FNCA Study panel, March 7 2019

Environmental Impact Assessment of Tsuruga Nuclear Power Plant 3 and 4

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Contents

Overview of JAPC

Tokai No.2

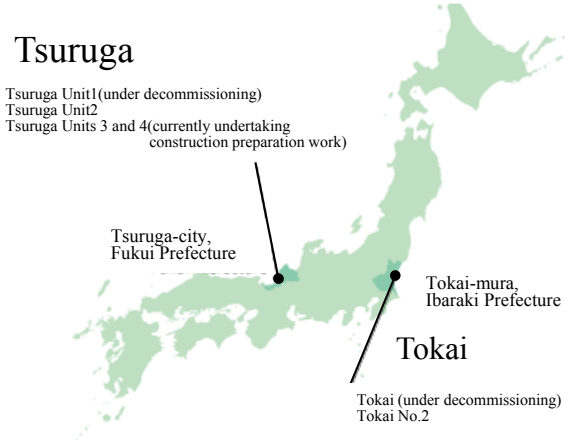
BWR5(1,100MWe)
C/O 1978-

First BWR-5 in the world

Tsuruga Unit 2

PWR(1,160MWe)
C/O 1987-

First PWR by domestic technology



Generation Ⅰ (Early prototypes)

Generation Ⅱ (Commercial Power)

Generation Ⅲ/Ⅲ+ (Advanced LWRs)

First NPP in Japan

Tokai

GCR(166MWe)
C/O 1966-1998
Dec 2001-

First Decommissioning in Japan

Decommissioning started : December 4, 2001

First LWR in Japan

Tsuruga Unit 1

BWR(357MWe)
C/O 1970-2015

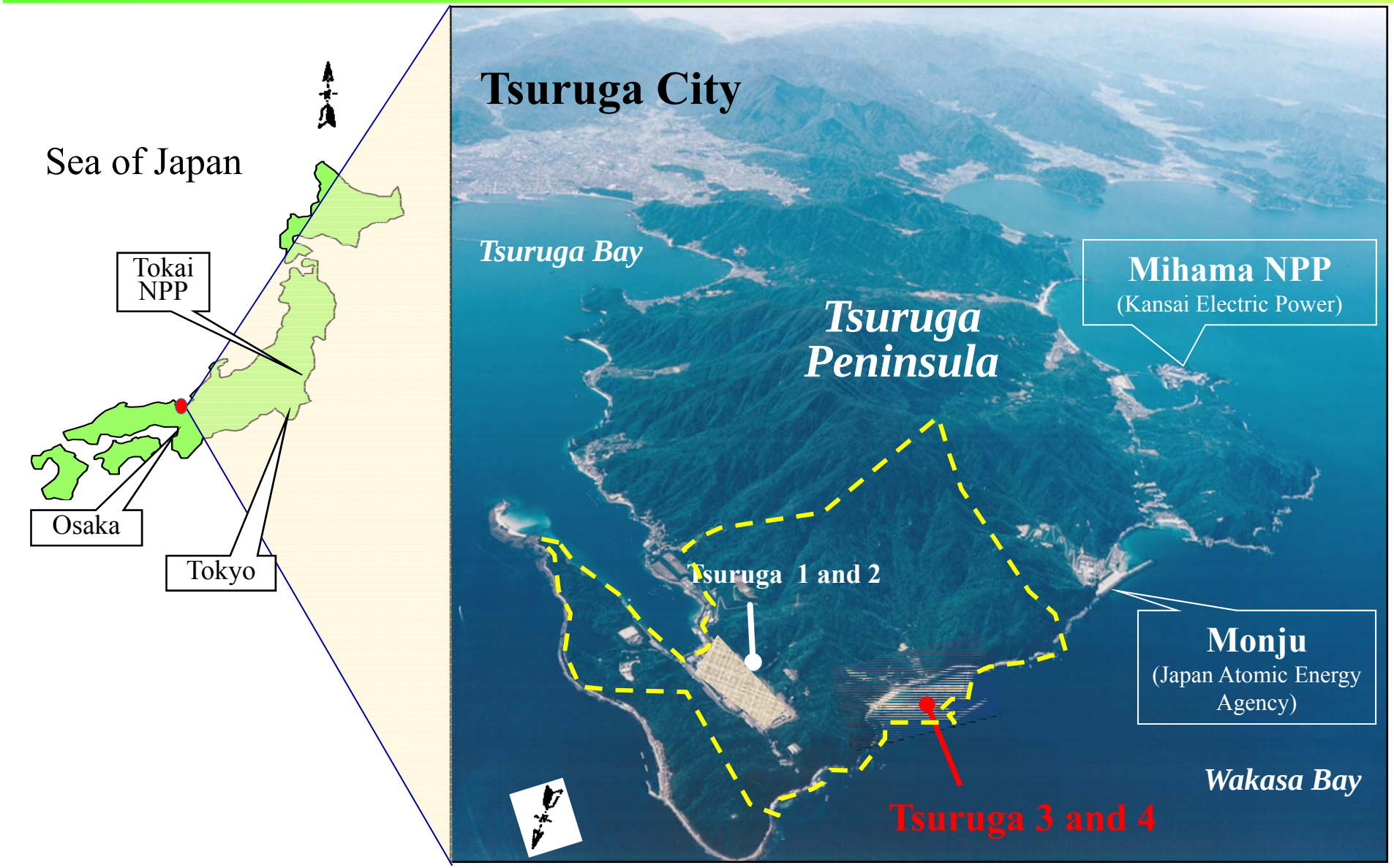
Decommissioning started : May 15, 2017

First APWR in the world

Tsuruga 3 and 4

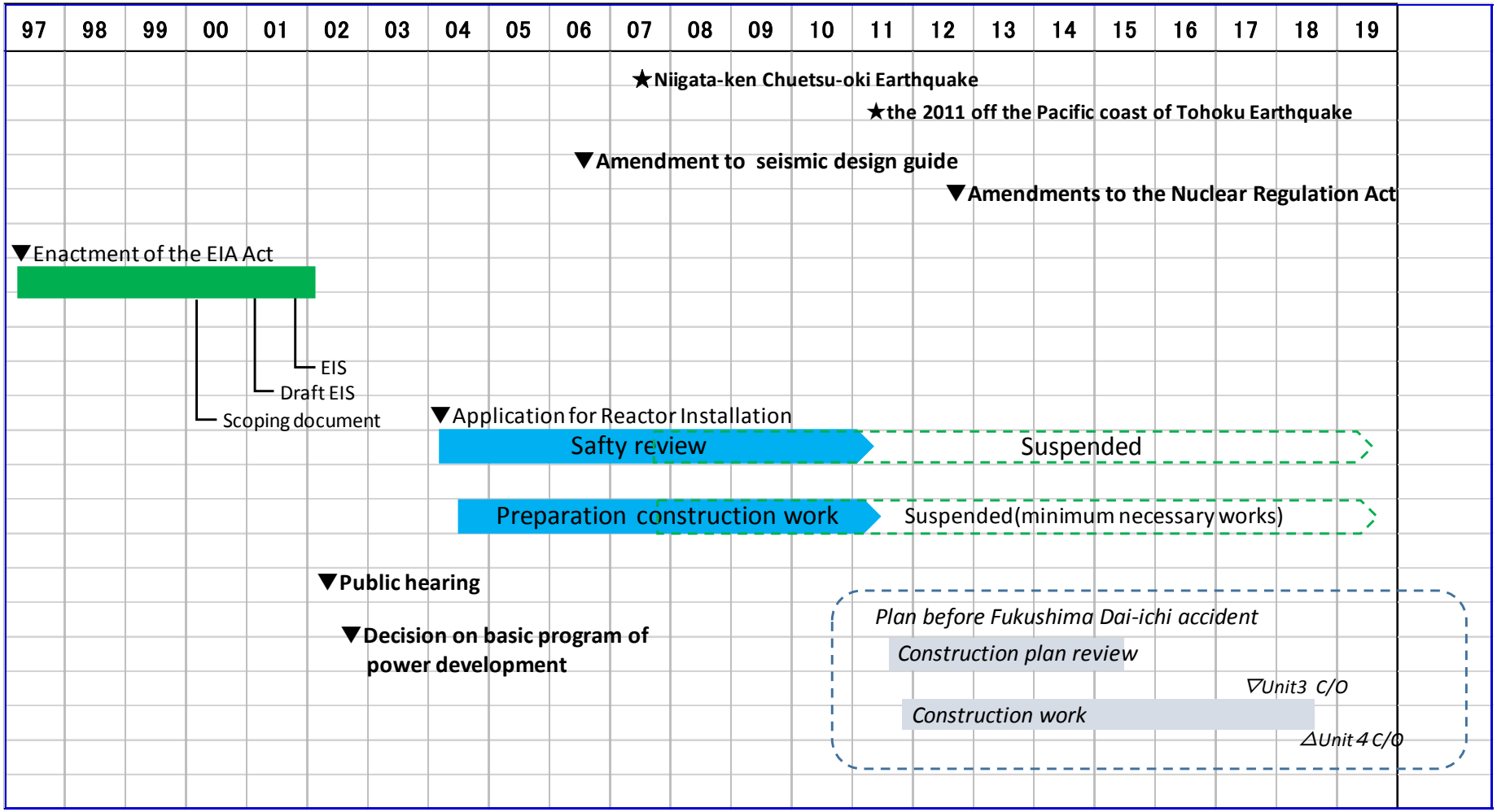
APWR(1,538MWeX2)
CPW 2004-
(construction preparation work)

