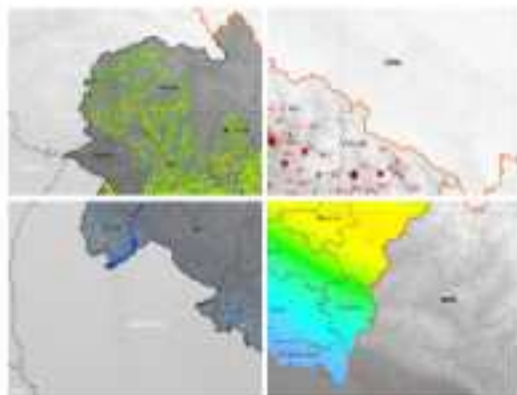




In Collaboration with the Earth Disaster Policy Research

Uttarakhand Disaster Recovery Project Disaster Risk Assessment of Uttarakhand



State Level Assessment

Volume 3A

Project Implementation Unit TA & CEDRM

January 2018



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Uttarakhand Disaster Recovery Project

Disaster Risk Assessment of Uttarakhand

State Level Assessment

Prepared for: Project Implementation Unit, TA & COORD

Represented by: Dr. Gauri Joshi

This report has been prepared under the DRI Business Management System
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Uttarakhand State Disaster Risk Assessment Report

CONTENTS

01	General Socioeconomic Profile	1
01.1	Population	4
01.2	Residential buildings	6
01.3	Critical buildings	7
01.4	Transportation infrastructure	8
01.5	Power infrastructure	9
01.6	Economic activity	10
02	Multi-hazard Loss Profile	19
03	Earthquakes	29
Hazard Profile		30
03.1	Peak ground acceleration (PGA)	30
03.2	Seismic hazard map: 10 year return period	30
03.3	Seismic hazard map: 100 year return period	30
03.4	Seismic hazard map: 475 year return period	30
03.5	Seismic hazard map: 1000 year return period	30
Exposure Profile		30
03.6	Population exposure to earthquakes	30
03.7	Residential building exposure to earthquakes	30
03.8	Critical building exposure to earthquakes	30
03.9	Transportation infrastructure exposure to earthquakes	30
03.10	Power infrastructure exposure to earthquakes	30
03.11	Economic activity exposure to earthquakes	30
Loss Profile		40
03.12	Population losses due to earthquakes	40
03.13	Residential building losses due to earthquakes	40
03.14	Critical building losses due to earthquakes	40
03.15	Transportation infrastructure losses due to earthquakes	40
03.16	Power infrastructure losses due to earthquakes	40
03.17	Economic activity losses due to earthquakes	40
04	Floods	56
Hazard Profile		56
04.1	Flood hazard modeling (riverine flood)	56
04.2	Flood hazard map (riverine flood): 100 year return period	56
04.3	Flood hazard map (pluvial)	56
Exposure Profile (Riverine and Pluvial Floods)		70
04.4	Population exposure to floods	70
04.5	Residential building exposure to floods	70
04.6	Critical building exposure to floods	70
04.7	Transportation infrastructure exposure to floods	70
04.8	Power infrastructure exposure to floods	70
04.9	Economic activity exposure to floods	70
Loss Profile (Riverine and Pluvial Floods Only)		80
04.10	Population losses due to floods	80
04.11	Residential building losses due to floods	80
04.12	Critical building losses due to floods	80
04.13	Transportation infrastructure losses due to floods	80
04.14	Power infrastructure losses due to floods	80
04.15	Economic activity losses due to floods	80

2.6	Land Use	122
Health Profile		123
3.1.1	Land Use	123
Key Data Profile		124
3.2	Population exposure to diseases	125
3.3	Residence building exposure to diseases	127
3.4	Ordnance building exposure to diseases	128
3.5	Transportation infrastructure exposure to diseases	129
3.6	Power infrastructure exposure to diseases	130
3.7	Other infrastructure exposure to diseases	131

2.1 Baseline Exposure Profile



This section will summarise the state of Uttar Pradesh as a whole, in terms of the baseline social, human and economic which must ultimately be exposed to the hazards under consideration. Uttar Pradesh location is shown in the inset map to the right, relative to India's other states and international neighbours.

To illustrate the spatial distribution of this baseline exposure, a series of maps are presented in the following sections, grouping exposure into five portfolios: population (Volume 3.1.1), residential buildings (Volume 3.1.2), critical buildings (Volume 3.1.3), transportation infrastructure (Volume 3.1.4), power infrastructure (Volume 3.1.5), and various services sector (Volume 3.1.6).



As an initial summary, the figure below summarises selected demographic indicators of the state of Uttar Pradesh. All figures are derived from the 2011 Census, using 2017 projections for the population and number of households are based on the observed growth rates between the 2001 and 2011 Censuses.

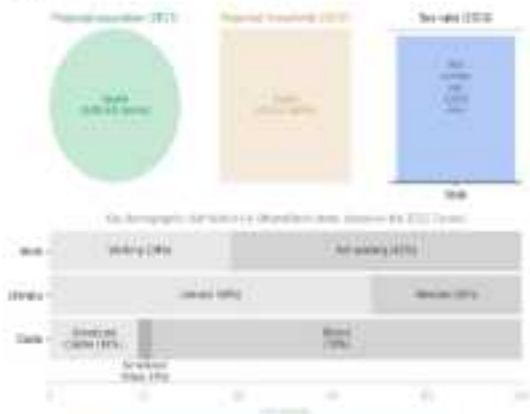


Figure 2.1.1. Selected demographic indicators extracted from the 2011 Census for Uttar Pradesh.

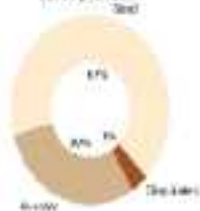
On the following page, a section of household statistics from the 2011 Census are included for the state in Figure 3.2, providing insight into the condition and use of its buildings, the most common housing materials for walls, and the gender distribution of the population.

Summary of findings for urban households

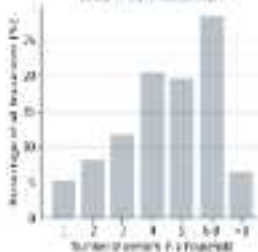
Population distribution



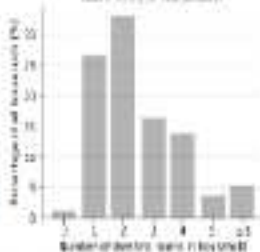
Building condition



How many rooms are there in all the houses?



How many bathrooms are there in all the houses?



What material is used for walls?

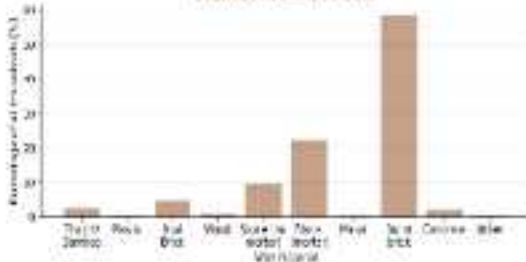


Figure 2.1: Building features and characteristics from the 2017 Census for Urbanites

















Figure 1. Map of the study area showing the location of the study area within the state of Georgia.



Indonesian Government's Policy
on Corruption





1.2 Risk-based Assessment – Earthquakes & Fluvial Floods

Loss Profile

This section provides a summary of the average annual economic losses and the potential fatalities resulting from the probabilistic assessment of Earthquake and Fluvial Flood risk. Following this summary, the economic and losses are presented in greater detail for each hazard.

Figure 3.14 shows the breakdown of the combined Economic AAL, in terms of the hazard type (inner ring) and portfolio (outer ring). It is clear that at the State level, losses due to earthquakes are far more significant than those due to fluvial floods, over the long term.

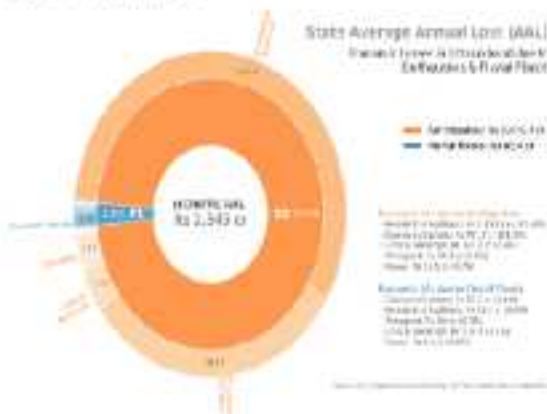


Figure 3.14 Breakdown of total average annual loss by hazard and portfolio

Figure 3.15 presents a ranking of all Districts and Divisions within the State, in terms of their total Average Annual Loss (AAL), including losses due to both earthquakes and fluvial floods.

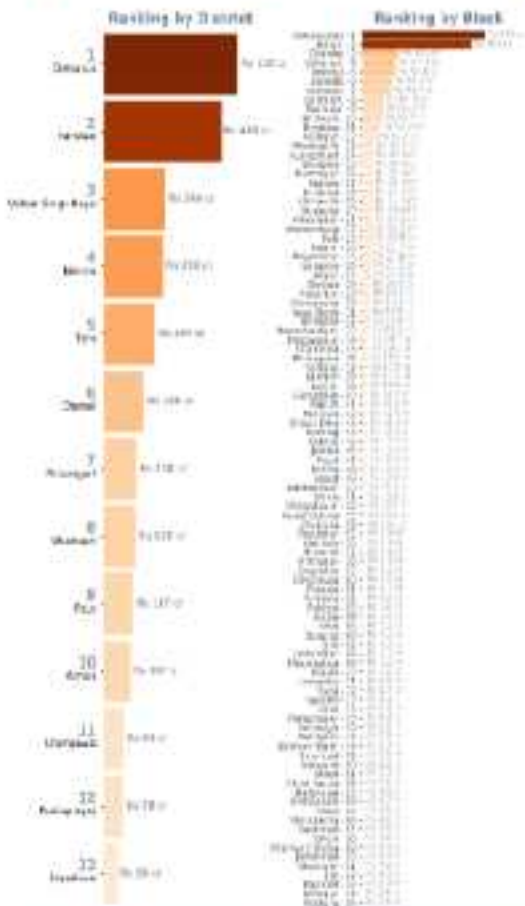


Figure 2.10: Ranking of all Districts and Blocks by value. Based on data collection through WorldPop (Download)

Figure 1. Map of the study area showing the location of the study area in the north of Iran. The map shows the location of the study area in the north of Iran, with the study area highlighted in red.



Figure 1. Map of the study area showing the location of the study area in the north of Iran. The map shows the location of the study area in the north of Iran, with the study area highlighted in red.

