Heliacal rising of Sirius and flooding of the Nile

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Among historians of astronomy it is widely believed that in Ancient Egypt the astronomial observations were carried out as early as the Early Kingdom (3120 to 2649 BC). This view is based on the interpretation of the text, dating from the I Dynasty, which is the only documental source of that time desribing the connection of the first morning visibility (heliacal sunrise) of Sirius (α Canis Major) with the flooding of the Nile River. Modern interpretations of this text are based on the loose interpretation of the original source, and often contradict each other. In fact it appears that the original text is formulated very vaguely, and it is nearly impossible to derive a reliable astronomical infromation from it. The time of observation before the 15th century BC does not match dates of any version. The results of dating should be considered unsatisfatory, as they are all based on the erroneous assumption that the summer solstice and the rising of Sirius coincides with the flooding of the Nile. Modern observations of the early 20th century and Pliny's data refute this point of view. According to historical evidence of ancient Greek authors and Egyptian texts of the the Greco-Roman era, the flooding of the Nile could be predited by heliacal rising of Sirius in the later times, i.e. at the beginning of the I millennium AD. This fact is confirmed by astronomical calculations.

Keywords: archeoastronomy, Ancient Egypt, heliacal rising of Sirius

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Ecosystem-based Disaster Risk Reduction in coastal area.

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Japanese country has been highly developed along the coastal line since the World War II. But both environmental, e.g. climate change, global warming, sea level rise, extreme events, etc., and social situation, e.g. population decrease, abandoned farmland, decrease of budget, etc., made it difficult to continue to maintain these Grey Infrastructure areas. This presentation introduces the resilience of coastal sand dune area as Green Infrastructure and makes discussion about the ecosystem-based disaster risk reduction in coastal area for the future land use plan with hall.

Keywords: coastal dune, ecosystem-based disaster risk reduction, resilience, green infrastructure

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Ecosystem service of coastal sand dune, the change of sake brewery environment with social situation

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Coastal sand dune is buffer zone between sea and land, fresh water layer is in the underground 10m before and after. Water of fresh water layer has used as domestic water of agricultural water and drinking water etc, and the function of coastal area plays a roll as ecosystem service (Kaneko et al. 2012, Kaneko et al. 2013). Chiba Prefecture, Japan, is bordered on three sides by the sea, and coastal sand dunes are distributed in a band shape. Although sake brewing recorded on the coast along Tokyo Bay in 1925, today, in several areas, sake breweries have completely disappeared. Although we considered that these breweries have received the benefits of ecosystem services of the coastal dune. There are no validation examples about these ecosystem services.
This research aims to clarify from landscape viewpoints and the potential environment (e.g., landscape, soil, deep degree and water quality of groundwater) whether ecosystem service of coastal sand dune was used by grasping the sake breweries environment of the period which was brewed in disappeared region and these disappeared factors. The records of sake breweries quoted.
Regarding the environment of the sake breweries that operated in the coastal area along Tokyo Bay in 1925, the breweries were often located within an altitude of 10 m and a distance of 1.0 km from the sea. The geographical features consisted of sand, sandbanks, natural levees. The surface geology consisted of sand-rich sediments, including sand 1(i.e., exceedingly soft). In the water environment, the depth of the groundwater was 3-10 m, and the hardness was middle hard water, hard water and strong hard water. I speculate that these sake breweries benefited from using the natural ingredients that formed in the coastal zone. I believe that sake brewing in these areas benefited from the proximity of the coast (i.e., ecosystem service).
Moreover, I clarified the following factors as for the extinction factors, Bankruptcies and reconstruction difficulties that followed the destructive 1923 Great Kanto Earthquake, Industrial adjustment in wartime during World War 2 (1939-1945), The changed availability of luxury goods (e.g., beer, wine, whiskey), Coastal industry development.

Keywords: Ecosystem Service, Coastal Sand Dune, Development, Disaster

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Desired Functions of Parks and Green Space in Reconstruction Plan from the Great East Japan Earthquake in Miyagi Prefecture

