaster is the critical time period to take actions carefully in order not to cause another destructive impact on properties and prevent a secondary hazard and its effects, if any. For example, in case of a fire which has more than 50% probability of occurrence in any given year at Bergama according to GFDRR[174], some

[174] GFDRR. Think Hazard. Retrieved from http://thinkhazard.org/en/report/27921-turkey-izmir-bergama

fire extinguishing methods may damage properties like using too much amount of water; although the Bergama Museum has well-planned fire alarm and extinguisher system, the extinguishing instruction does not have any criteria specialized in museum objects. In another case, if properties are not consolidated immediately after earthquake by necessary interventions, if any second shock occurs it can be more destructive for already damaged structures. The site should prepare for the risks that may rise after 72 hours of a disaster by adding these foreseen possibilities and dealing ways with them to DRM plan of Bergama. The related part should include risks both the ones occur as secondary shock and as a result of wrong responses.

Therefore, there is an urgent need to establish an "emergency response team" for Bergama in order to be prepared for how to response an emergency by not causing any damage on properties. The team should include any relevant expert and institution according to defined hazards and properties of Bergama so the team should be consisted of site manager, municipality officers, academicians, police, fire and health departments, provincial directorates of related institutions; Disaster And Emergency Management, Culture and Tourism, Environment and Urbanization, citizens, volunteer groups, NGOs (Table 4.8). The team should know their duty that defined in advance with the by means of drills that performed before disaster stage.

Table 4.8 The composition of Bergama Emergency Response Team and the responsibilities of members

Emergency Response Team of Bergama	**Responsibility of the member**
Site Manager	*Coordinator for all action for all tangible and intangible heritages within WHS boundary*
Bergama Municipality, Branch Office of WHS	*Administrator and financer*[175] *for all activities for all tangible and intangible heritages within WHS boundary, defining emergency routes and emergency assembly areas inside the traditional settlement area, preparing maps for archeological sites and traditional settlements indicating exits, response equipment, preparing "Emergency Response Handbook" with the participation of all stakeholder*
Academicians: İzmir Institute of Technology, Department of Architectural Restoration. Ege University, Bergama Vocational School, Department of Monument Conservation. Dokuz Eylül University, Earthquake Management, Restoration	*Archeological sites and traditional structures*
Mukhtars of the Neighborhoods of Bergama	*Community leaders*
Directorate of Bergama Museum	*Organizing drills with AFAD, Fire Department*
Local people	*To ensure community based DRM and awareness raising both for preparing and responding to emergencies, acting as first responders*
İzmir Team of Search and Rescue Association (AKUT), GEA Search and Rescue İzmir Office, ICORP Turkey	*Evacuation of citizens, staff and visitors,*

[175] World Heritage Fund can be used for getting prepared activities.

Table 4.8 (continued)

NGOs of Bergama: Disable People Association, Turkish Red Crescent Bergama Office, Bergama Social Assistance and Solidarity Foundation, Bergama Culture and Art Foundation	*Raising awareness about conservation of cultural heritages through their values and giving trainings on DRM plan*
Bergama Fire Department	*Attending drills, installing fire equipment and alarm system in both archeological sites and traditional settlement areas*
Bergama Police Department, Bergama Health Department	*To respond to emergencies under the supervision of above listed members for built and natural environment and communities' health*

In order to become well prepared for emergencies for Bergama, emergency assembly areas have been defined within the border of WHS (assembly areas can serve for 50.360 people where the total local population is 52.173) (Table 4.9) (Figure 4.19). However, these areas should be increased for visitors (Bergama had 305.710 visitors at 2018[176]) and which criteria is needed to define emergency assembly areas should be clarified and implied to these assembly points. Also, "the shortest exit route" for local people and visitors should be included in DRM plan for them.

Also, the traffic regulations should be arranged to shorten response time to access emergency vehicles to damaged site like fire engine. In property scale, necessary equipment should be installed according to defined risks, like fire extinguisher for fire. All these regulations and arrangements should be available for citizens, visitor and emergency response team as a map version indicating them. For a broader extent an "Emergency Response Guide for Bergama" can be prepared to raise awareness of citizens, visitors and to instruct them in case of an emergency. That guide should also include contact numbers of emergency response team members which are selected from defined institutions at the (see Table 4.8).

[176] BERTO: Bergama Chamber of Commerce. (2018). 94. Faaliyet Raporu. Bergama Dikili, Kınık:7,8

Table 4.9 Emergency assembly areas location and capacity. (prepared by the author based on Bergama Municipality's assembly areas data.)

Name of the Neighborhood and the Degree of Site	Name	Capacity
Gazipaşa / 3rd degree archeological + urban site	Cumhuriyet Square	1.400 people
Inkilap / 3rd degree archeological site	Foundation's Olive Grove	13.440 people
Maltepe / 3rd degree archeological site	Stadium	8.520 people
Ulucami / 3rd degree archeological + urban site	Gurnellia	1.600 people
Zafer / adjacent to 3rd degree archeological site	Çamlıpark	5.000 people
İslamsaray / 3rd degree archeological site	Topçu Kışlası	20.400 people

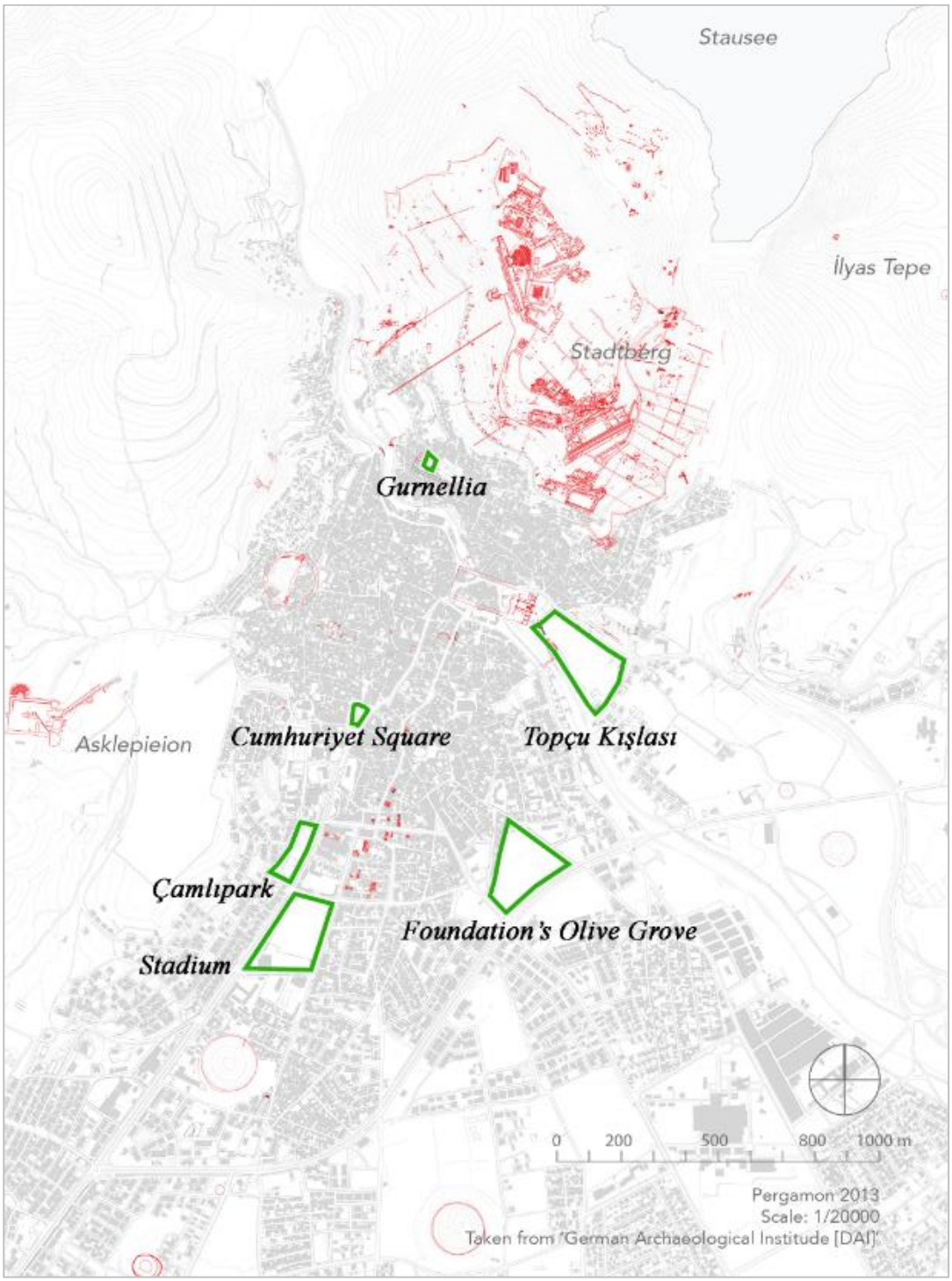


Figure 4.19 *Defined assembly areas of Bergama within the WHS boundary. (prepared by the author based on Bergama Municipality's assembly areas data.)*

While preparing a DRM, these should be taken into consideration that municipal infrastructure may be destructed in case of a disaster like electricity, internet and communication. Therefore there is a need for offline communication method for both citizens' and emergency response team's communication.

