

# Efforts for Recovery of Roads from the 2016 Kumamoto Earthquake

May 31, 2017

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Ministry of Land, Infrastructure, Transport and Tourism



- The National Institute for Land and Infrastructure Management is the only national research organization in the housing and public capital field.
- “Disaster response support” is one of the major roles of NILIM.
- NILIM have sent experts to many areas affected by disasters including the Great East Japan Earthquake, to support restoration, in cooperation with the Public Works Research Institute.

**2016 Itoigawa City large-scale fire**



**2011 The Great East Japan Earthquake**



**2016 Typhoon disaster**



**2014 Hiroshima landslide disaster**



**2015 Kanto · Tohoku heavy rain**



**2016 Kumamoto earthquake**



**2012 North Kyushu heavy rain**



**2014 Mt. Ontake eruption**



- ◆ Overview of the Kumamoto Earthquakes and the damage
- ◆ Disaster response by MLIT
- ◆ The efforts to restore roads

# Occurrence of the Kumamoto Earthquake

○ From April 14 to 16, 2016, a series of earthquakes ranging from M6.5 to M7.3 struck the Kumamoto Area.

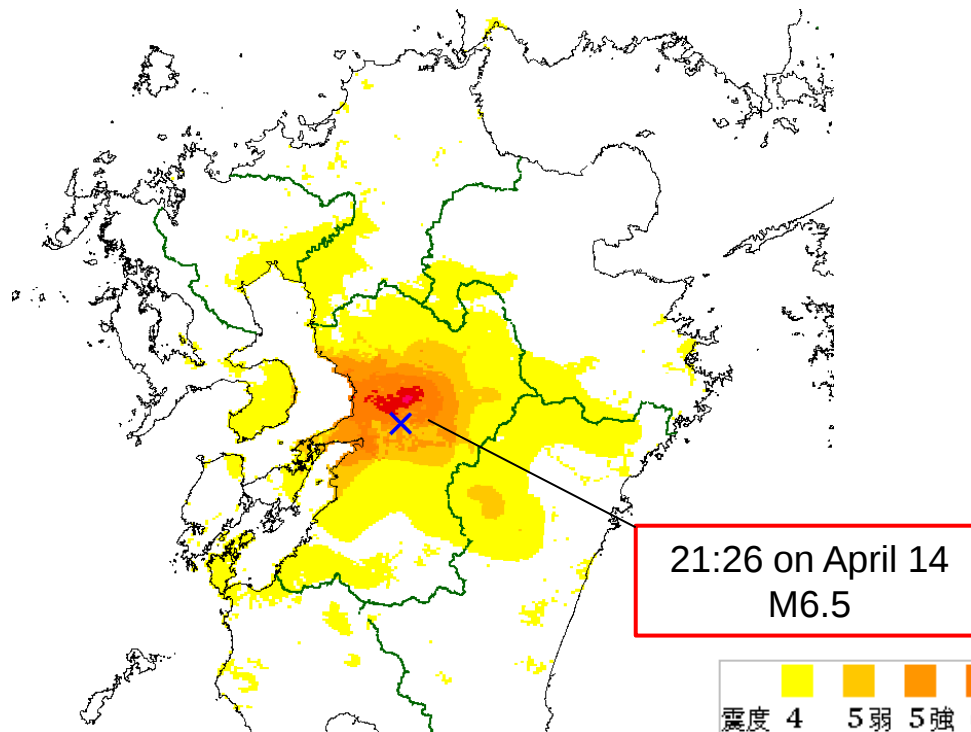
## ○ Foreshock

Date/time: 21:26 on April 14

Epicenter: Kumamoto region of Kumamoto Prefecture  
(North 32° 44' and East 130° 48')

Epicenter depth: 11km

Scale of earthquake: Magnitude 6.5



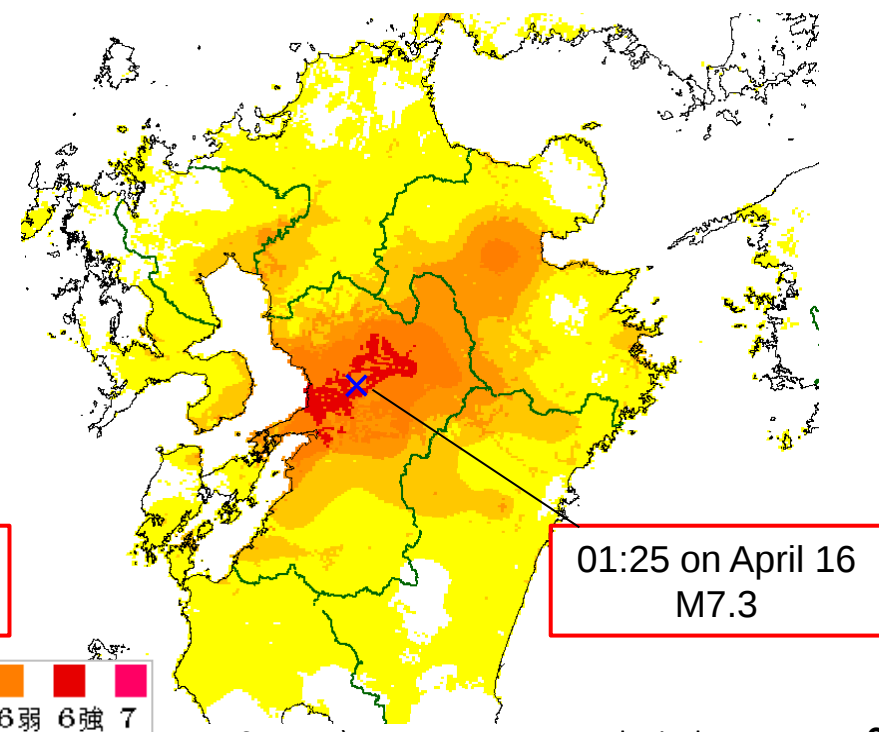
## ○ Main shock

Date/time: 01:25 on April 16

Epicenter: Kumamoto region of Kumamoto Prefecture  
(North 32° 45' and East 130° 45')

Epicenter depth: 12km

Scale of earthquake: Magnitude 7.3



# Damage caused by the Kumamoto Earthquake

- 50 deaths were caused directly by building collapse and sediment disasters. About 200,000 buildings were damaged.
- Roads, railways, water supply and sewage systems, electric power and other public services were severely damaged.

