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GOVERNERSHIP OF ISTANBUL

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ISTANBUL GOVERNORSHIP
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ISTANBUL PROJECT COORDINATION UNIT

# Urban Planning and Construction Guide for Disaster Risk Reduction

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

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**Urban Planning and Construction Guide for Disaster Risk Reduction**

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In 2020, "Disaster Preparedness Training Materials for Society" were rewritten under the heading of “Social Training Modules” in line with the advancing technologies, new lines of learning, having regard to the changing conditions, regulations and laws, theories and experience worldwide.

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# Abbreviations

| | |
|---|---|
| **AFAD** | Disaster and Emergency Management Presidency |
| **AFKEN** | Disaster Temporary Urban Management System |
| **AYDES** | Disaster Management and Decision Support System |
| **CAS** | Climate Action Summit |
| **CBRN** | Chemical, Biological, Radioactive, Nuclear |
| **DASK** | Natural Disaster Insurances Institute |
| **DBYBHY** | Regulation on Buildings to Be Constructed in Seismic Zones |
| **EN** | Eurocode (European Union Standards for Building Structure Design) |
| **GDP** | Gross Domestic Product |
| **HERI** | Heat-related Elderly Index |
| **HGK** | General Command of Cartography |
| **IDNDR** | International Decade for Natural Disaster Reduction |
| **ISDR** | International Strategy for Disaster Reduction |
| **JICA** | Japan International Cooperation Agency |
| **KENTGES** | Integrated Urban Development Strategy and Action Plan |
| **MDG** | Millennium Development Goals |
| **NGO** | Non-Governmental Organization |
| **NUA** | New Urban Agenda |
| **SD** | Statutory Decree |
| **SDG** | Sustainable Development Goals |
| **TAMP** | Turkish Disaster Response Plan |
| **TBB** | Turkish Association of Municipalities |
| **TBDY** | Turkish Building Code of Earthquake |
| **TBMM** | Grand National Assembly of Turkiye |
| **TMMOB** | Union of Chambers of Turkish Engineers and Architects |
| **TOKİ** | Housing Development Administration of Turkiye |
| **TRT** | Turkish Radio and Television Corporation |
| **TSRŞB** | Association of Insurance and Reassurance Companies of Turkiye |
| **TÜBİTAK** | Scientific and Technological Research Council of Turkiye |
| **TUİK** | Turkish Statistics Institute |
| **UDSEP** | National Earthquake Strategy and Action Plan |
| **UN** | United Nations |
| **UNDRR** | United Nations Disaster Risk Reduction |
| **URAP** | National Radiation Emergency Plan |
| **YÖK** | Council of Higher Education |

# How to Use This Guide?

This Guide is intended for the professionals of all occupational groups as well as local administrations involved in the urban planning and construction process. The book consists of five interrelated chapters. The first chapter deals with **Framework Programs** and **Action Plans** in global scale. These programs contain primary strategies and approaches both in fighting against disasters and creating liveable and safer cities. These actions plans in which Turkiye takes part have reflections in both our development plans and institutional strategic plans. The scope of the process and strategies in global scale is, therefore, significant for understanding current national strategies and legal regulations.

The second chapter contains the headings of **Sources of Hazards, Vulnerability** and **Risk Assessment.** In the operations for reduction of disaster loss, it is essential to adopt an approach which takes into consideration the integrated hazards. The concept of **Vulnerability** (fragility) is discussed not only in structural scale, but from a wider point of view. In this way, on the one hand problems in connection with a built-up environment are identified and on the other hand social and economic sensitivities are identified and thus it makes it possible to develop an integrated approach both for mitigation and enhancement of social resilience. And the last part of the chapter where risk analysis is discussed in structural and urban scale presents techniques which allow estimating direct and indirect damages.

The third and fourth chapters deal with **Urban Planning** and **Risk Reduction** in **Structural Scale**, respectively. In these chapters, you may gain information about effects of disasters both in structural and city scale, results of mistakes/faults made as well as legal regulations. And then strategies of the related institutions concerning their fields of subject are summarized. In the fourth section, fields of subject and approaches giving support to enhancement of social resilience are presented under the heading **Strategies for Enhancement of Social Resilience.**

The matters as well as their relationship with each other as discussed in this guide indicates necessity of active involvement of all decision-makers, professionals and all segments of society in the disaster mitigation. Integrated and proactive approaches both enhance capacity for fighting against disasters and assure total integration and strength.

## Why is Urban Planning and Construction Important for Disaster Risk Reduction?

Although city structure has developed and changed from the first settlements in the history to date, the basic goal for establishment of them has remained the same. Settlements are areas where people lead a safe life and meet their requirements of accommodation, working and resting. However, “safe life” mentioned in this definition has been deeply shaken many times because of the natural threats turning into natural disasters. However, thanks to their ability to survive and carry on somehow, the human beings have always taken a step further to struggle with disasters by help of scientific and technological developments. Although earthquakes, floods, landslides, fires, volcano eruptions and storms etc. still pose threats to our daily life and safety today, we know what kind of precautions we can take to minimize our losses The central issue is the practical implementation stage of this knowledge. Applications contrary to the structural safety of buildings, wrong decisions regarding site selection, bottlenecks of infrastructure systems and overloads in the urban equipment areas all stand out as factors that magnify effects during and after disaster. Therefore **Urban Planning** and **Construction** constitute the very foundation of the process for reduction of disaster loss.

Especially from the 1980s on, the natural disasters have multiplied damages several times, not only because of their effects, but also damages arising from the man-made structures/ facilities. In the process described above, the areas that become subject to such loss most are, of course, cities. In addition to the long-term negative effects of industrialization, the change in production patterns, the concentration of the changing workforce in urban areas where the infrastructure is insufficient and threatening the quality of life, also the increase of industrial accidents caused the title of "man-made disasters" and are added to disaster literature. And, furthermore, while human mobility in the world has shortened distances in the world, numerous damages occurred because of inadequacy, lack of maintenance or human faults with respect to the transportation systems which allowed such mobility. As a result of growth of the settlements as centres of attraction beyond control, giving irremediable damage to the natural resources, the neglected chain of faults have hit the people themselves living in these areas in the end.

Hence the primary objective of the *Urban Planning and Construction Guide for Disaster Risk Reduction* is to define risks associated with the cities by types of hazards and acquaint the local administration and community with the mitigation methods and processes by using the existing technical and legal means.

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# Current Status

The 1999 earthquakes caused change, update and also formation of new instruments for all systems and legal bases regarding to construction and urbanization in Turkiye. Although the 1999 earthquakes were not the first big-scale disasters ever experienced in Turkiye, they triggered to concretely shape sensitivities and efforts regarding mitigation. New regulations have been entered into effect, starting with Development Plans in regional, provincial, district, neighbourhood and building scale. Furthermore, studies for raising both individual and social awareness have gained momentum. In the framework of managerial structure, **AFAD** was established in 2009, followed by **Turkish Disaster Response Plan** (TAMP) in 2013. Enactment of the Law on Transformation of Areas Under Disaster Risks in 2012, references made to this law in the Regulations on Making Spatial Plans in 2014, **Turkish Earthquake Code for Buildings** in 2019 and **Turkish Seismic Hazard Map** renewed in 2019 are among the important legal legislation in the recent period.

While the mitigation operations gaining momentum, different types of disasters have continued to occur. The earthquakes in Bingöl (2003), Van (2011) and Elazığ (2020) have been recorded in history again with great damages and the 2019 Silivri earthquake was frightening. In addition to them, the 2009 Istanbul flood, the hail squall in Istanbul in 2017 and the avalanche in Van in early 2020 have been indicators that natural hazards other than earthquake should not be neglected. And human-made hazards also continued to remind themselves. The Zümrüt Apartment tragedy in Konya (2004), the explosion in OSTİM Industrial Zone in Ankara (2011), the explosion in Afyonkarahisar (2012), the mine accident in Soma (2014), the high speed train accidents in Pamukova (2004) and Ankara (2018), the train accident in Çorlu (2018), the building collapse in Kartal (2019) and numerous traffic accidents and also the plane crash at Sabiha Gökçen Airport in early 2020 are among the first disasters coming to mind in the last 20 years.

And the new developments beyond the national borders also caused new crisis, indicating that urgent measures should be taken. Among them are the volcano eruption in Iceland (2010) which affected the air traffic, problems with respect to social integration of new refugees in Turkiye (2011), death toll in the military operations organized for protection of national security, numerous terror attacks and finally in late 2019 the Wuhan, China originated COVID-19 pandemic, which spread over the entirely world.

The mitigation means and disasters mentioned above affect directly or indirectly operation of the cities in physical, social, economic and mobility terms. As seen from some examples, the cities may generate their on disasters due to site selection mistakes and wrong decisions on land usage and have to deal with problems arising from them. In the *Urban Planning and Construction Guide for Disaster Risk Reduction,* the cities and structures are considered both in terms of threats to which they are subject and the disasters that they may cause.

## Legal Framework and Legislation

Current legal frameworks and documents/plans that regulate or contribute the planning and construction efforts of disaster mitigation are given in the table below:

| YEAR | LEGAL REGULATION/DOCUMENT | SUMMARIZED CONTENT |
|---|---|---|
| 1959 | Law 7269 on Measures to Be Taken and Aids to Be Provided for Disasters Affecting the Public Life | Measures and aids with respect to the areas which sufferer o likely to suffer from disasters |
| 1985 | Zoning Law | Legal arrangement concerning planning |
| 2000 | Natural Disaster Insurances Institute | Mandatory earthquake insurance |
| 2001 | Building Inspection Law | Legal arrangement concerning the inspection of buildings |
| 2008 | Building Inspection Implementation Regulation | Legal arrangement concerning the building inspection process |
| 2009 | Law 5902 on Organizations and Functions of the Disaster and Emergency Management Presidency | Legal arrangement concerning the establishment of AFAD |
| 2011 | Principles of Establishment, Functions and Operations of the Disaster Risk Reduction Platform of Turkiye | Legal arrangement regarding disaster mitigation and awareness through a multi-stakeholder structure |
| 2012 | Disaster Insurances Law 6305 | Legal arrangement regarding mandatory and private insurances for disasters |
| 2012 | Law 6306 on Transformation of the Areas Under Disaster Risk | Regulation regarding the restructuring process of buildings and areas determined under risk |
| 2012 | National Earthquake Strategy and Action Plan | Plan for building a resilient society by minimizing disaster damages and incorporating R&D operations |
| 2013 | Turkish Disaster Response Plan (TAMP) | Plan for the organization of working groups and provinces in case of disasters |
| 2014 | Regulation on Making Spatial Plans | Legal arrangement for making spatial plans |
| 2017 | Zoning Regulation for Planned Areas | Legal arrangement regarding conditions of constructions in areas with a zoning plan |
| 2019 | Turkish Earthquake Code for Buildings | Legal arrangement concerning the design of new buildings constructed under seismic effect and consideration of and design for strengthening existing buildings |
| 2019 | Turkish Seismic Hazard Map | Unlike the 1996 map, it was made by using the largest ground acceleration values. |
| 2020 | National Radiation Emergency Plan (URAP) | Planning in national and city scale for a radiation-related emergency |

Publication on disaster mitigation has considerably increased, particularly from 1970s on. The year 1999 was a considerable milestone in Turkiye. **Disaster Mitigation** constitutes an important area in switching from Disaster Management to Risk Management. **Mitigation and risk management approach aims not only to intervene in the chaos after the disaster and return it to its normal course with technical and legal means available, but also to identify the hazards and conduct risk analyses to eliminate the vulnerabilities of things under risk as much as possible.**

During this process it has been understood, how important the headings were, which have not been emphasized much previously in the framework of the field in question. Foremost among them comes the heading of **Raising Social Awareness.** The literature on Mitigation underlines building of an organizational system and, additionally, stakeholders to take role in this system together with their functions, responsibilities and interactions. Taking a step further from this point, strategies for formation of societies resilient against disaster have started to take their place under the heading of disaster mitigation. A long distance has been taken from the initiative of International Decade for Natural Disaster Reduction (IDNDR) started in 1989 by the United Nations to the Sendai Framework for Disaster Risk Reduction in 2015 and thus Mitigation has gone beyond being an interdisciplinary subject and become an independent discipline.

Another outstanding heading in literature is **Disaster Logistics.** Firstly, Sumatra Earthquake in 2004 and secondly, Haiti Earthquake in 2010 have given important lessons, indicating how the supply chain could be vulnerable and insufficient after a disaster. It has shown the fact that both the flow of supply chain should be optimised for disasters and the city spaces should be arranged so that they allow such optimization.

Finally, remaining in the background of these developments, but constituting a basic field of subject, the concepts **Risk Perception** and **Change of Attitude** have gained importance. **In the disaster mitigation operations (whether in building or city scale), manner and level of the perception of the hazards and possible risks determines effectiveness of the actions to be performed.** While overestimation of the hazard bolsters up desperation and in return the idea that it is useless to take action, underestimation of the hazard lead to not taking even the simplest measures. This applies not only to the individuals, but also to the executives and professionals. In order that mitigation activities, which should be performed in a contributory manner, reach the specified goals, the risk communication is expected to be supported by initiatives among institutions, between institution-community and in the community itself.

Hence the *Urban Planning and Construction Guide for Disaster Risk Reduction* is based on current and scientific approach, which involves steps and methods in compliance with the changing structure of mitigation. Furthermore, national and international studies containing more comprehensive and detailed findings are also used in the specific subject matters.

# Urban Planning for Disaster Risk Reduction

Framework Programs and Action Plans in Global Scale

First Step against Disasters: Recognition of Hazards and Weaknesses (Pretreatment Diagnosis)

Disaster Risk Reduction in Urban Planning Scale

Risk Reduction against Disaster in Constructional Scale

Strategies for Enhancement of Social Resilience

# Framework Programs and Action Plans in Global Scale

Disasters represent unexpected breaking points and huge destructions. Creating a burden of switching from the normal daily life to a much more different system as well as changing comfortable and safe conditions of the individuals dramatically, the disasters are studied in the scientific world and take their place in the traditional structure of the societies. **Neptune** in the Roman mythology and **Poseidon** in the Greek one have been godlike figures associated with disasters. Similarly, the **Goddess Sekhmet** of the ancient Egyptian mythology represents violence, disasters and diseases. And, coming to the later periods, we only have historical records of some cities which have been subject to numerous disasters. However, there are also cities that have survived although they have experienced lots of disasters. Looking to the history, we encounter many examples of cities shaped by disasters and disasters caused by cities.

In addition to numerous examples that reflect social effects of the disasters, there are also many examples showing manners of leaders making decisions and taking actions. **Great Flood** and **Noah's Ark** are one of them which clearly account preparation against flood. Furthermore, going back to BC 3200s, **Asipu,** one of the groups called as the healers by the Mesopotamian civilizations, had undertaken the task of giving decision on risky and uncertain situations. In the decision-making process, the stages of data collection, analysis, development of alternatives and selection from the alternatives appear as the first simple example of the risk analysis we conduct today (Covello & Mumpower, 1985).

Firefighting in the Roman Empire can be given as an early example of an organization model against disasters. While the firefighting task was assigned to the slaves prior to the **Great Fire of Rome**, which occurred in July AD 64 and resulted in burning up of about two third of Rome, the first firefighting service in the history (Cohortes Vigilum or Vigiles Urbani) was set up. Water appears as an important factor from the first human settlements up to date. While the cities founded close to water resources and took advantage of it, they were also exposed to the risks of floods and deluges posed by it. In Ancient Egypt, in the period of Amenemhat III, the first river control project in the world was implemented, and the waters of River Nile were oriented to Lake Karun during the flood time. With this solution, both flood was taken under control and wide areas have been developed for cultivation (Quarantelli, 1985).

### Historical references

In the history, from the stories of first human settlements to those of modern cities, we see many examples of the **cities shaped by disasters** and the **disasters caused by cities.** Reflecting social effects of the disasters, these examples are antecedents of risk analysis.

Historically, the most striking example of planning and housing is **Machu Picchu**, the famous city of the **Inca Civilization**. Established in the area of Andes (an area covering modern Peru and Equator) in the western part of South America in 11th century, the Inca Civilization has reigned until it was destroyed by the Spanish colonial forces in late 1500s. Established in the 1450s, in the Andes against attacks at an elevation of 2500 meters above sea level, Machu Picchu gives us important lessons in terms of both architecture and planning.

While scientists researched the effects of local earthquakes within the **CUSCO-PATA Project** in the period of 2016-18, they discover significant findings. First of all, they noticed that both Machu Picchu and other major Incan cities have been deliberately developed in the areas close to the fault lines. The underlying reasons of it were easy access to stone sources for construction and orientation of snow and rainwater towards the city through the faults for easy water supply. And it is also observed that walls and terraced structural system in the cities were built parallel to the fault lines. It is also known that the buildings constructed masterfully by the Incans, using rocks only without any mortar or binder, have not been damaged by earthquakes to the extent of destruction and only displaced from the original axis where the stones had been placed. Furthermore, while the terrace system prevented landslides that might be caused by excess water, it also created areas for cultivation.

In the case of pandemics, the great plague, also called **Black Death,** which has terrorized the whole world in 14th century and the **Spanish Flue** which infected more than 500 million people in 1918-20, with a death toll of about 50 million, come to mind. And in recent periods, in addition of a variety of flue epidemics, SARS, MERS and finally COVID-19 are standing out as pandemics posing threat to human life. In the Middle Age, when Venice was especially a marine trade hub in 14th century and took advantage of its status, it was also the city most affected by the plague pandemics. In order to prevent the pandemics from spreading further, **Lazzaretto Vecchio** had been started for isolation and treatment of the inflected people from the community and acted later on as main central place where the vessels arriving from the plague-stricken places for a while. This waiting period of 40 days started to be called “quaranta”, meaning 40 days in Italian, and it is now universally used as “quarantine”. This spatial isolation applied by the Venetians for preventing spread of pandemics in Middle Age and protecting the city dwellers was also applied in other periods. The most known of them are Dubrovnik and **Quarantine Islands** in Urla (İzmir) and St. Ellis Island of New York.

Looking back to ancient times, we see that different technics and approaches had been used both to receive and to be prepared in dealing with disasters.

## Period after Second World War

**This section describes chronologically the framework and action programs developed in global scale and, furthermore, how the basic strategies and targets which are applicable today have developed and how they are reflected on the current development and urbanization strategies and legal framework.**

By the mid-20th century, the **United Nations** was founded in 1945 for protection of global peace and security and also for international economic and social cooperation and afterwards in 1948 the **World Health Organization** attached to the United Nations. In the forthcoming periods, many subunits started to operate under the roof of the United Nations, aiming to produce solution in specific subjects. The 1970s are known as the years when damage given to nature became clearly witnessed. In order to discuss this issue in all its aspects and provide future-oriented solution proposals, the first of a series of conferences called **HABITAT I** was held in Vancouver, Canada in 1976. The basic output of the first conference was the acceptance that housing and urbanization are global subjects, which should be dealt together.

UN HABITAT
FOR A BETTER URBAN FUTURE

Furthermore, upon this first conference, **UN-Habitat** was set up in 1978. A study on ecological resilience was published by Holling, which brought a new dimension to the concept of resilient frequently used today, but in the 1970s it attracted limited attention only of people interested in environment (Holling, 1973). The said study underlined that the concept of resilience usually used in the field of engineering corresponded to something very different in connection to natural environment. Today this approach expresses being resilient against disasters.

## Period of 1980-1990

The basic source of the term sustainability as we use today goes back to 1987. Gro Harlem Brundtland, working as the president of the Environment and Development World Commission operating under the United Nations and former Prime Minister of Norway, published a report titled **"Our Common Future".** This reference contained definition of sustainability and, furthermore, a system of close relations among environment, community and economics as well as strategy proposals for protection of natural environment in relation with them (Brundtland, 1987). The dynamics of the 1980s have been not only the subject of researches or discussions under supervision of the United Nations. In his book ***Risk Community*** (1986), the famous German sociologist Ulrich Beck pointed out that the cities have started to create their own disaster because of the new world and social order. Both environmental issues and increasing effects of natural or human-made disasters have made it clear that a new approach should be adopted. By declaring the 1990s as the **International Decade for Natural Disaster Reduction** (IDNDR) in December 1989, the United Nations helped move away from crisis management or disaster management and instead emphasize the subject matters of risk reduction, preparedness and planning before disaster. Key goals of IDNDR are given under the following headings (United Nations, 1989):

- Assistance to the developing countries to build their capacities particularly for effective risk reduction operations, install early alarm systems, construct buildings resistant to disasters and make them capable to anticipate their potential loss from disasters.
- Development of strategies for putting the existing scientific and technical information in practice by taking into consideration the cultural and economic differences between the societies and provide guidance in this respect.
- Support of engineering studies and scientific efforts for enrichment of knowledge to reduce loss of life and property and to remove deficiencies.
- Spread of technical knowledge, existing and emerging, for studies on anticipation and evaluation of natural disasters and risk reduction.
- Application of versatile programs for certain disasters and spaces such as technical support, technology transfer, implementation projects and trainings for anticipation, evaluation and reduction of natural disasters.

International Decade for Natural Disaster Reduction
IDNDR
1990 - 2000
Building a culture of prevention

International Decade for Natural Disaster Reduction (1990-1999)

## Period of 1990-2000

The transformation started by IDNDR has strengthened in the following years and in the conference held again by the United Nations in the city of Yokohama (1994), the progress of IDNDR was evaluated and new strategies and principles were determined. In this conference, **Yokohama Strategy and Plan of Action for a Safer World** (United Nations, 1994) was developed. Furthermore, among the things underscored by the United Nations were the increased rate of loss from disasters in the developing countries; difficulty of disadvantaged groups to fight against disasters; insufficient and costly response to disasters without preparedness phases prior to disasters; and failure of risk reduction. Likewise, performance of all these four phases before and after disaster is directly related to implementation of sustainable development and environmental protection policies and they should, therefore, be included in the development plans of the countries.

Principles specified by the strategy for the next ten years are as follows:

- Identification of risks is the primary step for a successfully disaster reduction policy and measures.
- Risk reduction and preparation operations before disasters are essential for reduction of damages after disasters.
- Risk reduction and preparation operations should be considered as an internal component of the development policies.
- Risk reduction succeeds when engagement is achieved in all levels, from local to international.
- Vulnerability can be reduced by means of operations for education of the society as a whole and by capacity building.
- For the success of risk reduction activities, sustainable development has to include environmental protection.

In 1996, 20 years later from the first one, the second HABITAT conference was held in Istanbul. In the scope of **HABITAT II,** a global action plan was adopted for sufficient housing and sustainable human settlements for everybody in the urbanizing world.

The basic outputs of the conference were: cities are locomotives of the global growth; urbanization is an opportunity; local administrations should have an active role; and power of engagement should be recognized.

