



高知大学
Kochi University



High-durability gabion embankment and natural disaster management projects and Japanese Gabion Technologies

Tadashi Hara
Professor, Kochi University

Special thanks

- We would like to thank everyone who organized this workshop.
- In particular, I would like to thank my Dr student Mr. Suresh for his great help.
- It is an honor to meet many friend in Nepal.
- We hope that this workshop will help to improve civil engineering technology in Nepal.

Today's lectures menu

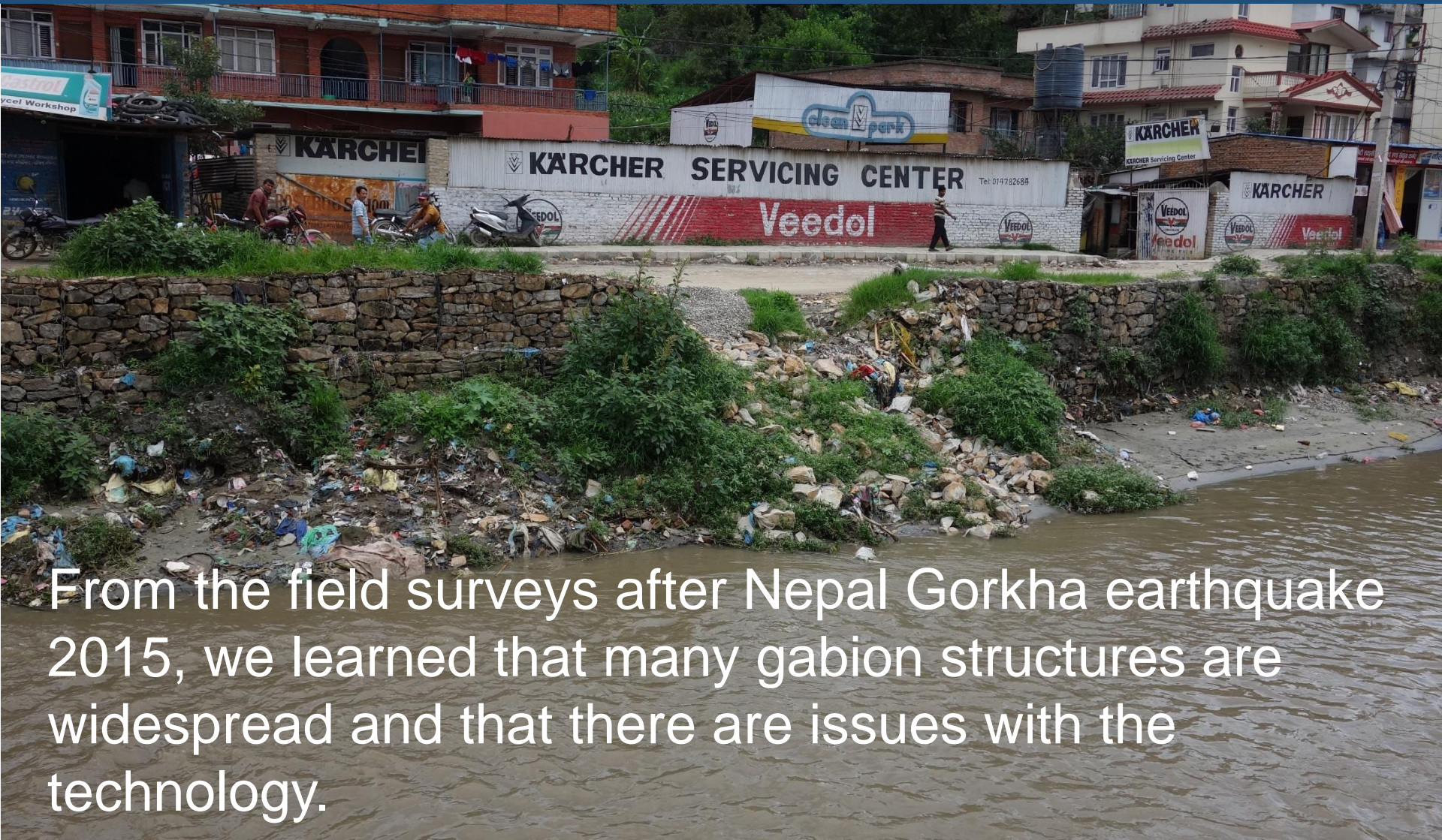
- First, I will give a general description of gabion structures.
- Then, Kochi University students will explain the results of the field survey in Nepal and laboratory tests of the model gabion levee.
- Finally, Prof. Nakazawa will talk about the Elemental tests and full-scale model experiments on gabion structures.

