



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

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### **ABSTRACT**

Istanbul is most vulnerable city because of its seismic-prone location nearby the North Anatolian Fault, and its high population and commercial/industrial densities. Taking into consideration that the probability of a major potential earthquake in next years will bring mass destruction in physical environment and economic sector with a high risk of life loss to Turkey, there is an urgent need to shift existing faith-oriented, reactive and recovery based policies into proactive, mitigative and preventive approaches.

Istanbul Seismic Risk Mitigation Project (ISMEP) is a significant attempt to implement essential principles of comprehensive disaster management financed by the World Bank, European Investment Bank, Council Of Europe Development Bank, Islamic Development Bank with a budget of 1.5 Billion Euro in total by the year of 2014. The main objectives are to improve the city of Istanbul's preparedness for a potential earthquake through enhancing the institutional and technical capacity for disaster management and emergency response, strengthening critical public facilities for earthquake resistance, and supporting measures for better enforcement of building codes and land use plans.

### **I.INTRODUCTION**

Turkey is highly vulnerable to natural disasters particularly earthquakes, located at one of the active regions in the world in terms of seismicity and therefore felt significant interruptions on social, economic and financial life for many years. Within the nation's high-risk context, Istanbul is most vulnerable because of its seismic-prone location on the North Anatolian Fault, and its high population and commercial/industrial densities. The social, economic and environmental impacts of a potential earthquake would be higher than the 1999 Kocaeli Earthquake, as Istanbul is not only the financial, cultural and industrial centre of the country, but is also a nexus of inter-continental importance and home of about 15 million people.

In this framework, "Istanbul Seismic Risk Mitigation and Emergency Preparedness Project" (ISMEP) is an important step forward to improve the city of Istanbul's preparedness for a potential earthquake and to reduce disaster-related impacts. Within this project, the main focus lies on the implementations of preventive and supporting measures on preparedness, mitigation, response and recovery activities covering pre-disaster, on disaster and post-disaster periods.

The Government of Turkey (GoT) and International Bank of Reconstruction and Development (IBRD) agreed upon a loan (no:4784-TU) on September 18th, 2005 to implement and finance the "Istanbul Seismic Risk Mitigation and Emergency Preparedness Project" (ISMEP). The Project started

on February 3rd, 2006 and is implemented by Istanbul Project Coordination Unit established under the Istanbul Special Provincial Administration.

ISMEP aims to improve the city of Istanbul's preparedness for a potential earthquake through strengthening institutional, social and technical capacity of emergency management including preparedness, mitigation, response and recovery activities, increasing public awareness on disaster, executing vulnerability inventory and retrofitting/reconstruction activities for priority public buildings, and taking supporting practical measures for better enforcement of building codes and land use plans.

The project consists of the following components and activities:

**Component A**, "Enhancing Emergency Preparedness" aims to enhance the effectiveness and capacity of the provincial and municipal public safety organizations in Istanbul to prepare for, respond to and recover from significant emergencies, especially those arising from earthquakes. **Component B**, "Seismic Risk Mitigation for Priority Public Buildings" covers risk mitigation activities on priority public buildings and some of the buildings under cultural and historical heritage. Then, **Component C**, "Building Code Enforcement" aims to improve technical and professional capacity of pilot municipalities (Bagcilar and Pendik) for streamlining building permit issuance procedures and cover public awareness activities on urban planning and construction for disaster mitigation and preparedness which are designed and implemented for 3 target groups (local decision makers, technical staff and community representatives).

## II. PROJECT ACTIVITIES

Under **Component A** of the ISMEP Project, enhancement of disaster and emergency communication systems (Subcomponent A1), design and deployment of emergency management information systems (Subcomponent A2), enhancement of operational capability of the Istanbul Provincial Disaster and Emergency Directorate (DED) (Subcomponent A3), enhancement of emergency response capacity of the first responder institutions (İstanbul Search and Rescue Unit (ISARU), İstanbul Health Directorate (IHD), Istanbul Police Department (IPD), İstanbul Gendarmerie Commandership, Turkish Red Crescent, etc.) (Subcomponent A4) and public awareness/training studies (Subcomponent A5) are being carried out.

Under A1 subcomponent, the current analogue radio communication infrastructure of the first responder public institutions have been enhanced by the procurement of analogue area relays, mobile relays, multimode digital radios, digital radio relays and peripheral communication devices, communication switches, HF/SSB Radios and communication vehicles. By investing and expanding the current security video network of the IPD, İstanbul DED has gained the capability to monitor the live video streams of the IPD network spread all over İstanbul city apart from the more than 1000 municipal video streams dedicated for traffic monitoring.

