

# Message from the Director-General

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## Good Development and Management of Infrastructure

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### 1. Introduction

They say “All roads lead to Rome,” the Roman Empire had a good road network and sanitary accommodations seen in the existing aqueduct. In Changan, an ancient Chinese capital during the Tang Dynasty, elaborately designed city facilities based on city planning supported the prosperity of the city.

It is still fresh in our mind that American President Obama told “we determined that a modern economy requires railroads and highways to speed travel and commerce”<sup>1)</sup> in his inaugural speech on January 21. Without listing these examples, history has shown that civilizations which has constructed and maintained the good infrastructure prosper.

### 2. National land and Infrastructure

Compared to Europe and America, Japan is under severe land conditions. We take it for granted and live our lives without paying much attention to it. However, it is very important as the basic information to think about the role of the country, we who are engaged in the technological policy of domestic land, should speak up at every opportunity.

- ① Form of the land: the long and thin and arched land, 2,000km from north to south and 2,000km east and west, is divided into four islands. A big mountain range parts between the Pacific side area and the coast of the Japan sea side area, and therefore such as flats and basins, which makes it difficult both for humans and things to use the land and travel.
- ② Geological conditions and Ground: Geological

conditions of the mountain area which occupies 70% of the land is subdivided varyingly because of the strong crustal changes and is prone to sediment disaster. The alluvial plain on which most big cities exist has soft ground.

- ③ Earthquake-prone: This is connected to the geological conditions and ground, twenty percent of the big earthquakes with magnitude 6 or more in the whole world are said to occur in Japan. Therefore, the earthquakes are felt strongly in the cities in which population and assets are concentrated. Also big tsunami could strike at the coast.
- ④ Meteorological phenomena: Annual amount of rainfall range 1,400mm to 1,600mm, which is twice of the world average. In typhoon and rainy seasons, Japan is often hit by heavy rain. The Sea of Japan side is hit by heavy snow.

It is not easy to maintain and control the infrastructure under these severe land conditions. But once we fail to make efforts, the country would not be able to go on as a civilized country.

### 3. Disaster Prevention

We had two great disasters in Japan two years ago; The Great East Japan Earthquake in March and the great flood on the Kii peninsula in September. Last year, we had a tornado of F3 in Tsukuba in May and the heavy rain in north part of Kyushu in July. It is pointed out that the Japanese islands have entered a period of brisk seismic activity, and heavy rainfall characteristics which are seemingly caused by climate change associated with global warming

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that is happening frequently today. The most important subject is to strengthen the infrastructure for disaster prevention towards better resilience to these conditions.

After The Great East Japan Earthquake, the necessity to consider for every possibility by putting the latest scientific knowledge in force so that we would not repeat the so-called “over assumption.”

Especially against tsunami which inflict enormous amounts of damage, though occurrence frequency is very low, “the largest class of tsunami (level 2 tsunami)” which inflicts enormous amounts of damage was decided to be reviewed with thinking about every possibility, based on the latest scientific knowledge. Though “the biggest class of tsunami” in Nankai has just already been reviewed by the Cabinet Office and disclosed in public, there are areas where the height of tsunami exceeds 30 meters.

The facility improvements which purpose is to completely protect the urban area from the external source are not realistic. As for countermeasures against level 2 tsunami, there is a real need for the combination of hard measures, such as the improvement of resilient and adaptable facilities to protect the coast or multiple protection facilities for which road embankments are used and the soft measures, such as preparation of hazard maps, centered mainly on evacuation.

Resilient and adaptable facilities protect the coast are constructed to extend the time it takes for the facilities to be leveled as much as possible or to reduce the possibility to come down completely as much as possible even if the height of the tsunami exceeds that of past tsunami that form design basis of the facilities (tsunami which occur about once a century) and overflows the breakwater head. In the architecture field, new provisions about secondary design were established in 1981, when Order for Enforcement of the Building Standards Act was revised, based on the post-disaster situation of the

Miyagiken-oki earthquake in 1978, so that horizontal load bearing capacity as well as conventional stress allowance should be calculated to judge the quake resistance of buildings when considering the strength and toughness (deformation capacity and tenacity) of the buildings against force of the earthquakes.

Additionally, for the evaluation of seismic capacity of the bunk, the concept how the post-disaster bunk should be due to earthquakes was introduced after the Great Hanshin earthquake. However, facilities have only scarcely been built based on the premise of the destruction and collapse. Engineers who plan and design facilities should always have those images in mind of the functions brought out before construction to prevent disasters.

#### 4. Strategic maintenance and control

Last December, an accident occurred in the Sasago Tunnel on Chuo Highway, in which ceiling panels came crashing down and 9 people died. From the point of disaster prevention, safety and security, it is a pressing issue to go ahead with strategic maintenance and control not only in tunnels but also in all the other facilities because it is expected that the infrastructure in which we invested heavily during the high economic growth period would become older.

Needless to say the fundamental strategy of maintenance and control of infrastructure should be “preventative maintenance,” by which damage or defects are to be found early and appropriate countermeasures are to be taken before deteriorating causes a grave crisis, and not be “breakdown maintenance” after severe damages happen.

The main measure against this will be the extension of life-span of the existing facilities by occasional reinforcement or repair work. However, as the service standard required goes up with the change of society and function would become obsolete with the improvement of the surrounding technologies, we should consider the

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renewal and improvement of the facilities. It is also important to take into account of the life cycle of the facilities, such as planning, design, construction, maintenance, control and abolishment.

The process of “preventative maintenance” is as follows: 1)inspection and diagnosis of the targeted facility 2)evaluation of the degree of soundness, 3) prediction of damage and deterioration, 4) planning the reinforcement and repair or renewal by adding the functional improvement of the facility which would be demanded in the future and 5) implementation of measures.

To complete this process maintenance of the “database” (including the records of inspection and repair etc.) of existing facilities and planning of the technical standard and technological development that is required for each step.

Unfortunately, there have been some failures in the construction and application of the database. The important points of views are: “For what and how is the database used?” “How is the system continuously used?” “How the various kinds of database are connected organically?” In addition, these points of views should be shared among the involved parties, from the people who enter the inspection and repair records into the system to those who process the data and decide the measures of the investing planning.

As for the technical development, we are achieving some positive results by the on-going development of the technology to inspect the place where visual check is hard to conduct and to observe the wide variety and large quantity of constructions efficiently and without fail by utilizing the civil knowledge in the general technological development project “Development of inspect and observing technology for preventative management of the social capital” (2010 – 2012).

In the future, not only inspection and observation, we have to press forward with the development of technology, with sensitively meeting the needs at each step of design and

execution and bringing in the advanced technology of each field, such as ICT.

## 5. Conclusion

Measures against disasters and deteriorations are the most important area for the Japanese people, now. Now is the time to involve ourselves in intelligence for good development and management of the infrastructure.

## 【References】

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