Keep in mind

～How we responded to ”the heavy rain disaster in July 2018”～

国土を整え、全力で備える

国土交通省
中国地方整備局
Ministry of Land, Infrastructure,Transport and Tourism
Chugoku Regional Development Bureau

Contents

Historic heavy rain, Levee failure, Sediment-related mass movement disaster, Road network was cut everywhere

As soon as practical

Make efforts toward a timely restoration from the disaster damage

Our Support

Our Duty

For the better future

The damage to Chugoku region
in “the heavy rain disaster in July 2018.”

Historic heavy rain

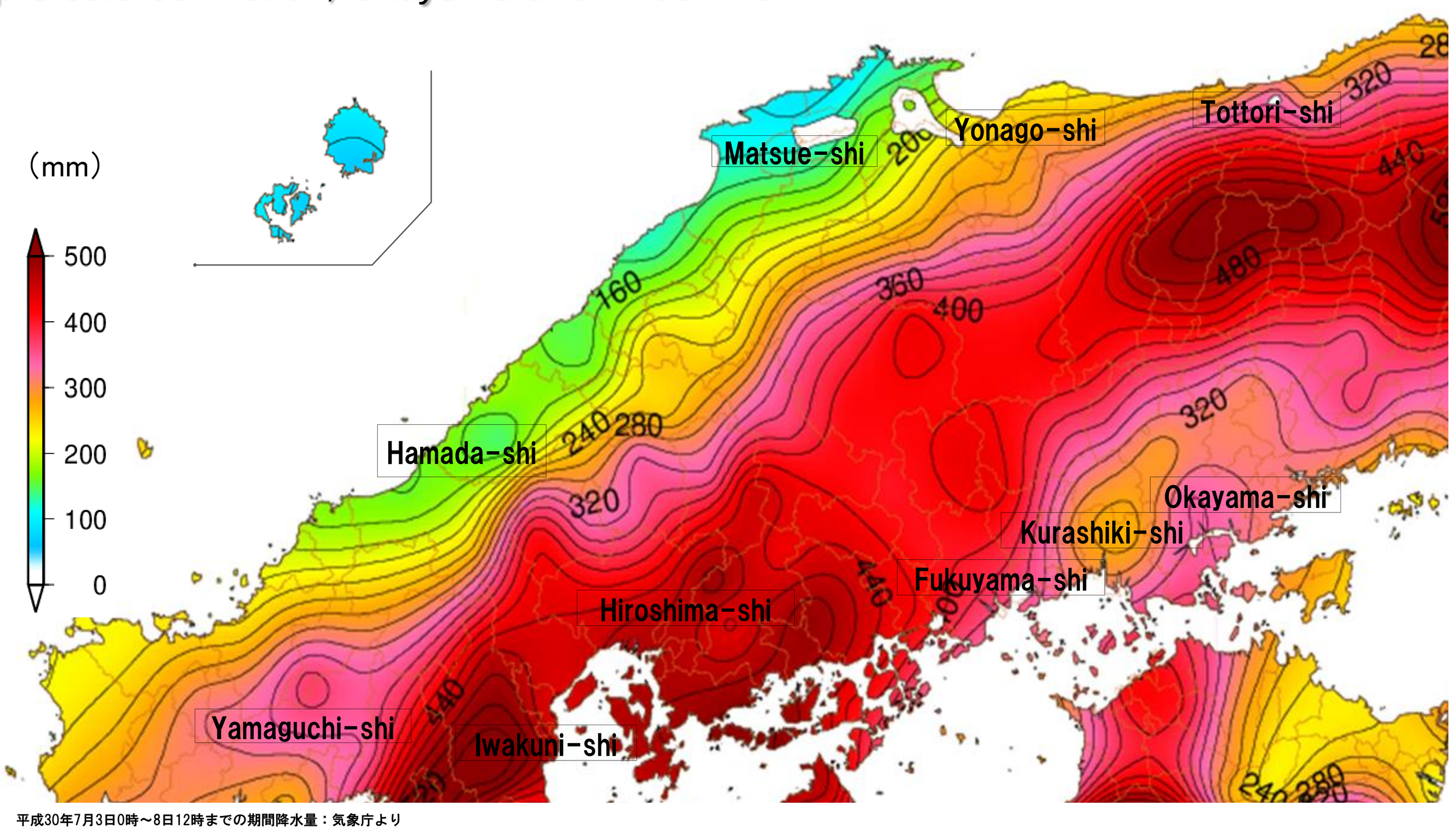
Levee failure

Sediment-related mass movement disaster

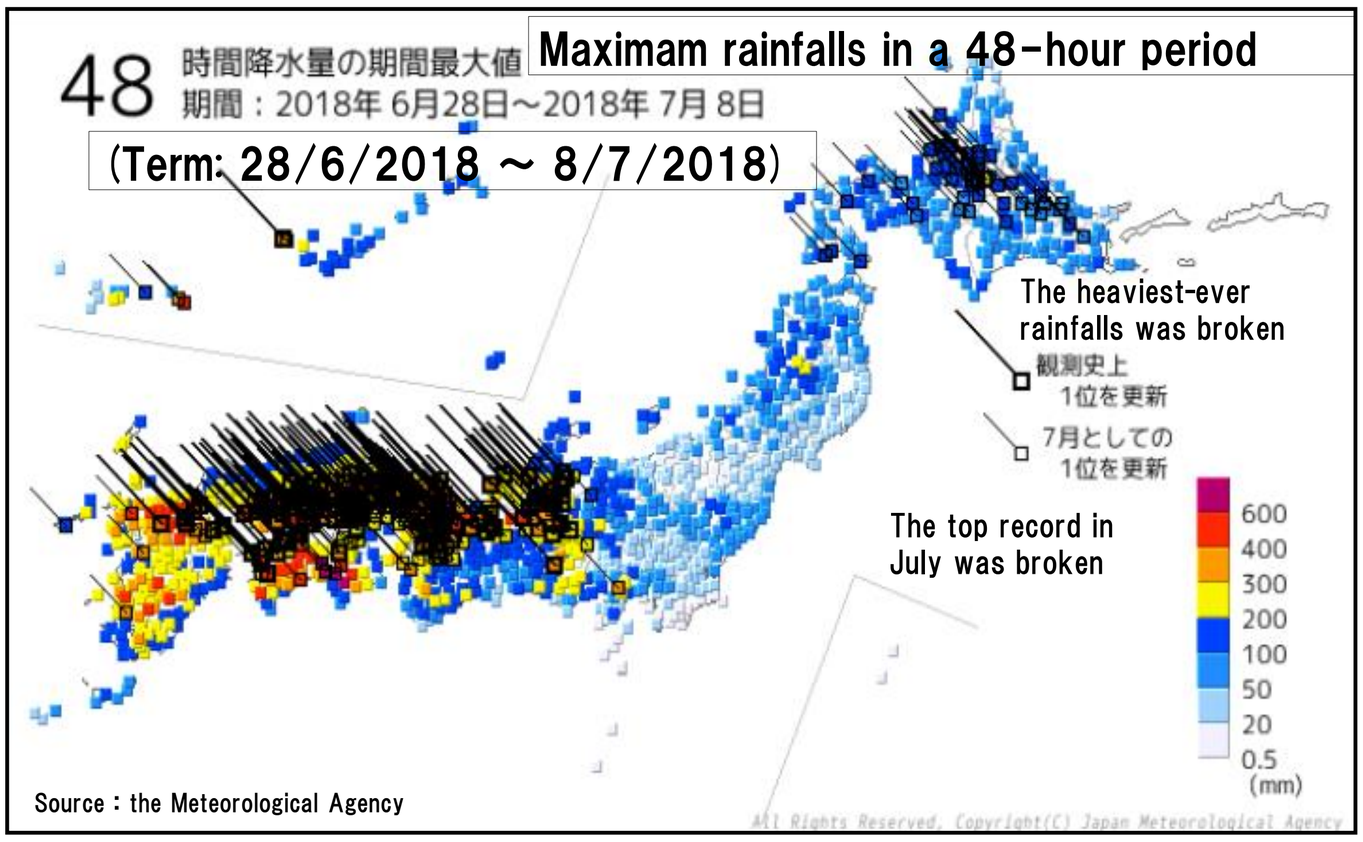
Road network was cut everywhere

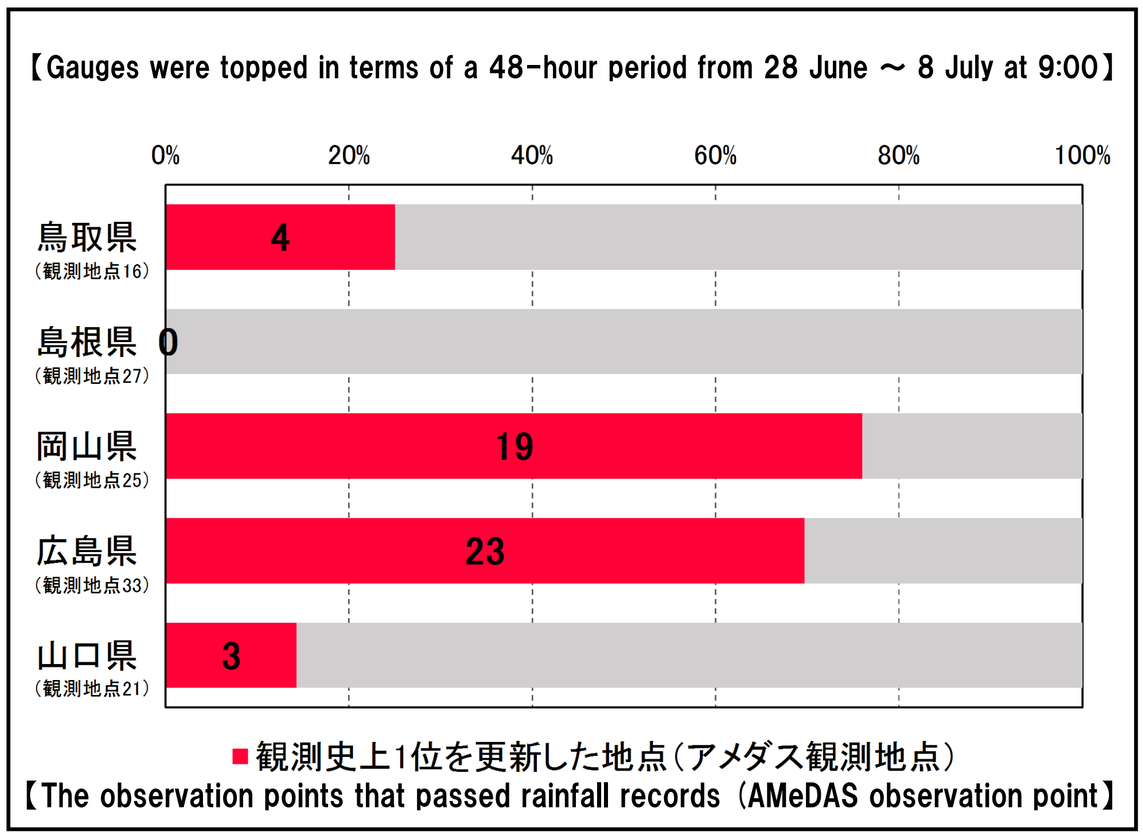
Historic heavy rain that we have ever seen

Rainfall records in a 24-hour period, a 48-hour period, and 72-hour period were passed at tens of observation points around Okayama and Hiroshima.
On this downpour, “Special heavy rain warnings” were issued in three prefectures : Tottori, Okayama and Hiroshima.