Under A2 subcomponent, İstanbul Disaster Management Information System software has been developed and deployed to İstanbul DED. The system aims to gather information from all the public institutions that may be needed for collaboration and command control during a disaster or emergency.

Under A3 subcomponent, dedicated to "Enhancing the institutional capacity of İstanbul DED", a new building was constructed and furnished in the campus area of the Governorship. Many IT equipment like display wall system, servers, active devices, communication devices, etc. have been procured to make the DED fully operational. The İstanbul Governorship designated two locations, one on the Asian and one on the European side, to be used as new emergency management centers. A protocol was signed on January 31, 2007 between the Ministry of Defense and the İstanbul Governorate, locating Hasdal for the European DED site. The Asian side DED was designated to be built next to the Turkish Red Crescent operation center in Akfırat. The construction of Hasdal and Akfırat DED have already finished .

Under A4 subcomponent, many procurement packages have been completed and the goods have been delivered to the public institutions.

***For İstanbul Health Directorate:***

- 1-Isolated Containers (50 items)
- 2-Variou Medical equipment
- 3-Vehicles (Electrical and diesel forklifts, 4x4 health rescue vehicles, emergency health service vehicles, heavy duty health service trucks, trailers, frigorific vehicles.)
- 4-Mobile Lighting Towers
- 5-Cold Air Depot (To keep vaccine and blood products)
- 6-Mobile Water Treatment Systems
- 7-Variou Camping Equipment

***For İstanbul Provincial Disaster and Emergency Directorate (DED):***

- 1-Vehicles (Mobile communication, mobile broadcast, survey, transport, operation vehicles)
- 2-Variou Communication Devices (Radio handsets, car radios, communication switches, antennas and antenna near products, etc.)

***For İstanbul Search and Rescue Unit:***

- 1-Vehicles (Off-road Equipped Search and Rescue, Water Rescue, K-9 Rescue, CBRN Decontamination System Truck, NBC Rescue, Mobile communication, survey and operation vehicles)
- 2-Variou Communication Devices (Satellite communication devices, Radio handsets, car radios, HF/SSB radios, etc.)
- 3- Variou Search, Rescue and Camping Equipment
- 4- Diving Equipment
- 5- IT Equipment (PCs, laptops, cameras, video cameras, printers, etc.)

***For İstanbul Police Department:***

- 1-Fully Equipped Water RescueVehicle

***For İstanbul Gendarmerie Commmandership:***

- 1-Fully Equipped Water RescueVehicle

***For Turkish Red Crescent***

- 1-Temporary Shelters (Mevlana Evleri)
- 2-Mobile Generator

With the help of these procurements, on-disaster and post-disaster responses of the related public institutions have been enhanced. For instance, İstanbul Search and Rescue Unit has been promoted as “Heavy Rescue Unit” by UN INSARAG with its new operational capability.

**Component B**, as an important part of the project, includes the retrofitting or reconstruction of priority public buildings (schools, hospitals, dormitories, administrative and social service buildings).

The preparatory work and the prioritization studies, which form the basis of the retrofitting works, were carried out under MEER Projected financed by the World Bank: the total number of evaluated buildings was 2473. ISMEP Project aimed to execute and perform the retrofitting and reconstruction of priority public buildings. The reconstruction decisions are given with respect to the results of the technical and economic feasibility studies for buildings which are not feasible economically for retrofitting. Therefore, the given number of buildings within the scope of the retrofitting works will change depending on the budgetary funds.

The retrofitting designs are reviewed with respect to the “Regulation on Buildings to be Constructed in Earthquake Zones”. Accordingly, the retrofitting designs for buildings which have been financially feasible for retrofitting are revised. Besides, the retrofitting designs were prepared in line

with the regulation for buildings which did not have retrofitting designs and financially feasible for retrofitting.

Retrofitting design studies for 1969 priority public buildings are taken into consideration by June 2014. With respect to the evaluation results, the retrofitting works are done for the below mentioned buildings.

