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

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

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

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

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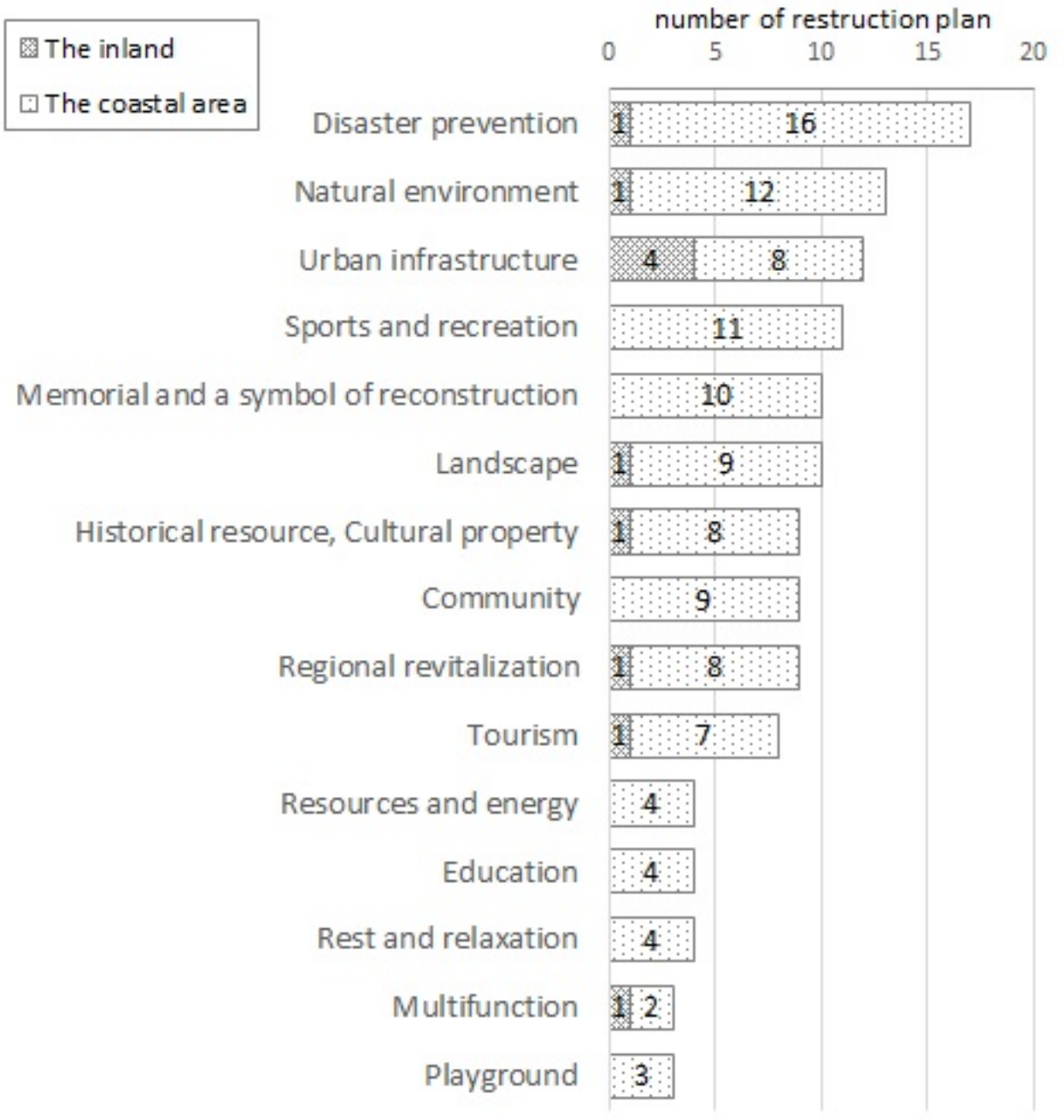
1. Purpose and Background
In recent years, many natural disasters have been taking place across the world. In 2011, the Great East Japan Earthquake struck Japan, and many of these affected municipal governments developed reconstruction plans to direct their restorations. Town development has been progressing 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

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



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

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

The relationship between the Nature and the Society: GIS "Disasters"