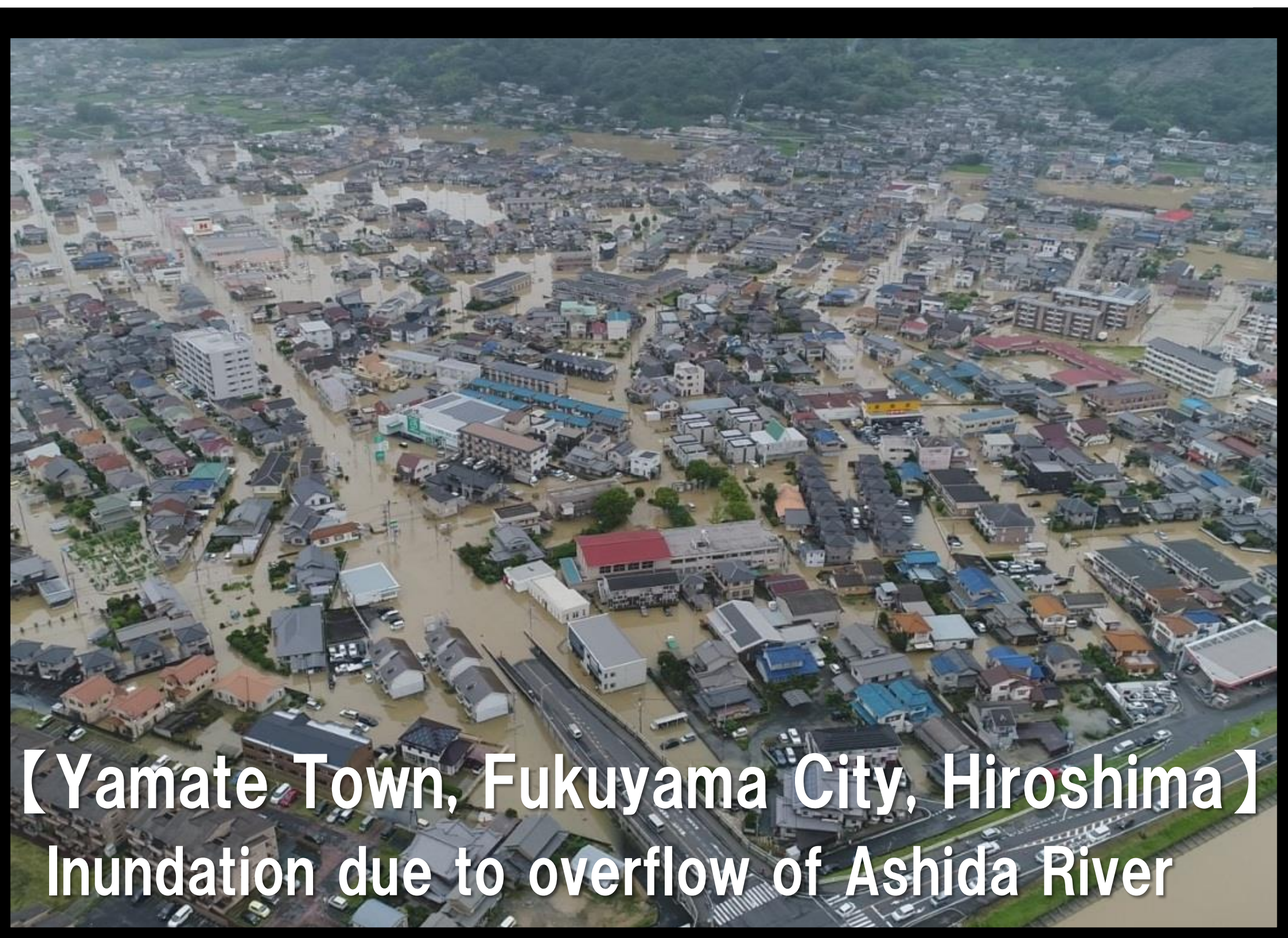
平成30年7月3日0時～8日12時までの期間降水量：気象庁より





Keep in mind
～How we responded to “the heavy rain disaster in July 2018”～

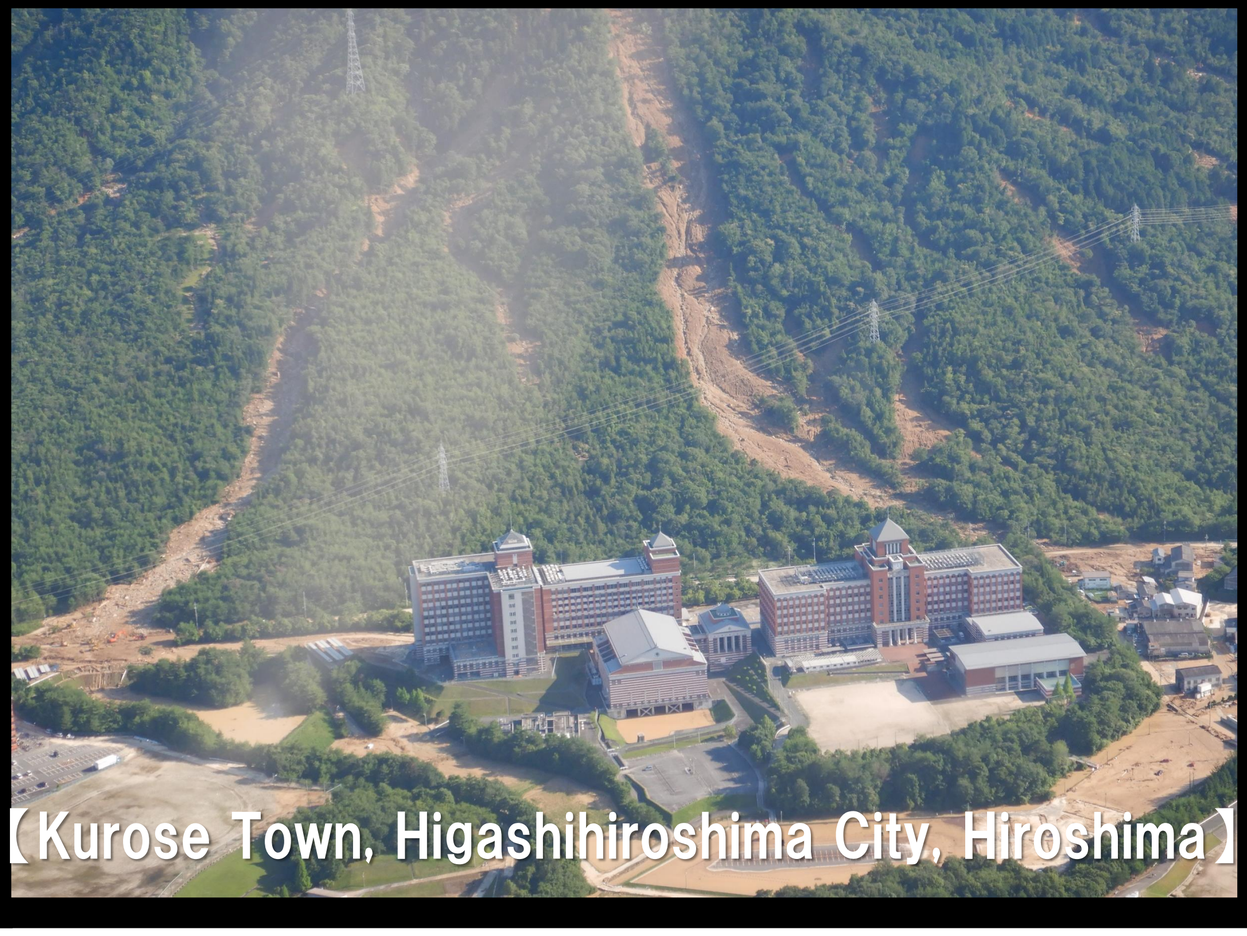
Human casualties and Building damages in five prefectures, Chugoku region



【Yamate Town, Fukuyama City, Hiroshima】
Inundation due to overflow of Ashida River

【Mabi Town, Kurashiki City, Okayama】
Inundation due to overflow of Oda River

【Koyaura, Saka Town, Aki District, Hiroshima】



【Kurose Town, Higashihiroshima City, Hiroshima】

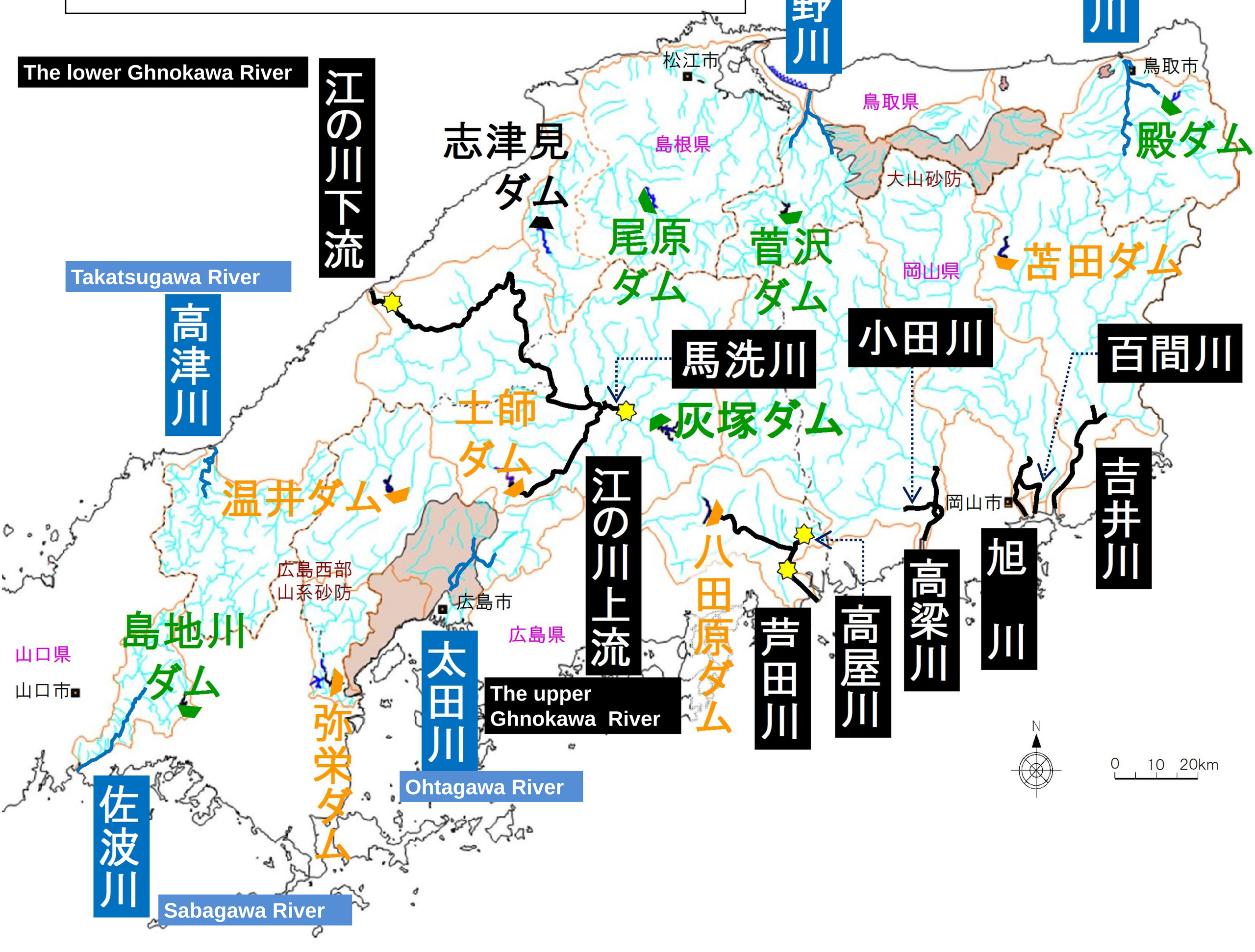
place	damage to citizens			damage to buildings					The maximum number of evacuees
	The dead	Missing	The injured	Completely destroyed	Half destroyed	Partially destroyed	Flooding above floor	Flooding below floor	
	Number of people	Number of people	Number of people	Number of buildings	Number of buildings	Number of buildings	Number of buildings	Number of buildings	Number of people
Tottori	0	0	0	0	0	3	7	54	1,324 (July 7)
Shimane	0	0	0	55	127	2	0	61	923 (July 7)
Okayama	61	3	161	4,822	3,081	1,108	2,921	6,035	4,787 (July 8)
Hiroshima	109	5	138	1,085	3,258	1,996	3,234	5,603	11,707 (July 7)
Yamaguchi	3	0	13	21	448	95	135	653	41 (July 7)

Source：The damage due to “The Heavy Rain in July 2018”(as of October 9, 2018)(CAO)

The Highest Water Level
which passed observation records

Legend

- A river which marked the top in recorded history.
- A river which surpassed an alarming level that could trigger floods or judge of evacuation.
- A dam which can reduce the flood damage by accumulating a part of floods.
- A dam which can accumulate water in case of flood.
- A spot which recorded the highest water level.



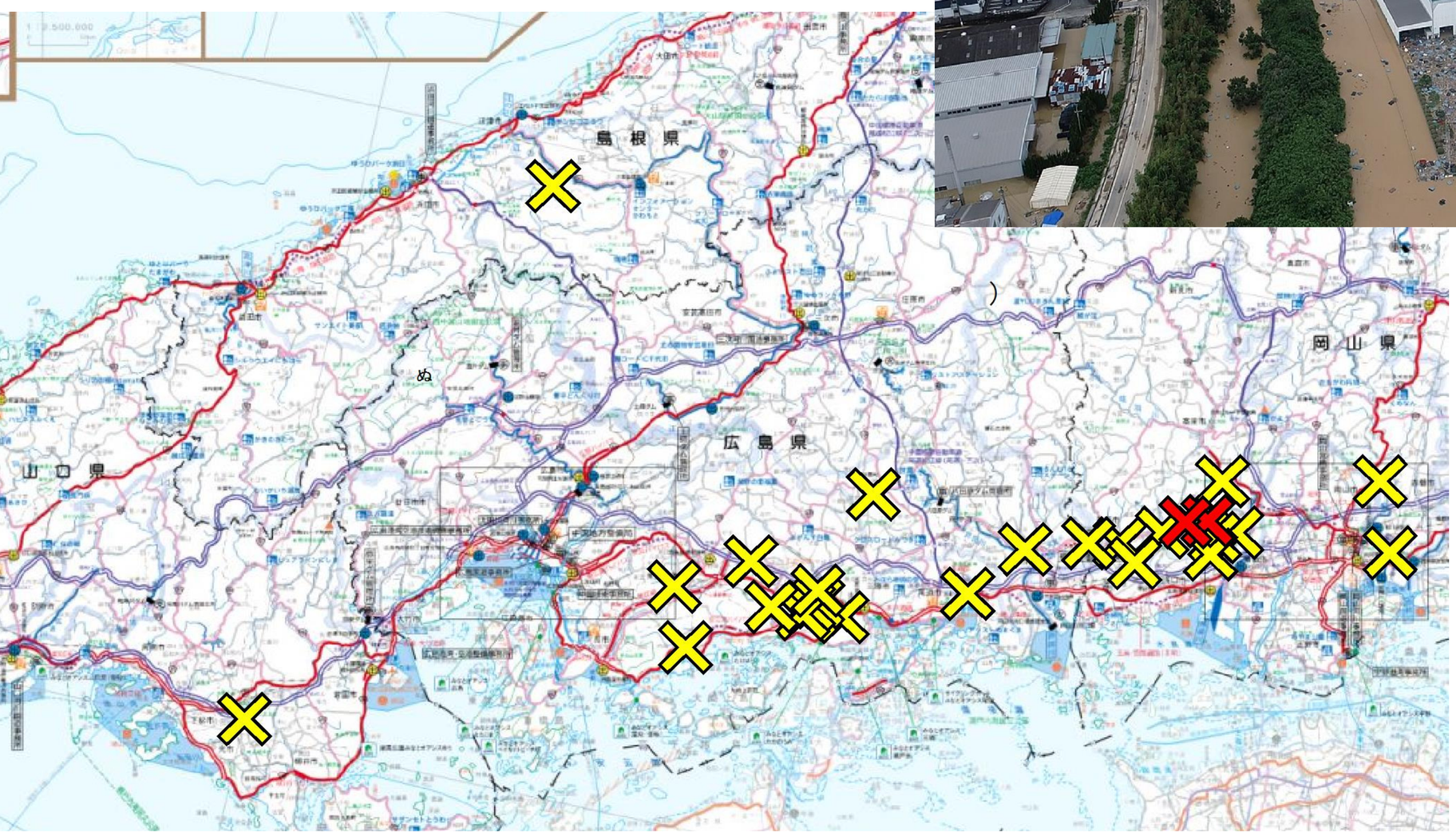
Keep in mind
～How we responded to “the heavy rain disaster in July 2018”～

Flood Disaster
in five prefectures, Chugoku region

The record rainfalls flowed into rivers to burst their banks, causing large-scale floods.

