

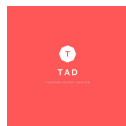
NEPAL SOLVEATHON 2019

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Disaster Economic Loss Estimation Portal

Team Members



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Problem Statement(s)

Most of the planning and decision making for Disaster Risk Reduction and Management is still being done on an ad hoc basis. Lack of proper identification, impact, and analysis of past data has been a huge setback for effective planning and evidence based decision making.

Our solution

- The team came up with the idea of estimating the possible economic loss by hazards based on past disasters
- A portal has been designed that provides the estimated economic loss data based on disasters events from 2011 till present
- The data is sourced from BIPAD (Building Information Platform Against Disaster)'s Damage and Loss module (<http://www.bipad.gov.np/damage-and-loss/#/overview>)
- The estimated economic loss data generated aims to help the decision makers to identify high priority areas for effective preparedness and mitigation planning.
- The output will also help the decision makers to plan for effective budget allocation accordingly.

Methodology

- The estimated model has been generated using OSL (Ordinary Least Square) Regression Model.
- The total loss has been taken as the dependent variable and different hazards and its frequency that cause the economic loss has been taken as the independent variable.
- The independent variables used are the province, belt, and hazards (animal terror, drowning, epidemic, fire, flood, hailstorm, heavy rainfall, high altitude, landslide, thunderbolt and other natural hazards).

Methodology

- The OLS regression analysis used is

$$Y = a + b_1x_1 + b_2x_2 + \dots + b_nx_n$$

Y= Total Estimated Economic Loss

x_1 = Province fixed effect

x_2 = Belt fixed effect

x_3 = Animal terror

x_4 = Drowning

x_5 = Epidemic

x_6 = Fire

x_7 = Flood

x_8 = Hailstorm

x_9 = Heavy rainfall

x_{10} = High Altitude

x_{11} = Landslide

x_{12} = Thunderbolt

x_{13} = Other natural hazards

Findings

Some of the findings from the estimation were as follows:

- Fire was the most frequent hazards
- Total economic loss was most affected by hailstorm
- Morang has the largest economic loss by hazards at $\log_{10}(8.4872)$

Findings (Regression Coefficients)

Coefficients:

	Estimate	Std. Error	t value	Pr(> t)	
(Intercept)	7.7183253	0.2052618	37.602	<2e-16	***
ProvinceKarnali	0.3372368	0.2507390	1.345	0.1842	
ProvinceProvince 1	0.2881068	0.2243786	1.284	0.2045	
ProvinceProvince 2	0.0034793	0.3048155	0.011	0.9909	
ProvinceProvince 3	0.2408374	0.2275135	1.059	0.2944	
ProvinceProvince 5	0.3399440	0.2235181	1.521	0.1340	
Provincesudurpashchim	-0.1597012	0.2521889	-0.633	0.5292	
beltMountain	-0.3591883	0.1786753	-2.010	0.0493	*
beltTerai	0.1944244	0.2861085	0.680	0.4996	
AnimalIncident	0.0039360	0.0213815	0.184	0.8546	
Drowning	0.0079891	0.0165856	0.482	0.6319	
Epidemic	-0.0458126	0.0286137	-1.601	0.1151	
Fire	0.0014288	0.0006305	2.266	0.0274	*
Flood	-0.0001302	0.0072175	-0.018	0.9857	
Hailstorm	-0.0047495	0.2011323	-0.024	0.9812	
HeavyRainfall	0.0023023	0.0044809	0.514	0.6095	
HighAltitude	0.0336653	0.0186388	1.806	0.0764	.
Landslide	-0.0012093	0.0051369	-0.235	0.8148	
Other_Natural	-0.0107954	0.0144778	-0.746	0.4591	
Thunderbolt	0.0038085	0.0049529	0.769	0.4452	

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Residual standard error: 0.4781 on 55 degrees of freedom
Multiple R-squared: 0.5273, Adjusted R-squared: 0.3639
F-statistic: 3.229 on 19 and 55 DF, p-value: 0.0003569

Disclaimer

The estimate generated are solely based on the total estimated loss and the indicators used is hazards. Due to unavailability of time and data, other indicators have not been used. However, with the availability of other independent variables that can estimate the economic loss, they can be added in the model.

The R^2 error (goodness of fit) for the estimated model is 0.5273. Since natural hazard are not easily predictable, R^2 and adjusted R^2 remains low.