For example, to provide connection between each member if there is any power outage in case of an emergency the STORM Project[177] offers a solution for this situation as introducing "EcoBox" to provide communication in power outage and absence of internet. The box provides an alternative communication channel between the site manager and first responder in order to initiate the response process and give instructions to responsible people.

In order to test the responsibilities of suggested team, drills should be performed and documentation of the site should be completed to assess disaster damages on properties.

4.4. Recovering and Rehabilitating the Site After Disaster

At 4th step, recovery and rehabilitation activities proposed for the DRM plan of Bergama are covered.

A disaster may be resulted another kind of risks. For Bergama these risks can be listed as;

- A secondary hazard may occur (see table 4.2)
- OUV may be affected as a result of response activities (properties may be affected by water caused as a result of firefighting)
- Reconstruction of damaged parts may cause to loss authenticity
- Opening emergency exit routes may affect historic city pattern
- Related kinds of livelihoods may be lost (loss of *Pinus Pinea* and olive trees in case of gold mining failure)

[177] "Safeguarding Cultural Heritage through Technical and Organizational Resources Management" EU Horizon 2020 Project

- People may migrate to another settlement

In order to assess the damage after a disaster;

- the number of effected people,
- the type of the WHS's components and the aspect of this component to survey,
- the type of documentation and recording,
- the responsible person,
- methods to avoid further damages,
- prioritizing the recovery activities should be defined.

To illustrate, in order to assess the damage after an earthquake at Bergama, firstly the number of damaged people including local people, visitors and the ones in the emergency response team should be identified, then which component of the Bergama (its archeological site, natural environment or historical settlement etc.) will be assessed in which aspect should be decided, for example the effect of earthquake on Ottoman Settlements in terms of their structural stability. To assess the damage, a "structural damage assessment survey" template should be prepared. To prevent any secondary hazard can be caused by earthquake like fire should be foreseen and necessary precautions should be taken like cutting the electricity and gas. The responsible person should be defined to lead to process.

After immediately after disaster period interventions, long term interventions should be formulated to ensure the properties' sustainable protection for future disasters, and also current DRM plan should be reviewed according to past experiences. Within this scope, national legal system regarding cultural heritage and DRM should be reviewed (in Appendices A, inadequate/ adequate points can be seen in detail).

4.5. Implementing, Reassessing and Reappraising the DRM Plan

An action plan should be prepared to apply the DRM plan that can be prepared after completing all steps. The plan should cover object, structure and district oriented activities with time-frame, related actors, institutions and financial sources.

DRM plan prepared by following all the steps and points that should be taken into account explained above, should be monitored and the monitoring and evaluation criteria should be included in the plan. Lessons learnt during the implementation of the plan should be used to review the plan.

In order to test the effectiveness of the plan drills should be performed periodically with the participation of all stakeholders within the scope of monitoring and evaluation system. Also, identification and assessment of disaster risk as 1st step should be updated regularly to make necessary update for other steps.

Preparing, implementing and monitoring-evaluation of the plan should be the responsibility of "Bergama Municipality", "Bergama District Governorship", Regional Conservation Council-2 and MoCT.

Financial sources should be provided by MoCT and MoEU for implementation of the plan. To prepare DRM plan or in an emergency situation, international funding mechanism (International Assistance and World Heritage Fund) can be used.

After assessing the situation in detail, if necessary the site should be inscribed as ***"WHS in danger"***, the risks that are identified in this study are sufficient to declare the site as so. Being inscribed in the list will make easier to be granted.

4.6. Overall Discussion on Regarding All Steps

After assessing the steps within the case on Bergama, an overall requirements regarding both the content of the manual and the context of Turkey have been discussed under this title. Following the guide within the focus of Bergama has shown critical results. First one is regarding the content of the guide, second one is related with the context of the country that WHS located on, which is represented with the case study site.

As the first discussion regarding the content of the guide; although there is not any 'one size fits all' kind of guide that prepared to use for all type of WHS, DRM for each site should be shaped with its own dynamics. In this manner the guide offers wide-range of examples and options regarding different situations. However, the guide can be developed with the addition of some topics;

- Legal base of the country that WHS located on: necessity of policy assessment and policy making regarding the context of the country.
- Funding and assistance mechanism regarding DRM,
- Examples to show the cases which more than one type of artefacts and hazard possibility,
- For further development projects (like dams that there is the one already built: Kestel Dam) "Cultural Heritage Impact Assessment" should be done to measure the projects effects on built and natural environment of the site, citizens and livelihoods that make stay the people in the site and conserve it. Because of the multi-layered landscape of the Bergama, all related expert should participate in the assessment.
- The effect of migration on the heritage sites, both in terms of migration of local people from the site and migration of other people to the site,
- Advices regarding DRM for modern heritage,

- Importance of documentation in before disaster steps,
- Importance of structural health analyses in before and after disaster steps,
- Detailed explanation of "the level of risk" and how to calculate and use it,
- Communication of emergency response team in case of an infrastructure failure due to hazards,
- Availability of SOC reports of the sites and how to integrate them the DRM plans,
- Importance and selection criteria of 'emergency assembly areas'
- Inter organization of defined emergency response team during disaster.

Preparing a DRM plan, especially for risk identification and assessment processes, requires an "extremely data intensive process"[178] that should be worked on with a multi stakeholder participation. For WHS, it requires different specialized stakeholders on conservation of cultural heritage. Therefore, there is also a need for "data management plan" also to ensure their technical and quality standards (Figure 4.20) with the collaboration and communication between institutions[179].

Therefore, beside data production, cooperation among institution is vital. Since DRM requires a multi-disciplinary working environment, different institutions should take responsibilities. While preparing new data and created an integrated system with current data institutions should work together. Responsible institutions that integrated DRM for Bergama should be representatives of each layer.

[178] UNISDR (2017). National Disaster Risk Assessment. Governance System, Methodologies, and Use of Results:51
[179] UNISDR (2017). National Disaster Risk Assessment. Governance System, Methodologies, and Use of Results:51

Figure 4.20 *Essential qualifications of datasets to assess risks properly. (UNISDR (2017). National Disaster Risk Assessment. Governance System, Methodologies, and Use of Results:51)*

In order to manage data and develop data management strategies, following suggestions should be taken into consideration to develop the DRM plan of Bergama[180].

- The lead agency that coordinates the data management process and works as "central data storage" by defining data standards: Bergama Municipality UNESCO WH Management Office.
- The stakeholders that are contributors and users of data to create relevant information: MoIA, MoCT, MoEU, MoAF (Figure 4.21). These institutions should be integrated to the process due to existence of related attributes (Table 4.10):

[180] Prepared based on UNISDR (2017). National Disaster Risk Assessment. Governance System, Methodologies, and Use of Results:52

Table 4.10 Institution should be participate data and information production to prepare proper DRM for Bergama. Italic shows the reason for participation of the institution. (Prepared by the author)

Institutions and Their Participation Reason to Data and Information Production				
MoIA	AFAD	The key institution for DRM nationwide		
	İzmir Governorship	Bergama District Governorship	Bergama District Police Department	*Structures, Local people, visitors, staff*
			Bergama District Health Department	*Local people, visitors, staff*
MoCT	DGoCHM	Directorate of Bergama Museum	*Bergama Museum*	
			Archeological Sites	*Acropolis*
				Asclepion
				Red Hall
		Regional Conservation Council-2	*Registered properties* *Archeological protected area* *Urban protected area*	
		Implementation and Inspection Offices (KUDEB)		
		İzmir Directorate of Surveying and Monuments		
		Branch Office of WHS	*Bergama and Its Multi-Layered Landscape*	
	DGoF	*Mosques, mescids, Tabaklar Bath, bedesten*		
MoEU	DGoGIS	*Know-how for integrated database management system*		
	DGoEIAPI	*Kozak highland*		
		Landfill waste		
	DGoLA	İzmir Metropolitan Municipality	*Bergama Municipality*	
			Directorate of Fire Department	
MoAF	DGoSHW	Regional Directorate of State Hydraulic Works - 2	*Kestel Dam* *Selinos Brook*	
	DGoM	Regional Directorate of Meteorology – 2	*Climate change effect*	
	DGoFor	İzmir Regional Directorate of Forestry	*Forest area*	

Table 4.10 *(continued)*

GAI	Bergama Head of Excavation	*Archeological remains*

- Data characteristics agreement on resolution, metadata, licensing, formats and other standards before starting to gather data.
- To encourage wide use, making the data accessible for all via e-devlet[181].
- Results that are produced by using collected data such as hazard maps and vulnerability maps also can be shared via e-devlet[182].
- Preparing a MoU (memorandum of understanding) between stakeholders that collect data and produce information together. There should be MoU between AFAD and MoCT, AFAD and" Bergama Municipality".

[181] E-government provides web-based public services, accessible at https://www.turkiye.gov.tr/
[182] Earthquake hazard map and nearest disaster and emergency assembly areas has been started to share via e-devlet under the services provided by AFAD.