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The natural and social disasters generate a huge stress in the world community. Most researches searching for the relationships between different catastrophic events consider the limited sets of disasters and do not take into account their size. This fact puts to doubt the completeness and statistical significance of such approach. Thus the next indispensible step is to overpass from narrow subject framework researches of disasters to more complex researches.
In order to study the relationships between the Nature and the Society a database of natural disasters and dreadful social events occurred during the last XXXVI (36) centuries of human history weighted by the magnitude was created and became a core of the GIS «Disasters» (ArcGIS 10.0). By the moment the database includes more than 2500 most socially significant ("strong") catastrophic natural (earthquakes, fires, floods, droughts, climatic anomalies, other natural disasters) as well as social (wars, revolts, genocide, epidemics, fires caused by the human being, other social disasters) events. So far, each event is presented as a point feature located in the center of the struck region in the World Map. If the event affects several countries, it is placed in the approximate center of the affected area. Every event refers to the country or group of countries which are located in a zone of its influence now. The grade J (I, II and III) is specified for each event according to the disaster force assessment scale developed by the authors. The GIS with such a detailed database of disastrous events weighted by the magnitude over a long period of time is compiled for the first time and creates fairly complete and statistically representative basis for studies of the distribution of natural and social disasters and their relationship.
By the moment the statistical analysis of the database performed both for each aggregate (natural disasters and catastrophic social phenomena), and for particular statistically representative types of events led to the following conclusions: natural disasters and dreadful social events have appeared to be closely related to each other despite their apparently different nature. The numbers of events of different magnitude are distributed by logarithmic law: the bigger the event, the less likely it happens. For each type of events and each aggregate the existence of periodicities with periods of 280 ±60 years was established. The identified properties of cyclicity, grouping and interaction create a basis for modeling essentially unified Geosocial Process at a high enough statistical level and prove the existence of the uniform planetary Geosocial Process. The evidence of interaction between "lifeless" Nature and Society is fundamental and provided a new forecasting approach of demographic crises taking into account both natural disasters and social phenomena. The idea of the interaction of Nature and Society through the disasters «exchange» as a uniform planetary Geosocial Process is an essentially new statement introduced for the first time.

Keywords: geodynamics, society, magnitude of disaster, interaction of disasters, geosocial process

Modeling of Information Flow for Early Warning in Mount Merapi Area, Indonesia

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Indonesia's Mount Merapi is one of the world's most active, dangerous volcanoes. Its 2010 eruption -- the largest following the 20th century -- and succeeding 2011 lahar events killed 389 persons and injured and displaced many more. One way to mitigate a disaster's impact on its potential victims is to provide the public with reliable information through early warning. Warning information must reach down to the community levels. However, little research has been done on the contents of warning information flowing from the monitoring and forecasting institutions to the public. For Merapi's early warning, the routes of information from monitoring and forecasting agencies down to the citizens was studied by Rahardjo in 2007, yet the contents of information itself was not understood. This study reinvestigated Merapi's early warning information flow down to the citizens by conducting interviews among stakeholders to collect the data received and from which stakeholder, data sent and to which stakeholder, and the method of delivery. The sender-data-receiver as the basic unit of information transfer was introduced for the construction of information flow networks. In terms of information flow networks, it was necessary to construct individual networks for eruption and lahar per local government district due to the complexity of structures. Among the districts, inconsistencies in relation to past and current network structures for both disasters and in each district, roles of institutions, decision-making for issuance of evacuation order, and monitoring sources were found. Information transfer redundancies and vulnerabilities such as bottlenecks and decision-making issues were also revealed. These issues could offer a new point of view on early warning information delivery for Merapi's disasters.

Keywords: information, early warning, Merapi, eruption, lahar

The Great East Japan Earthquake's Impact to Human Society as Described in Haiku

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1. Introduction
The magnitude 9.0 earthquake occurred on March 11, 2011, had severe impact on human society by the destruction of huge mass of living areas and taking away many lives. The psychological effects resulting from this disaster are still ongoing. The destruction of coastal settlements in Kesennuma has lost not only people but also their psychological support by the community. Before the earthquake, people made their living with rich bounty of sea and nature, the earthquake and tsunami left a deep sorrow and ineffable pain (Aoki, Fujita and Kumagai 2014). Even one or two years after, many people are yet suffering with serious injuries. When cherry blossom bloomed on damage trees fired, when the fish were landed in reconstructed fish markets, when volunteers and victims deepened their ties, people found their hope and were continuing to move forward, although still irritated in slow progress of reconstruction in the disaster areas. A great deal of reconstruction has already begun, but it will take longer time to complete it (photo). The current bustle of the city is caused by the activities of the migrant construction workers and their vehicles. A large amount of capital has been invested, but no one knows how long this will continue. After this investment end, people should resume daily life with a focus on tourism and fisheries.
In order to record this impact of disaster, poets conducted a haiku meeting in Kesennuma Ocean on July 29, 2012 in the affected areas Kesennuma, and collected 1752 haiku from inland and abroad (Kesennuma Haiku Association 2012). And the July 28, 2013, they collected 1734 haiku. Many volunteers and donation promoted this haiku meeting (Kesennuma Haiku Association 2013). Here, we describe the impact left in the haiku.
2. Method of Study
Generally, understanding of haiku will be differed by the knowledge of the disaster and the taste of haiku selection. So, we employed two types of respondents, e.g. respondents of the disaster area and respondents of other areas. They read the haiku and counted the number of disaster haiku.
3. Results
In 2012, respondents of disaster area selected 635 haiku (Table 1) by more than one person. But 123 of these haiku were not selected by the respondents of other areas. On the other hand, other areas selected 600 haiku by more than one person, but 94 of those haiku were not selected by disaster area. So the selection of disaster haiku was different by the area. This showed the different knowledge among areas on the disaster. And there are many haiku selected by only one respondent (Table 2). This showed the difference among individual knowledge on the disaster. In 2013, the disaster area selected 370 haiku by more than one person, other areas selected 423. Since total numbers of haiku in two years has no big difference, the disaster haiku was reduced within a year. Selected haiku mostly showed the tragic events, but some showed pleasure of landing of bonito.
4. Statistical analysis
From 2012 to 2013, the percentage of haiku composed by the disaster was decreased at the statistical significance level of 0.01 in all respondents (Table 3). Haiku recognized as to be composed by the disaster was decreased in all level (Table 4).
5. Detailed comparison of appreciation among respondents
Generally, variety of the appreciation on haiku was formed by their experiences of disaster and their taste of haiku. Although some variety will exist, more than 10 persons selected the same haiku. In 2012, they selected 109 haiku and 28 in 2013. So we can say disaster haiku was found in