In 1999, again an organization of the United Nations the International Strategy for Disaster Reduction (ISDR), today **United Nations Office for Disaster Risks Reduction** (UNDRR) was set up. The objective of this organ was to become a focal point that coordinates disaster risk reduction and make contribution to the disaster risk reduction activities of the United Nations in the fields of regional organizations, socioeconomic and humanitarian aid (United Nations, 1999).

## Period of 2000-2010

Announced in 2000 to cover the period up to 2015, the **Millennium Development Goals** (MDGs) have intersected with the mentioned goals of the disaster risk reduction in many points (United Nations, 2000). Climate change and adaptation policies have also been added to these two fields, which are directly related to each other. In this period, different organs of the United Nations, researchers and policy-makers have frequently pointed out that these three concepts should be dealt in an integrated way. The United Nations Development Program has defined disaster risk reduction as an important goal for development and stated that each of the Millennium Development Goals were directly in interaction with the disaster risk. Furthermore, the capacity to be built or the competence to be gained during the fight against disaster risk will make contribution in coping with the risks to appear in connection with climate change in future (UNDP, 2004).

Eight general headings of the Millennium Development Goals are as follows:

1. Eradicate extreme poverty and hunger;
2. Achieve universal primary education;
3. Promote gender equality and empower women;
4. Reduce child mortality;
5. Improve maternal health;
6. Fight against HIV/AIDS, malaria, and other diseases;
7. Ensure environmental sustainability;
8. Develop a global partnership for development.

ISDR (UNDRR) organized in 2004 another conference similar to that in Yokohama, this time in Kobe and published a framework for action with the goal of reduction of the disaster-related damages significantly for the period of 2005-15 (United Nations, 2005). The declaration under the name of **Hyogo Framework for Action: Building the Resilience of Nations and Communities to Disasters** had the following five primary steps:

1. Making Disaster Risk Reduction a Priority in National and Local Scale
2. Identification, Assessment and Monitoring of the Risks

3. Using Knowledge, Innovation and Education to Build a Culture of Safety and Resilience
4. Reducing Primary Risk Factors
5. Strengthening Disaster Preparedness and Effective Response at All Levels

Signed on December 11th, 1997 and entered into effect in 2005, the Kyoto Protocol is an international framework for response against global warming and climate change. The key goal of the Kyoto Protocol is stated as; maintenance of the greenhouse gas density in the atmosphere at such levels that will not have adverse effect on the climate.

Turkiye signed the Kyoto Protocol in 2009 and accepted the **National Climate Change Strategy** covering the period 2010-20. The action plan basing on this document was completed in 2011.



## Period of 2010-2020

As the principal step of the Hyogo Framework for Action, the objective was to spread at level of local administrations and a campaign was started under the name "Making Cities Resilient: My City is Getting Ready" for sharing the good practices from all of the world. The campaign contains a checklist consisting of ten primary items that can be used to make the cities resilient. This checklist was prepared particularly for local administrations, mayors and other related decision-makers:

1. Arrange organizations for the **Understanding and Reduction of Disaster Risks** with participation of citizen groups and non-governmental organizations and ensure their cooperation. Make local agreements. Ensure that all households understand their roles in reducing disaster risks and get ready for disasters.
2. Allocate budget for the reduction of disaster risks and **provide incentives** to the home owners, low-income families, communities, offices and public sector to reduce the risks they are facing
3. Collect up-to-date data for the points sensitive to the hazards and disasters, **make risk assessments** and use such risk assessments as basis for city development plans and decisions. Make these information and plans of the resilience of your city accessible to the public and get the opinion of them.
4. **Invest in the infrastructure** of critical importance for reducing risks such as flood drainage. Modify such infrastructures, if necessary, to deal with the problem of climate change.
5. **Assess safety** of all schools and healthcare facilities and increase their safety if required.
6. Apply realistic and risk-compliant **Construction Regulations and Land Usage Principles.** Locate safe lands for the low-income citizens and restore the unlicensed buildings in the appropriate places.
7. **Give training and education services** to the

students and local community for reduction of disaster risks.

**8.** Protect the ecosystems and natural buffers for mitigation of flood, storm and other hazards to which your city may be prone. **Develop good risk reduction applications and adapt yourself to the climate change.**

**9.** Install early alarm systems in your city, develop your emergency management capacity and **conduct public preparedness drills regularly.**

**10. Make the requirements of citizens surviving any disasters as the central point of the restructuring activities;** assist these persons and social organization in determining how the problems should be responded regarding the reconstruction of houses and the restoration of means of living.

By 2015, there were many action plans in the agenda concerning sustainability and reduction of disaster risks. While these plans can be dealt individually, they also, when looking at the details of them, appear as simultaneous actions supporting each other and ensuring no gap remains in the matters of sustainability and fight against disaster: Sendai Framework Program, Paris Climate Agreement, Sustainable Development Goals, World Human Summit and Habitat III. Upon expiration of the Hyogo Framework for Action (HFA) which was effective in the period of 2005-15, the **Sendai Framework** was put into action as a follow-up of it for application in the period of 2015-30. Four priority areas were determined basing on HFA-related experiences and disasters occurred in the last ten years:

**Priority 1.** Understanding the disaster risk;

**Priority 2.** Strengthening the disaster risk governance for the management of disaster risk;

**Priority 3.** Investing in the disaster risk reduction for resilience;

**Priority 4.** Developing and improving disaster preparedness operations for effective response and **"Building Better than the Previous One"** in the phases of rehabilitation and reconstruction.

Following the Millennium Development Goals covering the period of 2000-15, the **Sustainable Development Goals** (SDG) for the period of 2015-30 was put into action. This call for action, consisting of seventeen goals, was made for **eradicating poverty, protecting the planet and ensuring all people to live in peace and welfare**. This document serves as the main document to which all other agreements and frameworks between and after the period of 2015-16 were connected.

As the Kyoto Protocol will complete in 2020, **Paris Climate Agreement,** a new climate strategy and action plan, was approved in 2015. Main objective of the Paris Agreement is to maintain the temperature increase in the world under 2 °C. While the Kyoto Protocol focuses on emissions particularly of the industrialized and developed countries, the Paris Agreement adopts a global approach covering all countries. Turkiye signed the Paris Agreement in 2016, but has not been a part of it.

Turkiye signed the Paris Agreement, which was adopted in 2015 together with 175 nations in 2016 and completed the domestic legal process with the presidential decree issued on October 7th, 2021. Turkiye dwells on two matters, focusing on the solution of these points:

**(1)** Adoption of same treatment to Turkiye with its peers with respect to access to financial and technological support.

**(2)** It is impossible for Turkiye to apply absolute emission reduction, considering the criteria such

as economic growth and population increase of the country. This points should be recorded (for detailed information, see iklim.csb.gov.tr/paris-anlasma-si-i-98587).

The **World Humanitarian Summit** was hosted by Istanbul in 2016. Focused on the humanitarian aid, the key matters of responsibility are as follows:

**1.** Prevent and End Conflicts
**2.** Respect Respect for the Law of War
**3.** Struggle for Needs
**4.** Different Way to End the Needs
**5.** Invest in Humanity

In 2016, **HABITAT III** summit was held in Quito, the capital of Equator. In this meeting, importance of the management and orientation manner of urbanization on global basis was underlined for the achievement of sustainable development goals. In line with the Sustainable Development Goals, **New Urban Agenda** (NUA), Habitat III has specified the following commitments in light of sustainable urban development principles integrated with socioeconomic and environmental dimensions:

- Sustainable Urban Development for Social Inclusion and Extermination of Poverty
- Sustainable and Inclusive Urban Welfare, Social Equality and Opportunity for Everybody
- Environmentally Sustainable and Resilient Urban Development

In 2019, **Climate Action Summit** (CAS) was organized and designed to enhance implementation methods of both Paris Agreement and Sustainable Development Goals covering a period up to 2050. It has specified following key actions:

- Risk Reduction
- Social and Political Drivers
- Youth and Public Mobilization
- Energy Transition
- Industry Transition
- Infrastructure, Cities and Local Action (Turkiye acts as leader of this section in cooperation with Kenya and UN-Habitat)
- Nature-Based Solutions
- Resilience and Adaptation
- Climate Finance and Carbon Pricing

## Conclusion

Frameworks, action plans and agenda are made in matters of disaster risks reduction, human settlements, sustainability, climate change and humanitarian aid, and aim minimizing the damage given by the human activities to the ecosystem of the world. Started in the 1970s, this process has integrated with the main axis of the Sustainable Development Goals in 2015 (Figure 1). And the cities are the places where these subsystems which also incorporated many matters in intersections in the past are staged both as the issue itself and as the issue area (Figure 2).

Today, all regulations and strategies concerning urbanization and construction are considered as products of the global approach for building safe/resilient societies and cities as well as all kinds of implementations and process's basing on the reduction of disaster risks.

| SUSTAINABLE DEVELOPMENT GOALS | SENDAI FRAMEWORK | PARIS CLIMATE AGREEMENT | WORLD HUMANITARION SUMMIT | HABITAT III |
|---|---|---|---|---|
| ENDING THE POVERTY | ✓ | | ✓ | |
| ENDING THE HUNGER | | ✓ | ✓ | |
| HEALTHY and QUALITY LIFE | | | ✓ | |
| QUALIFIED EDUCATION | | | | |
| SOCIAL GENDER EQUITY | | | ✓ | |
| CLEAN WATER and SANITATION | | ✓ | | ✓ |
| ACCESSIBLE CLEAN ENERGY | | ✓ | | |
| DECENT WORK and ECONOMİC GROWTHAND | | | | |
| INDUSTRY, INNOVATION and INFRASTRUCTURE | | ✓ | | |
| REDUCTION OF INEQUALITY | | | | |
| SUSTAINABLE CITIES and COMMUNITIES | ✓ | ✓ | ✓ | ✓ |
| RESPONSIBLE PRODUCTION and CONSUMPTİON | | | | ✓ |
| CLIMATE ACTION | ✓ | ✓ | | |
| AQUATIC LIFE | | | | ✓ |
| TERRESTRIAL LIFE | | ✓ | | ✓ |
| PEACE, JUSTICE AND STRONG INSTITUTIONS | | | | |
| PARTNERSHIPS FOR GOALS | | ✓ | | |

**Figure 1.** Intersections of Sustainable Development Goals and related programs (Kundak)

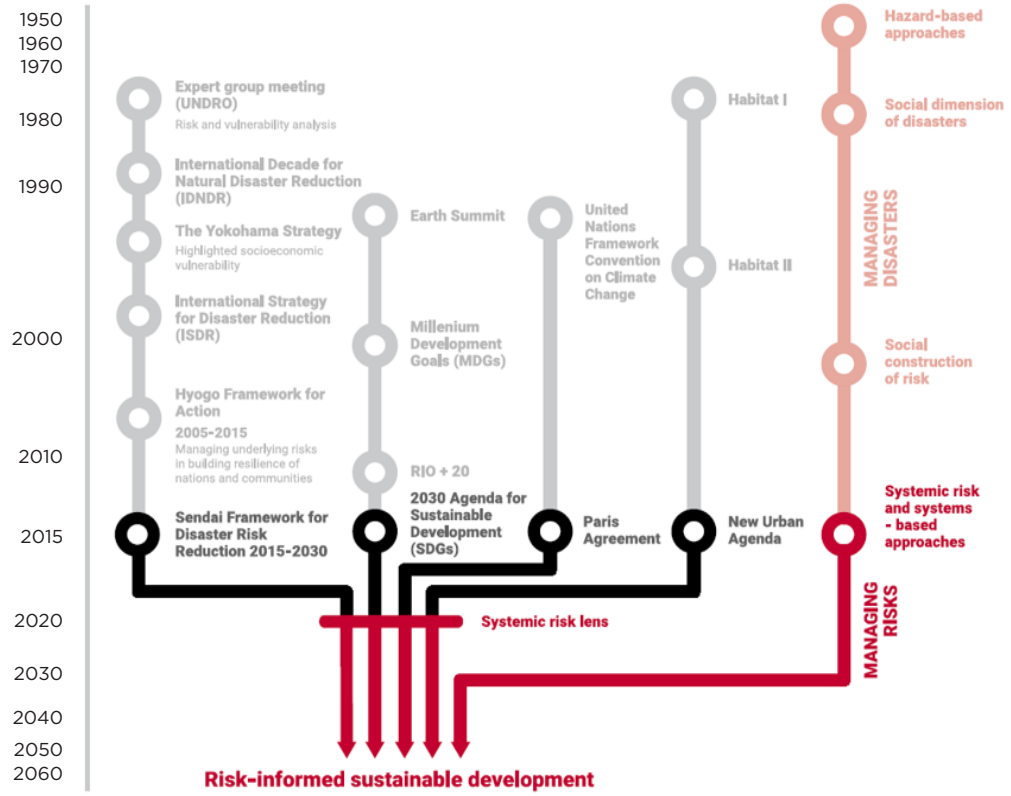



**Figure 2.** Chronology of Framework Programmes and Action Plans in Global Scale (The Global Assessment Report on Disaster Risk Reduction (GAR), 2019)

# First Step against Disasters: Recognition of Hazards and Weaknesses

## (Pretreatment Diagnosis)

For fighting against disasters, identification of the characteristics of hazardous sources and assessment of the items under threat of these sources of hazards bear great importance in determining the disaster risks. In this context, **Pretreatment Diagnosis** stands out as a process which should be studied carefully for correct responses. Today's disasters often show dramatically the need for an integrated approach in assessing the risks and taking measures against these risks.

Hazards which cities are facing can studied independently and in detail, however integrated hazard maps should be generated by considering the possibility of triggering each other or occurring together. In addition, assessment of different components of vulnerability and the interaction description of them will help identifying weak points of the settlements and society regarding possible threats. In short, these two sets of data (hazards and weaknesses) make it possible to conduct comprehensive and realistic risk analysis, identify urgent response areas and types of response and, consequently, develop integrated management strategies for urban disaster risks.

Cities are mostly defined as living organisms. Because cities show motion in course of time related to space, to its users and their missions/positions within the country. Therefore updating constantly the database, which is containing changes and developments of the city, appears as an important subject for study. For the development of a disaster and risk culture in Turkiye it would be an appropriate step to start with an up-to-date and reliable database system, which includes many different natural hazards.

**Remember**

Life and property loss, economic fluctuations and psychological traumas experienced in recently disasters show clearly that activities for risk reduction are not a **luxury**, but **mandatory.**

The **Geographical Information Systems** (GIS) provides numerous chances for development, updating and assessment of the database. Today many local administrations use these systems; however, in most institutions, these databases are generated once and remain idle without being updated. While the urban texture changes constantly, it is of great importance that the database acting as basis for future-oriented decisions should also be updated permanently. Only with such a move the social enlightenment, awareness and change of attitude can be achieved and great steps can be taken in fighting against disasters.

All matters discussed in this chapter involve a process made up from long-term activities with high initial costs which require expertise and teamwork. However the world has experienced, when compared with life and property loss, economic fluctuations and psychological traumas of recently occurred disasters that the labour, workforce and capital used by the institution for development of strategies to reduce disaster risks will be of course much lower. When looked from this

point of view, it is clear that activities for the reduction of risks are not a luxury, but an obligation.

## Sources of Hazards

Hazards facing the settlements fall into three categories: **Natural, Human-made** and **Integrated Hazards.** And it is also possible to classify these threats as rapid-onset and slow-onset hazards. Earthquakes which pose a threat to our country most are an example of rapid-onset natural hazards. But the drought is a slow-onset natural threat, but has long-lasting effects. Natural hazards are categorized under four main headings:

1. **Geological** (earthquake, volcanic eruption, landslide, etc.)
2. **Hydrological** (flood, deluge, etc.)
3. **Atmospheric** (storm, wave of hot or cold air, etc.)
4. **Biological** (pandemics)

Human-made hazards include events where nature is not effective at all, e.g. wars, acts of terrorism, industrial accidents and traffic accidents. **That an integrated approach should be developed for assessment of hazards is among the most important lessons learnt from the disasters we have experienced in recent years.** Disasters lead to occurrence of many secondary disasters. In this context, it appears clearly that the i**ntegrated disaster hazards** should also be analysed (Figure 3).

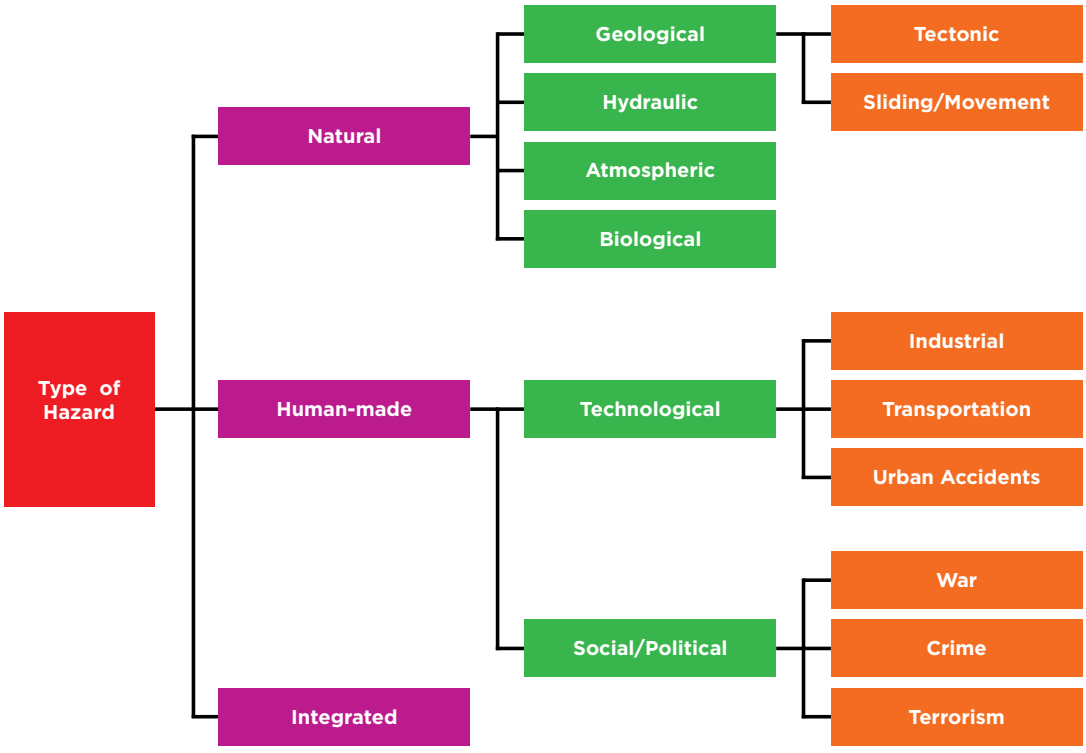



**Figure 3.** Types of Hazards (Kundak)

Disasters occurred in the past have shown both in Turkey and other countries that a natural event (earthquake, landslide, etc.) triggers another one and finally the disaster reach to a much greater extent than expected. Seismic tremors (earthquakes), for example, may cause landslides in nonstable areas. And, similarly, heavy rainfalls have the potential to trigger landslide. Massive landslides towards wide water areas such as sea and lake may cause sudden rise of the water level, which leads to floods in the areas on the shores of these water resources (Comment Box 1).

Making **Integrated Disaster Hazard Maps** is not simply overlapping of the maps that show different natural threats. Basing on the real events as those given in the Comment Box 1, you should consider their potential to trigger each other and develop scenarios regarding **chain reactions** that may occur in this way. Today when we calculate probabilities of natural hazards by help of probability methods developed for anticipation of hazards, we should always remember to predict the worst scenarios most of the time, considering the disasters experienced throughout in history.

**While natural hazards trigger each other, they also trigger technological accidents.** There

## Comment Box 1: Natural Hazards Triggering Each Other

### EARTHQUAKE » LANDSLIDE » FLOOD

In 1786, a 7.7 magnitude earthquake that struck the Sichuan province in China caused a great landslide on the banks of the Dandu River. This landslide blocked the flow of water in Dandu River like a dam. About 10 days after this event, the mass started to bear into pieces by the water power and caused a deluge, resulting in a death toll of more than 100,000 (Dai et al., 2004). And in 2008, again in Sichuan, a 7.9 magnitude earthquake and its aftershocks cause landslides of small and medium scale.

### EARTHQUAKE » LANDSLIDE

In 1989, the 5.5 magnitude Gissar earthquake caused a great landslide in the town of Sharora near Dushanbe, the capital city of Tajikistan and it suddenly buried the town with a population of 274 (UN, 2006; Havenith et al., 2003).

### EXCESSIVE PRECIPITATION » LANDSLIDE

On June 22th, 1988, a landslide started at midnight in the village of Çatak, the district Maçka of Trabzon and turned into a huge disasters at about 8:00 am on June 23th, 1988. Triggered and accelerated by excessive precipitation in addition to some other geological factors, the disastrous landslide caused a death toll of 64 (Genc, 1993).

### EARTHQUAKE » TSUNAMI

On December 26th, 2004, a 9 magnitude earthquake occurred in Sumatra, on floor of Indian Ocean, 250 km southeast of Indonesia and caused giant waves (tsunami) reaching up to 15-30 meters on the shores. Triggered by the Sumatra earthquake, the tsunami is considered as one of the biggest disaster in the history with its death toll over 200,000 people (USGS, web 2011).

are considerable lessons we should learn from the TÜPRAŞ fire, a technological disaster which remained in the background behind the destroyed buildings and death tolls of the 1999 earthquake. Another similar event was experienced in the Tohoku earthquake in Japan (2011).

Triggered by the earthquake, tsunami waves up to 15m reached the Fukushima Nuclear Plant and damaged the power supply system of the cooling system and stopped the cooling process in the reactor. Although Fukushima Nuclear Plant was designed to be highly resistant against earthquake in the construction phase, probability of such huge waves that would break down the power system has been neglected, resulting in the biggest disaster in recent years. Radioactive fallouts/clouds spread over the near settlements and then a wider range of land in short time. After the huge fires broken up as a result of the 1995 Kobe earthquake, the 2011 earthquake and Fukushima disaster are considered as the biggest technological accident triggered by a natural hazard ever occurred in the history.

## Vulnerability

Translated into Turkish as “damageable”, “weakness”, “sensibility”, “fragility” or “infirmity”, the term vulnerability was originally and generally used for engineering assessments of buildings. Basing on experienced disasters it was considered that use of the concept of “vulnerability” not only for the built-up area, but also for social, economic and environmental factors would be useful for more decent estimates in the process of risk analysis.

Although the degree of damages of affected buildings play important role in the conversion of hazards to disasters, we should remember that in addition to the human-related social and cultural effects, economic dynamics also serve as driving forces in the construction or usage process of those buildings or in the development process of the cities. Hence, in recent years, the concept of vulnerability is discussed by considering all its aspects in the related studies (see ENSURE and MOVE Projects).

While natural hazards trigger each other, they also trigger technological accidents. After the huge fires broken up as a result of the 1995 Kobe earthquake, the 2011 earthquake and Fukushima disaster are considered as the biggest technological accident triggered by a natural hazard ever occurred in the history.

