

A teal-colored map of Japan is positioned in the background of the slide. The map shows the four main islands: Hokkaido, Honshu, Shikoku, and Kyushu, along with numerous smaller islands. The map is centered and occupies most of the slide's width and height.

Current Activities of Earthquake Research Promotion in Japan

*Earthquake and Disaster-Reduction Research Division
Ministry of Education, Culture, Sports, Science and Technology (MEXT)
Government of Japan*

November 2006

Overview of Current Activities of Earthquake Research Promotion

Observation & Survey

Prediction of Occurrence

Mitigation of Damage

Promotion of Earthquake Research

Headquarters for Earthquake Research Promotion (HERP)

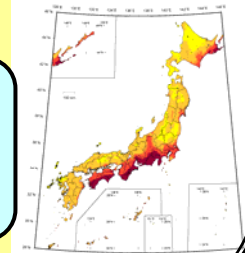
Fundamental Survey & Observation

Focused Survey & Observation for Special Earthquakes

Long-term Evaluation

Evaluation of Strong Ground Motion

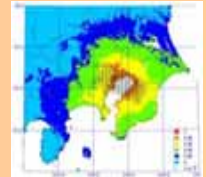
Generalized National Seismic Hazard Maps



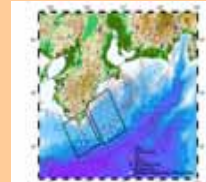
The 3-D Full-Scale Earthquake Testing Facility (E-Defense)



Special Project on Disaster Prevention and Mitigation for Earthquake under Metropolitan Area



Earthquake and Tsunami Observation System



Headquarters for Earthquake Research Promotion (HERP)

Establishment

- July 1995

(Hanshin-Awaji Earthquake: January 1995)

Structure of HERP

Headquarters

-Policy Committee

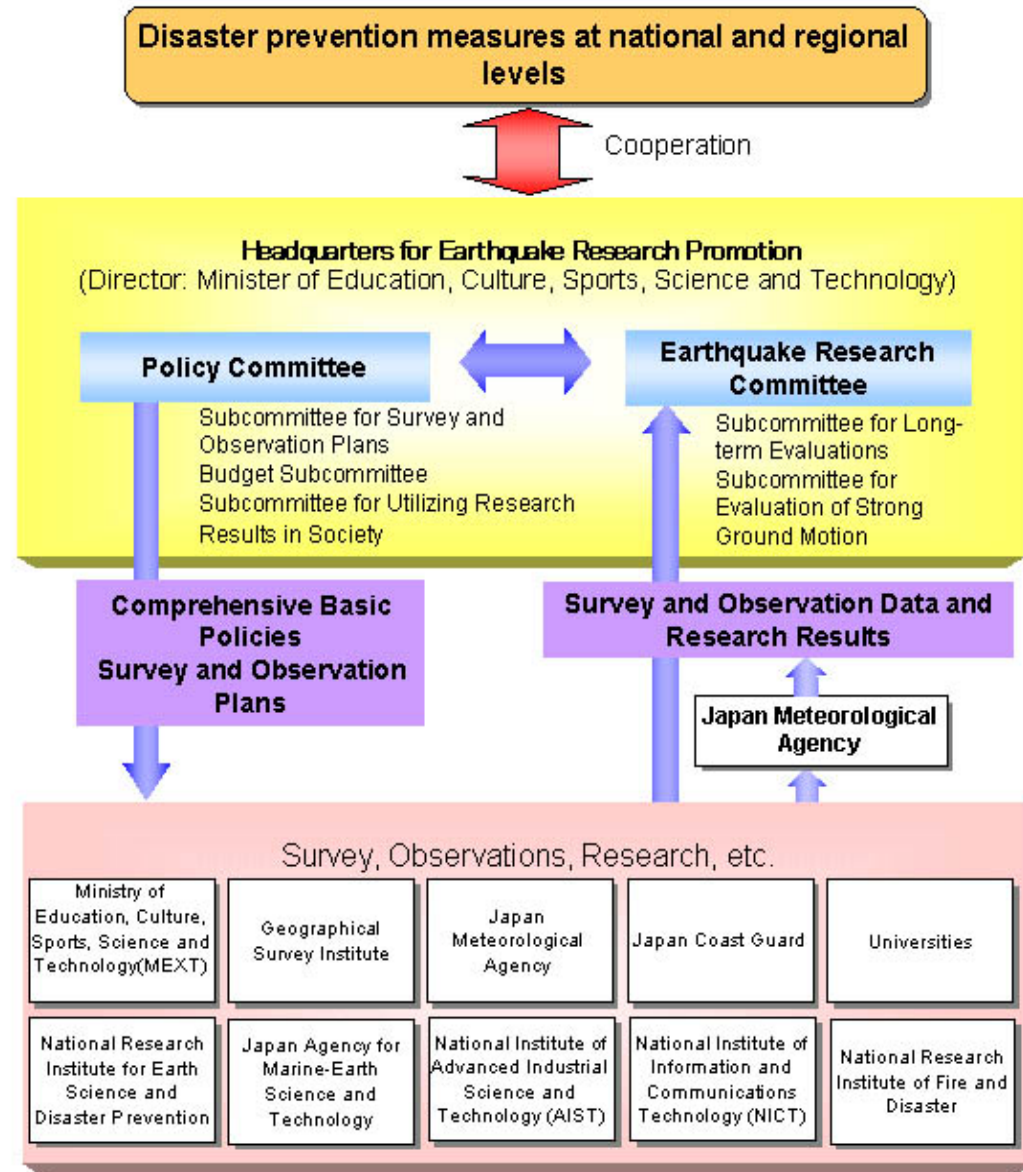
(4 subcommittees & 2 WGs)

- Plan basic policies
- Establish Survey & Observation plans
- Coordinate budgets
- Public announcements

-Earthquake Research Committee

(2 subcommittees & 5 WGs)

- Long-term Evaluations
- Evaluations of strong ground motions



Generalized National Seismic Hazard Maps

Release

- March 2005
- Revised in September 2006

2 kinds of maps

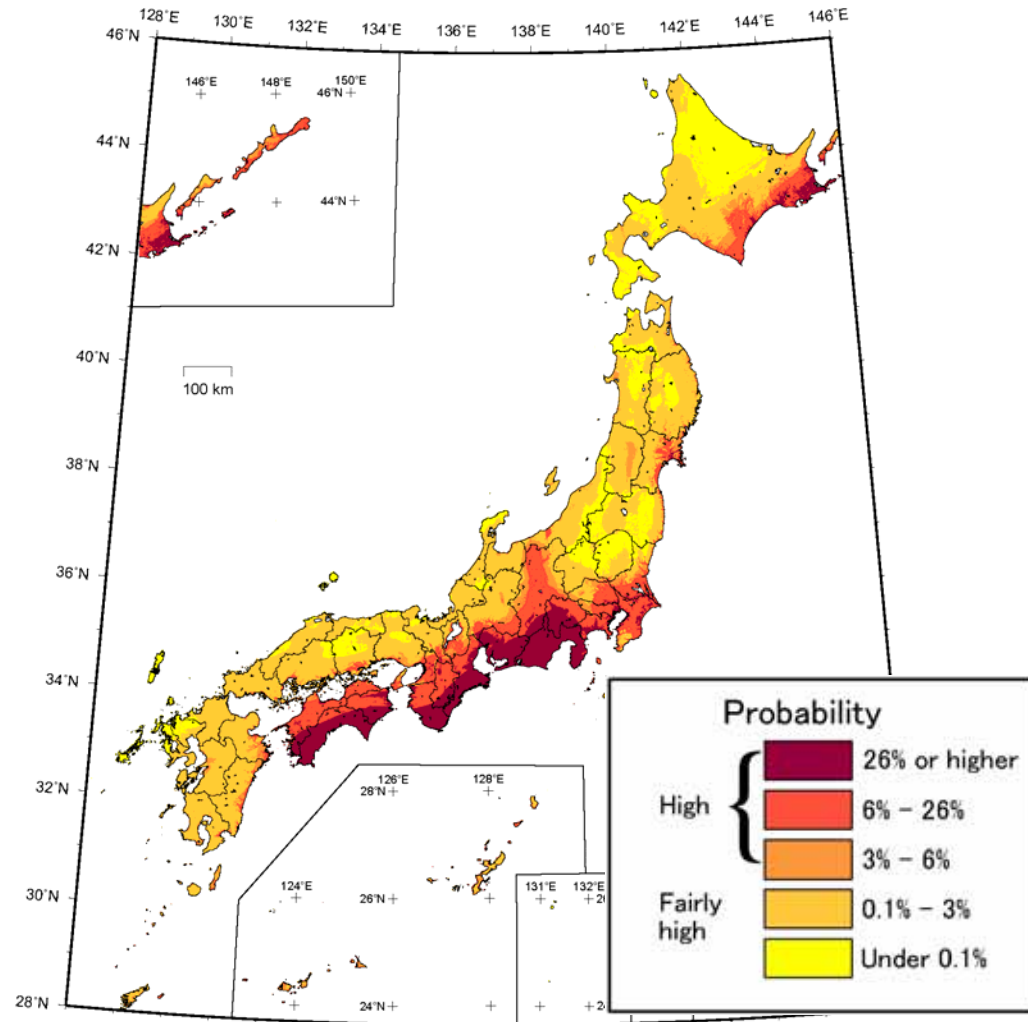
- Probabilistic Seismic Hazard Map
- Seismic Hazard Map
for Specified Seismic Source Faults