Levee failures: 36
Number of inundated houses: about 34,800
Flooded areas: about 8,000ha


【Mihara City, Hiroshima】Nuta River collapsed its levee.



Legend of disaster area

- Burst prefecture's levees
- Burst country's levees


【Mabi Town, Kurashiki City, Okayama】Oda River collapsed its levee.

【Places of burst levees in Chugoku region】

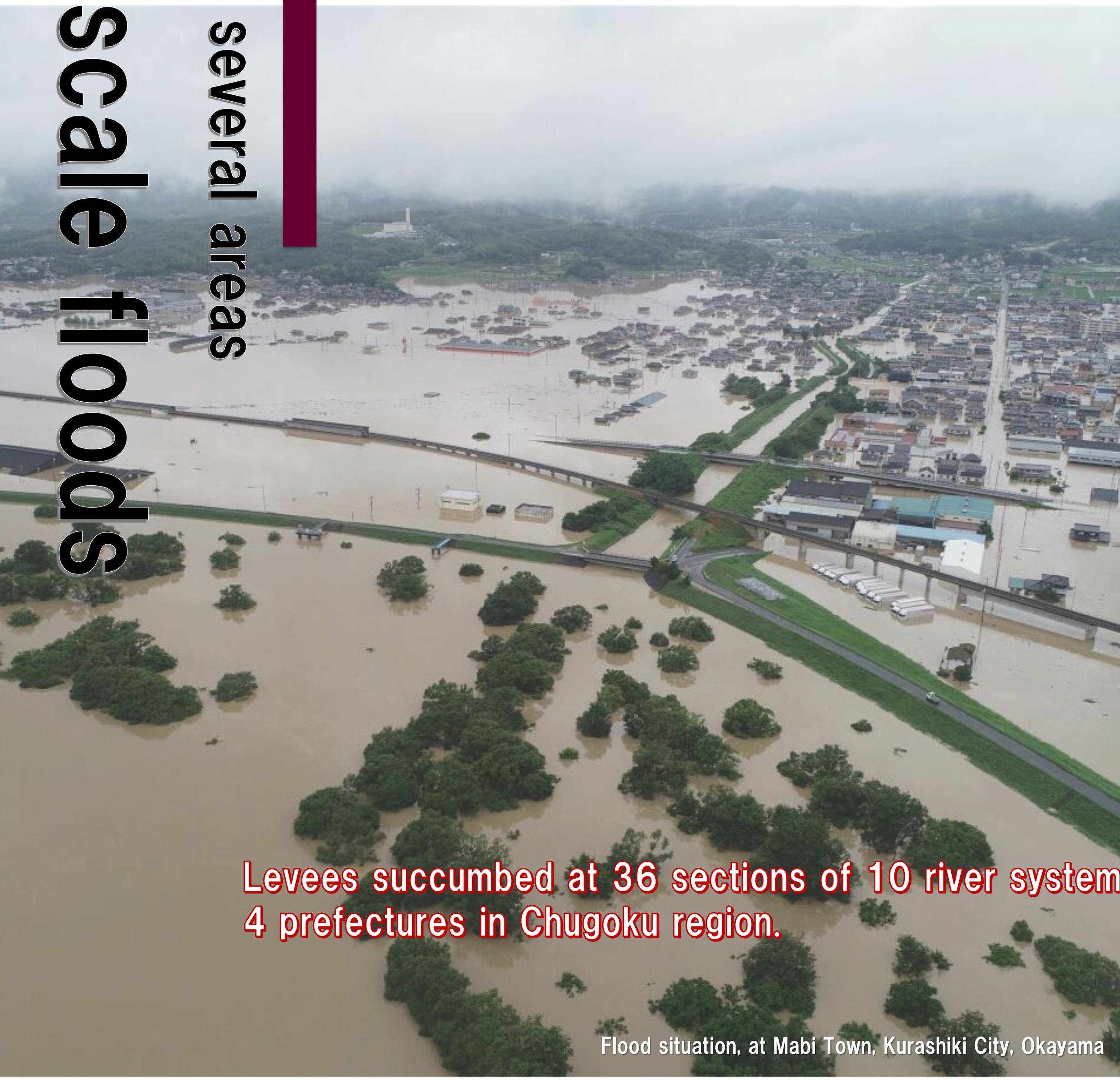
Prefecture	Name of river system (Number of burst levees)
Shimane	Yato River(1)
Okayama	Asahi River(2) Takahashi River(15)
Hiroshima	Ashida River(3) Hongo River(1) Nuta River(8) Kamo River(1) Noro River(3) Kurose River(1)
Yamaguchi	Shimada River(1)

(Source: MLIT Japan, as of September 5, 2018 at 15:00)

Large-scale flood

Levee failure in several areas

Historic rainfalls have caused rivers to overtop their levees, causing large-scale floods.
8 sections of levees including Odagawa River of Takahashigawa river system **failed** at Mabi Town in Okayama. The flooded areas were about **1,200ha**, and the greatest depth of floods was estimated to be about **5m.**

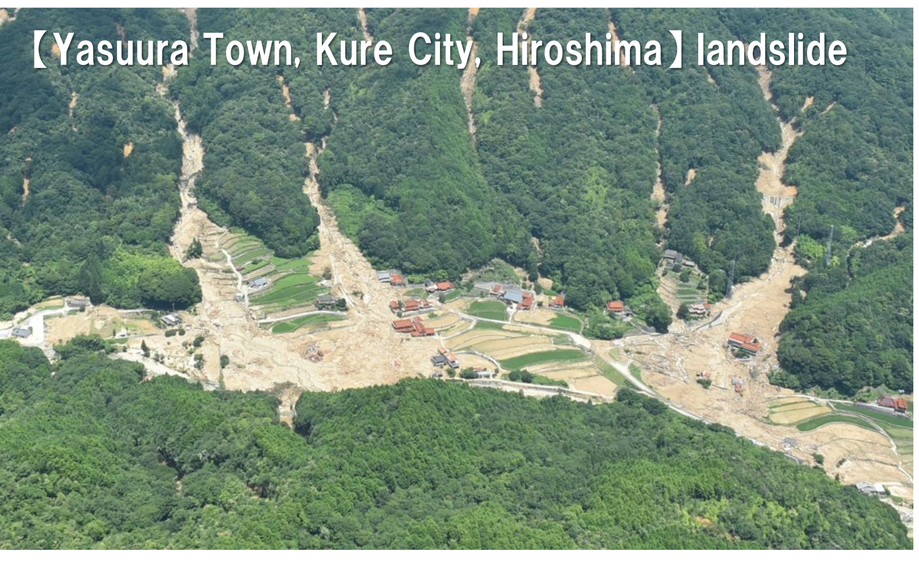


Levees succumbed at 36 sections of 10 river system 4 prefectures in Chugoku region.

Flood situation, at Mabi Town, Kurashiki City, Okayama

Sediment-related mass movement disaster in five prefectures, Chugoku region.

Mass movements and landslides in various parts of Chugoku region have recorded the highest death toll in Japan since 1988. About 1,500 mass movements were seen. The road was terribly damaged, affecting commercial distribution and regional economy. Significant sediment wash-out has reached downstream hillside business and residential areas. The damages were worsened due to scattered sedimentation.

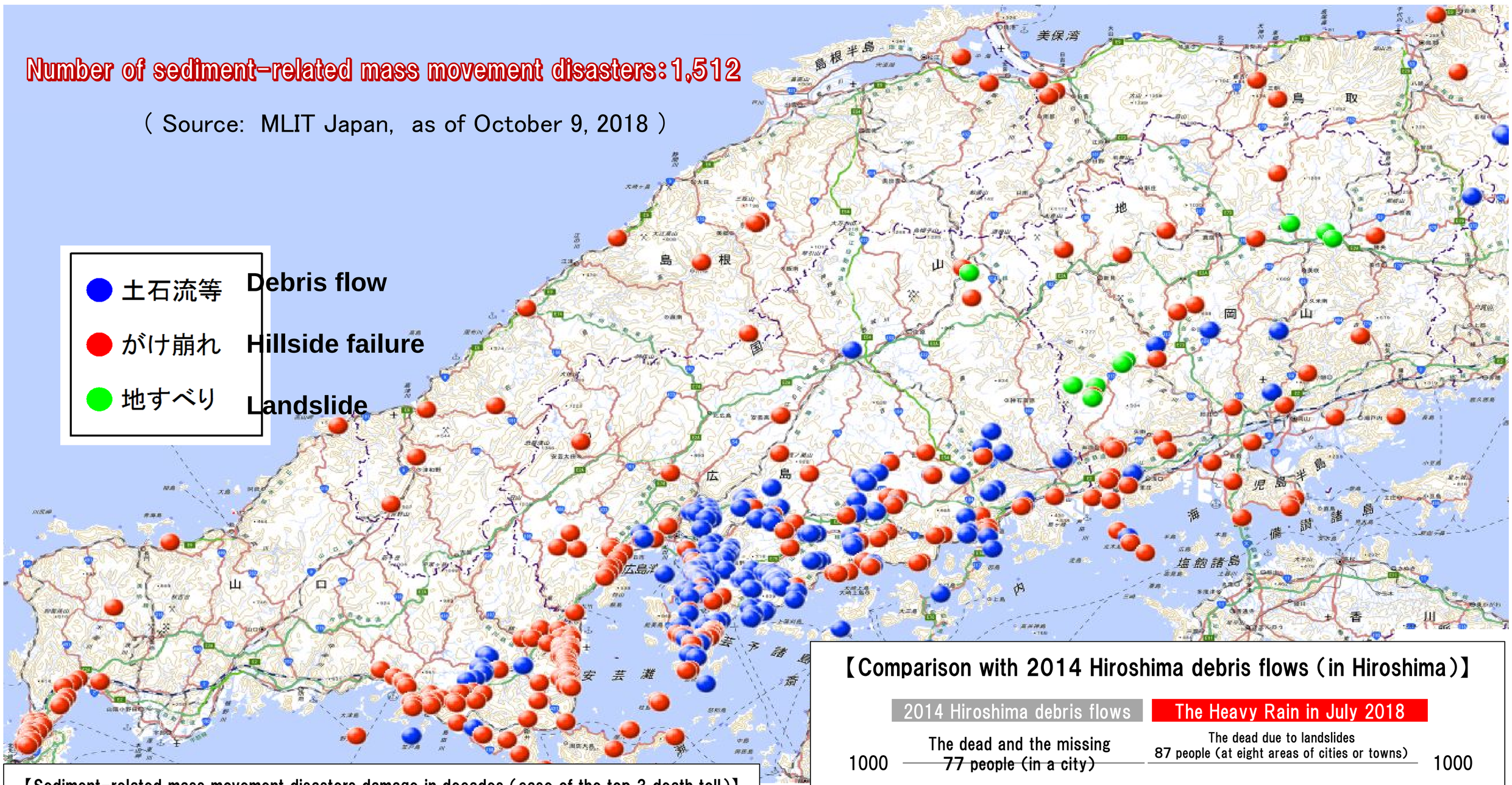

【Yasuura Town, Kure City, Hiroshima】landslide


【Mizushiri, Saka Town, Aki District, Hiroshima】landslide


【Chikanori, Takahashi City, Okayama】 debris

Number of sediment-related mass movement disasters：1,512

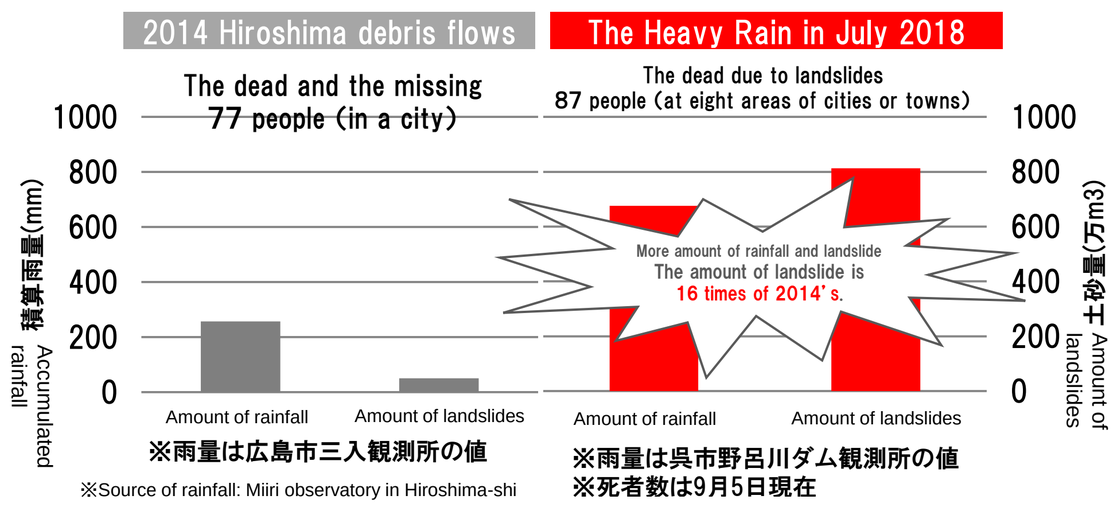
（ Source: MLIT Japan, as of October 9, 2018 ）



【Sediment-related mass movement disasters damage in decades（case of the top 3 death toll)】

Storm name	The death toll	Disaster area
The Heavy Rain in July 2018	118名	広島県、岡山県
Typhoon Talas in 2011	78名	和歌山県、奈良県、三重県
The Heavy Rain in 2014 (2014 Hiroshima landslides)	77名	京都府、兵庫県、広島県