▼ Land slide (Aso bridge area)



▼ Sunken road surface (Kyushu Expressway)



▼ Derailed bullet train (Kyushu Shinkansen)



▼ Damaged homes



▼ Damaged government office (Uto City Hall)



▼ Damaged Kumamoto Castle



Sources) Kokusai Kogyo Co., Ltd./Pasco Corp.  
Sources) Kyushu Regional Development Bureau

# Setting up of Disaster Countermeasure Headquarters

- Immediately after the earthquake on April 14, the Kyushu Regional Development Bureau set up the disaster countermeasure headquarters.
- At 23:00 on the same day, it held a TV conference with MLIT and shared information with the Minister.

4/14 22:25



▲ Disaster Countermeasure Headquarters

4/15 01:00



▲ Executive employees gathering information

4/14 23:10



▲ Sharing information about damage and response

4/15 01:10



▲ TV Conference with MLIT Conference

Sources) Kyushu Regional Development Bureau

# Sending liaisons and TEC-FORCE

- On April 14, at the same time as the Kyushu Bureau set up the Disaster Countermeasure Headquarters, liaisons were sent to Kumamoto Prefecture, Kumamoto City, Mashiki Town, etc. The liaisons collected information, supported the disaster area.
- The first 14-member TEC-FORCE was sent to Mashiki Town at 1:25 on April 15.



▲ Situation immediately after the disaster reported by the Mashiki Town Liaison



▲ State of evacuation reported by the Mashiki Town Liaison



▲ Meeting prior to departure of TEC-FORCE



▲ Dispatch of 1<sup>ST</sup> TEC-FORCE Team to Mashiki Town

# Sending equipment and materials

○ On April 15, Disaster countermeasure vehicles such as lighting vehicles and information gathering vehicles were deployed to support various activities.



# Surveying by a helicopter (April 15)

○ On the Morning of April 15, The Kyushu Bureau started to survey the damage using their own helicopter.



# Surveying by a helicopter (April 16)

○ On the day of the main shock, the Kyushu Bureau started to survey the damage and the opening of roads using the helicopter.

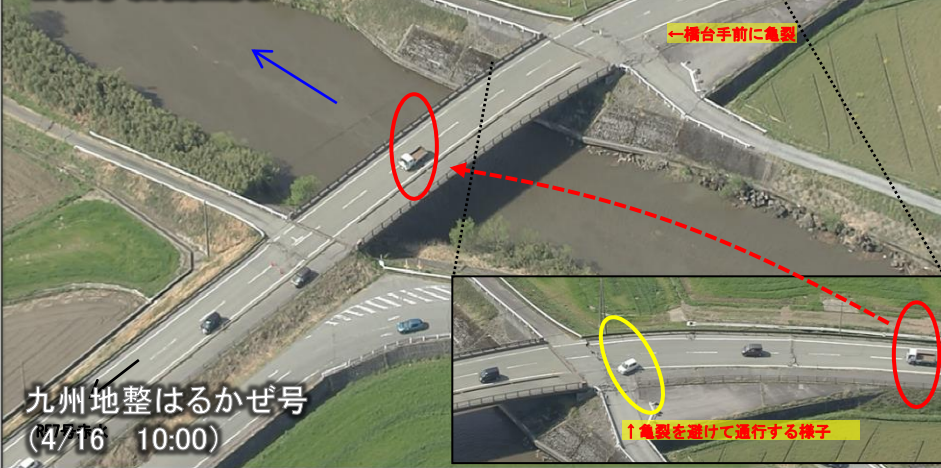
Land slide cut off a road and caused the Aso bridge to fall.



Land slide at portal of the Tawarayama Tunnel



Survey of opening roads where road surfaces were cracked



Damaged bridge (Choyo Bridge) 九州地整はるかぜ号



# Assisting evacuees

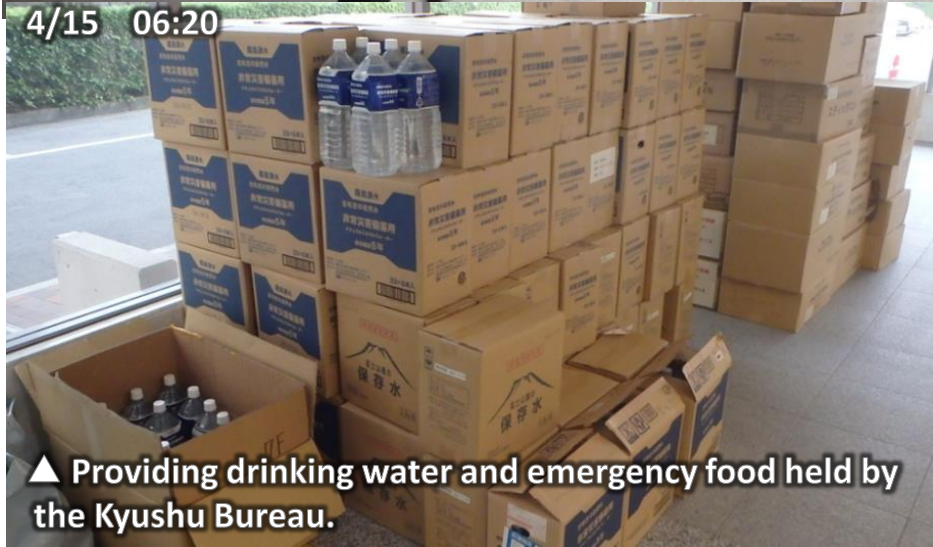
○ On April 15, drinking water, emergency food, blankets, etc. which had been held by the Kyushu Bureau were provided as emergency supplies to local governments in the disaster area.



▲ Provision of blankets held by the Kyushu Bureau



▲ Loading support materials on a truck



▲ Providing drinking water and emergency food held by the Kyushu Bureau.