Self-introduction

- 1974, Born in Nagano Pref.
- 1999, Master's degree obtained by Chuo University.
- 1999, Worked as a construction consultant (The establishment and maintenance of new electric power facilities.)
- 2003, Assistant Professor, Chuo Univ.
- 2005, Ph.D obtained by Chuo Univ.
- 2007, Associate Professor, Wakayama National College of Technology
- 2010, Associate Professor, Kochi Univ.
- 2014, Professor, Kochi Univ.



Encounter with Nepalese gabion technology

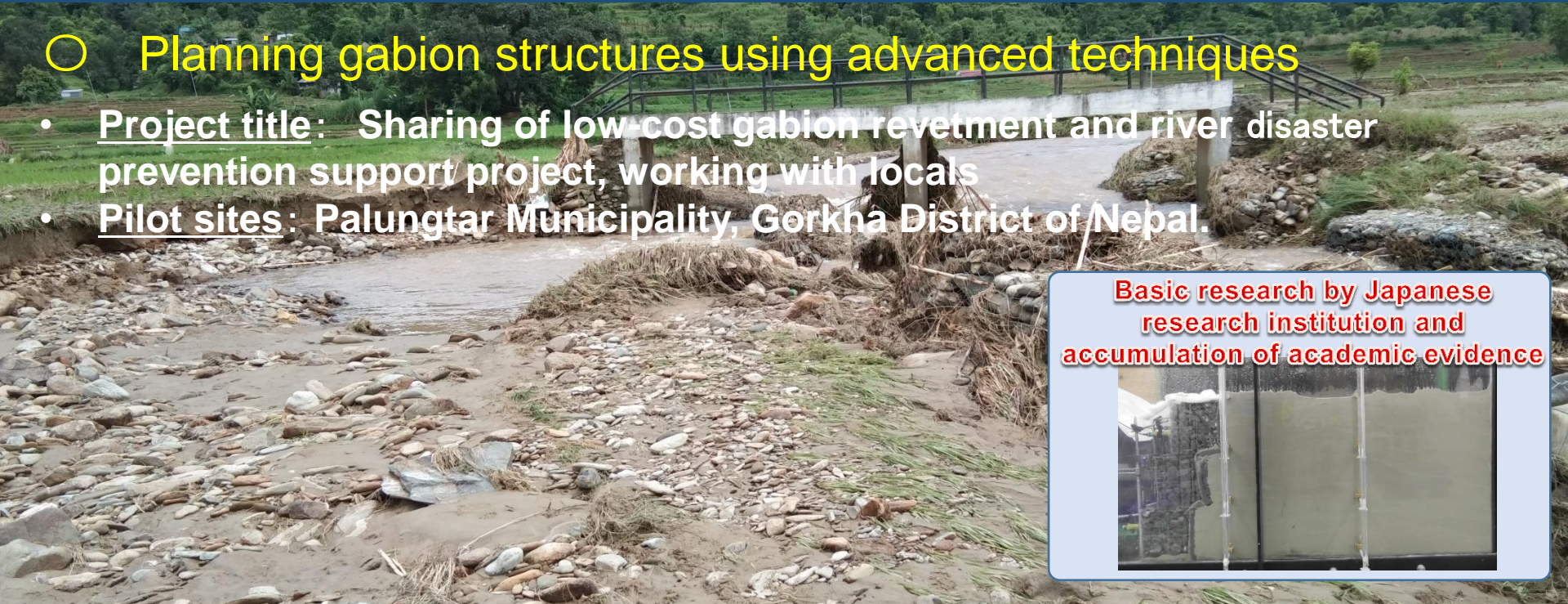


From the field surveys after Nepal Gorkha earthquake 2015, we learned that many gabion structures are widespread and that there are issues with the technology.