Use

- Rise of public's awareness
of earthquake disaster reduction
- Effective & efficient measures
for earthquake disaster reduction

Application

- Used to revise earthquake insurance
(May 2006)



Probabilistic Seismic Hazard Map

Probability of shaking greater than "seismic intensity 6 Lower",
occurring within 30 years (start date; January 1, 2006)

Long-term Evaluations

(Predicted magnitude & probability of occurrence within 30 years)

subduction-zone
earthquake

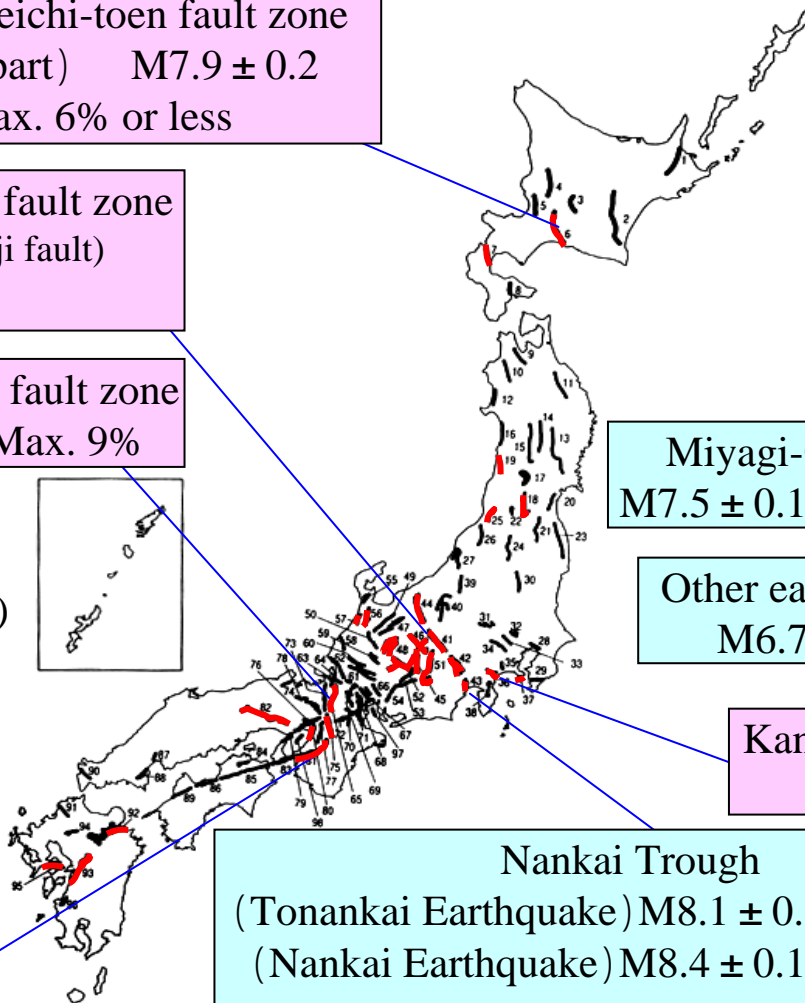
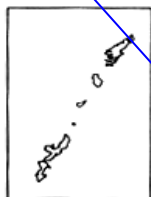
active fault

Ishikari-teichi-toen fault zone
(main part) $M7.9 \pm 0.2$
Max. 6% or less

Itoigawa-Shizuoka-kozosen fault zone
(segment including Gofukuji fault)
 $M8 \pm 0.5$ 14%

Biwako-Seigan fault zone
 $M7.8 \pm 0.2$ Max. 9%

(Start date: January 1, 2006)



Immediately before
the Hyogo-ken Nanbu
Earthquake
(Great Hanshin-Awaji
Earthquake Disaster)
 $M7.3$ Max. 8%

Miyagi-Oki
 $M7.5 \pm 0.1$ 99%

Other earthquake in Southern Kanto
 $M6.7 \sim 7.2 \pm 0.2$ About 70%

Kannawa/Kozu-Matsuda fault zone
 $M7.5 \pm 0.2$ Max. 16%

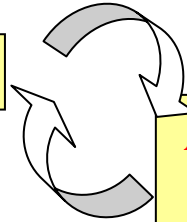
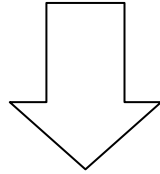
Nankai Trough
(Tonankai Earthquake) $M8.1 \pm 0.1$ About 60%
(Nankai Earthquake) $M8.4 \pm 0.1$ About 50%

Chuo-kozosen fault zone
(Kongou-Sanchi toen-Izumi-Sanmyaku nan'en)
 $M8.0 \pm 0.2$ Max. 5%

Fujikawa-kako fault zone
 $M8.0 \pm 0.2$ Max. 11%

Promotion of earthquake research

Generalized National Seismic Hazard Maps



Additional / complementary research
at active fault zones
(FY2005 ~)

The focused survey and observation of special earthquakes (FY2005 ~)

· Active faults (proposed):

Itoigawa-Shizuoka-Kozosen fault zone

Fujigawa-Kako fault zone (proposed)

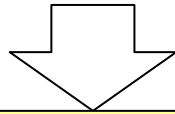
· Subduction-zone:

Nankai Trough (proposed)

Earthquakes around Japan & Kuril trenches (proposed)

(Miyagi-Oki, Nemuro-Oki)

Earthquakes of much
influence to seismic
hazard map

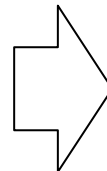


Highly-accurate...

Evaluation of strong motion

Evaluation of probability and magnitude

Information of crustal activities



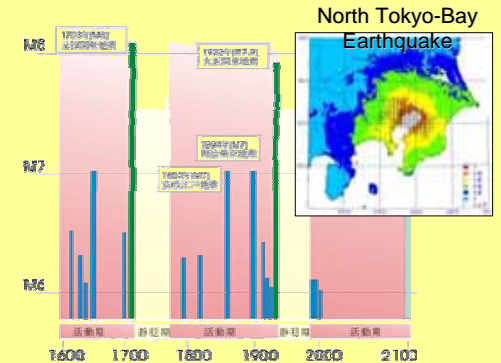
**Highly-accurate evaluation
of earthquake hazard**

Special Project on Disaster Prevention & Mitigation for Earthquake under Metropolitan Area

Earthquake under metropolitan area

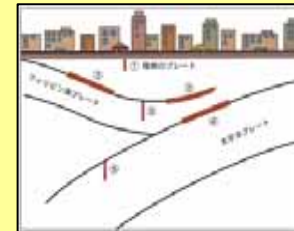
Pressing earthquake & Huge loss

- Probability (M7 earthquake): around **70% within 30 years**
- Estimation of damage (North Tokyo-Bay earthquake)
Max **11,000 casualties & 112 trillion yen** of economic loss



“Special Project on Disaster Prevention & Mitigation for Earthquake under Metropolitan Area”