▲ Sprinkler truck used to ensure water for daily use

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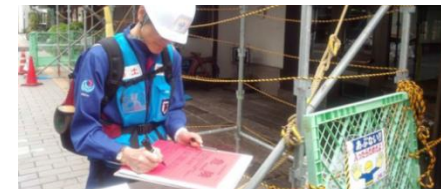
- from a boat owned by the Bureau



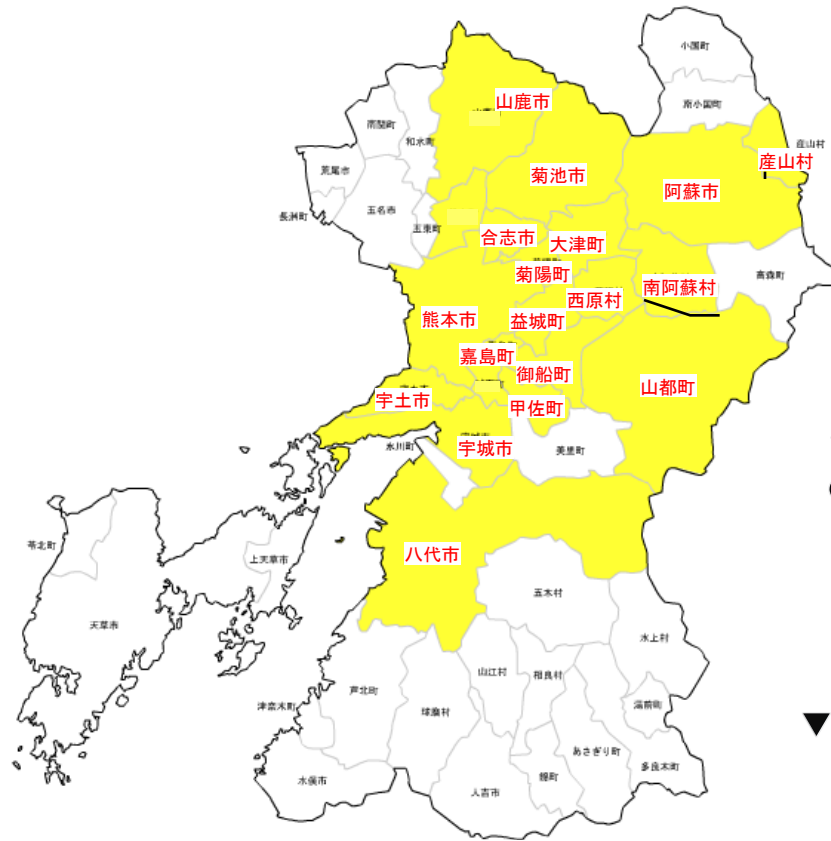
▼ Emergency damage inspections at the Uto City Hall



### ▼ Emergency safety assessment of a damaged building



### ▼ Surveying damage using drones



Sources) Kyushu Regional Development Bureau

# TEC-FORCE(Road-opening team)

- The TEC-FORCE road-opening team surveyed the state of damage to national roads, prefectural roads, etc.
- They also helped with early restoration, such as road opening work in response to requests.

【 National Route 443 opened on April 20】

【Prefectural Route 149 opened on April 17】



- Immediately after the earthquake, NILIM also set up a Disaster Countermeasure Headquarters and sent experts to Kumamoto as TEC-FORCE.
- TEC-FORCE of NILIM and PWRI gave advanced technological support with damage surveys and emergency restoration.



NILIM Disaster Countermeasure Headquarters meeting



Explaining the results of an emergency inspection to a self-governing body



Surveying state of damage on the scene



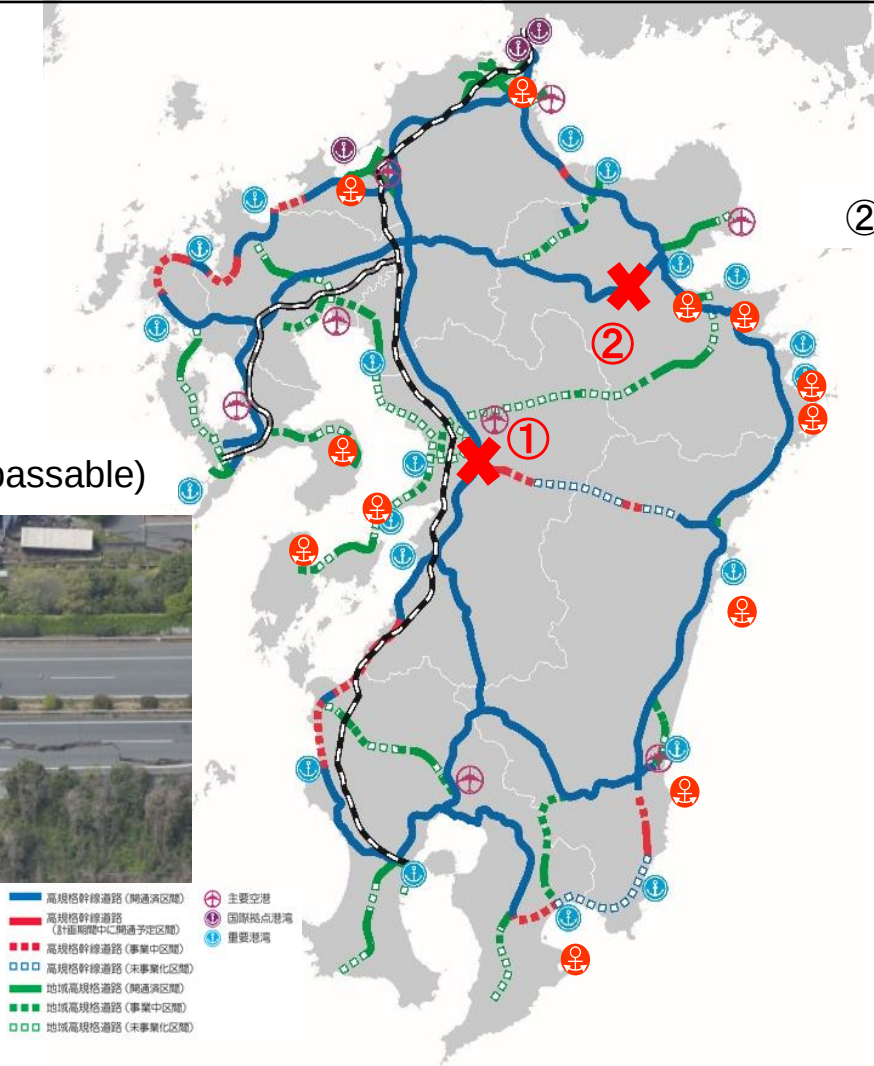
# Damage on Expressways

- Up to 507km of expressways in Kyushu were closed under the effects of the earthquake.
- On the Kyushu Expressway and Oita Expressway, bridges and slope faces were seriously damaged.