Because of its engineering effects, the concept of vulnerability has been studied more in terms of its **Physical Vulnerability** aspect up to now. While **Social** or **Demographic Vulnerability** is matched with population size that may be exposed to the effect of the threats, **Economic Vulnerability** has been directly interpreted as economic losses. However, vulnerability covers weaknesses that each component (human or building) has from the beginning or developed in the course of time. In addition, recent scientific researches have shown that different components of vulnerability have characteristics of affecting each other and spreading. And as a concept again frequently mentioned in recent times,

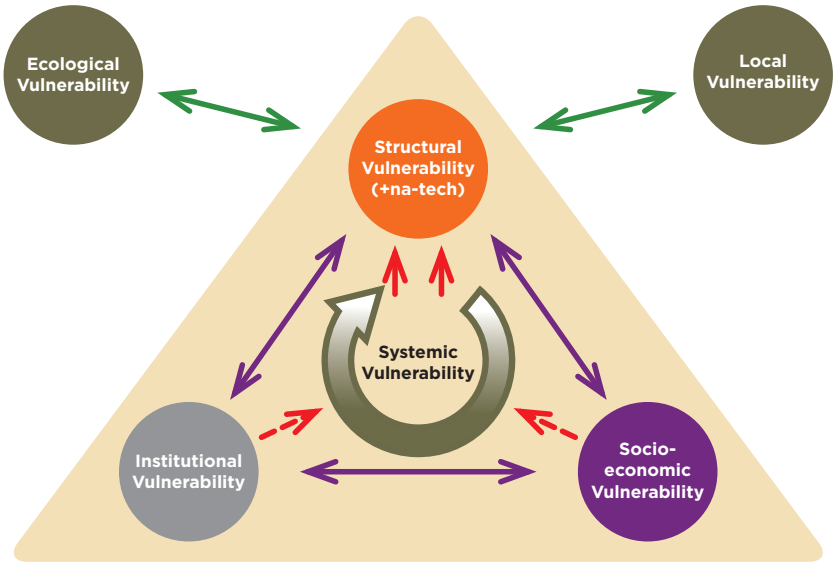



**Figure 4.** Components of Vulnerability (ENSURE, 2010)

**Systemic Vulnerability** studies the accessibility and service capability of critical facilities, particularly hospital, fire department etc. in case of disasters (Figure 4).

## Structural Vulnerability

Structural vulnerability is a concept extensively used in the disaster literature and mostly discussed in engineering terms. This type of vulnerability reveals mostly single building, side adjacent buildings, roads, bridges and infrastructure systems, identifying weak points and behaviour patterns of these structures in face of dangers. However, not only description of the structural characteristics of buildings and structures, but also description of the manner of their usage, integrity of land use and consequently associated the incompatible use is quite important for measuring urban structural vulnerability. Furthermore, if some structures and especially industrial facilities are damaged, possibilities and possible effects of secondary or **by natural hazards triggered technological accidents** (na-tech), should also be discussed in this context. Table 1 shows structural vulnerability variables in different scales. Variables in scale of a single structure and group of structures come under the responsibility and domain of the disciplines of civil engineering and architecture. When the scale gets larger and the vulnerability is studied in hierarchical form of quarter-district-city-region, some matters emerge, although related with construction, which come under the responsibility and domain of urban planning (Table 1).

## How Should These Variables Be Used in Different Scales?

**Subscale (Single Structure/Group of Structures):** The variables of single structure assessments include the relationship of building and ground, whether the building is an engineering structure or not, and after obtaining the occupancy permits (if any) of the building, whether interventions to the load-bearing system are made or not, and; whether the structure is used for its in-

| Subscale (Single Structure/ Group of Structures) | Medium Scale (Quarter/District) | Upper Scale (City/Region/National) |
|---|---|---|
| Structural type of building | Vacancy – Occupancy ratio | Land use |
| Condition of building | Texture of settlement | Transportation network |
| Number of storeys | Building density | Infrastructure network |
| Age of building | Age of settlement | Urban/Archeologically sites |
| Renovations and alterations | Land use | |
| Irregularities | Incompatibilities | |
| Usage type of building | Green and open area ratio | |
| Building/Use compatibility | Location of critical facilities | |
| Structural combinations | Transportation system | |
| Transportation roads | Traffic density | |
| Road widths | Infrastructure facilities | |
| Type of road | Historical texture | |
| Historical structures | | |
| Critical structures | | |

**Table 1.** Variables of Structural Vulnerability (Kundak, 012)

tended use. When taking a step further out of the structure, the relationship with surrounding structures gains importance. In case of the attached buildings, for example, the adjacent buildings with different floor levels and lack of sufficient dilatation (seen in structures which have not received engineering service) cause the buildings to strike each other at time of earthquake, resulting in the breakdown of a building's beam by the column of another building. And both use intensity and width of the access roads of the buildings are also important variables in terms of accessibility. For example, it is possible that a road with a width of 12-15 meters and 5-6 storey buildings on both sides can be obstructed and not allowing access due to fall of facade equipment or collapse of the buildings.

**Medium Scale (Quarter/District):** In this scale, the static order of the buildings together with the transitions of types of different land uses as well as the operation of transportation and infrastructure systems stand out. Occupancy-vacancy ratio, density of green areas and building density are variables closely interrelated with each. Common characteristics of the areas with high building density briefly include lack of open and green areas which are vitally important in case of disaster and emergency and transportation system which loses its function especially in rush hours. Furthermore, the areas with high building density (housings or offices) are also areas with high population density. In short, these areas are also considered as areas where escape areas or roads are not sufficient.

Types of use incompatible with each other and unsuitable are known as characteristics increasing effect of the disaster as actually observed in many disasters. There are numerous records of great damages given by the industrial facilities, e.g. areas used for processing or storage of flammable/explosive substances, which are close to housing, education, healthcare and similar land use types due to accidents in these facilities. And another variable standing out among the variables in this scale is site selection of the critical facilities. Examples about it are given under the heading of Systemic Vulnerability.

**Upper Scale (City/Region/Country):** Looking from a wider perspective, settlements nearest to hazards in country or region scale and hazards facing them are expressed by the variables in this scale. For example, before making investment decisions at country level which are realized on spatial scale, benefit-loss assessments should also be considered with respect to natural and technology-sourced threats. Furthermore, it is also important for the use of variables of upper scale that the settlements with a previous record of damage due to natural disasters should not be intervened only by means of structural measures, but also be moved to a safer area if required.

## Socioeconomic Vulnerability

Socioeconomic vulnerability stands out as a type of vulnerability of most complex structure. In a cyclical structure made up of a combination of social and economic systems, while, for example, social backwardness prevents development of the economic structure, the economic restrictions/issues affect social development, resulting both of them increasing the vulnerability level in this component. In the definition of the socioeconomic vulnerability, rather than the population and economic values under threat, the weaknesses of these items should be highlighted. For example, with a population of 15.5 million, Istanbul is faced with the earthquake hazard; however, not all of these people have the same weaknesses (or resilience). In Table 2, as in the previous heading, the variables of different scales are listed. While the subscales contain variables related to individual and singular formations, the higher scales have variables regarding different demographic and socioeconomic conditions of the community.

### How Should These Variables Be Used in Different Scales?

**Subscale (Individual/Family/Business):** Weaknesses regarding demographic and socioeconomic characteristics of the individuals are defined according to the statistics of the disasters experienced previously. In case of sex-related weaknesses, for example, the women may seem weaker in protecting themselves. In fact, the 1995 Kobe (Japan) earthquake showed that the women with two or more small children could not escape in time not because they were weak, but rather they tried to save all their children. For this reason, the factors underlying the variables which involve generalization should be read correctly. As to the age as a variable, small children, elderly, patients and people with disabilities fall into the groups considered to be weak because they could not act quickly or need assistance at time of an earthquake. Limited means or lack of alternatives for both household economy and economic structure of enterprises are defined as "weakness" in face of disasters.

| Subscale (Individual/Family Business) | Medium Scale (Quarter/District) | Upper Scale (City/Region/National) |
|---|---|---|
| Sex | Population density | Land use |
| Age | Population growth rate | Transportation network |
| Education status | Population mobility (night/day) | Network of infrastructures |
| Family size | Ethnical diversity | Urban/archaeological sites |
| Household income | Number of tourists | |
| Economic dependency | Fields of economic activities | |
| Number of baby/child, elderly, patients in the family | | |
| Type of business | | |
| Professional branch of business | | |
| Insurance | | |

**Table 2.** Variables of Socioeconomic Vulnerability (Kundak, 2012)

**Medium Scale (Quarter/District):** Variables concerning the general population structure gain importance in this scale. 7/24 based density movements in settlement areas are important for effective performance of the phases of research, rescue and evacuation during an earthquake.Among the branches of economic activities, those which are most sensitive to the disasters and those having potential to magnify effects of the disasters are included in the variables of this scale. Another variable group that should not be neglected is ethnical diversity and tourists. These groups with (generally) the lowest social integration should also be considered.

**Upper Scale (City/Region/Country):** The most dominant variables in this sale are variables on the economic platform. National and regional economy, basic fields of activity, interregional inequalities, production and labour structure and foreign relations should be considered for their weak and powerful aspects in face of disaster.

## Institutional Vulnerability

Institutional structure covers not only central and local administration structure, but also actors of all kind of governance activities and non-governmental organizations. Rules such as laws and regulations which are established by the administrative system are basic tools which ensure

In fact, the 1995 Kobe (Japan) earthquake showed that the women with two or more small children could not escape in time not because they were weak, but rather they tried to save all their children.

us to use the latest advancements in the field of technology and science for safe construction in city scale. These tools should be adapted and effectively used by all related stakeholders, particularly decision-makers and technical personnel. Furthermore, social organization, information flow and perception of the factors as constituents of the risk are among the key factors to create healthy governance (Table 3).

## How Should These Variables Be Used in Different Scales?

**Subscale (Institution/Non-Governmental Organization):** Variables of internal operation of the institutions, their strategies, their performance in having access to their strategies and competence of the professional staff are discussed in this scale. First of all it is important how the employees in institutional structures perceive and prioritize the risks. It is observed that when actions and programs for reduction of disaster risks remain much behind the issues of daily activities, no sufficient investment is made in personnel and infrastructure and vocational trainings on these issues are not given much weight.

**Medium Scale (Quarter/District):** Although the institutions achieve their internal operations by help of qualified personnel and adequate infrastructural facilities, the operation may fail after disaster because of weak interinstitutional communication, coordination and cooperation.

**Upper Scale (City/Region/Country):** Any kind of legal frameworks and applications take place in this scale. Furthermore, strategic plans and international frameworks and action plans that Turkiye has participated are also among the variables of this scale. For example, made in accordance with Sustainable Development Goals and the Development Plan, the achievements of the AFAD Strategic Plan with the strategic plans of other related institutions is discussed under this heading.

| Subscale (Institution/Non-Governmental Organization) | Medium Scale (Quarter/District) | Upper Scale (City/Region/National) |
|---|---|---|
| Governance | Interinstitutional Communication | Law |
| Transparency | Interinstitutional Coordination | Regulation |
| Reliability | Interinstitutional Cooperation | Institutional Structure |
| Risk Perception | People Engagement | Representation |
| Communication | ... | Central/Local Administrative Relations |
| Cooperation | | ... |
| Vocational Training | | |
| Duties and Responsibilities | | |
| Resource | | |

**Table 3.** Variables of Institutional Vulnerability (Kundak, 2012)

## Systemic Vulnerability

Systemic vulnerability can be defined as a situation where a subsystem in the greater urban system which is damaged during the disaster makes other systems inoperative. The examples most frequently given in this respect are related to critical facilities such as hospitals and fire departments which become inoperative because of possible damages/losses in transportation and infrastructure systems. Systemic vulnerability does not only involve consecutive damages/losses created by structural damages/losses in their own systems, but also their capacity to be indirectly affected by weaknesses in socioeconomic and institutional structures (Table 4).

## How Should These Variables Be Used in Different Scales?

**Subscale (Institution/Non-Governmental Organization):** Variables in single facility scale generally refer to any weakness that may lead to failure of providing service after disasters. These variables include, for example, the failure of available generator-sets or water tank as measures against power loss or the damage of health equipment because they had not been fixed in a healthcare facility or the occurrence of excessive demand much above the capacity of a healthcare institution.

**Medium Scale (Quarter/District):** The correct orientation of disaster victims after a disaster, receiving the required service and assistance at the point to which they are referred and the safety issues are considered in this scale. This section is also discussed in matters of disaster preparedness.

**Upper Scale (City/Region/Country):** Variables such as site selection for critical facilities and human/vehicle mobility take place in this group. Again clinging to the example of healthcare facility, if you cannot have access to a healthcare facility, which is not affected by the disaster, only because the highway having access to it is damaged, you may end up with not receiving the service you need.

## Ecological Vulnerability

Fragile ecologic resources and endemic flora and fauna are most affected by technological acci-

| Subscale (Critical Facility) | Medium Scale (Quarter/District) | Upper Scale (City/Region/National) |
|---|---|---|
| Lack of emergency equipment/ spares basing on institutional preparedness | Access | Access to the critical facilities |
| Unprepared personnel | Safety | Infrastructural damages |
| Disruption of the operation due to non-structural damages | Orientation | ... |
| | Evacuation | ... |
| | ... | ... |

**Table 4.** Variables of Systemic Vulnerability (Kundak, 2012)

dents triggered by the natural disasters. For example, fire and leaks at industrial facilities after disasters may give great damages to ecological systems. Such loss may directly or indirectly affect first the wildlife and then human health, resulting in economic loss. In the context of ecological vulnerability, first of all the relationship of special areas, agricultural areas and water resources with the settlement and built environment should be defined.

## Local Vulnerability

Locality defines the areas which are constituents of a whole, depending on a variety of determinants/ characteristics. Basic points of local vulnerability also contain geographical integrity along with social, cultural and economic bonds in a region. Furthermore, interregional bonds and interdependencies should also be discussed in this respect. In this context, it should be considered, what range of area the direct and indirect effects of a disaster at a special point could spread over and at what level this effects would be. While direct local effects may occur (loss of life, destruction, damage, etc.), they may occur also adverse effects in the region, outside the region or even at national scale because of indirect effects (displacement of victims, breakdown of production, economic effects, etc.).

## Risk Assessment

It is an assessment basing on risk analysis and description of threats and weaknesses of those who may be exposed to these threats. Therefore the variables mentioned above should be arranged qualitatively and quantitatively in a way that makes it possible to build a comprehensive database. The risk levels determined with such database can be called **low, medium** and **high** (Figure 5). Understanding what and how much contributes to the risk levels defined in this overview, provides important inputs in identifying priority areas for risk reduction activities. An area, for example, located at or very close to the centre of the hazard and whose weaknesses are defined as high upon assessment of many components of vulnerability will also have a high risk level. Such types of areas should be considered as priority areas for giving response during disasters.

Risk estimation is an assessment and closely related with hazard development. When a hazard occurs, losses result upon realization of predefined risks at certain rates. However, the existence of risk reduction factors stand out as critical factors for risk reduction. With respect to these critical factors, issues such as position and accessibility, for example of health facilities and whether they can provide service after disaster should also be studied.

The biggest danger in the risk estimation is to show the risks lesser or higher than required. This situation usually stems from uncertainties related to the components of sources of hazards and vulnerability. Today the words uttered after a disaster by the executives “disaster turned out to be much greater than we expected” show that these uncertainties are not understood well and the least occurrence rate in the probability calculations was neglected. Furthermore, because the occurrence frequency of great disasters is expressed by 100-200 years, it may be considered as a waste of resources making great investments against such great disasters. For this reason, when conducting **Integrated Urban Risk Analyses,** a vari-

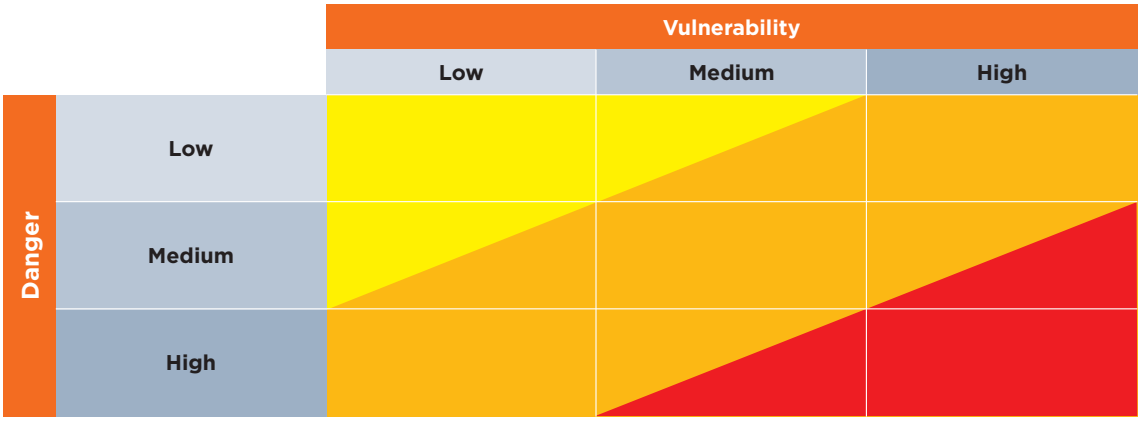



**Figure 5.** Risk Assessment Related to Hazard and Vulnerability (Kundak)

ety of scenarios should be created and loss estimates made, basing on the best situation and worst situation and conduct cost/benefit analyses with respect to response to a disaster.

## Hazard Analysis Is Not a Risk Analysis!

Hazard analyses are generally mistaken with risk analyses. For talking about earthquake risk of an area with high seismicity, there should be probability that people and settlements are adversely affected by earthquake. Figure 6 shows the Earthquake Hazard Map of Turkiye (AFAD, 2019). The hazard levels given in this map are basing on the fault lines and seismic activities in Turkiye. Only if the data from the Earthquake Hazard Map of Turkiye is considered together with variables such as population of the cities prone to these hazard levels, their social and economic data, we may talk about risk assessment.

In her study (2006), Kundak has made earthquake-related risk assessment for Istanbul by using the acceleration values of the earthquake scenarios created by JICA (Japan International Cooperation Agency) in the scope of Basic Plan for Disaster Prevention/Reduction for the City of Istanbul Including Seismic Micro-Zoning (2002). Information on 26 different variables was compiled in the database created by determining the parameters affecting the earthquake risk. However, some variables have been excluded in building phase of the model because they did not represent the generality or affect the assessment as a result of its interaction with another variable. Risk levels were calculated after assessment of fifteen variables on basis of quarters within the metropolitan municipality borders of Istanbul at that time.

**Risk estimation** is an assessment closely related to the development of the hazard. The biggest danger in the risk estimation is to show the risks lesser or higher than required.

As a result, while land use and population and building densities specifically on the study area stood out as risk-increasing factors, earthquake hazard appeared in the last lines among the risk-increasing factors. In this context, data or maps on hazards show only a part of the risk (Figure 7).

Another example showing the difference between hazard and risk is the study of Morabito et al., in2015, on hot air wave and the elderly population (Figure 8). When the population density and ratio of the elderly population about 65 years old to the total population in the cities of the study are considered together, although there are not great deviations in the heat passages, the distribution of risky areas are clearly noticeable in the maps. It is seen that although the hazard, i.e. heat, does not show great change, the risks arising out of this hazard is related with population structure and density.

In the study by Darabi et al. (2020), the flood-related risks of the city of Amol on the shore of the Caspian Sea in north of Iran were examined. In the study, an algorithm was created on basis of flood probability levels and geographical structure of the settlement, added by data on current land texture and demographical and socioeconomic structure of the people. The most important finding in this study, which shows that danger and risk are very different phenomena, is that the risk is higher in areas farther from the stream which constitutes the flood hazard, rather than in the immediate vicinity of the stream (Figure 9).

