Keynote Speech

Protecting coastal zones with forests:
Toward the development of disaster risk reduction (DRR) technology

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The construction of adaptation measures to climate change, such as global warming, has become a real challenge in the present age. The coastal zone is (1) a place where the land-ocean interaction system is expressed and is also (2) a place where different types of nature coexist, such as intertidal zones, shallow seas, and coastal lowlands. (3) From the perspective of human survival, it is necessary to guarantee the stability of the place. In addition, (4) there is a concern that the effects of climate change will be diverse and intense. The mangrove forest and its land, like a forest ecosystem of the sea, has attracted attention for its resourcefulness and land conditions and has become the target of a wide range of human activities such as environmental destruction, economic activities, and urbanization symbolized by the creation of shrimp ponds. On the other hand, it has played a role in attenuating the tsunami force in the 2004 Indian Ocean Tsunami. The mangrove forest area has also focused on proposals for new concepts such as climate change adaptation and REDD+. It has become a new policy target for utilization, like forest disaster prevention and mitigation functions. From the standpoint of a mangrove forest, one might think, “Humans are very self-rationalizing creatures in the way they treat mangroves.”

For those of us who have been studying and researching mangrove ecosystems as a field science subject and who have spent much effort to obtain precise data in deep mud, the dramatic development of sensing technology is an opportunity that marks a new era. The accuracy of sensing, three-dimension digitization, low cost of tools, and open source are unexpected developments. This progress may lead to further development in two significant ways. First, the accuracy of observation of forests and trees will be enhanced in a revolutionary way. The ability of individuals to handle high-performance equipment at their discretion and to generate and process data will pave the way for the visualization, quantification, and shared understanding of "reality," something that many people have felt itchy to do in the past. Second, the acquisition of

digital high-precision data on forests, landforms, and trees, which are the backbone of ecosystems, will advance the "numerical analysis" related to the growth, decline, and destruction limits of forests and trees, as well as land, water, and sediments.

Our sense tells us that the time has come to "turn tacit knowledge into evidence-based knowledge." Sensing technology is a fundamental technology for observation and measurement. By making good use of it, we can apply it to, for example, "quantification of the composition of forests and sediments," "evaluation of changes in the location and distribution of forests," and "construction of the best matching scenario for green and grey infrastructure." In this way, we believe that we will bring convincing results in developing and applying disaster prevention and mitigation measures in the coastal zones.

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Toyohiko Miyagi was born in 1951. He graduated from the Faculty of Letters, Tohoku Gakuin University, in 1974 and received his doctorate degree from the Faculty of Science, Tohoku University, in 1980. He became an assistant professor in the Faculty of Letters at Tohoku Gakuin University in 1980. In 2005, he moved from a professor at Faculty of Letters to a professor in the Department of Regional Studies, Faculty of Liberal Arts, Tohoku Gakuin University, retiring in 2019.

On the Surveying day, June 3, 2017, the Geospatial Information Authority of Japan (GSI) presented him with a certificate of appreciation for his distinguished service. His major research interests include natural geography, landforms of hilly slopes, landslide landforms, and geo-ecology of mangrove forests. He has also been promoting natural geography and disaster prevention education using hazard maps and GIS in recent years.