① Kyushu Expressway (impassable)



② Oita Expressway (impassable)



■ 高規格幹線道路 (開通済区域)  
■ 高規格幹線道路 (計画期間中・開通予定区域)  
■ 高規格幹線道路 (事業中区域)  
□ 高規格幹線道路 (未事業化区域)  
■ 地域高規格道路 (開通済区域)  
■ 地域高規格道路 (事業中区域)  
□ 地域高規格道路 (未事業化区域)

✈ 主要空港  
✈ 国際拠点港湾  
⚓ 重要港湾

Photo: NEXCO West Japan

- NEXCO West Japan performed emergency restoration, and opened all expressways by May 9, 2016.
- In part of the Kyushu Crossing Expressway in Kumamoto district, traffic was opened in 2 lanes out of 4, but all 4 lanes were completely restored and opened on April 28, 2017.



Immediately after earthquake

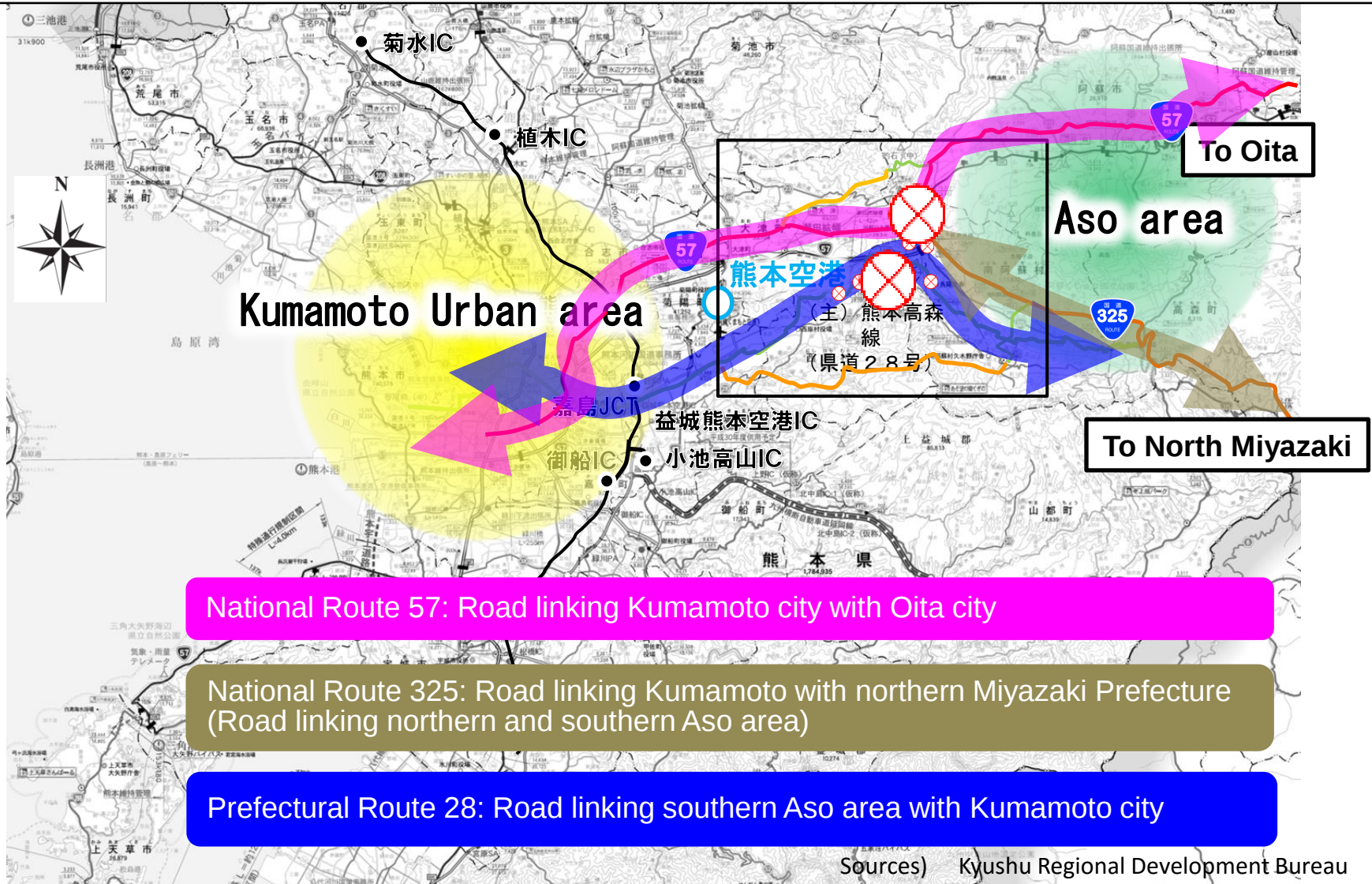
During restoration work

Present time

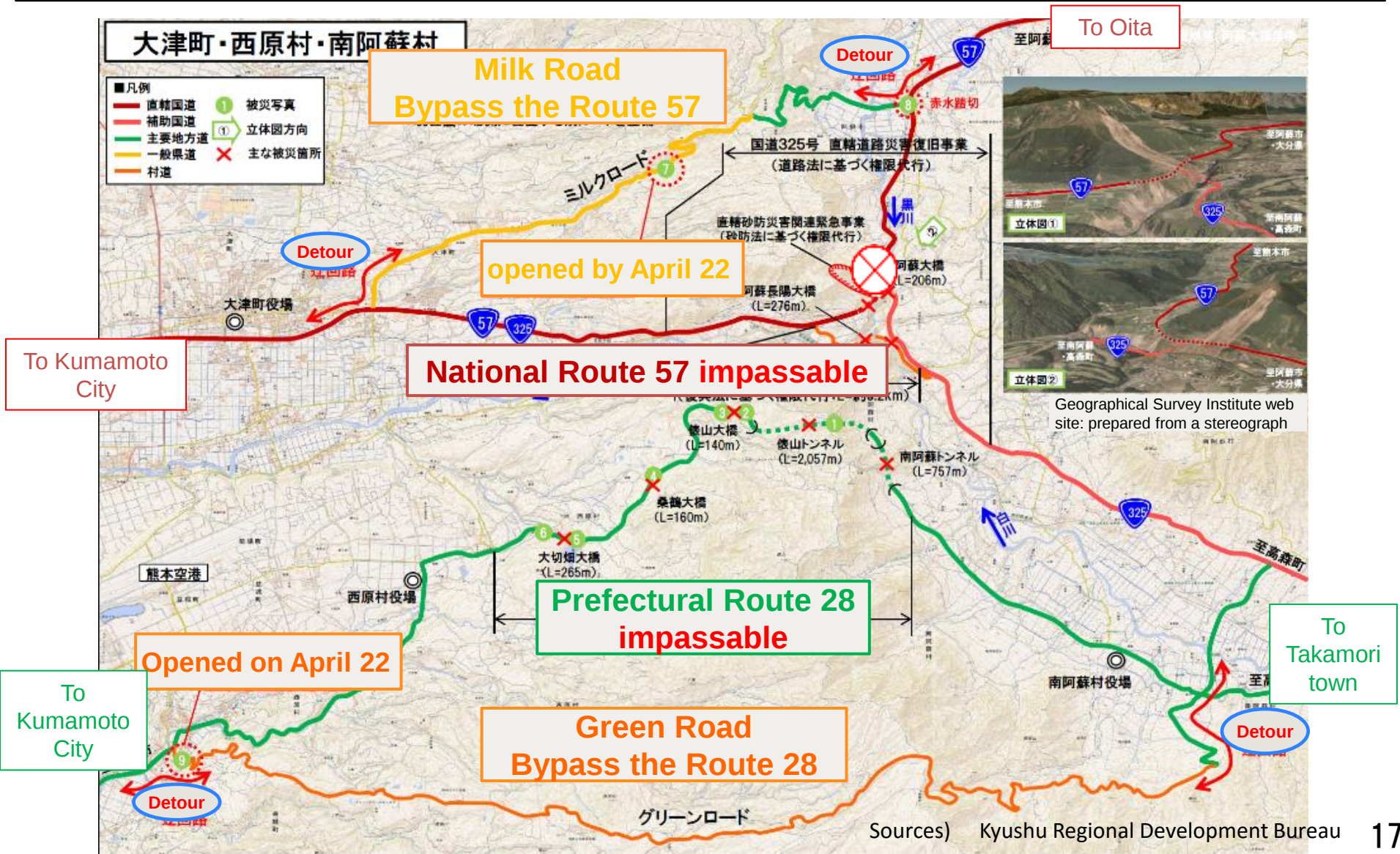
Photo: NEXCO West Japan

# Damage to Trunk Roads around the Aso area

- Between Kumamoto urban area and Aso area, roads were seriously damaged.
- National Route 57 and 325, Prefectural Route 28 were cut off traffic on these routes.
- These disasters had a major impact on inter-city traffic.



OTEC-FORCE helped open the Prefectural Milk Road and the Green Road on April 22 in 2016. OBy these, detours on National Route 57 and Prefectural Route 28 were secured.



# Cut Off National Route 57 and 325

- A land slide occurred in the area where National Route 57 and 325 meet. This cut off National Route 57 and the Hohi Line of the railway those link Kumamoto city with Oita.
