2010

[KADIKOY EARTHQUAKE EMERGENCY PREPAREDNESS PROJECT]

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ACCRONYMS

NAFZ : North Anatolian Fault Zone

JICA: Japanese International Cooperation Agency

IMM: Istanbul Metropolitan Municipality

BU-ARC: Bogazici University-American Red Cross

IEMP: Istanbul Earthquake Master Plan

FEMA: Federal Emergency Management Agency

GIS: Geographical Information Systems

EMS: the European Micro Seismic Scale

HAZUS: Hazards United States

A.K.O.M: Disaster Coordination Center

D.L.H: Port Services of the State

T.C.D.D: Railway Services of the State

A.K.U.T: Search and Rescue Team

ISKI: Istanbul Water and Sewer Management

AYEDAS: Istanbul Asian Side Electricity Distribution

IGDAS: Istanbul Gas Distribution Affairs

GSM: Global system for mobile communications

I.E.T.T: Istanbul Electrical Tram and Tunnel Management

D.M.O: Material Office of the State

SSK: Social Insurance Establishment

IDO: Istanbul Sea Transportation Management

TARC: Turkish Amateur Radio Club

USAR: Urban Search and Rescue

KADIKOY EARTHQUAKE EMERGENCY PREPAREDNESS PROJECT

1 Abstract

Despite the fact that the problem of reducing damage and destruction following an earthquake has been addressed many times in earlier studies, the " Kadikoy Earthquake Emergency Preparedness Project" aims to provide a unique approach to the post earthquake emergency process in that it considers the vulnerability assessment, emergency plan preparation in different phases and the installation of temporary shoring systems as a whole for the district of Kadikoy which is located in the Asian side of Istanbul, Turkey.

Besides assigning tasks to the authorities during different time periods for handling the emergency process (that is a result of a built complete event scenario based on a detailed vulnerability assessment study) in the most efficient way possible, in order to furnish a guidance for the authorities in a technical sense, the project presents the most feasible routes for transportation to the nearby facilities. The problem of unstable buildings after the main shock of the earthquake, on the other hand, is considered through proposing appropriate shoring systems to correspondent damage types in the building stock.

Eventually, the uncertainties arising from the assumptions and how they would impact the current situation are addressed.

2 Introduction

Throughout history, countless times, man has suffered due to natural disasters causing tremendous damage resulting in both loss of lives and the malfunctioning of the built environment. Dealing with the emergency situations arising from these disasters has always been of great significance to man. However, learning to cope with these phenomena and the consequent destructive effects is a long process the evolution of which is still in progress. Nevertheless, with the increasing number of urban areas, the emergency planning has come to a point where it is understood that no detail should be overlooked and scenarios should be developed as close to reality as possible.

As time progressed, with the concept of urbanization, the failure of one or more components of built systems have become much less acceptable on account of the fact that a disorder would cause a prolonged dysfunction. Among these natural disasters that induce the collapse of built systems, one that could cause arguably the greatest amount of damage, is an earthquake.

An earthquake is the shaking and vibration at the surface of the earth caused by underground movement along a fault plane or by volcanic activity (Geoscience, Australia). Today, in developed countries, all of the buildings are constructed according to a seismic legislation which makes them more resistant to lateral dynamic forces as induced by the phenomenon.

The performance of an urban area and its built environment under earthquake conditions is analyzed taking into consideration 3 important concepts, namely, vulnerability, exposure and risk where the former two are defining the latter.

An emergency plan which is a set of activities and responsibilities to be activated in a certain sequence by the relevant authorities in case of an emergency situation is prepared according to qualitative and quantitative analysis of these concepts. For instance, from a very broad point of view, in case of an earthquake, an emergency plan makes use of the seismic risk assessment in determination of to be more severely damaged areas and relatively more secure zones.

Evolving from these three initial concepts, numerous other factors to describe the performance of a built environment have been developed, the most significant of which are reliability, serviceability, accessibility and resilience.

In the light of these concepts, an earthquake emergency plan following a previously performed seismic vulnerability assessment study for the district of Kadikoy, Istanbul is proposed. Additionally, guidelines for installments of shoring systems for correspondent damage types are provided.

2.1 Definition of Concepts

Earthquakes are natural hazards that represent extreme and unavoidable geophysical events which are difficult to predict and over which the society has little or no control [1].

A natural hazard only becomes a disaster when it affects a human population that is exposed and vulnerable. The occurrence and extent of disasters thus depends on three basic variables hazard (natural phenomena such as earthquakes, typhoons or volcanic eruptions) exposure (structures, buildings, humans and other entities at risk) and vulnerability (propensity to suffer loss) which are explained below in more detail [2].

Kasperson et al. in 2003 defined ***vulnerability*** as the degree to which the humans and environmental systems are likely to experience damage due to a perturbation or stress. Specifically, for an earthquake, the concept of vulnerability defines the propensity to damage that is caused by an earthquake. The concept of vulnerability being a broad one led engineers and land use planners to observe it in 3 more specific subtexts; physical, systemic and organizational vulnerability. Physical vulnerability, as the name itself suggests, refers to the fragility to disruption in physical terms. For instance, the collapse of a column due to ground acceleration indicates that the column had a high physical vulnerability which resulted in its poor performance during an earthquake. "The notion of systemic vulnerability underlies what can be measured is how prone a system is to damage or failure not only as a consequence of some kind of physical damage occurring to one of its components, but also as the indirect effect of some physical, functional, or organizational failure suffered by other systems". An example for this kind of vulnerability is that of the lifelines thanks to their intra and interdependences [3]. Organizational vulnerability on the other hand, refers to how defenseless a community and its authorities are in responding to an emergency in terms of management of the extraordinary situation arising as a consequence of the natural disaster.

Exposure to a natural disaster is quantified as the number of households and goods that are going to be directly or indirectly affected from the disruptions caused by the incident. It is one of the two main criteria defining the concept of risk.

Risk, despite its common use as a word in everyday language, has been defined differently by different people throughout history leading to confusion regarding the discussions of the concept. One of the first and clearest definitions made by Frank Knight in 1921 is as follows: "Risk is the quantifiable uncertainty".

Another definition made by Huang Chongfu in 1995 states that risk is a two dimensional concept involving the possibility of an adverse outcome and uncertainty over the occurrence, timing and magnitude of that adverse outcome.

Despite the fact that many other definitions are available regarding the area of interest, in this report, risk is analyzed as a compound effect of vulnerability and exposure such that a system with higher vulnerability and greater exposure is likely to be influenced more detrimentally from the consequences of an incident. One key issue in understanding the concept of risk is that the difference between risk and danger must be clarified, in the sense that, for instance, a tank full of combustible substance is considered as a risk element only when there are households or goods around it. Without exposure, as in the case of an isolated environment, it is described as "dangerous". The concepts of risk, vulnerability and exposure are all equally significant parts of the equation when performing a risk assessment in an area.

Studying the concepts of risk, vulnerability and exposure in a more detailed manner, one is required to understand several other notions which facilitate comprehending these definitions. These are reliability, serviceability, accessibility and resilience. Here are their definitions.

Husdal in 2004 stated that *reliability* is the operability of a system under various strenuous conditions (i.e. the ability to continue functioning) .The reliability notion when associated to the transportation network vulnerability analysis such that failure of several links may or may not lead to dysfunction of the whole system, the latter implying a more reliable network.

Berdica in 2002 stated that the serviceability of a system, describes the possibility to use that system during a given period.

Accessibility, as defined by Jones in 1981*,* is generally perceived as ease of reaching a place and concerns the opportunity provided by the transport system for people to perform a particular activity or set of activities from a given location.

S. Menoni in 2010 defined *resilience* as the adaptation to changes, capacity to absorb/overcome a disturbance reaching a different/new level of dynamic equilibrium.

Eventually, an **emergency plan** is described by Eduado Calixtoas et al. as a group of procedures to be implemented in case of catastrophic event situation involving communication, planning, action, risk analysis, operational support, logistic support and whatever is necessary to reduce accident impacts.

2.2 General Information on the City of Istanbul

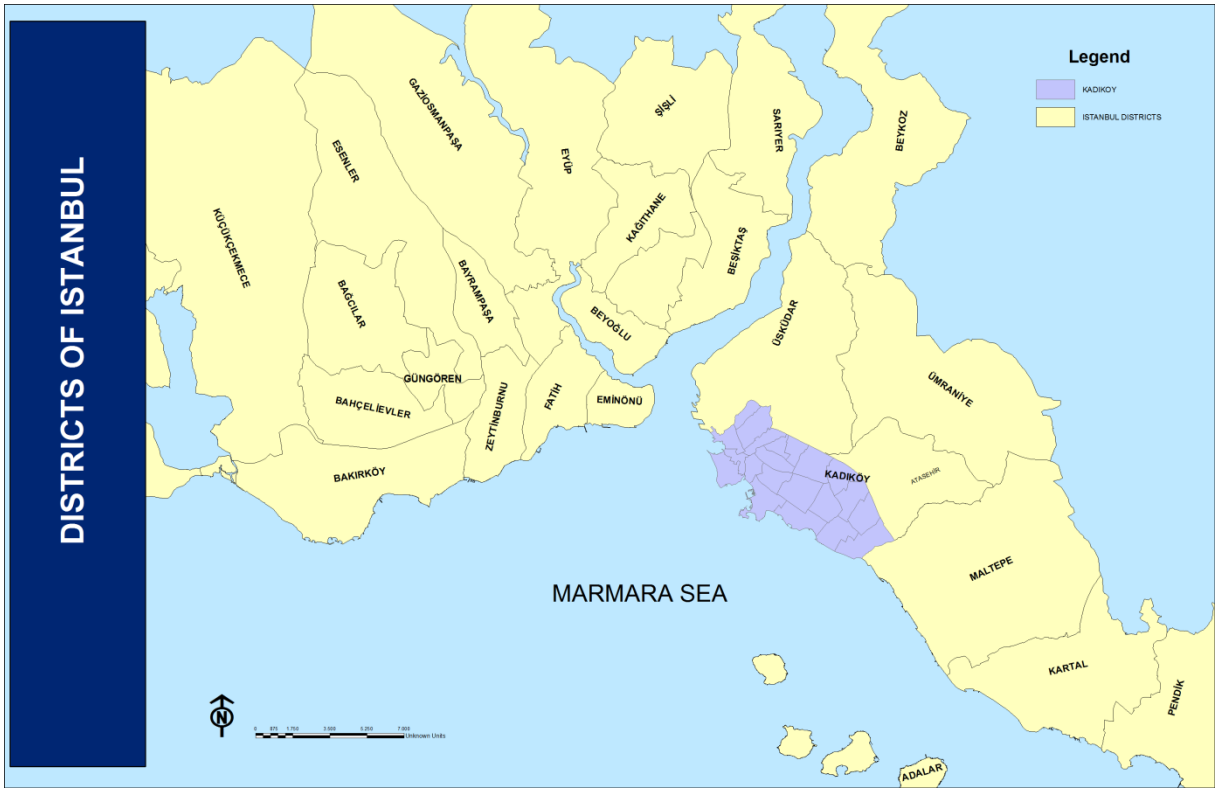


Figure 1 Istanbul Districts

Istanbul, historically known as Constantinople, is the largest city in Turkey and is located on the Bosporus Strait having an area of 5,343 km². It is the only metropolis in the world that is situated on two continents. The European part is twice the size of the Asian part and, a narrow channel of the Bosporus connects the trade routes of the Black Sea to the Sea of Marmara and the Mediterranean.

Besides the unique geographical state of the city, Istanbul has a great historical and cultural heritage which has come to symbolize it. The first foundations of today's Istanbul were laid down in the 7th century BC. It was rebuilt and made the capital city (Constantinople) by Emperor Constantine in the 4th century AD. Since then, for sixteen centuries the city has retained its position as the capital city of Eastern Rome, the Byzantine Empire, and Ottoman Empire. In addition to becoming one of the centers of Christianity under the reign of Emperor Constantine, Istanbul became the most important center in the Islamic world following the conquest of the city by the Ottoman Turks in 1453 [4].

In addition to historical heritage, the city is a very important center in terms of population, and economy in the country. The effect of migration due to rapid industrialization has lead to the increase in the population growth rate from the beginning of 50's until 90's [5]. In other words, Istanbul registered a dramatic population increase from 1.16 million to more than 10 million from 1950-2000 (during the same period, the Marmara region population grew from 3.1 to 17.4 million). As a result, Istanbul's share of Turkey's total population grew from 5.6% to 14.8% during the period 1950-2000 (and from 14.8% to 25.6% for the Marmara region. According to "2009 Address Based Population Registration System Population Census" performed by Turkish Statistical Institute, the city has a population of 12.782.960 with a growth rate of 17% mostly accounting for the countryside migration. Another significant point is that the economy of Istanbul has an international significance since it dominates the trade at the national level. The city concentrates 27% of national GDP, 38% of total industrial output and more than 50% of services, and generates 40% of tax revenues. Its GDP per capita exceeds the national average by more than 70% (i.e., the highest level among OECD metro-regions) and its productivity level by almost 50% [6]. In addition to this, the most important airport and harbor in Turkey are situated in the city.

Istanbul consists of 39 districts. Each district has its own mayor and council with its members elected by the public every five years. The district municipalities have their own budgets and revenues being responsible for providing waste management services and building construction permits to their residents. District Municipalities of Istanbul are stated as follows: Arnavutkoy, Avcılar, Basaksehir, Küçükçekmece, Bakırköy, Bahçelievler, Bağcılar, Güngören, Esenler, Büyükcekmece, Beylikdüzü, Catalca, Silivri, Bayrampaşa, Zeytinburnu, Fatih, Esenyurt, Kucukcekmece, Sultangazi, Beyoğlu, Beşiktaş, Şişli, Kağıthane, Sarıyer, Gaziosmanpaşa, Eyüp, Eminönü, in European side and Üsküdar. Beykoz, Kadıköy, Kartal, Pendik, Tuzla, Ümraniye, Adalar, Maltepe, Sile and Sultanbeyli, Sancaktepe, Sile Atasehir in the Asian side [4].

2.3 Description of the District of Kadikoy

Figure 2 Kadikoy

Kadikoy is located on the south-west of Asian part and is surrounded by districts Uskudar to the north, Atasehir to the east and the Marmara Sea to the south and the west. Its coast is 21 km. long starting from Haydarpasa and ending in Bostancı. It covers an area of 25, 2 km2. After the 2009 local elections the 7 neighborhoods were allocated from Kadikoy and hence the remaining 21 are as follows: Caferaga, Osmanaga, Rasimpasa, Kosuyolu, Acıbadem, Hasanpasa, Bostancı, Caddebostan, Dumlupınar, Egitim, Erenkoy, Feneryolu, Fikirtepe, Goztepe, Kozyatagi, Merdivenkoy, Sahrayıcedit, Suadiye, Zuhtupasa, Ondokuzmayis. Having a population of 533.452 (“2009 Address Based Census”) Kadikoy is one of the biggest districts of Istanbul.

Thanks to the geographical location the sea transportation plays an important role among others. It is possible to reach many points within the city by ferries. Even though, The port of Haydarpasa it is not the biggest port in terms of area, it keeps the control of 20 % of total freight transportation of the country [7]. In addition to sea transport, main highway arteries including D-100 and TEM (Trans European Motorway) pass through the district connecting it to Fatih Sultan Mehmet and Bogazici bridges. Moreover, Haydarpasa Terminal of the Turkish State Railways is located close to center of Kadikoy, serving east- and south-bound international, domestic and regional trains.

The economy is mostly based on the service sector followed by other sectors including textile, painting industry, health, entertainment, construction and tourism [8].

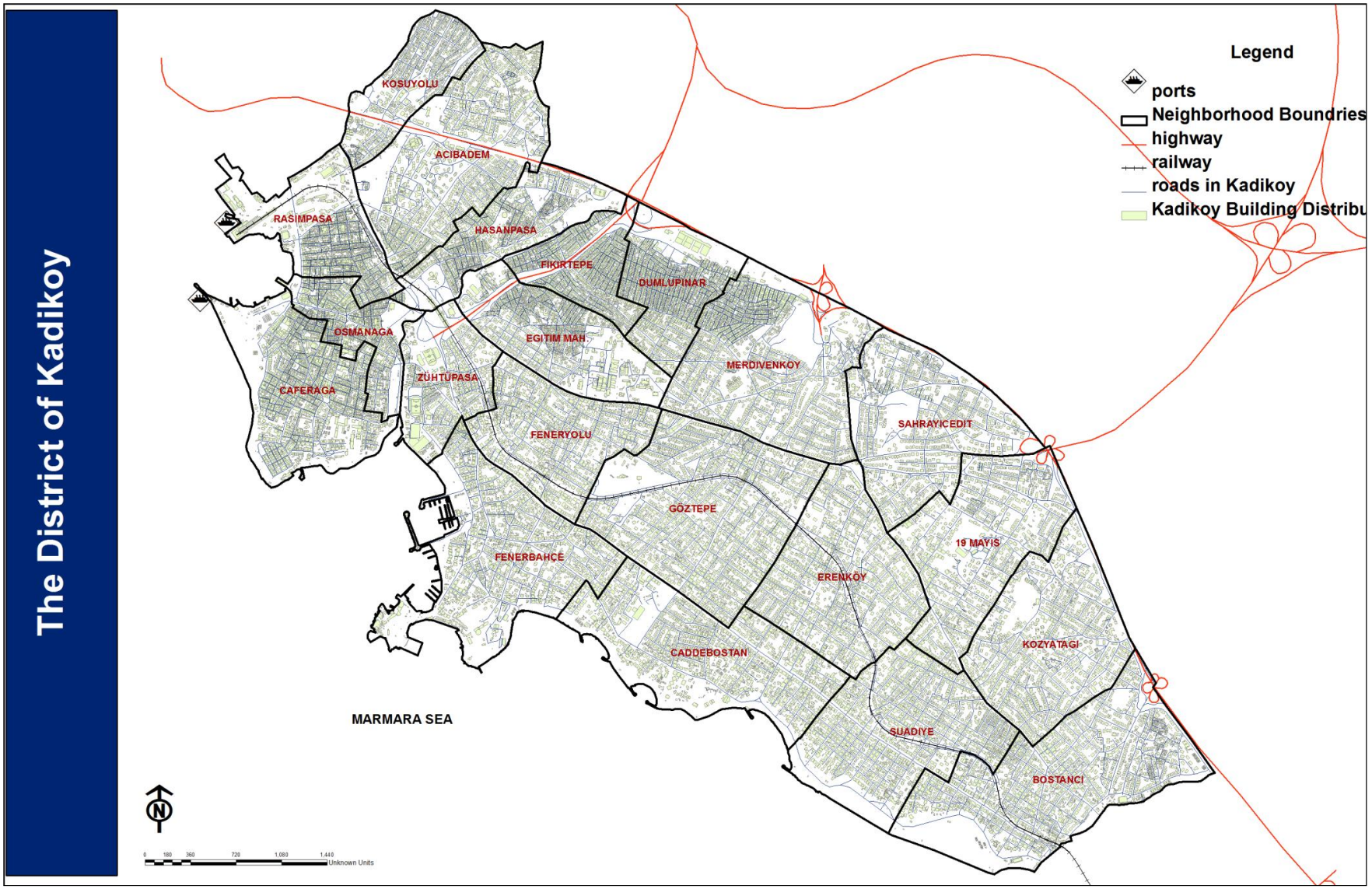


Figure 3 Building and Road Distribution of Kadikoy

2.4 Review of the State of the Art

Turkey is one of the countries which have suffered loss of livess and property due to earthquakes. So far in this century the earthquakes have resulted in more than 110000 deaths, about 250000 hospitalized injuries [9]. The western continuation of the North Anatolian Fault Zone (NAFZ) which accommodates 25 mm/yr of right lateral motion runs in close vicinity through the Marmara Sea. The NAFZ has produced a series of large and devastating earthquakes during the 20th century starting in 1939 in eastern Anatolia and then systematically propagating westwards. The most recent earthquakes of magnitude greater than 7.0 (M>7) in Richter's scale occurred in 1999 near Izmit and Duzce and produced accelerated seismic activity along the NAFZ south of the Istanbul area within the Marmara Sea [10].

Istanbul and its surrounding settlements were damaged by many earthquakes throughout history. Historical records for past 2000 years (Ambrayses, 2002) reveal a statistical recurrence of one destructive earthquake hitting Istanbul each century. Recent estimates indicate a 65% probability for the occurrence of an M>7 earthquake close to the population center of Istanbul within 30 years [9].

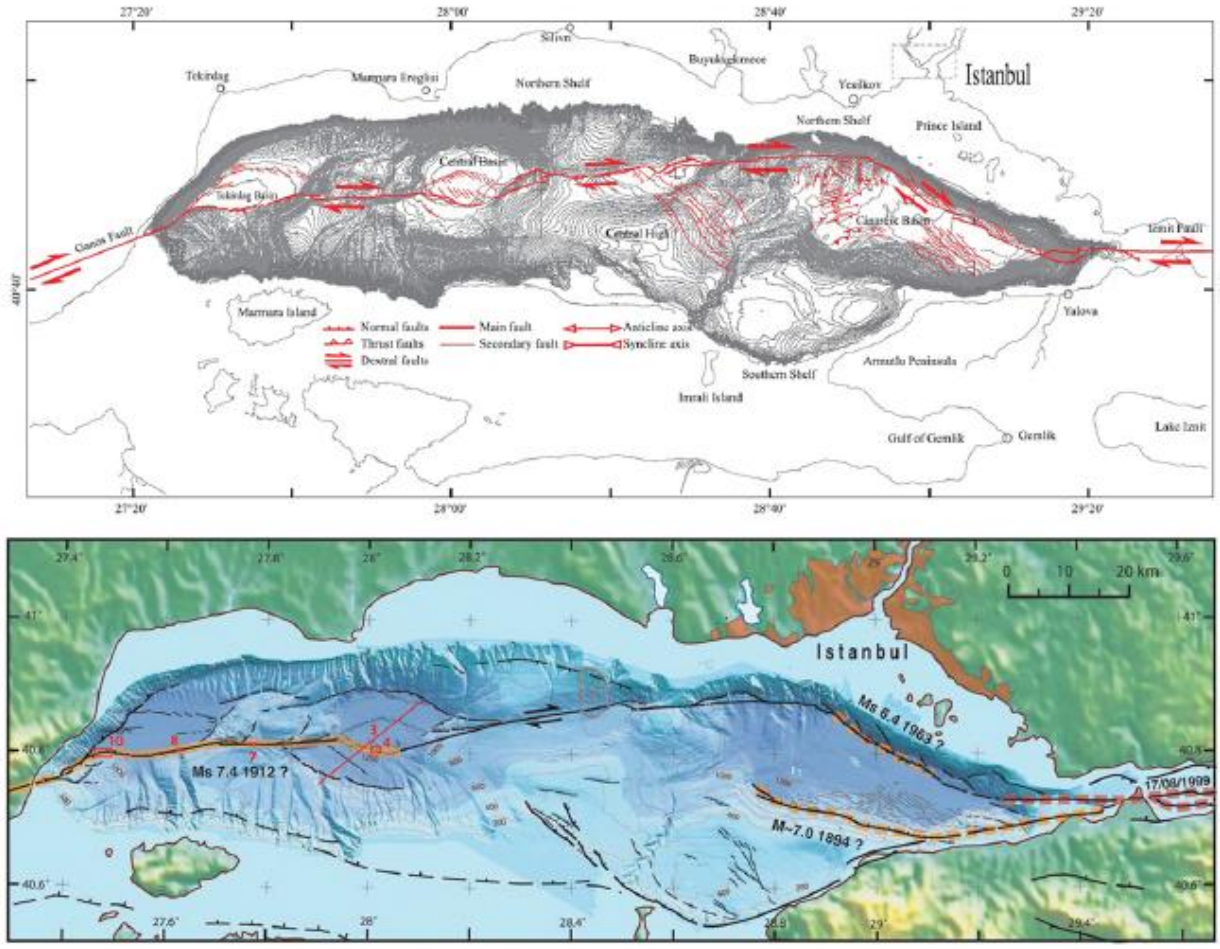


Figure 4 Tectonic models of Marmara Sea Region (K.Sesetyan et al (Soil Dynamics and Earthquake Engineering)

Besides the magnitude of a probable earthquake in Istanbul, the other important sources of risks due to earthquake are high rate of urbanization, faulty land-use planning and construction, inadequate infrastructure and services and finally environmental degradation. For instance, several studies (Erdik and Aydinoglu, 2002) have shown that the vulnerabilities of Turkish building stock are at least an order of magnitude higher than their counterparts in California, which shares comparable level of earthquake hazard. The reasons for this high vulnerability can be traced back to several reasons. Essentially, the building development system was conducive to poor construction due to high (chronic) rate of inflation (consequently very limited mortgage and insurance, impediment to large scale development and industrialization of the construction sector), high rate of urbanization (which created the demand for inexpensive housing), ineffective control/supervision of design/construction, regulations with limited enforcement, no accountability and government acting as a free insurer of earthquake risk .

The inevitability of the occurrence of such a large earthquake in Istanbul and risks show that there is a need for improved knowledge, methods and integrated framework for the assessment of hazards, vulnerability and risks. Furthermore mapping, prevention and mitigation strategies including consideration of economic and social factors need to be developed [11].

In order to assess the risks, Japan International Cooperation Agency had prepared a “Study on Disaster Mitigation/Prevention in Istanbul Including Seismic Microzonation”. The aim of the study was to prepare the seismic microzonation map of Istanbul which were compiled out of GIS database and will be used for disaster mitigation/prevention plans to give advice on seismic construction and designing of building[7].

In addition to JICA, another study –Earthquake Risk Assessment for Istanbul Metropolitan Area- was performed by Bogazici University (supported by the American Red Cross) (BU – ARC).Both studies of JICA – IMM and BU – ARC are used for the development of the information on the earthquake risk in Istanbul. In the light of this information, regions with different risk levels can be identified and priorities can be assigned for earthquake mitigation purposes. It should be noted that the JICA – IMM study assessed physical and social risks in the neighborhood level. Both in BU – ARC and JICA – IMM studies, earthquake risk assessment in Istanbul are based on the scenario earthquake governed deterministic methodology. As all the physical outcomes of the scenario earthquake are concurrent in time, this kind of assessment is well suited for the computation of total losses as well as for the planning of emergency and rescue activities, medical services and settlement issues [12].

Another important study, namely, The Earthquake Master Plan involved a multi-disciplinary team of more than 40 of the leading earth scientists, social scientists, engineers, urban planners, and other specialists from Turkey’s four leading institutions of Bogazici University, Istanbul Technical University, Middle East Technical University and Yildiz University. The investigators provided an in-depth assessment of the current situation, and identified and investigated several elements related to the Master Plan, including Seismic Risk Assessment, Urban Planning, Information Infrastructure, Education, Social Environment, and Disaster Management. The current earthquake risk factors and the aftermath of the 1999 earthquake are also well

documented in the report. The study complements a scenario and vulnerability study recently completed for the city under funding from the Japanese International Cooperation Agency (JICA).
This experience is one of the most relevant examples for other megacities the world. It shows a whole process and how different stakeholders agreed on assisting the city in developing this strategic document. The implementation phase has already started and new challenges will be faced by the municipality, providing a new learning environment for others [11].

2.5 Problem Statement

In this section, the problems that the study aims to focus on are pointed out.

To begin with, research indicates that there is a 65% probability that an earthquake of moment magnitude greater than 7.0 in Richter's scale will strike Istanbul over the next 30 years [9]. This makes it an obligation that the city is well prepared for the resultant emergency situations. Given that it is one of the most densely populated cities in the world, great exposure is observed. A great exposure combined with a high vulnerability implies great risk. For these reasons, an emergency plan based on a detailed vulnerability assessment study is required for each of its districts. Here only one district, "Kadikoy", is considered and the assumption that the district is analyzed as though it were isolated from the metropolitan area is underlined.

Another issue is that in spite of the fact that the JICA report, Earthquake Master Plan and the studies alike have made the possible effects of an earthquake of a certain magnitude visible for the authorities to completely perceive the significance of the consequences of the incident, there are still many voids in the earthquake emergency management, that is, for instance many authorities defined in the previous studies do not exist anymore and the task of the ones that are still present have seen several alterations. Moreover, the distributions of tasks have been set up in a way that a lot of overlapping arises among the authorities of central government and little responsibility is given to local authorities and nongovernmental organizations. In a real emergency situation, judging from past events, specificity has proved to be vital so the absence of it will mean many confusions as well as delays in the operating process. The earthquake emergency plan for Kadikoy aims to reduce the consequences of the organizational vulnerability that has been defined in the previous sections.

Next, the studies performed until present, ignore the fact that most of the physical damage is, in fact, physical induced damage that stems from the intra and interconnectedness of built systems. The issue, most recognizable in lifeline damages, is addressed in the following sections.

Owing to the fact that Istanbul is a megacity, the emergency plan for the city cannot be built without dividing the city in smaller zones in order to understand the area in a more detailed manner. Hence, a

scenario that is closer to reality can be created. Keeping this in mind, in the report, the planning is limited for the district of Kadikoy and its 21 neighborhood units. The reasons behind the selection of the Kadikoy District lie in the facts that it is one of the most densely populated districts in the city, that it hosts the port that keeps the control of 20% of total freight transportation in the country and that Haydarpasa Terminal of Turkish Republic State Railways which serves east and south bound international, domestic and, regional trains is located within its boundaries.

All in all, by means of a complete event scenario based on the seismic vulnerability assessment by JICA, an emergency plan for the district of Kadikoy, Istanbul is proposed. The goal of the project is, while pointing out the reliabilities and weaknesses of the built systems of the district, to clarify the activities and responsibilities, assuring the consideration of the former two and the implementation of the latter two in an earthquake emergency situation.

3 Methodology

3.1 Materials and Tools

During the construction of the emergency plan, JICA 2003, IEMP, Building Census 2000, BU-ARC and Kadikoy Strategic Plan of the municipality, FEMA (Federal Emergency Management Agency) guidelines were utilized as reference materials whereas ARC-INFO 9.3 (Network Analyst Extension) was used as the main tool for demonstrative purposes as well as the shortest path / closest facility analysis.

The JICA report provided the vulnerability analysis (except building vulnerability) including correspondent GIS maps based on the model A-earthquake the report referred.

BU-ARC study was cited when referring to the results of building vulnerability analysis.

Istanbul Earthquake Master Plan (IEMP) was exploited on the process of describing the laws and authorities related to emergency management in Turkey.

All of the information regarding the building properties and associated population density were obtained from **the Building Census 2000** which also was used to estimate casualties, injured persons and consequent requirements for temporary shelters.

In order to specify the resources (hospitals, vehicles, operators, volunteers, open spaces, etc...) of the municipality, needed for emergency management, Kadikoy Strategic Plan was often consulted.

FEMA shoring systems installation guidelines were referred frequently for the objective of providing a set of helpful instructions for designing the appropriate shoring for the relevant damage types.

GIS (Geographic Information Systems) is revolutionizing the ways in which geographically based or mapable information is stored, accessed, analyzed, displayed and made available to public. It is an efficient tool for emergency management purposes in the sense that it provides spatial relationships between features such that it can easily evaluate the distance, travel time comparisons between facilities and assigned incident points.

3.2 Procedure

In order that a realistic emergency plan can be developed, a vulnerability assessment is required for identifying the most and least critical areas. The results of the seismic vulnerability assessment study that was prepared by JICA in 2003 were used for this objective. The geographic information systems maps that were built for Istanbul as a whole were extracted for the district of Kadikoy only considering the recently defined boundaries which was explained in section 2.3.

Next, based on these vulnerability maps and 1999 Kocaeli and Duzce earthquakes, a complete event scenario which describes the sequence and connection of events and their probable durations, was developed.

Following these, the construction of the emergency plan began by analyzing the population in the stricken area in terms of casualties, hospitalized persons and, persons requiring temporary sheltering.

Afterwards, the emergency areas (camping areas, gathering points, hospitals, stocking areas, fire stations, etc...) were identified and assigned in the GIS maps by referring to strategic plan of the municipality of the district and the vulnerability study by JICA enabling a realistic representation of the district with all the facilities and open spaces was obtained as a GIS map.

Thereafter, the disaster law (No: 7269) in the Turkish constitution was examined to determine the involved authorities and their tasks during an emergency on the national and local bases.

Finally, the emergency plan was divided into phases in terms of time as well as response activities. The authorities were given different tasks considering the priorities in each phase and lessons learned from the 1999 earthquakes. Furthermore, a communication plan was proposed identifying the tools and the extent of information to be exchanged among different authorities.

In a technical sense, exploiting the ARC-INFO 9.3 Network Analyst tool, a closest facility analysis was performed in order to define the most feasible routes from the gathering points to hospitals and camping areas.

The following step after the formation of the emergency plan and definition of tasks for the authorities involved was to provide guidelines for shoring system installations. The damage types in Kocaeli that were explored previously were considered to be observed also in the Kadikoy case and referring to FEMA at times, the appropriate shoring systems were offered for the correspondent damage types.

4 Preparation of the Plan

Section 4 points out only the development process and considerations of the emergency plan not the plan itself. The emergency plan can be found in appendix attachment 6.

The emergency plan was developed for the district of Kadikoy according to a seismic vulnerability assessment study performed by the Japanese International Cooperation Agency (JICA) based on the assumption that the earthquake of magnitude 7.5 (Scenario A: the most probable one) strikes in the Istanbul Metropolitan area.

The primary authority, resources and directions for disaster operations were implemented according to the National Disaster Law No: 7269 in the Turkish constitution. In accordance with this law, the emergency begins with the declaration by the Prime Ministry Disaster and Emergency Management Presidency. On the local basis, emergency service providers assemble without authorization and are to operate 24 hours. This plan does not change policies and direction provided in the disaster law; rather, it provides additional guidance that may be used to complement the emergency operations. Moreover, since many variables govern the specific effects of an earthquake such as the magnitude, locations, no plan can possibly identify all considerations for a response. Therefore, the plan does not aim to describe detailed procedures of response tasks. However, it provides considerations that can be used to prepare for, and guide the execution of, response operations. Furthermore, for this plan to be effective, it is important that all concerned be made aware of its provisions and that every official, agency and department be prepared to carry out their assigned functions and responsibilities during the earthquake.

The plan primarily focuses on response and short-term recovery operations on the local basis. It depends on a scenario based on JICA vulnerability study defining the location and number of vulnerable elements and the experience in 1999 Kocaeli earthquake that defines the duration of recovery process of the built environment. Elements related to national basis authorities, preparedness, long-term recovery, and mitigation are not included. It was divided into three parts, namely, initial response (E + 72 hours) , sustained response (E+72 hours to E+21 days) and transition to recovery (E+21 days to E+ 3 months) each having different set of priorities on which the assignment of the tasks are based. During the post emergency phases, only the resources of the district itself were taken into account as though the district was at an isolated location rather than a metropolitan area.

Among the sources cited for the development processes of the plan are: San Francisco Earthquake Plan, Emergency Plan of City of Brantford, Santa Lucia Government Earthquake Response Plan, and British Columbia Earthquake Response Plan.

4.1 The Scenario

4.1.1 Deterministic Physical Scenario

The deterministic scenario was selected from the JICA report as the earthquake of Model A among 4 different models. Scenario Model A involved a rupture occurring in North Anatolian fault line that lies from Cınarcik basin until Silivri which had also led to 1999 Kocaeli earthquake, resulting in a moment magnitude of 7.5 and causing damage on the built environment of the Kadikoy District.

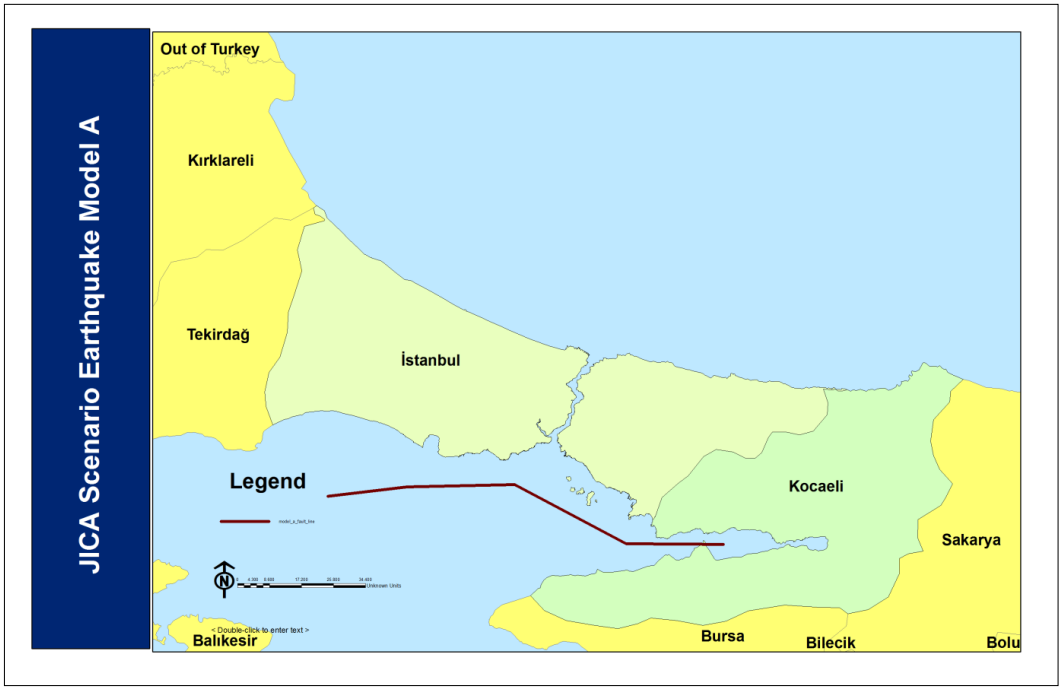


Figure 5 JICA Scenario Earthquake Model A

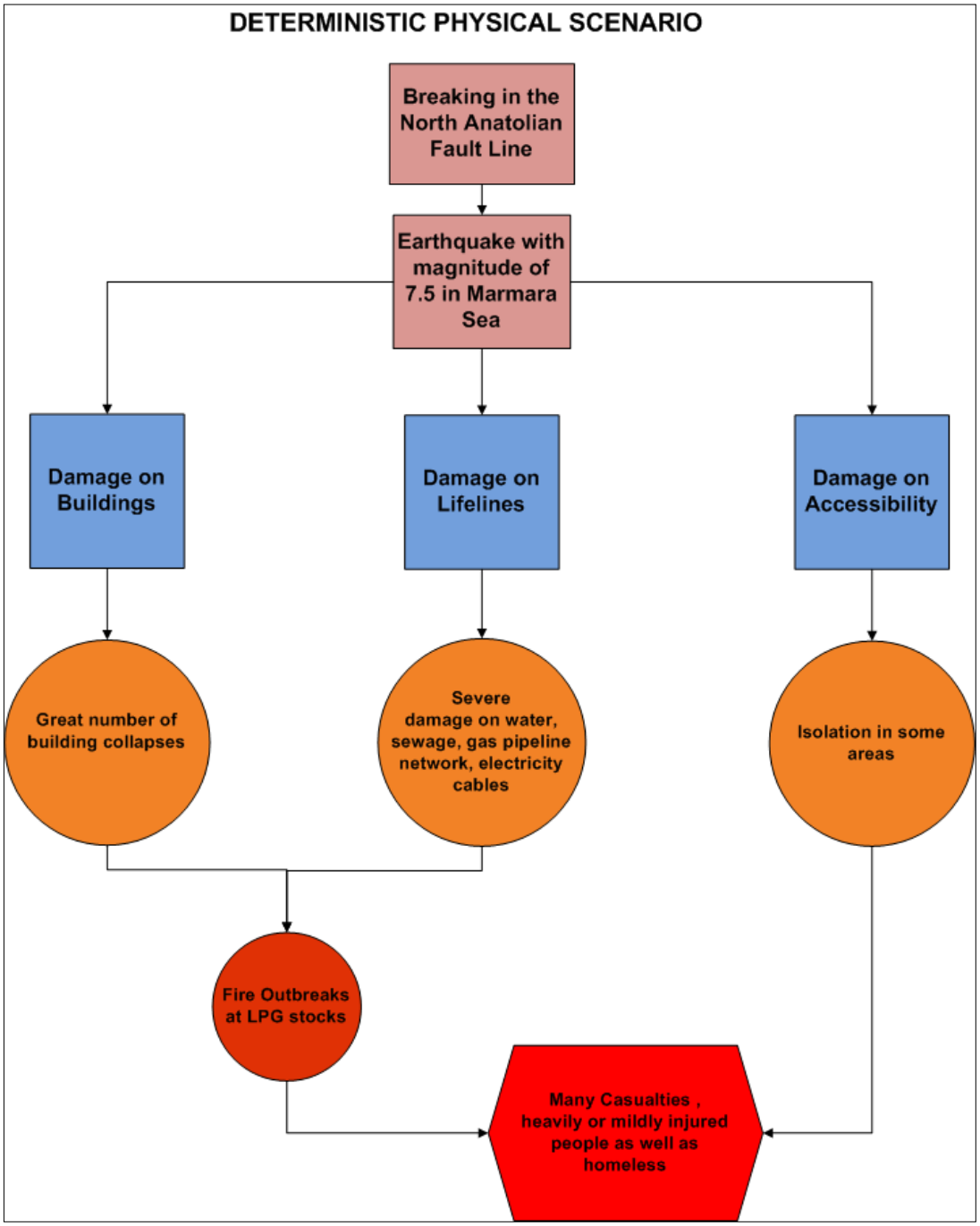


Figure 6 Deterministic Physical Scenario

4.1.2 Vulnerability Elements with respect to the Scenario Earthquake Model A

The results of the vulnerability assessment study by JICA along with brief descriptions and representative GIS maps that were prepared solely for the Kadikoy district are displayed below:

4.1.2.1 Building Vulnerability

The JICA report, in which building damages were computed based on intensity and spectral displacements, classifies the damage as heavy, moderate and partial damage where heavy damage comprises the total collapse and heavy structural damage corresponding to level 4 and 5 according to EMS-98.

Brief descriptions of the structural damage levels suggested for reinforced concrete buildings are provided below:

Slight damage: Fine shear cracks are formed in some columns and beams, near and inside the column-beam joints and in shear walls.

Medium damage: Cracks are formed in most of columns and beams.

Heavy damage: Heavy damage occurs in columns and beams, most of them reach the yield capacity level, and large cracks form, spilling of the concrete cover and buckling of the longitudinal reinforcements are seen. Diagonal shear cracks are formed in non ductile frame members and shear walls (this level corresponds to damage level 3 of EMS-98).

Very heavy damage (total collapse): Total failure of some or all of the structural members. Partial or total collapse of the building due to large deformations (this level corresponds to damage level 4 and 5 of EMS-98) [12].

As it can be concluded from figure 7 and table 1, the vulnerable neighborhoods in terms of building damage are Hasanpasa, Fikirtepe, Caferaga and Rasimpasa.

Code	Name	Total buildings	Number Heavily Damaged	Number Moderately Damaged	Number Partly Damaged	Percentage of Heavily Damaged	Percentage of Moderetaly Damaged
1	Acıbadem	1319	46	126	374	3.49	9.55
3	Bostancı	1268	43	125	382	3.39	9.86
4	Caddebostan	994	36	104	312	3.62	10.46
5	CaferAğa	2295	124	301	768	5.40	13.12
6	Dumlupınar	1826	74	183	496	4.05	10.02
7	Erenköy	1031	41	111	318	3.98	10.77
8	Eğitim Mah.	1183	92	203	448	7.78	17.16
9	Fenerbahçe	940	40	110	310	4.26	11.70
10	Feneryolu	853	28	80	249	3.28	9.38
11	Fikirtepe	1979	174	369	768	8.79	18.65
12	Göztepe	1314	41	121	381	3.12	9.21
13	Hasanpaşa	1191	120	263	554	10.08	22.08
15	Kozyatağı	870	28	81	251	3.22	9.31
16	Koşuyolu	1034	94	205	419	9.09	19.83
18	Merdivenliköy	1830	65	177	521	3.55	9.67
19	Osmanağa	1365	84	197	476	6.15	14.43
20	Rasimpaşa	1651	118	269	622	7.15	16.29
21	Sahrayıcedit	822	25	72	223	3.04	8.76
22	Suadiye	1131	49	132	375	4.33	11.67
26	Zühtüpaşa	451	57	120	236	12.64	26.61
28	19 Mayis	754	27	75	123	3.58	9.95

Table 1 Distribuiton of heavily and moderately damaged buildings in neighborhoods

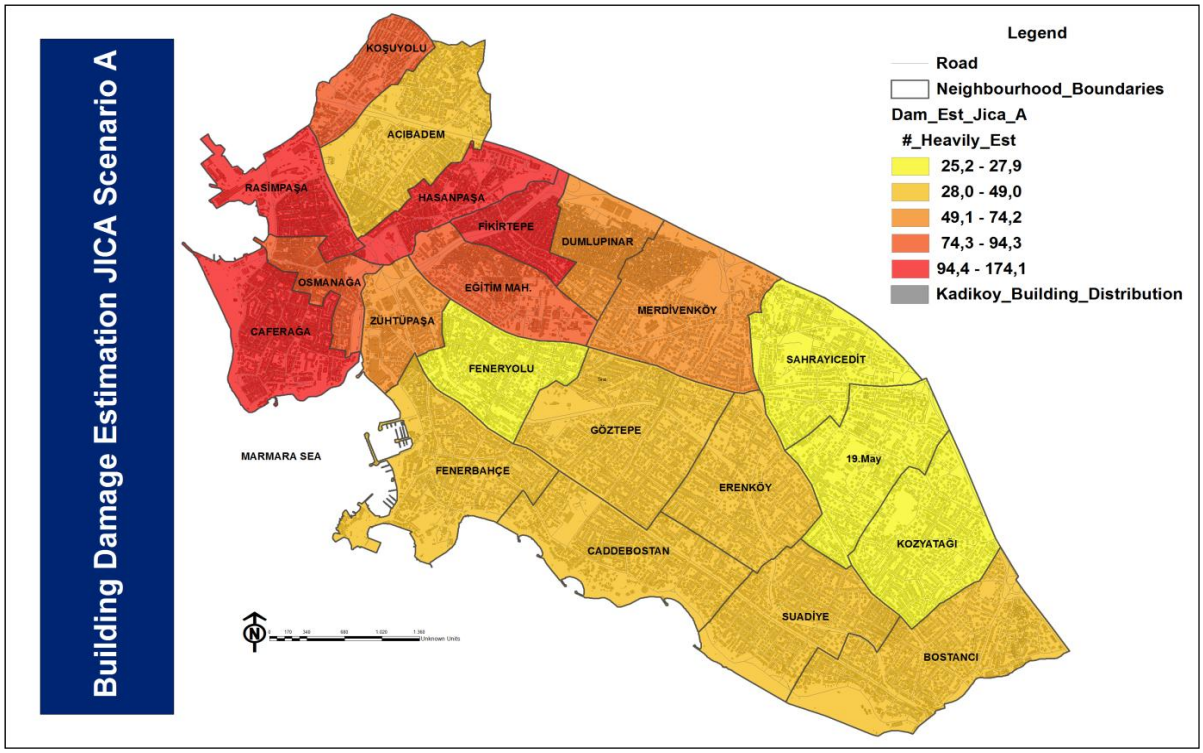


Figure 7 Building Damage Estimation JICA Scenario A

4.1.2.2 Water / Sewage Vulnerability

The expected damage ratio on water and sewage pipes was calculated as the product of the highest soil velocity, the pipe material coefficient, the pipe diameter coefficient, the soil state coefficient, and the liquefaction coefficient.

The figures below represent intensities of expected damage in different neighborhoods of Kadikoy. Hence, it helps visualizing the most critical parts of the district in this sense. The vulnerable parts are Zuhtupasa, Hasanpasa and Fikirtepe.

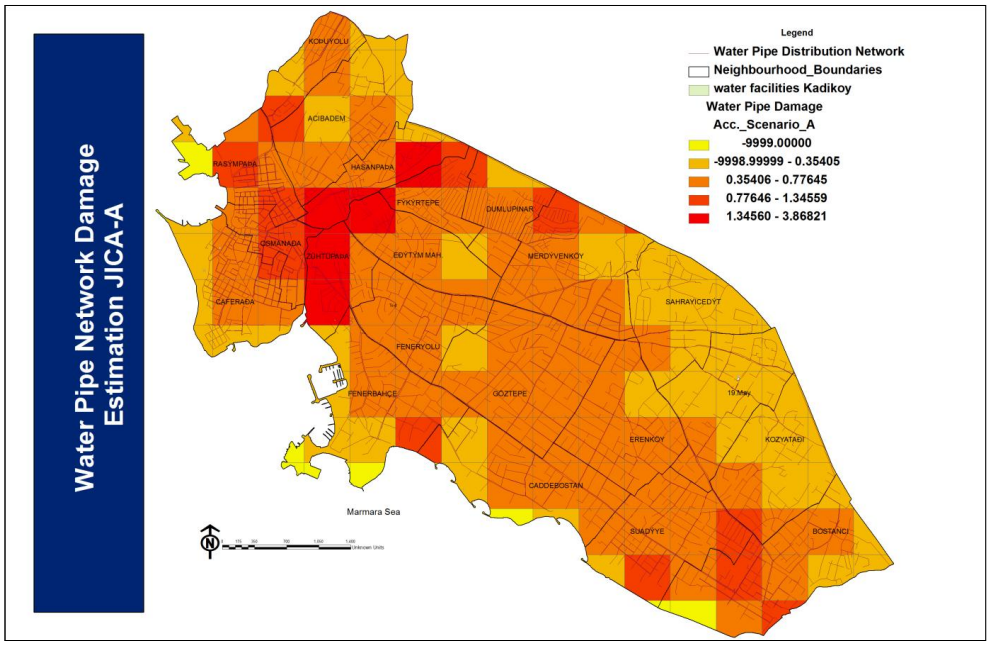


Figure 8 Water Pipe Network Damage Estimation JICA-A

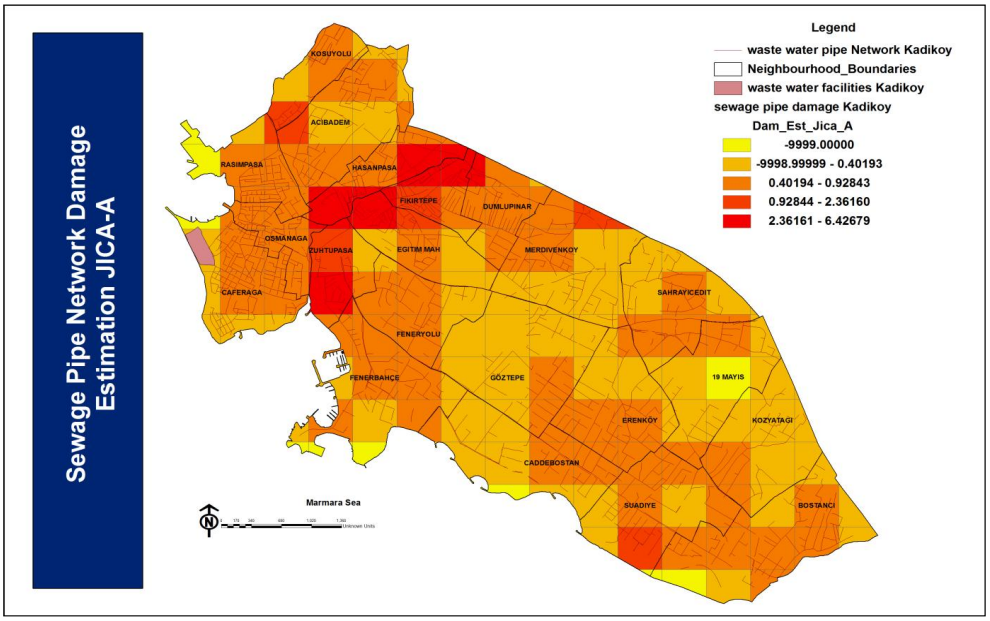


Figure 9 Sewage Pipe Damage Estimation JICA-A

4.1.2.3 Electricity Network Vulnerability

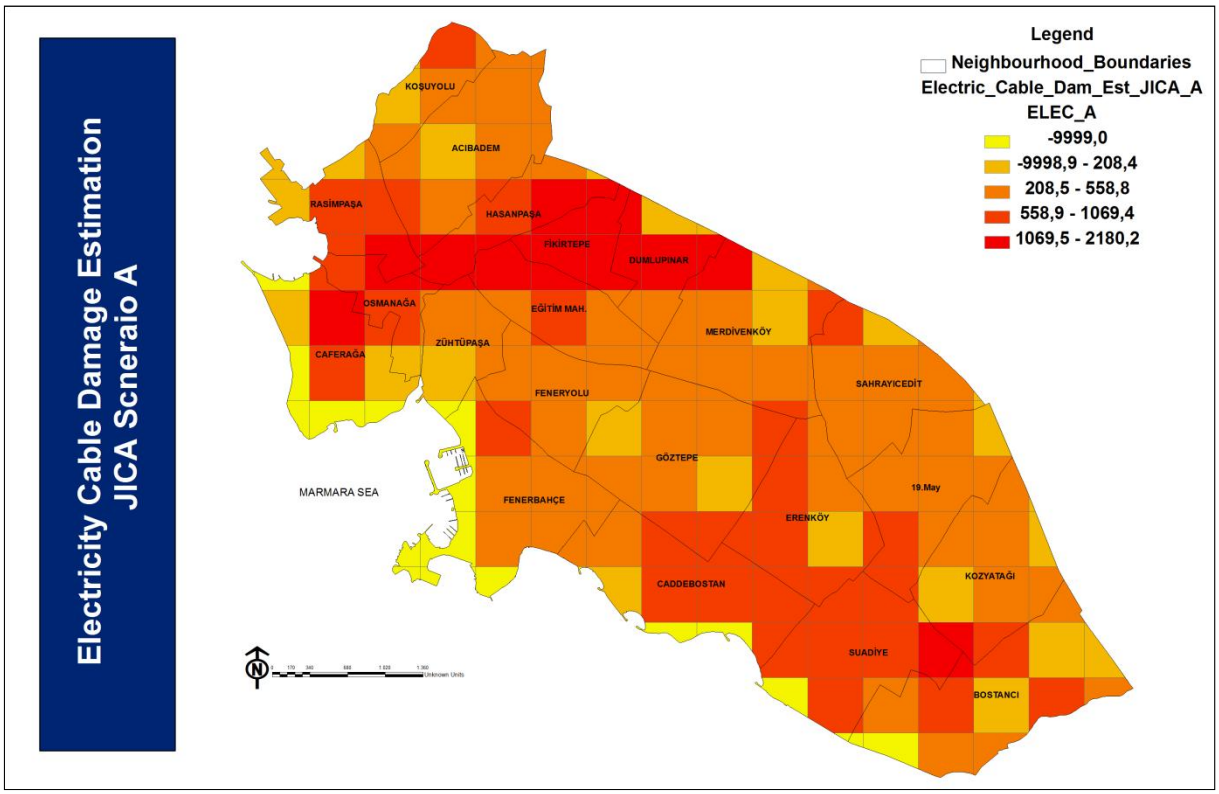


Figure 10 Electricity Cable Damage Estimation JICA Scenario A

Electricity systems are composed of transmission towers, and underground transmission lines. O'Rourke et al in 2000 states that transmission towers and high voltage transmission lines damages are rare. On the other hand in order to assess the expected damage for underground transmission lines, the damage function given in HAZUS-99 was used and damage that tends to occur due to soil deformation, building collapse and search / rescue activities is measured in terms of cable length that needs to be replaced.

For the Kadikoy case, the vulnerable parts are Egitim Mahallesi, Hasanpasa and Fikirtepe.

4.1.2.4 Natural Gas Pipelines and Service Box Vulnerability

In the JICA report, probable damage locations to pipelines and service boxes are presented. Different damage estimate methods were examined and amongst them, the methodology developed by the Tokyo Metropolitan Disaster Plan (1997) was used. This methodology uses the peak ground velocity as the hazard parameter. It also includes pipe material, soil condition and liquefaction. No damage is expected to occur on the natural gas pipelines except Fikirtepe. The reason for this is that the pipelines are fairly new and are made of earthquake resistant polyurethane material.

