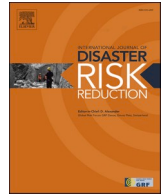




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An analysis of social vulnerability in a multi-hazard urban context for improving disaster risk reduction policies: The case of Sancaktepe, İstanbul

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ABSTRACT

Despite concerted calls over the past 20 years to ensure that urban development is undertaken in a manner that reduces disaster risk, urban planning often remains myopically focused on the built environment, seeing building codes, and land-use planning, as the most effective mechanisms of Disaster Risk Reduction (DRR). While these are clearly crucial elements of planning for Tomorrow's Cities, they are only a part of an effective strategy.

This article makes the fundamental assertion that DRR policies addressing urban spaces must strive to redress drivers of social vulnerability. This requires an understanding of the complex interactions of forms of marginalization within the local contexts, and how these have been shaped by the broader urban planning and DRR planning environment. A qualitative research method is employed in this study to assist the development of Tomorrow's Cities Decision Support Environment (TCDSE) that facilitates co-production for risk-informed decision-making on future pro-poor urban development in the context of natural hazards. The research study involved semi-structured interviews to obtain an in-depth account of social vulnerability in Sancaktepe, İstanbul. The narratives of the people draw upon different socio-demographic, and socio-economic vulnerabilities besides vulnerabilities due to urban renewal processes which underestimate pro-poor policies in İstanbul. Drawing on the narratives of interviewees, we then highlight the added value of contextualized and (inter)subjective qualitative interpretations. In conclusion, we argue how disaster risk-informed decision-making processes can be more progressive to ensure and serve in reducing vulnerabilities through our qualitative understanding as a voice of the community. This study is completed in İstanbul, within the Tomorrow's Cities Hub.

1. Introduction

The study and practice of Disaster Risk Reduction (DRR) have advanced dramatically over the past 20 years. This has been particularly marked following major disasters, with Hurricane Katrina and the COVID-19 Pandemic being watershed moments. Policy

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communities have embraced many of the academic findings, particularly with respect to the need to foreground social vulnerabilities. However, despite the explicit link made between social vulnerability and development, DRR is seldom a significant consideration in urban planning in rapidly urbanizing sites. When DRR does figure into urban planning, there is a myopic focus on the built environment and building codes, and at times land-use planning. While these are clearly crucial elements of planning for Tomorrow's Cities, they are only a part of an effective strategy. Informed decision-making in Disaster Risk Reduction is a multidimensional and complex problem, and this paper makes a critical intervention in demonstrating why a contextual understanding of social vulnerability is an essential component of integrating disaster risk reduction into planning for our future cities. In that sense, the earthquakes in Southeastern Turkey on 6-7 February 2023 raised concern on the need for a better understanding of urban socio-political components of disaster risk defining the context of such a massive destruction in a country where the construction sector is well-developed and building codes are present. Without this contextualized grounding of social vulnerabilities, disaster risk cannot be effectively reduced. Together with the contextualization, categorization of social vulnerability needs to be defined. The categories are the factors defining the social vulnerability to hazards such as the demographic conditions where some factors may define a position of marginality such as having limited landownership rights due to the coverage of legislation. We further demonstrate how an analysis of social vulnerability needs to move beyond a simple additive framework, where vulnerability is seen as the accumulation of factors of marginalization, to see how they combine in complex ways, and how these interactions are in turn informed and shaped by prior planning decisions.

Embedding DRR into urban planning means moving beyond disaster risk preparedness, seeking to redress, where possible, the underlying drivers of disaster risk. The Tomorrow's Cities Hub is developing a Decision Support Environment (TCDSE) to support municipalities in the planning and development of urban spaces in a manner that is pro-poor, reducing risk in the future [1]. This research article narrows its focus to vulnerability from a social context, where vulnerability incorporates the traits and conditions that produce or increase vulnerability of individuals or communities to natural hazards such as earthquakes. In doing so we illustrate how decision-making must account for social vulnerabilities and their drivers, paying particular attention to the impacts of planning processes, to ensure that our future cities are resilient and that they serve to reduce social vulnerabilities as a core component of effective disaster risk reduction. For this to be effective we advocate for the privileging of the voices of the marginalized in processes to develop and implement urban development and DRR policies to ensure that the drivers of their vulnerabilities are redressed. Social vulnerability is understood here as socially-constructed, embedded within particular social, political, cultural, and economic structures.

The first problem, once it is accepted that reducing social vulnerability is a core component of DRR that must be effectively integrated into urban planning, is how we can effectively understand and describe social vulnerabilities. This has three fundamental components, the first is the identification and assessment of categories of vulnerabilities, the second is how we can understand the underlying drivers of these categories of vulnerabilities, and finally, we need to understand what individuals and communities see as potentially efficacious mechanisms to redress their vulnerabilities.

The second problem this paper addresses is how informed decision-making around urban planning can effectively integrate consideration of contextual social vulnerabilities. This requires an analysis of the planning process related to both urban development and DRR. This must focus on how vulnerable populations are accounted for within the policies.

The final issue is how individuals, who are identified as being highly vulnerable, perceive the drivers of their vulnerabilities, and critically how they experience the impact of urban planning and DRR policies. At the same time, we need to elicit their views on what would be a more effective policy to reduce their social vulnerabilities as a core component of DRR-informed urban development. Our priority to represent the community needs in DRR processes is linked with the aim of Tomorrow's Cities Decision Support Environment (TCDSE) which proposes democratisation of the risk concept [2]. The TCDSE is intended to realize co-production which is pro-poor for risk-informed decision-making in an urban area with impact modelling that can assess both physical and social vulnerability in its framework [1, 3]. Stakeholder engagement, including representatives of vulnerable communities is central to the TCDSE, and starts with a Future Visioning phase to empower communities in describing a future urban space that serves to reduce their social vulnerabilities. We demonstrate here that this is critical to ensure that vulnerable groups' voices are heard, not just in the city they wish to see, but also in identifying the root causes that must be redressed to achieve Tomorrow's Cities.

A central component of TCDSE is its natural-hazard event simulations which provide for the capacity of local stakeholders to use a Risk Agreement process by which the community and public policy-makers come to an agreed risk for future spatial planning of an urban area [1]. The Risk Agreement process can be realized as if the Computational Model results are available which relies on conditions of vulnerability towards hazards through exposure all the way down to the level of individual people. Furthermore, the Social Impact Module in the framework of TCDSE, which models impacts in terms of any impact metric of interest with respect to a selected unit of analysis can be used to assess household level financial burdens associated with physical impacts across different income groups or other social categories [4]. For the disaggregation within low-income households, the root causes of contextual social vulnerabilities of those households or individuals can be analysed qualitatively to enhance the quantitative part of this module [1]; pp.8. In that respect, we will have a more realistic picture of the impacts of hazard scenarios on society. Therefore, we relied on an interview-based qualitative research agenda, which is to have an in-depth understanding of both individual and household conditions of social vulnerability in an urban area to better assist the development of TCDSE. The significant results from the interviews in terms of categories of vulnerability can be used to define additional social variables for the households for Social Impact Module. Similarly, the Urban Planning module which covers a Geographic Information System (GIS) database consisting of land use, building data and household information [1]; pp.6, [4]; pp.3 can be better calibrated by new information on socially vulnerable poor groups and their housing conditions.

Finally, we have collected policy ideas from interview participants on how their vulnerabilities might be redressed. This is an integral part of the Tomorrow's Cities framework to develop Policy Bundles utilizing co-production through its Future Visioning. Our

findings provide a clear validation of this approach, illustrating how vulnerable populations are well placed to identify targeted measures that serve the aims of Tomorrow's Cities.

This paper first grounds the discussion of social vulnerability within the broad definitional debates in disaster studies in Section 2. This provides the conceptual boundaries of our examination of social vulnerability. Also, this section tries to tackle the concept of contextual social vulnerability and why some particular identities are more vulnerable than others to hazards. Section 3 elaborates on our methodological approach, relying predominantly on qualitative research for understanding social vulnerability to address our core research questions in two ways; both on the macro contextual level and on the micro level representing the individual experiences and different positionalities. In Section 4 we then proceed to our specific case study where we establish the broad context of the community, examining the impact of urban planning and DRR policies on social vulnerabilities within İstanbul city. Section 5 then turns to the description and analysis of our research findings derived from our interviews where we focus on the concept of contextual social vulnerability in relation to socio-demographic and socio-economic position and housing conditions, risk perceptions and expectations of the participants from policy-makers with respect to disaster risk reduction, housing, and social assistance. In the final discussion and conclusion, we argue that the decision-making and urban planning policies have to focus on and give special attention to different categories of vulnerabilities experienced by the community related to reducing disaster risks. Moreover, these vulnerability categories together with policy-making solutions reflecting different experiences and positionings of the individuals in terms of disaster risks are important components of TCDSE that aim to inform decision-makers on the actual lived experiences of the community.

2. Conceptual discussion

The concept of social vulnerability has been central to Disaster Risk Reduction (DRR) strategies since the early 1980s [5]. Yet, its framing continues to be contested, with a broad range of definitions derived from distinct disciplinary and intellectual backgrounds [6, 7]. Studies of vulnerability to hazards are predominately rooted in three primary research perspectives: risk hazard; social-ecological systems [8]; and political ecology and political economy. From the risk-hazard perspective, vulnerability is understood as the combined result of biophysical, social, and economic factors [9, 10]. Vulnerability reduction is thus achieved through a combination of adjusting the physical exposure to hazards (e.g. by restricting development in floodplains) and through social interventions (e.g. by providing social services) [8]. In social-ecological systems (SES) theories, social and ecological systems are seen as complex, dynamic, and tightly coupled [11]; [8]. Finally, political economy and political ecology perspectives argue that vulnerability exists in social systems regardless of physical exposure to hazards. Accordingly, vulnerabilities are fundamentally rooted within social structures (i.e. political, economic, social, historical, and institutional contexts), which are subject to dynamic pressures that channel vulnerable populations into hazardous conditions, creating place-vulnerability [12–14]. Despite these substantive differences in approach, there is a broad agreement cross-cutting these debates that social vulnerability is fundamental to understand the drivers of disaster risk, and that its reduction is crucial to reducing risk.