- Also the Aso bridge on National Route 325 collapsed.

## ② View of the river course



Height of 700m

Width of 200m

①

① Cracks on the top of the collapsed slope

25



To Kumamoto City

Hohi Line of the railway

To Oita

National Route 57

②

Fallen Aso Bridge

National Route 325

To North  
Miyazaki

黒川

Sources) Kyushu Regional Development Bureau

# Sediment disaster prevention in the Aso bridge area 国土交通省

- To prevent the collapse of unstable soil from causing secondary disasters, the Kyushu Bureau began sediment disaster prevention works in May 2016.
- To ensure the safety of this work, it was done using construction machinery that can be remotely controlled.
- Manned execution began in January 2017.



Photo : Kumagai Gumi Co., Ltd.



## ▲ Sediment control work in the Aso bridge Area

Sources) Kyushu Regional Development Bureau

国土交通省

- ①



②



3

阿蘇市

To Oita

阿蘇市赤水

大津町

1

熊本中核工業団地

ミルクロート

Existing National Route 57  
impassable

③



To Kumamoto  
City

大津町引水

ゴルフ場

**[凡例]**

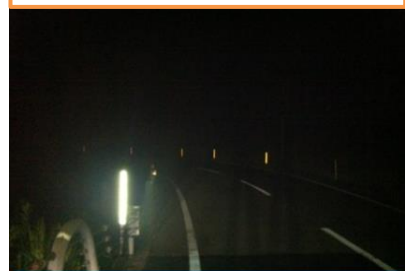
-  ルート範囲  
 斜面崩壊が発生したエリア(着色は実際の発生箇所)  
 小規模な斜面崩壊が発生したエリア(着色は実際の発生箇所)  
 洪水浸水想定区域  
 被災箇所(通行止め)

Sources) Kyushu Regional Development Bureau

# Improvement of the Milk Road

○ The Kyushu Bureau, in cooperation with Kumamoto Prefecture, improved the Prefectural Milk Road by December 2016, so it could serve as the detour around National Route 57.

