Flood hazards and impacts in Turkey – an overview

Gamze Koç | Annegret Thieken

University of Potsdam, Institute of Earth and Environmental Science - Geography and Natural Risks Research

MOTIVATION

Turkey has been severely affected by many natural hazards, in particular earthquakes and floods. Especially over the last two decades, these natural hazards have caused enormous human and economic damages. Although there is a large body of literature on earthquake hazards and risks in Turkey, comparatively little is known about flood hazards and risks.

In order to reduce adverse effects of natural hazards, risk reduction measures and risk management strategies have to be implemented. As a first step, the comprehension of spatial patterns and intensities of natural hazards is important. Therefore, this study aims to compare the severity of flooding to other natural hazards in Turkey and to investigate flood patterns by providing an overview of spatial distribution of flood losses as a metric for the societal and economic impacts of flood hazards in Turkey.

DATA & METHODS

To give an overview of spatial distribution of flood hazards and losses throughout Turkey, different disaster loss databases were searched, processed and analysed in order to enable a consistent comparison of disaster losses in Turkey. For this purpose, EM-DAT (Emergency Events Database) and TABB (Turkey Disaster Data Base) were used*.

To compare these two databases, the events of the two databases were reclassified by using the peril classification proposed by a workgroup within the Integrated Research on Disaster Risk. A main disaster type, a sub-disaster type and sub-sub disaster type was attributed to each event (Fig.1). For the analyses, the period from 1960 to 2014 was selected to consider a minimum time frame of 50 years.
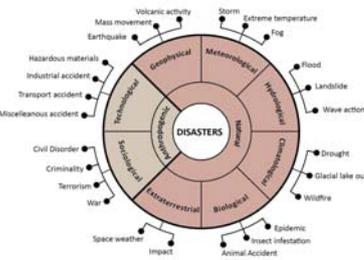

Figure 1: Disaster classification system

RESULTS

Overview of EM-DAT and TABB

Turkey has suffered several flood events in recent fifty years. TABB database reported 1076 flood events which caused 795 fatalities and around US$ 800 million economic loss (according to current price calculations) between 1960 and 2014. In contradistinction to TABB, EM-DAT reported 35 flood events which caused 773 fatalities and around US$ 2.2 billion economic loss.
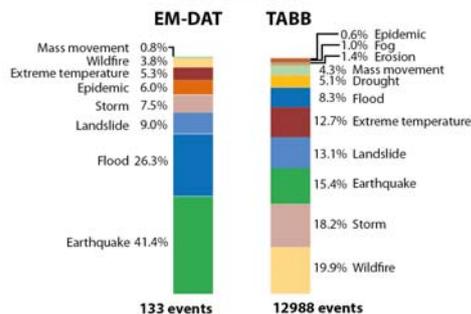

Figure 2: Overview of Natural Hazards in Turkey (1960–2014)

Societal and Economic Impacts of Flood Hazards (TABB, 1960–2014)

In risk assessment studies for natural hazards, risk is defined as a function of natural hazards, vulnerability and the quantification of the elements at risk (e.g. population, property, public utilities, industry, infrastructure, etc.). The TABB database was mainly analysed in terms of human loss and economic loss in order to identify the interactions between flood hazards and people/goods which is important in determining hazard-prone regions. The TABB results show that floods have more destructive effects in the Black Sea, Mediterranean and Eastern Anatolian regions in terms of fatalities and frequency in particular (Fig. 3). Considering economic losses as well, the Aegean region could be added to the list of flood-prone regions.

	% Number of Events	% Economic Loss	% Fatalities
Aegean	10.7	12.1	8.3
Black Sea	22.2	28.2	33.2
Central Anatolia	11.5	1.8	11.6
Eastern Anatolia	21.2	5.4	17.3
Marmara	11.0	9.7	4.9
Mediterranean	16.6	42.1	14.7
South-eastern Anatolia	6.8	0.7	10.0

Figure 3: Percentage of frequencies and impacts of floods in geographic regions of Turkey

