Adaptation for the Simultaneous Occurrence of Landslides Caused by Extremely Heavy Rain events - Attempt to create a risk map in Viet Nam-

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Forests have effects as NbS against various disasters as followings.

- Flood, Surface erosion.
- Tsunami by earth quake, Storm surges by typhoon.
- Land slide, Debris flow.
- Avalanche.
- Wild fire.
- Outflow of radioactive materials from forest areas to residential areas.

Today's Topic
1) History of forest management and soil conservation in Japan to decrease the disasters of floods, landslides and debris flow.
2) Attempts in Japan and Viet Nam in response to recent extreme heavy rain events.

Flood disaster in Kobe City (1938)
(https://web.pref.hyogo.lg.jp)

Debris flow disaster in Yamashiro Town (1953)
(http://www.pref.kyoto.jp/)

Until the 1960s, floods, landslides and debris flow occurred frequently in Japan, causing extensive damage.

Forest recovery works

・Carried out since the 1900's.

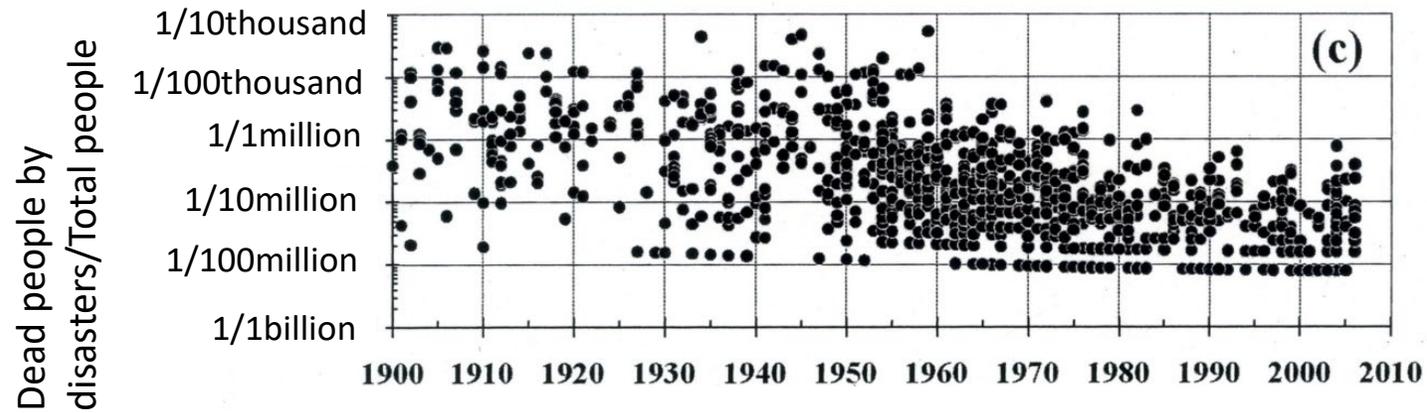・Creating a terrace to prevent the sheet erosion and planting trees.
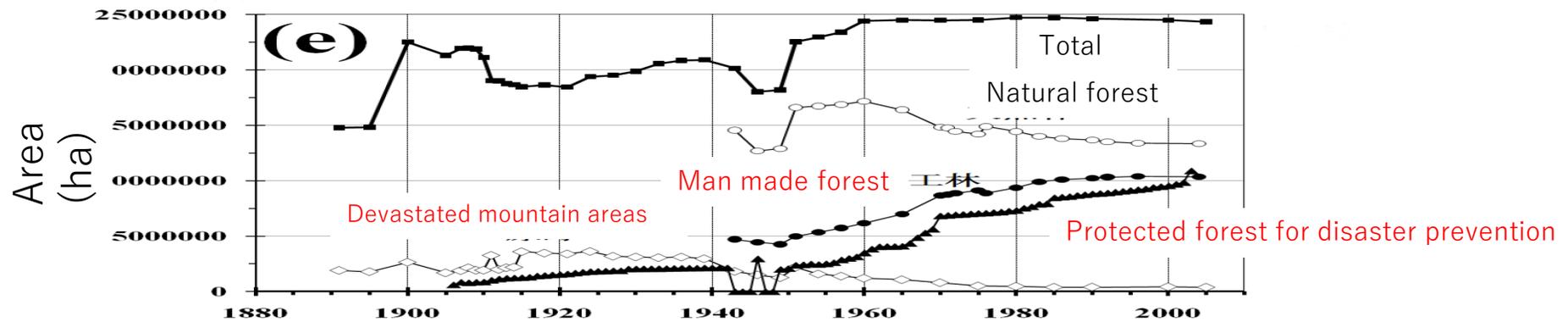