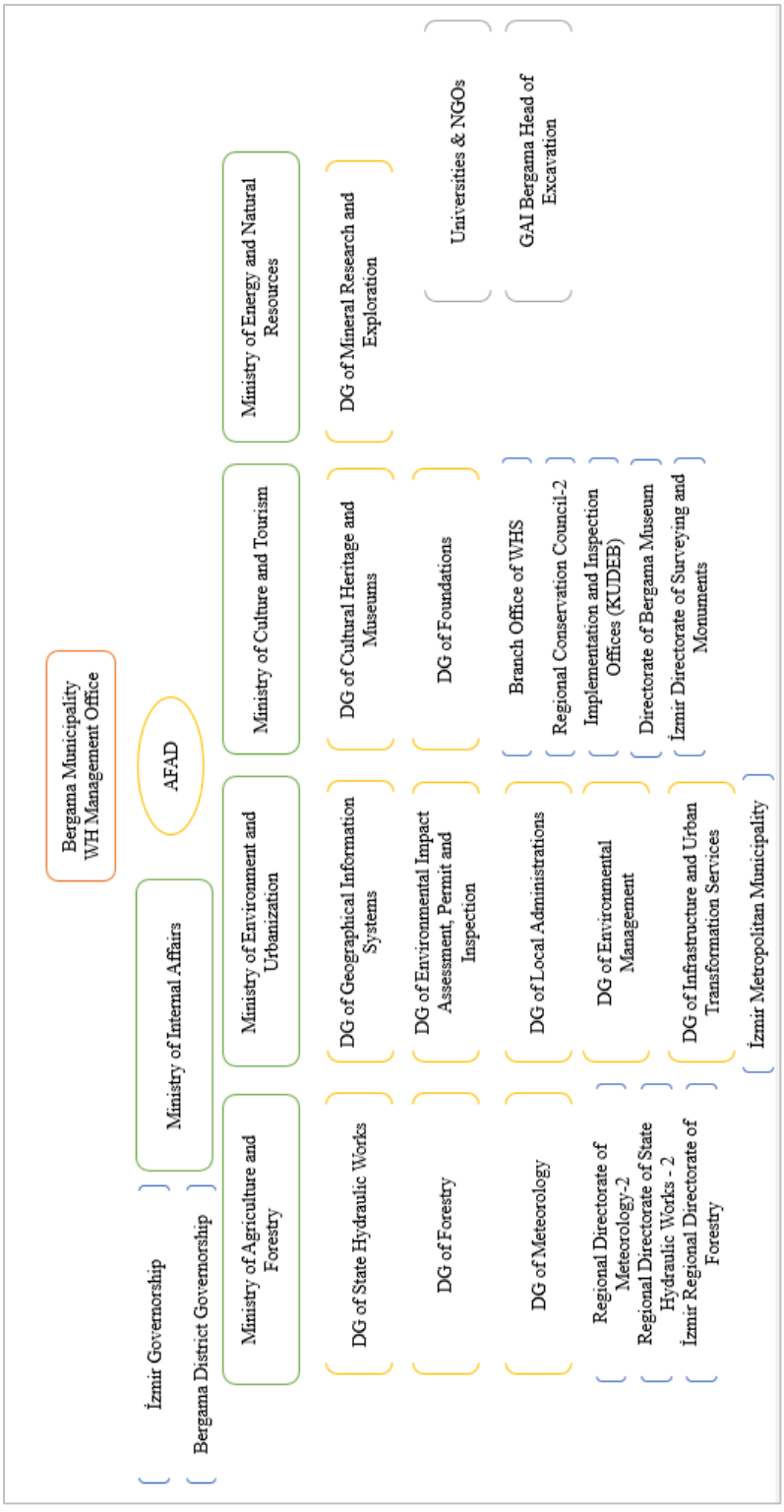


Figure 4.21 *Public institution stakeholder organization for data management (prepared by the author)*

As the second discussion, the manual which has been taken as guide to propose a framework for DRM for Bergama as a WHS, is an applicable guide that prepared accordingly to DRM for WHS literature that mainly created by UNESCO although it has some points to develop. It defines each step to prepare a DRM plan for WHS. However, while following its steps for the Bergama case, the need for necessary data and governance between related institutions to produce the data and to imply the plan has been appeared for the site.

Required data –if there is available- is generally scattered among different institutions and cannot accessibly easily so "data sharing culture" should be built. While collecting each data and producing information from them "user involvement" must be ensured. Also when different DRM actors need to use the data, they can be available in right format. All data collected regarding these, must be in right scale to use in the Bergama scale; details should be varied from material scale and structure to settlement scale also covering the outside of the WHS boundary. In order to interpret the data and information, "various skills from various disciplines" are needed. The collaboration should be according to the ability of understanding characteristic of different hazards, analyzing quantitative data and interpreting their results, providing effective communication for different audiences like local people, tourists and staff and building following DRM steps' intervention according to risk identification and assessment. "The siloed processes" should be prevented by providing "risk communication" among stakeholders. [183]

Therefore, in order to follow these data and data production, institutions should be in contact with each other. In this point it is suggested that cultural and natural heritage departments should be created within the scope of existing relevant institutions. In addition to these, corporate capacity of the relevant institutions should be built to follow assigned duties.

[183] GFDRR (2018). Understanding Risk. Disrupt, Communicate, Influence. Proceedings from the 2018 UR Forum:79,80

When the history of disaster risk management for cultural heritage is analyzed within the scope of both international and national context, it can be referred that while preparing a DRM plan for a WHS, all context including legislative and non-legislative should be considered with the site's own specific need and context.

All lessons learnt should be used for policy making by the related ministries. According to table that prepared to analyze current legal status of Turkey regarding the DRM processes for heritage properties (see appendices A) has revealed that laws and regulations have gaps in this field. Regardless of how a DRM plan prepared well, it will remain functionless without a legal basis. There should be legal sanction to add DRM plan to site management plan of each WHS.

CHAPTER 5

CONCLUSION

The thesis aims to test the applicability of the manual in the context of Turkey through assessing the DRM in a WHS following the approaches of the manual entitled "Managing Disaster Risks for World Heritage". The topic was studied on the case of "Bergama and Its Multi-Layered Cultural Landscape" as an example WHS in Turkey. Since the ultimate aim is to prepare a DRM framework, DRM terms and national and international literature on DRM for WHS have been analyzed and current DRM for the case study has been revealed. After describing general context and assets of the case study site, the manual has been followed through its steps[184];

- "Identifying and assessing disaster risk",
- "Preventing disaster risk and mitigating their impact",
- "Preparing for and responding to emergencies",
- "Recovering and rehabilitating the site after disaster" and
- "Implementing, reassessing and reappraising the DRM plan".

The possible hazards of Bergama have been identified as earthquake, river flood, urban flood, fire and mining/dam failure and assessed with the site's (with its natural and built environment, communities and livelihoods) exposure and vulnerabilities. All related institutions have been also defined with regarding to stated hazards and assets of Bergama.

After defining related institutions with their roles and responsibilities, the necessity of their collaboration for data collection and information production processes and for all steps of DRM process have been emphasized under each title. Finally, overall

[184] UNESCO, ICCROM, ICOMOS, IUCN (2010). Managing Disaster Risks for World Heritage.

requirements to create a DRM framework for Bergama by following the manual have been discussed regarding the content of the manual and the context of Turkey.

Bergama was chosen because in its WHS boundary, there are different type of artifacts as tangible and intangible due to its multi-layeredness, population dynamics and livelihoods; and different types of hazards due to both its natural and man-made environment, so the implementation requires multi-institutional and multi-disciplinary approach. Thus, the site represented the case study very well with the availability of different layers of "Antiquity and Late Antiquity", "Turkish-Islamic" and "Modern" periods with their vulnerabilities and existence of various natural, human-induced and climate change-induced hazards (that can be defined with the available data) as a reflection of its cultural and natural context. Also, the site represented the legal and managerial context of Turkey on DRM for cultural heritage sites which is another key point to assess the applicability of the manual in Turkey context.

The study has been conducted with the available data that collected from different agencies (see Table 4.1) and it is found that it should be developed through production of necessary data with the collaboration related institution and participation of related experts to data production processes as listed in each step. Sustainability of data production, DRM plan preparation and implementation processes, and addition of the DRM plan to upper scale plans is only possible with institutional governance. Therefore, in order to implement the manual in WHS of Turkey, the necessity of collecting and producing related data is shown. In addition, since risk assessment and effective risk management requires collecting and processing extensive amount of data related to natural hazards, and vulnerabilities of cultural assets, it is found that risk developing databases through the collaboration of responsible organizations in Turkey is vital to start formulating a DRM approach.

As a further work for Bergama case, it is suggested to prepare a ready to use DRM plan for Bergama by completing the production of necessary data with inter-institutional governance.

In order to prepare a DRM plan for “Bergama and Its Multi-Layered Cultural Landscape”, national and international fund opportunities can be investigated. It will be both useful to create DRM plan and highlight the importance of policy making on the “managing disaster risks in a world heritage site”. Therefore, as a further study in Bergama scale, the nomination dossier can be prepared for these potential funds.

Within the study, applicability of the manual has been tested for Bergama to create a DRM framework with existing data. However, each WHS in Turkey has unique conditions and needs to be defined in order to prepare a DRM plan. Therefore, to safeguard each WHS of Turkey against disasters, the approach that has applied in Bergama via the thesis should be also performed for them to assess their hazards, vulnerabilities and exposure.