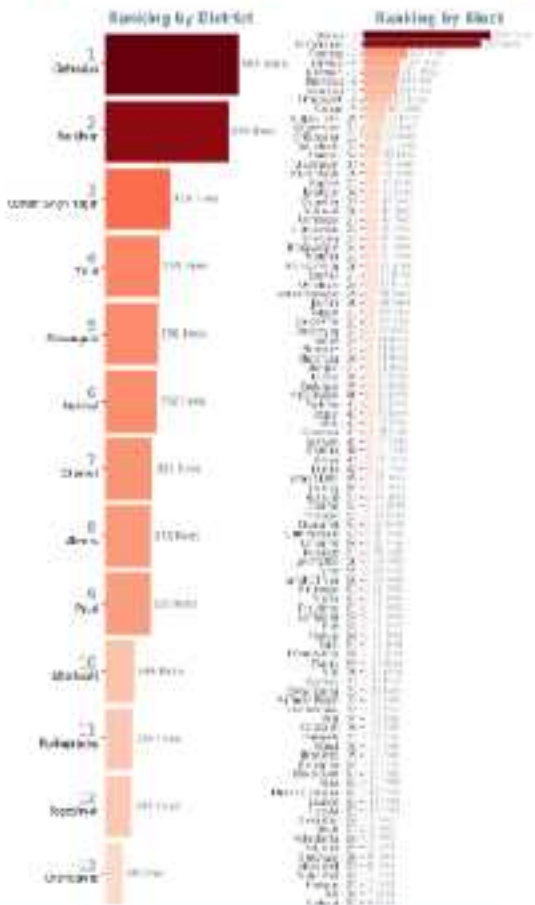


Figure 3.13: Ranking of all districts and blocks by value. Source: author's own calculations based on data provided.

Figure 1: Map of the study area showing the distribution of the study species. The map displays the geographical area covered by the study, with the distribution of the study species indicated by red shading. The map includes a scale bar and a north arrow.



3.2 Earthquake

Hazard Profile

Seismicity along the Red Sea, etc. is a consequence of the ongoing continental-continental collision between the African and Eurasian plates, with the result of widespread widespread earthquakes and rupture the Red Sea Fault zone.

At the time of writing, 50 historical earthquakes with epicentres within the state boundaries had so far been reported. Table 3.1 summarises the largest and the most recent of these, while the map in Figure 3.3.1 presents all historical earthquake events which have been reported in the state of Sudan since.

Table 3.1 Summary of the largest and most recent earthquake events reported in the state

Historical earthquake event	Date	Magnitude
Largest earthquake recorded	1994	5.5
Most recent earthquake recorded	26/12/2017	5.1

Based on the probabilistic seismic hazard assessment carried out for Ethiopia and Sudan in 1, Chapter 2 for a full description of the methodology, maps of the predicted seismic intensity (in terms of Peak Ground Acceleration) have been generated for the whole state, for nine different return periods. The ranges of PGA values estimated for all of these return periods are summarised in Figure 3.2b, whilst the following sections (Sections 3.3.2 - 3.3.5) present the maps for four of the return periods (10, 100, 475 and 1,000 years).

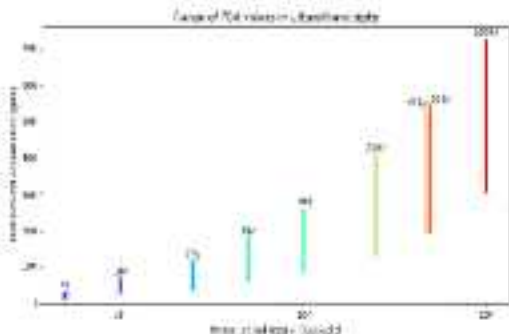


Figure 3.2b: Ranges of seismic Peak ground acceleration (PGA) values for different periods

For each aspect and each block in the data, the historic PGA values for the 475 year return periods were always stacked using tables. These are presented in Figure 3.2h (following page) with the distribution on the left and block on the right.

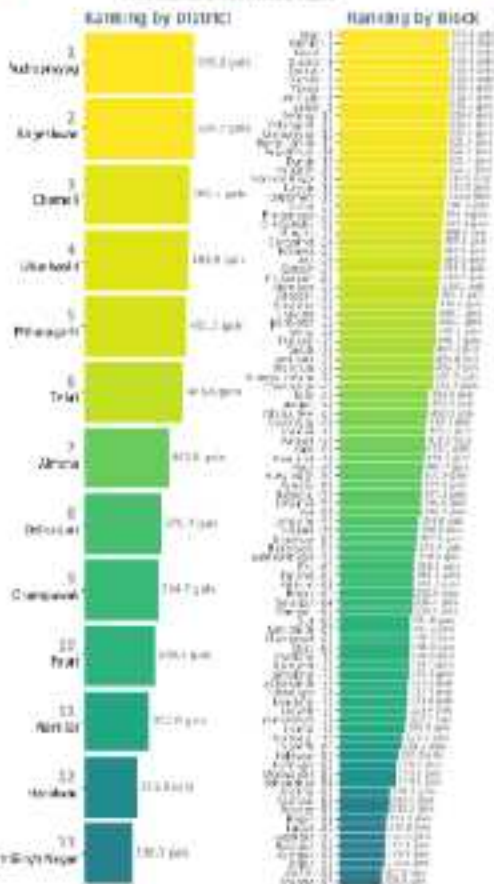


Figure 2.11: Ranking of districts and blocks for climate adaptation and food loss reduction strategies (by district and block)

These PSA values were also converted into intensity classes in the Modified Merriam Intensity scale, based on the equation $\text{deviation} \times 0.4 + \text{mean} + 0.4$ at 1982 for the region. The distribution of these intensity classes across the state is presented in Figure 3.22 for all return periods investigated, on the basis of eight classes ranging from 'very low' to 'extreme intensities'. For example, the DRI shows that for the 1 year return period, approximately 34% of the state is in the 'low' class, with the remaining 34% in the 'moderate intensity' class.

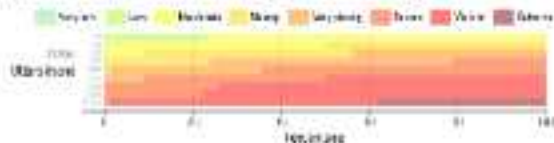


Figure 3.22: Intensity class distribution in the state of Mtwara







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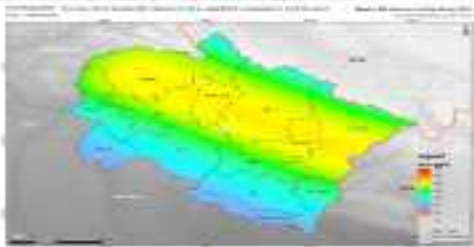
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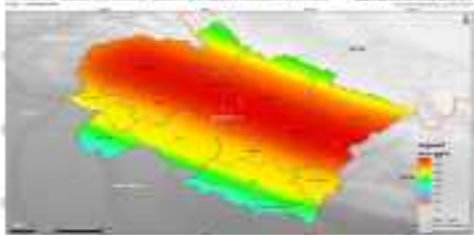


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Figure 1: A map showing the spatial distribution of [illegible] across a region. The map is color-coded, with a legend on the right side indicating values ranging from 0 to 100. The highest values (red/orange) are concentrated in the central and eastern parts of the region, while lower values (green/blue) are found in the western and southern parts.

Figure 2: A map showing the spatial distribution of [illegible] across a region. The map is color-coded, with a legend on the right side indicating values ranging from 0 to 100. The highest values (red/orange) are concentrated in the central and eastern parts of the region, while lower values (green/blue) are found in the western and southern parts.



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3.2 Earthquake

Exposure Profile

This section provides a summary of the data provided to estimate hazards. Rather than estimating losses, the exposure assessment only looks at the extent to which people and physical assets are exposed to different hazard scenarios, providing a useful preliminary indication of impact (which are subject to the uncertainties associated with economic valuation and vulnerability functions).

For this purpose, estimated PGA values for the 100 year return period earthquake hazard map were classified into six intensity classes, using a conversion to the Modified Mercalli Intensity (MMI) classes previously proposed for the Indian context¹. These intensity classes are based on observed effects with lower classes defined by how earthquakes are felt by people and higher classes by observed structural damage, and provide an intuitive way to describe seismic hazards.

As shown in Table 3.2, the earthquake hazard intensity distribution across the state with a 100 year return period covers three MMI classes: Moderate, Strong and Very Strong. In order to be able to visualize and assess exposure in more detail, each of these classes has been split into five equally-sized sub-classes (such that the Moderate class is further split into sub-classes M1, M2, M3, M4 and M5, and so on), so that the total number of the 100 year return period hazard across the state ranges from a low of 161 (the highest Moderate sub-class) up to a high of 1,000 (the middle Very Strong sub-class). All subsequent maps and plots illustrating exposure to hazards will use the classification system.

¹ See 3.2. Summary of data distribution used to generate the state's 100 year, 100 year BP earthquake hazard.

MMI Class	PGA Range	Description	Sub-class	Value
Moderate	0.05 – 0.07 g/m/s ²	Felt by nearly everyone, many awakened. Some dishes, windows broken. Unstable objects overturned. Swinging objects may swing.	M1	
			M2	
			M3	
			M4	
			M5	
Strong	0.07 – 0.09 g/m/s ²	Felt by all, many frightened. Some heavy furniture moved, a few instances of falling objects, damage to poorly constructed buildings. Damage to bridges.	S1	
			S2	
			S3	
			S4	
			S5	
Very Strong	0.09 – 0.10 g/m/s ²	Damage to masonry to buildings of good design with weak columns, which is moderate to well built ordinary buildings. Considerable damage to poorly built or badly designed structures. Some chimneys broken.	V101	
			V102	
			V103	
			V104	
			V105	

¹ International Code of Building Officials (ICBO), and F. Douglas Hous. 1982. A quantifying of intensity, a seismic distress, over eight magnitude and acceleration. *Geophysical Research Bulletin* 20: 127-142.

Figure 3.24 illustrates the exposure of all portfolios considered, in terms of the percentage of each acquisition group or economic asset exposed to “unsafe” (misdestabilizing) as opposed to “safe” (stable) (very strong) portfolio exposure (with reference to the 100-year return period portfolio threshold). In the context which follows, each portfolio will be considered separately, showing the key variables to which their risk is most likely to be exposed (in accordance with the 100-year return period threshold).

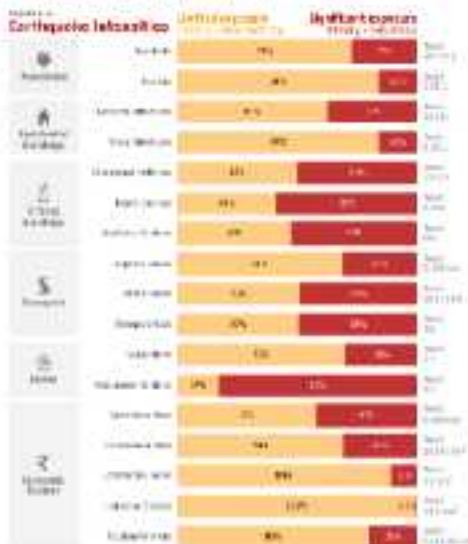


Figure 3.24: Visual summary of the data on portfolio exposure to portfolio exposure (100-year return period)



Figure 1. Distribution of the population of the world in 2000.

