Construction of a Disaster Reduction and Preparedness Index (DRPI) to Monitor progress made by the states in India in Disaster Risk Reduction and related Sustainable Development Goals (SDGs)

Indrani Chandrasekharan[a] and Bhagyam Chandrasekharan[b]

Over the last decade, China, the United States, India, Indonesia and the Philippines constituted the top five countries that are most frequently hit by natural disasters. India is vulnerable in varying degrees to a large number of natural as well as man-made disasters. Twenty-seven of its 36 states and union territories are disaster prone.

Considering the vast influence of disaster on many sectors of the economy and well-being of the citizens, construction of a ***Disaster Reduction and Preparedness Index (DRPI) as a monitoring tool for DRR and related SDG*** *to recognize the efforts made at the Central and State level yearly has been attempted. The DRPI would also serve as a monitoring tool for the Sendai Framework's seven targets and related SDGs.*

The paper discusses developing and constructing a Disaster Reduction and Preparedness Index (DRPI), with 16 data points linked to 5 Disaster Risk Reduction (DRR) indicators and ranks the states based on progress made so far. The paper provides a brief insight into the Policy, Legislations and Monitoring mechanism currently in place to achieve the Targets set for DRR in India, limitations of the DRR indicator and new solutions.

The paper also discusses the, draft Disaster Score Card (DSC) proposed for the country in a study sponsored by the MHA. DSC is designed to be a facilitating tool to identify the strong and weak areas of disaster risk management in each State and Union Territory of the country. An attempt has also been made to evolve further the DSC consisting of Disaster Risk Index (DRI) and Disaster Resilience Index (DRsI) and develop a Disaster Score Board.

Keywords: Disaster Reduction and Preparedness Index (DRPI), Sustainable Development Goals (SDGs); Disaster Risk Index (DRI) , Disaster Resilience Index (DRsI), Disaster Risk Reduction (DRR); National, Regional and Global Targets and Indicators, Criteria, Variables, Monitoring mechanism,

1. Introduction

India has been vulnerable, in varying degrees, to a large number of natural as well as man made disasters on account of its unique geo-climatic and socio-economic conditions. It is highly vulnerable to floods, droughts, cyclones, earthquakes, landslides, avalanches and forest fires. Text box-1 depicts Vulnerability profile of India.

Since the year 2000, globally natural disasters have resulted in the loss of life of over 1.1 million and affected 2.7 billion people. The Indian subcontinent is among the world's most disaster prone areas. Almost 85% of India's area is vulnerable to one or multiple hazard. Of the 29 states and 7 union territories, 27 are disaster-prone. As per National Institute of Disaster Management (NIDM)[1] India, annual impact on people from 1990-2010 due to disasters which have occurred in India has been: loss of life 4334, people affected 30 million and resulting in annual financial loss of 2% of GDP.

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a- Dr. Indrani Chandrasekharan- Former Adviser, Planning Commission and MoEF & CC.
b- Dr. Bhagyam Chandrasekharan, Knowledge Management Analyst, World Bank Group, Chennai, TN
For Correspondence (e-mail indusekh@gmail.com)

The Sendai Framework, 2015-2030, was the first international agreement adopted for Disaster Risk Reduction followed by two other major international agreements the Sustainable Development Goals 2015 – 2030 in September, and the UNCOP21 Climate Change agreement to combat human-induced climate change in December. DRR is a common theme in these three global agreements.

The Sendai Framework Monitor, launched on 1 March 2018, is based on a set of 38 indicators that will track progress in implementing the Sendai Framework's seven targets and related SDGs and targets, particularly SDGs 1 (no poverty), 11 (sustainable cities and communities) and 13 (climate action). As of 1st March, 2018, countries must use the Framework Monitor to report against the 38 indicators.

VULNERABILITY PROFILE OF INDIA

- Twenty-seven of its 36 states and union territories are disaster prone
- Over 40 million hectares (12 per cent of land) is prone to floods and river erosion.
- 58.6 per cent of the landmass is prone to earthquakes of moderate to very high intensity.
- Of the 7,516 km long coastline, close to 5,700 km is prone to cyclones and tsunamis.
- 68 per cent of the cultivable area is vulnerable to drought and hilly areas are at risk from landslides and avalanches.
- Further, the vulnerability to Chemical, Biological, Radiological and Nuclear disasters(CBRN) and terrorism has also increased.