**Table 1.** Completed/Ongoing Retrofitting Works for Public Buildings within the scope of the ISMEP Project by the end of June 2014

<b>Building Type</b>	<b>Completed</b>	<b>Ongoing</b>
Hospital	29	10
Polyclinics	59	
Schools	679	47
Administrative Buildings	39	5
Dormitories & Social Service Buildings	41	-
<b>TOTAL</b>	<b>847</b>	<b>62</b>

**Figure 1.** Retrofitting Works--Column Jacketing and Shear Wall and Implemented Renovation Works



The retrofitting and renovation works of existing Marmara Başbüyük Research and Training Hospital that approximately 113.000 m<sup>2</sup> built-up area and 600-bed capacity is ongoing. The innovative retrofitting technique named as “base isolation” will be executed to existing hospital building and the hospital will be operational during and after possible earthquake. The effect of ground movements during earthquake shall be abated by 829 base isolators installed under the building. No other building in the world has ever been constructed with such quantity of base isolators.

The decision for reconstruction was given when retrofitting was not financially affordable, economically justifiable, technically feasible, and socially acceptable. In addition to the retrofitting works, with respect to the evaluation results, the reconstruction works are done for the below mentioned buildings.

**Table 2.** Completed/Ongoing Reconstruction Works for Public Buildings within the scope of the ISMEP Project by June 2014

Building Type	Completed	Ongoing
Hospital	2	3
Polyclinics	2	
Schools	178	40
Administrative Buildings	8	3
Dormitories & Social Service Buildings	6	10
<b>TOTAL</b>	<b>196</b>	<b>56</b>

The reconstruction works of Ataturk Dormitory Campus is the first contract that has a large-scale budget in ISMEP. Since, the campus is the biggest dormitory in Istanbul that has the capacity of 3,500 students who are in the most successful category in Turkey; it means that this investment is very crucial for the future of Turkey. The project has been designed for modern requirements and the rooms are single or double-bedded. It consists of five dormitory buildings, one library and auxiliary buildings with the total built-up area of 110,000 m<sup>2</sup>.

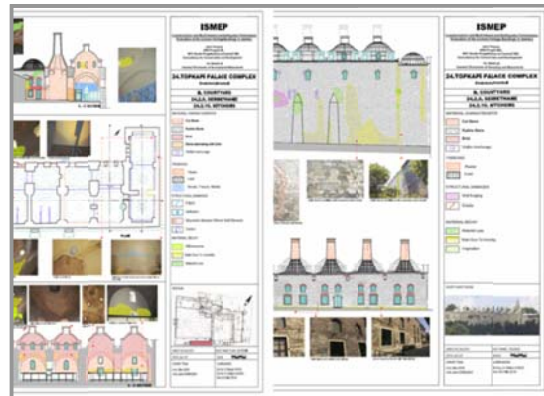
The Construction of Ümraniye Obstetrics and Pediatrics Hospital has been commenced and this 350 bed modern hospital will be operational by the end of March 2015.

The reconstruction of the Okmeydanı, Kartal Lütfi Kırdar and Göztepe Training and Research Hospitals, have been started. These hospitals are the biggest hospitals in Istanbul each serving around 1.500.000 patients yearly. Thus, the reconstruction designs are planned to assure that the current hospitals will be under operation while the new hospitals are constructed within the same land.

The seismic design of the hospitals targets to cover the “*Operational Building*” performance level in DBE (Design Basis Earthquake) and “*Life Safety*” performance level in MCE (Maximum Credible Earthquake) according to ASCE/SEI 41-06. Thus, the design covers seismic base isolators for an earthquake resistant hospital complex.

It is important to note that the hospitals to be reconstructed are also designed to meet the Gold level in LEED green building certification and will be pioneering examples as being first LEED certified hospitals in Turkey.

**Guideline for Seismic Retrofitting of School and Hospital Facilities in Istanbul:** A Commentary Guideline for the “Seismic Retrofit Design for School and Hospital Facilities in Istanbul” was prepared under B component as a part of the consultancy service contracts in order to prepare seismic retrofitting principles of education and health buildings under ISMEP Project.

**Figure 2.** Field Survey- Sample Drawings of Topkapı Palace Complex

Moreover, within the context of the B Component, the inventory of 26 cultural heritage buildings (176 buildings) of which are under the protection of the Ministry of Culture and Tourism were carried out. The data will be shared, depending on the level of confidentiality, with the public, universities and other public institutions. The retrofitting designs of Topkapı Palace, 4th Court – Mecidiye Kiosk, Archeological Museum Additional and Classical Building and Haggia Sophia Museum Directorate – Saint Irene were prepared and submitted. Seismic strengthening and preservation works financed by the Government on the Archeological Museum were started. The other two proposed designs for cultural heritage buildings (Mecidiye Kiosk and Saint Irene Monument) are yet to be approved by the Istanbul Protection Board for Heritage and Monument Buildings.