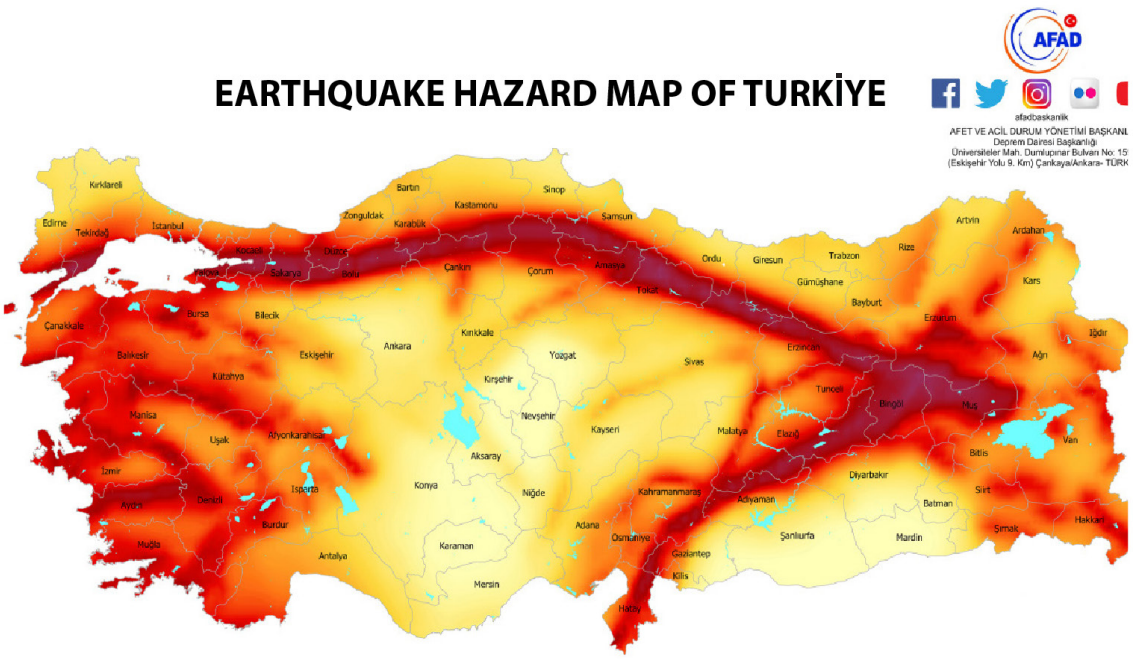



**Figure 6.** Earthquake Hazard Map of Turkiye (AFAD, 2019)

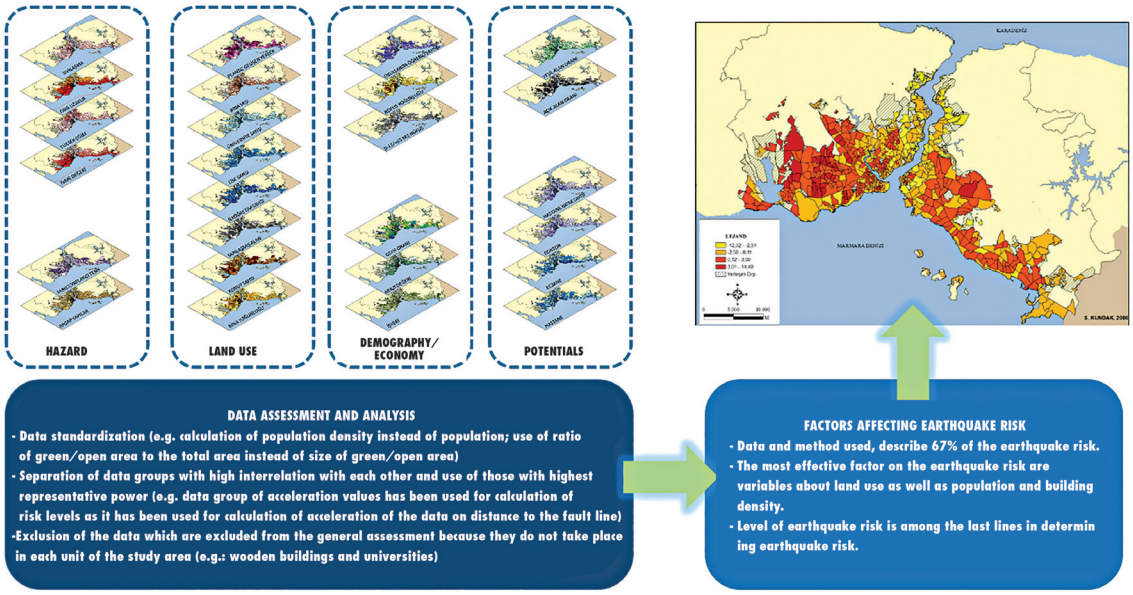
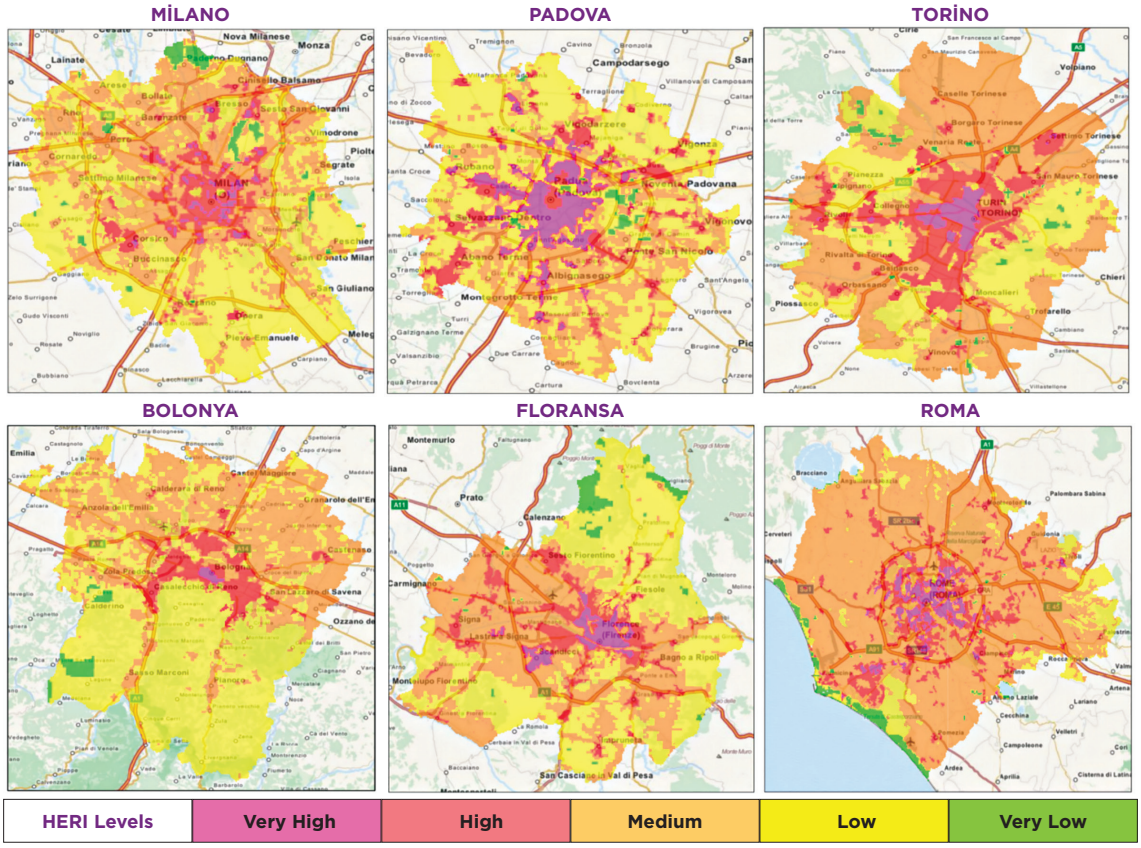



**Figure 7.** Sample Study for Assessment of Earthquake-Related Risks (Kundak, 2006)




HERI (Heat-related Elderly Risk Index)

**Figure 8.** Heat-related Risk Assessment (Morabito et al., 2015)

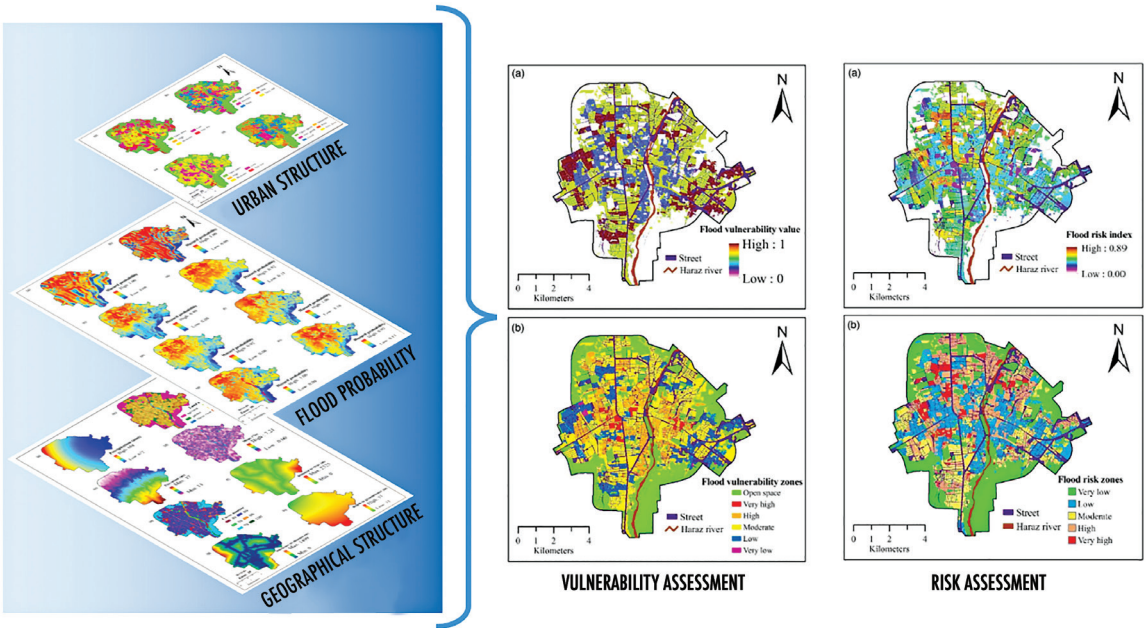



**Figure 9.** Flood-Related Risk Assessment (Darabi et al., 2020)

## Risk Analysis Is a Tool, Not a Purpose!

Risk analysis is an important tool providing assistance in the decision-making process for all kinds of public, institutions and organizations and particularly local administrations. However, risk analyses should not be interpreted as a final product. Although assessments related to the sources of hazards do not change much in course of time (except for hazards related to climate change and new findings related to earthquake modelling), both population and urban texture which are faced with these hazards have quite a dynamic structure. Hence a risk assessment study made in the past may not be guiding for today.

Risk analysis is also an assessment method which provides the most important input for risk management. Again basing on the example of urban scale, assessments to be made to determine what points, axes or parts of the city are more fragile, more problematic and/or more risky make contribution both to critical decision-making system in the planning phase and to formation of disaster-resilient settlements. While in the process from risk analysis to risk management, direct and indirect economic loss estimates can be made, steps can be taken for enhancement of social resilience by making assessments on social perception of risk on both urban and risky areas and developing risk communication strategies. Subject fields given in the grey box of the Figure 10 mostly express the subject areas representing society and individuals. Studies of the social structure and attitude of the individuals towards disasters particularly in metropolitan cities and in areas with high social segregation will help to deal with risk management in an integrated way.

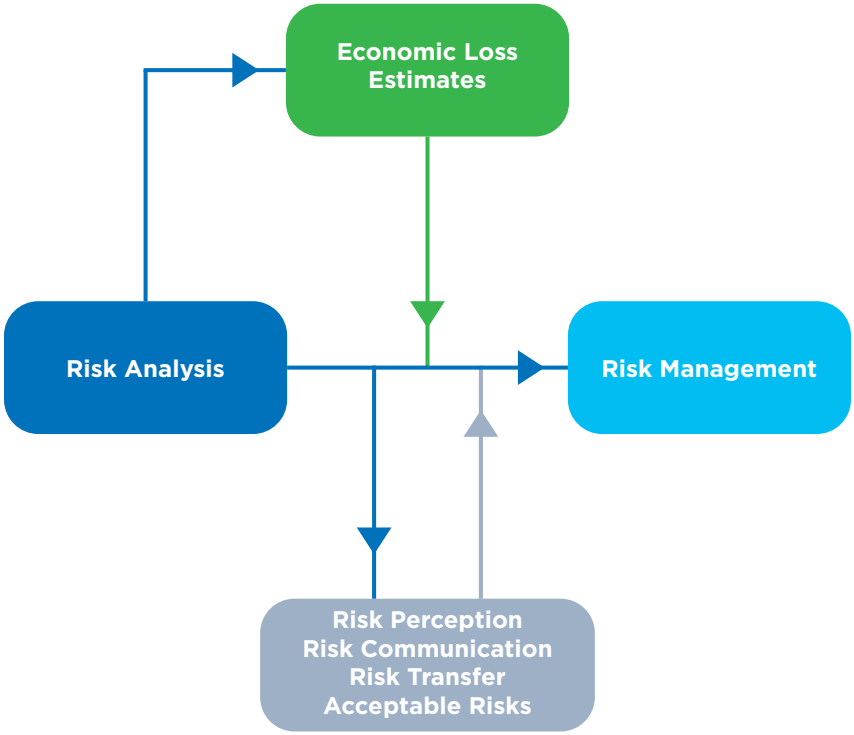



**Figure 10.** Subject Areas Supported by Risk Analysis (Kundak, 2015)

### How Should Risk Analysis Be Used? What is the most effective factor increasing risk across city?

In urban risk analyses, comparative assessment is made between the analysed units. For example, the risk level of a sub-district is compared with another sub-district. Data used in such studies are weighed in risk assessments by means of both statistical methods and different models. Outstanding data are the leading items which increase the risk in the said settlement. In light of these information, appropriate decisions can be taken for risk reduction in city scale.

### What are the priority areas for response?

Urban risk analyses make it possible to identify the most problematic areas of a city. Giving priority to these areas in the planning process is an important step for reduction of urban risks. Information to be derived from the sections above will be indicative for in what areas and to what extent such response can be given.

### What is the effect of plans on urban risks?

Urban risk analyses are made not only basing on the current status, but also on the plans which are in effect or under progress. For example, a study to this effect was made by Olshansky and Wu (2001) for Los Angeles (US), concluding that the new plan would increase the earthquake risk by 17.9 compared to the current status.

## Conclusion

In this chapter, particularly hazards posing threats to cities and then components of the weaknesses of these cities in face of these threats have been discussed. In the last part of the chapter, examples have been presented for scope of the urban risk analysis. Each subject area defined in the chapter underlines a teamwork where these subjects should be dealt and assessed by experts of the related subject matter.

Risk analyses are not studies which are conducted on basis of a single type of model or algorithm. Risk assessments can be conducted by using different and integrated approaches together. The examples given in this chapter cover only a part of them.

# Disaster Risk Reduction in Urban Planning Scale

Especially life and property loss together with economic, social and environmental loss caused by Marmara and Düzce earthquakes in 1999 have brought to the forefront possible efforts for **Risk Reduction,** instead of the conventional approach of relief. Both spread of unplanned and unhealthy settlements related to rapid urbanization and concentration of these developments in the areas exposed to natural hazards in Turkiye make it necessary to spread disaster-sensitive development and improvement policies from the national to local level. When the earthquake hazard map of Turkiye, important development areas and infrastructures are considered together at levels of settlement and country, it can easily be seen that there are probabilities of great social and economic losses.

This chapter first of all describes level of reaction and significance given by the components constituting the urban texture in face of natural and/or technological threats and discusses resilience in city scale and role of the current legal regulations in disaster risk reduction. And in the final part of the chapter, decisions taken in accordance with **11th Development Plan** and Strategic Plan (2019-2023) made by the Ministry of Environment and Urbanization (today: Ministry of Environment, Urbanization and Climate Change) are presented. Furthermore, information about duties and responsibilities of the local administration is also given in the scope of AFAD and TAMP.

## City Texture and Disasters

**Land Use**; for determination of risks that may arise from this use, we should, on the one hand, describe the risks posed by the types of use in the existing built texture by both hazardous areas and juxtaposition of them and, on the other hand, losses that possible effects of these such risks during disaster may give both to the built and socioeconomic environments.

When the earthquake hazard map of Turkiye, important development areas and infrastructures are considered together at levels of settlement and country, it can be easily seen that there are probabilities of great social and economic losses.

Determination of risks related to urban use:

- Incompatibilities in the use of urban area;
- Incompatibilities between the neighbouring uses and hazards arising from them;
- Deficiency of buffer area;
- Areas with border ambiguities (trade, industry, small manufacturing, etc.);
- Homogenous areas (particularly residential areas);
- Mixed uses that constitute different incompatibility categories (residence-service, residence-public, residence-business, residence-small manufacturing, residence-industry, residence-dangerous uses);
- Residential areas developing without plan;
- Areas of ecological importance such as water basin, natural and archaeological sites and agricultural lands; housing and use on or near these areas;
- Geologically inconvenient areas;
- Areas prone to earthquake and landslide; soil characteristics and density and poor physical quality and lack of equipment of existing housing texture in these areas.

**Residential areas;** they should be classified as planned developed old areas, planned developed new settlements, unplanned development settlements/shanty areas, collective housing areas and protected urban areas. These areas should be considered in terms of building density, building quality, age of structures and difference in socioeconomic characteristics of the dwellers. Possible hazards should be described after consideration and risk levels in these areas should be determined. And the residential areas which are located on geologically risky areas (defined as areas with potential of earthquake-related liquefaction and areas and stream beds prone to landslide and geologically inconvenient areas), showing high housing density should be identified.

**Business areas;** they can be discussed in two groups, e.g. industrial and service. **1.** In industrial areas, the risky areas should be identified by overlaying the areas where critical areas prone to all possible hazards and areas where industrial workplaces concentrate. Hazardous uses may cause accidents according to the functions they perform or materials they store and operations they engage. For prevention of possible accidents, the spatial distribution of the structures and facilities which pose threat to the environment, hazards they have by micro-areas (explosive, flammable, pollutant, chemical, organic, etc.) and inventory of concentration points should be developed. **2.** Service areas contain commercial, finance, R&D and similar activities. The risks facing these sectors in case of a disaster that may affect the entire city should be identified. For assessment of the business areas, areas of mixed use have different importance. While some incompatibilities reducing life quality may be observed among different types of land use may be seen in these areas, some situations may also be experienced that may cause secondary disasters to further increase loss during and after disaster.

If the structures such as hospital, school, religious facility, administrative facility and their locations are not damaged due to the disaster and remain usable, then operations of the response phase after the disaster can be performed regularly.

**Transportation and infrastructure** are factors providing mobility in the city. Any problem in these facilities may cause problems spreading to the entire city and affecting response operations adversely.

**Open and green areas;** they are defined as areas to be used for assembly, access by air, storage and distribution of emergency research and rescue materials, tents or temporary housing area for accommodation under emergency conditions.

**Emergency services;** they remain outside the uses mentioned above and contain hospital, school, religious facility, administrative facility and similar structures which are defined as equipment in the urban planning. If not dam-

aged by disaster and still usable, the structure provides regular operation of the response phase after disaster. Together with critical facilities, **Transformation and Infrastructure Facilities** should also be assessed in detail both for possible risks facing them and their importance after disaster. Transportation and infrastructure are factors that provide mobility in the city. Any problem to be encountered in these facilities may cause spread of the problem over the entire city and adverse effect on response operations.

## Resilience in City Scale

In the following years of the **Resilient Cities Campaign** (2010) led by the United Nations, numerous methods of assessment and samples of good practices were opened up for discussion. These studies can be roughly categorized under four main headings:

### 1. Urban Resilience against Local Disasters

Urban resilience against local disasters involves **Strategies** and **Actions** to enhance resilience against natural threats that affect a settlement or area. First of all, the source of hazard or, upon occurrence of such hazard, the areas that may be affected from it should be avoided. Under this heading, there are suggestions such as **narrowing the steam beds and prohibiting any settlements very close to them or restricting dense housing on the unstable soils or in the areas of possible soil amplification.** In the next step, matters of population and building density and uncontrolled growth are studied. In this context, it has been observed that rapidly growing cities with high population density are much more fragile against disasters and they could not resume normal life by their own means and in short time. And, finally, we see two key words: Robustness and Redundancy. Robustness means construction of all structures (infrastructure and superstructure systems) in accordance with the applicable regulations and durable against possible natural threats. And redundancy is existence of a thing more than required. Although it seems to have a negative association, the definition given here refers to use of the spares or alternatives of both emergency facilities and infrastructure systems in the present time and in case of disaster and emergency.

### 2. Resilience against Climate Change

**Regarding to climate change, the focus is upon reduction of Carbon Footprint, Use of Renewable Energy Resources and Concepts of Smart Buildings/Cities.** Regarding to city texture mixed use is supported. The aim is to meet the people's daily needs and activities while decreasing their vehicle-dependent mobility. Another advantage is that the spaces are used with similar mobility and liveliness at all hours of the day. And, as to climate change and agricultural production, the objective is use of the local resources of the resilient settlements at maximum level. For example, it is suggested that each settlement should be capable to get its agricultural products from an area in diameter of 200 km (Resilient City, 2020). Furthermore, approaches giving priority to protection of ecological diversity and protection of natural resources are also steps supporting enhancement of resilience in face of climate change.

### 3. Urban Resilience for Systemic Functioning

**Two factors stand out in connection with resilience against climate change, e.g. Transportation and Economy.** The subject areas under this heading involve proposals for maintenance of functional operations of the cities in both crisis and normal times. In the transportation system of the resilient cities, applications giving priority to pedestrian transport/access are highlighted. In the framework of resilient city economy, in addition to the approaches basing on local and regional economy, support for alternative energy resources and spread of systems not depending upon the use of private vehicles for transportation are recommended.

### 4. Urban Resilience for Enhancement of Life Quality

**Regarding urban resilience for enhancement of life quality, Urban Design Applications stand out.** In this respect, it is concentrated on design approaches necessary to define different spaces in the city as a "place" by gaining identity. Integration of natural environment (green area, recreational areas, etc.) and applications for preservation of natural resources are among proposals for the effective use of natural resources by local people and the reduction of adverse effects of climate change.

### Legal Instruments for Disaster Risk Reduction in City Scale

Law 7269 on "Measures to Be Taken and Aids to Be Provided for Disasters Affecting the Public Life", the oldest and still effective law regarding disasters, entered into effect in 1959. Although this law mentions about disasters and about assessments and aids to be made after disaster, Article 2 containing the definition of **Area Prone to Disaster** and Article 14 containing description of future investments in such areas stand out as the most important legal tools for risk reduction in city scale.

In the framework of resilient city economy, in addition to the approaches basing on local and regional economy, support for alternative energy resources and spread of systems not depending upon the use of private vehicles for transportation are recommended.

Entered into effect in 1985, the Zoning Law 3194 constitutes **Backbone of the Planning System and Hierarchy** in Turkiye. All kinds of arrangements and basic approach shaping the future of cities are defined by referring to this law. However, when looking at the law and governing regulations, we see no detailed statement for reduction of disaster risks. The clearest reference to disasters takes place in Article 9 of the law which describes powers of the ministry under conditions considered necessary.

Referring to the status of the areas subject to the regulation, Article 18 comes up with a statement regarding flood control facilities and describing how the implementations for prevention of floods will be performed in what manner in such fields of the regulation. Article 27 describes the acts of the parliament and makes a short reference to disasters. Although the supplementary Article 8 does not have any direct

content for reduction of disaster risks, it highlights that density cannot be increased on basis of land lot:

*"On building blocks which are not less than 1000 square meters; plan modifications which increases population, building density, number of floors, building height or plan changes bringing functional changes which require the use of cultural facilities, social and technical infrastructure, had to be provided in the centre of the block in an area of not more than 500 meters in diameter."*

Law on Transformation of Areas Prone to Disaster Risk (No. 6306 of 2012) and related Governing Regulation contain two new technical statements in meaning of planning: **Risky Area/ Structure** and **Reserved Area.**

**Law 7269 on Measures to Be Taken and Aids to Be Provided for Disasters Affecting the Public Life (1959)**

**ARTICLE 2**

When flooded areas or areas prone to flood are, upon proposal of the Ministry of Zoning and Housing, identified by the Ministry to which the State Hydraulic Works is affiliated, and the areas that experienced or may experience disasters such as earthquake, landslide, rock fall and avalanche are identified by the Ministry of Zoning and Housing and the borders of them that occurred or may occur in the cities and town are registered in the zoning plan and, in case of towns and villages having no zoning plan, in the maps or sketches once their borders are identified, they are qualified as area prone to disaster by a Presidential Decree and the borders identified in this manner, (..) are locally announced by the respective governorships.

**ARTICLE 14**

With respect to construction of buildings and housing in cities, towns and villages included in the disaster zones identified and announced as set forth in article two, the locations which are deemed hazardous by technical boards and whose borders are indicated on the sketches are deemed forbidden disaster areas and in fact is immediately announced by the municipality, if any, and by village council in the villages.

...

Borders of the forbidden disaster area are narrowed down or eliminated completely for prevention of the hazard through measures to be taken.

...