Drawing on Cutter et al. (2009)[15] we understand social vulnerability as a socially constructed phenomenon embedded within particular social, political, historical, and economic processes that influence social systems (individuals, communities). Social vulnerability is thus multidimensional, with overlapping and interacting components, including political, economic, social, and institutional root causes. Additionally, social vulnerability is taken as *contextual* which is a condition that is peculiar to the life-context of an individual or of a group. Contextual vulnerability approaches typically focus more on the current socio-economic determinants or drivers of vulnerability (i.e., social, economic and institutional conditions) [16]. As discussed by Feldman [16] and O'Brien et al. [7], the contextual vulnerability approach, in highlighting the specific circumstances driving vulnerabilities, and their contextual relevance to various hazard risks, allows for the development of policies that reduce vulnerabilities. To understand the root causes of contextual social vulnerability we draw upon [17] who argues that the cause of risk is predominately one of marginalization, defined as the exclusion of certain individuals and groups from economic, social, or political resources. This is commonly expressed through the exclusion of the poor in urban governance schemes. The existing political approaches towards disaster vulnerability on the national and international scale continue to prioritize practitioners' needs rather than the needs of the poor ([18] cited in [19]; pp.30). This is of fundamental importance, given that [20] have illustrated, drawing on an analysis of eight cities from the Global North and South, that land use planning, even when seeking to redress drivers of vulnerabilities and hazards around climate change adaptation can cause exclusion of the poor and increase socio-spatial inequalities. This is the particular issue that the TCDSE, and our advocacy for a focus on social vulnerability as a central component of planning choices, is seeking to redress.

Within this framework of inequalities, contextual social vulnerabilities can be categorized with respect to the socio-economic and socio-demographic conditions together with urban and housing conditions. There have been numerous studies that have demonstrated how disasters disproportionately affect individuals who are poor [21–24], have disabilities, elderly, very young, migrants, minority-language speakers, and single parents [19], [25–30], [31]. Household size is also important as it can increase the number of dependents [32,33]. Gender is another critical dimension where numerous studies have shown how women are often more vulnerable to hazards [32, 34, 35]. An additional category of social vulnerability is the nature of the urban environment where the accessibility to services, housing, and infrastructure quality are critical components of social vulnerability [36–38]. Moreover, studies show that property owners or tenants have different vulnerabilities when they are exposed to hazard risks ([39], [27]). While all of these categories are clearly important, a contextual analysis demands the exploration of how these combine in distinct ways in different spaces, and that their specific manifestations are historically contingent. In order to redress the power imbalances that contribute to social vulnerabilities, and to ensure that enacted policies are progressive, the involvement of the stakeholders, privileging bottom-up approaches, in identifying hazard risks, impacts and adaptive strategies is critical [40]. Understanding social vulnerabilities and their root causes through the participation of the community further supports more bottom-up approaches [41], [42] to be adopted by

policy-makers toward disaster risk reduction. Through the adoption of such an approach the decision-makers can develop new strategies identified to develop transformational urban planning and development practices for disaster risk reduction and create a resilient community [43].

The marginalization of the poor becomes especially significant in the urban context when they are directly excluded from, or not accounted by, various urban development and renewal schemes. In megacities where the urban land value is high and speculative, the situation may be worse. This is the starting point of our study, where we concentrate on analysing the context for social vulnerability in an at-risk urban area, the Sancaktepe district in İstanbul metropolitan area, in order to understand how the urban planning and DRR policies may impact social vulnerabilities, either by not effectively accounting for the various vulnerabilities of individuals or communities or by excluding groups from the policy gaze. Urbanization is of central importance as it both shapes - and is shaped by social vulnerabilities - as well as defines the physical components of hazard risks. According to Wamsler [44]; the gap between DRR activities and urban planning is increasing the vulnerability of the poor to disasters. This is clearly evident in our case study (discussed in greater detail later). Within this paper, we explore the roots of various social vulnerabilities of marginalized communities and illustrate how these planning endeavours have had a limited impact on reducing the disaster risk of particular groups. Vulnerability in natural hazards leads to marginalization of people disproportionately. Such marginalization takes place within the dynamics of daily activities. Also, as argued by Gaillard [86]; geographical conditions are affective on people because they live in hazard prone areas within informal settlements. Additionally, members of minority groups, disabled individuals, prisoners and refugees, the poor who are homeless and jobless, groups whose voices not heard like women, non-heterosexuals, children, and elderly, and those groups with inadequate access to social protection and with low social solidarity are also marginalized and become socially vulnerable [45].

As a consequence of this conceptual framing, in order to effectively understand the contextual dynamics of social vulnerabilities within an urban setting we examine three components and their interactions. First, we undertake an analysis of the categories of marginalization within the target urban setting, which requires a contextual understanding of specific urban spaces. Secondly, we analyse the policies related to both urbanization and Disaster Risk Reduction (DRR). Here we pay particular attention to the extent to which social vulnerabilities, focusing on marginalized communities, figure into such policies, and the impact of the inclusions and/or exclusions on these communities. Finally, we foreground the voices of community members related to the impact of urbanization on their lived experiences. In seeking to privilege their voices we need to understand what kind of impacts of urban planning and disaster risk reduction policies they see on their social vulnerability. In this way, we are able to better understand the dynamics of social vulnerability in urban spaces, and place these within the contexts of urban planning and DRR. Thus, the central question we seek to answer is “what are the drivers of social vulnerability in an urban setting, and how are these impacted by urban and disaster risk reduction planning?”

Then the major argument of the paper will be to display how this information can be utilized most effectively by the disaster risk reduction policies targeted to multi-hazard conditions. For this kind of policy development, we relied on the proposals of interviewees. As our methodology is to understand the vulnerabilities of individuals from their own expressions together with their risk awareness, we follow the same strategy for policy development. The individuals were able to express their prior policy needs during the in-depth interviews after a discussion on their vulnerabilities and capacities toward predicted types of hazards. Moreover, this process is a major component of TCDSE to represent the potential impacts of different hazards in relation to community aspirations. Finally, those proposed policies are juxtaposed with the policy gaps rooted in the political-economic context of urbanization causing exclusion from socio-urban conditions for different individuals or households.

3. Methodology

Before undertaking an in-depth analysis of vulnerable households our research commenced by analysing the connections between socio-political, economic, and spatial/material components in Turkish urbanization in İstanbul, to determine when, and in what ways, vulnerable communities were accounted for within policies. Subsequently, we conducted 20 in-depth interviews with individuals (who also represented their households) to understand and analyse the socio-economic and socio-demographic characteristics of vulnerable households within the urban context. We also explored their narratives of the root causes of their social vulnerability in disaster situations, as well as their policy ideas. Additionally, our Methodology in the selection of interview questions is an effort to feed the related modules (Social Impact, Urban Planning, Policy Bundles, Risk Agreement) of TCDSE, as defined in the Introduction part of this paper, with a qualitative understanding of when conducting research on categories of marginalization to natural disasters.

The following subsections cover the selection of vulnerable households for interviews, the scope of the urban policy analysis, the conduct of the interviews, and subsequent qualitative data analysis, as well as the limitations of our interviews. Here we must clarify that although the interviews were conducted with the selected individuals, they were also representing households.

3.1. Identification of vulnerable settlements and households

In order to identify socially vulnerable households, we used a deductive method starting from the city level down to the household level. At the İstanbul city level, we identified the settlements with the highest social vulnerability level from a previous study, Mega-IST (2017) as a first step. We then identified and reached out to vulnerable households within the settlements through our contacts with the local administrators.

Mega-IST (2017) is prepared by the Directorate of Earthquake and Ground Research of İstanbul Metropolitan Municipality through a survey with more than 40,000 households in 2017–2018 [46], covering all 39 districts and 955 sub-districts with residential occupation. The study produced a social vulnerability index (SVI) score which was classified into four categories based on the average SVI score: Low vulnerability (< -1 standard deviation (SD)), Low-moderate Vulnerability (-1 to 0 SD), High-moderate vulnerability

(0–1 SD), and High Vulnerability (>1 SD). Sancaktepe district in East İstanbul scored a high vulnerability level where households with severe risk of social vulnerability were concentrated. Nevertheless here we have to note that several criticisms of the indicator approach have been noted by some researchers including subjectivity regarding variable selection and weighting, lack of availability of certain variables, problems with aggregation to different scales, and difficulties validating the results [47–49]. Despite their failings, the usefulness of indicators for reducing complexity, measuring progress, mapping, and setting priorities make them an important tool for decision-makers aiming to lessen disaster vulnerability (Tate, 2011:25). Our use of the SVI is more limited, and we have relied on it strictly to identify those neighbourhoods with the highest level of vulnerabilities.

Rather than utilizing quantitative methods, such as the Principal Component Analysis (PCA) deployed in Cutter [50] Social Vulnerability Index (SoVI), our primary analysis has drawn upon qualitative methods. We explore the relationships between social vulnerability and urban planning by analysing the urban political-economic context, and how people perceive these interactions using interviews. Through using in-depth face-to-face interviews to acquire a deeper understanding of the individual level factors [51]. This foregrounding of the contextual vulnerability approach supports the TCDSE by providing a more complex understanding of the drivers of social vulnerabilities.

3.2. Analysis of urban planning and DRR policies related to social vulnerability

The analysis of urban planning and DRR policies involved primary research focusing on the formal policies and regulatory frameworks impacting İstanbul city and the Sancaktepe district in particular. The policy documents were reviewed for reference to social vulnerabilities and categories of marginalization. The extent to which the resulting policy implementation has served to reduce the drivers of vulnerability has then been assessed. Particular attention was paid to which categories of vulnerability were present in the policy documents, and whether the policies seek to either prioritize vulnerable groups or reduce sources of vulnerability.

3.3. Individual and household based analysis of social vulnerability by in-depth interviews

The final component of this research focuses on developing an understanding of the perceptions of individuals representing households on the drivers of their social vulnerabilities, and how people have experienced the impact of official planning on their lives. This has been achieved through qualitative research using purposive sampling which also informed our interpretation of the Mega-IST study. We have concentrated on 20 households within the most vulnerable neighbourhoods in the Sancaktepe district. Semi-structured in-depth interviews were then held with individuals as household representatives.

3.3.1. Recruitment of participants

As the study is a part of the broader UKRI - GCRF¹ Tomorrow's Cities Hub which is formally partnered with the İstanbul Metropolitan Municipality, we opted to work through the *Mukhtars* (local administrators) as a component of trust-building with local decision-makers. Secondly, due to the limiting conditions of the COVID-19 Pandemic, we were unable to visit the field in person and we relied on the *Mukhtars* with whom we had built prior connections. The *Mukhtars* provided the telephone numbers of the identified households and acted as a reference on our behalf. Nevertheless, ethic codes were applied, feedback was given and everything was conducted by consent. We followed the Code of Ethics of the University of Edinburgh and the ethical committee rules of Middle East Technical University, including securing formal consent for the recording of interviews. All interviews have been anonymized.