1. Survey of Plate Structure & Model Characterization
2. Aseismic Evaluation & Research of Keeping Function
3. Development of Real-time Disaster Prevention System



- **Analysis of whole image of earthquake under metropolitan area**
- **Drastic reduction of the loss by earthquakes**

Earthquake & Tsunami Observation System

Background

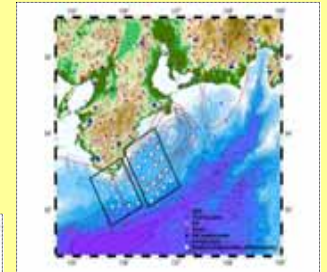
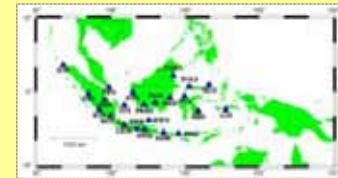
- Sumatra Earthquake & Indian Ocean Tsunami (2004)
over 300,000 casualties, over 7.8 billion dollars of economic loss
- Probability of occurrence: Tonankai earthquake: around 60% (M8.1)
(within 30 years) Nankai earthquake: around 50% (M8.4)
- Estimation of damage (Tokai, Tonankai & Nankai Earthquakes occur simultaneously)
21,000 casualties & 81 trillion yen of economic loss



Photograph: Japan International Cooperation Agency

Earthquake & Tsunami Observation System

1. Development of Ocean-bottom Network System
seismometers, water-pressure gauges, tiltmeters, gravity meters, etc.
2. Observation of Subduction-Zone Earthquakes
observe area around Indonesia etc.
provide data for neighboring countries



- **Analysis of an occurrence mechanism of subduction-zone earthquakes**
- **Progress of measures against disaster prevention & mitigation**

The 3-D Full-Scale Earthquake Testing Facility (E-Defense)

Background

Great Earthquake Damage



1995 Hanshin-Awaji Earthquake

6,400 casualties

12 trillion yen of economic loss

The most urgent countermeasure:

Prevention of the collapse of structures

E-Defense

Site: Miki, Hyogo Pref.

Shaking Table Area: 20m x 15m



Reproduce the ground motion of the 1995 Hanshin-Awaji Earthquake



➡ **Full-scale destructive experiments**

- **Understand failure process of structures**
- **Verify seismic retrofitting technologies**
- **Develop seismic isolation & control technologies etc.**

地震・防災分野の平成18年度予算案の主要課題

平成18年度予算案 15,919百万円
(平成17年度予算額 16,578百万円)

自然災害に強い社会を目指すため、地震等の調査観測研究や災害発生時の被害軽減を目指した防災分野の研究開発を推進するとともに、これらの成果等を地域の防災活動へ反映させる事業に取り組む。

地震等の調査観測

地震等の発生予測

災害発生時の被害の軽減

地震調査研究推進本部

(本部長:文部科学大臣、本部員:関係府省事務次官等)
・阪神・淡路大震災の教訓を踏まえ、地震防災対策特別措置法に基づき設置された政府の特別機関
・総合基本施策や調査観測計画などを策定し、関係省庁の連携の下、地震調査研究を一元的に推進

地震調査研究推進 (H17年度～)

基盤的調査観測

全国的に偏りなく実施

地震観測施設の整備・運用、活断層調査等

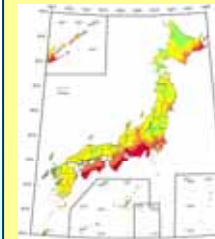
重点的調査観測

相対的に強い揺れに見舞われる可能性が高いと判断された地域の特定の地震を対象として重点的に実施

予測精度の向上

対象地域を重点化

強い揺れに見舞われる可能性を示す地震動予測地図の高度化



予測精度向上の成果を踏まえ、より完成度の高いものへ

東南海・南海地震等海溝型地震に関する調査研究 (H15年度～)

東南海・南海地震及び日本海溝・千島海溝周辺で発生する地震に関する調査研究を推進

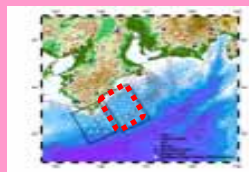
大都市大震災軽減化特別プロジェクト (H14年度～)

大都市圏において大地震が発生した際の人的・物的被害を大幅に軽減させるための科学的・技術的基盤を確立するとともに、それを我が国の地震防災対策に効果的に活用することを目指した研究開発を推進

海溝型巨大地震・津波対応海底ネットワークシステムの構築に向けた世界最先端の技術開発

(H18年度～)～国家基幹技術 統合地球観測・監視システム 地震・津波観測・監視システム～

地震計、津波計等の各種の観測機器を備えた海底ネットワークシステムについて技術開発を推進し、これを想定震源域の海域に敷設することによって、高精度な地震予測モデルの構築、地震発生直前に地殻活動現象が発現する場合のその検知、地震発生直後の地震及び津波発生情報の早期検知等による迅速かつ的確な防災・減災対策への寄与、を目指す



E-ディフェンスを活用した国内外共同研究の推進 (H17年度～)



地震災害に負けない都市を創るため、阪神・淡路大震災級の地震動を再現し、実大規模で破壊現象を解明、耐震技術向上に活かす

高度即時的地震情報伝達網実用化プロジェクト (H15年度～)

「緊急地震速報(気象庁)」の更なる高度化を図るとともに、同情報を防災・減災に生かすための各種システムの研究開発を推進

総合防災研究成果普及事業

(H16年度～)
大学・研究機関・地方公共団体等の連携により、最新の科学的知見を地域の防災活動に反映させる事業を推進

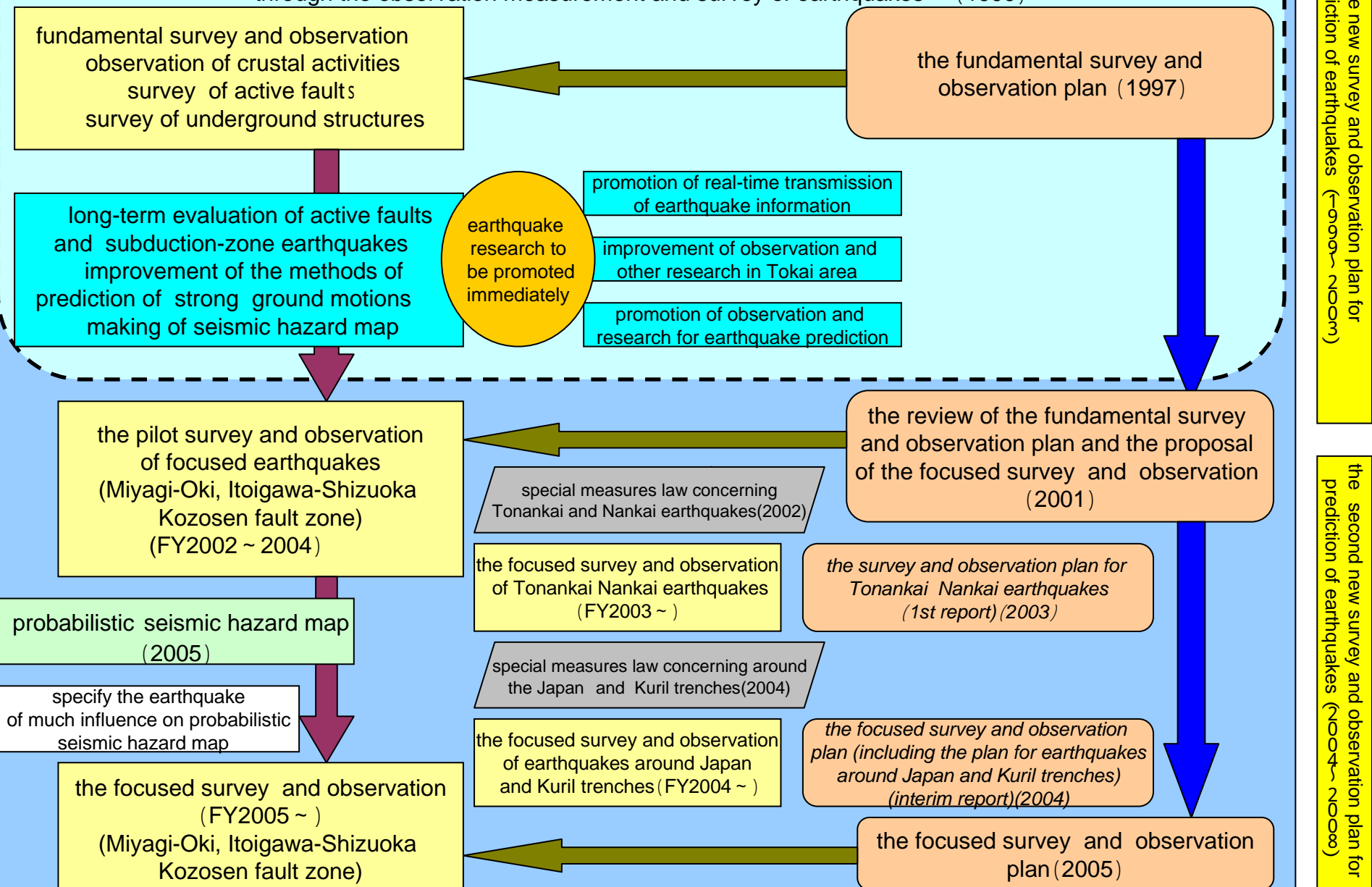
Government's Proposed Budget related to Earthquake Research for FY2006

