

Huge Water Channel Construction Project with Nature and Human Friendly Approach in the Sendai River



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Chapter 1_Summary of Satsuma Town Damage

1) Location of Sendai River Basin and Satsuma Town

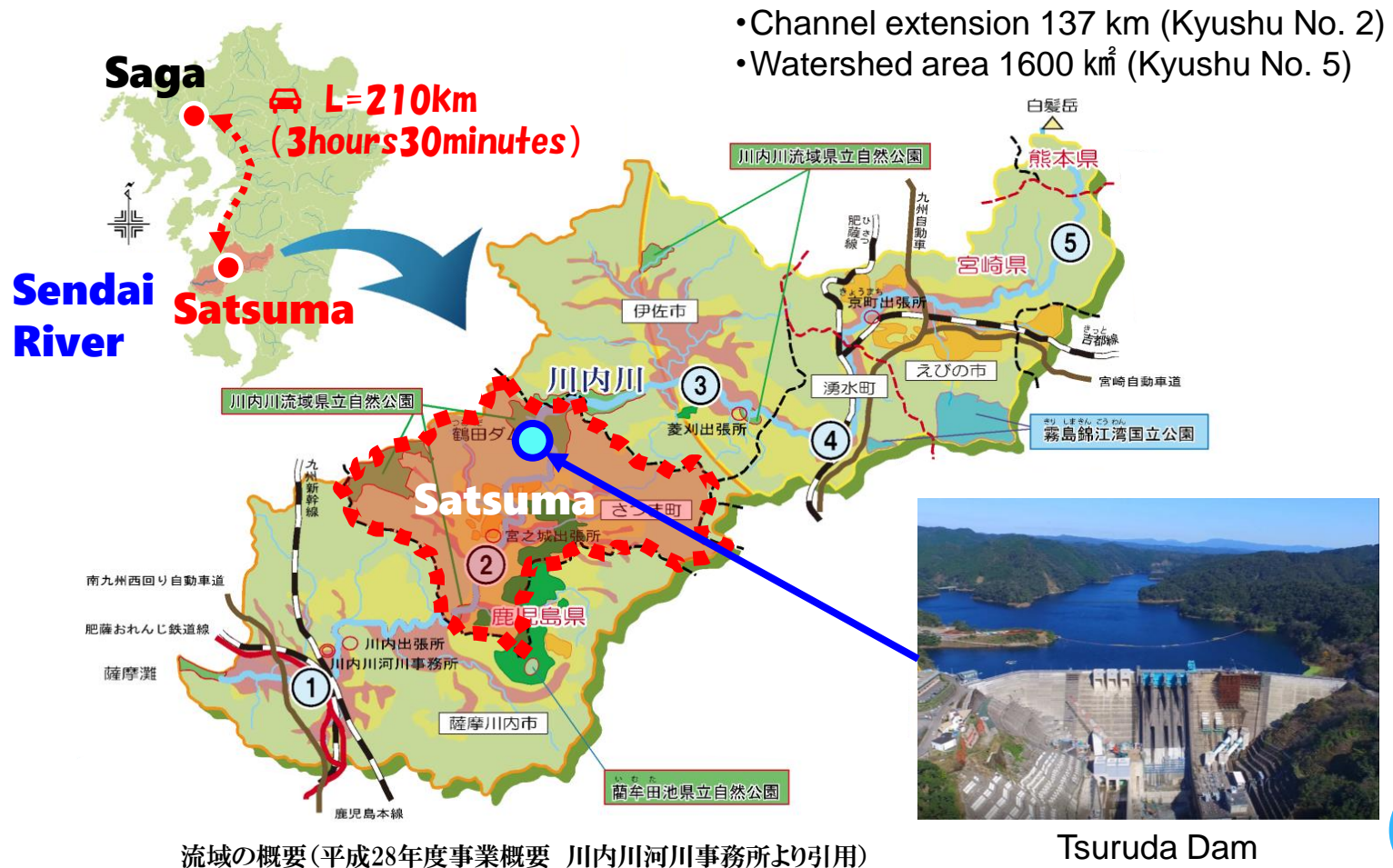
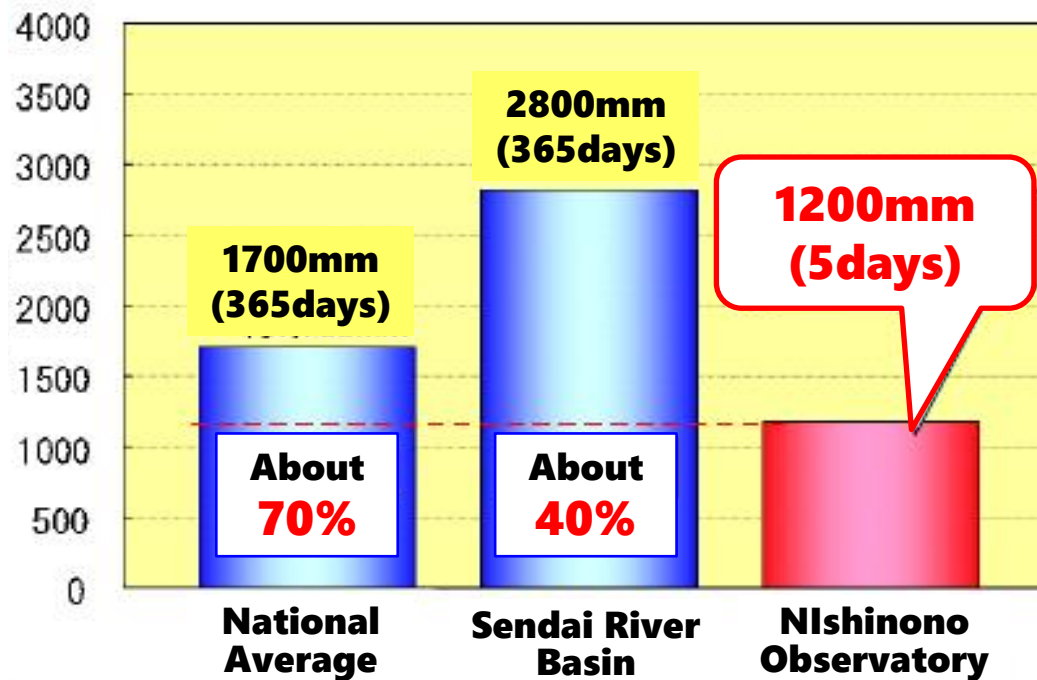


Fig1-1 Location of Sendai River Basin and Satsuma Town

Chapter 1_Summary of Satsuma Town Damage

2) 5 days of recordable heavy rain

Comparison with annual rainfall



※川内川流域(出典:国土開発調査会刊「河川便覧2004」)
※全国平均(出典:(財)水資源協会「日本の水2005」)
1971~2000年の平均

Fig1-2 5 days of recordable heavy rain (19th - 23rd July 2006)

Chapter 1_Summary of Satsuma Town Damage

3) Damaged situation in the Torai area

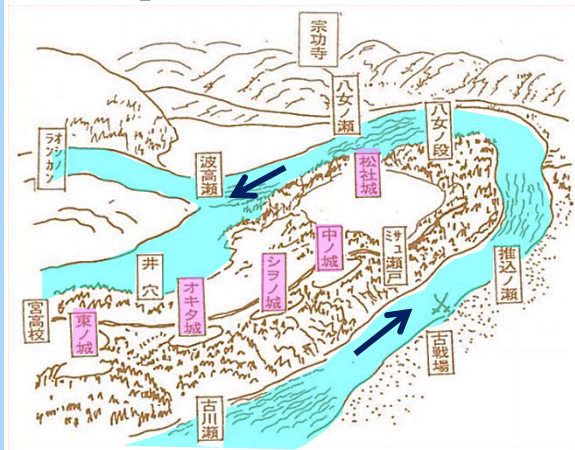


- one person dead and three minor injuries
- 367 semi-collapsed buildings
- 214 completely destroyed buildings
- 232 inundated buildings