3.3.2. Qualitative data collection

The data was collected in April 2021 through telephone interviews during the Pandemic. In the interviews, we asked people about demographics, socio-economic conditions, level of social capital, the formal and informal services they received, their experience of urban disaster risk, urban renewal demands and experiences, and their policy formulations for DRR. Participants showed a preference for phone interviews, they were willing to express themselves openly and share their household experiences without being apparently bothered about the concerns of privacy during the conversations. An interview form was developed to ensure a standard flow in interviews. The interviews lasted on average 30 min each and they were recorded. All recorded interviews were transcribed verbatim.

3.3.3. Qualitative data analysis

In qualitative research, the reality is not objective but constructed and not independent of the values and interpretation of the researcher (Andrews, 2016). The aim of a researcher is to transform the qualitative data collected via people's stories into knowledge that can contribute to a systematic understanding [52]; pp. 434). Although individual narratives are limited in their capacity to be generalized or reflect an issue in a full range of dimensions, they can clarify the central issues on the intersection of different identities [53]; pp. 23. In light of these considerations, in-depth qualitative data based on individual perspectives about the social vulnerability of households were collected.

All transcripts were revisited repeatedly and interesting parts, words, or sentences were highlighted as codes of the qualitative data. These codes were compared and reviewed multiple times, unnecessary codes were eliminated and similar ones were combined for qualitative data reduction. In addition, some quotes from participants were highlighted to be used as a way of presenting the qualitative data. Furthermore, for the coding and subsequent analysis, Turkish narratives were translated into English by the researchers with due diligence to stay true to the meaning of the original narrative of the interviewee. The research team has extensive experience working in the city, providing valuable contextual knowledge which has facilitated the interpretation of the qualitative data. The

¹ UKRI-GCRF is a UK Research and Innovations based funding for a special programme named Global Challenges Interdisciplinary Research Funding which supported Tomorrow's Cities HUB (ukri.org).

qualitative social vulnerability profiles of participants were analysed within their narratives as a compilation of all parts of the interview. Their policy proposals highlight the specific contextual needs of different households who are not able to afford to prepare their houses for disaster risk reduction.

Narratives from the participants were grouped in findings according to the main themes from the interview form, which is consistent with our conceptual framing as categories of vulnerabilities. Three main categories of social vulnerability; demographic, socio-economic, and urban/housing conditions together with policy proposals for DRR are represented in findings with details as below:

- demographic household characteristics;
- socio-economic characteristics like livelihoods, work, education, income, and cross-cutting with demographic characteristics;
- conditions of housing, urban renewal demands and experiences;
- risk perception and prioritization of hazards;
- policy proposals to prevent disaster risk.

3.3.4. Limitations

While the interviews were fruitful, and have provided the basis for significant depth of analysis on the contextual understanding of vulnerabilities, there are some critical limitations that need to be highlighted, deriving from both the broader scope of the pandemic, and the local context.

1. **Logistical Limitations:** Interviews were conducted in the context of the COVID-19 Pandemic in 2021. Hence, they had to be undertaken over the phone which may bring some limitations although all precautions of possible biases were taken.
2. **Sampling Limitations:**
 - 2.1. Using *Mukhtars* for the selection of interview participants may be a challenge. While in the Pandemic context, the *Mukhtars* were the best individuals at the neighbourhood scale; able to identify marginalized and poor families, their ethnic or political ties may divert their selection priorities. Therefore, we have tried to conduct the interviews within different neighbourhoods in Sancaktepe, to distribute the risk of bias. This is also important for our research concerns in conducting the interviews, that is to represent common points of vulnerability of different groups.
 - 2.2. One major challenge and limitation of the data collection was that the age and gender profile of the participants concentrated mostly around mid-age male household heads. This is mainly related to the dominant trend in Turkey that men are the main breadwinners and are selected by the *Mukhtars* as the persons who can answer better about the socio-economic situation of the household. This is a challenge but also an advantage since we can access more detailed information from men both on the socio-economic conditions of the household and on their housing properties.
3. **Ethical (Health) Limitations:** The Pandemic has produced unprecedented challenges both for society and social researchers. The ongoing Pandemic has been a profound aspect affecting the social vulnerability of different groups in terms of existing inequalities and new dimensions brought by the Pandemic. These conditions have created further research limitations, especially in reaching the participants and sampling. Researchers are also responsible for considering their respondents' physical and mental health. For this reason, conducting this study on social vulnerability during the Pandemic requires developing different strategies to maintain the health of researchers and participants regarding the additional health risks and to overcome limitations formed in these novel conditions. However, the Pandemic has proposed an opportunity for this study to focus on vulnerabilities that emerged during the Pandemic.
4. **Political Context Limitation:** Due to the relatively small number of interviewees, and the concern that interviewee responses to questions relating to religious, political, and ethnic profiles might increase the risk of interviewees we decided not to ask direct questions about these aspects of participants' profiles, and such information is not presented in the findings.

4. Contextual analysis of urbanization processes and DRR leading to social vulnerabilities

The dynamics of social vulnerability within İstanbul, and the emergence of impoverished settlements in areas of high hazard risk, have been shaped by the political-economic context of urbanization which has paved the way for the recent agendas of urban renewal. After we provide a historical political-economic context for the patterns of social-vulnerability, we turn our attention to the ways in which social vulnerabilities are now being shaped by urban planning and DRR policies. These DRR policies are grouped under two headings according to the conceptual design of this research which are; disaster management and recovery policies and social assistance schemes.

4.1. Urbanisation in İstanbul

In the last decade there have been numerous academic papers addressing urban renewal projects in İstanbul which have been legitimized as effective solutions for reducing disaster risk. Some of them cover a gentrification process (e.g. gentrification in the Tarlabası area in the centre of İstanbul [54]), some can be accepted as rehabilitation in protected areas (e.g. rehabilitation in historical Fener-Balat neighbourhood in İstanbul [55]), but most cover renewal schemes after a slum clearance operation (e.g. Slum Clearance in

Ayazma area in İstanbul around the new stadium, new building blocks in a poor settlement called Başbüyük in İstanbul [56]). Within the current legislation, the urban renewal process in the country has become related to the earthquake risk asserting the transformation needs of 'risky' areas or buildings. Although the legislation about urban development uses the term "*kentsel dönüşüm*" (urban transformation) in Turkish, the actual content of the legislation focuses on "urban renewal" similar to what is seen on the ground as highlighted by scholars such as [54, 57–59]. This legal context defines the understanding and expectations of residents of poor and risky settlements which can be seen in our findings of this research.

If we analyse the historical process of urbanization in modern Turkey for the emergence of housing on hazard-prone areas, the first phase - which Tekeli (2011a) terms as the 'radical modernity project' - commences with the proclamation of the Republic in 1923, running to the end of World War II. The most important spatial change in this process was installing Ankara as the capital of the young republic. This coincided with state-driven industrialization efforts in Anatolia in the name of regional development, which diverted migration from İstanbul to other cities. Following WWII, through the early 1950s, Turkey commenced an economic restructuring and industrialization [60]; pp.84-85, resulting in profiteering effects during the post-war period as a result of American economic aid and the Marshall Plan. From 1954, the agricultural sector began to lose its power in the Turkish economy, and the increased mechanization of the sector, combined with increasing salaries of industrial workers in state-owned establishments and civil servants in the urban areas sustained push and pull factors which increased the migration rate of rural people to urban areas. This period is described as the "labour power era" in urban areas [61]. This state-initiated industrial development continued until the neo-liberal era of the 1980s when the pull factors of the cities changed as the new economic system prioritized the private sector and the shrinkage of the State came to the fore. The decrease in agricultural subsidies and revenues in agriculture relative to other sectors resulted in large population movements away from the agricultural production process ([62]; cited in [57]; pp.165). Therefore, the neo-liberal period is associated with migration from rural to urban settlements and from smaller to bigger cities. However, since the absorbing capacity of the private sector was insufficient to provide for the mass migration, forcing most migrants to find work in the informal sector as unskilled labourers, often under subcontracting arrangements [57]; pp.165. This became an important factor of social vulnerability later on.

These migration trends drastically changed urban-rural population ratios in Turkey in the period between 1950 and 2000 which is clearly reflected in urban population statistics. The rate of urbanization which was 25% in the 1950s jumped up to 65% in the 2000s, getting closer to the Western European rate of 70%. In terms of population growth and urbanization, after the 1950s İstanbul city itself, and the Marmara Region in general, developed rapidly and İstanbul became the heart of Turkey's economy [63]. İstanbul's population which was about 1.2 million in 1955 increased to about 16 million in approximately 65 years.

İstanbul is the largest metropolitan city in Turkey accounting for about 19% of the entire population in the country. It is situated in a hazard-prone zone, namely the Marmara Region close to the North Anatolian Fault Line. With respect to the fast migration from rural to urban under different political-economic processes as mentioned above, the city has a risky and dense building stock with illegal, old, and not properly engineered buildings. Furthermore, land scarcity and poverty have exacerbated the situation. [64], in their paper on the multidimensional nature of urban poverty, highlight that inadequate housing and vulnerability are closely related as "the urban poor are more likely to reside on insecure lands with substandard housing quality and poor infrastructural systems. This circumstance makes poor urban residents more vulnerable physically, socially, and economically [64]. Therefore, a contextual understanding of social vulnerability highlights how socio-economic drivers have been significantly worsened in the urban context through land tenure insecurity [65] and low-quality housing.

Although there was massive construction and housing development in the peripheries of İstanbul after the 1970s, these houses were not affordable for newcomers or for poor sections of society. As a result, newcomers either moved into the emptied old historical urban houses with low quality which were located in the centre of the city, or tried to build their own homes in the illegal status mostly situated in the hazard risk zones suffering from flooding, earthquake or landslides both in the centre or in the periphery of the city. Therefore, illegal construction processes producing "*gecekondular*" (in Turkish, houses built-up in one night) houses as low-quality self-made housing became common practice in almost every part of the city [66]. There was also an absence of adequate funds and investments for social housing and the migrants were forced to build their illicit houses [61,63,66]. From a political economy perspective, the underlying cause of this is the delayed process of capitalist development in the country where - as a result of the pace of rural-to-urban migration - new urban dwellers could not be provided with employment opportunities in productive sectors [66]. Moreover, the *gecekondular* settlements became crowded in time with amnesty laws as the political parties always saw them as easy targets to get their votes by promising them a title deed [61]. This resulted in the legalization of settling on hazard-prone areas.