(unit: million yen)

Organization		FY2005 Budget	FY2006 Budget	major points	
Ministry of Education, Culture, Sports, Science and Technology	Ministry of Education, Culture, Sports, Science and Technology	3,666	4,942	<ul style="list-style-type: none"> * Administration of the Headquarter 659 (739) * Promotion of earthquake research 756 (823) * Research survey into crustal structures in urban areas, included in the special project of earthquake disaster reduction in megacity areas 942 (1,122) * Research on subduction-zone earthquakes, including the Tonankai and Nankai earthquakes 490 (703) * Projects on practical use of high-grade and immediate response transmission networks of earthquake information 161 (179) * Dissemination of outcome of disaster prevention research, applying research result 91 (100) * Observation and monitoring systems for earthquakes and tsunamis 1,842 	
	National University Corporation	Subsidy for operation	Subsidy for operation	<ul style="list-style-type: none"> * Research project on prediction of earthquakes and volcanic eruption (Special education and research) + Promotion of observation and research for elucidation of process of crustal activity leading to earthquake occurrence + Promotion of observation and research for forecasting simulation and monitoring of crustal activity + Development of new observation/experiment technology + Maintenance of systems for promotion of programs * International research on earthquakes and volcanoes (Special education and research) * Operation of observation stations, etc. 	
	Independent Administrative Institution, National Research Institute for Earth Science and Disaster Prevention	Subsidy for operation	325	<ul style="list-style-type: none"> * K-NET Facilities for earthquake observation 325 	
	Independent Administrative Institution, Japan Agency for Marine-Earth Science and Technology	Subsidy for operation	Subsidy for operation	<ul style="list-style-type: none"> * Study for evaluation and forecast of crustal activity by using seismological observation data * Construction of Japan Earthquake Hazard Information Station * Employment of synthetic, seismic observation at the sea bottom * Study on earth's interior dynamics * Promotion of deep-sea earth drilling projects 	
	Total	3,666	5,267	144% (Compared with FY2005)	
Ministry of Economy, Trade and Industry	Independent Administrative Institution, National Institute of Advanced Industrial Science and Technology	Subsidy for operation	760	<ul style="list-style-type: none"> * Maintenance of synthetic, groundwater related observation stations for forecasting Tonankai/Nankai earthquakes 760 * Research on advancing survey and evaluation of important active faults * Study for elucidation of continuity, activity and inhomogeneity of faults with a little evidence at the surface * Study of earthquake generation mechanisms * Study of earthquake hazard evaluation in the seismic gap area of Chuetsu region, Niigata prefecture * Research to elucidate history of subduction-zone earthquakes and to estimate damage caused by them * Observation and research of groundwater and others in the Area under Intensified Measures against Earthquake Disaster and in the vicinity of active faults * Research on advancing forecast of ground motion, displacement and deformation at the surface * Research on improving databases of geological structure beneath plains 	
	Total	-	760		

The promotion of earthquake research

- comprehensive basic policies for the promotion of seismic research through the observation measurement and survey of earthquakes - (1999)



Ministry of Land, Infrastructure and Transport	Geographical Survey Institute	2,447	2,363	* Japanese archipelago precise geodetic survey	1,568	(1,590)
				* Enhancement of observations regarding crustal deformation	431	(459)
				* VLBI(very long-range baseline interferometry) measurements	92	(92)
				* Geoid survey, leveling survey, gravity survey, and geomagnetic survey	114	(118)
				* Maintenance of a basis for location information	46	(48)
				* Research on geography and crustal activity related to earthquake research	93	(120)
				* Renewal of high-accuracy automatic tidal gauge	19	(19)
	Japan Meteorological Agency	3,075	3,714	* Earthquake observation networks, earthquake and tsunami observation system, etc.	2,118	(1,860)
				* Monitoring systems, etc. for Tokai and other areas, (including maintenance of cable type ocean bottom seismographs)	1,292	(912)
				* Collection of data from related organization (unification)	303	(303)
			* Cost of public relations regarding earthquakes			
Meteorological Research Institute	56	52	* Research on increasing accuracy of forecasting the so-called Tokai earthquake and on preparation process of Tonankai and/or Nankai earthquakes	52	(56)	
Japan Coast Guard	67	64	* Observation and others to reveal the crustal movement leading to the occurrence of the earthquake	2	(2)	
			* Observation and others for forecasting simulation and monitoring of crustal activity	34	(34)	
			* Promotion of marine geodetic measurement	28	(30)	
	Total	5,645	6,193	110% (Compared with FY2005)		
Total		9,310	12,219	131% (Compared with FY2005)		

Furthermore, there are additional policies, the results of which are assumed to make a contribution to the promotion of earthquake research. They are as follows.