## Improvement of the Milk Road



Delineator



Refuge space

To Kumamoto City

Monitor camera



## Prefectural Milk Road

## Improvement intersection

National Route 57  
impassable

To Oita

To North  
Miyazaki

【凡例】

●: 待避所整備箇所

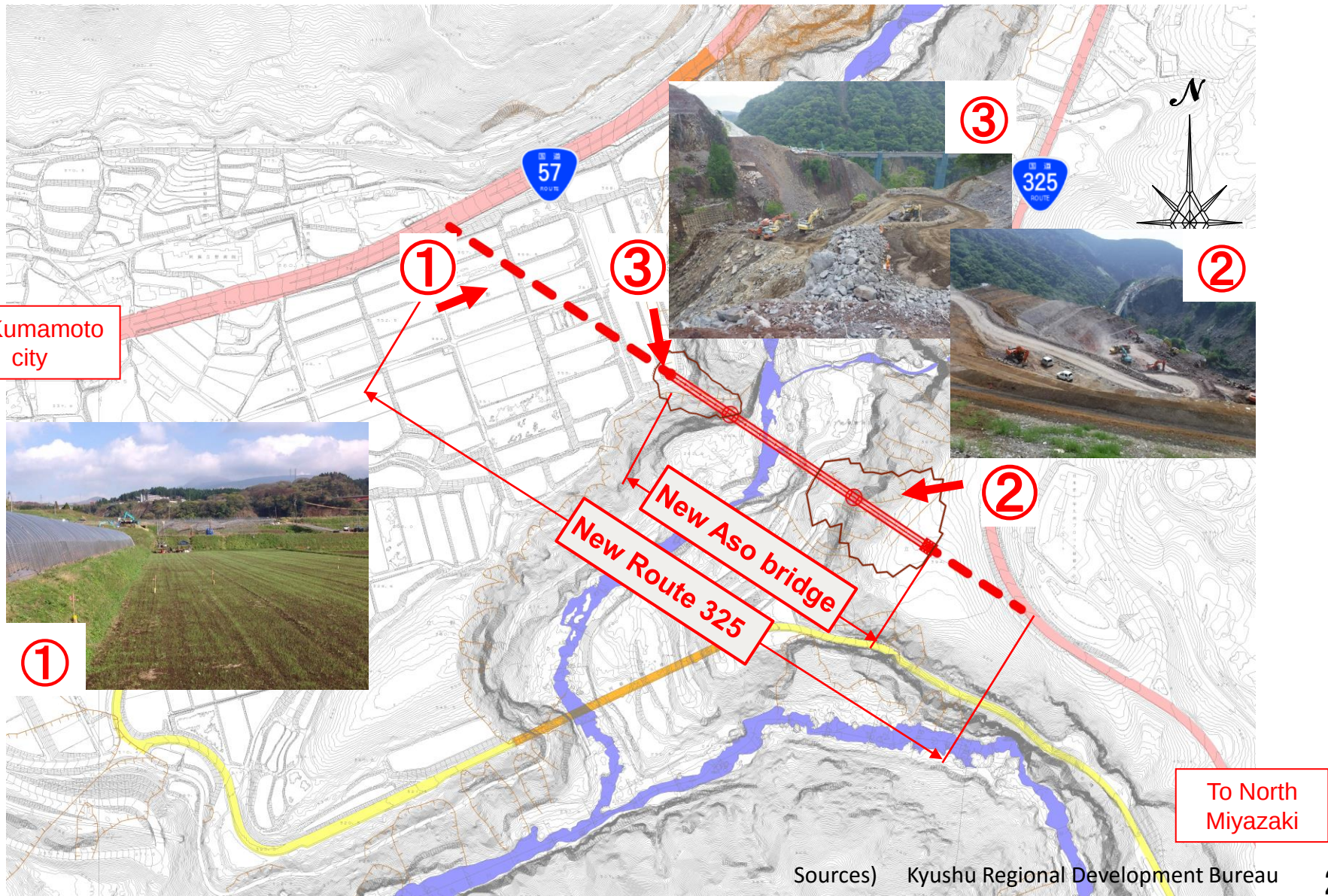
✕: 通行止め箇所

国土交通省

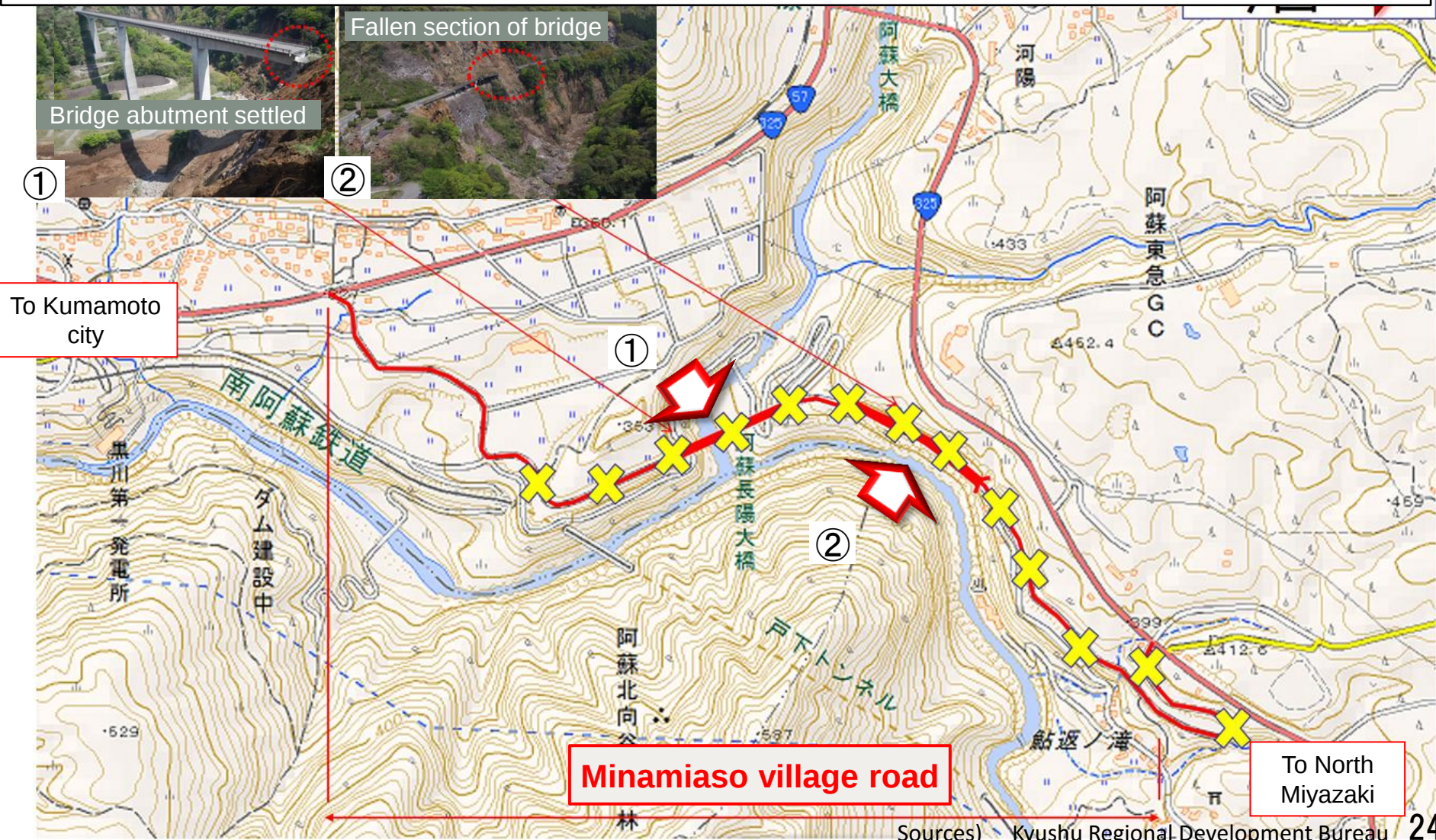
- 
- 国立公園指定地域  
特別保護地区
- 亀裂  
崩壊
- To Oita
- 至 宮崎
- 位置図
- 熊本市  
阿蘇山  
西原村  
南阿蘇村  
熊本空港  
熊本IC  
熊本駅
- 黒川
- 阿蘇大橋  
落橋
- Fallen Aso Bridge
- 南阿蘇村立野
- To Kumamoto City
- 新阿蘇大橋
- New Aso Bridge
- 阿蘇北向谷原始林
- 白川
- To North Miyazaki
- 南阿蘇村
- 阿蘇大橋(イメージ)
- Image of New Aso Bridge
- Sources) Kyushu Regional Development Bureau