**Table 5.** Law on Measures to Be Taken and Aids to Be Provided for Disasters.

| Zoning Law 3194 (1985) |
| --- |
| **ARTICLE 9**<br>The Ministry is authorized to make, cause to make, modify and approve directly all or part of any zoning plans and modifications thereof related to infrastructure, superstructure and transmission lines for public structures and power plants; any plans and modifications thereof required to be made because of disasters affecting public life or for housing estate construction or for implementation of Anti-Squat Law; metropolitan zoning plans which involve more than one municipalities or zoning and settlement plans in the locations in or around which railway or highway passes and which have airport or connection to airport or seaport by giving information to and, if required, in cooperation with the concerned municipalities or other administrations. |
| **ARTICLE 18**<br>It is essential that the areas of flood control facilities located in the regulated area should be met by the Treasury-owned area after reduction of the regulated share for the uses set forth in this subparagraph. However, if sufficient area cannot be allocated for the flood control facility and the provided regulated share does not exceed the ratio set forth in the subparagraph two, share is also allocated for the flood control facility from other lands and fields subject to the regulation after allocation of the regulated share for the uses specified in this subparagraph up to the rate laid down in the subparagraph two. |
| **ARTICLE 27**<br>Unless otherwise stated in the approved plans of higher level, the areas prone to disaster such as landslide and rock fall and areas which are sanitarily and geologically undesirable for construction of structures on them within the borders of the settlement area of village and main roads of the village and their widths are determined on the existing maps or cadastral map sheets by resolution of the respective town council in places where municipality border is city border and by resolution of provincial council in other places. |
| **SUPPLEMENTARY ARTICLE 8**<br>Plan modifications are made in accordance with the characteristic of the settlement in such a way that they will not impair primary resolution of the plan, their maintenance and integrity and will not disturb social and technical infrastructure balance and provide their compliance with the technical needs. For proposed plan modifications, a social and technical infrastructure impact evaluation report containing analysis of requirements is drawn up and presented to the administration which will approve the plan. On basis of lot, no modification can be made in the zoning plan which will increase building density, number of floors and building height. On building blocks which are not less than 1000 square meters; plan modifications which increases population, building density, number of floors, building height or plan changes bringing functional changes which require the use of cultural facilities, social and technical infrastructure, had to be provided in the centre of the block in an area of not more than 500 meters in diameter. |

**Table 6.** Zoning Law.

*"Risky structure: It refers to a structure which remains inside or outside a risky area and completed its economic life or detected that it has a risk of collapse or get heavy damage basing on scientific and technical data."* When a structure is subject to such an assessment, inspection is made in accordance with the Principles for Identification of Risky Structures attached to Annex-2 to the Governing Regulation of the Law 6306.

*"Risky area: It refers to an area which has risk to cause life and property loss due to its soil structure or housing on on it, determined by the Ministry of Administration by seeking opinion of the Disaster and Emergency Management Presidency and decided by the Council of Ministers upon proposal of the Ministry."* The Governing Regulation also makes an assessment referring to the definition of Area Prone to Disaster from the Law 7269. For the assessment of risky areas, criteria in ANNEX-A of the provisions given in the assessment phases of risky structures are used.

*"Reserved structure area: It refers to areas determined by the Ministry directly or upon request of TOKI or Administration by seeking opinion of the Ministry of Finance for use as new settlement area in the applications to be performed pursuant to this Law."* These areas are defined as reserved residential and office areas which are new and healthy with their safe living environments to which the people living in the risky areas and risky structures will be transferred. Furthermore, they are also specified as areas where any kind of applications may also be performed to generate income and revenue.

Regulation on Making Spatial Plans (2014) refers to the principles and planning and to **Disaster and Urban Risks** in the plans in different scales. It is specified that natural hazards and areas bearing urban risks in connection with the land to be planned should be determined in the analysis and assessments to be made according to the principles and rules of the general planning.

Pursuant to the **Regulation on Zoning in the Planned Areas** (2017), in addition to the articles regarding restrictions in the areas prone to disaster, in accordance with the additional article of the revision in 2019, following definition was added: *"Public gardens: They refer to great green areas bringing the people and nature together, meeting recreational requirements which may also be used as areas of assembly in case of disaster and the matters such as site selection, size, functions and design are specified in the Public Gardens Guide to enter into effect after issued by the Ministry."*

## High-Level Decisions and Strategies

In 2009, the Disaster and Emergency Management Presidency (AFAD) was established, attached to the Ministry of Interior, Republic of Turkiye pursuant to the Law 5902 on Organization and Functions of Disaster and Emergency Management Presidency. *"AFAD is a versatile, multi-actor, work-oriented, flexible and dynamic organization, taking care of rational use of resources, basing on interdisciplinary operations in its activities and assures cooperation among all organizations and enterprises of the country for planning, orientation, support, coordination and effective implementation necessary for prevention and mitigation of disaster risks, response to disasters and fast completion of recovery operations after disaster."* (afad.gov.tr)

| Regulation on Making Spatial Plans (2014) |
|---|
| **ARTICLE 7 - General Essentials of Planning**<br>(ğ) Plans are based on disaster, geological and natural data. |
| **ARTICLE 8 - Research and Analysis**<br>(10) If it is considered necessary for settlement or urban built environment with high disaster and other urban risks, urban risk analyses or avoidance planning operations are performed. Plans are also based on the risk-reducing measures taken for disaster and other urban risks. |
| **ARTICLE 14 Principles and Essentials of Planning**<br>b) Analysing and defining hazards and risks and taking measures for mitigation of disaster-related loss. |
| **ARTICLE 19 – Principles and Essentials of the Plan (Environmental Plan)**<br>h) It is essential to take into consideration the risk-resulting recommendations basing on the existing reports and geological surveys on disaster hazards. |
| **ARTICLE 21 – Principles of Zoning Plan**<br>9) Zoning plans reflects comments of the organizations and enterprises on energy transmission lines, stream protection zones, flood risk areas, areas prone to disaster and similar areas which have direct or indirect adverse effects on human health and safety.<br><br>(13) Zoning plans pay attention to requirements of open area, road and other spatial needs during disaster and emergency. |
| **ARTICLE 22 – Threshold Analysis**<br>(2) Topographic, geological-tectonic, hydrogeological structure characteristics and land use, agricultural and forest areas, drinking water basins, protected sites and other protection areas, fragile areas, seashore, infrastructure, natural and physical data and disaster hazards are analysed and assessed altogether. |
| **ARTICLE 23 - Master Zoning Plan**<br>v) Natural disaster hazards and urban risks, , and if any, risk management and avoidance plans. (to be conducted by getting information from the analyses list) |
| **ARTICLE 24 – Implementation Zoning Plan**<br>i) Geological surveys for identification of appropriateness for settlement by taking into consideration the disaster hazards. (to be conducted by getting information from the analyses list) |
| **ARTICLE 27 – Principles of Preparing a Zoning Plan for Protection**<br>c) Goals, strategies and implementation principles are specified for area-specific strategies regarding solution of problems identified in the preparedness phase of the zoning plans for protection purposes and, if required, how the activities and building stock in the registered cultural assets and protected sites can be made more resilient and safe against earthquake, flood, landslide, fire, rock fall and similar disasters. |
| **ARTICLE 29 Planning Principles for Integrated Seashore Areas**<br>b) Disaster hazards (earthquake, landslide, rock fall, flood, tsunami, etc.) (to be conducted by getting information from the analyses list) |

**Table 7.** Regulation on Making Spatial Plans

**National Earthquake Strategy and Action Plan** (UDSEP) prepared by AFAD for the period of 2012-23 contains three primary strategies: **(1)** Learning Earthquakes; **(2)** Earthquake Safe Settlement and Housing; **(3)** Coping with Effects of Earthquake. Target and some of the defined goals under these strategies are directly related to risk reduction studies in urban planning (Table 8). In 2010, the Ministry of Environment and Urbanization prepared the **Integrated Urban Development Strategy and Action Plan** (KENTGES) (2010-23). In the preparation phase of UDSEP, KENTGES strategy and action plan and goals and strategies of other concerned ministries, institutions and organizations for earthquake and other disasters were taken as basis in the related parts of it (Table 9).

Prepared by the Ministry of Environment and Urbanization, **Climate Change Strategy of Turkiye** (2010-23) defines short-medium-long term goals for many sectors, underlining things required to be performed and considered in city scale.

**In medium-term:**

- Widespread use of environment-friendly vehicles such as bicycle and arrangements promoting pedestrian access in the cities will be encouraged.
- Subway and light railway systems and public transportation systems will be extended, particularly in big cities.
- Smart transport system applications will be developed.
- Practices will be developed for enhancement of energy efficiency in transportation.
- Adaptation/reduction strategies for interaction of climate change and settlement will be developed basing on scientific studies.

**In long-term:** Involves mostly goals for land use:

- Adaptation/reduction strategies for climate change in the settlements will be developed and principles and procedures for planning and housing will be established.
- Strategies will be determined for effective use of urban land to prevent formation of urban heat islands.
- Increase of open and green area systems in the urban areas will be promoted and urban forestry will be developed.
- Measures will be taken for reduction of urbanization pressure on the rural and natural areas.

However, within the scope of the strategic plan, reviewing the legislations on **Disaster** and **Risk** and associating them with the plans of the **Environmental Impact** assessment processes are also included.

Prepared by the Ministry of Food, Agriculture and Livestock for 2014-20, the **National Rural Development Strategy** underlines goals involved with arrangements for the development of urban areas and it also refers to effects of urban development and expansion. Especially under the heading “Threats”, it mentions environmental pollution associated with industrial and manufacturing facilities located in and/around the urban areas and pressures arising from expansion of the cities towards the rural areas and use of the fertile agricultural fields beyond their intended use. And among the strategic goals and objectives, the subject matter of “provision of safe settlement conditions for fighting against natural disasters” constitutes an important one for planning of rural area and development of physical infrastructure.

**A – Understanding Earthquakes**

**B –Earthquake-Safe Settlement and Construction**

**TARGET B.1: Providing Earthquake-Safe Settlement and Earthquake-Resilient Construction**

**STRATEGY B.1.1** Methods basing on earthquake hazards and risks will be given importance and priority in the operations of planning, environment and urbanization.

**Action B.1.1.1.** Development Agencies will take into consideration the earthquake hazards and risks in the domain of their responsibilities and perform activities to reduce or not to increase these risks.

**Ministry in charge:** Ministry of Development

**Related organizations:** Development Agencies, AFAD, Metropolitan Municipalities and Municipalities, Ministry of Environment and Urbanization, Governorships, Provincial Special Administrations

**Action B.1.1.2.** Provincial Special Administrations will identify hazards and risks of the city prior to preparation of the city development and environment plans and develop risk-reduction strategy plans and ensure harmonization of these plans with the environment and development plans.

**Organization in charge:** AFAD

**Related organizations:** Ministry of Interior, Ministry of Environment and Urbanization, Development Agencies, Ministry of Development, Metropolitan Municipalities and Municipalities, Provincial Special Administrations

**C- Coping with the Effects of Disaster**

**TARGET C.2:** Making Legal Arrangements for Making the Earthquake Strategy Integral and Effective

**STRATEGY C.2.1** When preparing a new draft law related to disasters, effective use of the earthquake-related laws and regulations will be assured.

**Action C.2.1.1.** Regulations related to earthquake will be reviewed and collecte under single regulation.

**Organization in charge:** AFAD

**Related organizations:** Related Public Institutions and Organizations, Ministry of Environment and Urbanization, Universities, Local Administrations

**Action C.2.1.2** Structure law and urban transformation laws will be enacted.

**Ministry in charge:** Ministry of Environment and Urbanization

**Related organizations:** AFAD, Ministry of Forest and Water Affairs, Related Ministries, MetropolitanMunicipalities and Municipalities, Governorship, Non-Governmental Organizations, TOKI.

**Table 8.** Risk Reduction in City Scale under National Earthquake Strategy and Action Plan.

| Target11: Reduction of Disaster and Settlement Risks |
|---|
| **STRATEGY 11.3:** Urbanization and planning legislation will include hazard and risk analysis and avoidance planning for reducing disaster and settlement risks. |
| **Action 11.3.1:** Legal arrangements will be made regarding risk avoidance planning . |
| **Action 11.3.2:** A handbook about Risk Avoidance Planning will be prepared. |
| **Action 11.3.5:** Factors posing threat to human health and settlement safety will be identified in city scale. |
| **STRATEGY 11.5:** Emergency communication infrastructure will be reinforced for effective disaster response, and facilities such as evacuation corridors, assembly, provisional housing, disaster support centres and emergency facilities will be built. |
| **Action 11.5.2:** Studies will be made for determination of social facilities to be used in emergency. |

**Table 9.** Urban Scale Risk Reduction in the Scope of Integrated Urban Development Strategy and Action Plan.

The Turkish Disaster Response Plan (TAMP), prepared by AFAD in 2013, is the most comprehensive plan ever made. As an action plan, it is very important for different events and situations, including the worst scenarios. TAMP primarily determines **Response Levels.** These levels are determined in line with information received from the Provincial Disaster and Emergency Management Centre in charge of the area of disaster or crisis. In the TAMP system, **Working Groups** have been set up for effective operation of the organization. Main coordination of the working groups is under responsibility of the Disaster and Emergency Management Centre, Republic of Turkiye.

**Operations Service** is divided into two main branches, e.g. Emergency and Initial Recovery and consists of eighteen sub-working groups in total. There are five working groups under **Logistics and Maintenance Service,** one working group under **Information and Planning Service** and four working groups under **Financial and Administrative Services.** In the framework of TAMP, the primary solution partner (primary responsible unit) and the support solution partner are defined together with their functions and responsibilities for each working group.

The most important convenience that this system brings is that it is clearly specified that the related institutions and organizations should be in coordination and cooperation with disaster priorities of the units and that these institutions and organizations organize their own resources and trained personnel in accordance with the specified functions and responsibilities. Although when published first, the place of TAMP in the urban planning process and practice has not been clearly expressed, the matters of risk reduction, areas of assembly and logistics which are frequently mentioned in the strategies and action plans made later are forming the intersection of TAMP and urban planning (Kundak et al., 2019, TUBITAK final report).

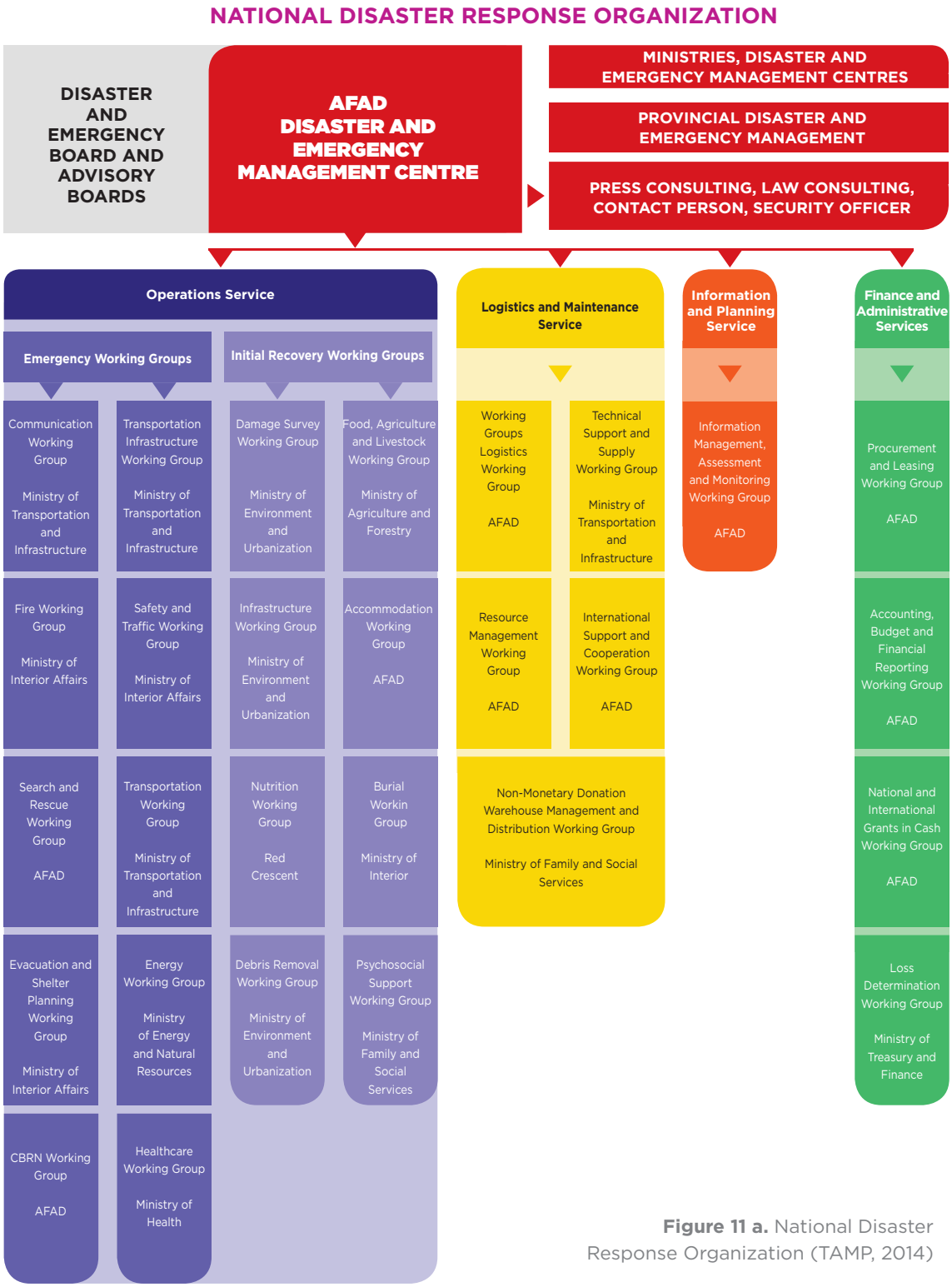



**Figure 11 a.** National Disaster Response Organization (TAMP, 2014)

## LOCAL DISASTER RESPONSE ORGANIZATION

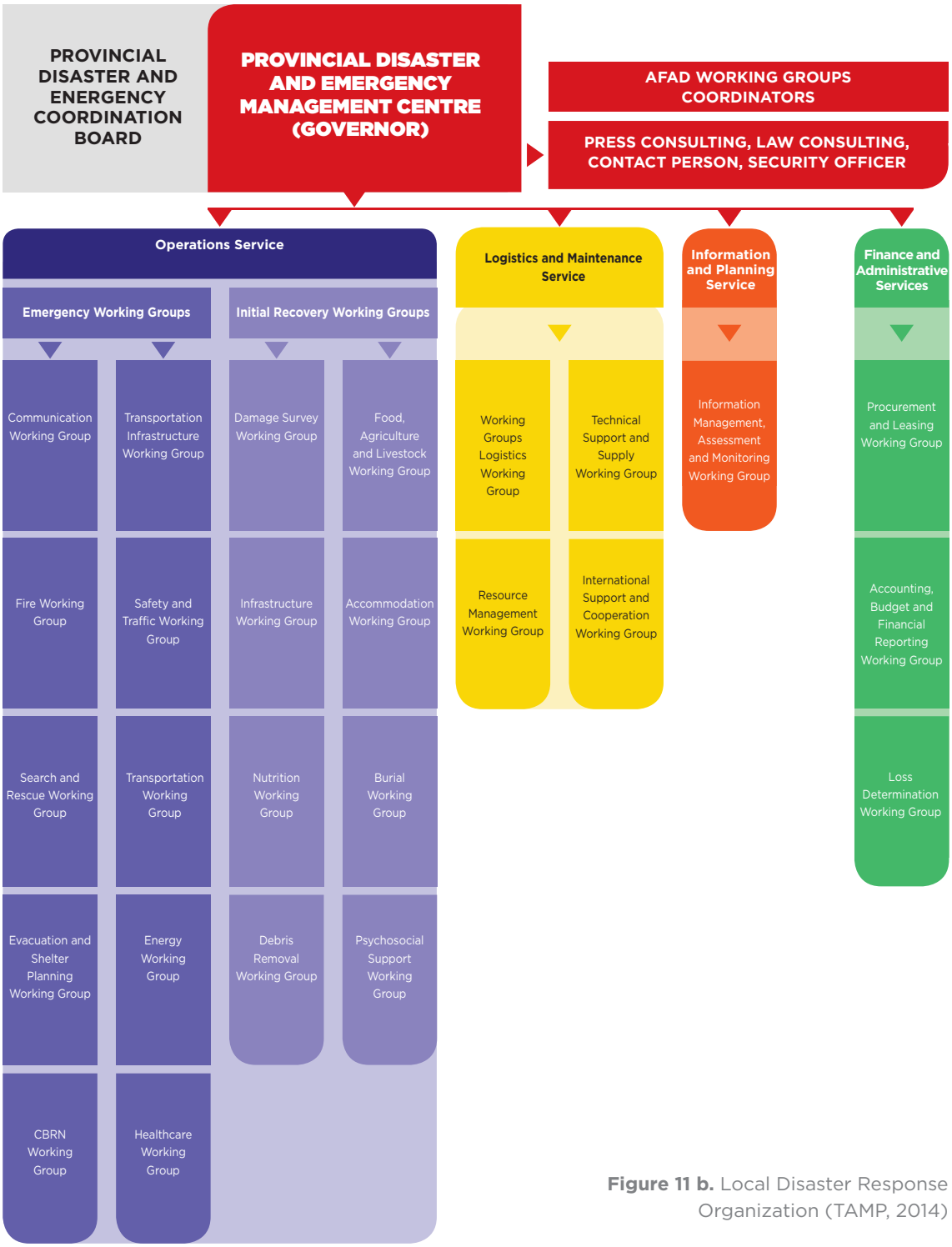



**Figure 11 b.** Local Disaster Response Organization (TAMP, 2014)

In TAMP, local administrations (city centre and district municipalities) are shown as support solution partner of 12 sub-working groups (Figure 11 a, b):

1. Accommodation Working Group
2. Evacuation and Shelter Planning Working Group
3. Non-Monetary Donation Warehouse Management and Distribution Working Group
4. Search and Rescue Working Group
5. Working Groups Logistics Working Group
6. Debris Removal Working Group
7. Loss Determination Working Group
8. Psychosocial Support Working Group
9. Transportation Working Group
10. Technical Support and Supply Working Group
11. Transportation Infrastructure Working Group
12. Nutrition Working Group

In this groups, functions and responsibilities expected from the local administrations are concentrated upon the main headings of Initial **Recover**, **Logistics** and **Information Supply.** In this context it is expected that the local administrations have an up-to-date database on current status in their domains, plan spatial organizations for disaster logistics previously and support high level operation with respect to classification and distribution for the aids to come after disaster (Kundak et al., 2019, TUBITAK final report).

As the planning phase follows a hierarchical structure, the lower level planning should comply with the upper level planning. In this respect, **11th Development Plan** and **2019-23 Strategic Plan** made by the Ministry of Environment and Urbanization basing on it, both being top level plans for urban planning and reduction of disaster risks in Turkiye, contain all subject matters which are binding to all other plans.

Basic construction of the Strategic Plan prepared by the Ministry of Environment and Urbanization has been correlated with the **Sustainable Development Goals.**

In this framework, there are many correspondences in Goal-11 and Goal-14 about the climate change concerning cities and settlements in the Strategic Plan (Table 10). Furthermore, those of the decisions specified in the 11th Development Plan that both take place in the domain of responsibility of the Ministry of Environment and Urbanization and are included in the matter of reduction of disasters risks are mostly covered by the heading of Urban Transformation (Table 11). In line with the goals stated in the Strategic Plan, the ***Urban Design Guides*** (2016), which were proposed in earlier stages and later in the ***Manual for Preparation of Urban Design Guide for Local Administrations*** (2017), have been completed.