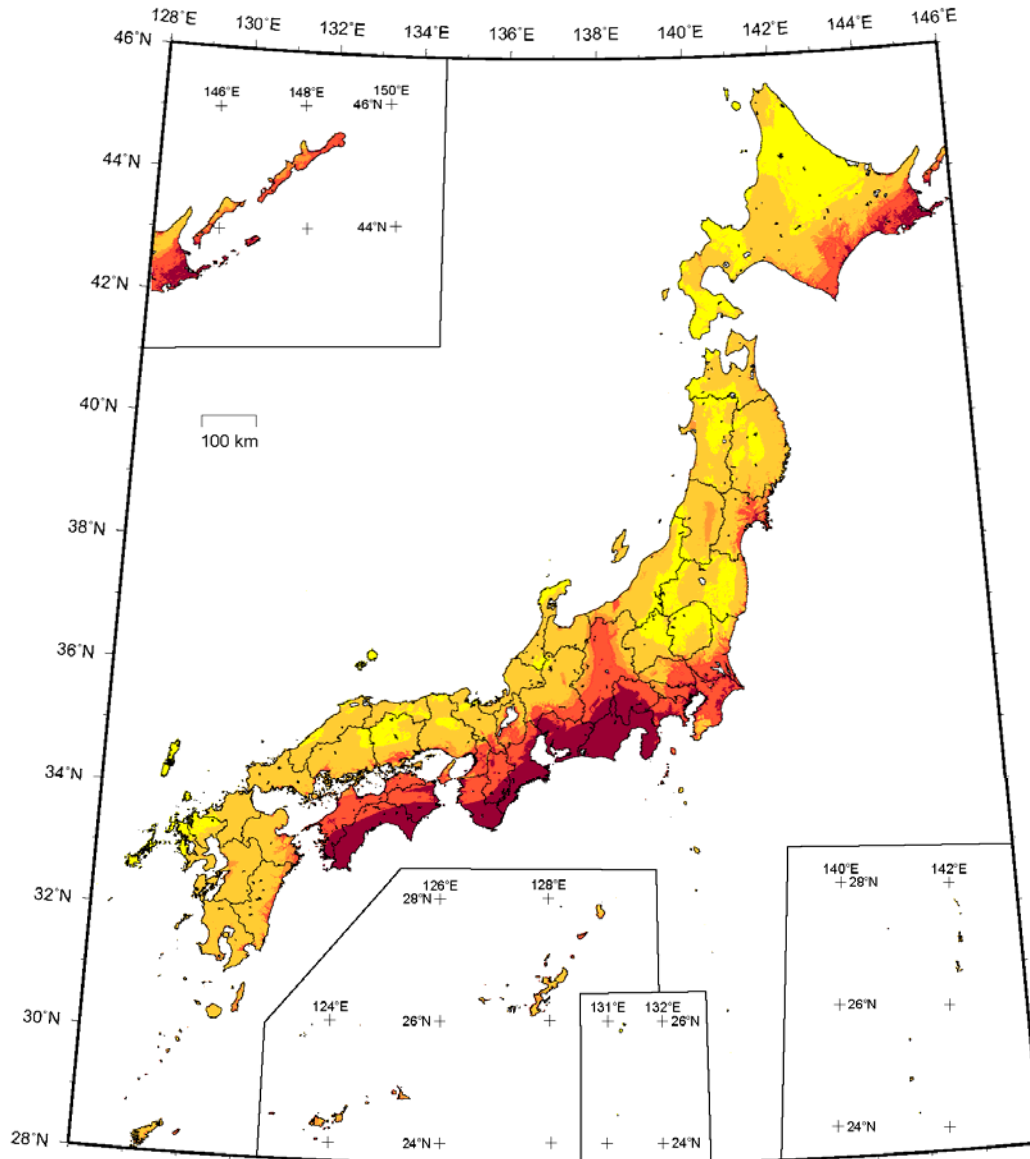
Organization		FY2005 Budget	FY2006 Budget	major points	
Ministry of Internal Affairs and Communications	Independent Administrative Institution, National Research Institute of Fire and Disaster	Subsidy for operation	35	* Development of diagnostic method for anomalous response or damage of oil tank during earthquakes	35
Ministry of Education, Culture, Sports, Science and Technology	Ministry of Education, Culture, Sports, Science and Technology	168	39	* Subsidies concerning radiation monitoring, etc.	39 (168)
	Independent Administrative Institution, Japan Agency for Marine-Earth Science and Technology	Subsidy for operation	Subsidy for operation	* Promotion of the earth simulator project * Employment of ships	
Ministry of Economy, Trade and Industry	Ministry of Economy, Trade and Industry	80	70	* Evaluation study of earthquake resistance for long period ground motion	70 (80)
Ministry of Land, Infrastructure and Transport	Ministry of Land, Infrastructure and Transport	-	-	* Strong motion seismographs and others	
	Geographical Survey Institute	104	95	* Cost for study of geography and crustal activity	95 (104)

Note 1) There may be slight discrepancies in the totals, as tables have been rounded off.

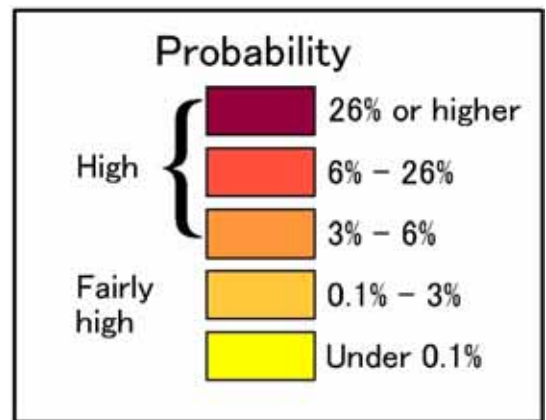
Note 2) Amounts relating to subsidies for operation for the independent administrative institution are not included in the total.

Note 3) "Maintenance of groundwater related observation stations for forecasting Tonankai/Nankai earthquakes forecast" was set under Independent Administrative Institution, National Institute of Advanced Industrial Science and Technology by proposal from Ministry of Economy, Trade and Industry on January 16, 2006. Accordingly the total sums were modified.

Probabilistic Seismic Hazard Map



Distribution map of probabilities of ground motions equal to or larger than intensity 6 Lower, occurring within 30 years from The present (start date; January 1, 2006)



Special Project on Disaster Prevention and Mitigation for Earthquake under Metropolitan Area

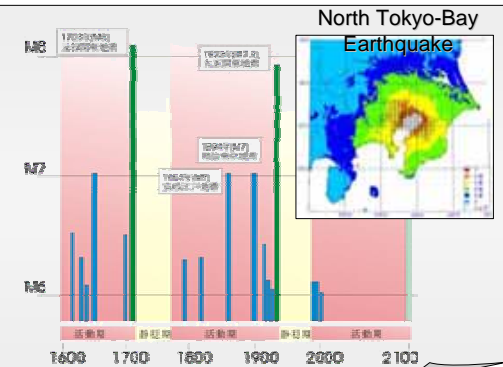
Government's Proposed Budget for FY2007 : **3.8 Billion Yen**

Earthquake under metropolitan area

Pressing earthquake & Huge loss

Probability of the occurrence M7 earthquake within 30 years: around 70%
Estimation of damage for North Tokyo-Bay Earthquake:
Max about 11 thousand casualties, about 112 trillion yen of economic loss

↔ These are estimation without any detail about M7 earthquakes
In Fundamental Policy of Japan 2006:
Promotion to work on Earthquake under Metropolitan Area

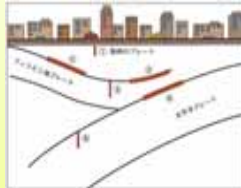


Foundation of “Special Project on Disaster Prevention and Mitigation for Earthquake under Metropolitan Area”

Project 1: Survey of plate structure and model characterization

Survey and Observation to show plate structure that occur earthquake directly under metropolitan Area

- Observe earthquake by middle sensitive seismometers (800 locations)
- Survey of crustal structure by controlled earthquakes etc.



Project 3: Development of real-time disaster reduction system

- Development of multi-functional real-time strong motion seismographs
- Development of systems to share information about certain area after earthquakes



Project 2 : Aseismic evaluation and research of keeping functions

3-D Full-scale destructive experiments by E-Defense

- Experiment of function keeping and aseismic evaluation for disaster prevention centers, hospitals, etc.
- Aseismic experiment for high rise buildings, seismic isolated structures, bridges, banks and fills



Promote research and development by cooperating each projects

Analysis of whole image of Earthquake under metropolitan area and drastic reduction of the loss by earthquakes

Earthquake and Tsunami Observation System

Government's Proposed Budget for
FY2007 : **2.3 Billion Yen**
FY2006 : **1.8 Billion Yen**

Background

Sumatra Earthquake and Indian Ocean Tsunami, Indonesia in 2004 caused extensive damage as over 300,000 casualties, 1.2 million sufferers, over 7.8 billion dollars of economic loss.

Probability of the occurrence within 30 years: Tonankai earthquake: around 60% (about M8.1)

Nankai earthquake: around 50% (about M8.4)

Estimation of damage when Tokai, Tonankai and Nankai earthquake occur simultaneously:

about 21,000 casualties and 81 trillion yen of economic loss (worst case)

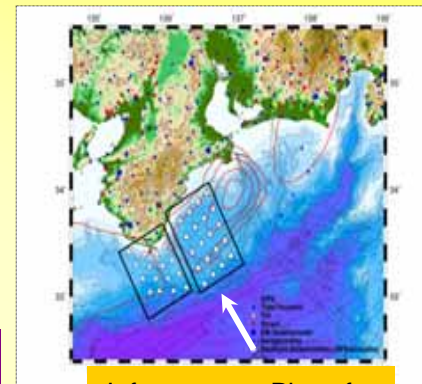


Development of earthquake and tsunami observation system

Development of ocean-bottom network system

Promote technical development of a dense ocean-bottom network system that consists of various observation instruments such as seismometers (20 locations), water-pressure gauges (max. 20 locations), tiltmeters, gravity meters etc., and put in place off the coast of Kumano on Kii Peninsula, the focal region of the anticipated Tonankai earthquake.

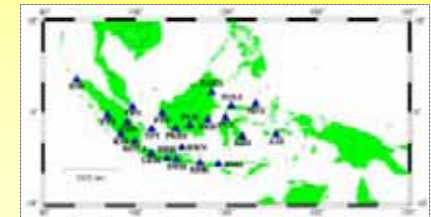
The same system will be put in the focal region of the anticipated Nankai earthquake.