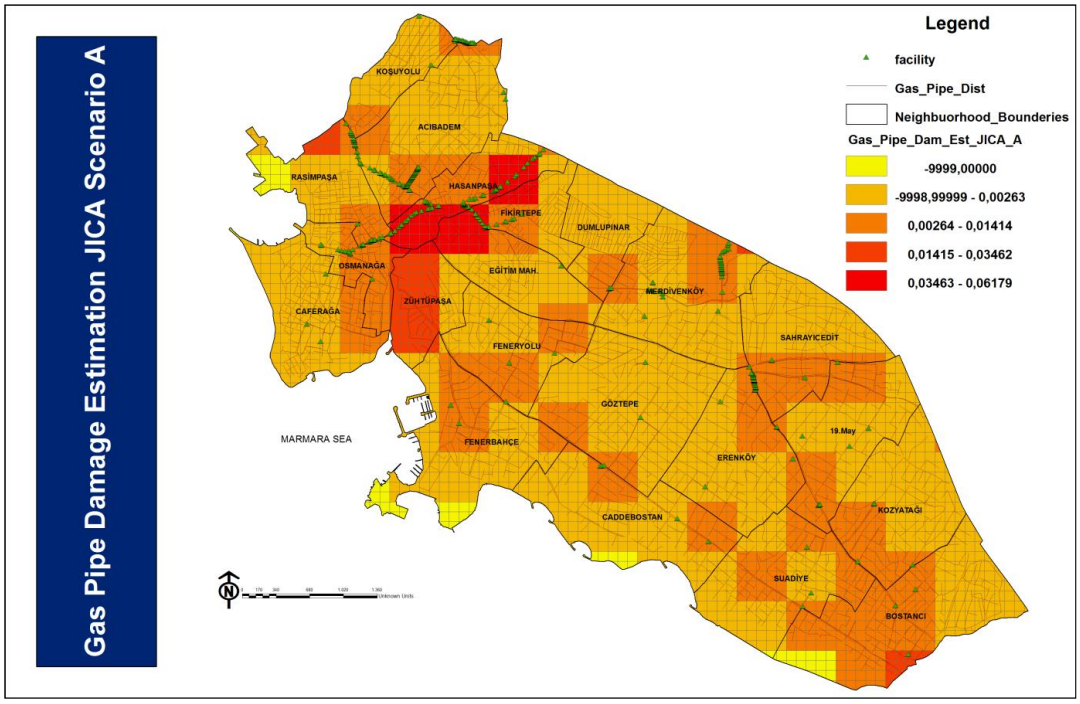


Figure 11 Gas Pipe Damage Estimation JICA Scenario A

Even though pipeline has suffered no damage, the damage due to service box may cause leakage which results in an explosion. In the JICA report, it is assumed that the service boxes of all the heavily damaged buildings and half of the moderately damaged buildings will be damaged. Therefore for the Kadikoy case, more damage is expected in Osmanaga, Hasanpasa, Fikirtepe, Caferaga neighborhoods.

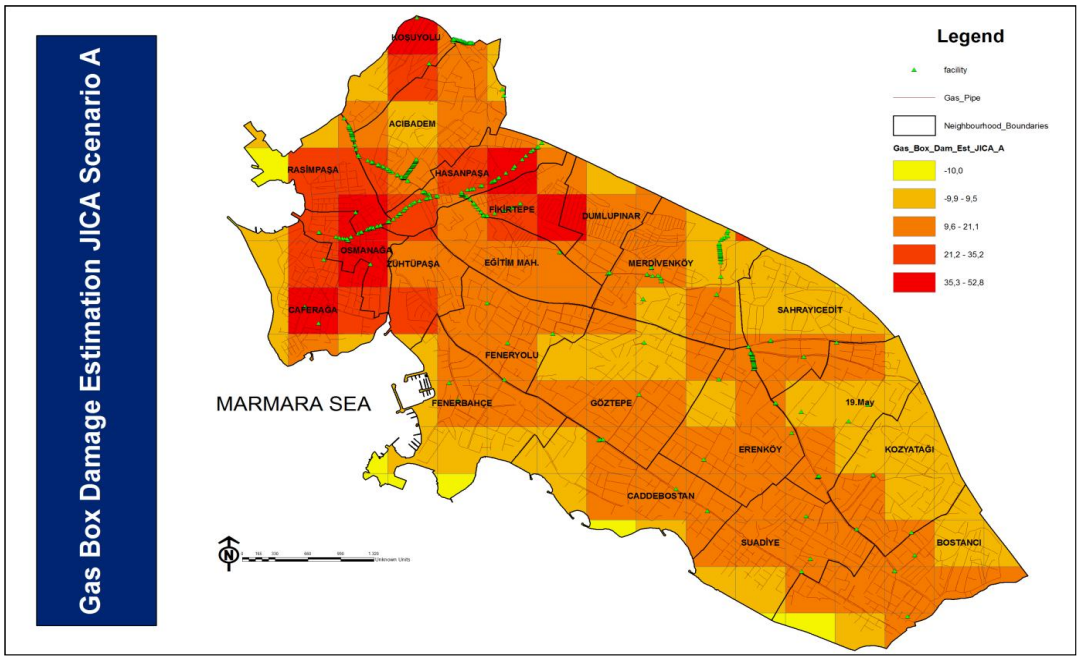


Figure 12 Gas Box Damage Estimation JICA Scenario A

4.1.2.5 Isolation Risk due to Road Closure

The JICA report defines road closure as a probability that serviceability is not ensured on roads wider than 3 meters due to building collapses. According to data obtained from the Kobe Earthquakes, the probability of closure is 98% for 2-6 m wide roads, 11% for 7-15 m wide roads and 0.3% for roads wider than 16 m. Isolations in areas due to road closure are evaluated in this respect and the isolations in Kadikoy are demonstrated in figure 13.

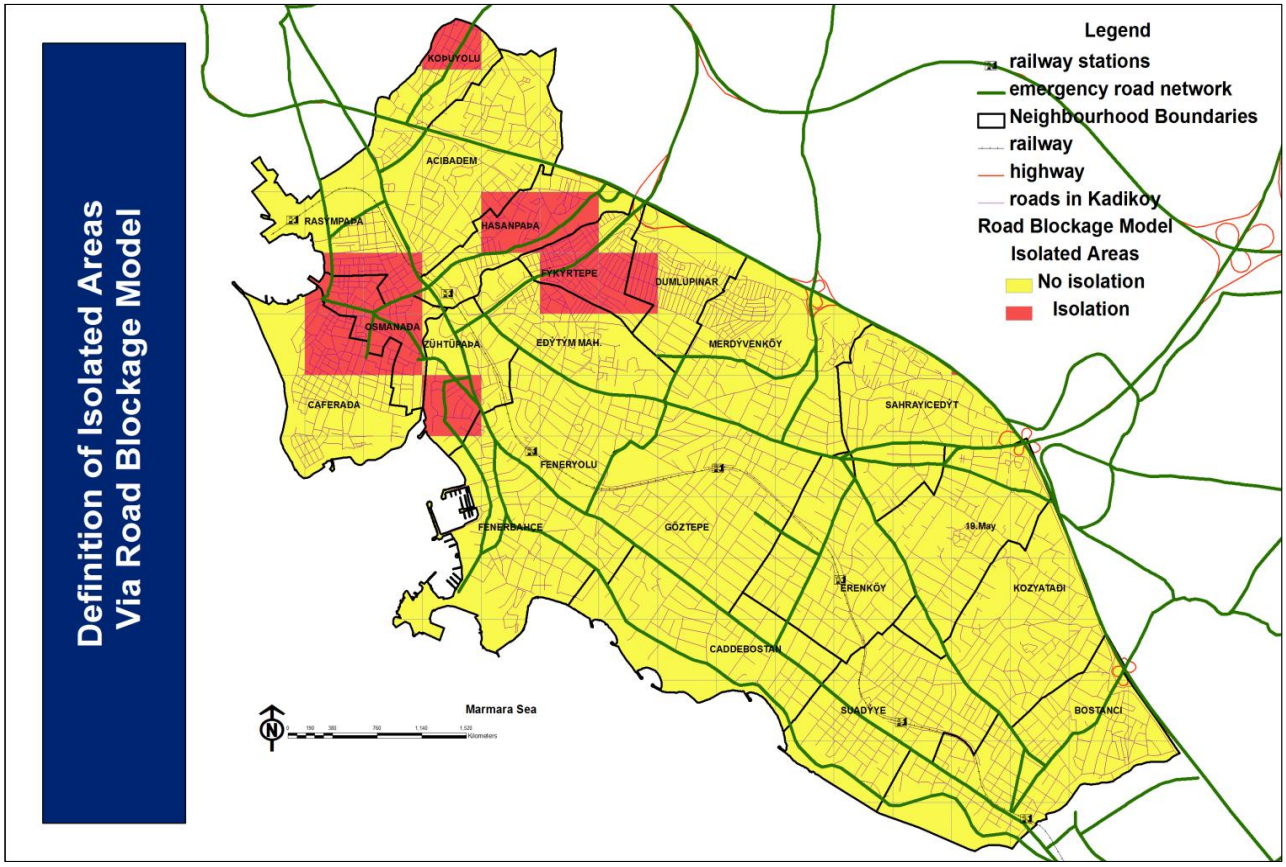


Figure 13 Definition of ISolated Areas via Road BLockage Model

In the red zones (Osmanaga, Caferaga, Rasimpasa, Fikirtepe, Hasanpasa, Kosuyolu) displayed above, there exists a probability of closure between 30% and 50% for 2-6 m wide roads. For these areas, only the emergency routes which are proposed by the same study are considered to be serviceable in the given emergency situation. In spite of the functionality of these routes, the areas are considered to experience many difficulties during the search & rescue activities. To overcome this problem to a certain extent, the areas located close to the shore are contemplated to benefit from the sea transportation in the emergency plan.

4.1.2.6 The Haydarpasa Port

The port of Haydarpasa, which controls the 20% of freight transportation in Turkey, is located in the region as underlined previously. It is stated in the JICA study that the port is expected to lose its functionality when the earthquake strikes. In the emergency plan, in order to regulate the transportation, the damage to the port is taken into consideration.

4.1.3 Dangerous Facilities

Dangerous facilities include LPG storages, factories producing paint and polish and gas stations. Such facilities can induce fires and result in secondary hazards. According to figure 14, the chemical stocks are located in Bostanci, Kozyatagi, Merdivenkoy and Fenerbahce while LPG stocks are located in Fikirtepe and Dumlupinar. In addition, there is a gas station in Hasanpasa.

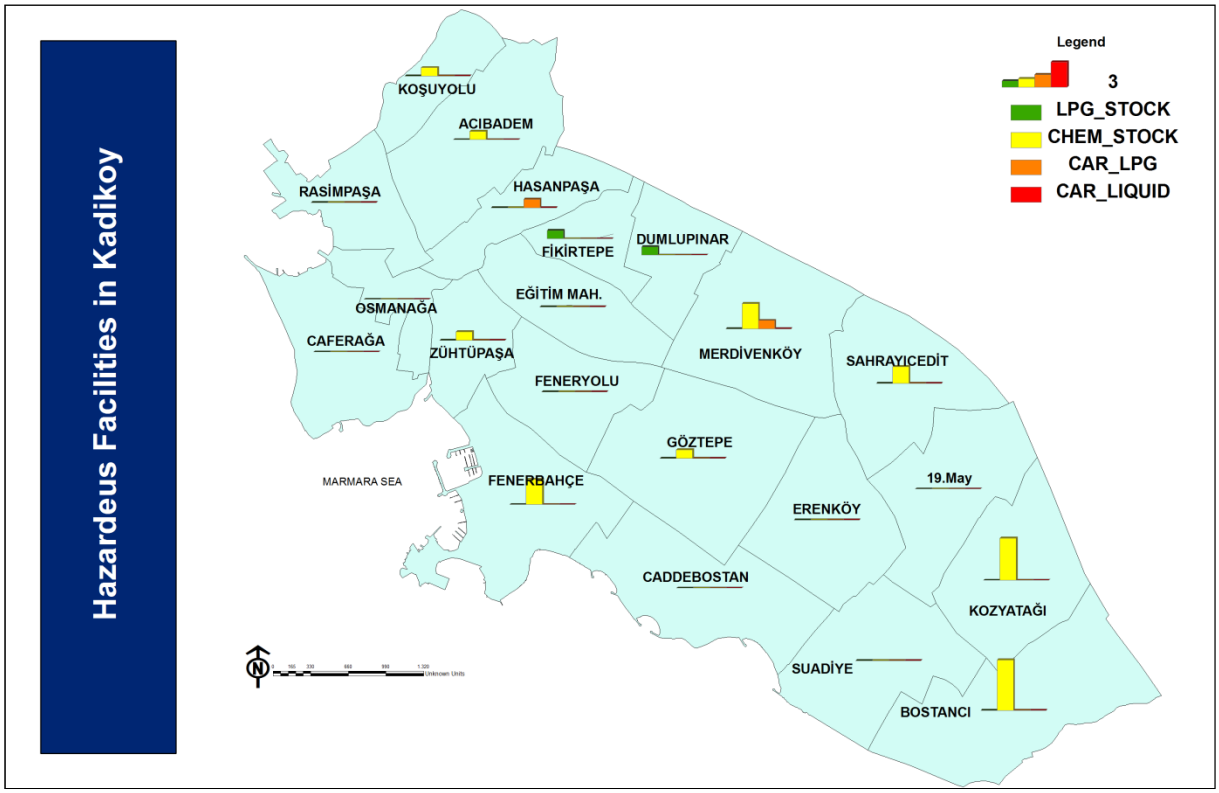


Figure 14 Hazardous Facilities in Kadikoy

4.1.4 Fire Outbreak Points

The fire outbreak is induced by the leakage of flammable and explosive liquids through the broken pipes and storage tanks. According to the study performed by the Kanawaga prefecture, the probabilities of producing a fire of such hazardous facilities are as follows [13] [14]:

- LPG storage tank : 57,9 %
- Paint / Polish factory : 3.66 %
- Gas station 2,55 %

Hasanpasa, Fikirtepe, and Dumlupinar can be considered as risky zones as expected, due to LPG storage tanks and gas stations. The locations of probable fire points are shown in figure 15:

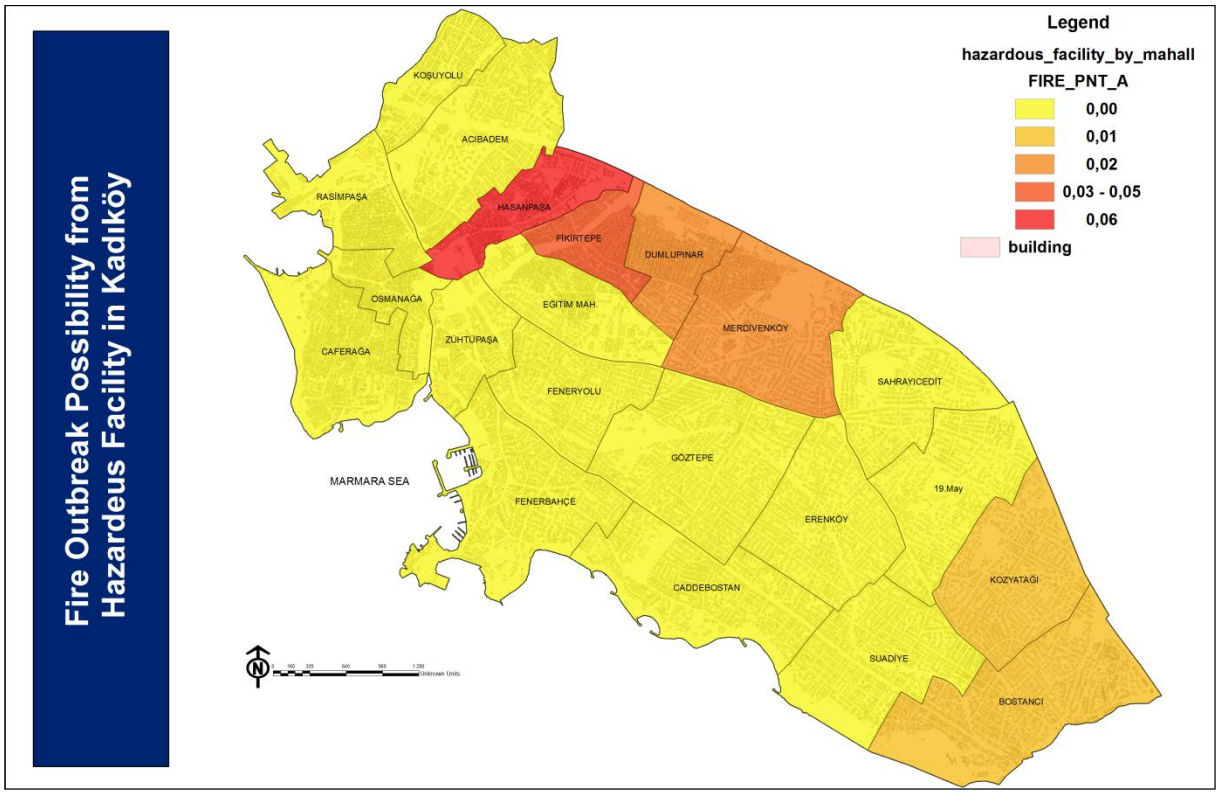


Figure 15 Fire Outbreak Possibilities in Kadikoy

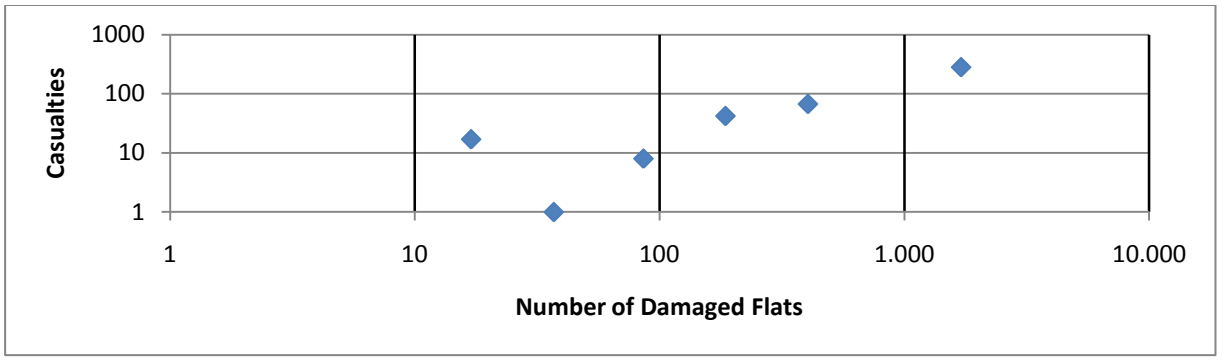
4.1.5 Analysis of the Population in the probably stricken area

Casualties in case of an earthquake are mostly related to collapsed buildings, fires, tsunamis and etc… If the vulnerability of building stocks in Istanbul is considered, JICA assumed that the collapse of the buildings will be the main reason of deaths as it was in the 1999 Kocaeli Earthquake. The estimation of casualties, injured people, and homeless people is of vital importance in that the temporary sheltering, medical supplies and hospitals have to be sufficient for the demand of the rest of the population.

In order to estimate the casualty rates on the neighborhood level (In the JICA report, it was limited to the district level); the correlations between the number of flats in the heavily damaged buildings and casualties were used in the emergency plan as suggested by JICA. The best fit function correlating the two variables represented in graph 1 was selected giving a slightly higher number of casualties in the district when compared to JICA. A similar approach was applied for the calculation of injured people.

The number of casualties and injured people expected were estimated to be 3885 and 5195 respectively the concentrated locations of which were defined to be the neighborhoods of Fikirtepe, Rasimpasa and Osmanaga where the building vulnerability was relatively higher.

The results obtained are shown in graph 1, figures 16 and 17:



Graph 1 Correlation between casualties and number of damaged flats

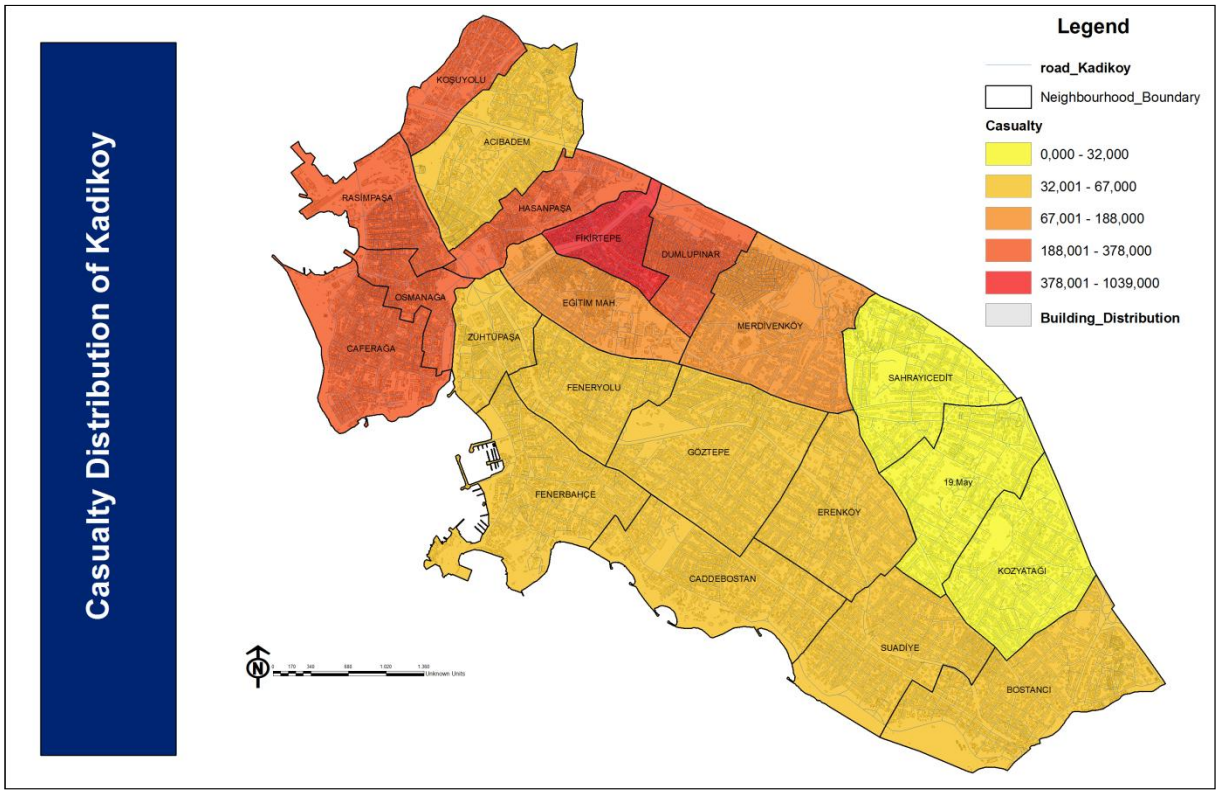


Figure 16 Casualty Distribution

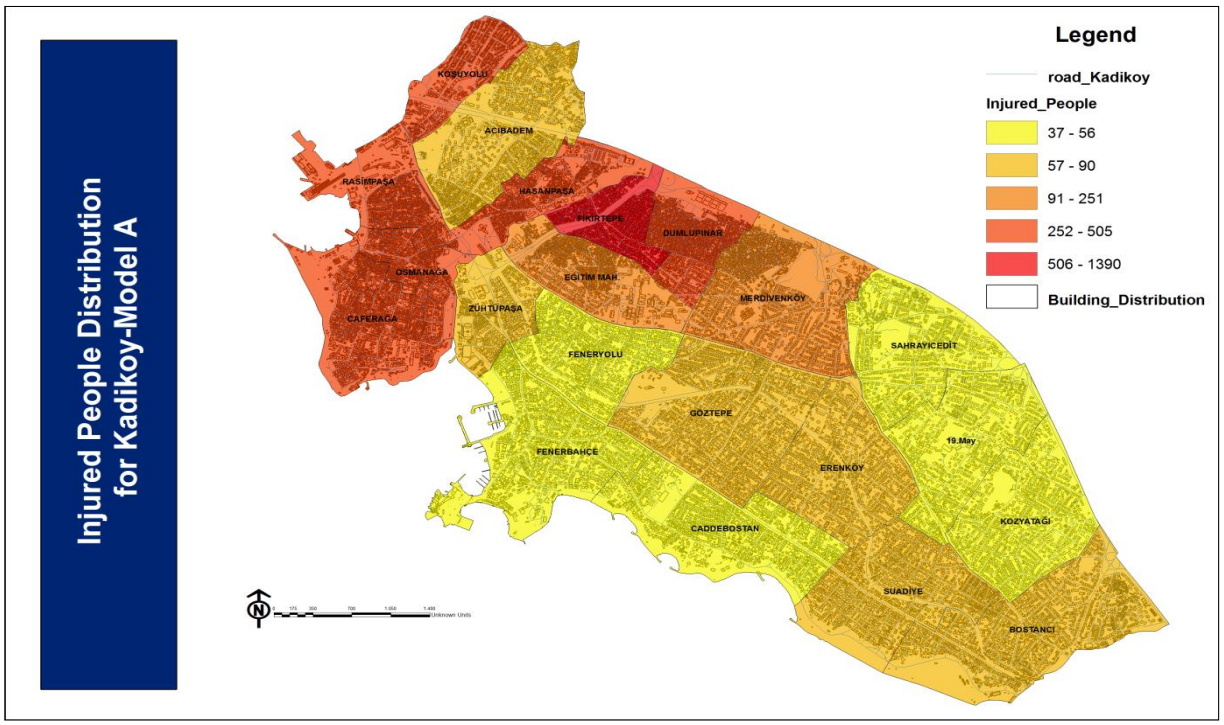


Figure 17 Distribution of Injured People

On the other hand, in the emergency plan, the number of people requiring temporary shelters was determined considering 100% of people who live in to be heavily damaged houses and 50% of to be moderately damaged and 10% of to be partially damaged ones as suggested by the JICA study. The greatest number of families requiring temporary sheltering was defined to be in the neighborhoods of Merdivenkoy, Goztepe, Erenkoy and Kozyatagi. Despite the fact that the physical vulnerability assessment stated that these areas were relatively more secure, the building population density led to more refugees forming. The expected numbers are represented in Table 2 on the following page:

Code	Name	Casualty	Injured	Population Heavily Damaged	Population Moderately Damaged	Population Partly Damaged	Population Need Sheltering
1	Acıbadem	67	90	1139	9738	1659	3558
3	Bostancı	48	65	1171	7567	1316	3866
4	Caddebostan	41	54	721	4603	812	2348
5	CaferAğa	372	498	1317	23994	3952	3359
6	Dumlupınar	296	396	912	22126	3645	2354
7	Erenköy	54	72	1300	9842	1699	4015
8	Eğitim Mah.	188	251	1352	16702	2761	3315
9	Fenerbahçe	41	55	892	5216	919	2767
10	Feneryolu	42	56	866	7309	1287	2832
11	Fikirtepe	1039	1390	1777	63565	10611	3405
12	Göztepe	49	66	1210	8394	1457	4069
13	Hasanpaşa	302	404	1489	22755	3748	3507
15	Kozyatağı	32	42	1184	7423	1343	3926
16	Koşuyolu	267	357	577	9956	1641	1197
18	Merdivenliköy	118	157	1463	15875	2648	4510
19	Osmanağa	366	490	375	9920	1634	660
20	Rasimpaşa	378	506	1016	19761	3255	2332
21	Sahrayıcedit	28	38	989	6053	1112	3267
22	Suadiye	65	86	1141	8818	1505	3486
26	Zühtüpaşa	64	86	1035	6811	1163	2489
28	19 Mayis	28	37	1150	6447	1186	3238
	Total	3885	5195	23075	292874	49354	64499

Table 2 Expcected casualty, injury and people need sheltering on the neighbourhood level

In order to facilitate the emergency response process, the district was, in a rough manner, divided in 3 categories (regions) according to their building vulnerabilities and the possibility to produce casualties, region 1 and 3 being the most and the least critical ones respectively. Therefore, region 1 is the area that the most emergency activities and resources will majorly take place.

The representation of this division is as follows:

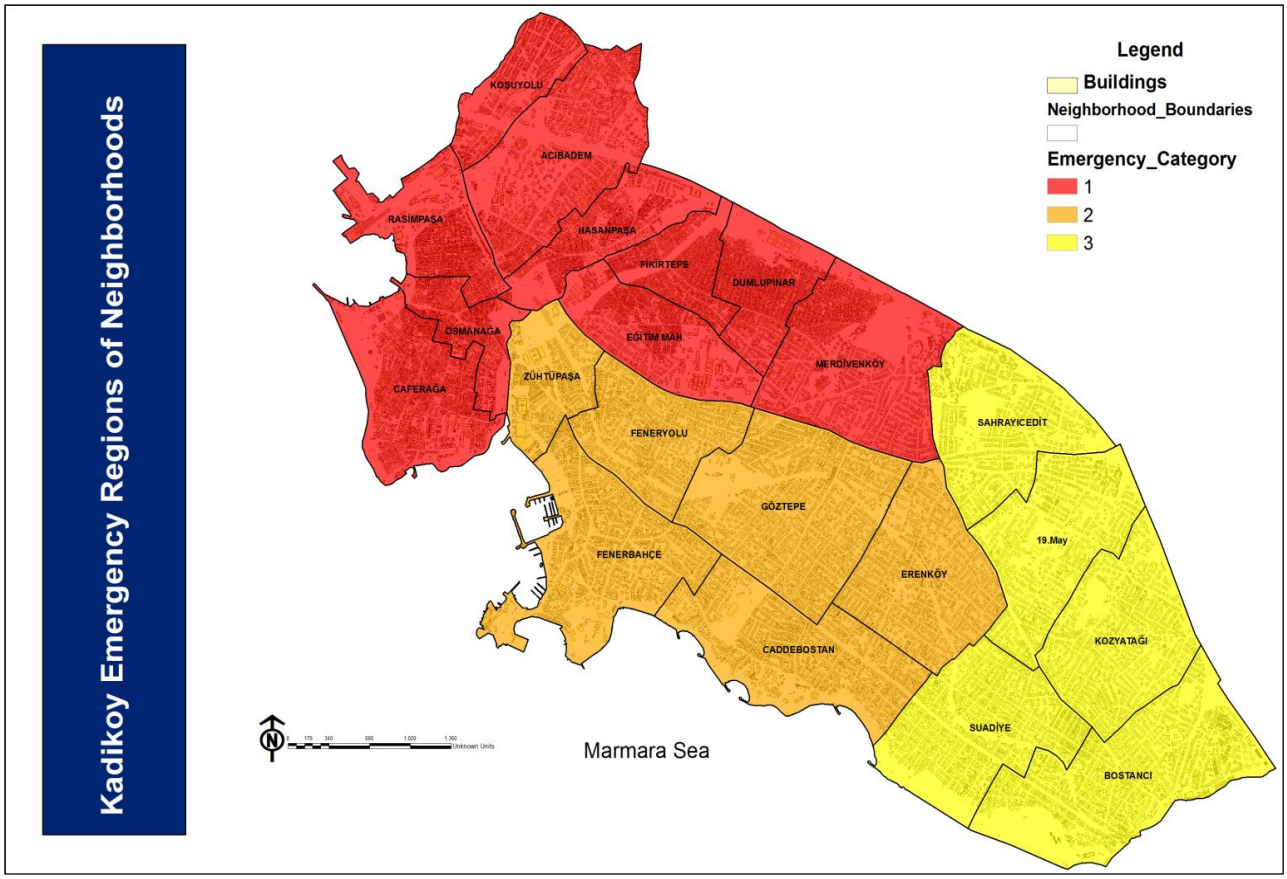


Figure 18 Kadikoy Emergency Regions of Neighborhoods

4.1.6 Accounting for Available Resources

The question of needed resources during an emergency must be addressed prior to the impact. This way, an efficient management of the distribution of these resources is assured. First, their classification is presented then their quantities in different locations are explained.

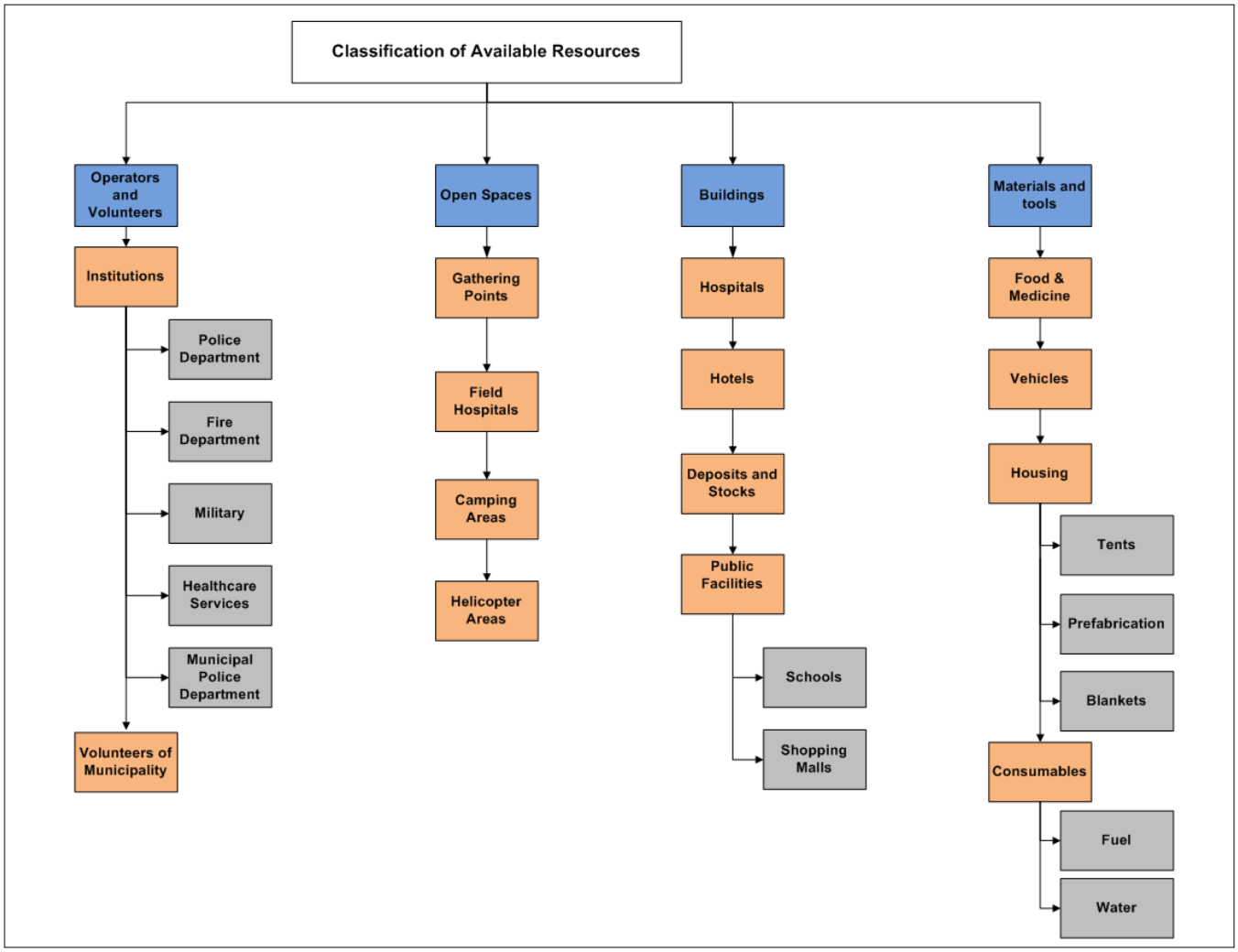


Figure 19 Classification of resources to be used during the emergency

4.1.6.1 Operators and Volunteers

Operators during the emergency are persons from **institutions** and **volunteers**. Institutions include Municipal Police, Police Departments, Fire Departments, Health Care Institutions, military and volunteers. People from these institutions take responsibility under the service providers of the municipality which will be explained in section 4.1.6.5. Volunteers, on the other hand, are made up of people that attend emergency courses held by the municipality. Their tasks are clarified specifically in each phase of the emergency.

	Type of Institution	Name/Location	People	Notes	Contact info
Operators and Volunteers	Fire Department	Tutuncu Mehmet Efendi Cad. 72, Goztepe Mah.	5 drivers, 23 firemen	1 guidance vehicle 2 fire extinguishing vehicles	0216 575 2118
		Sogutlucesme Cad. Turbe Sok. , Osmanaga Mah.	12 drivers, 58 firemen		0 216 336 0872
	Police Stations	Sahrayıcedit	not enough data available		0 216 411 30 72
		Bostanci	not enough data available		0 216 658 7820
		Rasimpasa	not enough data available		0 216 336 4339
		Goztepe	not enough data available		0 216 478 1720
		Hasanpasa	not enough data available		0 216 428 1040
	Municipal Police	Sogutlu Cesme	16 drivers 35 laborers	12 vans (double cabin) 4 type van glassy vehicles 2minibuses 2 towing trucks 1 Welding Machine 92 walkie talkies	0 216 542 5052
	Volunteers	various	2690 volunteers		

Table 3 Operators and volunteers in the district

4.1.6.2 Open Spaces

Open spaces are composed of **gathering points, camping areas, field hospitals and helicopter areas.**

The **gathering points** which function also as the **emergency control and public information centers** refer to the areas that the people assemble initially after the earthquake. Each gathering point is directed by a predefined site coordinator and involves a designated spokesperson as the authority. The site coordinator is responsible for the teams performing all emergency activities in the covered areas described in figures 20, 21, 22 while a designated spokesperson informs the community and public information coordinator in the municipality based on the communication plan which will be explained in section 4.5

The maps in figures 20, 21 and 22 were obtained by means of a service area analysis via the network analyst tool of the software ArcINFO 9.3. During the analysis, the break points in the network analyst were assigned as 200 m, 500 m and 1200 m enabling the boundaries of management for each gathering point to be formed in this sense. In other words, each site coordinator in the gathering points is responsible for an area defined by a radius of maximum 1200 m.

In the emergency situation, it is considered that the gathering points (Caferaga Seaside Gathering Point, Rihtim Caddesi Gathering Point, Kadikoy Sabit Halk Bazaar, Fenerbahce Seaside Gatherig Point, Caddebostan Gathering Point, Caddebostan Migros Shopping Mall, Bostanci IDO) that are located at the shore are to benefit also from the sea transportation for all logistic needs furnished by the transportation service providers of the municipality.

Gathering Points			
Code	**Neighbourhood**	**Name**	**Neighborhood to benefit**
16	Kosuyolu	Kosuyolu Pazar Park	Kosuyolu
1	Acibadem	Marmara Univ. Guzel Sanatlar Facullty	Acibadem
13	Hasanpasa	Hasanpasa IETT Area	Hasanpasa, Fikirtepe
13	Hasanpasa	Incirli Bostan Sport area	Hasanpasa, Fikirtepe
6	Dumlupinar	Devlet Malzeme Office	Dumlupinar ,Fikirtepe
6	Dumlupinar	Dumlupinar Gathering area/ Okul area	Dumlupinar, Merdivenkoy, Egitim Mah.
18	Merdivenkoy	Gozcubaba Parki	Merdivenkoy
18	Merdivenkoy	S.S.K Goztepe Parki	Merdivenkoy, Egitim Mah, Goztepe, Feneryolu
18	Merdivenkoy	Halit Berk Primary school	Merdivenkoy, Dumlupinar
21	Sahrayıcedit	Intas Park	Sahrayıcedit
21	Sahrayıcedit	Sahrayicedit Park	Sahrayıcedit, Merdivenkoy
21	Sahrayıcedit	Sahrayicedit Isiklar Park	Sahrayıcedit, Erenkoy, Merdivenkoy
28	19 Mayis	STFA Woods	19 Mayis
28	19 Mayis	Cevre High School	19 Mayis, Sahrayicedit, Erenkoy
15	Kozyatagi	Kozyatagi Primary High School	Kozyatagi
15	Kozyatagi	Hakki Deger Primary School	Kozyatagi, Bostanci
3	Bostanci	Senesevler High School	Bostanci, Kozyatagi
3	Bostanci	Bostanci Gosteri Merkezi	Bostanci
3	Bostanci	Bostanci IDO port park	Bostanci
22	Suadiye	Suadiye Seaside gathering point	Suadiye, Bostanci
22	Suadiye	Haci Mustafa Tezman High School	Suadiye, Kozyatagi
22	Suadiye	Mediha Tansel primary school	Suadiye
4	Caddebostan	Caddebostan Seaside gathering point	Caddebostan
4	Caddebostan	Caddebostan Migros Supermarket	Caddebostan
4	Caddebostan	Tarim Il Mudurlugu Building	Caddebostan, Erenkoy
7	Erenkoy	Zıhni Pasa Primary School	Erenkoy
7	Erenkoy	Fehmi Eksi Primary School	Erenkoy
12	Goztepe	Efdal Primary School	Goztepe, Caddebostan
12	Goztepe	Anadolu Ticaret Meslek High school	Goztepe, Merdivenkoy, Egitim Mah, Feneryolu
10	Feneryolu	Kalamis Muhtarlik Park	Feneryolu
10	Feneryolu	Melahat Sehzade Primary School	Feneryolu, Zuhtupasa, Egitim mah.
9	Fenerbahce	Fenerbahce Seaside gathering point	Fenerbahce, Caddebostan
9	Fenerbahce	Selamicesme Parki	Fenerbahce, Feneryolu, Goztepe
26	Zuhtupasa	Kenan Evren High School	Zuhtupasa, Osmanaga
5	Caferaga	Caferaga Seaside Gathering point	Caferaga
5	Caferaga	Kadikoy Kiz Meslek High School	Caferaga
5	Caferaga	Rihtim Caddesi Gathering Point	Caferaga, Osmanaga
19	Osmanaga	Sali Pazari	Osmanaga, Hasanpasa, Zuhtupasa
20	Rasimpasa	Kadikoy Sabit Bazaar	Rasimpasa, Osmanaga

Table 4 Proposed gathering points in Kadikoy

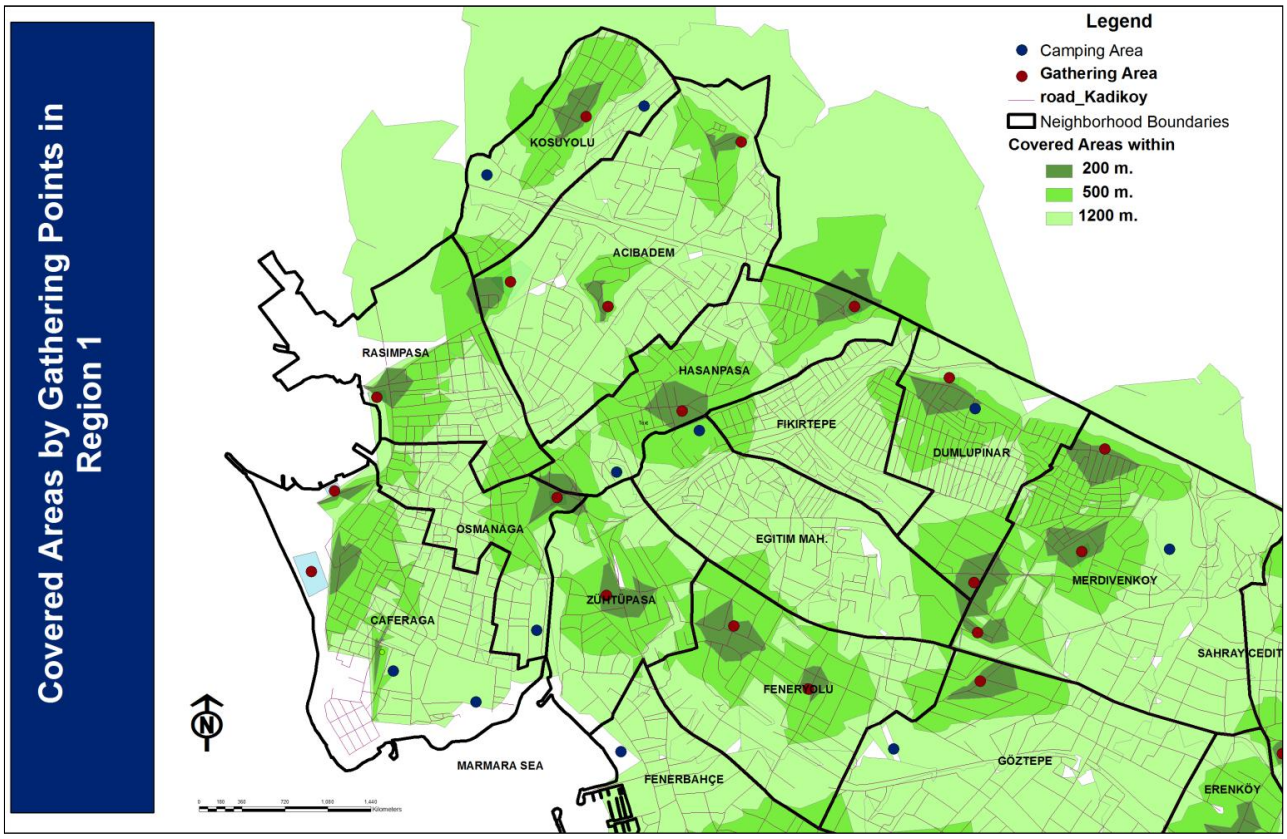


Figure 20 Covered Areas by Gathering Points in Region 1

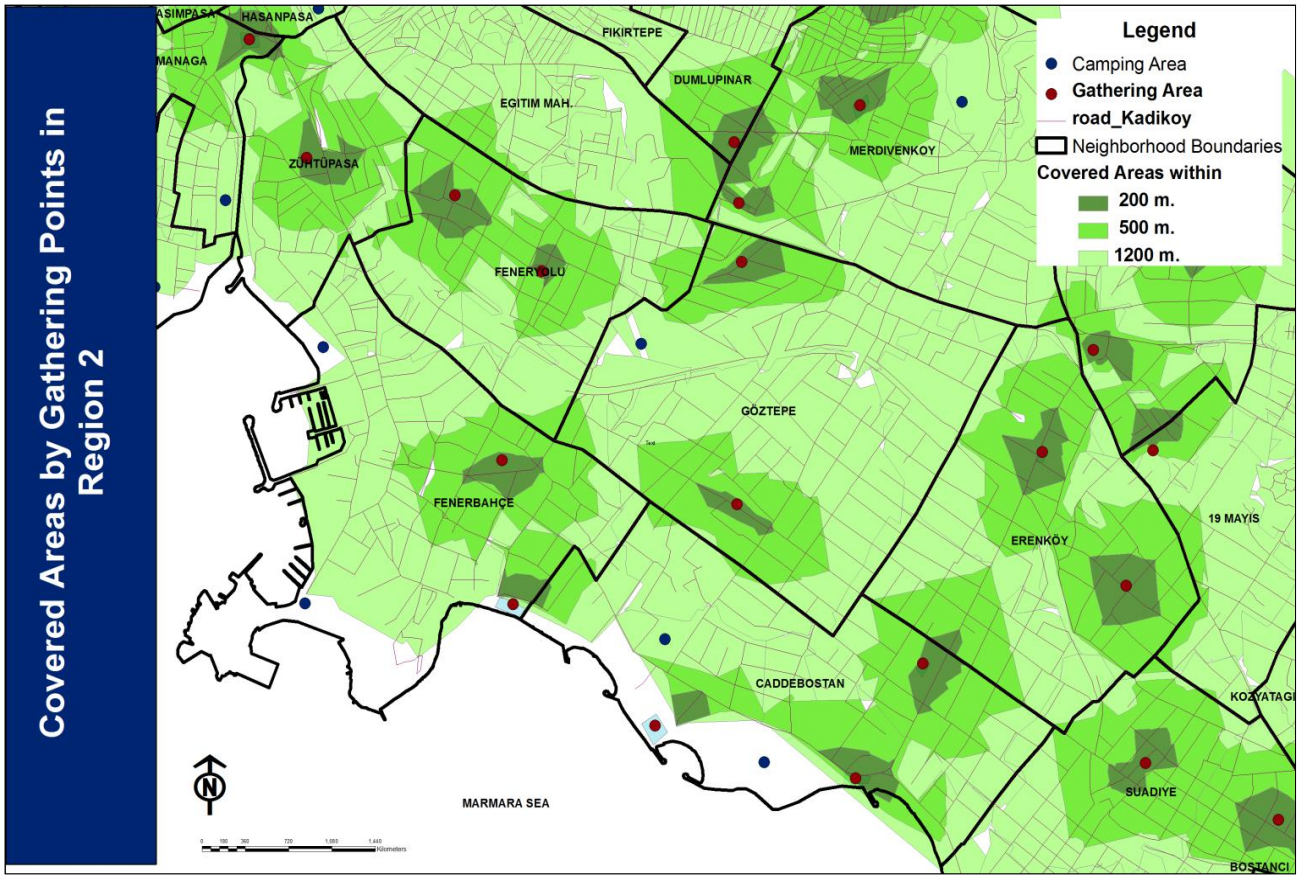


Figure 21 Covered Areas by Gathering Points in Region 2

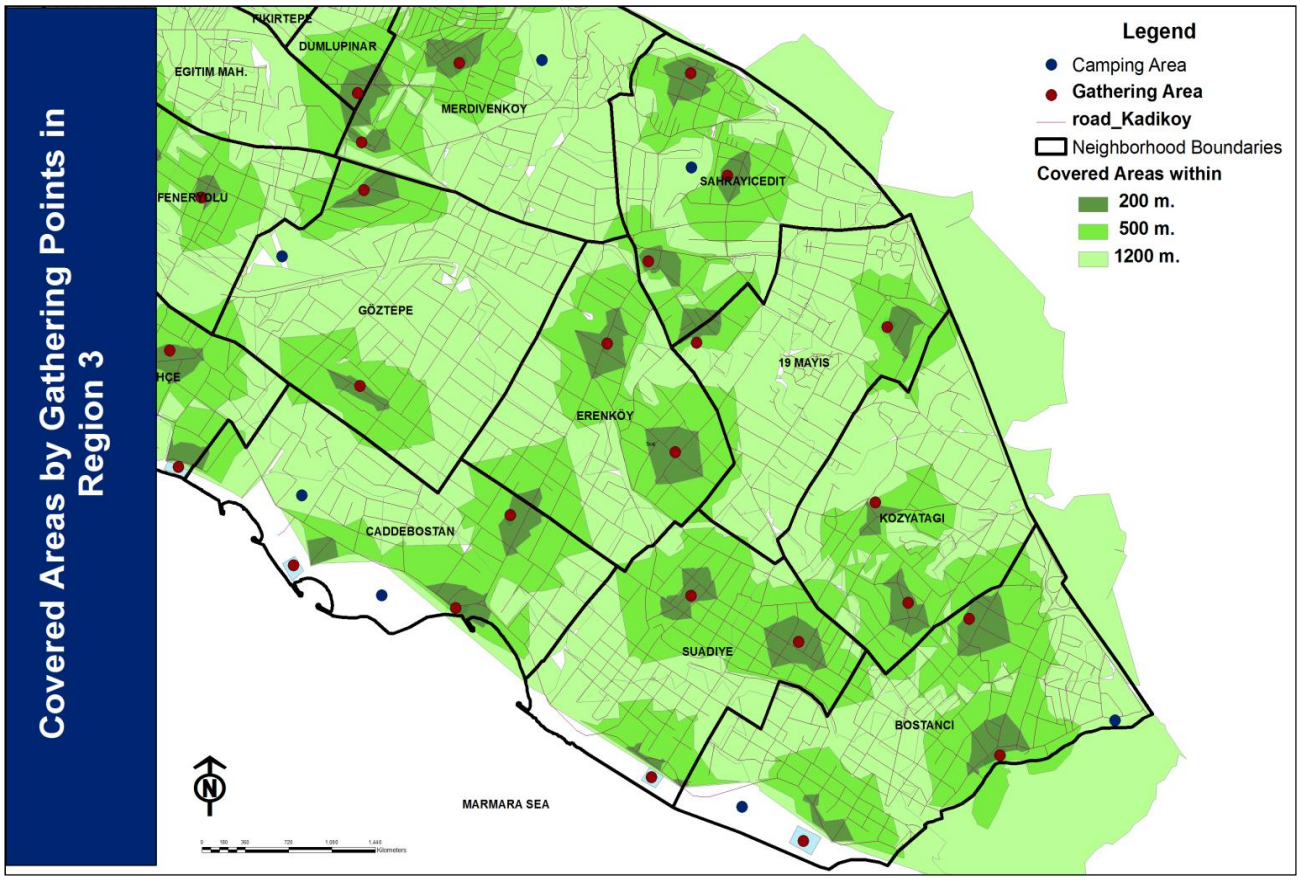


Figure 22 Covered Areas by Gathering Points in Region 3

The **camping areas** were formed in order to host temporarily the people requiring shelters after the earthquake. For determination of the locations and capacities of camping areas, often the Kadikoy Strategic Plan 2010-2014 was consulted. Some camping areas (Kadikoy Anatolian High School, Fenerbahce Port camping area, Fenerbahce Park, Caddebostan Migros Shopping Mall, Bostanci Seaside) that are located at the shore are to benefit also from the sea transportation for all logistic needs furnished by the transportation service providers of the municipality.

The temporary shelter service provider of municipality is the main authority in charge of the management of the camping areas. Definitive information regarding the tasks of this body is addressed in sections 4.2, 4.3 and 4.4 considering different phases of emergency.

Table 5 represents the camping areas, their locations and capacities.

Camping Area				
Code	**Name of Neighbourhood**	**Location**	**Area (m2)**	**Number of tents**
16	Kosuyolu	Kosuyolu Park	12000	200
16	Kosuyolu	Karacaahmet Mez. Arkası	10000	200
13	Hasanpasa	Kadikoy Belediyesi Parking Lot	17000	280
19	Osmanaga	Yogurtcu Park	20000	200
5	Caferaga	Kadikoy Anatolian High School	22000	250
5	Caferaga	Moda Sabit Pazari ve otoparkı	8000	80
9	Fenerbahce	Fenerbahce Parki	60000	850
8	Egitim Mah.	IETT Garage	8000	130
6	Dumlupinar	Fenerbahce Sport Facilities	19000	300
18	Merdivenkoy	Cocuk Esirgeme Kurumu Yard	96000	1650
12	Goztepe	Selamicesme Ozguluk Park	120000	2000
4	Caddebostan	Goztepe Park	90000	1500
21	Sahrayıcedid	Ataturk Caddesi Cebe Sokak	70000	1000
9	Fenerbahce	Fenerbahce Port Camping Area	15500	260
3	Bostanci	Bostanci New Bazaar	30000	500
3	Bostanci	Bostanci Seaside Camping Area	35000	775
4	Caddebostan	Migros Camping Area	85000	1450
		Total=	717500	11625

Table 5 Proposed camping areas in the district

The **helicopter areas** were taken from the Kadikoy Strategic Plan 2010-2014 and are shown in table 6

Helicopter Areas		
Code	**Neighbourhood**	**Location**
16	Kosuyolu	Kosuyolu Cardio Hosp. Park Area
13	Hasanpasa	Incirlibostan Foottball Area
5	Caferaga	Moda Sabit Bazaar
26	Zuhtupasa	Fenerbahce Stadium
8	Egitim Mah.	Goztepe Hospital
18	Merdivenkoy	Poliklinik

Table 6 Helicopter Areas in the District

Field Hospitals will serve as emergency health care centers in case the hospitals of the district are overloaded. Their locations and areas which were defined in the Kadikoy Strategic Plan 2010-2014 are represented in table 7.

Field Hospitals			
Code	**Neighbourhood**	**Location**	**Area (m2)**
26	Zuhtupasa	Fenerbahce Stadi	32000
21	Sahrayıcedit	Spor klubu	6630

Table 7 Field Hospitals in the District

4.1.6.3 Buildings

The needed resources which are buildings include **hospitals, hotels, stocking points, public facilities (**schools, shopping malls…**)**

The hospitals are the most significant buildings in emergency situations and it is important that their serviceability is assured before the event. All private and public hospitals (except clinics for outpatients, radiological centers) in the area, their addresses and bed capacities are shown in table 8.

		Name	Bed Cap.	Adress	Contact
Buildings	STATE HOSPITALS	KOSUYOLU ARASTIRMA HASTANESI	380	Salih Omurtak Cad., Kosuyolu	0216 336 91 96
		GOZTEPE EGITIM ve ARASTIRMA HOSPITAL	757	Doktor Erkin Caddesi , Goztepe	0 216 566 40 40
		MERDIVENKOY EGITIM ve ARASTIRMA HOSPITAL		Ressam Salih Ermez Cad.	0 216 566 66 60
		GOZTEPE EGITIM HOSPITAL		Kayısdagı Cad.	0 216 349 70 12
		ERENKOY RUH VE SINIR HASTALIKLARI HOSPITAL	550	Erenköy Mah. Sinan Ercan Cad. No:29	0 216 302 59 59
		PTT HOSPITAL	500	E5 Karayolu Üzeri Bostancı	0 216 578 30 00
		HAYDARPASA NUMUNE HOSPITAL	665	Tıbbıye Cad. No: 40	0 216 414 45 02
		VALIDEBAG HOSPITAL	200	Kalfacesme Sokak No:1	0 216 47479 00
		GATA	216	Selimiye Mahallesi	0 216 542 20 20
		SIYAMI ERSEK HOSPITAL	525	Tıbbiye Cad. Haydarpasa	0 216 444 52 57
	PRIVATE HOSPITALs	ACIBADEM HOSPITAL	132	8, Acıbadem Kadıköy	0 216 544 44 44
		ACIBADEM KOZYATAĞI HOSPITAL	91	İnönü Cad. Okur Sok. No.20 Kozyatağı	0 216 571 44 44
		ÇAGINER HOSPITAL	33	Uzun Çayır Caddesi Mirim Çelebi Sk. No:1	0 216 428 48 00
		FERIHAN LACIN HOSPITAL	36	Sarayardı Cad. No: 24	0 216 450 05 05
		ECHOMARGÖZTEPE HOSPITAL	58	Merdivenköy Yolu Şahika Sk. N:32 Göztepe	0 216 444 91 44
		GÖZTEPE ŞAFAK HOSPITAL	87	Fahrettin Kerim Gökay Cad. No:192	0 216 565 44 44
		İSTANBUL MEDİPOL HOSPITAL	60	E-5 Harem Yolu Üzeri	0 216 544 66 66
		KADIKÖY ŞİFA HOSPITAL	51	Caferağa 34710 Kadıköy	0 216 449 22 22
		KOZYATAĞI CENTRAL HOSPITAL	49	Kocayol caddesi Kozyatağı sokak No.5	0 216 410 77 99
		UNIVERSAL HOSPİTAL	128	Kurbağalıdere cd. no.108 34722 Hasanpaşa	0 216 339 23 71
		KADIKOY FLORENCE NIGHTINGALE HOSPITAL	75	Bağdat Cad. No:63 Kızıltoprak	0 216 450 03 03
		MEDİCAL PARK GÖZTEPE HOSPITAL	306	E5 Üzeri 23 Nisan Sok. No: 17 Merdivenköy	0 216 46844 44
		CIFTEHAVUZLAR MEDICAL CENTER	60	Bağdat Caddesi Tepegöz Sokak No: 1	0216 444 03 53
		YEDITEPE UNIVERSITY BAGDAT CADDESI HOSPITAL	43	Bagdat Cad. No: 238	0 216 467 88 60
		YEDITEPE UNIVERSITY HOSPITAL	190	Devlet Yolu Ankara Cad. No:102	0 216 578 40 00

Table 8 Private and state hospitals in the district

Another group of building resources is the **hotels** in the area. In emergency situations, the prefect can order the accommodation of the population temporarily in the hotels in case the temporary shelters are not sufficient.