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1. Purpose and Background
In recent years, many natural disasters have been taking place across the world. In 2011, the Great East Japan Earthquake struck Japan, and many of these affected municipal governments developed reconstruction plans to direct their restorations. Town development has been progressing based upon these plans. In this article, Miyagi Prefecture, which was severely affected by the Great East Japan Earthquake, has been selected as a study subject. Desired functions of parks and green space in the reconstruction plan are identified, and their roles in town development which anticipates natural disasters are discussed.
2. Methods
Reconstruction plans of Miyagi Prefecture and its municipal governments including cities, towns, and villages, are collected and analyzed with the following methods.
(1)Clarify the situation of reconstruction plan development and each government's location and damage incurred.
(2)Extract descriptions of parks and green space in the reconstruction plans and identify their desired functions.
(3)Compare desired functions of parks and green space in the prefecture and those in local municipal governments, and those in coastal areas and those in inland.
3. Results
(1) Among the 35 municipalities in Miyagi Prefecture, 21 developed reconstruction plans. Fifteen of these 21 municipalities are located in the coastal area, and six in the inland. All municipalities in the coastal area had reconstruction plans developed. This is assumedly due to the Tsunami causing severe damage to the coastal municipalities. Miyagi Prefecture also prepared a reconstruction plan.
(2) Among the 22 reconstruction plans, 15 types of desired functions of parks and green space have been extracted. The five most frequently listed functions are as follows. "Disaster prevention", such as coastal forest and disaster prevention parks, appeared in 17 plans, which was the most frequently mentioned function. Next, functions around "natural environment", such as recovery of biodiversity, was mentioned in 13 plans. Functions as "urban infrastructure", such as reconstruction of parks as a public facility, was noted in 12 plans. Among the rest, "sports and recreation" appeared in 11, and "memorial and a symbol of reconstruction" and "landscape" in 10 plans.
(3) The largest number of functions described in one plan was 11, and the average was 5.8. In the coastal area, all municipalities mentioned "disaster prevention" and a majority "natural environment" and "memorial and a symbol of reconstruction". On the other hand, municipalities in the inland did not touch on these functions much, and "urban infrastructure" was often mentioned. The functions which Miyagi Prefecture specified were six including "disaster prevention". It has been observed that municipalities planned desired functions of parks and green space according to each of their situations, regardless of the functions that the prefecture demanded.
4. Considerations
In Miyagi Prefecture, the damage conditions were different between the coastal area and the inland; therefore, the number of reconstruction plans and the desired functions of parks and green space

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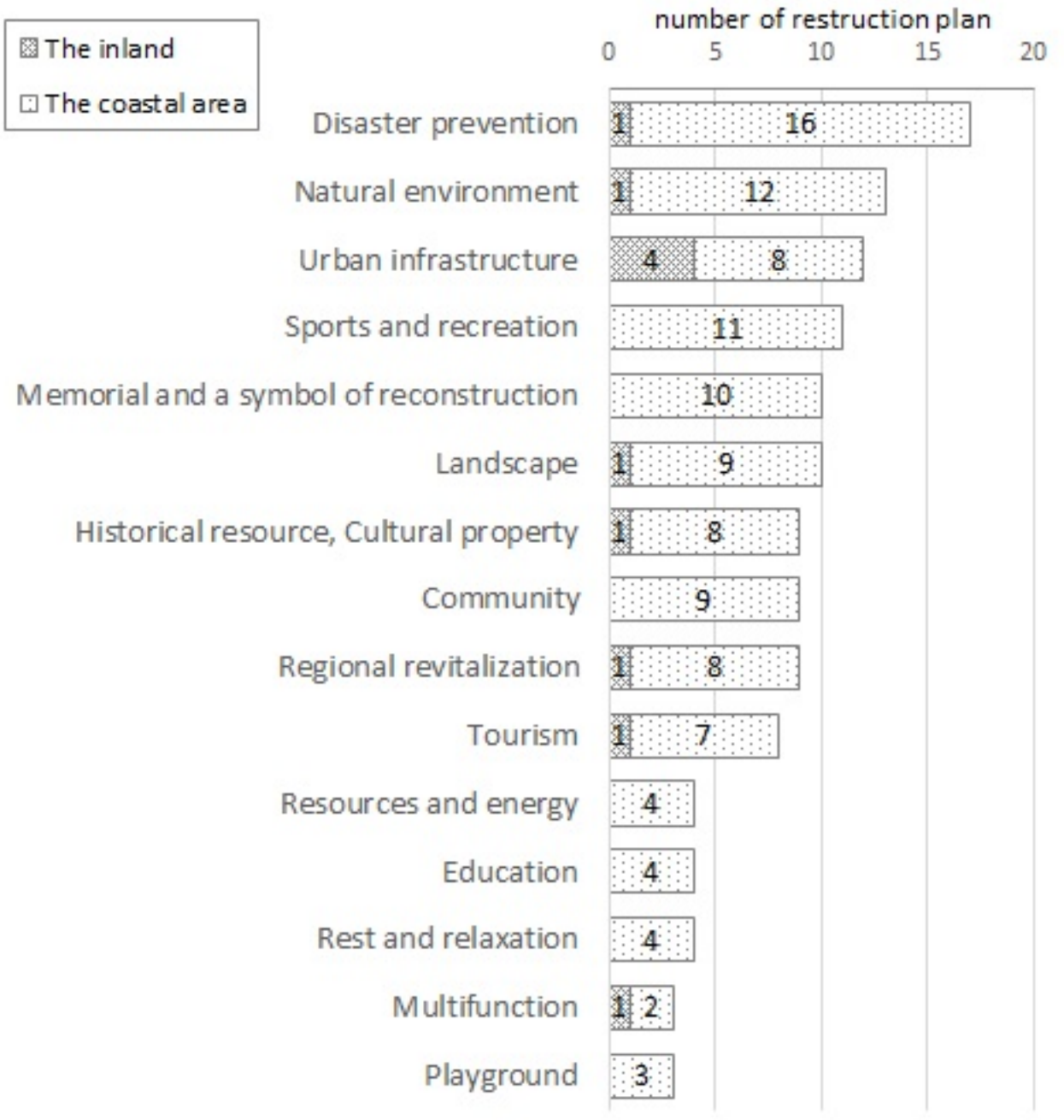
were different, depending on their locations. A tendency was detected that the diverse functions were desired with parks and green space in the coastal area which suffered from a severe damage. As discussed above, based on the reconstruction plans, parks and green space are expected to perform as a resource of town development with diverse functions, with disaster prevention being a main function. Upon furnishing parks and green space even with anticipation to manage natural disaster, it should be expected to create diverse contributions to town development without limiting their function to disaster prevention.