AFAD is working on urban-based databases for providing effective response services during and after disaster. The **Disaster Management and Decision Support System** (AYDES) was designed to ensure the operation of the process during disasters and provide infrastructure for data processing to help in the phase of risk reduction and preparedness before the disaster and in the phase of response and recovery after the disaster. This infrastructure also works on current database of cities. Hence each change in the database (land use, structural status, road maintenance operations, etc.) should be entered in the system. And regarding temporary shelter areas, **Disaster Temporary Urban Management System** (AFKEN) has to be involved.

| SDG Goal | Target of SDG | Goal of Strategic Plan | Target of Strategic Plan |
|---|---|---|---|
| **GOAL 11: Making the Cities and Settlements Inclusive, Safe, Resilient and Sustainable** | **11.5** Focusing on protection of the poor and fragile people, reduction the number of deaths arising from, and people affected by disasters, including water-sourced disasters considerably and the reduction of the relative share of the economic loss in the global GDP to a great extent by 2030. | **GOAL 1:** Protection of environmental and natural resources; providing sustainable management of the environment, fight against climate change and enhance the adaptation capacity of the country. | **H 1.2** Struggle against climate change with realization of the environmental infrastructure and technical support projects in the Sector Operational Program of the Environment and Climate Action. |
| | | **GOAL 3:** Achievement of energy-effective, environmental-friendly and human-oriented cities in Turkiye by 2023, which have a new urbanization vision and protect natural history and cultural values basing on horizontal architecture and which are prepared against disasters. | **H. 3.4.** Urban transformation; Adopting transformation on-site in areas prone to disaster risk, the process will be accelerated by means of transformation strategies specific to each province and new financial models and approaches will be developed and historical centres will be restored and industrial areas will be transformed in compliance with city texture and based on area, taking into consideration the current social structure. |
| | **11.7** Provision of general access to green and public areas in safe, inclusive and accessible manner especially for women, children and elderly people by 2030**.** | **GOAL 3.** | **H 3.1** Public gardens will be made widespread to enhance life quality of the people living in the cities and develop areas in touch with nature and Public Garden operations will be carried out over an area of 81 million m2 by 2023. |
| | **11.b.** Considerable increase in the number of cities and settlements by 2020, adopting and implementing integrated policies and plans. which give priority to inclusiveness, resource efficiency, compliance with climate change, reduction of climate change and which are resilient to disasters and also compliant with the Sendai Disaster Risk Reduction Framework 2015-2030 and integrated with the disaster risk management. | **GOAL 1.** | **H 1.2.** |
| | | **GOAL 3.** | **H 3.2** Spatial strategy, zoning planning, maps, surveys, land and field arrangements and urban design studies will be carried out with an urbanization approach that revitalizes the identity of our cities, takes into account the social texture and emphasizes the concept of neighbourhood based on topography and horizontal architecture. |

| SDG Goal | Target of SDG | Goal of Strategic Plan | Target of Strategic Plan |
|---|---|---|---|
| **Goal 13: Acting Urgently to Fight against Climate Change and Its Effects** | **13.1** Enhancement of resilience and adaptation capacity in face of hazards arising from climate change and natural disasters. | **GOAL 1.** | **H 1.2.** |
| | | **GOAL 3.** | **H 3.4.** |
| | **13.2** Inclusion of measures against climate change in the process of national policies, strategies and planning. | **GOAL 1.** | **H 1.2.** |
| | **13.3** Providing training on and raising awareness about the matters such as prevention of climate change and reduction of its effects and development of individual and institutional capacity. | | |

(SDG – Sustainable Development Goals)

**Table 10.** Sustainable Development Goals and Strategies of the Ministry of Environment and Urbanization by 2019-2023 for the Reduction of Disaster Risks.

| 11th Development Plan | Tasks/Requirements Assigned to the Ministry of Environment and Urbanization | Goal | Target |
|---|---|---|---|
| **2.4 Liveable Cities, Sustainable Environment**<br><br>**2.4.4 Urban Transformation** | **690.1** For urban transformation actions, the restoration of historical city centre areas will be made widespread and, in this context, a finance model will be developed and shared with the local administrations and the historical city centres in 81 provinces will be transformed by focusing on the urban identity and designed basing on horizontal architecture and human-oriented approaches. | **GOAL 3.** Achievement of energy-effective, environmental-friendly and human-oriented cities in Turkiye by 2023, which have a new urbanization vision and protect natural history and cultural values, basing on horizontal architecture and which are prepared against disasters. | **H 3.4.** Urban transformation; adopting transformation on-site in the areas prone to disaster risk, the process will be accelerated by means of transformation strategies specific to each province and new financial models and approaches will be developed and historical centres will be restored and industrial areas will be transformed in compliance with city texture and also area-based, taking into consideration the current social structure. |
| | **691.1** Urban transformation strategies including data on risky and reserve areas, social structure analysis, economic integration, infrastructure status, financing models and province-based transformation targets will be prepared on the basis of provinces and districts. | | |
| | **692.1** Social impact analysis will be conducted prior to urban transformation applications. | | |
| | **692.2 P**articipation principles will be defined in the urban transformation projects, and progress of the process in cooperation will be achieved. | | |
| | **693.1** For urban transformation actions, multi criteria model for prioritization on basis of settlement area will be developed taking into consideration the parameters such as disaster risks and hazard with respect to life and property loss, size of population they affect, financial requirements and existence of reserved area, and also settlement areas will be prioritized in this respect. | | |
| | **693.2** Buildings in the hazardous and risky areas will be prioritized by risk and the urban transformation services will be provided for the housings nationwide and for industrial sites located in the cities according to the requests and requirements. | | |
| | **693.3** A financial model will be developed regarding to urban transformation projects, for the installation of infrastructures of the transformation areas and for fulfilment of financial needs of the owners by means of rent aids. | | |

| 11th Development Plan | Tasks/Requirements Assigned to the Ministry of Environment and Urbanization | Goal | Target |
|---|---|---|---|
| | **693.4** Industrial parcels belonging to the treasury will be sold to small industrial cooperatives to provide resources for urban transformation applications. | | |
| | **693.5** For urban transformation applications in Istanbul as a whole and planning of areas to be zoned for construction, population density will be taken into consideration and areas of assembly will be allocated for disasters and emergencies. | | |
| | **693.6** Areas close to the fault line will be identified in Istanbul and priority will be given to such areas during the urban transformation operations. | | |
| | **693.7** Considering the building stock in existing built areas in Istanbul, disaster risk prioritization study will be made in existing infrastructure systems for enhancement of urban resilience and these infrastructures will be renewed if required. | | |
| | **694.1** For spatial planning studies, the Disaster Risk Reduction System prepared by AFAD will be used. | **GOAL 3.** | **H 3.2.** Spatial strategy, zoning planning, maps, surveys, land and field arrangements and urban design studies will be carried out with an urbanization approach that revitalizes the identity of our cities, takes into account the social texture and emphasizes the concept of neighbourhood based on topography and horizontal architecture. |
| | | | **H 3.3.** The spatial planning system will be developed to include participation and supervision processes, and the change and development of spatial quality will be monitored, and support and guidance will be provided to local governments for the development of urban and social technical infrastructure in cities. |
| | | | **H 3.4.** |
| | **694.2** Criteria for zoning planning will be developed for consideration of the disaster risks in the planning phase and zoning planning according to disaster hazards and risks will be made. | **GOAL 3.** | **H 3.2.** |
| | **695.1** Procedures and principles for application of urban transformation supporting domestic and innovative production will be identified and regulations will be developed in this line. | **GOAL 3.** | **H 3.4.** |

| 11th Development Plan | Tasks/Requirements Assigned to the Ministry of Environment and Urbanization | Goal | Target |
|---|---|---|---|
| **2.4. Liveable Cities, Sustainable Environment**<br><br>**2.4.7 Preservation of the Environment** | **714.2** Planning, implementation and capacity-building operations will be performed, including national and regional adaptation strategies for increasing capacity to adapt to adverse effects of the climate change. | **GOAL 1.** Protect the environment and natural resources, provide sustainable management of the environment, struggle against climate change, and increase the adaptation capacity. | **H 1.2.** Climate change will be combated, and environmental infrastructure and technical support projects included in the Environment and Climate Action Sector Operational Program will be carried out. |
| | **714.3** For adapting to the climate change and taking necessary measures, the requirements will be identified on region and city basis and Climate Change Action Plans will be prepared for 7 regions, particularly Black Sea Region. | | |
| | **718.1** Risk management and emergency response capabilities will be developed against big-scaled industrial accidents. | **GOAL 2.** Monitoring and inspecting the customer circles in order to improve the environmental quality and to accelerate the environmental impact assessment processes of investments. | **H 2.3.** E-inspection system will be developed as smart inspection application, environmental inspections on risk assessment basis will be made widespread and environmental indicators will be developed. |
| **2.4. Liveable Cities, Sustainable Environment**<br><br>**2.4.8 Disaster Management** | **724.1** Durability of the critical infrastructure facilities against disaster in Istanbul will be enhanced. | **GOAL 3.** | **H 3.4.** |
| | **725.1** Operations will go on for keeping inventory of the public service buildings and for reinforcing them against disasters. | **GOAL 5.** Ensure environment-sensitive, energy-effective and safe housing, develop new structural techniques and local materials, perform building inspection activities and establish principles and procedures for professional services. | **H 5.3.** Building inspection applications will be made more effective and traceable on site by means of modern technologies and service quality and energy efficiency will be increased in the stages of survey, design, construction and inspection of the public buildings. |

**Table 11.** 11th Development Plan and Strategies of Ministry of Environment and Urbanization by 2019-2023 for the Reduction of Disaster Risks.


**Figure 12.** Strategic Fields and Goals (AFAD, 2019).

In AFAD's Strategic Plan covering the period 2019-23, there are references to planning under the heading of Risk Reduction (Table 12). The equivalents of these action areas in the planning process and in practice are provided by new regulations and existing legal instruments.

Within the scope of the National Smart Cities Strategy and Action Plan covering the period 2020-2023, which was prepared by the Ministry of Environment and Urbanization, goals and actions to reduce disaster risks are listed. In Strategy 4, Target4.3, Action 15.9, actions related to disaster and emergency management and planning from the perspective of smart cities are defined (Table 13).

**The Disaster Risk Reduction Plan (IRAP)** is a sustainable plan that reveals the possible effects of disasters and describes what needs to be done before a disaster occurs in order to minimize these effects, and defines the responsible parties and responsibilities. It draws a road map of the steps to be taken in order to be resistant to disaster risks. The preparation of IRAP Plans started in 2019, continued with 6 pilot provinces selected in 2020, and in 2021, IRAP documents were completed in 74 provinces and made available throughout Turkiye. The parties of IRAP, which started to work to create sustainable, safe and disaster-resilient settlements are; Governorships, Provincial Disaster and Emergency Directory (AFAD), public institutions and organizations, local governments, universities, private sector, non-governmental organizations and citizens. Determining and implementing all the measures that can be taken before disasters occur with a participatory approach and increasing the resilience of the society against disasters reveal the basic point of IRAP's view.

The main objective of the Disaster Risk Reduction Plan is the determination of actions in

| GOAL 2 – RISK REDUCTION |
|---|
| **H2.1 Support and Conduct Operations for Reduction of Disaster Risks** |
| **PG2.1.1.** Preparation of the Disaster Risks Reduction Plan for Turkiye |
| **PG2.1.3.** Organization of events about disaster risks reduction |
| **PG2.1.4.** Preparation of a guide for provincial risk reduction plan, making it widespread in the cities |
| **H2.2. Determining Disaster Risks** |
| **PG2.2.3.** Defining methodology and putting it into software format for prioritization of critical infrastructure facilities |
| **PG2.2.4.** Development of modelling software for industrial accidents |
| **PG2.2.5.** Conduct of capacity building project for identification and reduction of risks of disasters that climate change may cause |
| **PG2.2.6.** Digitalization of the areas identified as area prone to disaster and transferring them to AYDES |

**Table 12.** Urban Scale Risk Reduction in Scope of the AFAD Strategy Plan.

1. **In line with the requirements in the field of Smart City, operations will be performed for risk reduction and mitigation by using Smart City Solutions.**
2. **Planning operations will be improved for disaster and emergency management by using Smart City Solutions.**
3. **Recovery operations will be performed with Smart City Applications in connection with response to the disasters and emergencies.**
4. **Operations will be performed for increase of efficiency by using Smart City Solutions in connection with the phase of disaster and emergency recovery.**
5. **Recovery operations will be performed by using Smart City Solutions for civil defence management.**
6. **Smart City oriented operations will be performed in connection with management local disaster and emergency.**
7. **Smart City oriented operations will be performed in connection with governance of disaster and emergency.**

**Table 13.** Urban Scale Risk Reduction in Scope of the National Smart Cities Strategy and Action Plan.

order to prevent or reduce the physical, economic, social, environmental, political damages and losses that possible disasters may cause on settlements and society. For this purpose, a systematic method should be used to obtain information about the hazards that may affect the region, and the targets to be determined in terms of hazards, vulnerabilities and risk reduction should be clearly revealed and plans should be prepared by following an effective risk reduction strategy.

# Risk Reduction against Disaster in Structural Scale

**Çağlar Göksu, Civil Engineer, Assoc. Prof. Dr.**

**Contributed by: Fikret Kuran**

The primary reason for big damages and losses experienced in the past, particularly encountered in earthquake disasters, is the failure to comply with the standards and regulations during the construction phase. As a result, the structures may have risks in face of earthquakes.

This section deals with types of risks and risk factors for buildings. Furthermore, structural responses for mitigation of loss arising from such risks of existing structures and strategies to be followed in the inspection process for newly constructed structures are discussed.

## Types of Risks for Buildings

Risks concerning buildings can be considered in two main headings (Figure 13):

1. **Risks Related to Structural Elements**
   - **a.** Risks that may occur due to damage of non-bearing structural elements
   - **b.** Risks that may occur due to damage of bearing structural elements
2. **Risks Related to Non-Structural Elements**

## Factors Constituting Risks Related to Structural Elements

The following risks can be given as examples for risks related to structural elements (Photo 1).

### 1. Risks Arising from Construction Not Taking into Consideration Soil Properties:

Since soil properties are also effective in the behavior of a building against earthquakes, necessary soil investigations should be carried out for new buildings to be designed under the influence of earthquakes and for existing buildings whose earthquake performance will be evaluated or strengthened (Photo 2).

The primary reason for big damages and losses experienced in the past, particularly encountered in earthquake disasters, is the **failure to comply with the standards and regulations** during the construction phase. As a result, the structures may have important risks in face of earthquakes.

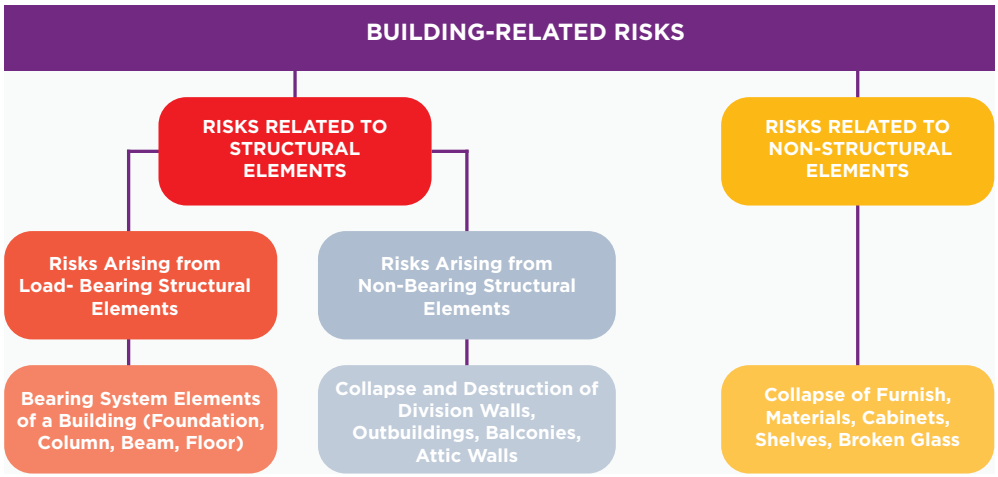



**Figure 13.** Building-Related Risks (Archive, Prof. Dr. Alper İlki).

A

C1

C2

B

D

**Photo 1.** Examples of Factors That May Create Risk on the Structural Elements: (A) Short column damage (Archive, Çağlar Göksu); (B) Discontinuity in the load-bearing column (Archive, Çağlar Göksu); (C1)/(C2) Deficiency of lateral reinforcement (Archive, Chamber of Civil Engineers, Istanbul Branch); (D) Deficient lap joint of longitudinal reinforcement (Archive, Prof. Dr. Alper İlki).

Soil surveys generally involve determination of properties of soil units as well as regional earthquake characteristics by drilling of sounding wells and/or inspection pits in sufficient number and depth. Basing on such soil surveys, a **Soil Survey Report** is issued.

Depending upon the dynamic characteristics of the building and soil dominant period, spectral accelerations may occur in the structures. These spectral accelerations determine to what extent the structure will be affected by earthquake and how much internal force it will receive. Hence identifying soil properties and considering them in the design is important.

**Liquefaction;** occurs when a water saturated soil substantially loses strength and stiffness in response to an applied stress such as shaking during an earthquake or other sudden change in stress condition, in which material that is ordinarily solid behaves like liquid. For soils which are expected to be subject to soil liquefaction triggered and/or considerable loss of strength/rigidity during earthquake, the soil properties should be recovered or reinforced on-site.

## 2. Risks Arising from Interventions Not Specified in the Project:

- Making additions to the building beyond specification of the design without studying the static condition of the building and excessing the specified vertical and horizontal loads;
- Cutting columns and/beams for convenient use of the space, especially in case of stores, galleries and floors converted to garage

**Photo 2.** Buildings Constructed Disregarding Soil Properties (Archive, Chamber of Civil Engineers, Istanbul Branch).

subsequently; giving damage to beams, partitions and columns for installing utility systems;

- Reduction of free heights of columns specified in the project because of reasons such as basement curtain and wall during the construction, leading to increase horizontal displacement rigidity and resulting in these columns (short column) being subject to excessive earthquake load.

## 3. Risks Arising from Structure-Specific Irregularities

- Horizontal or vertical irregularities of the structure which create extra buckling effect; negligence of structural joints in case of complex and asymmetrical designs and discontinuity of load-bearing elements horizontally and vertically (Figure 14).

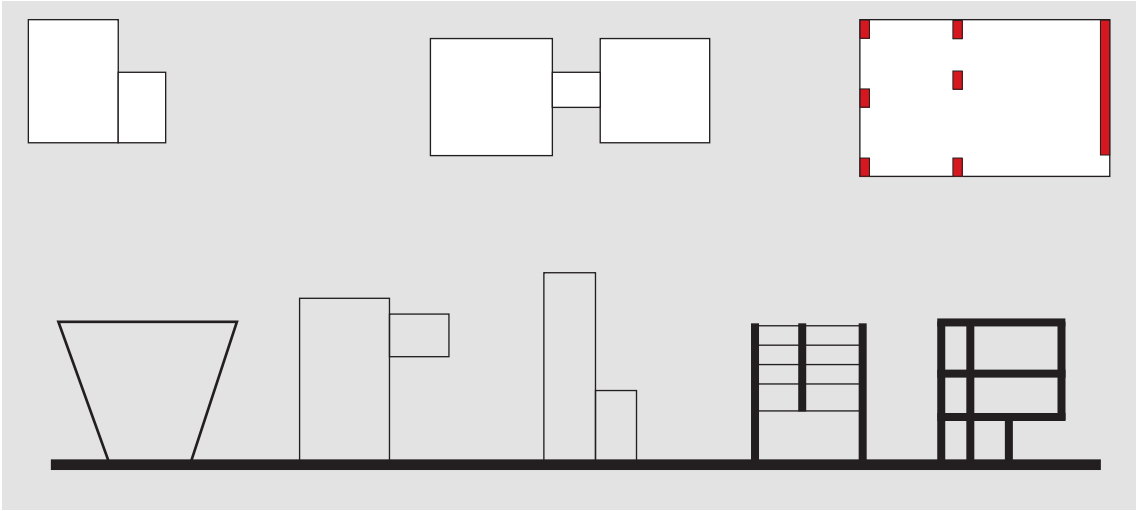


**Figure 14.** Buildings Irregular Horizontally and Vertically.

- Formation of soft storeys due to inadequate or no-wall construction of the reinforced concrete load-bearing system for using ground floors of the buildings as stores/shops, parking lots; this causes large horizontal displacements and collapse due to the absence of partition walls during the earthquake.

## 4. Risks Occurring from Wrong Building Constructions:

- Reinforcement in smaller diameter than specified with big gaps between; improper size and angle of hook; use of insufficient concrete cover and failure in placing the transverse reinforcements of columns, causing the building to lose its strength without need of high deformations and displacements.
- Improper joining of the longitudinal reinforcements at floor levels.
- Concrete strength lower than predicted.

## 5. Risks Occurring from Previous Damages of Structures

- Exposure of the structural reinforcements to corrosion (rusting) depending on time and environmental conditions because of low quality and permeable concrete arising from not properly washed sea sand, insufficient concrete cover and lack of plaster (Photo 3). Cracking and falling of concrete cover associated with corrosion; reduction in reinforcement cross section; reduced adherence between reinforcement and concrete (adhesion of concrete and reinforcement together).
- Reduction and loss of capacity of some load-bearing elements of the building occurring from previous earthquake damages.

## Mitigation Strategies for Existing Buildings

Mitigation strategies related to disaster-sensitive structural environment in building scale can be categorized under two main groups:

### 1. Repair and Strengthening

**Repair;** includes interventions made to restore the performance of a damaged structural element back to prior of the damage. **Strengthening;** involves interventions for enhancement of performance of the structural element, damaged or not.

Change of current regulations regarding buildings and replacement of them by new regulations which expect higher performance from the building; change of the intended use of the structure (for example, strengthening is required for a number of reasons such as the change of a building originally constructed as residence into a student dormitory and, consequently, increase of vertical and horizontal forces to be considered in the calculations); damage of the building because of earthquakes; damage of the building over time and due to environmental conditions or underperformance of the building in terms of strength.

**Photo 3.** Damaged Reinforcement Steel Due to Corrosion (Archive, Fikret Kuran)

**Before proceeding to strengthening phase, following should be done in order to determine current safety level of the structure:**

- Plans of the structure and sizes of the load-bearing components should be provided;
- Properties of the soil on which the structure was constructed and regional seismicity should be studied;
- Properties of the materials (concrete, rein forcement) used for construction of the structure should be identified and surveyed whether there is any existing damage in the structure;
- Data should be brought together and mechanical model of the structure generated and structural analyses conducted.