Within the scope of the thesis, Bergama has been studied, however many other studies can be carried to create DRM for other WHS of Turkey. In order to complete necessary data to prepare an effective DRM plan for WHS, it is obvious that collecting data related to cultural heritages is initial condition to prepare an effective and complete DRM plan for a site. As further work for Turkey scale, a practical and simplified guide can be prepared to list how local authorities should behave with the collaboration of other related institutions.

REFERENCES

AFAD. (2015) Türkiye Afet Müdahale Planı (TAMP)

AFAD Disaster and Emergency Management Presidency. AFAD Hakkında. https://www.afad.gov.tr/tr/2211/AFAD-Hakkinda

AFAD, 2019 Retrieved from https://deprem.afad.gov.tr/deprem-tehlike-haritasi

Akkar, S., Azak T., Çan T., Çeken U., Demircioğlu M.B., Duman T.Y., Erdik M., Ergintav S., Kadirioğlu F.T., Kalafat D.,. Kale Ö, Kartal R.F., Kekovalı K., Kılıç T., Özalp S., Poyraz S., Altuncu S., Şeşetyan K., Tekin S., Yakut A., Yılmaz M.T., Yücemen M.S. and Zülfikar Ö. (2017). Updated Probabilistic Seismic Hazard Maps For Turkey. PSHA Workshop Future directions for probabilistic seismic hazard assessment at a local, national and transnational scale

Antoniou, P. (2012) 'Concern for Disaster Risk Reduction in the management of World Heritage Properties: A research through the archives of the World Heritage Centre', UNESCO.

Baç, S. (2012) Tarihsel Bir Kentin Morfolojisi: Bergama Kent Örgütlenmesi. Aegean Geographical Journal, VOL. 21 (1), 23-38, (2012)

Bayatlı, O. (1957) Bergama'da Yakın Tarih Olayları 19. -20. Yüzyıl. Bergama Belediyesi

Bergama Belediyesi. Bergama Çok Katmanlı Kültürel Peyzajı Alan Yönetim Planı 2016-2020

Bergama Belediyesi. Bergama Çok Katmanlı Kültürel Peyzajı Alan Yönetim Planı 2017-2021

Bergama Belediyesi. (2012) Bergama Koruma Amaçlı Eylem Planı Analizleri (Analyses for Conservation Master Plan of Bergama)

Bergama Belediyesi. Tarihi Kentsel Doku. Retrieved from http://www.bergama.bel.tr/Home/Page/369

Bilgin, A. G. (1996) Urban Archeology: As the Basis for the Studies on the Future of the Town Case Study: Bergama. (Master's Thesis, METU)

Bilgin Altınöz, A. G. (2002) Assessment of Historical Stratification in Muti-Layered Towns as a Support for Conservation Decision-Making Process; A Geographic Information Systems (GIS) Based Approach Case Study: Bergama. (Doctorate Thesis, METU)

Bilgin Altınöz, A. G., Pirson, Felix, Bachmann, M., Binan, D., Kaptı, M. (2014). Pergamon and Its Multi-Layered Cultural Landscape, UNESCO Booklet.

Bilgin Altınöz, A. G., Ulusoy Binan, D. and Pirson, F. (2016) Pergamon and Its Multi-Layered Cultural Landscape. UNESCO World Heritage in Turkey

Binan, C. Ş. and Ulusoy Binan, D. (2005) An approach for defining, assessment and documentation of cultural heritage on multi-layered cities, case of Bergama (Pergamon) - Turkey. In: 15th ICOMOS General Assembly and International Symposium: 'Monuments and sites in their setting - conserving cultural heritage in changing townscapes and landscapes', 17 – 21 oct 2005, Xi'an, China. Retrieved from http://openarchive.icomos.org/275/

Boğaziçi University, Kandilli Observatory and Earthquake Research Institute Historical Earthquakes. Retrieved from http://www.koeri.boun.edu.tr/sismo/2/deprem-bilgileri/tarihsel-depremler/

Canadian Conservation Institute & ICCROM. (2016) A Guide to Risk Management of Cultural Heritage

Cardoso R., Lopes M. and Bento R. (2004). Earthquake Resistant Structures Of Portuguese Old 'Pombalino' Buildings. 13th World Conference on Earthquake Engineering Vancouver, B.C., Canada August 1-6, 2004 Paper No. 918

Centre for Research on the Epidemiology of Disasters CRED (2015). The Human Cost of Natural Disasters, A Global Perspective:7-10

Charter For The Conservation Of Historic Towns And Urban Areas (Washington Charter 1987). Adopted by ICOMOS General Assembly in Washington, DC, October 1987.

Choiseul-Gouffier, Marie Gabriel Florent Auguste de. Voyage pittoresque de la Grèce, Paris, J.-J. Blaise M.DCCC.IX, [=1809])

ÇEKÜL (2013) An example of Urban Conservation: Bergama. retrieved from https://www.cekulvakfi.org.tr/haber/kentsel-korumada-ornek-bergama

Feilden, B. M. (1987). Between Two Earthquakes: Cultural Property in Seismic Zones. Rome; Marina del Rey, CA: ICCROM; Getty Conservation Institute.

Feilden B. M. & Jokilehto J. (1993). Management guidelines for world cultural heritage sites. ICCROM, UNESCO, ICOMOS. 1998 edition

Global Facility for Disaster Reduction and Recovery (GFDRR). Turkey, https://www.gfdrr.org/turkey

GFDRR. Think Hazard. Retrieved from http://thinkhazard.org/en/report/27921-turkey-izmir-bergama

The Getty Conservation Institute (2002) Assessing the Values of Cultural Heritage. p.9

Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disaster World Conference on Disaster Reduction 18-22 January 2005, Kobe, Hyogo, Japan

Sendai Framework for Disaster Risk Reduction 2015 – 2030

ICOMOS (2005) Threats to World Heritage Sites 1994-2004: An Analysis

ICOMOS (2007) Heritage at Risk. Cultural Heritage and Natural Disasters. Risk Preparedness and the Limits of Prevention. TUDPress

ICOMOS (2011) The Paris Declaration On heritage as a driver of development Adopted at Paris, UNESCO headquarters, on Thursday 1st December 2011

ICOMOS (2011) The Athens Charter for the Restoration of Historic Monuments – 1931 (Carta del Restauro) . Adopted at the First International Congress of Architects and Technicians of Historic Monuments, Athens 1931. Retrieved from https://www.icomos.org/en/167-the-athens-charter-for- the-restoration-of- historic-monuments

IUCN (1967) Ninth General Assembly, 25 June-2 July 1966, Proceedings. IUCN Publications New Series, Switzerland

Koç V. (2016). Depreme Maruz Kalmış Yığma ve Kırsal Yapı Davranışlarının İncelenerek Yığma Yapı Yapımında Dikkat Edilmesi Gereken Kuralların Derlenmesi. Çanakkale Onsekiz Mart University, Journal of Graduate School of Natural and Applied Sciences, 2016:2, 1, 36-57

Law on the Conservation of Cultural and Natural Property' Law Number: 2863 Published in the Official Gazette on: 23/07/1983 number: 18113

Maier H.G., Riddell G. and Delden H. (2017). Natural hazard risk: is it just going to get worse or can we do something about it? https://www.preventionweb.net/news/view/55944

MoAF, Directorate General of Meteorology. (2019). Precipitation according to basins. Retrieved from https://mgm.gov.tr/veridegerlendirme/havzalara-gore-yagis.aspx?y=k)

MoAF, Directorate General of Meteorology. (2019). Seasonal temperature analysis. Retrieved from https://mgm.gov.tr/veridegerlendirme/sicaklik-analizi.aspx?s=m#sfB)

METU-Graduate Program in Restoration (2008). A Project for Preparation of Bergama Conservation and Management Plan within the scope of REST 507

MTA. Jeoloji Haritaları.

Ulusoy Binan, D. (2013) Türkiye'de Çok Katmanlı Yerleşimlerde Tanımlama-Koruma Yaklaşımı ve Öneriler: Bergama Örneği. Tasarım+Kuram Dergisi, Mimar Sinan Güzel Sanatlar Üniversitesi, Mimarlık Fak. Yay., Sayı 16, İstanbul, 1-26

UN (2012) Resolution adopted by the General Assembly on 27 July 2012. The Future We Want. A/Res/66/288:6

UN/ISDR (2004) Living with Risk. A Global Review of Disaster Reduction Initiatives. Geneva, Volume 1:16

UN/ISDR, Marsh, ICCROM, ICOMOS-ICORP, and UNESCO (2013) Heritage And Resilience; Issues and Opportunities for Reducing Disaster Risks

UNESCO. Armed Conflict and Heritage. Retrieved from http://www.unesco.org/new/en/culture/themes/armed-conflict-and-heritage/convention-and-protocols/1954-hague-convention/

UNESCO, State of Conservation Information System. List of Threats retrieved from https://whc.unesco.org/en/soc/

UNESCO. Tangible Cultural Heritage. Retrieved from http://www.unesco.org/new/en/cairo/culture/tangible-cultural-heritage/

UNESCO (2005) Basic Text of the 1972 World Heritage Convention

UNESCO (2007). Convention Concerning The Protection Of The World Cultural And Natural Heritage. WHC-07/31.COM/7.2

UNESCO, ICCROM, ICOMOS, IUCN (2010). Managing Disaster Risks for World Heritage

UNESCO (2014) Background Guide. Strengthening Disaster Risk Reduction Strategies in Order to Protect UNESCO World Heritage Sites

UNESCO (2014) State Of Conservation Of World Heritage Properties. A statistical analysis (1979-2013)

UNESCO. Disaster Risk Reduction in UNESCO designated sites. http://www.unesco.org/new/en/natural-sciences/special-themes/disaster-risk-reduction/disaster-risk-reduction-in-unesco-designated-sites/

UNESCO. WHC-06/30.COM/7.2 Retrieved from https://whc.unesco.org/en/decisions/1047/

UNESCO (2016). Disaster Risk Reduction. UNESCO's contribution to a global challenge.