Site Location of Tsuruga NPP

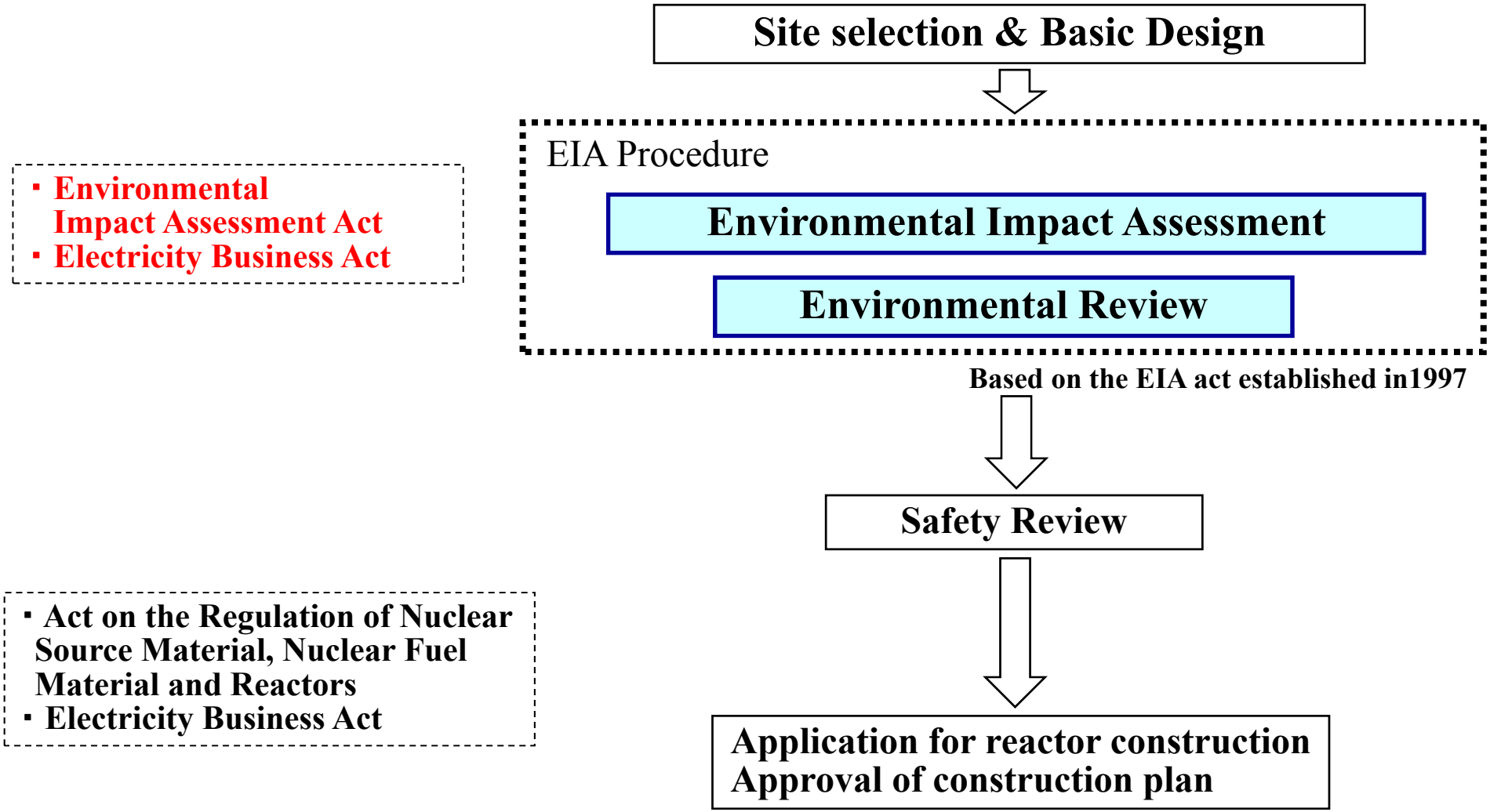


2. Outline of EIA

Tsuruga 3 and 4 Project schedule

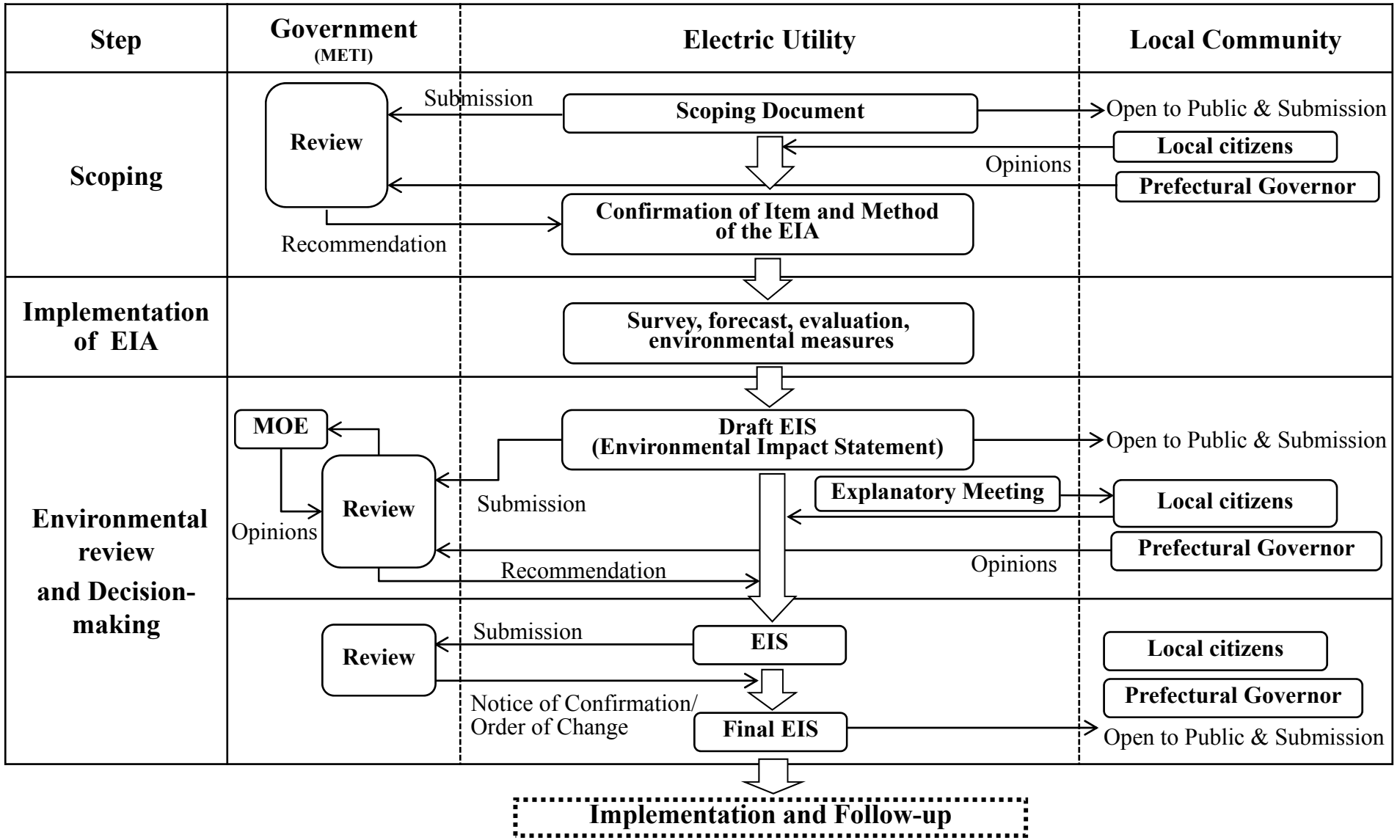


Regulatory Framework of NPP Construction in Japan

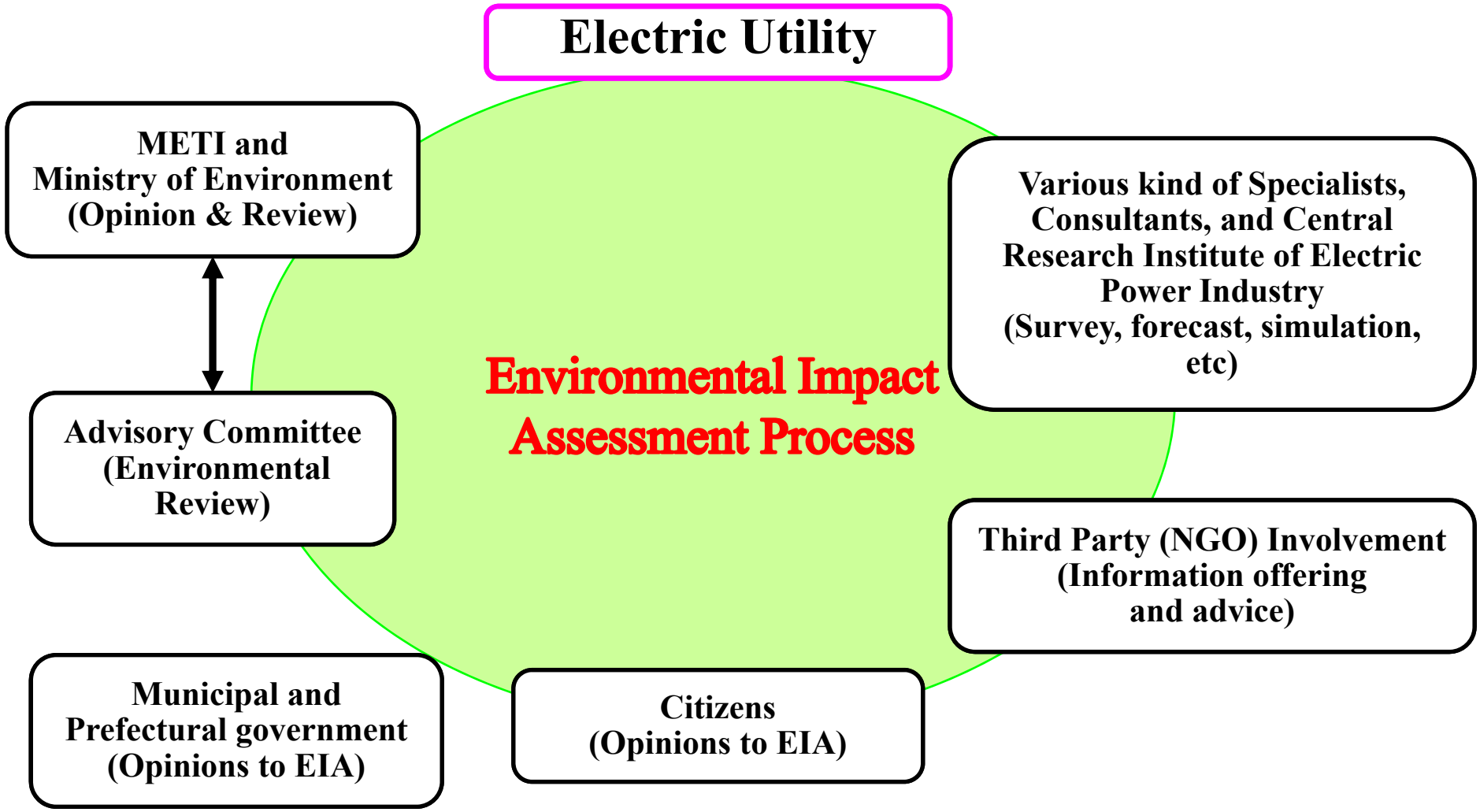


EIA Procedure of NPP Construction in Japan

Based on the EIA act established in1997



Related organizations of EIA in Japan



Public involvement (1)

Conformation of citizens involvement

Step	Process	Intention
Planning stage	・Public inspection ・Received opinions from citizens	Reflect the result in Scoping and subsequent procedures
Scoping stage	・Public notice and public inspection ・Explanatory meeting ・Received opinions from citizens	Consideration in determining the assessment method
Draft EIS	・Public notice and public inspection ・Explanatory meeting ・Received opinions from citizens	Consideration in the study of environmental measures , construction method and review of project plan.
EIS	・Public notice and public inspection	Make result of environmental assessment known to citizens.

Public Involvement (2)

Explanatory meeting for citizenes

Draft EIS Explanatory meeting

Tsuruga Citizen Culture Center

About 800 citizens gathered

Selected Items of EIA for Tsuruga 3 and 4

Environmental Elements (Factors) / An influence Factor				Construction			Operation						
				Transportation of Materials	Operation of Equipments	Reclamation (Temporal Effect)	Reclamation and Existing of Facilities	Operation of Facilities			Transportation of Materials	Waste Generation
								Drainage	Thermal Effluent	Operation of Equipments		
Living and Natural Condition	Air Environment	Air Quality	Nox	●	●						●	
			Dust	●	●							
		Noise		●	●						●	
		Vibration		●	●						●	
	Water Environment	Water Quality	Pollution					●				
			Turbidity		●	●						
			Temperature						●			
		Others	Water Flow				●		●			
	Topography						●					
Natural Environment	Animal	Terrestrial					●					
		Marine					●		●			
	Plant	Terrestrial					●					
		Marine					●		●			
	Ecosystem						●					
Contact with Nature	Landscape						●					