**Analytical results and deficiencies of the structure identified in terms of strength, ductility and rigidity should be considered and the current status should be reported:**

- After determination of the current status of the structure, the strengthening phase should be started, if required. In the strengthening phase, experienced engineering offices should make different proposals to the users for removing deficiencies of the structure, including cost-related information by taking into consideration the matters of usage, architectural restrictions, construction convenience, speed of manufacturing, prevention of use during implementation and appropriateness of the strengthening materials. After a strengthening method is

selected, the structural analyses and investigations/inspections are repeated and adequateness of the strengthening method is verified, the application drawings and details are made prior to proceeding the structural strengthening.

- In the scope of mitigation operations performed after the Marmara and Düzce Earthquakes (1999), repair-strengthening was carried out for many damaged structures and strengthening operations were performed for few non-damaged structures. However, as there have been no standards or regulations regarding determination and strengthening of the existing structures for earthquake safety in Turkiye till 2007, many implementations were performed by following different approaches. Therefore it is hardly to say that a significant part of the implementations has made the structures resistant to earthquake. With the reviewed Earthquake Regulation (Regulation Regarding Buildings to Be Constructed in Seismic Zones, 2007), standards have been established for the first time regarding examination and strengthening of the existing buildings for earthquake safety. On basis of deep knowledge in the field of earthquake engineering and advancements in building technology, the regulation was revised because of rapidly increasing number of high-rise buildings, earthquake insulated buildings as well as complex buildings constructed on poor soil conditions and afterwards the **Turkish Building Earthquake Code** (TBDY-2018) was published in the ***Official Gazette*** with effect from 1st January 2019.

## Approaches of Strengthening

If there are deficiencies only in some load-bearing elements of the structure in terms of strength or ductility and strengthening of these load-bearing elements can make the structure resistant against earthquake, it is possible to make the structure resistant against earthquake by strengthening these elements. Basing on this approach, operations to increase strength and deformation capacities of the elements meeting the earthquake loads are called **Element Strengthening** (for example, strengthening by means of reinforced concrete sheathing, flat steel and concrete profiles).

If deficiencies of strength or ductility are observed in many load-bearing elements of the structure or the structure has lateral rigidity or there are severe soft storeys in the building, extensive problems of short column and/or structural irregularities, strengthening on element basis may not be sufficient or cost-effective. In such case, instead of strengthening the load-bearing elements of the structure individually, addition of new elements to the load-bearing system to make it resistant to earthquake is called **System Strengthening** (for example, strengthening by addition of reinforced concrete curtain or addition of steel cross system).

## Examples of Strengthening Methods

Strengthening with reinforced concrete sheathing, flat steel and profiles or fibre-reinforced polymer materials (LP) are today's widespread element strengthening methods. Methods of **Wrapping** (Sheathing) with reinforced steel, steel and fibre polymer can be used for enhancement of shear and compressive forces for ductility of the load-bearing elements such

as column, curtain and beam. In the sheathing process for improvement of shear and compressive forces, it is not required to provide permanency of the transverse reinforcements added to the enlarged column between the floors.

In addition to capacities of shear and compressive forces of the columns, it is possible to increase bending capacities of them by reinforced sheathing of the column sections. Ductility of the longitudinal reinforcements added to the enlarged column should be provided between the floors. Longitudinal reinforcements may be passed through holes drilled on floor slabs for this purpose. In column-beam joining points, the beams should be drilled or anchored for adding transversal reinforcements.

Another system strengthening method used often in our country is strengthening with **Reinforced Concrete Curtain,** which is used for strengthening reinforced concrete load-bearing structures which have inadequate lateral rigidity and strength. Curtains to be added to reinforced concrete should be arranged in the frame axis and should be continued, starting from the foundation to the upper level of the curtain. To this end, continuity of the longitudinal reinforcements at the end part of the curtain and, if required, longitudinal reinforcements in the curtain body should be provided along the curtain height. Anchor rods should have sufficient strength to meet the shear stress generated under seismic forces.

Although the method of addition of **Steel Crosses** for enhancement of vertical load-bearing capacity of the structure is a frequently used method in foreign countries, it is generally used in Turkiye only under conditions when the concrete quality is relatively good.

Another method for strengthening existing reinforced concrete buildings is the use of non-bearing walls of the building. According to this method which is applicable for maximum three-storey buildings, except basement floor, rigidity and shear strength of non-bearing walls in the reinforced concrete frame showing continuity from above the foundation to upwards can be enhanced by strengthening with **Mesh Reinforcement Special Plaster** and **PF** (Polymer Fibre).

Mostly used methods for repair and strengthening of the **Masonry Structures** involve removing the damaged part of the wall and bonding it again, making the door and window openings smaller, adding bond beams and lintels, supporting the walls properly for protection them against out-of-plane effects and increasing sheer force capacity through application of mesh reinforcement and shotcrete on the wall. In addition to these methods, there are solutions for improvement of the behaviour of the walls under seismic effects by means of PF rods or sheets.

Great care should be shown when performing both repair and strengthening work. Particularly the strengthening work should include a good evaluation of status and design process. If the required care is not shown to this matter, the structural strengthening will not be successful and make the structure even more risky.

For the existing weak structures without sufficient earthquake safety, risk is considerably reduced by means of building strengthening which is designed and constructed in accordance with the engineering rules and these buildings are not damaged during earthquakes (Photo 4).

**Photo 4.** Earthquake Performance of Two Lodging Buildings, Strengthened and Not Strengthened, After Elazığ Sivrice Earthquake (24th January 2020) (Mw.6.8) (Promer Müşavirlik Mühendislik A.Ş.)

## 2. Demolition and Reconstruction

**Demolition and Reconstruction** involves intervention strategies which require demolition and reconstruction of the buildings which are not sufficiently safe. Taking decision on demolition and reconstruction or strengthening of the buildings which are not safe for earthquake is as much closely related to the zoning plan, social, cultural and historical value of the area of the building, owner and general economic status of the country as to the mechanical properties of the building.

In Turkey, it is known that the compressive strength of the existing buildings constructed before 2000 is about 100 kg/cm2. Accordingly, it may be said that a considerable part of the existing buildings has low quality concrete. It is known that in Japan or USA, strengthening is not considered for the buildings with such low compressive strength and that instead, they are demolished and reconstructed. However, considering the intensity of buildings with such quality in Turkiye, making decision on taking into account the economic conditions will be more accurate because it is very hard to demolish and reconstruct all these buildings.

If cost of strengthening for ordinary buildings having no social, cultural and historical value exceeds 40 percent of the demolition and reconstruction costs, demolition and reconstruction is more appropriate than strengthening.

Other mitigation strategies are produced according to zoning plan decisions in higher scales instead of building scale. They involve reduction of density and creation of urban transformation areas.

As the disaster risk, in particularly the earthquake risk, is high in our country and a greater part of our building stock is contrary to the zoning plan and illegal housing is too much, Law on Transformation of Areas Under Disaster Risk (6306) entered into force in 2012 for taking necessary measures prior to occurrence of disas-

In Turkiye, it is known that the compressive strength of the existing buildings constructed before 2000 is about 100 kg/cm2. Accordingly, it may be said that a considerable part of the existing buildings has low quality concrete.

If cost of strengthening for ordinary buildings having no social, cultural and historical value exceeds 40 percent of the demolition and reconstruction costs, demolition and reconstruction is more appropriate than strengthening.

ters. Objective of the Law, also called **Urban Transformation Law,** is to establish procedures and principles for **Recovery, Disposal** and **Renovations** for creating of healthy and safe living environments in areas under disaster risk and additionally in areas and lands with risky buildings. The Law determines the risk on basis of a specific building and also the risk on basis of a specific area on which the structure is located. Definitions of risky structure, risky area and reserve construction area set forth in the Law are as follows:

- **Risky Structure;** is defined as a structure which is located within or outside the risky area and completed its economic life or bears risk of heavy damage basing on scientific and technical data.
- **Risky Area;** is defined as an area which bears risk to cause life and property loss because of the soil structure or buildings constructed on it as decided by Presidential decree.
- **Reserve Construction Area;** is defined as an area to be used in the context of new settlement areas in which applications will be performed pursuant to this law according to the request of TOKI or Administration or determined only by the Ministry.

The law defines the Ministry of Environment and Urbanization as a ministry; municipalities within the boundaries of the municipality and adjacent areas as an administration, outside these borders special provincial administrations and metropolitan municipalities in metropolitan cities, and if authorized by the ministry, district municipalities within the boundaries of the metropolitan municipality. Risky buildings are determined according to the **Principles for Determination of Risky Structures** in Annex-2 attached to the Governing Regulation of the Law 6306. Property owners, real and legal persons, may apply to the institutions and organizations licenced by the ministry for determination of the risky status of their structures. In this stage, such determination may also be made upon application of one of the owners or his/her legal representative. Pursuant to the **Property Ownership Law** (634), if there is title deed with land share, because construction servitude or property ownership has not established, the land shareholder as owner of the structure actually on the land may apply for determination of its risky status.

If the building on the land is owned by another person and this fact is specified in the land registry office, then the request for determination of risk for the structure is made by the party there is annotation in favour of him. Any structures determined to be risky upon official inspections are notified by the institution and organization that made

such determination to the **Provincial Directorate of Environment and Urbanization** or, if authorized, to the **Administration.** The provincial directorates of environment and urbanization or administrations review the reports; if there are any incomplete or wrong points in the reports, these reports are returned to the concerned person; and those found appropriate are forwarded to the concerned land registry directorate for annotation.

The notification is made to dominant and personal beneficiaries stating that the statements registered in the land registry by the concerned land registry directorate may be objected within **fifteen days** from the date of notice by providing petition to the directorate at the place of the risky building, otherwise the structure **should be demolished** within the specified period, not less than sixty days and the directorate is made informed about this notification. The technical committee which examines the objections consists of seven members, e.g. four members to be appointed by the universities and four members who work in the ministry. Order is given for demolition of the structure and a grace of time, not less than **sixty days,** is granted to the owners of the properties registered in the land registry as risky structure. The buildings which are outside the risky area or reserved building area, but technically determined to be strengthened for reference is made to the Property Ownership Law, subparagraph 19/2 regarding how the **Strengthening Decision** can be taken. According to it, the written consent of 4/5 of the property owners is required.

For properties, on which the building is demolished and converted to a field, the construction servitude or property ownership status established previously may be cancelled, without consent of the concerned parties, by the sole discretion of the concerned land registry office upon request of the ministry and the field is registered in the name of the owners in proportion to their shares after consideration of its previous quality or stating the conditions of the agreement made with the owner in the land registry office. **For procedures regarding the properties on which the building is demolished and gained a field status, decision is taken by 2/3 majority.** Shares of those not taking part in this majority may be sold by public auction to other shareholders, who give their consents. Shares that cannot be sold by this procedure are directly registered for treasury in the land registry office and those deemed appropriate by the ministry are transferred to TOKİ or administration. **If majority (2/3) is not secured; then it may be expropriated by the ministry, TOKİ or administration.**

## Mitigation Strategies for Structural Safety in the Construction Process

Construction of new structures in accordance with the applicable construction rules and regulations is very important for structural safety. In addition to these engineering measures, a reliable building inspection process (Building Inspection and Building Use License) should also be provided. Building inspection contains inspection of the design and implementation by independent inspection companies in accordance with the rules from the design to the construction of the building. Building usage licence evidences that the said building was completed and there is no problem for obtaining occupancy licence.

## Building Inspection

**Objective of the Building Inspection Law** (No.4708 of 2001) is to supervise design and building supervision and specify procedures

According to the **Building Inspection Law,** the building inspection service is provided as per the provisions of service agreement made between the building inspection organization and the owner of the building or his/her representative.

The building owner may not appoint the contractor of the building he/she made agreement for construction as his/her representative; however, because it has been frequently observed in most applications for long time that owner or concerned party selects inspection firm by direction of the contractor, the building inspection companies are randomly assigned in electronic media according to new procedure which entered into effect by the ministry in 2019.

and principles concerning building supervision for constructing quality buildings in compliance with the zoning plan, scientific, professional and health rules to ensure life and property safety. The Law covers supervision of the buildings to be constructed in areas inside and outside the territories of the municipality and neighbouring lands, except for the public buildings and facilities set forth in the Article 26 of the Zoning Law 3194 and buildings not subject to licence as specified in the Article 27.

Article 3 of the Building Inspection Law Building Inspection Law reads:

*"Building inspection organizations conduct inspection primarily on risk basis. Construction inspection organizations, together with supervising architectures and engineers, designers, laboratory officers and the building contractor, are responsible against the building owner and related administration for any structural damages that may occur due to incomplete, faulty and improper construction in contrary to scientific, professional and health rules in proportion of their faults. Term of this responsibility is fifteen years from the issue date of building occupancy licence for the load-bearing structure of the building and two years for the non-loading parts. For any structural damage that may arise from modification made without getting permission of the related administration after the building occupancy license is issued, the responsibility belongs to the party who made modifications in question. Building inspection organization is not responsible for damages arising from landslide, avalanche, rock fall and flood, occurring outside the plot and giving damage to the building, for which no measure has been taken by the building owner despite of written warning."*

According to the **Building Inspection Law,** the building inspection service is provided in accordance with the provisions of the service contract made between the building inspection organization and the building owner or his/her representative.

The building owner may not appoint the contractor of the building he/she made agreement for construction as his/her representative; however, because it has been frequently observed in most applications for long time that owner or concerned party selects inspection firm by direction of the contractor, the building inspection companies are randomly assigned in electronic media according to new procedure which entered into effect by the ministry in 2019.

## Building Use Licence

The building construction phase starts with submitting the required documents to and getting construction permit from the municipality. The construction should start within two years and complete within five years depending on the design approve by the building inspection organizations. According to the provisions of the zoning code, if it is detected by the concerned organizations that the construction has been started without licence, except for the structures that may be constructed without licence, and in contrary to the licence and annexes of it, the structure is sealed and construction is stopped immediately. Any building constructed without a licence or contrary to the licence is demolished by the municipality or governorship upon decision of the provincial administration board and the related cost is charged to the building owner.

Starting with the building licence, the construction process ends with the building use licence. In the process of getting building use licence, the technical works department of the concerned municipality, upon application made by the building owner, inspects the building to determine whether it complies with the licence and its annexes. If it is determined that there is no problem for use of the building, then the building owner is asked to submit no lien affidavit from the related insurance organization with respect to the building. The municipality completes this procedure in not later than thirty days from the application of the building owner.

According to the **Building Use Class "BKS=3"** set forth in the Turkish Building Earthquake Code (2018), the design of the load-bearing systems of the structures such as residence, office, hotel and similar buildings is based on following behaviour criterions:

- Elastic behavior of structures in frequently occurring light earthquakes, and no damage to structural and non-structural system elements;
- Any damage in the structural and non-structural systems elements in case of medium earthquakes that may occur in medium frequency should be repairable;
- Buildings are expected not to collapse partly or completely for preventing loss of life in case of strong earthquakes that may occur rarely.

As it may be seen from the items above, even if a building is constructed in compliance with the code, it should be considered that it may suffer damage after earthquake. In such case, **Mandatory Earthquake Insurance** can be used to cover such damage. Mandatory Earthquake Insurance contains methods and principles for covering the financial loss that the buildings and building owners or beneficial owners may suffer as a result of earthquake.

The **Natural Disaster Insurance Agency** (DASK) was established after Marmara and Düzce Earthquakes (1999) through the Statutory Decree 597 and mandatory earthquake insurance was started. This Statutory Decree remained in force until the Disaster Insurances Law 6035 of 18th May 2012. The Natural Disaster Insurances Agency is a public institution with legal entity which is in charge of provision, implementation and management of Mandatory Earthquake Insurance in our country. Mandatory Earthquake Insurance provides financial assurance to the insured homeowners against earthquake and

earthquake-sourced risks of fire, explosion, landslide and tsunami. Building loss is compensated whether it is suitable to live or not in the building. Established by cooperation of the government with the insurance sector for fulfilment of needs in the most effective and rapid way, this system has the following primary goals:

- Assurance of all residences included in the system against earthquake in consideration of affordable premiums;
- Provision of risk sharing in the country;
- Distribution of any financial liability of our country arising from damages caused by earthquake in the international reassurance and capital markets by means of insurance;
- Reduction of the financial burden of the government arising from earthquakes, particularly building disaster homes after earthquake;
- Prevention of possible extra taxes that may be imposed upon the citizens because of financial burdens of the government;
- Use of insurance systems as an incentive means for production of healthy buildings;
- Formation of a long-term fund for the coverage of earthquake damages;
- Contribution to awareness of insurance and social solidarity in the society.

## Strategies and Action Plans

Under the **National Earthquake Strategy and Action Plan** (2012), matters regarding single buildings and private fields of activities have been considered. Primarily, actions for creation of inventory of the building stock and assessment have been planned. And, now development of legal arrangements concerning risk mitigation in building scale through revisions is on the agenda. Finally, they are followed by assessments and actions in connection with historical structures (Table 14).

The **Turkish Climate Change Strategy** (2010-23) concentrates on building materials and technologies to provide energy efficiency in the buildings. It should also be stated that efforts for implementation of the **Energy Identity Certificate** for existing buildings are supported. Furthermore, the use of architectural and building materials compliant with local climate is encouraged as well.

## A – UNDERSTANDING EARTHQUAKES

## B –EARTHQUAKE-SAFE SETTLEMENT AND EARTHQUAKE-RESISTANT CONSTRUCTION

### TARGET B1: PROVIDING EARTHQUAKE-SAFE SETTLEMENT AND EARTHQUAKE RESISTANT CONSTRUCTION

**STRATEGY B.1.2.** An inventory of buildings in Turkiye, especially schools and hospitals, will be drawn up and existing structures will be grouped on the basis of their vulnerability and risk.

**Action B.1.2.1** Number and typology of existing buildings, particularly schools and hospitals, will be determined and, furthermore, building identity system will be promoted.

**Ministry in charge**: Ministry of Environment and Urbanization

**Related organizations:** TUIK, Development Agencies, AFAD, Governorships, Ministry of Development, General Directorate of Civil Registration and Nationality Affairs, TBB

**Action B.1.2.2** Vulnerability of the existing buildings, particularly schools and hospitals, and related methodologies will be determined.

**Organization in charge:** AFAD

**Related organizations:** Governorships, Universities, related Public Institutions and Organizations, Trade Associations, Metropolitan Municipalities and Municipalities.

**Action B.1.2.3** The earthquake risk grouping of existing buildings, especially schools and hospitals, will be completed.

**Organization in charge:** AFAD

**Related organizations:** Related Ministries, Governorships, Universities, related Public Institutions and Organizations, Trade Associations, Metropolitan Municipalities and Municipalities.

**Action B.1.2.4** Priority will be given to strengthening of education facilities and ongoing operations will be accelerated.

**Ministry in charge:** Ministry of National Education

**Related organizations:** YÖK, related Public Institutions and Organizations, Governorship, Universities, Private Sector, Metropolitan Municipalities and Municipalities

**Action B.1.2.5** Earthquake damage estimation methods will be developed in city scale basing on construction conditions of existing buildings and they will be assessed again basing on the collected data and damage estimation methods will be updated.

**Organization in charge:** AFAD

**Related organizations:** Governorships, Universities, Trade Associations, Municipalities

**STRATEGY B.1.5.** The current earthquake code will be updated and enhanced by taking into consideration the Eurocode.

**Action B.1.5.1.** Studies of the committee to be set up for updating and developing the earthquake code will be kept on constantly.

**Organization in charge:** AFAD

**Related organizations:** Ministry of Environment and Urbanization, Universities, all related Organizations, Trade Associations

**STRATEGY B.1.6.** Methods for determination of earthquake security and strengthening of buildings will be developed, standardised and implemented basing on construction technology and practices in Turkiye with respect to bridges, viaducts and transportation systems as well as surface and buried transmission systems (pipeline, natural gas line, power, communication, etc.).

**B –EARTHQUAKE-SAFE SETTLEMENT AND EARTHQUAKE-RESISTANT CONSTRUCTION (continued)**

**Action B.1.6.1.** A coordination committee will be set up, consisting of the authorized officers of the institutions and organizations which make researches, implement and support**.**

**Ministry in charge:** Ministry of Transport, Maritime and Communication

**Related organizations:** Universities, TUBITAK, Ministry of Development, Ministry of Environ ment and Urbanization, Ministry of Energy and Natural Resources, AFAD, all Related Organ zations.

**Action B.1.6.3.** Necessary arrangements will be made for design, maintenance and inspection of transportation systems and vitally important transportation facilities.

**Ministry in charge:** Ministry of Transport, Maritime and Communication

**Related organizations:** Ministry of Environment and Urbanization, Metropolitan Municipali ties and Municipalities

**Action B.1.6.4.** Vitally important systems such as surface and buried water, waste water, power, communication and natural gas line will be assessed for their safety against earthquake and their quality will be brought to the specified quality.

**Organization in charge:** AFAD

**Related organizations:** All Ministries related to the matter, Metropolitan Municipalities and Municipalities, Universities, Professional Associations.

**TARGET B.2: PROTECTION OF HISTORICAL AND CULTURAL HERITAGE AGAINST EARTHQUAKE**

**STRATEGY B.2.1.** Technical information about determination of safety of the historical structures and strengthening them for earthquake will be developed, spreading across the country.

**Action B.2.1.1.** Inventory of the historical buildings in earthquake-prone areas will be kept and their degrees of significance and priority will be determined.

**Ministry in charge:** Ministry of Culture and Tourism

**Related organizations:** AFAD, General Directorate of Foundations, TMBB, Universities, TBB

**Action B.2.1.2.** Load-bearing systems of historical buildings under vertical loads and earthquake effects will be determined.

**Ministry in charge:** Ministry of Culture and Tourism

**Related organizations:** General Directorate of Foundations, TBMM, Universities, AFAD, Trade Associations, TBB

**Action B.2.1.3.** Methods, design and manufacturing principles will be established and developed in accordance with international rules which should be complied in repair and strengthening of historical buildings.

**Ministry in charge:** Ministry of Culture and Tourism

Related organizations: TMBB, Universities, AFAD, Trade Associations, General Directorate of Foundations, TBB

**Action B.2.1.4.** Methods, design and manufacturing rules will be established and improved in according with the international rules which should be observed in the performance of repair and strengthening of historical buildings.

**Ministry in charge:** Ministry of Culture and Tourism

**Related organizations:** TMBB, Universities, AFAD, Trade Associations, General Directorate of Foundations, TBB

**C- COPING WITH EFFECTS OF EARTHQUAKE**

**Table 14.** Building Scale Risk Reduction in Scope of the National Earthquake Strategy and Action Plan.

# Strategies for Enhancing Social Resilience

**Social resilience encompasses the capacity/ ability of the individual and community to cope and struggle with the negative effects and sustain the activities when faced with disasters or unexpected events.** In Turkiye, especially during the period which have started after the 1999 earthquakes, the masses have been tried to reach relating to earthquakes, through social trainings, exercises, public announcements and information platforms. As of 31 December 2021, 1,552,930 people were trained by IPCU within the scope of ISMEP. AFAD has placed great importance to its dissemination efforts and millions of people have received disaster awareness training. A large number of people were reached with the 2021 Disaster Education Year Campaign (trainings can be followed at: https://www.hazirol.gov.tr/#anasayfa). In order to increase social resilience and the effectiveness and continuity of trainings spread across the country, some concepts that are behind the scenes and the equivalents of these concepts in practice are discussed in this section.