The neo-liberal period of the 1980s saw housing construction rates increase dramatically. Almost 30% of all buildings in İstanbul were constructed between 1980 and 1989. This trend continued in the next ten-year period between 1990 and 2000 with 32.5% [67]. These urbanization trends have resulted in severe imbalances in housing stock in different areas. The construction sector flourished with various urbanization projects resulting in dense apartment building construction. After the 2000s development of gated communities and luxury residences increased to serve the demand of the rising middle classes [67]. At the same time, the neo-liberal era resulted in a much worse position for İstanbul's low-income residents as house rents increased as a direct result of urban land speculation. The control over the land by the authorities also increased to protect the valuable urban land from illegal dwellings. On the

other hand, this period also speeds up the urban renewal schemes in the city which gave an opportunity for some low-income populations in the city to convert their dwellings into apartment blocks, but only if they were seen as the “eligible owners of the land”. The others, tenants who are out of the coverage of housing amnesties became losers within this renewal process. Therefore, land tenure security comes up as an important factor in DRR-based urban renewal projects in Istanbul which has a direct effect on the social vulnerability of residents who are mostly tenants.

There were two phases of the urban renewal process in İstanbul.

1. The first phase of urban renewal projects mainly targeted to transform *gecekondu* areas into legal settlement areas with Squatter Amnesty Laws in relation to the political-economic context of the country [63]. This phase can be accepted as a partial urban renewal process based on *gecekondu* transformation which was mainly motivated by political factors. The *gecekondu* construction has reduced since 1985 as a result of difficulties in obtaining a title deed, and more control on the urban land by the authorities as empty land became a scarce resource in big cities.
2. 1999 was the turning point for housing construction and urban development which started the second phase of urban renewal when two major earthquakes hit the Marmara region causing at least 18,000 deaths and \$16 billion US dollars in economic loss. These events changed the authorities’ perspective on earthquake risk and its mitigation. As a result, the “Earthquake resistant design code” (published one year before the 1999 earthquakes) was widely implemented. Several initiatives such as programmes for strengthening schools, hospitals, and transportation systems have also started subsequently [67]. In the recent period, after the 1999 Marmara Earthquake, there is a new understanding of urban renewal in Turkey where the main target is transforming the housing stock that is not resistant to earthquakes, including illegal settlements.
 - 2.1. The second phase was also characterized by urban renewal projects, some of which have been criticised as accelerating gentrification processes, with little emphasis on disaster risk reduction [54].
 - 2.2. After National Law No. 6306, dated 2012, regarding the “Redevelopment of Areas Prone to Disaster Risks” was enacted, the renewal processes were defined clearly as a disaster risk reduction strategy and created an awareness in society on this issue. The new Law is covering all the disaster risk-related renewal of buildings, accelerating the urban renewal of old and risky buildings. There are two methods for the transformation process; one is building-based and the other is area-based.
 - 2.2.1. The conversion of ‘at risk’ buildings is mostly based on individual arrangements between the house/landowner and the contractor based on current building standards covering earthquake-resilient construction and energy efficiency regulations [68]; pp.95.
 - 2.2.2. Area-based conversions are also taking place through the decision and initiative of Municipalities or the Ministry of Environment, Urbanization and Climate Change according to Law No. 6306. The selection of areas is not all time in relation to too risky ground conditions of previous settlements but also to areas close to the city centre or to the main transport axis. In addition, urban planners propose area-based methods to have healthy neighbourhoods with social amenities and better infrastructure on a settlement scale. This also gave legitimacy to a number of urban projects in the city. The renewal process clearly privileges those with title deeds of land at the expense of those without legal title deeds of their houses or tenants.

In this urbanization context, housing-related social vulnerability in İstanbul for disaster risk is a result of fast population growth and migration, rapid urbanization and urban renewal schemes on land use causing high prices for land together with low quality/illegal housing supply, socio-economic and land tenure differences in the city. These factors also contribute to the social vulnerability in the Istanbul city context that will be questioned in this study.

4.2. Policies for disaster risk reduction in Turkey

4.2.1. Disaster management and recovery policies

As with the urban planning policies, disaster risk reduction policies have not effectively accounted for or served to reduce social vulnerabilities. In Turkey, DRR focuses on the recovery period and seeks to improve recovery capacities rather than mitigation and preparedness. Hence, the DRR policies lack the capacity to alleviate social vulnerability because of a lack of pro-poor policies. The responsible institutions are the Ministry of Environment, Urbanization and Climate Change (Ministry of EUC), the Disaster and Emergency Management Directorate (AFAD), the İstanbul Metropolitan Municipality, and the Ministry of Family and Social Services (MFSS). The responsibilities and services of each of these institutions are delineated by different laws.

The Ministry of EUC has responsibility for the identification of hazard-prone zones and buildings according to Law No. 6306.² The Ministry determines the risk level of buildings based on the assessment of authorized companies. There is a loan facility for the money to be paid to these firms if the house owner cannot pay. If the building is found risky, there is a low-interest loan from banks to have it demolished, and one year rental assistance for the landlord during the demolition process. In addition, a one-time payment for tenants to move to another building exists. For the majority of owners of old houses who have meagre incomes such low-interest loans or one-time payments are insufficient, as they cannot afford to convert a risky building by themselves. This creates a condition of housing vulnerability for the households living in such risky buildings through the existing policies which do not take into account the conditions of the poor.

The Mass Housing Administration (TOKİ) is also a major institution providing new houses to disaster victims. In order to claim a new house from TOKİ, get low-interest credits or get any loan, house owners need to be included in the housing insurance system called DASK (Compulsory Earthquake Insurance), after the 1999 Marmara Earthquake [69]. TOKİ builds new houses either in empty areas or

² <https://altyapi.csb.gov.tr/finansal-destekler-i-4708>.

in disaster-affected areas after demolition in coordination with other institutions. The rebuilding process usually starts after an area is declared by the Disaster and Emergency Management Directorate (AFAD) as a disaster region and the buildings are identified as having a high level of damage by the Ministry of EUC. Crucially, the legal owners of the damaged houses have a right to claim new flats, but the tenants are excluded which contributed to their marginalization. This is similar to the urban renewal processes, where being a legal owner means having a title deed that excludes some residents living in informal settlements that are not in the coverage of amnesties. On the other hand, in accordance with a Ministerial decision, after a disaster, tenants in heavily damaged buildings can receive some rental assistance. Controversially, the residents of collapsed buildings may become less vulnerable than those in damaged housing as a result of the support after a major earthquake. Most of the time, owners or tenants of buildings with moderate or light damage may be marginalized in terms of owning a new home (with either a small payment or no payment at all), and the absence of rental assistance. This again creates a condition of housing vulnerability through the policies which do not consider the lack of financial capabilities of especially the tenants and low-income house owners.

AFAD has a coordinating role during and after disasters. Law No. 7269 (1959 Law on Supports) defines the responsibilities of AFAD relating to measures to be taken in case of disasters that threaten public life.³ AFAD and TOKİ also have to work together to assist with the rebuilding of small businesses and shops. AFAD also gives training to the public to raise risk awareness.

Local governments have major responsibilities in times of disasters. İstanbul Metropolitan Municipality (İMM) has developed a specific initiative to speed up the urban transformation process of risky zones. The experts visit risky neighbourhoods and inform the residents about disaster risks to raise awareness and also give guidance about what to do. This kind of policy has a double significance: while raising awareness, it also gives technical and financial support to the poor to improve and strengthen their houses.⁴ Furthermore, in İstanbul, almost 95% of all schools, major hospitals, and other public buildings have been renovated and strengthened for earthquake risk after 1999 under the initiative of the Governor's Office,⁵ which is the provincial organization of the central government.

Since disaster risk reduction policies in Turkey are mainly concentrated during and after disasters, some social assistance schemes have been developed to help victims and the poor recover from the negative impacts.⁶

4.2.2. Social assistance schemes in Turkey

In Turkey, there are universal social assistance schemes related to poverty alleviation and the empowerment of disadvantaged groups mainly provided by the Ministry of Family and Social Services (MFSS) [70]. These schemes, however, do not directly target the drivers of disaster risk, though disaster victims can benefit from them. A social protection perspective is adopted in line with the Sendai Framework⁷ for Disaster Risk Reduction [71], however, only one component, social assistance, is well developed.⁸ Yet, the Social Assistance System is highly inefficient considering the risk mitigation or disaster preparedness purposes. There is only disaster risk management-related social assistance as explained above in section 4.2.1. which mainly provides assistance to households with collapsed buildings after a disaster but leaves out those with moderate or low damage. This means that some amount of social assistance will be provided to disaster victims by the Ministry of FSS in addition to the support of the Ministry of EUC. On the other hand, these assistance schemes are frequently criticised for not meeting the basic human needs of the poor [72]. These schemes do not cover variations in the survival requirements of the poor based on the social, environmental, and economic conditions of different households or individuals in different contexts.

5. Findings from the in-depth interviews in Sancaktepe – İstanbul

The Findings Section contains the summary of the results that emerged according to the answers given by the participants to the interview questions included in the methodology we created. As represented in the Methodology section, our findings are based on three categories of vulnerability; socio-demographic, socio-economic, and socio-spatial (based on urban development). In addition, we also interviewed the participants for their hazard risk prioritization and policy ideas for disaster risk reduction in order to overcome their vulnerabilities aiming at democratisation of the risk concept in relation to the TCDSE framework.

5.1. Demographic and socio-economic profile of participants

The demographic picture of participants shows that most of them are in their thirties and forties of age. Participants have a median age of 39 and a mean age of 43 in an age range of 45. With respect to gender, 15 out of the 20 participants are male. As participants were reached through *Mukhtars*, it can be understood that working-age males in households are more active in communication channels with administrative authorities. For more details on the social profile of participants, see [Table 1](#).

³ https://www.emo.org.tr/genel/bizden_detay.php?kod=132802.

⁴ <https://www.ibistanbul.org/arsiv/38115/istanbul-yenileniyor-kampanyasina-rekor-basvuru>, 24August 2021(campaign for urban renewal in İstanbul through İMM).

⁵ [https://www.ipkb.gov.tr/ismep-nedir/b-bileseni/guclendirme-calismalari/\(disaster empowerment work in İstanbul\)](https://www.ipkb.gov.tr/ismep-nedir/b-bileseni/guclendirme-calismalari/(disaster%20empowerment%20work%20in%20istanbul)).

⁶ <https://www.aile.gov.tr/sygm> (Ministry of Family and Social Services/Social Assistance General Directory).

⁷ The Sendai Framework for Disaster Risk Reduction 2015–2030 (SFDRR) is the first global policy framework of the United Nations post-2015 agenda that provides Member States with concrete actions to protect development gains from the risk of disaster. The Sendai Framework focuses on the adoption of measures that address the three dimensions of disaster risk (exposure to hazards, vulnerability and capacity, and hazard's characteristics) in order to prevent the creation of new risk, reduce existing risk and increase resilience.

⁸ <https://www.ademkuyumcu.com/belediyeelerden-engelliler-ve-yasliilar-icin-afet-durum-plani-bekliyoruz/>(expectations from municipal disaster plans for the disabled and elderly).

Table 1
Social Profile of the participants.