【Comparison with 2014 Hiroshima debris flows（in Hiroshima)】



※雨量は広島市三入観測所の値

※Source of rainfall: Miiri observatory in Hiroshima-shi

※雨量は呉市野呂川ダム観測所の値

※死者数は9月5日現在

※Source of rainfall: Norogawa dam observatory in Kure-shi

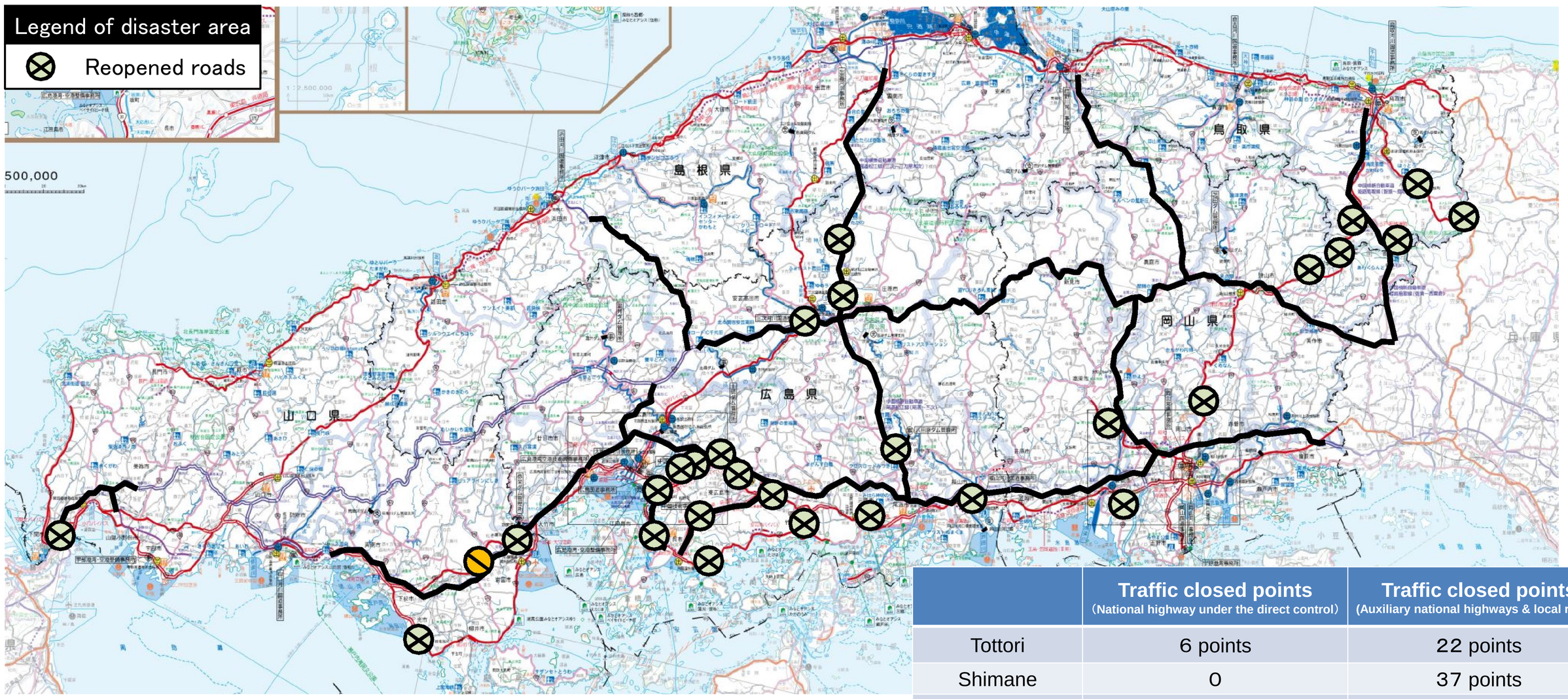
※The death toll is as of September 5.

Keep in mind
～How we responded to “the heavy rain disaster in July 2018”～

Road network scissored

in five prefectures, Chugoku region

The major east-west highway, Sanyo Expressway and National Highway 2, were severely damaged because of mass washout or slope protection collapse.



	Traffic closed points (National highway under the direct control)	Traffic closed points (Auxiliary national highways & local roads)
Tottori	6 points	22 points
Shimane	0	37 points
Okayama	4 points	197 points
Hiroshima	36 points	405 points
Yamaguchi	8 points	104 points
Total	**54 points**	**765 points**

- Expressways had been lifted traffic closed by September 21.
- National highway under the direct control of MLIT had been lifted by July 21.
- Auxiliary national highways and local roads had been lifted about 80% of traffic closed by October 15.

Traffic closed due to the loss of riverbank protection
【Aki Ward, Hiroshima City, Hiroshima】(National Highway 2)

Mass washout and driftwood inflow out of the road
【Higashihiroshima City, Hiroshima】(Sanyo Expressway (Around Takaya IC、JCT))

Hillside failure,
Washout of bridge,
Slope Protection failure

Knocked down transportation infrastructure

Hillside failure at Mizushiri (Saka Town, Aki District, Hiroshima) knocked down “Hiroshima-Kure road,” “Kure Line (JR West),” and “National highway 31” at the same time that transportation infrastructures links between Hiroshima and Kure were lost.

Prefectural roads in Chugoku region were also damaged and the road traffic were closed in many areas. Survivors in need of help and support in disaster areas were forced to wait days.

【Saka Town, Aki District, Hiroshima】
Landslide damaged to national highway 31

About 800 points of roads were so severely damaged that disaster survivors were forced to wait.

July in 2018
The operations
From the outset of disasters
to the emergency recovery

Our best

to bring back normal daily lives

as soon as practical

Map out the disaster situation immediately

By every conceivable means

Chugoku Regional Development Bureau have captured the whole picture of damages by **Emergency response helicopter** since July 8.

We enumerated required demands based on detailed disaster lookout taken by UAV(drone), which provided **real time images** of miniature cameras via satellite communication equipment.

Real time observation
by a satellite communication equipment(Ku-SATⅡ)

Investigation of disaster situation
by drone

Real time observation
by a satellite communication car

Keep in mind
～How we responded to “the heavy rain disaster in July 2018”～

TEC-FORCE operation
mobilized from all around the nation

The personnel of TEC-FORCE corps mobilized for “the heavy rain disaster in July 2018” were **6,163 person-day**.（From July 5 to September 21）
This effort is ranked third next to “Great East Japan Earthquake of March 11, 2011”（18,115 person-day）and “the 2016 Kumamoto earthquake.”（10,912 person-day）

【Shinjyo Town, Takehara City, Hiroshima】
Survey of damage situation（July 9）

【Ashidagawa River, Hiroshima】Survey of damage situation

【Yoshiura, Kure City, Hiroshima】Survey of sediment washout

Keep in mind
～How we responded to “the heavy rain disaster in July 2018”～

Flooding was pumped back by the clock

Concerted deployment of drainage pump vehicle

Right on the day flood disaster occurred in July 7, we massed drainage pomp vehicles to Mabi Town, Kurashiki City, Okayama from all around the nation.

We managed to start the drainage operation, keeping up day-in and day-out, by 23 fleets since July 8, and accomplished its operation on July 11.

The amount of drained flood water was not less than 700,000m^3 .

This is about 2,000 times as much as 25m swimming pool.

【Mabi Town, Kurashiki City, Okayama】
The drainage operations were put in place.

Mabi

Team formation and road clean-ups in Mabi Town

Reopen the roads for a recovery

There were left-out cars and huge amount of sediment on roads in flood areas after levees failure.

We formed a team, “TEC-FORCE: road clean-ups in Mabi Town” in two days after levee failure, and started to reopen community roads as emergency flood water pump out operations were finished.

At last, we were able to clean out sediment on highways in July 15.

Dispatching clean-up operation machines to flooded area to remove left-out automobiles and sediment from the areas as soon as practical.

【Mabi Town, Kurashiki City, Okayama】
sediment heaps in a flood area

【Mabi Town, Kurashiki City, Okayama】
removing operation of left out cars

Our operations for recovery
in response to “The Heavy Rain disaster in July 2018”

Make efforts

toward a timely restoration

from the disaster damage

The function of failed banks was restored in two weeks after the failure

Under repairs, Oda River levee（Mabi Town, Kurashiki City, Okayama）
Photo: 15 July 2018

In anticipation for the next one, we had to restore the banks emergently.


Photo:8 July


Photo:11 July


Photo: 15 July

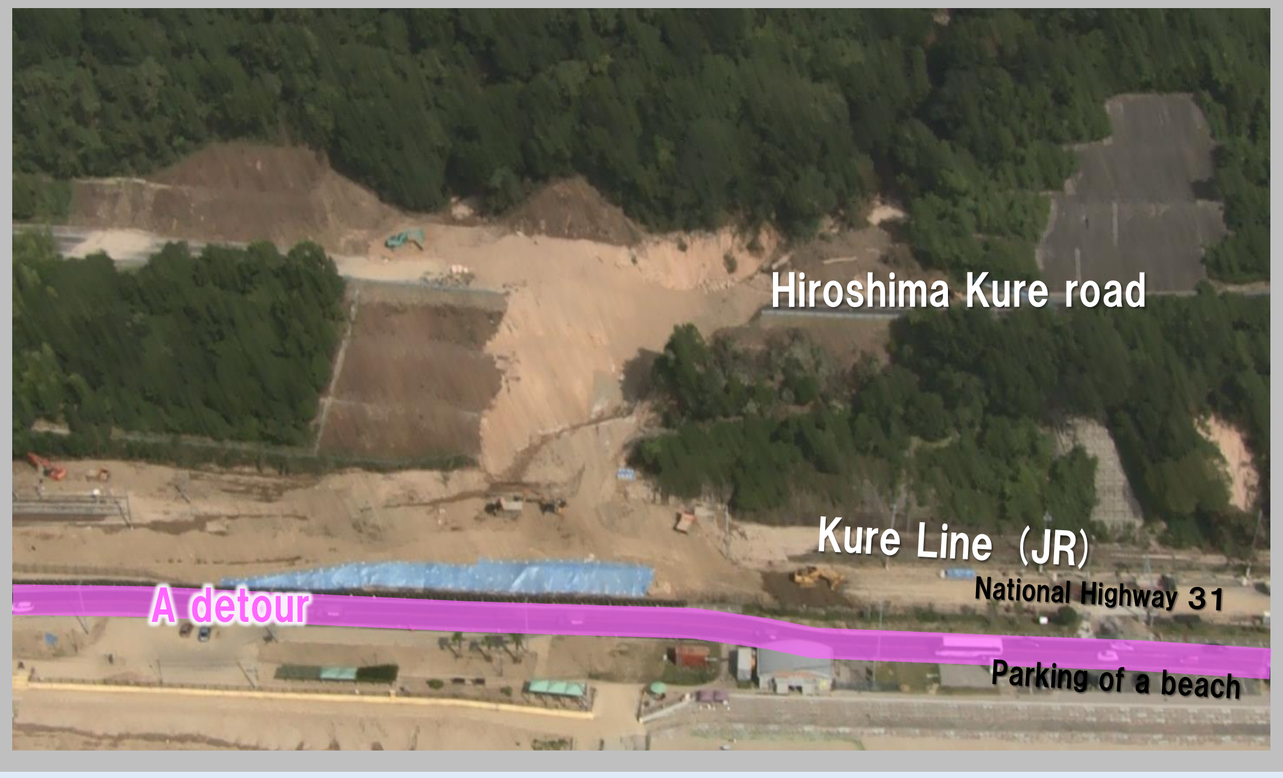
Photo: 21 July

Under repairs around the clock

Turning a parking area into the by passing detour, the blocked section of the road was **reopened sooner than expected.**

■Just after the disaster（Photo: 9 July 2018）

■After the maintenance of the detour（Photo: 12 July 2018）



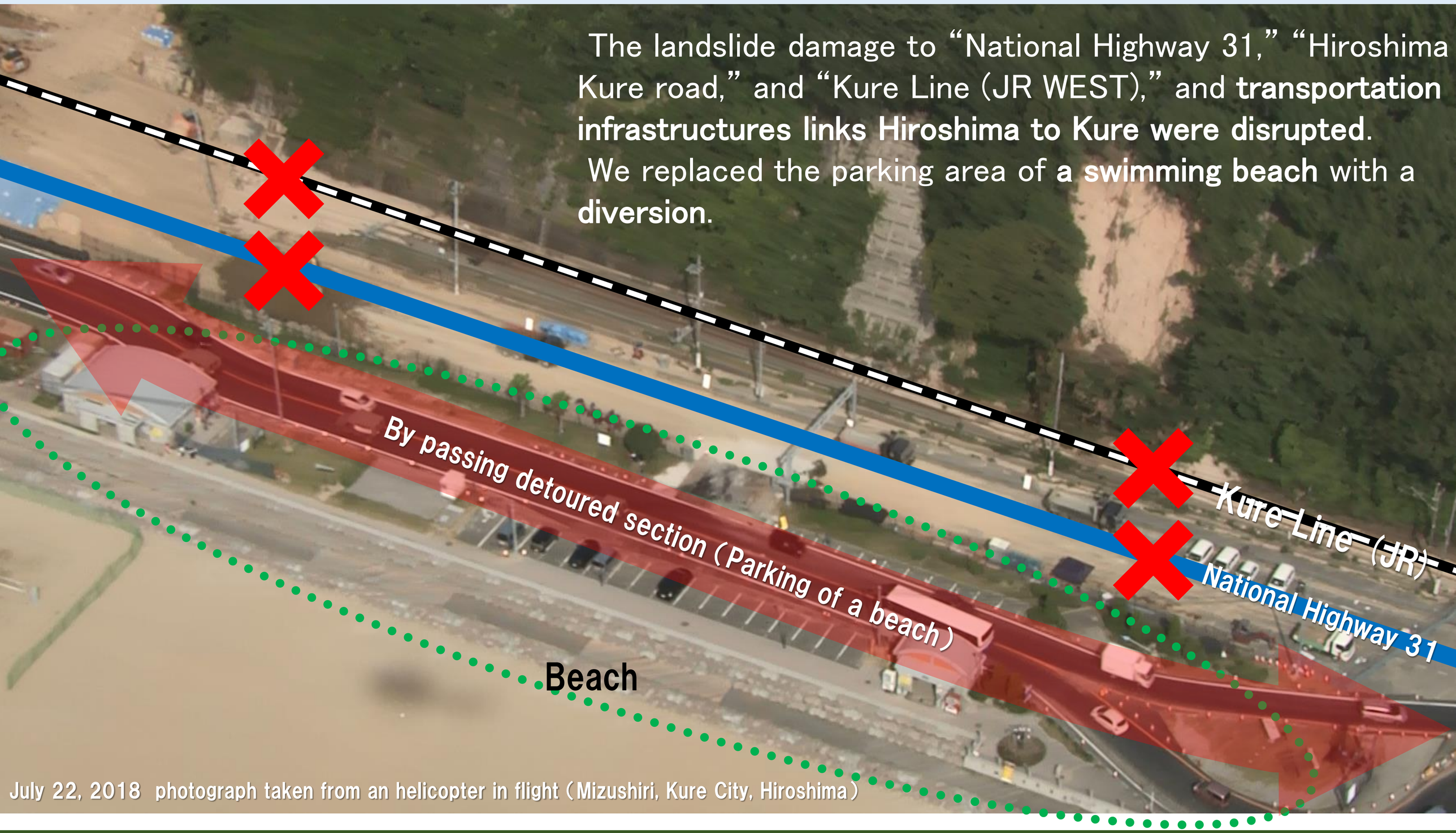
July 6
22:00
National Highway 31
Blocked

Only after **5days**

The maintenance of the bypassing detour

July 11
23:00
Reopened

The landslide damage to “National Highway 31,” “Hiroshima Kure road,” and “Kure Line (JR WEST),” and **transportation infrastructures links Hiroshima to Kure were disrupted.**
We replaced the parking area of **a swimming beach** with a **diversion.**



July 22, 2018 photograph taken from an helicopter in flight（Mizushiri, Kure City, Hiroshima）

Floating garbage on the sea traffic

Secure the safety of an ocean lane

by a marine environment maintenance ship

“The heavy rain disaster in July 2018” brought a large amount of driftwood and debris to Hiroshima Bay and the Inland Sea.