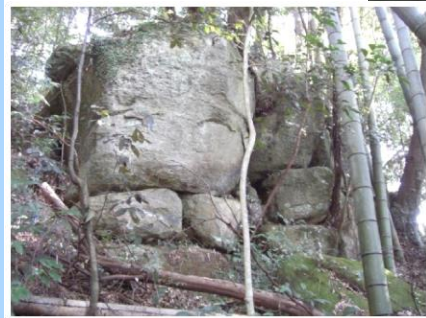
Photo1-1 Satsuma Town Torai district Afflicted situation Photo

Chapter 1_Summary of Satsuma Town Damage

4) Curved river channel and flooded area



Torai Castle Ruins



Masonry

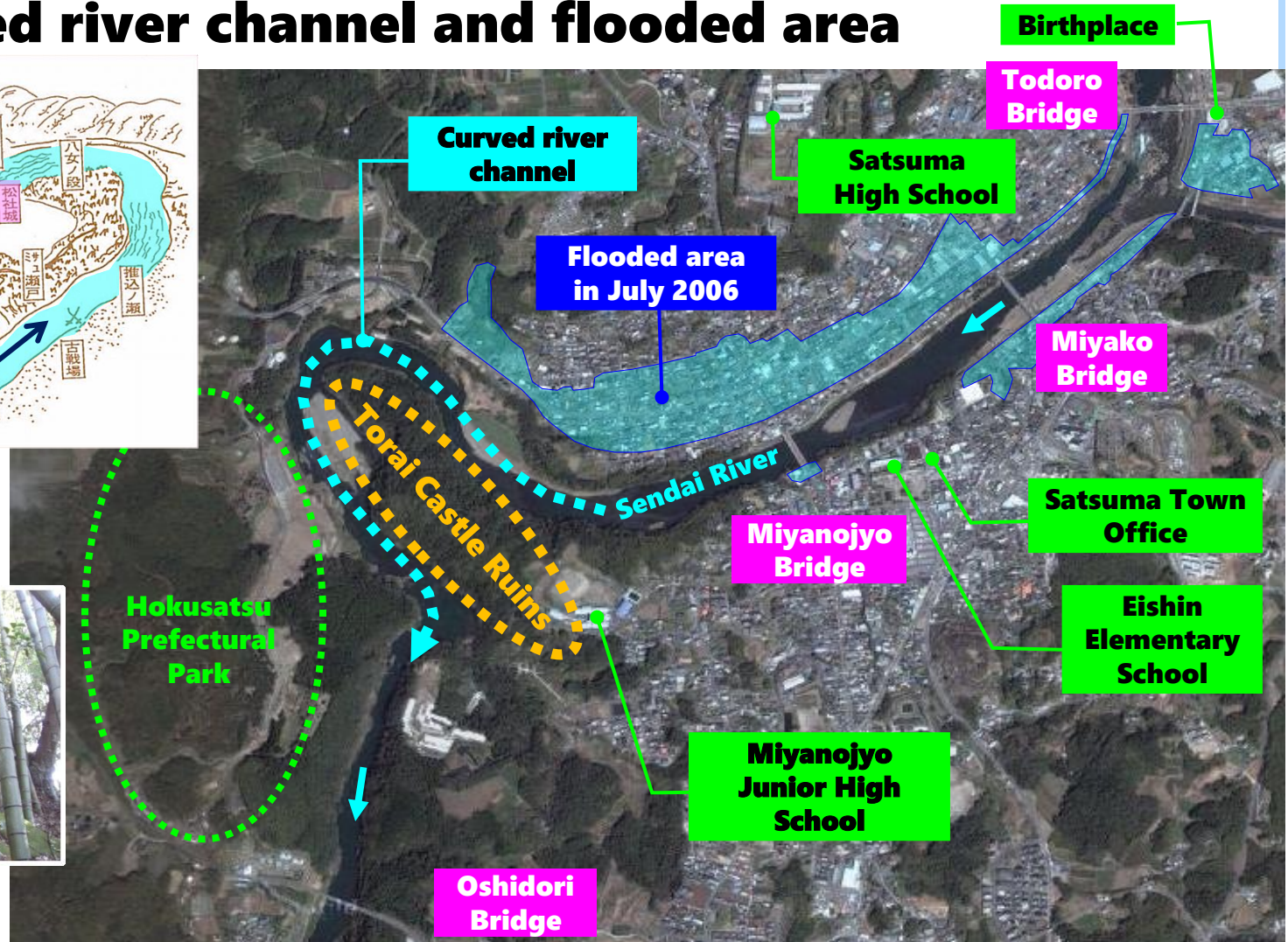


Fig1-3 Curved river channel and flooded area

Chapter 1_Summary of Satsuma Town Damage

5) Eliminate distrust of local residents

- Similar flood in 1972
- Distrust of the Tsuruda Dam
- Survival of life
- Impact on the natural environment



Photo1-2 Dam release status during floods

River landscape?
Environment?

Safety of
flood control?

Inheritance of
river culture?

What is my
house?

Do you need
a dam?

Return of
the city?

Is there
compensation?

Photo1-3 Eliminate distrust of local residents

Chapter 2_Participatory river making utilizing the landscape hydrological model

1) Holding more than 20 workshops in total

- From the beginning of the disaster, promotion of river development by freely participating townspeople
- Utilization of "multifaceted river making adviser system"