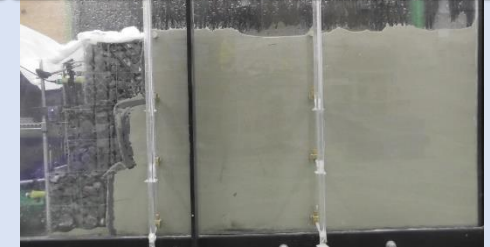
JICA Partnership Program (Phase 2) 2021-2024

○ Planning gabion structures using advanced techniques

- Project title: Sharing of low-cost gabion revetment and river disaster prevention support project, working with locals
- Pilot sites: Palungtar Municipality, Gorkha District of Nepal.



Basic research by Japanese research institution and accumulation of academic evidence



Technical exchange with local university and government officials



Construction of gabion revetment by locals



Building awareness of disaster prevention through disaster prevention drills with locals



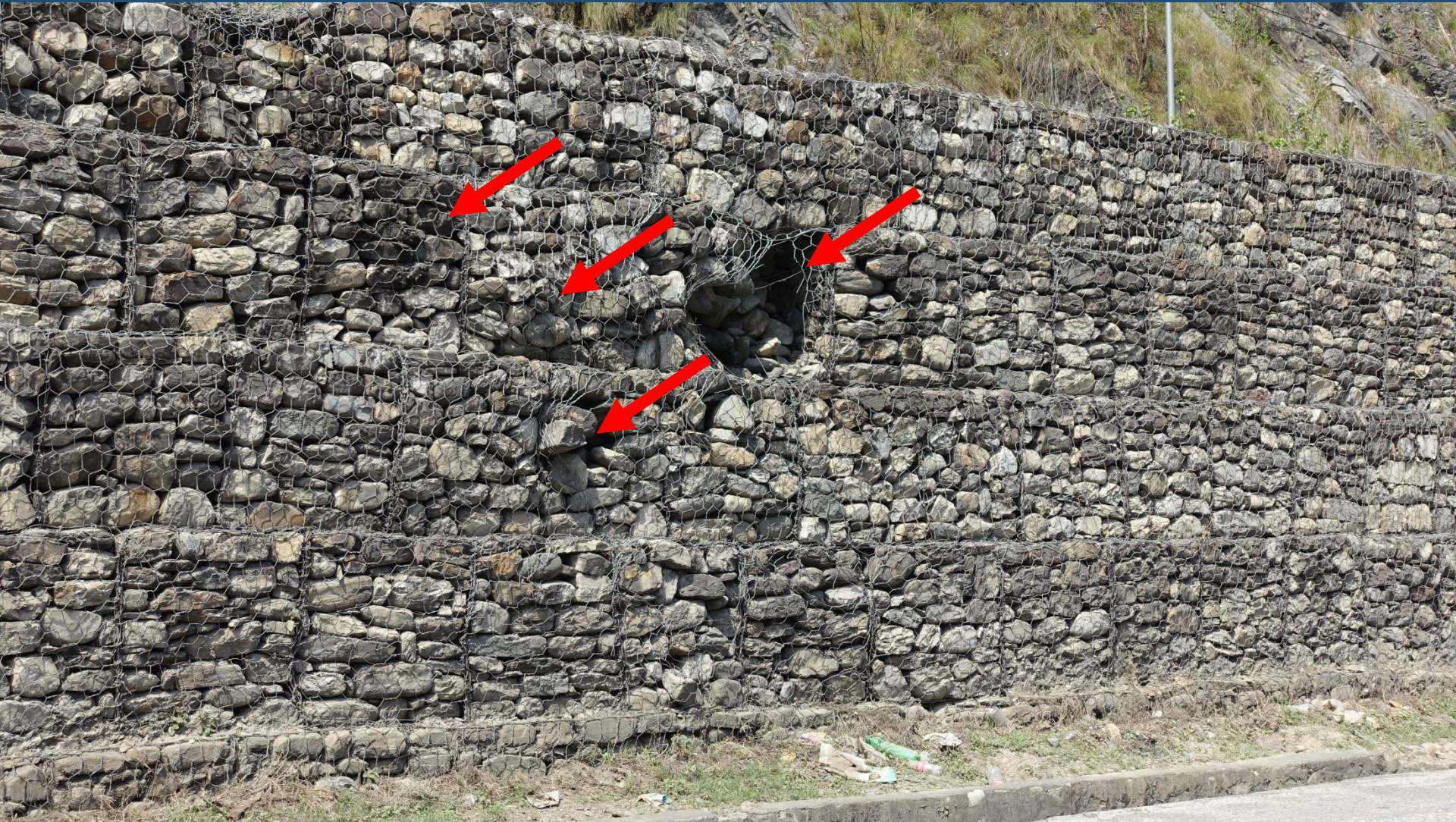
- Today, you will watch a video programs explaining the gabion embankment, design and construction considerations.
- After that, I will introduce a case study of a gabion structures in developing country.