For the safety of ocean lane, we collected driftwood and floating debris by collected marine environment maintenance ships. The amount of debris reacted well over $1,700m^3$. This amounts to the entire debris collection of the last year (2017).

To secure the safety of an ocean lane and transport relief supplies

Keep in mind
～How we responded to “the heavy rain disaster in July 2018”～

Our support to the affected areas
of “the heavy rain disaster in July 2018”

Our Support

Liaison were put in place for the affected local municipalities

Chugoku Regional Development Bureau dispatched **liaison, emergency disaster prevention measures members** to proactively survey required demands of affected autonomy. We prepared various support operations and shared the information of disaster and its recovery situation.

794 liaison members sent to 17 municipalities and to an institution from July 5 till August 31.

Sharing information at Hiroshima prefectural office

Preparation of supports at Kurashiki city hall

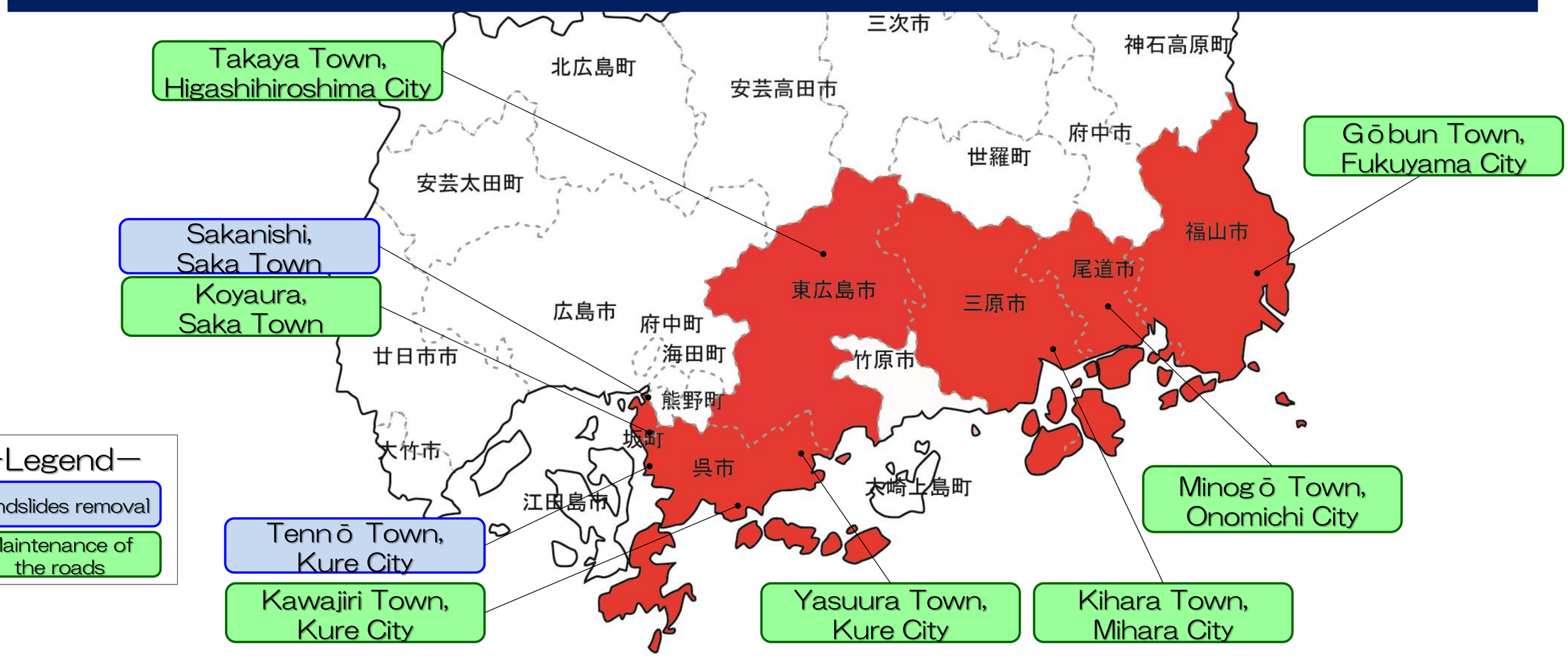
Keep in mind
～How we responded to “the heavy rain disaster in July 2018”～

Sediment removal in rivers and road clean-ups, support for affected local municipalities

From July 20, the day that emergency recovery operations of rivers and roads under our direct control were achieved, we started to remove sediments and repair roads. We **cooperate with the self-defense forces, fire fighters and municipalities** in doing recovery support of disaster areas.

Respond to demand of local municipalities, we supported to remove sediments and repair the roads.

Disaster affected areas and municipalities under our support（5 cities, a town, 9 districts）

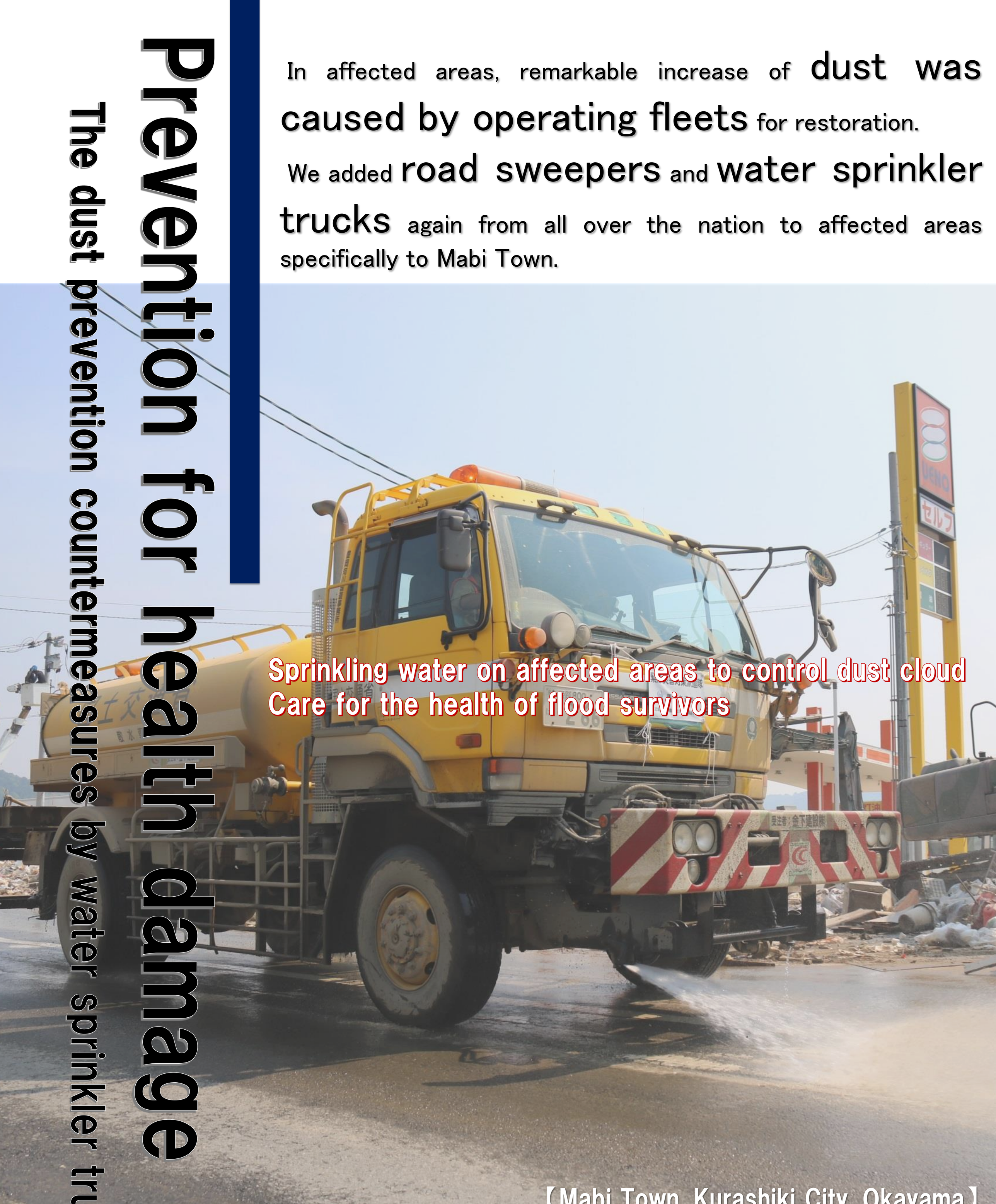


Prevention for health damage

The dust prevention countermeasures by water sprinkler trucks

In affected areas, remarkable increase of **dust was caused by operating fleets** for restoration.

We added **road sweepers** and **water sprinkler trucks** again from all over the nation to affected areas specifically to Mabi Town.



【Mabi Town, Kurashiki City, Okayama】

Providing drinking water by ships

Relief supplies transport

We provided **potable water supplies** for damaged areas without water supply which saw **difficulty in accessing** clean water such as islands or isolated districts.

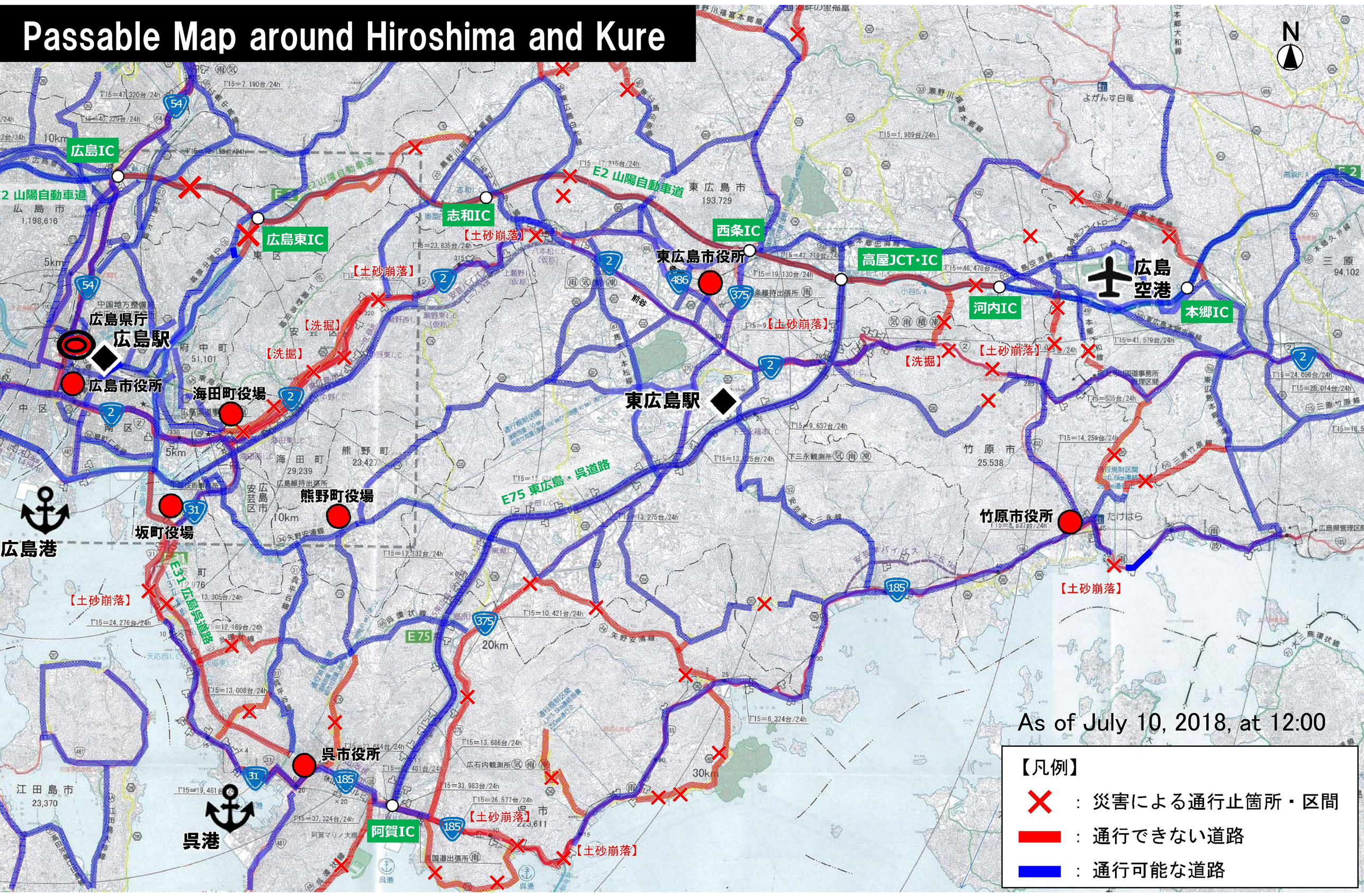
【Kamagari Bay, Kure City, Hiroshima】
Supply drinking water to survivors

Everyone wanted to know
where “the passable routes” were

Because traffic restriction was extended for a long time with too many “dots” signing closed traffic, phone calls for the passable routes saw a tremendous increase.

