Master's Program in Environmental Sciences
Doctoral Program in Sustainable Environmental Studies
University of Tsukuba, Japan

Final Report of the Domestic Internship in Kumamoto and Nagasaki

November 26th- 29th, 2012

Environmental Diplomatic Leader Education Program,
University of Tsukuba, Japan

University of Tsukuba

Environmental Diplomatic Leader

Strategic Funds for the Promotion of Science and Technology

Edited and compiled by
participants of the 2012 Domestic Internship

Participants of the Domestic Internship

Professors: Xiaogang SUN (Associate Prof.)
Rie MURAKAMI-SUZUKI (Assistant Prof.)
Vo le PHU (Vice Dean, Faculty of Environment, Ho Chi Minh city University of Technology)

Students: Marjangul NURYMKHAN (Mongolia, M1)
Yasin BANU (Nepal, M1)
Thu Hang DINH (Vietnam,M1)
Wei YANG (China, D1)
Adrianus AMHEKA (Indonesia, D1)
Qian ZHOU (China, D1)
Minh Khue DAO(Vietnam, M2)
Rajeev Sign KUMAR (Nepal, M1)
Van Minh VU (Vietnam, M2)
Nguyet Anh DANG (Vietnam, M2)
Md Tofail MIAH (Bangladesh, M1)
Munkhjargal ERDENEBADRAKH (Mongolia, M1)
Tu Anh NGUYEN (Vietnam, M2)
Nam Thang HA (Vietnam, M2)
Wenlong WANG (China, M1)
Junping LIU (China, D1)

Group photo

Minamata Disease Research Center

The Peace Statue in Memorial Peace Park

Schedule (November 26th- 29th, 2012)

	Day	Morning	Afternoon
1	Nov 26 (Mon)	04:30 Meeting time at Tsukuba center bus terminal no.8 04:40 Departure from Tsukuba center (Highway bus) 06:30 Arrival at airport Terminal 1 (check in and meet with Prof. Sun) 08:05 Departure from Haneda Airport (JL1803) 09:55 Arrival at Kumamoto Airport 11:30 Unit members are picked-up by city officers at hotel 12:00 Lunch (@Bros Kaneko, get together all members)	13:30 Minamata eco-town 1. Act-B recycling Co,Let 14:50 2.RBS Co,. Ltd (Composting of night soil) 16:10 3.Minamata Environemental Techno Center (Discuss with city officers) 17:00 Supermarket (water, sweets…you can't buy them around hotel.) 18:00 Arrive at hotel (Umi to Yuyake, Minamata city)
2	Nov 27 (Tue)	08:00 Departure from the hotel→go around on the way to museum 09:00 Minamata Disease Municipal Museum and Minamata Disease Information Center 11:40 Lunch (@Fukuda Farm Villa Española)	12:40 National Institute for Minamata Disease (experiments and discussion) 17:00 Leave from the institute→to Kumamoto city 18:45 Breaktime at Miyahara Highway Rest Area (if someone wants) 19:00 Arrival at Hotel (Chisun Kumamoto, Kumamoto city)
3	Nov 28 (Wed)	06:15 Departure from the hotel→Kumamoto Port 07:30 Kumamoto port (Ferry)→Shimabara Port 08:00 Arrival at Shimabara Port 08:30 Yue fishery harbour and Ariake fishery association 11:00 Lunch(@Nagasaki Kasutera Center)	12:15 Shirakimine plateau (View of Isahaya bay) 12:50 Kantaku no Sato (small museum of Isabaya reclamation) 15:00 Isahaya-bay Reclamation Office 17:00 Leave from Isahaya city→Nagasaki city 18:00 Arrival at hotel (Hotel New Nagasaki, Nagasaki city)
4	Nov 29 (Thu)	09:45 Departure from the hotel 10:10 Tokiwa Port (Ferry)→after guidance, Gunkanjima 11:10 Gunkanjima Island 13:00 Back to Tokiwa Port	13:30 Lunch & Free time 15:30 Nagasaki Atomic Bomb Museum 17:30 Leave from Nagasaki city→Nagasaki Air Port 18:30 Arrival at Nagasaki Air Port 19:35 Departure from Nagasaki Air Port (JL1854) 21:10 Arrival at Haneda Air Port Terminal 1→Hurry up to bus stop no.13! 22:00 Leave from airport→Tsukuba center (Highway bus, I hope all can ride!) 23:15 Arrival at Tsukuba Center

Contents

Part 1 Pre study presentations

Chapter 1 Minamata Diseases

Marjangul Nurymkhan
Yasin Banu
Thu Hang Dinh
Wei Yang
Adrianus Amheka

Should the government close down the Chisso Company in Minamata? Yes or No

In our previous study of Minamata Disease, we not only gave the presentation of information of minamata disease, but also we have the opportunity to discuss the problem "Should the government close down the Chisso company in Minamata?". I think it is especially important for the EDL members to join in such kind of discussion by using of our knowledge, logic, expression and the ability to persuade others.

The students could choose "Yes Group or No Group", and then the discussion began.

The Yes Group students said that: "The official discovery of Minamata disease caused by methyl mercury discharged by Chisso factory plant has been conformed, so it is necessary to close the Chisso Company in order to stop the pollution immediately. If don't do that, the number of victims will be increase, and how to make sure that the Chisso company's activities will not lead to another disease in the future? Because of the specific location and the technology of production of Chisso Company, that is why Minamata disease only occurred in Minamata City, so it is urgent to close down the factory."

The other group also gave some reasons: "If the company stopped production, how can Chisso company provide compensation for victims, and also there are a large proportion of local people working in the company, if the company was closed down, the workers will lost their jobs, and at the same time they had no income. The Chisso Company should be responsible for this disease and environmental pollution; the company should have to cooperate with the government to solve the ecological environment of sea. So Chisso Company should change their technology of process and provide medical assistance to local patients. "

Although the Chisso company has been existing in Minamata city, we just use the information we have to simulate making decision as an environmental leader. If we are the decision makers, what we will do, what kinds of factors should we have consider and what kinds of actions we will take. I think that is the most important objective of this program.

MINAMATA Disease

a brief assessment with emphasis on Minamata disease

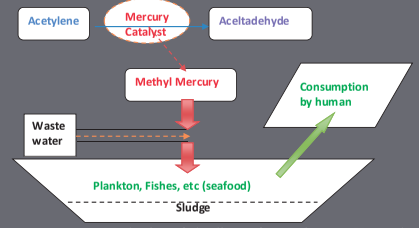
Prepare by
Adrianus AMHEKA (201235023)

Prepared to:
Preparation internship presentation
EDL Domestic Internship Program

UNIVERSITY OF TSUKUBA
November 14th, 2012

BACKGROUND

- Minamata disease was caused by consumption of fish , shellfish, etc (seafood) which methyl mercury is contaminated.
- Minamata disease was 1st identified officially in May 1st , 1956 (1st patient)
- Feb 20, 1963 formal announcement the disease caused by Chisso Minamata Factory
- Not only patients (pregnant) itself are infected but affect to their offspring (congenital disease).



Mechanism of the disease from Industry to Human body , *Adopted of Material course by Prof. Wakasugi, 2012*

Children with Congenital Minamata Disease due to intrauterine methylmercury poisoning (Harada 1986).

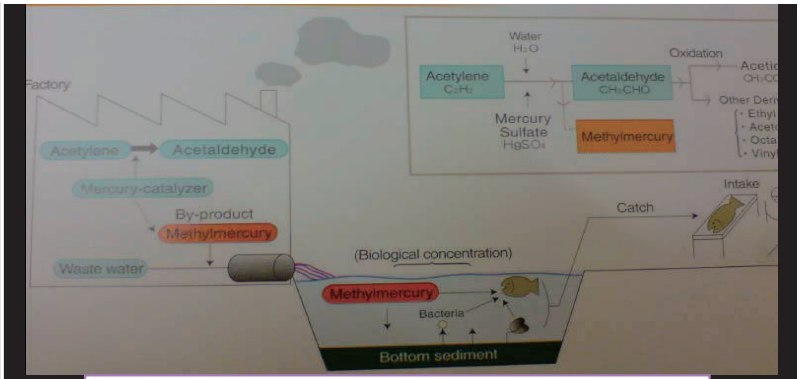


Figure 2, details route of methyl mercury from generation in Acetadehyde process to human body, Source: Minamata disease (its history and lessons), 2007

Clinical features:

- Affected central nervous system (brain) and liver, etc.
- Organic mercury pass through placenta and cause fetal Minamata disease.
- Wide range clinical course: Death –very severe-slight chronic-invisible
- Symptom: (Numbness, abnormal, Ataxia, Finger to nose/finger and test fail, cant not speak correctly, mental deficiency, memory disorder, Paralysis, Narrowed visual field, hearing loss

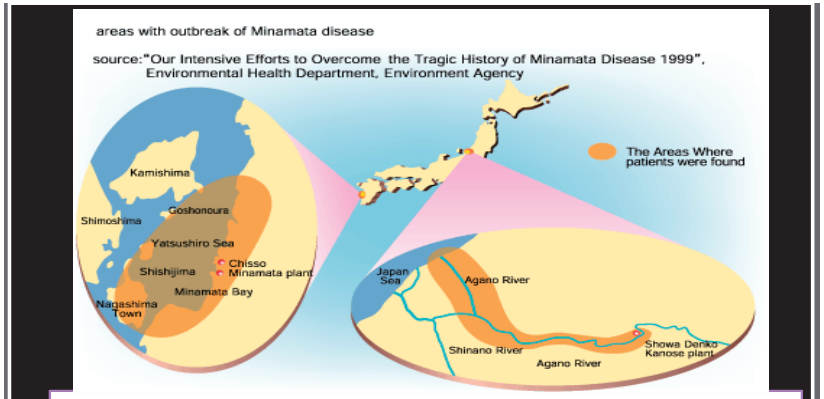


Figure 3, details route of outbreak of Minamata disease
Source: http://php.med.unsw.edu.au/embryology/index.php?title=Abnormal_Development_-_Heavy_Metals

The reality of fishery damage:

- Fish catchment was decrease dramatically since 1950/52 around 1,850kan - 540kan in 1956 and it of course effected on social-economic condition of society and also economic growth of Minamata municipality is hampered.

Researchers were taking part of the disease (local epidemiology research group, Kumamoto Univ. study group, etc)

- Researchers confirmed 74 of 121 house cats infected disease and the disease had already develop in Minamata area, but peoples were developing the disease without it being noticed.
- was many misunderstandings of the illness (until scientifically could answer what is exactly of the disease).
- June 1956 had discovered a number of patients and starting in mapping which family is infected and isolated in their home firstly. And then children patients are moving to isolation ward.
- Condition was faced very difficult but they keep strong and made contribution in etiological investigation of strange disease and found many patients and discovered that there was same correlation between cats and strange disease.
- **The great united efforts of the researchers were given valuable that the direction future countermeasures against pollution must be taking**

A medical doctor from Kumamoto Uni. (Dr. Harada), he was deeply became involved in the disease

Some reasons for the delay in officially acknowledging congenital Minamata disease patients (having CoI):

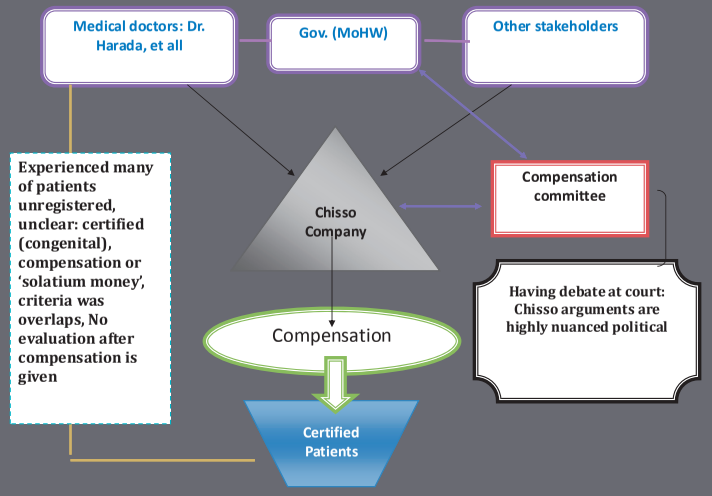
- Dr. Harada was recognized scientifically that congenital Minamata disease at children is caused of methyl mercury, however, Prof. Tatesu was an honest that we should not criticize the Chisso company under circumstance (methyl mercury is caused effected to children).
- According to Dr. Harada that Prof. Tatesu is quite reasonable to kept not aggravate the labor dispute at Chisso Company.
- After that Prof. Takeuchi and A/Prof. Matsumoto from Pathology department report the same case scientifically as Dr. Harada was told.

Solving problems:

Stakeholders: Medical doctor from Kumamoto Uni, Kumamoto Gov, etc were dealt and have agreed to make no mistakes or to avoid in handling Minamata Kumamoto disease. Why? Because the **impact has been extended to Kumamoto Minamata disease.**

- The methyl mercury sources of Chisso was distribute through Agano river basin (1958) effected for Niigata Minamata disease, whereas
- Kumamoto Minamata disease was caused by facility contaminated by methyl mercury of Chisso factory plant.
- **The idea of new concept was develop at the Minamata disease group including lawyers, etc (based on** book 'How to think about safety' by Taketani Mitsuo): "Industrial waste can be charged only when they are confirmed to be harmless"

Is any *politic will* in this complicated situation?



Recommedantions:

- Scientifically proven is necessary
- Communication approach is VERY VERY recommended.

Sugesstion:

Must be careful before deciding:

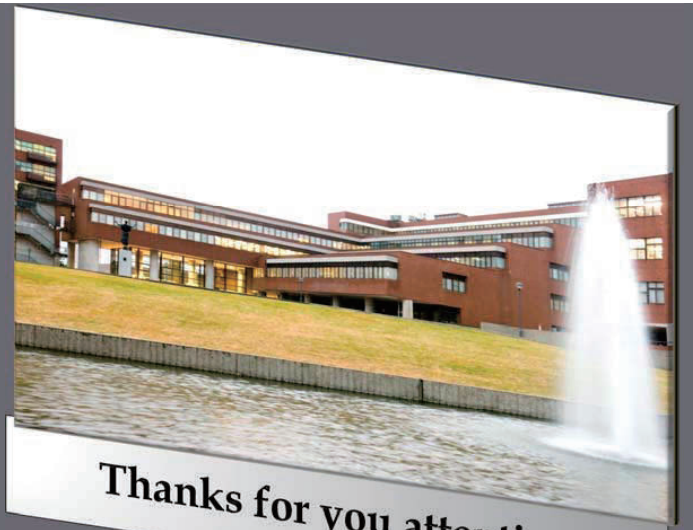
The Cisso company should to OPENED or CLOSED…

By carefully I decided should be:

OPENED

References:

- Harada M. 2004 (English edition), *Minamata Disease*, Kumamoto Nichinichi shinbun culture & information centre.
- Minamata City 2007, Minamata Disease: Its history and lessons, Minamata City



MINAMATA DISEASE

Marjangul Nurymkhan
Yasin Banu
Dinh Thu Hang
Yang Wei
Adrianus Amheka
Wang Wenlong
Liu Junping

Outline

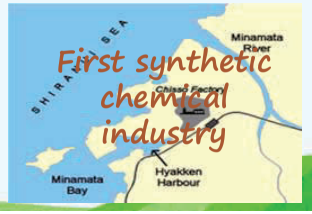
- THE FIRST PART
  About the Minamata city
  About the Chisso company
  About the Minamata disease
- THE SECOND PART
  A brief assessment with emphasis on Minamata disease
- THE THIRD PART
  Should the government close down or open the Chisso company in Minamata

Few words; Minamata City

Now overcoming the problems brought by Minamata disease, the City of Minamata, despite its size, is promoting an Environmental Model City in order to construct a resource circulation society while aiming at a warm and comfortable environmentally conscious city.

Historical overview
Chisso Minamata Factory

August 1908	Nippon Chisso Hiryo K.K
May 1927	Chosen Chisso Hiryo K.K
May 1932	Chisso Minamata factory



First synthetic chemical industry

What is an acetaldehyde?

Organic chemical compound

From where produced?

Calcium carbide → Acetylene → Acetaldehyde

Uses of acetylhyde?

For the organic chemical industry

Chisso company have been used Mercury as catalyst for Acetaldehyde production

Why disease occurred in Minamata

The many factories in Japan and overseas operated on the same chemical process.

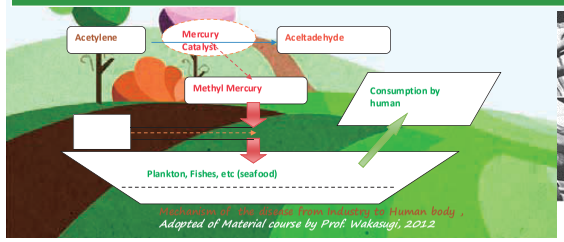
No one could imagine- HISTORICAL DISASTER

Developed and utilized only Chisso company

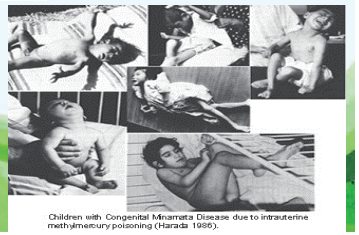
Oxidizing agent is permanganate

BACKGROUND

- Minamata disease was caused by consumption of fish , shellfish, etc (seafood) which methyl mercury is contaminated.
- Minamata disease was 1st identified officially in May 1st , 1956 (1st patient)
- Feb 20, 1963 formal announcement the disease caused by Chisso Minamata Factory
- Not only patients (pregnant) itself are infected but affect to their offspring (congenital disease).



Mechanism of the disease from industry to Human body , Adopted of Material course by Prof. Wakasugi, 2012



Children with Congenital Minamata Disease due to intrauterine methylmercury poisoning (Harada 1986).

