A "Resilient Urban Development Decision Support Environment (RUD-DSE)" for Istanbul

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1   INTRODUCTION & SCOPE OF WORK

The United Nations estimates that cities will be hosting almost 70% of the entire population on earth in the next decade (*UN, 2018*). Under the pressure of urban development and increasing impact of natural hazards and climate change, disaster risk reduction is one of the top priorities in the agenda of decision makers, private sector and communities. Disaster risk reduction relies on different types of interventions and actions to be carried out holistically and in coordination between various stakeholders and disciplines (*UN, 2015*). Among these activities, disaster risk communication plays an important role that aims at efficient transfer of scientific knowledge to stakeholders.

In this paper, we aim to highlight the main components and the background of the Resilient Urban Development Decision Support Environment (RUD-DSE) for Istanbul. RUD-DSE aims to meet the needs of stakeholders in accessing disaster risk information for generating portrayals of the consequences of multi-hazard scenarios on different development options, allowing the interrogation of multiple outputs and outcomes to support interactive decision flow.

RUD-DSE is under development as a part of the "Tomorrow's Cities" project that is supported by UKRI under the Global Challenges Research Fund. The Tomorrow's Cities project aims at fostering resilient urban development based on scientific risk analysis scenarios, participatory decision making and co-produced urbanization scenarios (URL-1). In the context of Istanbul, RUD-DSE will include both virtual and physical spaces to provide necessary information to increase the level of disaster risk communication among stakeholders. RUD-DSE's virtual space will be built on a web platform using a strong data and GIS background as well as creative content to enable users to grasp the notion of "risk" in the most correct way while physical space will let related stakeholders from academia, decision makers and communities engage and co-produce possible urbanization scenarios. The physical domain on the other hand, will act as a space where different stakeholders can gather and discuss decisions on urbanization scenarios and can access to risk information in an exhibition like environment that is aimed to attract their attention on disaster risk reduction.

Based on the stakeholder feedbacks prior to development of RUD-DSE, a multi-disciplinary, versatile and interactive concept is aimed for, which enables various types of stakeholders from different sectors to access, evaluate, input and benefit from miscellaneous sources of risk components (Çaktı et.al, 2020).

2 STAKEHOLDER CONSULTATION

RUD-DSE's hypothetical basis addresses the lack of access to relevant disaster risk information, and this is assumed as the main barrier that hinders disaster risk reduction in Istanbul context. This hypothesis is mainly constructed on the basis of the expertise and experiences of the research team in Istanbul. Nevertheless, in order to develop a holistic platform that covers the needs of various parties; we conducted several stakeholder meetings to interpret their perspectives, perceptions and needs regarding risk information.

Meetings were conducted with different stakeholder groups such as researchers, urban planners, communication experts and media representatives. The main output from these workshops has been that each group is somewhat interested with disaster risk information but all of them have different versions of difficulties in accessing the information.

Researchers who are the main group that are responsible for producing risk information, are finding it hard to access other researchers' findings due to lack of sharing among peers. They also complain about the media's attitude towards them, which simplifies disaster risk information as a rating booster instead of a tool to build awareness against hazards. The attendees consisted of academics from different disciplines such as structural, earthquake, tsunami, meteorology and engineering disciplines.

Urban planners as the practitioners who rely heavily on disaster risk information in planning the urban layouts are mostly finding it hard to combine different type of datasets that are provided from different sources such as geological, geophysical, hydrological, meteorological data and information regarding infrastructure and buildings. They also state the difficulties in accessing to standardized and reliable data that may be misleading or confusing for them to incorporate such critical information in urban plans. One of the key challenges of the urban planners is to evaluate how plan scenarios can impact disaster risk in the planning area. Thereof they mostly do not know how their decisions on spatial domain can change the risk. The workshop group consisted of planners from metropolitan municipality, chamber of planning and local representatives of central government.