	Area to Commune with Nature			●			●				●	
Load on Environme	Wastes	Industriala Waste			●							●
		Surplus Soil			●							

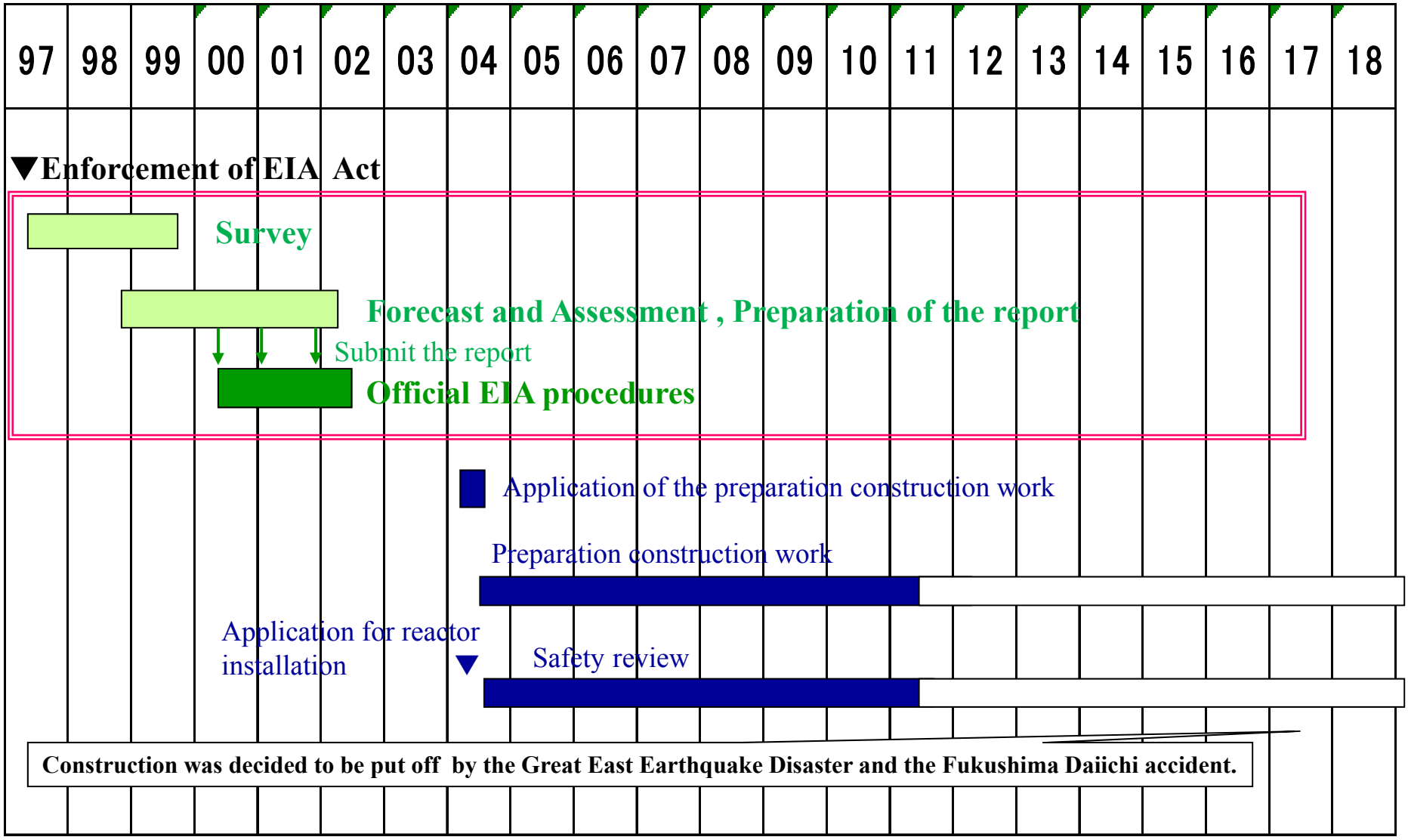
● : Items which were selected for environmental assessment of Tsuruga units 3 and 4
▭ : Standard items which were determined with guideline

Consists of a Final Environmental Impact

1. The name and address of the applicant
2. Purpose and summary of the proposed project
3. General information of natural and social conditions of the proposed area and its vicinity
4. Public comments on the Scoping document and opinions of the applicant, Recommendation of the Minister of METI
5. Public comments on the Draft EIS and opinions of the applicant, Recommendation of the Minister of METI
6. Items of the methods of survey, forecast and assessment
7. Advise from the Minister of METI to the methods of survey, forecast and assessment
8. Results of the EIA
9. Environmental measures
10. Environmental monitoring
11. Overall assessment of the Project
12. Names of the commissioned researchers and consultants

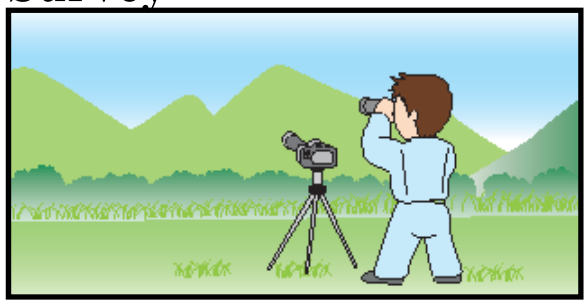
About 1,000 pages

Schedule of Tsuruga 3 and 4



Implementation of EIA

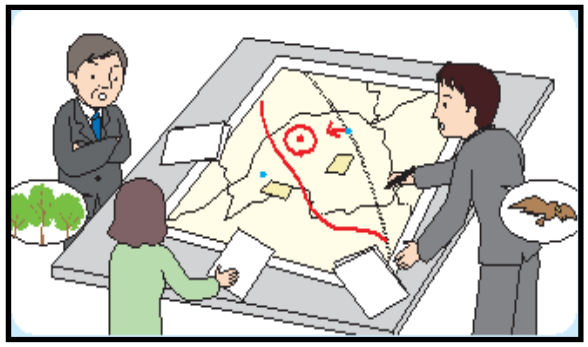
Survey



Collect environment information required for forecast and evaluation

[method of survey]
- **Collect information through the existing materials from the governments, scientific knowledge from experts**
- **Field survey in order to acquire the local environment information**

Forecast



Forecast quantitatively the amount of impact on the environment or change in state of environment

[method of forecast]
- **Numerical calculation by mathematical models, experimental model.**
- **Citation or analysis from the existing cases**

Evaluation

Influence assessment to environment by implementation of project

[Details of assessment]
- **Consider if possibility of the environmental impacts by the project are avoided or reduced to the extent possible, and the standards or targets concerning environmental protection are satisfied**