**UNESCO – ICOMOS Joint Mission Visit to the World Heritage Property of the Historic Areas of Istanbul:** Turkey is a State Party to the “Convention Concerning the Protection of the World Cultural and Natural Heritage and the Historic Areas of Istanbul was inscribed on the UNESCO World Heritage List. The mission visited Turkey in May 2008. The report prepared by the mission referred to the World Bank funded ISMEP Project. The mission declared that risk assessments of cultural heritage buildings under ISMEP Project were being implemented by appropriately qualified international expert consultancies and were designed as pilot projects for replication more widely in Turkey. Also the mission commend Turkey for this innovative and comprehensive initiative in risk mitigation, which would provide a model for emulation in other large and complex World Heritage properties exposed to earthquake risk.

**Component C** covers the activities aiming at **streamlining building permit issuance, planning and land use development procedures in two pilot municipalities** (Bagcilar and Pendik) which were selected in line with determined criteria (such as; located nearby disaster prone areas, high distribution of dangerous materials, high population density and growth). In that, firstly, a need analysis and evaluation study were made in pilot municipalities to improve efficiency and transparency in land use development, existing building permit issuance and application processes. Accordingly, IT infrastructure including software and hardwares, system room construction, local area network (LAN) backbone implementation and disaster recovery system hardwares were supported in order to develop their data management capacity and to manage systems to be established for digital archives and streamlining of internal work flows. In that, both municipalities received the ISO 27001 certificates proving that their systems comply with international standards for information management and data security.

The projects of geo-referenced data (spatial and non spatial data) integration, updating and collection services covering establishment of digital archive system for documents of land use development and permit activities were implemented. After that, all work flows related to land use and building permit procedures were analysed, improved and transferred into digital environment. Documentation management system was established and integrated into existing GIS based system to monitor land use development processes and increase service capacity of the municipalities to their community. The integration of processes to manage applications, requests and complaints from citizens and internal technical and administrative processes were adopted by the year of 2012. The municipalities is now able to accept all applications via web site or call center as well. The community can have detailed information about their application status. A baseline survey which aims to evaluate the impacts of the new digital system and streamlined procedures was conducted before and after the whole project activities. The results show that the level of satisfaction from the restructured municipal services increased. The duration of building permit approval process decreased and also the number of required documents and signature approvals fell. The process is more transparent and accessing to the documents has become much easier for the municipal personnell and citizens.

In addition, in order to increase the education level of civil engineers on “Regulation on Buildings to be Constructed in Earthquake Zones” (in short Retrofitting Code) issued on 6 March 2007, training sessions were implemented under the protocol signed between the Ministry of Environment and Urbanism and IPCU throughout Turkey between the years of 2008-2012. Training materials were

designed and prepared, training of trainers completed. Civil engineers are invited by the Ministry, with the help of the local chamber of civil engineers, from metropolitan and district municipalities and provincial directorates affiliated to the Ministry. As a result, a total number of 3631 engineers were trained. At the end of the 3-day training, trainees are taken to an evaluation on a voluntary basis. Based on the exam results, the Ministry provides participation or completion certificates to the trainees.

Under Component C, “**Public Land Management Study**”, introduces models and options based on sustaining public benefits for better/efficient management of public lands of public buildings to be relocated or to be demolished because of being exposed to disaster and having low accessibility within the city centre. In that, existing national and international policies and tools were analysed and evaluated in terms of legal and institutional framework with their opportunities and restrictions.

### III. SOCIAL ASPECTS AND CONTRIBUTIONS of ISMEP PROJECT

ISMEP Project with its three components gives importance to accomplish social dimensions of on going technical and institutional works and to increase public awareness on disaster mitigation activities.