Participant Number	Sex	Age	Education	Marital status	House ownership	Social security	Employment
P1	W	36	Secondary school	Single	Family house	Yes	Secretary
P2	M	37	High School	Single	Family house	Yes	Information processor
P3	W	37	High School	Divorced, two children (4 and 11 ages)	Tenant	No	Unemployed
P4	W	47	Primary school	Divorced, 1 child (16 age)	Tenant	No	House cleaning
P5	M	52	University	Married with 2 children (18 and 12 ages)	Tenant	Limited	Paid teacher
P6	M	34	Primary school dropout	Married with 3 children (9, 4, 2 ages)	Tenant	No	Waiter
P7	M	50	Primary School	Married with 3 children (26, 24, 21 ages)	Owner	No	Chronic patient unable to work
P8	M	35	Primary School	Married with 2 children (4 and 1 ages)	Tenant	No	Construction worker
P9	M	33	Secondary school	Married with 4 children (7, 5, 4, 2 ages)	Tenant	No	Construction worker (injured, unable to work)
P10	W	44	Vocational High school	Married with 3 children (15, 10, 8 ages)	Tenant	Yes	Civil technician, husband also works
P11	M	43	Primary School	Married with 4 children (17, 14, 10, and 7)	Tenant	No	Daily wage construction worker
P12	M	77	Illiterate	Married with 3 children	Owner	Yes	Retired
P13	W	37	University	Married with 2 children (8 and 5 ages)	Tenant	No	Only husband is working as a waiter
P14	M	39	Secondary school	Married with 3 children (14, 10, and 7)	Owner	Yes	Shopkeeper runs market
P15	M	32	University	Married with 3 children (8, 4 and 2)	Owner	Yes	Elevator maintenance company
P16	M	39	High School	Married with 2 children (13 and 10 ages)	Family house	Yes	Civil servant
P17	M	33	University	Single	Family house	No	Non-appointed teacher
P18	M	57	Primary school	Married with 1 child	Owner	No	Shuttle driver
P19	M	58	Primary school	Married with 5 children	Owner	Yes	Retired
P20	M	42	Primary school	Married with 2 children (8 and 5 ages)	Owner	Yes	Cook

5.2. Socio-demographic causes of contextual social vulnerability

In terms of socio-demographic causes of contextual social vulnerability the results of the interviews indicated that age, gender, household (HH) size, and marital status are significant dimensions, alongside health conditions. These households were vulnerable even before experiencing a disaster. This was also reflected in the Mega-IST study.

Firstly, most of the households are large, with extended families including young children and grandparents living in the same house. This means that most of these households have young and/or old members at dependent ages which puts a major care responsibility on the household.

“We have 13 people living in the same house. There is a grandmother, grandfather, my brother, his wife, his children, my wife, and my children.” (P14)

In addition to the difficult livelihood conditions of large families, it is not easy to find temporary shelter for large household sizes after a disaster event. Dependents in the household also mean health, education, and caregiving necessities where a hazard may cause a deficiency of those services in the city. This situation may increase the responsibility of the working age group in the household for caregiving and trigger an additional loss from the workforce and income for that family. The vulnerability of large families is indirectly reflected in the poverty statistics produced by Turkish Statistical Institute (TUIK) [73] which shows that households with seven or more members are at risk of absolute poverty in Turkey. A large household size decreases the capacity of the households to cope (P14) and adds to the vulnerability [30].

In crowded households, healthcare and chronic illnesses of the elderly members of the households were noted as additional significant causes of vulnerability. Three interviewees mentioned that they have elderly parents who are chronically ill and require frequent hospital visits (P15, P17, P11). However, this responsibility causes tension between the needs of earning income and providing care work. For such vulnerable households, health problems of their own or other members of the household may result in the loss of work (P19), increasing economic vulnerabilities. For example, one participant mentioned that he had suffered a lot after a work accident when he could not work and received limited social support (P9).

Age is a significant dimension of vulnerability where very young or very old age dependent members of the households will contribute to enhancing the vulnerability of the households. Hence the care and other responsibilities of the individuals fall onto the households and weaken their capacity to be resilient to disasters (P6, P8, P15). Age especially concerns the care responsibilities. Care responsibilities vary from the provision of economic welfare to childcare to health care for the young and the old. This is mainly

explained as a major burden by all the five women participants. All of the female participants stated that caring for young children caused them to be out of employment. Two single women with young children (P3, P4) said that their main vulnerability was to be a single mother without any income, while also emphasizing the cultural pressure on single mothers which is felt deeply in poor communities. In times of disaster, care responsibilities take a more severe form adding to the vulnerabilities of women.

Gender is another critical dimension that makes women more vulnerable to hazards as indicated by different research studies [32, 34,35]. In terms of our focus on contextual vulnerability, the social position of divorced and single mothers with major care responsibilities for young children experience high levels of vulnerability in terms of lack of income because they cannot go out for work and have to rely on social assistance only (P3, P4). However, gender is an intersectional aspect of vulnerability [74] as being a woman with young children or being a single woman with a lack of income are conditions that have a multiplier effect on the vulnerability of an individual [75]. Of course, gender is also a contextual issue since the vulnerability of women may not be the same in all different cultures.

One additional condition of contextual vulnerability among other major causes is to be a migrant. Migrant individuals and households experience vulnerability before and after disasters as mentioned in other studies on social vulnerability [19, 25–27]. In our study, almost all of the interviewees were rural migrants but the duration of migration is significant. Those households which have migrated recently (P3, P6, P9) have experienced contextual vulnerabilities in relation to finding jobs as well as housing problems due to insufficient income. They were tenants living in poor-quality houses as newcomers.

Socio-demographic root causes of vulnerability are also emphasised by a report published in February 2012 by the Disaster and Emergency Management Directorate (AFAD) [76]. This document states:

“Studies in which individual consideration is provided to each group that forms a great majority of the society, including women, children, old persons, and disabled persons, should be conducted and the results of these studies should be included within the disaster management system. Increasing the ability to cope with disasters and decreasing vulnerability are functions of social ties, power relations, knowledge and abilities, gender roles, health, and economic development levels and settlements of persons and social groups. In this process, the weakened position of women, children, old persons, and disabled persons should be included as factors that increase their vulnerability”.

While the sample of interviewees was limited, these details clearly demonstrate how a simple additive approach for assessing social vulnerability is insufficient to understand all drivers of vulnerability. Rather, this discussion illustrates the importance of seeking to understand the multidimensional and contextual character of social vulnerabilities, where many conditions intersect, potentially leading to a multiplier effect during and after a disaster.

5.3. Socio-economic causes of contextual social vulnerability

In terms of socio-economic causes of social vulnerability, the results indicated that the level of education, the nature of work and employment, the level of earnings, and the informal status of jobs were seen by the participants as significant dimensions. The effects of COVID-19 were also mentioned in the narratives (P2, P4, P8, P11, P17). Additionally, some participants declared that their skills are not in-demand, and some had to rely on informal jobs without social security on a daily basis (P8, P11). Some of them also stressed the difficulties of living with a minimum wage when there is a large household with many dependent-age children (P14). Other than caring for children, the participants said that the educational expenses are high for students even if they are going to public schools as social assistance for the education of children given to poor households was insufficient (P4, P9, P11).

Furthermore, within the socio-economic root causes, respondents discussed the condition and status of their houses, stressing the differences between home ownership and being a tenant. Tenants are in the most difficult situation, particularly if they are unemployed. Poor tenants tend to choose the flats with the cheapest rents, which tend to be either in basements or in low-quality houses according to the narratives. Additionally, if they have any credit debts for house ownership it was also a significant cause of vulnerability for participants. Interview results indicated that social assistance should be targeting house owners and tenants separately since both groups need different types of housing assistance.

“I only work in construction; I don't have another job. How much does a construction worker make? You tell me. I have two young children and I'm paying rent. How can you be fine while changing the diapers of your two children costs a lot for you? You also have to pay 900 Turkish Lira for rent.⁹ When I think of the costs of things like natural gas, water, electricity, and living costs, I see that we can no longer support ourselves and that our capacity to get along is low all the-time.” (P8)

“Well, now, God forbid, if there were a disaster, we would experience the biggest impact because we live on the ground floor which has the cheapest rent. The house is in the basement and is a reverse duplex flat. Since the children are sleeping downstairs, I am very troubled. Our means do not allow us to live in a better place.” (P13)

Socio-economic contexts of social vulnerability differed for the participants according to their age and gender, indicating that socio-demographic factors may have a multiplier effect on the socio-economic conditions of vulnerability. For example, the elders are unable to find work, which was exacerbated by the Pandemic (P7, P19, P18). Next, the household size which is mentioned in the demographic causes of risk is also important for the socio-economy of the household as the per capita income is low in households with large

⁹ At the time of the interviews the minimum wage in Turkey was 2.825,9 TL net pocket money, that was 345 US Dollars in April 2021 (For Currency Rate: https://www.tcmb.gov.tr/kurlar/202104/Apr_tr.html).

numbers of dependents.

Lack of employment was further highlighted by women, who stated that there was a substantial lack of job opportunities for women. It was stated that there are only a few cleaning and cooking jobs available in Sancaktepe, but they are all in the informal sector with worse pay and work conditions. Due to child care responsibilities women cannot search for work outside of Sancaktepe, making them particularly vulnerable.

“I’m not capable of working. Of course, as a mother of two, I have responsibilities. Because of the Pandemic, I am unable to leave the kids anywhere. Already, there is unemployment.” (P3)

Since these are poor households experiencing frequent unemployment, social assistance from the State or from the Municipalities is their only hope for financial support. In terms of expectations for socio-economic support, most of the participants thought that cash benefits for social assistance remained low compared to inflation. In particular, since these interviews were held during the Pandemic period, those in the restaurant business said that they were unemployed at that time and that the support they received from the State was not enough (P6, P13, P20). In the current situation, the most common assistance items accessed by users are food supplies, mostly distributed through municipalities and *Mukhtars*. However, almost all of the participants stated that many people who received this food assistance are not poor. Therefore, they want the decision-makers to pay attention to the fact that the assistance reaches really poor people. They also think that an increase in the amount of cash payments is necessary.

“I was working in the restaurant, as a waiter. As you know, let’s say about two years, we have been unemployed since the first COVID-19 event. I have not worked since then. Before the Pandemic, I always worked as an unregistered casual worker. That’s why I don’t have health insurance as well. In the Pandemic, there was something called this unemployment benefit; we can’t get it either because our firm did not pay our premiums. There is no income, none at all believe me, at the moment. In the meantime, when there is food support given by the State or Municipality, only this way we have something to eat.” (P6)

All the above socio-economic dimensions from the narratives indicate entrenched poverty with a lack of employment or casual employment, job insecurity, low incomes, and a lack of social security which also negatively affects access to health care. As mentioned by Fothergill and Peek [23]; the condition of poverty causes individuals and households to become vulnerable to disasters. However, the impact of poverty is further shaped by other underlying dynamics, including as we have seen; gender, age, family size and health (to name but a few). The poor are further made vulnerable due to the limited options for housing, often forcing people into hazard-prone areas due to pricing. Further, since the coping capacities of households in these circumstances are limited, converting their houses is almost impossible.