Does the example take advantage of the strengths of the gabion structure? Please think about it.

Is this gabion retaining wall stable?
Let's judge from this photo.



What happened to the gabion retaining wall? Let's judge from this photo.



What is the ingenuity of this retaining wall?
Let's judge from this photo.



What is the condition of this gation
revetment ? Let's judge from this photo.

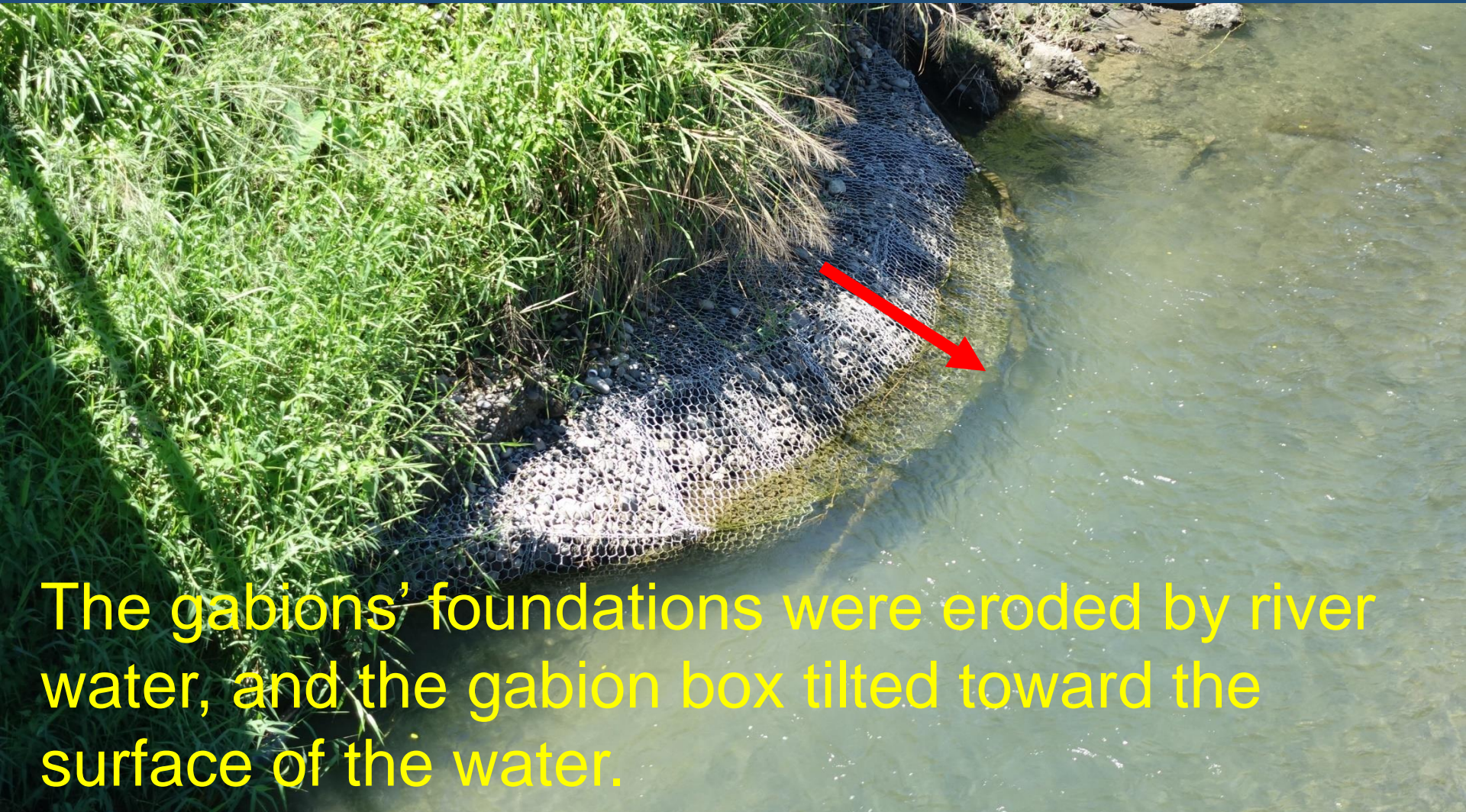


What is the issue with this gabion river revetment that has been under construction for one year?