【Kyushu University: Professor Shimatani】



Photo2-1 Status of the workshop

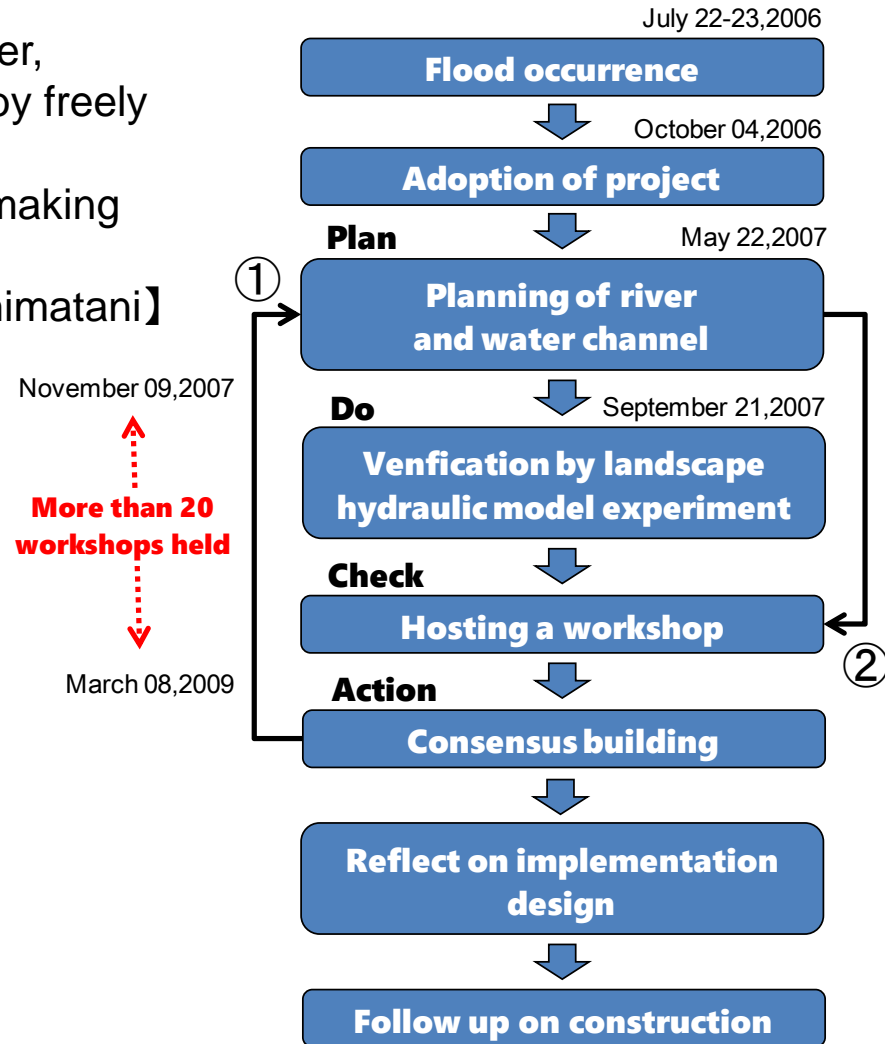


Fig2-1 Flow of river making

Chapter 2_Participatory river making utilizing the landscape hydrological model

2) Outline diagram of flood control measures

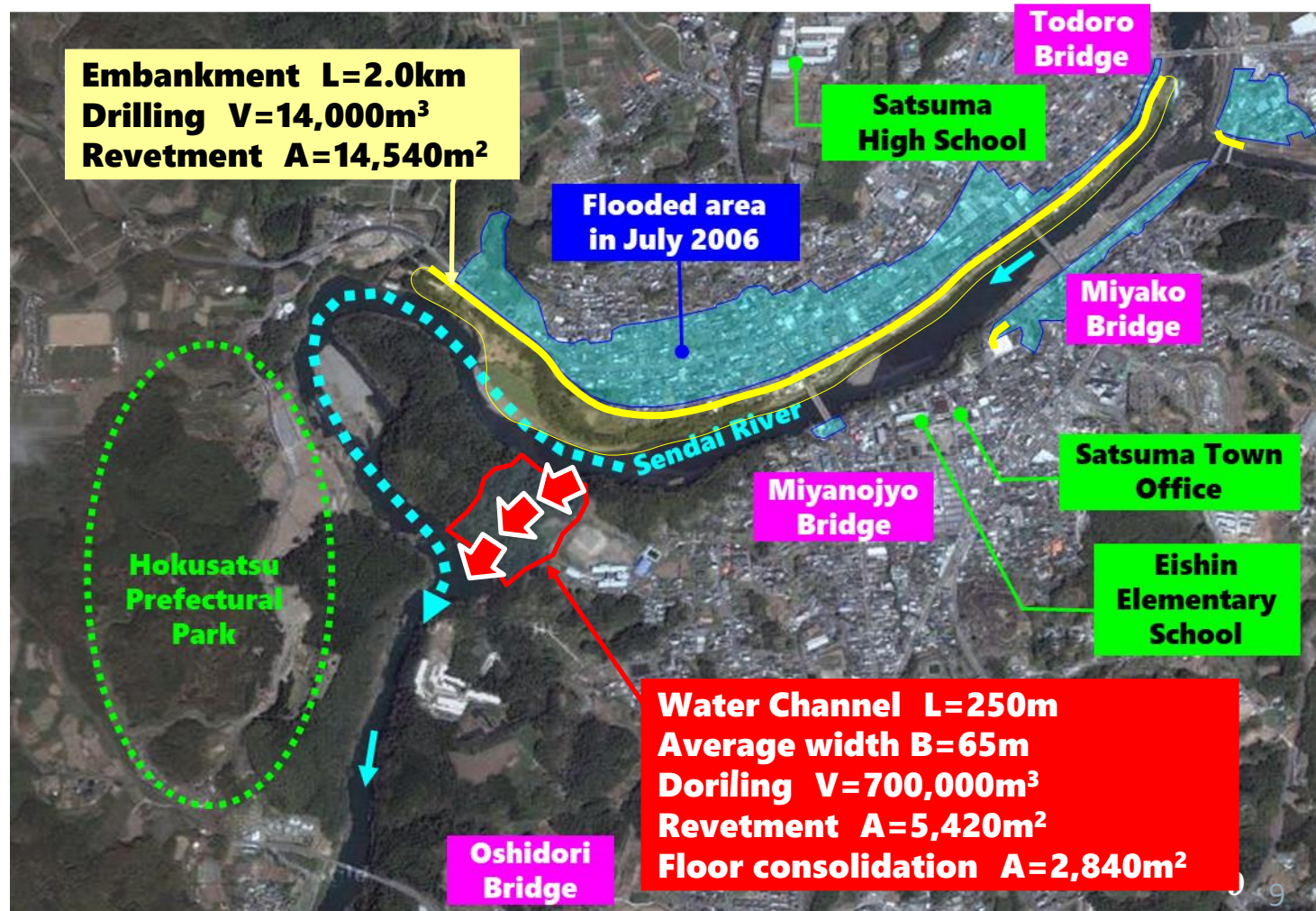


Fig2-2 Outline diagram of flood control measures

Chapter 2_Participatory river making utilizing the landscape hydrological model

3) Planning of river way

① First plan