5.4. Causes of contextual social vulnerability related to urban renewal and urban planning experiences

Urban renewal processes are a third root cause of contextual social vulnerability. As we were analysing social vulnerability with respect to hazards, living in housing structures that are fragile to disasters increases the vulnerability of the households. Therefore, at least six of the participants mentioned that they were living in old and inadequate housing.

The analysis of the narratives highlights that house owners were more aware than tenants regarding the condition of their houses and whether they are resistant in terms of disaster risks or not (P14, P16, P18). Among the participants, there were thirteen house owners and seven tenants. Having a title deed was an important factor for being less vulnerable according to urban renewal schemes as it secures land tenure for households. According to the existing legislation, house owners need to have the title deed to apply for house renewal or strengthening schemes to have a disaster-resistant house. On the other hand, after the announcement of a new amnesty for legalising illegal houses in 2017, two of the house owners had a chance to get their title deeds (P15, P16). The important point here was that they had to pay some fees to legalise their illegal house which many of these households were unable to afford.

“I was living in Seyrantepe and we had a house. We used to live in this neighbourhood before but a new site was built, I think it is called Sky Istanbul, which is next to the Galatasaray Stadium today. Then this place was declared as a risky area and urban transformation started. The neighbourhood was completely abolished; as you know, when that neighbourhood was abolished and new houses were built rental prices tripled. So, we have to move out of that neighbourhood. We have lost our friends, neighbours. Then I moved here where the rents are cheaper. I do not know anybody here. Actually, I feel I belong to West İstanbul (the European Side of İstanbul). That was my place. But we came here (East of İstanbul) because the rents are cheaper.” (P5)

The second vulnerable group in urban renewal processes are the tenants who also demand more housing assistance. When a house goes into the renewal process, the tenants may be made homeless since moving to another house is very costly due to high rents and removal costs. Therefore, with the urban renewal process, the tenants who become vulnerable demanded a subsidy for their rent in the new house which will have a much higher rent. However, such assistance for urban renewal is not available for the tenants in the existing policies. Only the house owners can get some compensation for rent during the renewal for two years.

In short, it has been illustrated that “social systems generate unequal exposure to risk by making some people more prone to disaster than others and these inequalities are largely a function of the power relations (class, age, and gender among others) operative in every society” [77]; pp.30. These inequalities also reflect in house ownership, choice of location in the city and urban renewal experiences.

5.5. Important hazards according to the participants

As stated, the TCDSE integrates a process whereby community members and other stakeholders agree upon an acceptable level of risk. As social vulnerabilities are contextual, the views of vulnerable populations on what constitutes significant hazards is critical. As the interview questions were related to disaster risk reduction, all participants mentioned earthquakes as the major risk in İstanbul city

Table 2
Scoring for important risk factors according to 20 interview participants.

Foreseen Important Hazards	Number of participants putting the hazard in the First Place (*3 points each)	Number of participants putting the hazard in the Second Place (*2 points each)	Number of participants putting the hazard in the Third Place (*1 point each)	Total Score
Earthquake	15	4	–	53
Fire	1	7	5	22
Pandemic	4	2	1	17
Flooding	–	4	8	16
Extreme Wind	–	1	3	5
Economic Crisis	–	2	–	4
War Risk	–	–	1	1
Water Scarcity	–	–	1	1

and in Sancaktepe. Furthermore, participants stated that earthquakes will have a similar effect on every resident in the city - even if there are economic differences between them. This appears to have derived from a perception that the main impact will be the loss of life due to the old buildings in the neighbourhood which is represented in the narratives.

Table 2 indicates the hazards mentioned by participants. Risk factors are analysed with a quantitative scoring in descending order, where the first place in importance gets 3 points and the one in the third place gets 1 point.

As the table clearly indicates, all participants identified earthquakes as the main hazard in their neighbourhoods, and for İstanbul. Not surprisingly, as these interviews were conducted by telephone during the closures of the Pandemic, most of the participants mentioned the Pandemic as a biological hazard. The risk of an economic crisis was also mentioned in relation to the Pandemic by some of the participants, as some of them experienced significant economic hardship during the Pandemic.

5.6. Policy proposals for DRR by participants

As mentioned in the introduction and the conceptual framing of this study, we relied on the DRR-based policy formulations of the interviewees to represent the policy gaps that are important for them in relation to the democratisation of the risk concept through the TCDSE, rather than our findings from İstanbul's urbanization context. During each interview participants first discussed the root causes of social vulnerability during and after a hazard event. In the final part of the interviews, we asked them about their possible solutions and what type of actions and policies they want to see from the policy-makers based on a hazard scenario in accordance with the TCDSE.

All of the participants suggested that DRR is best achieved by urban transformation/renewal processes through new policies and with more economic support for the residents. This is central to their aspirations to have a resilient city. The economic support demanded is mainly financial support for house renewal by the house landowners and rental support for the tenants. The emphasis on urban renewal and the desired changes to urban policy demonstrates that the broader community is well aware of the legal context of urban planning and DRR.

The second important observation of participants for earthquake risk reduction was the absence of assembly areas after a major earthquake. Some participants noted that empty land parcels allocated previously as assembly areas are now filled with new constructions. Old buildings and dense urban patterns are seen as important causes that increased exposure to the impact of earthquakes and fires in the neighbourhood. These findings show that the community is aware of the needs after an earthquake due to their previous experiences with earthquakes. Moreover, it can be translated into a policy formulation for DRR from the community to be assessed by TCDSE.

More specifically, flooding is seen by the participants as a second major hazard in the neighbourhood. They suggest that most of the houses in this neighbourhood have minor risks from flooding; however, those participants living on the basement floors (P9, P11) due to lower rents suffer from occasional flooding which may cause serious damage and/or even loss of life.

All of the policy recommendations reflected the participants' experiences and positionalities. They are mentioned by all participants as citizens living in İstanbul and being aware of the earthquake hazard risk. Drawing on their lay-knowledge, perceptions and preferences, the policy options presented by the interviewees should be included for consideration alongside other stakeholders'

Table 3
DRR policy proposals of the interviewees.

Disaster Type	DRR Policy Proposals of the Interviewees
Earthquake	Reserve housing and cash support for disaster victims More assembly areas to be used after the disaster Long-term urban planning with a less dense pattern Conflict solving mechanism for housing renewal Increased funding for housing renovation Free of charge clearance for demolished housing
Fire	Housing renovation and decoration support for disaster victims Less dense pattern and renewal of old compact settlements
Flooding	Improvement in sewage system for flash floods New building construction with a high-entrance

preferences [78–81]. Their policy ideas are listed in Table 3 and discussed below with respect to the type of natural hazard they think to be most probable in their neighbourhood.

When we asked them what to do for DRR in İstanbul at large and in their neighbourhood in specific they again gave very relevant policy proposals. In the following, these policy proposals will be given as a sum total of their views since all participants declared similar policies.

Firstly, how to be prepared for all types of natural hazards were discussed with the participants. Since the housing is the most important issue in their lives, they collectively declared that there should be new policies to increase control over the construction process of new buildings. Even when there are new building codes for disaster safety, contractors do not obey such rules and use cheap but low-quality materials and employ low-cost inexperienced construction workers.

Again, related to exposure risk in times of a disaster situation the number of search and rescue personnel in İstanbul should be increased and there must be contact persons in each neighbourhood in times of a disaster according to participants. Although AFAD has provided some trainings about what to do in disasters the participants still think that trainings are not sufficient and they should be integrated to the school education. Also, social media broadcasts could be beneficial to raise awareness of citizens to disaster risks. They claim that raising disaster risk awareness also needs provision of some extra financial support to the people to afford earthquake emergency kits or fire detectors which could be given for free. Besides, all these disaster risk reduction activities are highly connected to the development of new mechanisms which can resolve conflicts between local and national governments for disaster risk reduction initiatives. Such kind of conflicts may bring a barrier for some measures to be taken immediately before a natural hazard turns into a disaster. Hence, the contextuality due to urban political economic conditions is cited by the participants where they are suspicious about the building controls on the private sector within a market-oriented housing economy, and of the challenges posed by the political differences of decision-makers.

Secondly, since the major hazard is an earthquake in İstanbul, how to be prepared for earthquakes were also asked to the participants. They declared that the most likely root causes of housing damage in the urban areas are related to Municipalities allowing high buildings and dense urbanization patterns in the hazard prone zones among other causes. Exposure to hazards intensifies with dense urbanization. Therefore, preventive policies are needed. In this regard, the participants are highly concerned with the urban renewal process based on the 2012 Law. According to the participants, Government support for urban renewal projects should be increased and there has to be funding not only for renewal but also for building reinforcements to the buildings. Moreover, a long-term planning for building renewals in the whole of İstanbul controlled by the authorities without giving any profit-seeking initiative to the private contractors is mentioned as the main DRR solution to earthquakes.

The above comments on earthquake preparedness demonstrate that the participants have remarkably sophisticated understandings of the urban design and the building conditions. Besides their poverty and marginalization, their insights also derive from their contextual vulnerabilities as house owners or tenants and the memories of 1999 Marmara earthquake. The participants have high level expectations from the Central Government and Local Municipalities for solving the housing policy related issues. Top in the list comes a demand for legal solutions for the houses that do not have a title deed, which are mostly in *Gecekondu* status. Secondly, in the urban renewal process the transforming authorities offer smaller size new houses compared to their old houses/ flats which is not accepted by the residents. As there is increasing demand for house renewal process among participants, they asked for increased supports for elderly residents who are unaware or unable to apply for renewal procedures and rights. Building renewal process is also prone to many conflicts between the contractors and the owners of the old houses to be converted or in-between the owners in cooperative type of housing. Hence, the participants ask for a conflict resolution mechanism to be established as well as some financial support for demolition and rubble removal. Another important topic is the role of assembly areas to be used when an earthquake hits. Participants think that the capacity and accessibility of assembly areas should be increased since the neighbourhood population is always increasing and some of the already predefined areas are fulfilled with commercial functions. Additionally, reserve housing areas that are developed for disaster victims should be used after a disaster and some cash support should be given to the victims other than only giving food and heating supplies.