# Replacement work of the Aso bridge

○ The Kyushu Bureau is undertaking the work with the aim of replacing the bridge by 2021.



- A Minamiaso village road near the Aso Bridge was also became impassable due to disasters.
- Following the request of the village mayor, the Japanese government decided to restore it directly on behalf of the village under the Large Disaster Restoration Law.



# Restoration work of the Village Road

○ The Kyushu Bureau is undertaking restoration work with the aim of restoring the road in the summer of 2017.

## [1] Aso-choyo Bridge (restoration of abutment)



To  
Kumamoto  
city

## [2] Aso-choyo Bridge repair work

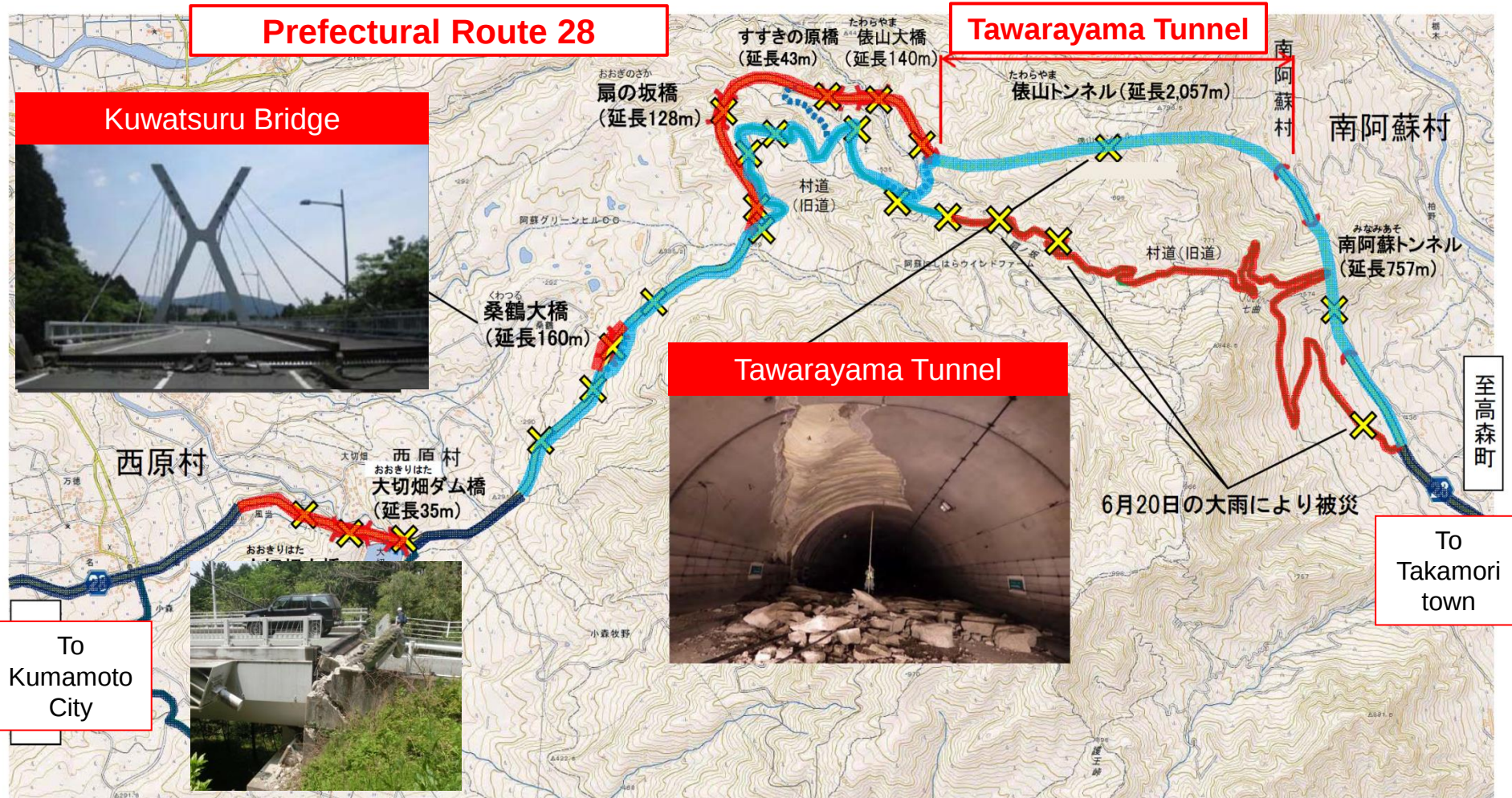


## [3] Toshita Bridge repair work



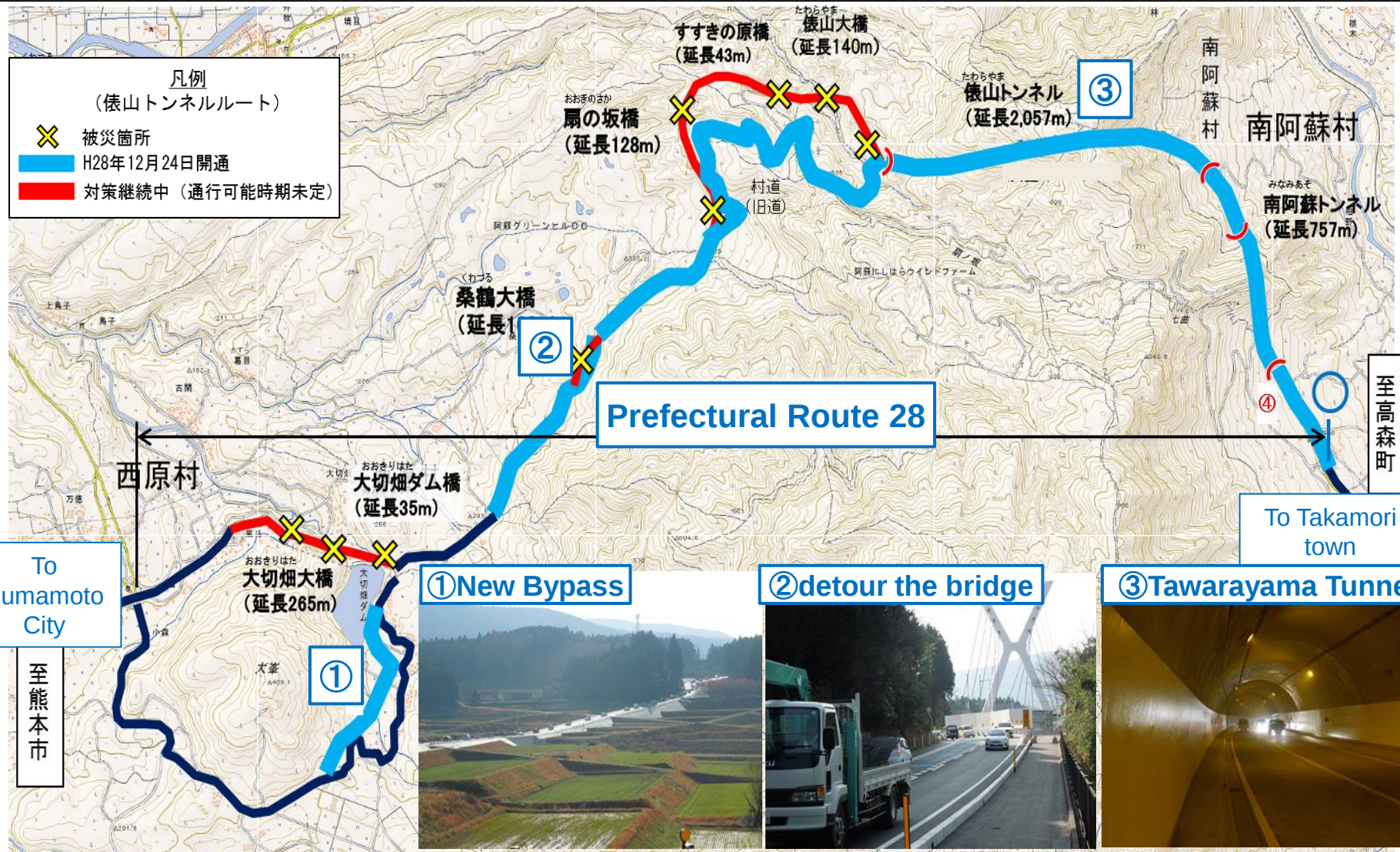
# Damage to Prefectural Route 28

- Prefectural Route 28 was impassable because 6 bridges and 2 tunnels were seriously damaged.
- Following the request by the Kumamoto prefectural governor, the national government decided to restore it directly on behalf of the prefecture under the Law.



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- It is continuing executing work to repair the six bridges.



- Advanced expertise is required for restoration of these roads and sediment control work, the Kyushu Bureau has established technical committees.