Therefore, we made “Passable Map” which showed people traffic restriction and passable routes at hand. We were able to respond to the needs of traffic users.

Passable Map around Hiroshima and Kure



【Legend】
× : Closed areas because of the disaster
- : Impassable way
- : Passable way

Infrastructures
stood for what they were meant
on “the heavy rain disaster in July 2018”

Our Duty

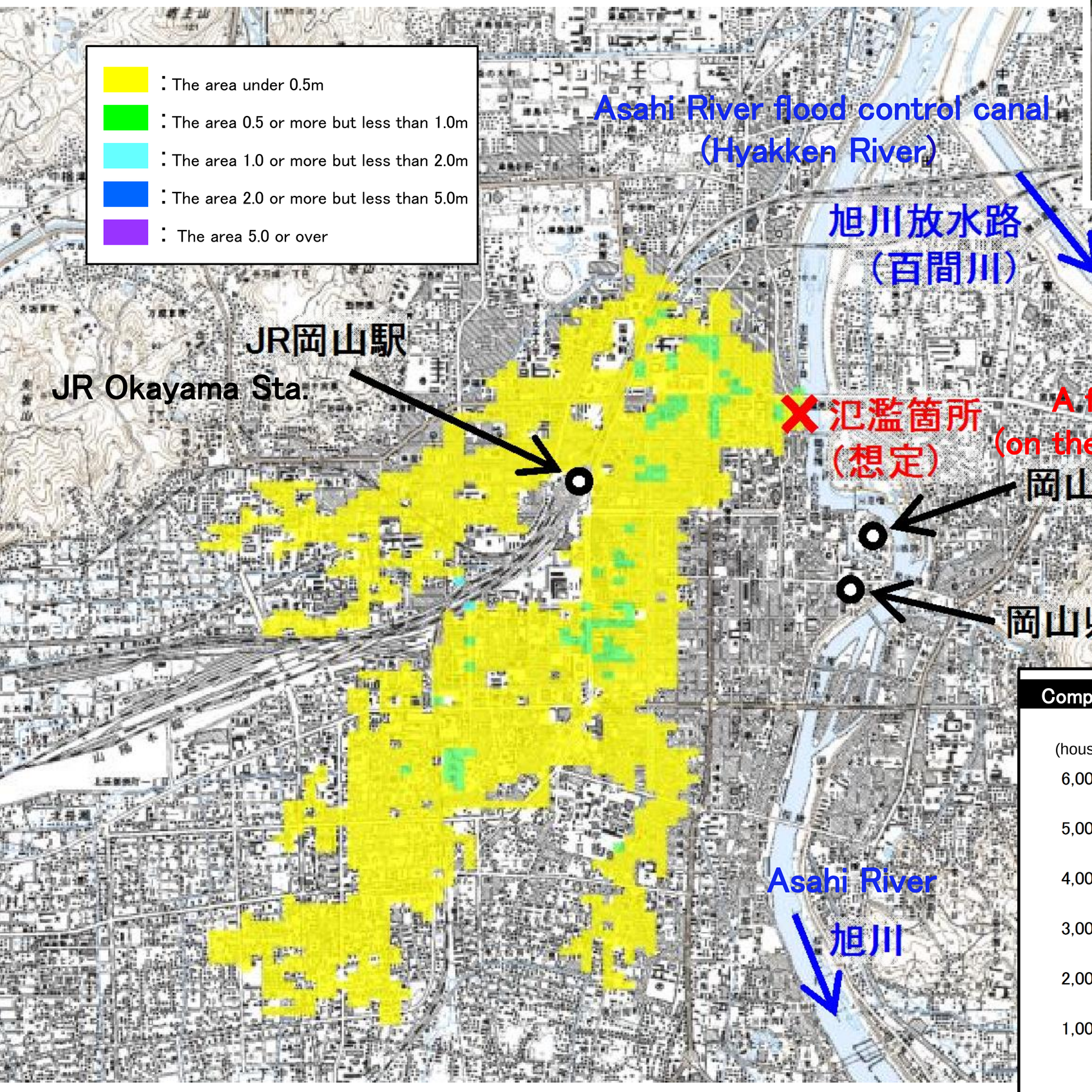
Asahi River flood control waterway reduced flood damage significantly.

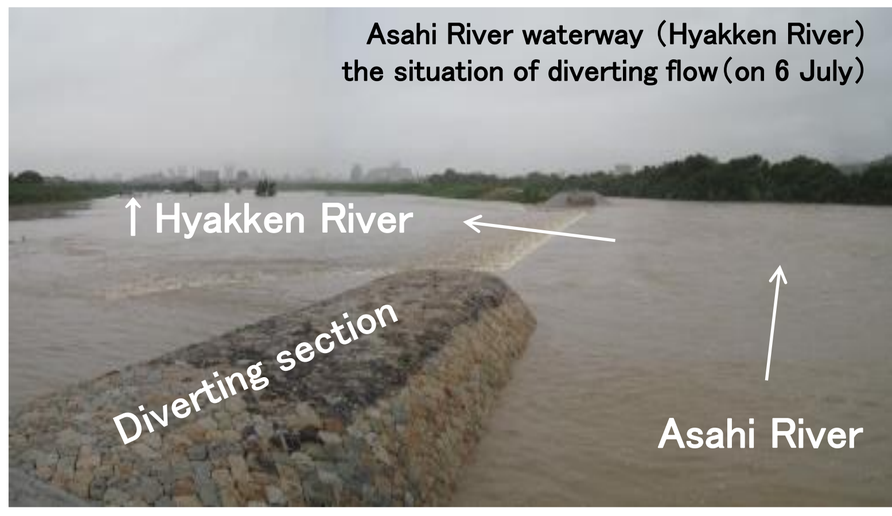
The water level at Shimomaki water level observatory where locating in the upper stream of Asahi River flood control waterway in Okayama surpassed an alarming level that could trigger major floods.

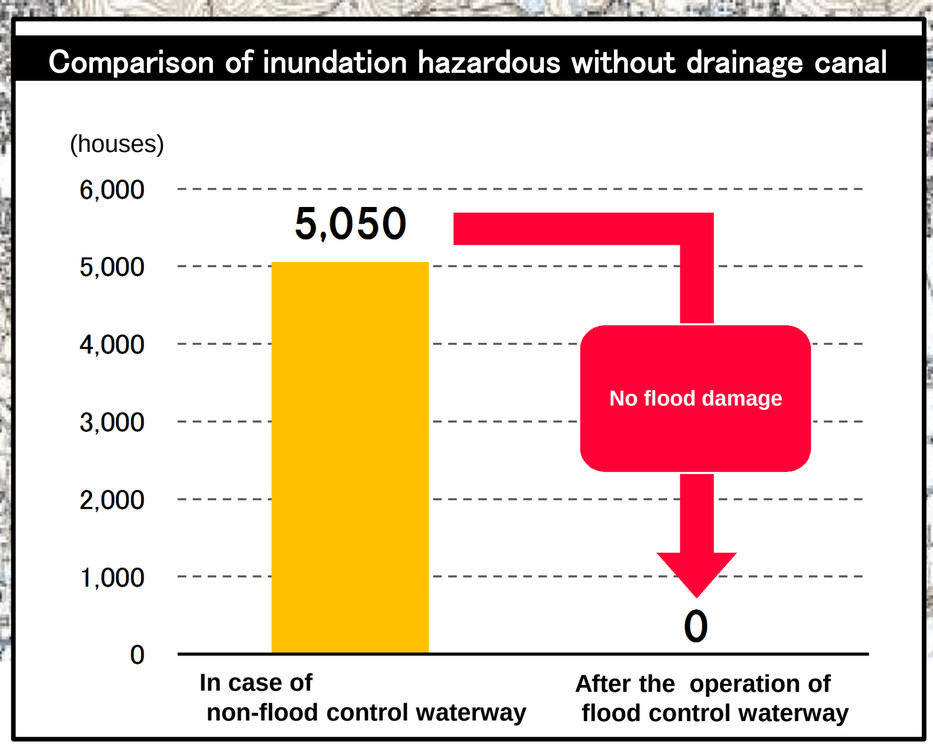
On 6 July, the observatory allowed water to divest into water way in order to reduce the flood impact. It succeeded in lowering the Asahi River's water level by divesting flow into waterway at a rate of 1,300㎥/s. (The rate was 4,500㎥/s before the diversion) Finally, the water level dropped below 1.5m.

If it had not been for Asahi River flood control waterway, it could have been overflowing the bank, which might have caused damages to 450ha and 5,050 houses in central Okayama City.

【Inundation hazardous area in case Asahi River flood control waterway were not at work.】

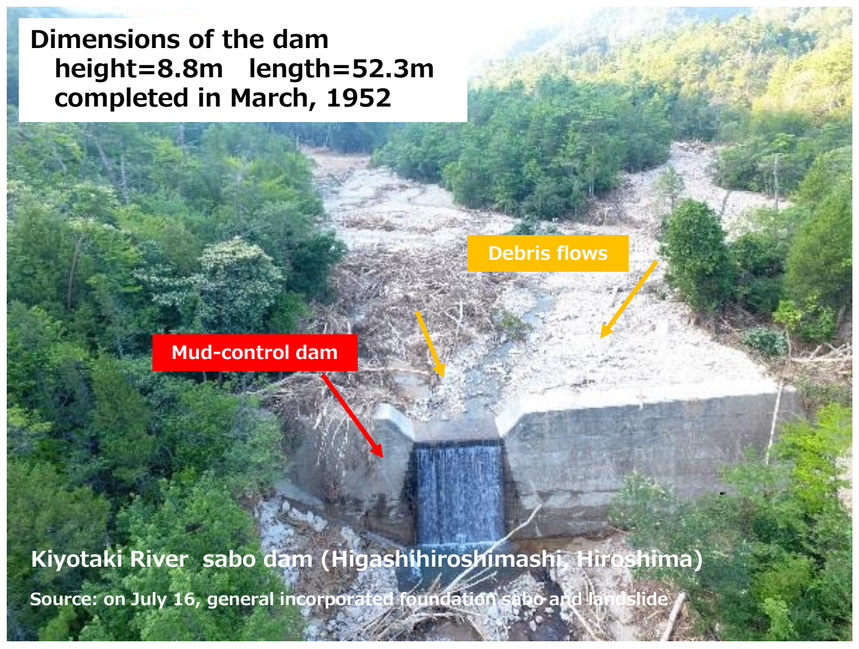






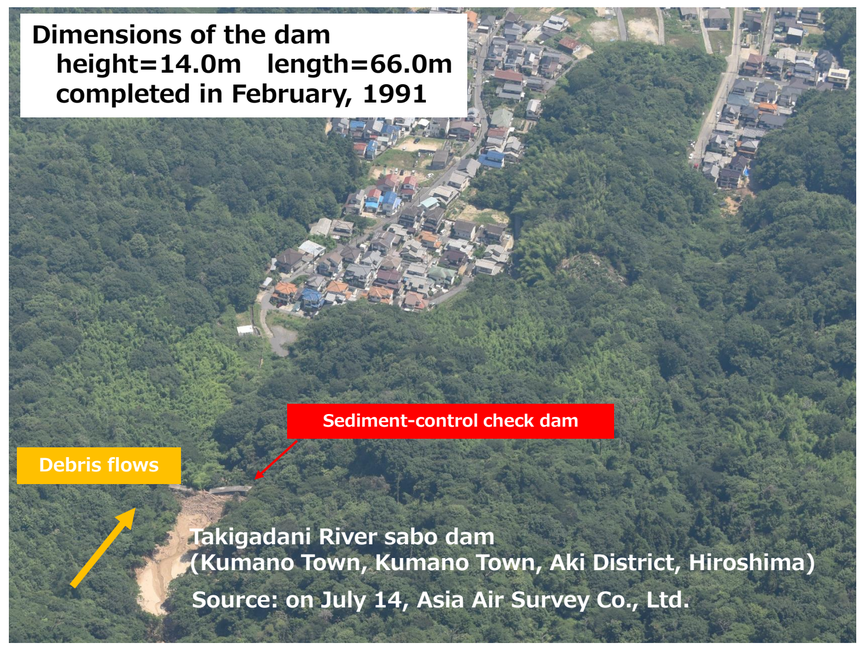
Keep in mind
～How we responded to "the heavy rain disaster in July 2018"～

The sabo dam contained debris flows and driftwoods.



Kiyotaki River sabo dam (Higashihiroshimashi, Hiroshima)

Source: on July 16, general incorporated foundation sabo and landslide



Takigadani River sabo dam
(Kumano Town, Kumano Town, Aki District, Hiroshima)

Source: on July 14, Asia Air Survey Co., Ltd.

【Kumano Town, Aki District, Hiroshima】
Takigadani River (Kumano Town, Aki District, Hiroshima) contained debris flows and driftwoods

Source: on July 15, Sabo Volunteer of Hiroshima prefectural assoc.