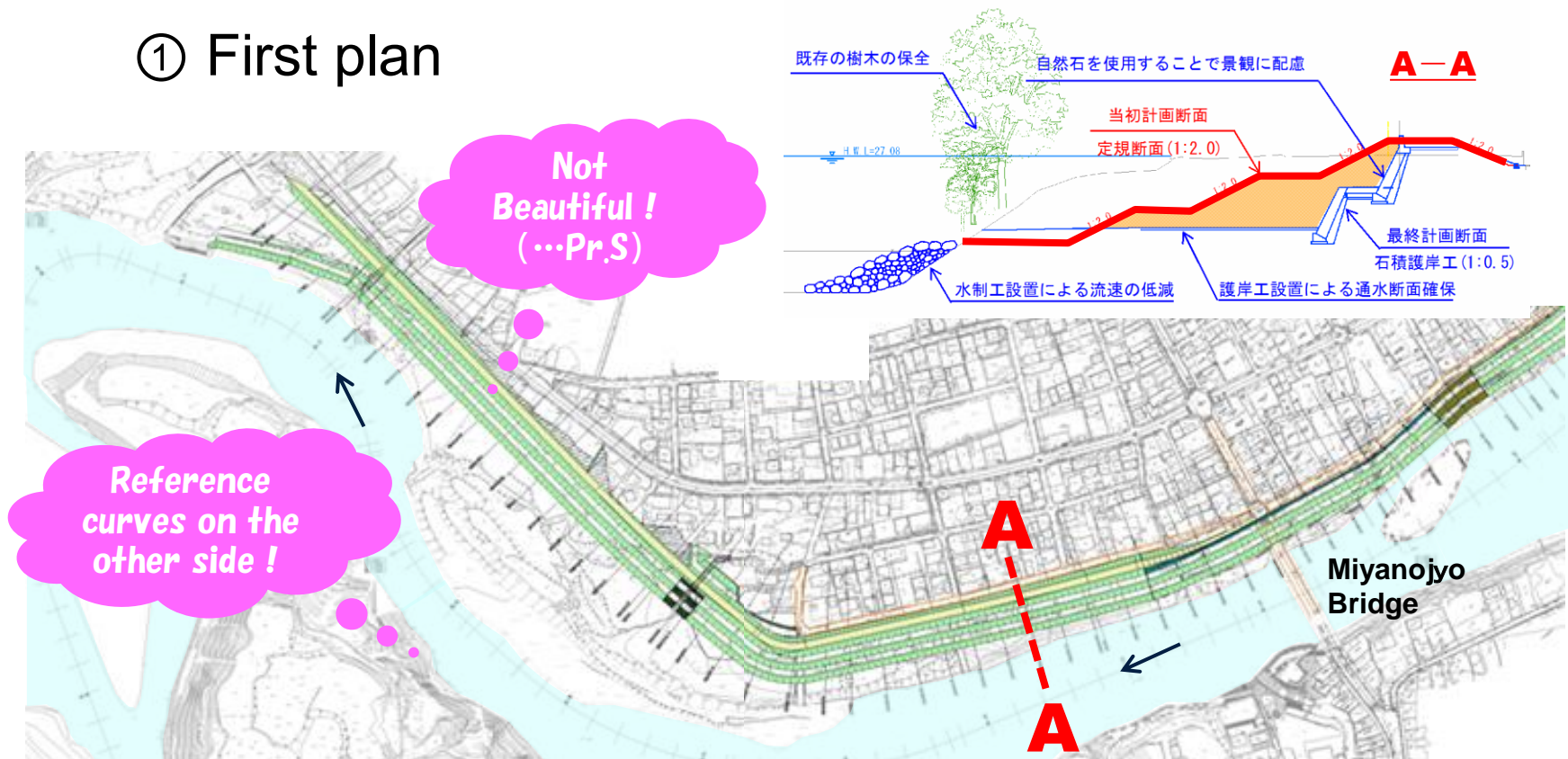


Fig2-3 Planning a river mainly with straight lines

Chapter 2_Participatory river making utilizing the landscape hydrological model

3) Planning of river way

② Secondary plan

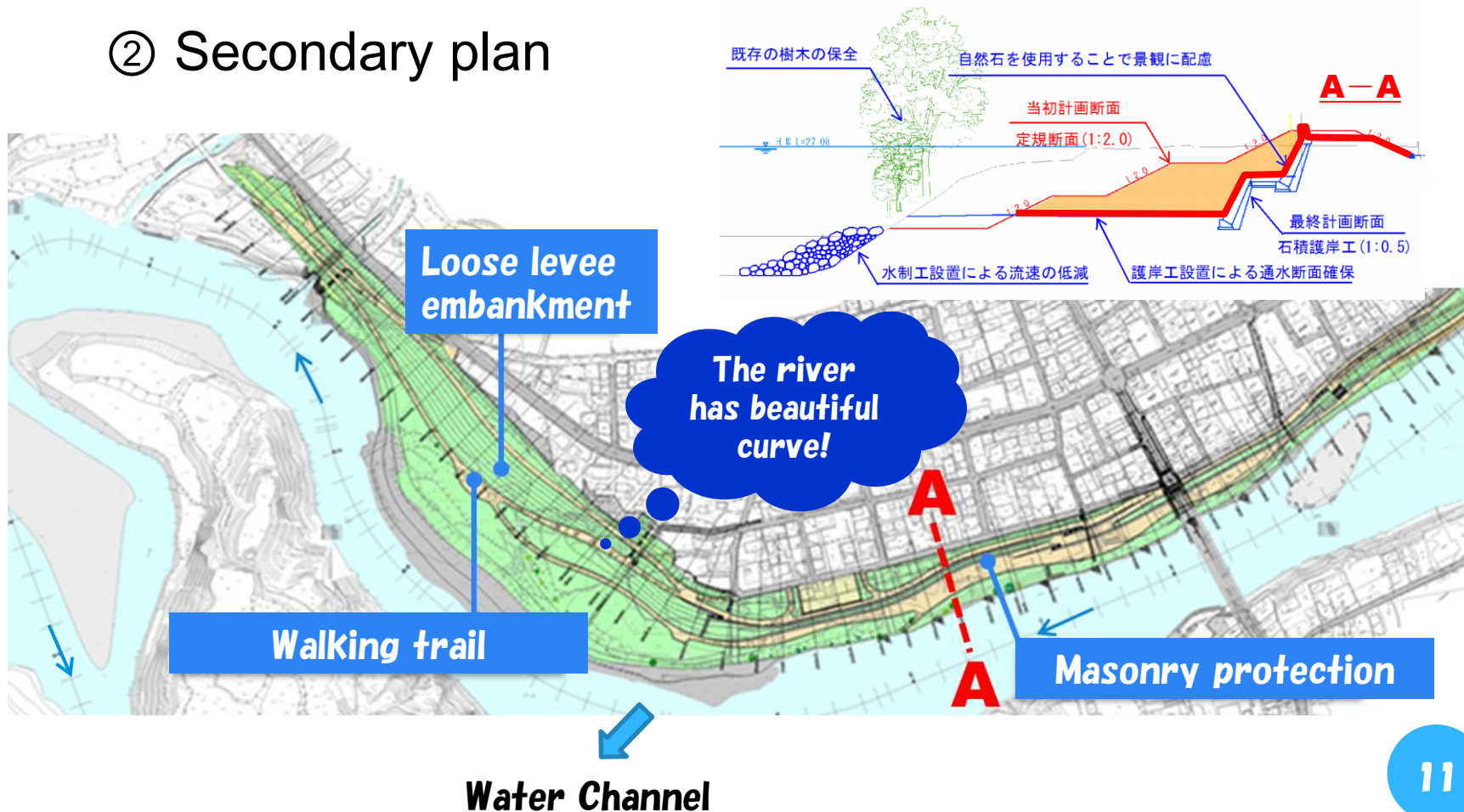


Fig2-4 Planning a river mainly with curves

Chapter 2_Participatory river making utilizing the landscape hydrological model

4) Planning of Water Channel

- ① Relaxing the safety of flood control
and its impact on the natural environment