The map shows the distribution of the population of the world in 2000. The population is concentrated in the Eastern Hemisphere, particularly in Asia and Europe. The Western Hemisphere has a lower population density.







Figure 1: Map of the study area showing the distribution of the study population.





Figure 1: Map of the study area showing the location of the study sites.

Figure 2: Map of the study area showing the location of the study sites.

Figure 3: Map of the study area showing the location of the study sites.

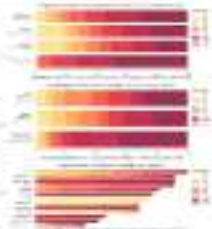


Figure 4: Map of the study area showing the location of the study sites.

Figure 5: Map of the study area showing the location of the study sites.

Figure 6: Map of the study area showing the location of the study sites.

Figure 7: Map of the study area showing the location of the study sites.

Figure 8: Map of the study area showing the location of the study sites.

Figure 9: Map of the study area showing the location of the study sites.

Figure 10: Map of the study area showing the location of the study sites.

Figure 11: Map of the study area showing the location of the study sites.

Figure 12: Map of the study area showing the location of the study sites.



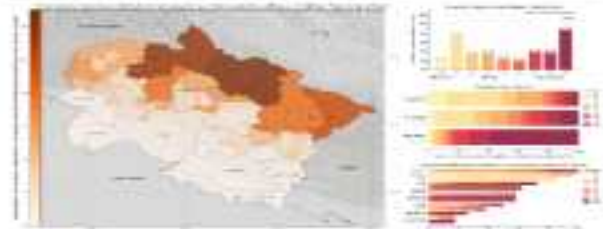
Figure 1: Map of the study area showing the distribution of the study species.

The map displays the geographical distribution of the study species across the study area, with a color scale indicating the density or frequency of occurrence.





Figure 1. The distribution of the population of the world in 2010. The map shows the distribution of the population of the world in 2010. The map is color-coded by population density, with darker colors indicating higher density. The map shows that the population is concentrated in the eastern half of the world, particularly in Asia and Europe. The map also shows that the population is concentrated in the coastal areas of the world, particularly in the eastern half of the world.





European Commission

How should we design the regional energy security strategy and priority investments to ensure energy security in the EU?

Study carried out by the European Commission

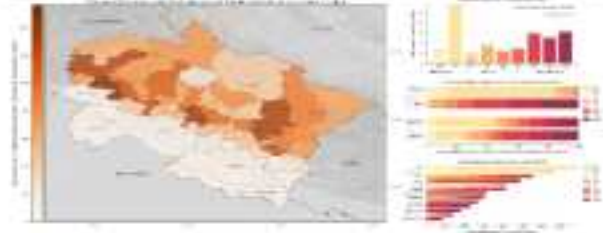
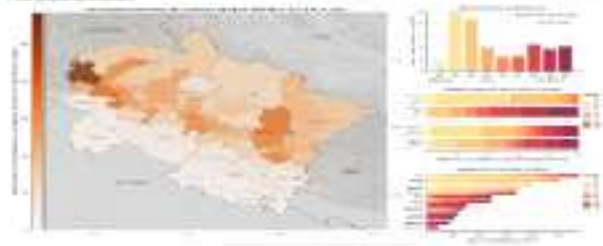
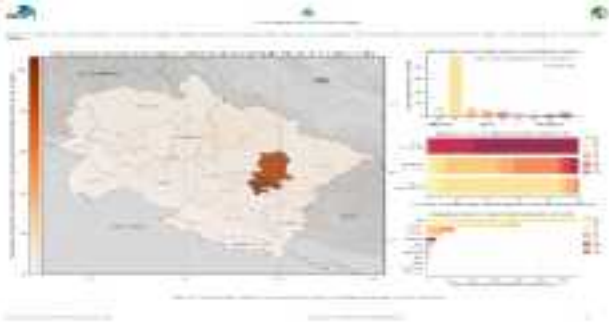
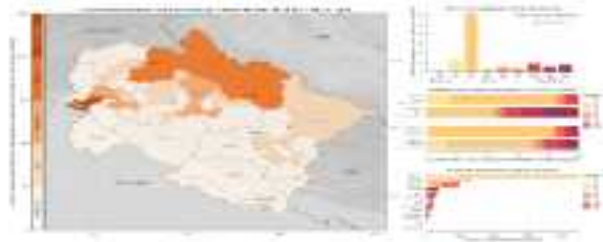




Figure 1. Map of the study area showing the location of the study sites (A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z) and the distribution of the study species (A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z).







3.3 Earthquake

Loss Profile

The Average Annual Loss (AAL) of economic value in the State due to earthquakes is approximately R\$ 2,400 (smaller). Figure 3.39 shows how the total is distributed between the various portfolios and their individual components.



Figure 3.39 Distribution of Economic AAL due to earthquakes, by economic sector

In Figure 3.40, the total AAL of economic value in each state is displayed, as well as the distribution of each state's total AAL, by portfolio.

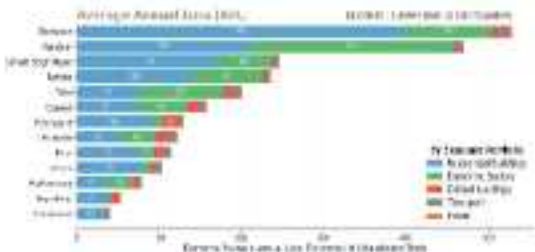


Figure 3.40 Distribution of Economic AAL due to earthquakes, by economic sector

The economic losses presented above include both direct losses (those incurred at the time of the disaster, in terms of damaged assets that have to be repaired or replaced and indirect losses (the loss of future income due to the disruption of revenue streams such as tourism, production or tourism activities).

In the case of the latter, assumptions must be made as to the maximum period over which revenue streams may be expected to be given disaster (with actual losses scaled proportionately according to the calculated damage percentage). Table 3.3 summarises these assumptions for each economic portfolio. As previously indicated in the risk assessment, as well as providing a general overview of the direct and indirect losses concerned, it is noted that cascading indirect losses (such as industrial losses due to disruption of power infrastructure) are not within the scope of the current assessment and therefore not accounted for in the loss estimates.

Table 3.3 Overview of direct and indirect losses measured for, including maximum estimate period for indirect losses

Category	Sub-category	Direct losses	Indirect losses	Max. assumption
Residential buildings	Residence	Replacement cost	None	100
	House	Replacement cost	None	100
Commercial buildings	Health, Education, Government	Replacement cost	None	100
Industrial infrastructure	Plant, Staff, R&D	Replacement cost	None	100
Power infrastructure	Power substations	Replacement cost	None	100
	Hydro-power stations	Replacement cost	Loss of electricity services	1 year
Livestock sector	Agriculture (poultry)	Replacement cost (market replacement)	Loss of income (yearly)	1 year
	Cattle	Replacement cost (market replacement)	Loss of income production services	1 year
	Commerce	None	Loss of market-related & services materials	1 year
	Mining	None	Loss of production services	1 year
	Seismic	None	Loss of tourism services	1 year (tourists) 2 years (rehabilitation) 1 year (decommission)

Figure 3.41: Illustrates the distribution of direct and indirect losses within the sectors (overall economic AAC) due to earthquakes



Figure 3.42: Losses from business closure and indirect losses in the 2009 Economic AAC, due to earthquakes

Figure 3.42 presents the closing of all business and sectors within the state, in terms of their sales through financial loss (bill.) of economic assets, as a result of both direct and indirect losses caused by earthquakes

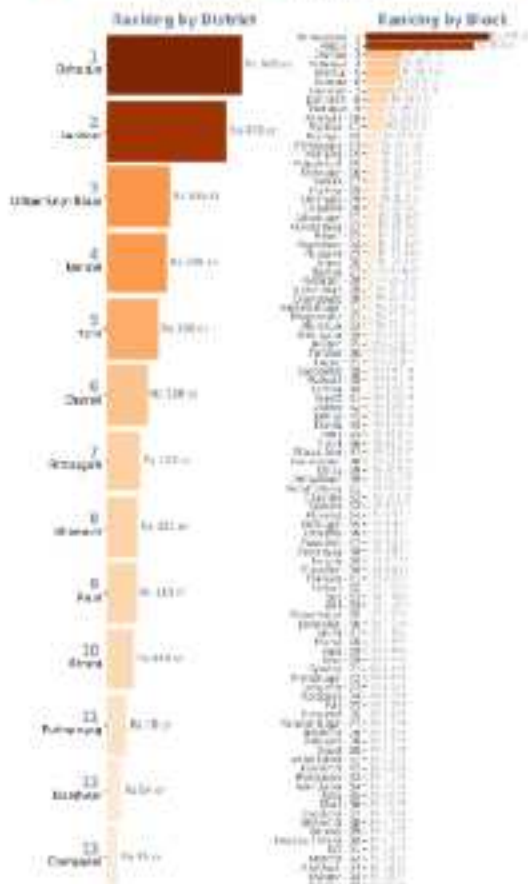


Figure 2.12 Ranking of 14 Districts and Blocks in Dera Iskan, based on Average Forest Land (km²) and its percentage

Probable Maximum Loss (PML) curves show the maximum losses that could reasonably be expected for exposed assets for a range of different return periods. Figure 3.43 presents the overall PML curve for all economic assets modelled in the study.

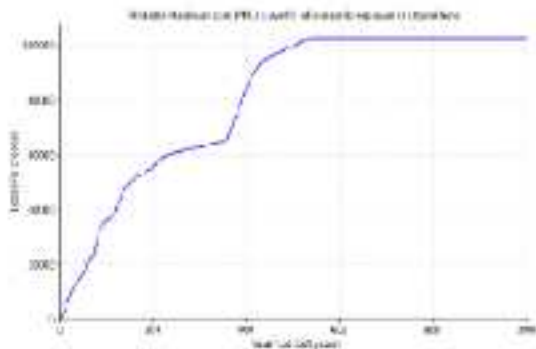


Figure 3.43: Probable Maximum Loss (PML) curves for all economic assets in Bangladesh (in USD million)

Figure 3.44 presents individual PML curves for each of the major economic portfolios in the study.

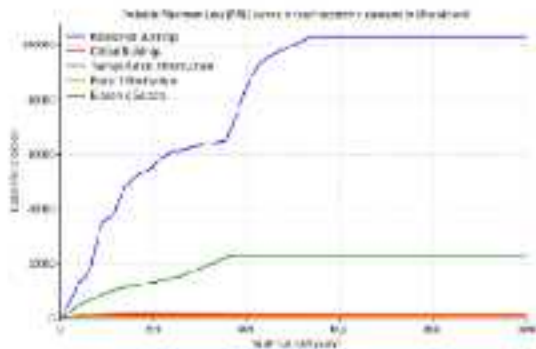


Figure 3.44: Probable Maximum Loss (PML) curves for major economic assets in Bangladesh (in USD million)

As for human losses, the Average Annual Loss (AAL) in the State due to earthquakes is estimated to be 1,500 lives. Figure 3.45 summarizes the distribution of this loss, in terms of the residency of those killed (State residents or tourists), the time of the earthquake (more people are inside buildings at night and therefore more exposed), and the structural quality of the building they were in at the time (in terms of Kathach Plaza structural loss).