Infrastructure Plans for
FY2006 ~ 2009

Observation of subduction-zone earthquakes

Observe frequently occurring area of subduction-zone earthquake such as Indonesia, and provide data for neighboring countries.



Establish high-accuracy earthquake estimation models
Detect crustal movement as it might occur prior to an earthquake occurring
Provide earthquake information quickly and accurately (e.g. Early Earthquake Warning)

Analysis of an occurrence mechanism of strong subduction-zone earthquakes and progress of measures against disaster prevention and mitigation

The 3-D Full-Scale Earthquake Testing Facility (E-Defense)

Great Earthquake Damage



Casualties

1995 Hanshin-Awaji : 6,400
2003 Iran Bam: more than 50,000

Economic loss

1995 Hanshin-Awaji : 12 trillion yen
Probable Tokai : around 37 trillion yen

Prevention of the collapse of structures is the most urgent countermeasure

Construction of E-Defense (1998 ~ 2005)



Site : Miki , Hyogo Pref.
Construction Cost : 45Billion yen
Shaking Table Area : 20m x 15m
Payload : 1,200tf
E-Defense can make the ground motion recorded during at the 1995 Hanshin-Awaji Earthquake

2005: E-Defense starts its operation
Full-scale destructive experiments are to be conducted

The Dai-Dai-Toku Project (Special Project for Earthquake Disaster Mitigation in Urban Areas : 2002~2006)

Research on mitigation of earthquake damage in urban areas

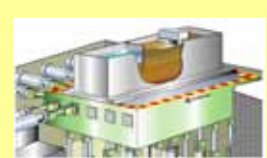
Wooden Structures



Reinforced Concrete Structures



Foundation and Geotechnical Structures



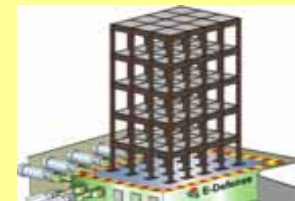
Research Topics: Understanding failure processes of structures
Understanding the effects of earthquake on aging structures Verifying seismic retrofitting technologies Developing countermeasures against soil liquefaction

US-Japan Collaboration Research utilizing E-Defense (2005~2009, Test start 2007~)

E-Defense/NEES Collaboration Research on Common Subjects



Bridges



Steel structures

Research Topics:

- Understanding failure processes of structures
- Verifying seismic retrofitting technologies
- Developing seismic isolation & control technologies

~ Expected Outcomes ~

- Verification of seismic isolation technology
- Contribution to the development of technical standards for various structure types
- Development of low cost seismic retrofitting technologies and promotion of retrofitting aged structures

survey, observation and research of earthquakes
research and development in the disaster reduction fields
dissemination of these results to public, etc.

Government's Proposed Budget in MEXT
 for FY2006 : **15.9 Billion Yen**
 FY2005: **16.6 Billion Yen**

survey and observation of earthquakes

evaluation of earthquake hazard

disaster mitigation

H E R P

promotion of earthquake research (FY2005 ~)

fundamental survey and observation

observation of crustal activities,
 survey of active faults, etc.

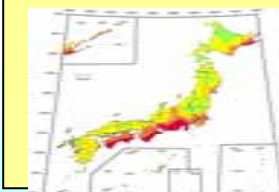
focused survey and observation

**Focused Survey and Observation in Wide Areas on the Outskirts of
 Tonankai and Nankai Earthquakes and Earthquakes around the Japan
 and Kuril Trenches (FY2003 ~)**

the results of survey
 and observation

to specify earthquake
 of much influence on
 seismic hazard map

**improvement of
 probabilistic
 seismic hazard map**



**promotion of full-scale destructive
 experiments utilizing shaking table
 "E-Defense" (FY2005 ~)**

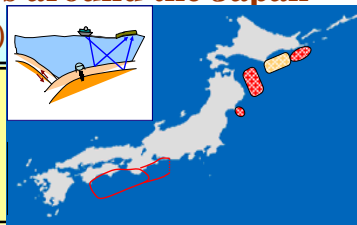
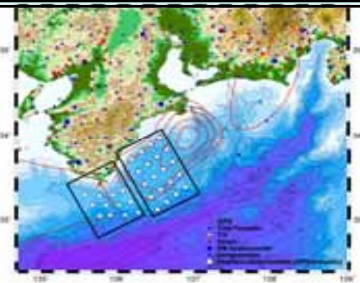


**Research Project for the Practical
 Use of "Real-time Earthquake
 Information Networks" (FY2003 ~)**

**Development of Dissemination
 Measure of Disaster Reduction
 Research Results (FY 2004 ~)**

**Development of a Ocean-bottom Network System against Large-magnitude,
 Ocean-trench Earthquakes and Tsunami (FY2006 ~ proposed)**

Special Project for Earthquake Disaster Mitigation in Urban Areas (FY2002 ~)



“Generalized National Seismic Hazard Maps”

~ The Earthquake Research Committee in March 2005 ~

Survey and Observation of Earthquakes

Research of Active Faults

Survey of Underground Structure

Long-term Evaluation of the Occurrence of Earthquakes

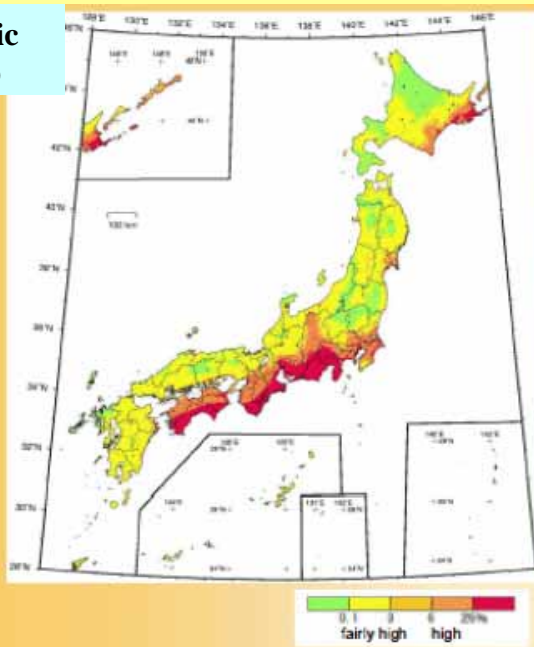
(Long-term evaluation of earthquake at 98 major fault zones and 7 subduction zone (location, magnitude, probability of occurrence))

Improvement of Methods of Predicting of Strong Ground Motions

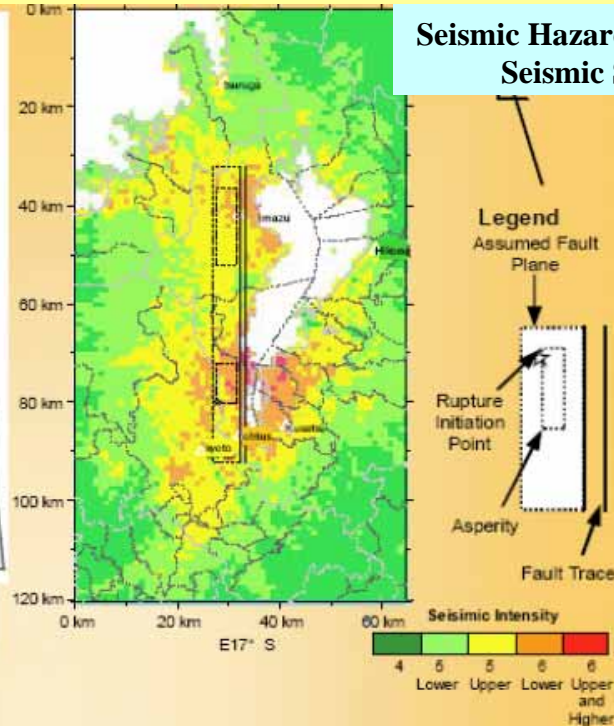
[Generalized National Seismic Hazard Maps]

Probabilistic Seismic Hazard Map

This map shows the probability of ground motions equal to or larger than seismic intensity 6 Lower, occurring within the next 30 years from the present.



Seismic Hazard Map for Specified Seismic Source Faults



This map shows the seismic intensities forecast for various regions around the Biwako-seigan fault zone.