The hotels in the district along with their addresses and bed capacities are listed in table 9.

		Name	Bed Capacity	Address	Contact Info
Buildings	Hotels	Kadikoy Aden Hotel	180	Rihtim Caddesi 2	0 216 345 1000
		Kadikoy Gloria Hotel	150	Rihtim Caddesi Misak-ı Milli 26	0 216 449 1654
		Grand AS Hotel	80	Nushet Efendi Sokak 27	0 216 346 9161
		Kadikoy Hotel Nova	64	Rihtim Cad. Resit Efendi Sok. 24	0 216 550 0351
		My Dora Otel	120	Rihtim Cad. Recaizade Sok. 6	0 216 414 8350
		Deniz otel	192	Sahap Gurler Cad. 2	0 216 348 74 55
		ByOtell	226	Saniye Ermutlu Sok. 3.	0 216 571 6100
		Sidonya Otel	80	Rihtim Cad. Nemlizade Sok. 34	0 216 349 5308
		Zirve Otel	100	Rihtim Cad. 36	0 216 414 5142
		Rihtim Otel	180	Rihtim Cad. 62	0 216 349 4991
		The Bostanci Hotel	150	Mehmet Sevki Pasa Cad. 20	0 216 362 4848
		Kadikoy Zümrüt Hotel	64	Rihtim Cad. 5	0 216 450 0454
		Dila Hotel	160	Fuat Bey Sok. 5	0 216 418 8383
		Eysan Hotel	192	Rihtim Cad. 26	0 216 346 2440
		Hotel Suadiye	314	Plaj yolu 25	0 216 445 8424

Table 9 Hotels in the district

Stocking points, the locations and areas of which are taken from the Kadikoy Strategic Plan 2010-2014, can be utilized in emergency situations for storing the materials and machines which will be used during the operations.Below in tables 10 and 11, the stocking points and medicine stocks are listed:

Stocking Areas			
Code	**Neighbourhood**	**Location**	**Area (m2)**
16	Kosuyolu	Park across Cardiological Hosp.	3800
1	Acibadem	Imam Hatip Lisesi	11700
13	Hasanpasa	Sogutlucesme T.C.D.D	15000
20	Rasimpasa	Haydarpasa T.C.D.D	90000
20	Rasimpasa	Et veBalik Kurumu	13800
5	Caferaga	Caferaga Sport Center	1800
5	Caferaga	Baris Manco Kultur Merkezi	1100
26	Zuhtupasa	Zubeyde Hnm Evlendirme Dairesi	19000
18	Merdivenkoy	Kati Atik istasyonu	2000
3	Bostanci	Sporium Tesisleri	15000

Table 10 Stocking Points in the District

Sites For Heavy Machinery			
Code	**Neighbourhood**	**Location**	**Area (m2)**
6	Dumlupinar	Devlet Malzeme Ofisi	3000

Table 11 Sites for heavy Machinery

Medicine Stocks		
Code	**Location**	**Number of Stocks**
16	Kosuyolu	1
1	Acibadem	6
11	Fikirtepe	**1**
21	Sahrayıcedit	1
7	Erenkoy	1
8	Egitim Mah.	1
19	Osmanaga	**2**
20	Rasimpasa	3
	Total	16

Table 12 Medicine Stocks in the Districts

4.1.6.4 Materials and Tools

Materials and tools consist of **vehicles belonging to municipality, emergency requirements of the public (food, medicine, tents, blankets, prefabrication).**

The vehicles, (their type and numbers) which can be needed during the emergency are listed below in table 13.

Vehicles Belonging to Municipality	
Type of Vehicle	**Number of Vehicles**
Trucks	13
Vans	49
Minibuses	17
Cranes	5
Ambulances	2
Heavy Machinery	21
Funeral Vehicles	2
Road Sweeping Vehicle	11
Buses (30 people)	1
Tow Trucks	2
Water tankers	7
Vehicles for disabled	2
Cleaning	12
Total	144

Table 13 Vehicles that belong to the municipality

Other emergency needs that fall into the category of materials and tools are **food; medicine, tents, blankets, fuel** and **water** are supplied by the authorities on the national basis and Kizilay.

Figure 23 represents all the available resources of the district of Kadikoy.

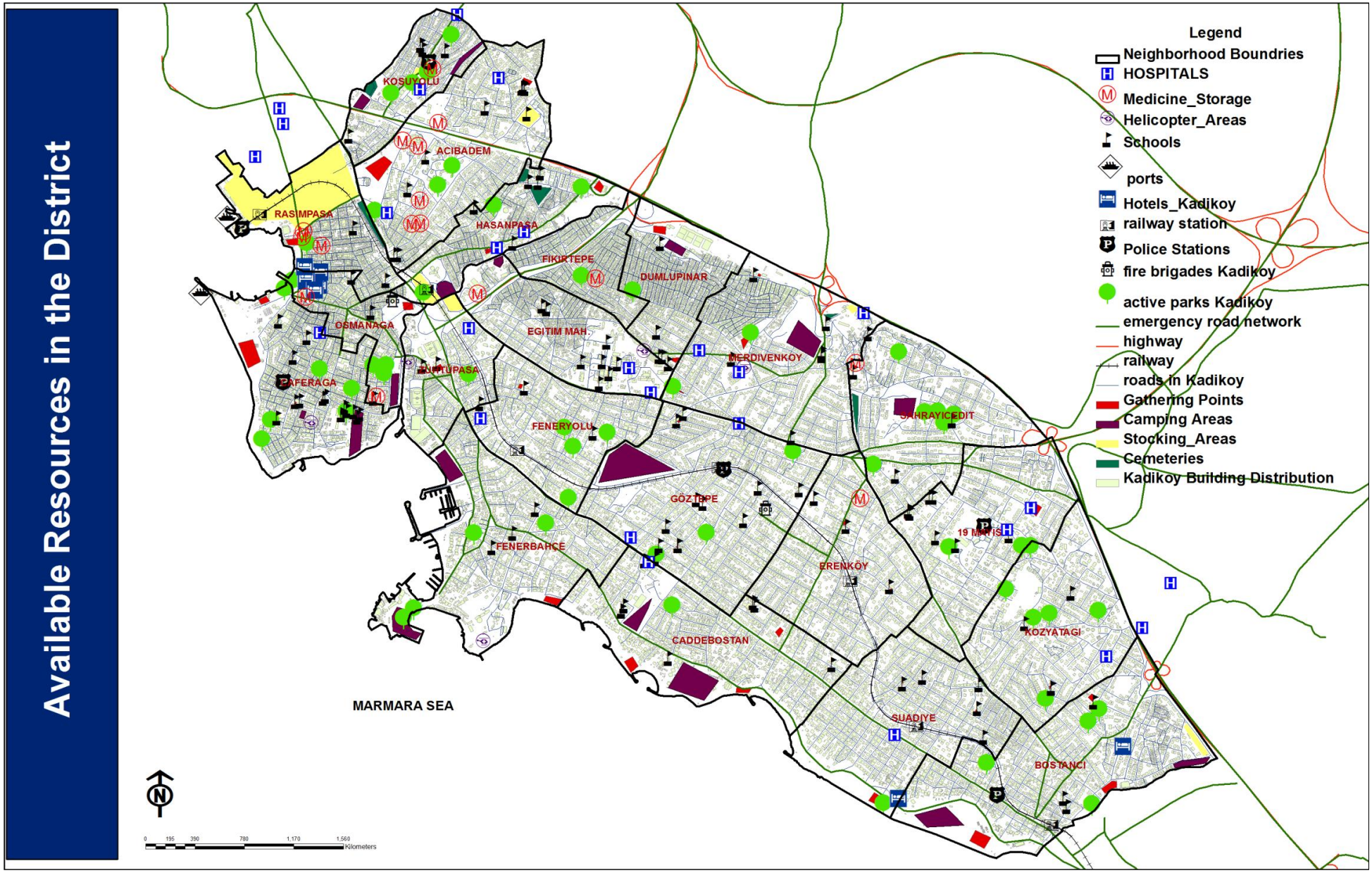


Figure 23 Locations of available resources in the district

4.1.6.5 Definitions of the authorities to be involved

A major earthquake will generate a large number of response requirements, and there are a number of agencies which can respond at all levels of government and in the private sector. As many of the response activities to be performed require coordinated actions by multiple agencies, a functional organization for response has been used to make this feasible.

The range of tasks to be performed has been categorized into "Emergency Service Providers". The response to an emergency or disaster is managed at the lowest level possible. Accordingly, local government has the primary responsibility for the response to an emergency or disaster. When the needs exceed the capabilities of the district, mayor may request assistance from neighboring districts and or the disaster and emergency management presidency.

Additionally, municipality has to ensure that emergency responders and managers have received training in the areas including use of emergency response, health and safety and supplies, public notification district wide.

The Emergency response process is managed by the municipality and in the gathering points (emergency control centers) predefined officers will be in charge as members of the field response units. The assignment of the authorities and duties is performed according to the disaster law 7269 in the Turkish constitution.

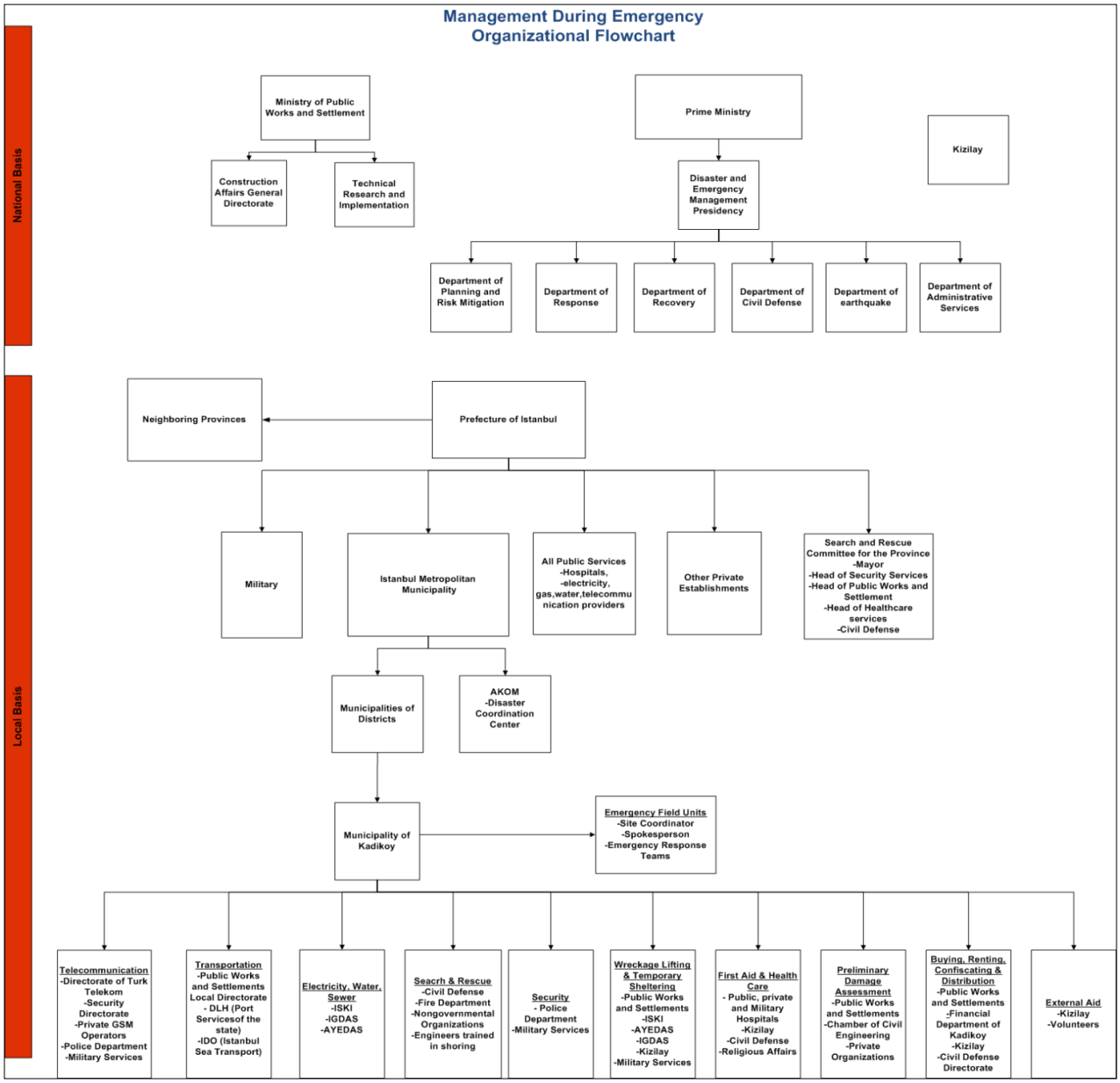


Figure 24 Organizational Flow Chart

Under the prime ministry, the **Disaster and Emergency Management Presidency** takes the main role in handling pre and post emergency activities. Its main responsibilities are planning and mitigation, response and recovery and civil defense.

The **Department of Planning and Mitigations** is appointed:

- To prepare disaster and emergency response, risk management and hazard reduction plans which will be applied nationwide.
- To determine cash, goods and humanitarian aid rules

The tasks of the **Response Department** are;

- The evaluation of all sources (public, private, foreign governments and organizations)for emergency activities to resolve the effects of disaster and emergency
- To manage Prime Ministry Disaster and Emergency Situations Center
- To ensure the establishment and management of emergency management centers at governmental agencies and in provinces.
- To define the standards of Fire Brigade and SAR Teams
- To co-operate with the agencies and institutions provides Fire and SAR services
- To plan and conduct protective and rescue activities
- To co-operate with the International Agencies and Foreign Governments in its own field.

The tasks of the **Department of Recovery** are:

- To take necessary measures for normalizing life after disaster and emergency situations
- To assure temporary settlement at disaster and emergency areas and to provide psychological support, social aid, food and medical treatment to effected people.
- To ensure coordination with other governmental authorities on the legal process of reconstruction, planning and projection work at disaster affected areas and to supervise the activities performed.
- To accept and provide international humanitarian aids.

The **Civil Defense Department** is appointed:

- To plan, carry out and supervise Civil Defense Services in governmental and private institutions/ organizations
- To plan and conduct all kind of activities for non-armed protection, rescue measures emergency rescue and first aid activities
- To determine measures to be taken and identify works to be done against Chemical, Biological, Nuclear and Radiological threats and hazards and to ensure coordination between Ministries, Governmental and private institutions/agencies in this regard.

The duties of the **Earthquake Department** are:

- To carry out of reconstruction, plan and project works of impacted zones and earthquake prone areas.
- Determination and efficient usage of any source belonging to public, private or nongovernmental organizations or foreign institutions that might be used for preparation, response and recovery phase of earthquake.

The **Department of Administrative Services** is committed:

- To provide or conduct logistic services at national level, support local governments, other governmental institutions and nongovernmental organizations.
- To manage resources related with disaster and emergency.

Kizilay, like Red Cross, is an independent organization and accounts for organization, storage and distribution of subsidies such as foods, clothes, blanket and tents. It also gives assistance to health activities.

The responsibilities of the **Ministry of Public Works and Settlements** through its two subunits are planning, cost benefit analysis of disaster related permanent resettlements.

In the local basis, in accordance with the 7269 disaster law in the Turkish constitution, the **prefects** are given extraordinary authorizations during emergencies such that if necessary, they are able to confiscate all the governmental and private resources for search and rescue activities as well as all other human requirements.

The **Disaster Management Center** which is under the supervision of the Prefecture is appointed to deal with the stages of mitigation, preparation, intervention and recovery.

The **Disaster Coordination Center (A.K.O.M)** is responsible for the coordination between the establishments of the Istanbul Metropolitan Municipality and implementing the orders coming from the prefect.

During the earthquake, the mayor of Kadikoy has the primary authority to response. In this regard, The Municipality of Kadikoy is made up of many service providers that share the responsibilities during emergencies according to the Disaster Law 7269. Emergency service providers assemble without authorization after the earthquake and operate 24 hours. The service managers have to certify mayor of Kadikoy on the ongoing activities. If the needs of the municipality exceed its capability to respond, mayor may request assistance from the prefect of Istanbul and the prime ministry disaster presidency.

Their definitions and assigned tasks are in the following:

Telecommunication Service Provider is composed of officers from Turk Telecom directorate, Security directorate, private GSM operators, police department and military service. The duties of this unit are:

- Immediate Set up and activation of cable and / or wireless telecommunication network and emergency lines and stations
- Introducing Mobile Telecommunication units and base stations in the impact zones.
- Repairing of damaged systems and cables.
- Taking precautions for overloading.
- Providing definitive and continuous information on the earthquake and on the estimation of the casualties and injured, the number of damaged buildings as well as the needed help
- Providing backup systems for the responsible organizations
- Informing the community on the facilities that can be used

Transportation Service Provider has officers from Public Works and Settlement local directorate, Road and Highway Department, DLH (Port Services of the State), TCDD (Rail way Services of the State), IDO (Istanbul Sea Transport) and its tasks are:

- Immediate detection of the interrupted roads / isolated areas and proposing alternative transportation modes.
- Maintaining connection with all the transportation establishments.
- Assuring the functionality of many roads as possible
- Verifying the means of transport that could be taken advantage of
- Organization of the transportation of Haydarpasa Port and Railway station
- Providing fuel for the means of transportation.
- Verifying the state of bridges and railways.
- If necessary, collaborating with the military.

Search and Rescue Service Provider is managed by Civil Defense Directorate and officers from fire department and other nongovernmental organizations (A.K.U.T) that have rescue teams and engineers trained in shoring from the chamber of civil engineers. Its tasks are:

- Rescuing of injured / trapped people
- Saving the valuable belongings of people
- Providing technical guidance in shoring activities
- If necessary, collaborates with foreign agencies and military services.

First Aid and Health Care Service Providers is composed of personnel from public, private and military hospitals, Kizilay, Civil Defense, and Religious Affairs.

- Setting up first aid centers in the impact areas
- Setting up the field hospitals
- Identifying the dead and undertaking their burying.
- Verifying the required medical supplies and ensuring their presence.
- Transferring of the injured to the near hospitals

Wreckage Lifting and Temporary Sheltering has officers from Public Works and Settlements Directorate, ISKI, AYEDAS, IGDAS, Kizilay and military. Its duties are:

- Removing of the debris that blocks transportation
- Initiation of the determination of the interventions on the partly damaged buildings
- Establishment and management of temporary shelters
- Verifying and satisfying the needs of the persons in the temporary shelters
- Transferring of the persons to the temporary shelters
- Verifying and assuring the lifeline services in the temporary shelters

Preliminary Damage Assessment is composed of people from the Public works and settlements general directorate and engineers from the chamber of civil engineering and private organizations. It is assigned the following works:

- Determination of the most damaged zones
- Preliminary assessment of damage by the predefined groups
- Providing information for definitive damage assessment
- Determination of the unsafe buildings
- Providing services for temporary accommodation areas

Security Service Provider has people from police department and military. It is responsible for the following:

- Maintaining surveillance on the streets
- Controlling the traffic
- Ensuring that the partly damaged houses are vacant
- If necessary , collaborating with foreign agencies

Electricity, Water, Sewage has people from ISKI (Istanbul Water and Sewer Affairs), IGDAS (Istanbul GAS Distribution Affairs), and AYEDAS (Istanbul Asian Side Electricity Distribution). Its tasks are:

- Initiation of the repairing of the damaged parts of the network
- Initiation of the work of providing service supplies in the camping areas and prefabricated houses
- Providing potable water to damaged zones with the private companies in accordance with the predefined collaborations
- Providing portable toilets and showers and their disinfections
- Providing generators when necessary

Buying, Renting, Confiscating and Distribution Service Provider is composed of people from Public Works and Settlements Directorate, Head of Financial Department of the District for the buying, renting and confiscating process and Public Works and Settlements, Kizilay, Civil Defense Directorate for the distribution process. It is assigned the following duties:

- Stocking, protection and distribution of the obtained materials
- Assisting Kizilay in the distribution of goods.
- Confiscating or renting of required land, tools, and vehicles.

External Aid Service Providers which is made of Kizilay people and volunteers are assigned these tasks:

- Coordination with foreign aid organizations
- Assisting the foreign search and rescue teams

4.1.7 Complete Event Scenario

The seismic vulnerability assessment performed for different neighborhoods in Kadikoy made it possible to come up with a complete event scenario according to which the emergency plan could be built considering the need for resources. The scenario describes the possible problematic areas, chain of events with the time needed to recover the damage.

In the process of building the project of Earthquake Emergency Plan for Kadikoy, the magnitude of the earthquake was taken to be 7.5 (Scenario A JICA) in Richter's scale and the incident was considered to take place during night time . This consideration was due to the fact that the estimation of the casualties was performed according to this assumption in the reports. A day time disaster would induce a significantly different number of victims, hence would require a modified emergency plan.

The damages in the scenario were explained not only in terms of direct physical damage but also induced physical damage. The induced damages mainly are made up of liquefaction and hazardous material releases.

Liquefaction: The potential for earthquake-induced liquefaction to cause significant damage to buildings, buried pipes and ports is well known.

Hazardous Material Releases become an additional disaster agent that must be integrated into the management framework for earthquakes. Under specified conditions, an earthquake could initiate releases from many sources simultaneously, severely taxing the emergency management system. Further, earthquake-related obstacles to emergency response severely hamper the management of hazmat releases.

As a result of the vulnerability assessment, the development of events and the period of absence of services are represented in the figures 24 and 25 respectively.

The chart representing the complete event scenario was based on the article of "Chains of Damages and Failures in a Metropolitan Environment: Some Observations on the Kobe Earthquake in 1995" by S. Menoni.

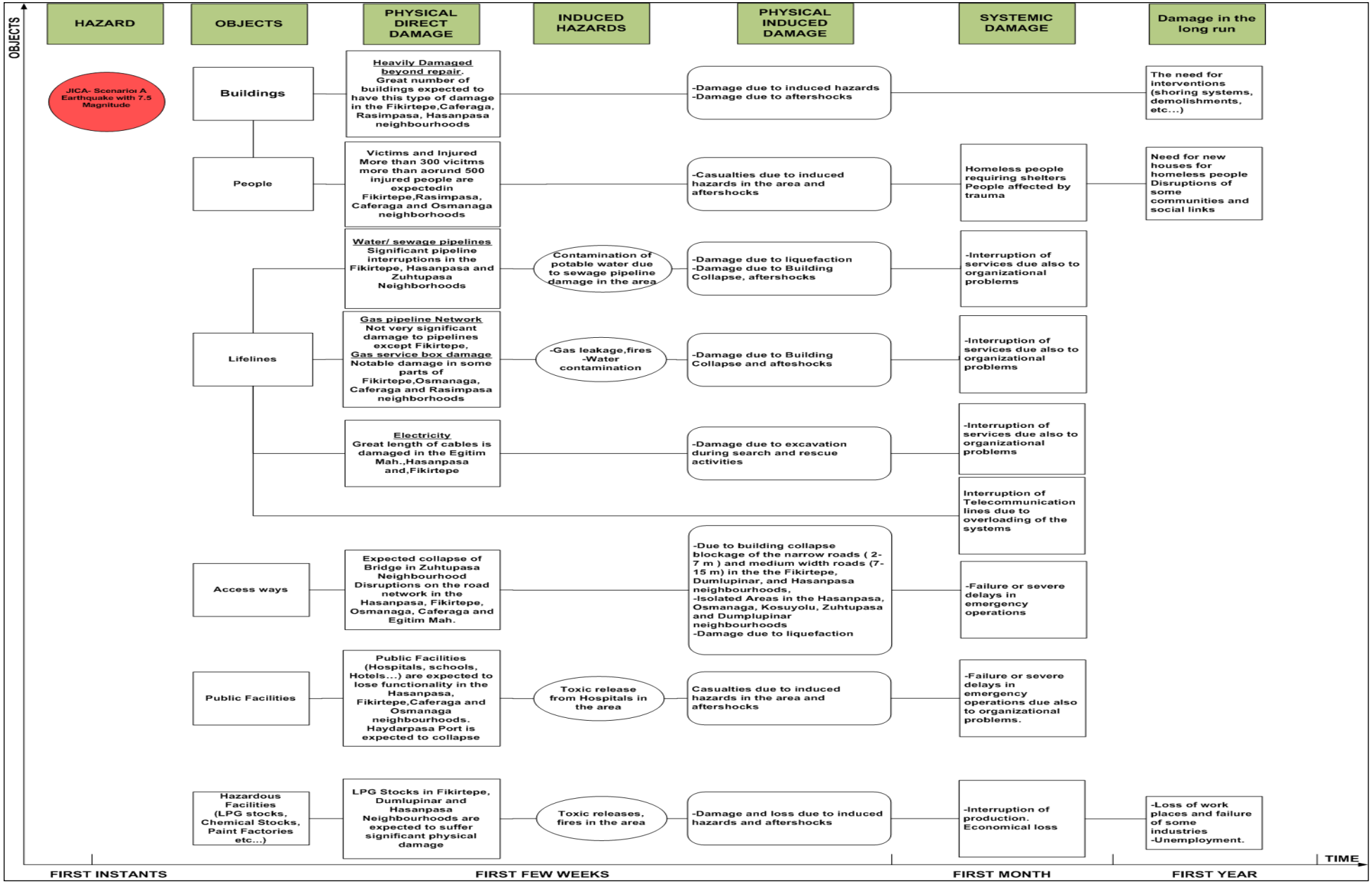


Figure 25 Complete Event Scenario

On the process of forming the scenario, the main criterion considered was the result of the vulnerability assessment. This way, taking into account different aspects, the most and the least critical areas were determined. The goal of creating an emergency situation as close to reality as possible, is, hereby, maximizing utility of the resulting contingency plans.

On the figure above, one is provided with the possible damages and chain of events on the built environment as well as the population as a result of an earthquake. The process for creating the scenario is as follows:

To begin with, under the title of objects, the expected to be damaged components of the built environment were considered. The most important component, besides people, was the buildings.

The direct damage to buildings can be grouped as heavily, moderately, and partially damaged. The vulnerability assessment results stated that in the neighborhoods of Fikirtepe, Caferaga, Hasanpasa and Osmanaga a great number of buildings were expected to fall into the category of heavily damaged structures. This made up of one of the key points of the preparation of the emergency plan as it pointed out the safer and risky zones. Moreover, the damage to buildings as well as the lifelines did not only consist of direct damage meaning that the physical induced damage played an important part in defining the final state of the structure. For instance, liquefaction is one of the most important consequences of an earthquake. When the ground acceleration and lateral forces fail to cause severe damage on a building, this phenomenon could lead the building to sink or lean on a nearby structure owing to poor soil qualities. In this case, the earthquake did not directly damage the building but it created a circumstance that the building could not withstand. This kind of damage was defined to be induced physical damage and is referred many times in the following sections. Another critical issue regarding the building damage due to seismic disturbance was defined as the damage in the long run which was described as the deficiency in providing accommodation for the population following the period in the temporary shelters (tents and prefabricated houses).

Secondly, the direct damage to lifelines consisted of breaking points and interruptions on the pipeline network for water and minor damage on the electric cables and gas pipeline network.

For the distribution of water, it was concluded that several interruptions were expected in the area of Fikirtepe, Hasanpasa and Zuhtupasa Neighborhoods. However, the greatest damage to water pipes would be a result of soil liquefaction leading to many breakpoints in the joints hence, interruption of services. During the vulnerability assessment study, JICA considered liquefaction potential. The gas network on the other hand proved to be relatively resistant to seismic disturbance whereas notable damage on the gas

service box could be expected in some parts of Fikirtepe, Osmanaga, Caferaga and Rasimpasa neighborhoods.

The significance of the gas pipeline network and gas service box damage lies in that the leakage from either would cause fires or even explosions. This, together with the water contamination, is considered to be the induced hazards that the gas network could cause. However, since no such induced hazards were observed in 1999 Kocaeli earthquake which had similar properties, the mentioned secondary hazards were overlooked in the complete event scenario.

The induced damage on the gas pipeline network, on the other hand, was contemplated to be due to the building collapses and aftershocks.

The electricity cable damage was concluded to take place mostly in the areas of Egitim Mah., Hasanpasa and Fikirtepe where the greatest part of the damage was expected to be caused by the excavation during the search and rescue activities.

For the entire lifeline systems mentioned above, the systemic damage which is defined as the damage because of the inter and intra connectedness of the systems was described as the interruption of services due also to organizational problems.

The direct physical damage to access ways included a bridge collapse in Zuhtupasa and disruptions on the road network in parts of Hasanpasa, Fikirtepe, Osmanaga, Caferaga and Egitim Mah. On the other hand, the physical induced damage on the access ways involves isolation of areas in Hasanpasa, Osmanaga, Kosuyolu, Zuhtupasa and Dumlupinar due building collapses.

Other than lifeline systems, the impact of the earthquake on the public facilities and industrial buildings needed to be assessed. While direct damage on these cannot be assessed due to the lack of data available, the induced damage on these was taken into consideration which was the disutility of the facilities that are situated in the defined isolated areas.

Another critical issue that stems from the damage to facilities is that it could lead to induced hazards such as fires and toxic releases resulting in more casualties. That is why, the issue makes up of a key point in the chain of events as well as the scenario produced. The loss of functionality of hospitals for instance, could cause severe delays and interruptions on the emergency operations. It was, therefore, required that the hospitals in the critical zones were determined and the emergency plan was built accordingly. The long term damage on industrial facilities was stated to be economical loss and unemployment.

In a specific sense, the Haydarpasa Port was considered to suffer major damage due to liquefaction which was taken into account in the emergency plan preparation.

The impact of the earthquake on the population was also required to be assessed while building the scenario in order to be able to determine the need for available and deficient services during the emergency. According to the vulnerability assessment, more than 300 casualties were expected in the neighborhoods of Fikirtepe, Rasimpasa, Caferaga and Osmanaga. The induced damage on the population was thought to be made up of the increase in the number of casualties due aftershocks and induced hazards introduced by public and industrial facilities as well as the lifeline systems. The long term effects of the earthquake on the population were concluded to be the deficiency in accommodation and disruptions of social links in several communities.

Despite the fact that all these expected incidents needed to be addressed on the process of producing the emergency plan, a list of events would mean little without a relevant timeline defined. Figure 26 represents the absence of certain services for different periods of time based on the Earthquake Spectra 2000 vol. 16, the Kocaeli Earthquake. For instance, the gas distribution service was selected to be the one that would be repaired in the shortest amount of time where as the building reconstruction could take up to several years. On the other hand, owing to the fact that the water pipes had been installed a long time ago, the distribution would be limited until 1 month from the earthquake.

To conclude, all the aspects mentioned above helped create the earthquake emergency scenario. In addition, the activities that were defined in the emergency plan were based on these considerations.

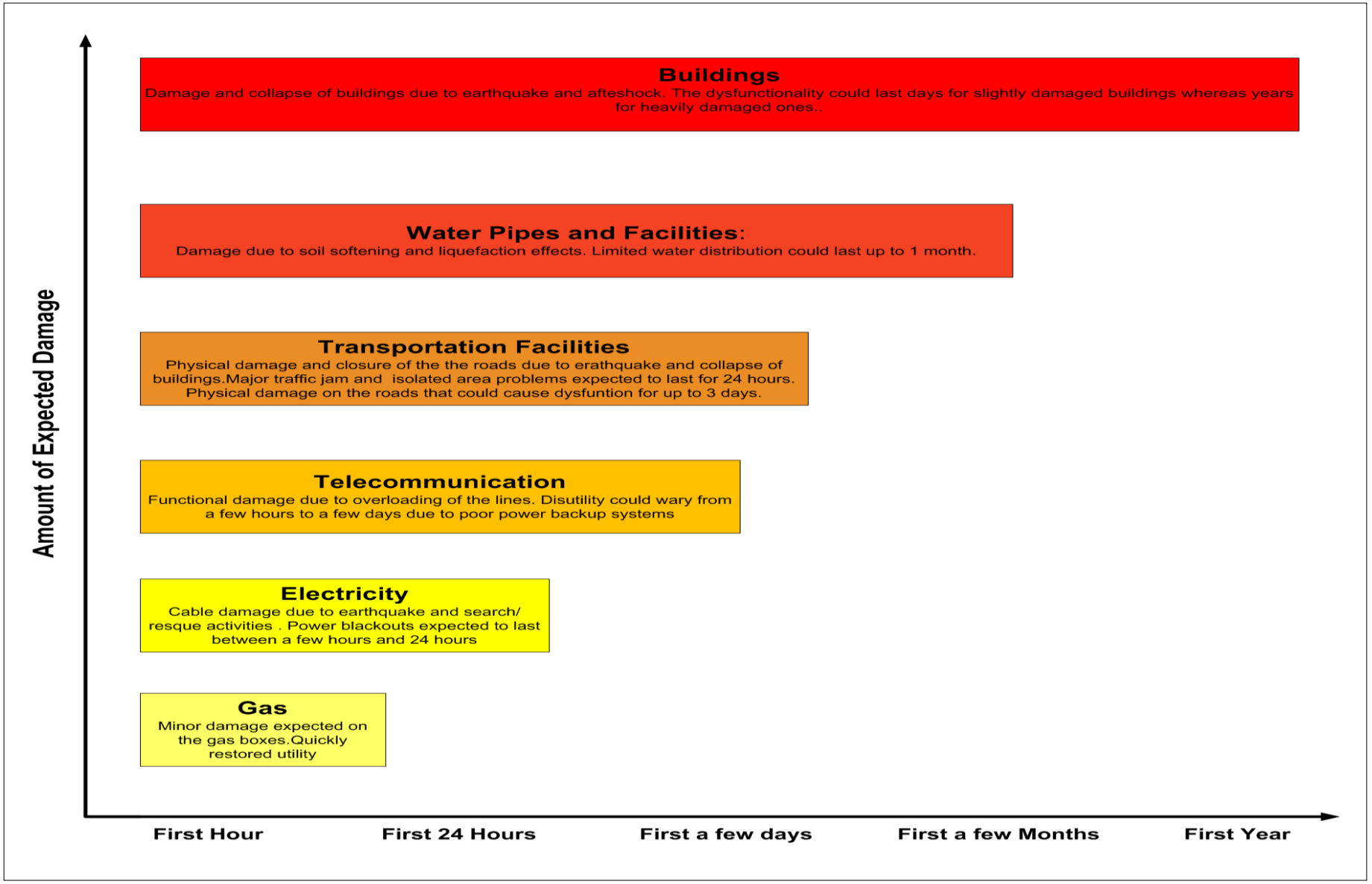


Figure 26 Expexted damage and recovery time(based on 1999 Kocaeli earthquake)

The scenario clarifies that major building collapse and a great number of casualties may occur within the boundaries of Fikirtepe, Osmanaga, and Caferaga and Hasanpasa neighborhoods.

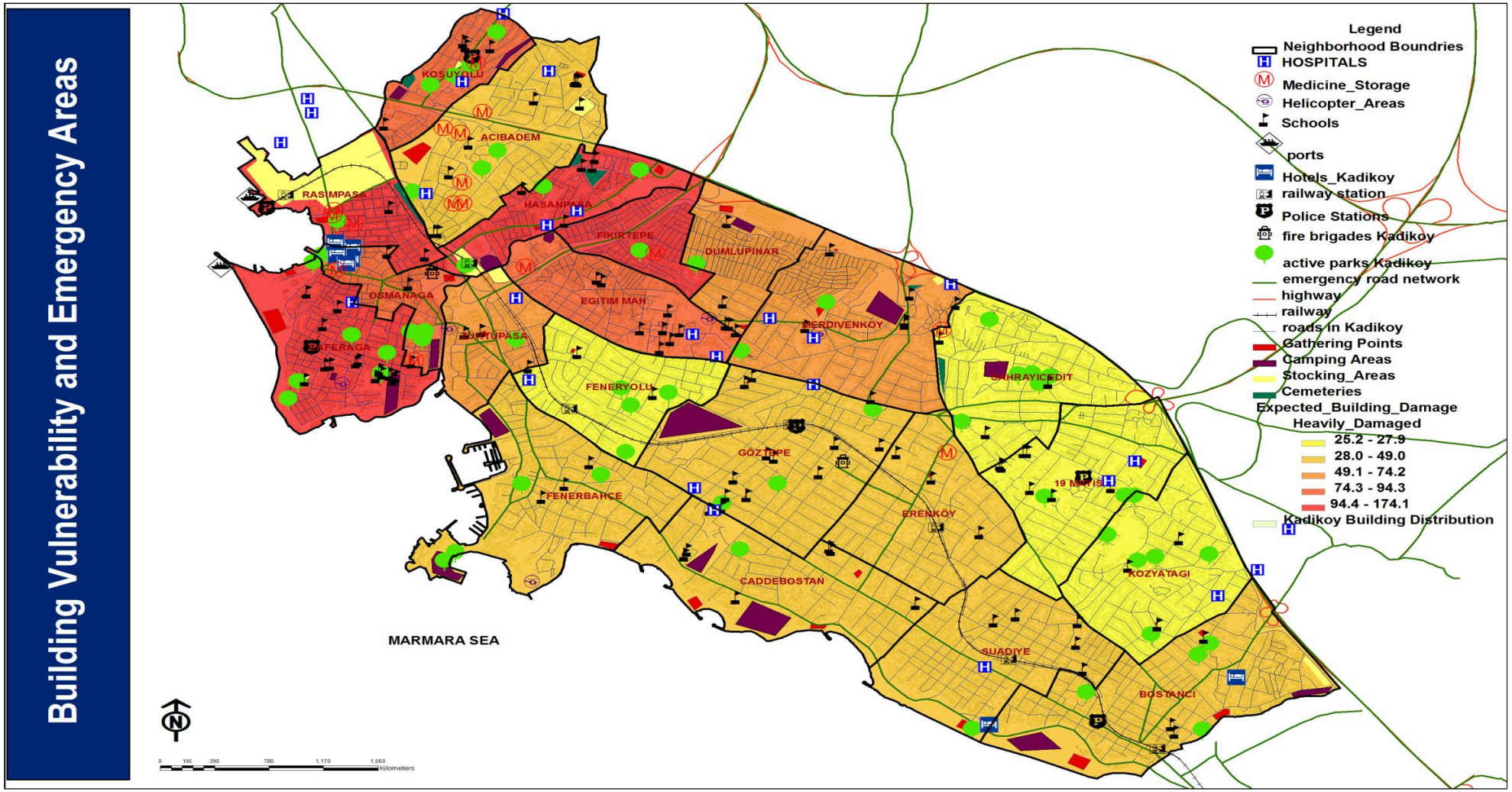


Figure 27 Problematic areas in terms of building vulnerability

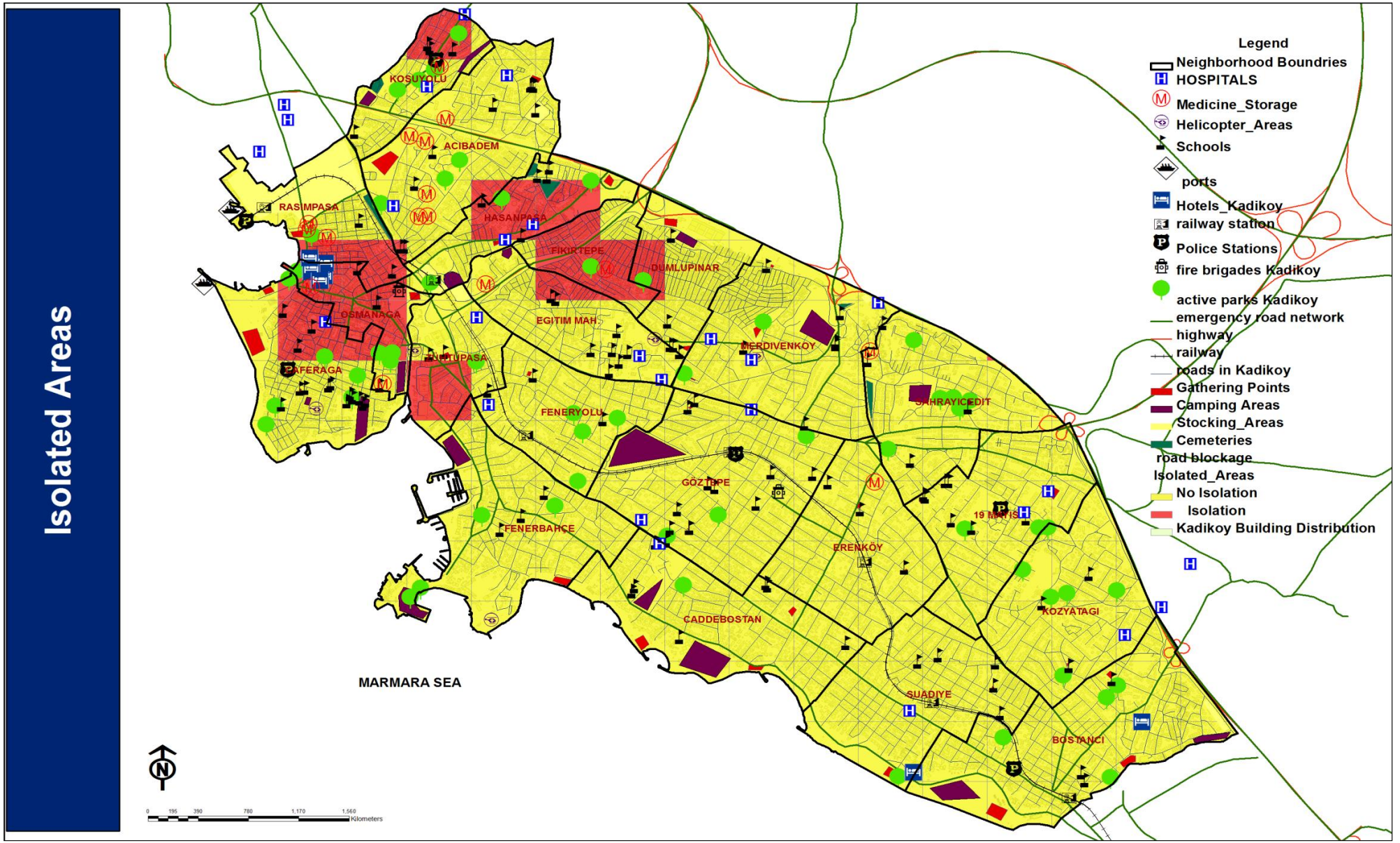


Figure 28 Isolated areas in the district

4.2 Initial Response: First 72 Hours after the Impact

The stage of initial response starts immediately after the earthquake. The previously explained emergency service providers assemble without authorization and the field response units take their assigned operating areas in various parts of the district. The security personnel that happen to be on the field at the time of the incident provide information to the authorities in the emergency management centers via their handled radio equipment. Any field personnel are expected to assess their situation and identify any threats to safety, following the response procedures established by the emergency plans of their departments.

In this phase, the primary government response role was defined to be the, saving and protection of life and property. The priorities in this stage were reckoned to be gathering information on the earthquake and the damaged zones, assuring the availability of access ways for the rescue teams to reach the critical areas, rescuing persons from under the wreckages and their transfers to the nearest hospitals, establishment and management of the gathering and camping areas. Emergency response and recovery of public facilities such as hospitals were set to receive high priority for restorations.

4.2.1 Monitoring of the Ongoing Situation

The critical information on this stage regarded:

- The earthquake magnitude, aftershocks and damaged areas.
- Number and locations of dead and injured people.
- Location of severely damaged and collapsed structures.
- The situation in the expected isolated areas.
- Location and estimated number of people trapped in collapsed structures.
- Location and extent of secondary events including fires, hazardous material leaks.
- Requirements for major evacuations and estimated number of people displaced.
- Establishment and arrangement of the gathering points and temporary shelters.
- Status of communication systems including emergency communication means, public phone and wireless systems, 112 dispatch systems
- Damage to critical public buildings including hospitals, police , fire facilities, schools and other infrastructures
- Status of and damage to major lifeline systems including water, sewer, electricity and natural gas.
- Debris removal and clean up

4.2.2 Actions on vulnerable/expected to be damaged zones

Level	Name of the Authority		Responsibility
National Basis	Disaster and Emergency Management Presidency		-Declaring the Emergency
	Response Department		-Managing the Prime Ministry Disaster and Emergency Situations Center -Verifying the presence and points of consequent induced hazards -Establishing and managing of emergency management centers at governmental agencies and in provinces by using all resources -Ensuring coordination between Ministries in this regard
	Kizilay		-Immediate verification of the resources and initiation of supplying food, blood, blankets, etc... -Participating in the emergency health care activities in the damaged zones
Local Basis	Prefect of Istanbul		-Ordering all of the establishments of emergency centers -Alarming all the responsible authorities in the local basis including public service providers. -Alerting the Disaster Management Centers (Kadikoy) -Getting in contact with private establishments -Contacting and requesting assistance to meet the needs from the neighboring provinces and military services based on the predefined collaborations -Inspecting the work performed by the emergency service providers. -Informing the community and the prime ministry on the current situation
	Istanbul Metropolitan Municipality		-Alerting A.K.O.M (Disaster Coordination Center)
	A.K.O.M Disaster Coordination Center		-Ensuring the coordination among the departments of the Municipality -Updating the municipalities of the districts (Kadikoy)
	Municipality of Kadikoy	Mayor	-Managing and supervising the restoration activities -Keeping contact with the authorities on the national basis for the requirements on the local basis -Approving news releases and public announcements

		Telecommunication	-Immediate set up and activation of cable and / or wireless telecommunication network -Introducing Mobile Telecommunication units in the impact zones. -Providing definitive and continuous information on the earthquake and on the estimation of the casualties and injured. -GSM operators set up mobile base stations in the area for emergency operations. -Collaborations with private telecommunication companies in accordance with the agreements. -Providing backup systems for the responsible organizations -Providing definitive and continuous information on the earthquake and on the estimation of the casualties and injured, the number of damaged buildings as well as the needed help -Informing the community on the facilities that can be used
		Transportation	-Immediate detection of the interrupted roads / isolated areas and proposing alternative transportation modes. -Maintaining connection with all the transportation establishments. -Establishing traffic control to permit an orderly flow of the response effort -Closing restricted and dangerous transportation routes and facilities to public access -Preliminary damage assessment and interventions on the access ways. -Verifying the means of transport that could be taken advantage of -Organization of the transportation of Haydarpasa Port and Railway station -Providing fuel for the means of transportation for emergency activities. -Verifying the state of bridges and railways. -Ensuring the reopening of the roads that lead to isolated areas.
		Electricity, Water, Sewer	-Initiation of the repair of the damaged parts of the network giving priority to critical public facilities -Initiation of the work of providing service supplies in the camping areas -Providing potable water to damaged zones with the private companies in accordance with the predefined collaborations -Providing portable toilets and showers and their disinfections -Providing generators when necessary -Collaborations with private companies in order to see to the water and electricity requirements of the camping areas.

		Search & Rescue	-Rescuing of injured / trapped people -Extinguishing fires -If necessary , collaborates with foreign agencies
		Security	-Maintaining surveillance on the streets -Controlling the traffic (road blocks for safety reasons) -Ensuring that the partly damaged houses are vacant -If necessary , collaborates with foreign agencies -Transferring of the orphans, the disabled and the elderly to the Social Services Directorate of the province -Guarding against vandalism and patrolling areas with evacuated buildings
		Wreckage Lifting & Temporary Sheltering	-Removing of the debris that blocks transportation -Initiation of the determination of the interventions on the partly damaged buildings -Establishment and management of temporary shelters -Verifying and satisfying the needs of the persons in the temporary shelters -Transferring of the persons to the temporary shelters -Verifying and assuring the lifeline services in the temporary shelters
		First Aid & Health care	-Setting up first aid centers in the impact areas -Setting up the field hospitals -Transferring of the injured to the near hospitals -Identifying the dead, arranging for temporary suitable storage of the dead until taken over by the coroner and undertaking their burying. -Verifying the required medical supplies and ensuring their presence.
		Preliminary Damage Assessment	-Determination of the most damaged zones -Preliminary assessment of damage -Providing information for definitive damage assessment -Determination of the unsafe buildings -Providing services for temporary accommodation areas
		External Aid	-Coordination with foreign aid organizations -Assisting the foreign search and rescue teams.
		Buying , Renting, Confiscating & Distribution	-Stocking, protection and distribution of the obtained materials. -Assisting Kizilay in the distribution of goods. -Confiscating, renting of the required land, tools and vehicles.
	Private Companies		-Preparing their tools and resources as ordered by the prefecture

Table 14 Distribution of tasks during the first 72 hours

4.2.3 Transferring of the Population to Hospitals & Camping Areas

The gathering points which are also the emergency centers in the neighborhood level provide services such as first aid for persons with minor injuries, transportation for homeless people to the camping areas, information regarding the ongoing situation and where to turn to for certain needs (food, clothes, WC, water, blankets, etc…)

The uninjured people whose houses are severely damaged and / or unsafe to enter are invited to come to the relevant gathering points and camping areas.

The gathering points assigned to different neighborhoods can be found in the section of accounting for the available resources in section 4.1.6.