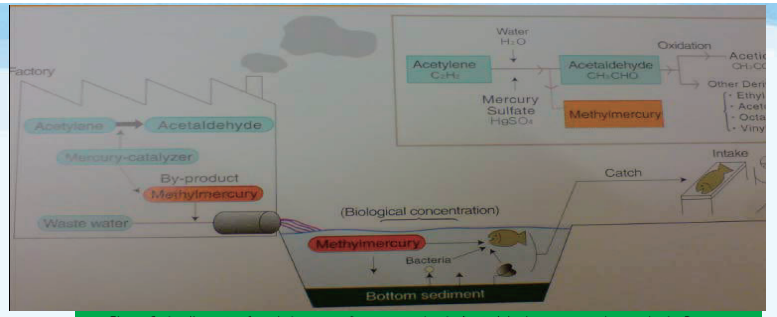


Figure 2. details route of methyl mercury from generation in Acetadehyde process to human body. Source: Minamata disease (its history and lessons). 2007

Clinical features:
- Affected central nervous system (brain) and liver, etc.
- Organic mercury pass through placenta and cause fetal Minamata disease.
- Wide range clinical course: Death –very severe-slight chronic-invisible
- Symptom: (Numbness, abnormal, Ataxia, Finger to nose/finger and test fail, cant not speak correctly, mental deficiency, memory disorder, Paralysis, Narrowed visual field, hearing loss

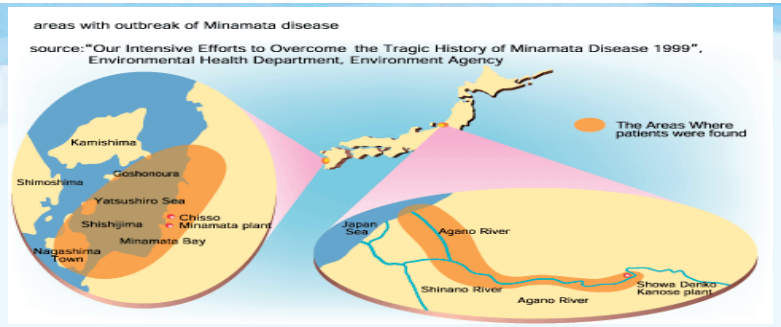


Figure 3, details route of outbreak of Minamata disease
Source: http://php.med.unsw.edu.au/embryology/index.php?title=Abnormal_Development_-_Heavy_Metals

Researchers were taking part of the disease (local epidemiology research group, Kumamoto Univ. study group, etc)

- Researchers confirmed 74 of 121 house cats infected disease and the disease had already develop in Minamata area, but peoples were developing the disease without it being noticed.
- was many misunderstandings of the illness (until scientifically could answer what is exactly of the disease).
- June 1956 had discovered a number of patients and starting in mapping which family is infected and isolated in their home firstly. And then children patients are moving to isolation ward.
- Condition was faced very difficult but they keep strong and made contribution in etiological investigation of strange disease and found many patients and discovered that there was same correlation between cats and strange disease.
- The great united efforts of the researchers were given valuable that the direction future countermeasures against pollution must be taking

A medical doctor from Kumamoto Uni. (Dr. Harada), he was deeply became involved in the disease

Some reasons for the delay in officially acknowledging congenital Minamata disease patients (having CoI):

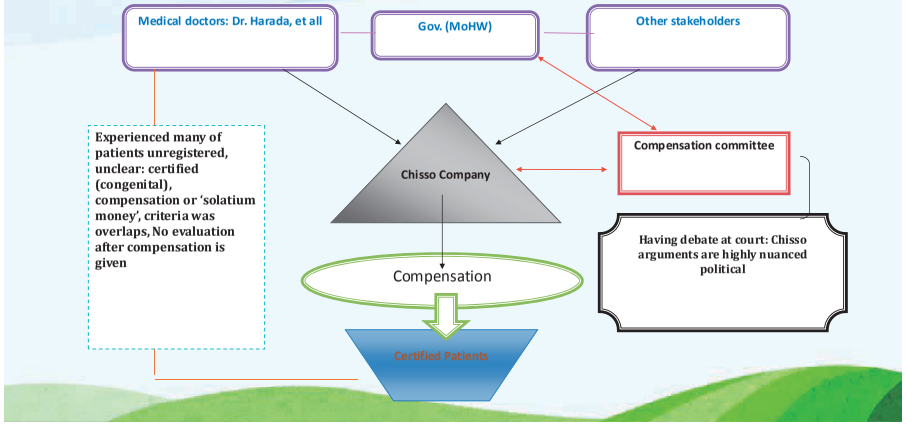
- Dr. Harada was recognized scientifically that congenital Minamata disease at children is caused of methyl mercury, however, Prof. Tatesu was an honest that we should not criticize the Chisso company under circumstance (methyl mercury is caused effected to children).
- According to Dr. Harada that Prof. Tatesu is quite reasonable to kept not aggravate the labor dispute at Chisso Company.
- After that Prof. Takeuchi and A/Prof. Matsumoto from Pathology department report the same case scientifically as Dr. Harada was told.

Solving problems:

Stakeholders: Medical doctor from Kumamoto Uni, Kumamoto Gov, etc were dealt and have agreed to make no mistakes or to avoid in handling Minamata Kumamoto disease. Why? Because the **impact has been extended to Kumamoto Minamata disease.**

- The methyl mercury sources of Chisso was distribute through Agano river basin (1958) effected for Niigata Minamata disease, whereas
- Kumamoto Minamata disease was caused by facility contaminated by methyl mercury of Chisso factory plant.
- **The idea of new concept was develop at the Minamata disease group including lawyers, etc (based on** book 'How to think about safety' by Taketani Mitsuo): "Industrial waste can be charged only when they are confirmed to be harmless"

Is any *politic will* in this complicated situation?



Recommedantions:

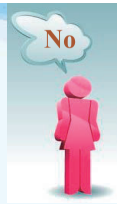
- Scientifically proven is necessary
- Communication approach is VERY VERY recommended.

Sugesstion:

Must be careful before deciding:

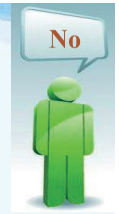
The Cisso company should to OPENED or CLOSED...

The Response of the Government



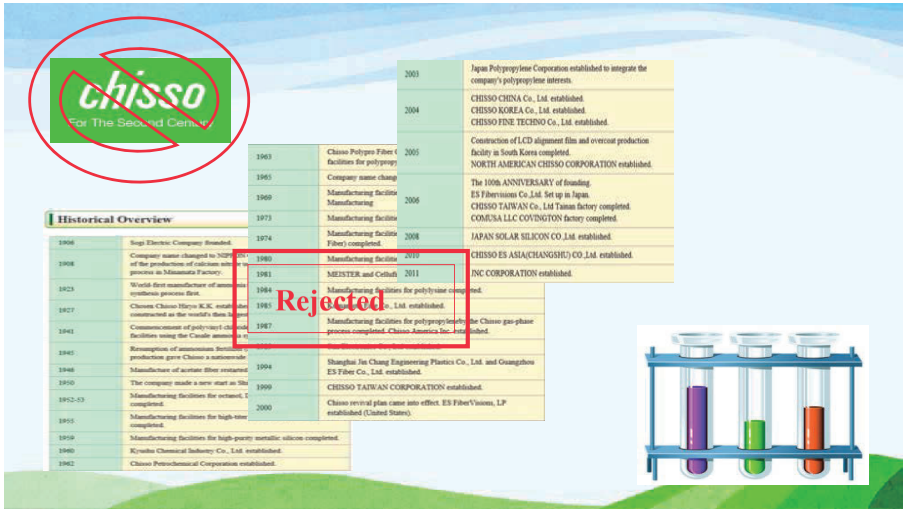
- *Regulation of factory effluent*
- *The Self-Imposed Fishing Bans*
- *Provisional Regulatory Standards for the Level of Mercury in Fish and Shellfish*
- *Installation of Dividing Nets by Kumamoto Prefecture*
- *Prohibition of (Fishery) Operations while Pollution Prevention Project works underway*
- *Call for Recreational Anglers to Refrain from Fishing*
- *Buy-back of Fishing Hauls while Dividing Nets in Place*
- *Removal of the Dividing Nets from the Nanatsuse Region*
- *Removal of the Minamata Bay Dividing Nets*
- *Fisheries Compensation paid by Chisso*
- *Administrative Aid to Support the Fishing Industry*

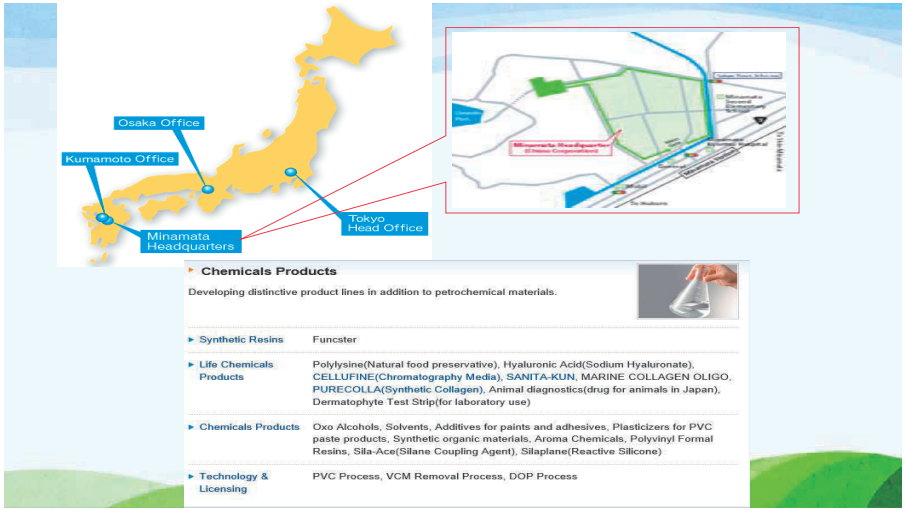
The Response of the Minamata City



- *Treatments as an infectious disease*
- *Isolation of patients in infectious disease wards*
- *Application of public welfare assistance*
- *Construction of a special Minamata disease ward*
- *The Minamata municipal hospital affiliated Yunoko Hospital*
- *Opening of Meisuien*
- *Establishment of a branch school for congenital Minamata disease patients*
- *Health survey*
- *Survey of residual mercury levels in hair and umbilical chord samples*

The Response of the Research

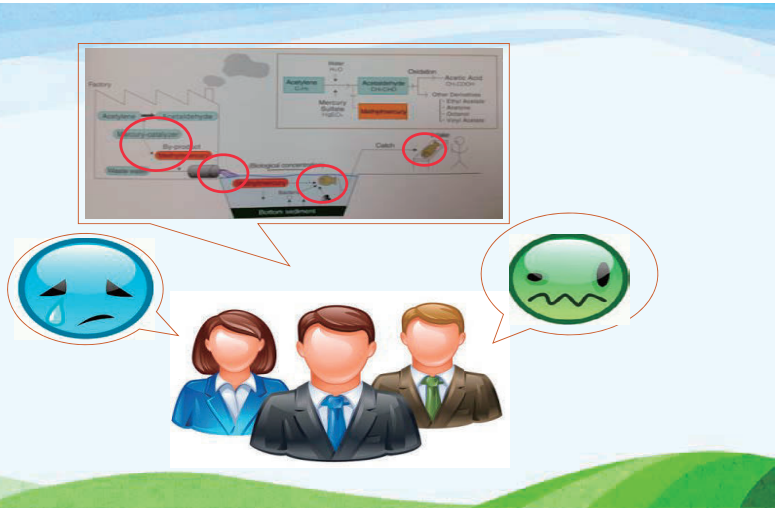




Chemicals Products

Developing distinctive product lines in addition to petrochemical materials.

Synthetic Resins	Funcster
Life Chemicals Products	Polylysine(Natural food preservative), Hyaluronic Acid(Sodium Hyaluronate), CELLUFINE(Chromatography Media), SANITA-KUN, MARINE COLLAGEN OLIGO, PURECOLLA(Synthetic Collagen), Animal diagnostics(drug for animals in Japan), Dermatophyte Test Strip(for laboratory use)
Chemicals Products	Oxo Alcohols, Solvents, Additives for paints and adhesives, Plasticizers for PVC paste products, Synthetic organic materials, Aroma Chemicals, Polyvinyl Formal Resins, Sila-Ace(Silane Coupling Agent), Silaplane(Reactive Silicone)
Technology & Licensing	PVC Process, VCM Removal Process, DOP Process



Should the government close down the Chisso company in Minamata?

"YES"

minamata disease
- unknown disease in the past

- An environmental disruption on a scale that humans had never before experienced.

1932	• Chisso began production of acetaldehyde
1956	• The official discovery of Minamata disease
1968	• Confirmation of the cause of Minamata disease

36 years

why minamata disease occurred only in minamata?

- The ordinary method to produce acetaldehyde: use of nitric acid as oxidant.
- 7 factories in Japan had the same method.
- Researches:

→

- The chlorine ion concentrations:
- Freshwater: lower than 10 ppm
- Seawater: over 1700 ppm
- Process water

→

Chisso factory's location in the immediate sea shore had an inevitable effect on the hazardous nature of Chisso's Minamata plant

chisso counterclaims

- 1957: Ministry of Health and Welfare decided that bans the catch and sales of contaminated fish.
- 1958: Chisso discharged wastewater into Minamata River mouth
- 1959: carried out experiments with cats at the Chisso Hospital

→Development of Minamata disease was confirmed

But it was not officially announced

chisso counterclaims

- Clause 5 in "Mimaikin" agreement:

"In the future, even if factory effluents are shown to be the cause of Minamata disease, no further demands for compensation will be made"

- Chisso sought to delay any response to the victims' demands and talks broke down.

killer's law


2.265 certified patients
Over 10.000 sufferers are receiving medical benefits
4000 applications for certification
chisso
SHOULD BE CLOSED


Thank you very much

Chapter 2 Minamata Eco-town

Qian Zhou

Minh Khue Dao

Rajeev Sign

Before attending the EDL Domestic Internship to Eco-Town in Minamata, our group made presentation and discussed on following issues:

1. Eco Town Projects in Japan

Eco-Towns in Japan were promoted by the Ministry of Economy, Trade and Industry and the Ministry of Environment after experiencing environmental pressures such as shortage of dump yards, against campaigns from residents on construction of waste disposal, etc and the decreasing economy.

Eco-Towns aim to construct a resources-recycling economic society through the development of industries by utilizing regional technologies and local industrial accumulations, the prevention and the promotion of recycling of wastes based on the uniqueness of local districts.

Central government, local governments, enterprises, local residents and education/ research institutes are main stakeholders involving in operating and implementing activities of Eco-Towns.

2. Minamata Eco Town

The starting point of Minamata Eco Town was the establishment of Minimata Industrial Park in 1996. Then, in 2001, Minamata Eco-Town was approved with targeted region of 16,300ha. There are 3 target concepts of Minamata Eco-Town plan including multi-stakeholders involvement; community based approach to achieve 4R; model for middle scale cities.

There are several projects on bottle reuse and recycle facility; waste plastic compound resin recycling facility, recycling home appliance, tires, oil, human waste, promoting environmental “ISO”, dissemination information on the Eco-Town, environmental education, systems supporting for agriculture producers.

3. Discussion: Should local citizen welcome the Eco Town Project in Minamata?

One side said “Yes” mentioned that as the Minamata has taken its efforts to develop environmental friendly city with help of eco town model and delivering the message to all people around the world about the Minamata disease which is great lesson for everyone to

preserve and protect the environment. These are the reasons why we support the Eco town at Minamata.

One side said “No” give the reasons as following: if the Eco-Town establishes, there will be a lot of land use, resource use such as energy, water, etc…instead of land for living, agriculture production and other production activities. In addition, it spends a lot kind of cost for it such as capital cost and operation cost of enterprises, subsidy from Government, even there will be potential environmental costs from production activities in Eco-Towns. It is skeptical the efficiency of reuse and recycling materials of recycled enterprises in Minamata regions, all kinds of jobs the Eco-Town create for domestic employees or for other region ones, efficiency of programs of environmental protection awareness in Eco-Towns. Especially, most of initial enterprises got big financial support from the Government to run their own business in Eco-Town Project while the project has concrete periods. The side said “No” worried on sustainable ability of Eco-Town in the far future.

EDL Domestic Internship 2012

Eco-Town Project in Minamata

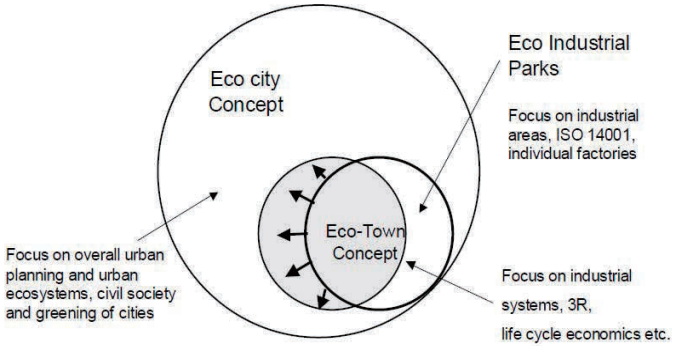
Zhou Qian
Dao Minh Khue
Rajeev Sign

Master's Program in Environmental Sciences
Doctoral Program in Sustainable Environmental Studies
Graduate School of Life and Environmental Sciences
University of Tsukuba

Outline

- Eco Town Projects in Japan
- Minamata Eco Town
- Discussion

Eco Town Concepts



Eco-Town concept

Eco-Towns in Japan

Number of Illegal Dumping cases in Japan

Source: http://www.unep.org/ietc/Portals/136/Events/ISWM%20GPWM%20Asia%20Pacific%20Workshop/One-stop_service%20.pdf

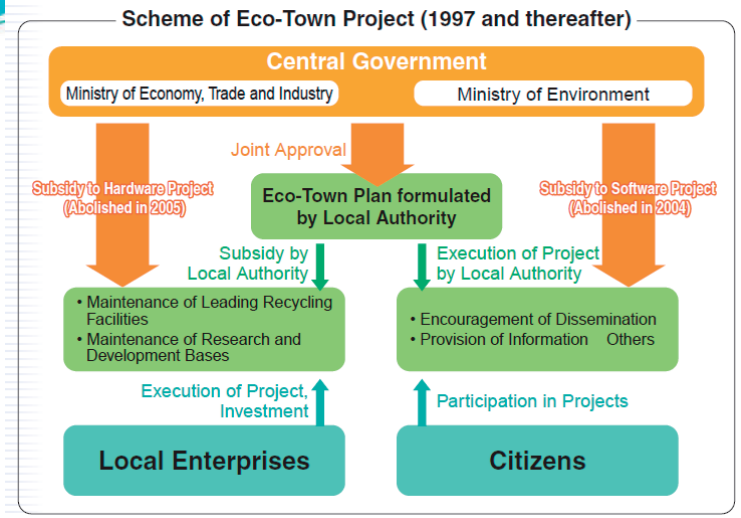
Objectives of Eco Town Projects

Construction of *a resources-recycling economic society* through the development of *industries* by

- utilizing local industrial accumulations,
- the prevention and the promotion of recycling of wastes based on the uniqueness of local districts.

And cooperation with *local residents,* operation by *loccal authorities*

5



6

Eco-Town Scheme for subsidized hardware projects in Japan

Applicable projects	Effective and stable recycle projects with maximum utilization of regional resources
Applications	Made by local governments
Number of projects to be adopted	Around three to five projects (every years)
Subsidy amount for a project	300~500 million yen
Primary amounts of a subsidy	One third of the total project cost (One half of the total project cost for high originality and leading projects)
Total amount	JPY 1.43 billion (2004) JPY 2.61 billion (2003)

7

Eco-Town Scheme for subsidized software projects in Japan

Applicable projects	● Planning for the Eco-Towns ● Massena projects ● Regional information projects ● Creation of business promotion model in the scheme of the creation of the sound material-cycle society
Applications	Made by local governments
Number of projects to be adopted	Around twenty ~ thirty projects (every years)
Subsidy amount for a project	3~5 million yen
Amounts of subsidy	Less than one half of the total project cost
Total amount	JPY 110 million (2004) JPY 70 million (2003)

8

Roles of Relevant Parties

<Central Government>

(1) Subsidy system
(2) Legislation system

<Local Authorities>

(1) Leading organizations for promoting environmental town-building
(2) Policy mix and promotion of cooperation among administrative departments
(3) Approaches for higher efficiency in resource recycling in the region
(4) Roles for achieving wide-area recycling
(5) Promotion of environmental education

<Local Residents/NPOs>

(1) Involvement in environmental town-building projects
(2) Positive utilization of recycled goods
(3) Cooperation for waste segregation

<Enterprises>

(1) Roles as the leading organization for implementing projects
(2) Roles for achieving promotion of prevention
(3) Approaches for higher efficiency in resource recycling in the region
(4) Roles for achieving wide-area recycling

<Educational/Research Institutes including Universities>

(1) Research and development concerning recycling technologies
(2) Development of evaluation methods
(3) Development of human resources utilizing people who can play the part of leaders or coordinators

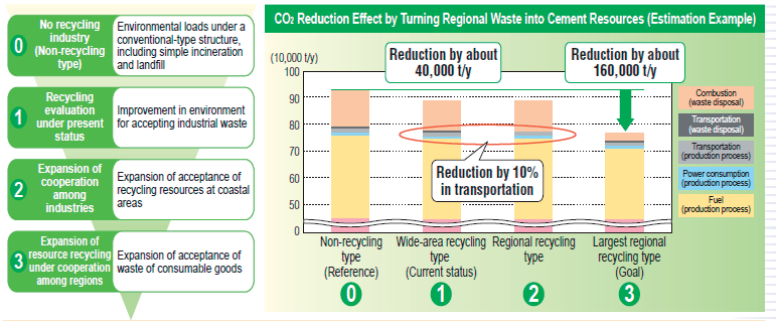
Approved Eco-Town Areas

- 26 Eco-Towns
- *Madatory* to share experiences, know how, problems; hold discussion, work together for new development of Eco Town projects

10

[Example of effect estimation of recycling facilities in Eco Town (Estimation at Kawasaki Eco Town)]

Quantitative evaluation and model estimation of resource recycling effect



Estimation Example: The Center for Regional Industrial Symbiosis Research, Toyo University

11

[Effects and Progress of Kita-Kyushu Eco-Town Project]

Effects of Project (As of the end of March 2006)

- Investment Amount: Approx. 57.8 billion yen (Municipality: 6 billion yen; Government, etc.: 10.7 billion yen; Private Sector: 41.1 billion yen)
- Persons Involved: Approx. 1,200 (Including part-timers)
- Visitors: 580,000 persons in total (1998 to March 2006)

Progress Status (As of the end of March 2007)

- Research Experiments: 17 (Excluding 24 already finished research projects)
- Facilities Put into Business Operation: 25
- PCB Treatment Facility: 1

[Economic Effect Brought about by Kita-Kyushu Eco-Town Project]

- Period: 1998 to 2003 (6 years of operation)
- Facilities: 45 (Including facilities for experimental studies, recycling, etc.)