Source: MOE "ENVIRONMENTAL IMPACT ASSESSMENT IN JAPAN"

Survey of Current Condition

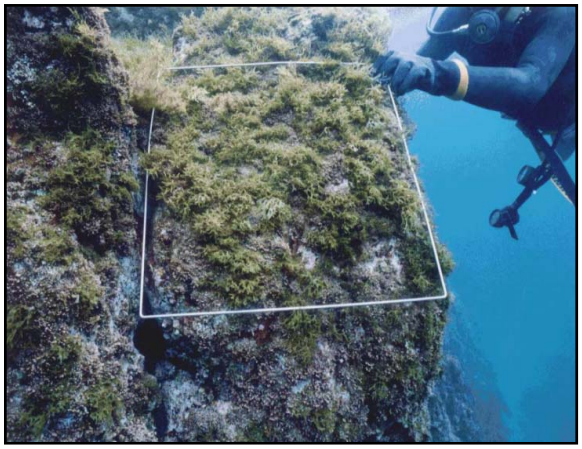
Air Quality

Land Animals

Noise and Vibration (Transportation)

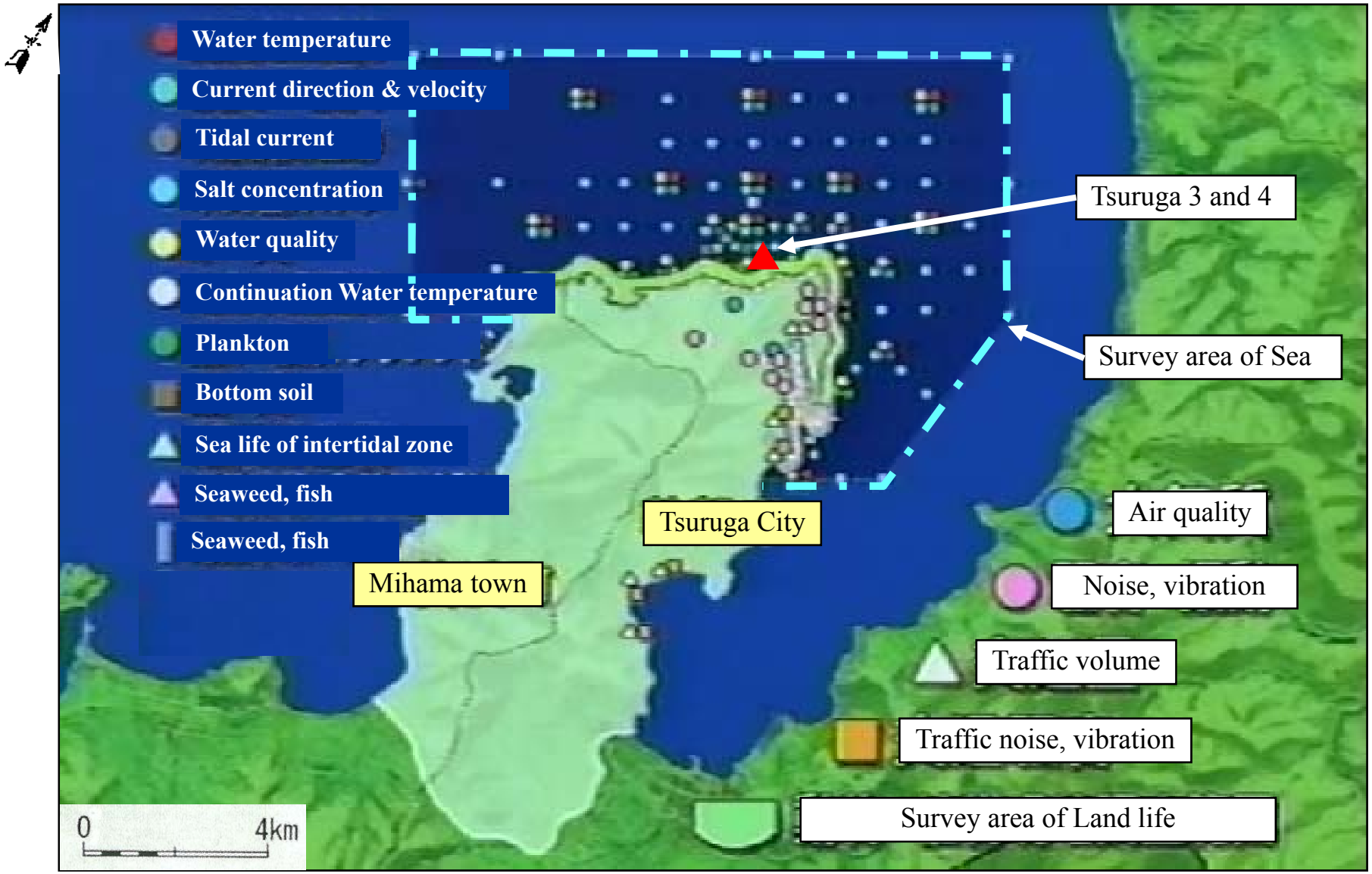
Water Quality

Marine Animals



Marine Plants

Scope and place of the survey



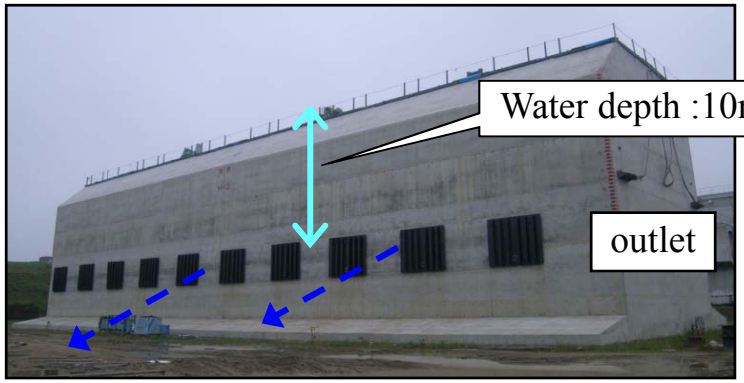
Methods of forecast

Method	Forecasting matter
Simulation technique	• Air pollutant dispersion (Material) • Thermal effluent diffusion area • Noise & Vibration level (Material transportation) • Amount of change of flow direction and Current
Model experiments	• Aerodynamic model tests (mainly in thermal power plant) • Thermal effluent diffusion • Hydrodynamic model tests for Thermal effluent diffusion (In case of complicated submarine topography)
Computer graphics	• Landscape Change (Change of landscape after construction by computer graphics) • Landscape Planting
Professional judgment	•Influence to the animals and plants and preservation
Reviewing case studies of projects in similar environments	•Influence to the animals and plants and preservation •Thermal effluent diffusion area
Comparison of monitoring data	• Air pollutant dispersion(Material) • Noise & Vibration level (Material transportation) •Influence to the animals and plants and preservation

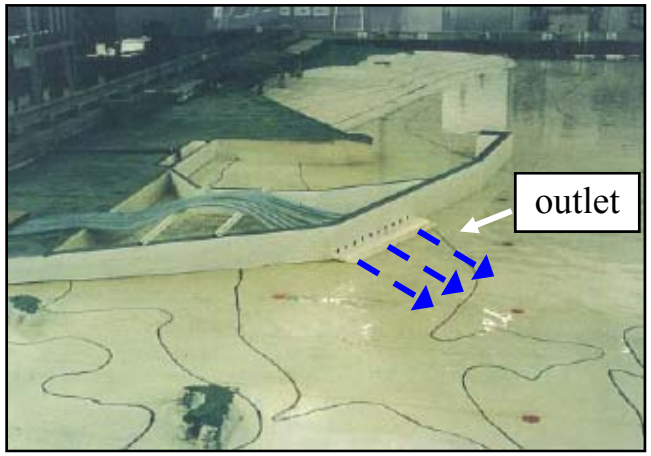
Source: UNEP "EIA Training Resource Manual, 2002"

Forecast of thermal effluent (1)

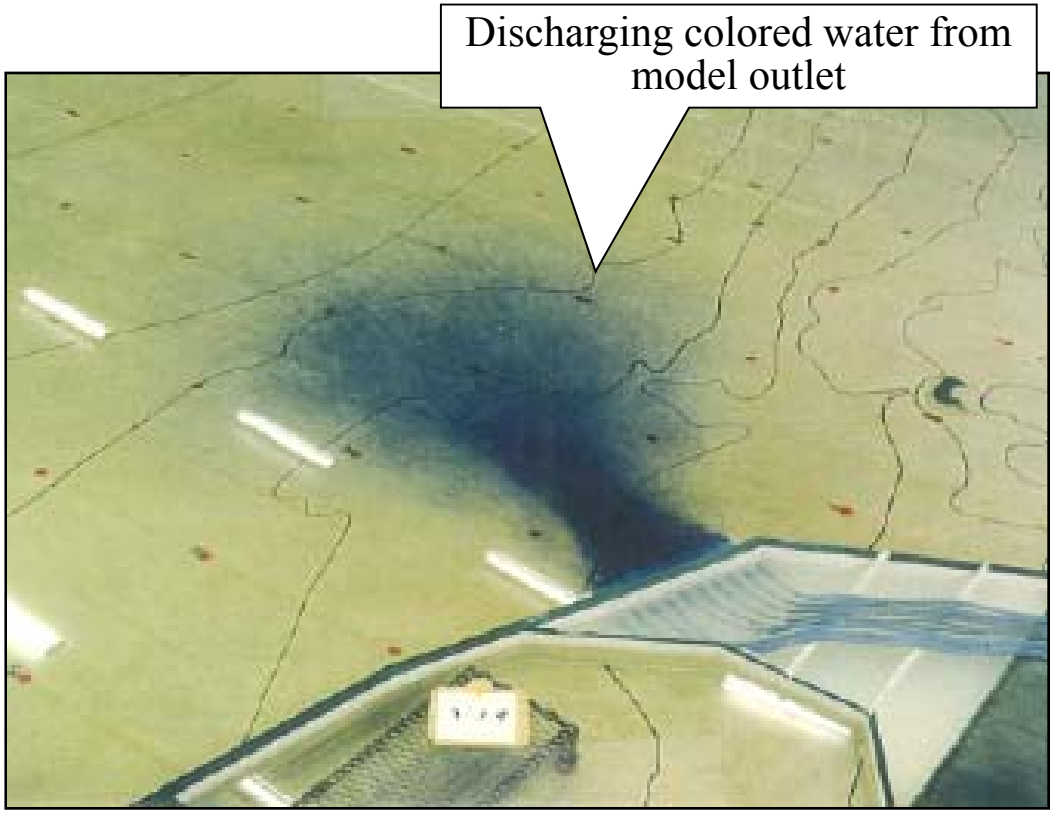
Hydraulics model experiment of thermal effluent diffusion