Keywords: The Great East Japan Earthquake, Reconstruction Plan, Parks and Green Space, Disaster Prevention, Miyagi Prefecture



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Probabilistic Tsunami Hazard Assessment along Nankai Trough (2) Inclusion of source areas that ERC(2013) DID NOT showed

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Last year, Hirata et al. (2015, SSJ) and Korenaga et al.(2015,SSJ) showed PTHA along the Nankai Trough, based only on 15 earthquake source areas (ESAs) that Earthquake Research Committee(2013) exemplified in their report about long-term evaluation of the Nankai earthquake. Here we set additional dozens of ESAs, with various sizes and geometries, other than the 15 ESAs that ERC(2013) exemplified to make PTHA for the Nankai earthquake comprehensively. In this talk, we will show the outline of the comprehensive PTHA along the Nanaki Trough.

First we briefly review the long-term evaluation of the Nankai earthquake by ERC(2013); the committee considered the next Nankai earthquake will possibly show various fault geometry and location along the trough. They evaluated the size of the next event would be expected M8 to M9, and the occurrence probability for the next 30 years (starting from 2013/01/01) would be 60% to 70%. They divided the whole Nankai Trough with its vicinity into 18 sub-regions (6 segments along the trough and 3 segments normal to the trough) and exemplified 15 ESAs as possible combinations of 18 sub-regions.

For the comprehensive PTHA, we newly set 70 ESAs in addition of the previous 15 ESAs so that total of 85 ESAs are considered. By producing tens of faults models, with various slip distribution patterns, from each ESA, we obtain 2500 fault models in addition of previous more than 1400 fault models so that total of more than 3900 fault models are considered (Toyama et al.,2015, JpGU). To make PTHA, the occurrence probability of the next Nankai earthquake has to be distributed to possible 3900 earthquakes. In other words, we have to set weights on possible 3900 earthquakes. In this study, we follow the following concept;

(I) In the additional 70 ESAs, there are 28 ESAs whose along-trough extents span 3 and more segments along the trough prescribed by ERC(2013). Any of along-trough extents that 28 ESAs span is equal to or included by those of the previous 15 ESAs exemplified by ERC(2013). So we regard these 28 ESAs as the same group as the previous 15 ESAs. We classify 28 ESAs into two sub-groups; (a) earthquakes with their ESAs whose along-trough extent completely coincide with any of those of 15 ESAs, and (b) earthquakes with an ESA whose along-trough extent DOES NOT coincide with any of those of 15 ESAs. For earthquakes (fault models) with 28 ESAs which consist of (a) and (b), we redistribute 15 weights for the previous 15 ESAs, introduced in “National Seismic Hazard Map for Japan(2014)” by ERC(2014), by the following tentative rules. For earthquakes in sub-group (a), we assume that earthquakes on the previous 15 ESAs likely occur than those newly added in this study so that we set tentatively weight balance, (any of 15 ESAs) : (newly added ESA) =1 : 0.5. Moreover, we assume that earthquakes in sub-group (a) likely occur than those in sub-group (b) so that we set tentatively weight balance, sub-group (a) : sub-group (b) =1 : 0.5.

(II) Out of the additional 70 ESAs, there are 42 ESAs whose along-trough extents span 1 segment or 2 segments along the trough prescribed by ERC(2013). Nankai earthquakes on such small ESAs have never been known historically so that “National Seismic Hazard Map for Japan(2014)” by ERC(2014) did not give weights for earthquakes on 42 ESAs. So we decide to handle small earthquakes on 42 ESAs as background earthquakes and introduce weight balance like a Gutenberg-Richter relation. Note

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that weight balances introduced above are nothing but tentative. If earthquake seismology progresses in the future, weight balance will likely be changed.
Construction of earthquake fault models with various pattern slip distribution and nonlinear tsunami calculation are the same as Toyama et al.(2015) and Hirata et al.(2015), respectively. In this talk, we will show probabilistic tsunami hazard curves at some coastal points and probabilistic coastal tsunami height map.

Keywords: probabilistic tsunami hazard assessment, tsunami, hazard, Nankai Trough

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