Rerouting over a wide area linking Hiroshima to Kure:
Higashihiroshima-Kure Expressway

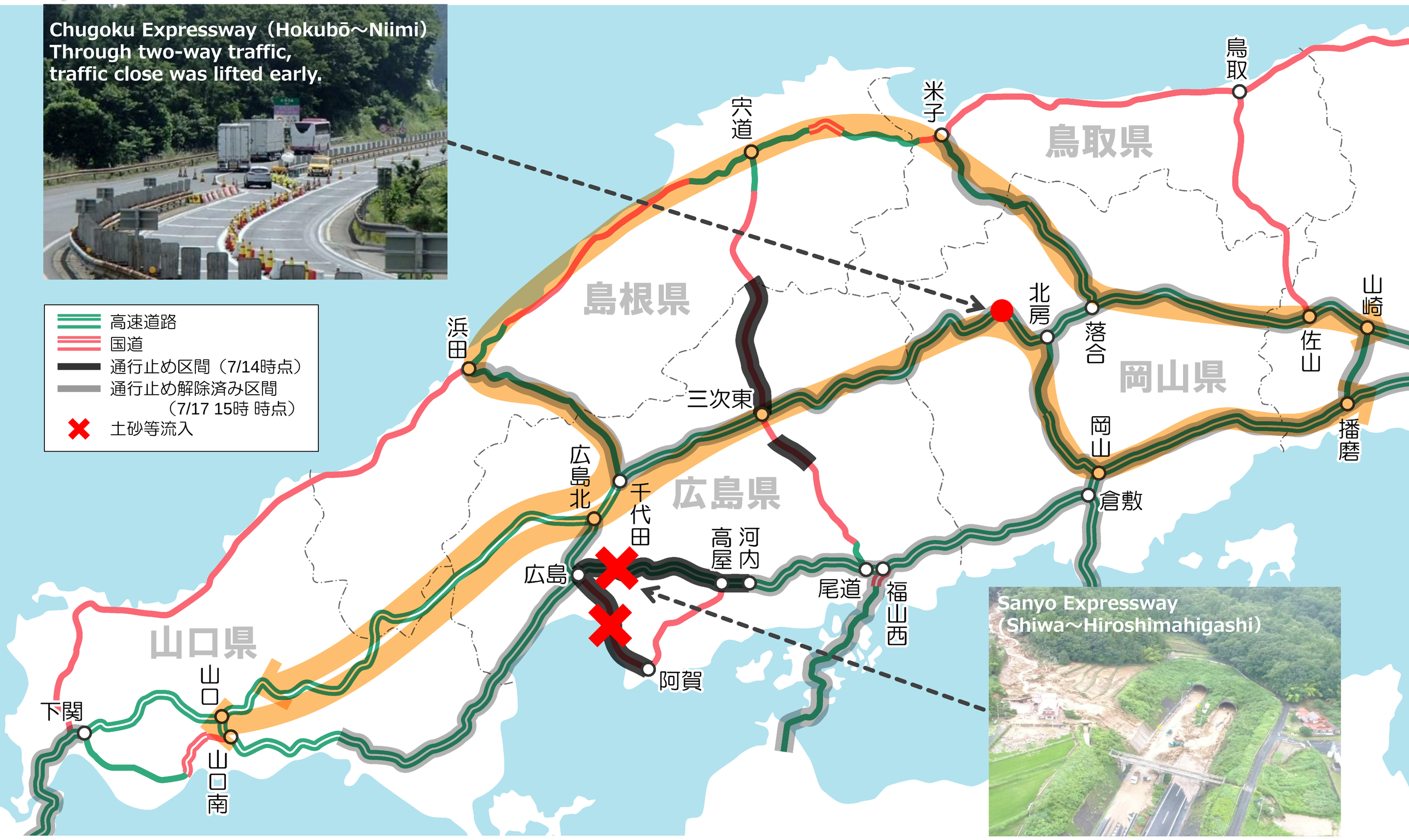
Higashihiroshima-Kure Expressway and Sanyo Expressway were utilized as a reroute.
The traffic was 1.2 times heavier than nomal during the Expressway closing.

The required time to Hiro, Kure-shi: if you take Higashihiroshima-Kure Expressway, you can save an hour.

発着：広島（広島BC）、呉市広付近（阿賀IC）
7月18日、8月21日に実施したプローブカー調査による所要時間
国道31号経由については、一般道、都市高速（宇品～仁保）、広島呉道路（仁保～坂北）、国道31号を利用
東広島呉道路経由については一般道、山陽道、東広島呉道路を利用
3hは6:00～9:00の3時間

The Expressway double network

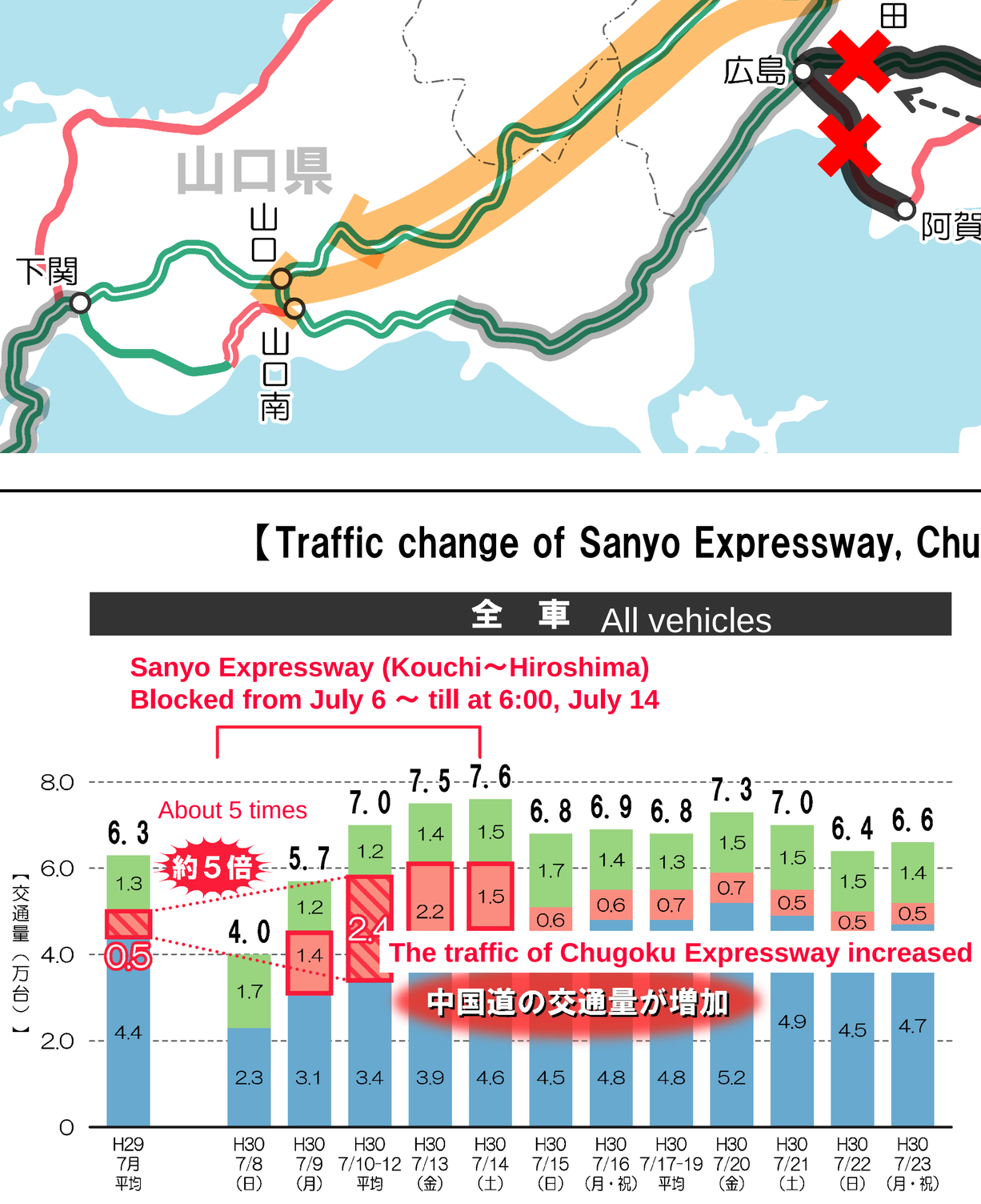
Sanyo Expressway, a main corridor linking East and West was blocked. However, the function of wide-area traffic was kept thanks to Chugoku Expressway and San-in Expressway. (Chugoku Expressway was reopened earlier because the section of the damaged area was converted from four-way traffic to two-way traffic for traffic users.)



【Traffic change of Sanyo Expressway, Chugoku Expressway and Sanin Expressway】

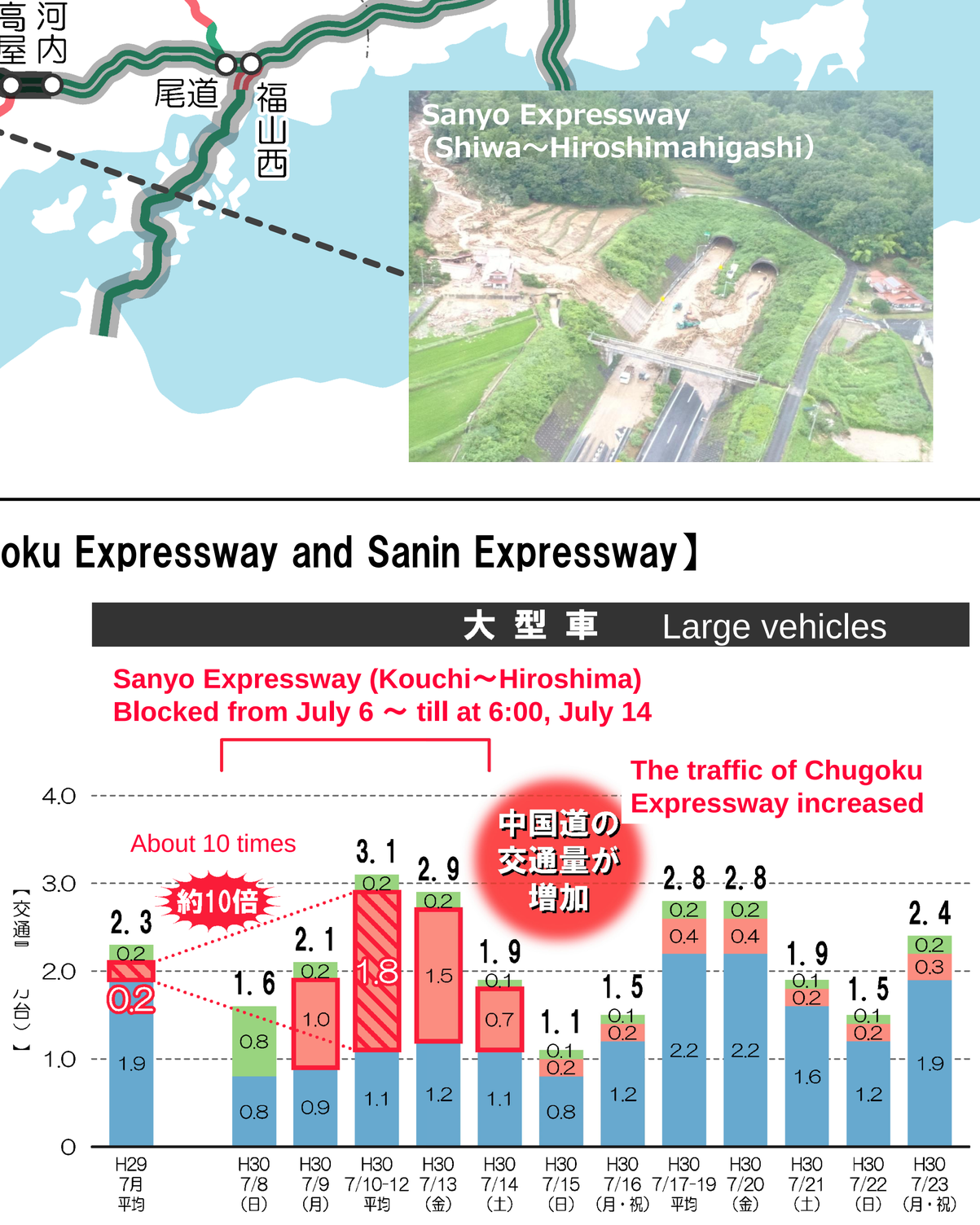
全　車 All vehicles

Sanyo Expressway (Kouchi～Hiroshima)
Blocked from July 6 ～ till at 6:00, July 14



大 型 車 Large vehicles

Sanyo Expressway (Kouchi～Hiroshima)
Blocked from July 6 ～ till at 6:00, July 14



山陰道　中国道　山陽道

Keep in mind
～How we responded to “the heavy rain disaster in July 2018”～

The operations for restration
in the aftermath of “The Heavy Rain
disaster in July 2018”