## Social Cohesion (Social Integration)

**Social cohesion means ability of all groups and individuals of a society to integrate by turning their differences into an advantage as a constructive element and without any segregation.** There are numerous studies about reflections of the social cohesion. The most prominent study field in this respect takes places under the heading of **Economy and Civil Conflicts.** And there are also studies on increase of diversity in the society and related gains. They especially conclude that what is important is not existence of the diversity, but how to manage it (Satır, 2016). In the study by Ataseven and Bakış (2018), the **General Social Cohesion Index** in Turkiye is shown to be at medium level. Again according to the same study, belonging social networks are at high degree in terms of social cohesion, while the items dropping the general index value are seen under the headings of civil engagement and adaptation to social rules.

## Social Capital

Social capital is primary element for social cohesion. In the simplest term, social capital defines the structure of a system of relations between the individuals and institutions and power of these bonds. Frequently used in the social studies since 1990s, the concept of social concept defines relations or bonds based on 3 different levels: (1) **Bonding Social Capital;** (2) **Bridging Social Capital** and (3) **Linking Social Capital.** The bonds at the first level correspond to relations in social groups such as family, relatives, friends, neighbours, colleagues etc. Bridging social capital expresses bonds between the groups that have come together for similar or homogenous purposes. As a simple example, we may give relations between families of married couples. The last level, linking social capital, is defined as the relations of groups taking place in categories (1) and (2) with decision-makers and administrators.

## Social Networks

Social networks mean **Non-Hierarchical Relations** created by the individuals or other human systems. Particularly upon development of internet and increased use of social media, the social networks and methods of analysis for these networks have started to be used in many different fields of studies. In the analysis of social

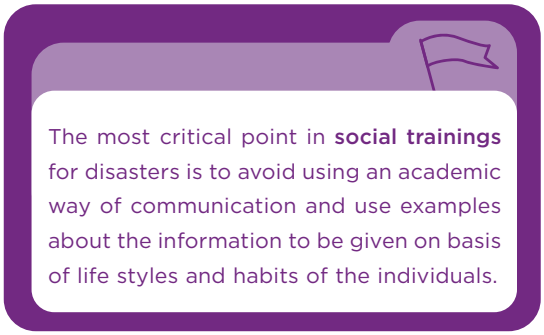
network, definition of basic nodes in the relations system created without a certain hierarchical structure and impact power of these nodes are also among important study subjects.

## Social Cohesion, Social Capital and Social Networks in the Framework of Social Resilience

There is a strong bond between the concepts shortly defined above and social resilience. These concepts and properties of the public should be studied in depth, and society strategies resilient to disaster should be established. From the 1999 earthquakes up to now, it was achieved to reach many individuals and families and unprecedentedly high number of new volunteers has been recorded. However, the matter should be reviewed, controlled and assessed in order that understanding of disaster resilient society or disaster culture may raise awareness and create change of attitude. Torun and et al. (2015) have interviewed individuals who have received training on disaster and make study to understand to what extent the training and/or information they gained has relevance in their private and/or business life. About 30% of the interviewees have said that they reflected the information they received during trainings in their own life.

Core knowledge about disasters essentially varies much. For example, although many different scenarios have been produced in this respect, existence of the North Anatolian Fault Line and fractures (earthquakes) on this fault line leading to great collapses, for example, is a widely recognized fact.

The most critical point in trainings for disasters is the way of communication of this information to different parts of the community. Age, educational background, professional status, disaster experience and similar matters about the individuals definitely require change of expression for the information to be given. Accordingly, academic expressions should not be used in social trainings and the information should be given by examples basing on life styles and habits of the individuals.




Communication way, accuracy and objectivity of information make it easy for the individuals to understand the subject and, furthermore, has a powerful relation with the confidence parameter. Level of confidence felt in the institution and administrator is related to third level relations in social capital, i.e. relate to the linking social capital. In case of high level of confidence the acceptance and internalization of the information by the individuals becomes easier. Similarly, once continuity, clarity and accuracy of information are confirmed in the process, the level of confidence also tends to increase. In the study of **Risk Perception** made by Kundak et al. in 2008, 2013 and 2019, the most trusted institutions, organizations and groups to inform about disasters were asked. According to the results for the year 2008, while **Academicians** have been shown as the most reliable group, AFAD, which was established in 2009 and recognized as the most competent and authorized institution

concerning disasters, became leader in the list of the studies made in 2013 and 2019.

Communication or more accurately **Risk Communication** is the key element for creating disaster-resilient societies as well as social cohesion, social capital and social networks described above. Technical and managerial communication between the institutions and authorities in the phase of disaster response is essentially established between AFAD and other related institutions and organizations. As to the society, the risk communication has a different structure, surpassing the "correspondence". First of all, for building correct communication, the terms sued should be understood by everybody in the same way. For example, the information of what the statement of **Emergency Routes** means and why there should be parking ban along these roads should be communicated both by help of examples and appropriate narration.

Another subject under the heading for communication is to inform people about **Areas of Assembly** and **Evacuation Routes** prior to disaster. In the current system, individuals can have access to information about the place where they live or make search on line about the areas they wonder. However, in the meaning of social inclusiveness, the individuals who are not acquainted with internet technologies or devoid use them should also be considered and more effective and understandable communication alternatives should be produced.

Another matter about communication that should definitely be mentioned is the **Mainstream Media** and **Social Media.** The most uttered sentence at the onset of the COVID-19 pandemic has actually been an indicator of how the disasters should be approached: "Neither be listless nor do panic … Stay in between…" Publishing's made via mainstream media and shares in the social media could be provider or distorter of this delicate balance. Manner and speed of distribution of correct or false information mentioned under the heading of social networks, determine spontaneous attitude and reaction of the individuals against disaster. Consequently, for the correct orientation of individuals and society, the information communication mentioned above and risk communication before disaster should be achieved.

The concept of **Awareness** is frequently used in the studies for enhancement of social resilience to disasters. Awareness is also related to perception of individuals. With respect to disaster, awareness of disaster overlaps the domain of risk perception. Risk perception is also affected by the society and social properties in addition to individual characteristics. In societies with fatalist mentality, the individuals consider themselves incapable or inefficient for reduction of risk. While this mentality brings acceptable risks up to a higher level, it may also act as an obstacle against implementation of risk reduction strategies in social scale.

It is possible to overcome such obstacles with effective information and communication strategies. However, risk perception is a matter that should not only be studied in society, but also at the level of technical personnel and decision-makers.

Passing from the individual and social scale to more organized structures, **Non-Governmental Organizations** (NGOs) stand out. These relations between groups and with management, which correspond to the second level

While it is possible to overcome **fatalist social mentalities** by means of effective information and communication strategies, risk perception is a matter that should not only be studied in society, but also at level of the technical personnel and decision-makers.

of the relations system in the social capital, act as a facilitator and mediator for creating a disaster-resilient community. In the societies where social cohesion is not at sufficient level, competition and conflict is inevitable between such groups. In managerial sense, strategies for encouraging and guiding such diversity should be developed. NGOs play a important role in forwarding such top-level decisions to all related groups and social layers.

## National Strategies

In 2011, the **Disaster Risk Reduction Platform of Turkiye** was set up in the body of AFAD. The objective of this platform is, "to increase sensitivity of the community to disasters and provide continuity in risk reduction operations, determine needs, monitor and assess practices for compliance of risk reduction with plans, policies and programs at all levels" (Table 15).

In the scope of the **National Earthquake Strategy and Action Plan** of 2012, primarily the necessity of vocational trainings is underlined and actions are specified in this respect. Additionally, opening of post-graduate courses and certificate programs at universities are also among the actions. For resilience to disasters, impact of the disaster experience is enormous. And transmission of such experience to future generations is also achieved with works of art and museum. The strategy and action plan also mentions this point. Furthermore, importance of approaches covering all groups of the community is also underlined.

In the Strategic Plan prepared by AFAD for the process in the period of 2019-2023, the vision of the organization is expressed as **Creation of a Disaster-Resilient Community.** Of the six essential objectives specified for the said period, one is mentioned under the heading of social awareness. Actions contain matters that technical trainings should be given and drills should be developed not only at social level, but within the institution. Trainings about disasters and awareness-raising actions at social level also have a structure compliant with the **Climate Change Strategy of Turkiye,** supporting each other.

## ESTABLISHMENT, FUNCTIONS AND WORKING PRINCIPLES OF THE DISASTER RISK REDUCTION PLATFORM OF TURKIYE (2011)

### FUNCTIONS OF THE PLATFORM

**ARTICLE 4 -** (1) Functions of the platform are as follows:

a) Making contribution for determining requirements, presenting proposals, scheduling operations, monitoring and assessing the practices with respect to reduction of disasters risks in all fields and introducing these operations internationally.

b) Giving support for the use of resources more effectively among the stakeholders working in the field of reduction of disaster hazards and risks.

c) Including the objective of disaster risks reduction in the development and political plans and programs; monitoring practices and make contribution to determination of the priorities.

ç) Providing support for the provision of basic information and data about natural, meteorological, technological or human sourced hazards for the reduction of disaster risks.

d) Providing support for the production and development of policies and strategies for the reduction of disaster risks.

e) Monitoring compliance of the risk reduction operations with Hyogo Framework and report the results.

f) Providing support for activities to raise awareness of the society concerning disasters.

g) Documenting the experience which is gained in the process of disaster risks reduction, and sharing the results nationally and internationally.

h) Acting as leader for establishment of a system where the institutions and organizations will share their knowledge and experience, concerning the reduction of disasters risks with other institutions and organizations by means of national and international contacts.

ı) Giving support for development of same or similar structures in central and local administrations in connection with the reduction of disaster risks.

**Table 15.** Functions of the Disaster Risk Reduction Platform of Turkiye.

## A- UNDERSTANDING EARTHQUAKES

## B- EARTHQUAKE-SAFE SETTLEMENT AND CONSTRUCTION

### TARGET B.1: PROVIDING EARTHQUAKE-SAFE SETTLEMENT AND EARTHQUAKE-RESISTANT CONSTRUCTION

**STRATEGY B.1.7.** Providing on-the-job training for the personnel working in the construction sector.

**Action B.1.7.1** Ensuring that more quality, efficient and practice-oriented engineering and architectural education is given in the universities.

**Organization in charge:** YÖK

**Related organizations:** Universities, Ministry of National Education, Ministry of Environment and Urbanization, TMMOB

**Action B.1.7.2** Developing and supporting vocational training activities.

**Organization in charge:** AFAD

**Related organizations:** TMMOB, Universities, all related Institutions and Organizations, Ministry of Labour and Social Security

**Action B.1.7.3** Assuring competent or professional engineering practice.

**Ministry in charge:** Ministry of Environment and Urbanization

**Related organizations:** TMMOB

**Action B.1.7.4** Developing the training and certification of workers, journeymen and masters working in the construction sector and preventing the employment of undocumented people in this sector.

**Ministry in charge:** Ministry of Environment and Urbanization

**Related organizations:** Ministry of National Education, Trade Associations, Private Sector, Governorships, Metropolitan Municipalities and Municipalities

**Action B.1.7.5** Providing the dissemination of professional liability insurance.

**Organization in charge:** Undersecretariat of Treasury

**Related organizations:** AFAD, Ministry of Environment and Urbanization, Turkish Association of Insurance and Reassurance Companies, TMMOB, related Public Institutions and Organizations

## C- COPING WITH EFFECTS OF EARTHQUAKE

### TARGET C.1: DEVELOPMENT OF TRAININGS ON EARTHQUAKES AND OTHER DISASTERS AND ACTIVITIES FOR RAISING AWARENESS OF THE PEOPLE

**STRATEGY C.1.1.** Achieving the consensus of opinion and language of managers and decision makers dealing with disaster and emergency management.

**Action C.1.1.1.** Ensuring the coordination and unity of communication.

**Organization in charge:** AFAD

**Related organizations:** Universities, Non-Governmental Organizations, Local Administration,TRT

**Action C.1.1.2.** Disaster and Emergency Management courses will be included in the vocational trainings of the local administrators, especially Civil Administration Chief

**Organization in charge:** AFAD

**Related organizations:** Ministry of Interior, Governorships, Universities

## C- COPING WITH EFFECTS OF EARTHQUAKE (continued)

**STRATEGY C.1.2.** Increasing the number of expert disaster administrators and developing disaster management trainings.

**Action C.1.2.1.** Opening multi-disciplinary post-graduate programs related to earthquake operations in universities with high-quality infrastructure.

**Organization in charge:** YÖK

**Related organizations:** AFAD, Universities, related Public Institutions and Organizations

**Action C.1.2.2.** Increasing post-graduate, doctorate and certificate programs of disaster management given to the administrators via distance learning and licence programs.

**Organization in charge:** YÖK

**Related organizations:** AFAD, Universities

**Action C.1.2.3.** Reviewing subject matters of Disaster and Emergency training and including these subjects in on-the-job trainings by the related organizations.

**Ministry in charge:** Ministry of National Education

**Related organizations:** Related Institutions Universities, Non-Governmental Organizations

**Action C.1.2.4.** Including some units basing on disaster and emergency in the curriculum of primary and secondary schools.

**Ministry in charge:** Ministry of National Education

**Related organizations:** AFAD

**Action C.1.2.5.** Providing disaster and emergency and also disaster protecting trainings to teachers making these trainings continuous.

**Ministry in charge:** Ministry of National Education

**Related organizations:** AFAD, Universities, Non-Governmental Organizations

**STRATEGY C.1.3.** Establishing earthquake museums in cities that experienced big earthquakes.

**Action C.1.3.1.** Raising the earthquake awareness of people by means of disaster museums and/or exhibitions.

**Ministry in charge:** Ministry of Interior

**Related organizations:** AFAD, Ministry of Culture and Tourism, TBB, Ministry of National Education, Universities, Turkish Religious Foundation, Provincial Special Administrations, Metropolitan Municipalities and Municipalities

**STRATEGY C.1.4.** Establishing the Disaster Volunteering System.

**Action C.1.4.1.** By scanning applicable laws, any repeats and/or deficiencies will be removed regarding the concept of disaster volunteering and job descriptions.

**Organization in charge:** AFAD

**Related organizations:** Non-Governmental Organizations, Turkish Red Crescent, Universities

**Action C.1.4.2.** Preparing necessary regulations and directives by public organizations and agencies for encouraging disaster volunteering.

**Organization in charge:** AFAD

**Related organizations:** Related Public Institutions and Organizations Universities, Non Governmental Organizations

**Action C.1.4.3.** By defining the functioning processes of voluntary institutions and organizations, handbooks for decision makers and practitioners will be prepared.

**Organization in charge:** AFAD

**Related organizations:** Universities, Non-Governmental Organizations

**C- COPING WITH EFFECTS OF EARTHQUAKE (continued)**

**TARGET C.2: REGULATORY ARRANGEMENTS FOR MAKING EARTHQUAKE STRATEGIY INTEGRATED AND EFFECTIVE**

**STRATEGY C.2.2.** Preparing the National Disaster Strategy and Action Plan.

**Action C.2.2.1.** Setting up the Disaster Risk Reduction Platform of Turkiye and sub-committees.

**Organization in charge:** AFAD

**Related organizations:** Universities, TMMOB, Non-Governmental Organizations, HGK, Ministries, Media, Private Sector

**Action C.2.2.2.** Making legal arrangements for the Earthquake Risk Reduction Plan.

**Organization in charge:** AFAD

**Related organizations:** Ministry of Interior, Ministry of Environment and Tourism, Municipalities, Provincial Special Administrations, Universities, Trade Associations

**Action C.2.2.3.** Preparing the Manual for Earthquake Risk Reduction Plan.

**Organization in charge:** AFAD

**Related organizations:** Ministry of Environment and Urbanization, Municipalities, Provincial Special Administrations, Universities, Trade Associations

**STRATEGY C.2.3.** Making special arrangements for risky individual groups.

**Action C.2.3.1.** Organizing a meeting and making necessary arrangements on national scale, to combine the risky individual groups and efforts for the determination of disaster risk.

**Organization in charge:** AFAD

**Related organizations:** Ministry of Family and Social Policies, Special Provincial Administrations, Non-Governmental Organizations

**STRATEGY C.2.4.** Expanding the Mandatory Earthquake Insurance.

**Action C.2.4.1.** It will be assured that Statutory Decree 587 is enacted, effectiveness is enhanced under control of mandatory earthquake insurance and that DASK and the insurance sector will have a greater part in operations related to earthquake, including scientific studies.

**Action C.2.4.2.** All means of communication will be used for making Mandatory Earthquake Insurance widespread.

**Organization in charge:** Undersecretariat of Treasury

**Related organizations:** AFAD, TSRSB

**Tablo 16.** Social Resilience in Scope of the National Earthquake Strategy and Action Plan.

**GOAL 1- COORDINATION AND COMMUNICATION**

**GOAL 2- RISK REDUCTION**

**GOAL 3- DURING AND AFTER DISASTER**

**GOAL 4- SOCIAL AWARENESS**

**H4.1** Increasing the training and practical capacity for disasters and emergencies

**PG4.1.1** Increasing the number of on-the-job training programs for planning and risk reduction

**PG4.1.2** Setting up a portal information infrastructure where all face to face training and distance learning of all target groups will be recorded, monitored and assessed

**PG4.1.3** Building and developing areas for drills and training

**PG4.1.5** Giving technical training to personnel of Provincial Disaster and Emergency Directorates

**H4.2** Raising social awareness of civil defence in disasters and emergencies

**PG4.2.1** Giving trainings with Mobile Disaster and Emergency Simulation Equipment

**PG4.2.2** Maintaining the Turkiye Ready for Disaster Project

**PG4.2.3** Ensuring that activities for raising awareness and consciousness of disasters and emergencies appear in the digital and conventional media

**PG4.2.4 (5)** Preparation of campaign movies and other materials for institutional promotion

**PG4.2.2 (6)** Giving practical trainings to the civil defence experts and chiefs

**H4.3** Inform the public correctly and prevent information pollution in disasters and emergencies

**H4.4** Establish and make widespread AFAD volunteering system

**PG4.4.1** Preparing volunteering training modules

**PG4.4.2** Organizing AFAD volunteering trainings

**PG4.4.3** Preparing public service ad

**PG4.4.4** Preparing posters/brochures/promotion materials

**PG4.4.5** Developing AFAD volunteering portal

**GOAL 5- INTERNATIONAL EFFECTIVENESS**

**GOAL 6- INSTITUTIONAL CAPACITY**

**Tablo 17.** Social Resilience in Scope of the AFAD Strategic Plan.

# Appendix

## Glossary

**City Planning or Urban Planning:** The technical and political process which deals with subject matters such as development and use of the settlements where people live; use of the physical environment; public benefit and urban environmental design.

**Disaster Risk Management:** A process for the identification and analysis of hazards and risks in scale of national, regional, city or settlement unit; of facilities, resources and priorities for risk reduction; preparation and achievement of policy and strategical plan and action plans. According to the definition given in the Law 5902: "Activities for identification, prevention, reduction and sharing of risk types and levels in national, regional, urban and local scale as well as planning principles in this respect. This process includes preparation of disaster scenarios, determination of implementation priorities and preparation of general politics and strategic plans, preparation and achievement of implementation plans for risk reduction."

**Disaster Risk Reduction Plan:** Plan of the project activities which constitute a basis for implementation of required goals and specific aims of the organizations and agencies for the reduction of disaster risks as well as short, medium and long term policies, strategies and actions for their achievement and which are administered together with risk management.

**Disaster Risk:** The occurrence of a certain hazard in a certain period of time in future; the possibility of loss it may create for people, human settlements and natural environment in proportion to their damage or vulnerability probability of loss. In order to talk about possibility of risk and loss, there should be existence of a hazard or event in certain size and existence of values that may be affected by them and rates at which these values are affected by such hazard or event or estimation of their vulnerability.

**Disaster:** An event caused by nature, human or technology, which causes physical, economic and social loss for all or parts of the community and disrupts or suspends normal life and human activities and with which the affected people have not sufficient capacity to cope. Disaster is not an event itself, but the result it creates.

**Ductility:** The capability of a system or element to expand/strain without loss of its bearing capacity. If a load of 1 ton is applied to a material and the material moves 1 cm (if its capacity design is 1 cm), it means the said material shows a ductile behaviour.

**Durability:** Condition and character of durability for an extended time; being robust and strong.

**Governance:** A management process which is based on the philosophy of collective management, collective arrangement and public-private sectors partnership, containing multi-actor and interactive relations, instead of relations unilaterally established by the classical management structures.

**Integrated Disaster Management:** A management process that takes into consideration all hazards to create a community which is capable to cope with and also resilient and resistant to disasters and performs necessary operations in the phases of mitigation, preparation, response and recovery and takes necessary measures by using all power and resources of the community.

**Mitigation Planning:** A dynamic and participatory planning process for creating a community with reduced disaster loss and increased capacity of coping and life quality, discussed in connection with strategic planning at national, regional, city and settlement levels, combining development goals with mitigation goals.

**Mitigation:** All structural and non-structural measures and activities to be taken and performed before, during and after disasters to prevent hazards caused by nature, human and technology and environmental degradations leading from disasters or reduce effects of it. These activities are long-term operations which require efforts of many organizations and agencies and a variety of disciplines in line with a certain goal. Phase of mitigation starts with activities in the phase of recovery in practice and continues up to occurrence of a new disaster. Activities performed in this phase involve a broad area of application at scale of national, regional and settlement unit.

**Resilience:** Ability of a general system to reach a new balance by giving reaction in opposite direction to an acute or chronic stress.

**Secondary Disaster:** New disasters such as fire, landslide, collapse of dam, explosion, epidemic diseases and industrial accidents that occur as caused or triggered by a disaster.

**Smart City:** A term assigned to cities which use information and communication technologies (ICT) to enhance quality and performance of city services such as energy, transport and public services and reduce consumption, waste and total costs of resources. Comprehensive target of a smart city is to increase life quality of its dwellers by taking advantage of smart technology.

**Social Inclusion:** Recognition of the social identity and legal personality of a person fully; self-realization of an individual in the society fully; acceptance of the individuals in the social, private and public structures; integration of the individual into the network of relations in the society through the participation channels basing on education, culture, employment and civil area. The opposite of social exclusion.

**Sustainable Development:** An organization principle for the maintenance of natural resources and ecosystem services on which the natural system, economy and society are based and for the achievement of human development goals.

**Sustainable Urban Development:** Spatial reflections of the principles, policies and actions of sustainable development.

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