Outlet Caisson

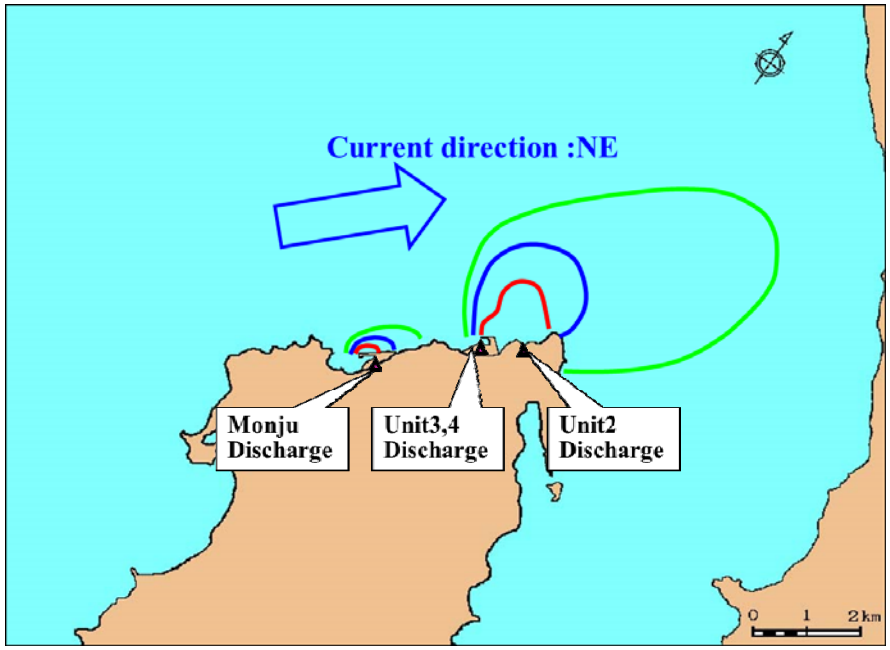


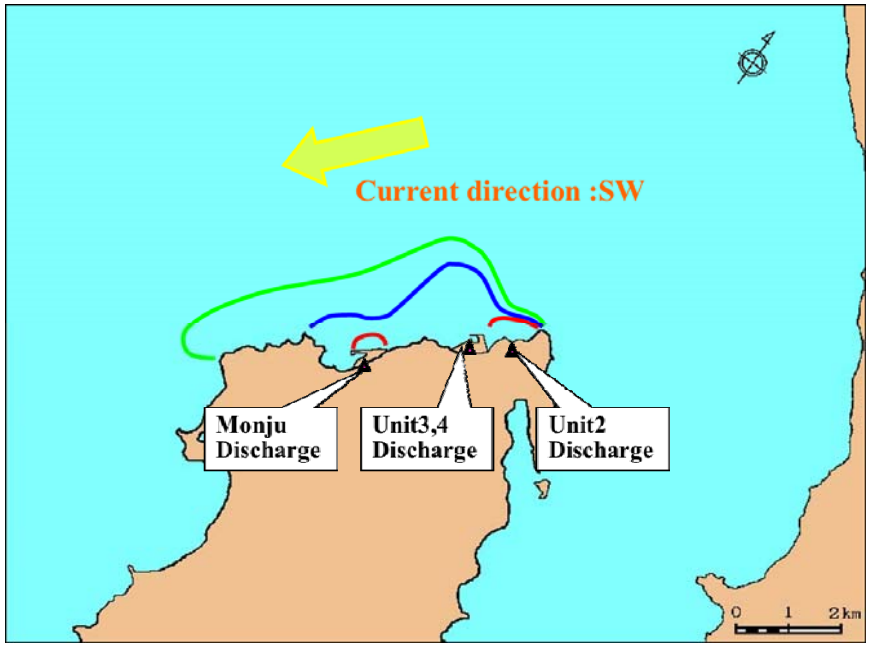
Fabrication of seabed model

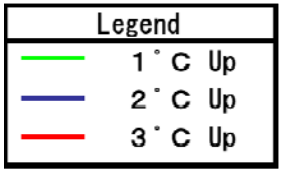


Forecast of thermal effluent (2)

Estimated diffusion area of thermal effluent in SW and NE current direction

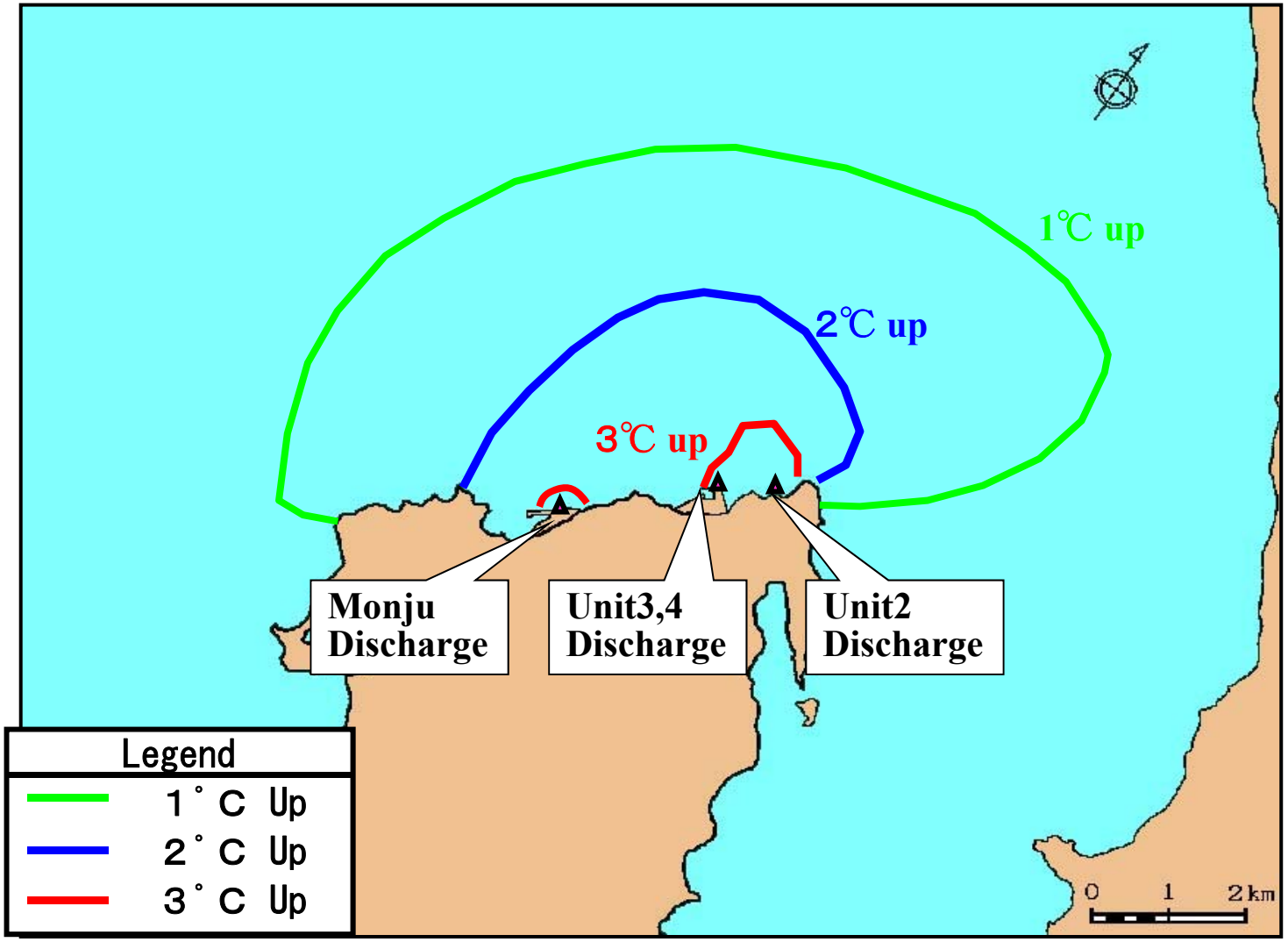






Forecast of thermal effluent (3)

