Appendices

A-1. List of Parties Concerned in the Recipient Country

Japan International Cooperation Agency (JICA)

Ms. Tomita Akiko	Deputy Director General, Middle East and Europe Department
Mr. Hanadate Daimin	Director, Europe Division, Middle East and Europe Department
Ms. Uchida Kumiko	Advisor, Europe Division, Middle East and Europe Department
Mr. Funakoshi Yu	Europe Division, Middle East and Europe Department
Mr. Takeya Kimio	Visiting Senior Advisor
Mr. Ota Koji	Visiting Senior Advisor
Mr. Sawada Hideki	Disaster Management Division 2, Water Resources and Disaster Management Group Global Environment Department
Mr. Saito Akio	Chief Representative, Turkey Office
Mr. Ueki Masahiro	Senior Representative, Turkey Office
Mr. Minamitani Taichi	Turkey Office
Mr. Emin Ozdamar	Senior Program Officer, Turkey Office
Mr. Ali Bekin	Turkey Office

AFAD Ankara

Mr. M Akif Danaci	Head of Planning and Mitigation Department
Mr. Sinan Demir	Geology Engineer, Department of Planning & Mitigation
Mr. Murat Beyhan	Geophysical Engineer, Department of Planning & Mitigation
Mr. Mehmet Akif Alkan	Department of Planning & Mitigation, Group Head
Dr. Teliz Teker	Department of Planning & Mitigation
Mr. Ferhat Erdinc	Department of Planning & Mitigation
Mr. Ozgur t. Ozmen	Department of Planning & Mitigation
Mr. Cumhur Ozkaptan	AFAD Assistant Specialist
Mr. Fatih Gungor	Disaster and Emergency Management Expert
Mr. Hamza Ozkilic	Head of Department of Administrative Services
Mr. Murat Nurlu	Head of Earthquake Department
Mr. Onur Demirkol	Head of System Management and Information Security Working Group
Mr. Melih Rustu Calikoglu	Head of Department of Management Services
Mr. Nihol Akbaba	IT Engineer
Mr. Oktay Gokle	IT Engineer
Mr. Tugbay Kilic	Earthquake Department, Chief of National Seismic Observation Network
Ms. Evrim Akin Yazgan	AFAD Attorney ship
Mr. Dogus Ok	Communication Group
Ms. Sezin Tuna	Department of Strategy Development
Ms. Cemile Akca	Department of Strategy Development
Mr. Ayhan Isik	Department of Recovery
Mr. Shoji Hasegawa	Expert, JICA

AFAD Bursa

Mr. İbrahim Tari	Director
Mr. Burhanettin Aydinli	Department Director

Mr. Cenk Seker	Geology Engineer
Mr. Bekir Becermen	Director of Search and Rescue
Mr. Rawazan Kurtgu	Bursa Treasury Communication Center
Mr. Yalcin Mumcu	Head of civil defence unit
Mr. Abdulkin Yioit	Chief of search and rescue team
Mr. Ibrahim Morkmaz	Engineer
Ms. Korsat Veral	Engineer
Ms. Mac Gesden	Engineer

<u>AFADEM</u>

Mr. Mete Mirzdaglu	Director
Mr. Feffah Olcak	Engineer
Ms. Pinar Onalemdar	Engineer
Ms. Serim Yelbay	Engineer

<u>Ministry of Environment and Urbanization</u>

Dr. Hayriye Sengun	Department Director
Mr. Yusuf Koc	Deputy General Director, General Directorate of Infrastructure and Urban Regeneration Services
Mr. Cahit Kocaman	Head of Earth Science Department
Ms. Ebru Alarslan	Engineer, Dept. of Infrastructure and Urban Transformation
Mr. Bubent Yalazi	Engineer, Dept. of Infrastructure and Urban Transformation
Ms. Didem Ertek	Engineer
Dr. Kamil Sonmez	Engineer

<u>Ministry of Health</u>

Dr. M. Ertugrul Egin	Deputy Director of Health Service Department (Coordinator)
Dr. Muhittin Demirkasimoglu	Department of Disaster and Emergency Management
Mr. Murat Binici	Deputy Director of Construction & Maintenance
Mr. Kaan Bektas	Construction & Maintenance, Civil Engineer
Mr. Ahmet Kaan Bektas	Directorate of Health Investments

<u>SAKOM, Ankara</u>

Uzm. Dr. Muzaffer Akkoca	Director, Dept. of Disaster and Emergency Management
Dr. Sidika Tekeli Yesil	Epidemiologist/Consultant
Dr. Muhittin Demirka Simoglu	Department of Disaster and Emergency Management
Mr. Bild Sahin	Department of Disaster and Emergency Management
Mr. Emine Emer	Department of Disaster and Emergency Management
Mr. Idris Arslan	Department of Disaster and Emergency Management
Dr. Murat Eindek	Department of Disaster and Emergency Management
Dr. Hakan Gides	Department of Disaster and Emergency Management
Mr. Jaduen Qemirei	Department of Disaster and Emergency Management

<u>Ministry of National Education</u>

Dr. A. Hakan Mutlu	Construction and Estate Department
Ms. Ayam Ginar	Construction and Estate Department
Mr. Muzafb Ortlek	Construction and Estate Department

Ministry of Development

Mr. Hasan Coban	Expert (Disaster Management)
Ms. Ayse Erkan	Staff

Governorship of Bursa

Mr. Ergun Gungor	Deputy Governor

Provincial Directorate of Environment and Urbanization, Bursa

Mr. Hakan Gür	Branch Manager
Mr. Gülşen Usta	Vice Director
Mr. Halit Turgut	Deputy Director
Ms. Cemalleddin Başalan	Deputy Director
Ms. Tülin Özmen	Project Works Branch Manager
Ms. Ebru Bilgili Kirlicar	Architect

Provincial Directorate of Health, Bursa

Dr. Ozcan Akan	Director
Dr. Murat Derin	Head of Health Research and Improvement
Dr. Zaynep Nur Gencerler	Emergency Health Services
Dr. Sibel Pasin	Emergency Health Services
Dr. Mehmet Kavak	Emergency Health Services
Dr. Mesut Yilmaz	Disaster Health Services
Dr. Hakan Bas	Emergency Health Services
Dr. Murat Derin	Development of research and health
Dr. Haice Alkan	Development of research and health
Dr. Elif Piskin	Development of research and health

AKOM, Bursa

Mr. Suleyman Alper	Branch Manager
Mr. Mustafa Şevk Eken	Chief

Provincial Directorate of National Education, Bursa

Mr. Hasmet Kartoglu	Deputy Manager, Construction Department
Ms. Aynur Çınar	Construction and Estate Department
Mr. Nejdet Kof	Construction and Estate Department
Mr. Serdar Akçıl	Construction and Estate Department
Mr. Denız Saraçoğlu	Construction and Estate Department

General Directorate of Highways / 14. Region Directorate, Bursa

Mr. Bekir Koc	Deputy Director
Mr. Bulent Ors	Real Estate Head Engineer
Mr. Soner Tokay	Responsible of Civil Defence

Provincial Directorate of Infrastructure and Urban Transformation, Bursa

Mr. Bayram Okumus	Acting Director
Mr. Eyup Gül	Infrastructure and Urban Transformation

Ms. Dilek Yildiz	Civil Engineer
Ms. Irem Aksulu	Geophysical Engineer
Mr. Himmet Dağli	Infrastructure and Urban Transformation

Provincial Directorate of Transportation, Communication and Maritime, Gemlik Office

Mr. Serkan Canli	Gemlik Harbour Master
Mr. M. Asim Sulu	Gemlik Harbour Master Assistant

Mudanya Port authority

Mr. Halil Karakus	Director

Provincial Directorate of Science, Industry and Technology, Bursa

Mr. Fevzi Muduru	Branch Manager

Provincial Special Administration, Renewal Construction Work Department HQ

Mr. Hakan Bebek	Map Engineer Renewal and Redevelopment Director

Bursa Metropolitan Municipality

Mr. Murat Uşun	Presidency of Settlement and Urbanization Department
Mr. Ismail Ayas	Settlement and Urbanization Department, City Planning/Branch Manger
Dr. Fazilet Altinişik	Geological Engineer (Reconstruction Implementation Branch)
Dr. Murat Emre Haşal	Settlement and Urbanization Department, Civil Engineer (Reconstruction Implementation Branch)
Ms. Ayse Isnl	Settlement and Urbanization Department
Mr. Hakan Karademir	Settlement and Urbanization Department, City Planner (City Planning Branch Management)
Mr. Habip Aslan	Branch Manager Real Estate and Expropriation Department
Ms. Ebru Beşiktepe	Settlement and Urbanization Department, Environment and City Planner
Dr. O. Metin Ilkişik	Settlement and Urbanization Department ,Consultant
Mr. Cağlor Ekşi	Settlement and Urbanization Department ,City Planning
Ms. Selin Gür	Settlement and Urbanization Department, City Planning
Mr. Haluk Acar	Settlement and Urbanization Department, City Planning
Mr. Murat Yun	Settlement and Urbanization Department, City Planning
Mr. Onur Acar	Settlement and Urbanization Department, City Planning
Mr. Esla Eser	Garbage Landfil Department
Mr. Yedim Dedeogl	Garbage Landfil Department
Mr. Orhan Dogan	Director, Fire Department
Mr. Ozcan Bayrak	Fire Department
Mr. Hakan Koyunlular	Head, Transportation Department
Ms. Mehnet Koz	Director of Water Department

Osmangazi Municipality

Mr. İsmail Selimoğlu	Deputy Mayor
Mr. Kenan Akan	Deputy Mayor
Mr. Alev Çetindaya	City Planner

Mr. Memis Memis	Garbage Section
Mr. Savas Çamlik	Garbage Section
Ms. Alev Çelinkaya	Garbage Section
Ms. Alev Çetinkaya	City Planner
Mr. Özcan Baytar	City Planner
Mr. Fatih Arslan	City Planner
Mr. Fatih Nazlım	City Planner
Mr. Ali Uzsezer	City Planner

Yildirim Municipality

Mr. Özgen Keskin	Mayor
Mr. Fatih Polat	Deputy Mayor
Ms. Gamze Genc	Director of City Planning
Mr. Elif Demir	Topographical Engineer
Mr. Mimar Sinan Ozturk	Construction Technician
Mr. Nur Cetinkaya	City Planner

Gemlik Municipality

AV. Refik Yirmaz	Mayor

MAG (Neighborhood Disaster Volunteer) Gemlik

Mr. Yusuf Yumru	Member
Ms. Bergin Özdem	Member
Ms. Güler Doğan	Member
Mr. Hale Utkuan	Member
Mr. Balü Selim Silahtarölu	Member

Geophysics Engineers Chamber, Bursa branch

Mr. Murat Arabaci	President of geophysics engineers chamber, Bursa branch
Mr. Tuncer Ciltas	Geology Engineer

Istanbul Technical University

Mr. Faith Sutcu	Faculty of Architecture Structural Systems Division

Uludag Univ. Directorate of Construction and Technical Works

Mr. Fahri Durmaz	Chief Administrative Officer Faculty of Medicine, Healthcare and Research Center
Arc. Nilay Onart	Director, Directorate of Construction and Technical Works

Bursa State Hospital

Dr. Nuri Dindar	Deputy Head Doctor
Mr. Selahattin Erkan	Administrative and Finance Director
Mr. Maksude Asci	Administrative and Finance Staff
Dr. Hüseyin Demirel	Staff

Cekirge Hospital

Dr. Muhaqmmed Gunaydin	Staff

Dr. Koyhan Poilur	Staff
Dr. Cenelettin Daglar	Staff
Dr. Koder Murbul	Staff
Dr. Biben Onat	Staff
Dr. Kemal Kaya	Staff
Dr. Husegin Deniber	Staff
Dr. Sepil Kaya	Staff

<u>Medical Park Healthcare Group Bursa Hospital</u>

Mr. Kemal Ekici	Technical Service Responsible
Ms. Aysengul Aydin	Technical Service Responsible

<u>SevketYilmaz Research and Education Hospital</u>

Prof. Dr. Mehmet Karadag	Director of Medical Service
Ms. Sevgi Inceler	Civil defence Expert
Mr. Kader Murgul	KHB
Ms. Nurcan Capaci	Staff
Ms. Sule Kurdal	Staff

<u>UEDAS</u>

Mr. Yusuf Ziya Yuce	Director of Corporate Communications

<u>Bursa Gaz</u>

Mr. Meksen Sukuru Ozden	Deputy General Manager
Mr. Melih Cetinkaya	Head of Operational Management Department
Mr. Mete Cetinkaya	Engineer
Mr. Gokalp Kamar	Engineer

<u>DOSAB:Demirtas Organize Industrial Zone Organization of businessmen and industrialists</u>

Mr. Ufuk Kivrak	General Coordinator
Mr. Adnan Sarmen	Board Member

<u>DSI (General Directorate of State Hydraulic Works)</u>

Mr. Sahin Cengiz	Deputy Director
Mr. Tali Buyruk	Disaster Management
Mr. Taha Guner	Disaster Management
Mr. Hakki Kilavuz	Maintenance
Mr. Alacffin Yagci	Engineer

<u>iLBANK</u>

Mr. Cihan Şımşek	Deputy Director General
Mr. Ibrahim Sahin	International Relations Department, Department Head
Dr. Birol Kayranli	International Relations Department, Project Management Division II
Ms. Gamze Aslan	International Relations Department, Project Management Division II Environmental Engineer
Mr. A. Turan Söylemez	Manager, Internatıonal Relatıon Dept.

Mr. Irfan Bahadir Onder	International Relations Department
Ms. Fazilet Tanrikulu	Department of Spatial Planning Urban Planner
Mr. Behive Somunw Anoay	Project Department
Mr. Mehmet Gurbuz	Planning Board Chairman
Ms. Belma Yaman	Directorate General of Architects

Turkish Association for Seismic Isolation

Mr. Mehmet Emre Ozcanli	Vice President

Taisei Corporation Marmaray Project Contract BC 1 Office, Istanbul

Mr. Toru Ueda	Deputy Project Director
Mr. Yoshihisa Hatano	Project Manager
Ms. Basek Dogan	Project Architect

HACETTEPE University Hospital

Prof. K. Hakan Altintas, M.D.	Head of Faculty of Medicine Department of Public Health
Ms. Selma Kilig	Staff
Mr. Hasan Kus	Staff
Mr. Ugur Yilmazer	Staff
Ms. Ayse Mertoglu	Staff
Ms. Neslihan Ugar	Staff
Ms. Didem Dajnoz M.D.	Staff
Ms. Ekin Koq M.D.	Staff

Hazama Ando Corporation Turkey Office, Istanbul

Mr. Moriwaki Yoshinori	General Manager

PROTA engineering Head Office, Istanbul

Mr. Joseph Kubin	Chairman, Board of Directors
Ms. Hülya Eksert	Deputy General Manager

ITOCHU

Mr. Aybars Ataeli	Deputy General Manager, Business Development

Honda Factory, Cayirova, Kocaeli

Mr. Ayhan Temizoz	Assistant Manager, Safety & Environment Human Resources

YD Arch. (Local Architecture Company, Istanbul)

Mr. Baris Dogan	Architect/ Director
Mr. More Algin Ersoy	Architect
Ms. Bora Yeruyurt	Architect/ Urban Planner

Seyas (Local Architecture Company, Istanbul)

Mr. a. alaz albay	CEO
Mr. savci baskurt	Civil engineer

Conger (Medical Equipment Consultants)

Mr. Baris Conger	Consultant

DINAMIK PROJE (Local Architecture Company, Istanbul)

Mr. Erden Ayas	Mech. Eng.

HB Teknik (Local Architecture Company, Istanbul)

Mr. Hasan Akgul	Electrical Engineer

YUKSEK Proje (Local Architecture Company, Ankara)

Mr. Ibrahim Ozturk	Civil Engineer President
Mr. Alptug Ozturk	Civil engineer

Su Yapi (Local Architecture Company, Ankara)

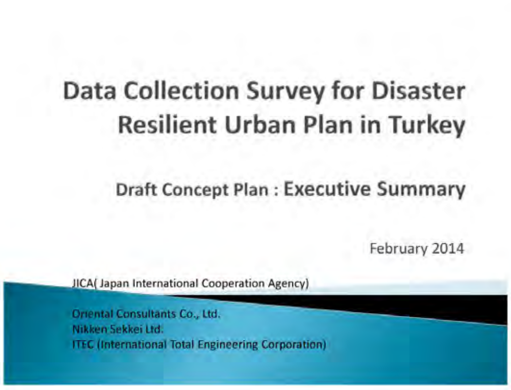
Mr. Ali Canoglu	General Manager
Mr. Ismail Fidan	Manager, Business Development & Marketing Dept.
Ms. Inci Yalim Olcay	Deputy General Manager & Manager of Architectural Design

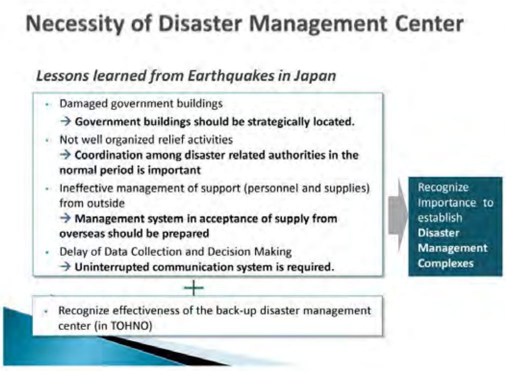
ANEL (Local Architecture Company M&E, Istanbul)

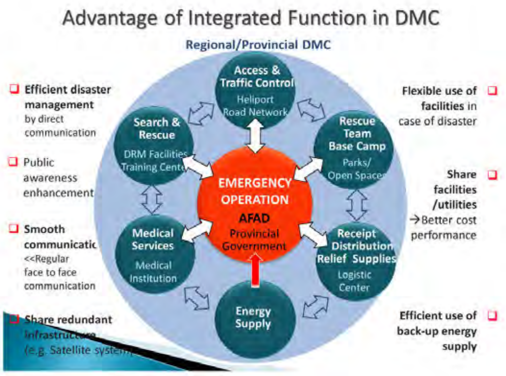
Mr. Icra Kurulu Uyesi	Executive Board Member
Mr. Turgut Alp Colakoglu	International Projects Coordinator
Mr. Suleyman Demirhan	Tender Manager/ Elecrical Engineer
Ms. M. Sirin Celikel	Electrical Engineer
Mr. K. Serkan Kilic	Tender Coordinator
Mr. F. Tuncay Ayhan	Mechanical Projects Coordinator/ Mechanical Engineer

A-2. Presentation Materials for the Meeting

1. Meeting with AFAD, Department of Planning and Mitigation, 25 February, 2014







Disaster Management Complexes by Planning Level

For large scale disasters beyond the capacity of regional level.

14 Regional DMCs
(for each AFAD Logistic Zone, 15 zones including Ankara)

- **Decision Making** (or supporting function)
- **Disaster Information Center**
- **Supply Center** of Stockpiles
- **Management** of Relief Activities (including medical care)
- **Distribution Center** of Relief Supplies and Personnel

66 Provincial DMCs (81-15 provinces)
Disaster response activity center at Provincial level.

- **Distribution Center** of Relief Supplies and Personnel.
- **Supporting Center** for community activities.
- Short-Medium term evacuation space

- **Center of district level activities** for disaster response.
- Temporary evacuation space

* District [A] : District with high population / high risk 7

Disaster Management Complex network

R-DMC 1 : higher ranked regional level DMC (back up for Ankara)
R-DMC 2 : regional level DMC
11 provinces which has AFAD Search & Rescue Team

** Location of regional level DMC are proposed by JICA Study Team according to their population.*

Support from Other Areas Overseas

Outside of disaster area

Logistic support DMC

- Acceptance of goods
- Transportation of goods
- Accept injured people, etc.

Disaster area

Front-line DMC

- Decision Making ⇔ Data Collection
- Management of Relief Activities
- Distribution of Relief Supplies / Personnel, etc.

Facilities required for DMC and Responsible Authorities

Facilities	AFAD	Metropolitan Municipality	Others
① Disaster Operation Center (Including Logistic Center, Search & Rescue Team Facilities, Heliport)	●		
② Disaster & Emergency Training Center	●		
③ Disaster Risk Education Center	●		
④ Satellite Network (VSAT)	●		
⑤ Information Gathering & Dissemination System	●		
⑥ R&D Institute	●		
⑦ DRM related Facilities (Fire /AKOM/112 etc.)		●Fire/AKOM	●112 (MOH)
⑧ Waste Incineration Plant		●	
⑨ Parks/Open Spaces/Sports Facilities		●	
⑩ Emergency Road Network		●	
⑪ Disaster Base Medical Center			●(MOH)
⑫ School			●(MONE)
⑬ Non-down life line			●

2. Proposed Components of proposed DMC

Facilities required for DMC related to AFAD

Facilities	National	Regional	Provincial
[1] Disaster Operation Center (Including Logistic Center, Heliport, and AFAD Office)	— On going	●【14】	●【12】
[2] Training Center (Including search & rescue team station)	●【10】	●【6】	
[3] Education Center	●【18】	●【10】	
[4] Satellite Network (VSAT)	●【50】		
[5] Information Gathering & Dissemination System	●【150】		
[6] R&D Institute	●【7】		
Total	【235】	【30】	【12】

【 】Approximate Cost Estimation by Million US $

[1] Disaster & Emergency Operation Center

including Logistic Center and Heliport

[Normal Period]

- Staff Training
- Public Education
- Disaster Preparedness Center
- Disaster Databank
- Storage of Stockpile

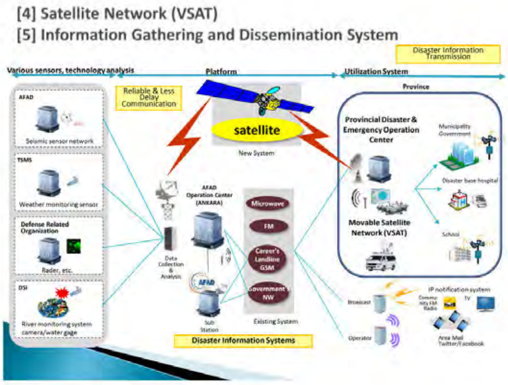
[Emergency Period]

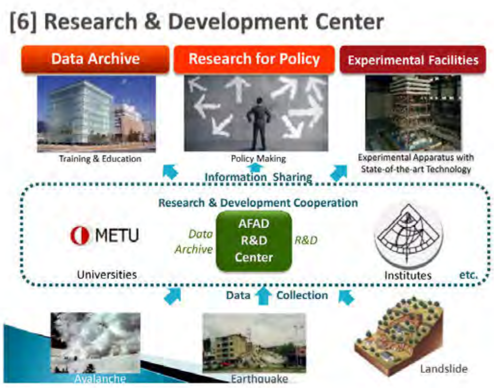
- Headquarter for Disaster and Emergency Management
- Disaster Information Center
- Supply Center of Stockpiles
- Distribution Center of Relief Supplies and Personnel


[1] Disaster & Emergency Operation Center in Disaster Situation
Disaster Information
AFAD Institutes
Complex Disaster Information flying around
Medical Services
SAKOM Hospitals
Many Injured People crowds into Hospital
Rescue Team Deployment
AFAD AKOM
Rescue Team acts at Several Places
Relief Supply
AFAD
Many Relief Supply arrives
Evacuation
Municipalities Schools
Many Evacuee crowds into Evacuation Place
AFAD
MINISTRIES
Situation Report
Support
Disaster & Emergency Operation Center
Data Collection
Analysis
Observation
Decision
Action
Traffic
MOTMC Municipalities
Many Evacuee uses Car Road and Bridge are Collapsed
Lifeline
MOENR
Lifeline is Damaged
Damage
AFAD AKOM Municipalities
Fire occurs around City Buildings are Collapsed
Casualty Toll
AFAD Municipalities
Many People are injured
Security
Police
People loots Stores
: Situation Report
: Order
13

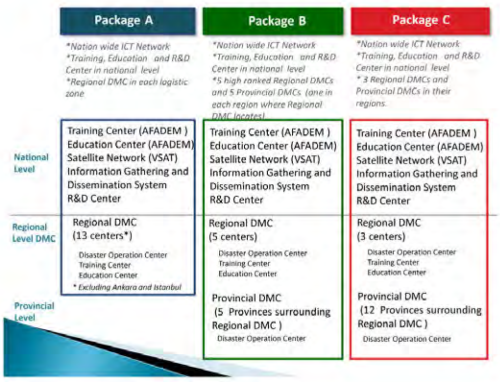

[2] Training Center for Search & Rescue
AFADEM (Ankara)
Regional Centers
Expansion of Disaster Response Training
AFADEM Ankara : TOT and training program & material development
Regional Training Center: Training for provincial, district and community level staff, NGO, volunteers, etc.
Practical Training for Search and Rescue
CURRENT AFADEM
UPGRADING of AFADEM, for more practical training
Collapsed Building
Transportation Disaster
Under Water
Rescue Dog
Industrial Disaster
CBRN
Proposed Assistance
Construction of Buildings and Procurement of Training Equipment
Technical Assistance for
Program/Curriculum Development
Training Techniques

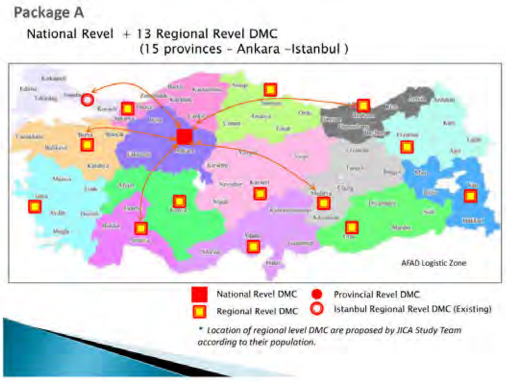

[3] Education Center for Disaster Preparedness
Hands-on Education for Disaster Preparedness
CURRENT AFADEM
Trial / Experiences
Earthquake Simulation
Fire Extinguisher
Smoke Simulation
Survival Tour
Rain Storm
First Aid Training
Scientific Information
Disaster Prevention Measures
Proposed Assistance
Construction of Buildings and Procurement of Training Equipment
Technical Assistance for
Operation & Management of Center
Education Program and Techniques

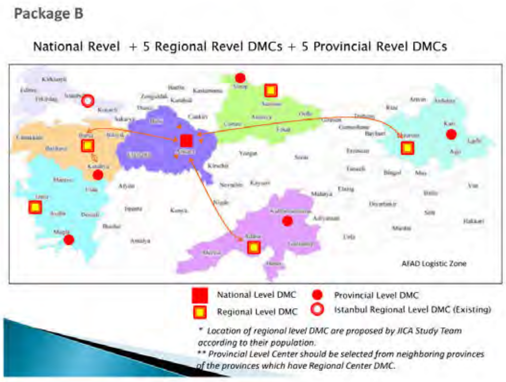

[4] Satellite Network (VSAT)
[5] Information Gathering and Dissemination System
Disaster Information Transmission
Various sensors, technology analysis
Platform
Utilization System
Reliable & Less Delay Communication
satellite
New System
Province
Provincial Disaster & Emergency Operation Center
Movable Satellite Network (VSAT)
Microwave
FM
Existing System
Disaster Information Systems

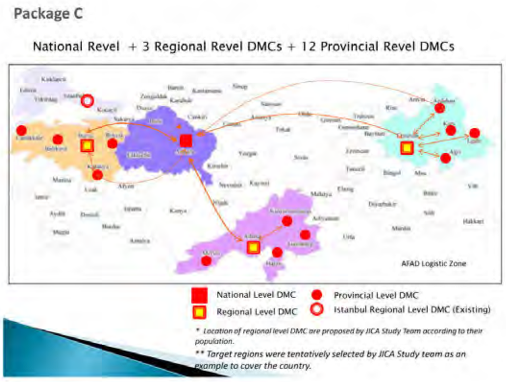

[6] Research & Development Center
Data Archive
Research for Policy
Experimental Facilities
Training & Education
Policy Making
Experimental Apparatus with State-of-the-art Technology
Information Sharing
Research & Development Cooperation
METU
Data Archive
AFAD R&D Center
R&D
Universities
Institutes
etc.
Data Collection
Avalanche
Earthquake
Landslide


3. Proposed Project Packages
For Japanese ODA assistance







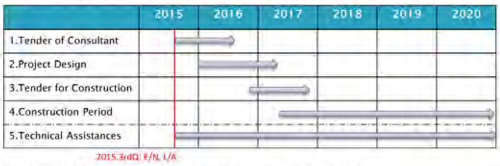


Project Package Alternatives

	A National 1 Regional 13	B National 1 Regional 5 Provincial 5	C National 1 Regional 3 Provincial 12
[1] Disaster Operation Center (Including Logistic Center, Heliport, and AFAD Office)	182	130	186
[2] Training Center (Including search & rescue team station)	88	40	28
[3] Education Center	148	68	48
[4] Satellite Network (VSAT)	50	50	50
[5] Information Gathering & Dissemination System	150	150	150
[6] R&D Institute	7	7	7
Total	625	445	469

Approximate Cost Estimation by Million US$

Image of Project schedule



- Necessary time for procurement (1~3) is from a year to two years.
- Construction Periods of each components is as follows.

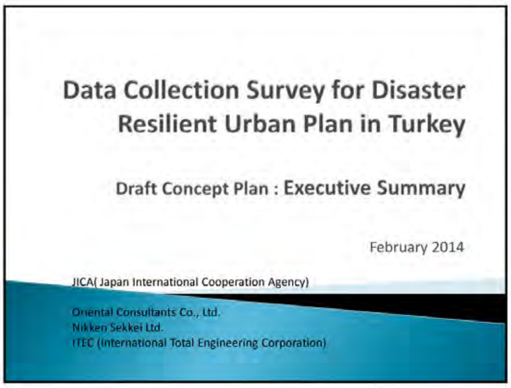
①Disaster Operation Center	around 2~3 years
②Training Center	around 2~3 years
③Education Center	around 2~3 years
④Satellite Network (VSAT)	around 1.5 ~ 2 years
⑤Information Gathering & Dissemination System	around 3~4 years
⑥Research Center	around 2~3 years

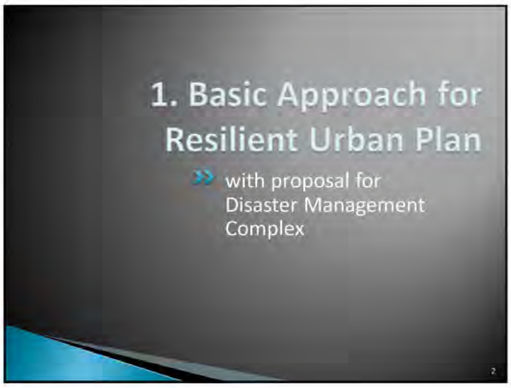
Action to be taken for project formulation

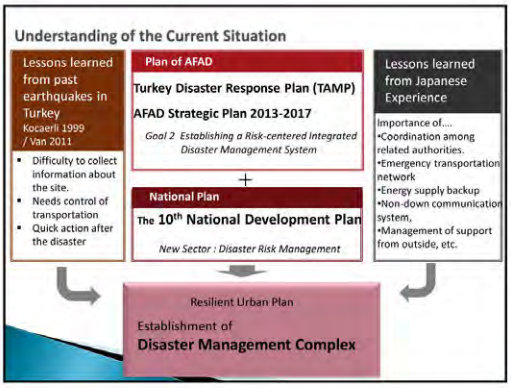
Action	Deadline	Responsible Organization
Submit an application for Investment Program to MOD	By August 2014 (the sooner, the better)	AFAD (JICA will support as possible)
Request ODA Loan to Japanese Government officially	By Octorber 2014 (the sooner, the better)	UT (after approval for a proposed project by MOD)
Dispatch Fact Finding Mission	By April 2015 (for 2 weeks)	JICA
Dispatch Appraisal Mission	By June 2015 (for 2 weeks)	JICA
Sign Exchange of Notes and Loan Agreement	By September 2015	E/N: GoT & GoJ L/A: AFAD & JICA

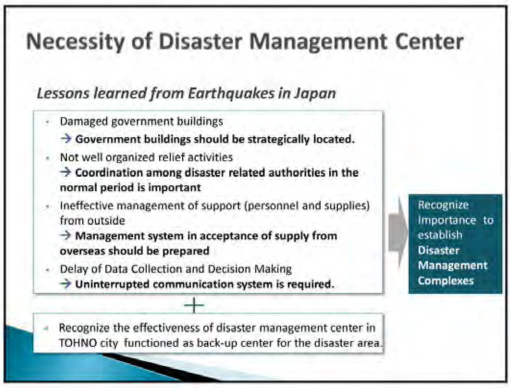
Teşekkür ederim

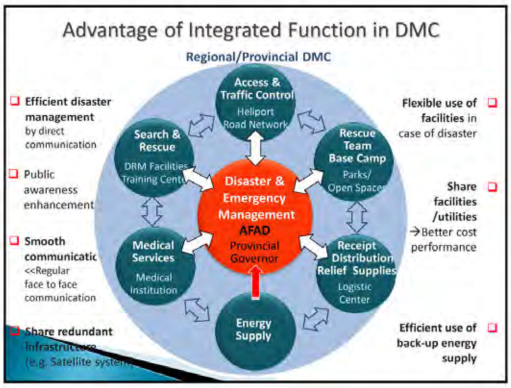
2. Meeting with AFAD, 26 February, 2014











Disaster Management Complexes by Planning Level

For large scale disasters beyond the capacity of regional level.

14 Regional DMCs
(for each AFAD Logistic Zone, 15 zones including Ankara)

- **Decision Making** (or supporting function)
- **Disaster Information Center**
- **Supply Center** of Stockpiles
- **Management** of Relief Activities (including medical care)
- **Distribution Center** of Relief Supplies and Personnel

66 Provincial DMCs (81-15 provinces)
Disaster response activity center at Provincial level.

- **Distribution Center** of Relief Supplies and Personnel.
- **Supporting Center** for community activities.
- Short-Medium term evacuation space

- **Center of district level activities** for disaster response.
- Temporary evacuation space

* District [A] : District with high population / high risk 7

Disaster Management Complex network

- R-DMC 1 : higher ranked regional level DMC (back up for Ankara)
- R-DMC 2 : regional level DMC
- 11 provinces which has AFAD Search & Rescue Team

* Location of regional level DMC are proposed by JICA Study Team according to their population.

Outside of disaster area

Support from Other Areas Overseas

Logistic support DMC
- Acceptance of goods
- Transportation of goods
- Accept injured people, etc.

Disaster area

Front-line DMC
- Decision Making ⇔ Data Collection
- Management of Relief Activities
- Distribution of Relief Supplies / Personnel, etc.