When human losses analysed due to floods in Turkey is allied to population density, it might be put an interpretation on relation between human loss and population density (Fig. 4). It is possible to see that there is not a directly proportional relation between fatalities and population density (Fig. 5). Similarly, when economic losses were analysed by considering industrial regions, it is possible to see that although Eastern Black Sea region and East part of Turkey have poorly or minor industrialized areas, economic losses are high (Fig. 6). This case connotes the possibility of other factors (e.g. geologic-topographic factors, inadvisable urban land use, etc.) for economic losses caused by floods.
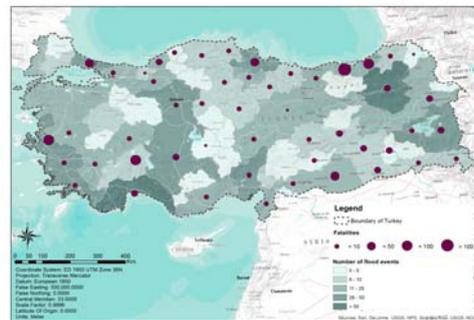

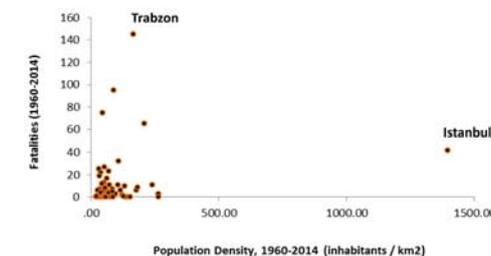*Figure 4: Fatalities due to flood hazards in Turkey (TABB, 1960–2014)*

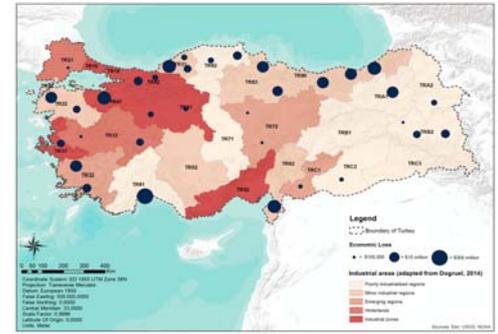*Figure 5: Correlation of human loss due to floods and population density (1960–2014)*

Figure 6: Economic losses caused by floods in Turkey (TABB, 1960–2014)

TABB database analysis that linked fatalities to population density and industrialised areas to economic losses shows that such over-simplified relations are insufficient to explain the impacts of floods. Therefore, further analyses are needed to go into more detail. As a starting point, a list of the most severe events was created and mapped to supply a useful database for historical severe flood events in Turkey (Fig. 7). To better understand the flood regime and pattern, the analysis of catastrophic flood events is a next step. These events will be used for further studies about the flood triggering processes and risk drivers.
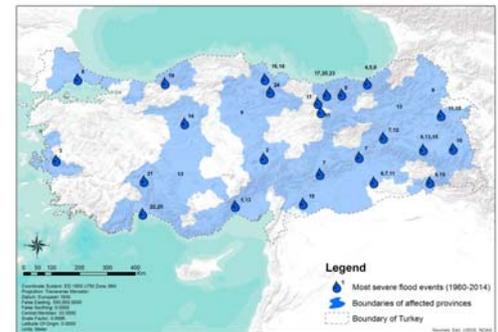

Figure 7: Most severe flood hazards in Turkey (1960–2014)

CONCLUSION

Loss data collection is gaining more and more attention, e.g. in the Sendai Framework for Disaster Risk Reduction 2015–2030 (SFDRR) and the loss and damage programme of the UNFCCC (United Nations Framework Convention on Climate Change). The case study demonstrates that big differences with regard to the number and spatio-temporal pattern of disaster losses in different databases. Therefore, documentation procedures, thresholds and data processing must be made transparent in order to assess the comprehensiveness and quality of the collected data. Correspondingly, the study could offer a base-work for developing guidelines and procedures on how to standardize loss databases and implement across the other hazard events to monitor progress of (flood) risk mitigation and adaptation in Turkey.

REFERENCES:
IRDR (2014), IRDR Peril Classification and Hazard Glossary. Report of the Data Group in the Integrated Research on Disaster Risk. (Available at: http://www.irdrinternational.org/2014/03/28/irdr-peril-classification-and-hazard-glossary).

UNISDR (2015), Sendai Framework for Disaster Risk Reduction 2015-2030. (Available at: http://www.preventionweb.net/-files/43291_sendaiframeworkfordrren.pdf).

UNDRO - Office of the United Nations Disaster Relief Co-ordinator: Natural Disasters and Vulnerability Analysis, Report of expert group meeting (09-12 July 1979) (available at: www.unisdr.org/files/resolutions/NL800388.pdf), Geneva, 1979.