The communication experts that attended our meeting were selected from academic and professional background in the field of communication. While two of these were academics, one was from the public relations sector and one was a radio broadcaster. Their main focus was on the availability of correct/reliable information that is the first necessity for an efficient communication process. They emphasize that lack of tools that provide risk information in an effective concept, leads to disinformation.

Media representatives consisted of practitioners in the visual and press media who were actively involved in news making process. Like the rest of our stakeholders, they also state the lack of resources that they can trust in case of disaster risk information. They are heavily concerned with the inaccessibility of the academics that are trustworthy by scientific means. They indicate the heavy burden in news making process in which ratings and clicks are the main concern instead of dissemination of the correct information to public.

In general, as summarized above; all groups that are relevant to disaster risk information complain basically about the lack of tools that enable the access to disaster risk and tools that address how to interpret such information. We believe that our hypothesis was mostly validated after the series of workshops which showed that there is a certain lack of access to risk information in Istanbul and even if they reach out to information; it is not clear how it should be interpreted.

3 DEVELOPMENT OF THE RUD-DSE PLATFORM

Based on the background explained above, the main aim of RUD-DSE is to provide an interactive environment for users to reach risk data/information/knowledge in the most efficient way. Therefore, RUD-DSE's digital portion will host various types of data formats such as written reports, visual materials and interactive tools. To enable that, RUD-DSE is designed based on three functional layers as acquisition, analysis and communication that will be feeding themselves and create an evolving process through time. As such RUD-DSE is envisaged as a living and dynamic ecosystem where inputs and outputs will be updated based on user activity and feedbacks.

In this regard, four cross-cutting actions will be applied in the context development process. First, each material that is provided as input will be described in detail and metadata files will be stored. Secondly, the quality of the materials will be monitored. Materials that lack quality by means of context, design or concept will be filtered by the system admins who will be from the research team. Thirdly, the whole system will be backed-up and secured in another infrastructure so that no data or information is lost. Lastly, the context of RUD-DSE should be updated and renewed based on the learned lessons and feedback from the users. The concept diagram and matrix of the RUD-DSE is given in Figure-1.
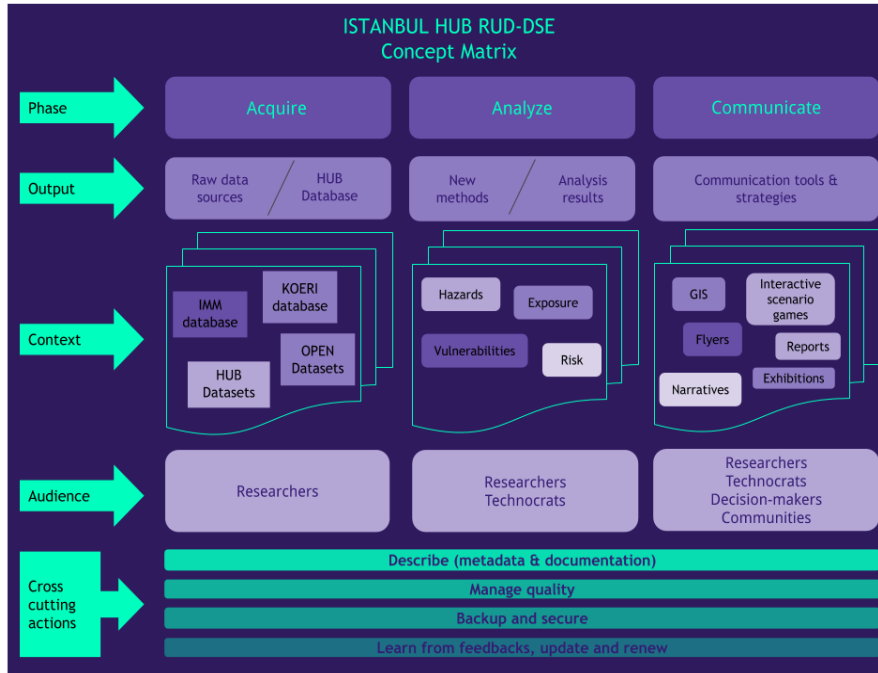