Under the scope of Components of A and C, **disaster public awareness trainings** for different target groups are organized in İstanbul to raise public awareness for disaster preparedness, urban planning and construction for disaster mitigation. Training modules and materials includes participant, instructors books, posters, brochures, info cards, power point presentations with technical drawings and spot films were prepared in both Turkish and English. Training Modules and Materials are given below;

1. First 72 Hours for The Individual and Family in an Earthquake
2. First 72 Hours for Disabled People in an Earthquake
3. Compulsory Earthquake Insurance Awareness
4. Survival Under Extraordinary Conditions
5. Psychological First Aid in Disasters
6. Non-structural Risk Mitigation Against Earthquake
7. Structural Risk Mitigation Against Earthquake
8. Structural Retrofitting Against Earthquake
9. Disaster Emergency Aid Planning for Educational Institutions
10. Disaster Emergency Aid Planning for Healthcare Organizations
11. Disaster Emergency Aid Planning for Industries and Working Places
12. Disaster Preparedness for Local Disaster Volunteers
13. Urban Planning and Construction for Disaster Mitigation for Local Decision Makers
14. Urban Planning and Construction for Disaster Mitigation for Technical Staff
15. Urban Planning and Construction for Disaster Mitigation for Community Representatives

**Safe Life Trainings** were prepared for the public to participate in the disaster preparedness activities and to build and extend “Safe Life Culture”. Within this context 73.000 volunteers were trained between 2009 and 2012. “Safe Life Trainings” are made up 3 steps. Safe Life 1 training is aimed to create public awareness and is about to inform public about for the first 72 hours after disaster and how to prepare for a family disaster plan and to build a “Safe Life Culture”. Safe Life 2 training is aimed on enhancing the awareness of individual with further knowledge and upskill, and increasing the awareness level from individual to family. Local Disaster Volunteers (LDV) training is aimed to improve social collaboration and is made up of two phases. LDV training is about to create disaster volunteerism, to identify disaster risks of neighborhoods and to participate public to response and recovery activities.

“Safe Life Trainings” are disseminated as “Individuals and Families Disaster Preparedness” training with an institutional cooperation model which is applied together with the Provincial

Directorate of National Education by 94 volunteer teachers working at the primary and secondary schools in 38 districts under the Provincial Directorate of National Education throughout Istanbul. Totally 37.195 (25.214 students, 3.667 teachers and 8.314 parents) people were trained by this dissemination model.

Under Component B, a study on the social aspects of retrofitting were initiated in order to reduce the problems arising from the retrofitting works and to inform the beneficiaries. The Information, Awareness Raising and Social Guidance Study were made within different groups with school directors, parent unions, members of schools and the Provincial Directorate of Education, District Directors of Education to increase their awareness about retrofitting activities. This study has been carried out both in retrofitting and host schools. Brochures were prepared and distributed for the schools being retrofitted. A number of 230.000 people were trained by the year of 2012. Moreover, social Impact Assessment Surveys were conducted to evaluate the social impacts of retrofitting works executed at schools and to identify the retrofitting/reconstruction work procedures.

**“Safe City, Safe Life Trainings”** are aimed to make a contribution to disaster mitigation and to build safe settlements. Participants are informed about the reduction of disaster damages, urban planning principles and safe settlements criteria. The trainings are carried out Bageclar and Pendik Pilot Municipalities were attended by 744 people.

Besides training programs, several public awareness campaigns are implemented in Istanbul in order to reach all citizens under the scope of ISMEP Project. The campaign motto was “Take a Step for Safe Life” and 312.000 people were reached and training materials were delivered during the campaigns.

**“Emergency and Disaster Prevention, Response and Recovery Plan for Istanbul”** (Istanbul DERRP) efforts has been started by Republic of Turkey Istanbul Governorship according to the legislation in force. The Istanbul DERRP aims is to provide a plan to the institutions/ organizations which are in charge of emergencies and disasters in order to fulfil its obligations quickly in possible emergency and disaster cases (earthquake, flood, dam failure, hazardous chemical accidents, etc.). As a part of these efforts, studies intends to develop a voluntary system so that volunteer potential of Istanbul will be integrated to Istanbul DERRP. With disaster voluntary model, it is aimed essentially how the voluntary resources will be involved in Istanbul Disaster and Emergency Plans to be implemented by Istanbul Provincial Disaster and Emergency Directorate in the case of emergency and disaster; rising the effectiveness of voluntary capacity in the phases of risk mitigation, preparedness, response and recovery known as disaster cycle; and improving voluntary management capacity of Istanbul Provincial Disaster and Emergency Directorate.

#### **IV. CONCLUSION**

ISMEP Project pursues a pro-active approach to mainstreaming risk mitigation and prevention for a potential of earthquake in İstanbul. The activities of ISMEP Project have crucial importance in terms of the prevention of potential loss of lives and mitigation of social, economic and financial impacts. Besides, ISMEP Project will be an outstanding model for the design and implementation of other national and international projects and activities in the field of disaster risk mitigation.