While the uninjured are attending to the gathering points and camping areas, the injured are to be taken to the nearest hospitals. The closest (within 3 km radius) hospitals were selected using the Arc-INFO Network extension tool where the locations of the injured people are taken to be the gathering areas in each neighborhood due to the fact that they form a good representation of the area. The closest facility analysis was performed such that all the properties of the roads (traffic load, capacity, speed limits etc…) except the length were ignored. A similar analysis was performed for the field hospitals in which the coverage area is determined to have a radius of 5 km. The hospitals assigned to the different neighborhoods are represented in Table 15 and in figures 29, 30, 31, 32 on the following page:

Hospital	Bed Capacity	Zones to Benefit	Expected Injured
Haydarpasa Numune Hospital	665	Kadikoy Bazaar, Rıhtim Caddesi Gathering Point, Tepe Nautilius Shopping Mall	5195 injured are expected in the district of Kadikoy
Siyami Ersek Cardiological Hospital	525	Kadikoy Bazaar, Rıhtim Caddesi Gathering Point, Tepe Nautilius Shopping Mall	
GATA	216	Kadikoy Bazaar, Rihtim Caddesi Gathering Point, Tepe Nautilius Shopping Mall	
Ferihan Laçin Hospital	36	Park,Hasanpasa I.E.T.T Yard	
Kosuyolu Hospital	318	Kosuyolu Sabit Halk Bazaar, Marmara University Fine Arts Faculty,Acibadem Sokullu Park	
Validebağ Ogretmenler Hosp.	200	Kosuyolu Sabit Halk Bazaar, Marmara University Fine Art Faculty	
Acibadem Hospital	128	Kosuyolu Sabit Halk Bazaar, Marmara University Fine Arts Faculty,Acibadem Sokullu Park, Incirlibostan Sport Yard	
Fenerbahce Stadium Field Hospital	32000 m^2	Acibadem Sokullu Park, Caddebostan Seaside Gathering Point, DMO, Dumlupinar Gathering Point, Efdal Primary School, Fenerbahce Seaside Gathering Point, Hasanpasa IETT Yard, Incirlibostan Sport Yard, Kadikoy Anadolu Ticaret Meslek High School, Kadikoy Bazaar, Kalamis Muhtarlik Park, Kenan Evren High School, Kosuyolu Sabit Halk Bazaar, Marmara Uni. Fine Art Faculty, Melahat Sehzade Primary School, Rihtim Caddesi Gathering Point SaliBazaar, Selamicesme Park, SSK Gozteoe Park Tepe Nautilius Shopping Mall	
Caginer Hospital	33	Incirlibostan Sport Yard, I.E.T.T. Yard, Sali Bazaar	
Universal Hospital Kadikoy	128	Incirlibostan Sport Yard, I.E.T.T. Yard, Kenan Evren High School, Sali Bazaar	
Istanbul Medipol Hospital	60	Kenan Evren High School, Melahat Sehzade Primary School, Sali Bazaar	
Kadikoy Sifa Hospital	51	Located in the isolated and the risky zone	
Goztepe Egitim ve Arastırma	751	DMO, Kalamis Muhtarlik Park, Dumlupinar Gathering Area, Gozcubaba Park, Halit Berk Primary School, Sahrayıcedit Park, Melahat Sehzade Primary School, SSK Goztepe Park,Kadikoy Anadolu Ticaret Meslek High School, Halit Berk Primary School, Fenerbahce Seaside Gathering Area, Selami Cesme Park, Sahrayıcedit Park	
Goztepe Egitim Hospital			
Merdivenkoy Egitim Ve Arastirma Hosp.			
Ozel Goztepe Safak Hospital	87	SSK Goztepe Park, Kadikoy Anadolu Ticaret Meslek High School, Sahrayicedit Isiklar Park	
Goztepe Echomar Hosp.	58	Dumlupinar Gathering Point, Gozcubaba Park, SSK Goztepe Park, Kadikoy Anadolu Ticaret Meslek High School, Halit Berk Primary School	

Kadikoy Florence Nightingale Hosp.	75	Kenan Evren High School, Melahat Sehzade Primary School, Kalamis Muhtarlik Park	
Medical Park	306	Halid Berk Primary School, Fehmi Eksi Primary School, Sahrayıcedit Park,Intas Park	
Sahrayıcedit Field Hospital	6600 m^2	Caddebostan Migros Shopping Mall, Cevre Koleji, Fehmi Eksi Primary School, Gozcubaba Park, Haci Mustafa Tezman High School, Hakki Deger Primary School, Halid Berk Primary School, Intas Park, Kozyati Primary School, Sabiha Tansel Primary School, Sahrayıcedit ISıkilar Park, Sahrayıcedit Park, Senesevler High School, STFA Woods, Tarim Il Mudurlugu, Zihnipasa Primary S.	
Ciftehavuzlar Tip merkezi	60	Fenerbahce Seaside Gahtering Point, Tarim Il Mudurlugu, Selamicesme Park, Efdal Primary School	
Yeditepe Uni. Poliklinik	30	Fenerbahce Seaside Gathering Area, Caddebostan Seaside Gathering Area, Caddebostan Migros Shopping Mall,Selamicesme Park, Efdal Primary School	
Acibadem Kozyatagi Hosp.	80	Sahrayıcedit Isıklar Parkı, Cevre Koleji, Zihnipasa Primary School, Intas Park, STFA Woods	
Erenkoy Ruh ve Sinir Hosp.	550	Fehmi Eksi Primary School, Sayrayıcedit Isıklar Park, Cevre Koleji, Zihnipasa Primary School, Intas Park, STFA Woods, Kozyatagi Primary School, Haci Mustafa Tezman High School, Caddebostan 1.Kisim Dolgu Area, Sabiha Tansel Primary School	
Central Hospital Kozyatagi	49	Kozyatagi Primary School, Hakki Deger Primary School, Senesevler High School	
Yeditepe Arastirma Hosp.	190	STFA Woods,Kozyatagi Primary School,Hakki Deger Primary School,Senesevler High School, Bostanci Gosteri Merkezi, Bostanci IDO	
PTT Hospital	500	Senesevler High School, Bostanci Gosteri Merkezi, STFA Woods	
Suadiye Tıp Merkezi	50	Caddebostan Seaside Gathering Area, Tarim Il Mudurlugu,HaciMustafa Tezman High School, Bostanci IDO	

Table 15 Hospitals and the gathering areas to benefit from them

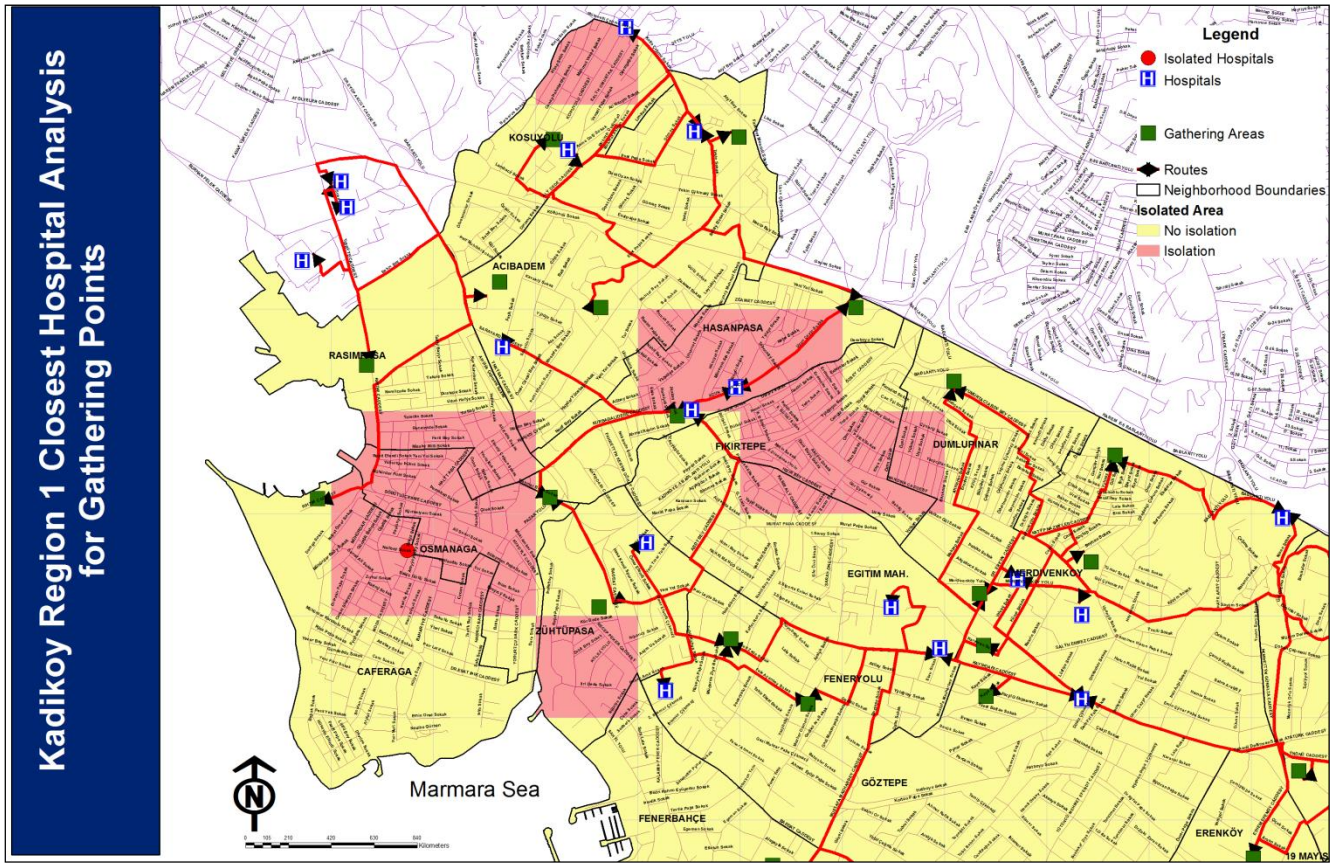


Figure 29 Closest hospitals and paths for gathering points in Region 1

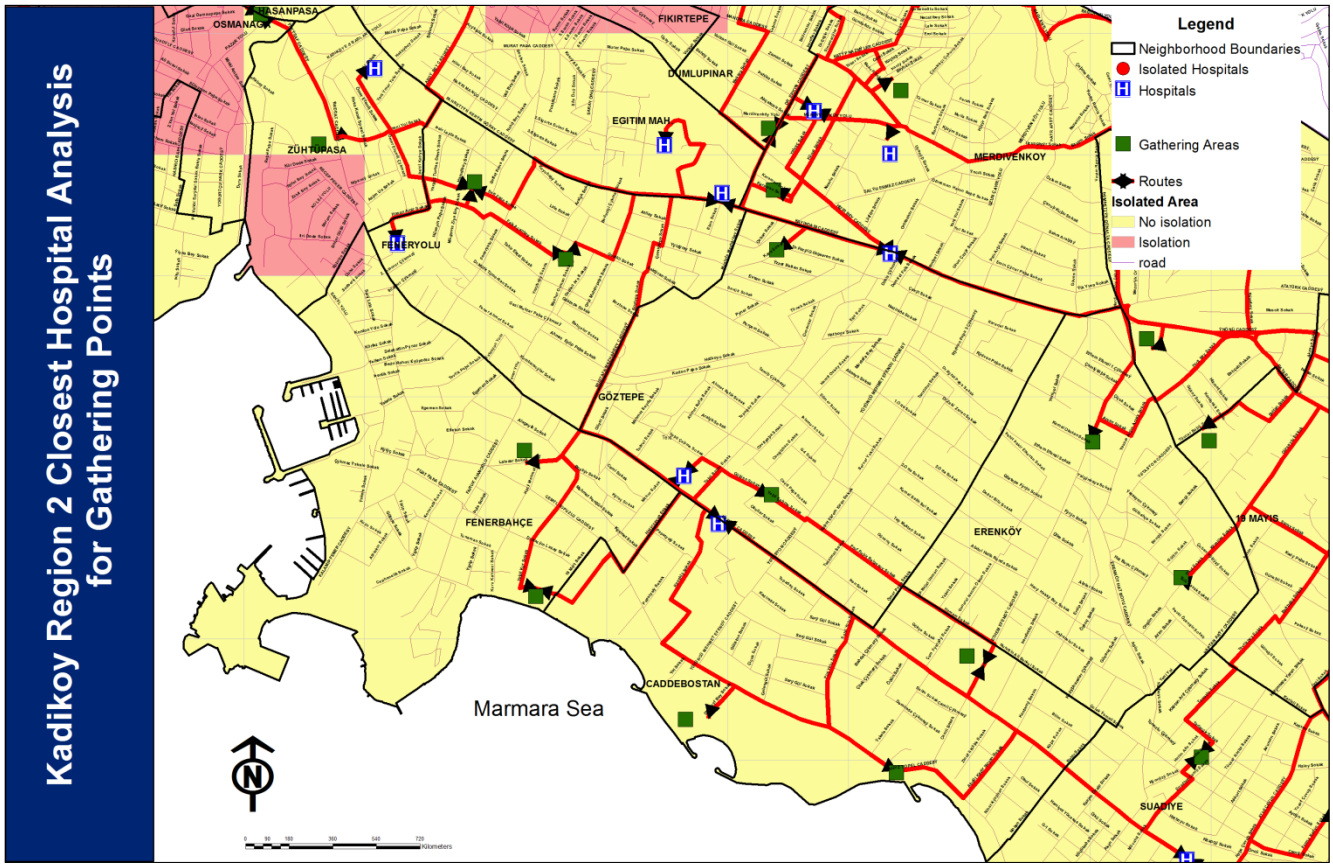


Figure 30 Closest hospitals and paths for gathering points in Region 2

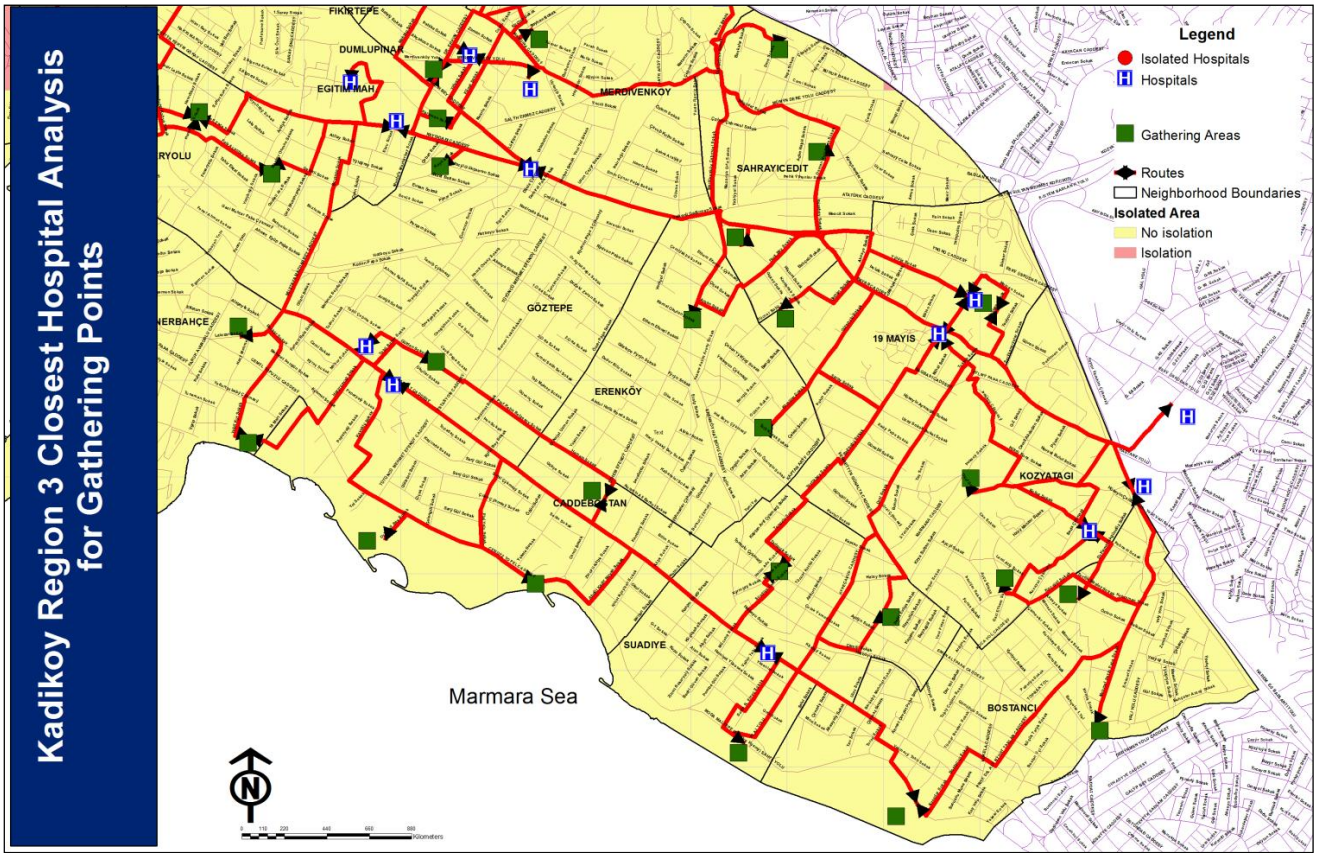


Figure 31 Closest hospitals and paths for gathering points in Region 3

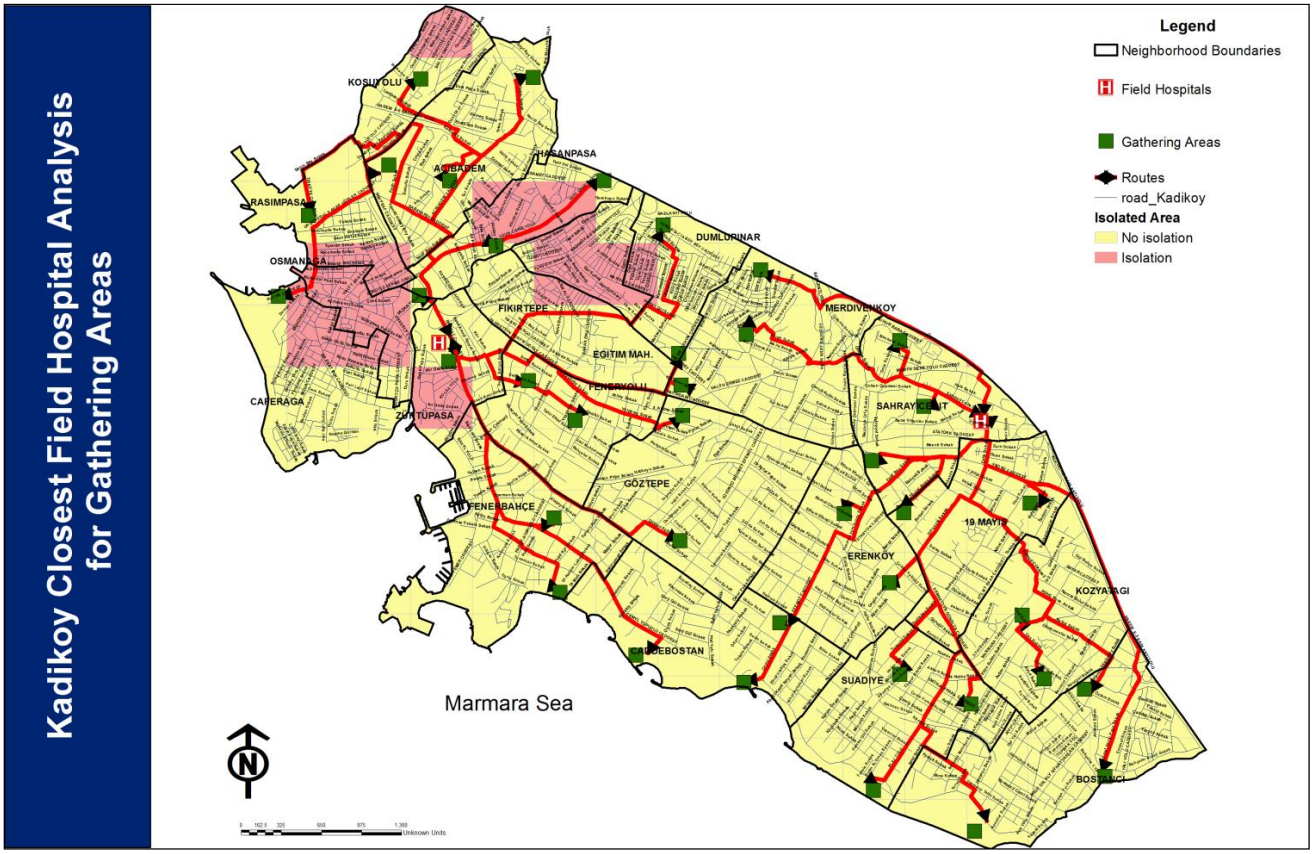


Figure 32 Closest Field hospitals and paths for gathering points in Kadikoy

The Network analyst tool of the Arc-Info software provided the directions for the given routes in a written format together with correspondent lengths as such:

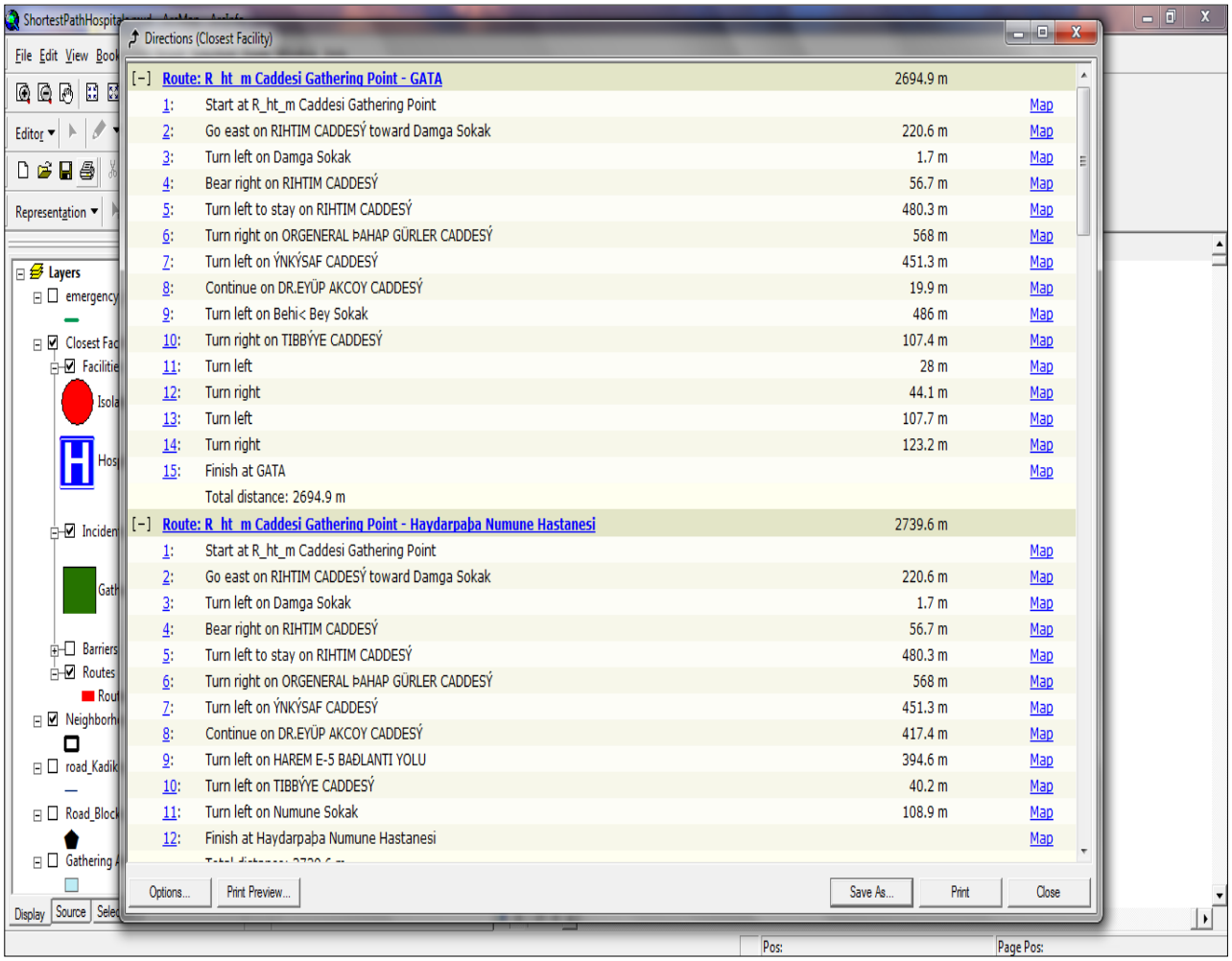


Figure 33 An example of shortest path analysis by Arc-Info

After having organized the initial gathering points, the responsible persons of Wreckage Lifting and Temporary Sheltering Service Providers are appointed with the organization of the transportation of people from the gathering points to the camping areas. Camping areas are assigned for the persons whose houses have collapsed, been heavily or moderately damaged. In the camping areas, people are provided with 3 meals a day.

The List that matches the gathering points to the corresponding camping areas which is prepared by utilizing the Closest Facility Analysis of ArcGIS-Info Network Analysis extension is displayed in the table below. Each camping area is assigned to cover 3 km. of radius. The calculated shortest paths are represented in the following table 16 and figures 34, 35, 36.

Code	Region	Camping Area Location	Tent Capacity (Units)	Corresponding Gathering Areas to benefit	Expected Number of People to Benefit
16	1	Kosuyolu Park	200	Kadıköy Bazaar, Acibadem Sokullu Park, Marmara University Fine Arts Faculty, Kosuyolu Sabit Halk Bazaar, Tepe Nautilus Shopping Mall, Rihtim Caddesi Gathering Point	1000
16	1	Karacaahmet Mez Arkasi	200	Kadıköy Bazaar Tepe Nautilius Shopping Mall Koşuyolu Sabit Bazaar, Marmara University Fine Art Faculty, Rihtim Caddesi Gathering Point,Acıbadem Sokullu Park	1000
8	1	IETT. Garage Egitim Mah.	130	Hasanpasa IETT Yard ,Hasanpasa Incirli Bostan Sport Yard ,Sali Bazaar	650
13	1	Kadikoy Belediyesi Parking Lot	280	İncirli Bostan Sport Yard Hasanpasa I:E.T.T Yard Sali Bazaar	1400
19	1	Yogurtcu Park	250	Kenan Evren High School (Zuhtupasa)	1000
5	1	Kadikoy Anatolian High School	250	Caferaga Seaside Gathering Point	1250
9	2	Fenerbahce Port Camping Area	260	Melahat Sehzade Primary School Kenan Evren High School,,Kalamis Muhtarlık	1300
6	1	Fenerbahce Sport Facilities	300	DMO Gozcubaba Park Halid Berk Primary School	1500
18	1	Merdivenkoy Cocuk Esirgeme Kurumu Yard	1650	Gozcubaba Park, SSK Goztepe Park, Kadikoy Anadolu Ticaret High School, Halid Berk Primary School, Fehmi Eksi Primary School ,Sahrayicedit Isiklar Park Cevre Koleji, Sahrayıcedit Park,Intas Park, DMO, Dumlupinar Gathering Point	8250

12	2	Selamicesme Ozgurluk Park	2000	Selamicesme Park ,Kadikoy Anadolu Ticaret Meslek Lises, SSK Goztepe Parki, Melahat Sehzade Primary School, Kalamis Muhtarlık Park, Dumlupinar Gathering Point	10000
21	3	Ataturk Caddesi Cebe Sokak.	1000	Intas Park,Zihni Pasa Primary School CevreKoleji, 19 Mayıs Sayrayıcedit Isiklar Park, Sahrayıcedit Park, STFA Woods, Fehmi Eksi Primary School	5000
4	2	Goztepe Park	1500	Caddebostan Seaside Gathering Area, Tarim Il Mudurlugu Building, Caddebostan, Fenerbahce Seaside Gathering Area, Caddebostan Migros Shopping Mall,,Efdal Primary School	7500
3	3	Bostanci New Bazaar	500	Bostanci Gosteri Merkezi, Senesevler High School, STFA Woods, Kozyatagi Primary School, Hakki Deger Primary School, Haci Mustafa Tezman High School, Bostanci IDO	2500
4	2	Caddebostan Migros Camping Area	1450	Caddebostan Migros ,Caddebostan Dolgu Area,Tarim Il Mudurlugu Building Efdal Primary School, ,Zihnipasa Primary School, Sabiha Tansal Primary School, Caddebostan Seaside Gathering Point	7250
3	3	Bostanci Seaside Camping Area	775	Bostanci IDO, Kozyatagi Primary School, Hakki Deger Primary School, Senesevler High School Caddebostan Dolgu Area Suadiye Haci Mustafa Tezman High School Zihnipasa Primary School,Bostanci Gosteri Merkezi,Sabiha Tansel Primary School	3875

Table 16 Camping areas and their corresponding gathering points

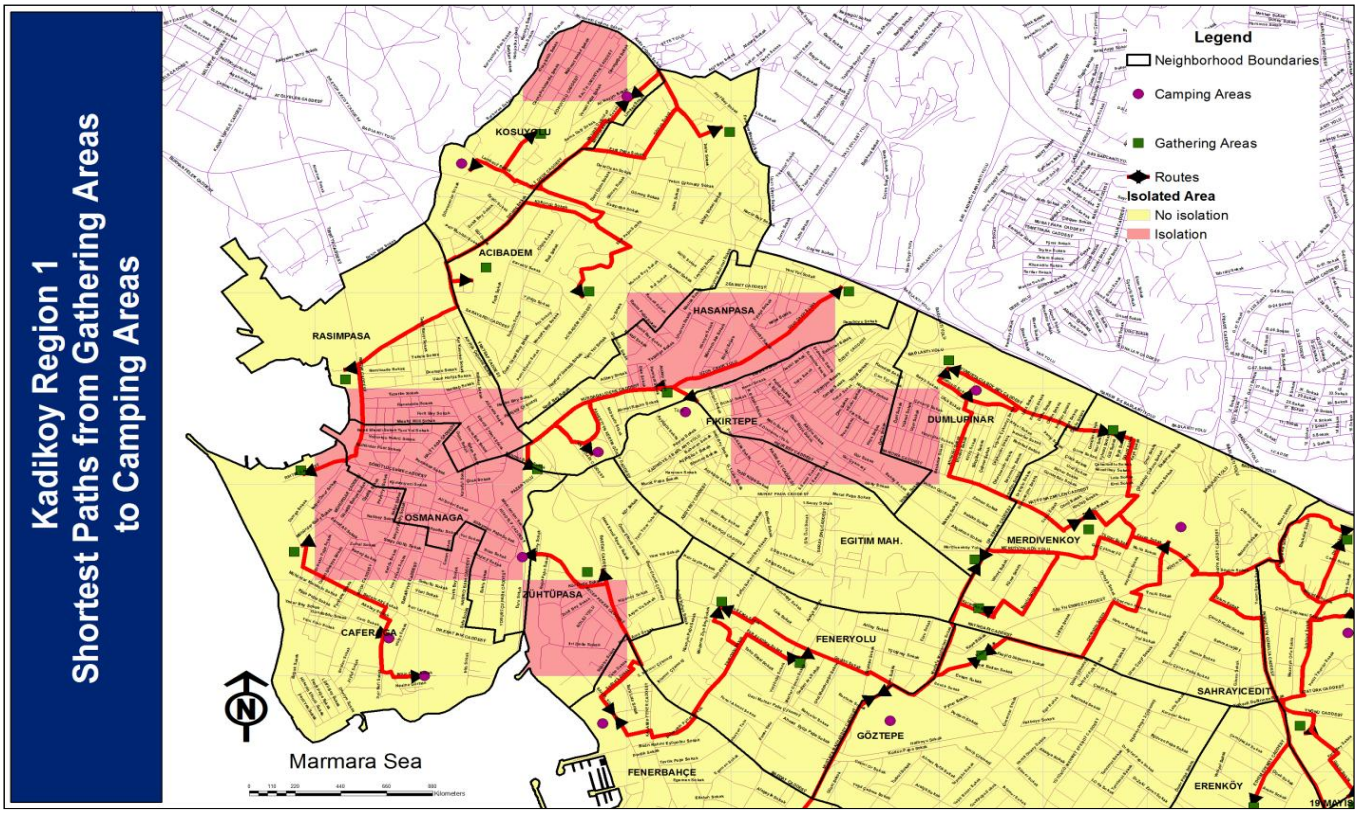


Figure 34 Shortest paths from gathering points to camping areas in Region 1

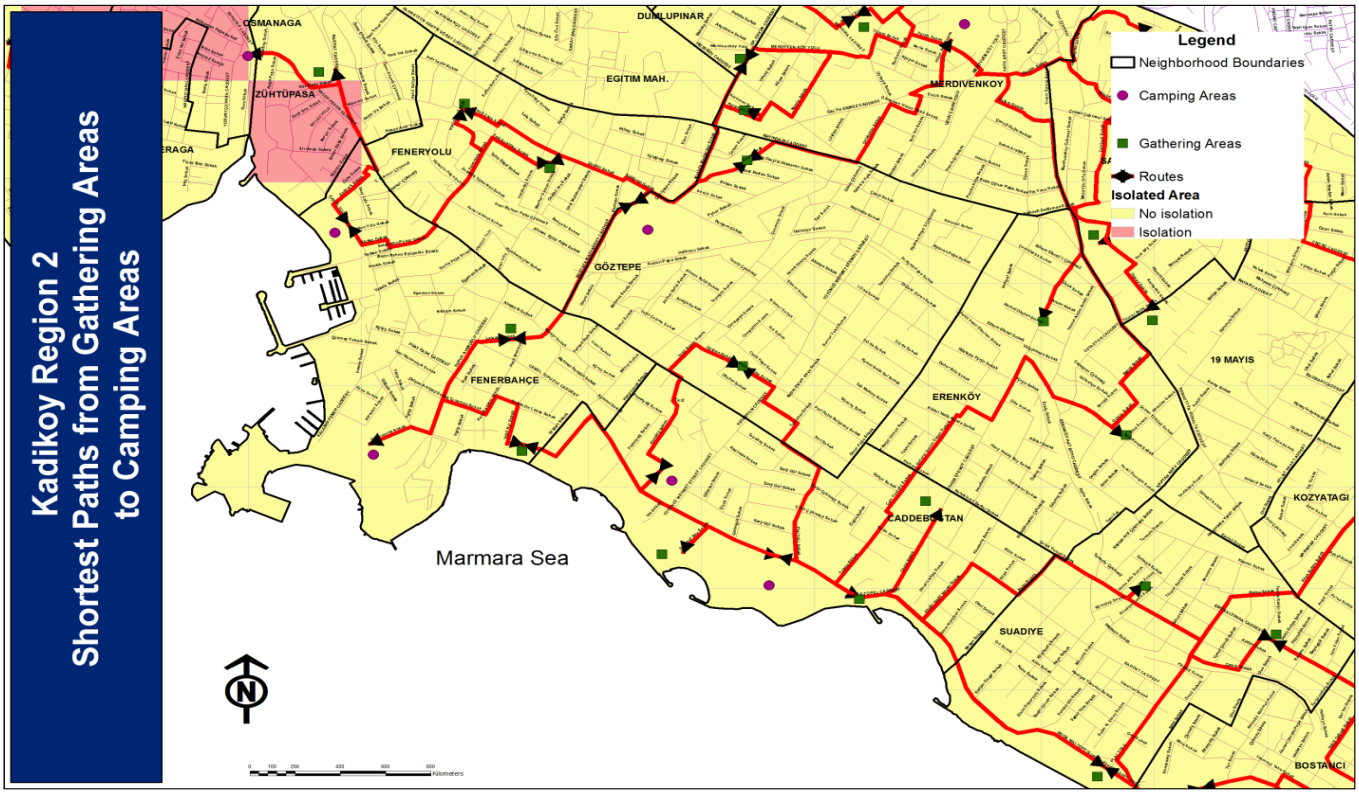


Figure 35 Shortest paths from gathering points to camping areas in Region 2

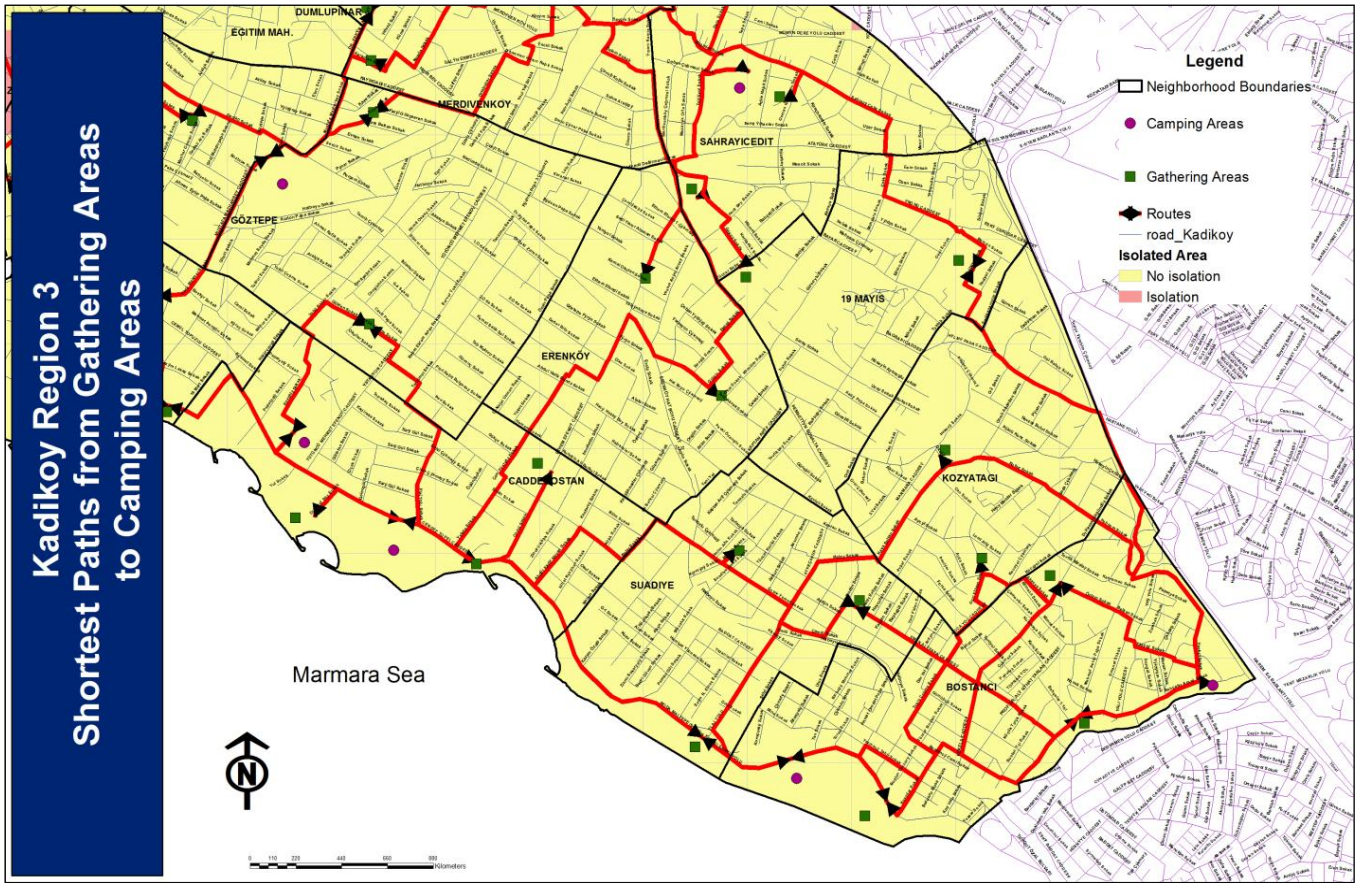


Figure 36 Shortest paths from gathering points to camping areas in Region 3

Another closest facility analysis performed by the network analysis extension of the Arc-Info 9.3 software was for the determination of the routes between expected fire outbreak points which were considered to be the LPG stocks and paint / polish factories located in the area and the fire brigades. While performing the analysis, the isolated roads were respected. The results stated that three possible outbreak points located in Fikirtepe and Hasanpasa were found to be out of reach. For this reason, the closed roads leading to these points which are displayed in figure 37 must be opened immediately.

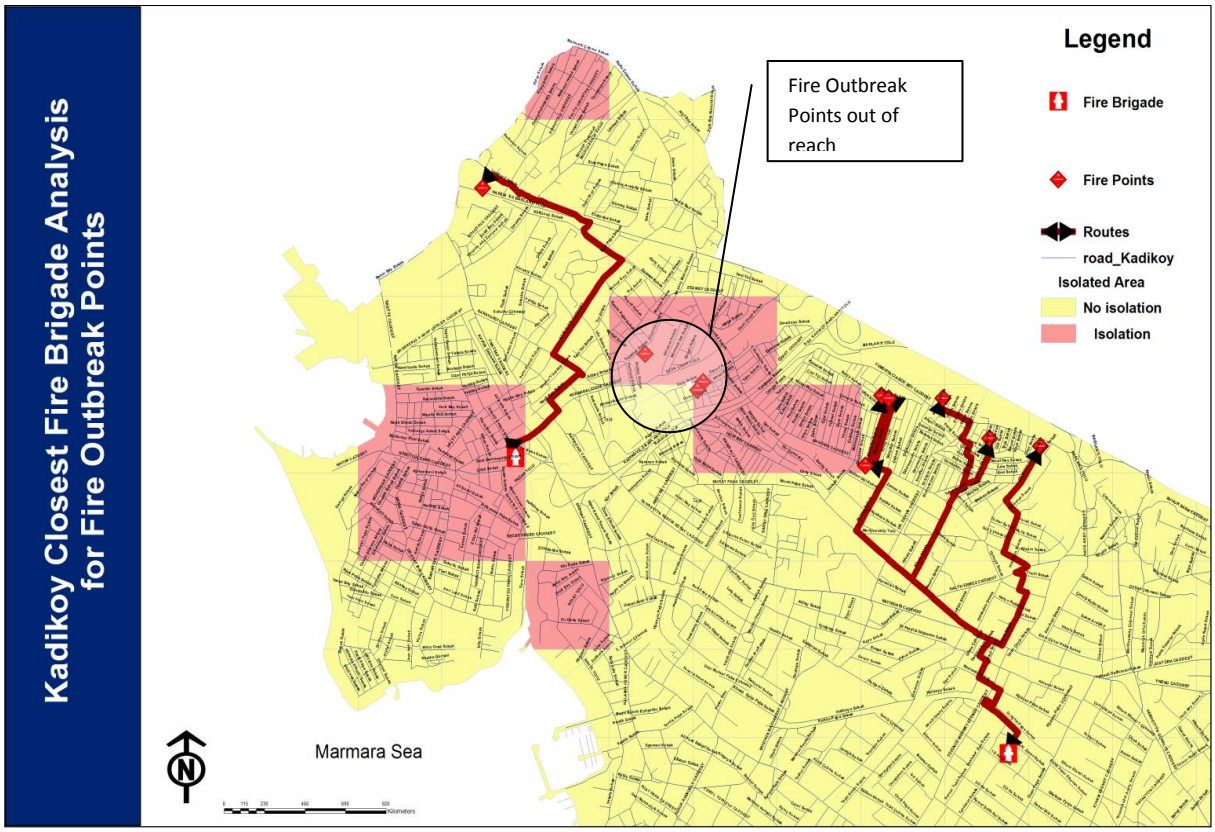


Figure 37 Closest fire brigade analysis for the probable fire points

As it can be deduced from the figure, 3 possible fire outbreak points are out of reach according to the scenario due to road closure. That is why it is suggested that the roads leading to Fikirtepe and Hasanpasa neighborhood are given critical care and reopened for service immediately.

4.3 Sustained Response: from the first 72 Hours to 21 days after the Earthquake

For sustained phase operations, the thrust of the activity swings from immediate life-saving requirements to the prevention of further loss of life and other forms of suffering, detailed damage assessment, and the prevention of further damage to property.

The primary operation areas were considered to be: ongoing rescue operations and other emergency measures, first surveys of access ways , buildings and lifelines, management of camping areas and identification of overall need and resources available. Moreover, establishment of mental support health, coordination with business community regarding the time of their business resumption are addressed.

4.3.1 Monitoring of the Ongoing Situation

The critical information at this stage regarded;

- Aftershocks and induced hazards
- Debris removal and clean up
- The current general situation in the evacuation places (hygiene, physical and / or mental health of people, medical and food supplies, etc…)
- Availability of new areas for relief supply and food distribution other than the gathering points and camping areas
- The psychological state of the people in the camping areas
- The damage state of the still standing buildings and their ability to withstand aftershocks
- The hazardous material leakage
- All licensed food establishments in the area
- The extent to which recovery of personal belongings will be allowed

4.3.2 Actions on Damaged Zones

Level	Name of the Authority		Responsibility
National Basis	Disaster and Emergency Management Presidency		-Sending personnel to the impact zones for damage assessment. -Seeing to the demands of municipalities
	Response Department		-Managing the Prime Ministry Disaster and Emergency Situations Center -Ensuring the induced hazards is under control. -Assisting the population in the damaged zones. -Repairing and retrofitting of the public and private facilities
	Kizilay		-Continuing the distribution of blankets, blood, food supplies.
Local Basis	Prefect of Istanbul		-Inspecting the ongoing activities. -Inspecting the works of the public service providers -Inspecting the work performed by the emergency service providers. - Contacting and requesting assistance to meet the needs from the neighboring provinces and military services based on the predefined collaborations. -Informing the community and the prime ministry on the current situation
	Istanbul Metropolitan Municipality		-Inspecting the ongoing activities -Upgrading the Prefect on the current state of work
	A.K.O.M Disaster Coordination Center		-Ensuring the coordination among the departments of the Municipality -Updating the municipalities of the districts (Kadikoy)
	Municipality of Kadikoy	Mayor	Managing and supervising the restoration activities -Keeping contact with the authorities on the national basis for the requirements on the local basis -Approving news releases and public announcements

		Telecommunication	-Restoring the telecommunication lines -Introducing Mobile Telecommunication units in the impact zones. -Providing definitive and continuous information on the earthquake and on the estimation of the casualties and injured -Collaborations with private telecommunication companies in accordance with the predefined agreements. -GSM operators set up mobile base stations in the area -Informing the community on the facilities that can be used -Providing back up power for centrals.
		Transportation	-Maintaining connection with all the transportation establishments. -Damage Assessment and interventions on the access ways. -Organization of the transportation of Haydarpasa Port and Railway station -Providing fuel for the means of transportation for emergency activities. -Repairing of bridges and railways. -If necessary, collaborating with the military -Ensuring the reopening of the roads that lead to isolated areas.
		Electricity, Water, Sewer	-Repairs of the damaged parts of the network -Providing service for camping areas - Providing potable water to damaged zones with the private companies in accordance with the predefined collaborations -Providing portable toilets and showers and their disinfections -Providing generators when necessary -Collaborations with private companies in order to see to the water and electricity requirements of the camping areas. -If necessary , collaborates with foreign agencies and the military
		Search & Rescue	-Rescuing of injured / trapped people -Saving the valuable belongings of people - Removal of the dead from collapsed structures -If necessary , collaborates with foreign agencies and the military

		Security	-Maintaining surveillance on the streets -Controlling the traffic -Ensuring that the partly damaged houses are vacant -If necessary, collaborates with foreign agencies. -Transferring of the orphans, the disabled and the elderly to the Social Services Directorate of the province. -Guarding against vandalism and patrolling areas with evacuated buildings
		Wreckage Lifting & Temporary Sheltering	-Removing of the debris that blocks transportation -Management of camping areas -Verifying and satisfying the needs of the persons in the camping areas -Transferring of the persons to the camping areas -Verifying and assuring the lifeline services in the camping areas
		First Aid & Health care	-Management of the first aid centers in the impact areas -Management of the field hospitals -Transferring of the injured to the near hospitals - Identifying the dead, arranging for temporary suitable storage of the dead until taken over by the coroner and undertaking their burying. -Verifying the required medical supplies and ensuring their presence and preventing disease outbreak or spread -Providing mental health care centers for the people with loss.
		Damage Assessment	-Damage Assessment of Buildings. -Determination of the interventions. -Evaluating the objections of the householders on the results of damage assessment and determination of the unsafe buildings.
		External Aid	-Coordination with foreign aid organizations -Assisting the foreign search and rescue teams.
		Buying , Renting, Confiscating & Distribution	-Stocking, protection and distribution of the obtained materials. -Assisting Kizilay in the distribution of goods. -Confiscating, renting of the required land, tools and vehicles.
	Private Companies		-Preparing their tools and resources as ordered by the prefecture

Table 17 Distribution of tasks of the authorities during sustained response

4.3.3 Survey of Damage to Access Ways

The phase of sustained response is when the damage to access ways is assessed in more detail. These access ways differ from the critical ones that required to be repaired immediately, in the sense that they are not a part of the emergency routes that had been introduced earlier.

The areas that were expected to be isolated due to road closure on account of building collapses were Hasanpasa, Fikirtepe, and the shore sections of Osmanaga neighborhoods.

The damage assessment to access ways which will be performed through the “Access Ways Damage Assessment Survey Sheets” in **attachment 1**, takes into account the following aspects;

- The neighborhood that the part of the road belongs to
- The geometric properties of the road
- The definitive description of the closure (Total closure, partial closure)
- The number of buildings that the part of the road forbids to reach
- The presence of public facilities that is isolated due to closure.
- The presence of alternative routes and their relative lengths for reaching the isolated area of buildings
- The amount of debris that needs to be lifted from over the part of the road
- The type of the heavy machinery required to remove the debris from over the mentioned part of the road

The corresponding survey form is to be compiled by the Transportation Service Provider Personnel from the municipality.

4.3.4 Survey of Damage to Buildings

According to a vulnerability assessment performed, the most risky areas in terms of building collapse were found to be Hasanpasa, Fikirtepe, Rasimpasa and Caferaga neighborhoods.

The damage assessment of structures in this phase aims at;

- Determination and classification of the damage to buildings as well as apprehending its usability.
- Identifying the actions to be taken in order to perform damage assessment.
- Determining the consequent loss of lives and property.
- Taking advantage of the obtained data in earthquake risk mitigation.

Types of Earthquake Damage on Buildings:

- NONE: No visible cracks on the supporting members
- SLIGHT: Cracks on the ceiling and the walls, minor cracks on the supporting members
- MODERATE: Major Cracks on columns and beams, diagonal and other cracks on walls
- HEAVY: Major dislocations on columns and beams, major crashing on walls with cracking
- TOTAL: Partial or total collapse, major displacements on the supporting members.

The damage assessment of the buildings in the district is performed via " Building Damage Assessment Survey Form" (Attachment 2-appendix) that is to be compiled by groups of two coming from Public Works and Settlements (local basis) and the chamber of civil engineering. The same groups are also responsible for the placement of earthquake placards that regulate the entrance to structures. Examples for these can be found in the appendix attachment 5.

The groups, prior to their initiation to the task, are trained by the Damage Assessment Working Group of the Department of Recovery of the Prime Ministry.

The owners of properties are granted with the right to object to the result of the damage assessment forms in which case the assessment is repeated by another group of engineers and technicians. For the "Petition of Objection" please refer to attachment 4 in the appendix.

The procedure for Damage Assessment was defined as:

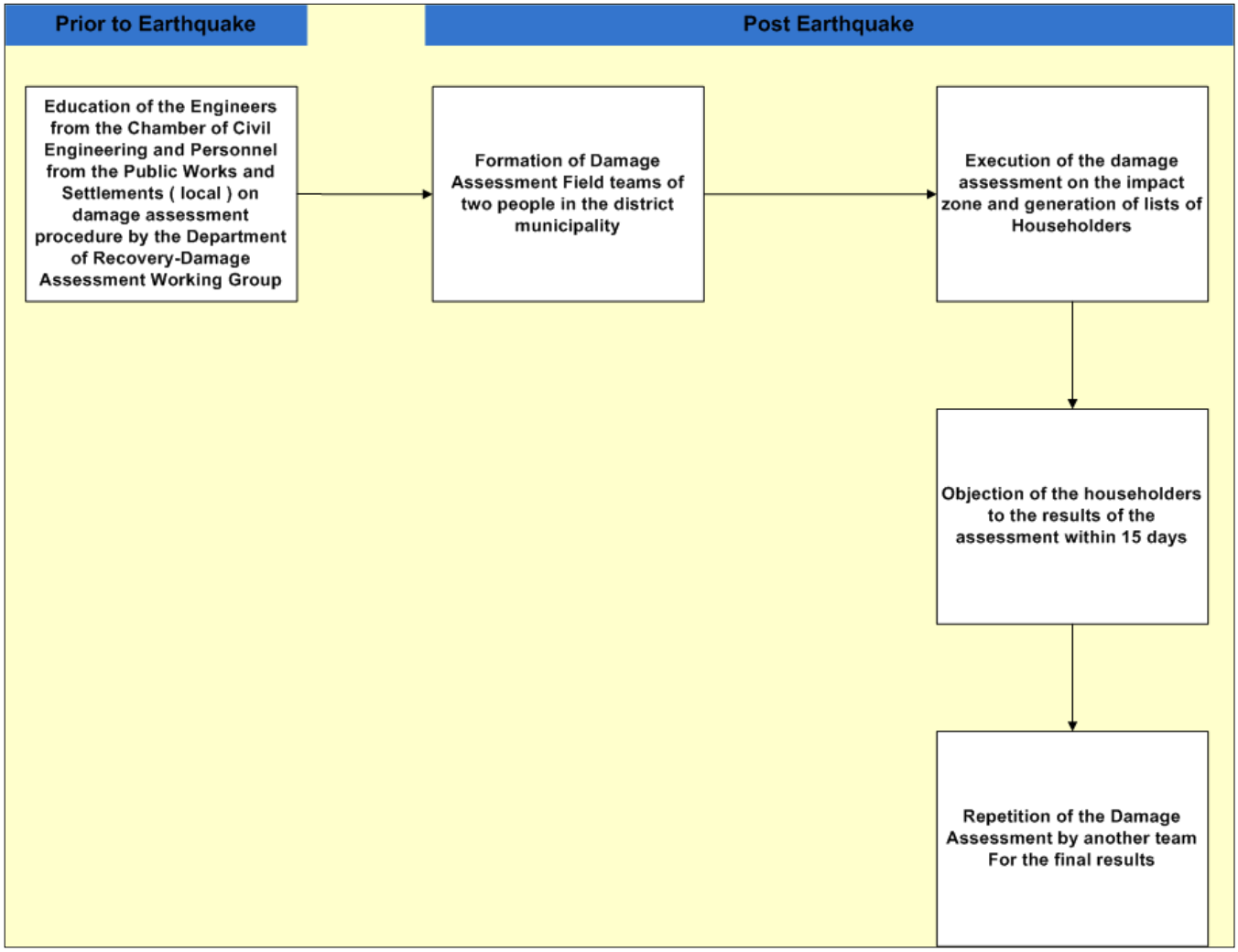


Figure 38 Damage assessment and objection procedure

Moreover, in this phase the shoring systems installments begin. The authorities responsible for the installations are private companies taking direct orders from the prefect of Istanbul

4.3.5 Survey of Damage to Lifelines

For the assessment and the repairing of the damage to the lifeline networks which are defined as water / sewer, electricity and gas distributions, the responsible authorities are ISKI, AYEDAS and IGDAS respectively. These Institutions are also required to satisfy the demand of the camping areas. In this respect, they work with private organizations in accordance with the previously defined agreements.

4.3.6 Management of Camping Areas

The management of the camping areas was to be handled in terms of:

- *Food, clothes and blanket supplies*→ Kizilay, Temporary Sheltering Service, Foreign Organizations
- *Electricity, Water, Gas, sewage requirements*→ Electricity, Water and Sewer Service Providers
- *Telecommunication demand*→ Telecommunication Service Providers, GSM Operators
- *Health and hygiene*→ Healthcare, Temporary Sheltering service providers
- *Reclamation of personal belongings from partially damaged houses*→ Search and Rescue Service Providers
- *Psychological Assistance Provision*→ Healthcare Service Providers, Volunteers

Responsible people of the camping areas demand the needed resources from the municipality of the district where in case the municipality is not able to satisfy the demand, it turns to the Department of Administrative Services in the prime ministry.

4.4 Transition to Recovery: from 21 days to 3 months after the Earthquake

Full recovery from a major earthquake will take years, if not longer considering the level of damage to housing, business, and infrastructure as well as the direct impact on the population. Nevertheless, rapid initiation of recovery operations is critical to restoring confidence in the community. The phase of transition to recovery is characterized by the following criteria:

- Search and rescue activities are concluded.
- Evacuations have ceased.
- Care and shelter operations have stabilized and shelter population is decreasing daily.
- Aftershocks have declined to a negligible state, and stabilization of the built environment has minimized the risk of aftershocks to life and property.
- Restoration of utilities and lifelines is under way.
- Local Assistance Centers are in operation.
- The tasks of the emergency centers in the neighborhoods are replaced with the service providers in the municipality

4.4.1 Monitoring of the ongoing Activities

In this phase, the focus was on:

- Debris removal and clean up
- Aftershocks and induced hazards
- The current general situation in the camping areas (hygiene, physical and / or mental health of people, medical and food supplies, etc…)
- The psychological state of the people dealing with loss
- Restoration of lifeline utilities and buildings
- Damage assessment and evaluating the objections
- Implementation of shoring systems
- Partial return of evacuated people to the undamaged houses
- The replacement of the homeless in the prefabricated houses
- Restoration of social, educational and health services
- Demolition of the unsafe building with the approval of the mayor
- Starting of the reconstruction of the permanent housing
- Business restoration
- Restoration of normal city services
- The damage state of the still standing buildings and their ability to withstand aftershocks
- The extent to which recovery of personal belongings will be allowed

4.4.2 Actions on Damaged Zones

Level	Name of the Authority		Responsibility
National Basis	Disaster and Emergency Management Presidency		-Sending personnel to the impact zones for damage assessment. -Seeing to the demands of municipalities
	Response Department		-Managing the Prime Ministry Disaster and Emergency Situations Center -Ensuring that the induced hazard is under control. -Assisting the population in the damaged zones. -Repairing and retrofitting of the public and private facilities
	Recovery Department		-Taking necessary measures for normalizing life -Preparing reconstruction and recruitment plans for post disaster period in cooperation with governmental agencies, local authorities and nongovernmental organizations
	Ministry of Public Works and Settlements		-Managing the bidding and construction process of prefabricated and permanent houses for the resettlement of the population.
	Kizilay		-Continuing the distribution of blankets and food supplies.
Local Basis	Prefect of Istanbul		-Inspecting the ongoing activities. -Inspecting the works of the public service providers - Contacting and requesting assistance to meet the needs from the neighboring provinces and military services based on the predefined collaborations. -Informing the community and the prime ministry on the current situation
	Istanbul Metropolitan Municipality		-Inspecting the ongoing activities -Upgrading the Prefect on the current state of work
	A.K.O.M Disaster Coordination Center		-Ensuring the coordination among the departments of the Municipality -Updating the municipalities of the districts (Kadikoy)
	Municipality of Kadikoy	Mayor	-Managing and supervising the restoration activities -Keeping contact with the authorities on the national basis for the requirements on the local basis -Approval of the interventions on the damaged buildings and return of people to the houses. -Ensuring the reopening of educational, social and health related public facilities for normalizing life

		Telecommunication	-Performing interventions for normalizing the telecommunication services -Restoring the telecommunication lines -Providing definitive and continuous information on the earthquake and on the estimation of the casualties and injured -Informing the community on the facilities that can be used
		Transportation	-Interventions for normalizing the transportation activities -Damage Assessment and interventions on the access ways. -Repairing of bridges and railways.
		Electricity, Water, Sewer	-Interventions for normalizing the distribution of the services -Repairing of the damaged parts of the network -Providing service for camping areas and prefabricated houses -Providing potable water to the camping areas with the private companies in accordance with the predefined collaborations -Providing portable toilets and showers and their disinfections -Providing generators when necessary -Collaborations with private companies in order to see to the water and electricity requirements of the camping areas.
		Search & Rescue	-Saving the valuable belongings of people
		Security	-Interventions for normalizing the social life -Maintaining surveillance on the streets -Controlling the traffic -Assisting the population to return to the approved buildings
		Wreckage Lifting & Temporary Sheltering	-Removal of debris and clean up -Management of camping areas -Verifying and satisfying the needs of the persons in the camping areas -Verifying and assuring the lifeline services in the camping areas -Assisting the transferring of the population to the prefabricated houses

		First Aid & Health care	-Management of the healthcare services -Identifying the dead and undertaking their burying -Verifying the required medical supplies and ensuring their presence -Providing mental health care centers for the people with loss
		Damage Assessment	-Damage Assessment of Buildings. -Determination of the interventions. -Evaluating the objections of the householders on the results of damage assessment. -Determination of the unsafe buildings.
		External Aid	-Coordination with foreign aid organizations -Assisting the foreign search and rescue teams.
		Buying , Renting, Confiscating & Distribution	-Stocking, protection and distribution of the obtained materials. -Assisting Kizilay in the distribution of goods. -Confiscating, renting of the required land, tools and vehicles.
	Private Companies		-Preparing their tools and resources as ordered by the prefecture

Table 18 Distribution of tasks of the authorities during the transition to recovery phase

4.4.3 Interventions to Restore Accessibility and Lifelines

The interventions on the lifelines and accessibility are performed by the service provider of the municipality of Kadikoy.

The lifelines and the zones that the intervention work will majorly take place are stated below:

- Electricity: Egitim Mah. ,Hasanpasa, Fikirtepe neighborhoods
- Water /sewage: Zuhtupasa, Fikirtepe and Hasanpasa neighborhoods
- Gas: Fikirtepe, Osmanaga and Caferaga neighborhood.

Specifically, the total repairing of different lifeline networks takes the following amount of periods of time:

- Telecommunication : 3 weeks
- Water/ Sewage: 1 month
- Gas: a few days
- Electricity: 1 to 3 weeks

4.4.4 Assessment of Degree of Damage to Buildings / Shoring Systems

As stated before, the most risky zones in terms of building collapse are Hasanpasa, Fikirtepe, Rasimpasa and Caferaga neighborhoods.

The damage assessment process of the buildings in the district continues being performed via “Building Damage Assessment Survey Form” (Attachment 2-appendix) as stated previously where at the same time the evaluations of the objections on the results of the assessments are finalized.

The activities of installation of the shoring systems continue in this phase as well.

4.4.5 Partial return of evacuated people to undamaged houses

People whose houses are evaluated to be habitable by the damage assessment teams and that receive the approval of the mayor return to their houses with the assistance of Security service providers of the municipality. Please refer to the attachment 5 in the appendix for the “Certificate of Habitability”.

4.4.6 Solution for Homeless

Prefabricated houses which are 30 m^2 of area are built for people of the camping areas whose houses are damaged beyond repair.

The authorities responsible for the bidding and construction process of prefabricated houses are the general directorates of Construction **Affairs** and **Technical Research and Implementation** which are both under the **Ministry of Public Works and Settlements.**

The people in the prefabricated houses are supplied with dry food.

Next, people currently benefitting from the prefabricated houses are provided with 3 options for their permanent accommodation:

1. Having their own houses built on their own land. This group is provided with bank loans.
2. Buying a new house from any neighborhood. This group is provided with bank loans.
3. Settling in one of the houses that government provides.

4.5 Communication Plan

In emergency situations, in order to overcome the confusion that stems from the existence of many response organizations at multiple levels, a communication plan is required. In the communication plan, information regarding the authorities, means of telecommunication and the kind and extent of information to be delivered were defined.

The plan was based on the lessons learned from the 1999 earthquakes of Kocaeli and Duzce.

4.5.1 Initial Response (0 – 3 days)

Due to disruptions on the standard telecommunication system, the emergency communication means are to be used. **Turkish Radio Amateur Club** (TRAC) activates 3 networks of amateur short wave radio the first one being between the Prime Ministry and the central authorities on the province level, the second one between Security services and the third one that belongs to the military [12]. Besides, the **administrators of governmental organizations (The Prefect, the Mayor)** that were previously defined in the emergency operations were specified to use their own satellite phones along with **the foreign organizations**.

An **emergency updating website** is established by the municipality of the district in order to provide information on the most recent activities

After the set up of emergency base stations, cell phones were considered to function again hence providing additional telecommunications means.

A public Information coordinator was defined in the Telecommunication Service Provider of the District the main task of who are:

- Being briefed about the site activities by the **spokesperson** who is responsible for documenting the activities in the coverage area (see figure 21) of the correspondent gathering point (Neighborhood Emergency Control Center)
- Reporting to the mayor about the ongoing emergency situations
- Provision of information to Media
- Monitoring news, coverage and erroneous information
- Maintaining copies of media releases

A predefined **spokesperson for** each gathering point in the neighborhoods is responsible for:

- Informing the public information coordinator on the ongoing activities in the associated coverage area
- Providing the community in the coverage area of the gathering point with information on the directions to and general state of the camping areas, the availability of nearby facilities (hospitals, closest points for food and water supplies, public and portable bathrooms, etc…) , general information on the results of the earthquake (number and identifications of dead and injured).