UNESCO. International Assistance; Acting for World Heritage Worldwide https://whc.unesco.org/en/intassistance

UNESCO (2016) State of conservation of properties inscribed on the World Heritage List WHC/16/40.COM/7B

UNESCO (2016) State of Conservation, Pergamon and its Multi-Layered Cultural Landscape. Retrieved from https://whc.unesco.org/en/soc/3435/

UNESCO. About World Heritage, The Convention. https://whc.unesco.org/en/convention/

UNESCO. Reducing Disaster Risk at World Heritage Properties. Retrieved from https://whc.unesco.org/en/disaster-risk-reduction/

UNISDR. Building cities' resilience to disasters: protecting cultural heritage and adapting to climate change. https://www.unisdr.org/we/inform/events/25027

UNISDR, (2009). Global Assessment Report on Disaster Risk Reduction Risk and poverty in a changing climate, Invest today for a safer tomorrow. Retrieved from; https://www.unisdr.org/we/inform/publications/9413

UNISDR (2016). Report of the open-ended intergovernmental expert working group on indicators and terminology relating to disaster risk reduction.

UNISDR (2017). National Disaster Risk Assessment. Governance System, Methodologies, and Use of Results

UN-SPIDER Disaster Risk Management. http://www.un-spider.org/risks-and-disasters/disaster-risk-management

Radt Pergamon,, W. (200) Antik Bir Kentin Tarihi ve Yapıları. YKY

SARAT Project. https://www.saratprojesi.com

Stovel H. (1998). Risk Preparedness: A Management Manual for World Cultural Heritage. ICCROM, UNESCO, ICOMOS, WHC

The Rapid Response Facility. Retrieved from http://www.rapid-response.org/

The Valletta Principles for the Safeguarding and Management of Historic Cities, Towns & Urban Areas. Adopted by the 17th ICOMOS General Assembly on 28 November 2011

T.C. Bergama Kaymakamlığı. İlçemizin Tarihçesi. Retrieved from http://www.bergama.gov.tr/ilcemizin-tarihcesi

T.C. İstanbul Valiliği, T.C. Başbakanlık Vakıflar Genel Müdürlüğü, T.C. Kültür ve Turizm Bakanlığı, İstanbul Proje Koordinasyon Birimi & ICOMOS Türkiye (2017). Tarihi Yapılar için Deprem Risklerinin Yönetimi Kılavuzu.

TMMOB, Jeoloji Mühendisleri Odası. (2005) Bergama Gerçeği ve Siyanürlü Altın Madenciliği

Tunçer, M. (2009) Bergama Koruma Politikaları. Milliyet. Retrieved from http://blog.milliyet.com.tr/bergama-koruma-politikalari--4/Blog/?BlogNo=173956

TUİK: Turkish Statistical Institute (2018). Address based population registration system.

APPENDICES

A. Assessment of Cultural Heritage Related Legislative Documents

Legislative document	**Implementation level**	**Involved actors**	**DRM for CH Relationship**		
			DRM Steps	**Yes (type of disaster) / No**	**Referred Actions**
Law on the '**Conservation of Cultural and Natural Property**' No. 2863"	National (for all movable or immovable cultural and natural properties)	Turkish Grand National Assembly, Ministry of Culture and Tourism, Superior Council for Conservation, Regional Council for Conservation, General Directorate of Cultural Assets and Museums, General Directorate for Foundations, Ministry of National Defense, Ministry of the Interior Governorships, Municipalities	Risk Assessment	yes/all (indirect)	preparing conservation plan (master or implementation development plans), conservation management plan, periodic maintenance, assessment, surveying
			Prevention	yes/all (indirect)	preparing conservation plan (master or implementation development plans), conservation management plan, periodic maintenance, assessment, surveying
			Preparedness	no	
			Response	no	
			Recovery	yes/all (indirect)	preparing conservation plan (master or implementation development plans), conservation management plan, substantial repair, restoration
Resolution Number 658 **Archaeological Sites, Conservation**	National (for all archeological sites)	Ministry of Culture and Tourism	Risk Assessment	no	
			Prevention	no	
			Preparedness	no	
			Response	no	

and Terms of Use"			Recovery	no	
Resolution number 662 - "**Structures and Structural Elements That Are Not Registered Yet Have the Feature of Immovable Cultural Asset"**	National (for all immovable cultural assets)	Ministry of Culture and Tourism, Superior Council for Conservation , Regional Council for Conservation , General Directorate of Cultural Assets and Museums	Risk Assessment	yes/all (indirect)	surveying (1/200 scaled silhouette, 1/50 scaled floor plan, 1/50 pavement plans, physical situation,) periodic maintenance
			Prevention	yes/all (indirect)	maintenance, repair
			Preparedness	no	
			Response	no	
			Recovery	yes/all (indirect)	restoration, reconstruction
Resolution Number 660 - **"Grouping, Maintenance and Repair of Immovable Cultural Property"**	National (for all immovable cultural assets)	Ministry of Culture and Tourism, Superior Council for Conservation , Regional Council for Conservation , General Directorate of Cultural Assets and Museums	Risk Assessment	yes/all (indirect)	(Evaluated as 1st group structures (monuments) and 2nd group structures (civil architecture) according to its characteristics) periodic maintenance
			Prevention	yes/all (indirect)	maintenance, repair
			Preparedness	yes/all (indirect)	moving (if event can be predicted), evaluating the structural condition
			Response	no	
			Recovery	yes/all (indirect)	(interventions should be made according to each structures' characteristics) restoration, reconstruction, liberation, reintegration, renovation, reconstruction, moving

Regulation - "**Classification, Registration of the Movable Cultural and Natural Assets To be Protected and Their Acquisition by the Museums**"	National (for all movable cultural and natural assets)	Ministry of Culture and Tourism, General Directorate of Cultural Assets and Museums, Assessing Authority	Risk Assessment	yes/all (indirect)	listing assets inventory
			Prevention	no	
			Preparedness	no	
			Response	no	
			Recovery	no	
Regulation - "**Determination and Registration of Immovable Cultural and Natural Property Required for Protection**"	National (for all immovable cultural and natural assets)	Ministry of Culture and Tourism, Superior Council for Conservation, Regional Council for Conservation, Directorate for Foundations, Directorate for Foundations, Directorate of Foundations, General Directorate of Cultural Assets and Museums	Risk Assessment	yes/all (indirect)	preparing notice of determination for registration (making risk assessment while preparing the notice is under the initiative of the team)
			Prevention	no	
			Preparedness	no	
			Response	no	
			Recovery	no	
Regulations - "**Museums Internal Services**" (validating by the approval of Ministry, date/no. 30.04.1990/1578)	National (for all cultural assets)	Ministry of Culture and Tourism, General Directorate of Cultural Assets and Museums, Museums	Risk Assessment	yes/all (indirect)	trainings on conservation of assets, preparing notice of registration, assessing and conservation of assets
			Prevention	yes/all (indirect)	maintenance, repair
			Preparedness	no	
			Response	no	
			Recovery	yes/all (indirect)	security measure for museum objects

Regulation - "**Determination and Registration of Immovable Cultural Assets and Sites that are Necessary to Protect**"	National (for all immovable cultural assets and sites)	Ministry of Culture and Tourism, General Directorate of Cultural Assets and Museums, Superior Council for Conservation, Regional Council for Conservation, Directorate of Regional Council for Conservation	Risk Assessment	yes/all (indirect)	preparing notice of determination for registration (making risk assessment while preparing the notice is under the initiative of the team)
			Prevention	no	
			Preparedness	no	
			Response	no	
			Recovery	no	
Resolution No 35 of the High Commission of Cultural Heritage Preservation - "**Implementation Concerning The Registered Immovable Cultural Property Together with Structures in Protection Areas and Their Interaction Transition Zones That Are Damaged As A Result of Earthquakes**"	National (for all Registered Immovable Cultural Properties Together with Structures in Protection Areas and Their Interaction Transition Zones That Are Damaged As A Result of Earthquakes)	Ministry of Culture and Tourism, Superior Council for Conservation, Regional Council for Conservation, Implementation and Inspection Offices (KUDEB), Directorate of Regional Council for Conservation	Risk Assessment	yes/eq	After the necessary physical and security measures have been taken by the relevant governorship and municipality, the issue will be forwarded to the Regional Council for Conservation together with the documents that can be obtained (static report, photographs, etc.) and evaluated by the Board first (if necessary by setting up additional agenda).
			Prevention	yes/eq	Severely damaged due to the earthquake and caused a danger of collapse, determined by the relevant administrations, were evacuated by the

					municipality or the governor's office.
			Preparedness	yes/eq	taking security and physical precaution / evacuation
			Response	yes/eq	evacuation
			Recovery	yes/eq	fundamental repairment through survey (restitution project should be approved by Regional Council for Conservation.), restitution, restoration projects, evacuation of structure in case of a disaster and heavy damage, interventions should be made according to each structures' condition
Regulation - "**Construction Rules and Inspection of Immovable Cultural Property required to be Protected**"	National (for all immovable cultural properties required to be protected)	Ministry of Culture and Tourism, Superior Council for Conservation , Regional Council for Conservation , KUDEB, Directorate of Regional Council for Conservation , Provincial Administration,	Risk Assessment	yes/all	survey, restitution, restoration projects.
			Prevention	yes/all	maintenance, repair. For new and additional structures, Conformity of building with scientific and health-related conditions should be taken into consideration.
			Preparedness	yes/all	evacuation
			Response	yes/all	evacuation