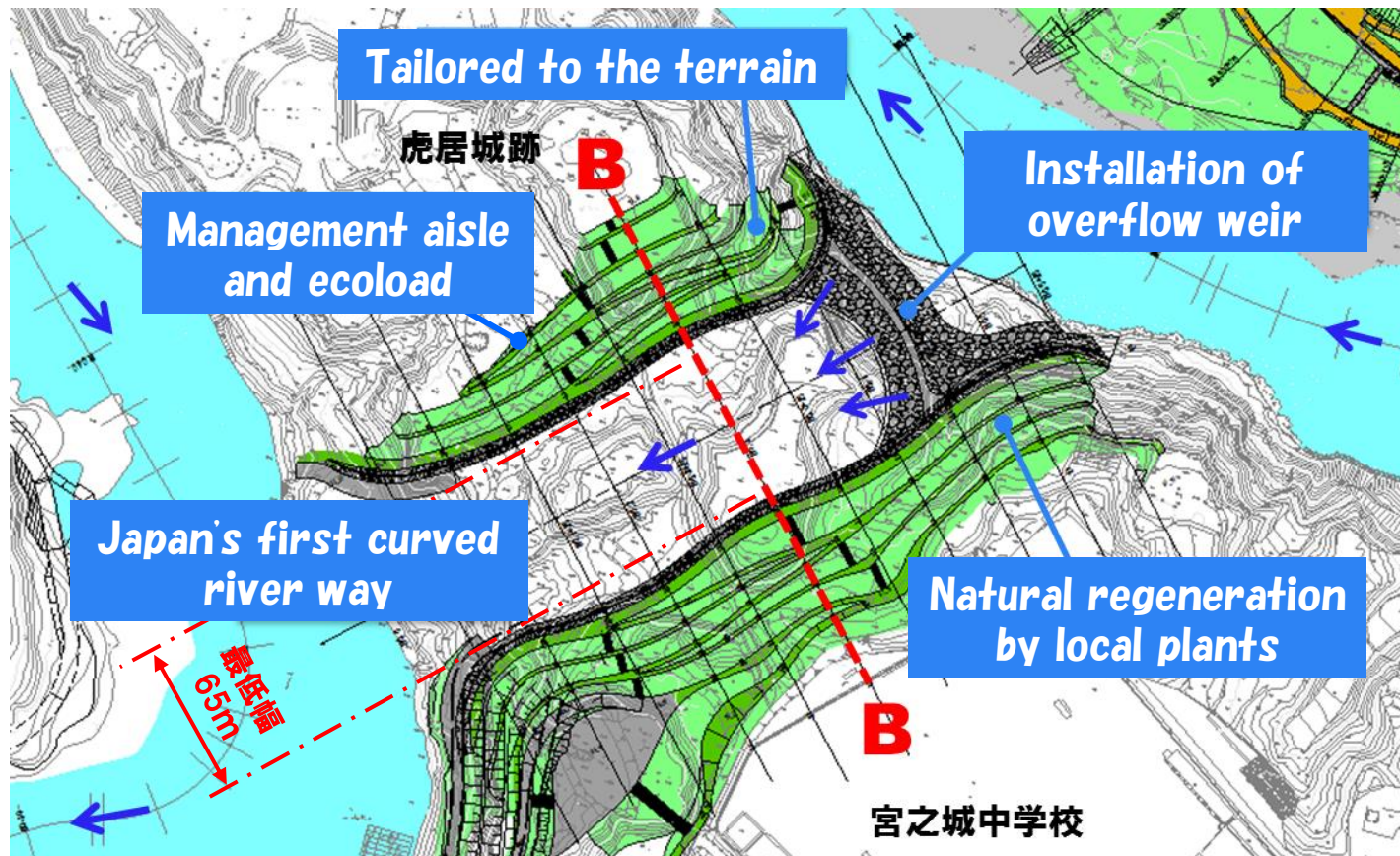


Fig2-5 Water Channel Floor Plan

4) Planning of Water Channel

-
- The diagram illustrates a cross-section of a water channel plan. Key features and dimensions include:
- Channel Width:** The bottom width is labeled as $B=65\text{m}$ (最低河床幅).
 - Channel Depth:** The depth is indicated as 9.0m (7.0m以下).
 - Channel Slope:** The slope is labeled as $1:1.0$ (法面勾配 1:1.0以上).
 - Channel Material:** The channel bed is labeled as **自然石護岸** (Natural stone revetment).
 - Channel Flow:** The channel flow is labeled as **H.W.L.** (High Water Level).
 - Channel Management:** The channel management is labeled as **Management aisle and ecoload**.
 - Channel Sediment:** The channel sediment is labeled as **Sediment discharge 700,000m³**.
 - Channel Regeneration:** The channel regeneration is labeled as **Natural regeneration by local plants**.
 - Channel Penetration:** The channel penetration is labeled as **Penetration of underflow water by a stone**.
 - Channel Masonry:** The channel masonry is labeled as **Masonry of 9m in height**.
 - Channel Boundary:** The channel boundary is labeled as **用地境界** (Land boundary).
 - Channel Slope:** The channel slope is labeled as **植樹による自然再生** (Natural regeneration by tree planting).

Fig2-6 Cross section of water channel plan

Chapter 2_Participatory river making utilizing the landscape hydrological model

5) Experiments with landscape hydraulic model

- Verification of flood effect
- Confirmation of landscape
- Visual impression for local residents



Formation of early consensus of project

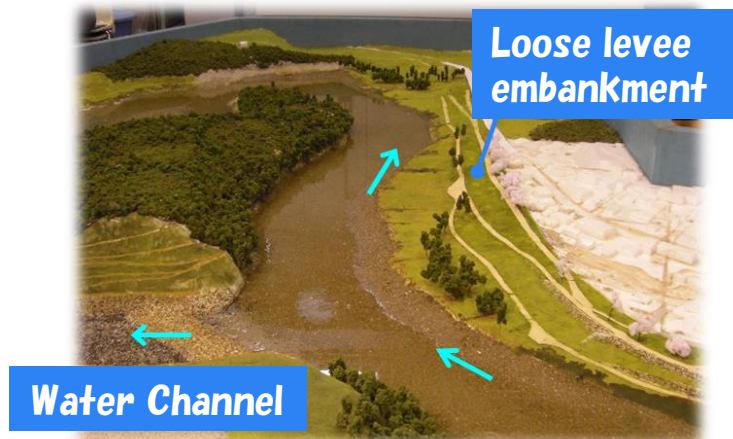


Photo2-2 Public experiments involving local residents(Kyushu University)

Chapter 2_Participatory river making utilizing the landscape hydrological model

6) Experimental results of hydraulic model

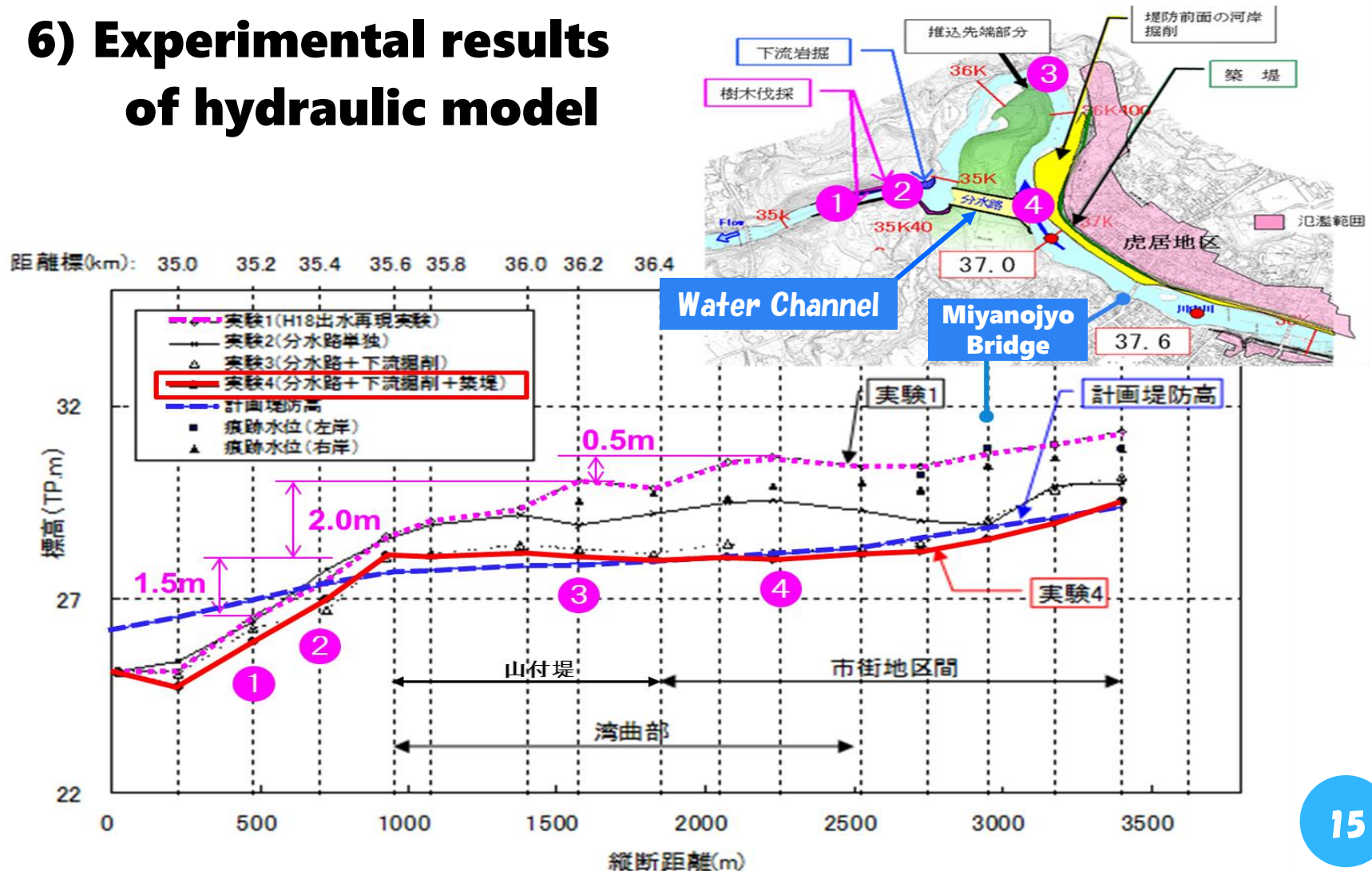


Fig3-5 Experimental results of hydraulic model

Chapter 2_Participatory river making utilizing the landscape hydrological model

7) Creation of regional design

① Regeneration of stone method

Effective Utilization of "Construction Generating Materials"