Direct effect concerning construction investment
Induced amount for production (direct investment) 34.2 billion yen

Effect concerning construction investment
Effect for inducing production 64.1 billion yen
Effect for inducing added value 33.5 billion yen
Effect for creating employment 4,266 persons

Direct effect concerning operations
Induced amount for production (direct investment) 26.1 billion yen

Operational effects
Effect for inducing production 45.2 billion yen
Effect for inducing added value 22.6 billion yen
Effect for creating employment 2,204 persons

Total Economic Ripple Effect and Evaluation

Effect for inducing production 109.3 billion yen
Effect for inducing added value 56.1 billion yen
Effect for creating employment 6,470 persons

- Contribute to the promotion of new industries in the city
- Contribute to the creation of employment in the region
- Utilize funds from private sectors, the central government, etc., to a maximum extent
- Additional effects brought about by visitors

Approx. 73.65 million yen/year (Including expenses for transportation, meals, lodging, etc.)
Period: 2002 (January 1 through December 31, 2002)
Visitors: 93,270 persons in total

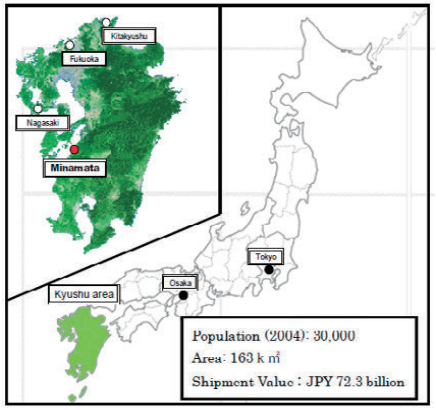
12

Major problems

- Measures for preventing global warming in the region
- Streamlining of resource recycling in the region
- Formation of adequate circulation recycling covering wide areas

13

Minamata City



•Location: the southern part of Kyushu
• Area:163 square km areas
• Population:30,000 (trend of decreasing and getting older)
• Shipment value of industries: JPY 72.6 billion (2001).

14

Minamata City

- Minamata disease
- Chemical Industry (Chisso Company)
- “Moyai Naoshi” Movement-Minama disease training
- “Environmental Model City”-environmental education trips
- Waste separation into 20 categories (1993)->23 (2006)

15

Eco-Town in Minamata city

- 1996, Minimata Industrial Park
- 2001, Minamata Eco-Town was approved
- Targeted region:16,300ha
- 3 target concepts of Minamata Eco-Town plan

1. Multi-stakeholders involvement
2. Community based approach to achieve 4R
3. Model for middle scale cities

16

Project Activities

- Two hardware projects on: bottle reuse and recycle facility; waste plastic compound resin recycling facility
- Four other projects on recycling home appliance, tires, oil, human waste.
- Some "software" projects on promoting environmental "ISO", dissemination information on the Eco-Town, environmental education, systems supporting for agriculture producers

17

	Eco-Town hardware projects		Other projects
	other projects		
	4	5	6
facilities	Human Waste Recycling	Used Tire Recycling Project	Oil Recycling facility
companies	RBS Co. Ltd.	Southern Kyushu Tire Recycling Co. Ltd.	Kiraku Mining Co. Ltd.
technologies	This project involves the production of fertilizer from human waste collected from the Minamata/Ashikita region. The fertilizer produced is used in park gardens, rice paddies, onion and other vegetable fields, tangerine and other fruit orchards, tea plantations, golf courses and so on, establishing an intra-regional resource cycle.	Used tires from cars and trucks are collected, crushed and ground into fine rubber pellets that can be made into reusable rubber, permeable elastic tiles, weeding sheets, permeable sheets, etc. The goal of this project is to promote the reduction of environmental pollution by processing used tires which would otherwise create a large amount of	Used oil from automobiles, gas stations, etc. is filtered and treated and made into a recyclable product to be used in paper mills, forging processes, secondary aluminum alloy smelting and various types of thermal-use heavy oil, in an attempt to apply effective resource allocation and reduce the burden on the environment.
capacities	Raw sewage treated:34,000 kl/year	Used tires：: 840 t/year	Used oil：1,000 kl/y
operation	2001.10.	2002.1.	2002.3.
costs	1.4 billion yen	140 million yen	400 billion yen
subsidies (by national government)	0	0	0
subsidies (by local government)	0	47 million yen	0
government)			

18

Support from Local Authorities

- Submit feasible study of Minimata Eco-Town
- Subsidies for Business sector
- Flexible in regulations (land for lease, not sold)
- PR activities (organize Eco-Town Festival, Eco-Town Summits, involve in Env Business Fair)

19

Partnership among Stakeholders

Minamata Environmental Techno Center (1999)

- Found by the Minamata City
- Create new environmental business with industries
- Research on environment, technology development and transfer
- Support other environmental activities

Minamata Eco-Town Committee (2002-2006):

- Established as a private organization: awareness raising among enterprises, organizing "Eco-Town Festival"
- Change to become a NPO (cooperate with research institutions, env business, venue for env learning)

20

A Topic Question

Should local citizen welcome the Eco Town Project in Minamata?

Yes!

21

Why Eco towns?

22

Benefits to the stakeholders

National government

- Creation of a “Sound Material Society
- Promotion of 3R industries
- Demonstration of the Initiative in the
- International Environmental field

Local Government

- Revitalization of local Economics
- Environmental improvement
- Administrative capability enhancement
- PR and city sales

Business

- Ensuring the profitability of new projects
- Accessibility to Information on Environmentally-Friendly Business
- Corporate Social Responsibility

Citizens

- Promotion of Environmental Education
- Increase the transparency and openness of waste management
- Image Improvement of city as an environmentally-friendly city

EDL Domestic Internship

local citizen welcome the Eco Town Project in Minamata?

Speaker : Qian Zhou
ID Number: 201230294
Sustainable Environmental Studies
Graduate School of Life and Environmental Sciences
University of Tsukuba

Outline

1. **Introduction of ECO – Town in Minamata**
2. **Disadvantage & Advantage**
3. **Conclusion**

Objectives of Eco Town Projects

Construction of ***a resources-recycling economic society*** through the development of industries by

- Utilizing ***local industrial accumulations***,
- Prevention and the promotion of recycling of wastes based on the uniqueness of ***local districts***.
- Cooperation with ***local residents***, operation by ***local authorities***

29

Targets

Minamata Eco-Town plan targets three concepts below:

1. Multi-stakeholders involvement
2. Community based approach
3. Model for middle scale cities

Disadvantage & Advantage

Disadvantage	Advantage
• Land use • Resource (Energy, water …) • Cost (capital, subsidy, operation cost, environmental pressure …) • Real environmental problem • Minamata disease (Short of value added industries) • Local industries will be blocked	• Reduce, reuse, recycle • Job opportunity (What kind of Job?) • Environmental protection awareness

Conclusion

local citizen welcome the Eco Town Project in Minamata?

N O ! !

Chapter 3 Isahaya Bay

Van Minh Vu
Nguyet Anh Dang
Tofail Miah
Munkhjargal Erdenebadrakh
Tu Anh Nguyen
Nam Thang Ha

Our group is responsible for the issues of Isahaya bay. We worked together to make a presentation on National Isahaya Bay Reclamation Work and Controversial Issues. In the presentation, we showed the historical development of Isahaya bay Reclamation Projects. After that, two students in my groups tried to persuade others that long term opening of the gates may have bad consequences on the ecosystem in the reservoir and the reclaimed land. Therefore, the drain gates should be opened periodically. The arguments are summarized as follows:

- Damage may be happen in case of opening the gates (in the hinterland and bay-closed farmland). Therefore, we need to consider carefully the schedule.
- Strengthen water exchange between inside and outside areas of the bay. This process will reduce the accumulation of the silts from river, improve carry capacity of water body….
- Periodical open of the gates may restore the tide current of the bay. This process can maintain and enhance the nutrition exchange as well as natural environment for fisheries. It also rehabilitate brackish water environment for aquatic animals. This will bring the prosperous perspective for fisheries.

The other students in our group also expressed different opinion for the problem. They agreed with the option to open all the gates of sea dyke with the following reasons:

- It makes the unusual impacts to sea flow in Ariake Sea, and it can lead to many unpredictable changes in the sea.
- Fishery damage by the Project: disappear of Tairagi-a special product that only exist in Isahaya Bay, damage of laver cultivation. And there is long and strongly protest against the Project of fishermen to make the gates open. *Originally, Isahaya Bay was one of the important fishing areas in Kyushu having nutritious tideland with big tidal difference of ebb and flow which effectively purified the sea water quality to grow and cultivate various forms of life [1].*
- Bad impacts to environment: Massive water blooms produce natural toxins making the water quality even worse, red tide.
- If open the all the gates, impacts to agriculture are small.

[1]. http://www.eforum.jp/TeiichiAoyamaWuhanUniversity2008.pdf

EDL Domestic Internship

National Isahaya Bay Reclamation Work and Controversial Issues

Students:

VU Van Minh
DANG Nguyet Anh
MIAH Tofail
ERDENEBADRAKH Munkhjargal
NGUYEN Tu Anh
HA Nam Thang

Outline

Part 1:

National Isahaya Bay Reclamation Project

Part 2:

Benefits of Closed-drain Gates and Influences of Long-term Opened Ones on the Ecosystem in Isahaya Bay

Part 3:

Should The Water Gate of the Isahaya Bay Salt Pan Embankment be Opened ? Yes

2

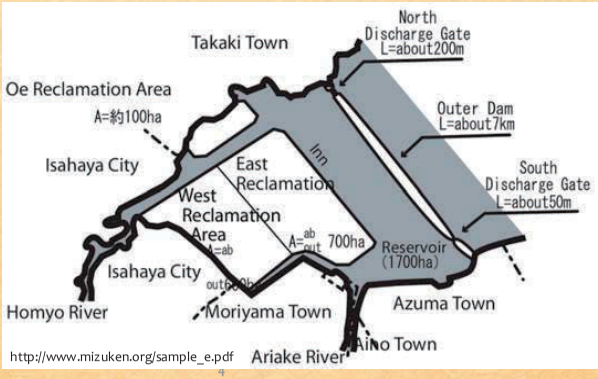
Part 1: National Isahaya Bay Reclamation Project

- Overview
- How the Reclamation work prevent disasters
- How the Reclamation Work develops local agriculture
- History of the National Isahaya Bay Reclamation Project

3

Overview

Isahaya Bay is located on the western side of the Ariake Sea estuary in north-western Kyushu. The project reclaims the largest tidal flat in Japan using a double dam approach (the outer dam closes off the whole Bay, totaling 3,550 ha, and the inner one encloses the reclaimed land of 1,635 ha).



4

Overview (cont.)

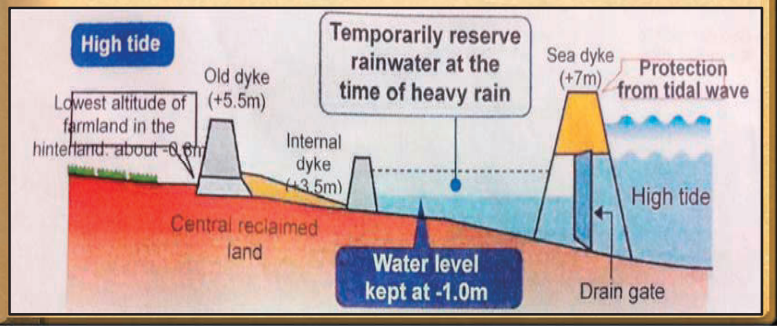
- Purposes:
  - Develop good farmland
  - Prevent disasters
- Project costs : JPY 253.3 billion (USD 2.4 billion)
- Project term: 1986-2007 (22 years)

How Reclamation work prevents disasters

Preventing damage from tidal wave

Top of sea dyke is 7m higher than mean sea level

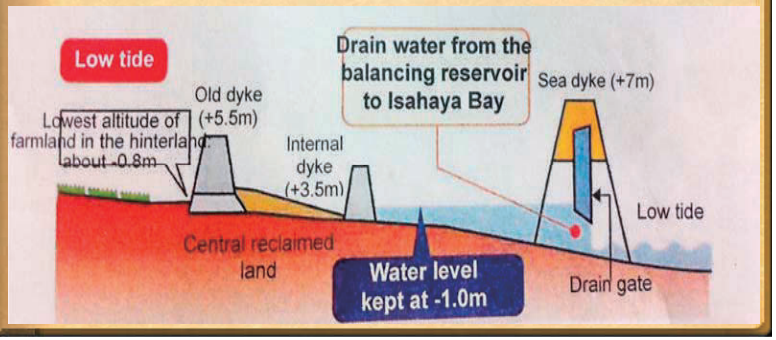
=> prevent high tide and wave.



How Reclamation work prevents disasters

Reducing flood damage

Water level in balancing reservoir is kept 1m lower than mean sea level.



How Reclamation work prevents disasters

Improving poor drainage

Prior to the dyke closure, drainage was difficult due to the accumulation of intertidal mud around the old dyke. After the dyke closure, no such mud formed, thereby allowing water to be drained smoothly and constantly from the hinterland to the balancing reservoir with a low water level

8

How the Isahaya Reclamation Project develops large scale agriculture

- Environmentally Sound Agriculture
- Farmland Lease System
- Agricultural Support System
- Production/Distribution Network

9

Environmentally Sound Agriculture

www.japantimes.co.jp

- Large scaled and eco-friendly farming
- Isahaya brand
- JAS organic agricultural products
- Eco-farmers
- GAP (Good Agricultural Practices)

Agricultural Support System

New Technology

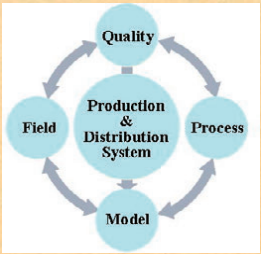
Agricultural skills for reclaimed land

Training by Researchers from Agriculture Institutes

11

Farmland Lease System & Production/Distribution Network

- Public work → Public assets
- Total area: 672 ha farmland produced
- Lease fee: 15,000 yen + 7,000 yen (service fee) /10ha in 5 years
- Lease contracts: 42 (individuals + corporations) in 2008
- Collaboration with surrounding areas
- Large sized, mechanized agriculture



12

History of Isahaya Reclamation Project

1989	**Isahaya Bay reclamation project began**
1992	Bivalve shellfish within Isahaya Bay started dying
April 14, 1997	Water gate of the Isahaya Bay salt pan embankment was closed in spite of the opposition of local people/fishermen
March 1999	Isahaya Bay salt pan embankment was completed
Dec 2000	Great bad crop of the laver/Nori in the Ariake Sea
2001	Minister of Agriculture, Forest and Fishery decided to release the drainage gate for short term investigation
Jan 2002	Minister resumed the construction in spite of the opposition of the fishermen
Nov 2002	2,500 fishermen brought their case to Saga court, claiming that the local fishing industry was damaged by the project and demanded the government to remove the dike and keep the gate open
Aug 26, 2004	Saga district court ordered "Don't continue the construction till the initial judgment".
June 27, 2008	Activists and fishermen won an important victory in Saga Prefecture court: The Saga District Court ordered the government to open the gate for a five-year for reevaluation
Dec 2010	the Fukuoka High Court ordered the state to keep the gates open for five years. Farmers were upset by the decision. They argued that opening the gates will damage agricultural land by flooding it or hurting it with salt intrusion of seawater

13

http://www.sozogaku.com/fkd/en/cfen/CD1000139.html)

Current situation (Hottest news)

*According to **The Japan Times Online**:*

Isahaya Bay gates to open in Dec. 2013?

- Agriculture minister Akira Gunji has informed opening of the floodgates in December 2013
- The Nagasaki prefectural gov. has opposed opening the gates due to concerns over flooding and adverse effects on farming on the reclaimed land
- Minister Gunji expected to continue talks with the prefectural government to win support for the gate opening.

(Nov. 6, 2012)

14

Complexity

Trade-off

Open >< Close?

15

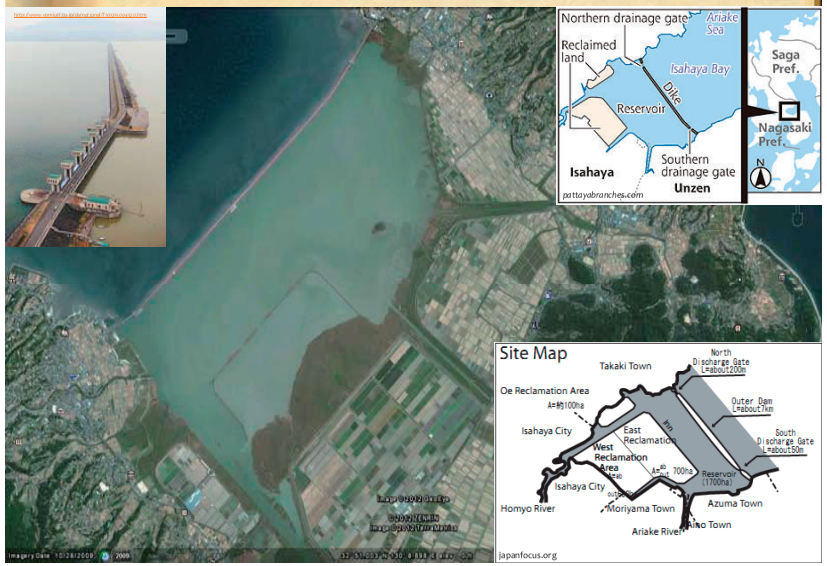
EDL Program

Domestic Internship: Reclamation Project in Isahaya Bay

Benefits of Closed-drain Gates and Influences of Long-term Opened Ones on the Ecosystem in Isahaya Bay

HA Nam Thang
NGUYEN Tu Anh
2nd year student, GS of Life and Environmental Science

1. Overiew of the ecosystems

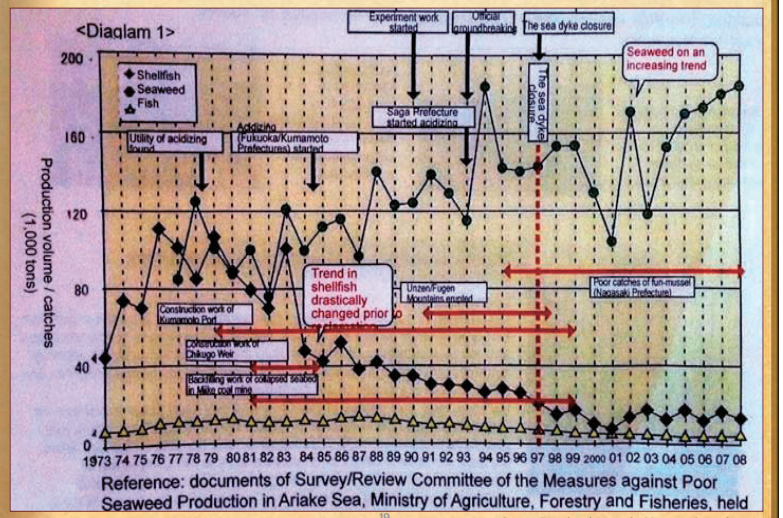


1. Overiew of the ecosystems (cont.)

- Closed from 1997 (T. Jinnai, 2010).
- Closure: floodgate is completely closed at all the time (T. Jinnai, 2010).
- Isahaya floodgates will be openned in Decmeber 2013 (Japantimes).