4.5.2 Sustained Response (3 days -21 days)

In the phase of sustained response, to a great extent standard telecommunication systems were considered to be reinstated. However, the emergency telecommunication means were still to be in use.

Turkish Amateur Radio Club (TARC) was set to provide information exchange between teams and local emergency centers. The emergency updating website of the municipality was assigned to continue providing up to date information via internet.

The duties of **the governmental administrations and foreign organizations** were reckoned to remain unchanged.

The tasks of the public information coordinator were defined to be the same for both phases whereas the **spokesperson** was assigned for the following duties:

- Informing the public information coordinator on the ongoing activities in the associated coverage area
- Acquainting the public with the availability of nearby facilities, the damage assessment process, and the extent to which the recovery of personal belongings are going to be allowed.

4.5.3 Transition to Recovery (21 days- 3 Months)

21 days after the earthquake, the standard telecommunications system were considered to be totally functioning properly hence eliminating the requirement of the emergency telecommunication means.

The tasks of the governmental administrations and foreign organizations were set to be the same as the previous phases.

While the duties of the public information coordinator remained the same, the spokesperson was appointed with the following tasks:

- Informing the public information coordinator on the ongoing activities in the associated coverage area
- Providing the community with information on the nearby facilities, the partial return of the people to the undamaged houses, the process of moving to the prefabricated houses, city services and scholastic activities, reconstruction on the permanent housing

5 Shoring Systems

Search for the injured and rescue of those trapped are among the most important and urgent post earthquake activities (ATC, 1999). Research has shown that the majority of survivors from earthquake induced building collapses are rescued within the first 24 hours (Olson and Olson, 1987), those conducting search and rescue activities can themselves become victims, as a high level of risk is associated with these activities. For instance, during the search and rescue activities in Mexico City Earthquake that struck in September 1995, it was estimated that 100 volunteer rescue workers were killed as a result of further building collapse[15]. The risks can be lessened if time spent in dangerous situations is kept to a minimum and if those involved take precautions. These precautions include awareness of hazards and the use of temporary shoring to stabilize weakened structures. In this respect, engineers can play a vital part in ensuring the safety of rescue activities by being involved in the assessment of damaged structures and determining the likelihood of further collapse [16].

In the Kadikoy case, for the reasons mentioned above, specific temporary shoring systems are proposed for the probably damaged buildings assuming the majority of the building failure mechanisms will be the same as those in 1999 Kocaeli earthquake. Following this assumption, the construction types of buildings and associated collapse mechanisms in 1999 Kocaeli earthquake were explored and compatible shoring systems are suggested by exploiting the FEMA Shoring guidelines and the experience from L'Aquila post earthquake evaluation process.

5.1 Role of the Engineer

The emergency service personnel may not fully appreciate the risks arising from several specific collapse mechanisms of buildings. Engineers are more likely to understand the mode of collapse and identify the potential hazards associated with the collapse by systematically assessing the level of risk associated with rescue operations and safety purposes.

The primary role of the engineer during search and rescue operations as defined by Hammond (1995a) is to provide critical information and not to make all the critical decisions. The rescue leaders will consider

the advice of the engineer, along with other advice and precede with the rescue activities. The key engineering aspects have been identified as follows:

• Building Classifications

• Building Triage

• Temporary stability measures by way of shoring

The rescuers' focus is to save victims, while the engineer's focus is to ensure rescue safety, and conflicts may arise resulting from these different objectives.

5.2 Building Classifications in Turkey

The predominant structural system used for buildings in urbanized Turkey consists of reinforced concrete frames with unreinforced masonry infill since the early 1960. Most of this construction consists of reinforced concrete beam-column frames, typically three to seven stories in height. These buildings have one or more residential units per floor with the lowest floor often used for commerce. Less common are reinforced concrete joist-slab-columns systems in which joists are formed by filling the slab with cinder blocks. Reinforced concrete shear wall buildings and low-rise unreinforced brick masonry buildings were observed infrequently and wood frame construction is rare [17].

Basic Construction type	*Descriptors*
Reinforced Concrete *(Almost all buildings in the* *Area)*	**Reinforced concrete columns- beams frames* **Non reinforced masonry Infill having hollow clay tile partit* **3-7 stories height* **Irregular column spacing and orientation* **One or more residential units per floor* **Lowest floor used for commerce* **The most vulnerable groups constructed prior to 1975* *(design based on outdated codes)*
Reinforced Concrete Joist-slab-column systems *(Rare)*	**Joists are formed by infilling the slab with cinder blocks* **Usually seven stories*
Adobe construction and mixed masonry *timber construction*	**Rural areas* **Usually older buildings*

Table 19 Basic contruction types in Turkey

5.3 Building Triage

Building triage determines the probability of the number of people trapped in collapsed structures so that emergency services can concentrate rescue efforts at selected sites to maximize possible returns. Triage procedures are likely to be repeated as post-disaster activities continue. The number of people trapped in a collapsed building will depend on the size and type of building. Therefore it is necessary to have some coherent method of prioritizing the affected structures by applying a risk/benefit analysis to search and rescue operations. The FEMA USAR Manual (FEMA, c.2000) provides guidance for the criteria to consider when performing building triage. The method can essentially be divided into two parts. The first part determines the number of potential victims; the second part determines the difficulty and danger associated with extricating these victims.

5.3.1 Occupancy of Structure

The criteria for determining the potential number of trapped victims include the following factors:

• Occupancy: Table 20 represents the typical building occupancies adapted from FEMA USAR Training Manual

Occupancy type	Typical occupancy/m^2	Range
Schools/Library	0.15	0.10-0.20
Hospitals	0.10	0.05-0.15
Multi Residential	0.05	0.05-0.10
Commercial	0.10	0.05-0.20
Office	0.10	0.05-0.15
Public Assembly	0.50	0.20-1.00
Industrial	0.05	0.05-0.10
Warehouse	0.02	0.01-0.03

Table 20 Typical Occupancies

One can obtain the total number of people trapped by simply multiplying the area with the given values and divide the result by 5 as suggested by FEMA.

• Time of day: In the Kadikoy case, since the scenario is considered to take place during night time, the public facilities such as schools, office buildings and shopping malls can be bypassed. However, had the earthquake stricken during the day, the search and rescue activities would have differed greatly in that schools and public buildings would have had the utmost priority owing to their high occupancy rates.

• Prior intelligence- information gathered from the general public near the scene: The number of trapped occupants can be determined by asking the local people of the neighborhood.

5.3.2 Structural Issues relating to Triage

The factors involved in the assessment of the structure include the following:

• Structural condition and instability of the building

One of the critical decisions to make regarding entry to a damaged structure is whether it is safe to enter. It will depend on amongst other things, the degree of damage, and the probability of damaging aftershocks if earthquake is the cause of collapse, and the urgency of the need to enter. The Applied Technology Council (1999) have developed guidelines for classifying instability of damaged buildings

Unsafe Buildings that have at least one of the following characteristics should be classified as unstable	
1.	May collapse or partially collapse under its own weight
2.	Likely to collapse in a strong aftershock, from additional damage
3.	Ongoing (progressive) lean
4.	Ongoing creep or structural deterioration
5.	So heavily damaged that its stability cannot be readily be determined

Table 21 Unstable Building Criteria

A guideline based on pushover analysis is that any building with floors approaching 1% inner-storey drift should be approached with caution. Steel structures should be approached with greater caution since they are particularly susceptible to stability problems leading to failure. While considering the residual lean of unreinforced masonry construction, any building where the out of plain lean of the wall is equal to the thickness of the wall can be considered in danger of collapse [16]. Moreover, the type of structure and material of construction can be an important factor for search and rescue since heavy concrete buildings require more resources and time [18].

• Structural Type

• Collapse Mechanism – how many voids may exist: Floors often collapse into the patterns that are shown in the next page:

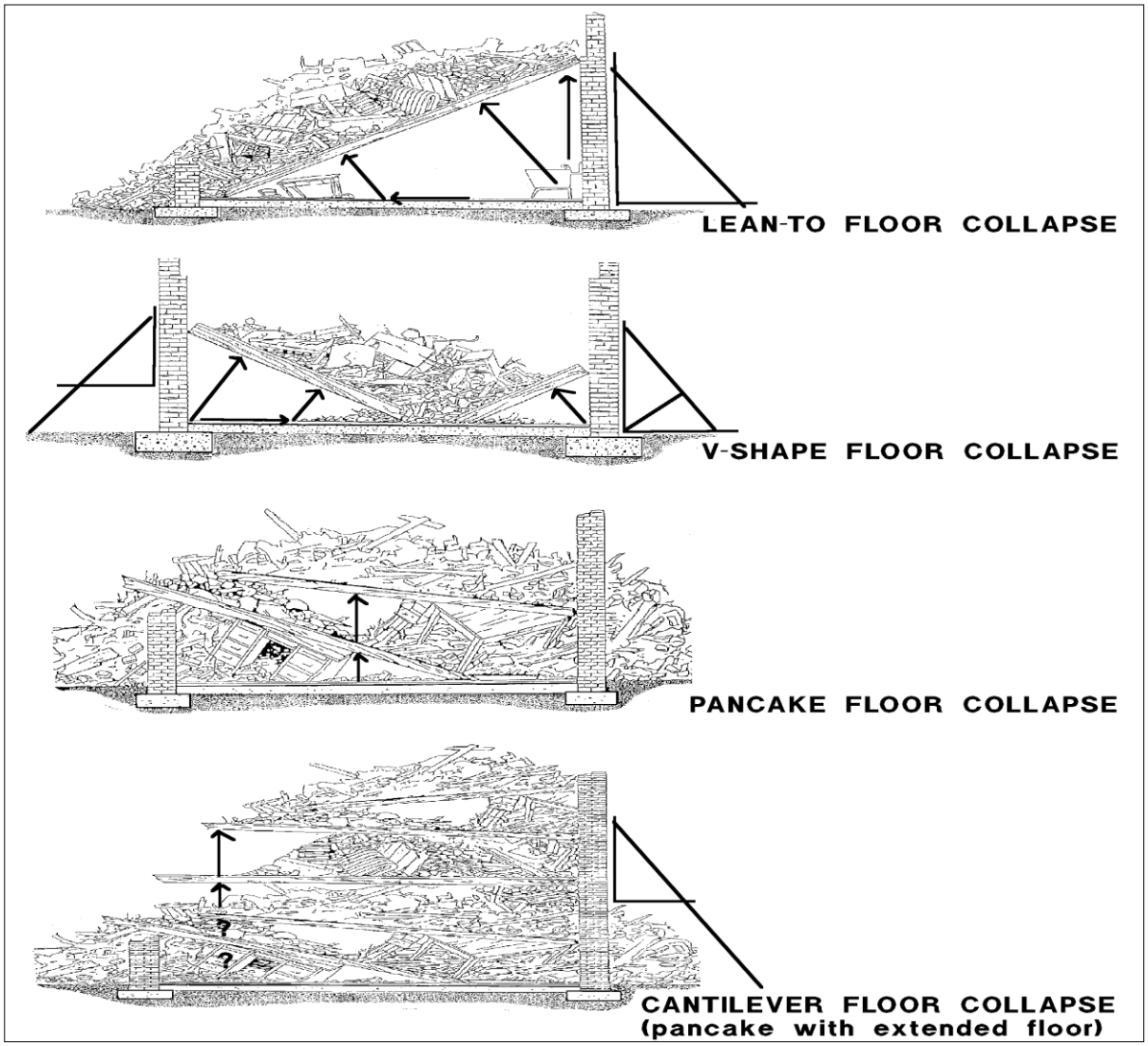


Figure 39 Collapse mechanisms

- LEAN-TO : Victims might be found under the suspended floor and on top of this floor at the lowest end·
- V-SHAPE Victims might be found under the two suspended floor pieces and on top of the floor in the middle of the V.
- PANCAKE - shoring is usually required under the floors. Victims might be found under the floors. Voids are formed by building contents and debris wedged between floors
- CANTILEVER - this type is similar to the pancake pattern with the added problem of some of the floor planes extending, unsupported from the debris pile. Shoring is usually required under and above the floors starting at the lowest level. Victims might be found under the floors as in the pancake condition [19].

• Search and rescue resources available

5.4 Temporary Shoring

Shoring is the temporary support of only that part of a damaged, collapsed, or partly collapsed structure that is required for conducting search and/or rescue operations at reduced risk to the victims and rescue teams. A Shoring system is like double funnel. It needs to collect the load with headers/sheathing, deliver it into the post/struts, and then to distribute it safely into the supporting structure below. A most desirable property for emergency shoring is to have a system that will give a warning when it is becoming overloaded, so that one can mitigate the situation. Shoring should be built as a system that has the following:

- Header beam, wall plate, other element that collects load
- Post or other load carrying element that has adjust ability and positive end connections
- Sole plate, bearing plate, or other element to spread the load into the ground or other structure below.
- Lateral bracing to prevent system from racking (becoming parallelogram), and prevent system from buckling (moving sideways).
- Built-in forgiveness (will give warning before failure) Example: If vertical shore is proportioned properly, (posts with length to width ratio of 25 or less) one can hear the header or sole crush against the post prior to the post starting to fail.

Minimum level of lateral strength in any vertical support system should be 2% of vertical load, but 10% is desirable where aftershocks are expected [19].

Other key issues that need to be accounted for are the maintenance of the shoring systems depending on the cost. At times, the renewal of a shoring system will be more feasible than the maintenance itself. Regardless, the response of these elements to temperature change, humidity and duration of load is of great significance. For instance, in spite of the fact wood is an economical and easy to apply, design and manage material, it is sensitive to rain, humidity and time which makes it a temporary solution rather than a permanent one. For long term supporting the unstable buildings steel is a better selection as material due to the fact that it is less vulnerable to the environmental conditions.

The two main systems of shoring can be divided into systems that resist vertical loads and systems that resist lateral loads.

5.4.1 Vertical shoring systems

Vertical shoring systems are primarily intended to provide vertical support such as damaged floors or beams, but should all have some lateral bracing for stability. (2% min., 10% reasonable) However, often, individual vertical supports are initially installed without lateral bracing; in order reduce risk while constructing a well-braced system [19]. Vertical shoring systems with governing design criteria highlighted include the following:

• **Timber Posts** can give warning of overloading with a noisy indication of high stress. In order to restrain buckling (a sudden brittle failure mode) length width ratio must be smaller than 25 especially in critical emergency shoring situations. The strength of a wood post system is determined by:

- Perpendicular to grain bearing on the header or sole plate
- Vertical capacity of the posts.
- Strength of header beam and/or sole plate.
- Strength of ground or structure below sole plate.

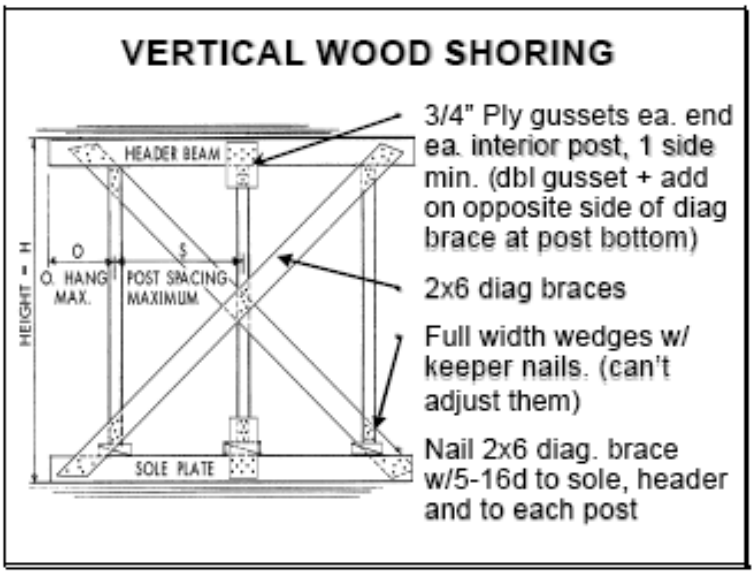
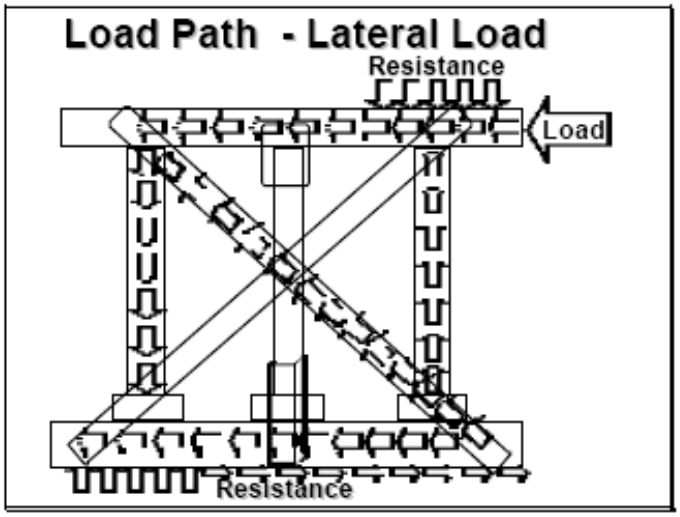


Figure 40 Vertical Wood Shoring



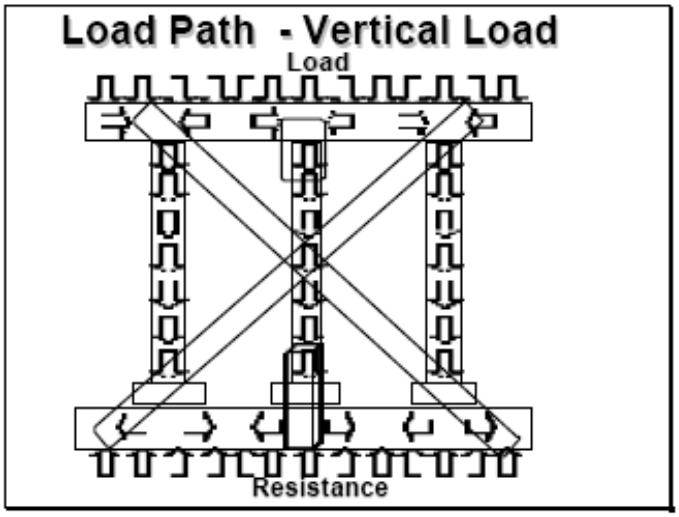


Figure 41 Load Paths

- **Window and door shores**: are used mostly in unreinforced masonry buildings to confine and support loose masonry over openings in the walls.

Figure 42 Window and door shores

- **Timber Cribbing**: multi member layup. The capacity is determined by perpendicular to grain load on sum of all bearing surfaces. Stability is dependent on height to width of crib and should not exceed 3 to 1.

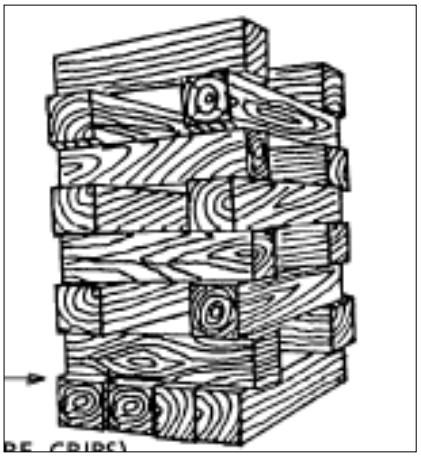


Figure 43 Timber Cribbing

- **Steel pipe systems** (adjustable steel props): While the capacity depends on buckling, using steel in shoring designs has many advantages such that it is more resistant to vibrations induced by earthquakes, it is not sensitive to environment influences and it is less problematic in terms of occupied space (no problem for people or vehicles)

Figure 44 Examples of Steel Pipe Vertical Shoring Systems

5.4.2 Lateral Shoring Systems

Lateral Shoring Systems are necessary to support damaged buildings that may have negligible lateral load carrying capacity, excessive lean, or show other signs of distress such as bulging walls [16]. Lateral Shoring systems include the following:

- **Wood Horizontal Shores:** have been used to support bulging walls.

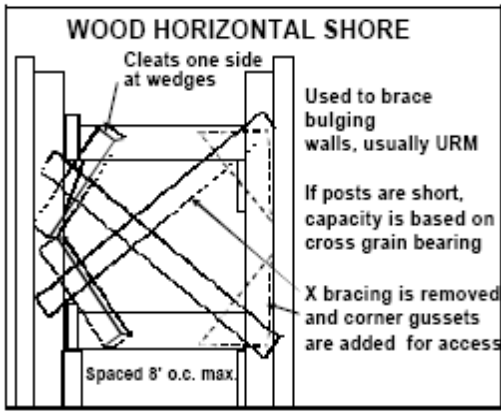


Figure 45 Wood horizontal shore

- **Raker shores** are useful in bracing heavy walls that cracked (especially at corners) and/or are leaning away from building. The capacity of rakers is usually limited by the nailed cleat connections, and/or the connection to the ground. They need to be configured in system that will account for both vertical and horizontal components of force in diagonal member. The required horizontal force may be less than two percent of the wall weight, since URM walls are seldom left standing very far out of plumb. However, since aftershocks are likely to occur, raker systems should be designed for about 10 percent of the weight of the wall and roof that is within the tributary area that they support. Rakers should be built away from dangerous area next to wall and then carried/walked into place. Rakers may be configured using the Full Triangle method (called Fixed raker) or as a Flying Raker (Friction Raker). Either configuration (Full Triangle or Flying) could be used on walls up to about 8 meters high.

Flying Rakers take the least amount of material to build and are recommended for use to initially stabilize a wall and/or building until a system with more reliable bracing can be installed. Full Height Rakers will weigh more, use more material, but are easier to walk along the ground for installation and can be more adequately braced.

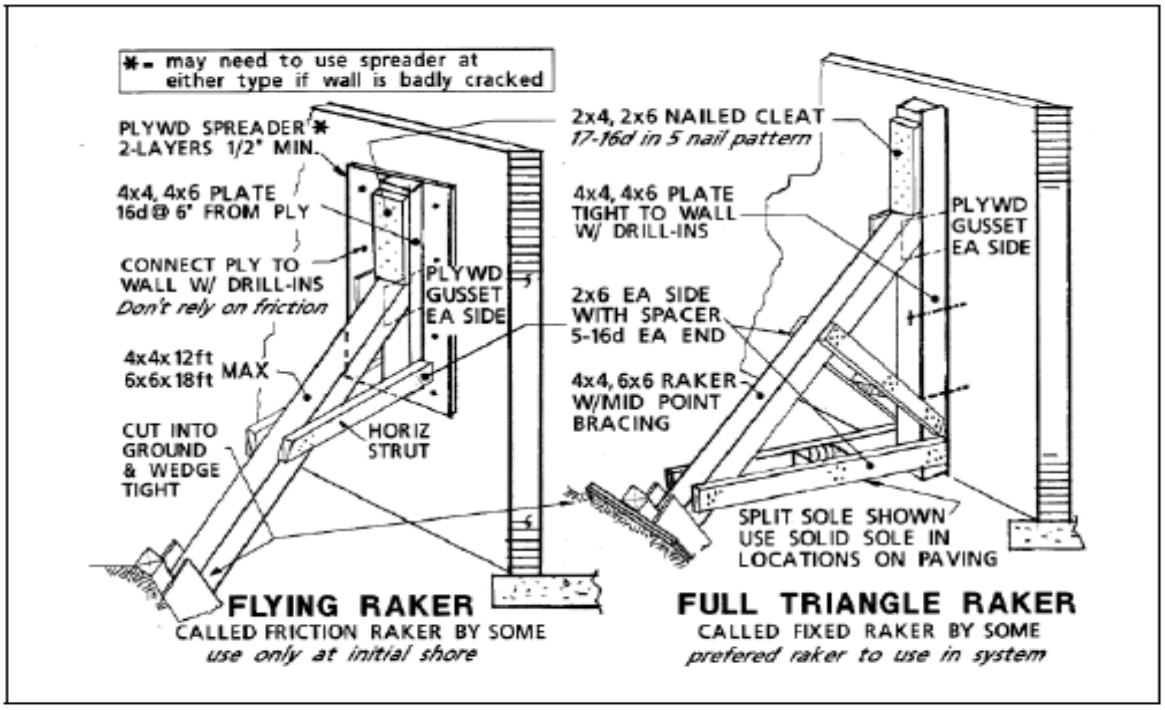


Figure 46 Raker shores

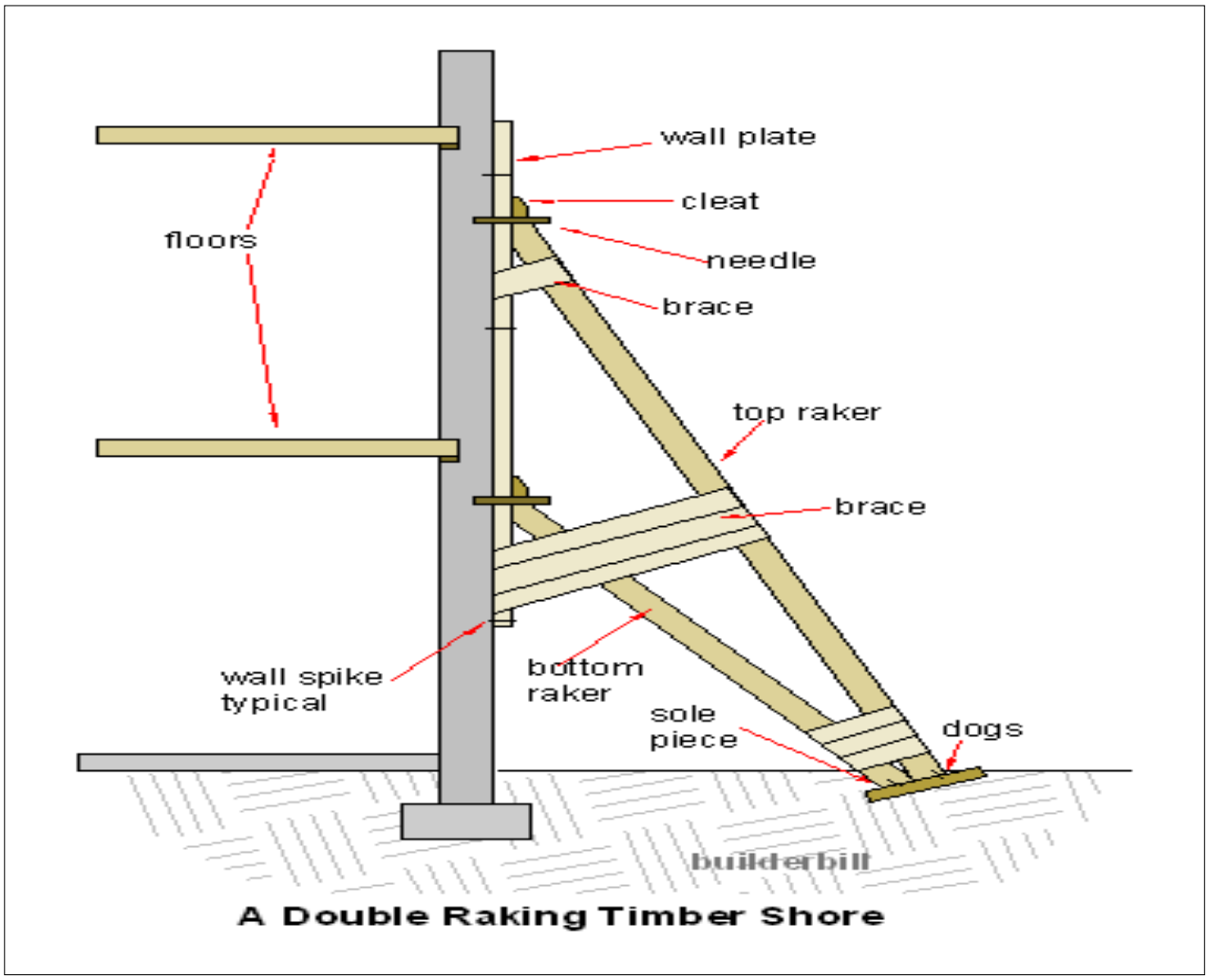


Figure 47 A double raking timber shore

Figure 48 An apllication of shoring in L'Aquila

• **Tiebacks:** When URM walls are over 10 m tall it is probably impractical to attempt to brace them with raker shores

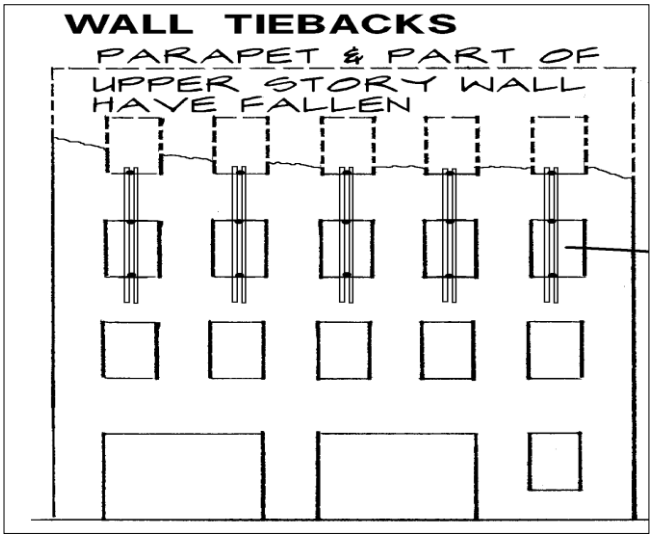


Figure 49 Tiebacks

• **Other confinement elements (**chains, tendons, flexible polyester, etc...**)** are all the oldest type of interventions for masonry buildings to improve connection between different structural elements enabling them to act more rigidly. The metallic members can elongate or contract on account of alterations in temperature. However, they are less expensive since small amount of material is used for many interventions. On the other hand, polyester members are easily modified [21].

Figure 50 Applications of shoring in L'Aquila

5.4.3 Procedures for Shoring Design and Application

For designing the shoring systems, the methodology shown in figure 51 is proposed. The process starts with the identification of building type and construction materials. The significance of this consideration lies in the fact that different materials change the total weight (vertical loads) of the structures drastically.

Next, the specification of the vulnerability elements that may lead to collapse is required in order to determine the type of shoring system (vertical or lateral) needed.

Then, the loads and load paths are estimated. For determination of gravity loads, table 22 provides the typical weights of several common construction materials. The total load due to self weight of structures can be calculated in a quick manner by multiplying the area with the values given in the table. The range of weights is influenced by the age of construction. Older buildings with less efficient use of materials will tend to have heavier building components compared to modern buildings. The shoring design may also need to take account of additional loads such as rubble on top of a floor. In order to define the lateral loads, The FEMA USAR Manual recommends providing a minimum level of lateral strength of 2% of the gravity load. When aftershocks are expected following a major earthquake a minimum lateral strength of 10% of the gravity load is considered more appropriate.

To sum up, the shoring systems are designed by taking into account the following:

- Type of building (masonry, R/C, steel)
- Type & Level of damage and mechanism of collapse (detachment of façade, collapse of arc)
- Type of loads (horizontal or vertical load)
- Level of actions (quantity of displacement, the severity of aftershocks)
- Duration of life of shoring system
- Environmental factors (humidity, neighbors, thermal variation)

The design process is displayed in figure 51:

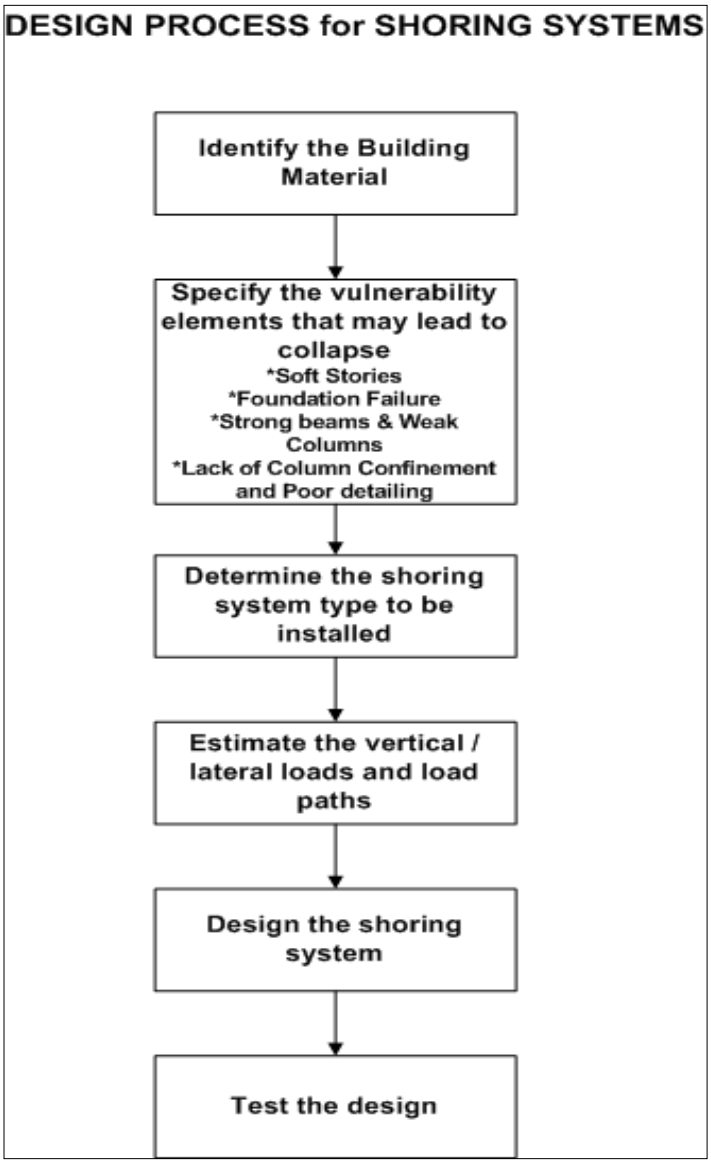


Figure 51 Design process of shoring systems

Form of Construction	Weight Pressure (kPa)	Mass Pressure (kg/m^2)
Concrete Floors	4.3-7.2	440-730
Steel beam w/concrete	2.4-3.4	250-350
Wood	0.5-1.2	50-120
Interior Floors	0.6	60
Allowance for contents	0.5	50

Source: FEMA USAR Manual (c.2000)

Table 22 Typical Weight of Materials

5.4.4 The Failure Mechanisms and Specified Shoring Systems in Turkey

The most common construction types in Turkey as explained in section 5.2 are reinforced concrete with unreinforced masonry infill, reinforced concrete joist-slab-column systems, adobe construction and mixed masonry timber construction.

Among them, most of the damage and collapse as well as nearly all the loss of life in 1999 Kocaeli earthquake, is associated with the common style of reinforced concrete frame construction having 3-7 stories in height[17].

Most casualties can be expected in this damage group, especially in a subset of this group where collapse will be in the “pancake” form. In pan caked buildings the floors pile up on top of each other rendering very difficult conditions for search and rescue and closure of roads [9].

The damage type to reinforced concrete buildings and associated shoring systems are stated below:

***Foundation failure**:* Foundation failures are observed for many buildings with large settlements, and in some cases, entire structures overturned. Foundation failures generally occur as a result of soil liquefaction or bearing pressure failures [20].

Figure 52 Foundation failure in 1999 Kocaeli Earthquake

The temporary support systems suggested for this kind of unstable structures are diagonal and / or vertical shoring systems for the objective of securing the built environment and access ways surrounding the building.

***Soft storey**:* is a floor that is structurally significantly more flexible and weaker than the others. Many failures and collapses can be attributed to the increased deformation demands caused by soft stories coupled with lack of deformability of poorly designed columns. For instance, pancake type collapse may result from the presence of soft stories. Soft storey buildings having opened street facades and solid back-walls tend to collapse toward the streets causing disruptions on accessibility and search and rescue activities [20].

Figure 53 Soft storey failure in 1999 Kocaeli Earthquake

Figure 54 Soft Storey Failure in Kocaeli 1999

Diagonal and vertical shoring systems are proposed in order to stabilize the buildings having this kind of damage while monitoring any change in racked structres. In any vertical support system, when there is the possibility of aftershocks, the desirable lateral strength is 10 % of the vertical load. In case of soft story damage, the lateral strength is provided by the diagonal member.

Victim access can be performed through floor / roof from above the collapse area, horizontal entry through existing cavities or walls. Moreover, for hazard reduction purposes actions such as shutting of the gas and avoiding or pulling down damaged veneer and chimneys must be executed [19].

Strong beams and weak columns :In most framed structures the beams were strong and remained elastic whereas the columns were weaker and suffered damage and failure in the form of compression crushing, plastic hinging or shear failure [20]. Lean to, V –shape and especially pancake collapse patterns result from combination of strong beams and weak columns.

Figure 55 Examples of Failure due to Strong Beams and Weak Columns

In order to prevent the leaning of the structure due to pressure exerted by the debris, horizontal shoring systems such as fixed rakers or multi rakers are proposed for heigts smaller than 8 meters in that they act like a retaining wall ensuring safety of the surroundings. For greater heigths, it is impractical to brace walls with raker shores in which case tie backs are suggested.

Lack of column confinement and poor detailing practice *:* the lack of confinement reinforcement in the column ends leads to deficiency in ductility [20]. This may stem from lack of anchorage of beams and columns reinforcement, insufficent splice length, poor concrete quality, less than full height masonry infill partitions.

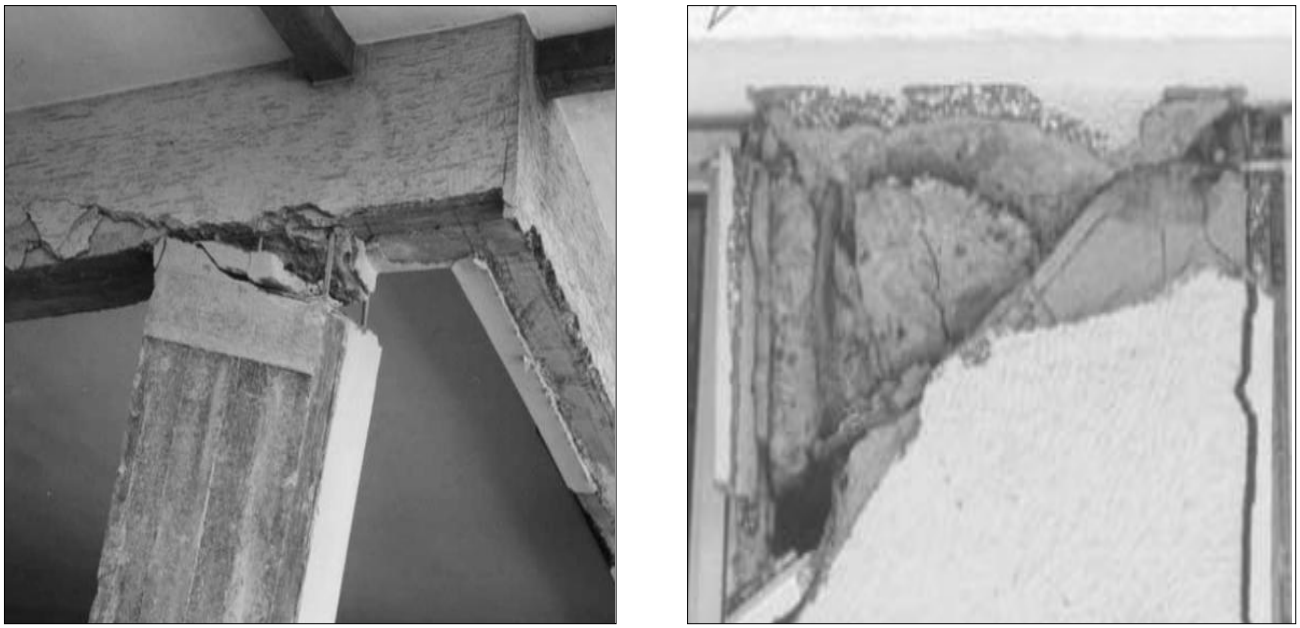


Figure 56 Examples of Poor Detailing Failure

For this kind of damage, in order to compensate for the carrying capacity loss of the columns, vertical shoring sytems such as timber posts or steel pipe systems are suggested. In addition, for the objective of preventing furher shear deformation of the columns, confinement elements such as flexible polyester or tendons are appropriate.

6 Uncertainty

Undoubtedly, the emergency plan preparation and consequent predictions of impact based on a selected scenario, regardless of how sensible the scenario is, has a certain number of blurred points that are clarified in the section of uncertainty. The differentiations in the scenario such as the magnitude of the earthquake and time of the event may lead to significant changes in the amount of damages, the critical zones, locations of isolated areas, number of casualties and people requiring shelters, the priorities for rescue teams and their sequence of actions as well as the general state of public facilities such as schools and hospitals.

The magnitude of the earthquake is the most critical aspect of the complete event scenario in that it could alter the amount of damages significantly. In the report, the magnitude was selected to be 7.5 in Richter's scale in the scenario based on the JICA report and the expected vulnerable zones were identified in this respect. However, an earthquake of greater magnitude implies that a drastically modified emergency plan that necessitates the reconsideration of the following:

- **Amount of the structural Damage:** The change in the magnitude of an earthquake leads to several variations in the intensity of the collapsed and unstable buildings. This issue, while requiring revisions in the plan, causes increases or decreases in the need for material to perform shoring systems installations for stabilization and safety purposes.
- **Casualty / injured rates and people requiring shelters**: A more severe earthquake causes a greater number of casualties changing the plans for hosting the homeless in the temporary shelters due to the fact that the estimations of the latter were based on the former. The number of homeless persons is bound to increase not only because of this reason but also, obviously, to stem from the increased number of heavily damaged and collapsed buildings. This dictates the planner that the camping areas and their capacities must see revisions.

The time of the event, being an equally important element, which was taken to be during night time in the report, can cause serious changes in the progress of incidents in the post earthquake phase.

The key points that it impacts when changed are:

- **Locations of people:** When the time of the event is shifted from night time to day time, the location of majority of population also shifts from the houses to the work / industrial places, schools and streets. This being a serious issue that increases exposure and casualty rates may modify the emergency considerations significantly.

- **Locations of most critical zones:** The critical zones defined in the report based on the JICA report which as well was prepared for a night time strike of the earthquake were mainly the neighborhoods of Hasanpasa, Fikirtepe, Rasimpasa, Caferaga and Osmanaga. However, these critical zones might be different in the point of view of casualties, if the earthquake hits during day time. While the building vulnerability remains the same, the most critical zones might see several additions such as Egitim Mah, Zuhtupasa and Merdivenkoy on account of the fact that they are occupied with greater number of schools, work places and public facilities.
- **Search and Rescue Activities:** The process of search and rescue activities is another aspect that is influenced by the time of the event. The greatest impact on S&R activities if the earthquake strikes during the day would be the changes in the durations for reaching the critical zones due to the presence of a panicking population and a traffic load on the streets causing delays on the operations. Other than the process of these activities, the priorities of the zones that require the immediate presence of rescue teams may differ. In this case, schools and work places become primary concern for the teams for they host the greatest number of people during the day while they would be mostly ignored in the during the night case.
- **The Traffic Load on the roads and Civil Disorder:** The traffic on the streets along with debris on the roads because of collapsed buildings as well as damaged roads, during the day, would cause a tremendous chaos making the search and rescue activities difficult to be performed. The civil disorder while also existing for the night time case would be more detrimental in that it would cause jamming of the roads in a quicker fashion.

To sum up, implementing the elements of uncertainty in the plan is an extremely difficult task as it means changing the scenario altogether from scratch multiple times. It is aimed in this report that the selected scenario must provide a somewhat visualization of the predicted events and their sequences in order to furnish a guidance for the activities of relevant authorities while acknowledging the uncertainty elements and the consequent circumstances that may arise on account of these points.

7 Conclusion

Even though, it is highly challenging to have a complete visualization of the post earthquake emergency process, a scenario based on a vulnerability assessment study allows the emergency planners, to some extent, to comprehend the situation after the impact. In this respect, the roles of authorities and management of resources can be handled in a realistic way in order to keep the negative outcomes of the incident on the population to a minimum.

"The Kadikoy Earthquake Emergency Project" was developed with the same objectives for the district of Kadikoy which is one of the largest in Istanbul. It started with extracting data from the previously developed vulnerability assessment study by JICA to identify the most and least problematic points in the area. For handling the emergency situation in the district in an efficient way, the resources within the boundaries of the district were identified in terms of open spaces, buildings, operators and volunteers, materials and equipment, etc… and then came the stage of distribution of tasks to the authorities in accordance with the disaster law of Turkish Constitution no: 7269. This act was repeated for each phase of the emergency which was defined to be Initial Response, Sustained Response and Transition to Recovery. During the process of building the emergency plan and actions, a closest facility analysis was performed in order to furnish the authorities with the shortest paths for emergency operations. Moreover, following a damage assessment process, diverse kinds of shoring systems for different damage types were proposed along with their technical explanations.

Finally, uncertainties during the process, issues that may have affected the emergency activities, were addressed.

All in all, the project having the purpose of providing a realistic visualization of the district after an earthquake emergency, analyzed the post earthquake conditions and the needed activities in the most specific way possible.

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9 Appendix

Attachment 1: Access ways Damage Assessment Survey Form

Access Ways Damage Assessment Survey Form			
DATE:		**Form No:**	
General Information			
Road Name:	**Road Type:**	**Belonged Neighborhood:**	**Reason for Closure:**
Geometrical Properties			
Road Width:	**Length of closure:**		**Approximate Debris Height:**
Closure Type			
Total Closure: □	**Closure that allows small Vehicles: □**		**Minor Closure: □**
Information on the state of Induced Damage			
State of Natural Gas pipelines:	**State of Water pipelines:**		**State of Electricity Cable Network:**
Information about Closure & Isolation			
Number of Isolated Buildings:	**Presence of Isolated Public Facilities: □ YES □ NO**	**Presence of Alternative Routes: □ YES □ NO**	**Relative Length of Alternative Route:**
Heavy Machinery / tools for the reopening operation of the roads:			
Notes and Descriptive Photographs			
The List of Compilers & Signatures			
Name	**Occupation**		**Signature**

Attachment 2: Building Damage Assessment Form

BUILDING DAMAGE ASSESSMENT SURVEY FORM	
Date:	Form Number:
1.General Information	
Type of Use: ☐ Residential ☐ Commercial ☐ Historical ☐ Public Facility ☐ Other:	
Adress:	
Householder Contact Info :	
Contact Person Info:	
2.External Properties	
Principal Direction: ☐ EW ☐ NS ☐ Other:	
Shape of Building: ☐ Rectangle ☐ Square ☐ Other:	
Position of the Building in the Block: ☐ Corner ☐ Middle ☐ Isolated	
Number of Floors: **Below Ground Floor:** **Above Ground Floor:**	
Number of Flats:	
Plan Area: ……. m²	
Age of Building:	

3.Structural Properties		
Support Systems		
1.Masonry	1. Without connection 2. Horizontally connected 3. Vertically and horizontally con. 4. With R/C Slab and or Roof	1. Mud-brick 2. Dry wall 3. Stone with mortar 4.Full Brick 5. Bricks with vertical holes 6. Bricks with horizontal holes 7. Briquette 8.Unreinforced Concrete
2. Reinforced Concrete	1.In-situ cast 2. Prefabricated	1. Light partition walls 2.Solid masonry wall 3. Vertically perforated brick wall 4.Horizontally perforated brick wall 5.Briquette partition wall
3. Steel	1.Heavy steel structure 2.Light steel structure 3.Steel mixed with R/C or masonry	1.Light partition wall 2.Solid masonry wall 3.Vertically perforated brick wall 4.Horizontally perforated brick wall 5.Briquette partition wall
3. Timber	1.Timber frame 2.Ribbed lath partition 3.Other	1.Light partition wall 2.Solid masonry wall 3.Vertically perforated brick wall 4.Horizontally perforated brick wall 5.Briquette partition wall
Slabs		
☐ 1.Reinforced concrete	☐ 2.Steel	☐ 3. Timber ☐ 4.Other
Foundation		
☐ 1. Raft foundation	☐ 2.Pad foundation	☐ 3. Strip foundation ☐ 4.Other
Roof		
☐ 1.Reinforced concrete	☐ 2.Steel	☐ 3. Timber ☐ 4.Other
Roof Cover		
☐ 1. Tile	☐ 2. Metal sheet	☐ 3. Bitumen paper sheet
☐ 4. Corrugated sheet	☐ 5. Soil	☐ 6. Terrace
Construction Quality		
☐ 1. High	☐ 2. Medium	☐ 3. Low
Support Systems		
☐ 1. Supporting wall	☐ 2. Frame	☐ 3.Frame + supporting wall
☐ 4.Shear wall + Frame	☐ 5. Column + Supporting wall	☐ 6.Other

The Rigidity of the First Floor relative to Others

☐ 1. Higher ☐ 2. Equal ☐ 3. Less

State of Repair after the previous earthquake

☐ 1. Repaired ☐ 2. Not repaired ☐ 3. Not known

The Degree of Damage

☐ 1. No damage ☐ 2. Slightly damaged ☐ 3. Moderately damaged

☐ 4. Heavily damaged ☐ 5.Totally damaged

Structural members:

☐ Supporting walls
☐ Columns
☐ Beams
☐ Frame connection points
☐ Shear walls
☐ Stairs
☐ Slabs
☐ Foundation
☐ Roof

Non structural members and plumbing system:

☐ Partition walls
☐ Light partition walss
☐ Outer walls
☐ Electricity system
☐ Water / Sewage system

Total Damage:

☐ 1. No damage ☐ 2. Sligthly damaged ☐ 3. Moderately damaged

☐ 4.Heavily damaged ☐ 5. Totally damaged

Induced Hazards:

☐ 1. Fire ☐ 2. Flood ☐ 3. Other

Foundation Problems :

☐ 1. No ☐ 2. Sligthly settled ☐ 3. Highly settled

☐ 4.Liquefaction ☐ 5. Rock detachment ☐ 6. Fault movement ☐ 7. Landslide

Post Earthquake Usability:

☐ 1. Habitable
☐ 2. Restoration required
☐ 3. Possibility of collapse

Emergency Measures:

☐ 1. No need
☐ 2. The necessity to clean of the debris
☐ 3. The necessity to prevent collapse
☐ 4. The necessity to protect the neighboring structures
☐ 5. The necessity to demolish immediately

Additional Information ☐ 1. No ☐ 2. Photo ☐ 3. Map ☐ 4. Other:	
Casualties: …….. Persons	
Comittee	
Title: **Name / Surname:**	**Signature:**
Title: **Name / Surname:**	**Signature:**
Title: **Name / Surname:**	**Signature:**
Title: **Name / Surname:**	**Signature:**

Attachment 3: Building Intervention Form

Building Intervention Form	
Form Number:	Date:
General Information	
Adress: Contact Person Info:	
Comittee Report	
Survey Complited: ☐ Yes ☐ No	General Appearance ☐ Observable ☐ Unobservable
	Unobservable State Reasons:
Intervention Types and Descriptive Photos :	
Member of the Comittee	
Title: Name&Surname:	Signature:
Title: Name&Surname:	Signature:
Title: Name&Surname:	Signature:
Title: Name&Surname:	Signature:

Attachment 4: Petition for Objection

Date: __/__/20__

To whom it may concern,

I hereby object the results of the damage assessment performed on __/__/20__ on my household at the address_____ _____ _____ _____ _____ and request the repetition of the process.

Best Regards,

Name:

Surname:

Signature:

Attachment 5: Building Inspection Cards

Date:__/__/20__

INSPECTED

OCCUPANCY PERMITTED

Facility Name and Adress:

_____
_____
_____

This structure has been inspected and no apparent structural and health threats has been detected.

☐ Inspected Exterior Only

☐ Inspected Exterior and Interior

Inspector Comments:

_____
_____
_____

(Remark: Aftershocks since inspection may increase damage and risk.)

Inspected by:

Title:_____ Title:_____

Name:_____ Name:_____

Signature:_____ Signature:_____

Title:_____ Title:_____

Name:_____ Name:_____

Signature:_____ Signature:_____

DATE:__/__/20__

INSPECTED

RESTRICTED USE

Facility Name and Adress:

_____
_____
_____

This structure has been inspected and found to be damaged as described below:

_____
_____
_____
_____
_____
____

(Remark: Aftershocks since inspection may increase damage and risk.)

Inspected by:

Title:_____ Title:_____

Name:_____ Name:_____

Signature:_____ Signature:_____

Title:_____ Title:_____

Name:_____ Name:_____

Signature:_____ Signature:_____

DATE:__/__/20__

UNSAFE

DO NOT ENTER OR OCCUPY

(THIS PLACARD IS NOT A DEMOLITION ORDER)

Facility Name and Adress:

_____
_____
_____

This structure has been inspected and found to be seriously damaged and is unsafe to occupy as described below:

_____
_____
_____
_____
_____
____

(Remark: Aftershocks since inspection may increase damage and risk.)

Inspected by:

Title:_____ Title:_____

Name:_____ Name:_____

Signature:_____ Signature:_____

Title:_____ Title:_____

Name:_____ Name:_____

Signature:_____ Signature:_____

Attachment 6: Earthquake Emergency Plan for the Distrcit of Kadikoy

EARTHQUAKE EMERGENCY PLAN for the DISTRICT of KADIKOY

2010

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Relevant Authorities - Contact Information

Authority	Contact Person	Telephone Number
Prime Ministry Emergency Management Presidency	Mehmet Ersoy	0312 220 26 12
Prefect	Hüseyin Avni Mutlu	0212 455 59 00
Mayor	Selami Ozturk	0216 542 50 55
Vice Mayor	MustafaDemircan	0216 542 50 94
Vice Mayor	Zekai Dede	0216 542 50 57
Vice Mayor	Hulusi Özocak	0216 542 50 66
Vice Mayor	Süreyya Ensari	0216 542 50 63
Ambulance		0535 480 90 40
Erenköy Müfrezesi Fire S.		0216 575 21 18
Sogutlucesme Fire Station		0216 336 0872
Sahrayıcedit Police Station		0216 411 30 72
Bostanci Police Station		0216 658 7820
Rasimpasa Police Station		0216 336 4339
Goztepe Police Station		0216 478 1720
Hasanpasa Police Station		0216 428 1040
Haydarpasa Port	Murat Sırt	0216 348 80 20
Haydarpasa Train Station	Orhan Tatar	0216 336 04 75

Disabled Person Vehicle		0216 444 00 81
Quay Presidency Building		0216 337 86 11
Health Care Services	Zeynep Süzme	0216 542 50 82
Cleaning Services	Hasan Tapan	0216 542 50 75
Suuporting Services	Nuray Keser	0 216 542 50 78
Transportation Services	Hasan Tapan	0216 542 50 75
Head of Municipal Police	Hakkı Aydın	0216 542 50 79
Municipal Police-Quay		0216 336 01 01
Municipal Police-Bahariye		0216 336 21 68
Municipal Police-Marina		0216 338 69 62
Municipal Police-Bostancı		0216 362 20 85
Municipal Police-Fikirtepe		0216 566 39 08
Municipal Police-Carsi		0216 414 98 74
Municipal Police-Goztepe		0216 385 78 97
Municipal Police-Kozyatagı		0216 386 26 03

1. INTRODUCTION

The earthquake emergency plan, hereinafter called “the plan”, was developed for the district of Kadikoy according to a seismic vulnerability assessment study performed by the Japanese International Cooperation Agency (JICA) based on the assumption that the earthquake of magnitude 7.5 strikes in the Istanbul Metropolitan area.

The primary authority, resources and directions for disaster operations were implemented according to the National Disaster Law No: 7269 in the Turkish constitution. In accordance with this law, the emergency begins with the declaration by the Prime Ministry Disaster and Emergency Management Presidency. On the local basis, emergency service providers assemble without authorization and are to operate 24 hours. This plan does not change policies and directions provided in the disaster law; rather, it provides additional guidance that may be used to complement the emergency operations. Moreover, since many variables govern the specific effects of an earthquake such as the magnitude, locations, no plan can possibly identify all considerations for a response. Therefore, the plan does not aim to describe detailed procedures of response tasks. However, it provides considerations that can be used to prepare for, and guide the execution of, response operations. Furthermore, for this plan to be effective, it is important that all concerned be made aware of its provisions and that every official, agency and department be prepared to carry out their assigned functions and responsibilities during the earthquake.

The plan primarily focuses on response and short-term recovery operations on the local basis. Elements related to preparedness, long-term recovery, and mitigation are not included. It was divided into three parts, namely, initial response (Event+ 72 hours) , sustained response (Event+72 hours to Event+21 days) and transition to recovery (Event+21 days to Event+ 3 months) each having different set of priorities on which the assignment of the tasks are based. During the post emergency phases, only the resources of the district itself were taken into account as though the district was at an isolated location rather than a metropolitan area.