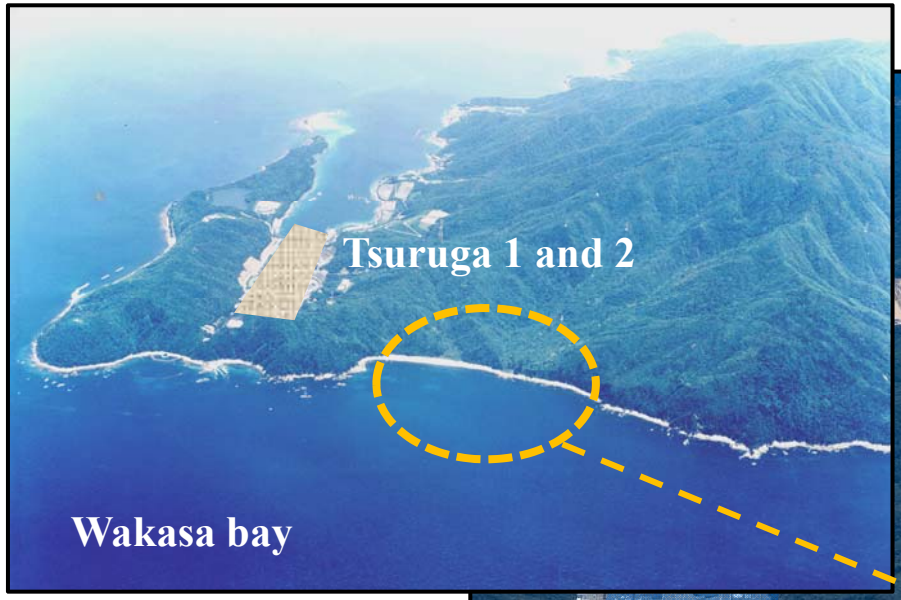
Diffusion area of the thermal effluent

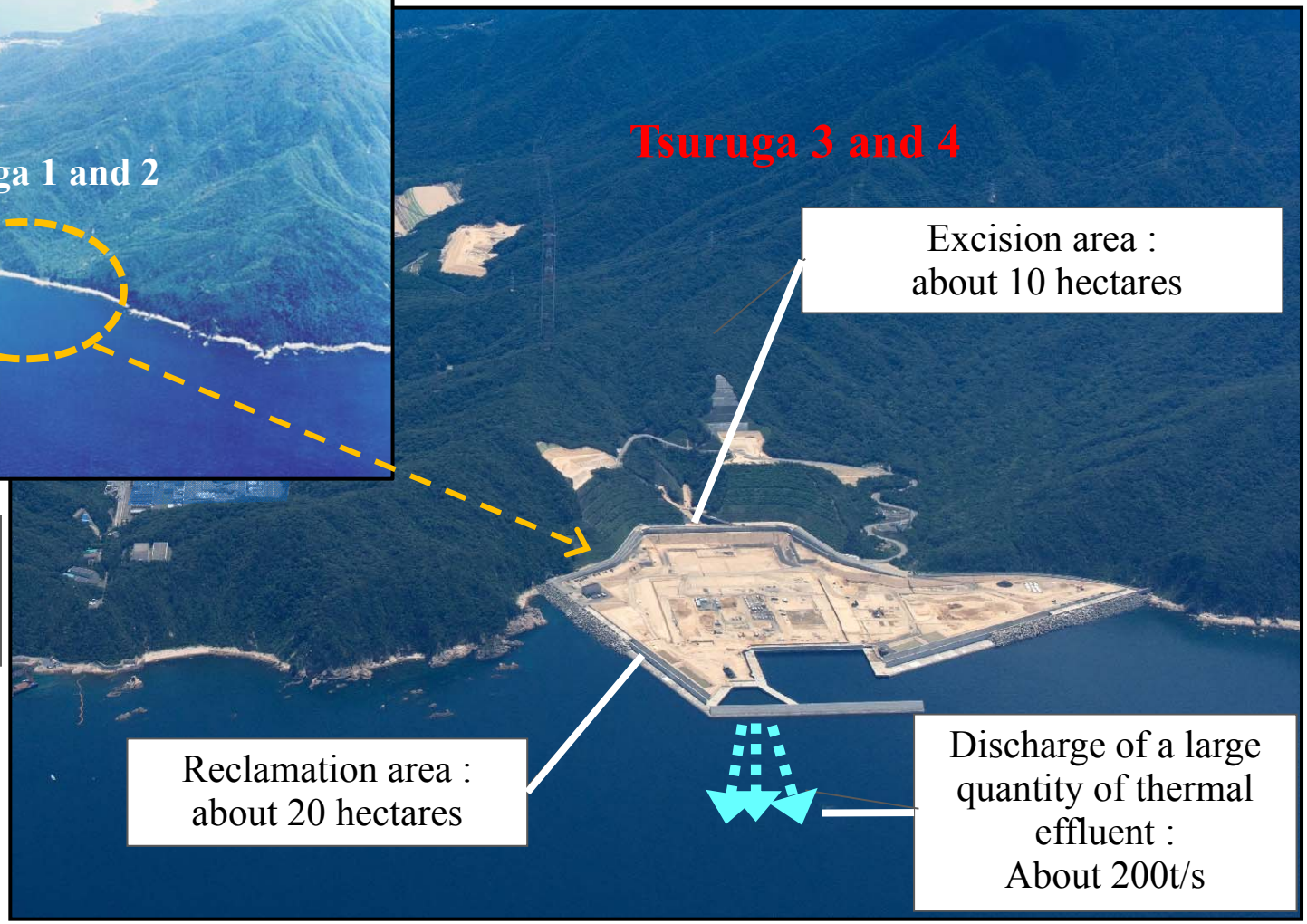


Environmental Measures

order of measures	summary	Examples Tsuruga 3 and 4
Prevent (or avoid)	・Important spots are excluded from project field ・Modification of the grading place ・Including a halt of a project	・Conservation of natural habitat ・Preserve particular spot (sea cave)
When it's not possible		
Minimization and Reduction	・Reduction of the grading place or felling field ・Reduction of diffusion area of thermal effluent	・Minimize reclamation area ・Deep layer sea water intake ・Temperature rise is limited up to 7℃ at condenser outlet
When impact cannot be prevented by any of the measures		
Mitigate or Compensate	・Tree planting, Transplant of the animals and plants ・Make new habitation in the different place	・Tree planting by local breeds of the slope, Seaweeds plantation, transplant of the animals and plants ・Installation of integrated discharged water treatment facilities and silt protector, Washing of construction vehicles ・Color coordination to harmonize with environment

Site of Tsuruga 3 and 4



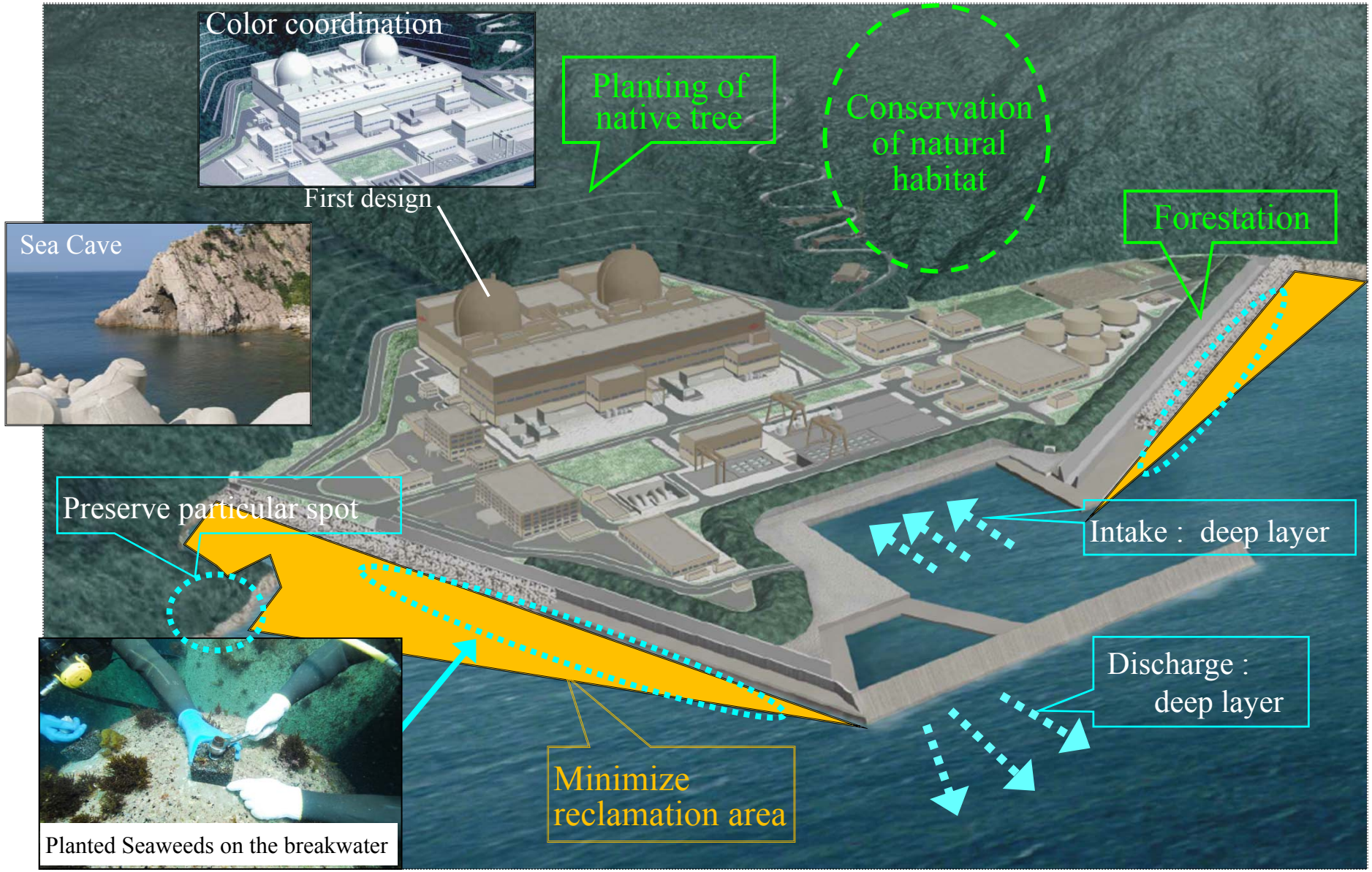


Large-scale site requires in NPP construction

⇩

Negative impact on the environment must be considered

Environmental measures of Tsuruga 3 and 4



Environmental measures (1)