Facilities required for DMC and Responsible Authorities

Facilities	AFAD	Metropolitan Municipality	Others
[1] Disaster & Emergency Management Center (Including Operation Center, AFAD office, Logistic Center, Heliport)	●		
[2] Training Center for Search & Rescue	●		
[3] Education Center for Disaster Preparedness	●		
[4] Satellite Network (VSAT)	●		
[5] Information Gathering & Dissemination System	●		
[6] R&D Institute	●		
[7] DRM related Facilities (Fire /AKOM/112 etc.)		●Fire/AKOM	●112（MOH)
[8] Waste Incineration Plant		●	
[9] Parks/Open Spaces/Sports Facilities		●	
[10] Emergency Road Network		●	
[11] Disaster Base Medical Center			●（MOH)
[12] School			●（MONE)
[13] Non-down life line			●

2. Proposed Components of proposed DMC

Facilities required for DMC related to AFAD

Facilities	National	Regional	Provincial
[1] Disaster & Emergency Management Center (Including Operation Center, AFAD office, Logistic Center, Heliport)	— On going	●【14】	●【12】
[2] Training Center for Search & Rescue (Including search & rescue team station)	●【10】	●【6】	
[3] Education Center for Disaster Preparedness	●【18】	●【10】	
[4] Satellite Network (VSAT)	●【50】		
[5] Information Gathering & Dissemination System	●【150】		
[6] R&D Institute	●【7】		
Total	【235】	【30】	【12】

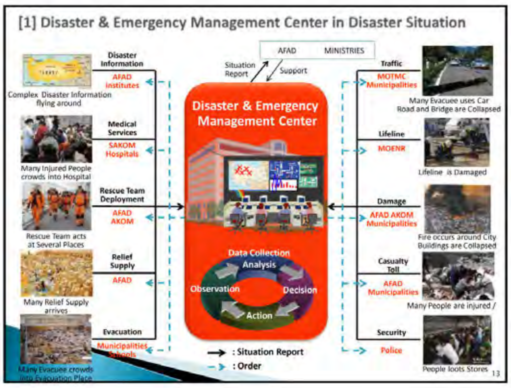
【 】Approximate Cost Estimation by Million US $

[1] Disaster & Emergency Management Center

including Logistic Center and Heliport

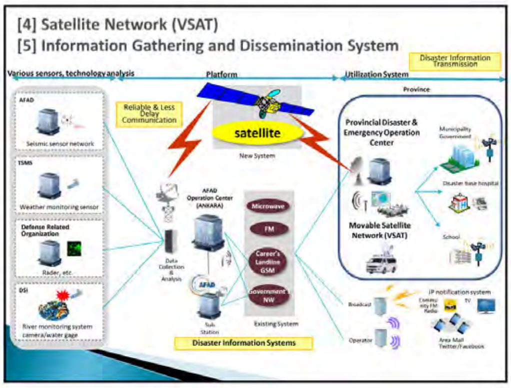
[Normal Period]
- Staff Training for DRM
- Public Education
- Disaster Preparedness
- Disaster Databank
- Storage of Stockpile

[Emergency Period]
- Headquarter for Disaster and Emergency Management
- Disaster Information Center
- Supply Center of Stockpiles
- Distribution Center of Relief Supplies and Personnel


[1] Disaster & Emergency Management Center in Disaster Situation
Disaster Information
AFAD Institutes
Complex Disaster Information flying around
Medical Services
SAKOM Hospitals
Many Injured People crowds into Hospital
Rescue Team Deployment
AFAD AKOM
Rescue Team acts at Several Places
Relief Supply
AFAD
Many Relief Supply arrives
Evacuation
Municipalities Schools
AFAD
MINISTRIES
Situation Report
Support
Disaster & Emergency Management Center
Data Collection Analysis
Observation
Decision
Action
: Situation Report
: Order
Traffic
MOTMC Municipalities
Many Evacuee uses Car Road and Bridge are Collapsed
Lifeline
MOENR
Lifeline is Damaged
Damage
AFAD AKOM Municipalities
Fire occurs around City Buildings are Collapsed
Casualty Toll
AFAD Municipalities
Many People are injured /
Security
Police
People loots Stores


[2] Training Center for Search & Rescue
(Professional & Semi-professional)
AFADEM (Ankara)
Regional Centers
Expansion of Disaster Response Training
AFADEM Ankara : TOT and training program & material development
Regional Training Center: Training for provincial, district and community level staff, NGO, volunteers, etc.
Practical Training for Search and Rescue
CURRENT AFADEM
UPGRADING of AFADEM, for more practical training
Collapsed Building
Transportation Disaster
Under Water
Rescue Dog
Industrial Disaster
CBRN
Proposed Assistance
Construction of Buildings and Procurement of Training Equipment
+
Technical Assistance for
Program/Curriculum Development
Training Techniques


[3] Education Center for Disaster Preparedness
Hands-on Education for Disaster Preparedness
CURRENT AFADEM
Trial / Experiences
Earthquake Simulation
Fire Extinguisher
Smoke Simulation
Survival Tour
Rain Storm
First Aid Training
Scientific Information
Disaster Prevention Measures
Proposed Assistance
Construction of Buildings and Procurement of Training Equipment
+
Technical Assistance for
Operation & Management of Center
Education Program and Techniques


[4] Satellite Network (VSAT)
[5] Information Gathering and Dissemination System
Various sensors, technology analysis
Platform
Utilization System
Disaster Information Transmission
Reliable & Less Delay Communication
satellite
New System
Province
Provincial Disaster & Emergency Operation Center
Movable Satellite Network (VSAT)
Microwave
FM
Career's Landline GSM
Government NW
Existing System
Disaster Information Systems


[6] Research & Development Center
Data Archive
Research for Policy
Experimental Facilities
Training & Education
Policy Making
Experimental Apparatus with State-of-the-art Technology
Information Sharing
METU
Research & Development Cooperation
Data Archive
AFAD R&D Center
R&D
Universities
Institutes
etc.
Data Collection
Avalanche
Earthquake
Landslide


3. Proposed Project Packages
For Japanese ODA assistance

	Package A	Package B	Package C
	*Nation wide ICT Network *Training, Education and R&D Center in national level *Regional DMC in each logistic zone	*Nation wide ICT Network *Training, Education and R&D Center in national level *5 high ranked Regional DMCs and 5 Provincial DMCs (one in each region where Regional DMC locates)	*Nation wide ICT Network *Training, Education and R&D Center in national level * 3 Regional DMCs and Provincial DMCs in their regions
National Level	Training Center for Search & Rescue Education Center for Disaster Preparedness Satellite Network (VSAT) Information Gathering and Dissemination System R&D Center	Training Center for Search & Rescue Education Center for Disaster Preparedness Satellite Network (VSAT) Information Gathering and Dissemination System R&D Center	Training Center for Search & Rescue Education Center for Disaster Preparedness Satellite Network (VSAT) Information Gathering and Dissemination System R&D Center
Regional Level DMC	Regional DMC (13 centers*) Disaster & Emergency Management Center Training Center for Search & Rescue Education Center for Disaster Preparedness * Excluding Ankara and Istanbul	Regional DMC (5 centers) Disaster & Emergency Management Center Training Center for Search & Rescue Education Center for Disaster Preparedness	Regional DMC (3 centers) Disaster & Emergency Management Center Training Center for Search & Rescue Education Center for Disaster Preparedness
Provincial Level		Provincial DMC (5 Provinces surrounding Regional DMC) Disaster & Emergency Management Center	Provincial DMC (12 Provinces surrounding Regional DMC) Disaster & Emergency Management Center

Package A

National Level + 13 Regional Level DMC
(15 provinces - Ankara -Istanbul)

National Level DMC
Regional Level DMC
Provincial Level DMC
Istanbul Regional Level DMC (Existing)

* *Location of regional level DMC are proposed by JICA Study Team according to their population.*

Package B

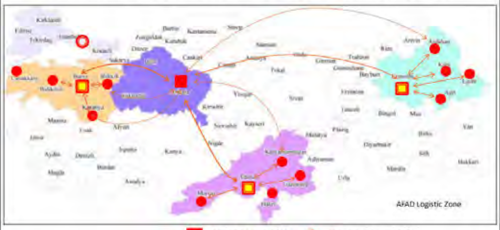
National Level + 5 Regional Level DMCs + 5 Provincial Level DMCs

National Level DMC
Regional Level DMC
Provincial Level DMC
Istanbul Regional Level DMC (Existing)

* *Location of regional level DMC are proposed by JICA Study Team according to their population.*
** *Provincial Level Center should be selected from neighboring provinces of the provinces which have Regional Center DMC.*

Package C

National Level + 3 Regional Level DMCs + 12 Provincial Level DMCs



National Level DMC
Regional Level DMC
Provincial Level DMC
Istanbul Regional Level DMC (Existing)

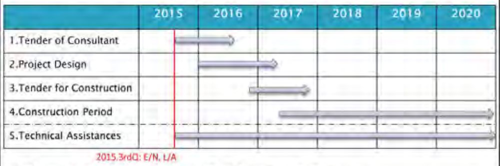
* *Location of regional level DMC are proposed by JICA Study Team according to their population.*
** *Target regions were tentatively selected by JICA Study team as an example to cover the country.*

Project Package Alternatives

			A National 1 Regional 13		B National 1 Regional 5 Provincial 5		C National 1 Regional 3 Provincial12	
		Unit Cost	No.	Cost	No.	Cost	No.	Cost
National	(2) Training Center for Search & Rescue	10	1	10	1	10	1	10
	(3) Education Center for Disaster Preparedness	18	1	18	1	18	1	18
	(4) Satellite Network (VSAT)	50	1	50	1	50	1	50
	(5) Information Gathering & Dissemination System	150	1	150	1	150	1	150
	(6) R&D Institute	7	1	7	1	7	1	7
Regional	(1) Disaster Management Center	14	13	182	5	70	3	42
	(2) Training Center for Search & Rescue	6	13	78	5	30	3	18
	(3) Education Center for Disaster Preparedness	10	13	130	5	50	3	30
Prov.	(1) Disaster & Emergency Management Center	12	-	-	5	60	12	144
	Total		625		445		469	

3. Next Steps Schedule

Image of Project schedule



- Necessary time for procurement (1~3) is from a year to two years.
- Construction Periods of each components is as follows.

①Disaster & Emergency Management Center	around 2~3 years
②Training Center for Search & Rescue	around 2~3 years
③Education Center for Disaster Preparedness	around 2~3 years
④Satellite Network (VSAT)	around 1.5 ~ 2 years
⑤Information Gathering & Dissemination System	around 3~4 years
⑥Research Center	around 2~3 years

Action to be taken for project formulation

Action	Deadline	Responsible Organization
Submit an application for Investment Program to MOD	By August 2014 (the sooner, the better)	AFAD (JICA will support as possible)
Request ODA Loan to Japanese Government officially	By October 2014 (the sooner, the better)	UT (after approval for a proposed project by MOD)
Dispatch Fact Finding Mission	By April 2015 (for 2 weeks)	JICA
Dispatch Appraisal Mission	By June 2015 (for 2 weeks)	JICA
Sign Exchange of Notes and Loan Agreement	By September 2015	E/N: GoT & GoJ L/A: AFAD & JICA

Teşekkür ederim

Cost Calculation basis

Package A

Component	Level	Unit U	Cost/Unit	Cost U*
[1] Disaster & Emergency Management Centre	Reginal	13	14	182
	Provincial	0	12	0
[2] Training Centre for Search & Rescue	National	1	10	10
	Reginal	13	6	78
[3] Education Center for Public Preparedness	National	1	18	18
	Reginal	13	10	130
[4] Satelite Network (VSAT)	National	1	50	50
[5] Information Gathering & Dissemination System	National	1	150	150
[6] R&D Institute	National	1	7	7
			Total	625

Approximate Cost by US million$

Cost Calculation basis

Package B

Component	Level	Unit U	Cost/Unit	Cost U*
[1] Disaster & Emergency Management Centre	Reginal	5	14	70
	Provincial	5	12	60
[2] Training Centre for Search & Rescue	National	1	10	10
	Reginal	5	6	30
[3] Education Center for Public Preparedness	National	1	18	18
	Reginal	5	10	50
[4] Satelite Network (VSAT)	National	1	50	50
[5] Information Gathering & Dissemination System	National	1	150	150
[6] R&D Institute	National	1	7	7
			Total	445

Approximate Cost by US million$

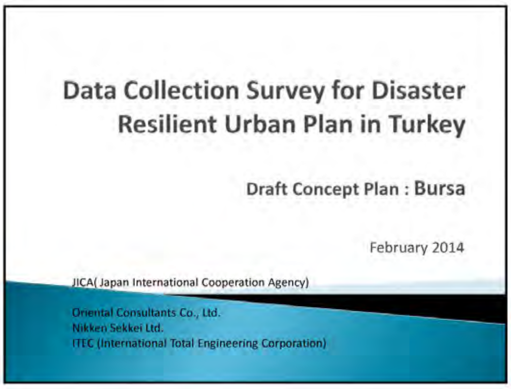
Cost Calculation basis

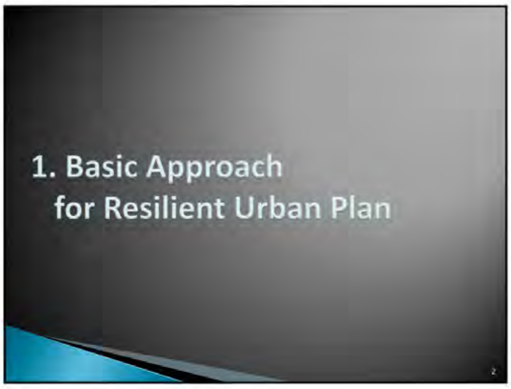
Package C

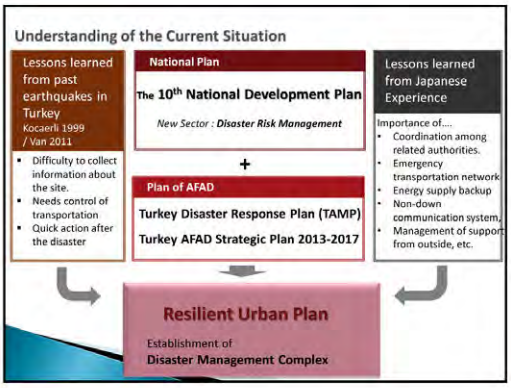
Component	Level	Unit U	Cost/Unit	Cost U*
[1] Disaster & Emergency Management Centre	Reginal	3	14	42
	Provincial	12	12	144
[2] Training Centre for Search & Rescue	National	1	10	10
	Reginal	3	6	18
[3] Education Center for Public Preparedness	National	1	18	18
	Reginal	3	10	30
[4] Satelite Network (VSAT)	National	1	50	50
[5] Information Gathering & Dissemination System	National	1	150	150
[6] R&D Institute	National	1	7	7
			Total	469

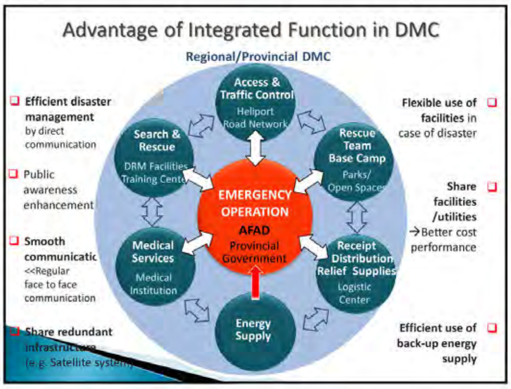
Approximate Cost by US million$

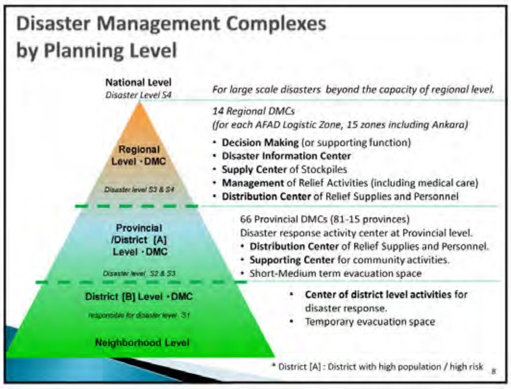
3. Round Table Meeting at Bursa, 21 February, 2014

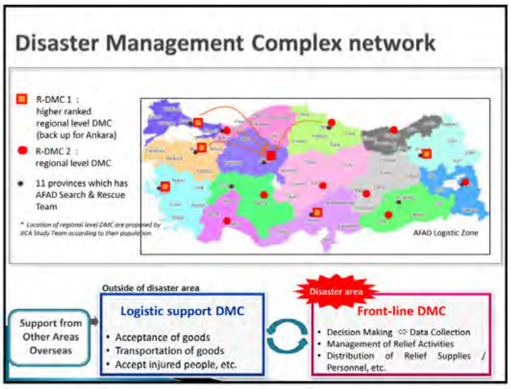


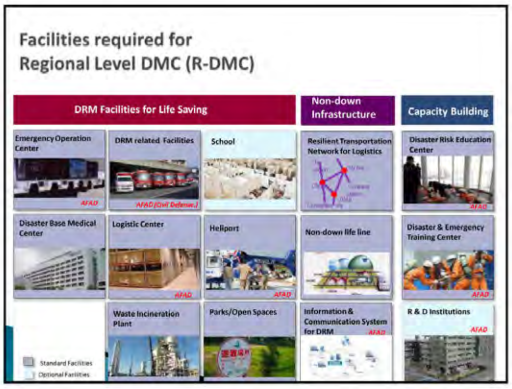


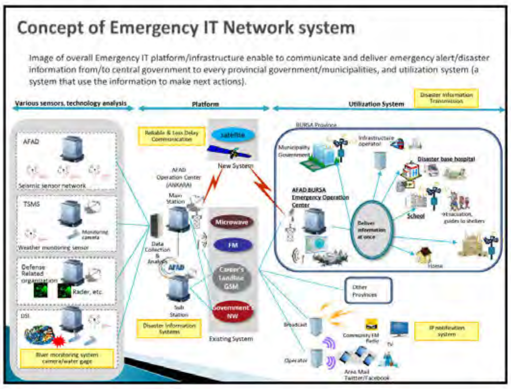


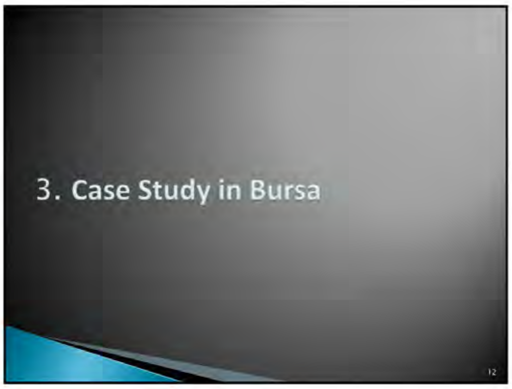

Advantage of Integrated Function in DMC
Regional/Provincial DMC
Efficient disaster management by direct communication
Public awareness enhancement
Smooth communication <<Regular face to face communication
Share redundant infrastructure (e.g. Satellite system)
Access & Traffic Control
Heliport
Road Network
Search & Rescue
DRM Facilities
Training Center
Rescue Team Base Camp
Parks/ Open Spaces
EMERGENCY OPERATION
AFAD
Provincial Government
Medical Services
Medical Institution
Receipt Distribution Relief Supplies
Logistic Center
Energy Supply
Flexible use of facilities in case of disaster
Share facilities /utilities
→Better cost performance
Efficient use of back-up energy supply

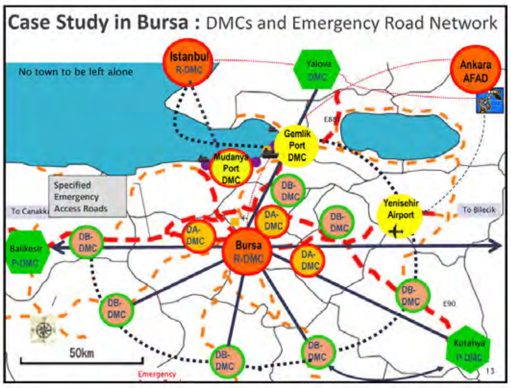

Disaster Management Complexes by Planning Level
National Level
Disaster Level S4
For large scale disasters beyond the capacity of regional level.
Regional Level - DMC
Disaster level S3 & S4
14 Regional DMCs
(for each AFAD Logistic Zone, 15 zones including Ankara)
Decision Making (or supporting function)
Disaster Information Center
Supply Center of Stockpiles
Management of Relief Activities (including medical care)
Distribution Center of Relief Supplies and Personnel
Provincial /District [A] Level - DMC
Disaster level S2 & S3
66 Provincial DMCs (81-15 provinces)
Disaster response activity center at Provincial level.
Distribution Center of Relief Supplies and Personnel.
Supporting Center for community activities.
Short-Medium term evacuation space
District [B] Level - DMC
Center of district level activities for disaster response.
Temporary evacuation space
Neighborhood Level
* District [A] : District with high population / high risk

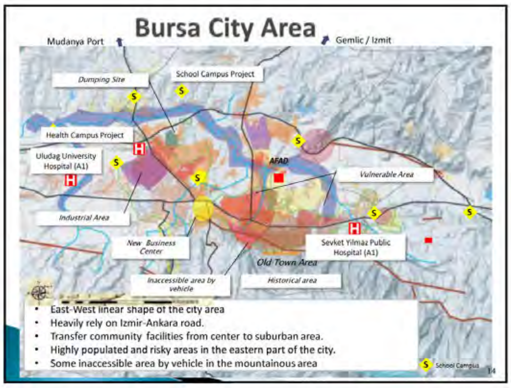

Disaster Management Complex network
R-DMC 1 : higher ranked regional level DMC (back up for Ankara)
R-DMC 2 : regional level DMC
11 provinces which has AFAD Search & Rescue Team
* Location of regional level DMC are proposed by JICA Study Team according to their population.
AFAD Logistic Zone
Support from Other Areas Overseas
Outside of disaster area
Logistic support DMC
Acceptance of goods
Transportation of goods
Accept injured people, etc.
Disaster area
Front-line DMC
Decision Making ⇔ Data Collection
Management of Relief Activities
Distribution of Relief Supplies / Personnel, etc.


Facilities required for Regional Level DMC (R-DMC)
DRM Facilities for Life Saving
Non-down Infrastructure
Capacity Building
Emergency Operation Center
AFAD
DRM related Facilities
AFAD (Civil Defense.)
School
Resilient Transportation Network for Logistics
Disaster Risk Education Center
AFAD
Disaster Base Medical Center
Logistic Center
AFAD
Heliport
AFAD
Non-down life line
Disaster & Emergency Training Center
AFAD
Waste Incineration Plant
Parks/Open Spaces
Information & Communication System for DRM
AFAD
R & D Institutions
AFAD
Standard Facilities
Optional Facilities

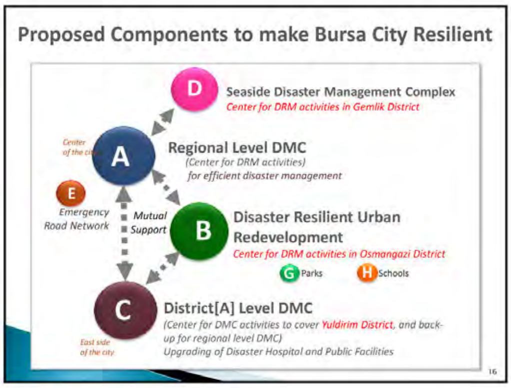

Concept of Emergency IT Network system
Image of overall Emergency IT platform/infrastructure enable to communicate and deliver emergency alert/disaster information from/to central government to every provincial government/municipalities, and utilization system (a system that use the information to make next actions).
Various sensors, technology analysis
Platform
Utilization System
Disaster Information Transmission
AFAD
Seismic sensor network
TSMS
Monitoring camera
Weather monitoring sensor
Defense Related organization
Rader, etc.
DSI
River monitoring system camera/water gage
Reliable & Less Delay Communication
satellite
New System
AFAD Operation Center (ANKARA)
Main Station
Data Collection & Analysis
AFAD
Sub Station
Disaster Information Systems
Microwave
FM
Existing System
BURSA Province
Municipality Government
Infrastructure operator
Disaster base hospital
AFAD BURSA Emergency Operation Center
School
Deliver information at once
Home
Other Provinces
Broadcast
Community FM Radio
TV
IP notification system
Operator
Area Mail Twitter/Facebook


3. Case Study in Bursa
12

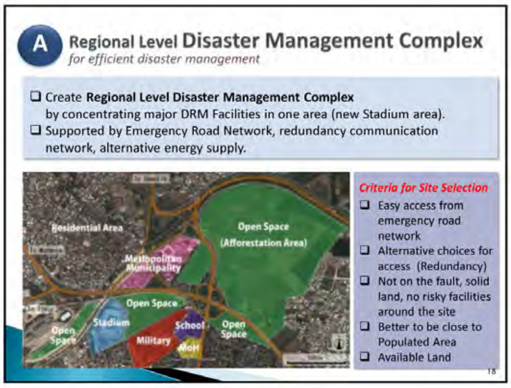

Case Study in Bursa : DMCs and Emergency Road Network
No town to be left alone
Istanbul
R-DMC
Yalova
DMC
Ankara
AFAD
Gemlik
Port
DMC
Mudanya
Port
DMC
Specified
Emergency
Access Roads
To Canakk
To Bilecik
Yenisehir
Airport
Balikesir
P-DMC
DB-
DMC
DA-
DMC
Bursa
R-DMC
Kutahya
P-DMC
50km
E90
Emergency
13

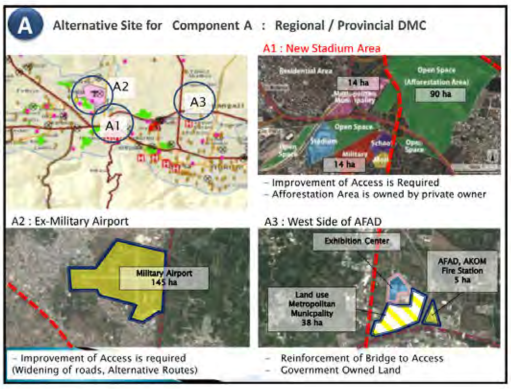

Bursa City Area
Mudanya Port
Gemlic / Izmit
Dumping Site
School Campus Project
Health Campus Project
Uludag University
Hospital (A1)
AFAD
Vulnerable Area
Industrial Area
New Business
Center
Sevket Yilmaz Public
Hospital (A1)
Old Town Area
Inaccessible area by
vehicle
Historical area
• East-West linear shape of the city area
• Heavily rely on Izmir-Ankara road.
• Transfer community facilities from center to suburban area.
• Highly populated and risky areas in the eastern part of the city.
• Some inaccessible area by vehicle in the mountainous area
School Campus
14


Proposed Projects to make Bursa City Resilient
LEGEND
Emergency Road Network
Parks
Schools


Proposed Components to make Bursa City Resilient
D
Seaside Disaster Management Complex
Center for DRM activities in Gemlik District
A
Regional Level DMC
(Center for DRM activities)
for efficient disaster management
E
Emergency
Road Network
Mutual
Support
B
Disaster Resilient Urban
Redevelopment
Center for DRM activities in Osmangazi District
Parks
Schools
C
District[A] Level DMC
(Center for DMC activities to cover Yildirim District, and back-
up for regional level DMC)
Upgrading of Disaster Hospital and Public Facilities
East side
of the city
16


Component
A
Regional Level DMC
(Center for DRM activities)
for efficient disaster management
17

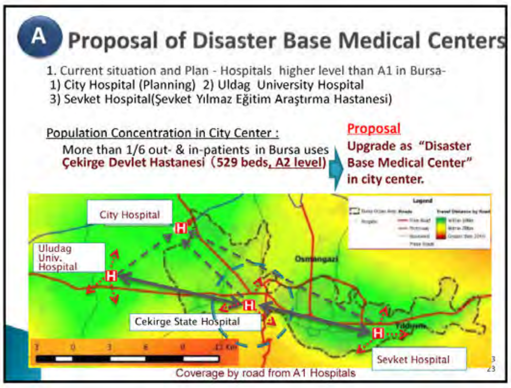

A
Regional Level Disaster Management Complex
for efficient disaster management
❑ Create Regional Level Disaster Management Complex
by concentrating major DRM Facilities in one area (new Stadium area).
❑ Supported by Emergency Road Network, redundancy communication
network, alternative energy supply.
Residential Area
Open Space
(Afforestation Area)
Metropolitan
Municipality
Open Space
Stadium
School
Open
Space
Military
MoH
Criteria for Site Selection
❑ Easy access from emergency road network
❑ Alternative choices for access (Redundancy)
❑ Not on the fault, solid land, no risky facilities around the site
❑ Better to be close to Populated Area
❑ Available Land
18


A
Alternative Site for Component A : Regional / Provincial DMC
A1
A2
A3
A1 : New Stadium Area
Residential Area
14 ha
Open Space
(Afforestation Area)
90 ha
Open Space
Stadium
Military
14 ha
Open Space
- Improvement of Access is Required
- Afforestation Area is owned by private owner
A2 : Ex-Military Airport
Military Airport
145 ha
- Improvement of Access is required
(Widening of roads, Alternative Routes)
A3 : West Side of AFAD
Exhibition Center
AFAD, AKOM
Fire Station
5 ha
Land use
Metropolitan
Municpality
38 ha
- Reinforcement of Bridge to Access
- Government Owned Land

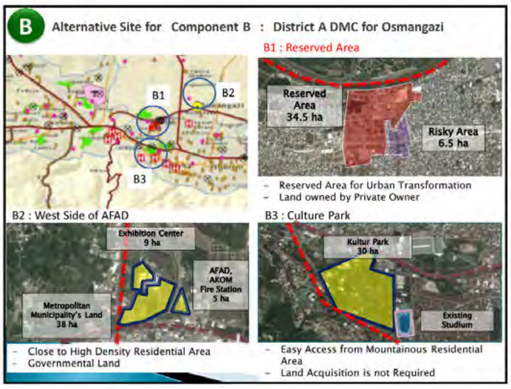

A
Regional Level Disaster Management Complex
for efficient disaster management
(Site A1)
Training Center, Education Centre, AKOM, Etc.
Heliport
Emergency Operation Centre, AFAD
Metropolitan Municipality
Greenery Reserved Site
Rescue Activities
Stock Pile Depot, Logistic Centre, Incineration Plant & Energy Plant, Etc.
New Stadium
Military Site
School
Mall
Service Route Connection
Disaster Base Medical Center
[1]
[2]
[3]
[1]Emergency Operation Center
[2]DRM Training Center
[3]Disaster Base Medical Center
Proposed Facilities for Regional Level DMC
[1] Emergency Operation Center (AFAD)
[2] DRM related Facilities (AFAD)
[3] Disaster Base Medical Center
[4] Parks/Open Spaces
[5] Logistic Center (AFAD)
[6] Heliport (AFAD)
[7] Waste Incineration Plant
[8] DRM Training Center (AFAD)
20

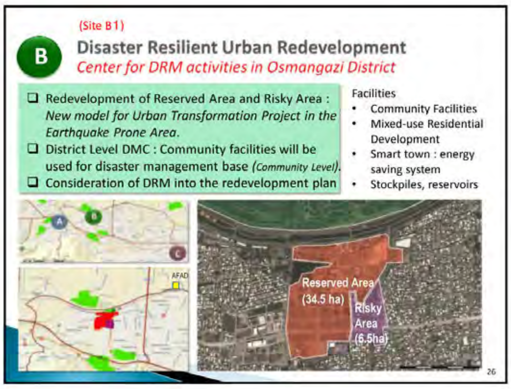

A
Emergency Operation Center
[Normal Period]
• Staff Training
• Public Education
• Disaster Preparedness Center
• Disaster Databank
• Storage of Stockpile
[Emergency Period]
• Headquarter for Disaster and Emergency Management
• Disaster Information Center
• Supply Center of Stockpiles
• Distribution Center of Relief Supplies and Personnel


A
Disaster Base Medical Center
Facility
Space for relief supplies
Equip for disaster relief medical services
Secure access via Air for patient transfer
Ensure continuity of medical activities
22


A
Proposal of Disaster Base Medical Centers
1. Current situation and Plan - Hospitals higher level than A1 in Bursa-
1) City Hospital (Planning) 2) Uldag University Hospital
3) Sevket Hospital(Şevket Yılmaz Eğitim Araştırma Hastanesi)
Population Concentration in City Center :
More than 1/6 out- & in-patients in Bursa uses
Çekirge Devlet Hastanesi (529 beds, A2 level)
Proposal
Upgrade as "Disaster Base Medical Center" in city center.
City Hospital
Uludag Univ. Hospital
Osmangazi
Cekirge State Hospital
Sevket Hospital
Coverage by road from A1 Hospitals
23

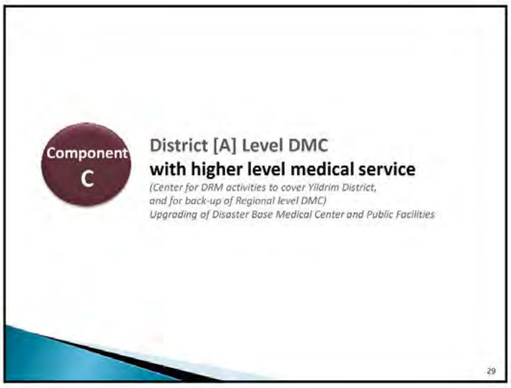

Component B
Disaster Resilient Urban Redevelopment
Center for DRM activities in Osmangazi District
24


B
Alternative Site for Component B : District A DMC for Osmangazi
B1 : Reserved Area
B1
B2
B3
Reserved Area 34.5 ha
Risky Area 6.5 ha
- Reserved Area for Urban Transformation
- Land owned by Private Owner
B2 : West Side of AFAD
Exhibition Center 9 ha
AFAD, AKOM Fire Station 5 ha
Metropolitan Municipality's Land 38 ha
- Close to High Density Residential Area
- Governmental Land
B3 : Culture Park
Kultur Park 30 ha
Existing Studium
- Easy Access from Mountainous Residential Area
- Land Acquisition is not Required


(Site B1)
B
Disaster Resilient Urban Redevelopment
Center for DRM activities in Osmangazi District
❑ Redevelopment of Reserved Area and Risky Area : New model for Urban Transformation Project in the Earthquake Prone Area.
❑ District Level DMC : Community facilities will be used for disaster management base (Community Level).
❑ Consideration of DRM into the redevelopment plan
Facilities
• Community Facilities
• Mixed-use Residential Development
• Smart town : energy saving system
• Stockpiles, reservoirs
AFAD
Reserved Area (34.5 ha)
Risky Area (6.5ha)
26


B
Disaster Resilient Urban Redevelopment
Center for DRM activities in Osmangazi District
(Site B1)
Botanic Park
Emergency Toilet System
Main road (For emergency logistics & rescue)
Evacuation & Rescue Zone (Disaster Response Base)
Sports Ground (Rescue & Logistics activity space)
Gymnasium, pool (Evacuation, Triage Space)
School
Medical Center
Deep well & District water supply
Seismic Free Housing Zone
Housing
Green Park (Evacuation space)
Artificial ground seismic isolation
wide road for rescue activities
Public Evacuation Shelter
Housing
Open spaces for evacuation


B'
Disaster Resilient Urban Redevelopment
Center for DRM activities in Osmangazi District
B2 Site
Stock Pile Depot, Logistic Centre, Water Supply System
[1] Stock Pile Depot
[2] Pool water can be used in case of disaster
Merinos Culture Park
Gymnasium, Pool (Evacuation, Triage Space) Upgrading
Existing Cultural Park
Emergency Evacuation Place
Old Factory Site
Heliport
New Civic Plaza (Existing Stadium)
Emergency Operation Centre (With Heliport)
[3] Emergency Operation Center
[3] Emergency Operation Activities
28

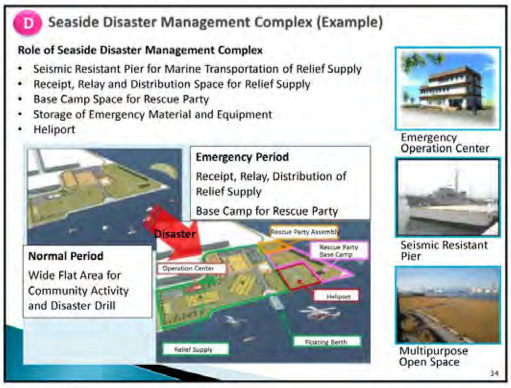

Component C
District [A] Level DMC
with higher level medical service
(Center for DRM activities to cover Yildrim District,
and for back-up of Regional level DMC)
Upgrading of Disaster Base Medical Center and Public Facilities
29


C
District [A] Level DMC
with high level medical service
❑ Upgrading function of Sevket Hospital as a Disaster Base Medical Center. (Research & Education Hospital which has function as a Disaster Response and CBRN Treatment. New Cardiovascular Unit will be constructed next year) .
❑ AFAD Education Center and other public facilities/open spaces in this area will be retrofitted and equipped to be a sub center of DRM in the disaster periods.
Bursa Disaster Training Center (AFAD)
→ Center for Disaster Relief Activity (Volunteers)
Government Office
→Search & Rescue Support
Police Academy
→ Additional Hospital & Triage Space
→ Stockpile, Evacuation Space
Schools
→ Supporting Facility for Hospital
Provincial Government Office
→Distribution Center of Supporting Goods
→District Disaster Management Center
University
→ Evacuation Space & Supporting Facility for Hospital
Sevket Hospital
→ Disaster Base Medical Center
Open space → Evacuation
Government Office → Stockpile
30

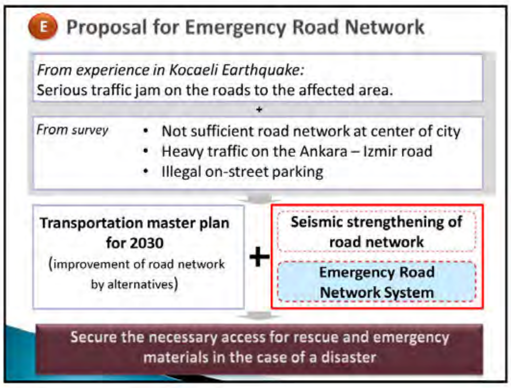

C
Upgrading of Disaster Base Medical Center
After 2011 Great East Japan Earthquake, Cardiovascular disease rapidly increased.
→ Holistic Medical approach is crucial for disaster medical care.
Sevket Yilmaz Hospital
should have the function of highly advanced medical treatment, advanced research and further education.
1. Upgrading of Existing Hospital :
Double bed capacity in disaster with Medical gas system (currently 10% only)
Heliport shall be attached
Separate backup of patient data
Satellite communication system
+
2. Additional Hospital function with Disaster Management :
Additional Clinical departments / seismic isolation
Staff Dormitory, Stock House for disaster, Evacuation
UMKE
Sub-coordination function of UMKE
Separate backup of patient data
Old Police College
Staff Dormitory
Evacuation Space
Sevket Hospital (Existing)
Cardiovascular Hospital (200beds) by MOH w/ Heliport
Stock House
Hospital
Heliport
HCP: Hospital Continuity Plan

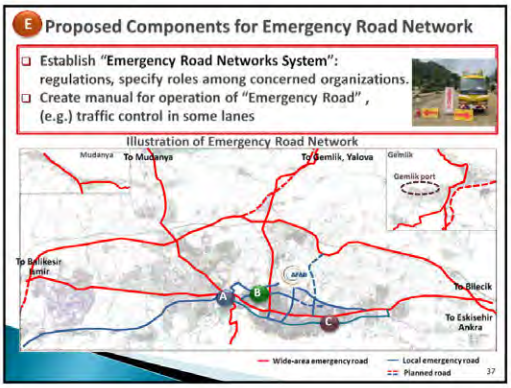

Component
D
Seaside Disaster Management Complex
(Center of DRM activities in Gemlik District)
32

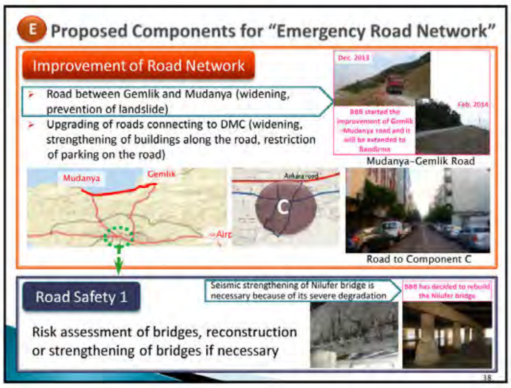

D
Upgrading of Public Port in Gemlik
Gemport Limanı
Gemlik Gübre Limanı
Public Port
Borusan Limanı
Roda Limanı
MKS A.Ş.
BP Gemlik Terminali
To Yalova
To Bursa
: Operational in case of disaster
: Not Operational in case of disaster (Petroleum, Chemical)
: Small Public Port
Existing Road
Highway under planning
33


D
Seaside Disaster Management Complex (Example)
Role of Seaside Disaster Management Complex
Seismic Resistant Pier for Marine Transportation of Relief Supply
Receipt, Relay and Distribution Space for Relief Supply
Base Camp Space for Rescue Party
Storage of Emergency Material and Equipment
Heliport
Emergency Period
Receipt, Relay, Distribution of Relief Supply
Base Camp for Rescue Party
Disaster
Normal Period
Wide Flat Area for Community Activity and Disaster Drill
Emergency Operation Center
Seismic Resistant Pier
Multipurpose Open Space
34