Natural disasters comprise, biological, geophysical, meteorological, hydrological, climatological, and extra - terrestrial disasters and includes climate change related disasters

2. Disaster Risk Reduction and Sustainable Development Goals (SDGs).

The 2030 Agenda for Sustainable Development, adopted by world leaders at the United Nations on 25 September 2015, sets out an ambitious plan of action for people, planet and prosperity, with the overarching objective of leaving no one behind. At its core are 17 Sustainable Development Goals (SDGs) comprising 169 targets.

The global indicator framework developed by the UN Inter-Agency and Expert Group on SDG Indicators and adopted by the UN Statistical Commission in March 2017 **agreed upon 232 indicators** to measure the 169 targets.

Out of the 17 SDGs and 169 targets, **SDG 1** to "End Poverty in all its forms everywhere" and **target 1.5** which states that "By 2030 build the resilience of the poor " is related to Disaster Risk Reduction (DRR)[1,2,3].The proposed indicators for DRR under the target

1.5 are, No. 1.5.1, 1.5.2, 1.5.3 that emphasizes on the monitoring of the "losses from Natural Disaster, by climate and non-climate related events and further Development of DRR Indicators[4,5]

The other indicators that apply to DRR are part of SDG 11 & 13 and are related to targets 1.5.1 and 1.5.2 and SDG 2 target 2.4.1 on sustainable agriculture and presented in Table-1

Table-1. Disaster Risk Reduction -SDG Goals , Targets and Indicators.

Disaster Risk Reduction Goal, Target No. & Details	**Indicators**	**Tier , Other goals and ,Indicators**
SDG-1: End poverty in all its forms everywhere		
1.5 By 2030 build the resilience of the poor and those in vulnerable situations, and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters	1.5.1: Number of deaths, missing persons and directly affected persons attributed to disasters per 100,000 population. a 1.5.2: Direct economic loss attributed to disasters in relation to global gross domestic product (GDP) 1.5.3: Number of countries with national and Local disaster risk reduction Strategies.	Tier II 2, 11, & 13
SDG-2: End hunger, achieve food security and improved nutrition and promote sustainable agriculture.		
2.4 By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality	2.4.1 Proportion of Agri-area under productive and Sustainable Agriculture.	11, & 13
SDG 11. Make cities and human settlements inclusive, safe, resilient and sustainable		
11.5: By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situation. 11.b: By 2020, substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, and develop and implement, in line with the Sendai Framework for Disaster Risk Reduction 2015-2030, holistic disaster risk management at all levels.	11.5.1: Number of deaths, missing persons and directly affected persons attributed to disasters per 100,000 population. a. 11.5.2 Direct disaster economic loss in relation to global GDP, including disaster damage to critical infrastructure and disruption of basic services a 11.b.1Proportion of Local Governments that adopt and implement Local disaster risk reduction strategies in line with the Sendai Framework for Disaster Risk Reduction 2015-2030. 11.b.2. Number of Countries with national and Local disaster risk reduction Strategies.	Tier II 13
SDG-13:- . Take urgent action to combat climate change and its impacts[b		
13.1: Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries. 13.2 Integrate climate change measures into national policies, strategies and planning.	13.1.1 Number of Countries with national and Local disaster risk reduction Strategies. a 13.1.2 : Number of deaths, missing persons and directly affected persons attributed to disasters per 100,000 population. a	Tier II
a .Report of the Inter-Agency and Expert Group on Sustainable Development Goal Indicators (E/CN.3/2016/2/Rev.1). **Tier classification for Global SDG indicators, 20th April,2017.**		

3. Limitations of DRR -Indicators

The global indicator framework is still being developed by the Inter-Agency and Expert Group on SDG Indicators (IAEG-SDGs)[6] and currently includes, 232 agreed indicators.

As of 20th April 2017; The updated tier classification contains 82 Tier I indicators, 61 Tier II indicators and 84 Tier III indicators. In addition to these, there are 5 indicators that have multiple tiers (different components of the indicator are classified into different tiers). It must be noted that the DRR indicators are 10 in number but actually are only 5 as some are repeated and fall under the tier II. Natural hazards can also trigger chemical disasters doubling the risk to both cities and rural population. This aspect is not highlighted in many documents published by international agencies.