Basic Policy ~ HERP in April 1999 ~

These maps are expected to be used

- to raise the public's awareness of earthquake disaster reduction
- to take the earthquake disaster reduction measures more effectively and efficiently
- to evaluate the risks of establishing important facilities and enterprises in a certain area.
- to revise premium of earthquake insurance

Needed to improve an accuracy

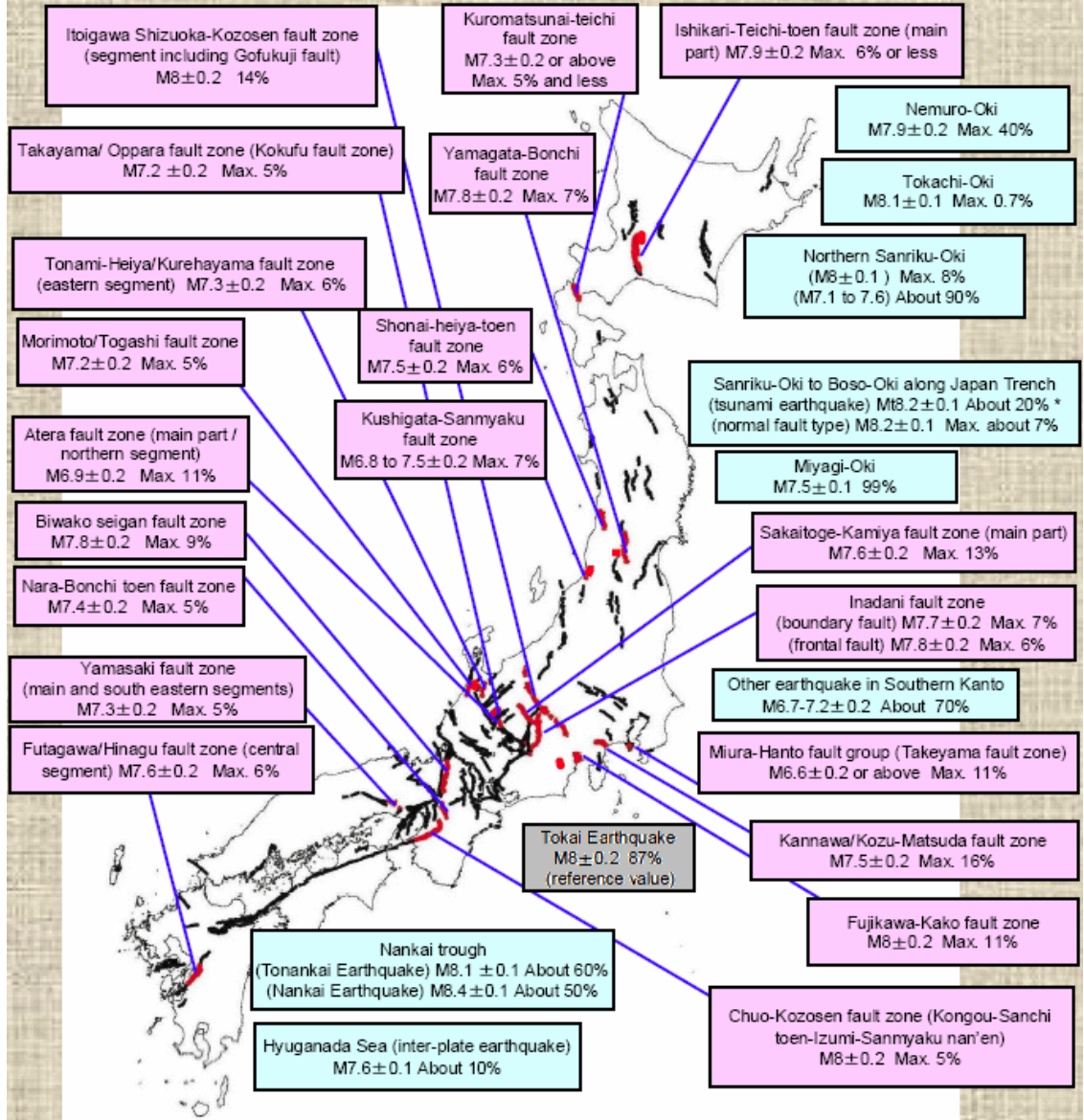
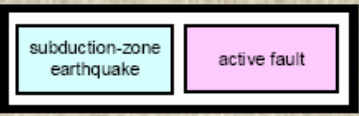
Long-term Evaluations of Active Faults and Subduction-zone Earthquakes

The Earthquake Research Committee evaluates the probability of the potential (location, magnitude, probability of occurrence) of earthquakes on major active faults and subduction-zone earthquakes, and makes announcements as necessary.

Earthquakes of Major Fault Zones and Subduction-zone Earthquakes

(Predicted magnitude and probability of earthquake occurrence within 30 years from now)

When there is variance in probability, the maximum value is given. **Example: Max. 7%**



[Information] Probability immediately before the occurrence of the Hyogo-ken Nanbu Earthquake (Great Hanshin-Awaji Earthquake Disaster) Nojima Fault $M7.3$ 0.02% to 8%

Probability based on the value predicted on June 1, 2003.
* Mt: Size of an earthquake measured by a tsunami height.

Survey and observation in wide areas on the outskirts of Tonankai and Nankai earthquakes and earthquakes around the Japan and Kuril trenches

Law

Laws setting out special measures for earthquake disaster prevention and mitigation have been established in relation to Tonankai and Nankai earthquakes(* 1) and earthquakes around the Japan and Kuril trenches(*2). These special measures laws require efforts to be made to promote survey and observation of ocean-trench earthquakes.

Government's Proposed Budget for FY2006(Apr-Mar) : 490 Million Yen (FY2005 : 703 Million Yen)

Measures in Mext

Based on these laws, MEXT commenced survey and observation into Tonankai and Nankai earthquakes in FY2003, and into earthquakes around the Japan and Kuril trenches as well in FY2004.

Examples of survey and observation

Observation using ocean-bottom seismographs

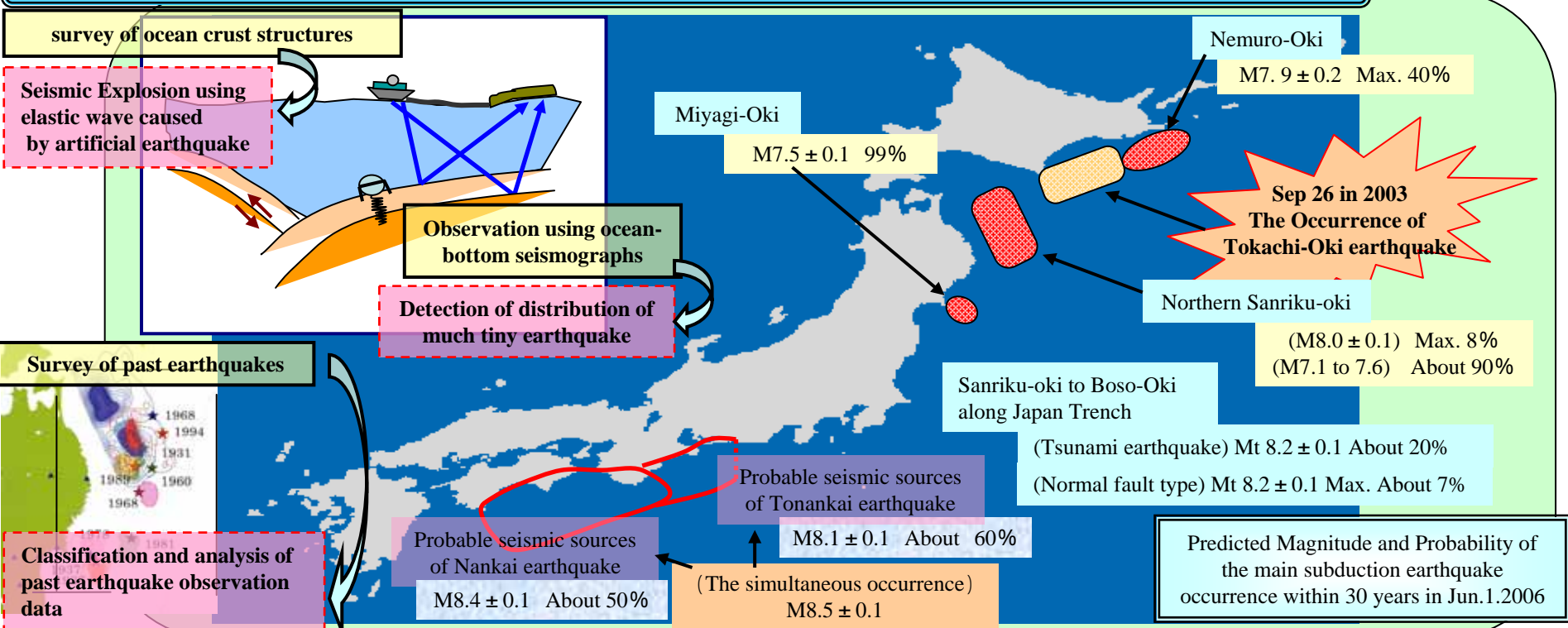
survey of ocean crust structures

The aims

To improve an accuracy of earthquake probability, of predicting strong ground motion.