Component
E
Emergency Road Network
35

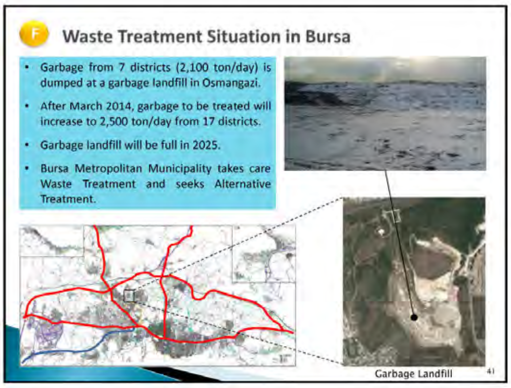

E
Proposal for Emergency Road Network
From experience in Kocaeli Earthquake:
Serious traffic jam on the roads to the affected area.
+
From survey
Not sufficient road network at center of city
Heavy traffic on the Ankara – Izmir road
Illegal on-street parking
Transportation master plan for 2030
(improvement of road network by alternatives)
+
Seismic strengthening of road network
Emergency Road Network System
Secure the necessary access for rescue and emergency materials in the case of a disaster

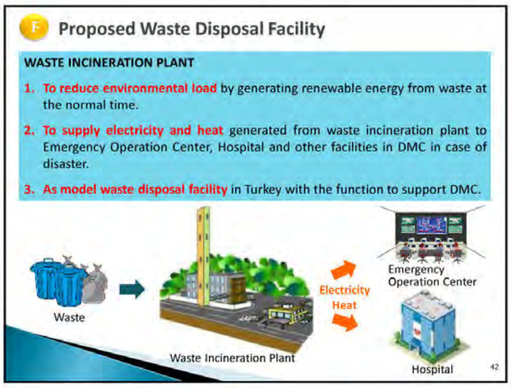

E
Proposed Components for Emergency Road Network
Establish "Emergency Road Networks System": regulations, specify roles among concerned organizations.
Create manual for operation of "Emergency Road", (e.g.) traffic control in some lanes
Illustration of Emergency Road Network
Mudanya
To Mudanya
To Gemlik, Yalova
Gemlik
Gemlik port
To Balikesir Izmir
To Bilecik
To Eskisehir Ankra
A
B
C
Wide-area emergency road
Local emergency road
Planned road
37


E
Proposed Components for "Emergency Road Network"
Improvement of Road Network
Road between Gemlik and Mudanya (widening, prevention of landslide)
Upgrading of roads connecting to DMC (widening, strengthening of buildings along the road, restriction of parking on the road)
Dec. 2013
Feb. 2014
BBB started the improvement of Gemlik -Mudanya road and it will be extended to Bandirma
Mudanya-Gemlik Road
Mudanya
Gemlik
Ankara road
C
Road to Component C
Road Safety 1
Risk assessment of bridges, reconstruction or strengthening of bridges if necessary
Seismic strengthening of Nilufer bridge is necessary because of its severe degradation
BBB has decided to rebuild the Nilufer bridge
38


D
Proposed Components for "Emergency Road Network"
Road Safety 2
Establish a system for assessment and information collection of road damage
Combine BBB existing camera monitoring system with Japanese damage assessment and automatic alarm system
Road Safety 3
Seismic strengthening of high buildings along the emergency roads
Road Safety 4
Risk assessment of retaining wall of grade crossings and strengthening if needed
Road Safety 5
Identification of potential landslide locations along the wide area emergency roads and construction of retaining wall


Component
F
Waste Incineration Plant
As Energy Source for DMC
40


F
Waste Treatment Situation in Bursa
Garbage from 7 districts (2,100 ton/day) is dumped at a garbage landfill in Osmangazi.
After March 2014, garbage to be treated will increase to 2,500 ton/day from 17 districts.
Garbage landfill will be full in 2025.
Bursa Metropolitan Municipality takes care Waste Treatment and seeks Alternative Treatment.
Garbage Landfill
41


F
Proposed Waste Disposal Facility
WASTE INCINERATION PLANT
1. To reduce environmental load by generating renewable energy from waste at the normal time.
2. To supply electricity and heat generated from waste incineration plant to Emergency Operation Center, Hospital and other facilities in DMC in case of disaster.
3. As model waste disposal facility in Turkey with the function to support DMC.
Waste
Waste Incineration Plant
Electricity
Heat
Emergency Operation Center
Hospital
42

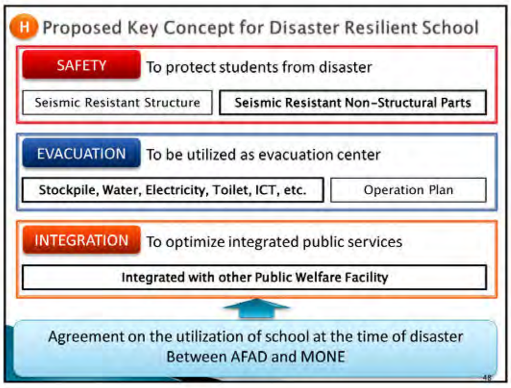

Component
G
Disaster Prevention Park
43


G Proposed Key Concept for Disaster Prevention Park
Evacuation
Open Area for Evacuee and Disaster Response Activity
Stockpile
Storage for Stockpile (Food, Generator, Light, Blanket, etc.)
Consolidation Area
Open Area for Consolidation and Distribution of Relief Supply
44

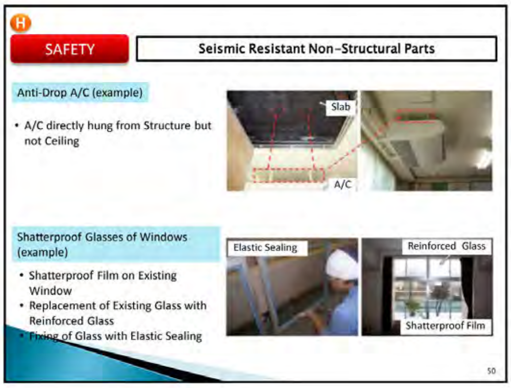

G Proposed Key Concept for Disaster Prevention Park
Water Supply
Water Reservoir for Potable Water
Well for General Service Water
Fire Spread Prevention
Planting Zone for Fire Spread and Radiation Heat Prevention
Emergency Transportation
Heliport for Transportation of Critical Patient, Emergency Material, Information Collection, etc.
Toilet
Temporary Toilet System
45

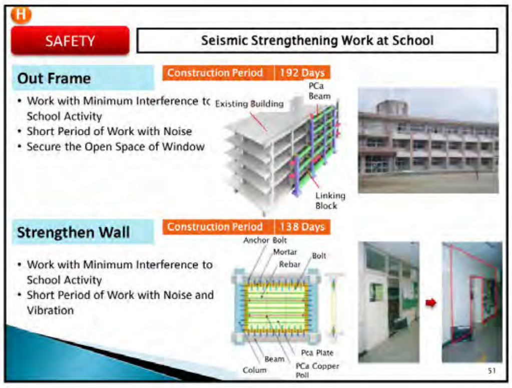

G Proposed Key Concept for Disaster Prevention Park
Toilet /Temporary Toilet
Planted Zone /Fire Spread Prevention
Administration Bldg. /Stockpile Storage
Heliport for Emergency Transportation
Open Area /Evacuation Area /Disaster Relief Activity
Seismic Resistant Water Reservoir
Well /General Service Water
Open Area /Relief Material Yard /Rescue Party Base Camp
46


Component
H
Disaster Resilient Schools
47

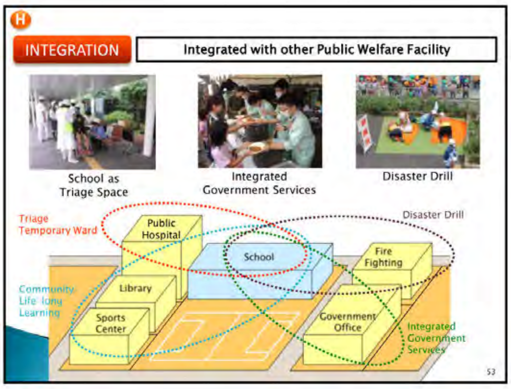

H Proposed Key Concept for Disaster Resilient School
SAFETY
To protect students from disaster
Seismic Resistant Structure
Seismic Resistant Non-Structural Parts
EVACUATION
To be utilized as evacuation center
Stockpile, Water, Electricity, Toilet, ICT, etc.
Operation Plan
INTEGRATION
To optimize integrated public services
Integrated with other Public Welfare Facility
Agreement on the utilization of school at the time of disaster
Between AFAD and MONE
48


H
SAFETY
Seismic Resistant Non-Structural Parts
After Great East Japan Earthquake
Ceiling
Interior Wall
Window Glass
49

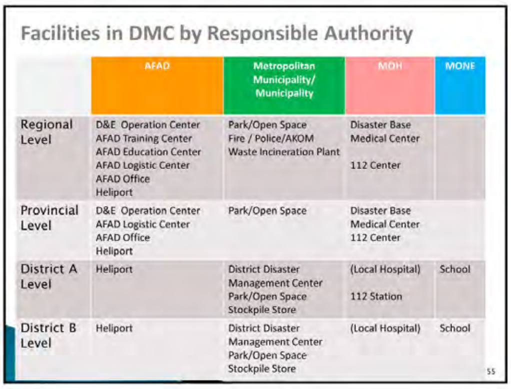

H
SAFETY
Seismic Resistant Non-Structural Parts
Anti-Drop A/C (example)
• A/C directly hung from Structure but not Ceiling
Slab
A/C
Shatterproof Glasses of Windows (example)
• Shatterproof Film on Existing Window
• Replacement of Existing Glass with Reinforced Glass
• Fixing of Glass with Elastic Sealing
Elastic Sealing
Reinforced Glass
Shatterproof Film
50


H
SAFETY
Seismic Strengthening Work at School
Out Frame
Construction Period 192 Days
• Work with Minimum Interference to School Activity
• Short Period of Work with Noise
• Secure the Open Space of Window
Existing Building
PCa Beam
Linking Block
Strengthen Wall
Construction Period 138 Days
• Work with Minimum Interference to School Activity
• Short Period of Work with Noise and Vibration
Anchor Bolt
Mortar
Rebar
Bolt
Pca Plate
Beam
Colum
PCa Copper Poll
51


H
EVACUATION
Stockpile, Water, Electricity, Toilet, ICT, etc.
Stockpile
Emergency Electricity
Water Reservoir
Temp. Toilet
Layout & Plan as Evacuation Place
Emergency Well
52


H
INTEGRATION
Integrated with other Public Welfare Facility
School as Triage Space
Integrated Government Services
Disaster Drill
Triage Temporary Ward
Public Hospital
School
Disaster Drill
Fire Fighting
Community Life long Learning
Library
Sports Center
Government Office
Integrated Government Services
53

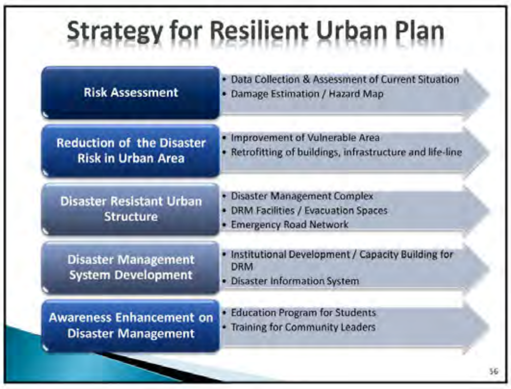

Teşekkür ederim

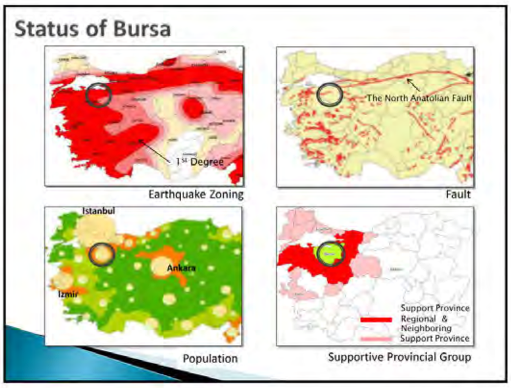


Facilities in DMC by Responsible Authority

	AFAD	Metropolitan Municipality/ Municipality	MOH	MONE
Regional Level	D&E Operation Center AFAD Training Center AFAD Education Center AFAD Logistic Center AFAD Office Heliport	Park/Open Space Fire / Police/AKOM Waste Incineration Plant	Disaster Base Medical Center 112 Center	
Provincial Level	D&E Operation Center AFAD Logistic Center AFAD Office Heliport	Park/Open Space	Disaster Base Medical Center 112 Center	
District A Level	Heliport	District Disaster Management Center Park/Open Space Stockpile Store	(Local Hospital) 112 Station	School
District B Level	Heliport	District Disaster Management Center Park/Open Space Stockpile Store	(Local Hospital)	School

55





A-3. Project Profile Summary Sheet

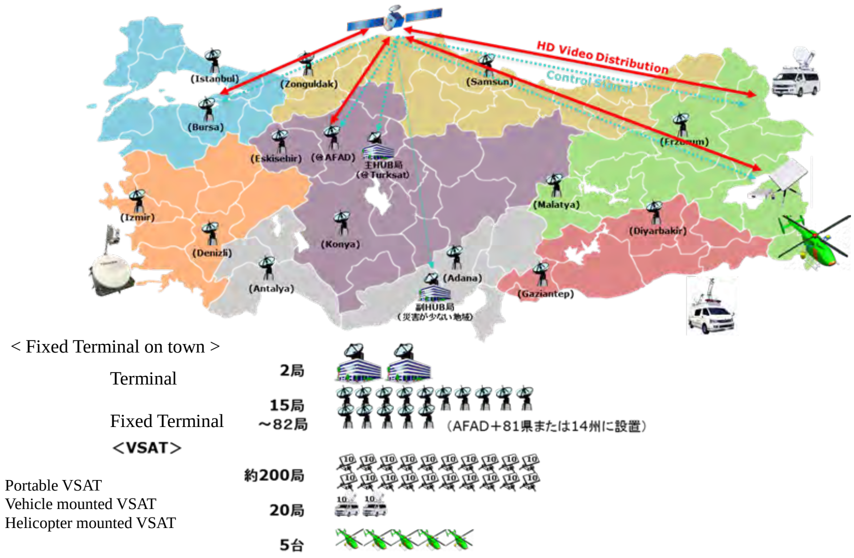
Project Title	**National 1-1** Upgrade of Disaster and Emergency Training Center (AFADEM) for Professional/Government Staff **Provincial 3-1-3** Establishment of regional disaster and emergency training center for professional/government staff
Project Components	Upgrade and establishment of disaster and emergency training center for central level (AFADEM) and regional level respectively. **[Ankara AFADEM]** Upgrades of the disaster and emergency training center of AFAD (AFADEM) include an upgrade of the facilities and of the training programs, and are in line with the nationwide AFAD human resources development goal. ■Facility and Equipment Development • Floor area: approximately 10,000 m^2 • Hands-on training facility including: traffic accident, train accident, firefighting, rescue from building, maritime accident, collapsed building, rescue from rubble, landslide, CBRN, and industrial disaster. ■Training Programs • Training of Trainers (TOT), and encouragement of new trainers to move to other provinces • Assistance for development of curriculum and teaching material • Addition of hands-on training in the new facilities to respond to complex urban disasters • Training for search and rescue team and central government officials **[Regional Level Training Center]** Construction of a regional disaster and emergency training center and development of a training program and training material for various disasters prone to occur in the region. ■Facility and Equipment Development • Floor area: approximately 5,000 m^2 • Hands-on training facility similar to that of AFADEM, with a special focus on region-specific trainings such as industrial disaster, mountain disaster, and landslide in Bursa.   
Meaning of the project in terms of resilient urban planning	Disaster response will be enhanced through upgrading AFADEM's function as a center of human resource development for disaster prevention which enables high level training for various disasters such as complex urban disasters and man-made disasters. Trainers trained at AFADEM will be deployed to regional training centers to provide and promote disaster prevention training at regional and provincial levels. Training programs will prepare trainees for region-specific disasters.
Effectiveness and the need for disaster management	TOT for improvement of disaster prevention knowledge and skill as nationwide human resource development will contribute to an increase in number of trainers and personnel related to search and rescue. In accordance with the amendment of the AFAD law, regional training centers will belong to AFADEM and regional training will contribute regional human resources development. [Normal time] Center of disaster response training for professionals. [Disaster time] Base for search and rescue teams.
Indicator	Number of trained professionals Number of trainings available in each region Number of hands-on training facilities

Approx. Estimated Cost	1,520 million yen (1 training center)
Duration	Facility: Planning and design: 1 year, Procurement: 6 months, Construction: 1 year Training programs: Technical Assistance for 2 years
Candidate Site	Existing AFADEM site at Ankara
Implementation Agency	AFAD
Intention of Implementation Agency	AFAD has a strong intention to enhance human resources development.
Budget secured in Turkey	No
Necessary Japanese technology	-
Priority	A
Maturity	Mid+ Human resources development is regarded as important in AFAD's 5-year Strategic Plan and AFADEM has started to discuss with the AFAD administration department regarding the establishment of center. Since there are existing organization and a training center, the project is ready to be implemented.
Related Project	1－2　Disaster Education Center
Note	Training of first trainers is necessary for newly introduced training facility, and could be performed in Ankara by Japanese experts.

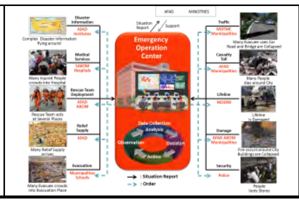
Project Title	**National 2-1** Establishment of a Disaster Education Center for Citizens (Bousai Kan)
Project Components	Construction of a disaster education center for citizens inspired by the Bursa disaster prevention experience-learning facility concept. Currently AFADEM's education center for citizens is limited to earthquake simulation equipment. The education center in Ankara should present all disasters prone to occur in Turkey, while regional centers should focus on region-specific disasters. Logistics associated with operating the centers also need to be developed. [National level] ■Floor area: approximately 12,000m^2 ① Exhibit of past major disasters and damages ② Provision of scientific knowledge and information regarding disasters through various methods including demonstration by experiment. ③ Disaster experience-learning facility (simulation of earthquake, storm, flood, fire, etc.) ④ Exhibit of countermeasures for disasters ⑤ Seminars and workshops (first aid, etc.) ■Development of contents, teaching material, instructor training, and assistance with operation and management. [Regional level] ■Floor area: approximately 6,000m^2 ① Exhibit of past region-specific disasters and damages ② Provision of scientific knowledge and information regarding disasters through various methods including demonstration by experiment. ③ Region-specific disaster experience-learning facility ④ Seminars and workshops (first aid, etc.) ■Instructor training and assistance with operation and management.   
Meaning of the project in terms of resilient urban planning	Disaster education centers contribute to the increase of citizens' disaster awareness through education programs including students and teachers. Practical education programs can be conducted such as development of evacuation maps and preparation of disaster prevention plans through workshops.
Effectiveness and the need for disaster management	Creating disaster education centers will enhance citizens' awareness of disaster prevention as citizens will learn about disasters through historical disaster presentations, scientific explanations, and simulations. Disaster education will be more effective through experience-learning methods. [Normal time] Disaster prevention training for citizens [Disaster time] Base for volunteers' activity
Indicator	Number of participants to education programs Number of workshops and their participants
Approximate Estimated Cost	2,200 million yen (National level) 1,100 million yen (Regional level)
Duration	Facility Planning and design: 1 year, Procurement: 6 months, Construction: 1 year Development of education program, development of exhibits, and technical assistance: 3 years
Candidate Site	Ankara for the central center, and to be determined for each regional center

Implementation Agency	AFAD
Intention of Implementation Agency	AFADEM has the intention to establish disaster education centers.
Budget secured in Turkey	No
Necessary Japanese technology	Shaking table (earthquake simulation equipment) Smoke simulation equipment
Priority	A
Maturity	High: The project is listed on AFAD's 5-year Strategic Plan
Related Project	1-1 Disaster and Emergency Training Center
Note	Maintenance is important for simulation equipment and maintenance costs are high. Therefore, the type and level of simulators for central and regional centers shall be carefully selected. Technical assistance for development of exhibits and operation and maintenance is necessary from the beginning of the project, and is available from Japanese experts.

Project Title	**National 3-2** Research Center for Policy Making / Decision Making
Project Components	Establishment of a research and development (R&D) center for comprehensive research activity on disaster prevention to assist AFAD's policy making. ■ Disaster information archive: All information related to disaster collected by each university and institute shall be consolidated and optimized for disaster risk management policy making and disaster response. Current AFAD Databank Project needs to be improved for this function. ■ Research on Disaster Management Policy: Research on practical disaster prevention activity useful for AFAD and local governments shall be conducted ■ Research Laboratory: AFAD's research and development center shall have a research laboratory and equipment to be utilized by universities to promote disaster prevention research. Floor area: approximately 10,000 m^2 Sector: seismology, earthquake engineering, river engineering   
Meaning of the project in terms of resilient urban planning	Establishment of a disaster R&D center will contribute disaster resilient urban planning.
Effectiveness and the need for disaster management	More effective disaster prevention and mitigation countermeasure will be taken through coordination with universities and institutes involved in disaster prevention R&D, information archiving, and technology development. Sharing facility and equipment with other R&D institutes will enhance research on disaster prevention in Turkey.
Indicator	Number of publications on research results Number of users of the disaster information archive
Estimated Cost	1,940 million yen (excluding special experimental equipment)
Duration	Facility Planning and design: 1 year, Procurement: 6 months, Construction: 1 year
Candidate Site	Existing AFADEM site at Ankara
Implementation Agency	AFAD
Intention of Implementation Agency	AFAD has strong intention to enhance the R&D center.
Budget secured in Turkey	No
Recommended Japanese technology	3 dimensional shaking table (Mitsubishi Heavy Industry)
Priority	A
Maturity	Mid: Databank project has been implemented together with Middle East Technical University. Earthquake department has implemented collaborative research with universities inside and outside of Turkey.
Related Project	-
Note	An engineer will be required for operation and maintenance of special experimental equipment.

Project Title	**National 5-1** Satellite Communication System
Project Components	AFAD has a plan to procure 700 VSTA earth stations to provide information to all provinces. 200 mobile stations and helicopter on-board stations are proposed. 
Meaning of the project in terms of resilient urban planning	Development of a highly reliable and real time communication infrastructure that connects the central level and provincial level disaster and emergency management centers/agencies across the country. Because there is a possibility that the existing fiberoptic network breaks in the event of a disaster, this proposed satellite communications network with high reliability is required for information communication.
Effectiveness and the need for disaster management	It is required to share disaster information from AFAD Ankara to all provinces and regions.
Indicator	Reception of disaster information images Use of images of when considering disaster recovery is possible
Estimated Cost	500 fixed stations, 200 mobile stations: 5 billion yen 3 helicopter on-board VAST stations: 2 billion yen
Duration	Pilot project will be started from 2014. Procurement will be performed from 2015 to 2017.
Candidate Site	Center station in ANKARA, Mobile and fixed stations in each province
Implementation Agency	AFAD
Intention of Implementation Agency	Implementation of this project is planned for June – July 2014. The pilot project implementation plan of the small-scale end of 2014 by the vendor chosen by the test(TUBITAK is carried out at AFAD budget) Modified later, the building will be completed procurement expected to start from 2015, to the end of the year 2017
Budget secured in Turkey	Until Pilot Project
Verification of a possible use Japanese technology	Lossless data transmission is available. Helicopter on-board VAST stations is achievable with Japanese products.
Priority	A
Maturity	High: The plan running at AFAD. Entrusted to the TUBITAK system construction, I have started a pilot project. Scheduled to be implemented already for fixed station, for possible mobile station is performed in April the technical review of equipment for the pilot project. Already implemented the presentation of Japanese products to AFAD (ITOCHU Corporation, JSAT other six companies) Industry Association of Japan.
Related Project	Information transmission system (a satellite system is required as infrastructure)
Note	-

Project Title	**National 5-2** Information Gathering & Dissemination System
Project Components	Establishment of a platform for information collection and transmission in case of disaster. In addition a disaster prediction system may be built, for early warnings related to earthquakes, floods, and landslides. The management of information will be performed in Ankara, while each region will have a server system to control and set up a notification system by voice and TV broadcasting. Note that establishment of a satellite communication network system is under another project.
Meaning of the project in terms of resilient urban planning	This project will enable early warning, leading to a reduction in material damage and human loss (rapid evacuation/sheltering). Further, it is possible to provide information after a disaster is also possible to take appropriate measures.
Effectiveness and the need for disaster management	Necessary mitigation can be implemented thanks to the rapid provision of information to the general public, the disaster management of AFAD as J-ARART of Japan.
Indicator	-
Estimated Cost	Central system (information collection and transmission): 3 billion yen Each province subsystem (information receiption and distribution): 10 billion yen
Duration	Three years, starting after 2015
Candidate Site	Center in ANKARA Subsystem in each provinces
Implementation Agency	AFAD
Intention of Implementation Agency	AFAD has interest in Japanese system
Budget secured in Turkey	-
Recommended Japanese technology	J-Alert system
Priority	A
Maturity	Middle: This system is included on the plan of AFAD's IT department
Related Project	Disaster forecast system and hazard map
Note	-

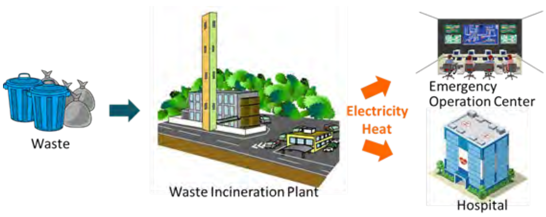
Project Title	**Provincial 3-1-1** Disaster and Emergency Management Center
Project Components	Establishment of provincial disaster and emergency management centers as the central facility of Disaster Management Complexes (DMC). AFAD office, heliport and logistic center shall be included on the site. ■Floor area: 6,000m^2 ◆ Operation center (with a large screen) ◆ Meeting room (information collection, meetings) ◆ Working place for relevant organizations ◆ Computer room ◆ Dining room, restrooms, locker rooms and bedrooms ◆ Storage, mechanical room ◆ Seismically isolated structure ◆ Ability to operate independently for 3-15 days in case of infrastructure failure. Redundancy of energy supply shall be considered. Energy saving technology shall be introduced. ◆   
Meaning of the project in terms of resilient urban planning	[Normal time] Coordination system among relevant organizations shall be developed through training during normal times. The center can be utilized for disaster education. [Disaster time] The sisaster and emergency management center is the central facility of every Disaster Management Complex (DMC), and is the location where the disaster and emergency board (main members of concerned entities) can be set up. The center collects information on the disaster, secondary disaster(s), response activities, and on the availability of relief supplies and volunteers. The center also analyzes the informaion and makes orders. In addition to being a contact point for central government, disaster related organizations and other province's disaster and emergency management centers, the center acts as base for relief supplies reception and delivery and for search and rescue activity. The center outside of the disaster affected area will function as logistic center for procurement and delivery of relief supplies.
Effectiveness and the need for disaster management	Confusion at the time of disaster can be avoided by establishment of a center specifically intended for disaster management. The center contributes to increasing disaster prevention awareness since the center will be utilized for disaster education to inform citizens of the importance of disaster prevention.
Indicator	Number of supporting activities during disasters Number of trainings during normal times
Approx. Estimated Cost	1,480 million yen (Facility with heliport: 1,000 million yen, Communication equipment: 350 million yen, Storage: 130 million yen)
Duration	2 years
Candidate Site	Regional/Provincial Disaster Management Complex
Implementation Agency	AFAD
Intention of Implementation Agency	Establishment of provincial disaster and emergency management centers is part of AFAD's 5-year Strategic Plan.
Budget secured by Turkey	No. Proposal to MOD was not accepted.
Recommended Japanese	Integrated disaster prevention system for local government, broadcast message system

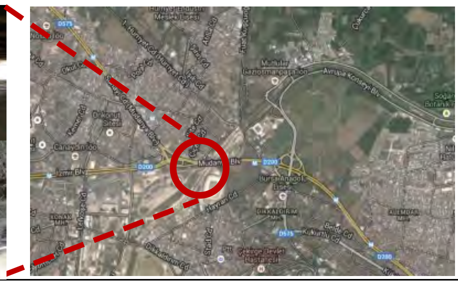
Technology	(Hitachi Solutions) Public information commons
Priority	A
Maturity	High: The project is planned in AFAD's 5-year Strategic Plan. It is not already implemented because provincial AFAD was under jurisdiction of provincial governors, and it is expected to be implemented shortly since the AFAD law was amended.
Related Project	Function will be enhanced by the simultaneous development of a satellite network and of an early information collection and warning system.
Note	-

Project Title	**Provincial 3-1-11** Construction of facilities related to Disaster Risk Management (Fire Station, AKOM, Police Station, 112 Station, Station of Civil Defense, etc.)
Project Components	Construction of facilities related to disaster risk management and emergency response close to each other to the Disaster Management Center. These facilities will have tools and equipment for disaster relief activities, and vehicles (fire engine, ambulance, and search & rescue vehicles), stand-by station and dormitory for staff on duty. Stockpiles required for each service should also be equipped.  Total Floor Area: 6,000 ㎡
Meaning of the project in terms of resilient urban planning	By building facilities related to disaster risk management and emergency response activities in/near the Disaster Management Complex, cooperation among the authorities will become easier in the event of a disaster to allow for enhanced communication, sharing of facilities and resources, and collaboration.
Effectiveness and the need for disaster management	One of the advantages to allocate disaster related facilities in the DMC is to support efficient disaster management. Close proximity of facilities will allow direct communication among staff of the institutions. It will help efficient disaster relief activities. Direct communication during normal periods will enable smooth communication and action during a disaster.
Indicator	Number of cases where teams dispatched for search and rescue activities include staff from different DRM organizations
Estimated Cost	680 million yen
Duration	Design and Tender Stage: 12-18 months (including PQ and preparation of tender documents) Construction: 12 months
Candidate Site	Within the sites of the regional or provincial disaster management complexes
Implementation Agency	Bursa Metropolitan Municipality, Bursa Provincial Directorate of Health and Interior
Intention of Implementation Agency	Coordination with several authorities is required. Some authorities already show positive intent to implement this project, if the land is available.
Budget secured by Turkey	Not yet
Recommended Japanese Technology	-
Priority	A
Maturity	-
Related Project	Disaster Management Complex
Note	-

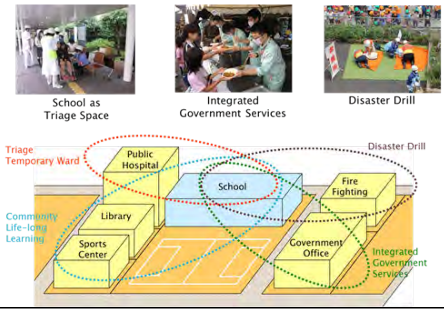
Project Title	**Provincial 3-1-4** Disaster Base Medical Center
Project Components	Although it is a new concept in Turkey, introduction of "Disaster Base Medical Centers" is proposed and a model hospital will be constructed. Component A: ✧ Reconstruction of Cekirge hospital with 700 beds and 140,000m^2 as a Disaster Base Medical Center. Component C: ✧ Renovation and expansion of Sevket Yilmaz Devlet hospital (strengthening of lifesaving emergency function, etc.). 
Meaning of the project in terms of resilient urban planning	The disaster prevention and response functions of the city can be improved by clarifying the function of Disaster Base Medical Centers and selecting sites strategically.
Effectiveness and the need for disaster management	The model hostpital will be a showcase of the function and capacity of a Disaster Base Medical Center providing appropriate medical services in times of emergency and disaster, which are different from routine medical services. The expansion of the concept to the rest of the country will greatly enhance Turkey's disaster prevention and response abilities.
Indicator	The number of emergency drills (which received training) Number of patients accepted in times of disasters
Approx. Estimated Cost	Component A: 43,770 million yen（Facility 26,770 million yen, Medical Equipment 17,000 million yen） Component C: 9,450 million yen（renovation of facility 4,600 million yen, medical equipment 4,850 million yen）, 9,530 million yen（150 beds expansion work, facility 5,900 million yen, medical equipment 3,630 million yen）
Duration	Three years
Candidate Site	Bursa province
Implementation Agency	AFAD and MOH
Intention of Implementation Agency	The importance of a disaster hospital is understood by MOH health service station. However, since the hospital of interest are subject hospitals PPP operations, trying to check to MOH about its feasibility.
Budget by Turkey side	-
Recommended Japanese technology	Seismic isolation technology of Japan such as base-isolating devices, flexible joints for mechanical piping, expansion joints and elevator with automatic diagnosis system
Priority	B
Maturity	Middle
Related Project	Disaster and Emergency Management Center Development of disaster medical information system
Note	In the present condition of Turkey, functions of Disaster Base Medical Centers are not specified as Japanese ones. By specifying functions and facility content of Disaster Base Medical Center, facility arrangement will be specified and ensured. Moreover, by cooperating with non-medical-related facilities, the disaster base medical center will take measures more effectively and rapidly against disaster in the Disaster Management Complex.

Project Title	**Provincial 3-1-10** Development of parks/open spaces
Project Components	Development of parks in regional/provincial/district level DMCs with a logistic center, aseismic resistant water reservoir, vegetation that helps prevent fire spread, heliport, temporary toilet, etc. Existing park shall be upgraded with facilities and equipment. Park area: Regional level: 300,000m² Provincial level: 100,000m² District level: 50,000m² 
Meaning of the project in terms of resilient urban planning	Open spaces can be utilized for multipurpose in disaster by developing park in DMC. Park/open spaces are necessary facility for regional/provincial DMC. Cost-effectiveness is high since existing park can be utilized.
Effectiveness and the need for disaster management	In disaster, parks can be utilized for evacuation, camp for search and rescue team, and storage of relief material. Parks will be considered as evacuation place when people visit there.
Indicator	Number of parks with disaster prevention facilities
Estimated Cost	2,430 million yen
Duration	Procurement: 6 months (incl. preparation of bidding documents) Construction: 12 months
Candidate Site	Regional/provincial DMCs
Implementation Agency	Ministry of Environment and Urbanization, Bursa Municipality
Intention of Implementation Agency	Municipality and district are favourable to the project
Budget by Turkey side	-
Recommended Japanese technology	Seismic resistant water reservoirs, although Japanese reservoirs perform similarly to Turkish reservoirs.
Priority	A
Maturity	Middle
Related Project	DMC
Note	-

Project Title	**Provincial 3-1-6** Waste incineration plant with power generator
Project Components	Construction of a waste incineration plant with power generator in DMCs. Currently there are no waste incineration plants in Turkey and waste is being landfilled. However, to promote waste incineration in the EU and to reduce the environmental load, a waste incineration plant with power generator shall be introduced. This type of plant produces more energy than a methane gas power generator. Incineration capacity: 3,000 ton/day Power generation capacity: 54MW/day Floor Area: furnace 20,000m^2, generator 2,500m^2 
Meaning of the project in terms of resilient urban planning	In times of disasters, it is necessary to continuously supply electricity to the Disaster Management Complex (DMC). Introducing a waste incineration plant with power generator in the DMC will supply electricity regardless of the damage to power generation or transmission facilities located further away from the DMC.
Effectiveness and the need for disaster management	Continuous supply of electricity in case of disaster enables the DMC to function.
Indicator	Power output, income and expenditure
Estimated Cost	45,000 million yen
Duration	Procurement: 1 year (incl. PQ and preparation of bidding documents) Construction: 42 months (Reference to construction period of waste incineration plant in Tokyo)
Candidate Site	Regional/provincial DMC
Implementation Agency	Bursa municipality
Intention of Implementation Agency	Bursa municipality is examining waste treatment instead of landfill since the current landfill site will reach fill capacity by 2025.
Budget secured by Turkey	No
Recommeded Japanese technology	Environmental measure: flue gas treatment system, which can be introduced to Turkey by Japanese experts. Seismic resistant structure: use Japan's experience which has the majority of the world's waste incineration plants.
Priority	B
Maturity	Waste incineration plan has been proposed by other projects. The need for waste incineration plants is high as an alternative to landfilling, in addition to disaster prevention.
Related Project	DMC
Note	Construction cost is expensive. It is necessary to establish a garbage collection system to separate burnable waste from other waste.