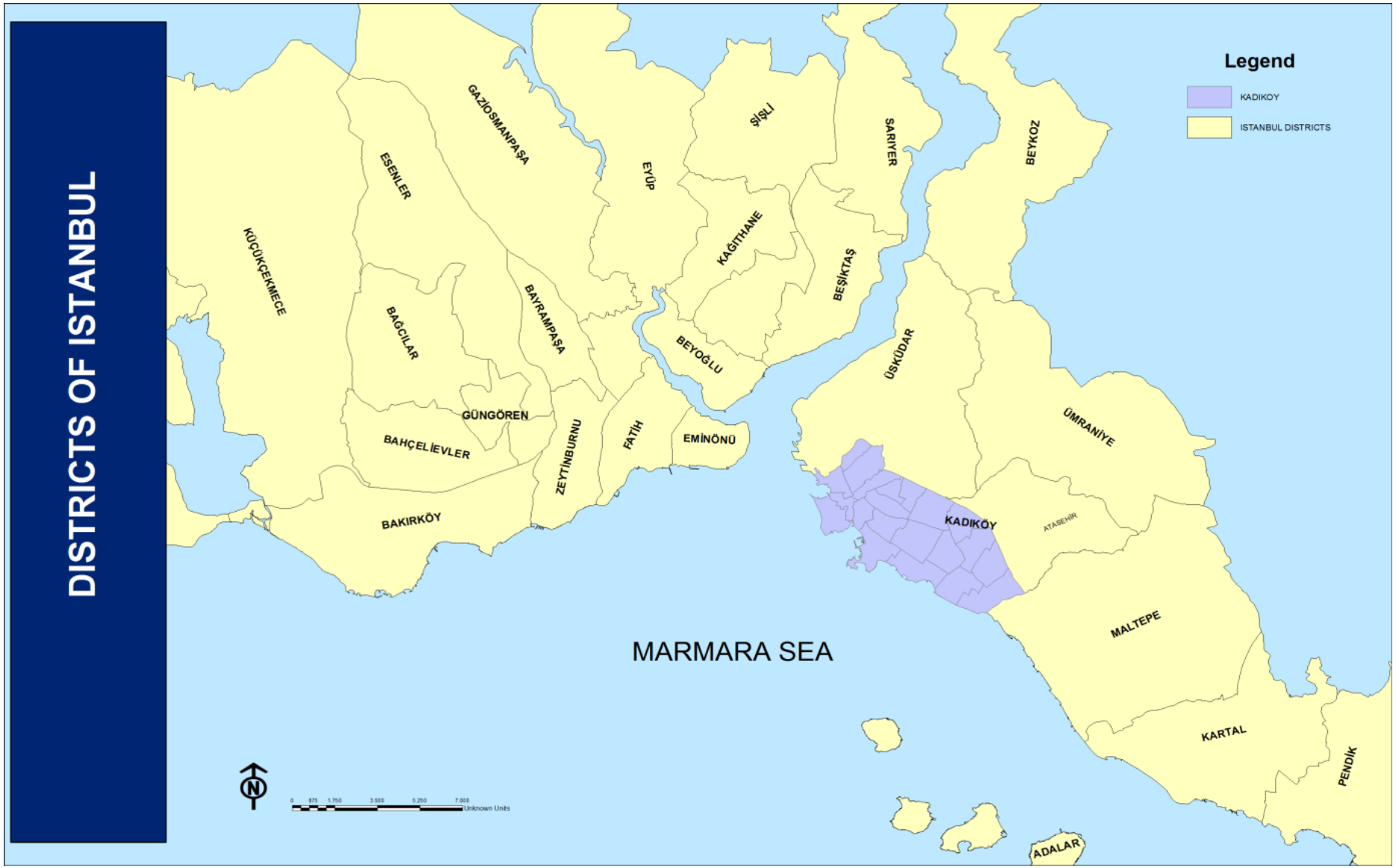


Figure1: Districts of Istanbul

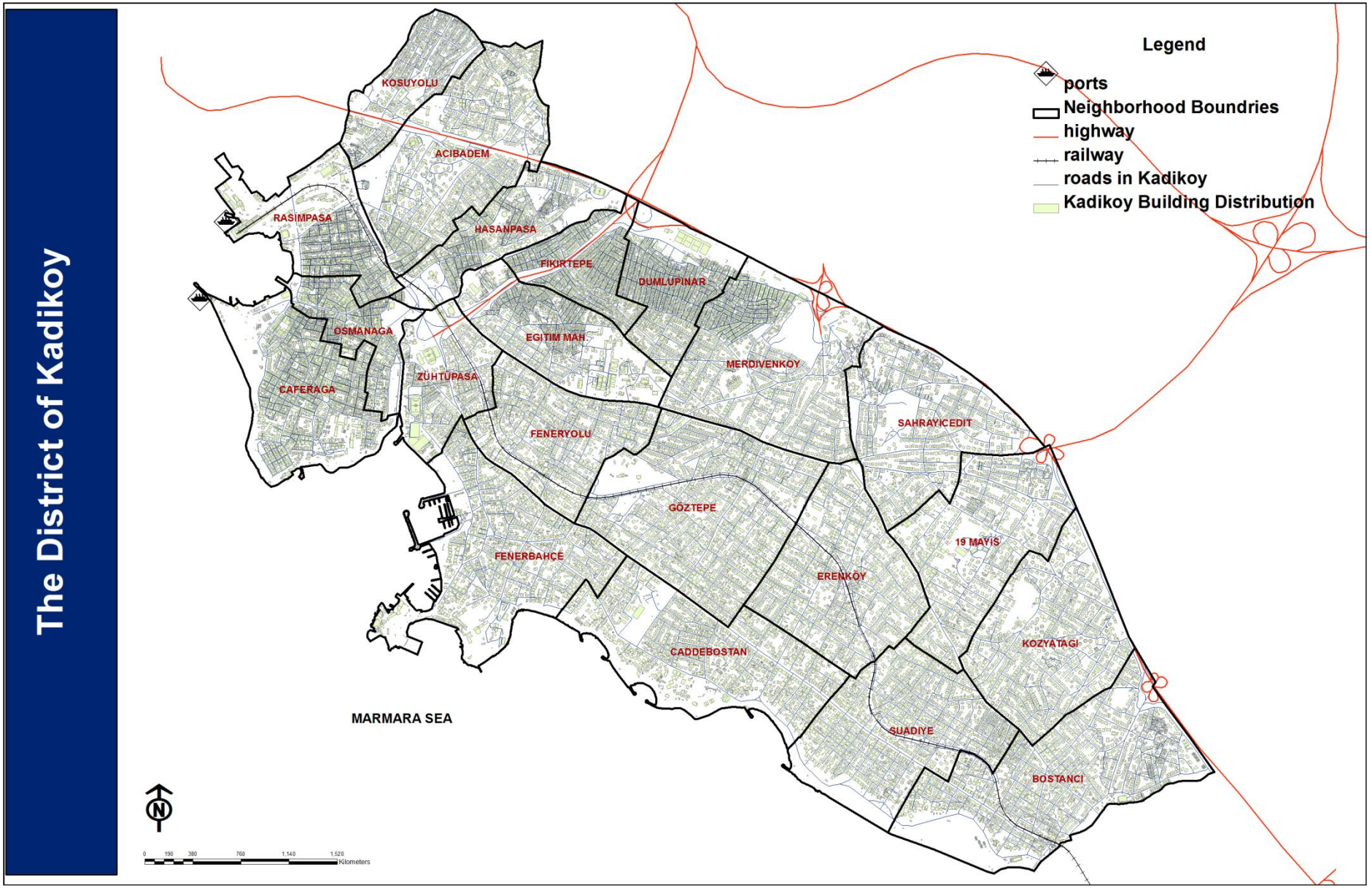


Figure2: The District of Kadikoy

1.1. AIM

Given that the probability of an occurrence on an earthquake is greater than 60% by the researches, it is an obligation to be well prepared for the resultant emergency situations. In this respect, the plan has the objective of providing an effective management of the response activities after the earthquake which comprise

- Assignment of tasks to responsible authorities considering the phases of the emergency
- Response operations for the first 3 months following the earthquake. The time frame for the plan begins with the occurrence of the earthquake and ends 90 days after the earthquake
- Specification of procedures to be taken for safety and evacuation of persons in the impact zone
- Obtaining and distributing materials, equipment and supplies during the emergency
- Description of the extent of information to be exchanged and tools for communication between authorities

1.2. SCOPE

The plan is an annex to the district of Kadikoy. It describes emergency response operations after the earthquake in the Marmara Sea that affects the metropolitan area of Istanbul. In the plan, Kadikoy is handled as if it were not located in a metropolitan area, implying the consideration of the resources within the district itself only.

Since the effects of an earthquake can change drastically, no plan can possibly describe all considerations for a response. Hence, this plan does not intend to identify detailed procedures for the execution of response tasks. However, it does provide considerations that can be used to prepare for and guide the execution of, short term (The first 90 days following the event) emergency activities.

THE SCENARIO

2. GENERAL CHARACTERISTICS and IMPACTS of the SCENARIO

2.1. DETERMINISTIC SCENARIO

The scenario earthquake has the following characteristics:

- It results from a rupture on the North Anatolian Fault Line that also caused the 1999 Kocaeli Earthquake having a magnitude of 7.5 in Richter's Scale
- Threats and hazards induced by the shaking throughout Kadikoy include:
    - Structural and non structural damage to buildings and infrastructures including widespread collapse of buildings specifically in the north west part of the district
    - Isolations in parts of Hasanpasa, Fikirtepe, Osmanaga and Zuhtupasa neighborhoods
    - Induced hazards: Liquefaction, aftershocks, hazardous material releases
    - Fires in industrial facilities in Hasanpasa and Fikirtepe Neighborhoods
    - Mass fatalities and injuries
    - Civil disorder
    - Interruptions in business

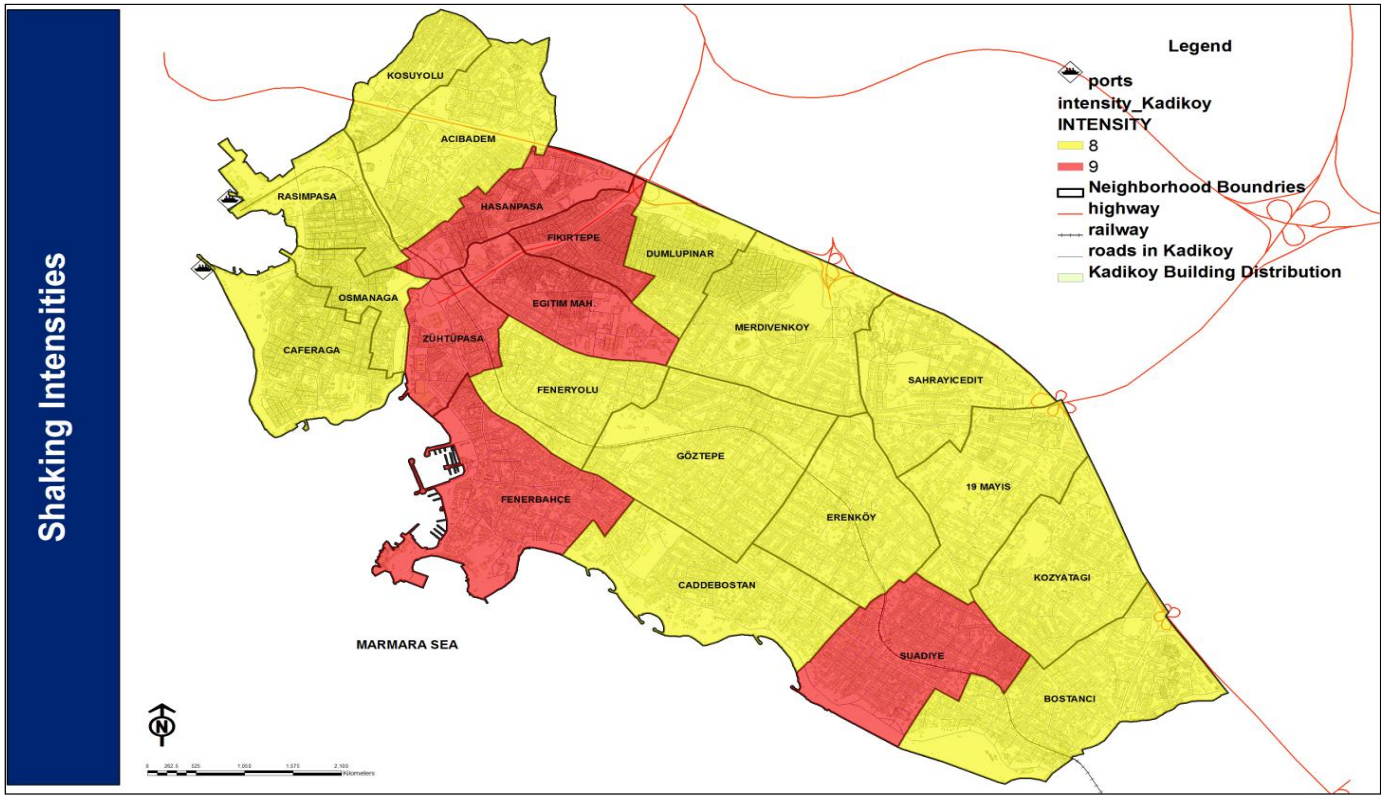


Figure3: Shaking Intensities

2.2. VULNERABILITY ELEMENTS in the DETERMINISTIC SCENARIO

The vulnerability elements are represented in the below figures according to the vulnerability assessment by JICA:

Buildings: The neighborhoods of Hasanpasa, Fikirtepe, Caferaga, and Osmanaga are expected to perform poorly. Therefore, the search and rescue as well as debris removal activities will be concentrated in these regions more. On the other hand, public facilities such as hospitals and hotels mainly located in the vulnerable zones (Osmanga, Zuhtupasa) will be affected.

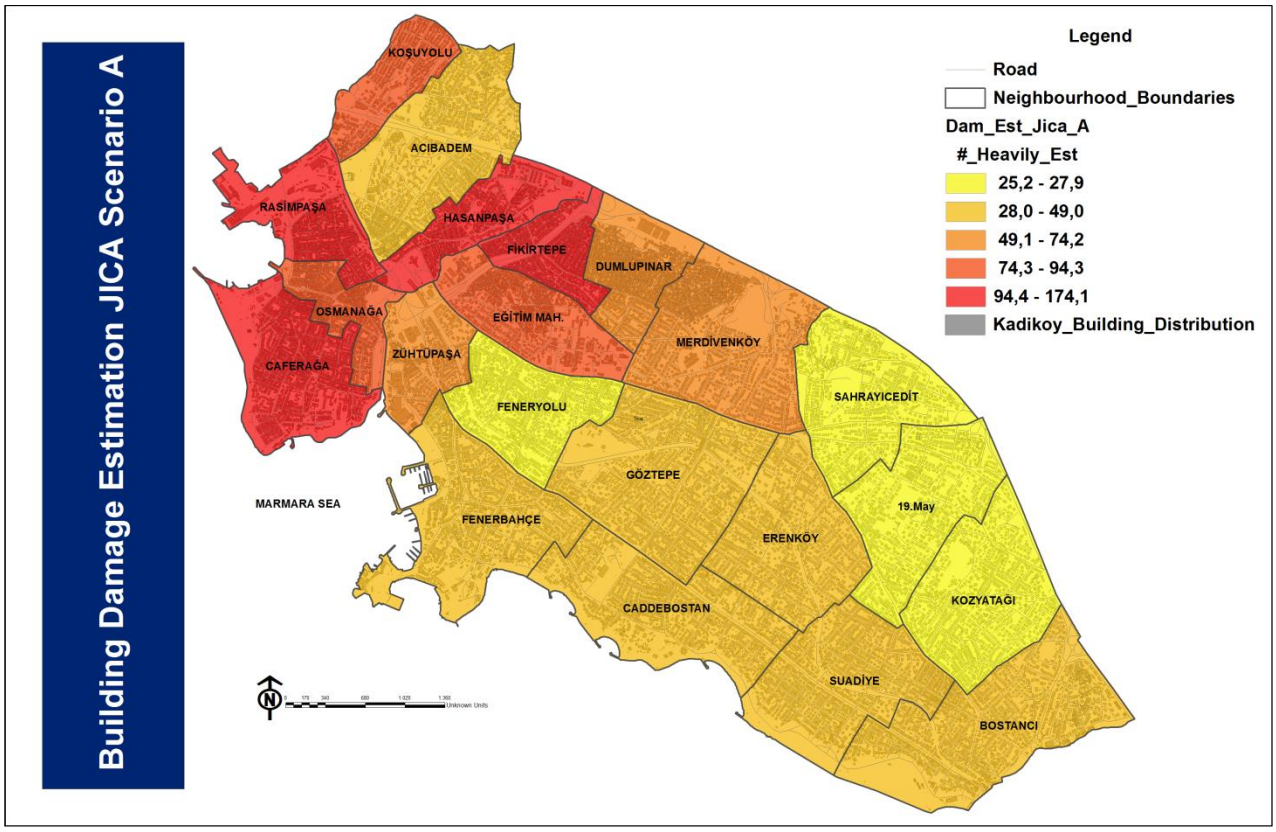


Figure 4: Building Damage Estimation according to JICA scenario A

Code	Name	Total buildings	Number Heavily Damaged	Number Moderately Damaged	Number Partly Damaged	Percentage of Heavily Damaged	Percentage of Moderetaly Damaged
1	Acıbadem	1319	46	126	374	3.49	9.55
3	Bostancı	1268	43	125	382	3.39	9.86
4	Caddebostan	994	36	104	312	3.62	10.46
5	CaferAğa	2295	124	301	768	5.40	13.12
6	Dumlupınar	1826	74	183	496	4.05	10.02
7	Erenköy	1031	41	111	318	3.98	10.77
8	Eğitim Mah.	1183	92	203	448	7.78	17.16
9	Fenerbahçe	940	40	110	310	4.26	11.70
10	Feneryolu	853	28	80	249	3.28	9.38
11	Fikirtepe	1979	174	369	768	8.79	18.65
12	Göztepe	1314	41	121	381	3.12	9.21
13	Hasanpaşa	1191	120	263	554	10.08	22.08
15	Kozyatağı	870	28	81	251	3.22	9.31
16	Koşuyolu	1034	94	205	419	9.09	19.83
18	Merdivenliköy	1830	65	177	521	3.55	9.67
19	Osmanağa	1365	84	197	476	6.15	14.43
20	Rasimpaşa	1651	118	269	622	7.15	16.29
21	Sahrayıcedit	822	25	72	223	3.04	8.76
22	Suadiye	1131	49	132	375	4.33	11.67
26	Zühtüpaşa	451	57	120	236	12.64	26.61
28	19 Mayis	754	27	75	123	3.58	9.95

Table 1: Estimations on Damaged Buildings

Access ways: Isolation risk due to building collapse induced road closure is present in parts of Hasanpasa, Fikirtepe, Osmanaga, Kosuyolu and Zuhtupasa neighborhoods. Unless the local roads except the proposed emergency routes are reopened for service, the search and rescue activities in these regions will be restricted. A hospital in Zuhtupasa, several hotels and 3 possible fire outbreak points will be out of reach due to the mentioned road closures.

The Haydarpasa Port has a probability to collapse due to liquefaction. The responsible people of the port are required to apply their emergency plans in order to regulate the national and international traffic.

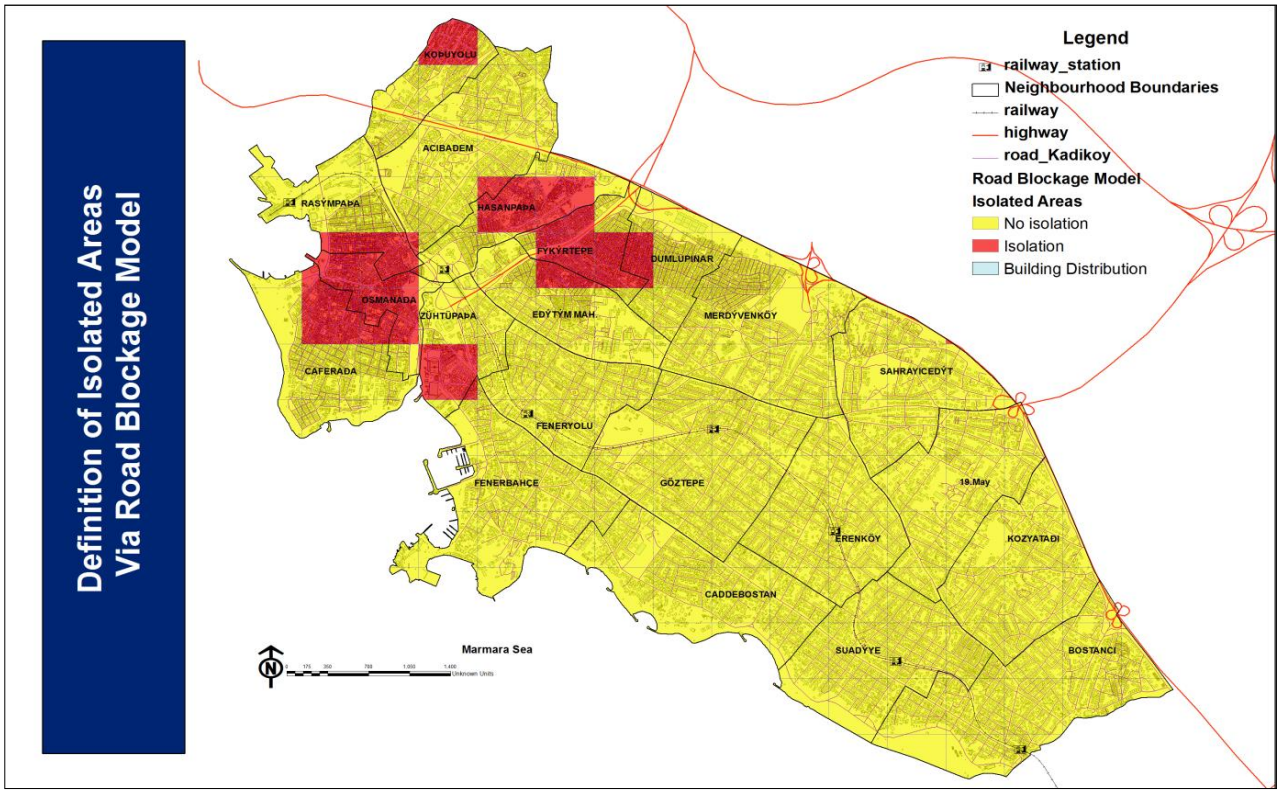


Figure5: Definition of Isolated Areas via Road Blockage Model

Lifelines: The water / sewage pipeline network will experience breakpoints in joints, and interruption of services that could take up to 1 month before it recovers its full functionality. The vulnerable areas are Zuhtupasa, Fikirtepe and Hasanpasa neighborhoods.

The gas pipeline network, on the other hand, is relatively resistant to seismic disturbance in the sense that the installments are relatively recent. Vulnerable areas, if there are any, parts of the Fikirtepe neighborhood. The network will be quickly restored, regaining its utility within the first 24 hours. However, for security reasons, the distribution might be blocked by IGDAS.

The gas service boxes of heavily damaged buildings and half of the moderately damaged buildings will present threats as a result of collapse induced leakage and explosions in the neighborhoods of Hasanpasa, Osmanaga, Fikirtepe and Caferaga.

Electricity cable damage will be most observed in Egitim Mah, Hasanpasa and Fikirtepe due to the influences of soil deformation, building collapse and search and rescue activities. The absence of service will last a few days.

Another network that will suffer on account of the earthquake is the Telecommunication. The loss of functionality will result from overloading of lines, the suggested solutions of which are explained in section 6 in the communication plan. The disutility could vary from a few hours to a few days depending on GSM services.

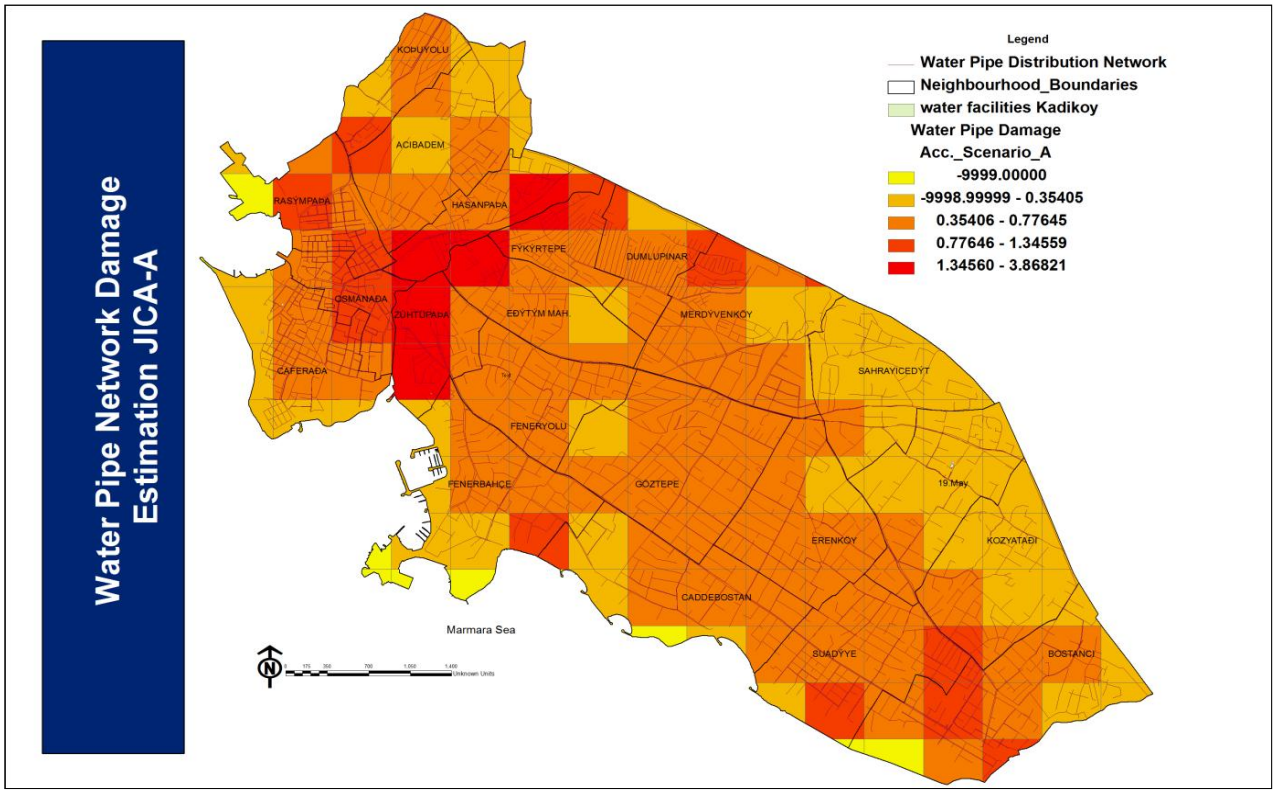


Figure 6: Water Pipe Network Damage Estimation according to JICA-A

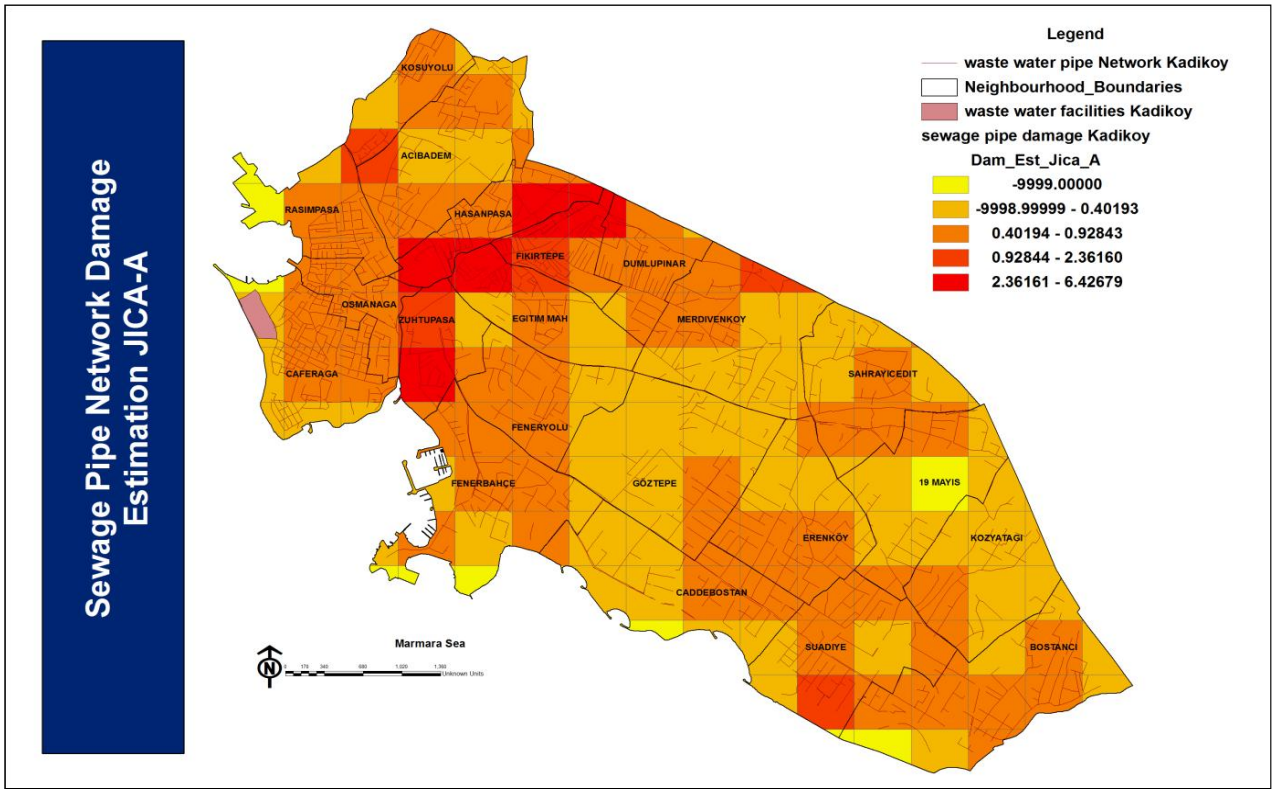


Figure 7: Sewage Pipe network Damage Estimation according to JICA-A

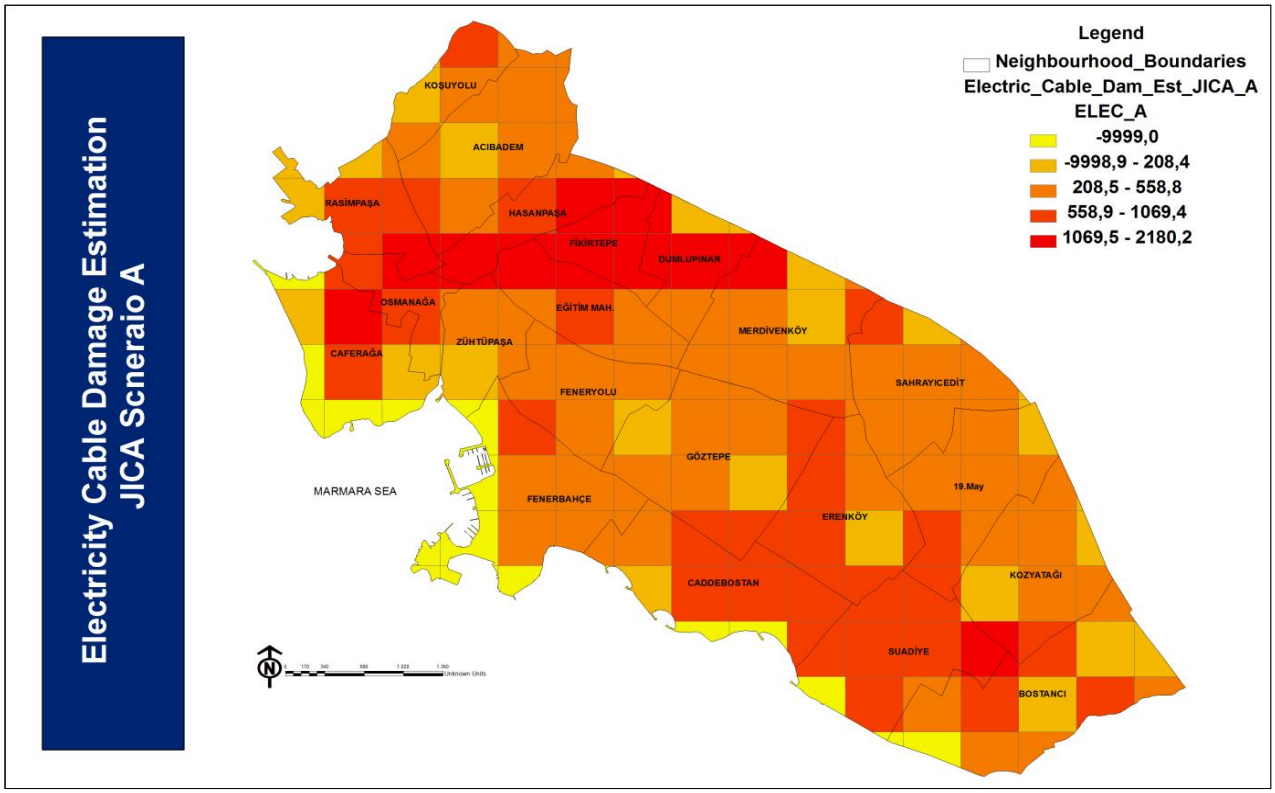


Figure 8: Electricity Cable Damage Estimation JICA Scenario A

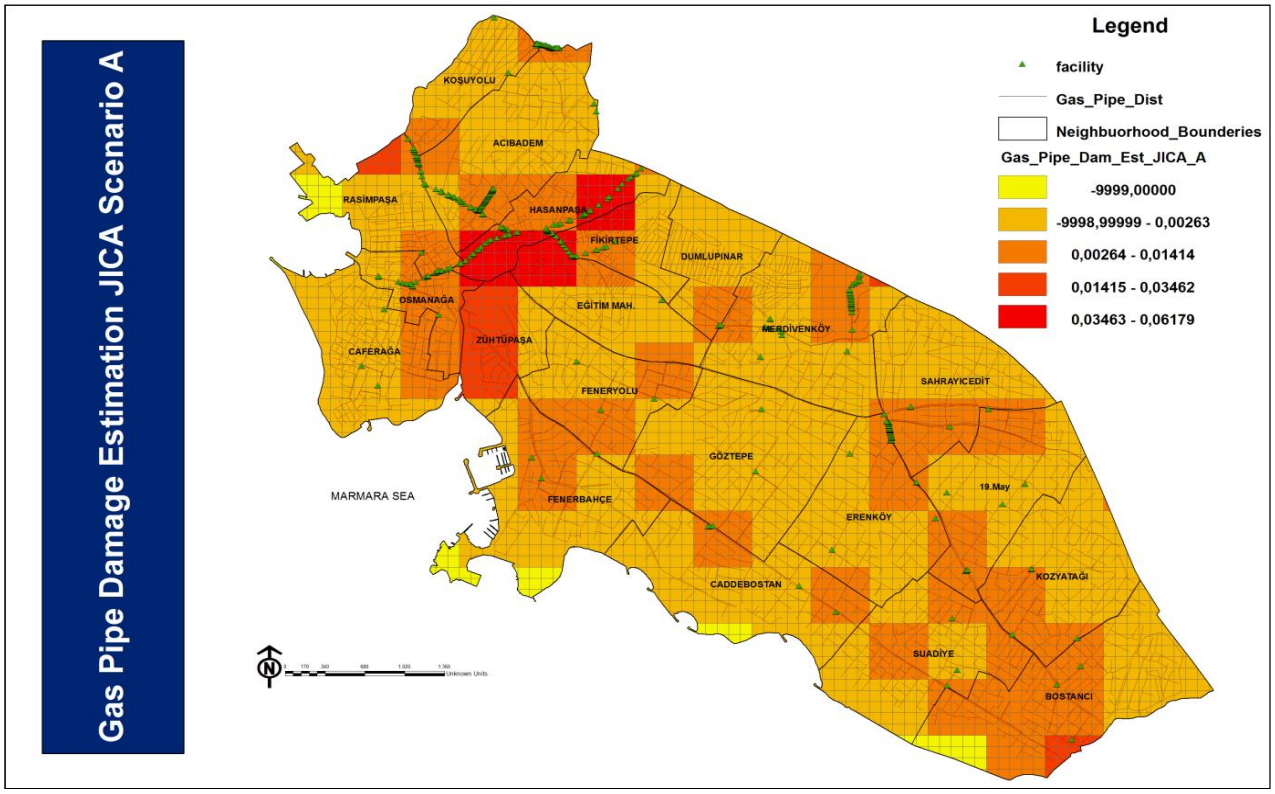


Figure 9: Gas pipe Damage Estimation JICA Scenario A

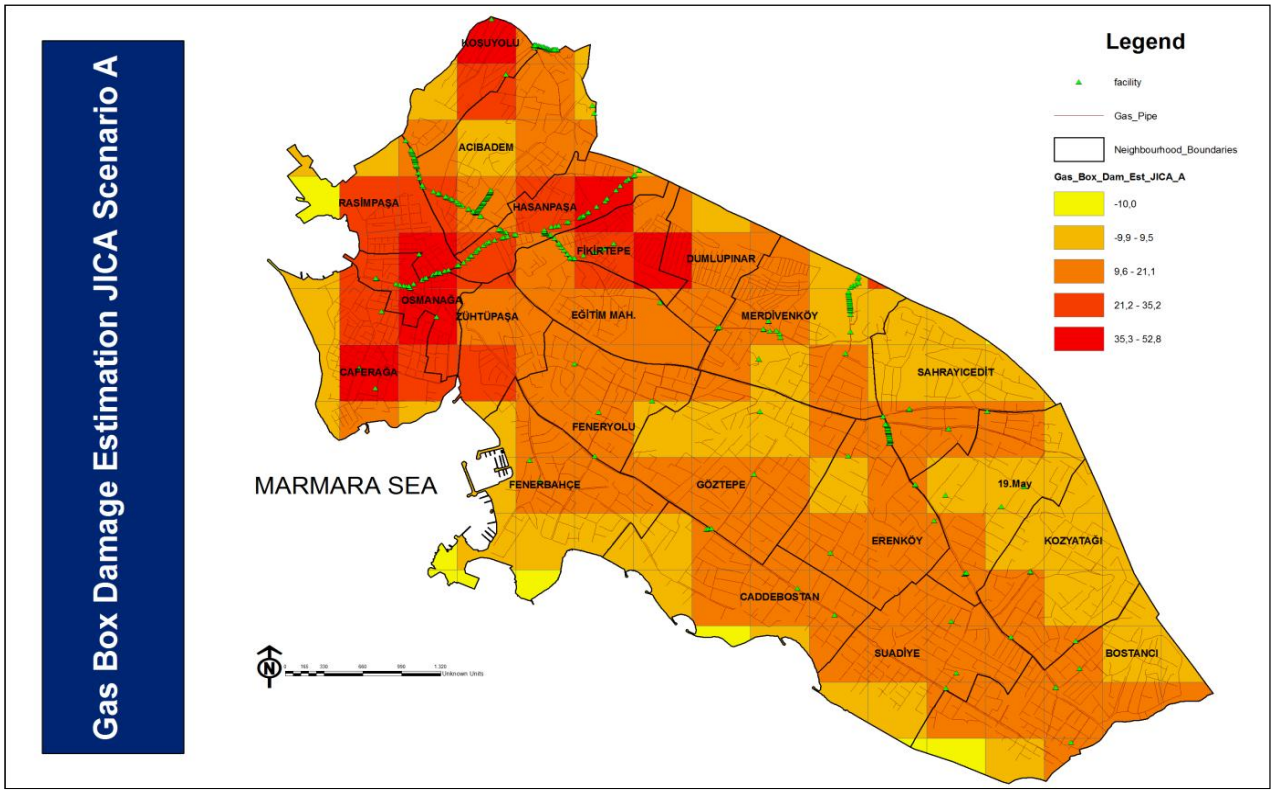


Figure 10: Gas box damage Estimation JICA Scenario A

In order to facilitate the emergency response process, the district is, in a rough manner, divided in 3 categories (regions) according to their building vulnerabilities and the possibility to produce casualties, region 1 and 3 being the most and the least critical ones respectively. Therefore, region 1 is the area that will need the most intense emergency response activities and resources.

The representation of this division is as follows:

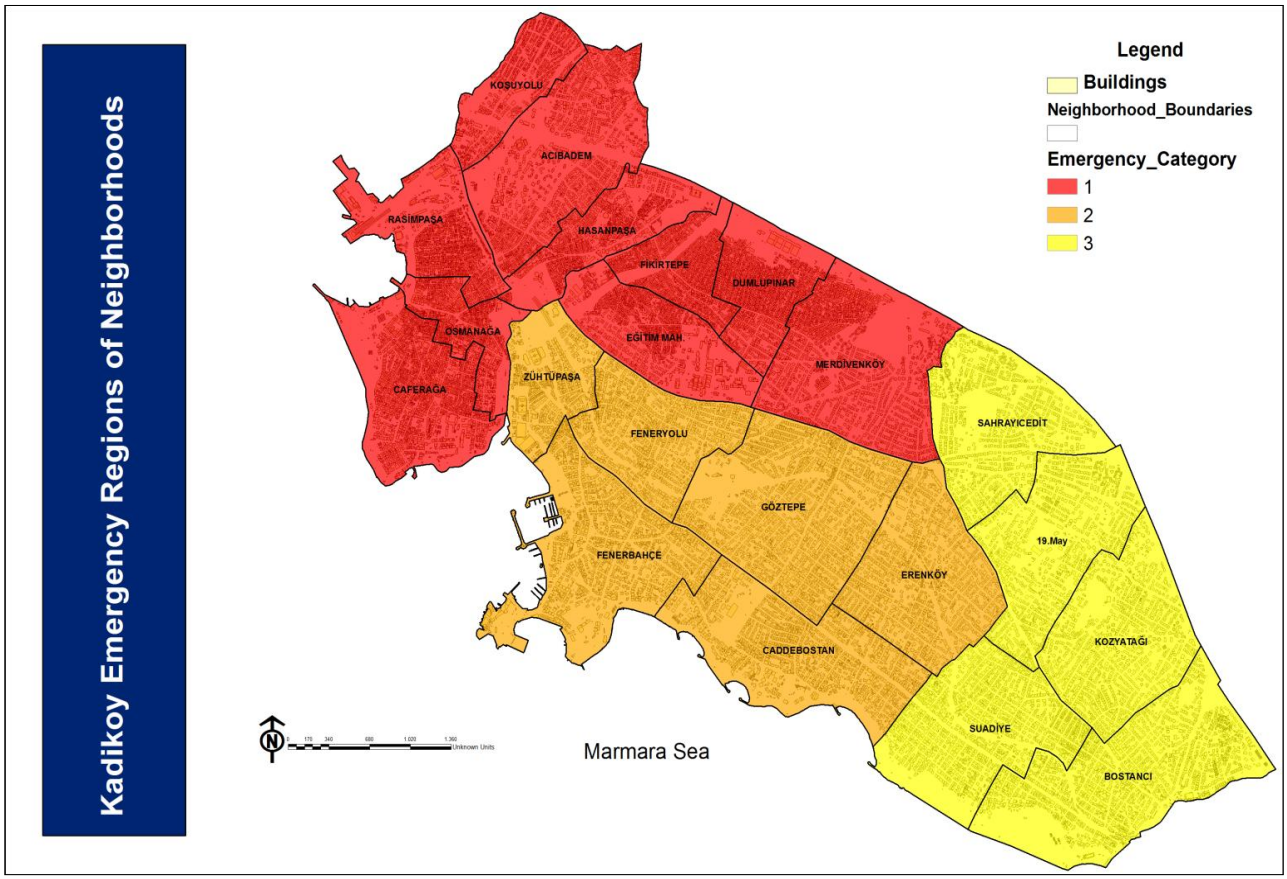


Figure 11: Kadikoy Emergency Regions of Neighborhoods

2.3. ANALYSIS of the POPULATION in the STRICKEN AREA

In Kadikoy, the demographic distribution of the population is as follows:

Age Group	Female	Male	Total
0-4	11058	11626	22684
5-9	10847	11797	22644
10-14	12853	13064	25917
15-19	14705	15241	29946
20-24	19397	18619	38016
25-29	24744	22701	47445
30-34	24734	22244	46978
35-39	22554	19978	42532
40-44	21157	17746	38903
45-49	21511	17719	39230
50-54	21145	17489	38634
55-59	18547	15552	34099
60-64	16800	13400	30200
65-69	13071	10142	23213
70-74	10806	7541	18347
75-79	9692	6453	16145
80-84	7739	4184	11923
85-89	3185	1582	4767
90+	1314	515	1829
Total	285859	247593	533452

Table 2: Demographic Distribution of Population in Kadikoy

The number of casualties and injured people are estimated to be 3885 and 5195 respectively. The places where the highest casualties are expected are the neighborhoods of Fikirtepe, Rasimpasa and Osmanaga where the building vulnerability is relatively higher.

On the other hand, the greatest number of families requiring temporary sheltering is defined to be in the neighborhoods of Merdivenkoy, Goztepe, Erenkoy and Kozyatagi. Despite the fact that the physical vulnerability assessment stated that these areas are relatively more secure, the building population density led to more refugees forming. The expected numbers are as follows:

Code	Name	Casualty	Injured	Population Heavily Damaged	Population Moderately Damaged	Population Partly Damaged	Population Need Sheltering
1	Acıbadem	67	90	1139	9738	1659	3558
3	Bostancı	48	65	1171	7567	1316	3866
4	Caddebostan	41	54	721	4603	812	2348
5	CaferAğa	372	498	1317	23994	3952	3359
6	Dumlupınar	296	396	912	22126	3645	2354
7	Erenköy	54	72	1300	9842	1699	4015
8	Eğitim Mah.	188	251	1352	16702	2761	3315
9	Fenerbahçe	41	55	892	5216	919	2767
10	Feneryolu	42	56	866	7309	1287	2832
11	Fikirtepe	1039	1390	1777	63565	10611	3405
12	Göztepe	49	66	1210	8394	1457	4069
13	Hasanpaşa	302	404	1489	22755	3748	3507
15	Kozyatağı	32	42	1184	7423	1343	3926
16	Koşuyolu	267	357	577	9956	1641	1197
18	Merdivenliköy	118	157	1463	15875	2648	4510
19	Osmanağa	366	490	375	9920	1634	660
20	Rasimpaşa	378	506	1016	19761	3255	2332
21	Sahrayıcedit	28	38	989	6053	1112	3267
22	Suadiye	65	86	1141	8818	1505	3486
26	Zühtüpaşa	64	86	1035	6811	1163	2489
28	19 Mayis	28	37	1150	6447	1186	3238
	Total	3885	5195	23075	292874	49354	64499

Table 3: Number of casualties, injured people, and persons requiring shelters

2.4. ACCOUNTING of AVAILABLE RESOURCES

The classification of available resources is stated as follows:

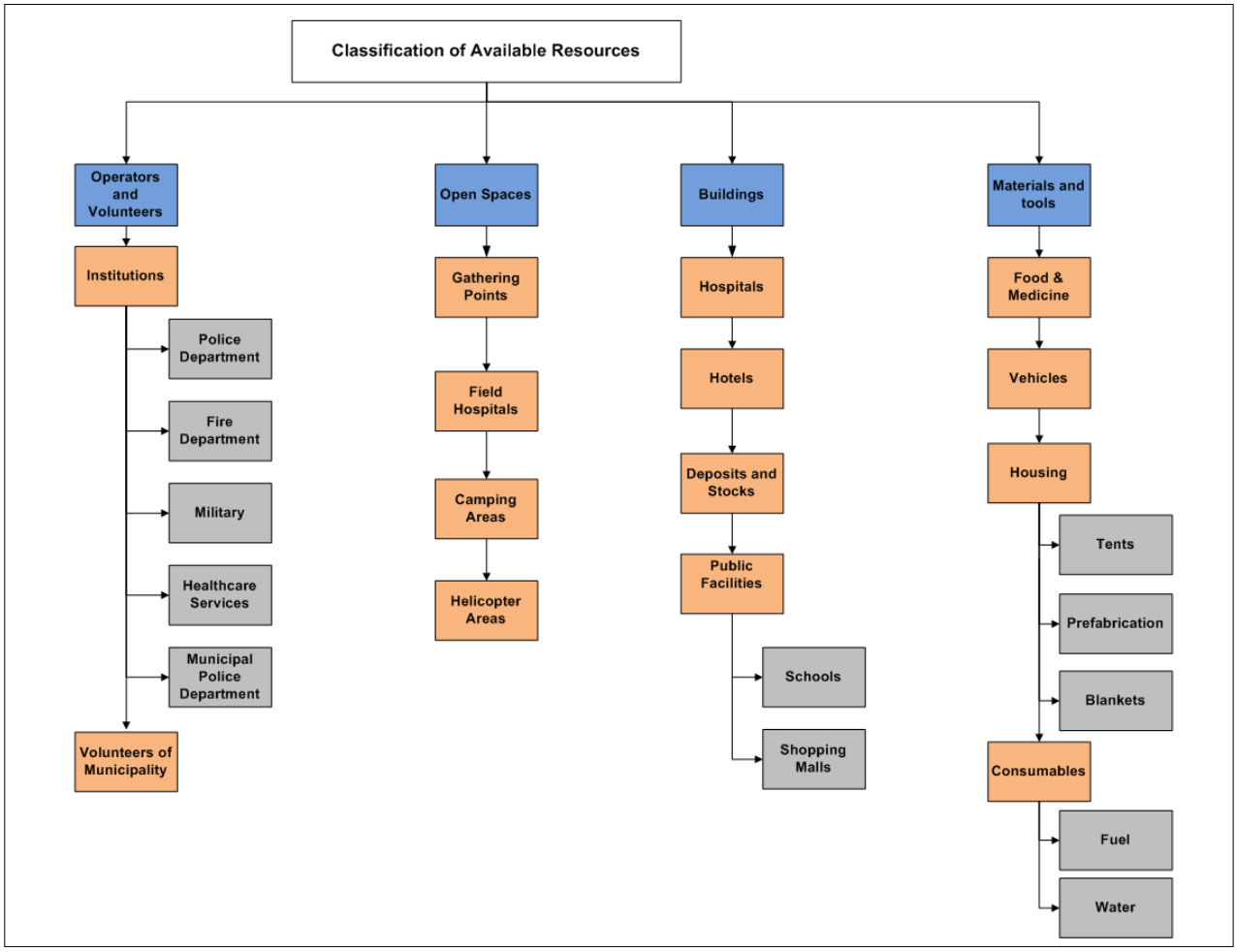


Figure 12: Classification of Resources

Operators and Volunteers take their places in the correspondent service providers of the municipality.

Volunteers are made up of people who attended several training programs held by the municipality. For more information please refer to section 2.5.

The operator and volunteers are presented in table 4.

	Type of Institution	Name/Location	People	Notes	Contact info
Operators and Volunteers	Fire Department	Tutuncu Mehmet Efendi Cad. 72,Goztepe Mah.	5 drivers, 23 firemen	1 guidance vehicle 2 fire extinguishing vehicles	0216 575 2118
		Sogutlucesme Cad. Turbe Sok. ,Osmanaga Mah.	12 drivers, 58 firemen		0 216 336 0872
	Police Stations	Sahrayıcedit	not enough data available		0 216 411 30 72
		Bostanci	not enough data available		0 216 658 7820
		Rasimpasa	not enough data available		0 216 336 4339
		Goztepe	not enough data available		0 216 478 1720
		Hasanpasa	not enoughdata available		0 216 428 1040
	Municipal Police	Sogutlu Cesme	16 drivers 35 laborers	12 vans (double cabin) 4 type van glassy vehicles 2minibuses 2 towing trucks 1 Welding Machine 92 walkie talkies	0 216 542 5052
	Volunteers	various	2690 volunteers		

Table 4: Operators and Volunteers

Open Spaces

The gathering points which function also as the emergency control and public information centers refer to the areas that the people are assembled initially after the earthquake. Each gathering point is run by a site coordinator that manages the activities in the coverage areas defined in figure 10 while a designated spokesperson informs the community and public information coordinator based on the communication plan. Other members of the gathering point (emergency control center in the neighborhood) include search and rescue teams, volunteers and other groups working in the coverage area.