"Inheritance" of history and culture



Adopted "NUNOMETUMIKUZUSHI" with "品" as the basic form



Expansion of river product
Structurally strong
Masonry in the landscape



Photo3-5 Sogi Water Channel



Photo3-6 Nagano Kinzan

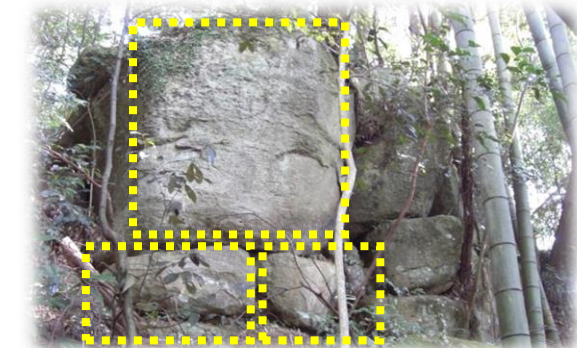
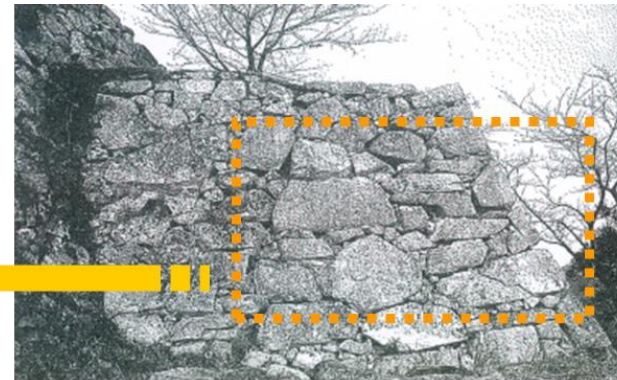
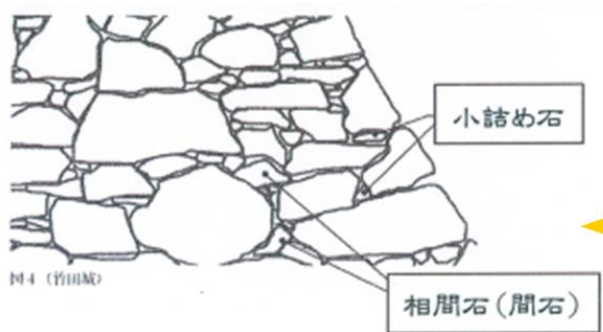


Photo3-7 torai castle ruins

Chapter 2_Participatory river making utilizing the landscape hydrological model

7) Creation of regional design

② Teaching “NUNOTUMIKUZUSI”



Takeda castle

石の積む順を表したもの

Stone is stacked horizontally

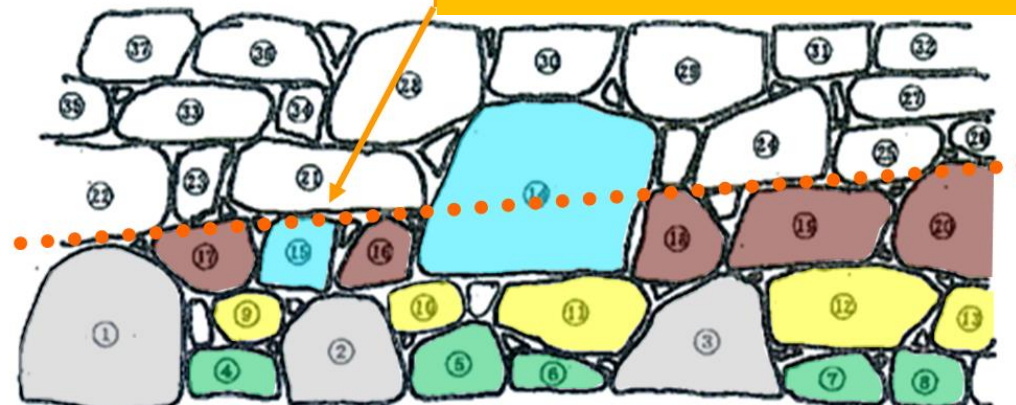


Fig3-10 Construction procedure drawing (reference 「穴太の石積」)

Chapter 2_Participatory river making utilizing the landscape hydrological model

7) Creation of regional design

② Teaching “NUNOTUMIKUZUSI”

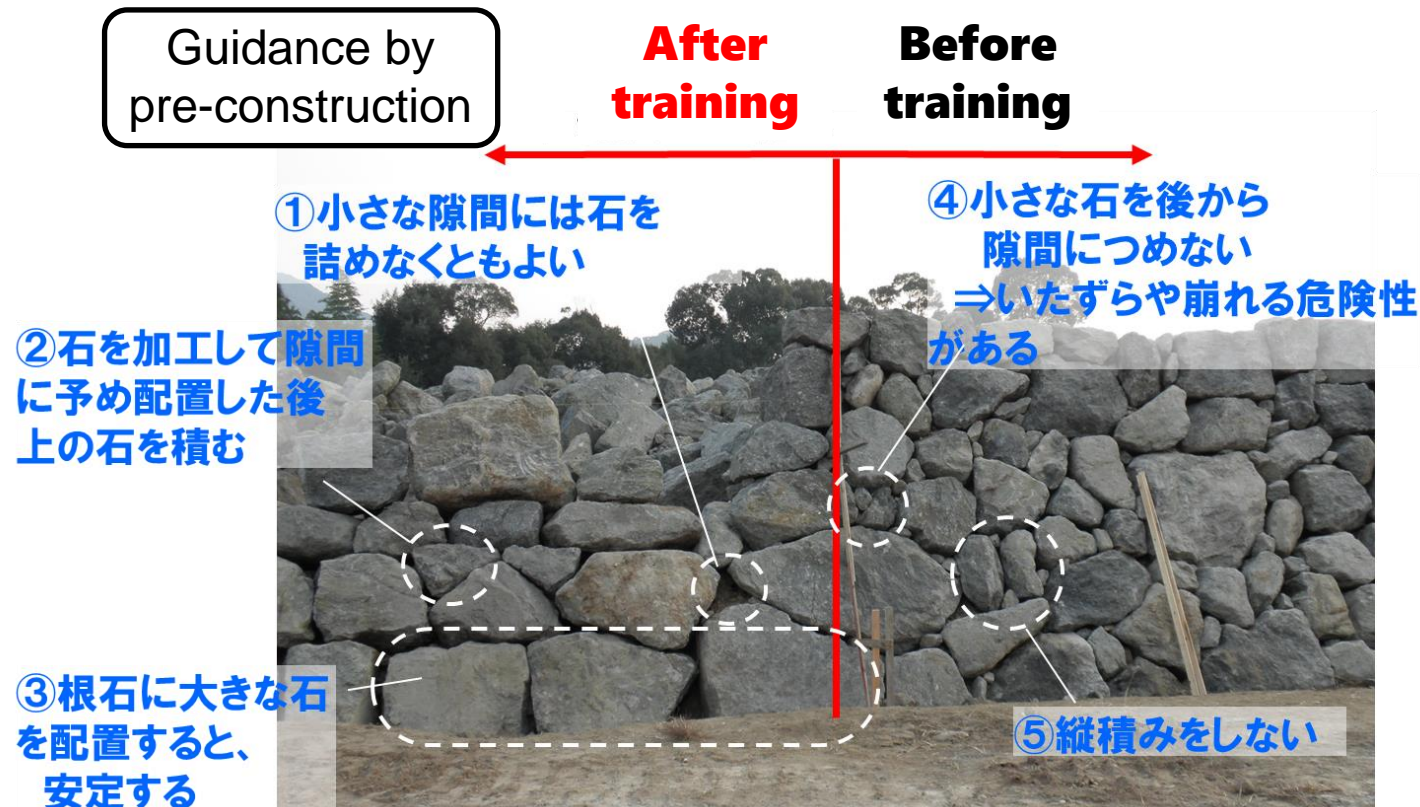


Fig3-11 Implementation of workshops with stone artisans

Chapter 2_Participatory river making utilizing the landscape hydrological model

7) Creation of regional design

③ Information sharing of design philosophy

Current status
photo
(Human eye)