Project Title	**Provincial 3-4-3, 3-4-6** Improvement of the seismic performance of bridges, elevated bridges, and retaining walls of underpasses.
Project Components	Assess damage to bridges on the emergency road network using the scenario earthquakes and, if necessary, retrofit piers and/or girder or replace the bridge.   
Meaning of the project in terms of resilient urban planning	To secure the function of emergency road network during disasters
Effectiveness and the need for disaster management	The degradation of bridges (tilt of piers and exposure of rebars of girders) on the Ankara – Izmir road, the main road of Bursa, can be observed by visual inspection. It is necessary to conduct the seismic assessment of bridges, elevated bridges and retaining walls of underpasses of roads included on the emergency road network, and to conduct seismic strengthening retrofits or replacements.
Indicator	Bridge damage risk reduction
Estimated Cost	JPY130 million (for strengthening)
Duration	2 years
Candidate Site	All bridges in Bursa
Implementation Agency	Bursa metropolitan municipality
Intention of Implementation Agency	Recognized the necessity of the assessment and strengthening
Budget secured by Turkey	Bursa metropolitan municipality has a plan and associated budget to strengthen bridges
Recommended Japanese technology	Bridge strengthening and girder-falling prevention technology
Priority	B
Maturity	High, Bursa metropolitan municipality has a plan to strengthen bridges
Related Project	1-4-1 Development of emergency road network system, construction of DMC
Note	There is a plan and budget for rehabilitation of the Nilufer bridge

Project Title	**Provincial 3-1-9** Establishment of Sports Center
Project Components	Construction of sports center in regional/provincial DMCs (athletic field, gymnasium and swimming pool) Floor area: 4,500m^2
Meaning of the project in terms of resilient urban planning	In disaster, large-space sports center can be utilized effectively as evacuation shelters and for storage of relief supplies in coordination with other facilities, by developing the sports center as part of the DMC. Sports centers with storage of supplies can be a model of disaster prevention facility. 
Effectiveness and the need for disaster management	Sports center can be utilized as evacuation shelters and logistic centers. Swimming pools can be used as water reservoirs.
Indicator	Number of accepted evacuees in case of disaster Volume of water in the swimming pool.
Approx. Estimated Cost	760 million yen
Duration	Procurement: 10 months (including PQ and preparation of bidding documents Construction: 12 months
Candidate Site	Regional/provincial DMCs
Implementation Agency	Bursa municipality, Ministry of Youth and Sports
Intention of Implementation Agency	-
Budget secured by Turkey	No
Recommended Japanese technology	Seismic resistant structure: similar standards in Turkey and Japan
Priority	B
Maturity	The center is required for regional/provincial DMC
Related Project	DMC
Note	-

Project Title	**Provincial 2-2-2, 2-2-3** Seismic resistant school model
Project Components	Construction of a school using a seismic resistant structure and seismic-resistant non-structural components, and planned as an evacuation center with water reservoir and supplies in district DMCs. Floor area: 4,800m² (1,200m² x 4 story x 1 school) 
Meaning of the project in terms of resilient urban planning	Schools in district DMCs can be utilized as evacuation centers, triage space, and logistic center in coordination with other facilities. Schools with disaster prevention functions can be a model for future school planning.
Effectiveness and the need for disaster management	Safety of students will be ensured. School can be utilized as an evacuation center for neighborhood.
Indicator	Increase in number of schools with water reservoirs and storage for emergency supplies
Estimated Cost	200 million yen (1,200m² x 4 story x 1 school)
Duration	Procurement: 6 months (including preparation of bidding documents) Construction: 8 months (1 school)
Candidate Site	District DMC
Implementation Agency	Ministry of National Education
Intention of Implementation Agency	Concept of school in consideration of disaster prevention is useful for the engineers of MONE (MONE Bursa provincial office)
Budget by Turkey side	-
Recommended Japanese technology	Seismic resistant structure: Japanese and Turkish standards are similar, although retrofits presented in Chapter 5 are well known by Japanese engineers and would benefit the implementation of this project in Turkey. Strengthening of non-structural part: any local contractor should be able to implement changes, although oversight by a well versed Japanese engineer may be beneficial in the beginning. Plan as evacuation center: Japan's experience can be adapted to fit Turkey's situation.
Priority	B
Maturity	School is required for district DMC and MONE Bursa provincial office.
Related Project	DMC
Note	-

Project Title	**Provincial 3-2-2** Reinforcement of Public Port in the City of Gemlik
Project Components	Expansion and improvement of the Gemlik public port partly through reclaiming land from the sea (enhancement of disaster-prevention performance) ◆ Been extended the Public Port in the vicinity of Gemlik town, earthquake-resistance is also made. ◆ A disaster prevention square to become the relief supplies acceptance base in times of a disaster ◆ Construction of a disaster prevention park for the residents of Gemlik ◆ Warehouse for emergency supplies, water tank
Meaning of the project in terms of resilient urban planning	【In normal times】 Providing residents in the Gemlik city center with venues for leisure and relaxation. Strengthening traffic convenience with vessels and aircrafts. 【During a disaster】 Function as a wide-area disaster relief activity base during a large-scale disaster, contribute to facilitating lifesaving and supporting disaster-stricken citizens, and enhance disaster prevention performance in the region.
Effectiveness and the need for disaster management	Build disaster-prevention bases against a large-scale disaster, such as a base to receive support supplies in case a petroleum-related or chemical substance-related accident occurs on the commercial side of the port during a disaster.
Indicator	Volume of disaster support supplies delivery and distribution Time of supplied to disaster-stricken areas. Number of relief unit members received Transport time of response personnel and volunteers to disaster-stricken areas.
Estimated Cost	10.1 billion yen
Duration	Current status research and drafting layout plans of port facilities: 1 year Assessment of the impact on environment, etc.: 1 year Implementation of land reclamation (by using soil excavated from hill development in the city center): 2 years Stabilizing the soils of reclaimed land, etc.: 1 year Preparation of port facilities, broad-area disaster-prevention bases, etc.: 1 year
Candidate Site	Inner part of Gemlik Port
Implementation Agency	MOTMAC
Intention of Implementation Agency	The mayor is showing a positive attitude. However, there is a need to reaffirm the intention of the mayor after the election.
Budget secured by Turkey	Not secured yet
Recommended Japanese technology	-Technology to develop residential land plots on the hill and simultaneously reclaim land from the sea. (It was proved feasible at Kobe Port Island and Rokko Island.) -Land reclamation technology (including a high-pressure method to inject and mix cement slurry)
Priority	A
Maturity	Not ready yet
Related Project	Construction business of DMC
Note	-

Project Title	**Provincial 3-4-1** Development of an emergency road network and associated operation regulations at the provincial level
Project Components	Development of an emergency road network ① Wide-area emergency road: main road necessary for securing the traffic of emergency vehicles for rescue, relief, and firefighting; roads to receive supporting personnel and relief materials from neighboring cities; roads for providing personnel and relief materials to neighboring provinces struck by a disaster The main emergency road is specified as that which connects the province governor's office, metropolitan office, DMC, AFAD office, airport, seaport and critical disaster management facilities. ② City emergency road: roads necessary for emergency traffic for rescue, relief and firefighting, which links the main road with the road to police station, fire station, disaster base hospital, etc. ③ Creation of traffic control plan applied to disaster based on the real situation of road width as well as the possible disaster scale ④ Enact necessary legal regulations to allow for the effective operation of the road during disasters 
Meaning of the project in terms of resilient urban planning	To assure the efficient emergency response by securing the emergency vehicle traffic (such as rescue, relief, and firefighting) immediately after a disaster.
Effectiveness and the need for disaster management	Traffic congestion happened in the 1999 Kocaeli earthquake on the road to disaster area. Japan has experienced the difficulty of emergency traffic in disaster due to the damage of roads and/or the obstruction by collapsed buildings. Bursa is aware of the importance of the emergency road network, but hasn't developed such network yet.
Indicator	Securing the delivery of rescue and relief personnel, emergency goods and shortening arrival time of emergency vehicles
Estimated Cost	390 million yen
Duration	2 years
Candidate Site	Bursa province
Implementation Agency	Bursa metropolitan municipality
Intention of Implementation Agency	Be aware of the importance of the emergency road and having a plan for the improvement of road
Budget secured by Turkey	Budget partially secured
Recommended Japanese technology	Experience of emergency road network development
Priority	B
Maturity	Middle
Related Project	Development of DMCs
Note	Construction for widening the road between Gemlik and Mudanya has been started

GENERAL TECHNICAL REPORT
on
TURKISH STRUCTURAL DESIGN CODES

Prepared for: NIKKEN SEKKEI LTD.

Date: November 2013

Fatih SUTCU, Ph.D.
Istanbul Technical University
Faculty of Architecture
Structures & Earthquake Engineering Working Group

1. SUBJECT

JICA (Japan International Cooperation Agency), in collaboration with the Japanese Government is preparing to propose a Disaster Resilient City Concept including a Central Medical Hospital for Disasters with resilient infrastructure. The hospital in question is planned to be built by Japanese loan in Bursa-city. In this context, Nikken Sekkei is contract with JICA for a survey project on “Seismic Resilient City in Turkey”.

In this project, Nikken Sekkei in collaboration with Oriental Consulting as a civil engineering consultant and ITEC as a medical consultant will propose the concept of Central Medical Hospital for Disasters with Japanese-origin seismic isolation system.

This report which investigates the essential issues on the current Turkish Seismic Code and the progress on Seismic Isolation regulations in Turkey is the basis for Nikken Sekkei for preparing the above mentioned proposal.

2. LIST OF CODES AND REGULATIONS WHICH CONTROL STRUCTURAL DESIGN IN TURKEY.

2.1. Turkish Seismic Code: Specification for Buildings to be Built in Seismic Zones (2007). (Abbreviated as DBYBHY 2007)

This is the main code used for seismic design of buildings in Turkey. This code will be referred as "Turkish Seismic Code" throughout this report. This code includes the following chapters:

- Analysis Requirements For Earthquake Resistant Buildings
- Earthquake Resistant Design Requirements for Reinforced Concrete Buildings
- Earthquake Resistant Design Requirements For Structural Steel Buildings
- Earthquake Resistant Design Requirements For Adobe Buildings
- Foundation Soils And Earthquake Resistant Design Requirements For Foundations
- Evaluating Existing Buildings And Retrofitting

The historical development of Turkish Seismic Code (2007) is given in Chapter 3 of this report.

Background of setting design spectrum in this code is given in Chapter 1.2.2 as follows:

DBYBHY 2007
Chapter 1.2.2 – The design earthquake considered in this Specification corresponds to highintensity earthquake defined in 1.2.1 above. For buildings with Building Importance Factor of I = 1 in accordance with Chapter 2, Table 2.3, the probability of exceedance of the design earthquake within a return period of 50 years is 10 %. Earthquakes with different probabilities of exceedance are defined in Chapter 7 to be considered in assessment and retrofit of existing buildings.

The importance factor of medical buildings is I=1.50. This corresponds to an earthquake with 10% probability of exceedance within a return period of 50 years (2475 years return period.). At least 3 artificial ground motions are required for time history analysis. Outline of common practices and/or guidelines for seismic ground motion input to be used in time-history analysis procedures is explained in this code at Chapter 2.9. (Please refer to the file "DBYBHY 2007-English-Chapters1,2")

Turkish Seismic Code also includes chapters for the seismic requirements for non-structural or Mechanical/Electrical elements. Namely, these chapters are "2.11 - Seismic Loads Applied To Structural Appendages, Architectural Elements, Mechanical and Electrical Equipment" and "2.12 - Non-Building Structures". Please refer to the file "DBYBHY 2007-English-Chapters 1,2.pdf" for details.

Turkish Seismic Code does not include chapters regarding Robustness/Redundancy requirements.

Currently the the Turkish Ministry of Public Works and Settlement (MoPWS) has established commissions among academic stuff from universities to prepare additional chapters for the Turkish Seismic Code. New chapters will include Seismic Isolation Design, Passive Control of Buildings, Smart Retrofitting Methods, etc.

On internet 2 separate files may be found in English regarding Turkish Seismic Code. First is "Specification for Buildings to be Built in Seismic Zones (2007)", (**Refer to file DBYBHY2007-English-Chapters1,2.pdf**). This is the translation of the first two Chapters by Prof. Aydinoglu who is a member belonging to the preparing committee of the code.

The second file is "ANNEX Specification for Structural for Structures to be Built in Disaster Areas". This is the unofficial translation of Turkish Seismic Code. Please ignore this file.

In addition I have an almost-complete English translation of Turkish Seismic Code which is not officially announced yet. (R**efer to DBYBHY2007-English-Full.pdf**). Please find this code in the additional attachments. Please remember that this is a draft version. It starts from Chapter 5. Apparently there will be additional 4 chapters in the beginning. This translation includes all parts of Turkish Seismic Code except for the chapter originally named as "Chapter 7: Evaluating Existing Buildings And Retrofitting" in the Turkish version.

2.2. TS500 (February 2000) Requirements For Design And Construction Of Reinforced Concrete Structures (by Turkish Standards Institute)

This code includes comprehensive information about material properties of RC components, the design of RC member sections and construction practice details. TS500 can be used for RC building design in non-earthquake zones. In earthquake zones, the building design must meet the requirements of TS500 and Turkish Seismic Code together.

2.3. TS 648 (December 1980) Building Code for Steel Structures (by Turkish Standards Institute)

This code explains the material properties of structural steel members, the design of steel member sections connection and construction practice details. TS648 can be used for steel building design in non-earthquake zones. In earthquake zones, the building design must meet the requirements of TS648 and Turkish Seismic Code together.

2.4. TS 498 (November 1997) Design Loads For Buildings (by Turkish Standards Institute)

This code explains the design loads for structural design. Wind loads, snow loads, live loads are given in this code.

Earthquake loads are calculated according to the relevant chapter of Turkish Seismic Code.

Load combinations including the earthquake loads are given in Turkish Seismic Code. Load combinations including other types of loading such as wind loading, temperature changes or earth thrust loads are given in TS500. The load combinations subject is investigated in detail in Chapter 4 of this report.

In TS 498 the live loads for hospitals may be found in Chapter 12.1. The live loads are summarized in the following table:

Table 1. Live loads for hospitals

Area definition	Design live load (kN/m^2)
Patient rooms	2.0
Examinations rooms	3.5
Operation rooms and corridors	5.0

The wind loads are given in Chapter 11 of TS498 and calculated as $W = C_f.q.A$ where W is the wind load, C_f is the aerodynamic coefficient, q is the velocity pressure (kN/m^2) and A is the surface area. Values C_f and q are obtained for varying wind velocities and aerodynamic properties by the given tables in this chapter.

Example: For hospital type buildings where building height is less than 20m, velocity pressure q=0.8 kN/m2 and aerodynamic coefficient of a relevant surface C_f =1.2. Therefore unit wind load is approximately W'=0.96 kN/m^2. Design wind load of a special location (relevantly high hills, seaside or a valley receiving strong winds) is determined by the judgment of the design engineer unless indicated otherwise in design requirements.

2.5. Turkish Ministry of Health –Standards for Design and Construction of Seismically Isolated Medical Buildings (2013)

This is a very brief standard about seismic isolation design and construction of medical buildings. This standard is published by Turkish Ministry of Health in 2013 summer and is effective for the medical buildings with more than 100 beds to be constructed in 1st and 2nd grade seismic zones of Turkey explained in Turkish Seismic Code. This code is based on the following regulations and codes:

- **ASCE 7-05** Minimum Design Loads for Buildings and Other Structures
- **The Building Standard Law of Japan**, Notification No. 2009, Establishment of Technical Criteria Necessary For Safety of Structural Methods for Buildings With Seismic Isolation System.
- **Eurocode 8**- Seismic Design of Buildings
- **Fema 577** - Design Guide for Improving Hospital Safety in Earthquakes, Floods, and High Winds.

The design earthquakes considered in this code corresponds to an earthquake with the return period of 475 years and 2,475 years. The probabilities of exceeding these two cases are 10% and 2% in 50 years, respectively. The hospital buildings with seismic isolation are required to be designed by using the 475 years return period earthquake and the displacement of the seismic isolation layer should be checked with time-history analysis by using the 2,475 years return period earthquakes. At least 7 ground motions are required for time history analysis.

2.6. Seismic Isolation Design Code For Buildings (2009) prepared by Turkish Association For Seismic Isolation

This code is prepared by “Turkish Association for Seismic Isolation” in 2009 and is based on the American regulations. The code is prepared in English and is given in additional attachments along with this report. (**Please refer to TC SEISMIC ISOLATION DESIGN CODE Turkish Association for Seismic Isolation.pdf**) After the regulation by Turkish Ministry of Health (given in Chapter 2.5 of this report) is announced this code is not used in Turkey actively.

3. HISTORICAL BACKGROUND of TURKISH SEISMIC DESIGN CODE DEVELOPMENT and CODE ESSENTIALS.

While many catastrophic earthquakes have hit various areas of Turkey in history, the first major catastrophic natural disaster experienced by Republic of Turkey was the Erzincan earthquake in 1939. The magnitude of the earthquake was 7.8 and caused a loss of more than 33,000 lives and destruction of 140,000 homes. This earthquake was a milestone for adoption of the concept of earthquake-resistant design and construction in Turkey.

Consequently, the first set of explicit legal provisions for earthquake-resistant design was established in 1940 by the Ministry of Public Works. This seismic regulation was revised in 1944. The law stated that any building built without complying with the requirements of the regulation would be demolished. However, it is not clearly stated which authority will do the demolishment and consequently no demolishment was done. The seismic regulation was updated in 1949 and 1953 to reflect the amendments of the seismic zone map without any major change in the code. By the establishment of Ministry of Reconstruction and Resettlement in 1958, the disaster prevention policy was upgraded and the formulation of the base shear coefficient was revised in 1961. The next revisions in 1968 and 1975 brought important enhancements to the seismic design and introduced the international developments to the engineering society in Turkey. The concept of ductility was first time mentioned at member and structural levels in 1975 code. The principles of the capacity design were introduced by the 1998 code together with important detailing issues for seismic design.

The most recent version of the code issued in 2007, particularly has been a very important step towards the displacement-based design through the related requirements for the seismic assessment of existing buildings and retrofitting. The evolution of the seismic design code is summarized below.

3.1 1940 Seismic Regulation

This was the first seismic regulation in Turkey. Besides several rules related to construction, materials and workmanship, this code gave the fundamental base shear coefficient of 0.10 for calculation of the lateral seismic load. In case of presence of the wind load (W), the design lateral load (H) is calculated by Eq. 1, where only half of the live load (P) is considered in addition to the dead load (*G*). On the other hand, half of the wind load (*W*) is included as well. No specific distribution of the lateral load along the height of the building was defined in this code.

$$H = 0.10\left(G + \frac{P}{2}\right) + \frac{W}{2} \quad (1)$$

3.2 1944 Seismic Regulation

This regulation was based on the Italian code of the time and it included a seismic zone map having two seismic zones, Zones I and II. Areas outside Zones I and II were considered to be safe in terms of seismicity.

The fundamental base shear coefficient (the ratio of the base shear force to the seismic weight of the building) was adopted to be 0.02–0.04 and 0.01–0.03 for Zones I and II, respectively. Selection of the appropriate value in these ranges was the responsibility of design engineers. However, approval of the inspecting authority was required for the selected value.

Like in previous version, in this regulation, the geotechnical conditions of the construction site and the structural characteristics were not taken into account. Furthermore, the distribution of the lateral load along the height of the building has still not been defined either.

3.3 1961 Seismic Regulation

In 1960s and 1970s, due to very rapid industrialization and a great portion of the existing buildings were demolished and reconstructed by increasing number of stories according to 1961 Seismic Regulation. In this regulation, parameters related to the seismic zone, type of the structural system and the ground conditions were taken into account for determining the base shear coefficient. Upper limit of the base shear coefficient is assumed to be 0.10 and the distribution of the seismic loads is considered to be uniform along the height of the building.

A qualitative recommendation was also present in this code to prevent excessive irregularities in plan and to minimize the potential negative effects of global torsion. The code required that all parts of the building should resist seismic lateral load given in Eq.2. In this equation, *C* and *n* were the fundamental base shear coefficient and the live load reduction factor, respectively. The live load reduction factor was given as 0.5 for ordinary buildings (residential buildings), whereas no load reduction was allowed for densely populated buildings (theaters, hotels, factories and office buildings). The fundamental base shear coefficient was calculated by Eq.3, where C_o was a coefficient depending on the height of the building, n_1 was a coefficient related to soil conditions (Soil type I, II and III) and to type of structural system (reinforced concrete or steel), and n_2 was the seismic zone coefficient (Zones I and II). The numerical values of Co and n1 are summarized in Tables 2 and 3, respectively.

It should be noted that the interaction between soil and structure was somehow taken into account through the coefficient n_1. The coefficient n_2 was to be taken as 1.0 and 0.6 for the seismic zones I and II, respectively. On the other hand, higher seismic demand on the lower buildings due to their relatively higher stiffness, particularly in case of stiff soil conditions, was not taken into account properly in this code. Clearly, this negligence may result with unnecessarily high seismic design loads for relatively high-rise structures, whereas the seismic design loads taken into account for low-rise structures may be on the unsafe side.

$$H=C(G+nP)+W/2 \quad (2)$$

$$C=C_0 n_1 n_2 \quad (3)$$

It should be noted that, when the wind load (*W*) is higher than the design lateral load calculated by Eq.2, the design lateral load is considered to be equal to the wind load. The code permitted an increase of 50% in allowable stresses in case of seismic design. The seismic zone map was revised in 1963 and the number of seismic zones is increased from two to four including a zone where no seismic design is required.

Table 2. The coefficient of Co depending on building height

Height of building (m)	C_0 coefficient
<16	0.06
16-22	0.07
22-28	0.08
28-34	0.09
34-40	0.10
>40	+0.01/for each 3m

Table 3. The coefficient n1 according to building type and ground conditions

Ground Type	Reinforced Concrete	Steel
I	0.8	0.6
II	0.9	0.8
III	1.0	1.0

I rock, hard soil, II medium soil, III soft soil

3.4 1968 Seismic Regulation

This code introduced significant enhancements to seismic-resistant design such as:

- Definition of minimum dimensions for columns [depth of short side ≥ maximum (240 mm; 0.05 × story height)]
- Definition of minimum dimensions for beams (150 × 300 mm, depth ≥ 3 times of the slab thickness)
- Definition of minimum dimensions of shear walls [width ≥ maximum (200 mm and 0.04 × story height)]
- Confinement reinforcement requirement for columns and beams in the vicinity of joints (transverse reinforcement is to be doubled with respect to the mid-height of the column and mid-span of the beam).
- Confinement reinforcement requirement in the beam–column joint
- Consideration of dynamic characteristics of the building
- Introduction of the building importance factor
- Inverse triangular distribution of the lateral forces
- Increase of the base shear force due to global torsion of the building, when the eccentricity between centers of mass and rigidity exceeds 5% of the larger plan dimension of the building.

In this code, base shear force (F) to consider the effects of earthquakes is to be calculated by Eq.4. In this equation, W is the total weight of the building to be considered for the seismic analysis (Eq.5) and C is the fundamental base shear coefficient to be calculated by Eq.6. It should be noted that according to this code no live load reduction factor is allowed for buildings such as theaters, schools, stadiums, storage facilities. However, a live load reduction factor of 0.5 is given for health facilities, hotels, administrative or residential buildings. C_o given in Eq.6 is the seismic zone factor (0.06, 0.04 and 0.02, for Zones I, II and III, respectively), α is the coefficient reflecting ground conditions (0.8, 1.0 and 1.2, for hard, medium and soft soil, respectively), β is the building importance factor (1.5 for important or densely populated buildings such as communication buildings, hospitals, fire stations, museums, schools, stadiums, theaters, train stations, religious buildings, and 1.0 for ordinary buildings such as residential, office and industrial buildings, hotels, restaurants, etc.), and γ is the dynamic coefficient to be calculated by Eq.7a or 7b depending on the fundamental period of the building (T) in seconds.

A simple equation is also given in the code for calculation of the fundamental period of the building (Eq.8) to be used unless the period is not calculated by using a sophisticated method. In this equation H and D are the height of the building (m) and the plan dimension of the building (m) in the direction of the considered lateral load.

$$F = CW \tag{4}$$

$$W = \sum W_i = \sum G_i + n_i P_i \quad (i : storynumber) \tag{5}$$

$$C = C_0 \, \alpha \, \beta \, \gamma \tag{6}$$

$$\gamma = 1 \; (T \leq 0.5s) \tag{7a}$$

$$\gamma = \frac{0.5}{T} \; (T > 0.5s) \tag{7b}$$

$$T = \frac{0.09H}{\sqrt{D}} \; (s) \tag{8}$$

According to the code, the lateral forces are to be distributed to floor levels along the height by using Eq.9. In this equation, F_i, W_i and h_i are the lateral forces applied to the i^{th} story floor, the weight of the story and the height of the story measured from the foundation level, respectively.

$$F_i = F \frac{W_i h_i}{\sum W_i h_i} \tag{9}$$

In 1972, the seismic zone map was divided into five seismic risk zones (Fig.1a), including the zone with no seismic risk.

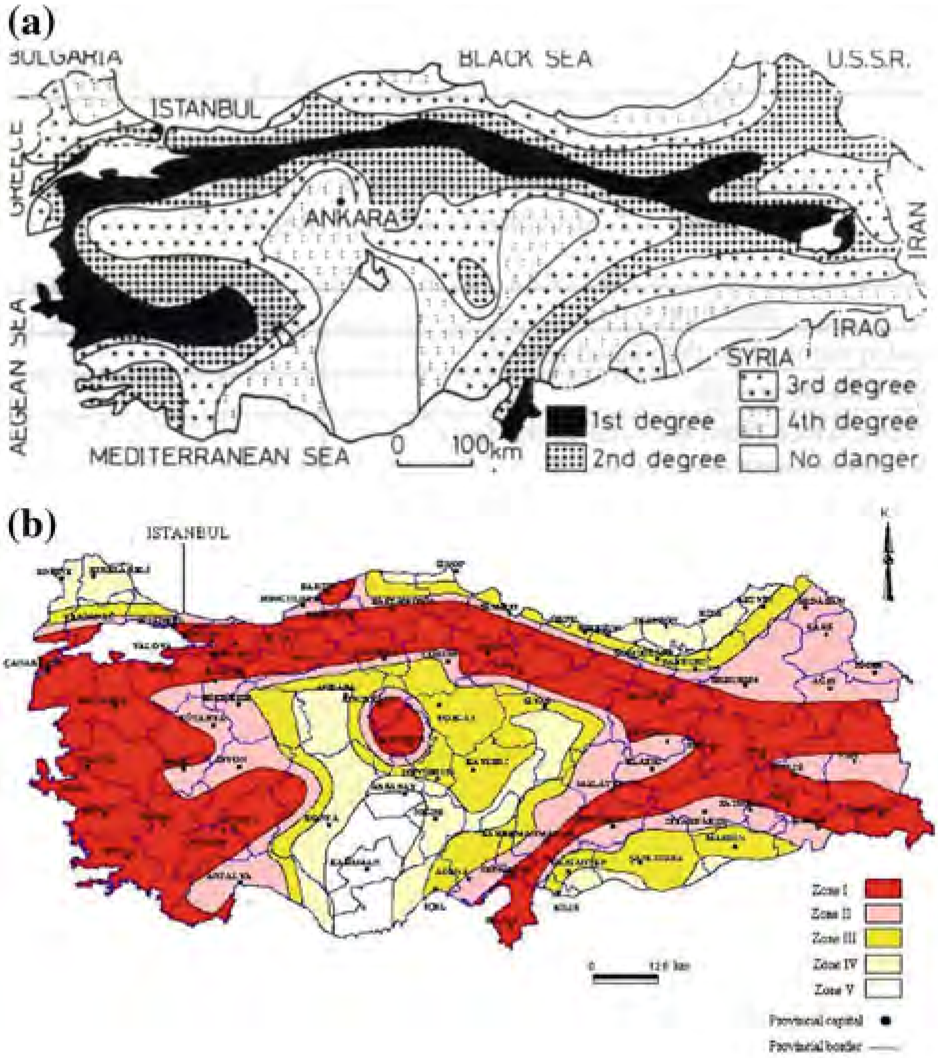


Fig. 1 (a) Seismic zone map in 1972 , **(b)** current seismic zone map (source: Ministry of Public Works and Settlements, http://www.deprem.gov.tr)

3.5 1975 Seismic Regulation

1975 Seismic Regulation has been valid for more than 20 years. A great portion of existing buildings in Turkey were designed and constructed, while this code was in effect. This is the first code that defines ductility explicitly. Furthermore, the base shear force was given as a function of structural ductility for the first time implicitly according to a structure type coefficient. Other important improvements in the code were:

- Inclusion of more detailed principles related to seismic-resistant detailing
- Inclusion of details about minimum cross-sectional dimensions and minimum reinforcement ratios for structural members

- Inclusion of more detailed requirements related to confinement
- Inclusion of a quantitative shear design for beam–column joints
- Inclusion of the ground dominant period into the equation given for determination of the spectrum coefficient
- Inclusion of an explicit definition of irregular buildings (although the definitions of irregularities were not sufficiently detailed)
- Inclusion of the requirement of the modal analysis for irregular or high-rise structures (H > 75 m)
- Introduction of the concept of increased longitudinal reinforcement at end zones of shear walls
- Consideration of an additional eccentricity of 5% of the largest plan dimension of the building.

However, it should be noted that while an increase of longitudinal reinforcement at the end zones of the shear walls was introduced in the code, the confinement of longitudinal bars in these end zones was not required.

In the code, the base shear force was to be calculated by Eq.10. In this equation *C, Co, K, S* and *I* are the fundamental base shear coefficient, the seismic zone coefficient (0.10, 0.08, 0.06 and 0.04, for Zones I, II, III and IV, respectively), the structure type coefficient, the dynamic coefficient and the building importance factor, respectively. The values of the structure type coefficient *K*, which was actually introduced for consideration of ductility capacity of various structural systems, are given in Table 4 depending on the type of the structure. As seen in this table, relatively lower ductility capacity of the shear wall structures is taken into account by increasing design base shear force in this version of the seismic design code.

The dynamic coefficient (spectrum coefficient) is to be evaluated by Eq.11, where T_o is the effective period of the ground in seconds. It should be noted that the dynamic coefficient should be assumed as 1.0 for one and two-story structures and all masonry buildings. For the fundamental period of buildings, in addition to Eq.8, which has already been given in the 1968 regulation, an alternative formula was given as well (Eq. 12). In Eq.12, *N* is the number of stories. The building importance factor, *I* was almost same as in the 1968 code (either 1.0 for ordinary buildings, or 1.5 for important or densely populated buildings.

$$C = C_0 KSI \geq \frac{C_0}{2} \tag{10}$$

$$S = \frac{1}{\left|0.8 + T - T_0\right|} \leq 1.0 \tag{11}$$

$$T = (0.07 \sim 0.10)N \tag{12}$$

Table 4 The structure type coefficient, *K*

Structure type	K [a]
Ductile frames [b]	(a) 0.60, (b) 0.80, (c) 1.00
Non-ductile frames [b]	(a) 1.20, (b) 1.50, (c) 1.50
Steel frames with bracings [b]	(a) 1.20, (b) 1.50, (c) 1.60
Shear wall–ductile frames [b,c]	(a) 0.80, (b) 1.00, (c) 1.20
Shear wall structures without frames	1.33
Masonry buildings	1.50
Others	1.00

[a] The minimum value of *K* is 1.0 for one or two-story structures
[b] Having (a) reinforced concrete or reinforced masonry infill walls, (b) unreinforced masonry infill walls, (c) light weight or few
infill walls, or prefabricated concrete infill walls
[c] The ductile frames should resist at least 25% of the lateral loads

The distribution of the base shear force along the height of the building was again adopted according to the first mode shape of the building, with an additional singular force to be applied to the top story (F_t), to take implicitly into account the effects of higher modes approximately as given in Eqs.13 and 14. According to this version of the code, F_t was assumed to be zero for low-rise buildings (H/D $\leq$3).

$$F_i = (F - F_t)\frac{W_i h_i}{\sum W_i h_i} \tag{13}$$

$$F_t = 0.004F\left(\frac{H}{D}\right)^2 \leq 0.15F \tag{14}$$

It is important to note that the permission to increase the allowable stresses of concrete and steel was reduced to 33% from 50% in the code. Additionally, the permitted increase of the ground allowable stress was reduced to 33% for the ground types I, II and III. No increase for the ground allowable stresses was permitted for the ground type IV, as well as for the concrete and steel allowable stresses for structures on the ground type IV.

It should be noted that while the building weight to be considered for calculation of the base shear force was similar to the 1968 code (Eq. 5), the values of live load reduction factor (*n*) were slightly revised. This value was 0.8 for storage type structures, 0.6 for schools, theaters, concert halls, shops, dormitories, and 0.3 for residential buildings, offices, hospitals, hotels. It is important to emphasize that the reinforced concrete design and construction code in Turkey (TS500) was revised in 1984 and 2000.

After 1984, while still the use of allowable stress design was permitted, the ultimate strength design was encouraged. Consequently, after mid-1980s, design engineers began to use the ultimate strength design instead of the allowable stress approach. In the most recent version of the reinforced concrete design and construction code published in 2000, the use of the allowable stress design is not permitted any more. In 1996, the seismic zone map has been revised once more (Fig. 1b). In the revised seismic zone map, which still has five seismic zones, the area for Zone I is significantly increased. This seismic zone map is still in use.

3.6 1998 Seismic Regulation

After more than 20 years of the publication of the 1975 code, a revised version was published in 1998 just 1 year before the catastrophic earthquakes experienced in 1999. Therefore, the 1998 code and the earthquakes experienced created a milestone in terms of earthquake-resistant design and construction, as well as the demand of public for safe housing.

The most important advances introduced through the 1998 code are:

- Inclusion of the detailed capacity design principles
- Explicit definition of the design earthquake in terms of occurrence probability
- Explicit definition of the acceptable structural performance under the design earthquake
- Definition of the elastic design spectrum
- Definition of the seismic load reduction factor depending on the structural characteristics, including dynamic properties and ductility of the structural system and the over-strength factor
- Inclusion of detailed requirements on confinement and explicit rules for reinforcement detailing
- Quantitative definition of irregularities.

The capacity design principles in the code provide that plastic hinges form at beams by assuring that columns are stronger than beams framing into the same joint. Furthermore, the shear capacity of beams and columns as well as shear walls is kept higher than their bending capacity, so that ductile failure is ensured in case of seismic loads higher than that considered in seismic design.

The design earthquake considered in the code corresponds to an earthquake with the return period of 475 years for ordinary buildings (for building importance factor 1.0) and 2,475 years for the most important buildings (for building importance factor 1.5). The probabilities of exceeding these two cases are 10% and 2% in 50 years, respectively.

In the code, the spectral acceleration coefficient *A(T)* is given by Eq.15, where A_o, *I* and *S(T)* are the effective seismic acceleration coefficient (seismic zone coefficient), the building importance factor and the elastic spectrum coefficient evaluated for 5% damping ratio. The effective seismic acceleration coefficient (A_o) is to be taken as 0.40, 0.30, 0.20 and 0.10, for the seismic zones I, II, III and IV, respectively, (Fig.1b). The building importance factor (*I*) is given with more details in the code compared to its previous versions, (Table 5). Spectrum coefficient (*S(T)*) is determined through Eqs.16a, 16b, 16c as a function of the fundamental period the building (*T*) and the characteristic spectrum periods (T_A and T_B), which are to be determined depending on the ground type.

The characteristic spectrum periods for various ground conditions are given in Table 6. In this table, it is apparent that Z1 represents strongest ground conditions, while Z4 corresponds to the weakest.

$$A(T) = A_0 I S(T) \tag{15}$$

$$S(T) = 1 + 1.5\frac{T}{T_A} \quad (0 \le T \le T_A) \tag{16a}$$

$$S(T) = 2.5 \quad (T_A \le T \le T_B) \tag{16b}$$

$$S(T) = 2.5\left(\frac{T_B}{T}\right)^{0.8} \quad (T \ge T_B) \tag{16c}$$

Table 5. The building importance factor, *I*

Purpose of occupancy or type of building	Importance factor (I)
1. Buildings to be utilized after the earthquake and buildings containing hazardous materials (a) Buildings required to be utilized immediately after the earthquake (hospitals, fire fighting buildings, telecommunication facilities, transportation stations and terminals, power generation and distribution facilities, official administration buildings, etc.) (b) Buildings containing or storing toxic, explosive and flammable materials, etc.	1.5
2. Intensively and long-term occupied buildings and buildings preserving valuable goods (a) Schools, dormitories, military barracks, prisons, etc. (b) Museums	1.4
3. Intensively but short-term occupied buildings Sport facilities, cinema, theatre and concert halls, etc.	1.2
4. Other buildings Buildings other than defined above (residential and office buildings, hotels, building-like industrial structures, etc.)	1.0

Table 6. Characteristic spectrum periods

Local Site Class	T_A(s)	T_B(s)
Z1	0.10	0.30
Z2	0.15	0.40
Z3	0.15	0.60
Z4	0.20	0.90

The fundamental period of the building can be calculated by Eq. 17 or Eq. 18. Equation 17 is the well-known Rayleigh equation, where m_i is the mass of the i^{th} story, F_{fi} is the fictitious lateral load acting on the i^{th} story and d_{fi} is the corresponding displacement of the i^{th} story in the direction of F_{fi} . On the other hand, Eq.18 is an empirical relation, where C_t is a coefficient and depends on structural system of the building (0.08 for steel frames, 0.07 for reinforced concrete frames, ≤ 0.05 for shear wall buildings) and H_N is the total height of the building in m.

$$T_1 = 2\pi \sqrt{\sum_{i=1}^{N} m_i d_{fi}^2 / \sum_{i=1}^{N} F_i d_{fi}} \qquad (17)$$

$$T_1 \cong T_{1A} = C_t H_N^{3/4} \qquad (18)$$

For using inelastic capacity of the structures, certain level of inelastic deformations (controlled damages) beyond elastic limits are allowed under the design earthquake explicitly, provided that the building does not collapse, life safety is ensured and damages are kept within the controlled limits. For utilizing inelastic deformations, the structural system should have a certain level of ductility.

According to the code, the buildings can be designed considering two levels of ductility; normal or high. There are several rules, particularly in terms of the application of the capacity design, construction details and irregularities for classifying the structural systems as normal or high ductility. Since inelastic deformations are allowed, the lateral load demand evaluated by using the elastic design spectrum is reduced depending on the characteristics of the structural system by the seismic load reduction factor $R_a(T)$ given by Eqs.19a, 19b.

Obviously, if the structural system can be classified as a high ductility system, the reduction in lateral loads is higher than that of a normal ductility structural system.

$$R_a(T) = 1.5 + (R - 1.5)\frac{T}{T_A} \quad (T \le T_A) \tag{19a}$$

$$R_a(T) = R \quad (T > T_A) \tag{19b}$$

As seen in Eqs. 19a, 19b the seismic load reduction factor R_a can be calculated as a function of the structural system coefficient, R, which can be determined through Table 7. Finally, the reduced base shear force (V_t) can be calculated by Eq.20, where W is the total weight of the building to be calculated in a similar method as in the 1975 Code by considering dead load and reduced live load. Furthermore, in this revision the lateral drift limits were also revised.

$$V_t = W\frac{A(T)}{R_A(T)} \ge 0.10 A_0 I W \tag{20}$$

Requirements on the combinations of the seismic loads with the other loads are given in the related codes for typical buildings, such TS500. In this code, the wind and seismic loads are not considered in one single combination together. Some typical design combinations given in this code are 1.4G + 1.6Q, G + Q + E, 0.9G + E, G + 1.3Q + 1.3W and 0.9G + 1.3 W, where *G, Q, E* and *W* represent dead, live, seismic and wind loads, respectively.