18

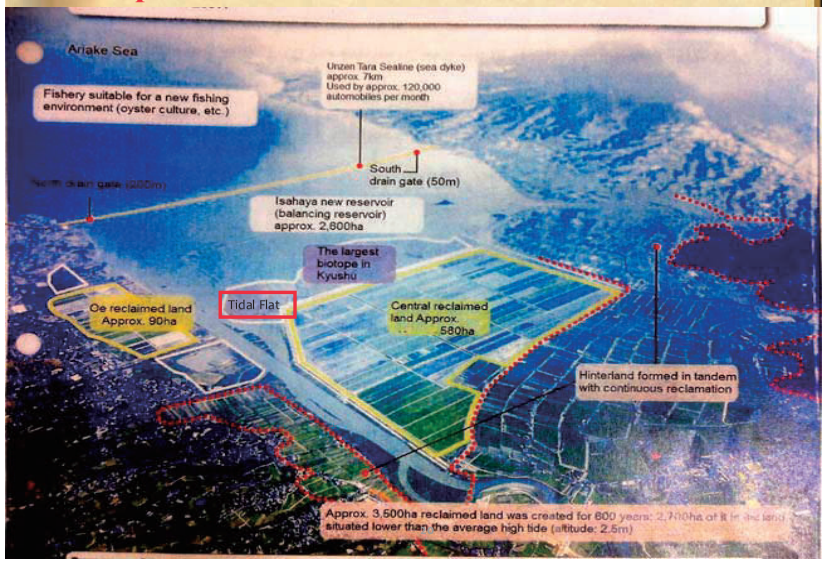
1. Overiew of the ecosystems (cont.)



19

Source: Distributed material – Minamata Internship

2. Impact of saltwater to the farmland

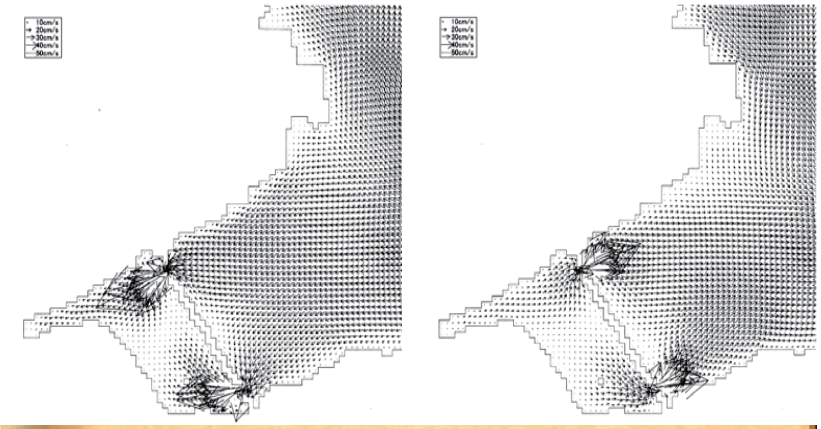


3. Impact of dyke opening on fisheries

- Change in tidal current
- Accumulate the intertial mud insdie and outside Isahaya bay
- Risk of algae blooming

21

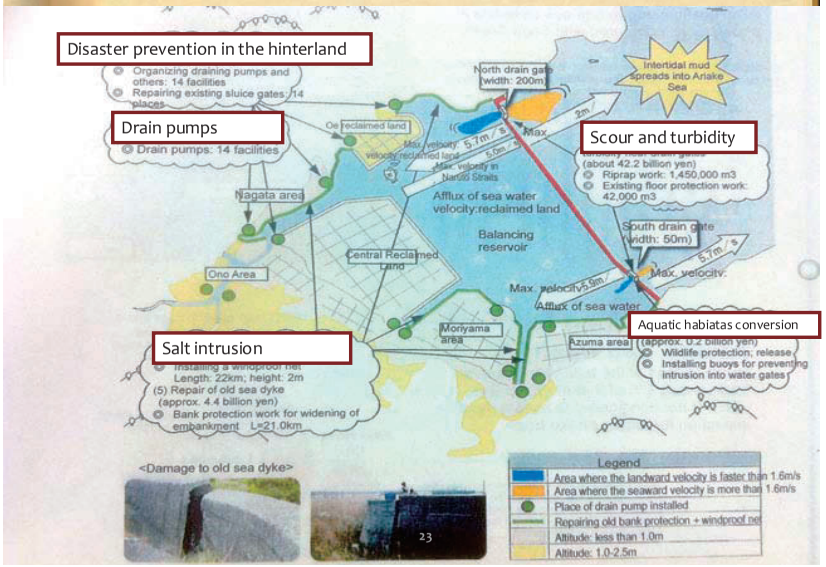
3. Impact of dyke opening on fisheries (cont.)



T. Aoyama, 2008

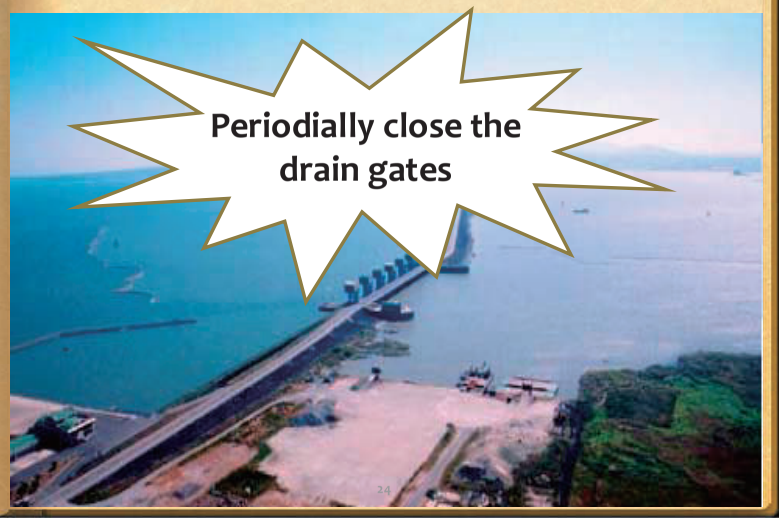
22

4. Countermeasures need to be undertaken in case of opening drain gate



23

5. Conclusion



24

6. References

Website:

http://www.japantimes.co.jp/text/nn20121106b3.html

Brochure:

Takayuki Save! The seas of Isahaya, Awase and Nagashima, 2010.

Lecture:

Teiichi Aoyama. Research on deterioration of water quality and its improvement caused by dam construction in Japan: Case study of Isahaya bay reclamation project. Lecture at Wuhan university, China, 21 -22 November, 2008.

25

EDL Program
Domestic Internship: Reclamation Project in Isahaya Bay

Should The Water Gate of the Isahaya Bay Salt Pan Embankment be Opened ? Yes or No.

YES

MIAH Tofail
ERDENEBADRAKH Munkhjargal
1st year student, GS of Life and Environmental Science

Closure of Isahaya bay & Environmental Effect

- The loss of water purification function due to absence of benthic species in the tidal flat. Now, concentrations of pollutants in the regulating reservoir exceed the EQS.

Source: www.ramnet-j.org/2010/10/20/**save3seas**_e.pdf

- Massive water blooms produce natural toxins making the water quality even worse.

www.ramnet-j.org/2010/10/20/**save3seas**_e.pdf

27

www.flickr.com/photos/marufish/2672754019

Effect of NIBRP

- Polluted water discharged from the regulating reservoir into the bay can cause red tides. contaminated the whole Ariake sea.

Source: www.ramnet-j.org/2010/10/20/**save3seas**_e.pdf

28

Effect of NIBRP

- Closure of the floodgate caused the sea current to slow, gave rise to red tides, oxygen deficiency and sedimentation of silt on the sea bed.
  Source: www.ramnet-j.org/2010/10/20/**save3seas**_e.pdf
- These have led to die-offs of fish and shellfish species. Generation of the anoxic water mass, destroy the fishery of the bay completely.


www.ramnet-j.org/2010/10/20/**save3seas**_e.pdf 29

NIBRP Debate & Some Questions

- "Is it really effective at flood prevention?"
- "Isn't it better to close the gates of the outer dam only when a typhoon comes?"
- "Why is the government so focused on reclamation, disregarding other methods of flood control like reinforcing existing dikes?"
- "Why does the government neglect the importance of fisheries for self-sufficiency in food?"

Source: www.mizuken.org/sample_e.pdf 30

NIBRP Debate & Some Questions

- "Why create new farmland while the farming population is in a sharp decline?"
- "Isn't it better to re-cultivate areas of farmland that are abandoned before creating new areas?"
- **Benefit/Cost = 138.5 bill/249.0 bill = 0.56 (<<1.0).**

The CBA shows NIBRP is economically bankrupt project.

Source: www.mizuken.org/sample_e.pdf 31

Appeal & Decisions

- Fishermen of the four prefectures (Nagasaki, Saga, Fukuoka, and Kumamoto) around Ariake Sea in 2002 filed a lawsuit with the Saga District Court calling for the opening of the sluice gate.
- The Fukuoka High Court on December 6, 2010 upheld the lower court ruling ordering the government to open the Isahaya Bay dike gates for 5 years. Japan Press Weekly December 7, 2010.
- Finally, Agriculture minister Akira Gunji has told Nagasaki Gov. Hodo Nakamura that the drainage gates of Isahaya Bay dike, built for a state reclamation project in Nagasaki Prefecture, will open in December 2013. DAILY YOMIURI ONLINE November 6, 2012

32

Final Opinion !

Closing the drainage gates cause horrible problems for the ecosystem & some scientists believe that re-opening the gates and flooding the reclaimed land will eventually improve the situation.

The Water Gate of the Isahaya Bay Salt Pan Embankment should be Opened.

33

Thank You for Your Kind Attention !

Isahaya group

34

Part 2 Report of Internship

Chapter 4 Minamata Disease

Adrianus AMHEKA, Marjangul NURYMKHAN, Wei YANG,

Thu Hang DINH, Yasin BANU

1. Overview

1.1 The Global and Local Implication of Minamata Disease

Minamata city is located in Kumamoto prefecture, Japan. It is on the west coast of Kyushu. This City is growth rapidly as of 2012 and the population estimated of 26,460. The total area is 162.88 km². (Fig 4.1) However, health development continues to be overshadowed difficult circumstances of the past called Minamata disease until today. It's caused by methyl mercury poisoning (emitting untreated wastewater to the Minamata Bay) since 1956 from a local chemical plant (Chisso Company) and causing a disease.

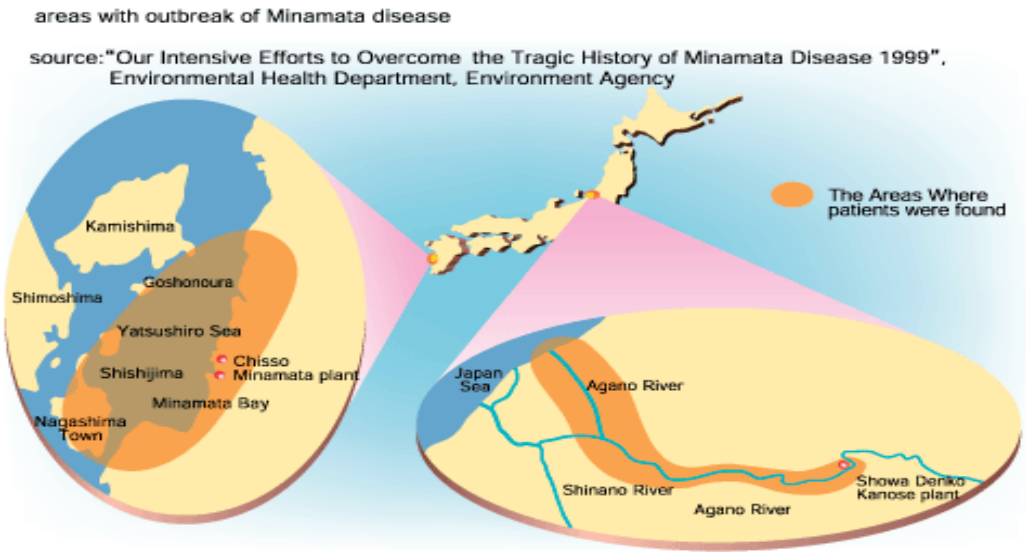


Figure 4.1 Details Route of Outbreak of Minamata Disease,

(*Source:http://php.med.unsw.edu.au/embryology/index.php?title=Abnormal_Development_-_Heavy_Metals)*

Chisso Minamata factory was established actually since 1908 with name 'Nihon Carbide Company' then merged with 'Sogi electric' and changed name 'Japan nitrogen fertilizer'. Since Chisso Minamata factory was being the most advanced factory before and after World War II. Since 1956 the methyl mercury as a chemical waste had been caused as Minamata disease.

1.2 Minamata Disease from the View Point of Health

Parts and/or tissues of the human body are affected by Minamata disease (Clinical features): (Fig 4.2)

- Affected central nervous system (brain) and liver, etc
- Organic mercury passes through placenta and cause fetal Minamata disease.
- Wide range clinical course: death ~very severe acute ~ slight chronic ~ invisible
- Symptom: numbness, abnormal or loss sensation, ataxia (unsteady, waddling, cant' walk correctly), finger to nose, finger to finger test fail, dysarthria (could not speak correctly), mental deficiency, memory disorder, paralysis, narrowed visual field, hearing loss

Following the gravest and lightest symptoms among the symptoms of Minamata disease in 1962

Impaired intelligence	17 cases (100%)
Primitive reflex	17 (100)
Cerebellar symptoms	17 (100)
Hyperkinesias (extrapyramidal)	16 (94)
Dysarthrias (speech disorder)	17 (100)
Spasms	14 (82)
Strabismus	14 (82)
Abnormal reflex	12 (70)
Drooling	16 (94)
Limb deformities	17 (100)
Developmental abnormalities	17 (100)
Number of cases	17

Children with Congenital Minamata Disease due to intrauterine methylmercury poisoning (Harada 1986).

Figure 4.2 Patients of Minamata Disease At The Moment

In 1956 were established 'Minamata Strange Disease Countermeasures Committee'. Structure organization of this organization is consisting number of stakeholders at Minamata City including doctor association of the public health office, Chisso factory hospital, City hospital of Minamata and City government. Role and responsibilities of those days were comprehensively identification patients and made classification by ages (children, mature, old man) and academically convince to the public that this is the dangerous disease but did not know yet what actually occurs of Minamata disease. Their activity at the time very helpful to identification suspected a contagious disease, isolated the patients are infected, disinfected the affected areas, initiated an epidemiological study details to discover the cause. Some research groups from Kumamoto University is deal the disease which has been confirmed 74 of 121 house cats infected disease and already develop in Minamata and surrounding, but peoples were developing the disease without it being noticed of local government. Nevertheless during June 1956 those researchers discovered a number of patients and starting in mapping which family is infected and isolated in their home firstly. And then children patients are moving to isolation ward. The condition was faced very difficult but the researchers keep strong and made contribution in epidemiology investigation of strange disease. They found many patients and discovered that there was same correlation between cats and strange disease. The great united efforts of researchers were given valuable that the direction future countermeasures against pollution must be taking.

In 1956 a comprehensive analysis report written by Dr. Hosokawa a medical doctor from Chisso Company submitted to the Ministry of Health and Welfare regarding what was happened

in Minamata disease scientifically. He was also identified what happened to patients and made classification to patients by year, age, sex, occupation and hamlet. He also mentioned what treatment had been applied such as given Vitamin B, antibiotics, etc. however, the treatments remain to be assessed. An important think later said by Dr. Hosokawa "in the case of pollution, prevention is far more important than relief". Dr. Hosokawa still kept the important results of experiments which were disease sources due to methyl mercury contamination. Although in the end, he told truth that Minamata disease caused by methyl mercury then he retired from Chiso Company.

At that time there was a doctor named Dr. Harada. He presented neglect and questions on fundamental human rights in the idea of compensation to methyl mercury's victims. He was not disappointed with 'The Workmen's Compensation Law'. He think that human is not a machine and the compensation is given to the extent that ability to work is lost. The law was also did not consider people as individual spirits and how the mental pain victims and not consider the patient's families resulting from this damage. Dr. Harada expressed on behalf of medical doctors that 'they struggle was a struggle within the framework of 'the workmen's compensation law' for a law that regarded humans beings as part of a machine.

1.3 Minamata Disease from Socio-economic Viewpoint at the Time (based on Dr. Harada's perspective)

Dr. Harada has strong dissatisfaction with the offers by the Compensation Committee of the Ministry of Health and Welfare (MHW) pretending to be rationalized in law, logic and the mediation plan which ranks symptoms. (Fig 4.3) He realized that Chisso arguments are highly nuanced political. *A remark was identical to Chisso's argument in court 'it is necessary to examine whether the compensation agreement was valid or not. It includes a clause saying that patients will not ask for any further compensation even if it is confirmed in the future that Minamata disease was caused by the firm's industrial effluents*. Reasoned dissent because '*Chisso stated the ¥300,000 paid as condolence money under the old agreement was equivalent to the highest amount payable to the victim of an automobile accident under the automobile insurance law at that time, as they had deliberately conflated Minamata disease with automobile accidents'*. Furthermore Dr. Harada was saying '*Physicians are familiar with classifying the symptoms of patients as serious moderate, mild and so on. We must be aware, however, that such classifications can be abused of they are to justify lowering the amount of compensation in cases of occupational or automobile accidents or in pollution cases, as mentioned in previous case on CO poisoning at the Miike mine'*. On the other hand he was written a report "*Kokuhatsu* (Indict)" in the report he mentions worried compensation system is unclear because compensation is given for those who is certified as patients of Minamata disease without consider throughout sufferers of methyl mercury. He also afraid the compensation is not real the compensation itself but it's just a 'solatium money' and criteria they made are overlaps.

He think even though a patient could not receive solatium money unless he/she are certified, it is possible for a doctor to diagnose a patient as suffering from Minamata disease based on his own knowledge of medicine.