Average Annual Loss (AAL)

The loss is estimated to be 1,500 lives in the State.



Figure 3.45: Average Annual Loss (AAL) of human loss, by residency, time of earthquake, and building quality

Figure 3.46 summarizes the AAL of human loss in each of the State's districts, as well as the distribution of each district's AAL, in terms of the residency of those affected (State residents or tourists).

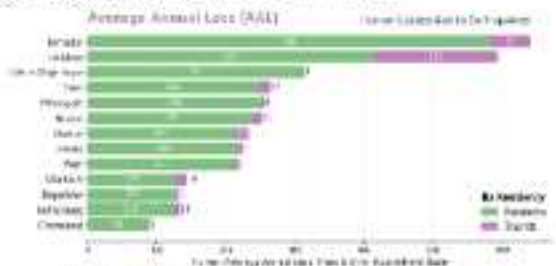


Figure 3.46: Average Annual Loss (AAL) of human loss, by district and residency (constant/multiplier)

Figure 3.47 presents the ranking of all districts and blocks within the State, in terms of their total Average Annual Loss (AAL) of human life, as a result of earthquake hazards.

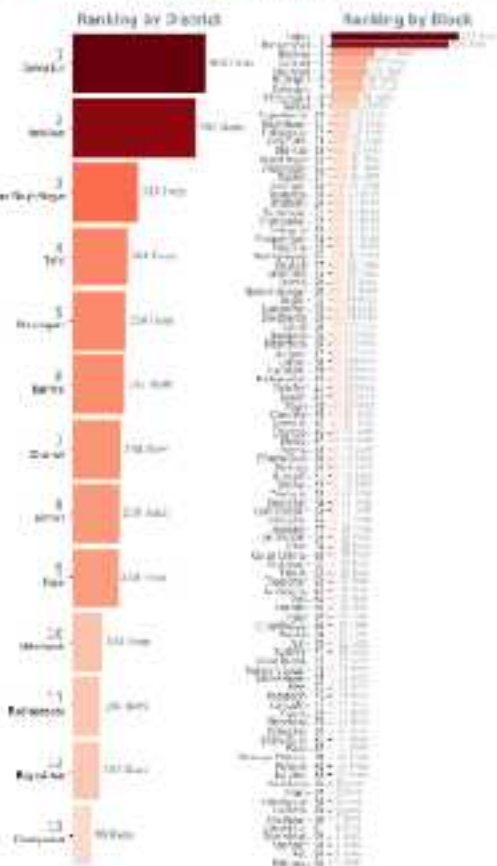


Figure 3.4.7: Ranking of 40 Districts and Blocks in the study, based on the study data provided by the study

Probable Maximum Loss (PML) curves show the maximum losses that could reasonably be expected for exposed assets, for a range of different return periods. Figure 3.43 presents the overall PML curve for all people (inhabitants and tourists) in the city.

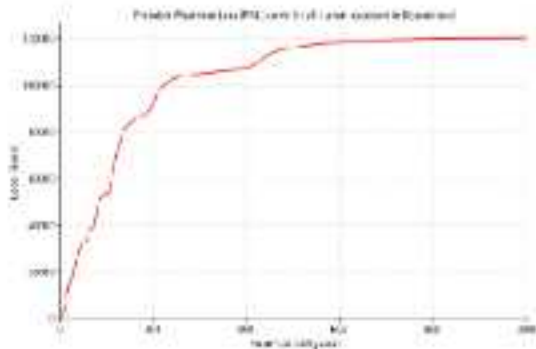


Figure 3.43: Probable Maximum Loss (PML) curve for all losses (excluding the loss of life) in Copenhagen

Figure 3.47 presents individual PML curves exploring the impact of sea level rise on rate of loss, given very different spatial distributions of population at different times of day.

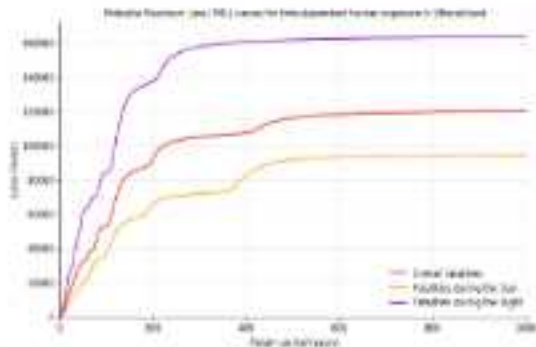


Figure 3.47: Probable Maximum Loss (PML) curves for all losses (excluding the loss of life) in Copenhagen, illustrating differences in the spatial distribution of the exposed population

The human AA, discussed so far, provides an estimate of the likely loss of life directly attributable to earthquakes (primarily resulting from the collapse of buildings during or immediately following the earthquake). However, there are likely to be longer-term possible impacts too, depending on the extent to which the affected area's capacity to respond to the disaster has been compromised. This will depend on factors such as:

- Extent of displaced population to be housed in temporary camps (where disease outbreaks could result)
- Capacity of local health facilities (those still functional post-disaster)
- Capacity of other government facilities to support disaster/recovery efforts
- Transport connectivity within the affected area, particularly roads and air transport
- Pre-existing socio-economic vulnerability of population in affected area
- Proportion of affected population made up of tourists (less local knowledge and thus more vulnerable)

With limited modelling to quantify the risk of lost capacity, a qualitative assessment has been performed, in order to evaluate the likely significance of mortality in the state overall and also in some of the individual factors that directly, as a result of the seismic loss, were highlighted.

It should be clearly noted that this is a **relative** assessment only: each District is compared to all other Districts in the State, and (known for Districts) either then being assessed against an external standard or reference. Thus it can be stated with some confidence that one District is at a higher vulnerability risk than another, but the actual level of the risk remains unknown.

A map showing the initial earthquake-affected mortality risk score, estimated for each District (left) and each District-Lower Right in Queensland is presented in Figure 5.52, along with a histogram of the class contribution to totals (lower right). Further details for each District and Lower Right are available in the corresponding state volume.





Figure 1: Map of the study area showing the distribution of the study species.

Figure 1: Map of the study area showing the distribution of the study species.

Figure 1: Map of the study area showing the distribution of the study species.



Figure 2: Map of the study area showing the distribution of the study species.



Positive Maximum Likelihood (PML) curves show the maximum losses that could reasonably be expected for selected assets, for a range of return periods. Figure 5.12 presents the PML curve for human life expectancy in the 2020s.

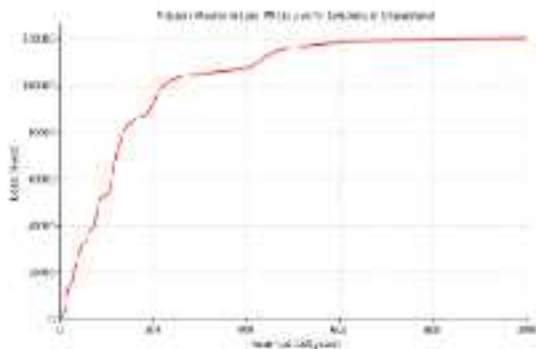


Figure 5.12: Positive Maximum Likelihood (PML) curve for life expectancy in 2020s (assumed due to war scenario)



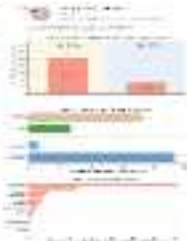
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Positive Maximum Loss (PML) curves show the maximum losses that could reasonably be expected for selected assets, for a range of different return periods. Figure 3.3a presents the PML curve for human loss (fatal) in the 2000.

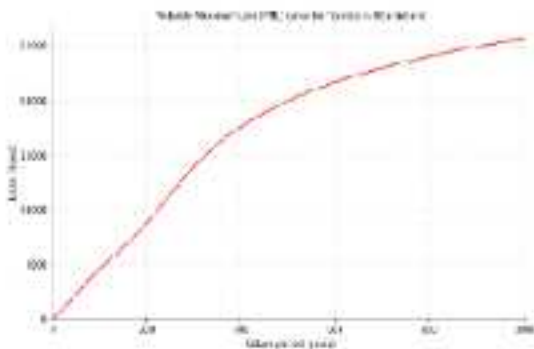
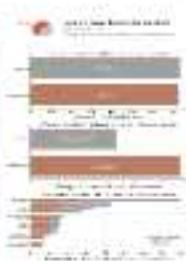


Figure 3.3a: Positive Maximum Loss (PML) curve for human loss (fatal) in the 2000 (based on the 2000 population)



Figure 1: Map of the study area showing the distribution of the study population.



Proctor Maximum Limit (PML) curves show the maximum mass that could reasonably be expected to be obtained for a range of effective water potentials. Figure 3.16 presents the PML curve for residential buildings in the UK.

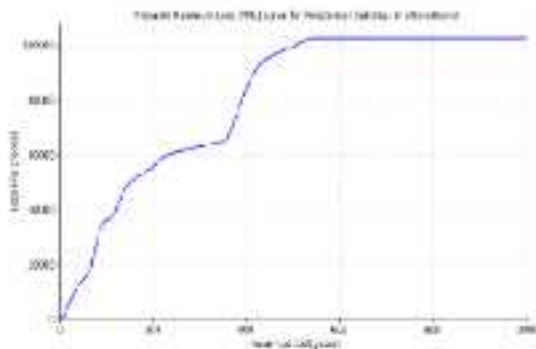


Figure 3.16: Proctor Maximum Limit (PML) curve for Residential buildings in the United Kingdom



Topic: Environmental Sustainability

Topic: Environmental Sustainability



Possible Maximums (PMs) curves show the maximum losses that could reasonably be expected for various assets, for a range of different storm periods. Figure 4.28 presents the PMs for major infrastructure in the state.

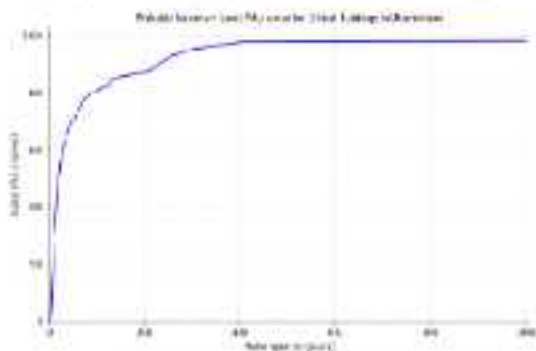


Figure 4.28 Possible Maximum Loss (PM) curves for major buildings in Queensland state infrastructure



Figure 1: Map of the study area showing the distribution of the study species.