		Metropolitan Municipalities, Municipalities, Union of Chambers of Turkish Engineers and Architects * direct relation with earthquake	Recovery	yes/all	fundamental repair through survey, restitution, restoration projects.
Presidency Decree-National Palaces Administration (Date/No 16.7.2018/ 30480 Official Gazette Decree No:12 and Official Gazette Decree No: 16 about changes)	for national palaces, museums, pavilion, and factories which is headquarted in İstanbul	Department of National Palaces, National Palaces Science and Evaluation Board,	Risk Assessment	yes/all (indirect)	periodic maintenance, assessment, surveying
			Prevention	yes/all (indirect)	periodic maintenance, assessment, surveying
			Preparedness	no	
			Response	no	
			Recovery	yes/all (indirect)	substantial repair, restoration
Museology Guide	National		Risk Assessment	no	
			Prevention	no	
			Preparedness	no	
			Response	no	
			Recovery	no	
National Earthquake Strategy and Implementation Plan (UDSEP 2011) Part B.2.1.1 -5	National	Ministry of Interior Disaster And Emergency Management Presidency ,Ministry of Culture and Tourism, Universities, Directorate General of Foundations,	Risk Assessment	yes	CH Inventory has been started
			Prevention	yes	fixing on shelves in showcases and warehouses at museums has been going on.
			Preparedness	yes	Structural System safety under vertical and earthquake loads have been analyzed. Strengthening methods have been developed

					for structures that do not have sufficient strength
			Response	no	
			Recovery	no	
Turkish Disaster Response Plan (TAMP)	National	Ministry of Transport and Infrastructure, Ministry of Interior, Turkish Armed Forces General Staff, Ministry of Culture and Tourism	Risk Assessment	no	
			Prevention	yes	To ensure the security and protection of cultural assets.
			Preparedness	no	
			Response	yes	transportation/evacuation of cultural assets in case of natural disaster, To ensure the security and protection of cultural assets.
			Recovery	no	
Regulation - "**Regulation Regarding Fire Protection of Buildings**" (19/12/2007)	National	Ministry of Environment and Urbanism, Ministry of Interior, Mnistry of Culture and Tourism, Regional Council for Conservation,	Risk Assessment	no	
			Prevention	yes/fire	Fire detection and extinction precautions should be taken so as not to damage the values of the historic structure. In historical buildings open to the community, which are more than a floor, the main bearing column need to be insulated during the restoration in such a way that they are resistant to fire for at least 90 minutes. The electrical cables used in the wooden parts of the historical building must be

					at least 60 minutes long and must be passed through the steel pipe. It is imperative that junctions are made of non-combustible material. In wooden structures, materials that are not flammable or easily flammable can be used for the preservation or staining of wood. In historical buildings, flammable, combustible or explosive substances cannot be placed without creating a separate fire compartment. If the building is not provide fire safety regulation, building license cannot be given (for newly build structures)
			Preparedness	no	
			Response	yes/fire	If the number of users on one floor exceeds 100 people, the escape doors shall be replaced with a panic arm to open in the direction of escape or an officer shall be present during the use of the structure. In the absence of any change in the physical, and

					visual appearance of the historical buildings, the existing staircase is considered a fire escape.
			Recovery	yes/fire	In the case of renovations or repairs to be made within the historical structure, the same materials used in the construction of the structure may be used in order to remain authenticity.
Turkish Building Earthquake Code (2018)	National		Risk Assessment	Yes	State of the art Seismic Hazard Maps are available for whole Turkey territory
			Prevention	no	
			Preparedness	no	
			Response	no	
			Recovery	no	
5366 Code - **"Protection and Usage of the Eroded Immovable Cultural Assets through Renovating and Sustaining"**	National	Metropolitan Municipalities, Municipalities, Regional Council for Conservation, Housing Development Administration (TOKİ)	Risk Assessment	yes/all	renovation according to disasters (supporting urban transformation), investigation new areas disaster risk
			Prevention	yes/all	renovation according to disasters (supporting urban transformation), investigation new areas disaster risk
			Preparedness	yes/all	renovation according to disasters (supporting urban

					transformation), investigation new areas disaster risk
			Response	no	
			Recovery	yes/all	renovation according to disasters (supporting urban transformation), investigation new areas disaster risk
Regulation - "Procedures and Principles Regarding Preparation, Demonstration, Implementation, Inspection and Ownership of Conservation Development Plans and Land Use Projects".	National	Ministry of Culture and Tourism, Superior Council for Conservation, Regional Council for Conservation, General Directorate of Cultural Assets and Museums	Risk Assessment	yes/all	preparing conservation master plan
			Prevention	yes/all	The objectives, strategies and implementation principles regarding the development of activities and building stock in the registered cultural assets and protected areas in order to be more durable and safe against earthquakes, floods, landslides, fires, rock falls and similar disasters are introduced in the development plans. The plan is processed in notes.
			Preparedness	yes/all	The objectives, strategies and implementation principles regarding the development of activities and building stock in the registered cultural assets and protected areas in order to be more durable and safe against

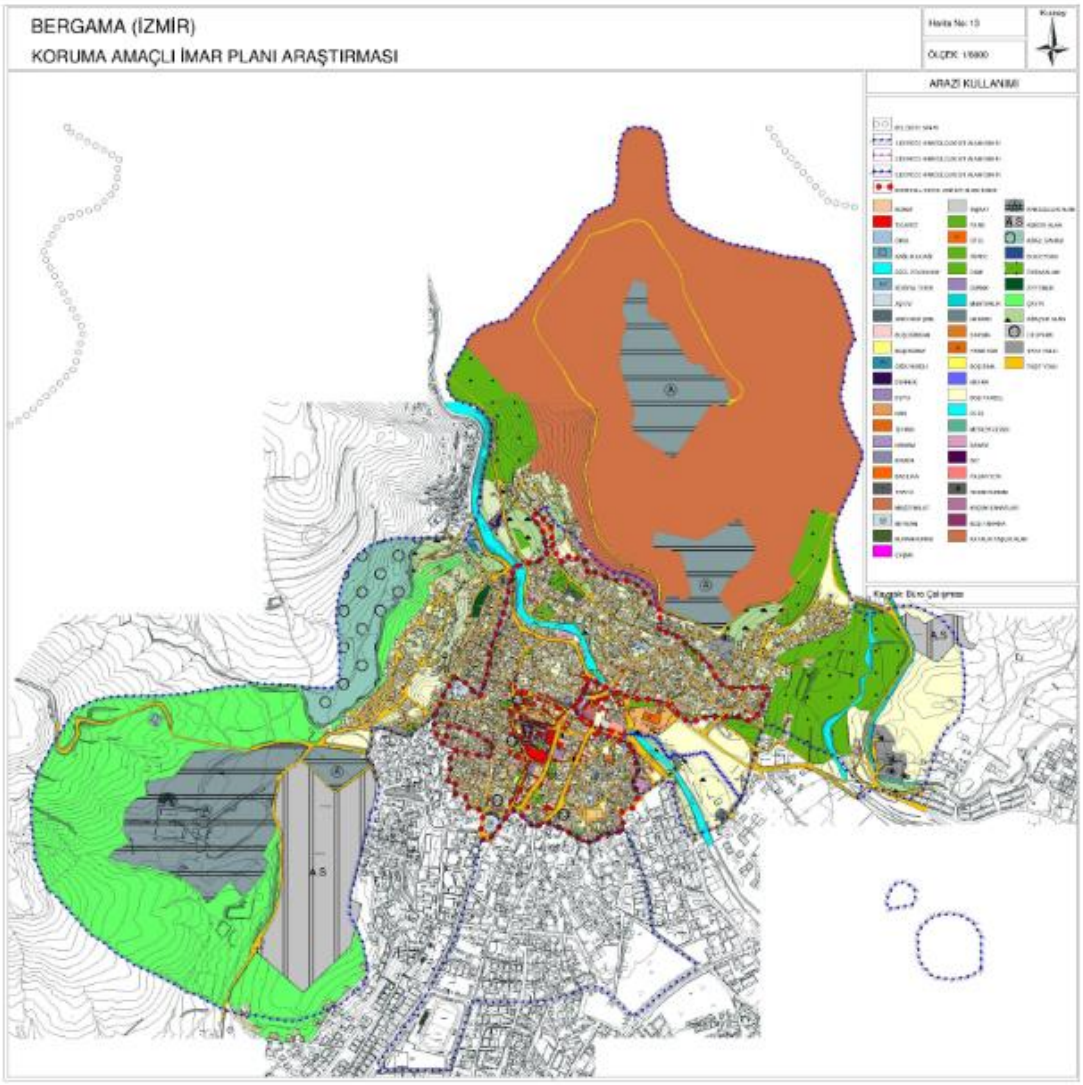
					earthquakes, floods, landslides, fires, rock falls and similar disasters are introduced in the development plans. The plan is processed in notes.
			Response	no	
			Recovery	no	
Law no. 6306 on Transformation of Areas under Disaster Risk	National	Ministry of Environment and Urbanism, Metropolitan Municipalities, Municipalities, Regional Council for Conservation, Housing Development Administration (TOKİ)	Risk Assessment	no	
			Prevention	no	
			Preparedness	no	
			Response	no	
			Recovery	yes/all	if there is registered areas in the transformation area, opinion of the MoCT is taken.
Regulation - "**Building Principles and Auditing**" (Official Gazette 11.06.2005 - 25842)	National	Ministry of Culture and Tourism, Superior Council for Conservation, Regional Council for Conservation, KUDEB, Directorate of Regional Council for Conservation, Provincial Administration, Metropolitan Municipalities, Municipalities	Risk Assessment	no	
			Prevention	no	
			Preparedness	no	
			Response	no	
			Recovery	yes/eq	Reconstruction according to survey, restitution and restoration . Evacuation in case of collapse. The practices related to the structures exposed to earthquake from immovable cultural assets are carried out by taking into consideration the decisions of the Superior Council