Some biological disasters (epidemics, insect infestations, animal stampedes) can be climate-related[7]. The indicator would specify clearly which of these events are considered climate-related. There are some limitations around measuring the scale of disaster losses recorded. International Disasters Database (EM-DAT) has a lower-end threshold for recording losses than other commonly used reinsurance databases. Chemical accidents and such accidents triggered by natural disasters, infact , are well documented at National , Regional and Global level.

4. Policy, Legislation and monitoring mechanism in India to achieve the Targets set for DRR

4.1 Policy and Legislation

In December, 2005, Government of India (GOI) enacted the Disaster Management Act, 2005[8], which envisioned the establishment of Disaster Management Authorities at National (NDMA), at State (SDMA) and District level (DDMAs). The strategy was to shift relief centric response to a proactive prevention, mitigation and preparedness driven approach for conserving development gains and also to minimize losses of life, livelihood and property. As per NDMA[9] of the 28 States ,5 states are yet to constitute DDMA's.

The National Policy on Disaster Management (NPDM) formulated in 2009 is an effort of Indian government to work with the International Strategy for Disaster Reduction, the Rio Declaration, the Millennium Development Goals and the Hyogo Framework at local levels. The policy addresses the key issues and strategies towards development of a disaster free country[10].

The National Rehabilitation and Resettlement Policy 2007 was introduced by Ministry of Rural Development (Department of Land Resources) GOI[11], with the objective to minimize displacement from development activities, ensure adequate rehabilitation packages and protect the rights of the weaker sections of society. A Land Acquisition, Rehabilitation and Resettlement (LARR) Act was enacted in 2013[12], which brings the issues together in a single Act and emphasizes the right to fair compensation and transparency in land acquisition.

Under the E(P) Act, 1986[13], two set of rules namely; Manufacture, Storage and Import of hazardous chemicals Rules, 1989(amended in 1994 and 2000)[14] and Chemical Accidents

(Emergency Planning, Preparedness and Response) Rules, 1996 were notified[15]. The objective of the MSIHC rules is to; Provide procedures and safeguards for handling of hazardous chemicals at a site (industry, isolated storage, pipeline) , lay down requirements for the industry and authorities to manage chemical emergencies, report accidents, prepare on-site and Off-site plans. The CA(EPPR) rules mandate setting up of Crisis Groups namely; CCG, SCG and DCG at the Central, State and District levels and monitor preparation of district and state level Off-Site plans , conduct mock drills and publish regularly details of Major Accident Hazard (MAH) units, accident details etc. The regulation and authorities help save lives in case of both manmade and natural disaster triggered chemical accidents and help in data collection and maintenance.

4.2 Monitoring DRR targets linked to SDGs

Setting DRR targets and achieving those means, monitoring progress, highlighting issues related to data collection, methodologies and baseline setting. Due to its cross-cutting nature DRR is interlinked with various SDGs (Table-1) beyond the explicit DRR targets set out. With most of the issues the linkage is two-fold; if DRR is not given prominent focus, achieving several of the SDG targets, such as ones related to poverty eradication, water, education, slums, and health, will be extremely challenging for the , country. Also, falling behind the set ambition level on many of the existing SDG targets that serve as underlying drivers of disaster risk, such as the ones related to poverty eradication, sustainable cities, food security, health, natural resources management, or climate change, will mean additional challenges in achieving the DRR targets.

At 48th annual meeting of World Economic Forum in Davos, the world leaders committed to ensure the beginning of a movement of globalization.[16] Achieving this target however is a real challenge unless an equitable, unexploited access to the common resources can be maintained across all sectors of the society. Hence, it is necessary to map out some of the key inter-linkages (Table-1) between disaster risk reduction and the 4 SDGs.

Disasters cause severe agricultural losses and hamper food security. According to FAO estimates, there has been a total of USD 4.9 billion in crop and livestock production losses caused by droughts in Africa alone between 2003 and 2013. Natural disasters also destroy critical agricultural, infrastructure and assets. They cause losses in the production of crops, livestock and fisheries, leading to serious damage to livelihoods. Food security also becomes questionable for millions of small farmers, pastoralists, fishers and forest-dependent tribes and communities over the globe while worst affecting the developing countries. SDG 2 and indicator 2.4 is hence one of the 4 SDG's related to DRR.