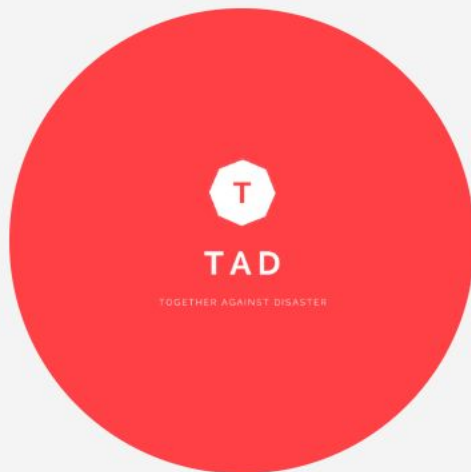
Our MVP

- A beta version of the portal has been designed.
- The portal has the feature to select the province. Once a province is selected, it will give the estimated loss of that province in the coming year.
- The model can also estimate the loss in district level and as per the hazard.
- Github link: bit.ly/2rmFIZm



About section

About Estimated Disaster Loss Prediction Portal



The portal provides the estimated economic loss data based on the past disasters from 2011 till present. The data is sourced from BIPAD (Building Information Platform Against Disaster), a government-led integrated Disaster Information Management System (DIMS). The estimated loss data generated aims to help the decision makers to identify high priority areas for effective preparedness and mitigation planning and decision making. The output will also help the decision makers to plan for effective budget allocation. The data has been estimated using OSL (Ordinary Least Square) method.