▶Air pollution

- ・Use of low-emission vehicle and construction machinery

▶ Thermal effluent

- ・Take Cooling sea water from deep layer of the sea
- ・Temperature rise is limited up to 7℃ at condenser outlet
- ・Discharge from deep layer and at high velocity

Environmental measures (2)

- ▶ Conservation of plants, animals and ecosystem
  - ・Minimized land transformation
  - ・Avoid land alteration in the area vulnerable animal or plant inhabiting
  - ・Transplant of vulnerable plant to another habitat
  - ・Planting of native tree at the area of land alteration
  - ・Planting seaweed on the breakwater

- ▶ Water contamination
  - ・Installation of integrated discharged water treatment facility(under construction work)

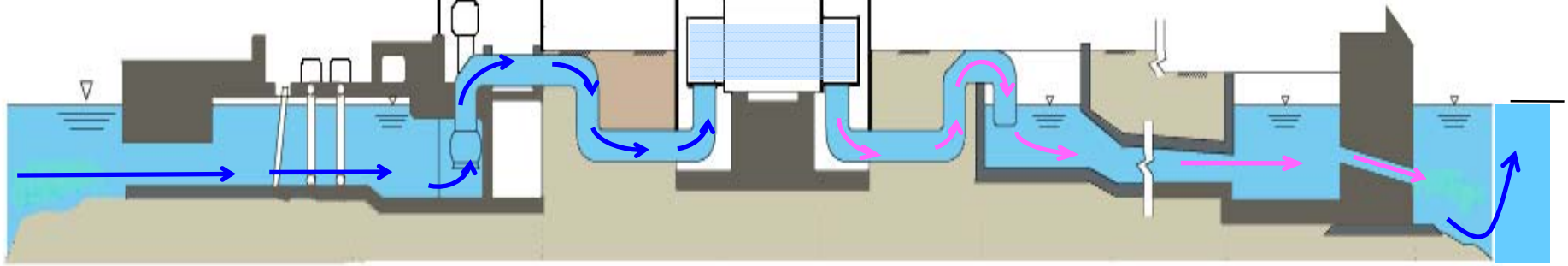
Example of environmental measure (1)

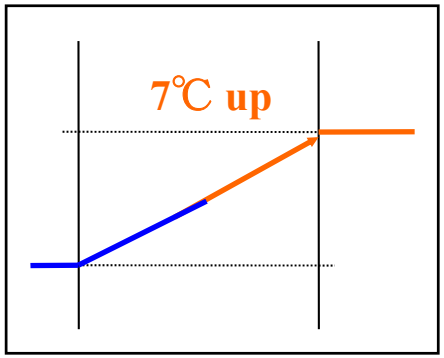
Mitigation measure of cooling water system

Intake :
Deep layer & Low velocity

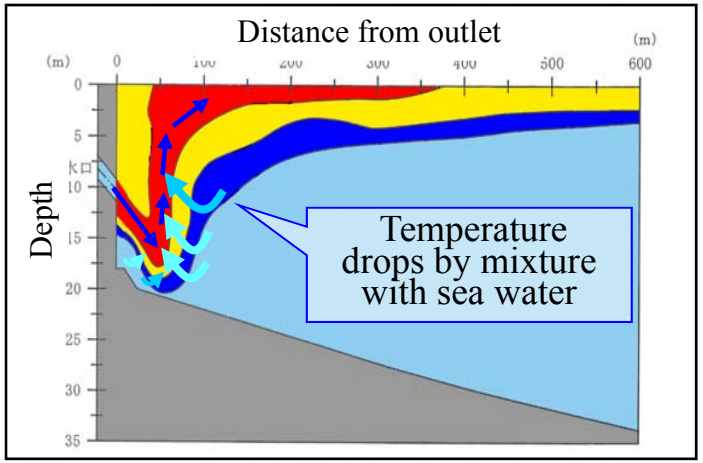
Condenser

Discharge :
Deep layer & High velocity

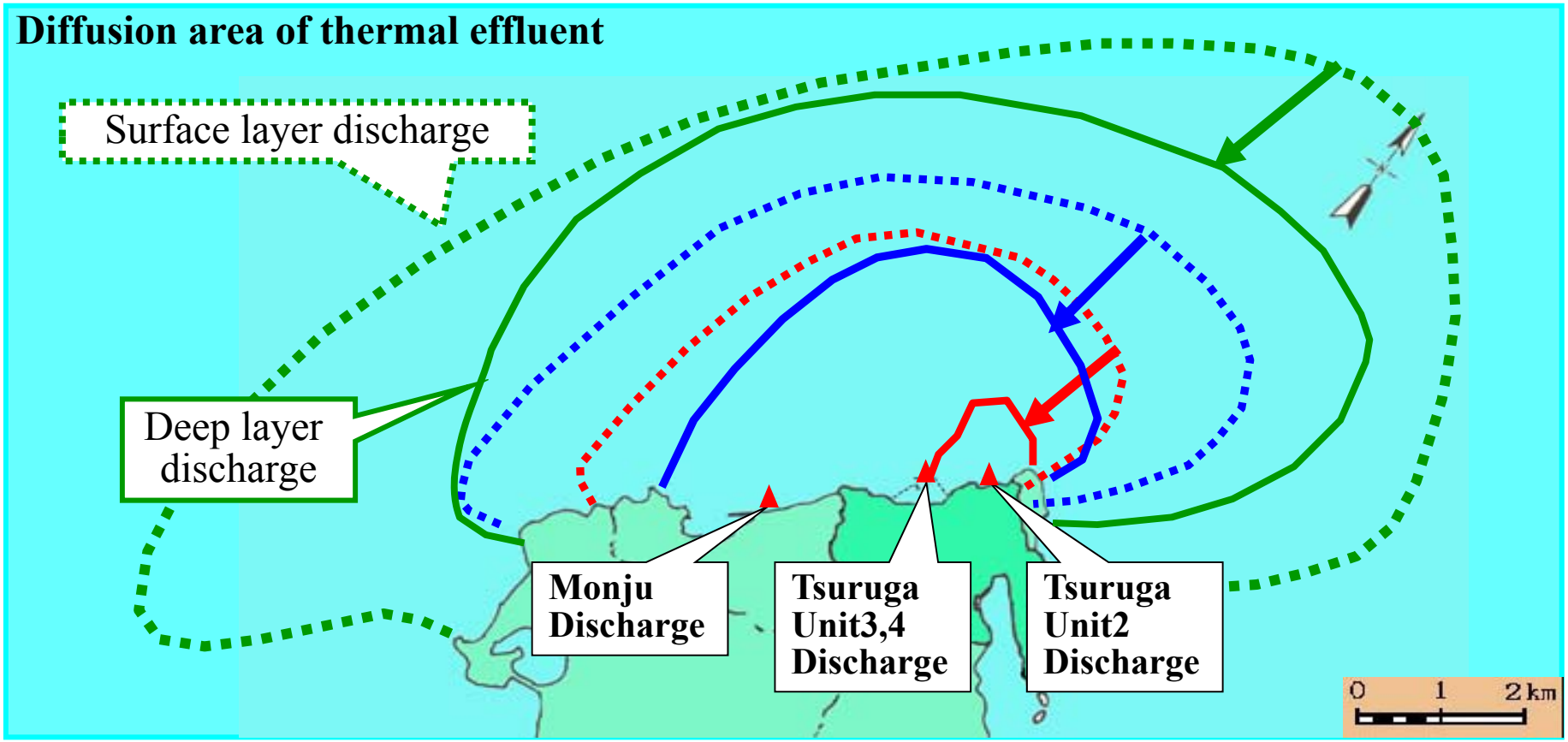




Temperature rise limit



Example of environmental measure (2)



Example of environmental measure (3)

Water quality protection

Flushing of rubble

Discharged water treatment facility

Environmental conservation of excavation slope

Wood chip

Composting

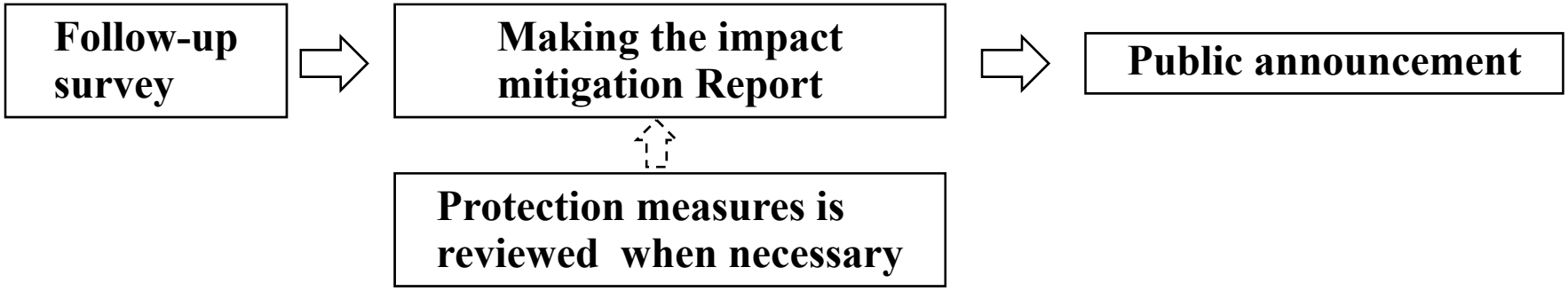
Planting of native tree

Purpose of Monitoring (Follow-up)

After the procedure for the EIS is completed and construction is started, a follow-up survey is conducted in order to monitor environmental condition at the construction and operation stages.