On the other hand, earthquakes are not the only disaster risk in the city. In İstanbul risks due to fires and flash floods are also valid. The participants declared that similar to earthquake risk, dense urban pattern also increases the fire risk. They urge that the dense areas in old neighbourhoods of the city should be renewed by thinning the previous urban structure. Also, after a fire there may be need for financial support to renovate and redecorate their housing. Such needs and expectations are pointed at by the participants in relation to the conditions of the poor households who are more vulnerable to fires.

In relation to flash floods, the participants declare that floods are common in many areas of İstanbul though it was not seen as a major risk in Sancaktepe. However, the negative impacts of flash floods can be decreased in the city with the new buildings with high entrances. Also, the Municipalities are expected to improve sewage systems against flash floods.

Flooding is seen as a minor hazard risk, even if it is common, probably because of the location of our case study area, and the participants think that it can be solved with compensation policies within a risk-sensitive urban infrastructure and building design. Other than city-level infrastructure development, flooding risk is related to the situation of being poor, similar to fire, as the poor are most of the time living in cheap rent flats in İstanbul which are below ground level.

We argue that such findings about DRR policy proposals of the participants and their expectations from the decision-makers are representative of the root causes of vulnerability for each household. Hence, they are contextual with regard to the different positioning of participants for hazard risks. In that context, elderly citizens, tenants, people living in low-standard housing, poor homeowners who cannot renew their house, large households who need larger flats, and people living in dense quarters where the assembly areas (open spaces) are limited, perceive themselves as vulnerable to earthquakes. They also expect such vulnerabilities to be solved by the Municipalities or Government.

6. Discussion: how to relate social vulnerability findings within the TCDSE framework to assess DRR policies in a specific urban context

In this paper, we have argued that the decision-making and urban planning policies have to focus on and give special attention to different categories of vulnerabilities experienced by the community to reduce disaster risks. By using in-depth interviews as a method of qualitative analysis in this study, we are able to define different intersecting categories of marginalization in an urbanization context that are fundamental to social vulnerability. These profiles of vulnerability may be used for individual or household-based models that aim to represent social and economic losses after hazards about who may experience the most impact from a disaster. Our results indicate that five selected individual cases from among the interviewees are significant for this kind of analysis in order to define a more realistic TCDSE for policy-making within the Turkish context. These cases of different individuals display very well the intersectional and multidimensional nature of social vulnerability.

Case One - Divorced, unemployed woman, single parent living with social assistance: A gender-sensitive approach is needed giving priority to women with no or limited income for DRR. Hence, this case is a good example of the importance of identifying intersectionality of gender-based vulnerability to build up the TCDSE in order to deal with at-risk populations in disaster zones.

Case Two - A tenant living in a rented house with his family but dislocated due to urban renewal: This case underlines that disaster-sensitive urban policy-making processes must cover possible displacements of residents after urban transformation/renewal projects. In the existing context of urban renewal policies tenants are left out and they experience much more vulnerabilities when they have to leave the house and cannot find another with a similar cheap rent. Within TCDSE, relocation may be assessed based on the range of rental houses in the city and purchasing power of different income groups.

Case Three - a man who represent the working poor working in daily jobs, with high job insecurity, and living in a basement floor with his family: This case indicates the importance of risk analysis capabilities of TCDSE that is in relation to household size, household income, and location (floor number) in a building in different hazards can be an important intersectional dimension of vulnerability. Especially if a household is frequently experiencing job insecurity, low income, or long periods of unemployment they are compelled to live in a house with the cheapest rent which is the basement floors in most of the cases. In this context, HH with low or no income and lack of jobs living in basement floors are prone to floods or suffer deaths most in an earthquake. Hence, living in the basement increases vulnerability risks from both earthquakes and flooding.

Case Four - a man who is unemployed due to chronic illnesses in the Pandemic and living in a risky house with a large family: In this case, we can see a crowded family, who is a household head having a chronic illness, also with dependent elderly needing care in the household. A crowded family, the household head having a chronic illness, dependent elderly needing care in the household, and also decreased income in the context of the Pandemic increase the total vulnerability risk factor of this HH. Regarding the needs of large households, a possible social housing policy to be assessed in TCDSE should consider household sizes and HH characteristics in the policy formulation stage.

Case Five - a large family living in an old and risky house without a title deed: The legal status of the house and economic condition of the family do not give them a chance to renew their building with a new one that is sufficient for all the household members. Therefore, this case gives us an understanding of the importance of legal procedures which do not usually cover the risk metrics of socio-economic vulnerabilities in a standard decision support tool which intends to decrease disaster risk. In this aspect, the main barriers in front of having disaster-resistant settlements in most countries are the results of political and legal contexts together with the existence of poverty. Therefore, TCDSE is more than a tool, with its broader coverage of policy implications in its framework.

As emphasised more specifically by the selected cases described above, we need to find the context specific gaps in DRR policies which enhance vulnerabilities to contribute developing a policy framework for TCDSE. To reach policies that can be assessed in TCDSE in order to decrease the potential losses of individuals or households, we made an upper-level or macro-level policy analysis as the first step according to our contextual analysis in Section 4.

At the macro or national policy level the following gaps are found to have a priority on contextual social vulnerabilities of different groups (more details are on [Appendix I](#) with respect to the related Laws and possible actions for vulnerable groups):

1. Urban Transformation/Renewal Law:
 - Poor are not included as their special conditions are not covered (they cannot pay back the credits for house renewal),
 - House owners without a title deed (they are not seen as eligible owners and they do not have a land tenure security)
 - Tenants are excluded from the benefits of the Law (after renewal with rising rents when they have to move to another neighbourhood),
 - Elderly cannot move the house (they need assistance for renewal procedures and for moving)
2. Physical Planning/Zoning Law:
 - The lack of socioeconomic contextualization of planning projects has led to an inequitable allocation of housing resources
 - Lack of disaster risk-sensitive urban plans without any specific urban design can cause people to suffer from various hazards due to low-quality settlements, infrastructural problems
3. DRR assistance for housing recovery:
 - House owners with low-level damage after disasters are vulnerable as housing renewal support is given based on damage level and only after disasters
4. İstanbul City DRR Plan (IRAP):
 - Financial assistance and support needed for renewal and for vulnerable groups are not taken into account
5. Social protection system:

- No specific assistance exists in connection to DRR policies
6. Disaster response for special groups:
- Special groups such as old-aged or handicapped are not recorded in an address-based system specialized for disaster risk areas

Conducting interviews with vulnerable households in Sancaktepe District in İstanbul, has enabled the participants to identify gaps in existing DRR policies and to propose new policies which can be assessed in TCDSE. All of the participants recommended more economic support for building renewal from the National Government, and more technical support from the local municipalities. Most of the participants also think that the urban plans should limit dense land uses and protect/increase open/green spaces to reach a more resilient urban design. They also observed that political differences between different levels of administration, and high-profit expectations of house owners and private contractors are important barriers to have a disaster-resistant neighbourhood by prolonging renewal processes. Most of the participants think that there are still many citizens that are unaware of disaster risks in the city. Therefore, they proposed training to be given in schools and broadcasts on TV and social media to increase awareness.

The root causes of vulnerabilities in the five participant cases above are shown below in Table 4 and matched with the most significant DRR policy ideas from the participants.

7. Conclusion

This research is a combination of analysing macro and micro level causes of social vulnerability of a hazard-prone city. Contextual realities with respect to urban dynamics in the local sense and DRR and social security schemes from the national policies define vulnerabilities and capacities at the macro level. Next, interviews that are directed to vulnerable households in order to understand details of their vulnerabilities and capacities represent the micro or individual level. The contextual categories of the macro level that are effective on different root causes of social vulnerability based on interview results are given in Fig. 1 below. Important effects of contextual categories on the lived experiences of different participant households are:

- DRR policies such as urban renewal legislation, disaster preparedness training in schools, flood-protection infrastructure implementations increased awareness in the community about disasters. At the same time, those policies help to mitigate the possible socio-economic losses after disasters.
- Social policies such as financial support from authorities for vulnerable groups like the poor or unemployed have positive effects on the socio-economy and socio-demography of the households.
- Urban renewal process based on earthquake risk is the most common DRR activity in İstanbul. Therefore, many participants have experience with it. The aim of the process is to mitigate the losses (socio-economic, demographic) during a hazard event, especially life loss. In contrast, on many occasions, it caused increasing living costs or displacement for some households who are tenants or the ones that cannot afford the renewal process. In that sense, the poor households that are excluded from the financial schemes of this process are continuing to live in risky buildings as a representation of increasing urban inequalities between different income groups in big cities.

The interviews were conducted in one of the poorest neighbourhoods of İstanbul, with low-quality housing and infrastructure. Most of the households are also experiencing poverty due to unemployment, job loss, or lack of any means of income. These households are typically dominated by male household heads as single-income earners in the household. In most of the cases these male household heads are in their mid-ages representing the economically active population. Also, the earnings are mostly at the level of minimum wage (2.825 TL in 2021). Hence, considering that these families have a household size between 4 and 6 members on average we can consider them as working poor typical of most Turkish families. Poor households are mostly employed in the informal sector, that is, working in casual, irregular jobs which are fragile and can be lost immediately in the case of a pandemic or any other disaster. This means the most important socio-economic result of a sudden shock is having a job loss or losing economic means to survive as some of them recently witnessed due to the COVID-19 Pandemic, or their poverty condition deepened which is parallel with the results of the

Table 4
Vulnerabilities for five cases and related policy proposals.