Application of research

Risk of damage to gabions installed on a levee (Tamboko Village, Solomon)



The gabions' foundations were eroded by river water, and the gabion box tilted toward the surface of the water.

Is this erosion control gabion Sabo dam stable?





- The road surface is heavily eroded due to drainage from the slope.
- Insufficient volume received by the drainage basin.



The slope behind it has eroded over the years !

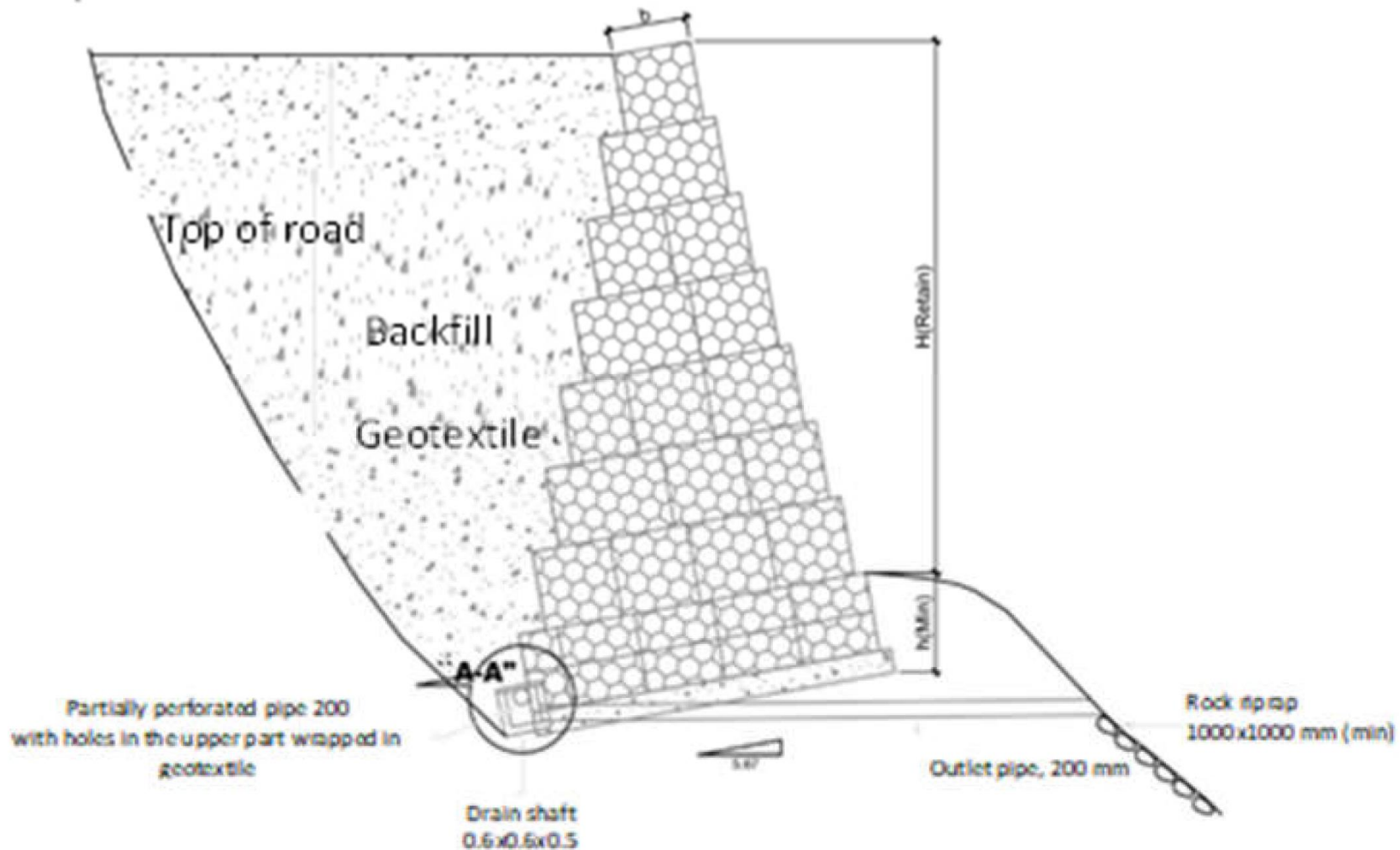
Does it have the function of a gabion frame and filling material properly sized?



