A proposal for a method for evaluating the ecological benefits of green infrastructure as Eco-DRR using environmental DNA

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Eco-DRR is a promising option in Japan, where disasters are expected to become more frequent and intense, and the population is expected to decline. However, due to the lack of examples of implementation, the method to evaluate whether an infrastructure as Eco-DRR has a proper conservation effect on ecosystems, has not been established yet. Furthermore, for implementation, it is necessary to explore a clear indicator of the state of the ecosystem and biodiversity. In this presentation, we propose the use of environmental DNA (eDNA) to measure the biodiversity in various ecosystems, and to use the obtained information on eDNA as a proxy of biodiversity because eDNA has advantages in terms of citizen participation and continuous sampling. We conducted field-sampling to measure the biodiversity for various ecosystems in the coastal area of Miyagi Prefecture in Japan. We conducted field-sampling to measure the biodiversity for various ecosystems in the coastal area of Miyagi Prefecture in Japan. The study sites included sandy beach, mud flats, salt marsh and brackish water area. From each ecosystem, we sampled the environmental water and filtering at the lab. After the DNA extraction from each filter, we amplified invertebrate DNA targeting cytochrome oxidase 1 region in mitochondrial DNA and measure the amplicon diversity using the next generation sequencer. As a result, the targeted DNA from each ecosystem was successfully amplified. The different information obtained from eDNA, such as the richness of operational taxonomic units (OTUs) and amplicon sequence variants (ASVs) were comparable in their effect on differences in diversity. These results showed that eDNA is a powerful method for monitoring invertebrate biodiversity. Based on these results, we propose that ecological monitoring by eDNA should be integrated into higher-level policy planning and used to evaluate infrastructure.