Before works

After works

Forest recovery works in Tanakami regions, Shiga Prefecture
（Japan Forestry Agency HP ； https://www.rinya.maff.go.jp/j/kouhou/archives/tisan/tisan.html）

Disaster History in Japan

Dead people by disasters/Total people

1/10thousand
1/100thousand
1/1million
1/10million
1/100million
1/1billion

(c)

1900 1910 1920 1930 1940 1950 1960 1970 1980 1990 2000 2010

Change in dead people by disaster from 1900 (Tada, 2010)

Area (ha)

25000000
0000000
5000000
0000000
5000000
0

(e)

Total

Natural forest

Man made forest 工林

Devastated mountain areas

Protected forest for disaster prevention

1880 1900 1920 1940 1960 1980 2000

Changes of forest area (Tada, 2018)

・Dead people by disasters has been on the decline since 1960

・The causes are the improvement of forests also contributes,
　　　in addition to the improvement of disaster prevention equipment.
　　　　　　　　　　　　　　　　　　　　　　　(Shinohara, et al., 2022)

Landslide
Heavy rain in North Kyusyu, Japan (July 5-6, 2017)

In Asakura City, around 900mm of heavy rain was estimated in 12hours and many landslide occurred.

Landslides in Asakura City, Japan
（Added red allows pointing the landslides to photo by Mr. Kurokawa）

Risk mapping

A disaster prevention has to be planed in a situation of limited budget and effort,

It is necessary to assess the disaster potential and the degree of damage.

And the Results of this assess should be displayed as a risk map in concrete.

Landslide risk

High risk

Low risk

0   2km
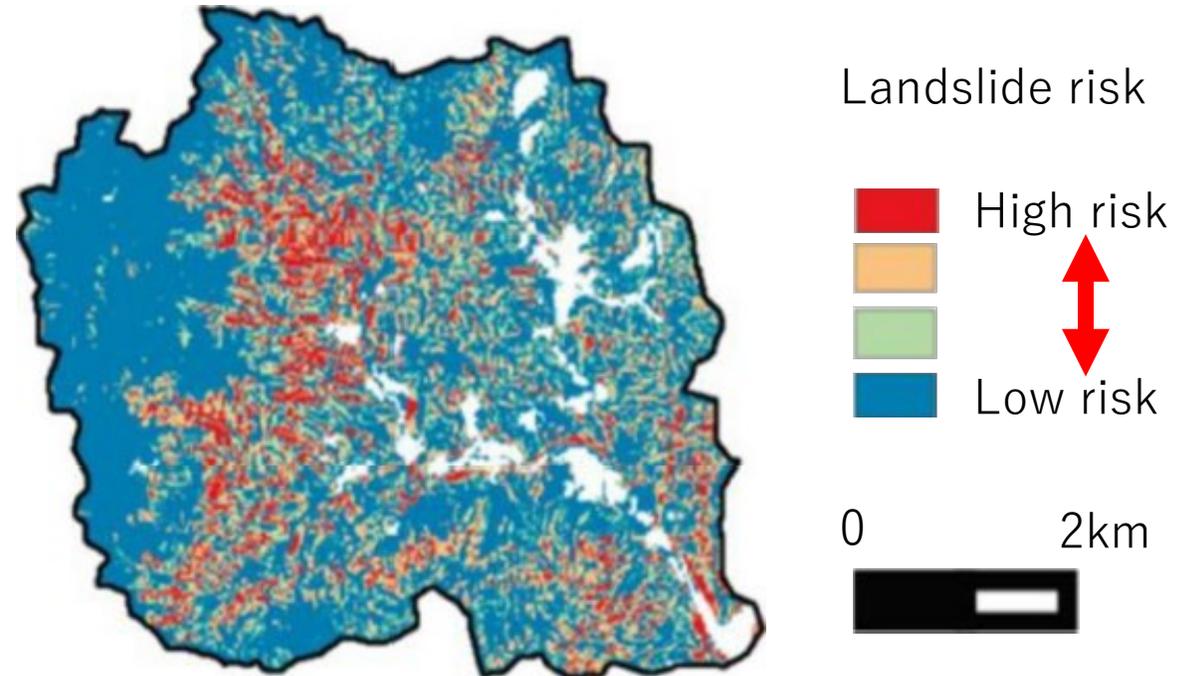
Landslide risk map in Hanazono river basin, Japan
（ FFPRI, 2020)