Figure 1: RUD-DSE Concept Matrix

The first tier of the RUD-DSE is "acquisition" where core datasets will be acquired and gathered in databases. Main outputs of this tier are predicted to be raw data sources that are obtained to be used in research activities within risk research. In line with this, a web-based database will be developed for efficient access of data in an organized manner. These datasets will be based on different sources such as Istanbul Metropolitan Municipality (IMM), Kandilli Observatory and Earthquake Research Institute (KOERI), Tomorrow's Cities Project partners and open sources such as land cover and land use datasets like Corine Land Cover and Urban Atlas (accessible through Copernicus Portal), population/education/demographic data (accessible through Turkish Statistical Institute), economic data (accessible through World Bank data repositories). In this tier, the target audience is the researchers who will be using these datasets for their research and analysis purposes. Currently, acquired datasets cover the metropolitan area of Istanbul and pilot study areas.

In the second tier of RUD-DSE, analysis results gathered from researchers will be presented. These results will not only include analysis outputs; but also new methods that are developed by researchers in the project. The expected outputs will be new hazard models, vulnerability maps, exposure patterns and risk information in web-based GIS format. Since these outputs will be the basis for the decision-making process; along with researchers, technocrats and practitioners are target audiences for the analysis results as they stand at critical points as facilitators between researchers and decision makers. GIS background of the core data and analysis sections will allow users to conduct spatial analyses and to create urbanization scenarios.

In the third tier of RUD-DSE, dissemination and communication tools will be provided in virtual and physical environments. Since RUD-DSE's main components will take place on a web platform, various types of media will be used there such as interviews, videos, infographics, narratives, GIS interface, informative brochures and flyers. Context of these tools are being developed as below:

Interviews: Interviews will include experts' view on a subject related with disaster risk reduction and specifically on how research must be understood by relevant stakeholders and especially society.

Multimedia: Multimedia section will include both animations and VR type media. In RUD-DSE, a VR environment will be established including an earthquake scenario inside an apartment flat to test and monitor

the actions of users during a seismic shaking. In the scenario, the aim is not to scare or frighten the users although a certain amount of stress is desired so that their cognitive awareness about the risk can be triggered.

Library: In addition to interactive tools and outputs, RUD-DSE will include scientific reports, working papers and articles related with our research. Thereof, the library will act as a repository for relevant literature in which stakeholders can find studies and findings regarding disaster risk.

Infographics: Infographics are informative and visually comprehensible ways of presenting statistics, information, data and analysis results. By using such infographics about the findings of the research outputs and findings; it is aimed at providing critical and relevant aspects of the HUB research with an articulable fashion.

Narratives: Narratives in RUD-DSE will include stories and experiences from different parts of the community such as public sector, private sector, academia, NGOs and individuals. These narratives will highlight what people from different backgrounds have lived against disaster risks. These narratives are also important to incorporate citizen science perspective to HUB research.

The physical space of RUD-DSE, is yet to be developed, and will act as a focus for interaction between academia, communities, decision makers and private sector representatives. It provides an environment where different stakeholders from different disciplines and sectors can gather, discuss and present their studies and ideas. The physical space is predicted to be a lively place including exhibitions, panels, workshops, art shows and similar events that will increase the interactivity between stakeholders in disaster risk reduction.

3   RESEARCH OUTCOMES

As a multi-hazard prone city, based on our various conversations with DRR stakeholders; it is envisaged that for Istanbul context, one of the most common problems in Istanbul is the access to risk information in an efficient way. Different type of stakeholders from different institutions including local governments, academia, media or NGOs complain about reaching valid and trustworthy information regarding disaster risk. The main outcome of RUD-DSE will be to cover this gap that is evaluated by us as a critical barrier in reducing disaster risk in Istanbul. It is also planned that datasets and information from other cities in Tomorrow's Cities project (Kathmandu, Quito, Nairobi) can also be included in the system so that RUD-DSE can act as a cross-city platform.

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