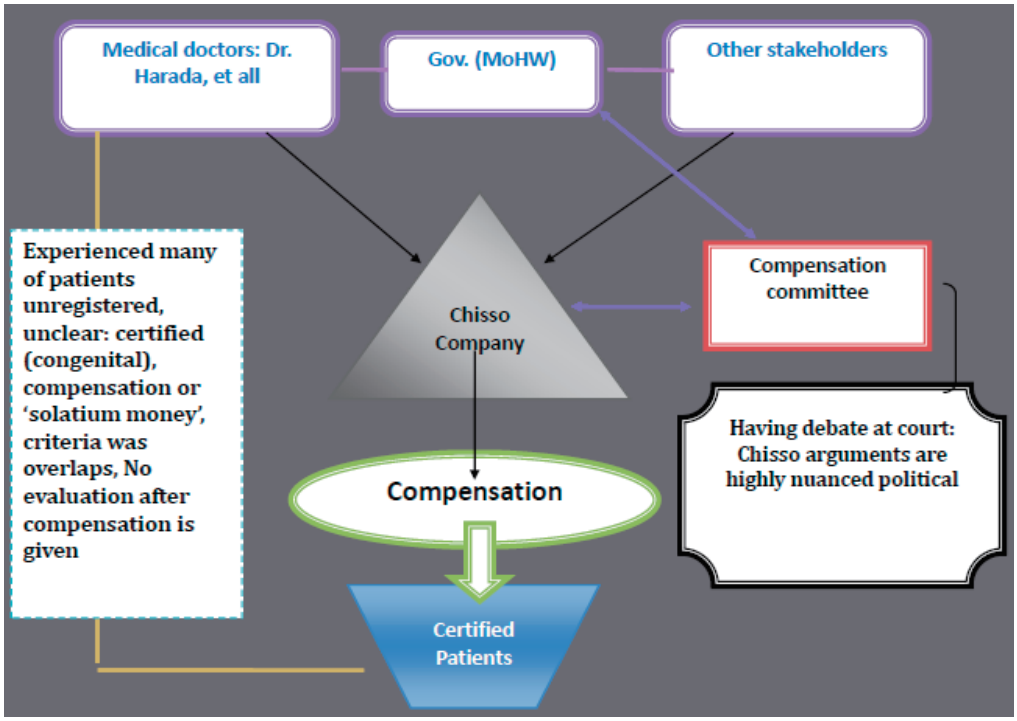


Figure 4.3 Compensation Flow Chart At The Time (Modified by A. Amheka) (*Source: Harada, 2004)*

Socio-economic situation of fishery is worse when the fish catchment decrease dramatically since 1950/52 around 1,850kan to 540kan in 1956 and definitely effected to society and economic growth of Minamata City is hampered. It's kind of reality of fishery damage. From this point of view our gratitude express to medical doctor at the time is helping very much in countermeasures and carry out role as researcher and medical doctor professionally.

1.4 Revitalization Getting Done By Government.

The Minamata area today has restored its past scenic beauty as the polluted area has been safely reclaimed with the verification of the safety of local fish and shellfish. Concerted efforts for community development have been made to turn the major negative legacy of Minamata disease into a positive legacy. (Fig 4.4)

Figure 4.4 Recovered Minamata Bay (adopted from: Ministry of Env. Japan, 2011)

From 1990 to 1998, the Kumamoto Prefectural Government and the Minamata City Government jointly promoted the Minamata Initiative for Environmental Creation based on the concept of "*Moyai-naoshi*" (mooring the ship again) which is function as a base for interchanges revitalization and local welfare services and for work to repair the bonds among local residents including Consolidation of Medical Treatment and Welfare Measures. other than that the various initiatives are established : memorial service for Minamata Disease victims (1st of May every year since 1992), programme to dispatch story tellers to developing countries (since 1996 to 2002) to convey the experiences and lessons learned from Minamata Disease, from 2003 educate programme still in progress to disseminate knowledge of Minamata Disease to teachers and students in Japan and also to invite government officials from developing countries for training in Japan under JICA programmes, establishes the National Institute for Minamata Disease in October 1978. Initiative is reinforced by cabinet decision regarding revitalization and development of local communities, transmission of Japan's experiences of Minamata disease and international cooperation (Promotion of the Revitalisation and Reconciliation) in addition to the settlement of disputes in 2010 meeting.

Some policies that are born from Minamata case such as National Environmental Standard and Emission Standard for Mercury, Regulation of Mercury Use in Product, Basic Policy Concerning Promotion of the Procurement of Eco-Friendly Goods and Services. (Fig 4.5)

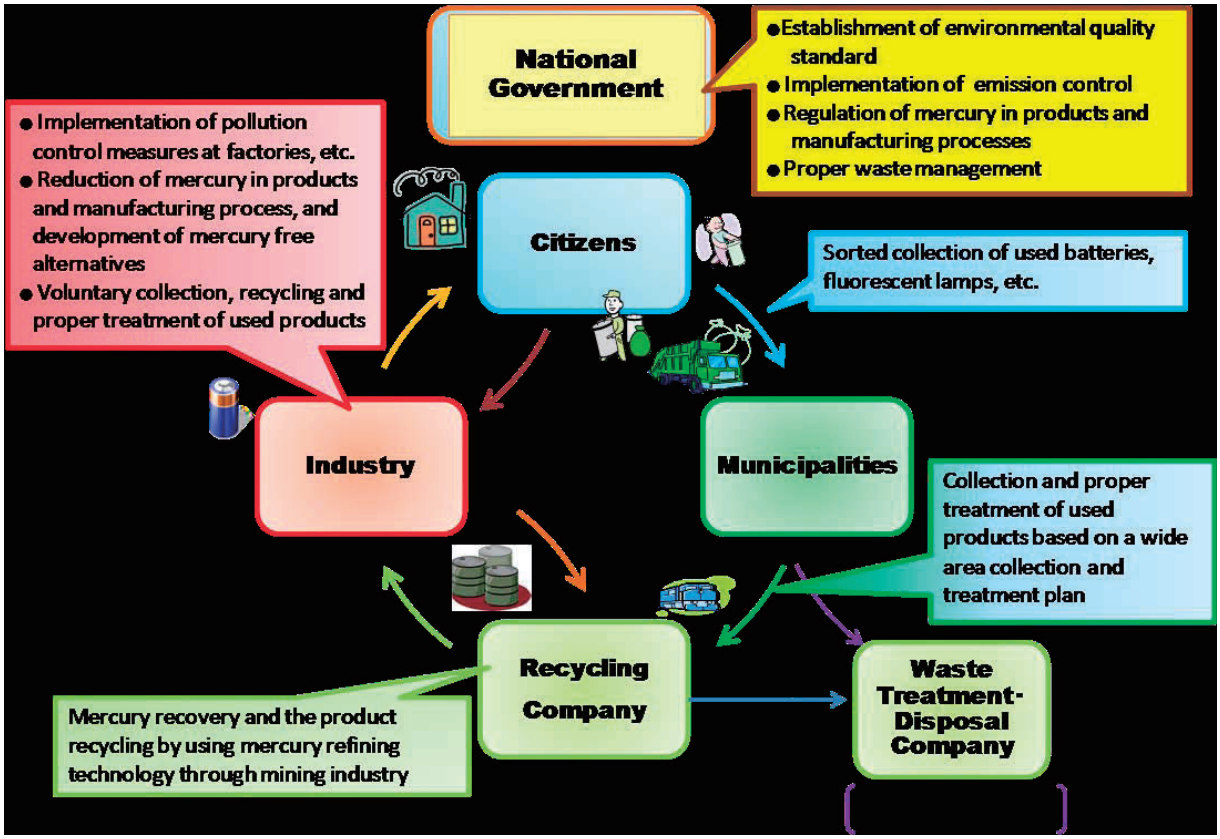


Figure 4.5 Overview of Mercury Management in Japan, 2011

2. Learning and Experiences of Domestic Internship

2.1 The Way to Study

After nearly fifty years, Minamata disease seems to have been forgotten in Japan, many young people do not ever know about it. However, in the small island, where the disease broke out, the pain persists and Minamata disease is not over.

Due to our involvement in Minamata domestic internship program, we have realized and would like to emphasize as priority that prior to any conduct of research work it is vital to see the reality in the target areas which further allows you to acquire thorough knowledge. When you want to have an in-depth and comprehensive understanding of one environmental pollution event, it is not enough to acquire some information from books and repots, so obtaining some information from local people plays an important role. The information from different stakeholders is indispensable.

Meetings and idea exchange with different stakeholders including victims, patients, scholars, research institutions, local media, social institutions, government and so on could be achieved during Minamata disease internship. We could understand this event from different directions deeply and comprehensively. However, sometimes we could find out that some information were conflicting or inconsistent, especially the inconsistence between government and other stakeholders. Sometime governmental officials didn't answer the questions from students and teachers directly.

Certain effort has been made for the report to demonstrate how much devastating impact has been brought by the Minamata disease caused due to the methyl mercury discharged to Shiranau Sea by Chisso company.

2.2 Why Minamata Disease Took So Long Time

At Minamata, there is a story was about the economic development impacts on the environment. The hurtful lessons about Minamata Bay are still there. The most exam ple of economy development damaged to human health. In this story, the suffering are these people who lived, ate the seafood at Minamata Bay where was seriously polluted by the methyl mercury from Chisso Company.

Obviously, the Chisso Company hadn't yet realized that they could have brought such harmful impact to the health of the residents while discharging methyl mercury to the sea polluting the environment. Even though it was clear that Minamata disease so called took its root from the methyl mercury discharged by them, they didn't want to accept intentionally as it was obvious how much compensation they should have paid.

Minamata disease was found out the first time in 1956 at Minamata Bay. However, until 1968, Japanese government have admitted that the disease intoxicated by organic mercury which was discarded from chemistry factories. Why the government of Japan – a country has many advanced technologies and researches need to take twelve years to get the official announcement of the cause of this disease? Why had the government's actions to prevent Minamata disease not been done sooner?

Initially, Minamata disease was recognized as one kind of infectious disease, so the patients were isolated before they died. More seriously, the people tried not to go to their house, and no one bought fish from their family. Some patients were afraid to apply for the certification, because they didn't want to bring some bad influence to themselves or their family. Some victims tried to escape from Minamata disease reality. Plus, those victims exposed residing in that area had had poor awareness that such disease could have resulted from the environmental pollution. Therefore, they were ashamed of their health condition and hid the disease from the public as they could have been discriminated. Because if they were recognized, their lives would be difficult, they couldn't get married. But we don't think the main reason for Minamata disease included this kind of discrimination at the beginning.

In the meantime the executives of the company had already established tight contacts and relationship with the governmental authorities. The discrimination was most from government and Chisso Company. The government used the law to reject the applications that symptoms were not included in the law. The patients only simultaneously had the five symptoms that could be certified. The Chisso Company didn't cooperate very well with the local people, sometimes, they wanted to evade responsibility, and refused to provide some aids.

All these factors made the Minamata disease to be revealed and investigated fairly who should have born the liability in 1956. Therefore, it was officially announced by the Government in 1968 or in 12 years for the first time that the disease was the consequence of the methyl mercury discharged to Shiranau Sea by Chisso Company.

As a result, for a long time, the people here have to live and die with this disease. One hundred and six Minamata residents died within a decade, and a lot of victims became blind, deaf, and insane. Many people suffer from limb tremors, loss of sensation, loss of balance, loss of movement coordination, and vision limited. If the mother got poison during pregnancy, the development of the fetal brain was affected. Thus, the newborns would get some symptoms such as cerebral palsy, deafness, blindness, tiny head, and cognitive impairment.

It took a long time for Japanese government to restore the environment, and take care of Minamata disease patients. Certificated Minamata disease patients are 2,969 (2001). Sixty two were recognized by court ruling and more than 40,378 people are recipients of official medical care support program (for patients having partial symptoms). Furthermore, total 48.5 billion yens anti-pollution projects were started from 1977 – 1990, 260 billion yens compensation for sewage treatment and refresh water resource. However, Minamata disease is not over yet. Certified patients are denied access to as much adequate medical care or livelihood relief as they deserve whereas those still uncertified.

2.3 Compensation and Related Problems

It is clear that Chisso Company paid vast amount as compensation, however, we would like to stress out that the liability should be born as cash compensation for the environmental pollution and adverse impact brought to the human health, but there should be preventive measures or system available. Obviously, there would not such case of Chisso Company with devastating impact be witnessed anymore in Japan.

As a result of close collaboration and effort by Kumamoto prefecture and Minamata city, there has been various initiatives and actions implemented to remind as a lesson learnt from the past for the next generation. It was really impressive. Such initiatives should be lessons for other companies; therefore, they have been able to take measures to prevent environmental pollution and run with less adverse impact. However, much has changed and achieved in Japan throughout the period since the revelation of Minimata disease. Still, rehabilitative works are taken place for the environment resulted from the Chisso Company. Again there is funding issues raised.

Then how about the attitudes of developing countries towards such issues are? Whether they are all aware of the situation of Japan? Those larger corporations of developing countries do

not often realize their corporate social responsibilities for environment while only seeking for profitable business.

2.4 Lessons from Minamata Disease

It is more necessary for the developing countries government and companies to learn the lessons from Minamata disease. If the governments only focus on economic increase without paying enough attention to environmental protection, they will lose a lot, not only the economy, but also environment, trust and lives of local people. We would like to emphasize that once the environmental protection issues are kept in line with business in developing countries, and then the sustainable development can be realized.

In conclusion Minamata disease has given us a very strong impression, especially after we went to Minamata where the disease happened, and met the people here. Before our eyes, colorful paintings are assembled together to reflect a painful past continues to the present. And we know for sure that the past is also taking place in the present.

We cannot ignore environment disaster in order to meet development requirements.

3. Future Implications

3.1 A Way Forward

Future Implications are continuing discrimination could lead to jealousy, a possibility to be Minamata disease 2, suppression of social progress and general welfare of the people. Whereas a way forward:

Discrimination ⟶ *Equality, Tolerance, and Fairness*

Educational awareness, self-awareness, social improvement strategies, stronger collaboration amongst stakeholders, consensus is needed to bury the hatchet, platform for victims to communicate (foster sense of belonging and new community)

Lack of Information ⟶ *Education and Communication*

Promotion of think-tanks, sharing of research both between researchers and to the other stakeholders, targets grassroots awareness program, investigative journalism, valuing traditional knowledge

Government Bureaucracy ⟶ *Political Accountability and Transparency*

Proactive instead of retroactive policy, forward thinking, interface between research and policies, policy making that works toward achieving sustainable development

3.2 Recommendations

As a researcher should be a radical reform prominent as an integrated comprehensive approach regarding environment damage, public health, socio-economic and even be able to solve the political problems of health significantly.

How to build a proper future for human beings, and as young generation (scholars of medicine) need to be great deal of time and concentration for their own research and expected they can spend a lot of time to carry out the research, teaching and health care activities more deeply for prevent, protect and improving quality of life including quality of human health.

References

1. Minamata City 2007, *Minamata Disease: Its history and lessons*, Minamata City.
2. Ministry of the Environment Japan 2011, Lessons from Minamata Disease and Mercury Management.
3. Ishimure, Michko. 1990. Paradise in the Sea of Sorrow. English translation by Livet Monnet. Yamaguchi Publishing House (c/o Japan Publications Trading Co., Ltd., Tokyo).
4. "Minamata Disease: The history and Measures", The Ministry of the Environment, 2002, retrieved 17 January 2007.
5. Minamata Disease Archives by the National Institute for Minamata Disease, refrieved 29 October 2006.
6. Harada, Masazumi, 1972, Minamata Disease, Kumamoto Nichinichi Shinbun Centre and Information Center/Iwanami Shoten Publisher.

Chapter 5 Minamata Eco-town

Qian ZHOU, Minh Khue DAO, Singh Rajeev KUMAR

1. Introduction on Eco-Town in Japan and in Minamata City

Minamata Eco-Town, one of 26 projects approved by the Ministry of Economy, Trade and Industry and the Ministry of Environment until now, was established officially in 2001 with the aim for promotion of establishment of a sound material-cycle society by citizens' involvement. The targeted region is 16,300ha of the entire Minamata City.

After having experienced the serious consequences of industrial pollution caused by Chisso Company on environment and human health with disease so called Minamata disease, the local Government and its citizens would like to improve and enhance their city's image in public's eye. They wanted to change the public's mind when think about Minamata. It was a place that a serious disease occurred but nowadays, it becomes an environmentally friendly living place, an Environmental Model City.

Minamata Eco-Town plan targets three concepts[1] including (i) multi-stakeholders involvement in which administrations, industries and citizens are in unity to aim at creating sound recycling society and harmony with environment; (ii) "community based approach" to achieve 4R (refuse, reduce, reuse and recycling) by utilizing first-hand materials and technologies; (iii) "model for middle scale cities" which differs from conventional styles such as complexes in big cities.

Local government, residents, NPOs, enterprises and institutes, universities involves in Eco-Town projects and play their own roles[2]. Local authorities play the leading role of organization for promoting environmental town building and support for activities of companies in Eco-Town by many ways by subsidies for business sector, flexible in regulations such as land for lease, PR activities such as organizing Eco-Town Festival, Eco-Town Summits, involving in Environmental Business Fair. Local residents and NPOs cooperates with environmental town building projects while enterprises play the role of implementing projects, achieving promotion of prevention and get higher efficiency in resource recycling in the region. At the same time, educational, research institutes including universities conduct research and develop recycling technologies, evaluation methods, develop human resources utilizing people who can play the part of leaders or coordinators.

Minamata tries to develop environmentally friendly industries with three goals[3] including (i) producing biomass energy from regional resources; (ii) having safe and reliable production in Agriculture, Forestry and Fisheries; (iii) developing a second Eco-Industrial Housing Complex, mostly filled with private companies that focus on the environment and the park is now filled with companies for recycling e-waste, a glass, waste plastic, waste oils, rubber; making fertilizer from sewage and other materials; establishing the Minamata Environmental Technology Center which is a research center that researches and promotes technology transfer with an environmental benefit.

There are two “hardware” projects on bottle reuse and recycle facility; waste plastic compound resin recycling facility in Minamata Eco Town. Those has been subsidized mostly by the Central Government. There are four other projects on recycling home appliance, tires, oil, human waste run by the private companies[4]. Moreover, Minamata Eco-Town has promoted environmental “ISO” for offices, households, schools, kindergartens and hotels. It has also promoted the exchange and spread of information on the Eco-Town, and environmental education, systems supporting for agriculture producers as the Eco-Town "software" project.

Minamata Government has many active efforts for developing the Eco-Town by providing financial and many other supportive policies for recycling materials and resources; creating jobs and respecting the remaining disable people suffering from Minamata disease, renew the friendly environmental image of Minamata city instead of a city suffering from serious pollution and disease. The local people shows their responsibility for Minamata development by following and collaborating with the local Government’s environmental policies. The citizen’s awareness on environmental protection has been raised time by time and become a positive habit now.

2. Reports on Three Visited Places

2.1 Act B Recycling Co. Ltd

The plant is located in Minamata city of Kumamoto prefecture. It was established in December 17th 1999 and started its operation in April 2001. It came into being as a result of the Home Appliance Recycling Law that was implemented in April 2004.They recycles home appliances by dismantling them and separating the parts that are still useful so as to recover and recycle them as resources. They also recover and properly dispose chlorofluorocarbons, which if not disposed of properly can cause global warming.

They receive five different kinds of home appliance for recycling, such as CRT-based TVs, flat-screen TVs, washing machines, clothes drier, refrigerators and freezers from six prefectures in Kyushu, excluding the northern area. (Fig 5.1) The total disposal number reached 2.5 million in the middle of May 2008, and is expected to rise to 4 million by the March of 2011. Supporting a resource recycling society, they give unbending effort to recycle and utilize limited resources as effectively as possible. In February 2006, they became a member of the Dowa Group.