4.3 Measuring progress – target 1.5 , 2.4, 11.5 , 11.b and 13.1.

The Draft Mapping, Development Monitoring and Evaluation office of the Niti Aayog , GOI has mapped[17] the progress made so far by India SDG wise, indicating the Nodal and concerned ministries involved, , interventions made and centrally Sponsored schemes in progress. An attempt has been made to compile progress made (**Table-2**) relevant to DRR, SDG , target and indicator wise.

4.4 New solutions for measuring

As new technologies for data collection have become increasingly available and user-friendly, the disaster risk reduction community has been exploring these channels to complement and even bypass often arduous and expensive traditional data collection methods. In particular, the traditional and new data sources, including big data, could be brought together for better and faster data analysis in several phases of the disaster cycle. These new ways of data collection can be used in the full disaster management cycle to guide preparedness and early warning, impact and response as well as mitigation, risk and vulnerability monitoring.

ESSO-INCOIS (Earth System Science Organization- Indian National Centre for Ocean Information Services), Ministry of Earth Sciences, GOI provides an early warning alarm system for tsunami and other oceanic events[26,27] which was established in 1992.

Eco-DRR [Ecosystem-based disaster risk reduction (Eco-DRR)] can provide an effective tool for DRR by sustainable management, conservation and restoration of ecosystems. In agriculture dependent countries like India eco-conservation is an indigenous practice are linked to achieve the SDG **target 6.6** and **indicator 14.12**. International Union for Conservation of Nature advocates and suggests the benefits of Eco-DRR[28].

5. Disaster Reduction and Preparedness Index (DRPI)

Sustainable Development Solutions Network (SDSN) aims at two disaster-related **targets 1.5 and 11.5** which states, that "By 2030, significantly reduce the number of deaths and the number of people affected per 100,000 and decrease by [X] per cent the economic losses related to gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations[23].

Countries with very low risks, DRR measures do not play a significant role in implementing the SDGs, while for India there is always a prerequisite for achieving not only the DRR targets but also many other goals. Due to very different country risk profiles, differentiation at the national level is inevitable with DRR. Also, for some countries significant reductions in mortality and economic losses will be easier to achieve than for India, based on their GDP and the hazards they face.

Considering the above and the vast influence of disaster on many sectors of the economy and well-being of the citizens, construction of a **Disaster Reduction and Preparedness Index (DRPI) as a monitoring tool for DRR** to recognize the efforts made at the Central, State and District level yearly has been attempted by identifying Variables that need to be measured, under the 10 indicators(Table-3) and grouped under 5 criteria's.

Table-3: Criteria and Variables under DRR indicators.

	SDG & Targets	Indicator No.	Criteria	Variables	Scores
1	I & 1.5 11 & 11.5 13 & 13.1	1.5.1 11.5.1 13.1.1	Population affected/ exposed	1.Dead , 2. Missing 3.Injured, 4. Affected	4
2	1 & 1.5 11 & 11.5	1.5.2 11.5.2	Economic losses.	1.Compensation,Relief and Ex Gratia 2.finance for Infrastructure. 3. GSDP loss	3
3	1 & 1.5	1.5.3 13.1.2 11.b.2	Disaster Management Plan	1.State DM Plan 2.Institutional setup (N & S) 3.Budget Allocation 4.Finance spent	4
4	11.& 11.b	11.b.1	District plan	1. District DM plan 2. Capacity	2
5	2 & 2.4	2.4.1	Agri-Area	1.Vulnerable Agri-Area 2.District plan for Agri area 3.Agri GSDP loss.	3
Total	4 SDGs 5 Targets	10 Indicators	5 Criteria	16 Variables	16

*Measuring distance to the SDG targets-An assessment of where OECD countries stand, June-2017

After a careful study of the vast and varying methodologies, including the Environmental Performance Index (PC-EPI) evolved in 2013[24] and modified in 2018 (paper submitted[25]) in India, to recognize the efforts made by the States to arrest degradation of the environment, and databases on DRR, a methodology for **Disaster Reduction and Preparedness Index (DRPI)** has been evolved for adoption , which calculates DRPI Scores (Table-4) for the 16 Variables(data points) for the 10 DRR indicators, grouped under 5 Criteria ,nationally and for States. To start with, the 10 DRR indicators grouped under 5 criteria with 16 variables were chosen and the normal deviation and distance travelled method was used for variables for which standards/Norms Globally accepted, have been notified and in respect of variables which have no standards a method was evolved and these integrated to arrive at the composite Index.