Risk assessment using AI and machine learning：
Case of Yen Bai Province, Vietnam

Landslide Risk Map by AI and machine learning technology
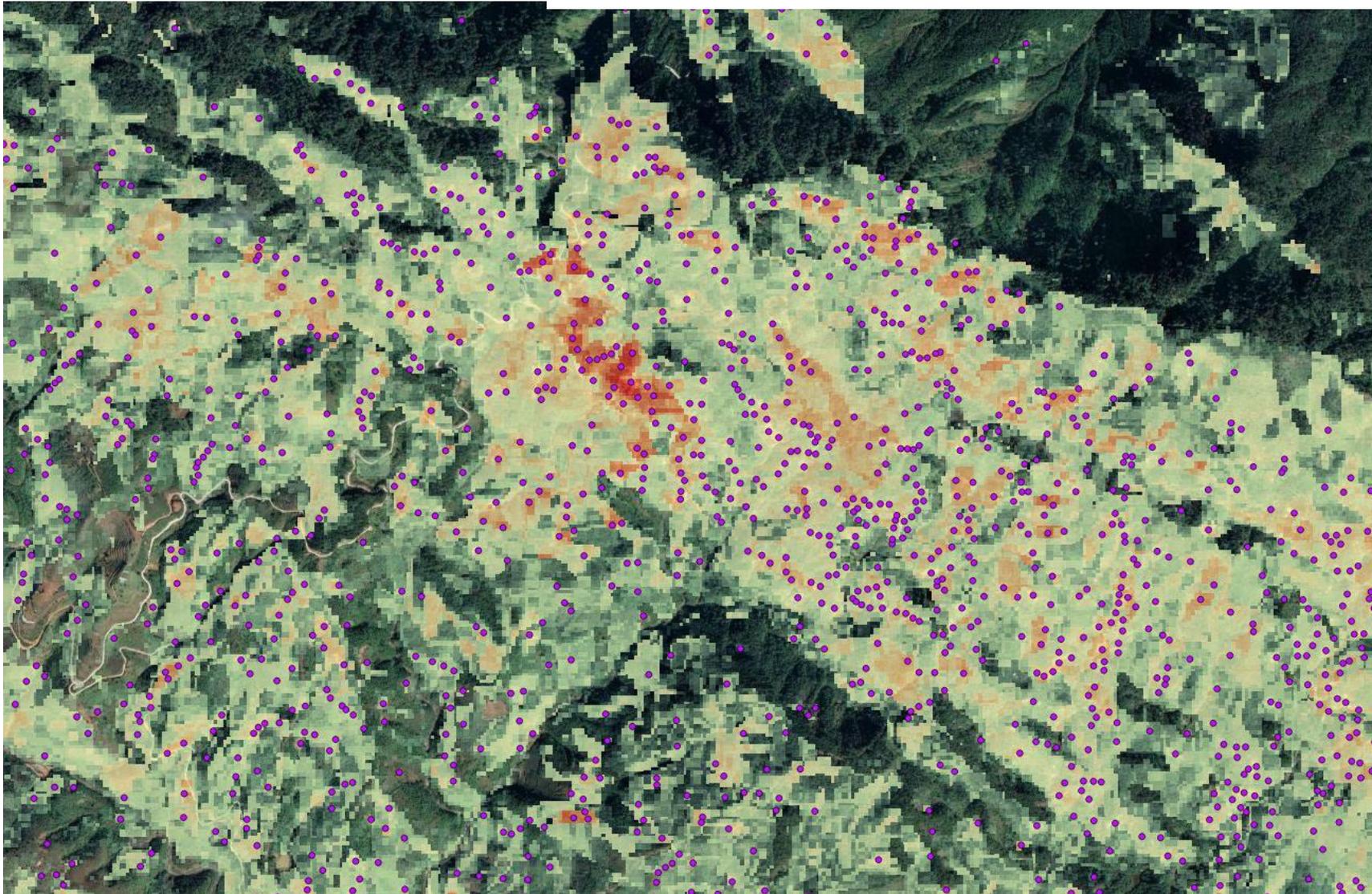
- Areas painted with redder color indicate areas of higher landslide risk.

- The purple points show the locations of the actual landslide in 2017.

(FFPRI, 2024 in Press)

Challenges identified through field research

Land use on slopes of Viet Nam differs by region.

Photo. Terraced paddy field
Steep slopes are used to create terraced paddy field.

Photo. Mountain slopes
The upper part of the mountain in the photo was once used as a burnt field, but is now regulated and forested. The lower part of the mountain continues to be used as farmland and grassland.

➡ **Land use differences may affect the risk of landslide.**

➡ It is difficult to detect such differences in land use with current remote sensing technology. Field surveys and visual data collection of future higher resolution satellite imagery are needed.