this experiment. Those haiku were listed in table 5 and 6.

Keywords: haiku, effect of disaster, emotional damage

Subsidence hazard assessment and mapping around underground space considering the angle of collapse

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As the human activities in underground area increased in order to enhance the land use, the number of ground subsidence occurrences are also escalating. It is observed not only domestically but also globally that the ascending trend in both pecuniary losses and casualties where the ground foundation is unstable. Analyzing and mapping the ground subsidence hazards in advance is one of the most essential process. GIS (Geographical Information System) is powerful tool for quantitative estimation and display of ground subsidence hazards on regional sites. In recent studies, it is popular that conducting statistic approaches on hazard assessments using GIS. The objective of this research is to design the analysis model to assess subsidence hazard adopting the triggering factors within the radius of influence. The radius of influence can be calculated with the spatial analysis algorithm, which is mainly concerned with the angle of collapse, and allocated to each underground cavity. Ground subsidence inventory obtained by Korea Expressway Corporation and Mine Reclamation Corporation are applied to training stage of frequency ratio analysis, which identifies the degree of each triggering factor. The whole analysis stages are designed as a spatial analysis module to automate the whole process. As a result, the ground subsidence hazard map is composed to display the risk level of target site. It is supposed that this analysis can help in decision-making stage for the reinforcement and urban planning.

Keywords: Ground subsidence, Hazard assessment, Hazard mapping, GIS

Microclimatic characteristics of three different urban districts in a context of more frequent and intense heatwaves

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Located in the south-eastern part of France, the territory of the Greater Lyon consists in 59 communes covering an area of 524 square kilometres and housing a population of about 1.3 million. First signs of climate change have taking the form of a rise in average annual and seasonal temperatures and the number of very hot days, indicating that heatwaves can be considered as the main hazard to deal with. If the Greater Lyon has been fully involved for ten years in the national effort for a local reduction of greenhouse gases, the local adaptation policy is still being developed. It is up against several scientific obstacles in particular local climate measurement. To address this issue, this study proposes the first results of a multidisciplinary research at the crossroads between engineering sciences and humanities. It is now well known that characterising heat-related risk needs to identify the spatial components of the urban heat island phenomenon, which may amplify the impacts of coming heatwaves on citizens and urban systems (Romero-Lankao et al., 2012). A first mesoscale approach is currently led covering the whole Greater Lyon using remote-sensing and computer modelling but it does not allow to ensure an in-depth knowledge of the local microclimates.

As a first step to solve this problem, a map of human vulnerabilities has been displayed as an early result from a vulnerability index (Renard et al., 2015). This allowed identifying the most vulnerable urban districts of the Greater Lyon, which generally correspond to high density residential areas with rather different urban morphologies. Three different districts with high vulnerability values have been retained : “Lyon-Terreaux”, in the historic old city ; “Lyon-Perrache”, an ancient suburb in full renovation and “Rillieux-Semailles” in the residential suburbs.

A characterization of the related microclimate is completing this approach to evaluate the corresponding exposure in these three districts. Microclimatic simulations are currently performed using “SOLENE-microclimat” model, developed by the CRENAU Laboratory from the Nantes School of Architecture (Musy et al., 2015). This model has been chosen because of its capacity to take into account radiative transfers, conduction and storage in walls and soils, airflow and convective exchanges, evapotranspiration from natural surfaces (vegetation, water ponds, humidification systems) and the energy balance. A recent enhancement allows now its coupling with Code-Saturne Computer Fluid Dynamics (CFD) for a more accurate characterisation of local microclimates in terms of surface temperature, air temperature and velocity.

First results and analysis highlight some urban properties that significantly influence the local microclimatic conditions and human comfort, and which are especially challenging for urban planning, in a context of more frequent and intense heatwaves. Effects of urban morphology are especially stressed, while this factor may also be related to social and economic trends.

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Keywords: microclimatic, urban district, urban heat island, heat waves