Case Number	Factors of Vulnerability	Policy Proposals
1, 2, 3, 4, 5	Vulnerability due to urban patterns in poor areas	Designing less dense neighbourhoods to decrease the hazard exposure Increasing the number of urban spaces Strengthening sewage systems
1, 3	Vulnerability due to building condition	Upgrading houses below ground level Upgrading houses not resistant to earthquakes
4, 5	Vulnerability due to low income	More financial support for building renewal Socio-economic support for poor and extended families Socio-economic support for individuals who have witnessed sudden shocks of unemployment or health
3, 5	Vulnerability due to tenancy or living in illegal housing	Affordable or social housing for tenants and illegal housing owners Reserve housing in the city to be used after hazards or in case of sudden shocks or during renewal implementations
1, 4	Vulnerability due to age, gender, or being ill/disabled	Social support mechanisms to special groups to assist them in daily life and after hazards

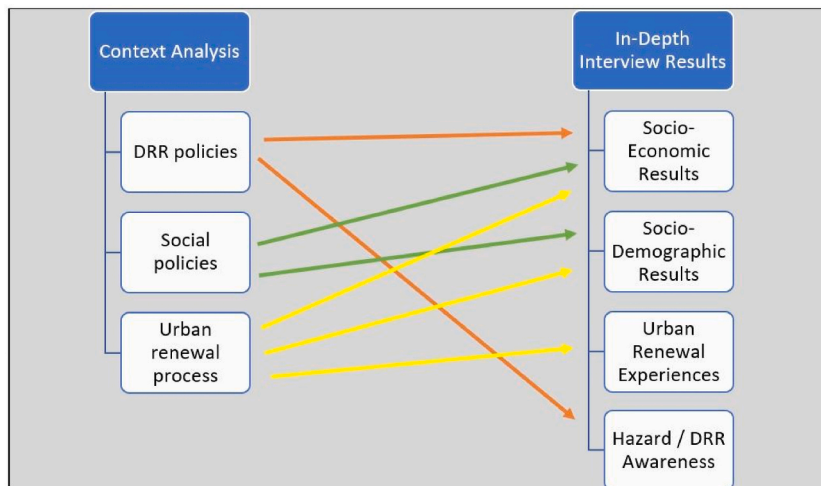


Fig. 1. Contextual Categories with their Effects on Individual Experience.

study done by Fu et al. [82]. As housing is an important factor of multi-dimensionality of social vulnerability in disaster risk areas according to this study, the poor interviewees have a common potential for losing shelter after a disaster. Most of the participants are aware of disaster risk - particularly to earthquakes - but they cannot acquire disaster-resistant housing due to a lack of income, legal status, and also due to urban renewal policies which may exclude some cases because of certain preconditions and rules. This resulted in the marginalization of people by exclusion from urban governance as Pelling [17] argued. This situation also shows an interrelation between poverty and fragile housing conditions similar to what is mentioned by Salami et al. [80].

Considering significant conclusions from our study, we argue firstly that the participants are well aware of the poor physical conditions of their neighbourhood or houses, but this is exactly why the rents are cheaper and they can only afford to live there. Thus, if someone needs an affordable house to live in İstanbul, there is not much chance to live in a place other than a fragile neighbourhood or in a fragile building or basement floor level according to the participants. A common example for the housing condition of the poor is that they are living on the basement floor according to the interviews which causes a flooding risk for them as Wamsler [44] underlined in a previous study. This ambivalence is not something the citizens can solve by themselves and must be considered in policy-making for DRR.

Another conclusion is that to make the housing structure of poor communities resilient to disasters, as spoken by all 20 participants in our research, more needs to be done by the authorities as the people have no capability to make a change by themselves. As the main disaster risk that is identified by them for İstanbul is a major earthquake, the city needs to have fast action for disaster-resistant urbanization to earthquakes. Fragile buildings have to be identified totally as the first step and then the process of renewal has to be started immediately without waiting for residents to apply or for legal processes to be finalized for different legal statuses of risky buildings. If there is a housing fund that is available for this process, the liabilities can be solved afterwards between owners, builders, banks, and the authorities. This will decrease the vulnerability of poor residents as they are not capable of renewing their houses in the recent schemes as represented in the findings above.

Another major conclusion that comes out from this research is that there are different forms of vulnerabilities. Firstly, it is possible to say that vulnerability is cumulative. There appears to be a pattern of vulnerabilities accumulating. Low educational achievement, migrant status, a single-income family, single parents, elderly and chronically ill individuals, divorced women, and the greater number of dependent children in the household, affect each other and cause a permanently vulnerable life. This accumulation, however, is not simply additive, but rather potentially exponential. Secondly, there is also vulnerability caused by sudden emerging situations due to disasters. Situations such as sudden job loss due to a pandemic or economic crisis, bankruptcy, epidemic diseases, sick child needing care, divorce, or sudden death of the head of household may lead to a fragile life for the households. These vulnerabilities have lifespans that are well beyond the standard period of disaster recovery policies. Furthermore, if the urban planning policies, nominally to alleviate disaster risk, fail to account for the conditions of the most vulnerable (e.g. poor renters), their situations may be further worsened. This serves to illustrate the dynamic and contextual nature of social vulnerability, which can stay below the radar of quantitative index-based social vulnerability detection.

Our approach has made it possible to understand the distribution of the social vulnerability pattern in the urban space. Our methodology provided an opportunity to define the socio-political root causes of disaster risk in İstanbul for local DRR implementations. Next, our qualitative understanding of social vulnerability gives us a chance to have a realistic figure for the vulnerability that is a living expertise beyond quantitative formulations. Different profiles of a highly vulnerable community living in a risky area are defined by this qualitative methodology. To define contextual social vulnerability; factors like age group, gender, household size, number of children in HH, ill/old-aged individuals in HH, education level, house ownership, income, risk perception, socio-economic status, social security, physical condition of the building/floor level, and the neighbourhood's infrastructure level come out as important indicators to be used for TCDSE for quantification of social vulnerability even we rely on a qualitative understanding in this

study. On the other hand, as a result of the qualitative approach, aforementioned it is found that differentiation between structural (contextual) and temporal (sudden) causes of vulnerability (i.e. the effect of the Pandemic) of the households is critical in dealing with vulnerabilities for DRR.

One important emphasis we would like to make is that the social vulnerability research gives us also an understanding to develop pro-poor, resilient action planning. For this, we need to disaggregate the impact on different sectors of society (income classes, ages, genders, and marginalized communities). An awareness of the different vulnerabilities of different groups, and the intersectional ties between such vulnerabilities is also a must for resilient action planning. For this, a co-production of knowledge through inter-disciplinarity will be also needed to identify different intervention options for policymakers to reduce risks.

In terms of the contextual nature of social vulnerability according to the study, vulnerability indicators are found to be effective within a cross-cutting relationship in the households. Thus, gender, age, socio-economic status, birthplace, locality, belongingness, social networks, solidarities, expectations from the policymakers, and housing conditions all have an intersectional impact on emerging vulnerabilities. One of the most important intersectionality is the gender factor which is underlined by Enarson et al. [75] that has a multiplier effect on the vulnerability of an individual such as a single mother. It is argued that none of these indicators alone is a cause of vulnerability. The simultaneous relationship of multiple indicators leads to the fragility of households in disasters. Therefore, in this paper, it is proposed that for disaster risk reduction in the city of tomorrow, in addition to all the above findings, the intersectional impact of vulnerabilities should be understood and embedded into any model or plan.

In addition, the policy or political dimension should be available which defines a new type of governance that is inclusive for marginalized groups such as the poor in DRR activities of a city. For a resilient society, the political dimension appears to be an important factor in disaster risk reduction. Decisions and policies most of the time come from “the top to the bottom”. The people expect that the leaders, bureaucrats, and policymakers make the decisions, but such policy decisions should reflect the real experiences of the people, especially the poor. As the interviews indicate, there are critical gaps between the policies formulated and the experiences of the people. To adopt a new policy paradigm addressing the disaster risk reduction for the poor and the vulnerable, the decision makers can use bottom-up approaches which will increase the adaptive capacity of the population. The participatory and bottom-up approaches can also increase the transformative capacity of the municipalities. Hence, disaster risk reduction strategies could be developed in a much more sensitive way for different contextual vulnerabilities of different social groups. Within the discussion part of this paper, some policy solutions proposed by the participants reflecting their own experiences in a hazard risk prone urban area context are given. It is one of the expectations of this study that DRR policy recommendations from the voice of the residents of Sancaktepe could assist the building of the TCDSE framework for DRR considering an individual/household-based modelling of the impacts.

For future studies, one suggestion coming out from our study is that on contextual social vulnerability in different cities, the researchers should try to make engagements with different social groups in society. Our results show that development of methods to represent the contextual nature of social vulnerabilities of different age groups, gender, migrant groups, disabled and the poor in the community can make an important contribution. This can be possible with more participation from the community. As we relied on in-depth interviews to acquire the narratives of participants, which is a time-consuming activity, participatory group discussions, such as focus groups, that represent disaggregated social groups may be an alternative option for future research. It will also assist the co-production for risk-informed decision-making within the framework of TCDSE.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The data that has been used is confidential.

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Appendix 1

Disaster Risk Reduction Policies in Turkey and İstanbul

Policy/Plan/Legislation	Vulnerable groups that are defined or not defined but affected by the policy/plan/legislation	Possible implications for vulnerable groups that are affected by the policy/plan/legislation
National Law No. 6306 (Law on Redevelopment of Areas Prone to Disaster Risks)	Tenants, Poor, Old-Aged (Tenants are not seen as eligible owners of the property; they may only be covered on a project basis) (Poor cannot afford transformation schemes as the	Prioritization may be possible for previous tenants in the area of transformation or renewed housing. Poor homeowners may be given new housing without any cost in the short run.

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(continued)

Policy/Plan/Legislation	Vulnerable groups that are defined or not defined but affected by the policy/plan/legislation	Possible implications for vulnerable groups that are affected by the policy/plan/legislation
	homeowners need to share some of the renewal costs) (Old-aged cannot move to another house even for the renewal process)	Old-aged residents may be given support in their moving process.
National Law No. 3194 (Physical Planning/Zoning Law)	People living in urban areas without having disaster-risk-sensitive urban plans (Law covers land use planning standards of settlements and buildings without any specific urban design scheme in disaster zones)	The uninhabitable areas for natural disaster risks and building standards for earthquake risk are defined by legislation. Still, there is no urban design scheme with respect to different disasters. Therefore, new legislation is needed.
National Law No. 7269 (Law on Supports to be made and measures to be taken in case of disasters that threaten public life)	House owners with low-level damage after disasters (By this Law, housing renewal support is given based on damage level and only after disasters)	The law covers the renewal of damaged houses after a disaster by public funds. The Law can be expanded to cover the renewal of all risky housing in the disaster area for future DRR.
National Law No. 4123 (Law on the conduct of services relating to damage due to a natural hazard-related disaster)	People Having Loss (by the property, business, family, body health) (Financial aid to business owners and house owners in disaster areas and to relatives of the decedents and disabled due to disaster after Presidency decision)	Financial aid can be given to all having a loss after a disaster without approval from top-level decision making by a change in legislation.
İstanbul City DRR Plan (IRAP)	Vulnerable Population (defined in the Plan as disabled, old-aged, children, women under protection, and immigrants) (Vulnerable groups are covered only in one action under the Action Plan of İstanbul DRR which cover financial aid for them to become resistant to industrial and chemical disaster risks)	Vulnerable groups may be given financial assistance for multi-hazard disaster risks (natural and industrial, technological, chemical) in addition to İstanbul DRR Plan.
There is the absence of a DRR National Law	All vulnerable groups that need financial and social aid in disaster zones	Vulnerable groups and social policies for them have to identify before the occurrence of disaster events by Law.
There is the absence of information for the population with special needs in a disaster situation	Population with special needs	Before any disaster hits, all information about the elderly, disabled, and all other individuals with special needs should be recorded and updated regularly according to the address-based system.

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