*1) Special Measures Law Concerning Promotion of Disaster Prevention Countermeasures Related to Tonankai and Nankai Earthquakes (enacted in 2002, and brought into effect in 2003)
*2) Special Measures Law Concerning Promotion of Disaster Prevention Countermeasures Related to Earthquakes Originating in and around the Japan and Kuril Trenches (enacted in 2004, and brought into effect in 2005.)

Survey and observation to improve accuracy of the evaluation of earthquake hazard



Towards the Development of a Ocean-bottom Network System against Large-Magnitude, Ocean-trench Earthquakes and Tsunami

Results of Investigation and Research related to Tonankai and Nankai earthquakes established to date

Findings

- (a) There are specific crustal structures off the coast of the Kii Peninsula and they might be factors for the period and pattern of the next earthquake.
- (b) In previous Tonankai and Nankai earthquakes (1944 and 1946), the collapse started in the area off the coast of Kumano on the Kii Peninsula.

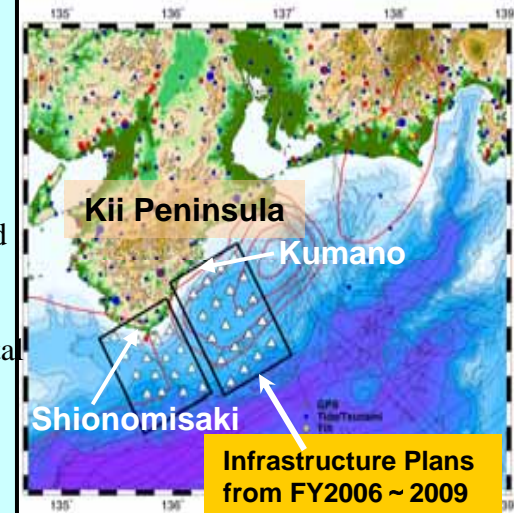
Simulations (The present simulations using models based on partly the above findings shows the following.)

- (a) The results of the simulations almost succeeded in replication of the past origination of collapse and various ways of occurrences, ex, Tokai earthquake and Tonankai earthquake could occur simultaneously, or that Tokai, Tonankai, and Nankai earthquakes could occur simultaneously.
- (b) The extraordinarily frictional place on the simulations is very close to the point of the specific crustal structures above .
- (c) Specific events (pre-slippage) may occur in the deep subduction areas off the coast of Kumano on the Kii Peninsula prior to an earthquake.

Probability of the occurrence within 30 years () Tonankai earthquake ; around 60%
Nankai earthquake ; around 50%

Government's Proposed Budget for
FY2006(Apr-Mar) : **1.8 Billion Yen**

FY2006 ~ 2009 : **7.6 Billion Yen**



Long-term evaluation made by the HERP
Earthquake Research Committee

As part of a four-year project, a ocean-bottom network system that consists of seismographs, pressure gauges (in 20 locations), etc. put in place off the coast of Kumano.

Almost the same system will be put in place in the waters off Shionomisaki starting after five years.

- (i) Establish highly sophisticated earthquake estimation models
- (i i) Detect crustal movement and other phenomena as it might occur prior to an earthquake occurring
- (iii) Contribute to disaster prevention by speedy and accurate earthquake information
(e.g Emergency earthquake warnings by JMA)

Special Project for Earthquake Disaster Mitigation in Urban Areas

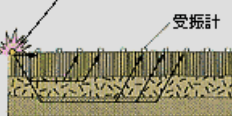
This Special Project aims to drastically reduce the loss of human life and property caused by large earthquakes in major urban areas such as Tokyo, and the Kyoto-Osaka-Kobe area.

Government's Proposed Budget for FY2006(Apr-Mar) : 24 Billion Yen (FY2005 : 28 Billion Yen)

Prediction of strong ground motion

Deep Seismic Explosion
(Using elastic wave caused by artificial earthquake)

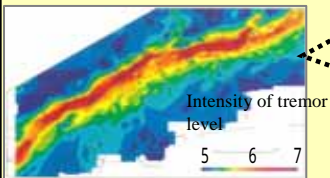
(人工的に弾性波を発生)



Survey by Deep Drilling



survey and research of regional characterization of the crust in metropolitan areas



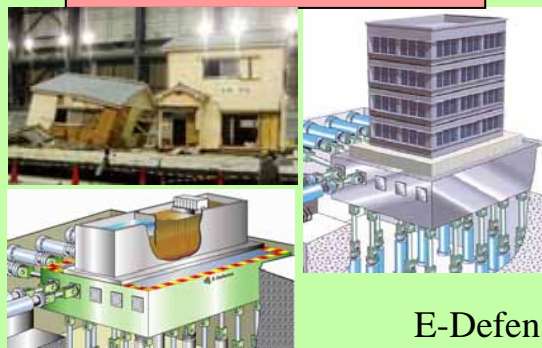
To contribute to compile a detail version of seismic hazard map covering metropolitan areas

Significant improvement of seismic performance of structures

Full operation of "E-Defense", a full size three-dimensional vibration destruction facility started in 2005.

Destruction experiments of full size testing structure

Wooden houses
RC frame
Soil-structure interaction



E-Defense

Advanced disaster management system

Robots

Development of Advanced Robots and Information Systems for Disaster Response



Simulation



Development of Integrated Earthquake Disaster Simulation Systems
Development of Frontier Simulation Technologies

Integration of earthquake disaster mitigation research results

- Retrofit of policy and system enforcing the ability for disaster prevention
- Construction of system to collect, process, and transmit disaster information changing by time
- Development of a tool drafting a plan for making smooth the process of recovery and reconstruction

Contribution to earthquake disaster mitigation measures
~ Drastic reduction of the loss of human life and property caused by large earthquakes in major urban areas ~

Research Project for the Practical Use of Real-time Earthquake Information Networks

Government's Proposed Budget for FY2006(Apr-Mar) : 161 Million Yen (FY2005 : 179 Million Yen)

Emergency earthquake information system : System transmitting real-time earthquake information prior to major earthquake-induced ground motion by **(1) detecting P waves close to the source of the earthquake and (2) immediately estimating its magnitude and epicenter**

NIED (1) and REIC (2) consigned by MEXT, have been carrying out this project since FY 2003 and many other research institutes have been working on furthering research in this field.

Consequently, JMA (3) has started to provide such information on a trial basis in the form of emergency earthquake information since February 2005, and it plans to be formally provided to public by March 2007.

This project is composed of **2 themes**.

Research about the way of immediately processing earthquake information to determine the magnitude and epicenter JMA (3) has developed the different way of processing from NIED, but each one has different merits each other.

- JMA's way is better in the point of determining the **magnitude**.
- NIED's way is better in the point of determining the **epicenter**.

JMA uses the both ways

To drastically improve an accuracy of determination

Study about the way of practical use example;

- To enable many children to evacuate prior to the principal shock arriving by setting a warning system
- To shut off household gas mains to prevent fire
- To open doors to prevent occupants from being trapped

1 National Research Institute for Earth Science and Disaster Prevention
2 The Real-time Earthquake Information Consortium (NPO)
3 The Japan Meteorological Agency