Table 7. The structural system coefficients, R

Building structural system	Systems of normal ductility level	Systems of high ductility level
(1) Cast-in-situ reinforced concrete buildings		
(1.1) Buildings in which seismic loads are fully resisted by frames	4	8
(1.2) Buildings in which seismic loads are fully resisted by coupled structural walls	4	7
(1.3) Buildings in which seismic loads are fully resisted by solid structural walls	4	6
(1.4) Buildings in which seismic loads are jointly resisted by frames and solid and/ or coupled structural walls	4	7
(2) Precast reinforced concrete buildings		
(2.1) Buildings in which seismic loads are fully resisted by frames with connections capable of cyclic moment transfer	3	6
(2.2) Buildings in which seismic loads are fully resisted by single-story hinged frames with fixed-in bases	–	5
(2.3) Buildings in which seismic loads are fully resisted by prefabricated solid structural walls	–	4
(2.4) Buildings in which seismic loads are jointly resisted by frames with connections capable of cyclic moment transfer and cast-in-situ solid and/or coupled structural walls	3	5
(3) Steel buildings		
(3.1) Buildings in which seismic loads are fully resisted by frames	5	8
(3.2) Buildings in which seismic loads are fully resisted by single-story hinged frames with fixed-in bases	4	6
(3.3) Buildings in which seismic loads are fully resisted by braced frames or cast-in-situ reinforced concrete structural walls		
(a) Concentrically braced frames	3	–
(b) Eccentrically braced frames	–	7
(c) Reinforced concrete structural walls	4	6
(3.4) Buildings in which seismic loads are jointly resisted by frames and braced frames or cast-in-situ reinforced concrete structural walls		
(a) Concentrically braced frames	4	–
(b) Eccentrically braced frames	–	8
(c) Reinforced concrete structural walls	4	7

It is worth noting that while the code was quite comprehensive in terms of reinforced concrete structures, recommendations on steel structures were not equally detailed. This was due to the fact that number of steel structures was very low compared to reinforced concrete structures before the 1999 earthquakes. Consequently, while still being in marginal numbers with respect to reinforced concrete structures, the amount of steel construction has increased significantly after the 1999 earthquakes, necessitating more comprehensive seismic provisions in the code.

3.7 2007 Seismic Regulation (Turkish Seismic Code)

Based on the demand of people and the official institutions for earthquake safe environment after the earthquakes experienced in 1999, many structures were investigated in terms of seismic safety and some of these were retrofitted. However, due to lack of official guidelines and standards about seismic safety assessment and retrofitting, in many cases non-standard and sometimes inappropriate approaches were being used by design engineers while analyzing or retrofitting the existing buildings. Therefore, the most recent version of the seismic design code published in 2007 includes the issues on seismic safety assessment of existing buildings and retrofitting comprehensively. The code has only minor revisions in the provisions related to reinforced concrete buildings to be newly designed. However, the seismic safety requirements for steel structures, which were not addressed in sufficient comprehensiveness in the previous codes, are covered comprehensively in the code. With this version, the title of the code, which was “Specification for structures in disaster areas” since 1961, has been changed as “Specification for buildings to be built in seismic areas”. Consequently, issues related with other disasters (such as flood and fire) are removed from the code.

The most important advances introduced through the 2007 version of the code are:

• Inclusion of a new extensive chapter on seismic safety assessment and retrofitting of existing buildings
• Inclusion of a linear elastic method for seismic safety assessment considering the inelastic behavior in terms of approximate allowable demand/capacity ratios given depending on the damage level
• Inclusion of the performance-based assessment principles for existing structures in seismic safety evaluation and retrofitting
• Inclusion of different levels of design earthquakes (such as service, design and maximum earthquakes) and performance levels (such as immediate occupancy, life safety and collapse prevention) to be considered for various types of buildings
• Inclusion of single-mode and multi-mode push-over analysis for seismic safety assessment and retrofitting
• Inclusion of nonlinear time history analysis
• Inclusion of principles and details related with conventional retrofitting techniques (such as concrete jacketing, strengthening with steel members, and shear wall additions) and retrofitting using innovative materials (such as fiber reinforced polymers).

As known, in performance-based assessment, seismic performance of the building is determined based on the extent and distribution of structural member damages. In the code, the damage levels are determined depending on the concrete compressive strain at the extreme compression fiber (either on the cover or core depending on the damage level) and tensile reinforcement strain, which are calculated through the rotations of plastic hinges when push-over analysis is carried out. When distributed plasticity assumption is used, the critical strains can be evaluated directly.

Additional Information:

Seismic zone maps for individual cities are prepared by Ministry of Public Works and Settlements and 2 example cities are given here, Istanbul and Bursa. The whole map is given in the attachment as an Excel file named “**Turkish seismic zone maps city by city.xls**”.

Figure 2 . Seismic zone map for Istanbul.

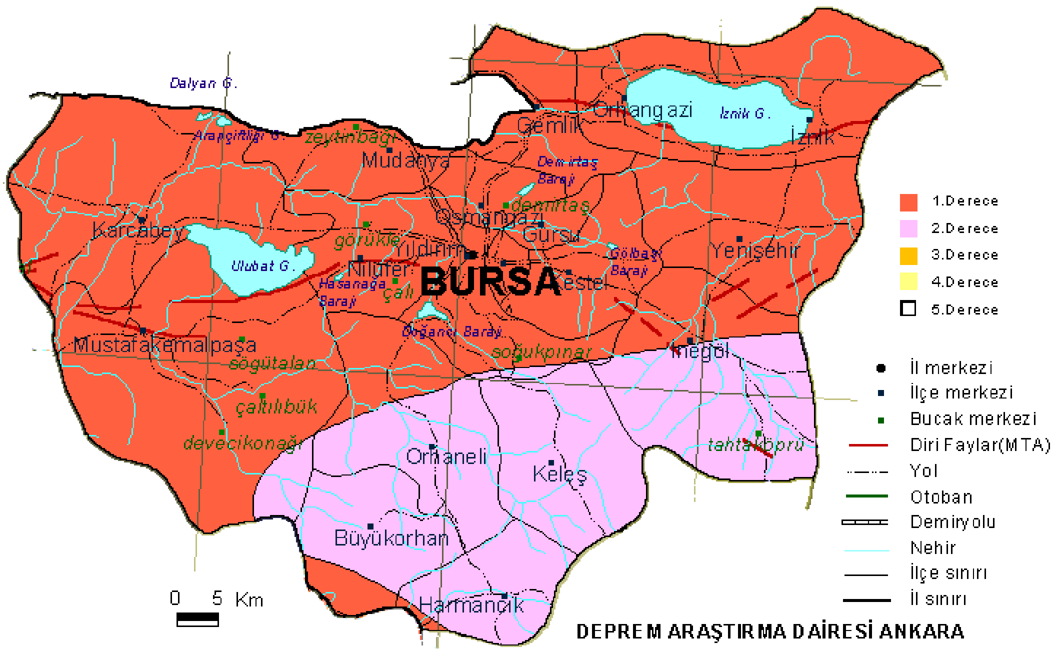


Figure 3. Seismic zone map for Bursa.

4. STRUCTURAL DESIGN METHODOLOGY

4.1 Material strength

Definition of material strength for reinforced concrete structures is defined in “TS500 Requirements for Design and Construction of Reinforced Concrete Structures - Chapter 3.2-Rebars and Chapter 3.3 Concrete”. These chapters are translated and explained as follows:

TS500

3.2 Re-bars

The steel material for re-bars should meet the requirements of “TS708 Steel for the Reinforcement of Concrete - Reinforcing Steel”. The mechanical properties of steel materials are given in the following table. The young modulus of rebar steel is 2x10^5 MPa.

Table 3.1. Mechanical properties of rebar steel types. (from TS708)

Mechanical property	Rebars					Mesh reinforcement
	Natural hardness			Cold formed steel		
	S220a	S420a	S500a	S420b	S500bs	S500bk
Minimum yielding strength f_{yk} (MPa)	220	420	500	420	500	500
Ultimate strength f_{su} (MPa)	340	500	550	550	550	550
$\varphi \leq 32$ Ultimate strain ε_{su} (%)	18	12	12	10	8	5
Ultimate strain ε_{su} (%)	18	10	10	10	8	5

3.3 Concrete

Concrete should be prepared in-site according to the design strength value given by the structural engineer or ready-mixed concrete should be used which meets the requirements of TS 11222 Standards for ready mixed concrete.

(Note by Fatih Sutcu: TS500 is published at 2000. Effective from 2002, abovementioned TS11222 is no longer used. Instead of TS11222, a new code TS EN 206 which is adopted from European Standard “ENV 206 Concrete - Part 1: Specification, performance, production and conformity” is used. Please refer to **ENV 206 EN206-1 European Norm for Concrete.pdf** in the attachment)

3.3.1 Concrete types and compressive strength of concrete

Concrete types are determined by compressive strength value. Characteristic compressive strength of concrete specimens, f_{ck} is evaluated by using cylindrical concrete specimens with diameter of 150 mm and height of 300mm. Specimens is cured for 28 days before testing. The compressive strength tests are performed according to “TS3068 Making and Curing Test Specimens for Concrete in Test Laboratory”. The test values of characteristic concrete types are given in the following table:

Table 3.2. Concrete types and strength values**.**

Concrete type	Characteristic compressive strength, f_{ck} MPa	Characteristic tensile strength, f_{ctk} MPa	Young modulus after 28 days of cure, E_c MPa
C16	16	1.4	27000
C18	18	1.5	27500
C20	20	1.6	28000
C25	25	1.8	30000
C30	30	1.9	32000
C35	35	2.1	33000
C40	40	2.2	34000
C45	45	2.3	36000
C50	50	2.5	37000

4.1 Limit States

Definition of limit states to be considered in structural design and the load combinations including seismic loads are given in this section.

In TS500 Requirements for Design And Construction Of Reinforced Concrete Structures the resistance factors and load combinations for reinforced concrete buildings are given in “Chapter 6.2- Structural Safety”. This chapter is translated and explained as follows:

TS500

6.2- Structural Safety

6.2.1. Introduction

In structural design, the building should be designed to prevent collapse in building life-span and also cracks, deformations or vibrations which will negatively affect the strength or using comfort of the building. In this context the design loads are increased with certain load coefficients while material strength is reduced for safety. These coefficients are determined by statistical methods.

6.2.2. Limit states Method.

In order to satisfy the abovementioned safety requirements the substantial limit states of a building in its life-span shall be investigated separately for (i) ultimate strength limit state and (ii) serviceability limit state.

6.2.3. Ultimate strength limit state

The ultimate strength of all structural members (design strength) that are calculated using the reduced material strengths given in 6.2.5 should be not less than the inertial forces calculated by the increased design loads defined in 6.2.6

6.2.4 Serviceability limit state

In all structural members the cracks, deformations and displacements caused by the effective loads should be calculated by the methods given in Chapter 13 and should be in the range of limits given in the same chapter.

6.2.5. Material strength coefficients

The design strength of structural materials will be obtained by reducing the characteristic material strength given in Chapter 3 by Material strength coefficients that are equal or larger than 1.0. For Ultimate strength limit state the Material strength coefficients for concrete and steel is given as follows:

Concrete: $f_{cd} = f_{ck} / \gamma_{mc}$

$f_{ctd} = f_{ctk} / \gamma_{mc}$

Steel: $f_{yd} = f_{yk} / \gamma_{ms}$

f_{cd}: Design compressive strength of concrete
f_{ck}: Characteristic compressive strength of concrete
f_{ctd}: Design tensile strength of concrete
f_{ctk}: Characteristic tensile strength of concrete
γ_{mc}: Material strength coefficient of concrete
f_{yd}: Design compressive strength of steel
f_{yk}: Characteristic compressive strength of steel
γ_{ms}: Material strength coefficient of steel

γ_{mc} =1.5 and γ_{ms}=1.15.

Example:
C25 concrete. f_{ck}=25N/mm^2 → f_{cd} = f_{ck} /γ_{mc}.→ f_{cd}=16.7N/mm^2

For Serviceability limit state the Material strength coefficient is assumed to be 1.0.

6.2.6. Load coefficients and load combinations
The characteristic load effects are defined in TS 498 and Turkish Seismic Code. The design load F_d obtained by common load combinations are given as follows:

(a) Only vertical loads
F_d = 1,4G + 1,6Q
F_d = 1,0G + 1,2Q + 1,2T
Where G is dead load, Q is live load and T is the loads by temperature changes, shrinking or differential settlement. T is considered is the cases that T effect cannot be neglected.

(b) In cases of effective wind loading, following load combinations are considered in addition to the load combinations in (a).
F_d = 1,0G + 1,3Q + 1,3W
F_d = 0,9G + 1,3W

(c) In cases of effective earthquake, following load combinations are considered in addition to the load combinations in (a).
F_d = 1,0G + 1,0Q + 1,0E
F_d = 0,9G + 1,0E

(d) In cases of lateral soil pressure, following load combinations are considered in addition to the load combinations in (a).
F_d = 1,4G + 1,6Q + 1,6H
F_d = 0,9G + 1,6H

(e) In cases of fluid pressure, the evaluated fluid pressure is increased by 40% and added to all load combinations with live loads.

(f) In Serviceability limit state design all load combination coefficients are considered to be 1.0.

5. EVALUATING THE SEISMIC PERFORMANCE OF EXISTING BUILDINGS

Turkish Seismic Design Code (DBYBHY 2007) includes a chapter for evaluating the seismic performance of existing buildings, namely “Chapter 7. Evaluation and Retrofitting of Existing Buildings”. This chapter is not translated in English officially or unofficially. Here I have roughly translated this chapter in English.

DBYBHY 2007

CHAPTER.7 EVALUATION&RETROFITTING OF EXISTING BUILDINGS

7.1 CONTENTS

7.1.1. Chapter 7 is used for the assessment of existing and retrofitted buildings.

7.1.2. The analysis procedures given are not for applying to Steel and Masonry type structures. Steel structures are to be evaluated by using Chapter 2 and 4, new building design methods.

7.1.3 Prefabricated reinforced concrete buildings are to be evaluated depending on Chapters 2 and 3

7.1.4 The given rules are not to be used for non-building structures defined in 2.12

7.1.5 A damaged structure’s earthquake performance may not be evaluated by this chapter

7.1.6 For the retrofit of a damaged structures and the evaluation of retrofitted structures this chapter will be used. For retrofitting, existing member strength and stiffness of damaged buildings will be evaluated by the engineer in charge.

7.2 DATA COLLECTING FROM BUILDINGS.

7.2.2. Data levels

Depending on the data level, a data level coefficient will be used for the capacity evaluation.

7.2.2.1. Limited level
7.2.2.2. Mid-level
7.2.2.3. Comprehensive level
7.2.3 Material strength
The existing buildings material strength is used for capacity evaluation.

7.2.16. Data level coefficients to be applied on member capacities.

Table7.1

Data level	Data level coefficient
Limited level	0.75
Mid-level	0.90
Comprehensive level	1.0

7.3. DAMAGE LEVELS AND DAMAGE REGIONS IN STRUCTURAL MEMBERS

7.3.1. Sectional Damage Levels

For ductile members, 3 levels are defined. These are Minimum Damage level (MN), Safety Damage level (GV) and Collapse Damage level (GC). Minimum Damage level defines the beginning of non-linear behavior level for sections, Safety Damage level defines the upper limit of safe non-linear behavior and Collapse Damage level defines the pre-collapse behavior of the section. Non-ductile members are not classified here.

7.3.2. Damage regions

Damage regions are defined depending on the damage level of its critical sections using Fig 7.1

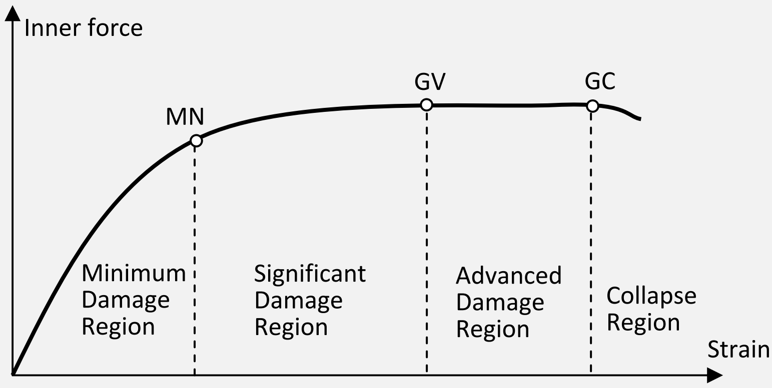


Figure 7.1

7.3.3. Defining member and section damages

The damage level of a section will be decided by using the inner forces and/or strains evaluated by methods given in 7.5 or 7.6 and the levels defined in 7.3.1.

Member damage will be decided according to the section with the highest damage

7.4 GENERAL PRINCIPLES AND RULES FOR EARTHQUAKE PERFORMANCE EVALUATION

7.4.1. The aim of this chapter is to evaluate the earthquake performance of an existing or retrofitted building. In order to do this, linear methods described at 7.5 or non-linear methods described at 7.6 may be used. These two theoretically separate approaches will obviously not result identically. However, the general principles and rules defined below are valid for both approaches.

7.4.2. For the definition of earthquake input effect, the elastic acceleration spectrum given in 2.4 will be used. However modifications given in 7.8 will be applied in order to consider the exceeding possibilities. The building importance factor given in 2.4.2 will not be used. (I=1.0 for all buildings)

7.4.3. Earthquake performance of buildings will be evaluated by the combined effects of vertical loads and earthquake effects. Live loads will be determined using chapter 7.4.7

7.4.4. Earthquake forces will be applied on the building in both directions and both ways, separately.

…

7.4.13. Stiffnesses of concrete members are defined by considering cracked concrete sections. The cracked section stiffnesses of beams are taken as 40% of uncracked section stiffnesses and cracked section stiffnesses of columns and shear walls are calculated according to their axial load level:

if $N_d/(A_c*f_{cm}) \leq 0.1$, then 0.40 of uncracked stiffness is taken as cracked stiffness,

if $N_d/(A_c*f_{cm}) \geq 0.4$, then 0.80 of uncracked stiffness is taken as cracked stiffness,

For the values of $N_d/(A_c*f_{cm})$ between 0.1 and 0.4, interpolation is done to calculate cracked stiffness.

N_d is the axial load value under gravity loading, A_c is the concrete section area, f_{cm} is the existing concrete compressive strength.

7.5. EVALUATING THE EARTHQUAKE PERFORMANCE OF A BUILDING WITH LINEAR METHODS.

7.5.1. Analysis methods

Linear analysis methods to be used for the seismic analysis of buildings and building-like structures are, Equivalent Seismic Load Method given in 2.7, Mode-Combination Method given in 2.8. The following additional rules will be applied to the aforementioned methods.

7.5.1.1. The selected buildings should not be taller than 25m, have at most 8 stories and torsional irregularity coefficient η_{bi} is smaller than 1.4. For base shear demand calculation, R is taken as 1, and building importance factor I is also taken as 1. On the other hand a new λ constant is introduced as 1.0 for buildings up to 2 stories except basement and 0.85 for others. (The reason is that the effective mass for the first mode of such buildings is generally not higher than 85% of building mass)

7.5.2 Evaluating the damages for structural members of RC buildings

7.5.2.1. For evaluating the damage levels of ductile RC members with linear analysis methods the demand to capacity ratios (r) are used. By dividing the earthquake demands with the corresponding residual capacities, the demand to capacity ratios (r) are calculated.

7.5.2.2. RC members are classified as "*ductile*" in case their collapse mechanism is bending failure and "*brittle*" if it is shear failure.
Shear capacities (V_r) for beam end sections and column mid sections are calculated according to TS 500. If V_E is greater than V_r , then the element is defined as brittle, otherwise ductile. Detailed method is explained in Chapter 3.

7.5.2.5. For obtaining the damage region of a member, the calculated r (demand to capacity) ratios will be compared to Table 7.2, Table 7.3, Table 7.4 limit values for columns, beams and structural walls respectively.

Table 7.2

Ductile Columns			Damage Level		
$\frac{N}{A_c f_c}$	Confinement	$\frac{V}{b_w d\, f_{ct}}$	MN	GV	GC
≤ 0.1	YES	≤ 0.65	3	6	8
≤ 0.1	YES	≥ 1.30	2.5	5	6
≥ 0.4	YES	≤ 0.65	2	4	6
≥ 0.4	YES	≥ 1.30	2	3	5
≤ 0.1	NO	≤ 0.65	2	3.5	5
≤ 0.1	NO	≥ 1.30	1.5	2.5	3.5
≥ 0.4	NO	≤ 0.65	1.5	2	3
≥ 0.4	NO	≥ 1.30	1	1.5	2
Brittle Columns			1	1	1

Table 7.3

Ductile Beams			Damage Level		
$\frac{\rho - \rho'}{\rho_b}$	Confinement	$\frac{V}{b_w d\, f_{ct}}$	MN	GV	GC
≤ 0.0	YES	≤ 0.65	3	7	10
≤ 0.0	YES	≥ 1.30	2.5	5	8
≥ 0.5	YES	≤ 0.65	3	5	7
≥ 0.5	YES	≥ 1.30	2.5	4	5
≤ 0.0	NO	≤ 0.65	2.5	4	6
≤ 0.0	NO	≥ 1.30	2	3	5
≥ 0.5	NO	≤ 0.65	2.5	4	6
≥ 0.5	NO	≥ 1.30	1.5	2.5	4
Brittle Beams			1	1	1

Table 7.4

Ductile Shearwalls	Damage Level		
Confinement	MN	GV	GC
YES	3	6	8
NO	2	4	6
Brittle Shearwalls	1	1	1

7.5.3. Relative story drift control.

In a linear analysis of a building, the relative story drift of any column or shear wall at each storey, in the considered direction should be compared to the values according to the damage limits defined in Table 7.6. If these inter-storey drifts are greater than the limit values at any storey, then the building does not satisfy the selected performance level.

Table. 7.6

Inter-story drift ratio	Damage Level		
	MN	GV	GC
δ_{ji}/h_{ji}	0.01	0.03	0.04

7.6. INELASTIC METHODS

Push-over method and Time-history method is explained in detail.

7.7 EVALUATING THE BUILDING EARTHQUAKE PERFORMANCE

7.7.2 Instant Occupancy Performance Level **(IO)**

At each storey, in the considered direction 10% of beams may exceed to the Significant Damage Region at most, while all other structural members are in the Minimum Damage Region. No retrofitting is required except for strengthening of the brittle members if any.

7.7.3. Life safety Performance Level **(LS)**

At each storey, in the considered direction 30% of the beams may exceed to the advanced damage region at most.

The columns at advanced damage region shouldn’t be greater than 20% of the overall lateral strength of columns on that story. (40% for top story)

All other structural members are at Minimum or Significant Damage Region.

7.7.4. Collapse Prevention Performance Level (CP)

Including that all brittle members are at Collapse Range, at each storey, in the considered direction 20% of the beams may exceed to the Collapse Region at most. All other structural members are at Minimum, Significant or Advanced Damage Region. The occupation of this type of building is unfavorable in the means of life safety.

Table 7.8. The expected earthquake performance levels for buildings:

Building purpose and type	**Earthquake level**		
	At 50 years %50	***At 50 years %10***	***At 50 years %2***
Buildings to be used after an earthquake (Hospital, communication, energy supplier..)	-	IO	LS
Buildings with long time&dense inhabitants (Schools, museums..)	-	IO	LS
Buildings with short time&dense inhabitants (Theatres, sport facilities..)	IO	LS	-
Buildings with dangerous contents. (Toxic stocks..)	-	IO	CP
Others (Accommodation, hotels, offices..)	-	LS	-

6. REGULATIONS AND CODES REGARDING THE MECHANICAL, ELECTRICAL and PLUMBING (MEP) SYSTEMS.

The seismic design of MEP systems is explained in the Chapter 2.1 of this report. As abovementioned the Turkish Seismic Code eplains the seismic design of MEP systems very briefly in DBYBHY 2007 Chapter 2.11 - Seismic Loads Applied To Structural Appendages, Architectural Elements, Mechanical and Electrical Equipment. (**Refer to file DBYBHY2007-English-Chapters1,2.pdf**)

Except for this chapter, there are no other seismic design codes for MEP systems. However, Turkish Standards Institute has published several codes about the MEP systems. Current “MoH regulation for hospital design” includes the standards to be used for MEP systems. Most of these codes are prepared according to the international or European codes such as IEC (International Electro-technical Commission), CENELEC HD (European Committee for Electro-technical Standardization - Harmonization Document) or EN (European Committee for Standardization)

Some of the important standards required for the design of medical facilities by MoH is given in the following chapters.

6.1. Electrical Standards

Table 8: Turkish Standards regarding electrical systems

Turkish Standard no	International Standard no if any	Standard name
TS HD 60364-7-710	HD 60364-7-710:2012	Low-voltage electrical installations - Part 7-710: Requirements for special installations or locations - Medical locations
TS EN 61558-2-15	EN 61558-2-15:2012	Safety of transformers, reactors, power supply units and combinations thereof - Part 2-15: Particular requirements and tests for isolating transformers for the supply of medical locations
TS267 EN 60076-1	IEC 60076-1	Power transformers Part 1: General
TS 10901 EN 60076-2	IEG 60076-2	Power transformers - Part 2: Temperature rise
TS 10902 EN 60076-3	IEC 60076-3	Power transformers –. Part 3: Insulation levels, dielectric tests and external clearances in air

TS 10903	IEC 60076-4	Power transformers - Part 4: Guide to the lightning impulse and switching impulse testing
TS 10904 EN 60076-5	IEC 60076-5	Power transformers –. Part 5: Ability to withstand short circuit
TSHD 428.1 Sİ	CENELEC HD 428.1 Sİ	Three-phase oil-immersed distribution transformers 50 Hz, from 50 to 2500 kVA with highest voltage for equipment not exceeding 36 kV - Part 1: General requirements and requirements for transformers with highest voltage for equipment not exceeding 24 kV
TSHD 428.3 Sİ	CENELEC HD 428.3 Sİ	Three-phase oil-immersed distribution transformers 50 Hz, from 50 to 2500 kVA with highest voltage for equipment not exceeding 36 kV - Part 1: General requirements and requirements for transformers with highest voltage for equipment not exceeding 36kV
TS 8711	IEC 60551	Determination of transformer and reactor sound levels
TS3215	IEC 60354	Loading guide for oil-immersed power transformers
TS EN 50180	BS EN 50180	Bushings above 1 kV up to 52 kV and from 250 A to 3,15 kA for liquid filled transformers
TS EN 50386	BS EN 50386	Bushings up to 1 kV and from 250 A to 5 kA, for liquid filled transformers
TSHD 428.2.3.S1	HD 428.2.3.S1	Three-phase oil-immersed distribution transformers 50 Hz, from 50 to 2500 kVA with highest voltage for equipment not exceeding 36kV
TSEN60641-1+A1	IEC 60641-1-AM1	Amendment 1 - Specification for pressboard and press paper for electrical purposes. Part 1: Definitions and general requirements
TS EN 60641-2	IEC 60641-2	Pressboard and press paper for electrical purposes - Part 2: Methods of tests
	IEC 60298	A.C. metal-enclosed switchgear and control gear for rated voltages above 1 kV and up to and including 52 kV

	IEC 60056	Specification for alternating-current circuit-breakers - Part 6: Guide to the testing of circuit-breakers with respect to the switching of cables on no-load
	IEC 60129	Alternating current (isolators) and earthing switches
	IEC 60694	Common specifications for high-voltage switchgear and control gear standards
	IEC 60281	Magnetic cores for application in coincident current matrix stores having a nominal selection ratio of 2:1

The list for the standards of Electrical devices and equipment includes a big number of standards. This is a brief list to show that Turkish standard is adapted to the International codes.

6.2. Elevator Standards

The standards for elevators are given as follows:

Table 9: Turkish Standards regarding elevators.

Turkish Standard no	International Standart no if any	Standard name
TS 1812	EN: 81-1	Safety rules for the construction and installation of lifts - Part 1 : Electric lifts
TS EN: 81-2	EN: 81-2	Safety rules for the construction and installation of lifts – Part 2 : Hydraulic lifts
TS EN: 81-3	EN: 81-3	Safety rules for the construction and installation of lifts Part 3: Electric and hydraulic service lifts
TS 4789	ISO 7465	Passenger lifts and service lifts -- Guide rails for lift cars and counterweights -- T-type
TS 8237	ISO 4190-1	Lift (Elevator) installation -- Part 1: Class I, II, III and VI lifts
TS 8238	ISO 4190-2	Lift (US: Elevator) installation -- Part 2: Class IV lifts
TS EN 13015	EN 13015	Maintenance for lifts and escalators. Rules for maintenance instructions

Other Standards required by MoH for elevators are given as follows:

TS EN 12385-5 ; TS EN 81-70; TS EN 81-28 ; TS EN 81-58 ; TS EN 81-72 ; TS EN 81-71 ; TS EN 81-73 ; TS EN 81-80 ; TS EN 12015 ; TS EN 12016

6.3. Medical Installments And Plumbing Standards

Standards for Medical installments and plumbing are as follows:

Table 10: Turkish Standards regarding medical installments and plumbing.

Turkish Standard no	International Standart no if any	Standard name and explanation
TS EN ISO 13485	ISO 13485	Medical devices -- Quality management systems -- Requirements for regulatory purposes
	COUNCIL DIRECTIVE 93/42/EEC	Medical devices
TS EN ISO 7396	ISO 7396-1	Medical gas pipeline systems -- Part 1: Pipeline systems for compressed medical gases and vacuum ISO 7396-1:2007 specifies requirements for design, installation, function, performance, documentation, testing and commissioning of pipeline systems for compressed medical gases, gases for driving surgical tools and vacuum in healthcare facilities to ensure continuous delivery of the correct gas and the provision of vacuum from the pipeline system. It includes requirements for supply systems, pipeline distribution systems, control systems, monitoring and alarm systems and non-interchangeability between components of different gas systems. ISO 7396-1:2007 is applicable to pipeline systems for the following medical gases: oxygen, nitrous oxide, medical air, carbon dioxide, oxygen/nitrous oxide mixtures; to pipeline systems for the following gases: oxygen-enriched air, air for driving surgical tools, nitrogen for driving surgical tools; and to pipeline systems for vacuum.

TS EN ISO 7396-2	ISO 7396-2	Medical gas pipeline systems -- Part 2: Anaesthetic gas scavenging disposal systems ISO 7396-2:2007 specifies requirements for the design, installation, function, performance, documentation, testing and commissioning of anaesthetic gas scavenging disposal systems, to ensure patient safety and to minimize exposure of the operator and other persons to anaesthetic gases and vapours. It includes requirements for the power device, pipeline system, performance, non-interchangeability between key components and avoidance of cross connections between anaesthetic gas scavenging (AGS) disposal systems and medical gas and vacuum pipeline systems.
TS EN ISO 11197	ISO 11197	Medical supply units ISO 11197:2004 specifies requirements and test methods for medical supply units intended for use in healthcare facilities to supply electric power and/ medical gases and/or liquids and anaesthetic gas scavenging systems. It is applicable in conjunction with IEC 60601-1:1988.

Other Standards for Medical installments and plumbing are given as follows:

TS EN ISO 10524-1; TS EN ISO 14971 ; TS EN ISO 9170-1 ;TS EN ISO 9170-2 ; TS EN ISO 14155-1; TS EN ISO 15002 ; TS EN 1041 ; TS EN 980 ; TS EN 60601-1 ; TS EN 13348 ; HTM 2022

6.4. Regulation for Fire Protection:

Turkish Fire Protection and Training Association (TUYAK) has published “Turkey's Regulation on Fire Protection” in English in 2012. This Regulation may be obtained from TUYAK.

This English regulation is the translation of the original Turkish regulation prepared in 2009.

TUYAK Office:
Tel: +90 212 320 24 04- +90 541 617 99 59
Fax: +90 212 320 24 03
Tuyak@tuyak.org.tr
www.tuyak.org.tr

6.5. Regulation for Clean Water Supply System

The regulation used by MoH for clean water supplying system is, "TS 1258 Rules for Calculation for Installation Water Supply on Building"

7. DISASTER RESILIENT PLANS FOR MEDICAL FACILITIES

Although there is not a standard disaster plan provincial private administration, Turkish Ministry of Health has announced a document for “Guidelines for Preparing Emergency Plans by Local Health Authorities”. This document has comprehensive information on how to prepare an emergency plan regarding a disaster.

Each Local Health Authority is supposed to use this guideline to prepare for emergency cases such as natural disasters or technological explosions..etc.

The Guideline contents may be summarized as follows:

- City risk assessment.
- Evaluating past disasters and emergency cases.
- Current situation of the city.
- Preparation for an emergency case.
- Evaluating the structural performance of existing important buildings.
- Emergency response topics.
- Structure of Local Health Authorities during an emergency case and job definitions.
- Emergency response in first 72 hours.
- General Coordination
- Evaluation of health issues
- Evaluation of alternate medical attendance areas
- Evaluation of buildings to be used as hospitals such as schools during an emergency case
- Evaluation of food/drink and clothing sources of hospitals during an emergency case
- Evaluation of places to be used as morgues in case.
- Coordination management.
- Systems for gathering emergency data and coordination.

- Rehabilitation issues (evaluation of the structural system of medical facilities and repairing methods; psychological support for survivors..etc)
- Evaluating the plans determining the city or cities to support during a wide-range emergency case.

Although this guideline is very comprehensive, the number of cities which has prepared an emergency plan, or the contents of the plans that has been prepared or the awareness of medical facilities about this plan is unknown at the moment.

However I have reached to the emergency and disaster resilient plans of several governmental hospitals from internet, including the abovementioned topics.

8. CONCLUSIONS

This report investigates the essential issues on the current Turkish Seismic Code, the progress on Seismic Isolation regulations in Turkey and the regulations that govern the structural engineering issues in Turkey.

In addition to the structural engineering issues the report gives information about the Mechanical, Electrical and Plumbing Standards that are effective in Medical Facility design.

Throughout the report references are given to the codes in English when available. The English codes available are also sent as additional attachments with this report. When not available in English, the necessary parts are translated and included in this report.

The codes that are only available in Turkish (e.g. TS500Reinforced Concrete Code) are not sent as an attachment, although required parts can be translated on demand in the future.

Finally, a brief explanation about the “Guidelines for Preparing Emergency Plans by Local Health Authorities” prepared by Turkish Ministry of Health is given.