Probable Maximum Loss (PML) curves show the maximum losses that could reasonably be expected for a given asset, for a range of different return periods. Figure 3.60 presents the PML curves for transportation infrastructure in the state.

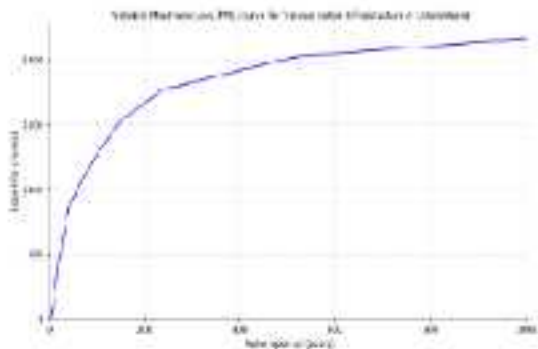


Figure 3.60. Probable Maximum Loss (PML) curves for transportation infrastructure by individual loss component

Probable Maximum Loss (PML) curves show the maximum losses that could reasonably be expected for selected assets, for a range of return periods. Figure 3-62 presents the PML curve for phase infrastructure in the 320.

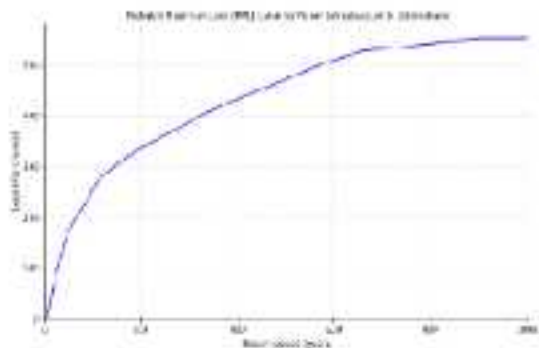


Figure 3-62 Probable Maximum Loss (PML) Curve for Phase Infrastructure in the 320



Figure 1. Map of the study area showing the location of the study sites.





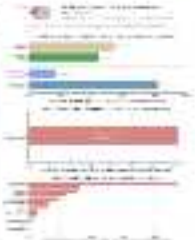
Map of the administrative units of the Republic of Serbia





Genel Sağlık İstatistikleri Yıllık Raporu
2022

Genel Sağlık İstatistikleri Yıllık Raporu
2022



Probable Maximum Loss (PML) curves show the maximum losses that could reasonably be expected for selected assets, for a range of different return periods. Figure 3-46 presents the PML curve for economic assets in Chedoke Dam, encompassing agriculture (irrigation dams only), industry, commercial, mining and business activities.

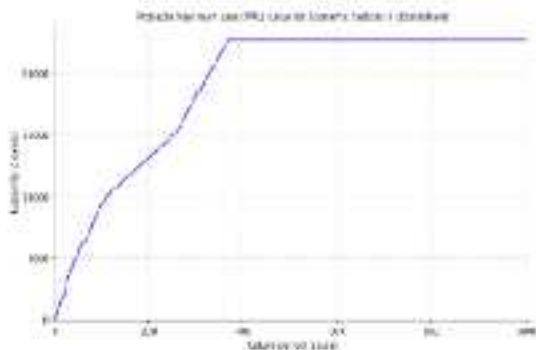


Figure 3-46: Chedoke Dam Probable Maximum Loss (PML) curve for economic activities in Chedoke Dam in Saskatchewan

1.4 Floods

1.4.1 Hazard Profile (Flood & Fresh Flood)

Assessing flood hazards for Uthmaniyah required two modelling approaches in order to capture the different types of flood that may pose a threat to people and property in the WQF. Flood event threats were characterised using two-scale analysis: 1) 63 model hydrological and hydrodynamic, based on long-term time series of daily rainfall data. Flood floods and ponding due to short, intense, localised meteorological events were modelled using a 2D model, based on 24 design rainfall events. Further details regarding the flood flood and fresh flood modelling approaches are provided in Volume 1, Chapter 3.

In the following sections, Figure 1.4.1 presents a map showing which of these approaches were used for different parts of the study. The main river network (modelled using the long-term time series model) is indicated by the green and red lines. The different colours show the level of uncertainty in simulated results along that stretch, which is mostly a function of the underlying DEM quality. The narrower of the study was covered by the short-term hydrologic model, capturing overland and gully flows, as well as rainfall-induced ponding. This map also shows a digital building footprint, as a simple indicator of exposure, as well as postal lines which have been assessed to cover a flood impact at district level (Districts 04, 09 & 10).

In Volume 1.4.2, a map of flood exposure which shows a 100-year return period is presented, combining outputs from the two modelling approaches described above, in order to ensure the fullest possible coverage of the entire study. Over any 100-year period, a flood of this magnitude for greater has a 40% chance of occurring at least once. It is estimated that such a flood event would result in approximately 18.7% of the study being inundated to a depth of 0.3m or greater. This is illustrated in the plot below, showing it covers into six different inundation depth classes.



Figure 1.4.1: Proportion of study by different inundation depth classes (based on a 100-year return period)

Based on the same analysis, the following page presents a ranking of all districts (left) and postal (right) in the study of Uthmaniyah, in terms of the percentage of their area expected to be inundated to a depth of 0.3m or higher during the 100-year return period flood.

As well as inundation depths, flow velocities are significant in evaluating the overall flood hazard, particularly in terms of the risk to people and buildings during flood flood events. The map in Volume 1.4.3 presents the flood flood hazard zones defined for Uthmaniyah, based on both depth and flow velocity, following a widely used approach to hazard ratings developed by HR Wallingford (2012).

The plot below summarises the proportion (by area) of Uthmaniyah in each hazard zone, as a quick visual summary of its flood flood hazard profile.



Figure 1.4.2: Proportion of study by different flood flood hazard zones (based on a 100-year return period)



World Distribution of
the ...







1.4 Floods

Exposure Profile (Flood & Flash Floods)

This section presents a summary of the state's exposure to flood hazards, in terms of both flooding from flood depths and from flash floods (which are subject to the velocity as well as depth). Rather than estimating losses, the exposure assessment only looks at the extent to which people and economic assets are exposed to different hazard intensities, providing a useful preliminary indication of areas (which aren't subject to the uncertainties associated with economic valuation and vulnerability functions).

Figure 3.73 visualizes the exposure of all portfolios to flooding from flood depths, in terms of the percentage of each population group or economic asset exposed to 'limited' depths (<0.3m) as opposed to 'significant' depths (>0.3m), with reference to 100-year return period flood depths.



Figure 3.73: Exposure profile of the State's assets exposed to flood depths with a 100-year return period

Figure 3.14 visualises the exposure of all portfolios to flash flood hazard zones, in terms of the percentage of each portfolio's total gross building asset exposure to hazard zones into the Low, Med, and Significant hazard zones (all zones higher than Low), with reference to 100 year return period flood depths and flow velocities. As described in the Hazard Profile section of this Volume, flash flood hazard zones were defined based on both maximum flood depths and flow velocities, following a widely used approach developed by HR Wallingford plc (2012).



Figure 3.14: Visual summary of the Dorset water exposure to flash flood based zones with a 100 year return period.

In the sections which follow, each portfolio will be considered separately, showing its exposure to floods in terms of both flood depth ranges and flash flood hazard zones for each case based on the 100 year return period flood depths and flow velocities.







Source: <https://www.ourworldindata.org/grapher/average-temperature-in-the-us>





Document describing the results of the analysis of the data collected during the fieldwork in the study area. The document is organized into four main sections: Introduction, Methodology, Results, and Conclusions. The Introduction provides a brief overview of the study and its objectives. The Methodology section describes the data collection and analysis procedures. The Results section presents the findings of the analysis, and the Conclusions section summarizes the main results and provides recommendations for future research.





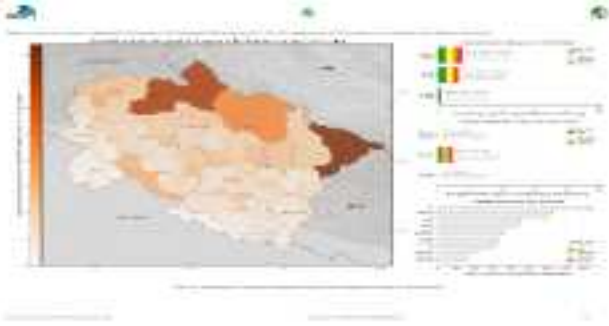
Figure 1.1: A map of the world showing the distribution of a certain variable. The map is color-coded, with a legend on the right side. The legend shows a color scale from blue to red, with corresponding numerical values. The map shows a high concentration of the variable in the central and eastern parts of the world, with lower concentrations in the western and southern parts.













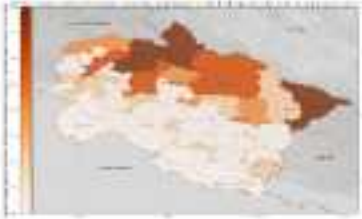




Figure 1. Map of the study area showing the location of the study sites (A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z) and the distribution of the study species (A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z).



Figure 1. Map of the study area showing the location of the study sites (A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z) and the distribution of the study species (A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z).



Figure 2. Bar chart showing the distribution of the study species (A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z) across different regions (A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z). The Y-axis represents the number of individuals (0 to 100). The X-axis represents the regions (A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z). The bars are colored blue and yellow, indicating different groups of species.











Figure 1: A map of the United States showing the distribution of the population by state. The map is color-coded by population density, with darker shades of brown indicating higher density. The map includes state boundaries and labels for each state.

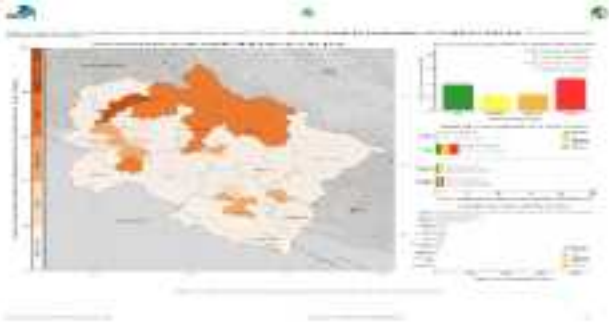




Introduction

World Bank - World Development Indicators





14
Fisch

 Low Profile (Furless Furrows Only)

The Average Annual Loss (AAL) of economic value to the State due to fuel foods is approximately \$6.25 million. Figure 3-10 shows how this cost is distributed between the years 4 portions and their related components. Note that buildings and people have been assumed to be pressures from higher frequency events (up to the 100 year event in urban areas and the 25 year event in rural areas), based on observations made during field trips around the state. This does not apply to agriculture, horticulture, foods or fisheries, which are considered unprotected.