					for Conservation and other relevant legislation provisions.
Construction Zoning Law - numbered 3194	National	Ministry of Interior, Ministry of Environment and Urbanism, Ministry of National Defense	Risk Assessment	no	
			Prevention	no	
			Preparedness	no	
			Response	no	
			Recovery	no	
Regulations describing the scope of tenders for procurement of project and implementation works.	National		Risk Assessment	no	
			Prevention	no	
			Preparedness	no	
			Response	no	
			Recovery	no	
Law dated 20.08.2016 and numbered 2845 - **"Supporting Investments on a Project Basis and Making Amendments to Certain Laws and Decree Laws"** (changes Law 2863)	National	Ministry of Culture and Tourism	Risk Assessment	no	
			Prevention	yes/all	The Ministry may carry out the project and application works for the repair and restoration of immovable cultural properties, which are privately owned, where the public order or safety is to be cut off, or where natural disasters occur, without consent of the owners and other interested persons. For the project and implementation work carried out

					in this context that cannot be completed within one financial year, it can be transferred to common loading in the future years - not to exceed four years
			Preparedness	no	
			Response	no	
			Recovery	no	
Convention concerning the Protection of the World Cultural and Natural Heritage (World Heritage Convention), UNESCO, 1972	National /International	World Heritage Committee, State Party, World Heritage Fund, cooperate with: International Centre for the Study of the Preservation and Restoration of Cultural Property (the Rome Centre), the International Council of Monuments and Sites (ICOMOS) and the International Union for Conservation of Nature and Natural Resources (IUCN), as well as on public and private bodies and individuals	Risk Assessment	Yes/all	list of World Heritage in Danger (serious fires, earthquakes, landslides; volcanic eruptions; changes in water level, floods and tidal waves..), World Heritage Fund and International Assistance
			Prevention	Yes/all	list of World Heritage in Danger, public awareness raising, World Heritage Fund and International Assistance
			Preparedness	Yes/all	"develop scientific and technical studies and research and to work out such operating methods as will make the State capable of counteracting the dangers that threaten its cultural or natural heritage" Article 5, World Heritage Fund and

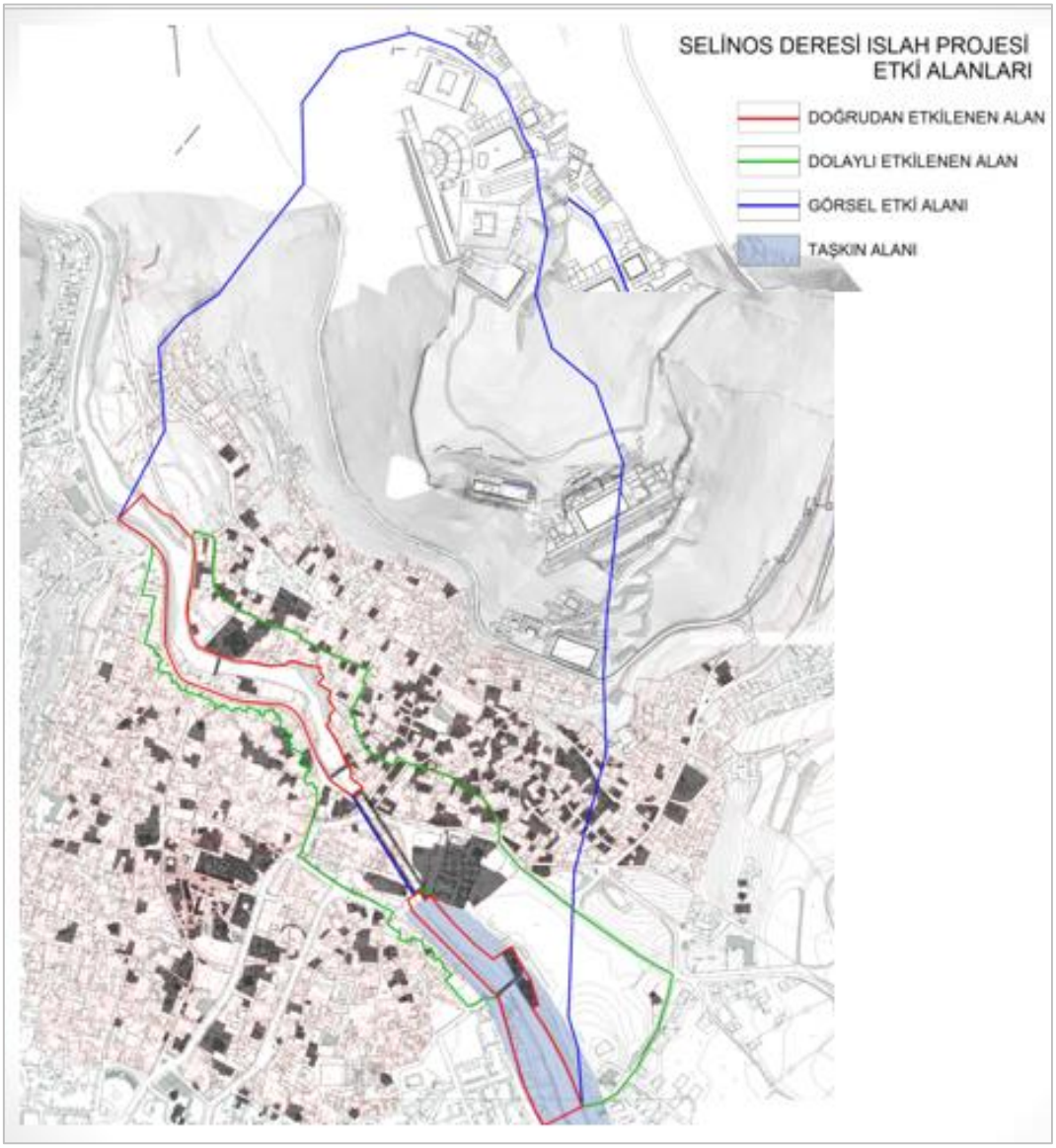
					International Assistance
			Response	Yes/all	World Heritage Fund and International Assistance
			Recovery	Yes/all	World Heritage Fund and International Assistance