Fig 5.1 Home Appliance for Recycling

The organization system of the company is as follows: (Fig 5.2)

CORPORATE ORGANIZATION

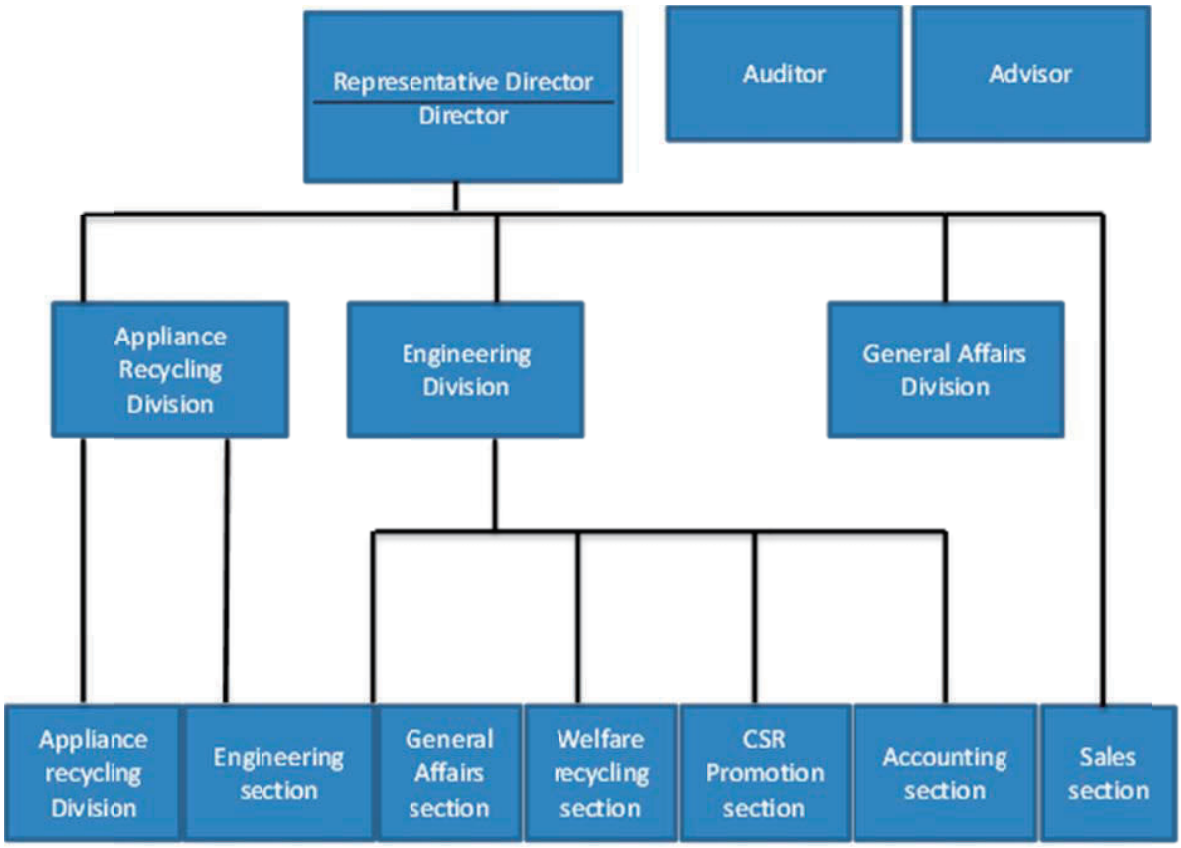


Fig 5.2 Organization System of Company for Waste Management

PERSONNEL DISTRIBUTION

Representative Director	Advisor	Appliance Recycling Division	Engineering Division	General Affairs Division	Sales Section	Total
1	1	54	7	16	2	81

The objective of the company is to make a meaningful contribution to the earth environment as well as to customers by reducing, recycling and reusing (energy and) resources.

The principle of sustainable society is that we help each other for a sustainable human development. To avoid environmental destruction, we must use the limited resources effectively. First, we should stop dumping used appliances (and find ways to recycle them). Act-B Recycling strongly promotes recycling them by sorting out the resources. We believe that each and every

recycling work that we practice can help the development of a sustainable society and the global environmental protection.

ENVIRONMENTAL POLICY

The company is making an effort to achieve high goals to become an eco-friendly company. The company takes the initiative on continuous environmental improvement and the environmental management activities focus on various environmental impacts on the following items:

1. Make a contribution to build a sustainable society by reducing waste and promoting recycling resources.
2. Promote energy conservation by economical use of energy.
3. Improve collection rate of CFC that causes ozone depletion.
4. Improve the environment of workplace.

They set the environmental objectives make action plans and work hard to achieve them. By evaluating all actions and achievement level periodically they try to improve the systems accordingly and prevent contamination as well.

The company strives to conserve the environment by complying with all environment related laws, rules and regulations and by meetings other requirements on which the relevant organizations agreed. They also promote clean activities and make continuous efforts to preserve the natural environment of oceans, mountains, rivers and air. Finally to carry out the environmental agenda of the company and to improve awareness of our environmental policy, they provide education to all employees.

Some question we asked:

Question 1) The waste treated in the company is only form the Kumamoto Prefecture?

Answer: No, the waste is not only from Kumamoto prefecture. It comes from other nearby prefectures like Saga, Oita, Nagasaki, Miyazaki, Okinawa and Kagoshima prefectures.

Question 2) Is the waste coming in the factory constant?

Answer: No, there is a huge fluctuation in the waste coming to the factory. The amount of waste was increasing form 2001 till 2005. And then we saw a slight decrease in the amount of waste till 2008. But in from 2009 there is a huge increase in the amount of waste till now.

Question 3) Does the company help the people affected by Minamata disease?

Answer: Yes, five or six people affected by Minamata disease come to work in turns with an instructor form their facility which is located near the company and they work in the company.

Question 4) We saw the solar panel on the top of the company's buildings? What is the purpose of it?

Answer: Yes, they are used as a source of energy to produce electricity and decrease the use of non-renewable source of energy.

Question 5) It the solar panel efficient for the company?

Answer: At present, the produce electricity form solar panel is used to run all the office work but it only contributes 5% to 10% for the factory work. In coming future we are planning to increase more solar panels and its contribution to the factory work.

Question 6) What are other activities of the company?

Answer: The Company has clubs and the members in the clubs actively participate in community events like horticulture, softball, music, cleaning activities along with many events like Renryu festival, Industrial park festival, Minamata citizens' relay marathon and road race etc.

2.2 R.B.S. Tsukinoura Center

Our group visited R.B.S. Tsukinoura Center, located near the sea. It was told that the center was funded in September 2001 and has been operated by Private Finance Initiative method since then. Generally, the local government is in charge of processing of domestic waste and human waste. The staff told us that they use truck to collect the human waste and septic tank sludge from collection area. There are three palaces almost 42,000 persons included in their collection area: Minamata city, Tsunagi town and Ashikita town. After the treatment process in this center, the staff there puts the excess sludge to generate organic fertilizer and treated wastewater is discharged into the environment.

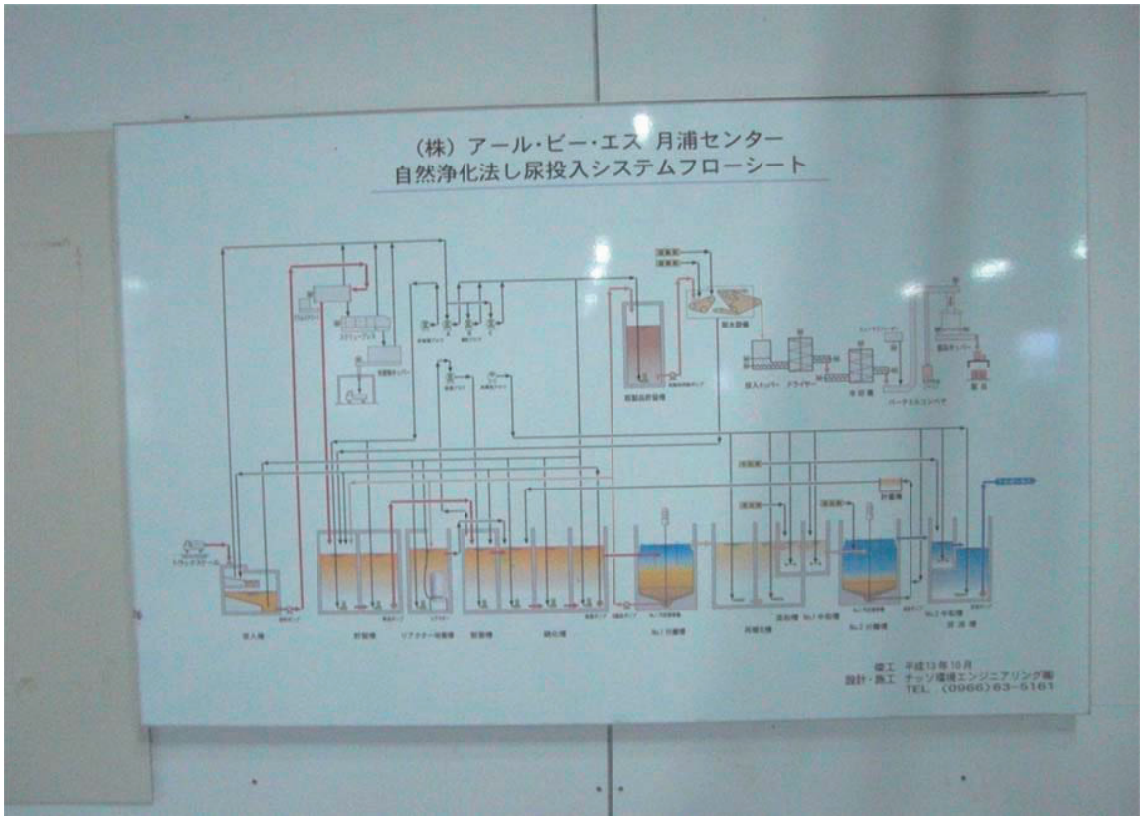


Figure 5.3 Summary of Natural-purification Process

R.B.S. Tsukinoura Center was funded in September 2001 and has been operated by Private Finance Initiative method since then. Generally, the local government is in charge of processing of domestic waste and human waste. It processes the human waste and septic tank sludge collected from different places in Minamata city, Tsunagi town and Ashikita town and puts the excess sludge to generate organic fertilizer at last. And treated wastewater is discharged into the environment.

(1) The Characteristics of R.B.S. in Tsukinoura Center

We saw the summary of Natural-purification process (shown in Figure 5.3) when we stepped into the wastewater treatment plant in the second floor of the center. It makes use of a human waste treatment system called “Natural purification method RBS”, developed by Chisso Environment Engineering CO.,Ltd. The system is different from the conventional activated sludge process. It is the central technology of the conventional sanitary sewage treatment put into an artificial processing system. And the system has 4 obvious characteristics. The first one is that the sense of a disagreeable odor does not arise. As we saw there, the plant there is very clean and tidy. We cannot imagine that it is a wastewater treatment center if we do not look down into the wastewater tank. The second one is that the antibacterial action is strong, which also contribute to the first characteristic. It is possible to process undiluted human waste directly in this center,

which is the third character. That is also an obvious advantage different from other traditional wastewater treatment system. The fourth one is that it facilitates the composting of excess sludge.

(2) The Natural – purification process is completed in the following facilities.

Under the staff's guidance, we've taken a look at the facilities. We also get some information about the facilities as following:

- Acceptance time: 8hrs/day, 6days/week
- Operator: 4 persons
- Sewage acceptance: 95 m^3/day
- Processing time: 24hrs/day
- Processing systems: Microbe processing (Reactor Bio System)
- Discharge to a sewer: 105m^3/day
- Sludge fertilizer production: 975kg/day

The staff also helped us to recognize the name of these facilities and their role for waste water treatment and resource recycling utilization.

(A) Smash pump, Drum screen
(B) De-nitrification tank (Fig 5.4) , Nitrification tank (Fig 5.5)
(C) Reactor tank (Fig 5.6)
(D) Separation tank (Fig 5.7)
(E) Sludge dehydration (Fig 5.9)

Fig 5.4 Denitrification Tank

Fig 5.5 Nitrification Tank

Fig 5.6 Reactor Tank

Fig 5.7 Separation Tank

Fig 5.8 Discharge Groove

Fig 5.9 Sludge Dehydration

(3) Contribution to Minamata City's Environment

We had a lecture from the staff in the center; they told us that the human waste input system designed in R.B.S. Tsukinoura Center is different from traditional system. Two students who majored in wastewater students asked staff some detail question about the sewage removal ratio and the advantage of the system. Based on their discussion, we find that the system there pays much more consideration for the environment. For example it transforms the human waste to sludge fertilizer, which can be used by a wide range of customers such as private households and farm households. It also contributes to the realization of a recycling-oriented society advocated by Minamata city and to maintain a good environment for the next generation.

2.3 Minamata Environmental Techno Center

It established in 1999 as a public-private company (Minamata City 67%, Chisso 13%, etc.) through an industry-academia-government linkup, the center acts as an environmental business base to making good use of organic waste, studies of the Shiranui Sea's water

environment, and research on environmental disruptors, as well as promoting exchanges between different industries and technology transfer from Chisso[4] [5].

Minamata Environment Techno Center is also one of the stakeholders in Minamata City, it cooperate with enterprises (Fig 5.10, 5.11), Minamata Eco-Town Committee and with each other to energize the Minamata Eco-Town. It promotes technology transfer with an environmental benefit.

Fig 5.10 Act-be Recycling Company

Fig 5.11 RBS Company

Contribution of Minamata Environemental Techno Center:

The center has engaged in various activities including various researches on the environment, technology developments, and technology transfers to local enterprises, in order to create new environmental businesses in the community. The center establish network among industries, Minamata City and academia, proposals for cooperation of businesses among Eco-Town enterprises, environmental seminars for local enterprises, and support to obtain ISO certifications. Also the Minamata Eco-Town Committee meetings are held at the center.

In the Minamata Environmental Techno Center, they gave us a presentation about their plan and activities to realize their plan. Through the presentation, we know their path to Community Renovation. They divided the target into 4 steps: step1 is to early relief for Minamata disease patients. Step2 is promotion of “Moyai-Naoshi” (relation-healing) movement. Step3 is clarification of future visions. The last step is actions toward future visions. They encourage all the inhabitants to pay much attention to environment and call on them participate the environment management activities. These activities not only strengthen the awareness of environment protection, but also promote the lovely town construction where the inhabitants are energetic, joyful and cheerful.

The first activity of the center when just founded in 2000 was the research on endocrine-disrupting chemicals. This 5-year research has brought about an improvement of research skills in the center and expansion of networks to various fields.

The Techno Center succeeded in developing the basic technology. The center is planning to propose the establishment of a database of the needs of Minamata enterprises and concrete cooperation with enterprises, since Minamata Eco-Town targets the whole area of the city.

Qustion & Answer

At the end of the presentation given by the staff of Minamata Environmental Techno Center, we had chance to ask some questions before we visited Minamata Eco-Town.

Question 1: From your presentation, we find that most of the participants of the Eco-Town activities are old people. How about the young generation? How do you let the young generation recognize the importance of Eco-town for the local environment and inhabitants healthy?

Answer: In the daytime old people are free. It seems only old people participate in the Eco-town activities. We take the young generations' education about Eco-town very seriously. We have one hour's morning recycling and evening recycling special for young generation. The school students should participate activates at specific times every week. They help adult to separate bottles and rubbish. Through these activities, they not only learn how to separate bottles and rubbish but also help them recognize the significance of building Eco-town here.

Question 2: As far as we know, most of the company in Eco-town here need subsidy to maintain their daily operation. If the company can't get subsidy from Central Government and Local Government, will they bankrupt or withdrawing investment here?

Answer: We have special fund from central government supporting for new industry's rising up. There are 7 companies here. 50% of their expense is subsided by Central Government and almost 33% is from Local Government. They also benefit from selling their own production.

Question 3: Before we visit here, we did some pre-study about Eco-town. It said that the Eco-town can bring jobs for local people. How many positions can they provide? Do the companies contribute greatly to local economic development?

Answer: There are 7 companies here, and they provide 200 jobs chance. As far as you know, most of the company begin to oversee invest, it is difficult for us to invite much more companies to invest here. About the economic contribution, here only Chisso Company contribute 1/3 of GRP (Gross Regional Product). The Eco-town companies contribute a little to economic development, but they contribute a lot for environment development.

3. Conclusions and Discussion

Eco-Town in Minamata city as well as in other cities were one of the solutions that the cities chose, especially under environmental pressure of the economy growth from the changes in global industrial structures, hollowing out of manufacturing industries and depression.

In which, private companies invested funds and labor in technological development, management innovations and environmental management, in order to survive. Municipalities were required not only to foster new industries but to address waste management and global warming. The environmental awareness of citizens was rising to a level that they voluntarily initiated their own activities, in addition to calling for measures and efforts from the government and private companies. Researchers attained some progress in research on technological and social systems related to 3R, material flow analysis, life cycle assessment and integrated waste management.

Reference

1. Eco-Town in Japan-Implications and Lessons for developing countries and cities, Global Environmental Centre Foundation, 2005
2. Eco Town Projects, Environmental Industries in Progress- Environment-Conscious Type of Town-Building. the Ministry of Economy, Trade and Industry
3. http://en.wikipedia.org/wiki/Minamata_Kumamoto
4. http://www.webmeets.com/files/papers/ERE/WC3/335/Minamata%20yoshida.pdf
5. http://www.unep.org/ietc/Portals/136/Publications/Waste%20Management/Eco_Towns_in_Japan.pdf

Chapter 6 Isahaya Bay

Van Minh VU, Nam Thang HA, Tu Anh NGUYEN, Nguyet Anh DANG

1. Isahaya Land Reclamation Project

In the Domestic Internship of EDL program, we have wonderful opportunity to visit a famous reclamation project in the North-Western of Kyushu namely *Isahaya Land Reclamation Project*. The project has a long and interesting history that was started on 1952 when the governor of Nagasaki prefecture announced the Nagasaki Great Reclamation Plan. At the beginning, the project area was whole Isahaya Bay with 10,000 ha. But after it were modified many times in name and purpose, the project area was cut down to 3,550 ha in 1983 with name "*the Isahaya Bay Disaster Prevention Total Reclamation Project*", and the name as current was decided in 1988. Then, the project construction works was started in November 1989. After 8 years of execution, the tidal dam gates were closed to separate seawater and fresh water in Isahaya Bay. Total cost of the project is 253.3 billion JPY equivalents with 2.4 billion USD.

1.1 Purposes of the Isahaya Land Reclamation

1. Strengthening disaster prevention functions: against the flood, the sea tide, and the ill-drainage in the back swamp. The standards that project based on, which to designed the dam is the Isahaya flood of 1957 and a tidal surge on the scale of the Ise-Bay typhoon of 1959. The project reclaims the largest tidal flat in Japan using a double dam approach [1]
2. Creating agricultural lands: Realizing the agriculture with the high productivity by developing the large-scale, flat superior farmland which has the regulating reservoir and the water whose source is the regulating reservoir [2]. The reservoir was created by 2 layers of dam, the outer dam (with 7km length) closes off the whole Bay, totaling 3,550 ha, and the inner one encloses the reclaimed land of 1,635 ha. The result is creating the reclamation farmland with 700 hectares.(Fig 6.1)

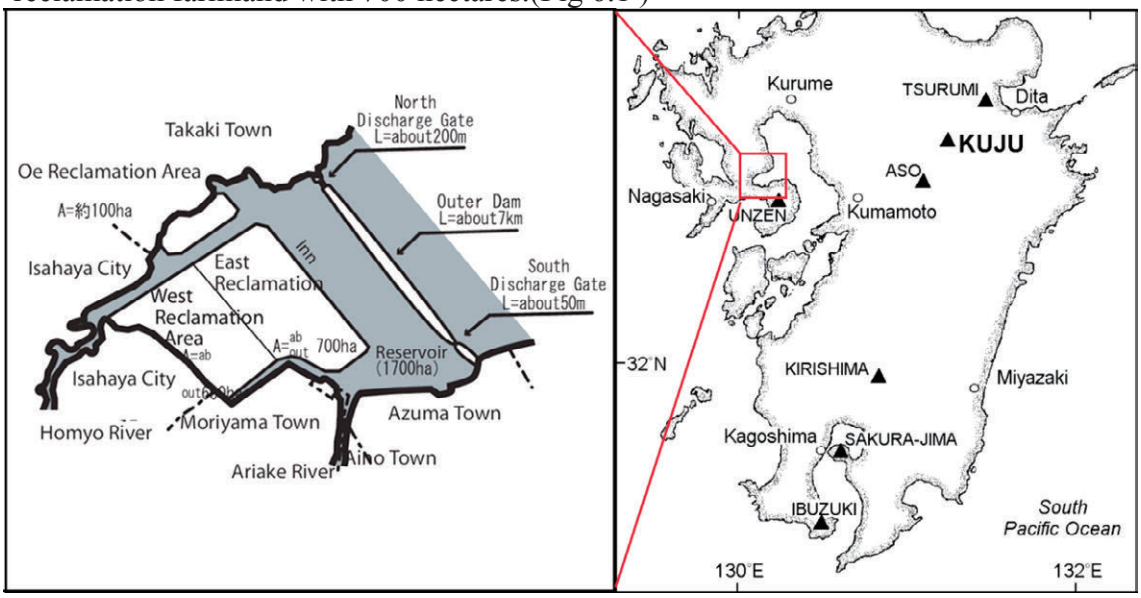


Figure 6.1 Scheme of Isahaya Land Reclamation Project [1] (left), [3] (right)

1.2 Isahaya Land Reclamation Project – a look from both sides

When we visit Isahaya Bay, we had chance to visit a fishery village and the manager office of Isahaya Land Reclamation Project.(Fig 6.2)

Fig 6.2 Meeting with Fishermen (left) and Manager of the Project (right)

The fishermen said that Isahaya Bay Reclamation Work has made unusual impacts in the Ariake Sea, and it is also the cause of the large disturbance of the fisheries promotion that has resulted in the decrease in the laver harvest and so on [4]. And they fight in court to open all the gates of sea wall.