Fatih Sutcu, PhD

Istanbul Technical University
Department of Architecture
Structures and Earthquake Engineering Work Group.
Istanbul-Turkey
Tel: +90-212-293 13 00 (2281)
fatih.sutcu@itu.edu.tr

ADDITIONAL ATTACHMENTS:

- **a.** DBYBHY2007-English-Chapters1,2.pdf
- **b.** DBYBHY2007-English-Full.pdf
- **c.** Turkish seismic zone maps city by city.pdf
- **d.** TC SEISMIC ISOLATION DESIGN CODE Turkish Association For Seismic Isolation.pdf
- **e.** EN206-1 European Norm for Concrete.pdf

A-5. DOCUMENTS FOR ESTIMATED COST OF PROJECT

1) Building Cost per Unit Area by MOEU（TL/m2）2014 Original

62 SERİ NOLU EMLAK VERGİSİ/ Serial No. 62 fixed property tax law
KANUNU GENEL TEBLİĞİ/ Offical Notice
EKİDİR/ Attach

2014 YILI İÇİN BİNALARIN METREKARE NORMAL İNŞAAT/ Year 2014 Building cost per unit area (m2)
MALİYET BEDELLERİNİ GÖSTERİR CETVEL/ Table of Cost

TL/m2

BİNALAR/ BUILDINGS	ÇELİK KARKAS BİNA/ STEEL BUILDING FRAMEWORK			BETONARME KARKAS / CONCRETE FRAMEWORK			YIĞMA KAGİR BİNA /Brick Masonry Building			YIGMA YARI KAGIR BI NA /HALF AND STONE MASONRY BUILDING			AHŞAP BİNALAR WOOD BUILDINGS			TAŞ DUVARLI BİNA BUILDING STONE WALL			GECEKONDU TARZI Bİ NA SLUM BUILDING STYLE			KERPİÇ VE DİĞ.BASİT ADOBE AND OTHER SIMPLE		
	ASG. Min	AZA. Max	ORT. Ave	ASG. Min	AZA. Max	ORT. Ave	ASG. Min	AZA. Max	ORT. Ave	ASG. Min	AZA. Max	ORT. Ave	ASG. Min	AZA. Max	ORT. Ave	ASG. Min	AZA. Max	ORT. Ave	ASG. Min	AZA. Max	ORT. Ave	ASG. Min	AZA. Max	ORT. Ave
1) FABRİKA VE İMALATHANE BİNALARI/ Factories and plants BUILDINGS																								
A) LÜKS İNŞ./ Luxuary Construction	-	-	**-**	-	-	**-**	-	-	**-**	-	-	**-**	-	-	**-**	-	-	**-**	-	-	**-**	-	-	**-**
B) 1. SINIF İNŞ./ 1st Class Construction	679.16	755.69	**717.43**	560.06	615.35	**587.71**	384.24	470.73	**427.49**	-	-	**-**	-	-	**-**	-	-	**-**	-	-	**-**	-	-	**-**
C) 2. SINIF İNŞ./ 2nd Class Construction	426.79	468.59	**447.69**	358.70	374.34	**366.52**	227.57	275.04	**251.31**	-	-	**-**	-	-	**-**	-	-	**-**	-	-	**-**	-	-	**-**
D) 3. SINIF İNŞ./ 3rd Class Construction	320.45	362.97	**341.71**	253.08	272.24	**262.66**	140.39	183.62	**162.01**	104.19	127.59	**115.89**	157.38	198.50	**177.94**	113.42	138.95	**126.19**	114.81	120.52	**117.67**	87.89	113.42	**100.66**
E) BASİT/ Basic	182.20	199.19	**190.70**	141.79	172.94	**157.37**	75.15	90.76	**82.96**	57.43	75.15	**66.29**	102.09	103.51	**102.80**	65.21	80.81	**73.01**	53.87	63.07	**58.47**	41.83	43.93	**42.88**
2) FABRİKA VE İMALATHANE BİNASI, SOSYAL BİNALARI VS./ Factories and plants BUILDING, SOCIAL HOUSE																								
A) LÜKS İNŞ./ Luxuary Construction	-	-	**-**	-	-	**-**	-	-	**-**	-	-	**-**	-	-	**-**	-	-	**-**	-	-	**-**	-	-	**-**
B) 1. SINIF İNŞ./ 1st Class Construction	679.16	755.69	**717.43**	560.06	615.35	**587.71**	384.24	470.73	**427.49**	-	-	**-**	-	-	**-**	-	-	**-**	-	-	**-**	-	-	**-**
C) 2. SINIF İNŞ./ 2nd Class Construction	426.79	468.59	**447.69**	358.70	374.34	**366.52**	227.57	275.04	**251.31**	-	-	**-**	-	-	**-**	-	-	**-**	-	-	**-**	-	-	**-**
D) 3. SINIF İNŞ./ 3rd Class Construction	320.45	362.97	**341.71**	253.08	272.24	**262.66**	140.39	183.62	**162.01**	104.19	127.59	**115.89**	157.38	198.50	**177.94**	113.42	138.95	**126.19**	87.89	113.42	**100.66**	73.06	87.89	**80.48**
E) BASİT/ Basic	182.20	199.19	**190.70**	141.79	172.94	**157.37**	75.15	90.76	**82.96**	57.43	75.15	**66.29**	102.09	105.63	**103.86**	65.21	80.81	**73.01**	41.83	51.01	**46.42**	30.46	41.83	**36.15**
3) OTEL BİNALARI/ HOTEL BUILDING																								
A) LÜKS İNŞ./ Luxuary Construction	1687.92	1812.71	**1750.32**	1410.75	1532.67	**1471.71**	1240.59	1363.24	**1301.92**	886.86	1002.41	**944.64**	1488.73	1588.68	**1538.71**	1217.94	1350.49	**1284.22**	-	-	**-**	-	-	**-**
B) 1. SINIF İNŞ./ 1st Class Construction	1215.09	1312.21	**1263.65**	981.14	1077.55	**1029.35**	860.62	915.21	**887.92**	635.18	673.46	**654.32**	993.92	1109.47	**1051.70**	840.78	937.18	**888.98**	-	-	**-**	-	-	**-**
C) 2. SINIF İNŞ./ 2nd Class Construction	818.10	878.37	**848.24**	655.76	696.16	**675.96**	530.97	602.57	**566.77**	407.65	426.07	**416.86**	655.76	735.86	**695.81**	523.89	579.18	**551.54**	-	-	**-**	-	-	**-**
D) 3. SINIF İNŞ./ 3rd Class Construction	637.32	701.83	**669.58**	456.51	514.66	**485.59**	346.67	412.60	**379.64**	286.40	305.55	**295.98**	471.41	547.99	**509.70**	331.74	397.00	**364.37**	-	-	**-**	-	-	**-**
E) BASİT/ Basic	-	-	**-**	-	-	**-**	90.76	111.29	**101.03**	67.34	87.89	**77.62**	170.15	213.38	**191.77**	108.49	130.44	**119.47**	-	-	**-**	-	-	**-**
4) SİNEMA - TİYATRO BİNALARI/ CINEMA - THEATRE BUILDING																								
A) LÜKS İNŞ./ Luxuary Construction	1883.84	2023.13	**1953.49**	1527.01	1629.08	**1578.05**	1384.60	1521.48	**1453.04**	946.28	1090.29	**1018.29**	-	-	**-**	-	-	**-**	-	-	**-**	-	-	**-**
B) 1. SINIF İNŞ./ 1st Class Construction	1356.12	1464.52	**1410.32**	1095.02	1136.18	**1115.60**	960.51	1021.43	**990.97**	708.90	751.62	**730.26**	-	-	**-**	-	-	**-**	-	-	**-**	-	-	**-**
C) 2. SINIF İNŞ./ 2nd Class Construction	913.06	980.33	**946.70**	731.88	776.97	**754.43**	592.61	672.51	**632.56**	454.96	475.53	**465.25**	-	-	**-**	-	-	**-**	-	-	**-**	-	-	**-**
D) 3. SINIF İNŞ./ 3rd Class Construction	711.30	783.32	**747.31**	509.50	574.39	**541.95**	386.90	460.51	**423.71**	319.65	341.01	**330.33**	-	-	**-**	-	-	**-**	-	-	**-**	-	-	**-**
E) BASİT/ Basic	-	-	**-**	-	-	**-**	98.11	117.90	**108.01**	60.93	72.78	**66.86**	-	-	**-**	80.70	107.61	**94.16**	55.39	68.06	**61.73**	41.92	52.98	**47.45**
5) HASTAHANE - KLİNİK BİNALARI/ HOSPITAL - CLINIC BUILDING																								
A) LÜKS İNŞ./ Luxuary Construction	1793.19	1912.22	**1852.71**	1441.18	1542.35	**1491.77**	1188.64	1307.67	**1248.16**	899.56	1032.21	**965.89**	-	-	**-**	-	-	**-**	-	-	**-**	-	-	**-**
B) 1. SINIF İNŞ./ 1st Class Construction	1284.72	1384.20	**1334.46**	1037.28	1079.80	**1058.54**	906.37	967.58	**936.98**	669.99	710.79	**690.39**	-	-	**-**	-	-	**-**	-	-	**-**	-	-	**-**
C) 2. SINIF İNŞ./ 2nd Class Construction	866.39	927.63	**897.01**	688.70	733.77	**711.24**	561.14	636.82	**598.98**	430.20	448.94	**439.57**	-	-	**-**	-	-	**-**	-	-	**-**	-	-	**-**
D) 3. SINIF İNŞ./ 3rd Class Construction	674.25	741.42	**707.84**	482.90	546.70	**514.80**	367.32	435.32	**401.32**	303.52	326.50	**315.01**	-	-	**-**	-	-	**-**	-	-	**-**	-	-	**-**
E) BASİT/ Basic	-	-	**-**	-	-	**-**	90.12	108.86	**99.49**	56.96	68.86	**62.91**	-	-	**-**	61.18	96.94	**79.06**	52.70	61.18	**56.94**	41.69	53.59	**47.64**

BİNALAR/ BUILDINGS	ÇELİK KARKAS BİNA/ STEEL BUILDING FRAMEWORK			BETONARME KARKAS / CONCRETE FRAMEWORK			YIĞMA KAGİR BİNA /Brick Masonry Building			YIGMA YARI KAGIR BINA /HALF AND STONE MASONRY BUILDING			AHŞAP BİNALAR WOOD BUILDINGS			TAŞ DUVARLI BİNA BUILDING STONE WALL			GECEKONDU TARZI BİNA SLUM BUILDING STYLE			KERPİÇ VE DİĞ.BASİT ADOBE AND OTHER SIMPLE		
	ASG. Min	AZA. Max	ORT. Ave	ASG. Min	AZA. Max	ORT. Ave	ASG. Min	AZA. Max	ORT. Ave	ASG. Min	AZA. Max	ORT. Ave	ASG. Min	AZA. Max	ORT. Ave	ASG. Min	AZA. Max	ORT. Ave	ASG. Min	AZA. Max	ORT. Ave	ASG. Min	AZA. Max	ORT. Ave
6) BANKA - SİGORTA BİNALARI/ BANK - INSURANCE BUILDINGS																								
A) LÜKS İNŞ./ Luxuary Construction	1808.50	2072.43	1940.47	1465.93	1563.93	1514.93	1074.01	1205.43	1139.72	908.43	1046.68	977.56	-	-	-	-	-	-	-	-	-	-	-	-
B) 1. SINIF İNŞ./ 1st Class Construction	1301.88	1405.93	1353.91	953.99	1051.22	1002.61	745.11	850.69	797.90	598.52	687.41	642.97	-	-	-	-	-	-	-	-	-	-	-	-
C) 2. SINIF İNŞ./ 2nd Class Construction	876.53	941.12	908.83	645.60	702.60	674.10	450.43	548.39	499.41	382.83	450.42	416.63	-	-	-	-	-	-	-	-	-	-	-	-
D) 3. SINIF İNŞ./ 3rd Class Construction	682.84	710.18	696.51	442.08	488.38	465.23	307.61	374.44	341.03	284.04	318.25	301.15	-	-	-	-	-	-	-	-	-	-	-	-
E) BASİT/ Basic	221.80	240.78	231.29	119.25	163.32	141.29	94.16	113.19	103.68	72.16	94.16	83.16	103.30	123.81	113.56	77.48	103.30	90.39	66.08	77.48	71.78	47.08	54.64	50.86
7) İDARE BİNALARI/ ADMINISTRATION BUILDING																								
A) LÜKS İNŞ./ Luxuary Construction	1459.66	1554.65	1507.16	991.06	1090.30	1040.68	778.39	886.86	832.63	573.52	750.04	661.78	-	-	-	-	-	-	-	-	-	-	-	-
B) 1. SINIF İNŞ./ 1st Class Construction	900.32	985.39	942.86	679.16	755.69	717.43	520.35	592.64	556.50	421.79	487.74	454.77	-	-	-	-	-	-	-	-	-	-	-	-
C) 2. SINIF İNŞ./ 2nd Class Construction	574.23	611.82	593.03	448.72	468.59	458.66	349.48	374.34	361.91	231.09	291.35	261.22	-	-	-	-	-	-	-	-	-	-	-	-
D) 3. SINIF İNŞ./ 3rd Class Construction	402.63	455.82	429.23	306.25	362.97	334.61	246.70	272.24	259.47	144.61	190.72	167.67	-	-	-	-	-	-	-	-	-	-	-	-
E) BASİT/ Basic	182.20	221.90	202.05	108.49	133.28	120.89	57.43	75.15	66.29	57.43	75.15	66.29	102.09	105.63	103.86	65.21	80.81	73.01	53.87	63.07	58.47	34.75	43.93	39.34
8) BENZİN İSTASYONU, YIKAMA VE YAĞLAMA BİNALARI/ GASOLINE STATION, WASHING & OILING BUILDINGS																								
A) LÜKS İNŞ./ Luxuary Construction	1379.54	1480.69	1430.12	1063.17	1169.63	1116.40	835.01	951.40	893.21	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B) 1. SINIF İNŞ./ 1st Class Construction	927.79	1017.53	972.66	728.58	810.69	769.64	527.01	635.76	581.39	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C) 2. SINIF İNŞ./ 2nd Class Construction	569.60	640.33	604.97	450.97	502.67	476.82	318.65	383.29	350.97	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
D) 3. SINIF İNŞ./ 3rd Class Construction	390.90	431.94	411.42	271.49	327.79	299.64	155.13	208.39	181.76	111.78	136.88	124.33	155.13	212.93	184.03	121.68	149.09	135.39	78.34	121.68	100.01	59.33	78.34	68.84
E) BASİT/ Basic	144.52	185.52	165.02	103.42	142.98	123.20	80.61	97.38	89.00	61.60	80.61	71.11	86.70	94.30	90.50	54.72	86.70	70.71	44.88	54.72	49.80	32.70	44.88	38.79
9) YERALTI GARAJLARI/ Underground garages																								
A) LÜKS İNŞ./ Luxuary Construction	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B) 1. SINIF İNŞ./ 1st Class Construction	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C) 2. SINIF İNŞ./ 2nd Class Construction	639.14	735.02	687.08	464.64	571.83	518.24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
D) 3. SINIF İNŞ./ 3rd Class Construction	456.51	510.43	483.47	320.45	386.38	353.42	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
E) BASİT/ Basic	182.20	221.90	202.05	141.79	182.20	162.00	-	-	-	-	-	-	-	-	-	36.15	48.22	42.19	24.78	30.46	27.62	18.79	23.76	21.28
10) MÜSTAKİL GARAJLAR/ INDEPENDENT GARAGES																								
A) LÜKS İNŞ./ Luxuary Construction	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B) 1. SINIF İNŞ./ 1st Class Construction	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C) 2. SINIF İNŞ./ 2nd Class Construction	380.11	429.25	404.68	301.33	369.39	335.36	169.19	187.91	178.55	164.96	204.14	184.55	223.47	279.86	251.67	179.20	220.68	199.94	109.56	158.80	134.18	-	-	-
D) 3. SINIF İNŞ./ 3rd Class Construction	271.51	320.45	295.98	193.18	236.80	214.99	126.18	133.28	129.73	104.19	127.59	115.89	157.38	198.50	177.94	113.42	139.68	126.55	73.06	113.42	93.24	65.21	73.06	69.14
E) BASİT/ Basic	141.79	172.94	157.37	108.49	133.28	120.89	43.23	53.87	48.55	57.43	75.15	66.29	65.21	80.81	73.01	65.21	80.81	73.01	34.75	43.93	39.34	30.46	41.83	36.15
11) ÇOK KATLI GARAJLAR/ MULTI STOREY GARAGES																								
A) LÜKS İNŞ./ Luxuary Construction	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B) 1. SINIF İNŞ./ 1st Class Construction	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C) 2. SINIF İNŞ./ 2nd Class Construction	723.47	789.98	756.73	510.14	587.89	549.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
D) 3. SINIF İNŞ./ 3rd Class Construction	495.54	523.15	509.35	364.39	402.63	383.51	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
E) BASİT/ Basic	224.72	265.10	244.91	141.79	182.20	162.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

BİNALAR/ BUILDINGS	ÇELİK KARKAS BİNA/ STEEL BUILDING FRAMEWORK			BETONARME KARKAS / CONCRETE FRAMEWORK			YIĞMA KAGİR BİNA /Brick Masonry Building			YIGMA YARI KAGIR BINA /HALF AND STONE MASONRY BUILDING			AHŞAP BİNALAR WOOD BUILDINGS			TAŞ DUVARLI BİNA BUILDING STONE WALL			GECEKONDU TARZI BINA SLUM BUILDING STYLE			KERPİÇ VE DİĞ.BASİT ADOBE AND OTHER SIMPLE		
	ASG. Min	AZA. Max	ORT. Ave	ASG. Min	AZA. Max	ORT. Ave	ASG. Min	AZA. Max	ORT. Ave	ASG. Min	AZA. Max	ORT. Ave	ASG. Min	AZA. Max	ORT. Ave	ASG. Min	AZA. Max	ORT. Ave	ASG. Min	AZA. Max	ORT. Ave	ASG. Min	AZA. Max	ORT. Ave
12) YURT BİNALARI/ DORMITORY BUILDINGS																								
A) LÜKS İNŞ./ Luxuary Construction	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B) 1. SINIF İNŞ./ 1st Class Construction	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C) 2. SINIF İNŞ./ 2nd Class Construction	546.60	603.98	**575.29**	352.96	426.20	**389.58**	295.99	353.89	**324.94**	296.05	340.30	**318.18**	-	-	-	-	-	-	-	-	-	-	-	-
D) 3. SINIF İNŞ./ 3rd Class Construction	364.39	402.63	**383.51**	271.51	320.45	**295.98**	236.80	272.24	**254.52**	246.70	272.24	**259.47**	-	-	-	-	-	-	-	-	-	-	-	-
E) BASİT/ Basic	182.20	221.90	**202.05**	80.81	105.63	**93.22**	57.43	75.15	**66.29**	47.48	57.43	**52.46**	102.09	115.55	**108.82**	65.21	80.81	**73.01**	51.01	80.81	**65.91**	30.46	41.83	**36.15**
13) OKUL BİNALARI/ SCHOOL BUILDINGS																								
A) LÜKS İNŞ./ Luxuary Construction	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B) 1. SINIF İNŞ./ 1st Class Construction	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C) 2. SINIF İNŞ./ 2nd Class Construction	641.41	698.62	**670.02**	398.14	471.86	**435.00**	316.35	340.30	**328.33**	267.00	331.52	**299.26**	240.49	295.13	**267.81**	181.46	222.34	**201.90**	-	-	-	-	-	-
D) 3. SINIF İNŞ./ 3rd Class Construction	442.36	492.00	**467.18**	306.25	362.97	**334.61**	253.08	272.24	**262.66**	190.72	236.80	**213.76**	209.13	256.63	**232.88**	113.42	138.95	**126.19**	73.06	113.42	**93.24**	65.21	73.06	**69.14**
E) BASİT/ Basic	182.20	199.19	**190.70**	90.76	105.63	**98.20**	57.79	75.15	**66.47**	75.85	80.11	**77.98**	83.64	100.65	**92.15**	65.21	80.81	**73.01**	43.93	51.01	**47.47**	30.46	41.83	**36.15**
14) YÜZME HAVUZLARI/ SWIMMING POOLS																								
A) LÜKS İNŞ./ Luxuary Construction	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B) 1. SINIF İNŞ./ 1st Class Construction	918.61	1044.56	**981.59**	611.73	677.32	**644.53**	341.33	438.11	**389.72**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C) 2. SINIF İNŞ./ 2nd Class Construction	530.97	596.90	**563.94**	370.75	398.40	**384.58**	227.57	292.09	**259.83**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
D) 3. SINIF İNŞ./ 3rd Class Construction	385.64	442.36	**414.00**	236.80	272.24	**254.52**	111.29	144.61	**127.95**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
E) BASİT/ Basic	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15) BANYO ve HAMAMLAR/ BATH & BATHS																								
A) LÜKS İNŞ./ Luxuary Construction	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B) 1. SINIF İNŞ./ 1st Class Construction	1307.24	1416.42	**1361.83**	666.40	733.02	**699.71**	496.94	592.64	**544.79**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C) 2. SINIF İNŞ./ 2nd Class Construction	828.02	898.21	**863.12**	420.39	468.59	**444.49**	347.35	374.34	**360.85**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
D) 3. SINIF İNŞ./ 3rd Class Construction	618.18	662.83	**640.51**	253.08	305.55	**279.32**	187.14	236.80	**211.97**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
E) BASİT/ Basic	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16) PAZAR ve FUAR YERLERİNDEKİ YAPILAR/ BUILDINGS in and EXHIBITION MARKET PLACE																								
A) LÜKS İNŞ./ Luxuary Construction	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B) 1. SINIF İNŞ./ 1st Class Construction	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C) 2. SINIF İNŞ./ 2nd Class Construction	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
D) 3. SINIF İNŞ./ 3rd Class Construction	306.25	362.97	**334.61**	197.78	249.54	**223.66**	165.88	183.62	**174.75**	127.59	144.61	**136.10**	180.77	198.50	**189.64**	113.42	138.95	**126.19**	-	-	-	-	-	-
E) BASİT/ Basic	199.19	233.21	**216.20**	90.76	105.63	**98.20**	75.15	90.76	**82.96**	57.43	75.15	**66.29**	102.09	115.55	**108.82**	65.21	80.81	**73.01**	-	-	-	-	-	-
17) SOĞUK HAVA DEPOLARI/ COLD STORAGES																								
A) LÜKS İNŞ./ Luxuary Construction	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B) 1. SINIF İNŞ./ 1st Class Construction	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C) 2. SINIF İNŞ./ 2nd Class Construction	499.48	551.95	**525.72**	358.25	422.81	**390.53**	324.92	396.06	**360.49**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
D) 3. SINIF İNŞ./ 3rd Class Construction	364.39	402.63	**383.51**	271.51	320.45	**295.98**	194.26	236.80	**215.53**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
E) BASİT/ Basic	141.79	182.20	**162.00**	122.64	141.79	**132.22**	75.15	90.76	**82.96**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

BİNALAR/ BUILDINGS	ÇELİK KARKAS BİNA/ STEEL BUILDING FRAMEWORK			BETONARME KARKAS / CONCRETE FRAMEWORK			YIĞMA KAGİR BİNA /Brick Masonry Building			YIGMA YARI KAGIR BINA /HALF AND STONE MASONRY BUILDING			AHŞAP BİNALAR WOOD BUILDINGS			TAŞ DUVARLI BİNA BUILDING STONE WALL			GECEKONDU TARZI BİNA SLUM BUILDING STYLE			KERPİÇ VE DİĞ.BASİT ADOBE AND OTHER SIMPLE		
	ASG. Min	AZA. Max	ORT. Ave	ASG. Min	AZA. Max	ORT. Ave	ASG. Min	AZA. Max	ORT. Ave	ASG. Min	AZA. Max	ORT. Ave	ASG. Min	AZA. Max	ORT. Ave	ASG. Min	AZA. Max	ORT. Ave	ASG. Min	AZA. Max	ORT. Ave	ASG. Min	AZA. Max	ORT. Ave
18) KURUTMA YERLERİ/ DRY AREA																								
A) LÜKS İNŞ./ Luxuary Construction	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B) 1. SINIF İNŞ./ 1st Class Construction	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C) 2. SINIF İNŞ./ 2nd Class Construction	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
D) 3. SINIF İNŞ./ 3rd Class Construction	362.97	386.38	**374.68**	197.78	249.54	**223.66**	165.88	183.62	**174.75**	126.18	133.28	**129.73**	-	-	-	-	-	-	-	-	-	-	-	-
E) BASİT/ Basic	199.19	233.21	**216.20**	80.11	96.42	**88.27**	75.85	80.11	**77.98**	47.48	57.43	**52.46**	-	-	-	-	-	-	-	-	-	-	-	-
19) SİLOLAR/ SILO																								
A) LÜKS İNŞ./ Luxuary Construction	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B) 1. SINIF İNŞ./ 1st Class Construction	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C) 2. SINIF İNŞ./ 2nd Class Construction	828.02	898.21	**863.12**	448.72	517.49	**483.11**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
D) 3. SINIF İNŞ./ 3rd Class Construction	641.58	695.44	**668.51**	320.45	362.97	**341.71**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
E) BASİT/ Basic	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20) TRANSFORMATÖR BİNALARI/ TRANSFORMERS BUILDINGS																								
A) LÜKS İNŞ./ Luxuary Construction	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B) 1. SINIF İNŞ./ 1st Class Construction	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C) 2. SINIF İNŞ./ 2nd Class Construction	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
D) 3. SINIF İNŞ./ 3rd Class Construction	411.18	462.90	**437.04**	224.72	272.92	**248.82**	113.42	131.85	**122.64**	94.99	99.25	**97.12**	-	-	-	-	-	-	-	-	-	-	-	-
E) BASİT/ Basic	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21) DİĞER TİCARETHANE ve İŞYERLERİ/ OTHER BUSINESS FIRM and COMMERCIALS																								
A) LÜKS İNŞ./ Luxuary Construction	1808.50	1942.20	**1875.35**	1205.43	1329.22	**1267.33**	950.21	1074.01	**1012.11**	727.67	858.27	**792.97**	1313.27	1446.96	**1380.12**	-	-	-	-	-	-	-	-	-
B) 1. SINIF İNŞ./ 1st Class Construction	1236.54	1328.44	**1282.49**	850.69	922.08	**886.39**	598.52	721.56	**660.04**	368.37	470.91	**419.64**	926.63	1004.12	**965.38**	-	-	-	-	-	-	-	-	-
C) 2. SINIF İNŞ./ 2nd Class Construction	828.67	910.73	**869.70**	549.17	568.89	**559.03**	355.44	437.51	**396.48**	206.57	261.30	**233.94**	597.00	620.56	**608.78**	-	-	-	-	-	-	-	-	-
D) 3. SINIF İNŞ./ 3rd Class Construction	554.47	619.75	**587.11**	371.44	442.08	**406.76**	239.24	289.41	**264.33**	141.27	176.98	**159.13**	404.84	480.77	**442.81**	-	-	-	-	-	-	-	-	-
E) BASİT/ Basic	240.78	264.33	**252.56**	126.83	163.32	**145.08**	94.16	113.19	**103.68**	72.16	94.16	**83.16**	97.26	123.81	**110.54**	77.48	103.30	**90.39**	66.08	77.48	**71.78**	40.25	50.87	**45.56**
22) MESKEN BİNALARI/ HOUSE BUILDING																								
A) LÜKS İNŞ./ Luxuary Construction	1867.89	1991.91	**1929.90**	1107.99	1243.48	**1175.74**	908.73	937.04	**922.89**	-	-	-	1479.95	1631.38	**1555.67**	-	-	-	-	-	-	-	-	-
B) 1. SINIF İNŞ./ 1st Class Construction	1234.62	1332.04	**1283.33**	699.72	768.76	**734.24**	581.89	613.75	**597.82**	383.49	402.09	**392.79**	952.11	1069.46	**1010.79**	-	-	-	-	-	-	-	-	-
C) 2. SINIF İNŞ./ 2nd Class Construction	819.27	902.49	**860.88**	448.12	532.29	**490.21**	380.81	398.57	**389.69**	270.15	274.58	**272.37**	614.66	704.12	**659.39**	-	-	-	-	-	-	-	-	-
D) 3. SINIF İNŞ./ 3rd Class Construction	552.67	614.66	**583.67**	316.17	378.16	**347.17**	284.31	295.84	**290.08**	190.43	193.96	**192.20**	320.63	340.11	**330.37**	159.40	196.61	**178.01**	91.25	141.70	**116.48**	-	-	-
E) BASİT/ Basic	227.62	277.21	**252.42**	161.17	227.62	**194.40**	90.34	93.87	**92.11**	90.34	93.87	**92.11**	104.51	125.74	**115.13**	63.74	100.97	**82.36**	54.90	63.74	**59.32**	43.42	54.90	**49.16**

23) ÖZELLİK ARZEDEN BİNALAR/ Exceptional Features Buildings

ÖZELLİK ARZEDEN BİNALARIN VERGİ DEĞERİNİN HESABINDA, KULLANIŞ TARZINA GÖRE (OTEL, SİNEMA, TİYATRO, İŞYERİ VE MESKEN BİNASI GİBİ) VARSA BİR ÜST İNŞAAT DEĞERİNİN ORTALAMA RAKAMI ESAS ALINIR. BİR ÜST SINIFA AİT İNŞAAT DEĞERİ YOKSA TESPİT EDİLEN İNŞAAT SINIFINDAKİ ORTALAMA DEĞER % 50 ARTIRILMAK SURETİYLE DEĞERLENDİRME YAPILIR. İNŞAAT TÜRÜ İÇİN METREKARE NORMAL İNŞAAT MALİYET BEDELİ BELİRLENMEMİŞ İSE BU SINIFIN ALTINDA BELİRLEME YAPILMIŞ İLK SINIFA AİT ORTALAMA RAKAM % 50 ARTIRILARAK DİKKATE ALINIR. /
Buildind value calculation of Tax exceptional features of the Manipulative by (Hotel, Cinema, Theater, Comercial Building and Housing) Construction of a top value Versa will be based on average figures. If there is a top class value construction detected the construction grade 50% by increasing the average value assessment is made. Normal square meters for Building construction cost type, this class if under determined first class determination made to increase the avarage number 50% is taken into account.

HAFİF PREFABRİK BİNALAR, YIĞMA YARI KAGİR BİNA GRUBUNDA DEĞERLENDİRİLİR/ Prefabricated light buildings, and Stone Masonry Building group Half the evaluate

NOT: METREKARE NORMAL İNŞAAT MALİYET BEDELLERİNİN ORTALAMALARI ESAS ALINIR. METREKARE NORMAL İNŞAAT MALİYET BEDELLERİNE ASANSÖR, KALORİFER VEYA KLİMA TESİSAT BEDELLERİ DAHİL DEĞİLDİR. (BİNADA KALORİFER, KLİMA VE ASANSÖR TESİSATI VARSA BU BEDELLERE KALORİFER VEYA KLİMA İÇİN %8, ASANSÖR İÇİN %6 ORANINDA İLAVE YAPILIR.)
Note: this cost doesn't include the cost for hydronic panel heating, air conditioning and elevator facilities. Hence, 8% for the air conditioning and the heating and 6% for the elevator will be added as needed.

2) Scale of other facilities for calculate approximate cost estimate (Excl. Disaster & Emergency Management Center and Disaster Base Hospital)

Facilities	Scale	Assuming of scale
Training Center for Search & Rescue	11,700m2	Assuming a scale of AFADEM 11,700m2
Education Center for Disaster Preparedness (National level)	12,000m2	Assuming a scale of Life Safety Learning Center in Tokyo (Tachikawa Bousai-Kan) about 12,000 ㎡ Cost of building and equipment is calculated that divide proportionally of total floor area by Bursa Disaster Training Center.
Education Center for Disaster Preparedness (Regional level)	6,000m2	Assuming a scale of Bursa Disaster Training Center (6,200m2). Total Construction Cost is 14.5 million TL.
Research & Development Center:	10,000m2	Assuming about 2/3 scale of Hyogo Earthquake Engineering Research Center (16,642.90m2) in Japan
DRM related facilities (Fire Dept. /AKOM/112 etc.)	6,000m2	Assuming a scale of AFAD Disaster Management Center of Type A (6,000m2)
Park/Open Space	100,000m2	Assuming a scale of Miki Disaster Management Park (10ha)
School	3,500m2	Assuming a scale of 500 students, total floor area is 3500m2
Stockpile Storage	2,400m2	Assuming a scale of AFAD LOGISTIC CENTER (2,400m2)
Sports Center (Gymnasium, pool)	7,500m2	Assuming a scale of Yamagata city Sports Center in Japan. Total Floor area is 7,500m2 (Pool:2,044m2, Second Gymnasium:5,595m2)
Waste Incineration Plant	22,500m2	Assuming a cost scale of Proposal of the Project of Incineration plant and Disaster Management Complex related seismic base isolation. Incineration Plant and Power Generation facility (22,500m2/3,000 ton/day) 45,000 million yen
Heliport	5,000m2	Assuming a scale of Heliport next to the site of AFAD Bursa (5,000m2)
Smart Community Base Facilities	35ha	Assuming a scale of Harumi Triton Square in Japan (43.5ha, 45F+B4F)
Seismic strengthening of bridge	100 m	Assuming a distance of Highway in Bursa (100m)
Emergency Road Network	200,000m2	Assuming a distance of Mudanya - Gemlik road, 20km(L)×10m(W)=200,000m2
Seaside Disaster Management Complex: Gemlik port	10 ha	Assuming about 1/3 scale of Sakaisenboku Port second district area of Disaster prevention bases in Japan (27.9ha), 1870 million yen
Improvement of the mountainous area.		Project components are Expansion of Road:5km, Park/Open Space: 2500m2, Stockpile Storage, and Mini Monorail:250m is assuming Asuka Park in Kita-ku, Tokyo, Mini monorail Asuka pearl rail has 260 million yen per 48m.

3) List of contact of main interview on construction cost situation in Turkey

Date	Contact	Summary of Meeting
Oct. 1, 2013	PROTA engineering Head Office, Ankara Mr. Joseph Kubin(Deputy General Manager)	There is public unit cost table for public construction works in Turkey, but it is set at a cost that does not meet the market. Therefore, bidders are usually to submit your own cost.
Oct. 8, 2013	Provincial Directorate of Health Bursa Dr. Hakan Bas	Inegol Hospital (54,000m2 and 300 beds) is currently under construction, at an approximate cost estimate is about 54 million TL(about 2.7 billion yen).
Oct. 10, 2013	MOH Construction & Health Investment, Ankara, Murat BINICI (Health Investment Director)	Construction Cost per unit area for Hospital is about 900 USD/m2 to 1,000 USD/m2. In case of Erzurum Hospital, Total floor area of 1st Phase is 10,000m2 (700beds), 2nd Phase is 220,000m2, total cost is 320 million USD (Approx. 33,400 million yen). (Approx. 145,000yen/m2)
Nov 25, 2013	AFAD Bursa Mr. Ibrahim Tari (Director)	Total construction cost of Bursa Disaster Learning Center is 14,500,000TL (Approx. 700 million yen) including equipment. GLIVENCEM Turkish firm procured earthquake simulator. (Site: Bursa, Total floor area:6,200m2)
Feb. 13, 2014	YD Arch. (Local Architecture firm), Istanbul Baris Dogan (Architect/ Director)	Public unit cost table for public construction works in Turkey made by MOEU. This unit cost is used in the bid evaluation of the governmental construction project for comparing with the bidding cost. This unit cost is including architectural work, electrical and mechanical works cost but not including medical equipment cost.
Feb. 13, 2014	Taisei Corporation Marmaray Project office Mr. HatanoYoshihisa (Project Manager)	Escalation of construction materials cost is 8% to 12 % from 2010 to 2013. Re-bar and electric wire is made by Turkey, and most construction materials can be procured in Turkey. It is very difficult that compete in the bid amount cost in comparison to Turkish contractor and Japanese one with respect to construction cost.
Feb. 14, 2014	Hazama Ando Corporation Istanbul office Mr. Yoshinori Moriwaki (General Manager)	Normal worker's labor cost in turkey is about 500 USD/ month in construction works. Tax of 18 % is applied to the building construction cost. In addition, tax of 5.5% is applied that system of with Holding Tax that the construction period crosses fiscal year (Dec.-Jan.) is applicable. Construction materials cost of Bursa and Istanbul is about the same. Japanese contractor will be able to compete with Turkish contractor in the bid, if it has extra charge about 20% to 30% of the total construction cost.
Feb. 14, 2014	Seyas (Local Architecture firm), Istanbul a alaz albay (CEO)	We cannot make a comment about the Hospital project cost which is implemented by our firm. Because we have duty of confidentiality with the client. But we can say from previous experience, it is calculated that about 1,500 USD/m2 is for construction cost per unit area of Hospital and also 1,500 USD/m2 is for medical equipment. However, this cost is not including design fee (about 4% to 8% of total construction cost) and seismic isolation device fee.
Feb. 17, 2014	Yuksek Proje (Local Architecture firm) , Ankara Ibrahim Ozturk (Civil Engineer President)	Price of steel has been rising recently, we have adopted RC structures (95%) than the steel frame. Calculates a cost estimate of the facilities of public works in the unit price by MOEU is published, it is used when evaluate the tender price. Standard patient room is designed about 5.56m×4.10m of one room with two beds, and operation room is designed 8m×8m. I can say that this is the standard design of public hospital. With regard to hospital project cost, there is no made public announce in the bidding, but I think that it might be about to become 900 TL/ m2 approximately.
Feb. 18,	Su Yapi (local Engineering &	We are using the building unit cost by MOEU to make a roughly

2014	Consulting Inc.) Ankara Ali Canoglu (General Manager)	estimate cost of construction. This unit cost is not including 18% of TAX. It is used that detail construction materials cost by MOEU when we are estimating cost in the basic design phase with quantity of each works on detailed construction works. In the bidding stage, this cost will be discounted about 20% to 30% of the public unit cost. If you need to calculate Hospital building cost, you can use this public unit cost by MOEU. In case of Suyapi project, we can say about 1,500TL/m2 is the minimum cost of public hospital. In case of private sector hospital about 2,000TL/m2 or 2,500TL/m2 exist.
Feb. 19, 2014	AFAD Ankara Ms. Belgin (Planning & Mitigation)	There is two type of Logistic Storage scale, one of the 1,200m2(48 containers) and another one of 2,400m2 (96 containers). Total construction cost is 240 million TL (not incl. TAX) in the 81 provinces. (150 million yen per province)
Feb. 20, 2014	ANEL (M&E Local Architecture firm), at Istanbul Icra Kurulu Uyesi (Executive Board Member)	Roughly, it is estimated at 300 USD/m2 for building cost in the part of electrical and mechanical work cost in Turkey. in case of Kocaeli University Hospital, it has 700 beds and 70,000m2 of total floor area (100m2/bed), including seismic isolation structure, total cost of electrical and mechanical work is 32 million USD (not include medical equipment) (475USD/m2). In case of private hospital in Antalya (56beds) with Operation Room (3), Outpatient consultation room (18), Intensive care room(1), Dining room (1), ICU (3), total floor area is 11,000m2, total cost of electrical and mechanical work is 4.0 million USD (not include medical equipment) (363 USD/m2)
Feb. 20, 2014	YD Architects (Local Architecture firm), at Istanbul Mr. Baris Dogan (Architect Director)	From the last few years, Turkey is construction rush to build the building in the whole country. However, there are cases that new construction firm was created by people who do not know well hospital architecture design, and they succeeded bit. Regarding with design fee, there is calculation guideline by Turkish architectural Association.