Environmental monitoring activities are;

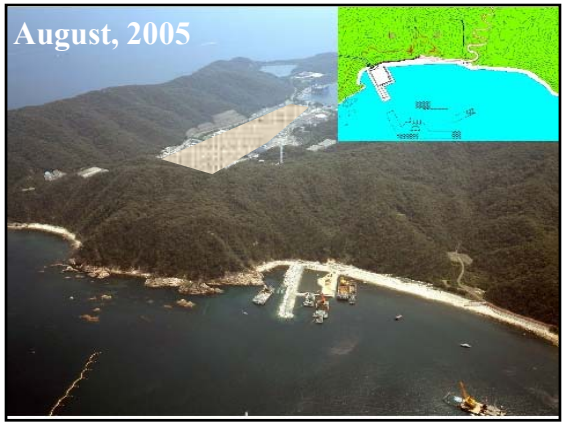
- **Establish baseline conditions**
- **Measure actual impacts and trends**
- **Verify the conditions are satisfied with the environmental standards**
- **Measure to unanticipated impacts**
- **Determine the accuracy of impact prediction**
- **Review the effectiveness of mitigation measures**



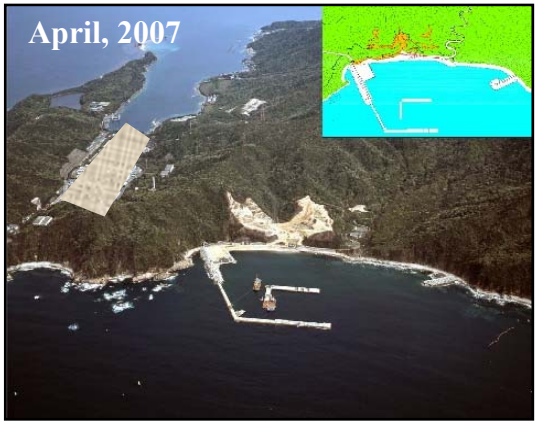
Examples of Measures in construction work

Process of Preparation Construction Work

Before preparation work
(July, 2004 : Started work)

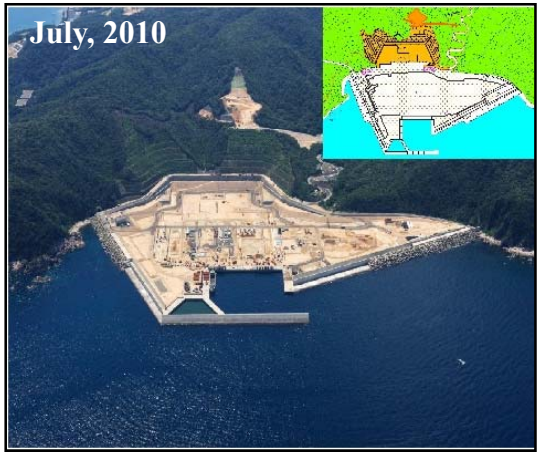


One year and two months later
(July, 2005 : Started the Seawall work,
Access tunnel excavation)



Two years and nine months later
(Caisson Installation & Trimming work)

Three years and ten months later
(Trimming and reclamation work)



Six years and six months later
(Cutoff wall and additional cutting off work)

Monitoring Program（Construction stage)

Environmental Items	Description
Air quality (transportation, construction machineries)	・Once at a peak period of construction works (continuous during a week) ・Construction area boundary and neighborhood residence place ・School which is located in a transportation route
Noise & Vibration (transportation, construction)	・Once a year(24 hour) at road side ・(same as above)
Water quality (Turbidity)	・Once a day during dredging work ・Marine structure construction area boundary
Terrestrial animals, plants and ecosystem	・Suitable time for observation of behavior or growth of each organism ・Habitation area of the rare animals and plants (Flower)
Marine organisms	・Once a year during marine works ・Marine structure construction area boundary
Industrial waste (generation, recycle)	・Timely ・The whole construction

Follow-up survey is done with survey method of environmental assessment basically

Environment Monitoring (1)

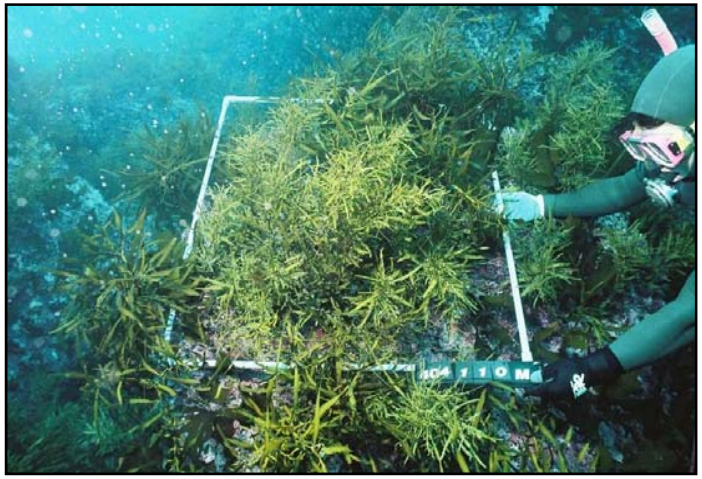
Traffic noise and Volume

Air pollution

Bats survey

Birds survey

Environment Monitoring (2)



Growth situation of seaweed

Water quality survey

Growth situation of forest

Growth situation of rare plant

Environment Monitoring (3)

Environmental measure of excavation slope

Planting of native tree

1 year later

3 years later

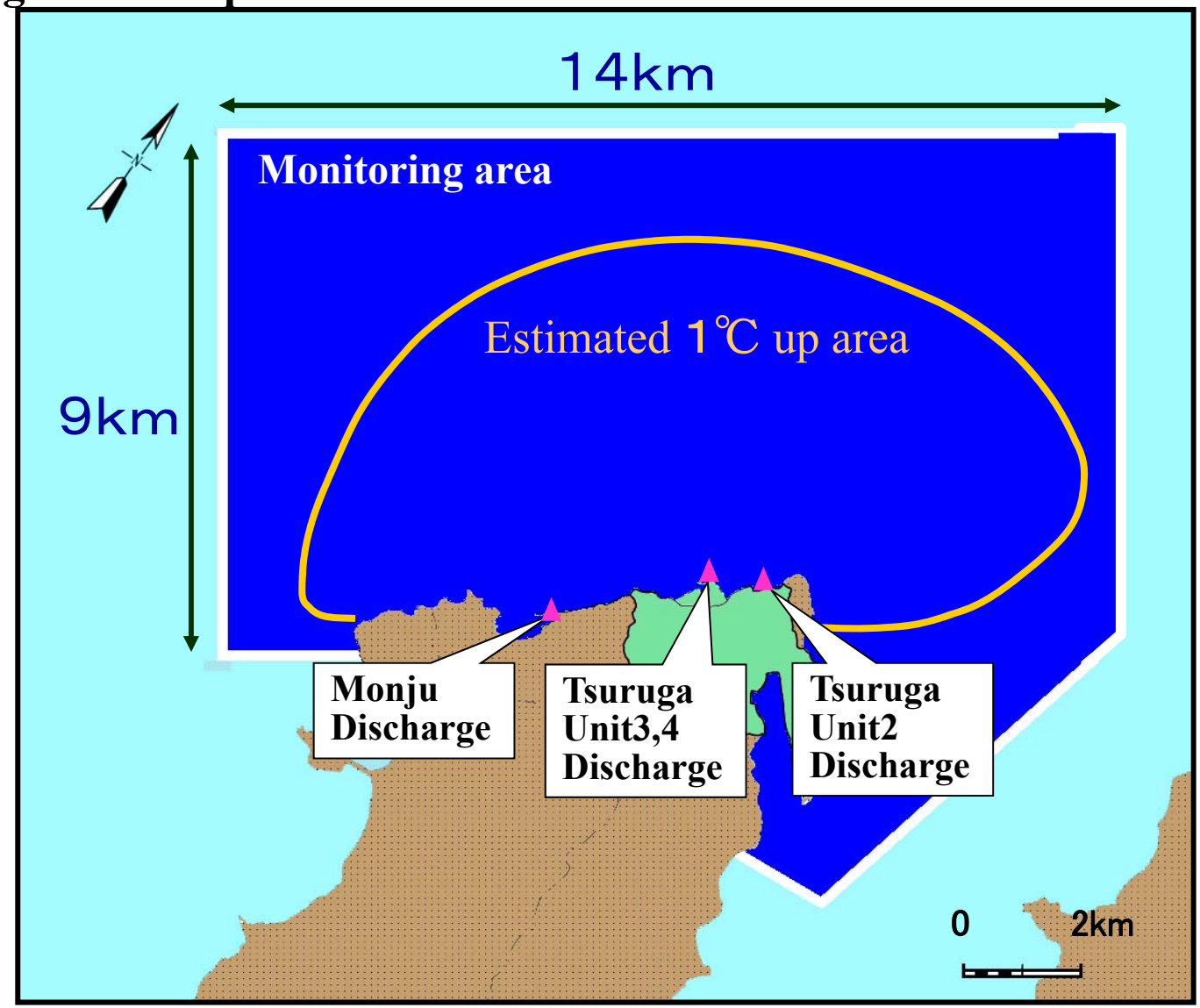
4 years later

Monitoring Program（Operation stage）

Environmental Items	Description
Air quality (auxiliary boiler)	・Once a year ・Exhaust exit
Noise (plant equipment)	・Once a half year ・Site boundary and a neighborhood residence place
Sea water quality Marine organisms	・Every season ・Area in front of water intake and where temperature of thermal effluent increases by 1℃
Thermal effluent diffusion (temperature, flow)	・Every season ・(same as above)
Terrestrial animals, plants and ecosystem	・Suitable time for observation of behavior or growth of each organism ・Habitation area of the rare animals and plants
Industrial waste (generation, recycle)	・Timely ・Site of a power station

Environment Monitoring

Monitoring area in Operation



Thank you for your attention