P-045

Climate change and population depletion control over sediment hazards and drifted wood hazards in japan

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1.Introduction

1.1 Climate change and population depletion in Japan

In recent years, heavy rainfall events have been increasing in japan, mostly because of climate change. Due to the effects of global warming, the temperature of the sea can rise and the state of the atmosphere can then become unstable, triggering heavy rainfalls with intensities over 50mm/h. Consequently, the risk of sediment hazards also increases. On the other hand, population depletion in Japan is a serious problem especially in local rural areas. The total population is decreasing, but the ageing rate is increasing. The present research area, Asakura city, is also facing this combinations of problems. The population is decreasing and the rate of elderly people is increasing. The lack of successors for the primary industry has caused desolated landscape. In the mountainous areas, cultivated land has left the place to forested slopes, which unfortunately can turn into the drifted woods easily during rainfall events.

1.2 Overview the July 2017 event and the damage

In the Northern part of Kyushu Island, at the limit between Fukuoka prefecture and Oita prefecture lies the municipality of Asakura-city, where the basin topography usually protects it from the heavy rainfall that are usually recorded in other part of the Island. However, an “extreme” rainfall event was observed in the north part of Kyusyu, (Japan) on the 5th and 6th of July 2017. Asakura city in Fukuoka prefecture and Hita city in Oita prefecture recorded the highest daily rainfall.

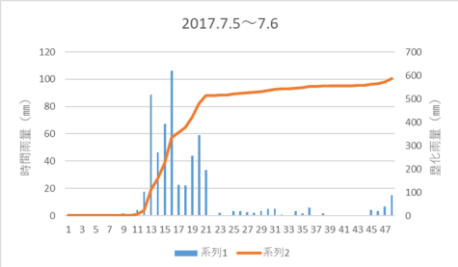

Fig.1: Hourly rainfall depth and cumulative rainfall in Asakura city on 2017.7/5~7/6

2.Method

2. 1Research location investigation

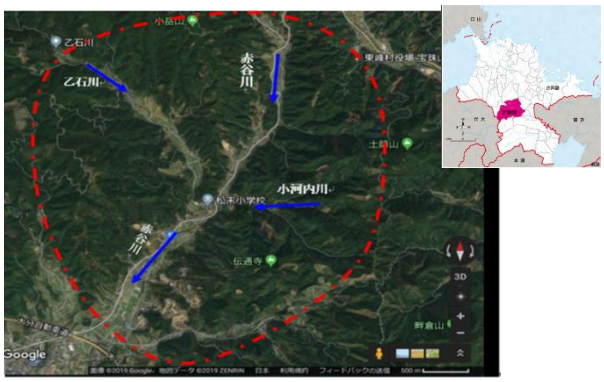

Fig.2: Field in Akatani basin at Asakura city, in Fukuoka prefecture

The research location is in Asakura city, Fukuoka Prefecture (Japan), on the basin of Akatani river. The size of catchment area: 20.1 km^2, length of the river : 15.5 km ○average slope of river bed：1/35(1.6°)○Collapse area rate：about3.1%○sediment volumeabout 2900000m^3 ○drift woods volume：about 39000m^3 ○the nature of the soil：granite.

2.2 Data acquisition and analysis

The aerial photographs and the DEM obtained from the LiDAR (Light Detection and Ranging) data were loaded in the GIS software QGIS for analysis. First I did digitize 5812 trees, out of the ortho-photographs. The method, unfortunately does not account for bio debris buried in the sediments and also underestimate the number of trees in the log-jam. Then, I measured each tree length and characteristics (with branches and foliage or not) Extract from the DEM data for each tree, and exported it in Excel. (how many trees, distance from the mouth of river, tree length, slope data, topo data, curvature data) in order to understand the stopping conditions of the drifted wood as well as the distribution of the drifted wood.

3. Result & Discussion

The statistical analysis has shown that trees can stop both on steep slopes and on the flat area of the valley, even if one would think that drifted wood would rather stop on flat area (Fig.3). This is explained by differentiations in the types of landslides. Some of the landslides were generated as debris flows along thin corridors, where only the first few centimeters of the soil have been eroded, whereas at other locations, deeper landslides have occurred. When the mass movements occurred as a debris flow, the soil loss its structure and all the trees have been evacuated from the area. On the contrary, in areas where the landslides are deeper, the top soil structure was not loss and the trees did not fully dissociate from the soil. The same landslides but different results, it is concluded that importance of the position in the water catchment.

Almost of trees in Japan are coniferous trees like cedar and cypress don't spread its roots deeply. They should be thinned at stated periods. But in Japan, population depletion and aging are advancing, so people who manage the forests are decreasing. So drifted woods caused by sediment hazards and landslide with heavy rain will be more thick and long in the future. And it applies to all over Japan.

With remote sensing system, it is easy to check some artificial forests and catch sight of fragile area. We can consider future measures about how prevent drifted woods and if there are dangerous area, we can prevent the damage before the disaster. This isn't the perfect tool but very effective tool.

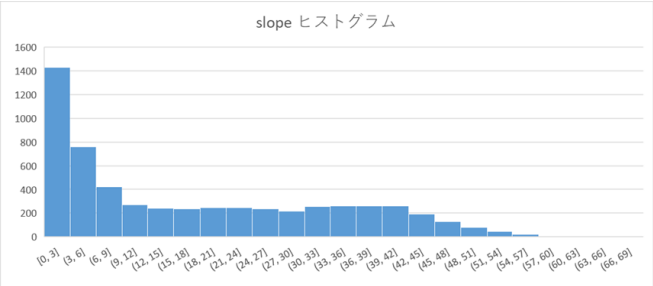

Fig.3: Distribution of trees per slope angles.

5.Conclusion

Drifted woods in sediment-disaster impacted valleys are a direct impact down to the valleys and the sea they have flown to, but a large amount of the timber trapped in the mountains appear to be a potential source of hazards in the future. As this distribution is dependent on the type of landslides, proper sabo structures would address present sediment and timber hazards as well as potential drifted wood hazards.

References

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