Image
perspective



Photos after
completion



Fig3-12 Information sharing of design philosophy (downstream)

Chapter 2_Participatory river making utilizing the landscape hydrological model

7) Creation of regional design

③ Information sharing of design philosophy

Current status
photo
(Human eye)



Image
perspective



Photos after
completion



Fig3-13 Information sharing of design philosophy (midstream)

Chapter 2_Participatory river making utilizing the landscape hydrological model

7) Creation of regional design

③ Information sharing of design philosophy

Current status
photo
(Human eye)



Image
perspective



Photos after
completion



Fig3-14 Information sharing of design philosophy (upstream)

Chapter 3_Completed photographs and usage status after servicing

1) Completed photos after maintenance

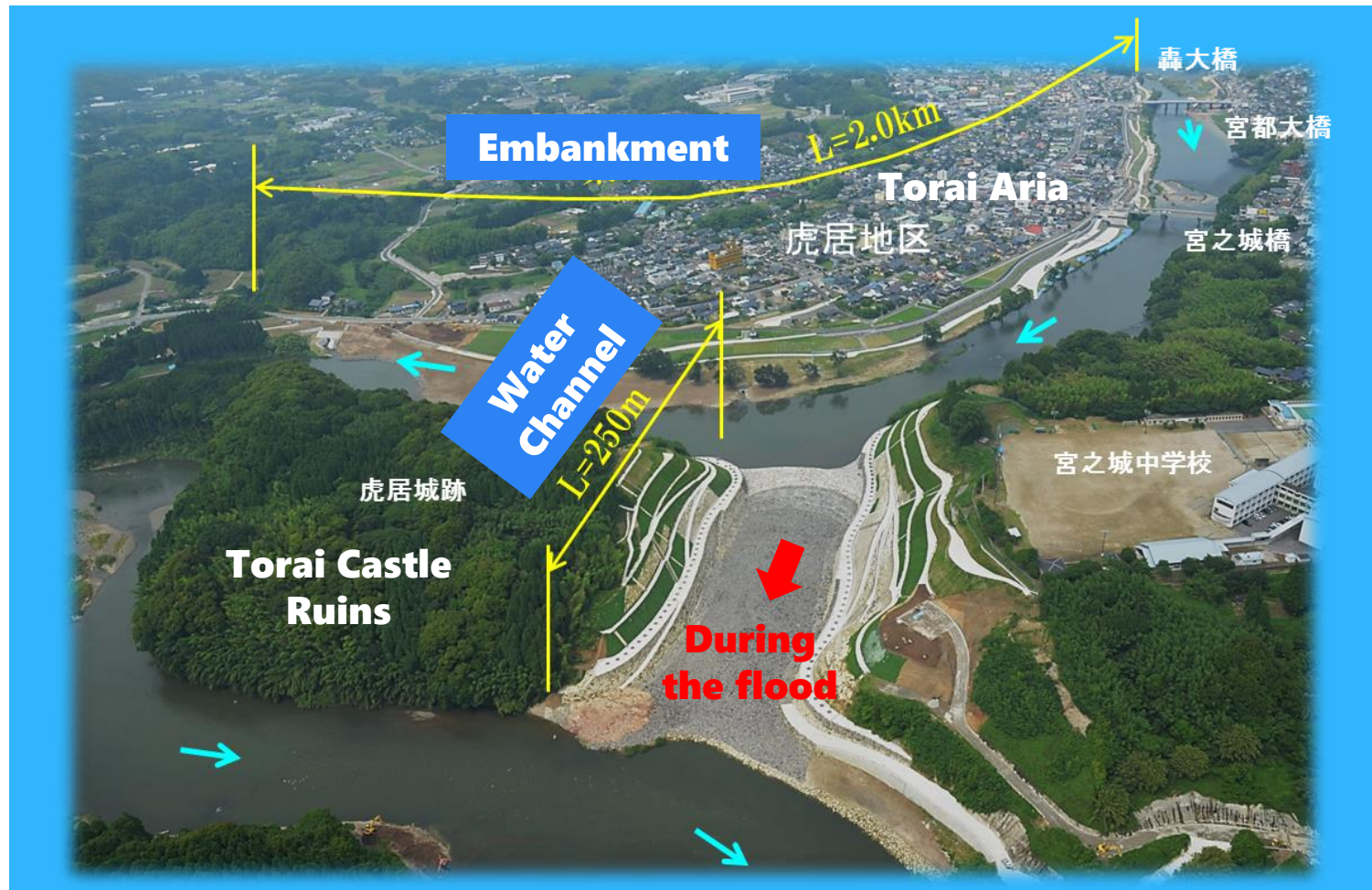


Photo3-1 Completed photograph of the Torai area

Chapter 3_Completed photographs and usage status after servicing

1) Completed photos after maintenance



Photo3-2 Around the water channel

Chapter 3_Completed photographs and usage status after servicing

1) Completed photos after maintenance

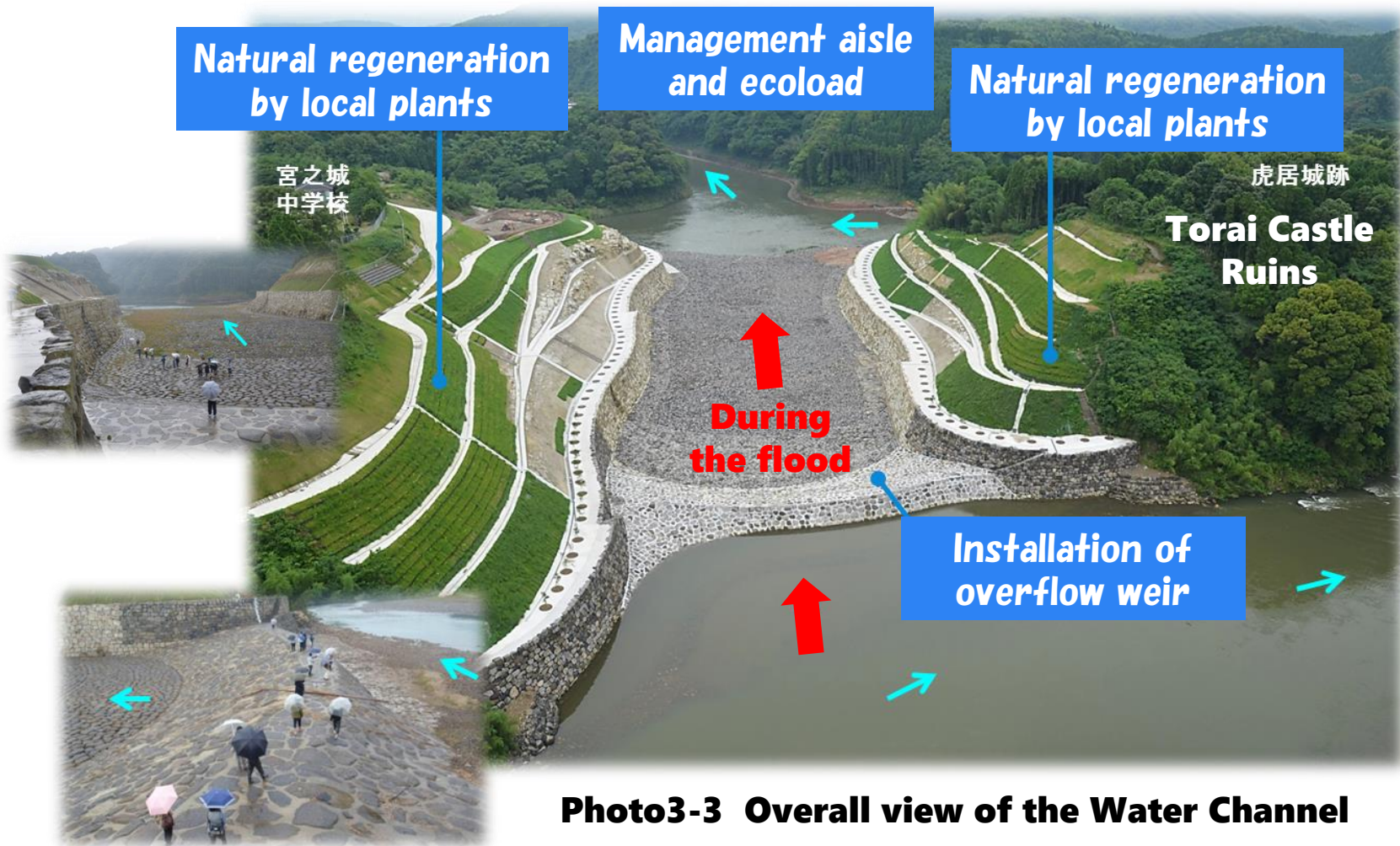


Photo3-3 Overall view of the Water Channel

Chapter 3_Completed photographs and usage status after servicing

1) Completed photos after maintenance

Normal
time



During
the flood

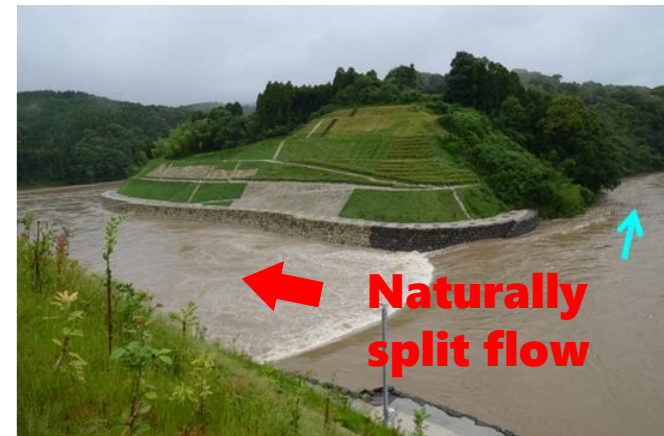


Photo3-4 Flooding occurred two weeks after completion

Chapter 3_Completed photographs and usage status after servicing