- Experts on sediment control, bridges, etc. from the NILIM and PWRI also join these committees, and survey at the disaster site to give technical advice on restoration methods etc.

## Technical Committees

- Technical Committee for Restoration in Aso Bridge area
- Technical Committee for Restoration of National Route 325
- Technical Support Team for Restoration of Prefectural and Village Roads



Technical Committee for  
Restoration in Aso Bridge area



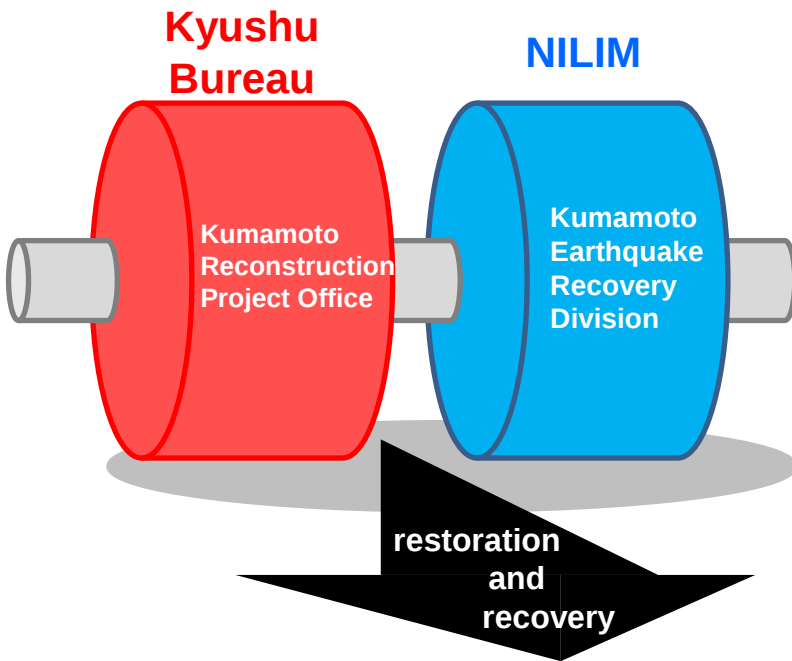
Technical Committee for  
Restoration of National Route 325



Survey at the disaster site

# Opening the Restoration Office and the Recovery Division in Kumamoto

- In July 2016, the Kyushu Bureau opened the Kumamoto Earthquake Disaster Countermeasure Promotion Office. Six experts from NILIM also participated as the Promotion Office members.
- In April 2017, the Kyushu Bureau opened the Kumamoto Reconstruction Project Office in Mimani-Aso Village in Kumamoto Prefecture. NILIM also opened the Kumamoto Earthquake Recovery Division in the same building as the Project Office.
- The two organizations will work together to promote the restoration and recovery from the Kumamoto Earthquake.



Opening ceremony (April 24, 2017)



Name plate



Project Office & Division