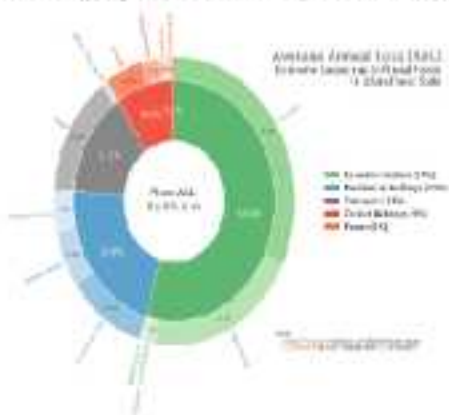
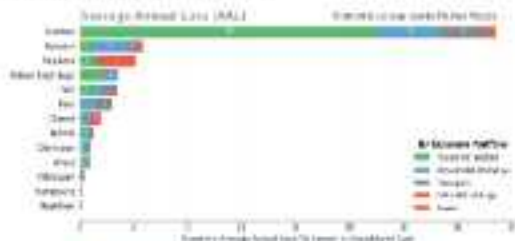


Figure 2.100: Distribution of responses to Q12: Are in Social Media, by gender and age group.

In Figure 3.36, the total ANU of economic value due to food products in each district of the state is displayed, as well as the distribution of each county's total ANU by product.



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The economic costs presented above include both direct losses (those incurred at the time of the disaster, in terms of damaged assets that have to be repaired or replaced) and indirect losses (the loss of future income due to the disruption of revenue streams such as industrial production or tourism activities).

In the case of the latter, assumptions must be made as to the maximum period over which revenue streams may be expected to be given auster (with actual losses would proportionately according to the calculated damage percentages). Table 3.4 summarizes these assumptions for each economic portfolio, as well as the risk assessment, as well as providing a general overview of the direct and indirect losses considered. It is noted that cascading indirect losses (such as industrial losses due to disruption of power infrastructure) are not within the scope of the current assessment and therefore not accounted for in the loss estimates.

Table 3.4: Overview of direct and indirect losses accounted for, according to each economic portfolio for different losses

Portfolio	Subcategory	Direct losses	Indirect losses	Time perspective
Government	Buildings	Replacement cost	None	1m
	Floods			
City and building	Health Services	Replacement cost	None	1m
	Manufacturing			
Industrial infrastructure	Power, Fuel, etc.	Replacement cost	None	1m
Transport infrastructure	Transport infrastructure	Replacement cost	None	1m
	Hydroelectric facilities	Replacement cost	Loss of electricity revenue	1 year
Economic Sectors	Agriculture, Production	Replacement cost (animal investments)	Loss of future profits	1 year
	Industry	Replacement cost (capital investments)	Loss of future production revenue	1 year
	Commerce	None	Loss of manufacturing & services revenue	1 year
	Mining	None	Loss of production revenue	1 year
	Tourism	None	Loss of tourism revenue	10 years (as estimated by experts) (estimated 8 months' accessibility)

Figure 3.17 illustrates the distribution of direct and indirect losses within the state's total economic AAL due to flood risks.



Figure 3.18: Distribution between direct and indirect losses in the State's Economic AAL due to flood risks

Figure 3.18 presents the splitting of all (direct and indirect) within the State, in terms of total AAL. Although direct loss (68%) of economic assets, as a result of both direct and indirect losses caused by flood risks. Note that only those blocks impacted by the major event modelled for this study are shown here.

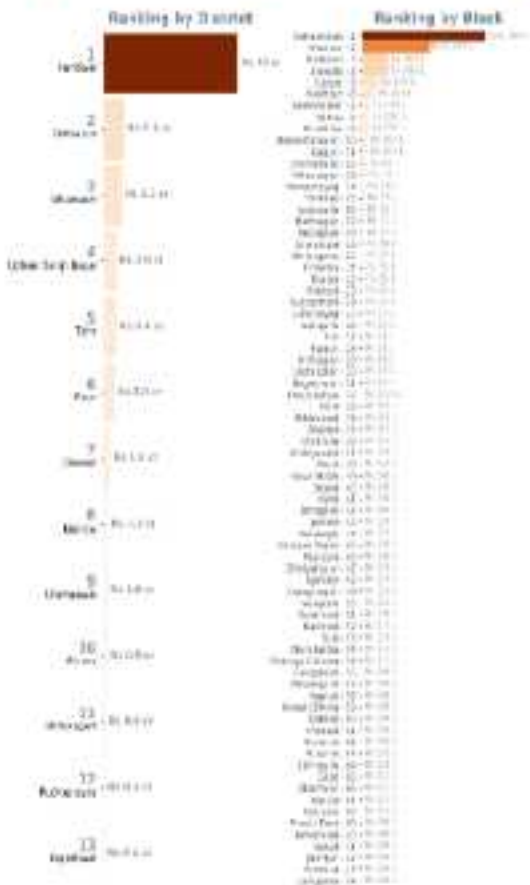


Figure 10: Ranking of all Districts and Blocks in the State. Based on Average of all the indicators in the State.

Probable Maximum Loss (PML) curves show the maximum losses that could reasonably be expected for exceed events, for a range of different return periods. Figure 3.100 presents the overall PML curve for all economic assets measured in the study, for two sets of assumptions: standard protection (with exposure protected up to the 50-year event in villages and the 100-year event in towns) and no protection at all. The reality is likely to be somewhere in between.

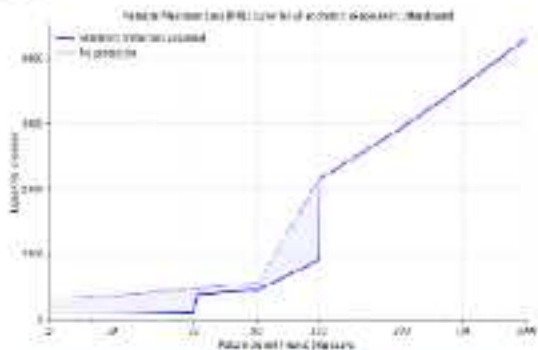


Figure 3.100. Probable Maximum Loss (PML) curve for all economic assets in the study (with standard protection assumed)

Figure 3.101 presents individual PML curves (based on the standard protection assumption described above) for each of the mapped economic activities in the study.

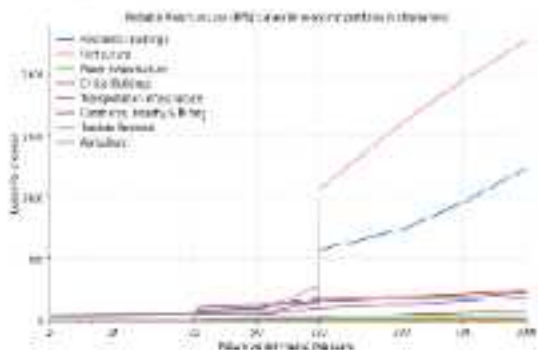


Figure 3.101. Probable Maximum Loss (PML) curve for economic portfolios in the study (with standard protection assumed)

As for burned losses, the Average Annual Loss (AAL) in the State due to forest fires is estimated to be four (4) mld. Figure 2.7.1.1 illustrates the distribution of FNCML, in terms of the quantity of forest land (area) located in counties, the size of the forest stand, and the potential (AAL) reduction of the area that is exposed to the risk.

Average Annual Loss (AAL)

It was not a surprise that the Thibault 3 levels ($n = 2$) that were less than 50 cm

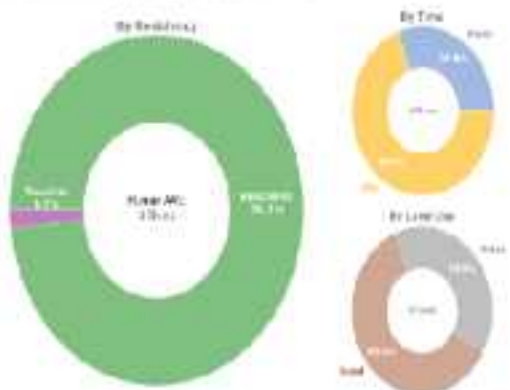


Figure 3. 3D Average model (step 144) of the mandible (a posterior) view of the specimen with a color bar.

Figure 3. 100 quantiles of the AAL of future lives at each of the 100 locations, weighted by the observed 1990 census AAL in terms of the residents of those affected areas (residents in 1990).

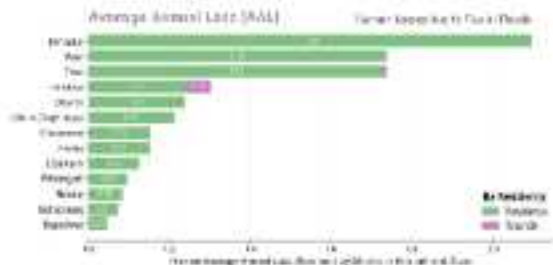


Figure 4. 2002 challenge period (June 15 to July 1) of *Neisseria meningitidis* by serotype and season by county/territory.

Figure 3. VGR captures the spring of 12 Darters and Killifish with the traps, in terms of their total average annual (VGR) of furrow loss, as a result of furrow erosion. Note that only those darters impacted by the major flows resulted in the study are shown here.

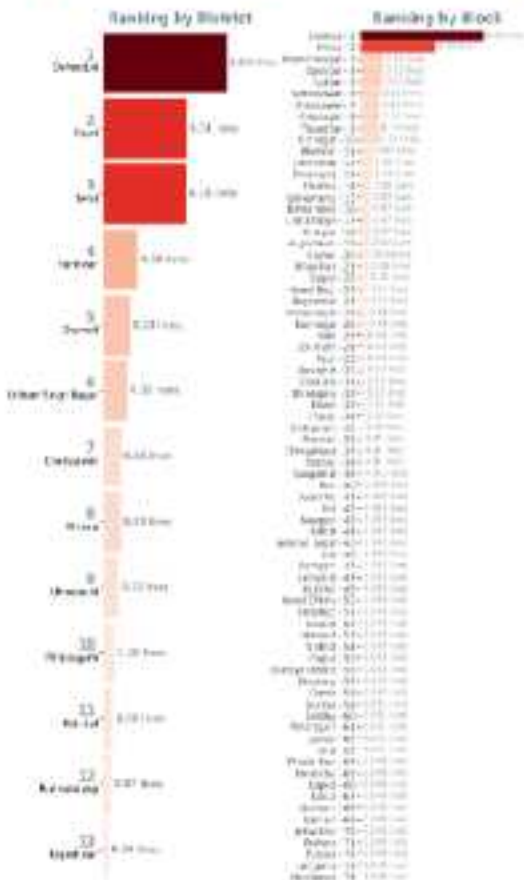


Figure 27.30: Ranking of all Districts and Blocks in Tripura, based on Percentage Forest cover (Forest) area in Forest Cover

Probable Maximum Loss (PML) curves show the maximum losses that could reasonably be expected for various events, for a range of different return periods. Figure 3.134 presents the overall PML curve for all possible residents and travelers in the state, for two sets of assumptions: standard protection (persons protected up to the 25-year event in villages and the 100-year event in towns) and no protection at all. The readily is likely to be conservative in column.