High-cost Gabion retaining wall (Design in Tajikistan)

TYPE I. Typical Gabion Mesh
(gravel foundation)

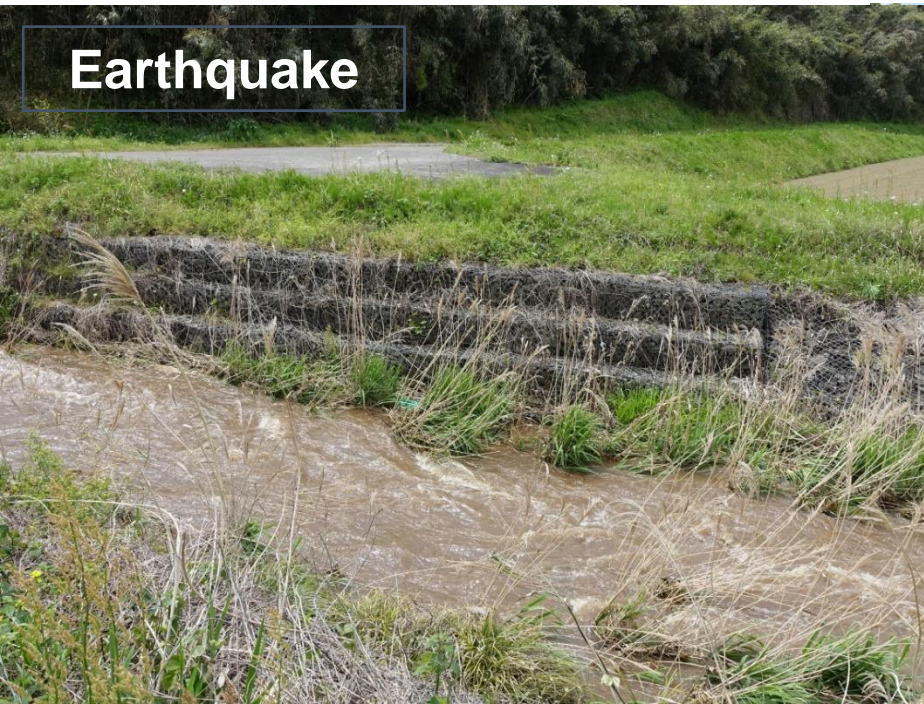
Source: Assessment of neconomic impacts from disasters along key corridors, World bank, 2021.5



When properly designed and constructed, they can withstand natural disasters and retain their functionality for 40 years or more !!

Why do gabion structures in developing countries have poor long-term durability?

Earthquake



[2016 Kumamoto Earthquake](#)
Nishihara Village,
Kumamoto Prefecture. Japan

Heavy rain



[July 2018 heavy rain in western Japan](#)
Aki City, Kochi Prefecture, Japan

Factors and tasks that inhibit sharing of gabion structures

I . Defects in the structure

1. No case studies and poor scientific knowledge of gabions.
2. Big differences in gabion quality due to few manuals for gabion planning, design and construction.
3. Lack of technical knowledge for customers and constructors.
4. Low productivity due to heavy reliance on human resources.
5. No knowledge of maintenance techniques.



Gabion retaining wall tilted inconsistently by the earthquake

II . Lack of awareness of natural disasters

1. No knowledge and no interest in disaster management facilities.
2. No knowledge leading to negligence toward gabion work.
3. Lots of thefts and related matters happen because of insufficient information provided to locals and lack of gabion maintenance. As a result, gabions lose their effectiveness in a very short time and it is a waste of money.



Stolen stones used for building houses

Increasing awareness of reducing natural disaster risks and loss requires technical development which meets the needs of locals, as well as efforts in collaboration with the government and local residents.



1. The government will be actively involved in the design, construction, and maintenance of the facility.
2. Residents are actively involved in the construction process.
3. Residents become attached to the facilities through maintenance.



We continue to support civil engineering technology in Nepal !



Interactive Workshop on Technological Equipment and Innovations for River Management, Canal/Drain Dredging and Soil & Water Conservation, September 17, 2023.

*Thank you for your
attention!*