Gathering Points			
Code	**Neighbourhood**	**Name**	**Neighborhood to benefit**
16	Kosuyolu	Kosuyolu Pazar Park	Kosuyolu
1	Acibadem	Marmara Univ. Guzel Sanatlar Facullty	Acibadem
13	Hasanpasa	Hasanpasa IETT Area	Hasanpasa, Fikirtepe
13	Hasanpasa	Incirli Bostan Sport area	Hasanpasa, Fikirtepe
6	Dumlupinar	Devlet Malzeme Office	Dumlupinar ,Fikirtepe
6	Dumlupinar	Dumlupinar Gathering area/ Okul area	Dumlupinar, Merdivenkoy, Egitim Mah.
18	Merdivenkoy	Gozcubaba Parki	Merdivenkoy
18	Merdivenkoy	S.S.K Goztepe Parki	Merdivenkoy, Egitim Mah, Goztepe, Feneryolu
18	Merdivenkoy	Halit Berk Primary school	Merdivenkoy, Dumlupinar
21	Sahrayıcedit	Intas Park	Sahrayıcedit
21	Sahrayıcedit	Sahrayicedit Park	Sahrayıcedit, Merdivenkoy
21	Sahrayıcedit	Sahrayicedit Isiklar Park	Sahrayıcedit, Erenkoy, Merdivenkoy
28	19 Mayis	STFA Woods	19 Mayis
28	19 Mayis	Cevre High School	19 Mayis, Sahrayicedit, Erenkoy
15	Kozyatagi	Kozyatagi Primary High School	Kozyatagi
15	Kozyatagi	Hakki Deger Primary School	Kozyatagi, Bostanci
3	Bostanci	Senesevler High School	Bostanci, Kozyatagi
3	Bostanci	Bostanci Gosteri Merkezi	Bostanci
3	Bostanci	Bostanci IDO port park	Bostanci
22	Suadiye	Suadiye Seaside gathering point	Suadiye, Bostanci
22	Suadiye	Haci Mustafa Tezman High School	Suadiye, Kozyatagi
22	Suadiye	Mediha Tansel primary school	Suadiye
4	Caddebostan	Caddebostan Seaside gathering point	Caddebostan
4	Caddebostan	Caddebostan Migros Supermarket	Caddebostan
4	Caddebostan	Tarim Il Mudurlugu Building	Caddebostan, Erenkoy
7	Erenkoy	Zıhni Pasa Primary School	Erenkoy
7	Erenkoy	Fehmi Eksi Primary School	Erenkoy
12	Goztepe	Efdal Primary School	Goztepe, Caddebostan
12	Goztepe	Anadolu Ticaret Meslek High school	Goztepe, Merdivenkoy, Egitim Mah, Feneryolu
10	Feneryolu	Kalamis Muhtarlik Park	Feneryolu
10	Feneryolu	Melahat Sehzade Primary School	Feneryolu, Zuhtupasa, Egitim mah.
9	Fenerbahce	Fenerbahce Seaside gathering point	Fenerbahce, Caddebostan
9	Fenerbahce	Selamicesme Parki	Fenerbahce, Feneryolu, Goztepe
26	Zuhtupasa	Kenan Evren High School	Zuhtupasa, Osmanaga
5	Caferaga	Caferaga Seaside Gathering point	Caferaga
5	Caferaga	Kadikoy Kiz Meslek High School	Caferaga
5	Caferaga	Rihtim Caddesi Gathering Point	Caferaga, Osmanaga
19	Osmanaga	Sali Pazari	Osmanaga, Hasanpasa, Zuhtupasa
20	Rasimpasa	Kadikoy Sabit Bazaar	Rasimpasa, Osmanaga

Table5: Gathering Points in Kadikoy

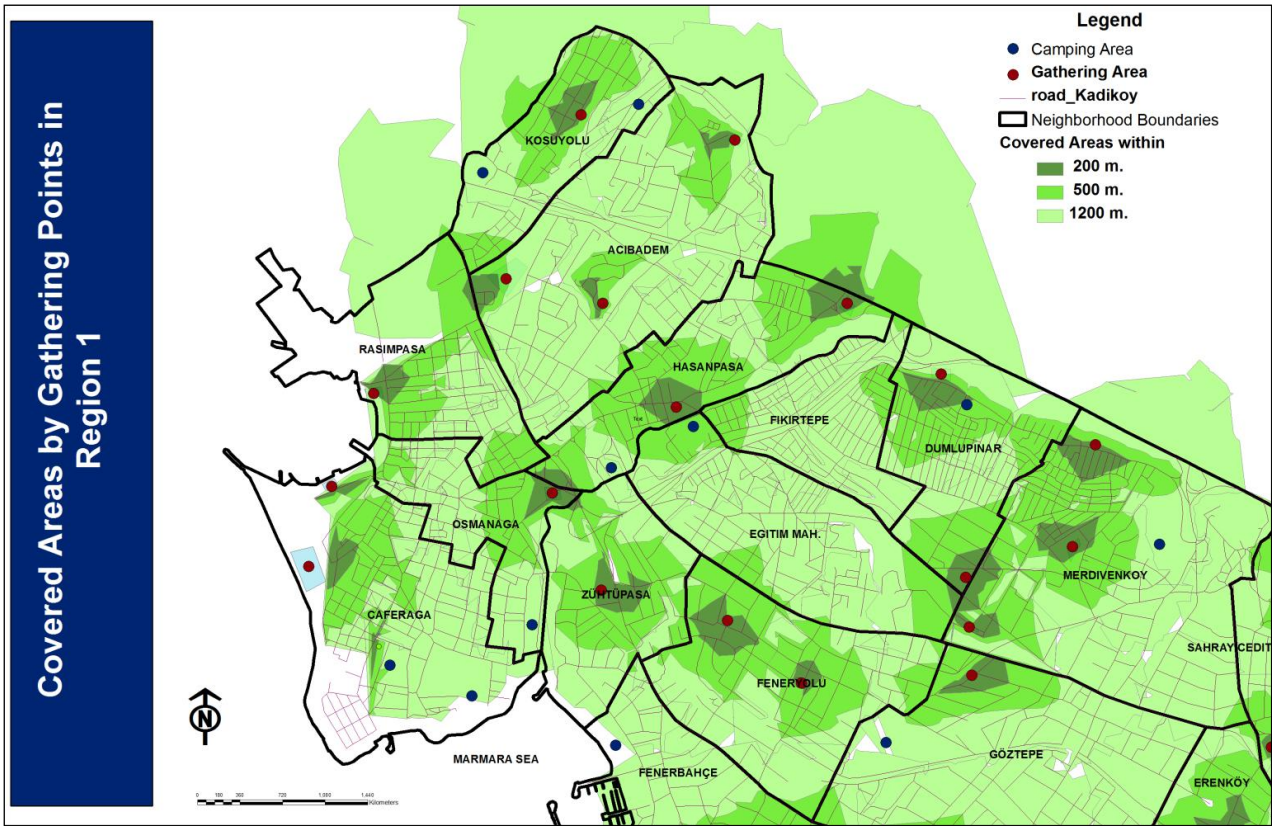


Figure 13: Covered Areas by Gathering Points in Region 1

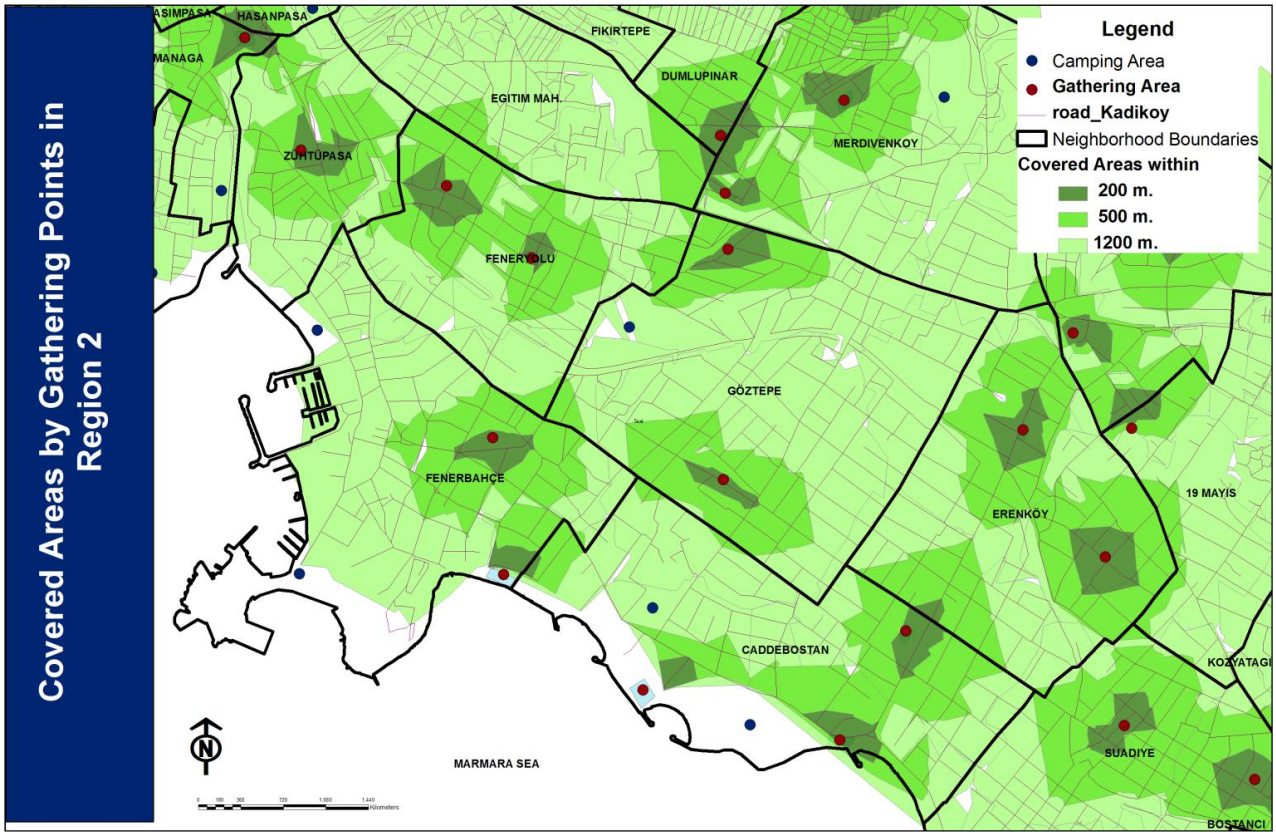


Figure 14: Covered Areas by Gathering Points in Region 2

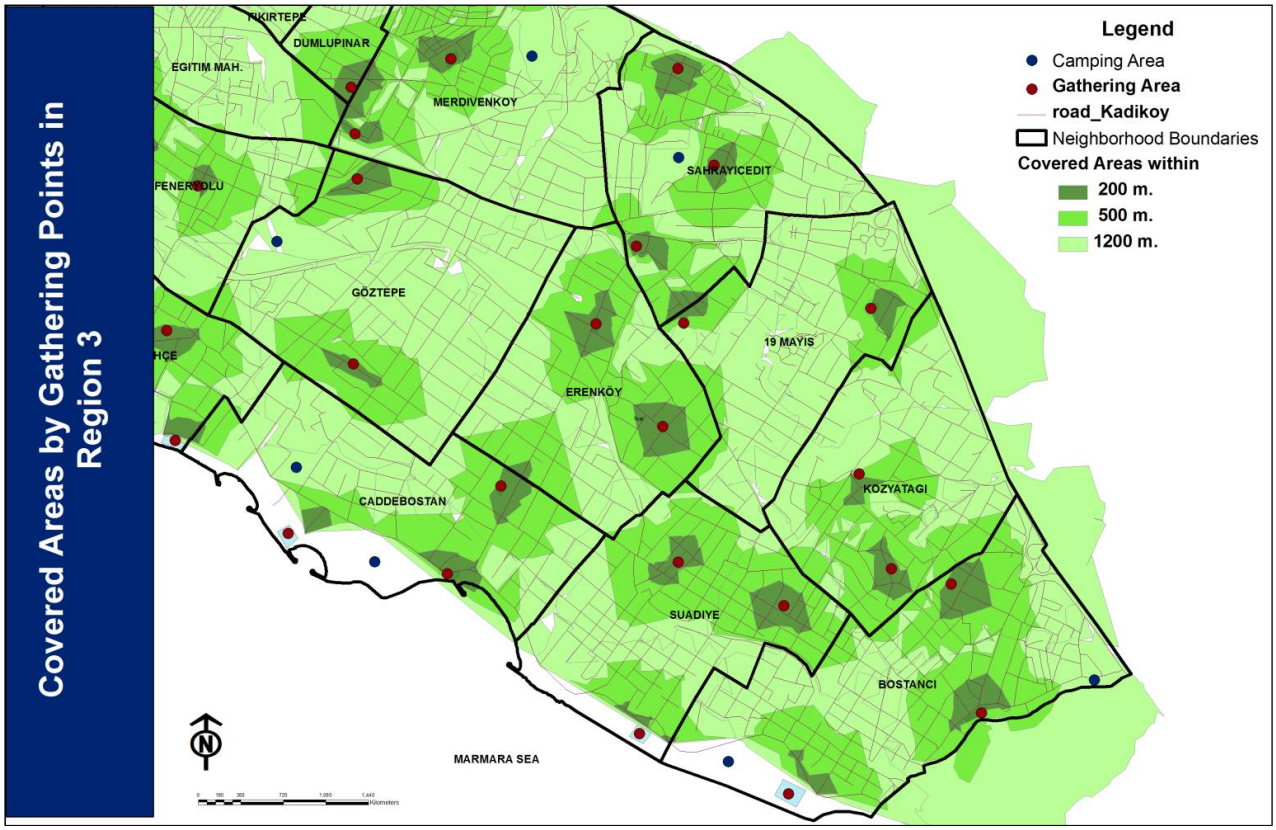


Figure 15: Covered Areas by Gathering Points in Region 3

The camping areas are formed in order to host temporarily the people requiring shelters after the earthquake. Consequently, a part of the people accommodating in these areas are transferred to prefabricated houses until their permanent accommodations are set up. The gathering points (Caferaga Seaside Gathering Point, Rihtim Caddesi Gathering Point, Kadikoy Sabit Halk Bazaar, Fenerbahce Seaside Gatherig Point, Caddebostan Gathering Point, Caddebostan Migros Shopping Mall, Bostanci IDO) and camping areas (Kadikoy Anadolu High School, Fenerbahce Port camping area, Fenerbahce Park, Caddebostan Migros Shopping Mall, Bostanci Seaside) that are located at the shore are to benefit also from the sea transportation for all logistic needs fornicated by the transportation service providers of the municipality.

The camping points, their capacities and locations are described in the next page:

Camping Area				
Code	**Name of Neighbourhood**	**Location**	**Area (m2)**	**Number of tents**
16	Kosuyolu	Kosuyolu Park	12000	200
16	Kosuyolu	Karacaahmet Mez. Arkası	10000	200
13	Hasanpasa	Kadikoy Belediyesi Parking Lot	17000	280
19	Osmanaga	Yogurtcu Park	20000	200
5	Caferaga	Kadikoy Anatolian High School	22000	250
5	Caferaga	Moda Sabit Pazari ve otoparkı	8000	80
9	Fenerbahce	Fenerbahce Parki	60000	850
8	Egitim Mah.	IETT Garage	8000	130
6	Dumlupinar	Fenerbahce Sport Facilities	19000	300
18	Merdivenkoy	Cocuk Esirgeme Kurumu Yard	96000	1650
12	Goztepe	Selamicesme Ozguluk Park	120000	2000
4	Caddebostan	Goztepe Park	90000	1500
21	Sahrayıcedid	Ataturk Caddesi Cebe Sokak	70000	1000
9	Fenerbahce	Fenerbahce Port Camping Area	15500	260
3	Bostanci	Bostanci New Bazaar	30000	500
3	Bostanci	Bostanci Seaside Camping Area	35000	775
4	Caddebostan	Migros Camping Area	85000	1450
		Total=	717500	11625

Table6: Camping Areas in the Kadikoy Neighborhoods

The areas for landing of the aircraft:

Helicopter Areas		
Code	**Neighbourhood**	**Location**
16	Kosuyolu	Kosuyolu Cardio Hosp. Park Area
13	Hasanpasa	Incirlibostan Foottball Area
5	Caferaga	Moda Sabit Bazaar
26	Zuhtupasa	Fenerbahce Stadium
8	Egitim Mah.	Goztepe Hospital
18	Merdivenkoy	Poliklinik

Table 7: Helicopter areas in the District

The sites for machinery are displayed in tables 6:

Sites For Heavy Machinery			
Code	**Neighbourhood**	**Location**	**Area (m2)**
6	Dumlupinar	Devlet Malzeme Ofisi	3000

Table 8: Sites for Heavy Machinery

The areas identified by the municipality to serve as field hospitals are:

Field Hospitals			
Code	**Neighbourhood**	**Location**	**Area (m2)**
26	Zuhtupasa	Fenerbahce Stadi	32000
21	Sahrayıcedit	Spor klubu	6630

Table 9: Field Hospitals

The medicine stock extracted from the strategic plan of the municipality:

Medicine Stocks		
Code	**Location**	**Number of Stocks**
16	Kosuyolu	1
1	Acibadem	6
11	Fikirtepe	**1**
21	Sahrayıcedit	1
7	Erenkoy	1
8	Egitim Mah.	1
19	Osmanaga	**2**
20	Rasimpasa	3
	Total	16

Table 10: Medicine Stocks

The tools and equipment belonging to the municipality are stated below in table 10.

Vehicles Belonging to Municipality	
Type of Vehicle	**Number of Vehicles**
Trucks	13
Vans	49
Minibuses	17
Cranes	5
Ambulances	2
Heavy Machinery	21
Funeral Vehicles	2
Road Sweeping Vehicle	11
Buses (30 people)	1
Tow Trucks	2
Water tankers	7
Vehicles for disabled	2
Cleaning	12
Total	144

Table 11: Vehicles Belonging to Municipality

Buildings

The needed resources which are buildings include **hospitals, hotels, stocking points, public facilities (**schools, shopping malls…**)**

The hospitals are the most significant buildings in emergency situations and it is important that their serviceability is assured before the event. All private and public hospitals (except clinics for outpatients, radiological centers) in the area, their addresses and bed capacities are shown in table 12.

		NAME	BED CAP.	ADRESS	CONTACT
Buildings	STATE HOSPITALS	KOSUYOLU ARASTIRMA HASTANESI	380	Salih Omurtak Cad., Kosuyolu	0216 336 91 96
		GOZTEPE EGITIM ve ARASTIRMA HOSPITAL	757	Doktor Erkin Caddesi , Goztepe	0 216 566 40 40
		MERDIVENKOY EGITIM ve ARASTIRMA HOSPITAL		Ressam Salih Ermez Cad.	0 216 566 66 60
		GOZTEPE EGITIM HOSPITAL		Kayısdagı Cad.	0 216 349 70 12
		ERENKOY RUH VE SINIR HASTALIKLARI HOSPITAL	550	Erenköy Mah. Sinan Ercan Cad. No:29	0 216 302 59 59
		PTT HOSPITAL	500	E5 Karayolu Üzeri Bostancı	0 216 578 30 00
		HAYDARPASA NUMUNE HOSPITAL	665	Tıbbıye Cad. No: 40	0 216 414 45 02
		VALIDEBAG HOSPITAL	200	Kalfacesme Sokak No:1	0 216 47479 00
		GATA	216	Selimiye Mahallesi	0 216 542 20 20
		SIYAMI ERSEK HOSPITAL	525	Tıbbiye Cad. Haydarpasa	0 216 444 52 57
	PRIVATE HOSPITALs	ACIBADEM HOSPITAL	132	8, Acıbadem Kadıköy	0 216 544 44 44
		ACIBADEM KOZYATAĞI HOSPITAL	91	İnönü Cad. Okur Sok. No.20 Kozyatağı	0 216 571 44 44
		ÇAGINER HOSPITAL	33	Uzun Çayır Caddesi Mirim Çelebi Sokak No:1	0 216 428 48 00
		FERIHAN LACIN HOSPITAL	36	Sarayardı Cad. No: 24	0 216 450 05 05
		ECHOMARGÖZTEPE HOSPITAL	58	Merdivenköy Yolu Şahika Sok. No:32 Göztepe	0 216 444 91 44
		GÖZTEPE ŞAFAK HOSPITAL	87	Fahrettin Kerim Gökay Cad. No:192	0 216 565 44 44
		İSTANBUL MEDİPOL HOSPITAL	60	E-5 Harem Yolu Üzeri	0 216 544 66 66
		KADIKÖY ŞİFA HOSPITAL	51	Caferağa 34710 Kadıköy	0 216 449 22 22
		KOZYATAĞI CENTRAL HOSPITAL	49	Kocayol caddesi Kozyatağı sokak No.5	0 216 410 77 99
		UNIVERSAL HOSPİTAL	128	Kurbağalıdere cd. no.108 34722 Hasanpaşa	0 216 339 23 71
		KADIKOY FLORENCE NIGHTINGALE HOSPITAL	75	Bağdat Cad. No:63 Kızıltoprak	0 216 450 03 03
		MEDİCAL PARK GÖZTEPE HOSPITAL	306	E5 Üzeri 23 Nisan Sok. No: 17 Merdivenköy	0 216 46844 44
		CIFTEHAVUZLAR MEDICAL CENTER	60	Bağdat Caddesi Tepegöz Sokak No: 1	0216 444 03 53
		YEDITEPE UNIVERSITY BAGDAT CADDESI HOSPITAL	43	Bagdat Cad. No: 238	0 216 467 88 60
		YEDITEPE UNIVERSITY HOSPITAL	190	Devlet Yolu Ankara Cad. No:102	0 216 578 40 00

Table 12: Hospitals in Kadikoy

Both the private and state hospitals in the area are responsible for implementation of hospital emergency plans, liaising with the emergency control centers as required, evaluating requests and making arrangements for the provision of medical site teams, when necessary requesting assistance from the ministry of health.

Another group of building resources is the **hotels** in the area. In emergency situations, the prefect can order the accommodation of the population temporarily in the hotels in case the temporary shelters are not sufficient. The hotels in the district are represented in Table 13.

Buildings	Hotels	Name	Bed Capacity	Address	Contact Info
		Kadikoy Aden Hotel	180	Rihtim Caddesi 2	0 216 345 1000
		Kadikoy Gloria Hotel	150	Rihtim Caddesi Misak-ı Milli 26	0 216 449 1654
		Grand AS Hotel	80	Nushet Efendi Sokak 27	0 216 346 9161
		Kadikoy Hotel Nova	64	Rihtim Cad. Resit Efendi Sok. 24	0 216 550 0351
		My Dora Otel	120	Rihtim Cad. Recaizade Sok. 6	0 216 414 8350
		Deniz otel	192	Sahap Gurler Cad. 2	0 216 348 74 55
		ByOtell	226	Saniye Ermutlu Sok. 3.	0 216 571 6100
		Sidonya Otel	80	Rihtim Cad. Nemlizade Sok. 34	0 216 349 5308
		Zirve Otel	100	Rihtim Cad. 36	0 216 414 5142
		Rihtim Otel	180	Rihtim Cad. 62	0 216 349 4991
		The Bostanci Hotel	150	Mehmet Sevki Pasa Cad. 20	0 216 362 4848
		Kadikoy Zümrüt Hotel	64	Rihtim Cad. 5	0 216 450 0454
		Dila Hotel	160	Fuat Bey Sok. 5	0 216 418 8383
		Eysan Hotel	192	Rihtim Cad. 26	0 216 346 2440
		Hotel Suadiye	314	Plaj yolu 25	0 216 445 8424

Table 13: Hotels in Kadikoy

Stocking Areas			
Code	**Neighbourhood**	**Location**	**Area (m2)**
16	Kosuyolu	Park across Cardiological Hosp.	3800
1	Acibadem	Imam Hatip Lisesi	11700
13	Hasanpasa	Sogutlucesme T.C.D.D	15000
20	Rasimpasa	Haydarpasa T.C.D.D	90000
20	Rasimpasa	Et veBalik Kurumu	13800
5	Caferaga	Caferaga Sport Center	1800
5	Caferaga	Baris Manco Kultur Merkezi	1100
26	Zuhtupasa	Zubeyde Hnm Evlendirme Dairesi	19000
18	Merdivenkoy	Kati Atik istasyonu	2000
3	Bostanci	Sporium Tesisleri	15000

Table 14: Stocking Areas in Kadikoy

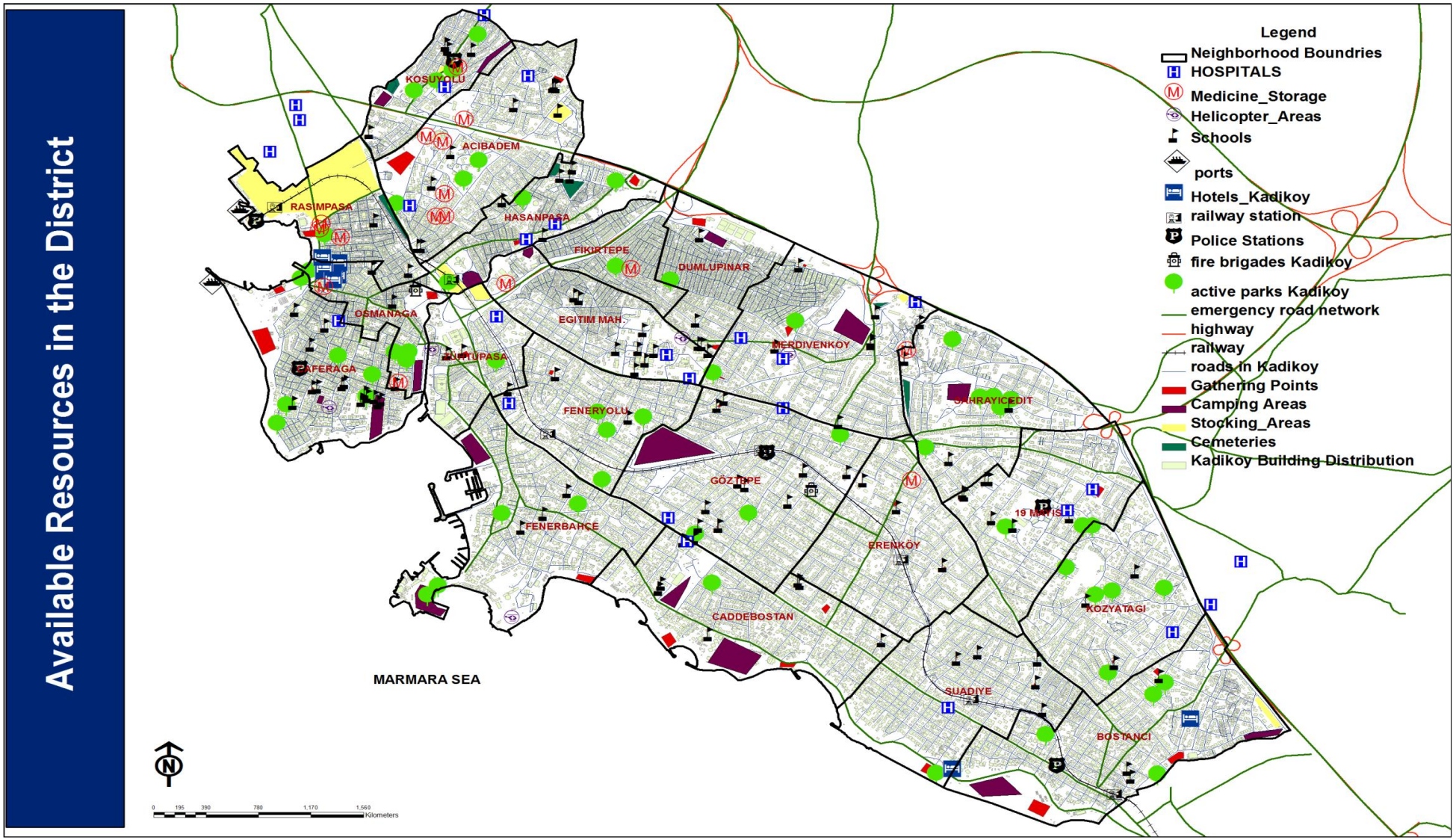


Figure 16: Available Resources in the District

2.5. DEFINITIONS of the AUTHORITIES INVOLVED

A major earthquake will generate a large number of response requirements, and there are a number of agencies which can respond at all levels of government and in the private sector. As many of the response activities to be performed require coordinatedactions by multiple agencies, a functional organization for response has been used to make this feasible. The range of tasks to be performed have been categorized into "Emergency Service Providers Functions".

The response to an emergency or disaster is managed at the lowest level possible. Accordingly, local government has the primary responsibility for the response to an emergency or disaster. When the needs exceed the capabilities of the district, mayor may request assistance from neighboring districts and or the disaster and emergency management presidency. The assignment of the authorities and duties is performed according to the disaster law 7269 in the Turkish constitution. The service providers on the local basis and their responsible persons are:

Telecommunication Service Provider: is composed of officers from Turk Telecom directorate, Security directorate, private GSM operators, police department and military service.

Transportation Service Provider has officers from Public Works and Settlement local directorate, Road and Highway Department, DLH (Port Services of the State), TCDD (Rail way Services of the State), IDO (Istanbul Sea Transport)

Search and Rescue Service Provider is managed by Civil Defense Directorate and officers from fire department and other nongovernmental organizations (A.K.U.T) that have rescue teams and engineers trained in shoring from the chamber of civil engineers.

First Aid and Health Care Service Providers are composed of personnel from public, private and military hospitals, Kizilay, Civil Defense, and Religious Affairs.

Wreckage Lifting and Temporary Sheltering has officers from Public Works and Settlements Directorate, ISKI, AYEDAS, IGDAS, Kizilay and military.

Preliminary Damage Assessment is composed of people from the Public works and settlements general directorate and engineers from the chamber of civil engineering and private organizations.

Security Service Provider has people from police department and military.

Electricity, Water, Sewage has people from ISKI (Istanbul Water and Sewer Affairs), IGDAS (Istanbul GAS Distribution Affairs), and AYEDAS (Istanbul Asian Side Electricity Distribution).

Buying, Renting, Confiscating and Distribution Service Provider is composed of people from Public Works and Settlements Directorate, Head of Financial Department of the District for the buying, renting and confiscating process and Public Works and Settlements, Kizilay, Civil Defense Directorate for the distribution process.

External Aid Service Providers are made up of Kizilay people and volunteers.

The Emergency response process is managed by the municipality and in the gathering points (emergency control centers) predefined officers will be in charge as members of the field response units.

The duties of these organizations will be addressed separately for each phase of the emergency in sections 3, 4 and 5.

Additionally, municipality has to ensure that emergency responders and managers have received training in the areas including use of emergency response, health and safety and supplies, public notification district wide.

The hierarchical organizational chart for the authorities to act in an emergency situation represented in the following figure.

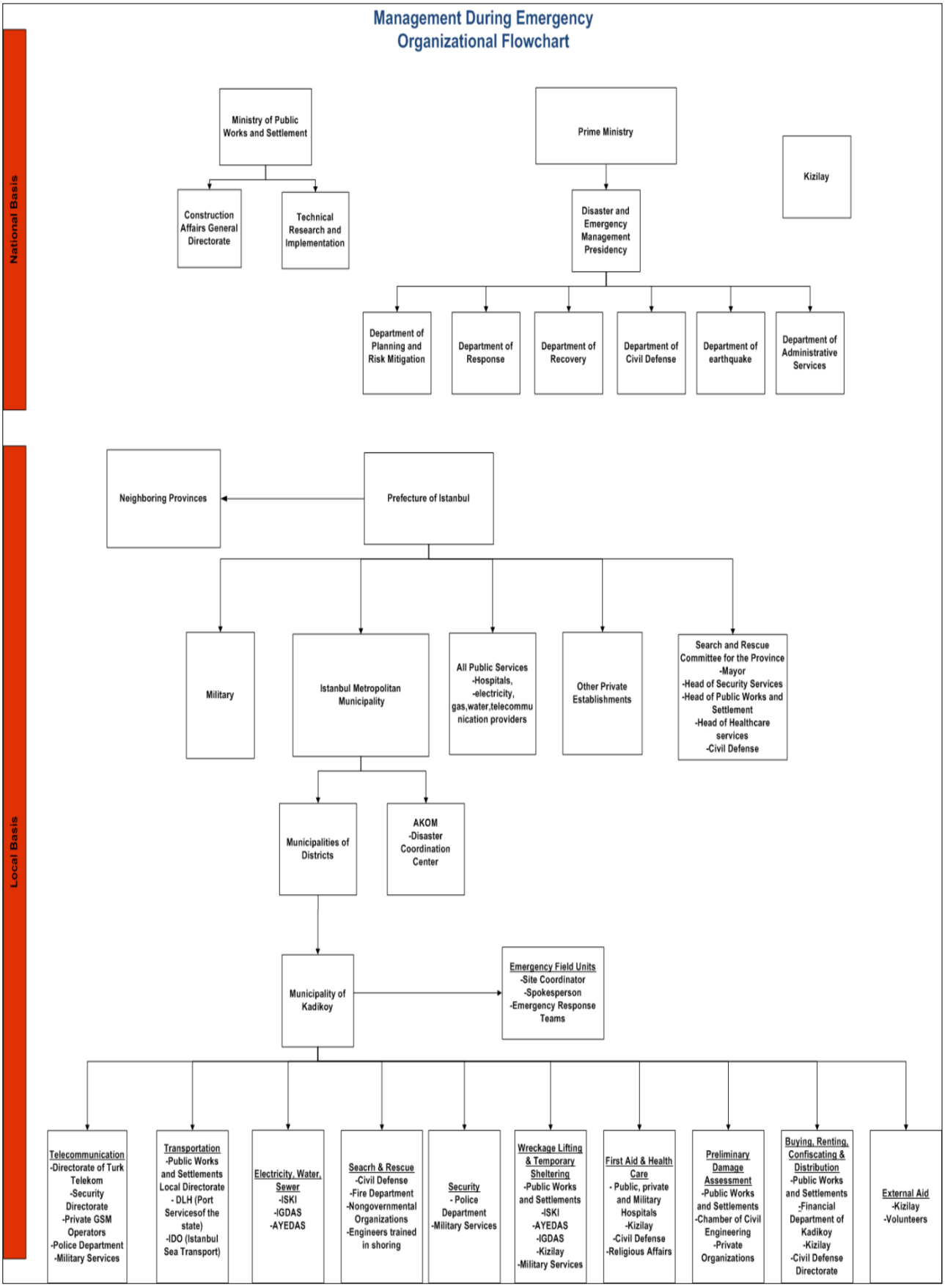


Figure 17: Organizational Flow Chart

2.6. The COMPLETE EVENT SCENARIO

The complete event scenario describes the probable chains of events following the striking of the earthquake with a defined timeline. It does not only take into account the direct damages that the objects themselves suffer but also considers the physical induced damages and induced hazards that arise on account of the inter and intra connectedness of the elements of the built environment. Moreover, the complete event scenario is utilized in the process of description of the phases and correspondent emergency operations.

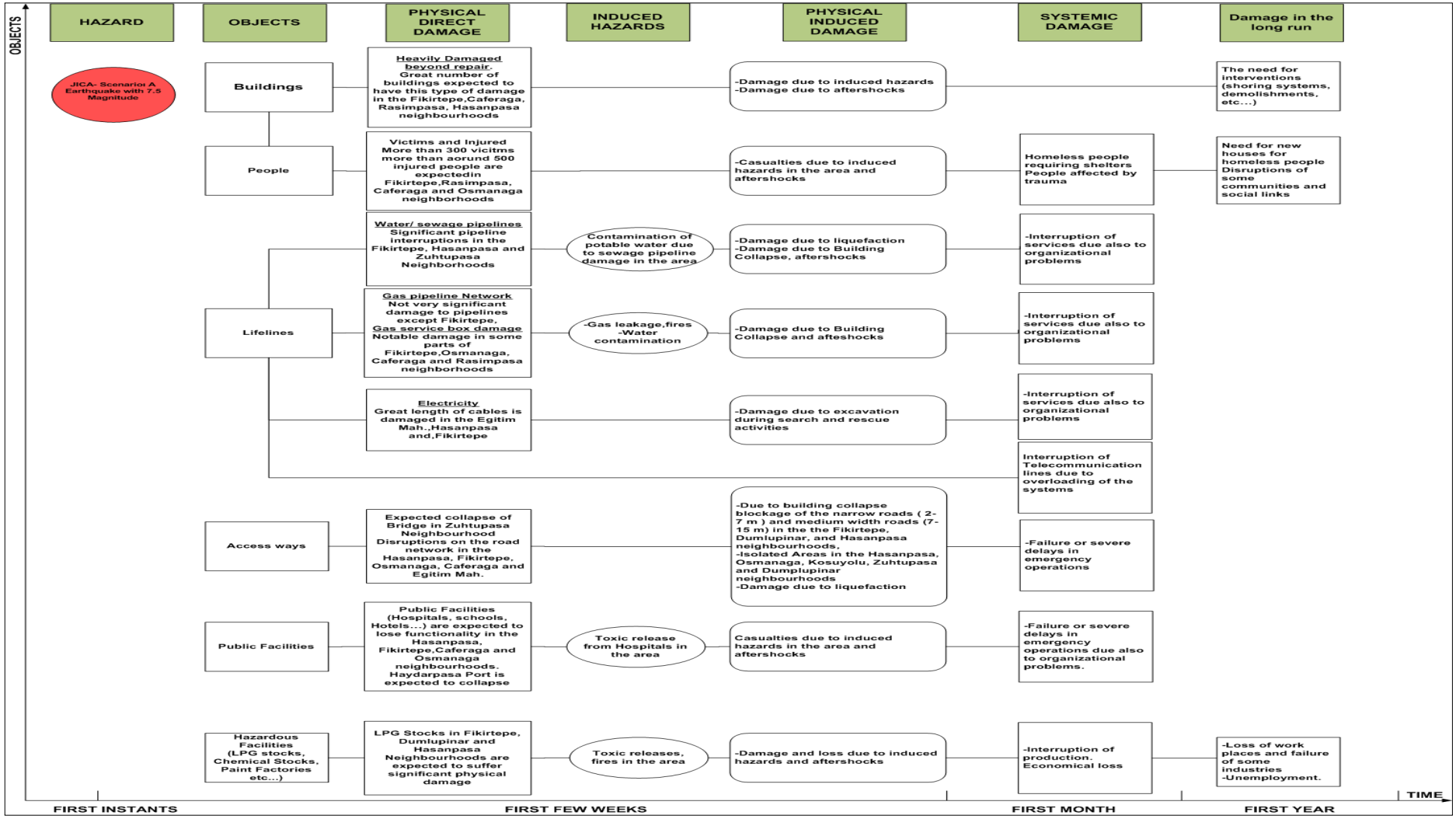


Figure 18: The Complete Event Scenario demonstrating the chain of incident

INITIAL RESPONSE: FIRST 72 HOURS

3. INITIAL RESPONSE: FIRST 72 HOURS AFTER the IMPACT

The stage of initial response starts immediately after the earthquake. The previously explained emergency service providers assemble without authorization and the field response units take their assigned operating areas in various parts of the district. The security personnel that happen to be on the field at the time of the incident provide information to the authorities in the emergency management centers via their handled radio equipment. Any field personnel are expected to assess their situation and identify any threats to safety, following the response procedures established by the emergency plans of their departments.

In this phase, the primary government response role is the saving and protection of life and property. The priorities in this stage are gathering information about the earthquake and the damaged zones, assuring the availability of access ways for the rescue teams to reach the critical areas, rescuing persons from under the wreckages and their transfers to the nearest hospitals, establishment and management of the gathering and camping areas. Emergency response and recovery of public facilities such as hospitals receive high priority for restorations. At the same time, the community residents are responsible for helping each other survive.

3.1. MONITORING of the ONGOING SITUATION

The critical information on this stage regards:

- The earthquake magnitude, aftershocks and damaged areas.
- Number and locations of dead and injured people.
- Location of severely damaged and collapsed structures.
- The situation in the expected isolated areas.
- Location and estimated number of people trapped in collapsed structures.
- The well being of the emergency response responsible persons and their replacements
- The state of the assigned gathering and camping areas
- Details regarding the designated emergency routes
- Locations and extent of secondary events including fires, hazardous material leaks.
- Requirements for major evacuations and estimated number of people displaced.
- Establishment and arrangement of the gathering points and temporary shelters.
- Status of communication systems including emergency communication means, public phone and wireless systems, 112 dispatch systems
- Damage to critical public buildings including hospitals, police, fire facilities, schools and other infrastructures.
- Status of and damage to major lifeline systems including water, sewer, electricity and natural gas.
- Debris removal and clean up

3.2. ACTIONS on VULNERABLE & to be DAMAGED ZONES

Level	Name of the Authority	Responsibility
National Basis	Disaster and Emergency Management Presidency	-Declaring the Emergency
	Response Department	-Managing the Prime Ministry Disaster and Emergency Situations Center -Verifying the presence and points of consequent induced hazards -Establishing and managing of emergency management centers at governmental agencies and in provinces by using all resources -Ensuring coordination between Ministries in this regard
	Kizilay	-Immediate verification of the resources and initiation of supplying food, blood, blankets, etc... -Participating health care and emergency activities in the damaged zones
Local Basis	Prefect of Istanbul	-Ordering all of the establishments of emergency centers -Alarming all the responsible authorities in the local basis including public service providers. -Alerting the Disaster Management Centers (Kadikoy) -Getting in contact with private establishments -Contacting and requesting assistance to meet the needs from the neighboring provinces and military services based on the predefined collaborations -Inspecting the work performed by the emergency service providers. -Informing the community and the prime ministry on the current situation
	Istanbul Metropolitan Municipality	-Alerting A.K.O.M (Disaster Coordination Center)
	A.K.O.M Disaster Coordination Center	-Ensuring the coordination among the departments of the Municipality -Updating the municipalities of the districts (Kadikoy)

	Municipality of Kadikoy	Mayor	-Managing and supervising the restoration activities -Keeping contact with the authorities on the national basis for the requirements on the local basis -Approving news releases and public announcements
		Telecommunication	-Immediate set up and activation of cable and / or wireless telecommunication network -Introducing Mobile Telecommunication units in the impact zones. -Providing definitive and continuous information on the earthquake and on the estimation of the casualties and injured. -GSM operators set up mobile base stations in the area for emergency operations. -Collaborations with private telecommunication companies in accordance with the agreements. -Providing backup systems for the responsible organizations -Providing definitive and continuous information on the earthquake and on the estimation of the casualties and injured, the number of damaged buildings as well as the needed help -Informing the community on the facilities that can be used
		Transportation	-Immediate detection of the interrupted roads / isolated areas and proposing alternative transportation modes. -Maintaining connection with all the transportation establishments. -Establishing traffic control to permit an orderly flow of the response effort -Closing restricted and dangerous transportation routes and facilities to public access -Preliminary damage assessment and interventions on the access ways. -Verifying the means of transport that could be taken advantage of -Organization of the transportation of Haydarpasa Port and Railway station -Providing fuel for the means of transportation for emergency activities. -Verifying the state of bridges and railways. -Ensuring the reopening of the roads that lead to isolated areas.

		Electricity, Water, Sewer	-Initiation of assessment and the repair of the damaged parts of the network giving priority to critical public facilities. -Initiation of the work of providing service supplies in the camping areas -Providing potable water with the private companies in accordance with the predefined collaborations -Providing portable toilets and showers and their disinfections -Providing generators when necessary -Collaborations with private companies in order to see to the water and electricity requirements of the camping areas. -If necessary , collaborating with foreign agencies and the military
		Search & Rescue	-Rescuing of injured / trapped people -Extinguishing fires -If necessary , collaborating with foreign agencies
		Security	-Maintaining surveillance on the streets -Controlling the traffic(road blocks for safety) -Ensuring that the partly damaged houses are vacant -If necessary , collaborating with foreign agencies - Transferring of the orphans, the disabled and the elderly to the Social Services Directorate of the province -Guarding against vandalism and patrolling areas with evacuated buildings
		Wreckage Lifting & Temporary Sheltering	-Removing of the debris that blocks transportation -Initiation of the determination of the interventions on the partly damaged buildings -Establishment and management of temporary shelters -Verifying and satisfying the needs of the persons in the temporary shelters -Transferring of the persons to the temporary shelters -Verifying and assuring the lifeline services in the temporary shelters
		First Aid & Health care	-Setting up first aid centers in the impact areas -Setting up the field hospitals -Transferring of the injured to the near hospitals - Identifying the dead, arranging for temporary suitable storage of the dead until taken over by the coroner and undertaking their burying. -Verifying the required medical supplies and ensuring their presence.
		Preliminary Damage Assessment	-Determination of the most damaged zones -Preliminary assessment of damage -Providing information for definitive damage assessment -Determination of the unsafe buildings -Providing services for temporary accommodation areas
		External Aid	-Coordination with foreign aid organizations -Assisting the foreign search and rescue teams.

		Buying , Renting, Confiscating & Distribution	-Stocking, protection and distribution of the obtained materials. -Assisting Kizilay in the distribution of goods. -Confiscating, renting of the required land, tools and vehicles.
	Private Companies		-Preparing their tools and resources as ordered by the prefecture

Table 15: Distribution of Task during Initial Response

3.3. TRANSFERING to HOSPITALS AND CAMPING AREAS

The gathering points which are also the emergency centers in the neighborhood level provide services such as first aid for persons with minor injuries, transportation for homeless people to the camping areas, information regarding the ongoing situation and where to turn to for certain needs (food, clothes, WC, water, blankets, etc…)

The uninjured people whose houses are severely damaged and / or unsafe to enter are invited to come to the relevant gathering points and camping areas.

The gathering points assigned to different neighborhoods can be found in the section of accounting for the available resources.

The injured people are to be taken to the closest hospitals by health care service providers.

The closest paths from the gathering areas to the nearest hospitals including the field hospitals are displayed separately for region 1 to 3 in the following figures.

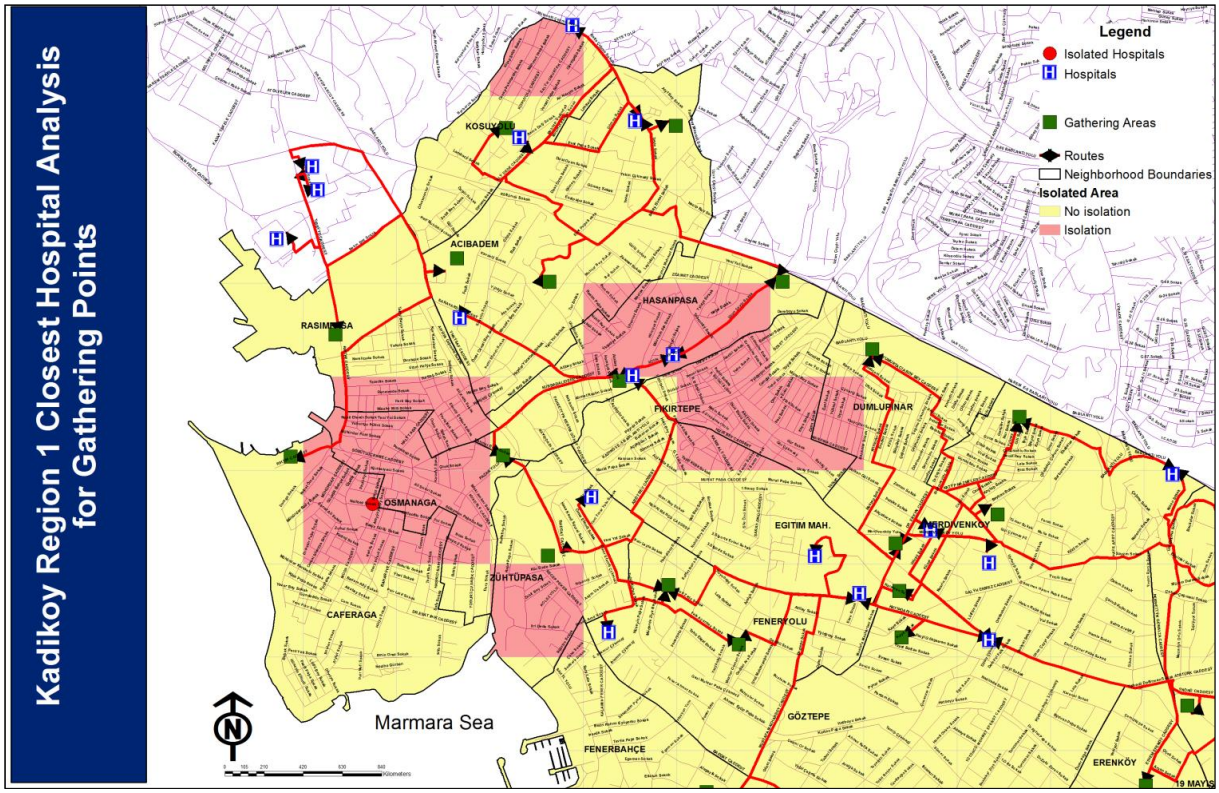


Figure 19: Kadikoy Region 1 Closest Hospital Analysis for Gathering Points

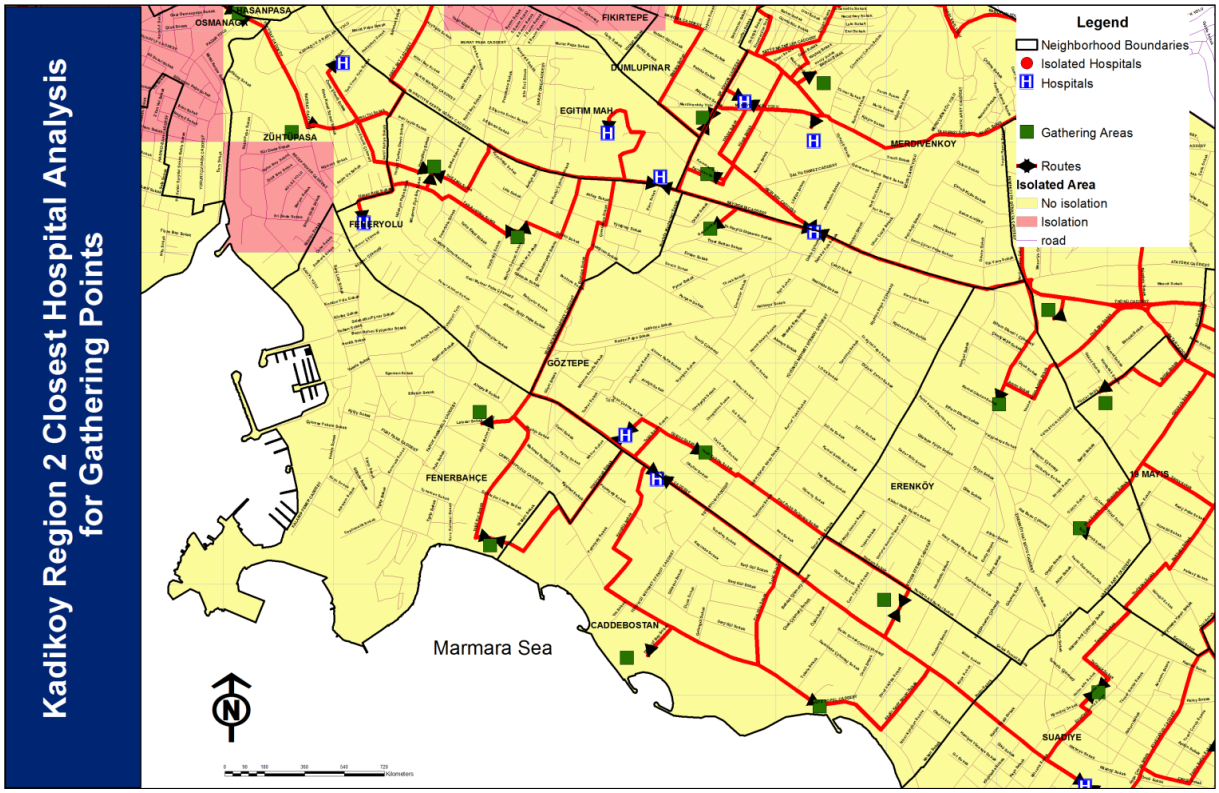


Figure 20: Kadikoy Region 2 Closest Hospital Analysis for Gathering Points

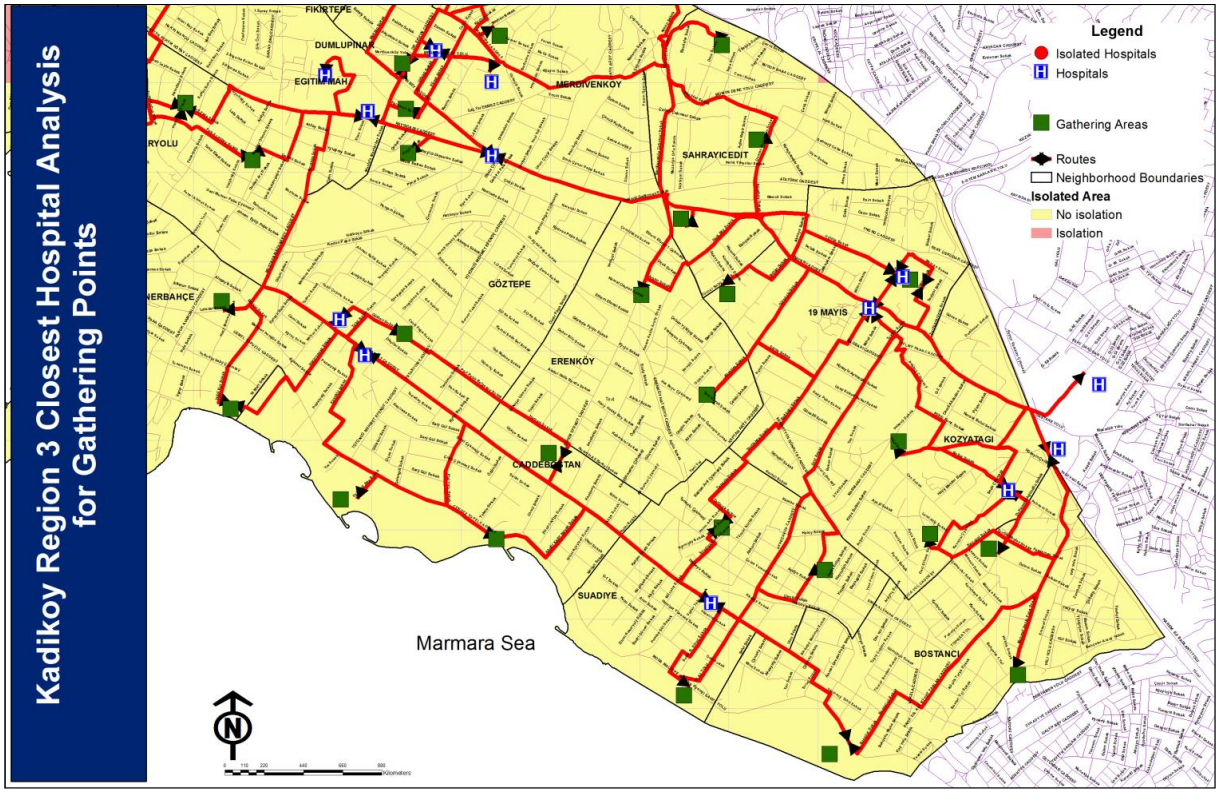


Figure 21: Kadikoy Region 3 Closest Hospital Analysis for Gathering Points

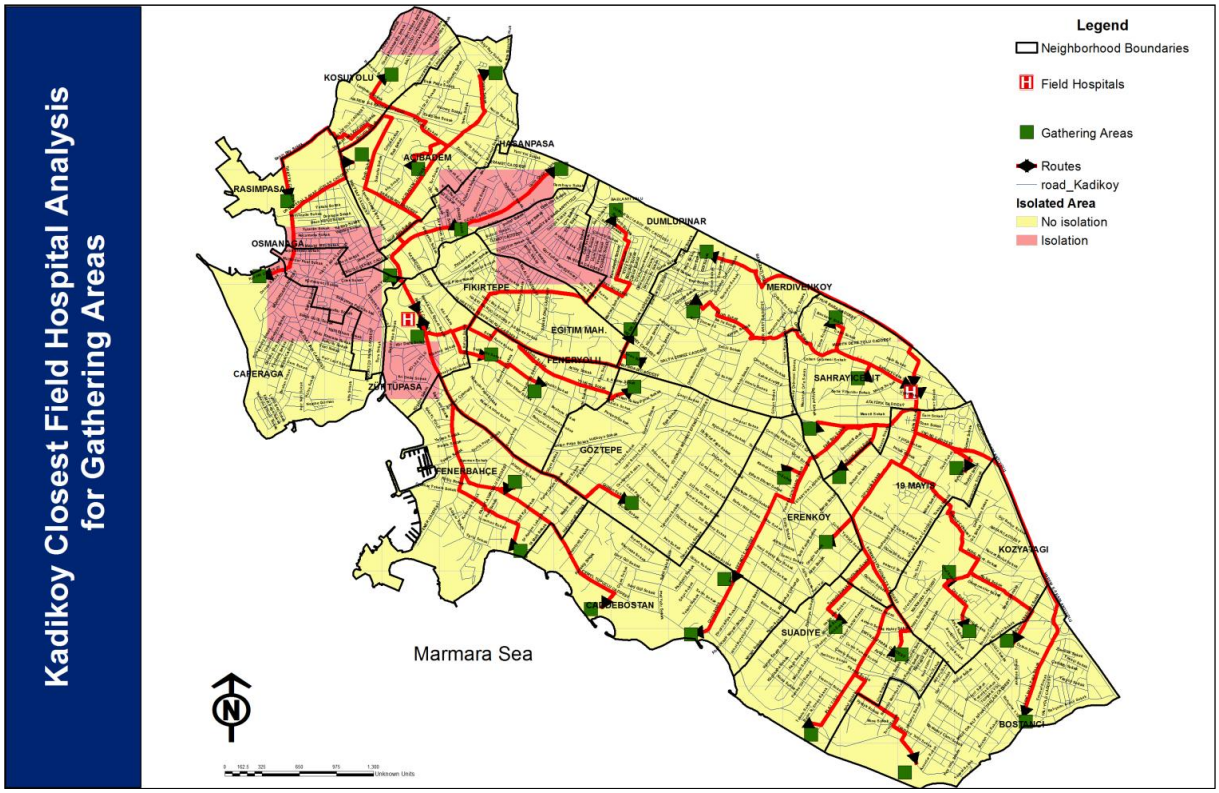


Figure 22: Kadikoy Closest Field Hospital Analysis for Gathering Points

The hospitals and the correspondent gathering points are listed in the following table:

Hospital	Bed Capacity	Zones to Benefit	Expected Injured
Haydarpasa Numune Hospital	665	Kadikoy Bazaar, Rıhtim Caddesi Gathering Point, Tepe Nautilius Shopping Mall	
Siyami Ersek Cardiological Hospital	525	Kadikoy Bazaar, Rıhtim Caddesi Gathering Point, Tepe Nautilius Shopping Mall	
GATA	216	Kadikoy Bazaar, Rihtim Caddesi Gathering Point, Tepe Nautilius Shopping Mall	
Ferihan Laçin Hospital	36	Park,Hasanpasa I.E.T.T Yard	
Kosuyolu Hospital	318	Kosuyolu Sabit Halk Bazaar, Marmara University Fine Arts Faculty,Acibadem Sokullu Park	
Validebağ Ogretmenler Hosp.	200	Kosuyolu Sabit Halk Bazaar, Marmara University Fine Art Faculty	
Acibadem Hospital	128	Kosuyolu Sabit Halk Bazaar, Marmara University Fine Arts Faculty,Acibadem Sokullu Park, Incirlibostan Sport Yard	

Fenerbahce Stadium Field Hospital	32000 m²	Acibadem Sokullu Park, Caddebostan Seaside Gathering Point, DMO, Dumlupinar Gathering Point, Efdal Primary School, Fenerbahce Seaside Gathering Point, Hasanpasa IETT Yard, Incirlibostan Sport Yard, Kadikoy Anadolu Ticaret Meslek High School, Kadikoy Bazaar, Kalamis Muhtarlik Park, Kenan Evren High School, Kosuyolu Sabit Halk Bazaar, Marmara Uni. Fine Art Faculty, Melahat Sehzade Primary School, Rihtim Caddesi Gathering Point SaliBazaar, Selamicesme Park, SSK Gozteoe Park, Tepe Nautilius Shopping Mall	**5195 injured are expected in the district of Kadikoy**
Caginer Hospital	33	Incirlibostan Sport Yard, I.E.T.T. Yard, Sali Bazaar	
Universal Hospital Kadikoy	128	Incirlibostan Sport Yard, I.E.T.T. Yard, Kenan Evren High School, Sali Bazaar	
Istanbul Medipol Hospital	60	Kenan Evren High School, Melahat Sehzade Primary School, Sali Bazaar	
Kadikoy Sifa Hospital	51	Located in the isolated and the risky zone	
Goztepe Egitim ve Arastırma	751	DMO, Kalamis Muhtarlik Park, Dumlupinar Gathering Area, Gozcubaba Park, Halit Berk Primary School, Sahrayıcedit Park, Melahat Sehzade Primary School, SSK Goztepe Park,Kadikoy Anadolu Ticaret Meslek High School, Halit Berk Primary School, Fenerbahce Seaside Gathering Area, Selami Cesme Park, Sahrayıcedit Park	
Goztepe Egitim Hospital			
Merdivenkoy Egitim Ve Arastirma Hosp.			
Ozel Goztepe Safak Hospital	87	SSK Goztepe Park, Kadikoy Anadolu Ticaret Meslek High School, Sahrayicedit Isiklar Park	
Goztepe Echomar Hosp.	58	Dumlupinar Gathering Point, Gozcubaba Park, SSK Goztepe Park, Kadikoy Anadolu Ticaret Meslek High School, Halit Berk Primary School	
Kadikoy Florence Nightingale Hosp.	75	Kenan Evren High School, Melahat Sehzade Primary School, Kalamis Muhtarlik Park	
Medical Park	306	Halid Berk Primary School, Fehmi Eksi Primary School, Sahrayıcedit Park,Intas Park	
Sahrayıcedit Field Hospital	6600 m²	Caddebostan Migros Shopping Mall, Cevre Koleji, Fehmi Eksi Primary School, Gozcubaba Park, Haci Mustafa Tezman High School, Hakki Deger Primary School, Halid Berk Primary School, Intas Park, Kozyati Primary School, Sabiha Tansel Primary School, Sahrayıcedit ISıkilar Park, Sahrayıcedit Park, Senesevler High School, STFA Woods, Tarim Il Mudurlugu, Zihnipasa Primary S.	
Ciftehavuzlar Tip merkezi	60	Fenerbahce Seaside Gahtering Point, Tarim Il Mudurlugu, Selamicesme Park, Efdal Primary School	

Yeditepe Uni. Poliklinik	30	Fenerbahce Seaside Gathering Area, Caddebostan Seaside Gathering Area, Caddebostan Migros Shopping Mall,Selamicesme Park, Efdal Primary School	
Acibadem Kozyatagi Hosp.	80	Sahrayıcedit Isıklar Parkı, Cevre Koleji, Zihnipasa Primary School, Intas Park, STFA Woods	
Erenkoy Ruh ve Sinir Hosp.	550	Fehmi Eksi Primary School, Sayrayıcedit Isıklar Park, Cevre Koleji, Zihnipasa Primary School, Intas Park, STFA Woods, Kozyatagi Primary School, Haci Mustafa Tezman High School, Caddebostan 1.Kisim Dolgu Area, Sabiha Tansel Primary School	
Central Hospital Kozyatagi	49	Kozyatagi Primary School, Hakki Deger Primary School, Senesevler High School	
Yeditepe Arastirma Hosp.	190	STFA Woods,Kozyatagi Primary School,Hakki Deger Primary School,Senesevler High School, Bostanci Gosteri Merkezi, Bostanci IDO	
PTT Hospital	500	Senesevler High School, Bostanci Gosteri Merkezi, STFA Woods	
Suadiye Tıp Merkezi	50	Caddebostan Seaside Gathering Area, Tarim Il Mudurlugu,HaciMustafa Tezman High School, Bostanci IDO	

Table 16: Hospitals and Corresponding Gathering Areas to Benefit

After organizing the gathering points, the responsible persons of Wreckage Lifting and Temporary Sheltering Service Providers are appointed with the organization of the transportation of people from the gathering points to the camping areas. Camping areas are assigned for the persons whose houses have collapsed, been heavily or moderately damaged. In the camping areas, people are provided with 3 meals a day.