B. Land Use Map of Bergama

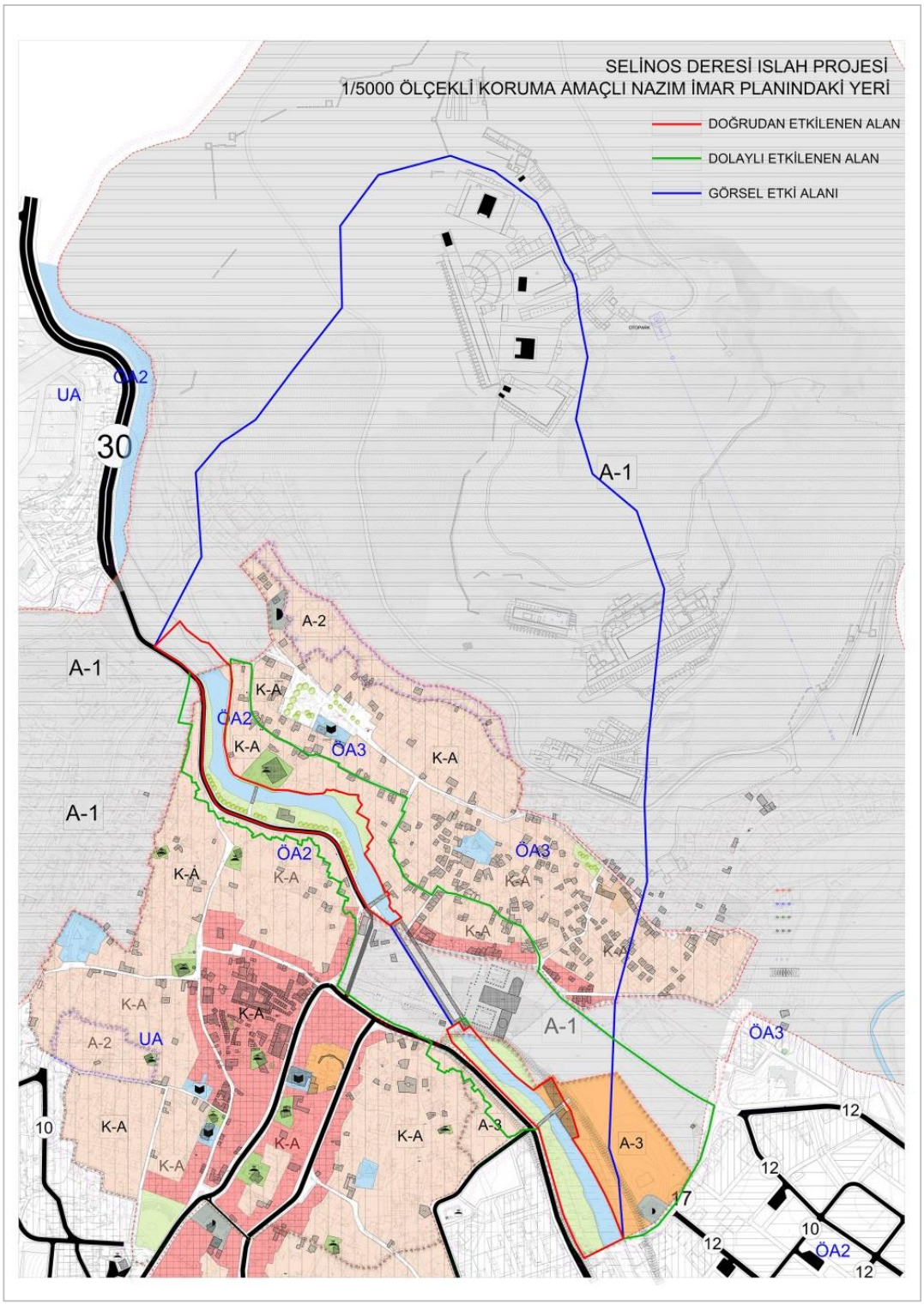


Land Use Map of Bergama (Bergama Municipality, 2012)

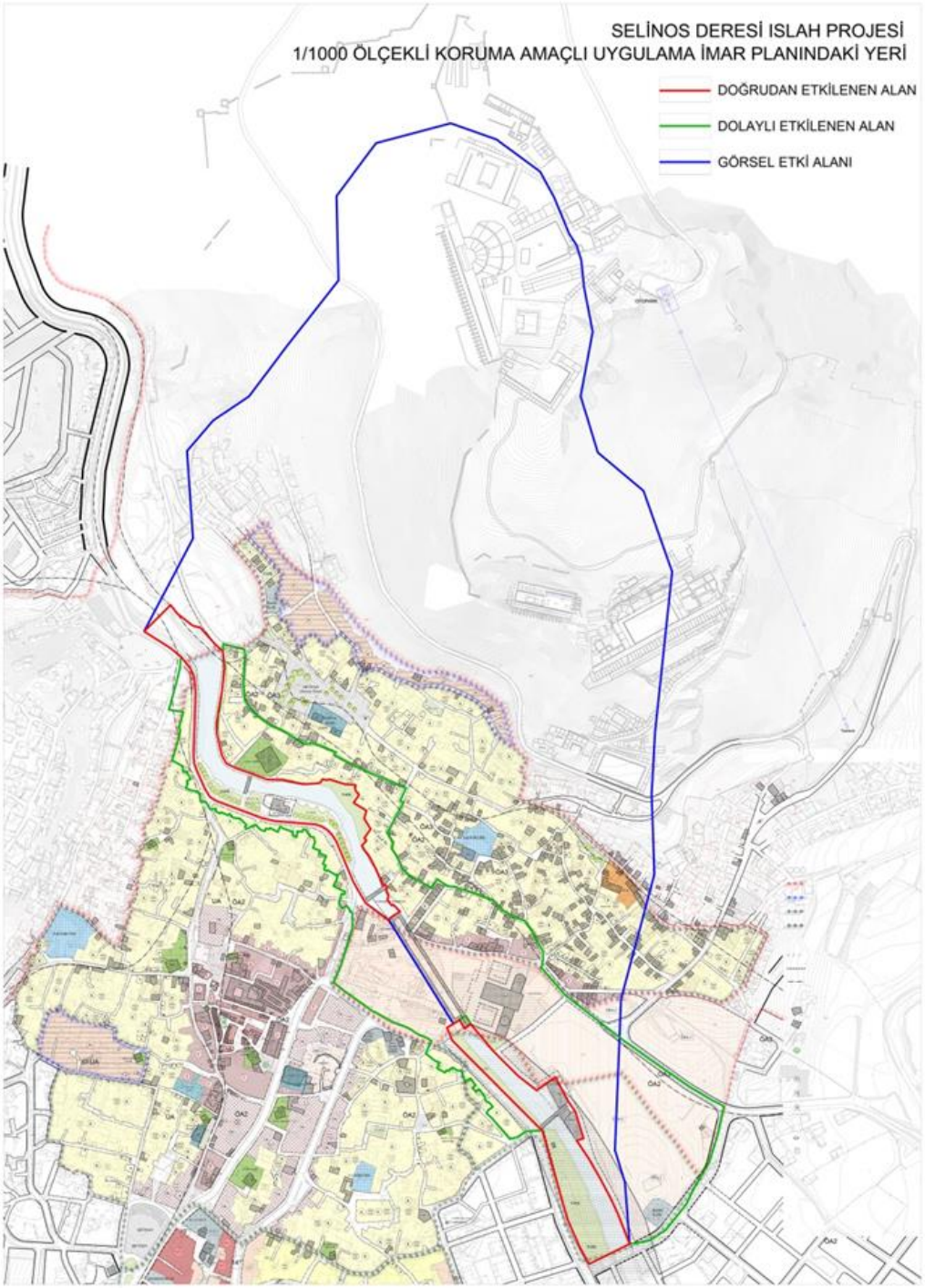
C. Cultural Heritage Impact Assessment for Selinos Brook Amelioration Project



Impact Areas (Bergama Belediyesi)

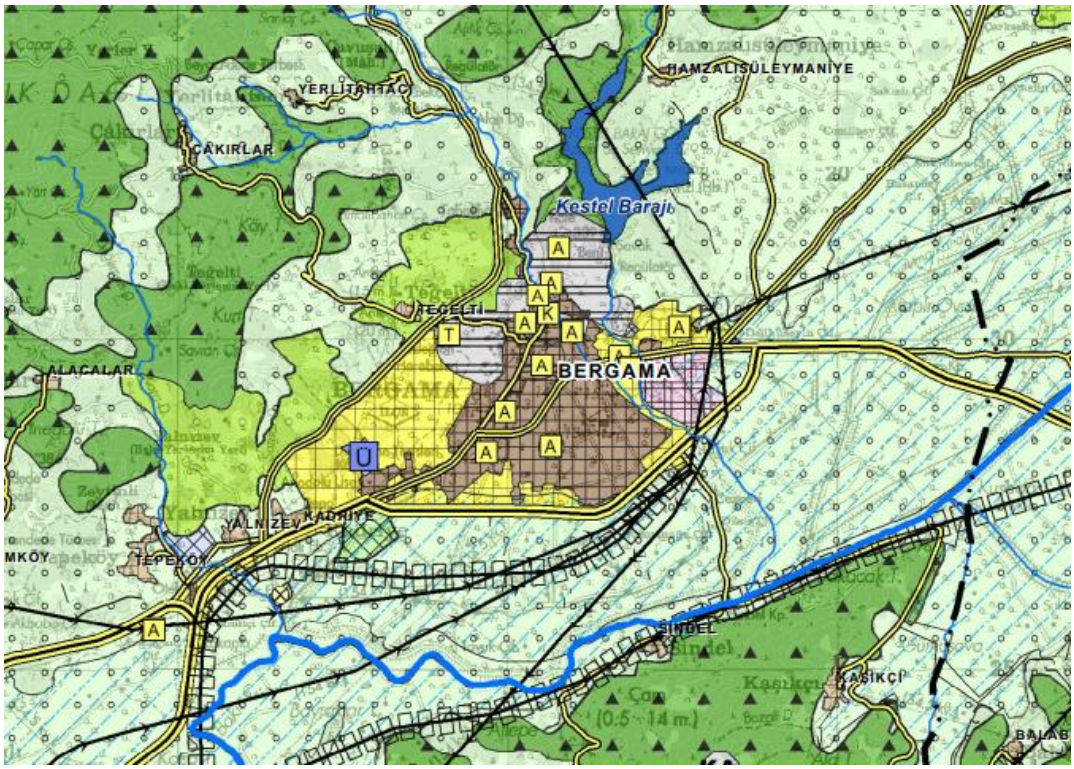


Selinos Amelioration Project on Conservation Master Plan (Bergama Municipality)



Selinos Amelioration Project on Conservation Implementation Master Plan (Bergama Municipality)

D. 1/100.000 Scaled Regional Development Plan



1/100.000 Scaled Regional Development Plan, J18 Number Map Section (MoEU, 2018 Retrieved from https://webdosya.csb.gov.tr/db/mpgm/icerikler/j18-20181011141531.pdf)