The Project management office said that sea wall that Project built has good affected to enhance the disaster prevention, and create high productivity area of agriculture land. They also give the evident that there is no bad influence of the Project to environment, and aquacultures as well.

2. Influence of Reclamation Project on Fisheries in Isahaya Bay, Ariake Sea from Fishermen's Viewpoint

2.1 Impact of Reclamation Project on Isahaya Bay Ecosystem

Reclamation project was undertaken in Isahaya bay, Ariake sea in 1986 [6]. This was a huge project to create the safe zone for the hinterland as well as the farming land from the typhoon and flood. They separated approximately 3,000 ha [6] of the tidal flat, divided Isahaya bay into the inner and outer ecological zones from its original structure. (Fig 6.3)

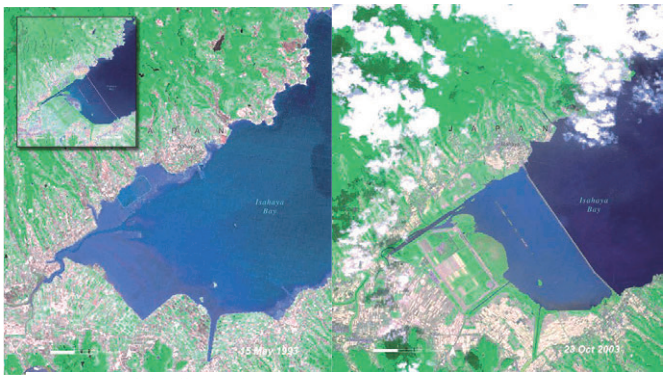


Figure 6.3 Satellite Image Illustrated the Process of Reclamation project in 1993 and 2003 [15]

This project, however, steadily processed for approximately 40 years [10] before we can observe it clearly from satellite image in 2003 [15]. Since its gates were closed in 1997 [6], not only ecological environment but also fisheries has been influenced significantly [9]. T. Aoyama (2008) simulated and reported the variation of tidal regime when we open and close the gates at different time. (Fig 6.4)

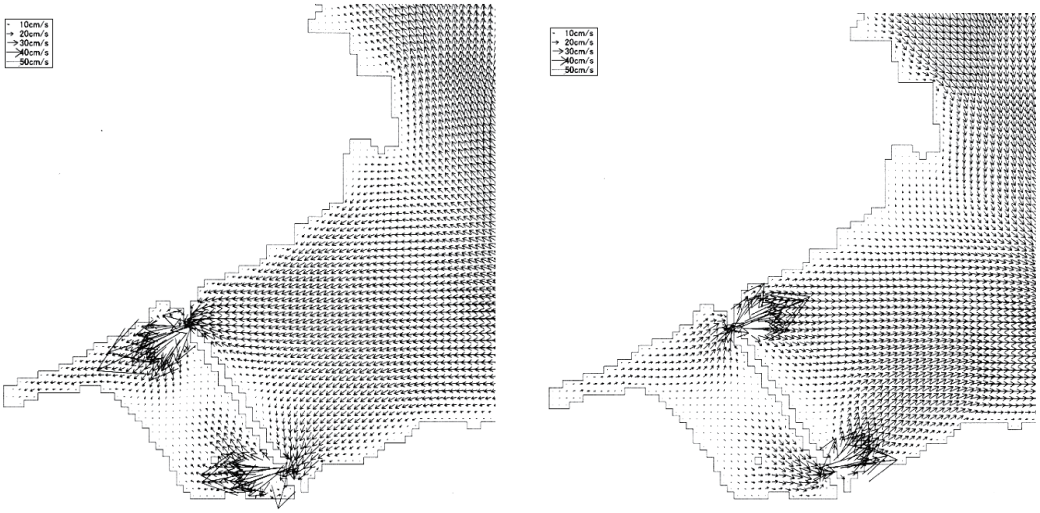


Fig 6. 4 Current Variation When the Tide Rise and Recess [10]

Obviously, this variation will impact on the migration and growth of the fishes in Ariake sea as the disorder of nutrition cycles as well as losing the natural habitat of fingerlings [11]. On the other hand, due to the prevention of water exchange from the dyke, the sedimentations accumulated strongly in the reservoir [10,11]. Almost these volumes of mud move from the hinterland where farmers have undertaken their crops [6]. Besides, the rivers around the Isahaya bay also contributed a considerable amount of sedimentation to the reservoir [6].

Figure 3: Algae blooming and turbid water inside the reservoir

Along with the time, this process caused the shallow reservoir, increased the turbidity

As well as the frequency of algae bloom. It probably die-offs the fish [9] and prevent fingerlings from growing. Takayuki Jinnai reported the degradation of the biodiversity as well as fish volume inside and outside the reservoir [10].

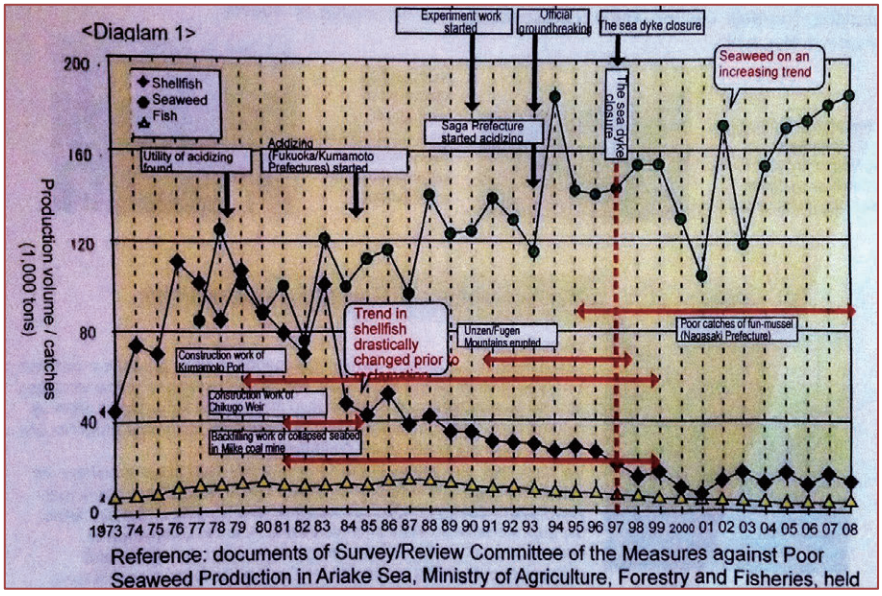


Fig 6.5 Dynamic Chart of Rish, Seaweed and Shellfish Volume in Ariake sea from 1973 to 2008

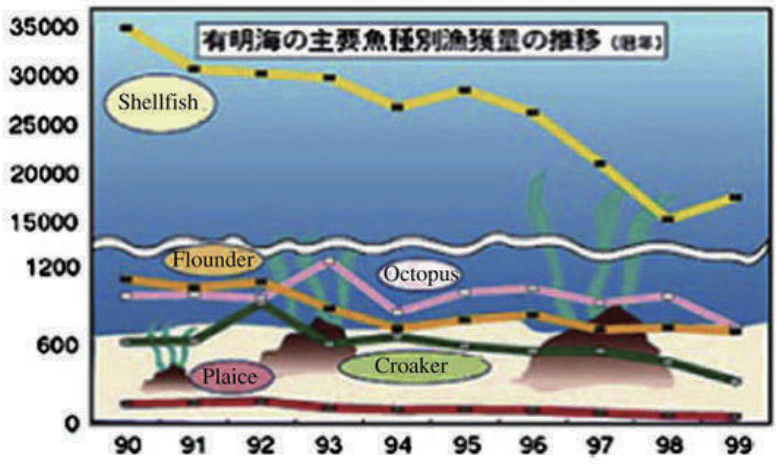


Fig 6.6: Reduction of the Aquatic Resources in Ariake Sea from 1990 to 1999. (Nagasaki newspaper 2001, H. Yamashita, 2009

The above diagrams (Fig 6.5, 6.6) figured out the variation of seaweed, fish and shellfish in Ariake sea. Generally, fish and shellfish decreased gradually [5] whilst seaweed volume raised and dropped rapidly before increasing steadily from 2003. We tried to find the explanation for the fluctuation in the productivity of fish, seaweed and shellfish but no steady reasons have been found. The changes in the natural weather conditions and seawater environment might be one possible reason.

2.2. Discussion

Fisheries community keeps facing to unsustainable prospective if the dyke gates are not opened to the end of this 2013 [12]. Currently, they live on seaweed and oyster culture in Isahaya bay [8]. However, there are still several problems which constrict this production, such as high mortality in summer season, heavy fouling and low demanding in the local market [8]. Other fishermen have been suffered from massive decline of Taigari mollusk as well as Asari claim (due to the red tide and de-oxygenation of the sea water) [5]. In 2008, Saga prefecture court ordered the government to open the gates for 5 years for reevaluation the possible effectiveness of the dyke [14]. And in 2010, the Fukuoka high court ordered the state to maintain the opening gate for next five years. This decision, however, were strongly claimed by the farmers. The conflict between the farmers and fisherman is clearly. In K. Gotoh's research [8], he proved that the willingness to pay for removing reclaimed land has reduced, thanks to the social benefits from reclamation project. Therefore, this problem can't be solved from any unique position. Moreover, before any given decision, the government should undertake the environmental impact assessment. While keeping the dyke gate opening for improving the water quality and ecological habitats, they need to balance the benefits from both of the farmers and the fisherman. From the sustainable perspective, we recommend a periodical opening schedule for the dyke. It's necessary to conduct these solutions before the riots come to their points.

3. Agricultural Development in Isahaya Bay under Land Reclamation Project from Nagasaki Prefectural Government's Viewpoint

Nagasaki Prefecture is located in the mountainous area near the Ariake Sea. (Fig 6.7) This area did not only struggle with the flood but also the lack of agricultural land required for food production. Therefore, two out of the main objectives of the Isahaya Bay Reclamation Land Project (IBRP) are creating a new highly productive agricultural land and securing water for agricultural and domestic use [12],[19].

Fig 6.7: The Change of Reclaimation Land in Isahaya Bay from 1993 to 2003 [2]

As the information provided by IBRP Office, in 2008, this reclamation land was opened and allowed farmers to register and do farming. Currently, 600 ha of the reclamation land is in good quality and has higher yield than other surrounding areas. In this area, the government implementing two main activities including (1) 'land for sale by lease system'; and (2) enhancing environmental-friendly agriculture[20]. There are 25 individual farmers and 16 agricultural corporations are doing farming in this area [20].

There are 6 main requirements for the farmers participating in farming activities in the reclamation land area including:

- Ages are ranging from 20 to 50;
- When registering, farmers have to list all their farming activities had done;
- Must be eco-farmer by using haft amount of fertilizer in comparison with other farmers;
- Entering a 5-year lease and have to pay 15,000 JPY/10 ha/year;
- Making a declaration of not using chemical fertilizer;
- Farmers must enter a contract with the market place where they can sell their products.

Fig 6.9 Agricultural Activities in the Reclamation land

Farming activities in this area are not only rice cultivation but also vegetable cultivation and livestock raising and dairy production. Currently, the local government is encouraging researches related to three main issues, including: ([21] Fig 6.9)

- Construction of large-scale agricultural production system aiming to enhance environmental conservation technology;
- Establishment of high quality agricultural products and stable production technology toward branding Isahaya Bay reclamation quality, such as scientific understanding and processing suitability;
- Establishment of a recycling agricultural substance.

According to IBRP Office, the agricultural business inside the reclamation land has been run smoothly and developed. However, in this area, there are many controversies between stakeholders on whether the government should open or keep closing the water gates of Isahaya Bay. This is a very difficult question because it related to both livelihood of many stakeholders and environmental protection issues. There is an evident that keeping and following the current project would provide higher social benefits than turn it back to the wetland area [8]. Thus, in my opinion, in order to make a sufficient decision, the government should recognize that any issue has its both advantages and disadvantages. Solving a problem is not to ignore all its advantages but to reduce the disadvantages in a multi-benefit approach.

4. Solutions to the Problems of the National Isahaya Bay Reclamation Project (NIBRP)

4.1. Conflicting Interests in the Isahaya Bay

Two main stakeholders in Isahaya are fishermen and farmers whose interests have conflicted for many years.

Fishermen: In the case of reclamation project in Isahaya Bay, it is natural for fishermen to object to the idea of closing the bay because the project has resulted in a significant deterioration on fish catch and other aquaculture activities in Isahaya Bay as well as Ariake Sea. This causes high drop in the fishermen's incomes. Consequently, a great number of fishermen lost their job and livelihood due to the construction of the dike. The reclamation project is one typical example of excessive human interference in nature and the loss of valuable marine and aquatic diversity. (Fig 6.10)

Figure 6.10 Discussion With a Member of Isahaya Bay Fisheries Association For The Impacts Caused By Rhe Dike Construction.

Farmers: The reclamation land has a total area of 3,500 hectares. Individual farmers and companies who are growing their crops currently use this land as farming land. Farmers in the Isahaya Bay area afraid of the damage from salt water, which may badly impacts on their farmland. At the moment, water used for agricultural activities comes from the fresh water reservoir inside the dike. If the gate opens, that water will be mixed with the seawater, which is not suitable for farming. The number of large-scale farmers and companies having agricultural activities in the farmland is not high but their investment is considerable. Therefore, opening the gate is considered a great risk to farmers. What happens to the farmland is still a big question to all the farmers. A loss of crops is foreseeable to the farmers

if the gates open this year under the decision by the High Court and the government support. Moreover, worry about the failure of flood control is another problem to those who lives around the reclamation project site.

Figure 11: Crops On Reclaimed land of Isahaya Bay Reclamation Project

The problem becomes complex when there are different stakeholders and authorities getting involved in the decision to open or close the 7.2-kilometer dike. In deed, it takes long time for discussion and negotiations. However, up to present, the final solution has not come regardless of the decision by central government to open the gates in 2013.

4.2 A Failure of Public Work

The Isahaya Bay land reclamation project is consider a typical example of a public works project that is unable to be stopped once it is started. A number of debatable issues remain before the project can come to a satisfactory end to all the stakeholders of conflicting interests.

“The government had spend a lot of money on the project and that the fishermen on the other hand had been paid millions of yen for damage caused to the fisheries sector. These losses could have been prevented if the planners had sought opinions from various organizations and stakeholders in the process [23].. In a national project, the government covered all the cost and initial compensation for fishermen. Over 250 billion yen was invested in the reclamation project during 20 years since construction began in 1989. The project was initiated in the 1950s for increasing food production. In the 1960s, the government thought the dike could also contribute to flood-control efforts. However, the construction of the dike is considered a main reason to destroy fisheries in the Isahaya bay. Therefore, they appealed for open the gates and remove the dike to return the bay back to the previous situation.

Opening the gates could damage farms on reclaimed land with a huge a mount of investment money for which the government is supposed to pay massive compensation for the farmers working on the reclaimed land. Farmers of large scale farming use water from the reservoir, but they are likely to find other water source which may be costly and infeasible.

With the decision to open the dike gates in 2013 by the government "The 41 individuals and corporations who farm in the bay feel betrayed by the government, since it was the Agriculture, Forestry and Fisheries Ministry that launched the farming project by reclaiming land." [24].

Opening the gates may also disturb the sea bottom, which could impact on the fishing and aquaculture activities in Isahaya Bay. Based on draft calculation, some underwater construction work to limit the impacts of gate opening would require additional over 60 billion yen. Project review is stilled recommended by the government, even though 250 billion yen has been spent on it.

4.3 Lessons Learnt and Solution to the Problem At Isahaya Bay

"The problems associated with the Isahaya Bay project are complex and there is no clear solution" [23]. Looking at the complexity and the failure of the National Isahaya Bay Reclamation Project (NIBRP), we recognize that for environmental impact assessment is important to the success of any construction project, especially national large-scale project like NIBRP. The calculation the advantages and disadvantages the two options should also be considered carefully before giving any decision to open or keep closing the gates. In other word, the relevant authorities should have cost-benefit analysis on the two options to limit the damages and the compensation to the affected stakeholders in the Isahaya bay. Moreover, the complication of the circumstance in Isahaya bay project requires multilateral negotiations to achieve most appropriate solution. Finally, the current concern is not opening or closing the dike gates but how to open the gates. Scientists must conduct thorough researches on the long-term impacts of opening gates as well as the best way to open the gates with lowest risk for the farmers and residents living around Isahaya bay.

We cannot change the past but from the lessons learnt in the case of Isahaya bay national project, we understand the importance of environmental assessment before initiating a project and the complexity of ecosystem under the human interference.

Reference

1. http://www.mizuken.org/sample_e.pdf
2. http://www.sozogaku.com/fkd/en/cfen/CD1000139.html
3. http://www.volcano.si.edu/volcanoes/region08/kyushu/kuju/2009kuj1.png
4. Masahiko KUNISHIMA, Michihide MIURA, The fishery damage by NationalIsahaya Bay Reclamation Work, 1997
5. Ariake sea network of fisherman and citizens. *An avoidable mistake: The "Guillotines" of Isahaya bay*. Brochure, http://blog.goo.ne.jp/gyomin-net.
6. EDL (Environmental Diplomatic Leadership). *Isahaya bay reclamation and relevant issues*. Distributed material for the debate on November 15th, 2012, Tsukuba university.