The list that matches the gathering points to the corresponding camping areas is displayed in the table below. Each camping area is assigned to cover 3 km. of radius. The calculated shortest paths are represented in table 17, figures 23, 24, 25.

Code	Region	Camping Area Location	Tent Capacity (Units)	Corresponding Gathering Areas to benefit	Expected Number of People to Benefit
16	1	Kosuyolu Park,	200	Kadıköy Bazaar,Rihtim Caddesi Gathering Point Tepe Nautilus Shopping Mall Kosuyolu Sabit Halk Bazaar Marmara University Fine Arts Faculty,Acibadem Sokullu Park	1000
16	1	Karacaahmet Mez Arkasi	200	Kadıköy Bazaar, Tepe Nautilius Shopping Mall Koşuyolu Sabit Bazaar Marmara University Fine Art Faculty,Rihtim Caddesi Gathering Point Acıbadem Sokullu Park	1000
8	1	IETT. Garage Egitim Mah.	130	Hasanpasa IETT Yard Hasanpasa Incirli Bostan Sport Yard,Sali Bazaar	650
13	1	Kadikoy Belediyesi Parking Lot	280	İncirli Bostan Sport Yard Hasanpasa I:E.T.T Yard Sali Bazaar	1400
19	1	Yogurtcu Park	250	Kenan Evren High School	1000
5	1	Kadikoy Anatolian High School	250	Caferaga Seaside Gathering Point	1250
9	2	Fenerbahce Port Camping Area	260	Melahat Sehzade Primary School,Kenan Evren High School,Kalamis Muhtarlık	1300
6	1	Fenerbahce Sport Facilities	300	DMO,Gozcubaba Park, Halid Berk Primary School	1500
18	1	Merdivenkoy Cocuk Esirgeme Kurumu Yard	1650	Gozcubaba Park,SSK Goztepe Park,Kadikoy Anadolu Ticaret High School,Halid Berk Primary School,Fehmi Eksi Primary School,Sahrayicedit Isiklar Park,Cevre Koleji,	8250

12	2	Selamicesme Ozgurluk Park	2000	Selamicesme Park,Kadikoy Anadolu Ticaret Meslek Lisesi SSK Goztepe Parki,Melahat Sehzade Primary School Kalamis Muhtarlık Park. Dumlupinar Gathering Point	10000
21	3	Ataturk Caddesi Cebe Sokak.	1000	Intas Park,Zihni Pasa Primary School,CevreKoleji, 19 Mayıs Sayrayıcedit Isiklar P.,Sahrayıcedit Park,STFA Woods,Fehmi Eksi Primary School	5000
4	2	Goztepe Park	1500	Caddebostan Seaside Gathering Area,Tarim Il Mudurlugu Building, Caddebostan Fenerbahce Seaside Gathering Area, Caddebostan Migros Shopping Mall,Efdal Primary School	7500
3	3	Bostanci New Bazaar	500	Bostanci Gosteri Merkezi Senesevler High School STFA Woods,Kozyatagi Primary School,Hakki Deger Primary School,Haci Mustafa Tezman High School,Bostanci IDO	2500
4	2	Caddebostan Migros Camping Area	1450	Caddebostan Migros Caddebostan Dolgu Area Tarim Il Mudurlugu Building Efdal PrimarySchool,Zihnipasa Primary School, Sabiha Tansal Primary School, Caddebostan Seaside Gathering Point	7250

3	3	Bostanci Seaside Camping Area	775	Bostanci IDO,Kozyatagi Primary School,Hakki Deger Primary School,Senesevler High School,Caddebostan Dolgu Area,Suadiye Haci Mustafa Tezman High School Zihnipasa Primary School Bostanci Gosteri MErkezi Sabiha Tansel Primary School	3875

Table 17: Camping Areas and Corresponding Gathering Points

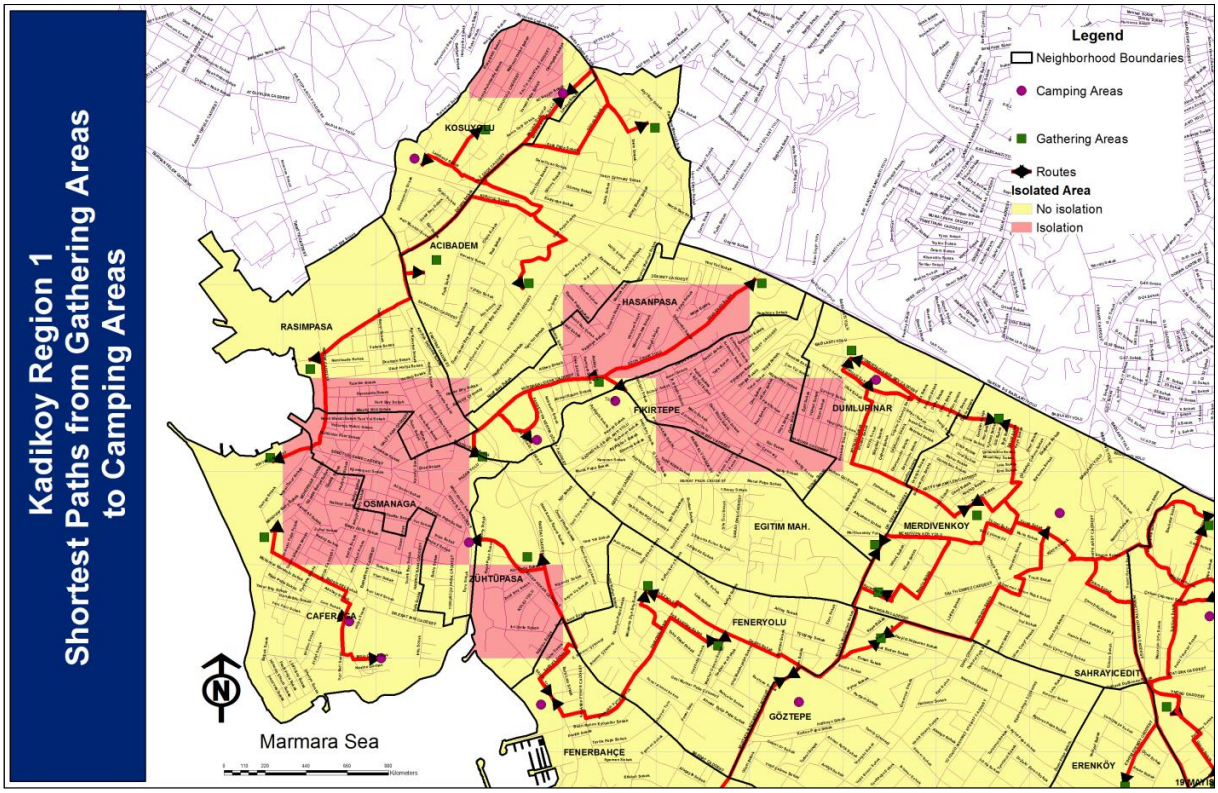


Figure 23: Kadikoy Region 1 Shortest Paths from Gathering Points to Camping Areas

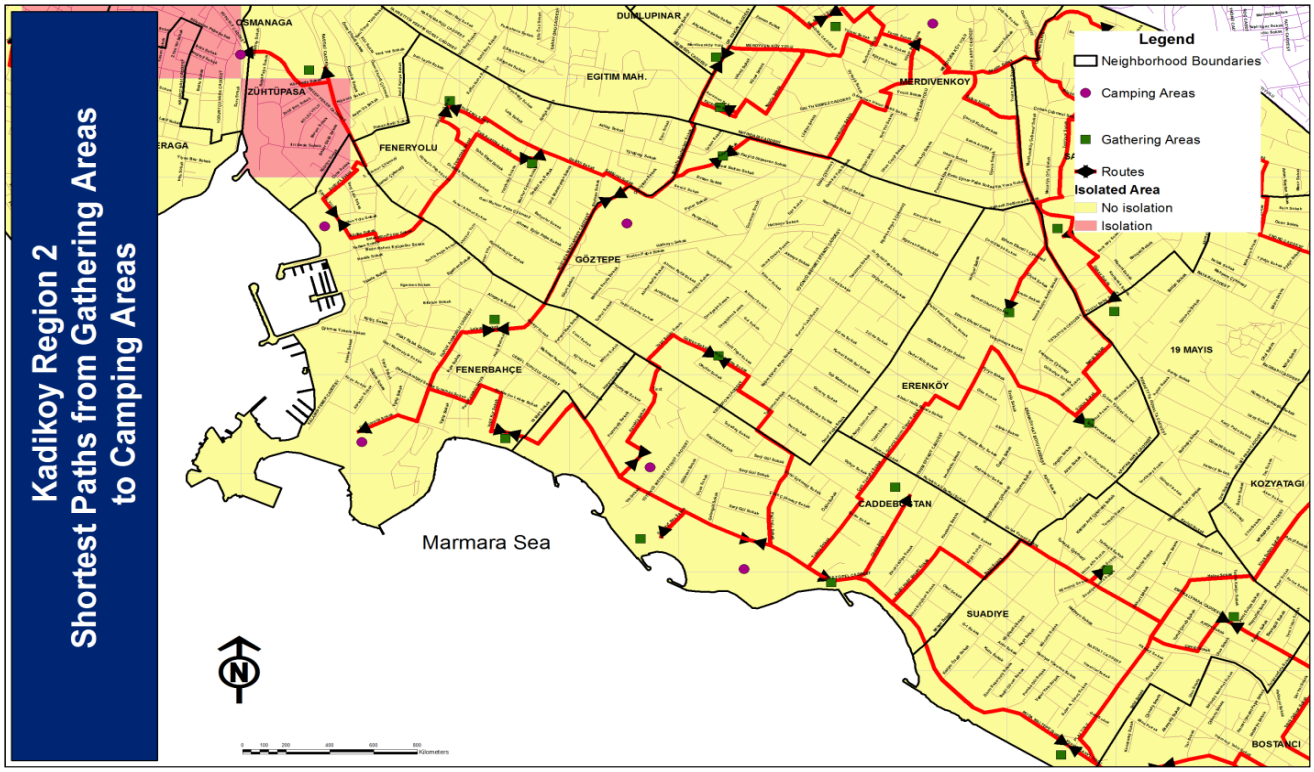


Figure 24: Kadikoy Region 2 Shortest Paths from Gathering Points to Camping Areas

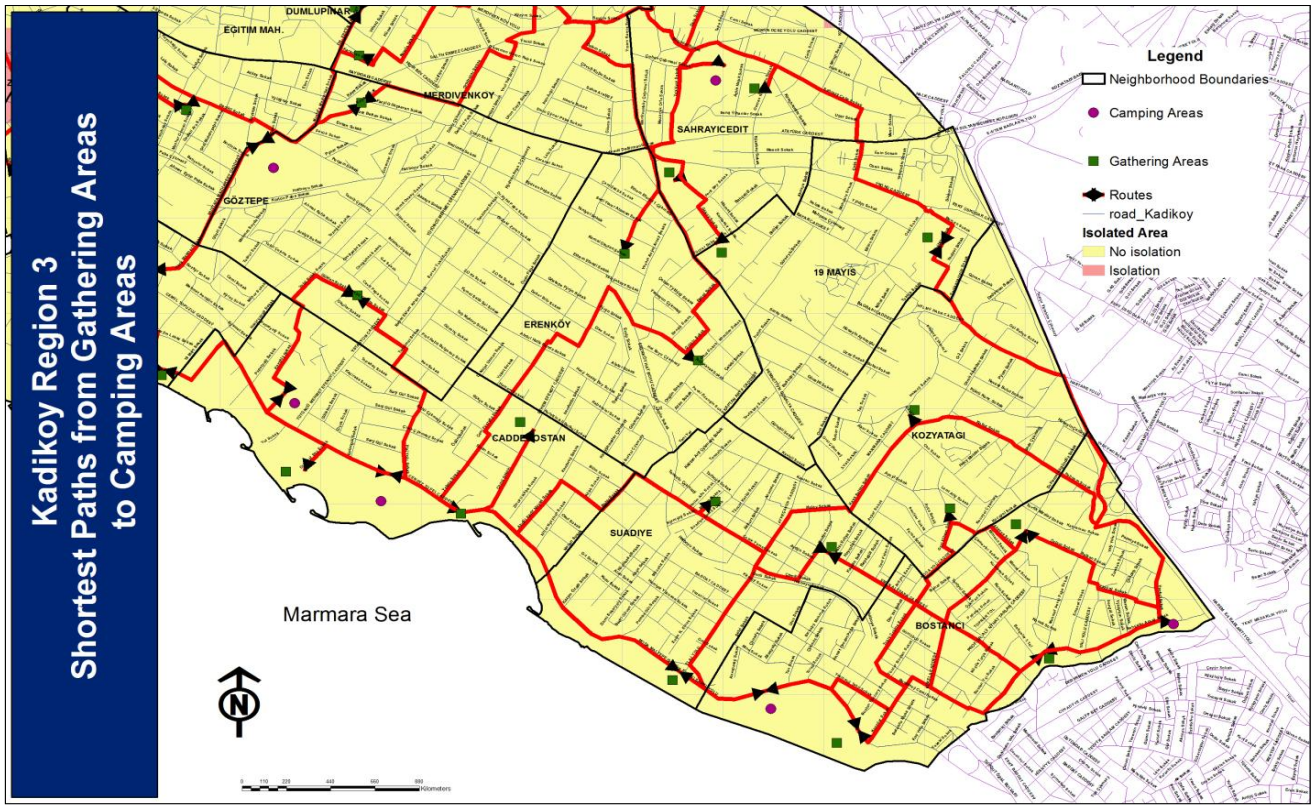


Figure 25: Kadikoy Region 1 Shortest Paths from Gathering Points to Camping Areas

The scenario states that fire outbreaks are expected in the LPG stocks, paint and polish factories in the neighborhoods of Kosuyolu, Hasanpasa, Fikirtepe, and Dumlupinar. Therefore, the shortest paths from the closest fire stations to the outbreak points are presented in the below figure:

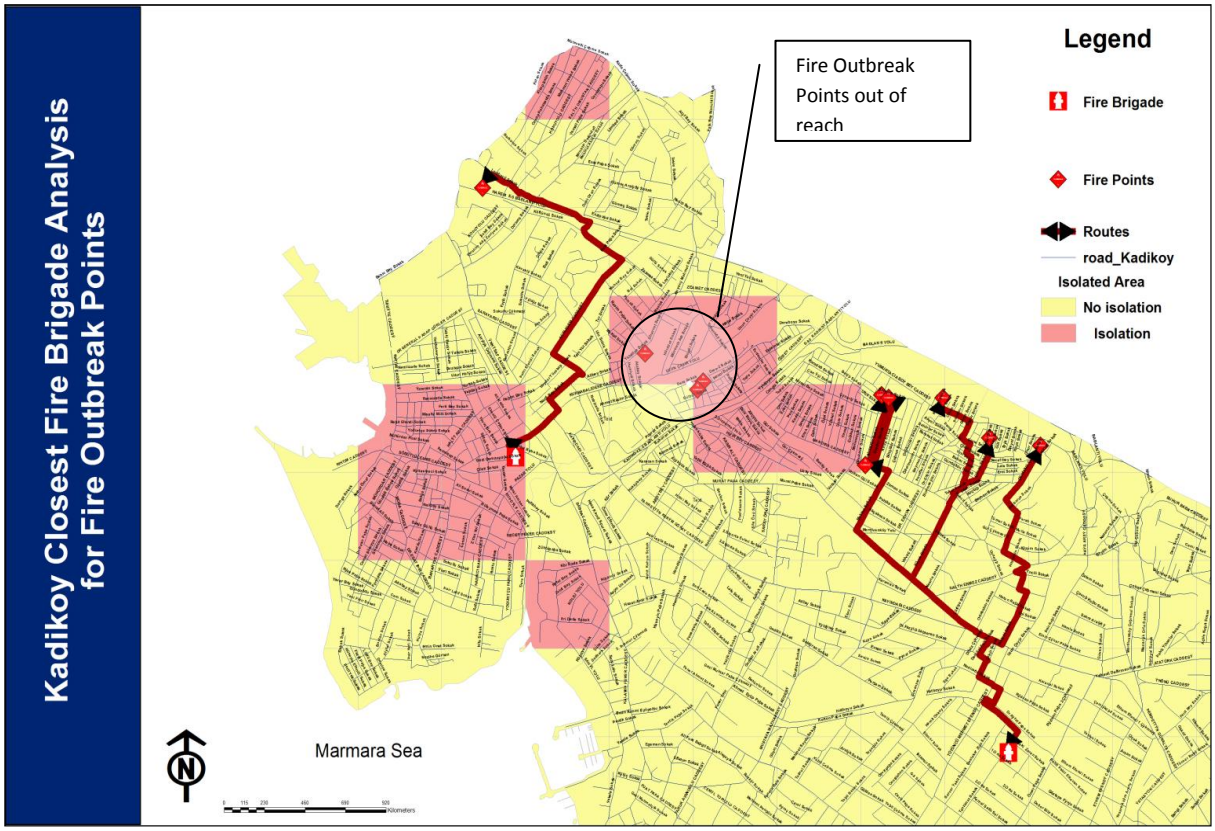


Figure 26: Kadikoy Closest Fire Brigade Analysis for Fire Outbreak Points

SUSTAINED RESPONSE:

From 72 HOURS to 21 DAYS AFTER the EARTHQUAKE

4. SUSTAINED RESPONSE: FROM FIRST 72 HOURS to 21 DAYS AFTER THE EARTHQUAKE

For sustained phase operations, the thrust of the activity swings from immediate life-saving requirements to the prevention of further loss of life and other forms ofsuffering, detailed damage assessment, and the prevention of further damage to property.

In this phase, the primary operation areas are ongoing rescue operations and other emergency measures, first surveys of access ways , buildings and lifelines, management of camping areas and identification of overall need and resources available. Moreover, establishment of mental support health, coordination with business community regarding the time of their business resumption are addressed.

4.1. MONITORING of the ONGOING SITUATION

The critical information at this stage regards;

- Aftershocks and induced hazards
- Debris removal and cleanup activities
- Preliminary damage assessment for public facilities
- The current general situation in the evacuation places (hygiene, physical and / or mental health of people, medical and food supplies, etc...)
- Availability of new areas for relief supply and food distribution other than the gathering points and camping areas
- The psychological state of the people in the camping areas
- The damage state of the still standing buildings and their ability to withstand aftershocks
- The hazardous material leakage and other environmental problems
- All licensed food establishments in the area
- The extent to which recovery of personal belongings will be allowed

4.2. ACTIONS on DAMAGED ZONES

Level	Name of the Authority		Responsibility
National Basis	Disaster and Emergency Management Presidency		-Sending personnel to the impact zones for damage assessment. -Seeing to the demands of municipalities
	Response Department		-Managing the Prime Ministry Disaster and Emergency Situations Center -Ensuring the induced hazards is under control. -Assisting the population in the damaged zones. -Repairing and retrofitting of the public and private facilities
	Kizilay		-Continuing the distribution of blankets, blood, food supplies. Participating health care and emergency activities in the damaged zones
Local Basis	Prefect of Istanbul		-Inspecting the ongoing activities. -Inspecting the works of the public service providers -Inspecting the work performed by the emergency service providers. - Contacting and requesting assistance to meet the needs from the neighboring provinces and military services based on the predefined collaborations. -Informing the community and the prime ministry on the current situation
	Istanbul Metropolitan Municipality		-Inspecting the ongoing activities -Upgrading the Prefect on the current state of work
	A.K.O.M Disaster Coordination Center		-Ensuring the coordination among the departments of the Municipality -Updating the municipalities of the districts (Kadikoy)
	Municipality of Kadikoy	Mayor	-Managing and supervising the restoration activities -Keeping contact with the authorities on the national basis for the requirements on the local basis -Approving news releases and public announcements
		Telecommunication	-Restoring the telecommunication lines -Introducing Mobile Telecommunication units in the impact zones. -Providing definitive and continuous information on the earthquake and on the estimation of the casualties and injured -Collaborations with private telecommunication companies in accordance with the predefined agreements. -GSM operators set up mobile base stations in the area

			-Informing the community on the facilities that can be used -Providing back up power for centrals.
		Transportation	-Maintaining connection with all the transportation establishments. -Damage Assessment and interventions on the access ways. -Organization of the transportation of Haydarpasa Port and Railway station -Providing fuel for the means of transportation for emergency activities. -Repairing of bridges and railways. -If necessary, collaborating with the military -Ensuring the reopening of the roads that lead to isolated areas.
		Electricity, Water, Sewer	-Repairing of the damaged parts of the network -Providing service for camping areas - Providing potable water to damaged zones with the private companies in accordance with the predefined collaborations -Providing portable toilets and showers and their disinfections -Providing generators when necessary -Collaborations with private companies in order to see to the water and electricity requirements of the camping areas. -If necessary , collaborates with foreign agencies and the military
		Search & Rescue	-Rescuing of injured / trapped people -Removal of the dead from collapsed structures. -Saving the valuable belongings of people -If necessary , collaborating with foreign agencies and the military
		Security	-Maintaining surveillance on the streets -Controlling the traffic -Ensuring that the partly damaged houses are vacant -If necessary, collaborating with foreign agencies. -Transferring of the orphans, the disabled and the elderly to the Social Services Directorate of the province. -Guarding against vandalism and patrolling areas with evacuated buildings
		Wreckage Lifting & Temporary	-Removing of the debris that blocks transportation -Management of camping areas

		Sheltering	-Verifying and satisfying the needs of the persons in the camping areas -Transferring of the persons to the camping areas -Verifying and assuring the lifeline services in the camping areas
		First Aid & Health care	-Management of the first aid centers in the impact areas -Management of the field hospitals -Transferring of the injured to the near hospitals - Identifying the dead, arranging for temporary suitable storage of the dead until taken over by the coroner and undertaking their burying. - Preventing disease outbreak or spread -Verifying the required medical supplies and ensuring their presence. -Providing mental health care centers for the people with loss.
		Damage Assessment	-Damage Assessment of Buildings. -Determination of the interventions. -Evaluating the objections of the householders on the results of damage assessment. -Determination of the unsafe buildings.
		External Aid	-Coordination with foreign aid organizations -Assisting the foreign search and rescue teams.
		Buying , Renting, Confiscating & Distribution	-Stocking, protection and distribution of the obtained materials. -Assisting Kizilay in the distribution of goods. -Confiscating, renting of the required land, tools and vehicles.
	Private Companies		-Preparing their tools and resources as ordered by the prefecture

Table 18: Distribution of Tasks during Sustained Response

4.3. DAMAGE ASSESSMENT of ACCESS WAYS

The phase of sustained response is when the damage to access ways is assessed in more detail. The areas that are expected to be isolated due to road closure on account of building collapses are Hasanpasa, Fikirtepe, and the shore sections of Osmanaga neighborhoods.

The ***transportation service provider*** of the Kadikoy Municipality will perform a damage assessment to access ways (The remaining local roads that are interrupted due to debris accumulation) via the "Access Ways Damage Assessment" survey forms which can be found in attachment 1 of the appendix.

4.4. DAMAGE ASSESSMENT of BUILDINGS

According to the vulnerability assessment performed by JICA, the most risky areas in terms of building collapse are found Hasanpasa, Fikirtepe, Rasimpasa and Caferaga neighborhoods.

The damage assessment of structures in this phase aims at;

- Determination and classification of the damage as well as apprehending its usability.
- Identifying the actions to be taken in order to perform damage assessment.
- Determining the consequent loss of lives and property.
- Taking advantage of the obtained data in earthquake risk mitigation.

The damage assessment of the buildings in the district is performed via " Building Damage Assessment Survey Form" (Attachment 2-appendix) that is to be compiled by groups of two coming from ***Public Works and Settlements*** (local basis) and ***the chamber of civil engineering.*** The same groups are also responsible for the placement of earthquake placards that regulate the entrance to structures. Examples for these can be found in the appendix attachment 5.

The groups, prior to their initiation to the task, are informed by the Damage Assessment Working Group of the Department of Recovery of the Prime Ministry.

The owners of properties are granted with the right to object to the result of the damage assessment forms in which case the assessment is repeated by another group of engineers and technicians. For the "Petition of Objection" please refer to attachment 4 in the appendix.

The procedure involving the damage assessment process and the objections is:

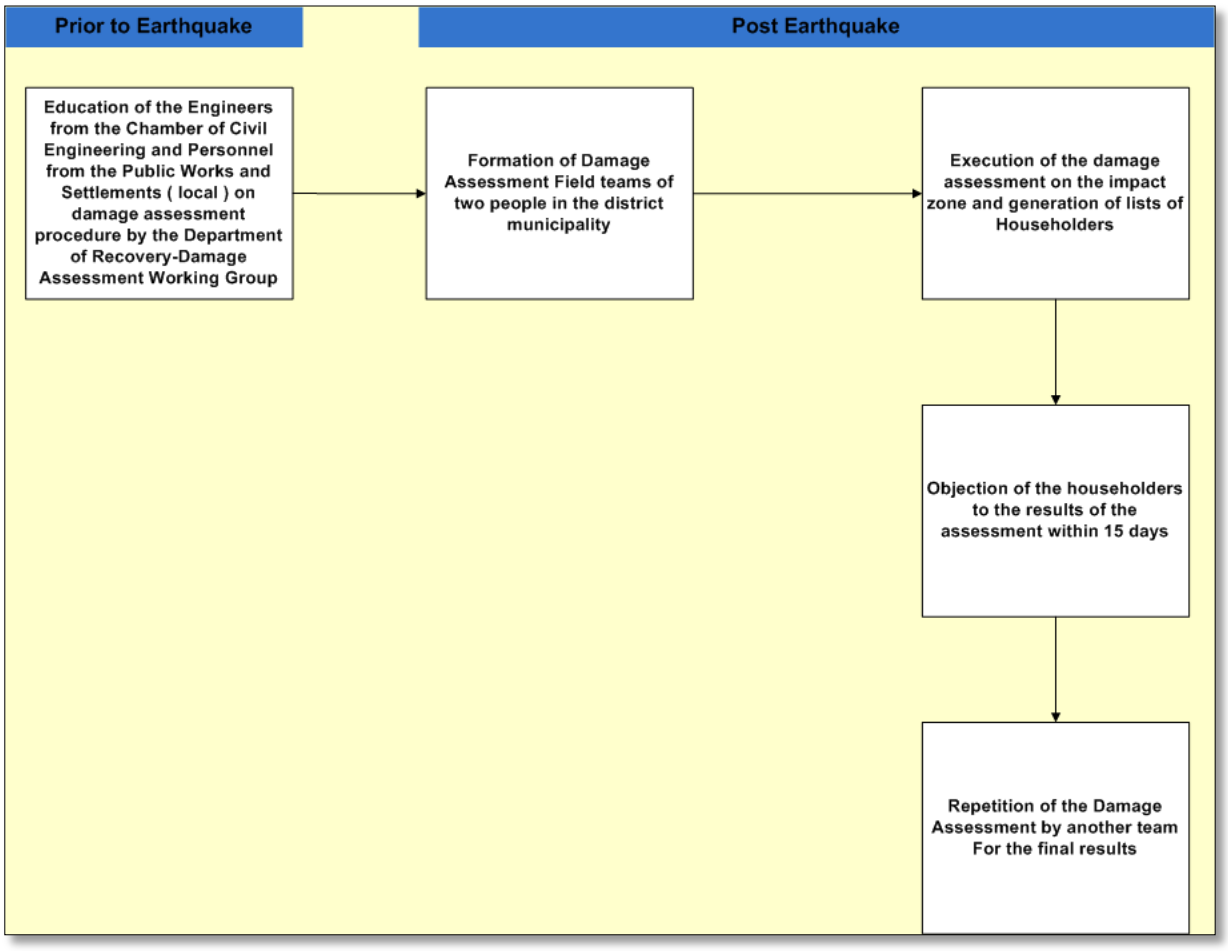


Figure 27: Damage Assessment and Objection Procedures

Engineers from the damage assessment service provider of the municipality are also appointed with the determination of the type of interventions and shoring systems to support the unstable buildings through building intervention form that can be found in the attachment 3 in appendix. In accordance with the results, the shoring systems installments begin.

4.5. SURVEY of DAMAGE to LIFELINES

For the assessment and the repairing of the damage to the lifeline networks which are defined as water / sewer, electricity and gas distributions, the responsible authorities are **ISKI**, **AYEDAS** and **IGDAS** respectively. These Institutions are also required to satisfy the demand of the camping areas. In this respect, they work with private organizations in accordance with the previously defined agreements.

4.6. MANAGEMENT of the CAMPING AREAS

The management of the camping areas is to be handled in terms of:

- *Food, clothes and blanket supplies* by **Kizilay, Temporary Sheltering Service, Foreign Organizations**
- *Electricity, Water, Gas, sewage requirements* by **Electricity, Water and Sewer Service Providers**
- *Telecommunication demand* by **Telecommunication Service Providers, GSM Operators**
- Health and hygiene by **Healthcare, Temporary Sheltering service providers**
- *Reclamation of personal belongings from partially damaged houses* by **Search and Rescue Service Providers**
- *Psychological Assistance Provision* by **Healthcare Service Providers, Volunteers**

Responsible people of the camping areas demand the needed resources from the municipality of the district where in case the municipality is not able to satisfy the demand, it turns to the ***Department of Administrative Services*** in the prime ministry.

TRANSITION to RECOVERY: 21 DAYS – 3 MONTHS AFTER the EARTHQUAKE

5. TRANSITION to RECOVERY: 21 DAYS - 3 MONTHS AFTER the EVENT

Full recovery from a major earthquake will take years, if not longer considering the level of damage to housing, business, and infrastructure as well as the direct impact on the population. Nevertheless, rapid initiation of recovery operations is critical to restoring confidence in the community. The phase of transition to recovery is characterized by the following criteria:

- Search and rescue activities are concluded.
- Evacuations have ceased.
- Care and shelter operations have stabilized and shelter population is decreasing daily.
- Aftershocks have declined to a negligible state, and stabilization of the built environment has minimized the risk of aftershocks to life and property.
- Restoration of utilities and lifelines is under way.
- Local Assistance Centers are in operation.
- The tasks of the emergency centers in the neighborhoods are replaced with the service providers in the municipality

5.1. MONITORING of the ONGOING ACTIVITIES

In this phase, the focus is on:

- Debris removal and clean up
- Aftershocks and induced hazards
- The current general situation in the camping areas (hygiene, physical and / or mental health of people, medical and food supplies, etc…)
- The psychological state of the people dealing with loss
- Restoration of lifeline utilities and buildings
- Damage assessment and evaluating the objections
- Implementation of shoring systems
- Partial return of evacuated people to the undamaged houses
- The replacement of the homeless in the prefabricated houses
- Restoration of social, educational and health services
- Demolition of the unsafe building with the approval of the mayor
- Starting of the reconstruction of the permanent housing
- Business restoration
- Restoration of normal city services
- The damage state of the still standing buildings and their ability to withstand aftershocks
- The extent to which recovery of personal belongings will be allowed

5.2. ACTIONS on the DAMAGED ZONES

Level	Name of the Authority		Responsibility
National Basis	Disaster and Emergency Management Presidency		-Sending personnel to the impact zones for damage assessment. -Seeing to the demands of municipalities
	Response Department		-Managing the Prime Ministry Disaster and Emergency Situations Center -Ensuring that the induced hazard is under control. -Assisting the population in the damaged zones. -Repairing and retrofitting of the public and private facilities
	Recovery Department		-Taking necessary measures for normalizing life -Preparing reconstruction and recruitment plans for post disaster period in cooperation with governmental agencies, local authorities and nongovernmental organizations
	Ministry of Public Works and Settlements		-Managing the bidding and construction process of prefabricated and permanent houses for the resettlement of the population.
	Kizilay		-Continuing the distribution of blankets and food supplies.
Local Basis	Prefect of Istanbul		-Inspecting the ongoing activities. -Inspecting the works of the public service providers - Contacting and requesting assistance to meet the needs from the neighboring provinces and military services based on the predefined collaborations. -Informing the community and the prime ministry on the current situation
	Istanbul Metropolitan Municipality		-Inspecting the ongoing activities -Upgrading the Prefect on the current state of work
	A.K.O.M Disaster Coordination Center		-Ensuring the coordination among the departments of the Municipality -Updating the municipalities of the districts (Kadikoy)
	Municipality of Kadikoy	Mayor	-Managing and supervising the restoration activities -Keeping contact with the authorities on the national basis for the requirements on the local basis -Approval of the interventions on the damaged buildings and return of people to the houses. -Ensuring the reopening of educational, social and health related public facilities for normalizing life
		Telecommunication	-Performing interventions for normalizing the telecommunication services -Restoring the telecommunication lines -Providing definitive and continuous information on the earthquake and on the estimation of the casualties and injured -Informing the community on the facilities that can be used

		Transportation	-Interventions for normalizing the transportation activities -Damage Assessment and interventions on the access ways. -Repairing of bridges and railways.
		Electricity, Water, Sewer	-Interventions for normalizing the distribution of the services -Repairing of the damaged parts of the network -Providing service for camping areas and prefabricated houses -Providing potable water to the camping areas with the private companies in accordance with the predefined collaborations -Providing portable toilets and showers and their disinfections -Providing generators when necessary -Collaborations with private companies in order to see to the water and electricity requirements of the camping areas
		Search & Rescue	-Saving the valuable belongings of people
		Security	-Interventions for normalizing the social life -Maintaining surveillance on the streets -Controlling the traffic -Assisting the population to return to the approved buildings
		Wreckage Lifting & Temporary Sheltering	-Removal of debris and clean up -Management of camping areas -Verifying and satisfying the needs of the persons in the camping areas -Verifying and assuring the lifeline services in the camping areas -Assisting the transferring of the population to the prefabricated houses
		First Aid & Health care	-Management of the healthcare services -Identifying the dead and undertaking their burying -Verifying the required medical supplies and ensuring their presence -Providing mental health care centers for the people with loss
		Damage Assessment	-Damage Assessment of Buildings. -Determination of the interventions. -Evaluating the objections of the householders on the results of damage assessment. -Determination of the unsafe buildings.
		External Aid	-Coordination with foreign aid organizations -Assisting the foreign search and rescue teams.
		Buying , Renting, Confiscating & Distribution	-Stocking, protection and distribution of the obtained materials. -Assisting Kizilay in the distribution of goods. -Confiscating, renting of the required land, tools and vehicles.
	Private Companies		-Preparing their tools and resources as ordered by the prefecture

Table 239: Distribution of Tasks during Transition to Recovery

5.3. INTERVENTIONS to RESTORE ACCESSIBILITY and LIFELINES

The interventions on the lifelines and accessibility are performed by the damage assessment service provider of the municipality of Kadikoy.

The lifelines and the zones that the intervention work will majorly take place are stated below:

- Electricity: Egitim Mah. ,Hasanpasa, Fikirtepe neighborhoods
- Water /sewage: Zuhtupasa, Fikirtepe and Hasanpasa neighborhoods
- Gas: Fikirtepe, Osmanaga and Caferaga neighborhood.

Specifically, the total repairing of different lifeline networks takes the following amount of periods of time:

- Telecommunication : 3 weeks
- Water/ Sewage: 1 month
- Gas: a few days
- Electricity: 1 to 3 weeks

5.4. DAMAGE ASSESSMENT and INTERVENTIONS on BUILDINGS / SHORING SYSTEMS

As stated before, the most risky zones in terms of building collapse are Hasanpasa, Fikirtepe, Rasimpasa and Caferaga neighborhoods.

The damage assessment process of the buildings in the district continues being performed via "Building Damage Assessment Survey Form" (Attachment 2-appendix) as stated previously where at the same time the evaluations of the objections on the results of the assessments are finalized.

The activities of installation of the shoring systems continue in this phase as well.

5.5. RETURN of EVACUATED PEOPLE to UNDAMAGED HOUSES

People whose houses are evaluated to be habitable by the damage assessment teams and that receive the approval of the mayor return to their houses with the assistance of Security service providers of the municipality.

Please refer to the attachment 5 in the appendix for the "Certificate of Habitability"

5.6. SOLUTION for HOMELESS PEOPLE

Prefabricated houses which are 30 m^2 of area are built for people of the camping areas whose houses are damaged beyond repair.

The authorities responsible for the bidding and construction process of prefabricated houses are the general directorates of **Construction Affairs** and **Technical Research and Implementation** which are both under the **Ministry of Public Works and Settlements.**

The people in the prefabricated houses are supplied with dry food.

Next, people currently benefitting from the prefabricated houses are provided with 3 options for their permanent accommodation:

4. Having their own houses built on their own land. This group is provided with bank loans.
5. Buying a new house from any neighborhood. This group is provided with bank loans.
6. Settling in one of the houses that government provides.

6. COMMUNICATION PLAN

In emergency situations, in order to overcome the confusion that stems from the existence of many response organizations at multiple levels, a communication plan is required. In the communication plan, information regarding the authorities, means of telecommunication and the kind and extent of information to be delivered are defined.

The plan is based on the lessons learned from the 1999 earthquakes of Kocaeli and Duzce.

6.1. INITIAL RESPONSE

Due to disruptions on the standard telecommunication system, the emergency communication means are to be used. **Turkish Radio Amateur Club** (TRAC) activates 3 networks of amateur short wave radio the first one being between the Prime Ministry and the central authorities on the province level, the second one between Security services and the third one that belongs to the military [12]. Besides, the **administrators' organizations (The Prefect, the Mayor)** that were previously defined in the emergency operations are specified to use their own satellite phones along with **the foreign organizations**.

An **emergency updating website** is established by the municipality of the district in order to provide information on the most recent activities

After the set up of emergency base stations, cell phones start to function again hence providing additional telecommunications means.

A public Information coordinator is assigned in the Telecommunication Service Provider of the District the main tasks of who are:

- Being briefed about the site activities by the **spokesperson** who is responsible for documenting the activities in the coverage area (see figures13,14,15) of the correspondent gathering point (Neighborhood Emergency Control Center)
- Reporting to the mayor about the ongoing emergency situations
- Provision of information to Media
- Monitoring news, coverage and erroneous information
- Maintaining copies of media releases

A predefined **spokesperson for** each gathering point in the neighborhoods is responsible for:

- Informing the public information coordinator on the ongoing activities in the associated coverage area
- Providing the community in the coverage area of the gathering point with information on the directions to and general state of the camping areas, the availability of nearby facilities (hospitals, closest points for food and water supplies, public and portable bathrooms, etc…) , general information on the results of the earthquake (number and identifications of dead and injured).

6.2. SUSTAINED RESPONSE

In the phase of sustained response, to a great extent standard telecommunication systems are expected to be reinstated. However, the emergency telecommunication means will still be in use.

Turkish Amateur Radio Club (TARC) was set to provide information exchange between teams and local emergency centers. The emergency updating website of the municipality is assigned to continue providing up to date information via internet.

The duties of **the governmental administrations and foreign organizations** were reckoned to remain unchanged

The tasks of the public information coordinator are defined to be the same for both phases whereas the **spokesperson** is assigned for the following duties:

- Informing the public information coordinator on the ongoing activities in the associated coverage area
- Acquainting the public with the availability of nearby facilities, the damage assessment process, and the extent to which the recovery of personal belongings are going to be allowed.

6.3. TRANSITION to RECOVERY

21 days after the earthquake, the standard telecommunications system are considered to be totally functioning properly hence eliminating the requirement of the emergency telecommunication means.

The tasks of the governmental administrations and foreign organizations are the same as the previous phases.

While the duties of the public information coordinator remain unchanged, the spokesperson is appointed with the following tasks:

- Informing the public information coordinator on the ongoing activities in the associated coverage area
- Providing the community with information on the nearby facilities, the partial return of the people to the undamaged houses, the process of moving to the prefabricated houses, city services and scholastic activities, reconstruction on the permanent housing

7. GUIDELINES for SHORING SYSTEMS

Shoring is the temporary support of only that part of a damaged, collapsed, or partly collapsed structure that is required for conducting search and/or rescue operations at reduced risk to the victims and rescue teams. The two main systems of shoring can be divided into systems that resist vertical loads and systems that resist lateral loads.

Vertical shoring systems are primarily intended to provide vertical support such as damaged floors or beams, but should all have some lateral bracing for stability (2% min., 10% reasonable). They can be applied in the form of timber posts, window and shores, timber cribbing, steel pipe systems.

Lateral Shoring Systems are necessary to support damaged buildings that may have negligible lateral load carrying capacity, excessive lean, or show other signs of distress such as bulging walls. They can be applied in the form of wood horizontal shore, rakers, tiebacks, tendons and confinement elements (chains, flexible polyester)

The design process for shoring systems is as follows:

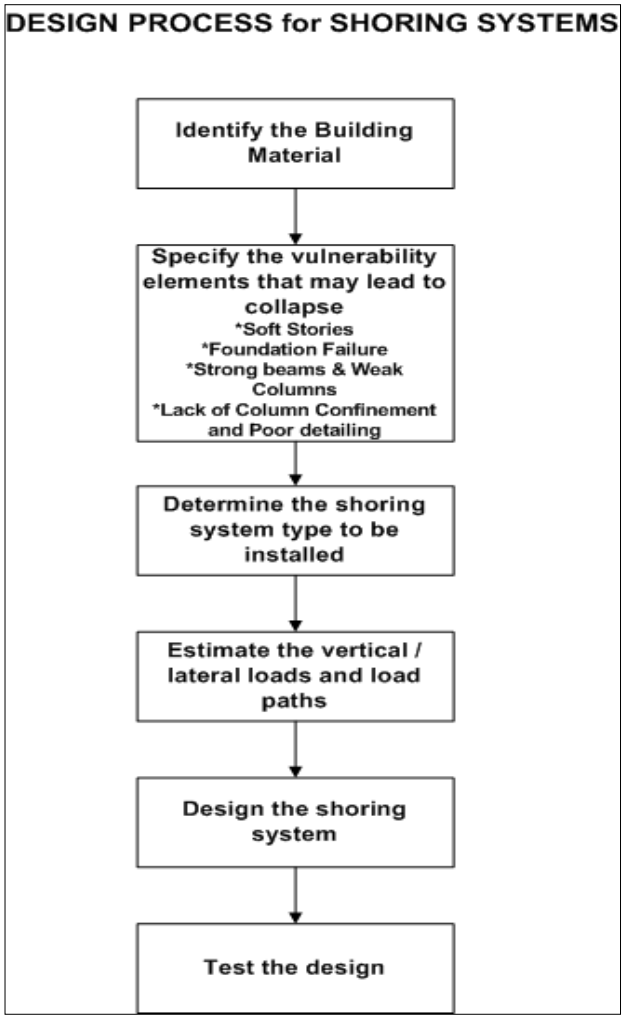


Figure 28: Shoring Design Process

For designing the shoring systems, the methodology shown in figure 28 is proposed. The process starts with the identification of building type and construction materials

Next, the specification of the vulnerability elements that may lead to collapse is required in order to determine the type of shoring system (vertical or lateral) needed.

Then, the loads and load paths are estimated. For determination of gravity loads, table 18 provides the typical weights of several common construction materials. The total load due to self weight of structures can be calculated in a quick manner by multiplying the area with the values given in the table. The range of weights is influenced by the age of construction. Older buildings with less efficient use of materials will tend to have heavier building components compared to modern buildings. The shoring design may also need to take account of additional loads such as rubble on top of a floor. In order to define the lateral loads, a lateral strength of 10% of the gravity load is considered when aftershocks are expected following a major earthquake .To sum up, the shoring systems are designed by taking into account the following:

- Type of building (masonry, R/C, steel)
- Type & Level of damage and mechanism of collapse (detachment of façade, collapse of arc)
- Type of loads (horizontal or vertical load)
- Level of actions (quantity of displacement, the severity of aftershocks)
- Duration of life of shoring system
- Environmental factors (humidity, neighbors, thermal variation)

Form of Construction	Weight Pressure (kPa)	Mass Pressure (kg/m^2)
Concrete Floors	4.3-7.2	440-730
Steel beam w/concrete	2.4-3.4	250-350
Wood	0.5-1.2	50-120
Interior Floors	0.6	60
Allowance for contents	0.5	50

Source: FEMA USAR Manual (c.2000)

Table 20: Typical Weights of Materials

8. APPENDIX

Attachment 1: Access ways Damage Assessment Survey Form

Access Ways Damage Assessment Survey Form			
DATE:		**Form No:**	
General Information			
Road Name:	**Road Type:**	**Belonged Neighborhood:**	**Reason for Closure:**
Geometrical Properties			
Road Width:	**Length of closure:**		**Approximate Debris Height:**
Closure Type			
Total Closure: □	**Closure that allows small Vehicles: □**		**Minor Closure: □**
Information on the state of Induced Damage			
State of Natural Gas pipelines:	**State of Water pipelines:**		**State of Electricity Cable Network:**
Information about Closure & Isolation			
Number of Isolated Buildings:	**Presence of Isolated Public Facilities: □ YES □ NO**	**Presence of Alternative Routes: □ YES □ NO**	**Relative Length of Alternative Route:**
Heavy Machinery / tools for the reopening operation of the roads:			
Notes and Descriptive Photographs			
The List of Compilers & Signatures			
Name	**Occupation**		**Signature**

Attachment 2: Building Damage Assessment Form

BUILDING DAMAGE ASSESSMENT SURVEY FORM	
Date:	Form Number:
1.General Information	
Type of Use: ☐ Residential ☐ Commercial ☐ Historical ☐ Public Facility ☐ Other:	
Adress:	
Householder Contact Info :	
Contact Person Info:	
2.External Properties	
Principal Direction: ☐ EW ☐ NS ☐ Other:	
Shape of Building: ☐ Rectangle ☐ Square ☐ Other:	
Position of the Building in the Block: ☐ Corner ☐ Middle ☐ Isolated	
Number of Floors: **Below Ground Floor:** **Above Ground Floor:**	
Number of Flats:	
Plan Area: ……. m²	
Age of Building:	

3.Structural Properties		
Support Systems		
1.Masonry	1. Without connection 2. Horizontally connected 3. Vertically and horizontally con. 4. With R/C Slab and or Roof	1. Mud-brick 2. Dry wall 3. Stone with mortar 4.Full Brick 5. Bricks with vertical holes 6. Bricks with horizontal holes 7. Briquette 8.Unreinforced Concrete
2. Reinforced Concrete	1.In-situ cast 2. Prefabricated	1. Light partition walls 2.Solid masonry wall 3. Vertically perforated brick wall 4.Horizontally perforated brick wall 5.Briquette partition wall
3. Steel	1.Heavy steel structure 2.Light steel structure 3.Steel mixed with R/C or masonry	1.Light partition wall 2.Solid masonry wall 3.Vertically perforated brick wall 4.Horizontally perforated brick wall 5.Briquette partition wall
3. Timber	1.Timber frame 2.Ribbed lath partition 3.Other	1.Light partition wall 2.Solid masonry wall 3.Vertically perforated brick wall 4.Horizontally perforated brick wall 5.Briquette partition wall
Slabs		
☐ 1.Reinforced concrete	☐ 2.Steel	☐ 3. Timber ☐ 4.Other
Foundation		
☐ 1. Raft foundation	☐ 2.Pad foundation	☐ 3. Strip foundation ☐ 4.Other
Roof		
☐ 1.Reinforced concrete	☐ 2.Steel	☐ 3. Timber ☐ 4.Other
Roof Cover		
☐ 1. Tile	☐ 2. Metal sheet	☐ 3. Bitumen paper sheet
☐ 4. Corrugated sheet	☐ 5. Soil	☐ 6. Terrace
Construction Quality		
☐ 1. High	☐ 2. Medium	☐ 3. Low
Support Systems		
☐ 1. Supporting wall	☐ 2. Frame	☐ 3.Frame + supporting wall
☐ 4.Shear wall + Frame	☐ 5. Column + Supporting wall	☐ 6.Other

The Rigidity of the First Floor relative to Others

☐ 1. Higher ☐ 2. Equal ☐ 3. Less

State of Repair after the previous earthquake

☐ 1. Repaired ☐ 2. Not repaired ☐ 3. Not known

The Degree of Damage

☐ 1. No damage ☐ 2. Slightly damaged ☐ 3. Moderately damaged

☐ 4. Heavily damaged ☐ 5.Totally damaged

Structural members:

☐ Supporting walls
☐ Columns
☐ Beams
☐ Frame connection points
☐ Shear walls
☐ Stairs
☐ Slabs
☐ Foundation
☐ Roof

Non structural members and plumbing system:

☐ Partition walls
☐ Light partition walss
☐ Outer walls
☐ Electricity system
☐ Water / Sewage system

Total Damage:

☐ 1. No damage ☐ 2. Sligthly damaged ☐ 3. Moderately damaged

☐ 4.Heavily damaged ☐ 5. Totally damaged

Induced Hazards:

☐ 1. Fire ☐ 2. Flood ☐ 3. Other

Foundation Problems :

☐ 1. No ☐ 2. Sligthly settled ☐ 3. Highly settled

☐ 4.Liquefaction ☐ 5. Rock detachment ☐ 6. Fault movement ☐ 7. Landslide

Post Earthquake Usability:

☐ 1. Habitable
☐ 2. Restoration required
☐ 3. Possibility of collapse

Emergency Measures:

☐ 1. No need
☐ 2. The necessity to clean of the debris
☐ 3. The necessity to prevent collapse
☐ 4. The necessity to protect the neighboring structures
☐ 5. The necessity to demolish immediately

Additional Information ☐ 1. No ☐ 2. Photo ☐ 3. Map ☐ 4. Other:	
Casualties: …….. Persons	
Comittee	
Title: **Name / Surname:**	**Signature:**
Title: **Name / Surname:**	**Signature:**
Title: **Name / Surname:**	**Signature:**
Title: **Name / Surname:**	**Signature:**

Attachment 3: Building Intervention Form

Building Intervention Form	
Form Number:	Date:
General Information	
Adress: Contact Person Info:	
Comittee Report	
Survey Complited: ☐ Yes ☐ No	General Appearance ☐ Observable ☐ Unobservable
Unobservable State Reasons:	
Intervention Types and Descriptive Photos :	
Member of the Comittee	
Title: Name&Surname:	Signature:
Title: Name&Surname:	Signature:
Title: Name&Surname:	Signature:
Title: Name&Surname:	Signature:

Attachment 4 - Petition of Objection

Date: __/__/20__

To whom it may concern,

I hereby object the results of the damage assessment performed on __/__/20__ on my household at the address_____ _____ _____ _____ _____ and request the repetition of the process.

Best Regards,

Name:

Surname:

Signature:

Attachment 5: Building Inspection Cards

Date:__/__/20__

INSPECTED

OCCUPANCY PERMITTED

Facility Name and Adress:

_____
_____
_____

This structure has been inspected and no apparent structural and health threats has been detected.

☐ Inspected Exterior Only

☐ Inspected Exterior and Interior

Inspector Comments:

_____
_____
_____

(Remark: Aftershocks since inspection may increase damage and risk.)

Inspected by:

Title:_____ Title:_____

Name:_____ Name:_____

Signature:_____ Signature:_____

Title:_____ Title:_____

Name:_____ Name:_____

Signature:_____ Signature:_____

DATE:__/__/20__

INSPECTED

RESTRICTED USE

Facility Name and Adress:

_____
_____
_____
_____

This structure has been inspected and found to be damaged as described below:

_____
_____
_____
_____
_____
_____

(Remark: Aftershocks since inspection may increase damage and risk.)

Inspected by:

Title:_____ Title:_____

Name:_____ Name:_____

Signature:_____ Signature:_____

Title:_____ Title:_____

Name:_____ Name:_____

Signature:_____ Signature:_____

DATE:__/__/20__

UNSAFE

DO NOT ENTER OR OCCUPY

(THIS PLACARD IS NOT A DEMOLITION ORDER)

Facility Name and Adress:

_____
_____
_____

This structure has been inspected and found to be seriously damaged and is unsafe to occupy as described below:

_____
_____
_____
_____
_____
_____

(Remark: Aftershocks since inspection may increase damage and risk.)

Inspected by:

Title:_____ Title:_____

Name:_____ Name:_____

Signature:_____ Signature:_____

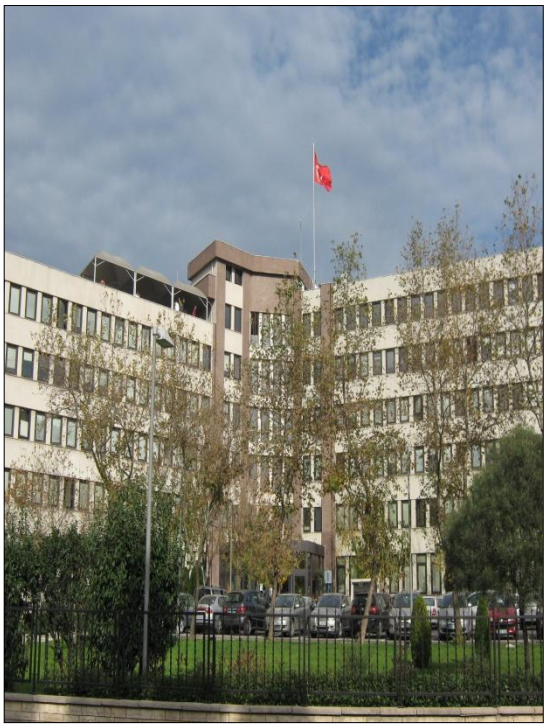
Title:_____ Title:_____

Name:_____ Name:_____

Signature:_____ Signature:_____

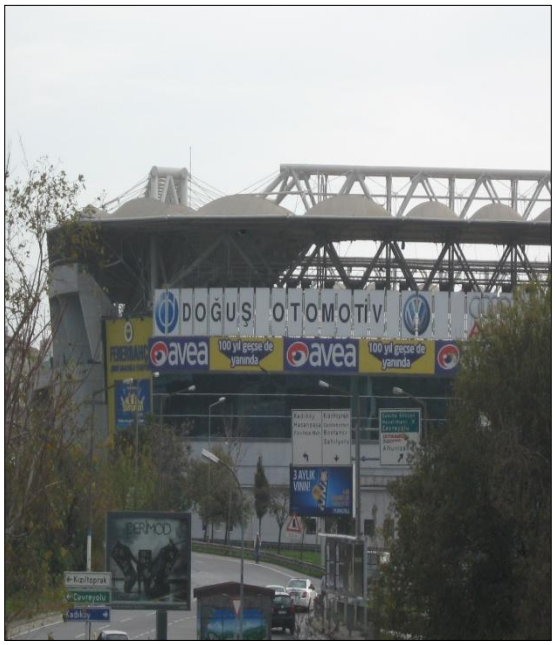
Attachment 7 Descriptive Photographs

Rihtim Caddesi



The Municipality of Kadikoy

Haydarpasa Train Station



Fenerbahce Stadium Field Hospital

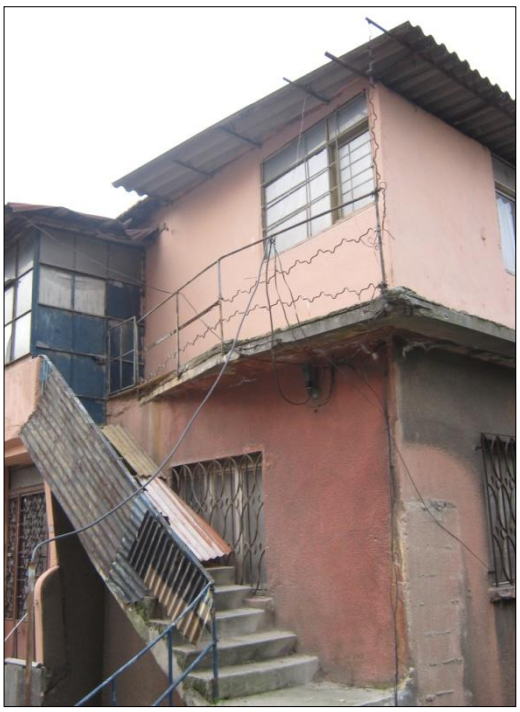
Examples of Isolated Area

Example of Isolated Area

Sali Pazari Gathering Area

Examples of Buildings in the Vulnerable Zone

Example of Streets from the Vulnerable Zone



Buildings in Fikirtepe (Vulnerable Zone)