4) Breakdown cost of Hospital construction projects in Turkey (source by local architecture firm)

A) Sakarya 400 Bed hospital (at Sakarya province)

Sakarya 400 Bed hospital — 67,693 m2 Total floor area — 1TL= 46.85 yen

	Work		Interim Payment	Final Payment	Cost According to % (TL)	TL	1000 JPY	ratio
1	Foundation			4.00%	3,701,080.00	47,651,405.00	2,232,468	51.50%
2	Basement + ground floor + other floors formwork, reinforcement, concrete			15.00%	13,879,050.00			
3	Wall, sill and parapet works			2.50%	2,313,175.00			
4	Roof works			3.00%	2,775,810.00			
5	Installing doors, windows, counters, benches and cabinets			6.00%	5,551,620.00			
6	Facade			4.00%	3,701,080.00			
7	Floor covering			5.00%	4,626,350.00			
8	Ceiling			5.00%	4,626,350.00			
9	Stairs (inc, emergency stairs)			1.00%	925,270.00			
10	Wall covering			5.00%	4,626,350.00			
11	Paint works			1.00%	925,270.00			
12	Mechanical installation works			22.95%	21,234,946.50	21,234,946.50	994,857	22.95%
	A)	Sanitary installations	1.25%					
	B)	Heating system installations	1.20%					
	C)	Mutual installations	3.00%					
	D)	Ventilation and air-conditioning installations	6.50%					
	E)	Automation system installations	1.20%					
	F)	Burner installations	0.10%					
	G)	Kitchen installations	1.00%					
	H)	Laundry installations	0.45%					
	I)	Hospital equipment installations	5.00%					
	J)	Cooling equipment installations	3.25%					
13	Environmental lighting system			0.05%	46,263.50	12,074,773.50	565,703	13.05%
14	Transformer shift			3.00%	2,775,810.00			
15	Automatic door			0.50%	462,635.00			
16	Hermetic sliding door							
17	Low-pressure voltage sliding door							
18	Electrical installations			9.50%	8,790,065.00			
19	Elevator			4.00%	3,701,080.00	4,163,715.00	195,070	4.50%
20	Automation			0.50%	462,635.00			
21	Infrastructure and landscape			3.00%	2,775,810.00	7,402,160.00	346,791	8.00%
22	Miscellaneous works			5.00%	4,626,350.00			
	Total			100.00%	92,527,000.00		4,334,890	100%

64,037 yen/m2

B) Seyrantepe Hospital (at Istanbul province)

Seyrantepe Hospital 169,760 m2 Total floor area 1TL= 46.85yen

		Work	Interim Payment	Final Payment	Cost According to % (TL)	TL	1000 JPY	ratio
1	A)	Soil improvement methods		4.00%	7,247,000.00	96,566,275.00	4,524,130	53.3%
	B)	Foundation		4.50%	8,152,875.00			
2	Basement + ground floor + other floors formwork, reinforcement, concrete			17.30%	31,343,275.00			
3	Wall, sill and parapet works			2.00%	3,623,500.00			
4	Roof works			1.50%	2,717,625.00			
5	Installing doors, windows, counters, benches and cabinets			4.00%	7,247,000.00			
6	Facade			5.00%	9,058,750.00			
7	Floor covering			4.20%	7,609,350.00			
8	Ceiling			3.80%	6,884,650.00			
9	Stairs (inc, emergency stairs)			0.50%	905,875.00			
10	Wall covering			6.00%	10,870,500.00			
11	Paint works			0.50%	905,875.00			
12	Mechanical installation works			25.15%	45,565,512.50	45,565,512.50	2,134,744	25.2%
	A)	Sanitary installations	2.50%					
	B)	Heating system installations	3.00%					
	C)	Mutual installations	3.40%					
	D)	Ventilation and air-conditioning installations	5.80%					
	E)	Automation system installations	2.40%					
	F)	Burner installations	0.10%					
	G)	Kitchen installations	1.50%					
	H)	Laundry installations	0.45%					
	I)	Hospital equipment installations	2.50%					
	J)	Pneumatic Installations	1.50%					
	K)	Cooling equipment installations	2.00%					
13	Electrical Works			14.65%	26,542,137.50	26,542,137.50	1,243,499	14.7%
		Cable	2.50%					
		Lighting Automation	0.50%					
		Armatures	0.50%					
		Charged Armatures	0.05%					
		Operating room system	1.00%					
		Negatoscope	0.10%					
		Exit guidance armatures	0.20%					
		Bedhead units	1.00%					
		Switch	0.50%					
		Soket	0.30%					
		Sliding door hermetic and automatic doors	0.70%					
		Phone box and distribution boards	0.20%					
		Fire detection and notification central	0.20%					
		TV system	0.10%					
		Data system	0.30%					
		X-ray device, door detector, card-pass system	0.10%					
		Vocalisation - music broadcast system	0.40%					
		CCTV system	0.10%					
		Central timer system	0.10%					
		Parking access control system	0.15%					
		LCD patient get in line system	0.10%					
		Nurse call-up system	0.15%					
		Generator and Generator-system	1.00%					
		UPS system	0.40%					
		Cable tray system	0.30%					
		Environmental lighting system	0.15%					
		Lighting conductor-basic earting system	0.15%					
		Main Panels	0.75%					
		Secondary distribution panels	0.40%					
		Compensation panels	0.25%					
		Transformaer and OG installations	1.25%					
		Automation	0.75%					
14	Elevator			1.40%	2,536,450.00	2,536,450.00	118,833	1.4%
15	Infrastructure and landscape			1.50%	2,717,625.00	9,964,625.00	466,843	5.5%
16	Miscellaneous works			4.00%	7,247,000.00			
	Total			100.00%	181,175,000.00		8,488,049	100%

50,000 yen/m2

C) Inegol Hospital (at Bursa province)

Inegol Hospital 51,000 m2 Total floor area 1TL= 46.85yen

		Work	Interim Payment	Final Payment	Cost According to % (TL)	TL	1000 JPY	ratio
1	A)	Soil improvement methods		4.50%	2,527,380.00	30,047,740.00	1,407,737	53.5%
	B)	Foundation		4.50%	2,527,380.00			
2		Basement + ground floor + other floors formwork, reinforcement, concrete		16.00%	8,986,240.00			
3		Wall, sill and parapet works		2.50%	1,404,100.00			
4		Roof works		2.00%	1,123,280.00			
5		Installing doors, windows, counters, benches and cabinets		5.00%	2,808,200.00			
6		Facade		4.00%	2,246,560.00			
7		Floor covering		4.50%	2,527,380.00			
8		Ceiling		4.00%	2,246,560.00			
9		Stairs (inc, emergency stairs)		1.00%	561,640.00			
10		Wall covering		5.00%	2,808,200.00			
11		Paint works		0.50%	280,820.00			
12		Mechanical installation works		26.75%	15,023,870.00	15,023,870.00	703,868	26.8%
	A)	Sanitary installations	3.25%					
	B)	Heating system installations	3.10%					
	C)	Mutual installations	5.00%					
	D)	Ventilation and air-conditioning installations	5.00%					
	E)	Automation system installations	1.20%					
	F)	Burner installations	0.10%					
	G)	Kitchen installations	1.00%					
	H)	Laundry installations	0.45%					
	I)	Hospital equipment installations	5.20%					
	J)	Cooling equipment installations	2.45%					
13		Electrical Works		12.75%	7,160,910.00	7,160,910.00	335,489	12.8%
		Cable	2.00%					
		Armatures	0.50%					
		Lighting Automation	0.50%					
		Charged Armatures	0.05%					
		Operating room system	0.50%					
		Negatoscope	0.10%					
		Exit guidance armatures	0.20%					
		Bedhead units	1.00%					
		Switch	0.50%					
		Soket	0.30%					
		Sliding door hermetic and automatic doors	0.60%					
		Phone box and distribution boards	0.20%					
		Fire detection and notification central	0.20%					
		TV system	0.10%					
		Data system	0.30%					
		X-ray device, door detector, card-pass system	0.10%					
		Music-anouncement-conference system technical specification	0.40%					
		CCTV system	0.10%					
		Central timer system	0.10%					
		Parking access control system	0.15%					
		LCD patient get in line system	0.10%					
		Nurse call-up system	0.15%					
		UPS system	0.40%					
		Cable tray system	0.25%					
		Environmental lighting system	0.15%					
		Lighting conductor	0.15%					
		Main Panels	0.60%					
		Secondary distribution panels	0.30%					
		Compensation panels	0.25%					
		Transformaer building installations	1.50%					
		Energy automation	1.00%					
14		Elevator		1.00%	561,640.00	561,640.00	26,313	1.0%
15		Infrastructure and landscape		2.00%	1,123,280.00	3,369,840.00	157,877	6.0%
16		Miscellaneous works		4.00%	2,246,560.00			
		Total		100.00%	56,164,000.00		2,631,283	100%

51,594 yen/m2

D) Sancaktepe Hospital (at Istanbul province)

Sancaktepe Hospital 53,335 m2 Total floor area 1TL= 46.85yen

	Work	General Percentag	Cost According to % (TL)	TL	1000 JPY	ratio
1	Construction Installations	53.15%	35,318,175.00	35,318,175.00	1,654,656	53.2%
2	Landscape Insallations	6.19%	4,113,255.00	4,113,255.00	192,706	6.2%
3	Sanitary Installatons	2.02%	1,342,290.00	16,366,635.00	766,777	24.6%
4	Heating-Cooling Installations	6.15%	4,086,675.00			
5	Air-Conditioning Installations	9.16%	6,086,820.00			
6	Medical Gas Installations	2.31%	1,534,995.00			
7	Fire safety equipment installations	1.04%	691,080.00			
8	Natural gas installations	0.38%	252,510.00			
9	Kitchen and laundry installations	1.60%	1,063,200.00			
10	Pneumatic tube conveying system	0.56%	372,120.00			
11	Automation system	1.26%	837,270.00			
12	Garden irrigation system and decorative pool installation	0.15%	99,675.00			
13	heavy current installation	5.90%	3,920,550.00	10,651,935.00	499,043	16.0%
14	low current domestic installations	3.15%	2,093,175.00			
15	substation, distribution denter, UPS VE generator installations	4.85%	3,222,825.00			
16	elevator, lightning protection and basic earthing installations	2.13%	1,415,385.00			
	Total	100.00%	66,450,000.00		3,113,183	100%

58,370 yen/m2

E) Detail of M&E cost of ADANA Health Complex (at Adana province)

Adana Health Complex/Turkey

437,000 m2 Hospital Building
140,000 m2 Carpark
1,550 bed Capacity

		USD	
Electrical Works		**124.69**	**/m2**
HV Systems		**5.4**	**/m2**
	supply of main energy cables	excluded	
	HV Switchgear	1.92	/m2
	Transformers	2.76	/m2
	HV Cables	0.72	/m2
LV System		**84.99**	**/m2**
	LV Switsgears	10.71	/m2
	UPS Units	1.81	/m2
	Generators	16.84	/m2
	Lighting Automation System	1.72	/m2
	Bus Ducts	1.65	/m2
	Low VoltageCables	16.24	/m2
	Cable trays	10.73	/m2
	Lighting Fixtures	11.94	/m2
	Façade Lighting	excluded	
	Landscape Lighting	excluded	
	Lighting & Sockets, including all piping and cabling	11.54	/m2
	Heat Tracing	excluded	
	Snow Melting System	excluded	
	Earthing & Lightning Protection System	1.81	/m2
	Elevator & Escalators	excluded	
Weak current Systems		**34.3**	**/m2**
	IP CCTV Systems	2.41	/m2
	Clock Systems	1.51	/m2
	Capark Systems	excluded	
	Nurse Call Systems	3.68	/m2
	Fire Alarm Systems	5.13	/m2
	Others	21.57	/m2

Mechanical Works	**186.69**	**/m2**
Plumbing & Sanitary	30.90	/m2
ACMV (Air Conditional Mechanical Ventilation)	89.85	/m2
Fire protection	24.94	/m2
BMS (Business Management System)	8.00	/m2
Others (Medical Gas & Vaccum)	13.00	/m2
Cogeneration - Trigeneration System	14.07	/m2
Solar Panels (for hot water production)	2.04	/m2
Grounding Heat Pump	3.89	/m2

5) Calculation of design fee by local architecture firm

MINIMUM COST ACCOUNTING / NEW ARCHITECTURAL PROJECT COST

PROJECT INFORMATION

Project City/District/Municipality: İstanbul/İstanbul/Metropolitan Municipality I-II-III Group

Area coefficient: 1

Project area: 100000 m²

The number of duplicate blocks: 1

The Project kind: New architectural Project

The building unit cost group: 5B

Architectural class of service: Class 5

Unit cost: 1.270,00 TL

Modification rate: 1

PROJECT SERVICE and PROFESSINONAL PRACTICE	RATE	SERVICE FEE
Preparation and Survey work	5 %	106.680 TL
Preliminary Project work	15 %	320.040 TL
Final Project work	20 %	426.720 TL
Construction Project work	30 %	640.080 TL
System and Installation details	10 %	213.360 TL
Shop drawing	10 %	213.360 TL
Technical Specifications	5 %	106.680 TL
Quantity Survey	3 %	64.008 TL
Cost Estimate and cCost Analysis	2 %	42.672 TL
TOTAL	100 %	2.133.600 TL

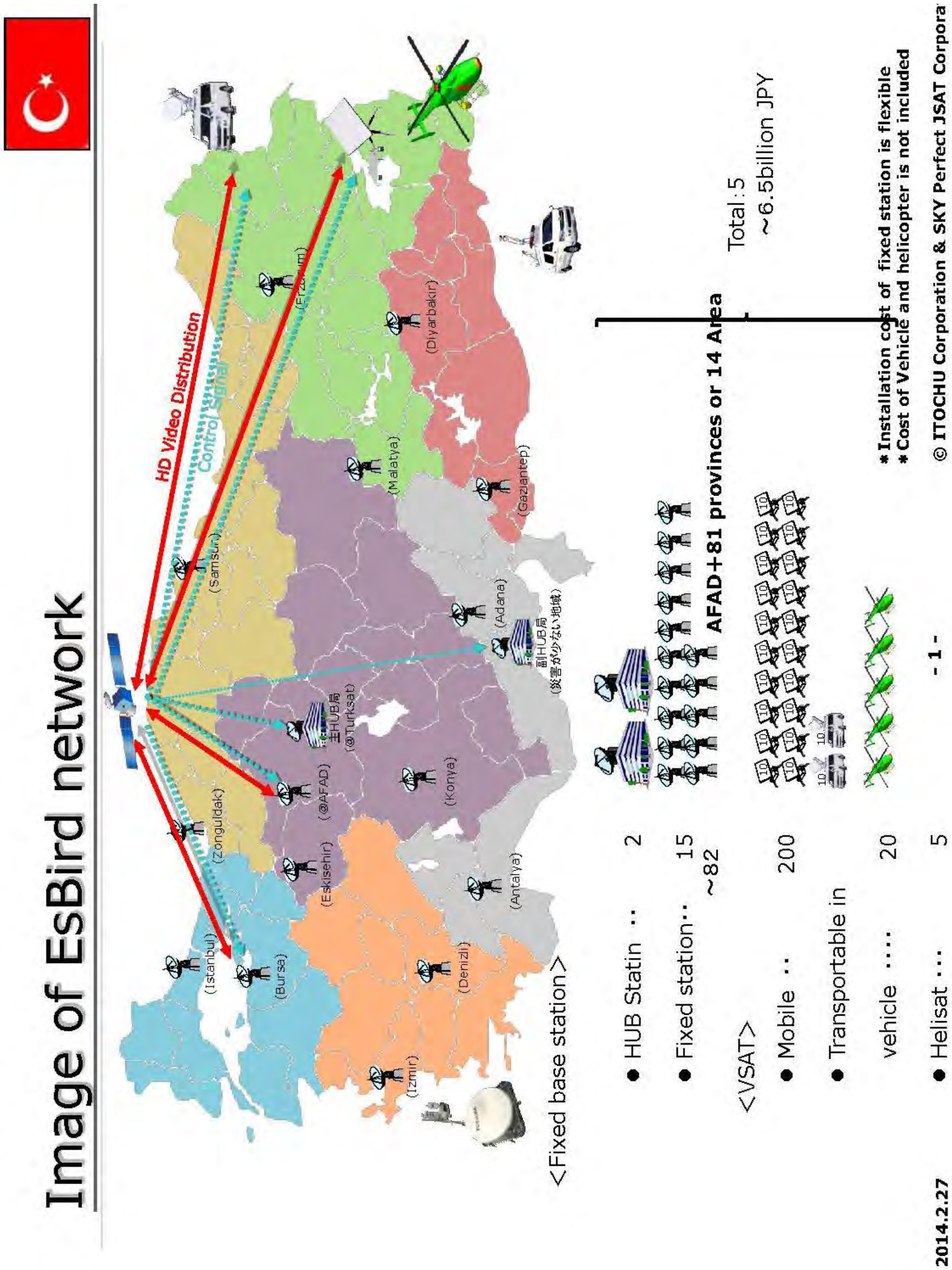
PROFESSINONAL INSPECTION SERVICES	RATE	SERVICE FEE
Inspection and As-build Project	50 %	1.066.800 TL
Final account	7 %	149.352 TL
Acceptance of delivery	3 %	64.008 TL
TOTAL	60 %	1.280.160 TL

SCIENTIFIC RESPONSIBILITY SERVICES	RATE	SERVICE FEE
Scientific responsibity services	27 %	576.072 TL
Acceptance of delivery	3 %	64.008 TL
TOTAL	30 %	640.080 TL

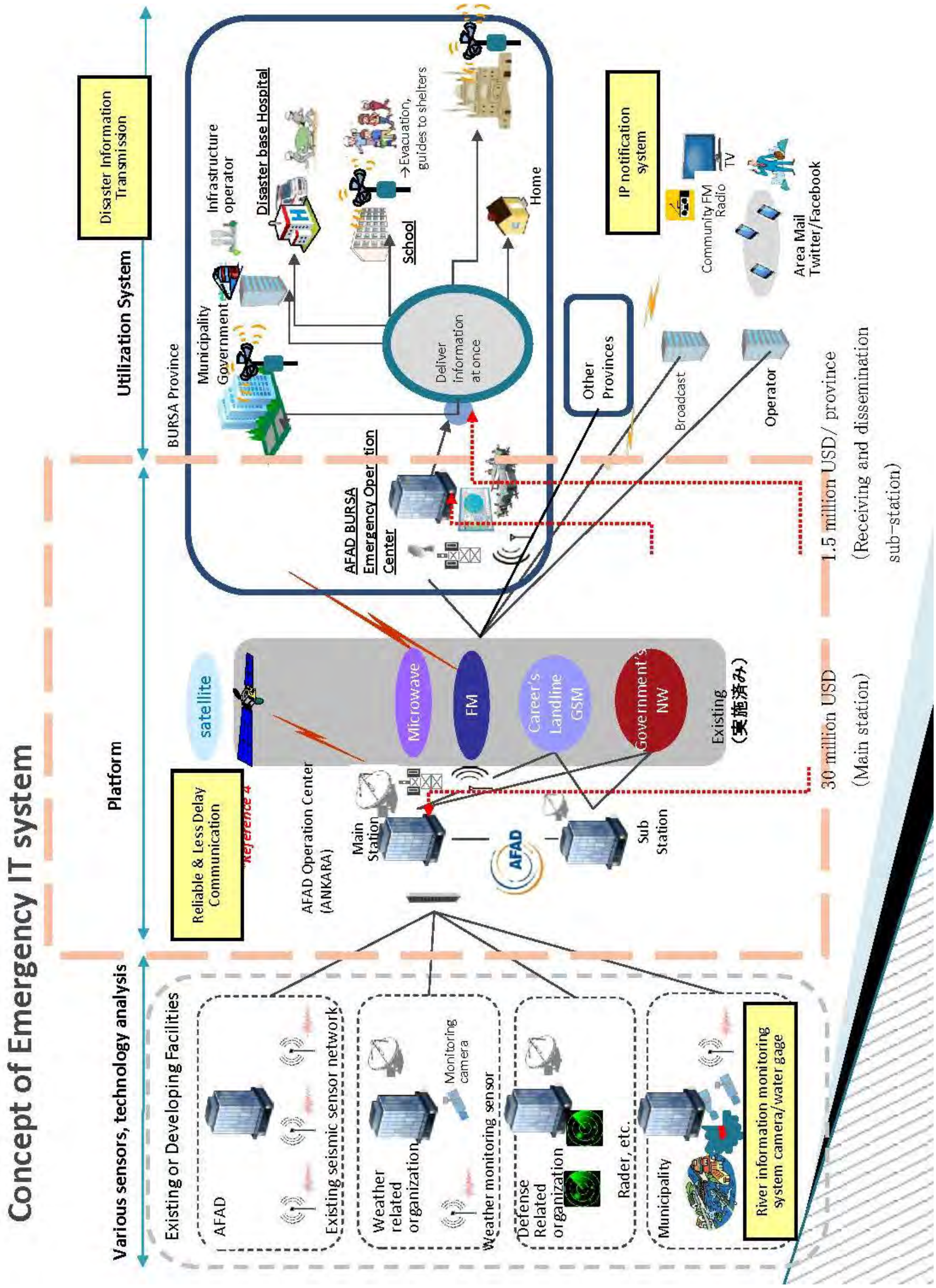
PROFESSIONAL INSPECTION FEE: 300 TL

Total Construction Cost：100,000m2×1,270TL/m2＝127,000,000TL
Design Fee：2,133,600TL+1,280,160TL+640,080TL+300TL=4,054,140 TL
Design Fee／total construction cost＝3.2%

6). Image and Approximate cost estimate of Satellite Communication System (EsBird system) （VSAT network）



7). Image and Approximate cost estimate of Information Gathering & Dissemination System



A-6. Disaster Medical Plan by the Turkish Red Crescent

The Turkish Red Crescent has blood centers and disaster management centers in more than 700 branches in 81 provinces across the country.

1) Disaster management

The Turkish Red Crescent has established a disaster logistics system with regional disaster management logistics centers across the country in preparation for and response to disasters. Its disaster response system is well organized with the nationwide networks. Its telecommunication vehicles are equipped with a mobile Turksat satellite communication system. The regional disaster management center owns a stationary satellite communication center and thus is able to respond to disasters in Turkey and the neighbouring countries.

The Turkish Red Crescent engages in humanitarian support activities at the time of disasters by utilizing its Disaster Management Directorate, nine regional disaster management bureaus (BAYM), 23 rural disaster management divisions (YAYS), and AFOM.

The Disaster Management Directorate uses 23 communication vehicles, 10 Turksat satellite communication systems, four Inmarsat satellite communication systems, 11 VHF systems, 20 HF SSB long-wave radio systems, 158 VHF hand radios, 24 VHF fixed radios, and 33 VHF vehicle-mounted radio systems.

The Disaster Coordination Center (AFOM) engages in disaster response activities in Turkey and global disaster management activities. It also engages in disaster response activities with its nationwide 33 disaster response logistics centers, eight centers of which also serve as rural centers and the remaining 25 centers serve as regional disaster management logistics centers.

At the time of the Great East Japan earthquake in 2011, the Red Crescent dispatched an emergency support team of 30 staff members to Iwate prefecture in Japan. Based on lessons learned from the 2011 Van earthquake, the Red Crescent focuses on providing many tents promptly rather than building temporary residences, and for this reason it has developed and manufactures winter and all-weather tents. Its tent manufacturing factory, food storage facilities, and other facilities are built on the premises of the disaster management centers.

2) AFOM

AFOM was founded in 2001 for the purpose of working together with all the divisions of the Red Crescent for faster and effective response to disasters. Currently, it has approximately 500 staff members. The Disaster Management Directorate is responsible for the administration of AFOM, responding to disasters and crises in collaboration with relevant organizations.

3) UNITS

a. Disaster Preparation Unit

- Formulation of humanitarian support programs in and outside the country, and realization of the programs with governmental funds
- Formulation and implementation of humanitarian support programs on behalf of the government and in cooperation with the national government's disaster management organizations if it engages in disaster management in and outside the country with governmental funds
- Preparation for prompt and effective humanitarian support at the time of disasters, and formulation and implementation of regional and local action plans necessary for the support
- Implementation of global disaster prevention and disaster response training for members of the Turkish Red Crescent actually engaging in disaster management, as well as disaster management volunteers (meetings, symposiums and other opportunities to raise awareness

of disaster prevention)

- Import of aid supplies, transport equipment and transportation vehicles necessary at the time of disasters
- Securing the public land to deal with disasters and build logistics centers
- Contribution to raising public awareness in terms of disaster prevention

b. Disaster Response Unit

- Assistance to organizations of other countries on implementing projects in line with the principles of the Red Crescent, dispatching staff members to disaster-afflicted areas in and outside the country, and supplying necessary facilities and materials
- Provision of necessary psychological care at public facilities
- Food assistance to disabled individuals and people in poverty; food assistance and care to patients, elderly individuals, and childrenResponse to disasters in Turkey: to provide temporary shelters, food, and healthcare services, the disaster response unit may request for assistance, if necessary, from Red Cross and Red Crescent Societies in other countries, accept financial support from these societies, and provide support to regions in need
- Implementation of international humanitarian and financial support upon the approval of the Council of Ministers if such request is announced by Red Cross, Red Crescent Societies, or other international organizations (Dispatch of UMKE volunteers and response jointly with disaster management organizations in Turkey)
- Coordination and support to international humanitarian support organizations which come to Turkey to offer disaster management support. Acceptance, record, storage and distribution of support materials arriving in Turkey from abroad

Source: http://afetyonetimi.kizilay.org.tr/Default.aspx

Figure A.6.1 Locations of the Turkish Red Crescent Disaster Management Directorate and Chieftaincies

A-7. Training Curriculum for UMKE Members

(1) Basic Training

Table A.7.1 Basic training curriculum at UMKE

A	**GENERAL DISASTER INFORMATION MODULE**
1.	Training for developing a general approach on disaster and extraordinary situations.
2.	Turkish disaster and crysis management system.
3.	The health risk management in disaster and extraordinary situations.
4.	Introduction training on disaster epidemiology
5.	NMRT mission definitions
6.	Disaster logistics training
7.	National and international constitutions related to disasters
B	**PSYCHO-SOCIAL SITUATIONS TRAINING MODULE**
8.	Ethical behaviour in the field and cultural issues training
9.	Team work and management in case of disaster
10.	Stress and chaos management
11.	Leadership and motivational training
12.	Disaster psychology training
C	**DISASTER AND EXTRAORDINARY SITUATION INTERVENTION MODULE**
13.	Security training in the disaster or extraordinary situation scene.
14.	Medical rescue training
15.	Basic CBRN introduction training
16.	Health management in disasters
17.	Enviromental health services in disasters
18.	Sheltering, nutrition, hygen and psycho-social services in disasters
D	**MEDICAL ATTENTION INFORMATION MODULE**
19.	Medical pack training
20.	Basic and advanced life support training (theorical)
21.	Basic and advanced life support training (practice)
22.	The fixture of patient or injured person with alternative splints, stretchering and transportation training
23.	Intervention training in accidents with multiple injury cases
24.	Triage training
25.	Crush syndrome training
E	**FIELD EXERCISE TRAINING MODULE**
26.	Basic camper, continuing life under disaster and extraordinary conditions and physical conditions training.
27.	Field exercise training under disaster or extraordinary conditions
28.	Communication skills

Source：Press release by MOH UMKE http://www.acilafet.gov.tr/UMKE/

(2) Additional training

Extended training is conducted for UMKE members who has completed the basic training. Trainees learn disaster epidemiology, disaster psychology, medical approach to terrorist attacks, medical approach to fires, situation management, triage training and moulage (with plaster, etc.).

Table A.7.2 Advanced training courses for UMKE regional members
(for members engaging in mountain rescue, underwater rescue, CBRN, and air transportation)

F	IMPROVEMENT TRAINING MODULES
1.	Mountain rescue training
2.	Underwater rescue training
3.	Air intervention and transportation training
4.	CBRN attacks and industrial accidents training

Source：Directive for UMKE issued by General Directorate of Emergency Health Service,

A-8. List of Hospital PPP Projects

Table A.8.1 PPP projects at the bidding stage [Projects which tender has been announced]

1. Projects in the tender process

No.	Name of Projects	Beds No.
1	Kayseri Integrated Health Campus	1,583
2	Ankara Etlik Integrated Health Campus	3,566
3	Ankara Bilkent Integrated Health Campus	4,376
4	Elazig Integrated Health Campus	1,038
5	Konya Karatay Integrated Health Campus	838
6	Manisa Education and Research Hospital	558
7	Yozgat Education and Research Hospital	475
8	Bursa Integrated Health Campus	1,355
9	Istanbul Ikitelli Integrated Health Campus	2,682
10	Mersin Health Campus	1,253
11	Adana Health Campus	1,539
12	Gaziantep Health Campus	1,867
13	Physical Therapy and Rehabilitation (PTR), Psychiatry (P) and High Security Forensic Psychiatry (HSFP) Hospitals	2,400
14	Kocaeli Health Campus	1,180
15	İzmir Bayraklı Integrated Health Campus	2,000
16	Turkish Public Health Agency & Turkish Pharmaceuticals and Medical Devices Agency	-
17	Eskisehir Health Campus	1,060
18	Isparta City Hospital	755
19	Istanbul Uskudar State Hospital	425
20	Istanbul Bakirkoy Health Campus	1,043
	小計 Sub-total	29,993

: Tender has been awarded

Table A.8.2 Hospital PPP projects before the bidding stage [Projects which Tender has not been announced yet]

2. Projects approved by the Higher Planning Council

No.	案件名	病床数（予定）
1	Samsun Health Campus	900
2	Denizli City Hospital	1,000
3	Sanliurfa Health Campus	1,700
4	Izmir Yenisehir Hospital	1,200
5	Tekirdag State Hospital	479
	小計	5,279

3. Projects which proposals were submitted to the Higher Planning Council

No.	案件名	病床数（予定）
6	Trabzon Fatih City Hospital	600
7	Izmir Southern City Hospital	1,200
	小計	1,800

4. Projects which proposals are going to be submitted to the Higher Planning Council

No.	案件名	病床数（予定）
8	Ordu City Hospital	600
9	Aydin City Hospital	600
10	Istanbul Fatih Sultan Mehmet Hospital	400
11	Manisa YGAP Hospital	100
12	Istanbul Sancaktepe City Hospital	3,700
13	Bolu City Hospital	400
14	Diyarbakir Yenisehir Health Campus	600
15	Diyarbakir Kayapinar City Hospital	750
16	Antalya City Hospital	1,000
17	Izmir Guney Health Campus	1,400
18	K. Maras Elbistan City Hospital	300
19	K. Maras Maternity and Children's Hospital	300
20	Khramanmaras Hospital	500
21	Istanbul Erenkoy State Hospital	300
22	Bursa Osmangazi State Hospital	400
23	Mersin-Akdeniz State Hospital	400
24	Bartın State Hospital	400
25	Izmir-Buca State Hospital	400
26	Kastamonu State Hospital	400
27	Ankara-Gölbaşı State Hospital	200
28	Antalya-Kepez State Hospital	300
29	Balıkesir-Edremit State Hospital	200
30	Bilecik State Hospital	200
31	Bursa-Nilüfer State Hospital	250
32	Hatay Dörtyol State Hospital	150
33	Bursa-Yenişehir State Hospital	75
	小計	14,325
総計		51,397

A-9. Healthcare Insurance System in Turkey (about SGK)

1) Social security system in Turkey

The social security system in Turkey was substantially revised in 2007-2008, and three insurance funds – the general social insurance union (SSK), pension fund (Emekli Sandigi) and insurance union for self-employed workers (Bag-Kur) – were integrated into a single organization called the social insurance organization (SGK).

Persons under the social insurance system (employees, self-employed and civil servants) are subject to the insurance set forth in the Social Insurance and Universal Health Insurance Law and eligible for medical benefits and cash benefits. Insurance premiums are about 3-4% of the monthly income of an ordinary employed worker. As for medical benefits, insurance holders have access to medical services provided by hospitals and other medical institutions with which the insured persons have agreements. Cash benefits are classified into short-term benefits and long-term benefits (pensions) as outlined in the following table.

2) Summary of the social security system

The status, types and rights of insured persons under the Social Insurance and Universal Health Insurance Law (Law No.5510, effective on January 1, 2008) are summarized as follows:

a. Medical benefits

General Healthcare Insurance (GHI):

The GHI is definable as insurance aiming to protect the people’s health and cover medical costs incurred by health-related risks. It also covers elderly pensioners. Citizens who are neither insured nor deemed to be recipient of insurance benefits of GHI holders need to pay GHI premiums. Persons in a household with an income level which is one third of the minimum wage, beneficiaries of child welfare, rehabilitants, migrants, etc. are deemed to be GHI holders. The premium is set at 12.50%, of which insured persons bear 5% and their employers bear 7.50%. The self-employed need to bear all the 12.50%.

b. Cash benefits

Short Term Benefits:

Short term benefits are paid for temporary disability. Upon the condition that the relevant doctor or the medical commission of an authorized organization submits a “disability report”, the insured person concerned is paid in cash 50% of the daily income for hospital treatment, or 66% of the daily income for outpatient care.

Long Term Benefits:

Long term benefits are paid for disability, elderly persons and death. The payment term starts when the insured person concerned reaches 18 years of age, but the premiums paid until age 18 are integrated in the premium payment term. The long term benefits include the following pensions.

* Disability pension (Monthly pension benefits for insured persons who have become disabled. Persons insured for at least 10 years are eligible for the disability pension.)
* Elderly pension (Monthly pension benefits for females aged 58 and older and males aged 60 and older. Persons having paid premiums for at least 9,000 days are eligible for the elderly pension.)

According to the SGK, the social insurance system covered approximately 83% of all the population in 2010, and the medical insurance system has covered all the population since 2012.

・ Medical costs are basically paid by insurance, so patients (insured persons) basically bear no medical costs. However, patients must pay the costs of medical services at private hospitals (private practice) which are outside the coverage of the medical insurance system. (National hospitals are not allowed to collect treatment fees from patients (mixed billing).

・ Patients are required to pay 10-20% of the costs of medicines and medical supplies provided as a part of medical services. Unlike Japan, some eye glasses prescribed by doctors are covered by the medical insurance system.

・ A comprehensive Diagnosis Related Group (DRG) payment system is adopted as a payment system for medical services. Its pilot system was first introduced to national hospitals in 2010, and the full-scale DRG payment system is being introduced to all the hospitals including university and private hospitals.

3) Billing by hospitals, etc. to insurance holders, and payment by insurance holders

・ Within the scope of the medical insurance system administered by the SGK, hospitals and other healthcare providers first send the invoice of medical services, medicines, medical supplies, eye glasses, etc. to the SGK, the insurer, which pays the cost to the hospitals and other healthcare providers. It is becoming common for hospitals, etc. to send the invoice online.

・ The payment by the SGK for medical services at national hospitals is made to the MOH, rather than individual hospitals. The SGM calculates the payment amount according to the economic trend, budgets and other factors and pays a fixed amount on a monthly basis.

・ Some medical supplies including prostheses necessary for hospital treatment are requested by patients directly from the SGK.

4) Details of medical supplies

Law No. 5510 and Article 7 of the related Healthcare Practice Directives set forth the details of medical supplies to be supplied to patients. These laws and regulations stipulate that there are some medical supplies that patients directly request from the SGK.

(i) Medical supplies used for treatment of inpatients:

・ Healthcare institutions registered to the SGK must provide medical supplies necessary for treatment of inpatients. However, they are not necessarily required to provide those classified in the list of prostheses attached to the Directive and those that will be returned to the SGK later.

・ If an inpatient himself has purchased medical supplies necessary for his treatment directly, rather than via the medical institution, the inpatient will be paid the cost of the supplies and the cost will be deducted from the bill of the medical institution by the SGK.

(ii) Medical supplies used for treatment of outpatients:

・ Healthcare institutions registered to the SGK must provide visually assistive tools subject to prescription (eye glasses and contact lenses). The cost incurred will be paid by the SGK to the healthcare institutions.

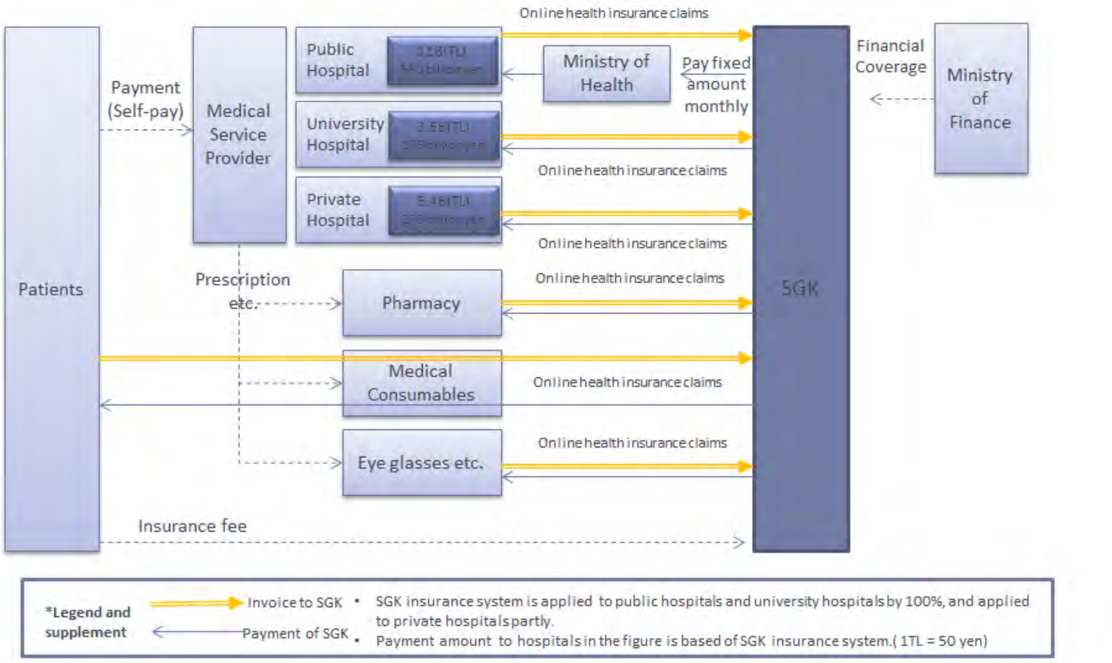
・ If outpatients themselves have purchased other medical supplies subject to prescription, they will be refunded after submitting the treatment report, prescription, bill and other relevant documents.

(iii) Medical supplies that need to be purchased by patients themselves

・ Insurance holders or their guardians are required to pay the cost of certain medical services, which include materials for visually supportive tools, oral prostheses, and other prostheses and orthodontic appliances that are not vital for life maintenance.

5) Compensation payment by the MOF to the SGK

- The SGK is financed by the revenues of insurance premiums. But insurance premiums accounted for some 30% of all its expenditure in the previous three years; the remaining 70% were financed by grants from the MOF.



FigureA.9.1 Flow of Medical Fees in Turkey

A-10. Photo Collection in the Field Study

THE CITY OF BURSA

Photo 1. Central city of Bursa (South direction from the north side): Bursa's urban area is spread east-west in the plains and extends up to the steep foothill slopes of the Uludag mountain to the north. The high-rise housing area on the right side of the photo has been redeveloped under the Urban Transformation Law. Most of the rest of the city is composed of 4-5-story reinforced concrete buildings.