Probable Maximum Loss (PML) Curve for all loss measures in Illinois

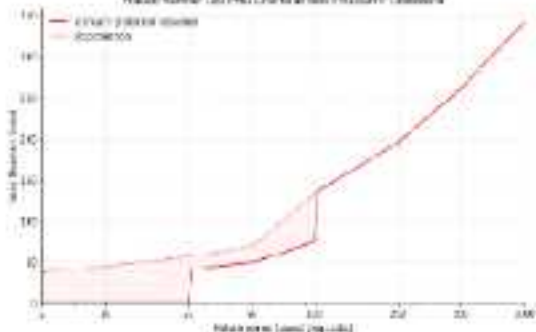


Figure 3.134 Probable Maximum Loss (PML) curve for human life loss measured in total losses

Figure 3.135 presents individual PML curves (based on the standard protection assumption described above) for each of the mapped human groups in the state (residents and travelers).

Probable Maximum Loss PML curve for human groups in Illinois

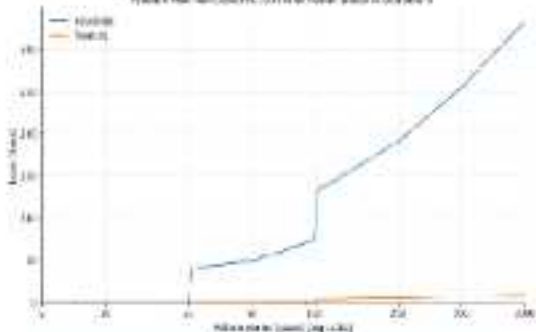


Figure 3.135 Probable Maximum Loss (PML) curve for human groups by human group in Illinois

The human AAL discussed so far provides an estimate of the likely size of the deaths attributable to flood losses (primarily resulting from drowning and the spread of foodborne disease). However, there are likely to be long-term morbidity impacts too, depending on the extent to which the affected **communities capacity to respond to the disaster** has been compromised. This will depend on factors such as:

- Size of displaced population to be housed in temporary camps (where disease outbreaks may likely)
- Location of significant standing water near (or within) (increases risk of waterborne diseases)
- Capacity of local health facilities (those still functional post-disaster)
- Capacity of other government facilities to support emergency response efforts
- Transport connectivity within the affected area (particularly rural and all-weather)
- Preexisting socioeconomic vulnerability of population in affected area
- Practices of affected population made up of thousands of years of knowledge and thus more resilient
- Risk of vector- and zoonotic disease transmission due to contact with water after a flood

While detailed monitoring to quantify this risk is not possible, a qualitative assessment has been performed, in order to evaluate the likely significance of morbidity in the state exposed and also in some of the adjacent factors listed above due to flood losses.

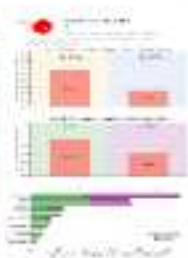
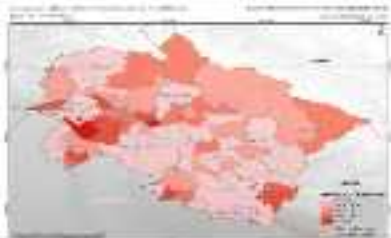
It should be clearly noted that this is a **relative** assessment any such District is compared to all other Districts in the State, and hence to Districts better than being assessed against an external standard or reference. Thus it can be stated with some confidence that one District is at a higher morbidity risk than another, but the actual level of that risk remains unknown.

A map showing the overall flood-loss-disaster morbidity risk class estimated for each Block (left) and each District (top right) in Uttar Pradesh is presented in Figure 5.1.18, along with a histogram of the class distribution for those Block right. Further details for each District and Block are provided in the corresponding data tables.





پنجاب صحت و خاندان
Punjab Health and Family Welfare



Probable Maximum Loss (PML) curves give the maximum losses that could reasonably be expected for structural assets, for a range of different return periods. Figure 3.108 presents the PML curve for human lives presented in the atlas, for two sets of assumptions: standard protection (specifically extended up to the 25 year event in multiple) and the 100 year event in hazard and for protection of all. The results are likely to be somewhere in between.

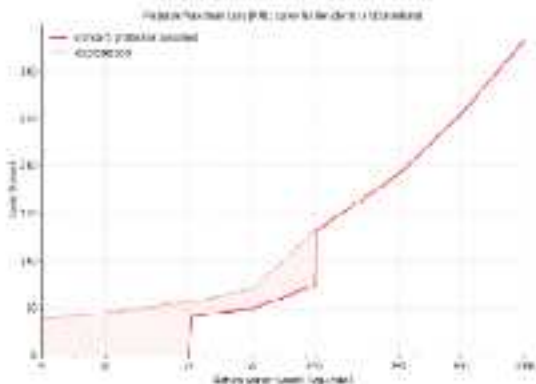
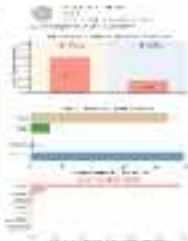


Figure 3.108: Probable Maximum Loss (PML) curves for human lives: (assumes no adjustment due to human lives)



Map of the world showing the distribution of the species.

Map of the world showing the distribution of the species.



Number of species

Region

Probable Maximum Loss (PML) curves show the maximum losses that could reasonably be expected for selected assets, for a range of return period scenarios. Figure 3.113 presents the PML curve for human risk potential in the state, for two sets of assumptions: absolute protection (people protected up to the 25-year event in magnitude and the 100-year event in timing) and no protection at all. The reality is likely to be somewhere in between.

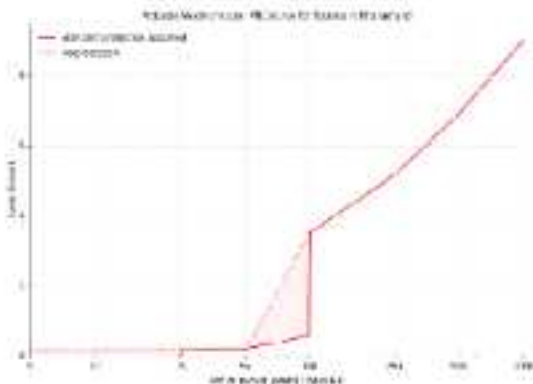


Figure 3.113: Probable Maximum Loss (PML) curve for human risk potential in the state of South Dakota



Probable Maximum Loss (PML) curves show the maximum losses that could reasonably be expected for selected assets for a range of different return periods. Figure 8.112 presents the PML curve for residential buildings in the state, for two sets of assumptions: standard protection (built exposure protected up to the 25-year event in villages) and the 100-year event in coastal and metropolitan areas. The results clearly look somewhat different.

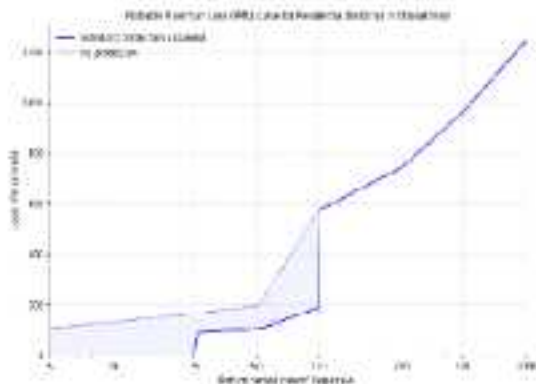


Figure 8.112 Probable Maximum Loss (PML) curves for residential buildings in Queensland due to Tropical Cyclone



Despite the much less ORE, it is seen that the maximum losses that can be reasonably be expected for selected assets for a range of different return periods. Figure 3.11.6 below presents the PRL curve for motor buildings in the state, for two sets of assumptions: standard protection (built exposure protected up to the 22-year event in damage) and the 50-year event in total and reconstruction at all. The reality is likely to be somewhere in between.

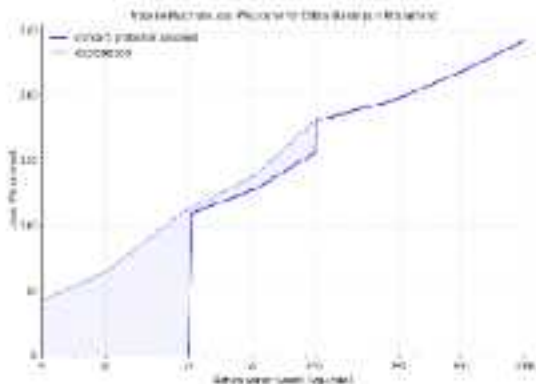


Figure 3.11.6 Probable Maximum Loss (PRL) curve for motor buildings in the state due to future floods



Probable Maximum Loss (PML) curves show the maximum losses that could reasonably be expected for a given asset, for a range of return periods. Figure 2.115 presents the PML curve for transportation infrastructure in the state. Note that only one version of the curve is presented for transportation infrastructure, based on the evaluation of its protection (given the wide spatial distribution of the exposed elements making up the portfolio).

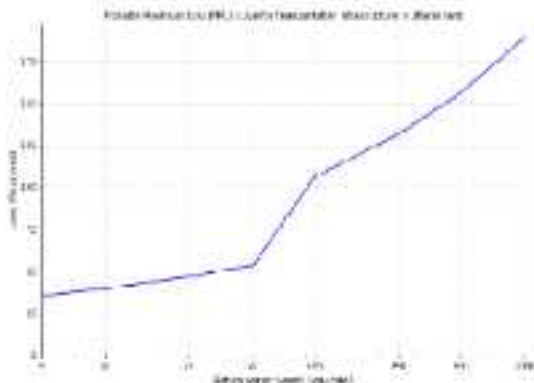


Figure 2.115: Probable Maximum Loss (PML) curve for transportation infrastructure in Colorado (state level)



Probable Maximum Loss (PML) curves show the maximum losses that could reasonably be expected for selected assets for a range of different return periods. Figure 2.114 presents the PML curve for power infrastructure in the state, for two sets of assumptions: standard protection (built exposure protected up to the 25-year event in design) and the 100-year event in both and reconstruction at all. The results are likely to be sensitive to between:

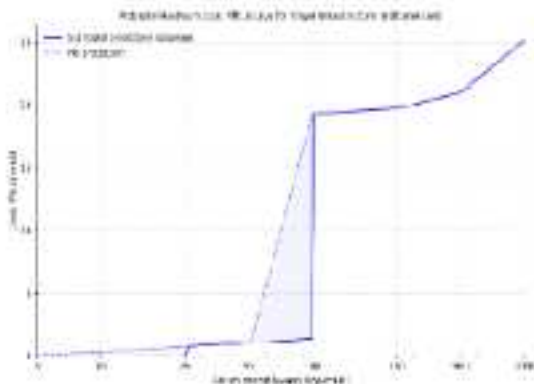


Figure 2.114: Probable Maximum Loss (PML) curve for power infrastructure in the state



Ministry of Health of the Republic of Serbia

General Directorate of Public Health

Department of Infectious Diseases

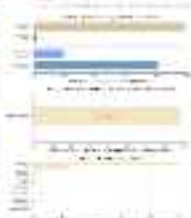
Page 1 of 1

Report on the results of the

epidemiological surveillance



Legend



Probable Maximum Loss (PML) is used when the maximum losses that could reasonably be expected for insured assets for a range of different return periods. Figure 3.12C presents the PML curve for agriculture in the state. Note that only one version of this curve is presented for agriculture, based on the assumption of no protection (given the widespread distribution of the exposure elements making up this sector).