2) Usage situation of local residents



Walk with swans



Carp streamers by region



Girls high school students
play in the river!



Rafting with NPOs

Photo3-6 River utilization situation of local residents

Chapter 3_Completed photographs and usage status after servicing

2) Usage situation of local residents



Swimming in the Sendai River



We are not defeated by reflux



Bike... ?



Children's bicycle



Running



Fast running backward
in the water channel

Photo3-7 Try Triathlon at Torai !

Chapter 3_Completed photographs and usage status after servicing

2) Usage situation of local residents



Photo3-8 Event by Satsuma-cho Chamber of Commerce

Chapter 4_Summary

1) Water management and environmentally conscious business

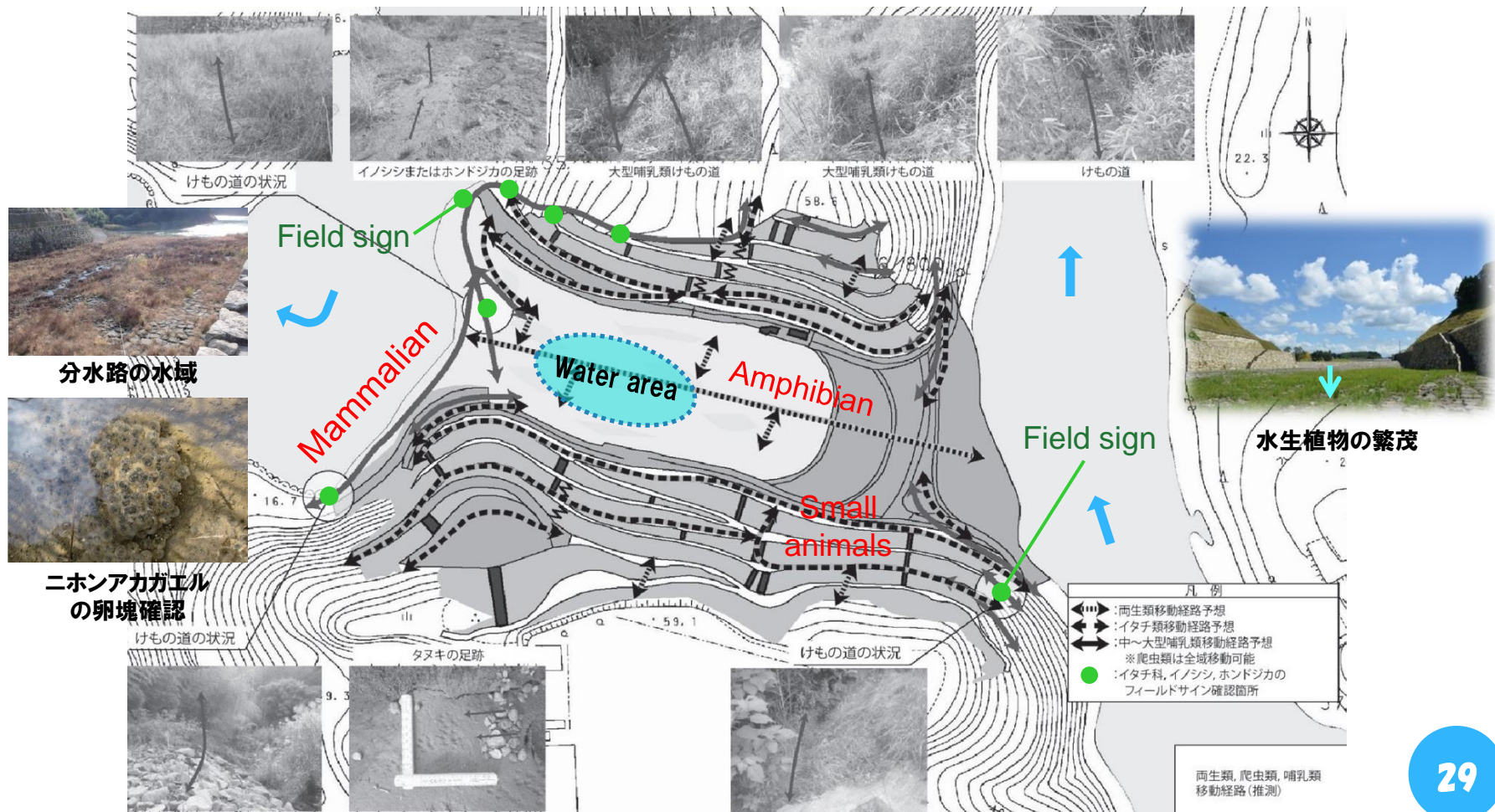


Fig4-1 Ecosystem survey results

2) Responding to further natural threats

Self-help lore



Photo4-1 River flow experiences



Photo4-2 Dive experience



Photo4-3 Lesson scenery of disaster prevention learning



3) Regional Promotion Utilizing Nature in the Basin



Photo4-4 Endurance tournament of elementary school



Photo4-5 Social experiment of river cruise tour



Photo4-6 Infrastructure Tour of Tsuruta Dam



Photo4-7 A waterfall experience of Sogi waterfall (Isa city)

**Both riverside are
full of fireflies.**

**That is all for my
presentation.
Thank you very much.**



Satsuma-cho
Image character
SATSUMARU-*chan*

Japan's leading Genji firefly habitat (Koushi Area of Sendai River)