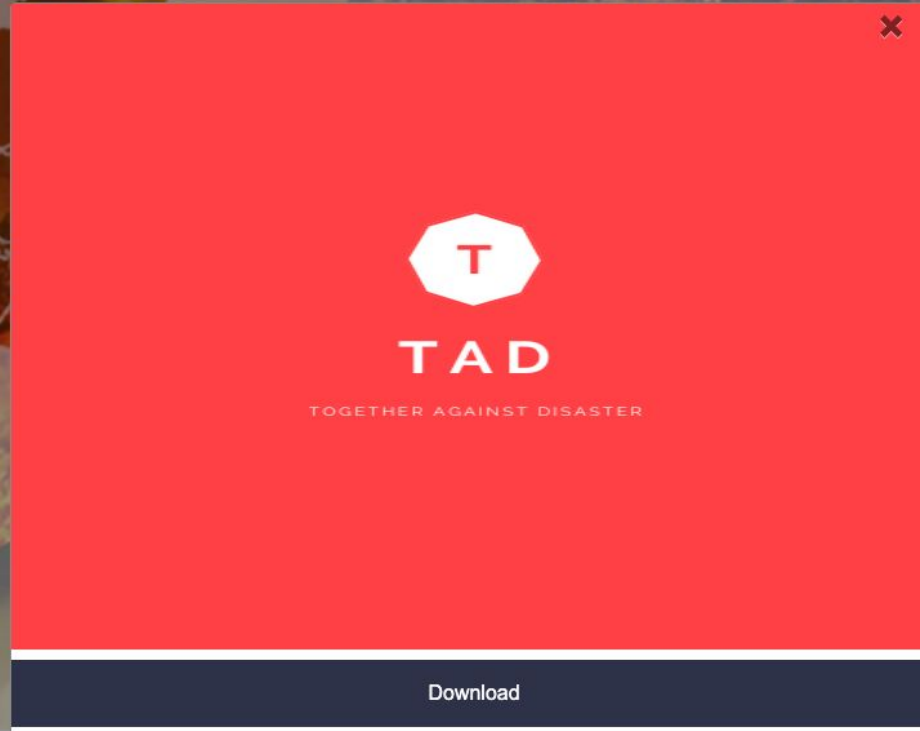


Loss

Estimation Parameter

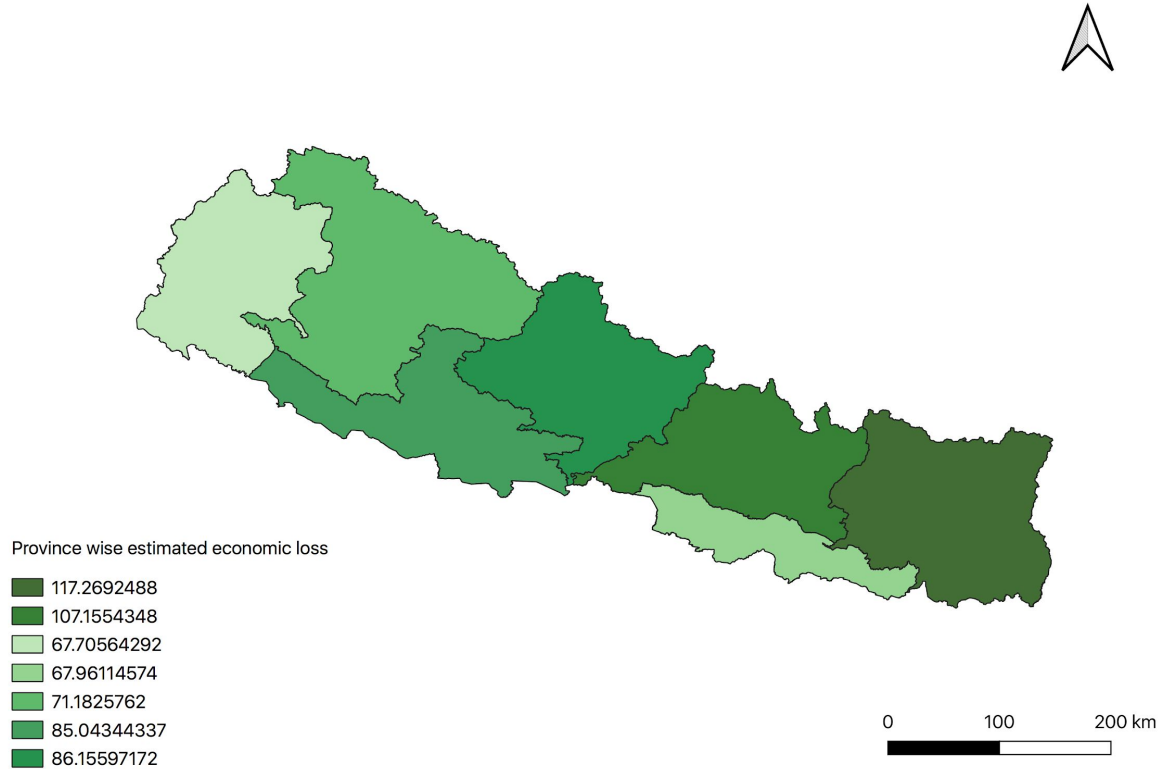
- ✓ Select Province
- Province-1
- Province-2
- Province-3
- Gandaki
- Province-5
- Karnali
- Sudurpaschim

Location filter

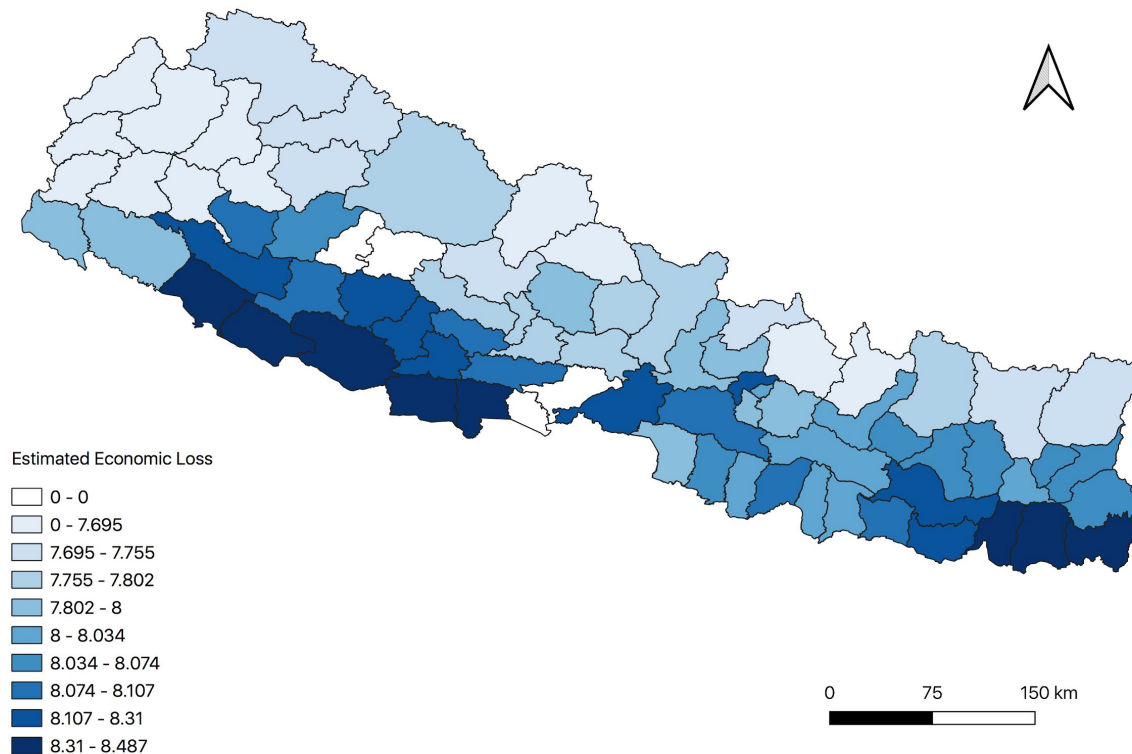


The box will have the estimation results which can also be downloaded.

Province level estimation in map visualization



District level estimation in map visualization



Next Steps

- Search for the data that can contribute as other indicators/independent variables.
- Upgrade the model as per the new data available.
- Work on the portal to make it interactive and user friendly.
- Research on uptake of the model by decision makers.

THANK YOU