Photo 2. Central city of Bursa (View north-east): The residential high rises visible in the center of this photo were built to replace traditional 4-5-story buildings with high-rise, high-density housing. Including in the existing urban area, redevelopment projects aim for high density land use. (Osmangazi District)

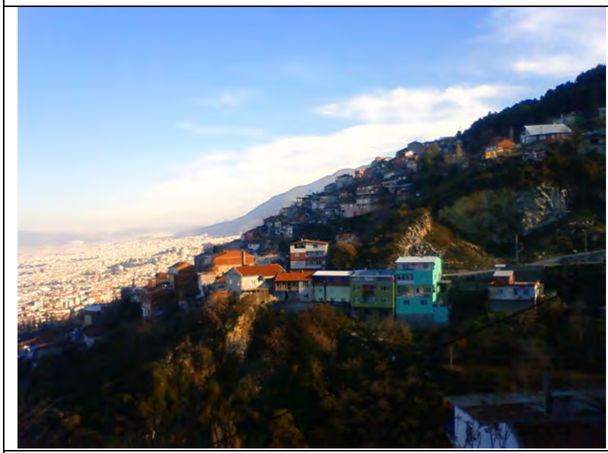


Photo 3. Urban area that extends to the steep slopes of the foothills of Uludag mountain: The city extends up to the mountain from Seri Old Town. Building is aging. Many of them is not in contact with the road. (Osmangazi District)

Photo 4. Building and slope typical of steep city: Many buildings are directly in contact with the stone pavement and a step prevents car from driving on this street. The building is dilapidated. Vacant in many cases. (Osumangazi District)

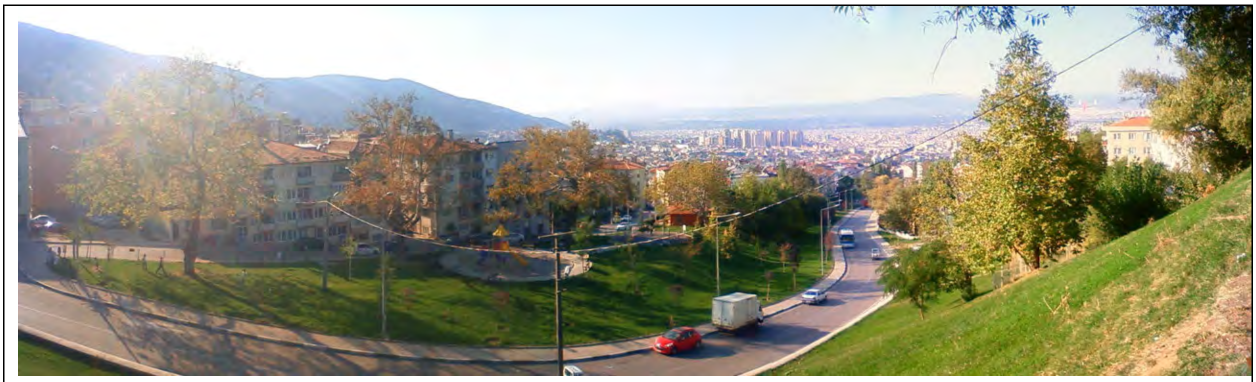


Photo 5. Area where redevelopment is advanced out of the city slope: Redevelopment of housing, roads and parks is progressing. Here is a good environment. (Yulidrim District)

Photo 6. Meeting place and parks within the redevelopment area: Closer view of the meeting place shown on the center of photo 5. (Yulidrim District)

Photo 7. State buildings with demolished buildings on adjacent land: Pillars and floors are made of reinforced concrete, but the wall is made of bricks, which cannot resist seismic motions. This construction type is still often used for new buildings. (Yulidrim District)

Photo 8. High-density urban area to expand on the slopes: A structure similar to that of the Photo 7 is also typically used for 4-5-story buildings. Parking is not provided on-site, and cars are parked on the road. (Yulidrim District)

Photo 9. Dense urban areas on the slope: Existing buildings have been demolished along the road that is being improved, to prevent building debris from blocking the road in times of disasters, and to broaden the road. Redevelopment of the city is underway. (Yulidrim District)

Photo 10. Dense urban areas that have been identified in the risky area (1): Building of the city wards of the ones that are about 4 ~ 6m secured Old road width. Both the tenant and the building owner is a resident. (Yulidrim District)

Photo 11. State of the extension of the building of dense urban areas that have been identified in the risky area: This is a typical example of building in an area identified as risky. Upper floors are left unbuilt and will be built once sufficient funds are secured. Floors and pillars are made of reinforced concrete, while the rest of the building is masonry blocks with lightweight walls. (Yulidrim District)

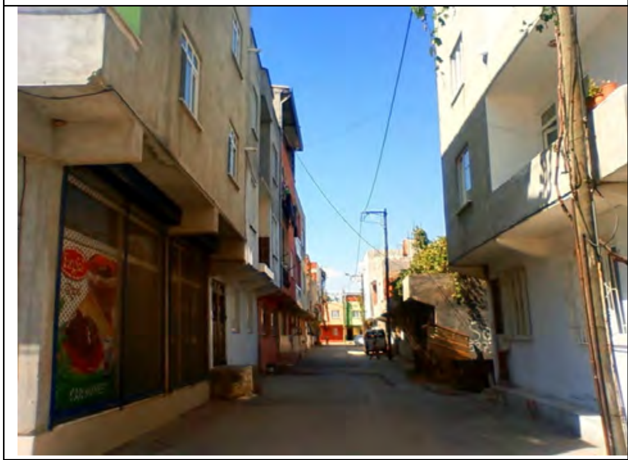


Photo 12. Dense urban areas that have been identified in the risky area (2): Various neighborhood service stores, and commercial stores are located in the low-rise section, while housing is on the upper floors. (Yulidrim District)

Photo 13. General urban area facing the main street: There are stores on the lower section, and housing on the upper floors. 4-5-story mixed use buildings are common. The building shows signs of aging. (Yulidrim District)

Photo 14. Downtown area of the Old Town (1): There are several relatively new buildings, however most buildings are old. Most buildings have 4-5 stories. (Osmangazi District)

Photo 15. Downtown area of the Old Town (2): This shopping arcade is a mall for clothing and daily necessities. Aging buildings are covered with tarps. (Osmangazi District)

Photo 16. Downtown area of the Old Town (3): Fresh food shops.
A tent projects off the first floor of a rigid 4-5-story building to perform business directly in the street. (Osmangazi District)

Photo 17. Downtown area of the Old Town (4): Shop front on the main street. This street is continuously lined with commercial stores in the first story of solid 4-5-story buildings.
(Osmangazi District)

Photo 18. Downtown area of the Old Town (5): This vacant lot used to have residential buildings, which were demolished, leaving the structure of the adjacent building visible. (Osmangazi District)

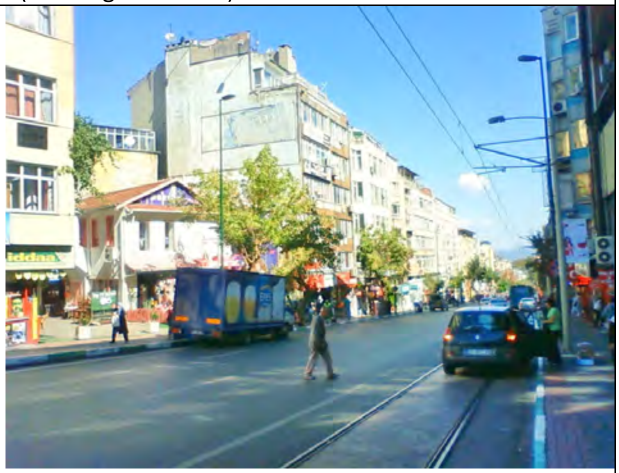


Photo 19. Downtown area of the Old Town (6): Buildings along the main road are decrepit and if they are destroyed by a large earthquake, they might block the road. (Osmangazi District)

Photo 20. Central city area of Osmangazi District (1): Typical narrow side street. (Osmangazi District)

Photo 21. Central city area of Osmangazi District (2): Along the main street, the first sotry of buildings tend to be stores while the upper floors are residences and offices. (Osmangazi District)

Photo 22. Reserved area that is based on the urban redevelopment law of Osmangazi District: This large open space has been secured and a redevelopment plan developed, redevelopment will soon be advanced in compliance with the plan. (Osmangazi District)

Photo 23. Primary school in the reserved area: This primary school is located in the reserved area of shown on photo 22. Redevelopment is carried out without demolishing this primary school, which was assessed as safe. (Osmangazi District)

Photo 24. Playground of Primary school in the reserved area: Relatively wide school playground. The site is surrounded by a relatively high walls so people cannot get inside easily. (Osmangazi District)

Photo 25. Central city area of Gemlik District: Advanced aging of buildings in the central city area. (Gemlik District)

Photo 26. City of Gemlik District, area facing the Marmara Sea: The road along the coast is lined with decrepit buildings. (Gemlik District)

Photo 27. Residential area of Mudanya District facing the sea: There are many relatively new detached housing estates in this area. (Mudanya District)

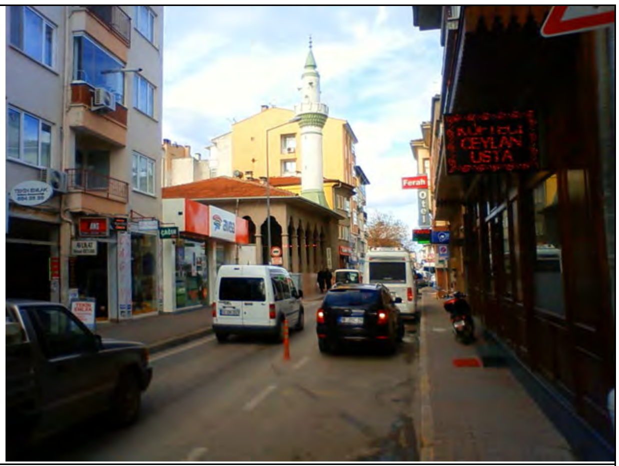


Photo 28. Central city located on the coast of Mudanya District: There are many historical buildings, and the road is narrow with dense traffic. (Mudanya District)

Photo 29. Extention of the city into the suburbs: To the north of the city, new buildings are being built along the main road. (View northeast, from the Hilton Hotel in Osmangazi District)

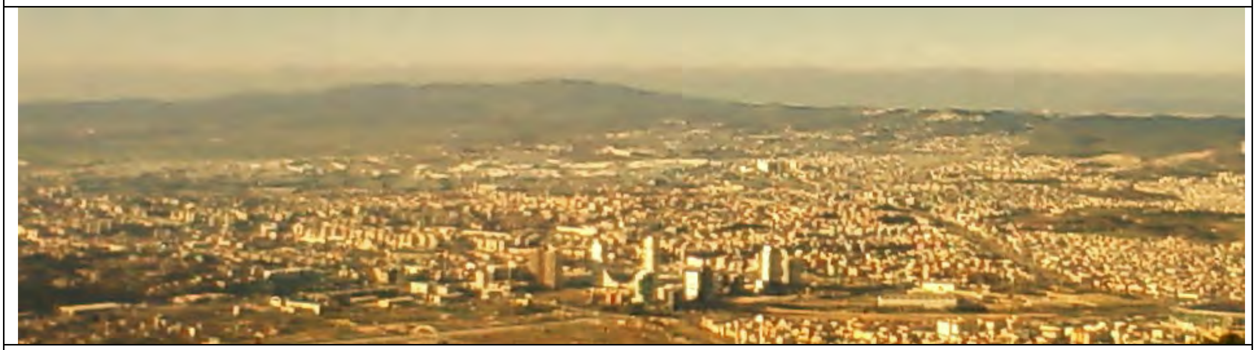
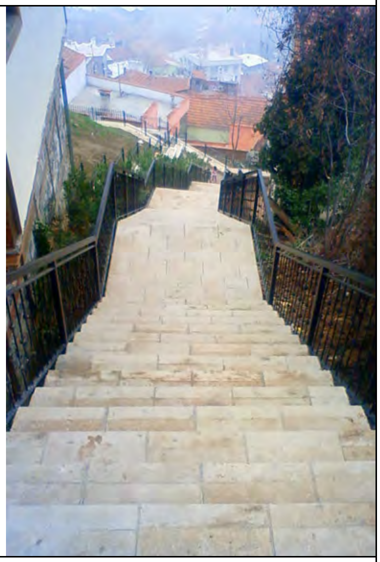


Photo 30. In the western part of the city, site development is also progressing: New urban areas are being developed in the eastern direction. (View from the hillside of Uludag mountain in the direction of Nulifer District)

Photo 31. Rivers flowing to the center of Bursa Uludag mountain: Rivers are steep valley shape, and bidding up the city toward the mountain. (Osmangazi District)



Photos 32. and 33. Dense urban areas in the steep slope of Uludag mountain: Dense urban areas of steep slopes above the area shown on Photo 31. Electricity, gas, and water supply utilities run to this area, however there is no access for vehicles near these houses. Residents walk up and down the steep stairs. (Osmangazi District)

Photo 34. Stairs renovated: In conjunction with the conservation of historical buildings (Religious Sites), stairs have been renovated. (Osmangazi District)

ROAD CONDITIONS OF BURSA

Photo 35. Ankara - Izmir road:
State of the near candidate sites of DMC (A). 3 lanes.

Photo 36. Road of urban redevelopment in the risky area of Yildirim:
width of the road is narrow, not divided roadway, sidewalk.

Photo 37. Gemlik road between Mudanya:
Width is narrow, there is a point with the landslide risk. Bursa Metropolitan Municipality have started widening road work.

Photo 38. Road of Bursa Old Town:
There is a possibility that on-street parking is not only cause of traffic congestion, and prevent passage of emergency vehicles.

Photo 39. Ankara bridge girder part of Nilufer bridge in Ankara Izmir Road:
Degradation of the beam subjected piers, the bridge girder was visually, can be confirmed rebar exposed.

Photo 40. Derichai bridge on the Izmir - Ankara road:
State of the bridge is good visually.

GEMLIK PORT

Photo41. Gemlik public port : South-western view from the jetty which was established relatively recently (Gemlik District)

Photo 42. Public jetty: established relatively recently. (Gemlik District）

Photo 43. Ship reservoir: Small vessels are moored (Gemlik District)

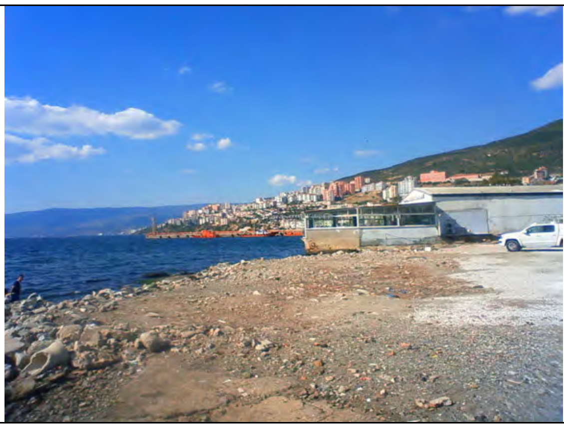


Photo 44. Seawall Development: Sequentially, the development of the seawall is advanced; and a coastal park will also be advanced. (Gemlik District)

Photo 45. Seawall Refurbished: Park and coastal shore protection with a small slope of rocks.
There is no embankment function. (Gemlik District)

Photo 46. Jetty for medium-sized vessels (public harbor): Located in the center of the inner part of the baythis jetty allows medium-sized vessels to moor. (Gemlik District)

Photo 47. Seaplane (public harbor): There is a landing site of seaplane to go to Istanbul from the jetty at the back central portion of the bay.
Companies Bursa city-funded has managed. (Gemlik District)

Photo 48. Port of private companies (1): Petrochemical products handling facilities. (Gemlik District)

Photo 49. Port of private companies (2): Continued from the right side of photo 8.
Housing for workers who work in the port area. (Gemlik District)

Photo 50. Port of private companies (3): Continued from the right side of the photo 9. Facilities for container loading and unloading, as well as oil tankers terminals. (Gemlik District)

Photo 51. A small fishing port and yacht harbor in Mudanya (1): There is a small fishing port and yacht harbor on the east side of the ferry pier. Liveaboard boats are moored in the harbor. (Mudanya District)

Photo 52. A small fishing port and yacht harbor in Mudanya (2): Coastline view from the jetty of the yacht harbor. Fishermen can fish near the pier where small boats are moored on the left side of the picture.There is a fishing workshop on the jetty. (Mudanya District)

Photo 53. Ferry Pier in Mudanya: Istanbul and Mudanya are connected by a ferry line. Port facilities are relatively new. However, the degree of seismic resistance has not been confirmed. Ferries are funded by the city and operated by the IDO Istanbul Company. (Mudanya District)

Photo 54. Pier of cruise ships in Mudanya: Pier where cruise ships can moor. High-speed crafts connecting Istanbul to the shore side can moor at another pier although these crafts were cancelled on the day this picture was taken due to high wind and rough sea. The high-speed line is funded by the city and operated by the BUDO Company. (Mudanya District)

Photo 55. Ferry docks and yacht harbor in Mudanya: The center of Mudanya city is visible on the right side of this picture. (Mudanya District)

SOUTHERN DISTRICT IN THE BURSA PROVINCE

Photo 56. Road connecting the city to the southern district of Bursa province: One lane road passing through the mountain. Pavement does not cover all part.

Photo 57. A town in the southern district of the Bursa Province(Orhaneli): The town is surrounded by the mountains.

DAM IN BURSA PROVINCE

Photo 58. Nilufer dam: picture taken from downstream Observe that a word “DSI” engraved in the slope of rock-fill dam. The width of dam is approximately 300m and the height is more than 50m.

Photo 59. Nilufer dam: the upstream seen from the surface.
According to the manager, the amount of water is small due to the scarce rainfall in 2013.

Photo 60. Nilufer dam: downstream seen from the surface. Observe that small amount of water flowing out of a narrow spillway seen in the right hand side of the picture.

Photo 61. Nilufer dam: Slope in upstream.
Gradation of the collar of stones shows the water level of full capacity, said the manager.

Photo 62. Doganci dam : picture taken from the downstream
Rock-fill dam with the width of 100 m

Photo 63. Doganci dam : Upstream seen from the surface. It can be observed that the water level is down significantly. The dam supplies tap water to the city of Bursa

INDUSTRIAL PARK AT BURSA


Photo 64. Location Map of DOSAB Industrial Park

Photo 65. Hearing Survey at DOSAB Industrial Park

SCHOOL IN BURSA

Photo 66. Exterior of a School in Osmangazi, Bursa: The school is a 2-story building, on which seismic strengthening work has been completed in accordance to MONE Bursa Provincial Office.

Photo 67. Interior of a School in Osmangazi, Bursa: This 60x60cm column was seismically strengthened.

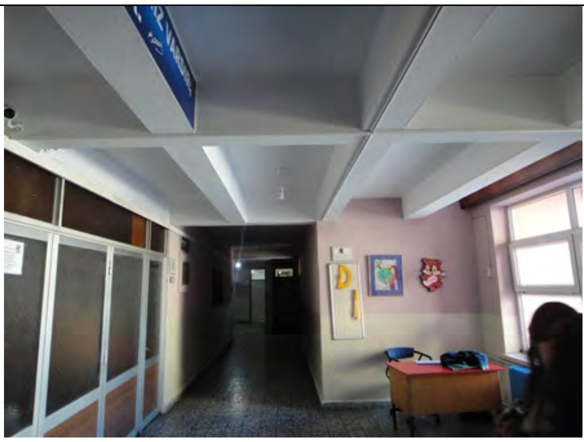


Photo 68. Interior of a School in Osmangazi, Bursa: Roof beams with close interval.

Photo 69. Exterior of a High School in the Suburb of Bursa: Newly established high school located in the suburb of Bursa.

Photo 70. Interior of a High School in the Suburb of Bursa: The corridor is wide enough for timely evacuation and the cross-sectional area of columns and beams is large.

Photo 71. School Campus Site: Several high schools are planned to be moved to this site in the suburb, in accordance with the School Campus Project.

AFADEM

Photo 72. Training facilities for rescue activity:
To provide rescue training for distressed accident in the mountain etc.

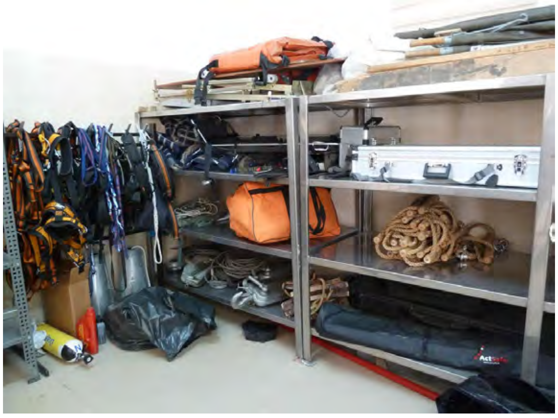


Photo 73. Search and rescue equipment:
To store training equipment regarding search and rescue activity.

Photo 74. Training of evacuation from building: AFADEM offers training programs to company. Picture shows training for personnel in charge of disaster prevention in the Bank.

Photo 75. Rescue training building: : Training facilities for evacuation from the height.

Photo 76. Search and rescue vehicle: The vehicle contains relevant equipment and portable generator.

Photo 77. Education facility: Seismic simulation tools. To provide educational program for teachers, students and ordinary people.

Photo 78 .Education tools: to demonstrate seismic damage of building to children.

THE TRAINING CENTER OF ANKARA AFAD

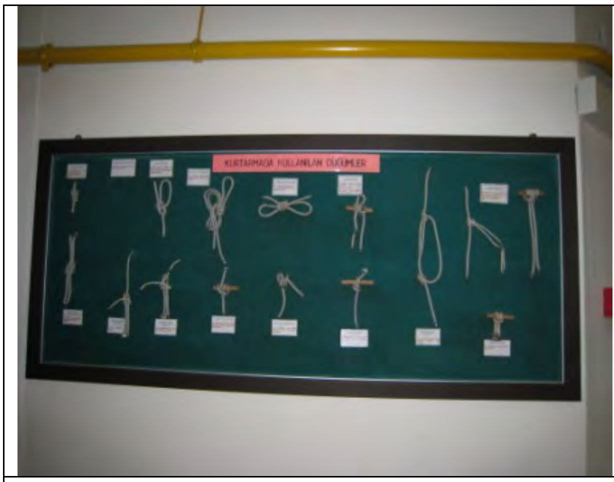


Photo 79. How to tie a rope is exhibited.

Photo 80. Chemical protective suits to respond to chemical weapon terrorism action.

Photo 81. Chemical protective suits to respond to chemical weapon terrorism action.

Photo 82. Newspaper article about the radiation leak in Fukushima

THE BURSA DISASTER PREVENTION EXPERIENCE-LEARNING FACILITY

Photo 83., 84. Picture of the rows of houses after the earthquake considered in the exhibit

Photo 85. Exhibit of the brick wall failure and of the floor collapse

Photo 86. Exhibit of the fall of furniture and all interior items, and the collapse of the floor above.

Photo 87. Equipment which can reproduce the motions of an earthquake

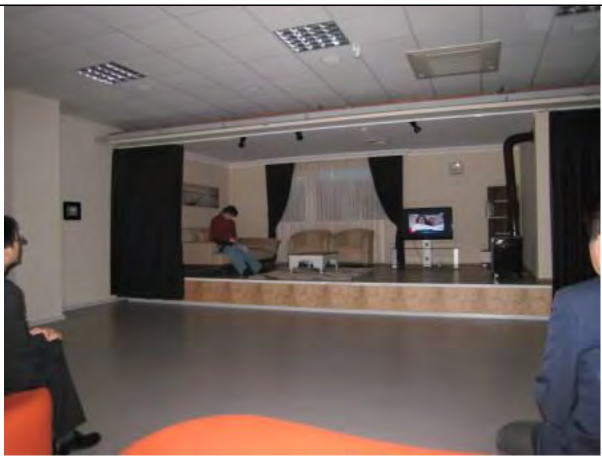


Photo 88. Furniture and mannequin in the room show what a typical room would experience at the time of the simulated earthquake

Photo 89. An aerial photo of the city in Bursa is exhibited in the building, and shows the location of disaster base institutions, including the AFAD office

Photo 90. Visual education tool to show liquefaction (on a shake table)

Photo 91. Visual education tool: model of a residence to show the effects of earthquakes on furniture and fixtures (on a shake table).

Photo 92. Panel of information related to the Great East Japan Earthquake

Photo 93. Exhibit of household emergency preparedness materials for earthquake disasters

Photo 94. The relative energy of earthquakes of different magnitude is exhibited via bowls of different sizes

Photo 95. Cardiopulmonary resuscitation (CPR) training.

Photo 96. Training facilities for use of fire extinguishers

RESEARCH FACILITIES

Photo 97. The center for earthquake engineering research in Istanbul technical university: Laboratory in the center for earthquake engineering research.

Photo 98. Istanbul technical university: Shaking table in construction
A Red Table in the picture is 3m×3m one-dimensional vibration pressure. Establishment is complete and now in the stage of assessment.

Photo 99. The center for earthquake engineering research in Istanbul technical university
Facilities such as pressure walls are constructed by JICA project in 1993. These are still in use now.

Photo 100. Middle East technical university, department of civil engineering:
Facilities in the right hand side is an experiment facility for the construction of high way. Brue part are pressure walls.

HOSPITAL IN ANKARA

Photo 101. HACETTEPE University Hospital: The hospital of the National University contains 1150 beds.

Photo 102. HACETTEPE University Hospital:
Medical gas is considered as basic cylinder correspondence.

Photo 103. HACETTEPE University Hospital seismic retrofitting:
Concrete column is retrofitted by steel.

Photo 104. HACETTEPE University Hospital:
Inside of an area in renovation

HOSPITAL IN BURSA

Photo 105., 106. Medical Park Hospital in Bursa: A private hospital located inside the city of Bursa and managed by Medical Care Healthcare Group with 219 beds and 650 staff. The hospital has periodical trainings for traditional incidents such as fire accidents but has no specific training considering large scale earthquakes.

Photo 107.,108. Plan of Standard Floor of Medical Park Hospital in Bursa and Nurse Station: The hospital is a 15-story building, and wards are located at the upper floors. Plan of ward floor (left photo) and a nurse station located at the centre of the floor (right photo).

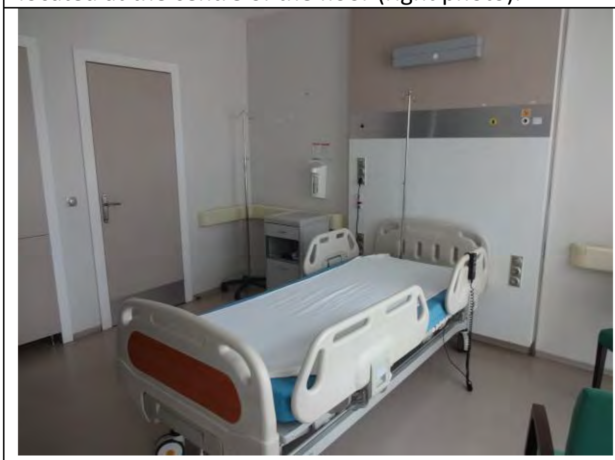


Photo 109. Ward of Medical Park Hospital in Bursa: The ward is composed of single and double bedrooms.

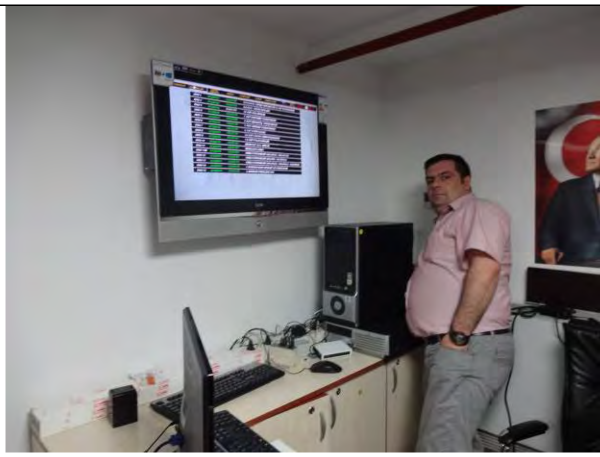


Photo 110. BMS of Medical Park Hospital in Bursa: A room for BMS (Building Management System) controlling hospital facilities. This system controls electricity, air conditioning, fire alarm, security, etc. with computers.

Photo 111. Cekirge Devlet Hospital: The third largest hospital in Bursa with 529 beds, built 40 years ago. 200 doctors and 1,500 staff in total are working here.

Photo 112. Hearing Survey with Director of Cekirge Devlet Hospital

Photo 113. Cekirge Devlet Hospital: 60% of the existing hospital buildings have completed anti-seismic reinforcement. The hospital is planning on adding a capacity of 700 beds by merging with a maternal care hospital and a pediatric hospital located nearby.

Photo 114. Cekeirge Devlet Hospital: A liquid oxygen tank (front) and the radiology department (back)

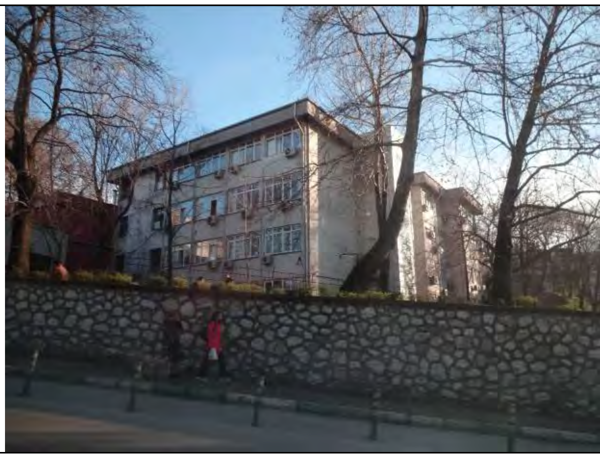


Photo 115., 116. Cekirge Devlet Hospital: Plan of hospital buildings (left photo). Isolated buildings are available in the wide slope land and some buildings have been expanded or renovated (right photo)

Photo 117. Bursa Public Hospital (Bursa Devlet Hospital): Designed by a German company and built on 1952. A seismic assessment of the main building showed no issues. Outpatient building, emergency building and policlinic building are planned to be rehabilitated for anti-seismic reinforcement

Photo 118. Meeting with the Director of the Bursa Public Hospital (Bursa Devlet Hospital)

Photo 119. Sevket Yilmaz Hospital Main Building: Main building built in 2002 satisfying structural seismic standards. This is one of the two public hospitals in Bursa ranked as A1.

Photo 120. Floor Guide of Sevket Yilmaz Hospital Main Building

Photo 121., 122. Sevket Yilmaz Hospital Maternal Care Building: Full view of the maternal care building (left photo) and the entrance for outpatients (right photo). Built in 2007, and located next to a park.

Photo 123. Triage Line on the Floor of Sevket Yilmaz Hospital: Red, yellow and green lines are drawn on the floor to show the direction of triage.

Photo 124. 4-Bed Room of Sevket Yilmaz Hospital: Currently, single or double bedrooms are allowed in newly constructed public hospitals under the regulation of MOH, and this type of 4-bed rooms are not allowed anymore.

Photo 125., 126. Designated Spots for Evacuation in Sevket Yilmaz Hospital: 2 areas, open place inside the site and car park, are designated as evacuation spots. Sign posts are easy to find and are designed to gleam at night (without power source).

Photo 127. Security Control Room in Sevket Yilmaz Hospital: Controlling the condition of each area inside the hospital with multi-screen monitors.

Photo 128. Generator Room of Sevket Yilmaz Hospital: Backup electrical facilities are 2 1,600KVA generators and 4 650KVA generators inside the generator room built on 2006. A 1,000L oil tank (inside) and a 2,500L oil tank (outside) are available for use in these generators. (70% of the hospital electricity demand is covered by these.)

Photo 129. Area Adjacent to Sevket Yilmaz Hospital: For expansion of the hospital, they consider acquiring adjacent land. The police academy next to hospital is not used for academy and only dormitories are being used.

Photo 130. Planned Site for Cardiovascular Hospital of Sevket Yilmaz Hospital: Planned to build a cardiovascular hospital with 200 beds removing Yuksek Ihtisas Hospital.

Photo 131. Entrance of the Outpatient Department of Uludag University Hospital: The only public hospital accredited with JCI (Joint Commission International), a global healthcare accreditation organization.

Photo 132. Entrance of Uludag University Hospital: One of the two public hospitals in Bursa ranked as A1.

Photo 133. Reception of the Ophthalmology Department of Uludag University Hospital: Disaster Hospital Building is one of the 4 blocks constituting the hospital and built 5 years ago. It is used as an ophthalmology ward in general and will become a special centre during emergency situation such as earthquake.

Photo 134. Ward of Uludag University Hospital: Example of the multi-beds room.

Photo 135. Storage of Uludag University Hospital: Medical supplies are stored for emergency case.

Photo 136. Meeting with the department of architectural technology of Uludag University about anti-seismic design

Photo 137. Yuksek Ihtisas Hospital: Entrance of outpatient

Photo 138. UMKE base of Yuksek Ihtisas Hospital: An UMKE base is provided inside the hospital site. Part of the UMKE building is shown behind the UMKE vehicles shown on this picture.

MOH BURSA

Photo 139. Hearing Survey with UMKE staff at Bursa Health Office: 96 UMKE employees are available in Bursa, and 6,000 nationwide. They are working as doctors or nurses, usually at medical facilities.

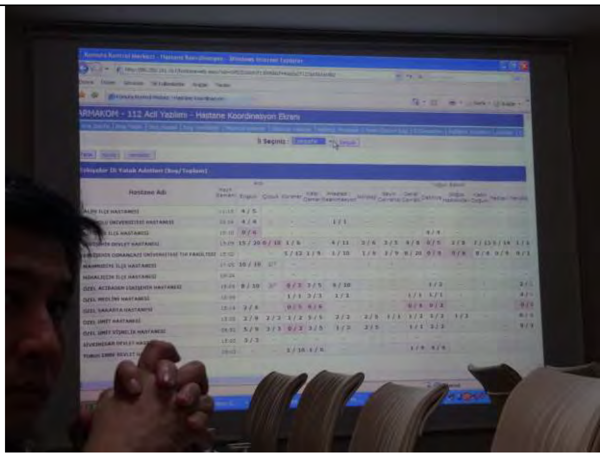


Photo 140. Hospital Monitoring System in Bursa Health Office: Vacancy and availability at the different ICU, CT, wards etc. of each hospital can be shared through the internet among MOH and each health office. Usage information entered to computers by each hospital is automatically transferred to MOH and each health office.

112 AMBULANCE STATION INSIDE AKOM FACILITIES IN BURSA

Photo 141. AKOM in Bursa: Established inside fire stations of metropolitan Bursa. After establishment of AFAD on 2009, AKOM came under the authority of AFAD and fire stations in each district removed the AKOM signs.

Photo 142. Explanation of AKOM in Bursa: Only 3 employees are usually working in AKOM. In case of disaster, trained fire fighter, search and rescue etc. will work there.

Photo 143. 112 Ambulance Station inside AKOM facilities in Bursa: Arranging ambulances upon emergency orders from 112 command and control centre

Photo 144. Plan of 112 Ambulance Station in Bursa: Prototype of a planned 112 Ambulance station.

AKOM, 112 AMBULANCE STATION AND DEPARTMENT OF CONSTRUCTION AND REPAIR IN MOH

Photo 145. Department of Construction and Repair: This department is responsible for conducting construction projects for MOH. It is one of the five departments of the Directorate of Construction and Health Investment.

Photo 146. Department of Construction and Repair: Photo of a seismically-isolated hospital planned in Elzurm. It will be equipped with 386 seismic isolators and will be the first public seismically-isolated hospital.

SAKOM IN MOH

Photo 147., 148. SAKOM in MOH: Emergency Control Center under the authority of the Department of Disaster and Emergency Management of the General Directorate of Emergency Health Services. SAKOM was established in 2009 to provide disaster medical services quickly and effectively.

Photo 148. Meeting with SAKOM of MOH

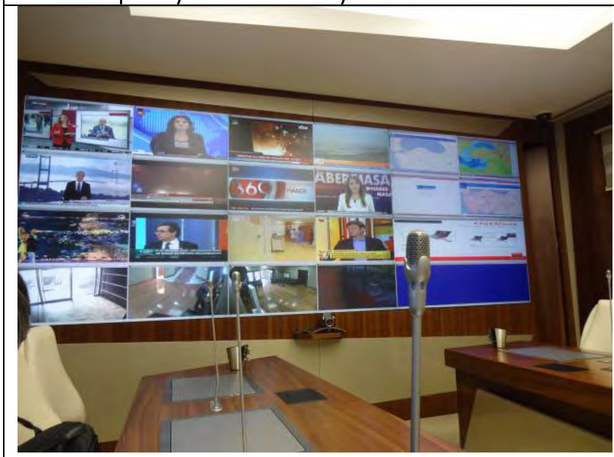


Photo 149., 150. SAKOM's display System of SAKOM: SAKOM has SAR a display system called "Master Search and Rescue System" to monitor the activities of disaster units at regional level or 112 command and control centre in each province. SAKOM can communicate with 81 provincial health offices using VHF system and satellite communication system.

Photo 151. SAKOM's Tracking System of Ambulances: It allows to track the movement of ambulances in the map on the screen, and covers all public, private and military hospitals. Details such as affiliation, staff, direction etc. of all 4,000 ambulances are controlled by the hospital information system.

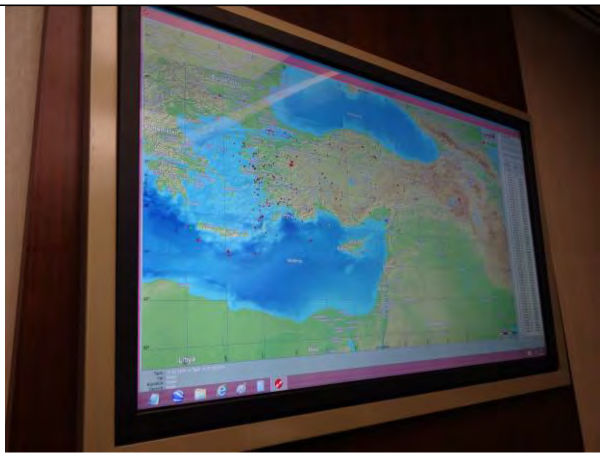


Photo 152. SAKOM's Earthquake Sensing System: Situation of domestic earthquakes can be shown on the screen. It also monitors the condition of the airport, and fires or accidents covered by 112 ambulance centers. SAKOM's system is different than the system used by AFAD but the two systems can share information if necessary.

INFORMATION GATHERING INVESTIGATION FOR THE SEISMIC ISOLATION STRUCTURE IN ISTANBUL

Photo 153. Meeting with the vice president of the Turkish Association of earthquake-absorbing systems The vice president's name is Mehmet Emre Ozcanli

Photo 154. Meeting with staff of the HAZAMA Ando Turkey office

MEETING AT A LOCAL ARCHITECT OFFICE

Photo 155. At the Seyas local architects office in Istanbul

Photo 156. PROTA Local Architecural Company at Ankara. Hearing survey for Seismic Isolation in Turkey

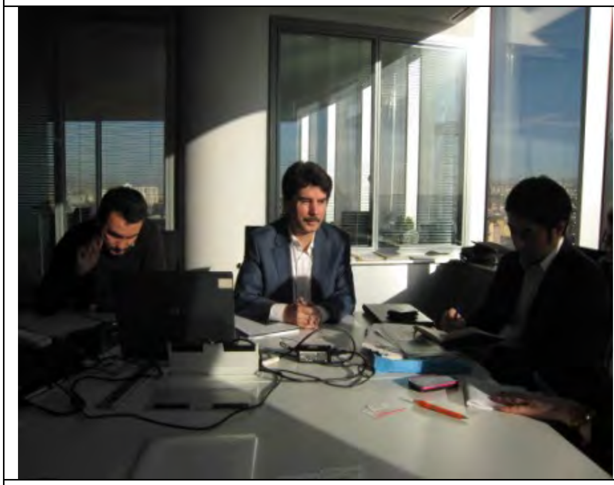


Photo 157. At the Yuksek Proje local architect office in Ankara：His offices at in own high rise building that was designed in-house.

Photo 158. At the Su Yapi facility design company in Ankara: The company mainly works on urban infrastructure such as a gas pipelines, dams, and water and sewage facilities