7. Hiromi Yamashita, 2009. *Making invisible risks visible: Education, environmental risk information and coastal development*. Ocean and coastal management, 52, 327-335.
8. Keinosuke GOTOH, 2001. *Social Evaluation for Land Usage Isahaya Bay Reclamation Project.*
9. Junya HIGANO, 2009. *Manila Clam and Pacific Oyster Culture in Isahaya Bay For the Sustainable Production in Stressful Environment*.
10. Takayuki Jinnai, 2010. *Closure of Isahaya bay dike and Environmental disturbance in Ariake sea: open the Floodgate to recover prosperous fishing industry and Achive the coexistence of agriculture and Fisheries*. Isahaya bay emergency rescue task force – Tokyo office.
11. Teiichi AOYAMA, 2008. *Research on deterioration of water quality and its improvement caused by dam construction in Japan: A case study of Isahaya bay reclamation project*. Lecture at Wuhan university, China.
12. Wataru NISHIDA and Masato NOGUCHI, 1999. *Environmental assessment and reclamation of Isahaya bay in Japan.* International symposium on integrated environmental management, Kangwon National University.
13. *www.japantimes.co.jp/text/nn20121106b3.html.* Visited on November 10th, 2012.
14. *www.sozogaku.com/fkd/en/cfen/CD1000139.html.* Visited on November 10th, 2012.
15. UNEP, 2005. Coastal Screen. Case study: Isahay bay, Japan.
16. T. A. Nguyen, Artist, *Reclaimation Land in Isahaya Bay.* [Art]. EDL Domestic Internship, 2012.
17. United Nation Environment Programme, "One Planet Many People - Atals of Our Changing Environment," United Nation Environment Programme, USA, 2005.
18. H. Noguchi, "Administrative Support and Its Problems in Isahay Bay Reclamation Project," Graduate School of Public Management, Waseda University, [Online]. Available: www.f.waseda.jp/katagi/noguchi.htm. [Accessed 22 January 2013].
19. Y. Matsushita, "Government and Citiens in Isahaya Reclamation," 2010. [Online]. Available:gyosei.mine.utsunomiya-u.cp.jp/enshua00/matsushitay/matsushitay.html. [Accessed 22 January 2013].
20. Everybody"s Agricultural Plaza, "Visit the Isahaya Bay polder," 30 January 2009. [Online]. Available: www.jeinou.com/topics/2009/01/30/093953.html. [Accessed 2013 January 2013].
21. Nagasaki Agricultural and Forestry Techinical Development Center, "Sector and Agricultural Reclamarion Research," [Online]. Available: www.n-nourin.jp/nougi/section/03reclaimed_land/index.html. [Accessed 22 January 2013].
22. Y. I. H. N. Y. H. S. U. A. Keinosuke Gothoh, "Social Evaluation for Land Usage Isahaya Bay Reclamation Project by CVM," *Nagasaki Techonology University Research Paper,* vol. 38, no. 70, p. 20, 2008.
23. JENESYS (2009). Environmental Conservation through Biodiversity: In Search of Sustainable Development. East Asia Future Leaders Programme.
24. Hata, M. & Kobuchi, I. (2010) .Open the floodgates (of govt money) / Kan's call could mean a 250 bil. yen project was for naught, and that's just the start. Retrieved January 16, 2013,fromYomiuriShimbunwebsite:*http://www.yomiuri.co.jp/dy/national/T101216005171.htm*

Chapter 7　History of Japanese Industry

Junping LIU, Wenlong WANG, Md Tofail MIAH,

Erdenebadrakh MUNKHJARGAL

1.　History of Coal Mining Industry in Nagasaki

Japan's domestic coal mining started in the late 17th century, which keeps the development until the 1800s. The modern coal mining industry is established in Japan at that time. However, endogenous coal mining located in Yamaguchi, Fukuoka and Nagasaki is with small scale up to the middle of 18th century because at the end of the eighteenth century a big development in coal market is kept for a long time, results from the fact that coal is treated as a quite common substitute fuel for burning in home consumption and industries such as salt manufacturing. Thus endogenous coal mining has been established to meet the request of commercial production at the end of the 18th century, when the mining technology is greatly improved compared with the primitive one. With this favorable status, Japan's coal is supplied to the other foreign countries through the connection with the world coal market [1]. The gray area in the Fig7.1 shows the Nagasaki coal mining developed area.

Fig 7.1 Nagasaki coal mining area[2]

Coal was discovered on Hashima around 1810. Hashima is also called Gunkanjima Island, which lies around 4.5km west of the Nagasaki peninsula, 2.5km southwest of the Mitsubishi Mining Company's main coalmine on the island of Takashima, and 19km southwest of Nagasaki harbor. It is a tiny island with a seabed coalmine. It measures 480m north to south and 160m east to west, with a circumstance of 1200m and an area of 63000m^2. The island is surrounded by a sea wall, and has multi-storey reinforced concrete apartment, giving it the appearance of the warship Tosa. For this reason it has become known as "Battleship Island"[3]. The location of the island is shown in the Fig 7.2.

Fig 7.2 the location of Hashima island [6]

Although the Saga clan carried out some small-scale coal mining, it was when the mine came under the control of Mitsubishi Goshi Kaisha (Mitsubishi Limited Partnership) in 1890 that full-scale seabed coal mining operations began [3].

As the amount of coal being excavated increased, the population of Hashima grew, and in 1916 Japan's first reinforced concrete high-rise apartment building was constructed to house the many people living on this small island [3]. (Fig 7.3)

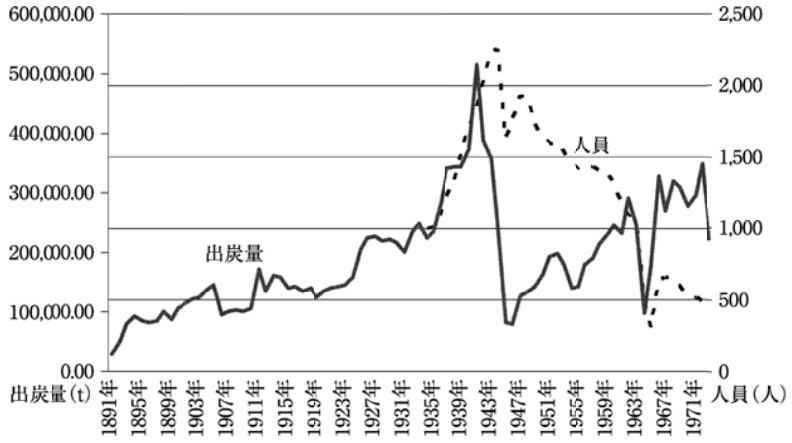


Fig 7.3 coal production and number of assignments in Hashima Island [3]

At its peak the population of the island was around 5300, giving it a population gradually shrank along with the island's population. In Meiji 23 years, 1890, the Hashima mine located on the seabed which is more than 1000m below the Hashima Island, distributing as layers in the level. In the stage of 1941, more than 0.41 million ton coal production was achieved and main good quality of coking coal is provided to Yawata iron Production Corporation until in 1974 the production of coal production is stopped [4]. (Fig 7.4)

Fig 7.4 Current situation of Hashima island

In 1974, coal mining business began to decline. The whole world tended to use oil instead of coal as the main energy. Japan began to close all parts of the country's coal mine, so the Mitsubishi company also in 1974 declared to close the Hashima island coal mining and make the workers leave the island. A year later, the last resident leaved this island, which meant the island was thoroughly closed [5].

With the typhoon, earthquake frequently happened for decades, the island became a broken landscape, and doomsday seems to be happened all in here. Not all the people used to be living here died and people who emigrated from the island all hope to be able to leave their once life of evidence so that the island is turned into sightseeing here, ghost city sightseeing. Factory located in the island at that time is just like a village, where people work and live in the same place. We can see the lighthouse from the sea, a lighthouse which seems never grow old. Many buildings are connected with each other, which indicate that once the residents should be lived quite closely. At that time the population density of the island is seven times the population in Tokyo.

In world war II, nearly thousands of north Koreans and Chinese were cheated to do slave labor on the island, hard to death, so the island has another name, and the prison island. It is a huge and broken grave without its owners.

2. History of Shipbuilding in Nagasaki

We EDL domestic internship group visited the Main plant of Nagasaki shipyard & Machinery Works, which has four sites: Main plant, Koyagi plant, Saiwaimachi Plant and Isahaya Plant, respectively. (Fig 7.5) [6]

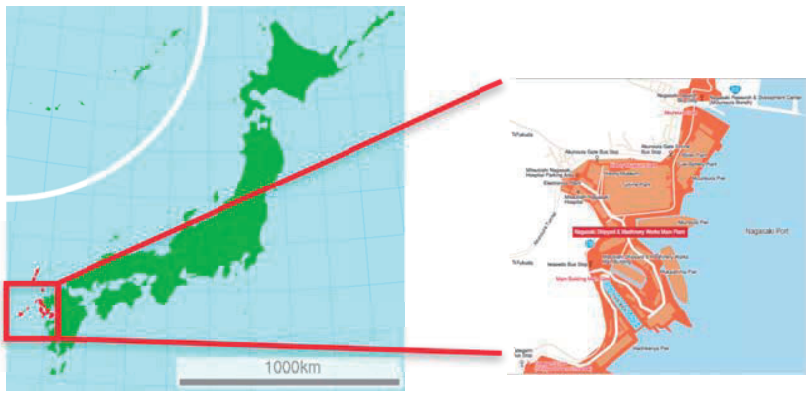


Fig.7.5 Nagasaki shipyard & Machinery works in Nagasaki

Nagasaki bay is gracile inserting into Nagasaki's mainland, the shipbuilding yards are built on both sides of the bay. This made hypsographical superiority for shipbuilding industry, which are developing fast after Mitsubishi heavy industry's Nagasaki shipyard & machinery works established[2]. (Fig 7.6) [7]

Fig 7.6 The shipyard in Nagasaki

As we know that the coaling station in Gunkanjima made most contribution for economy in Nagasaki before it closed, but after that, the shipbuilding became the biggest industry in Nagasaki. Currently, the shipbuilding yard provides ship for both military and civilian use, such as specialized commercial vessels including LNG carriers, oil tankers and passenger cruise ships. (Fig. 7.7)

Fig 7.7 Nagasaki shipyard

Nagasaki shipyard & Machinery Works was traced back to the 1857. Initially, the foundry was designed for ironwork under Japanese government control. After 1884, the foundry finished privatization, which was own to Mitsubishi Company. After 20 century, the shipyard's function became completer. It added service like power station and so on. Moreover, after the Second World War, some new constructions were built such as dry dock, coal fired boiler ship, Isahaya plant, space equipment shop, electronic ship, solar cell factory, wind turbine shop and so on. [8]

3. Atomic Bombing of Nagasaki

3.1 Nagasaki Atomic Bomb Museum

We visited Nagasaki's Museums on Nov.29.2012. It's a great museum that opened for all in April 1996 as a part of the 50th anniversary of the Nagasaki Atomic bombing. Earlier it was Nagasaki International Culture Hall. The museum exhibits a number of photographs, large sized materials exposed, artifacts that describe the destruction caused by the atomic bombing and help us to understand how devastating nuclear weapons are and also raise peoples urge towards peace in the world. Everyone should visit the Museum during travelling Nagasaki. It's horrifying but seeing what happened after the Atomic bomb dropped on Nagasaki.

During the visit a lot of new knowledge has provided by the atomic bomb museum. We got the audio guidelines in English and found them very informative and describe chronologically the entire incidents. It has further allowed us to understand the devastating nature of the atomic bomb. The influence on today's life of generations could get a bit more attention from the museum. The museum archives of materials relevant to the atomic bombings and its further radiation effects. Besides, the museum acts as a centre of international collaboration and exchange.

Fig 7.8 Nagasaki Atomic Bomb Museum

The Nagasaki atomic bomb museum is very well managed and shows all the significant memories about bombing and consequences to the visitors. The museum truly with a message from history of people's endless misery and sufferings. We are very shudder when visited this museum especially to observe the videos of the survivors.

3.2 History of Atomic Bomb in Nagasaki

Nagasaki city is located in the western part of Kyushu Island. The port city is surrounded by mountains in three sides with fascinating natural beauties along with charming history of 374 years.

We came to know the history delineated inside the Atomic bomb Museum that during World War II the four cities namely Hiroshima, Kyoto, Yokohama and Kokura Arsenal were selected for bombing. In the early day on August 09,1945 the B29 Boscar airplane loaded with a bomb started towards Kokura for pre-planned attack. The visibility from the sky was disturbed due to cloud at that time. Finally the aircraft changed its course towards Nagasaki which was the alternate target. The peace and harmonies ended with the explosion and the cruel devastation started at 11.02 AM in Nagasaki. [9] We saw time stopped at 11.02 in the watch preserved in the museum.

The atomic bomb that dropped in Nagasaki was 3.25 m in length, 1.52 m in diameter and 4.5t in weight (Fig 7.9). We saw the picture of original Bomb and life size model inside the museum. The atomic bomb was name "Fat Man" due to its bulky shape. The energy emission of atomic bomb was equivalent 21 kilotons TNT at the time explosion. The type of nuclear material used in the Nagasaki atomic bomb was plutonium 239. Surrounding explosives compressed the plutonium 239 core that created the fission reaction and huge energy produced by the explosion.

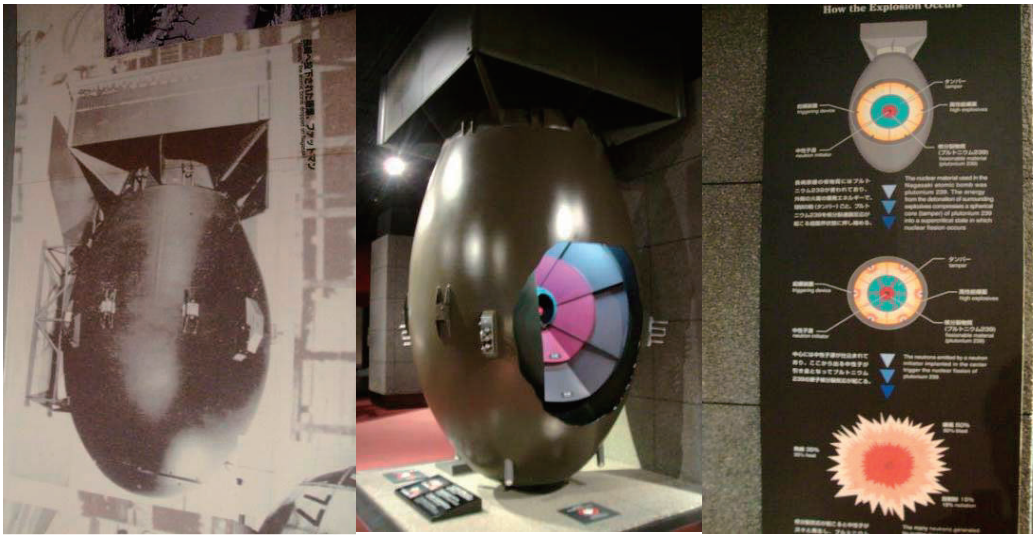


Fig 7.9 (1) Original A-Bomb "FatMan" (2) Life size model of "FatMan". (3) How explosion occurred

3.3 Consequences of Atomic Bomb Explosion in Nagasaki:

From pictorial view and analytical description we informed that fire occurred in a huge area approximately 200 m diameter were spread over 4 km from the hypocenter and mushroom cloud was created in the sky just after the explosion (Fig 7.10, 7.11). The temperature reached up to 6, 000 degree Celsius in the ground.

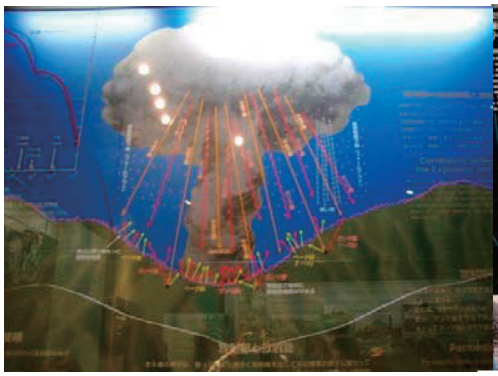


Fig7.10 Mushroom clouds created after bombing.

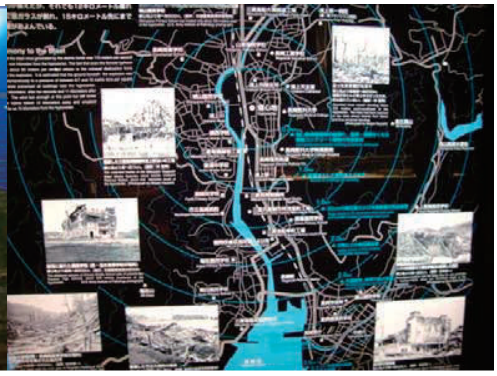


Fig 7.11 Areas Affected around hypocentre.

From this devastation caused by the atomic bombing we informed that 73884 people died completely, 74909 people partially injured, 120820 people became homeless (within a radius 4km), 18409 houses fully damaged, 11574 houses completely burnt down, 1326 houses fully destroyed, 5509 houses partly destroyed, 2.59 square miles land fully leveled of Nagasaki. [10]

We saw the clothing of ill fated peoples that found around 1.2 kilometer of the hypocenter and the pictures of peoples who were working outside was affected mainly

by the burning of exposed parts of body (Fig 7.12). Also people who can survive from that event, there are took indelible mental and physical scars and with disorders due to radiation. Some burned ceramics and showpieces are exhibited in the museum that expressed the fatal tale of the Atomic Bombing (Fig 7.13).

Fig7.12 Clothing found 1.2 km from hypocenter.

Fig7.13 Ceramics found 500m west from hypocenter.

We visited the ground in the hypocenter area that was ruined from destroyed building, scorched earth, melted glass and other material. The original ground level is preserved and displayed here as important evidence of the atomic bomb disaster. That is well documented and presented. (Fig 7.14(1)(2)

Fig7.14 (1)Ground in the hypocentre. (2) Hypocentre of the Atomic bomb explosion. (3) Wall section of Urakami Cathedral.

The explosion of the atomic bomb destroyed Urakami Cathedral which was the grandest church in East Asia at that time. It was located on a small hill about 500 m northeast of the atomic bomb hypocenter. During our visit we found a portion of the southern wall was brought to near ground zero for the response of the souls of the atomic bomb victims (Fig 7.14 (3). Now, the hypocenter remains as an international peace park and a symbol of the aspirations of the world for peace and harmony.

3.4 The Message for World Peace

We visited the Peace Memorial Park which is located close to atomic bomb museum. There are lots of monuments constructed about against the atomic bomb by international countries.

The peace statue in the Nagasaki Memorial Peace Park was constructed in August 1955 on the 10th year anniversary of the tragic atomic bombing in Nagasaki. The 10mm high statue, designed by Seib Kitamura, expressed an appeal for desiring world's peace and prayer that such devastation would not be happened in the history of human life. The uplifted right hand focused and point s attention to the threat of nuclear weapons. The other hand represents the harmony, calm and world peace. Divine love and a prayer for the souls of all the victims & sufferers of atomic bomb are expressed in the closed eyes of the statue. Added to this the left leg set in action in assisting humanity. (Fig 7.15, 7.16)

Fig7.15 The Peace Statue in Memorial

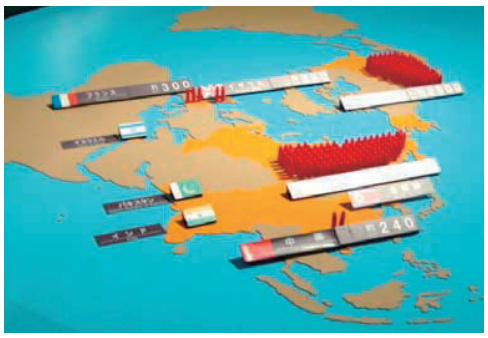


Fig 7.16 Nuclear Weapons Possession in the World

In the world some countries still possess stock of nuclear weapons at present. The accuracy of missiles that carry nuclear warheads has made remarkable progress since the atomic bombing of Nagasaki. The power of nuclear warheads has increased significantly with a size reduction with intent of using on the battle field. All human beings should raise their voice and build consensus to make safe disposal of these weapons so that no more atomic tragedy will be experienced in the human history. We should learn the lessons from Nagasaki Atomic bombing.

References

1. Coal Mining, Nisaburo MURAKUSHI, excerpt from *Technology and Labor in Japanese Coal Mining*
2. http://www.gunkanjima-odyssey.com/GS22-00.htm
   http://www.gunkanjima-odyssey.com/GS22-00.htm
3. 端島炭鉱「軍艦島」の生活，井上 博登，Vol. 19，pp212，2010. 3

4. 端島（軍艦島）における聞き取り調査及び現地調査，後藤，惠之輔；森，俊雄；坂本，徳；小島，隆行，長崎大学工学部研究報告 Vol.35(64) p. 57-62, 2005
5. http://zh.wikipedia.org/zh-hans/%E7%AB%AF%E5%B3%B6
6. http://www.mhi.co.jp/en/company/organization/nagasakiw/index.html
7. http://www.skyscrapercity.com/showthread.php?t=894600
8. http://en.wikipedia.org/wiki/Mitsubishi_Heavy_Industries
9. Nagasaki Atomic Bomb Museum available at http://www1.city.nagasaki.nagasaki.jp/peace/english/abm/ (Accessed January 20, 2013)
10. http://en.wikipedia.org/wiki/Atomic_bombings_of_Hiroshima_and_Nagasaki (Accessed January 20, 2013)