For the better future

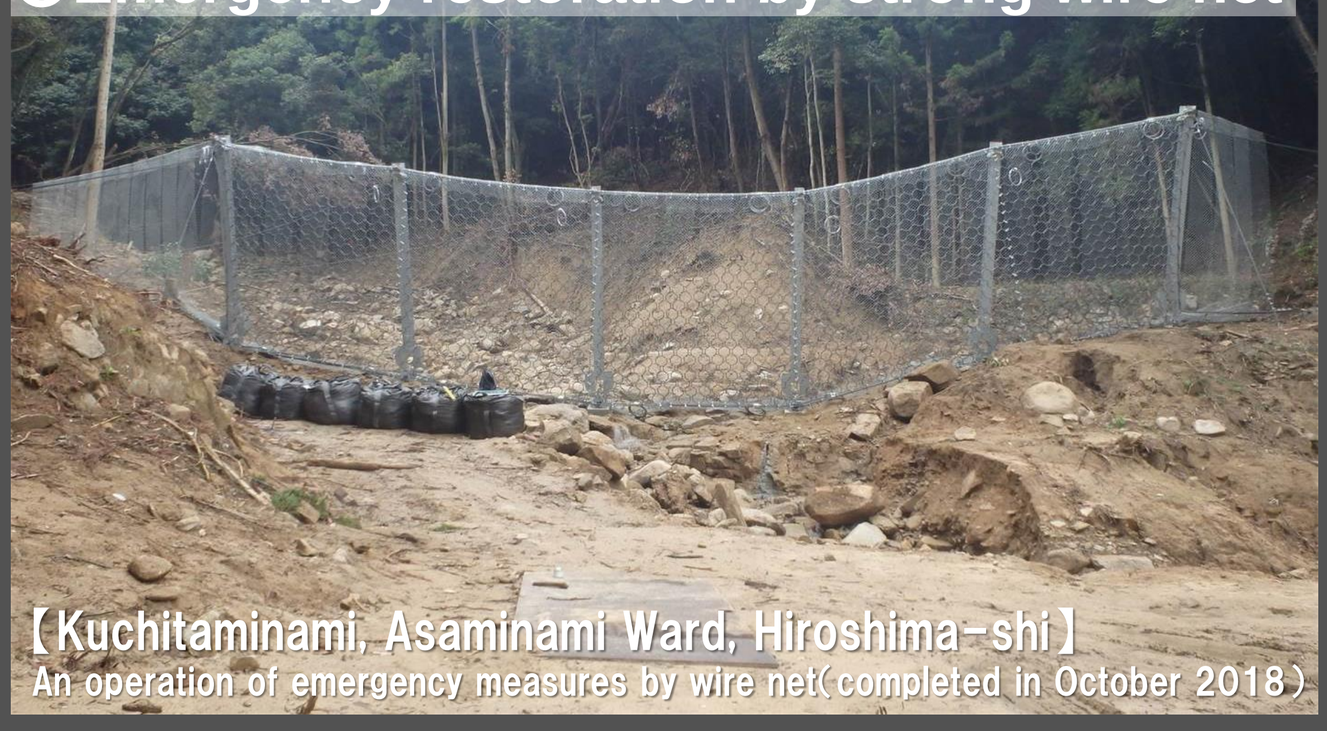
Emergency Sabo works

Hiroshima

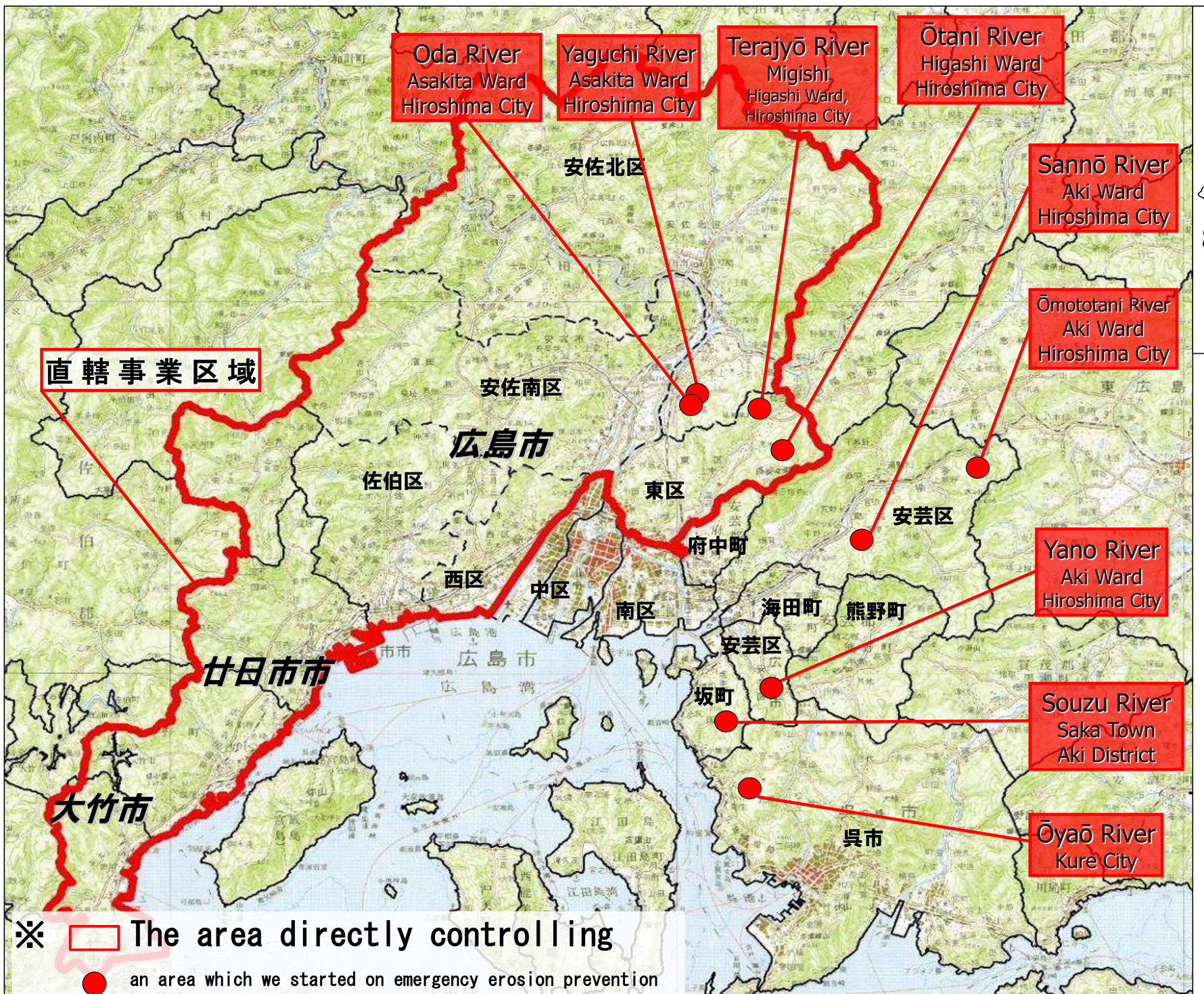
At nine local communication which suffered heavy sediment-related damage from “The Heavy Rain in July 2018” in Hiroshima, we started works to mitigate in-coming sediment hazard, caused by upstream leftovers.

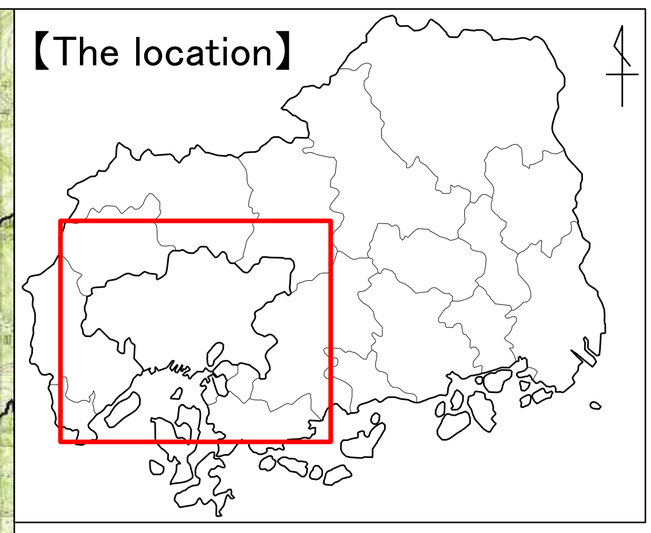
Natural damming of the lower Souzu River due to landslide

○Emergency restoration by strong wire net



【Kuchitaminami, Asaminami Ward, Hiroshima-shi】
An operation of emergency measures by wire net（completed in October 2018）





Establishment of emergency restoration measures branch office

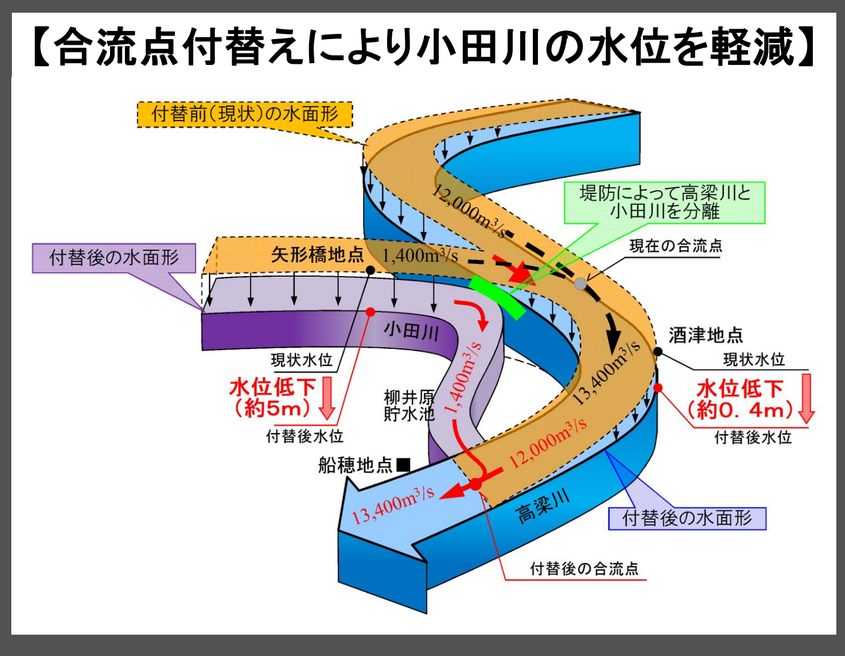
Keep in mind
～How we responded to “the heavy rain disaster in July 2018”～

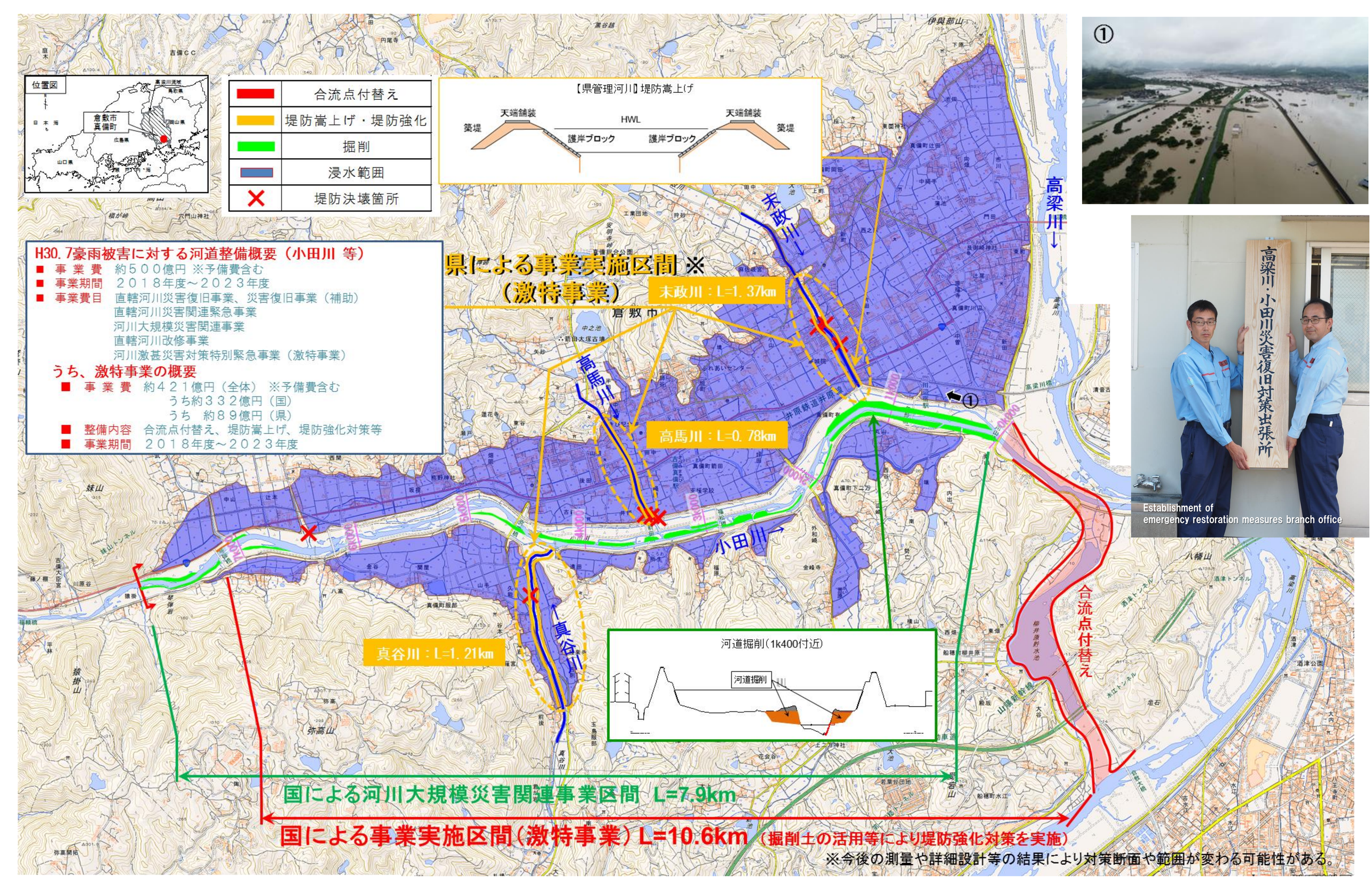
Emergency flood control measure

Mabi Town, Kurashiki City, Okayama

■We set out emergency river improvement works for the alleviation of the disaster, “The heavy rain in July 2018.” (This is what is called “special emergency projects for the control of severe river disasters.”) **The relocation of Oda River’s confluence**, bank and its protection works have already started.

■ Besides these structural measures, on “the natural disaster reduction conference of Takahashi River system in face of large-scale floods, **related organizations** are supposed to cooperate with each other and to add non-structural measures.





Establishment of
emergency restoration measures branch office

Keep in mind
～How we responded to “the heavy rain disaster in July 2018”～

Support team for the reconstruction of town and houses

In order to support affected municipalities toward “Reconstruction of the town and houses” from “The heavy rain disaster in July 2018,” we organized the support team for the “Reconstruction for town development / house construction in Chugoku region.”

【Our immediate operations】

- **〇To make consultation for affected local municipalities**
- **〇To give advice to autonomy about the disaster situation and the project which corresponds to their demands**
- **〇To give advice to autonomy which consider the plan of “Reconstruction for town development / house construction**
- **〇To visit affected autonomy and exchange ideas to grasp their demands carefully**
- **〇To cooperate and share information with the ministry proper and relevant organizations**

Support local municipalities toward the early restoration of town and houses

【Initial field survey of affected areas】
Confirm the damage situation in Tenou area, Kure City

Keep in mind
～How we responded to “the heavy rain disaster in July 2018”～

Chugoku Regional Development Bureau

Ministry of Land, Infrastructure, Transport and Tourism

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