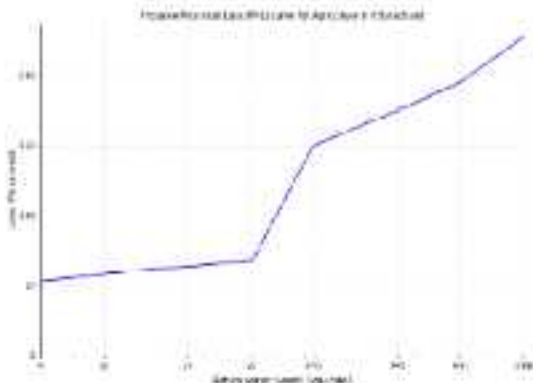


Figure 3.12C: Probable Maximum Loss (PML) Curve for Agriculture in Connecticut due to Future Events

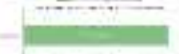


Map of the Republic of Serbia showing the distribution of the population by administrative units (municipalities).

Map of the Republic of Serbia showing the distribution of the population by administrative units (municipalities).



Legend: Population density (persons per km²)



Source: Statistical Bureau of the Republic of Serbia, 2011.

Prognostic Maximum Loss (PML) curves show the maximum losses that can be reasonably be expected for different assets, for a range of different return periods. Figure 3.122 presents the PML curve for maximum loss based on the only one version of the curve is presented for illustration. Based on the assumption of no protection (given the widespread distribution of the exposure elements making up the portfolio).

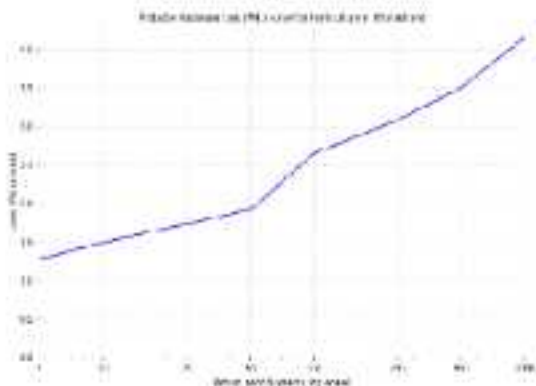


Figure 3.122 Prognostic Maximum Loss (PML) curve for maximum loss based on the only one version of the curve



Survei Kesehatan Masyarakat (SKM) Kabupaten...

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Survei Kesehatan Masyarakat (SKM) Kabupaten...



Probable Maximum Loss (PML) is used to show the maximum losses that could reasonably be expected for insured assets for a single or different time periods. Figure 3.4(a) presents the PML curve for commercial and industry in the state for two sets of assumptions: standard protection level exposure protected up to the 25 year event in villages and the 100 year event in towns and no protection at all. The reality is likely to be somewhere in between.

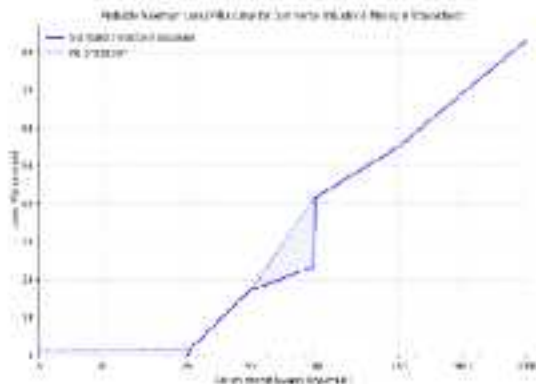


Figure 3.4(a) Probable Maximum Losses of PML curves for commercial and industry in the state for two sets of assumptions

Possible Maximum Loss (PML) curves show the maximum losses that could reasonably be expected for various assets, for a range of different return periods. Figure 3.125 presents the PML curve for Southern revenue in the state, for two sets of assumptions: standard protection (full exposure protected up to the 25 year return in 4 days) and the 100 year return in 4 days and full protection at all. The results are likely to be conservative at best.

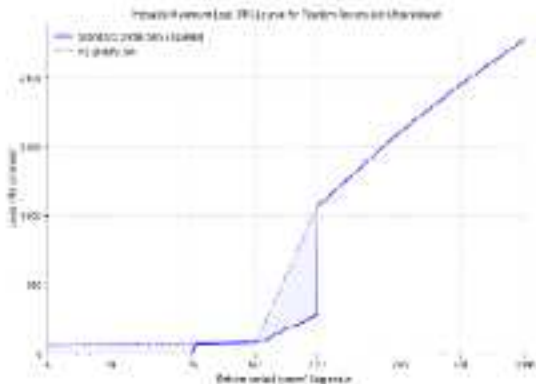


Figure 3.125: Possible Maximum Loss (PML) curve for Southern revenue in 4 days (due to 100 year return)

3.5 Landslides

Hazard Profile

Landslide susceptibility modeling has been executed using a series of district-level Maxent models (with the exception of Urban Fringe Higher District, where no historical landslides have yet been recorded and where road networks are too irregular). Further details of the modeling methodology are discussed in volume 1, Chapter 2.

In each of the district-level landslide susceptibility sections, a brief summary of the district's Maxent model is provided, giving a useful insight into which of the marginal datasets proved to make the largest contributions to the results in that particular district. All of these are summarised in Figure 3.127, showing clearly the significant impact that road ratings have, as well as topographical properties such as slope and aspect.

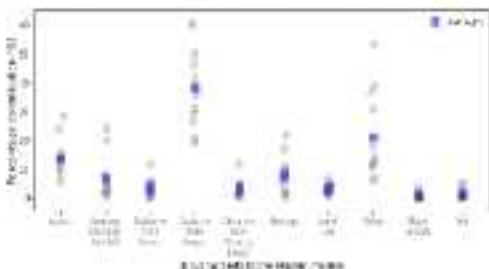


Figure 3.127: Summary of each input variable's contribution to the landslide Maxent models in the 11 districts with records

For each district model, model performance is assessed, quantifying the benefit the model provides over a random prediction, with reference to a dot known as a Receiver Operating Characteristic (ROC) curve. This plot shows the Area Under the Curve (AUC), for which a value of 0.5 is equivalent to a random prediction and a value of 1.0 would indicate a perfectly predictive model. For the district-level Maxent models run, the average train and test scores were 0.862 and 0.826, respectively, indicating a significantly superior performance over random prediction.

The results of these Maxent landslide models were reclassified into five categories, ranging from 'None' to 'Very High', in terms of landslide susceptibility. In the case of Urban Fringe Higher (for which a Maxent model could not be established) it was assumed that the district fell entirely in the 'None' category given that no landslides have ever been reported there. Figure 3.128 shows the distribution of these classes (by area) across the entire state.



Figure 3.128: Percentage of state in five landslide susceptibility classes

For each district and block, these distributions were also used to calculate a weighted average of the probabilities issued by different classes (with higher susceptibility classes weighted more heavily). These weighted averages were used to rank all districts and blocks in the state, the results of which are shown in Figure 3.129.

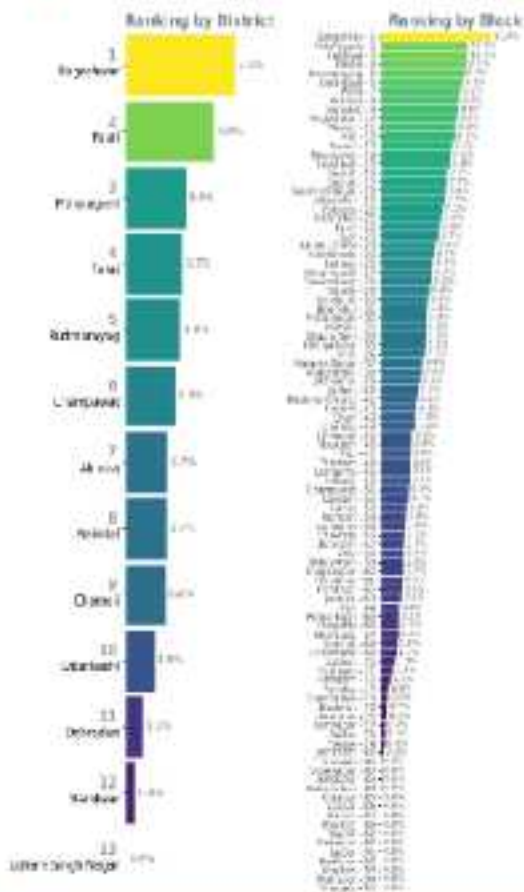


Figure 3. (a) Ranking of districts by improved water supply, based on a weighted average of the extent to which improved access to off-grid connectivity houses (darker green) and on-grid connectivity houses (lighter green) is available.



3.3 Landslides

🏠 / 👤 Exposure Profile

This section presents a summary of the state's exposure to landslide susceptibility zones, with zones defined based on an event scenario consideration of the range of possible susceptibility zones predicted by the Flowet model.

Rather than estimating losses, the exposure assessment only lists, at the sector level, which people and economic assets are exposed to different hazard intensities, providing a useful preliminary indicator of impact (which is left called to the uncertainties associated with economic valuation and vulnerability functions).

Figure 3.3.1 illustrates the exposure at all profiles considered, in terms of the percentage of each population group or economic asset exposed to 'limited' as opposed to 'significant' landslide susceptibility zones (based on the susceptibility zone classification indicated in the figure). In the sections which follow, each profile will be considered separately, showing the susceptibility zones in which they are each likely to be exposed.

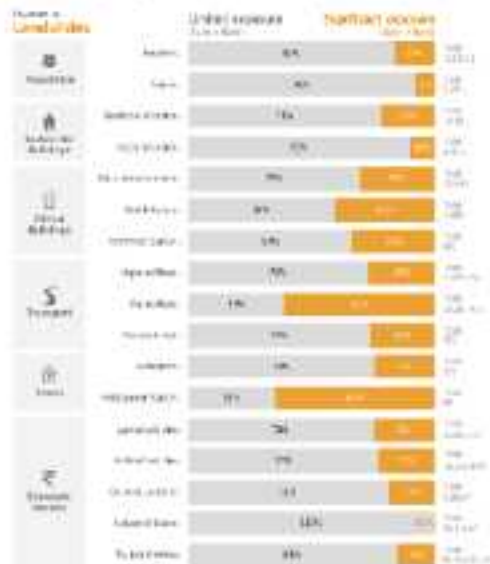


Figure 3.3.1 Visual summary of the state's model exposure in landslide events



Figure 1.1: The distribution of the world's population in 2019