The idea is that the 16 variables selected when combined could give a composite DRPI ranking of the states and could serve as a monitoring mechanism at the national and State level. The cumulative DRPI score is a measure of the current status of preparedness and planning for Disaster Management of the states i.e States with a score of 1 are characterized as well prepared, meet norms/ standard set/notified, including implementation of legislations, institutional mechanism and efforts towards DRR.

Table-2:- Sustainable Development Goals (SDGs), Nodal , Concerned Ministries , Targets, Indicators, CSS and Interventions

SDG No. & Description	Nodal Ministry	Concerned Ministry	Targets	Indicators	Related Centrally Sponsored Scheme	Related Intervention
SDG-1 -End poverty in all its forms everywhere	**Rural Development Ministry**	Home Affairs	1.5 By 2030, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related extreme events and other economic, social and environmental shocks and disasters	1.5.1: Number of deaths, missing persons and directly affected persons attributed to disasters per 100,000 population 1.5.2: Direct economic loss attributed to disasters in relation to global gross domestic product (GDP**).** 1.5.3: Number of countries with national and Local disaster risk reduction strategies [a]	1. National Rural Employment Guarantee Scheme (MGNREGA) 2. Deen Dayal Antyodaya Yojana (DAY) - NationalRuralLivelihood Mission(NRLM) & National Urban Livelihood Mission (NULM) 3. National Social Assistance Programme (NSAP	1)Pradhan Mantri Jan Dhan Yojana. 2) Pradhan Mantri Jeevan Jyoti Bima Yojana 3) Atal Pension Yojana (APY)
SDG-2 End hunger, achieve food security and improved nutrition and promote sustainable agriculture	**Agriculture & Farmers Welfare**	Agriculture & Farmers Welfare .	2.4 By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality	2.4.1 Proportion of Agri area under productive and sustainable agriculture**.**	1.Rashtriya Krishi Vikas Yojana (RKVY); and Krishi Unnati Schemes. **2.** Pradhan Mantri Fasal Bima Yojana (PMFBY). **3.** Rasthriya Pashudhan Vikas Yojana (White Revolution), the umbrella scheme. 4. Interest subsidy for short term credit of farmers. 5. Price Stabilisation Fund	

SDG-11 Make cities and human settlements inclusive, safe, resilient and sustainable	Urban Development Urban Development	Home Affairs Urban Development	11.5 By 2030, significantly reduce the number of deaths and the number of people affected and substantially decrease the direct economic losses relative to global gross domestic product caused by disasters, including water-related disasters, with a focus on protecting the poor and people in vulnerable situations 11.b By 2020, substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, resilience to disasters, and develop and implement, in line with the Sendai Framework for Disaster Risk Reduction 2015-2030, holistic disaster risk management at all levels	11.5.1: Number of deaths, missing persons and directly affected persons attributed to disasters per 100,000 population.[a] 11.5.2 Direct economic loss in relation to global GDP, including disaster damage to critical infrastructure and disruption of basic services [a] 11.b.1 Proportion of Local Governments that adopt and implement Locall disaster risk reduction strategies in line with the Sendai Framework for Disaster Risk Reduction 2015-2030.a 11.b.2 Number of countries with National and Local disaster risk reduction strategies [a]	1.Jawaharlal Nehru National Urban Renewal Mission (JNNURM)	1.Smart Cities Mission 2.Atal Mission for Rejuvenation and Urban Transformation (AMRUT)
SDG-13 Take urgent action to combat climate change and its impacts	MoEF&CC	**Home Affairs** MoEF&CC	13.1 Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries. 13.2 Integrate climate change measures into national policies, strategies and planning	13.1.1: Number of countries with National and Local disaster risk reduction strategies [a] 13.1.2: Number of deaths, missing persons and directly affected persons attributed to disasters per 100,000 population	(National Mission for a Green India, Integrated Development of Wildlife Habitats, Conservation of Natural Resources and Ecosystems	National Action Plan for Climate Change i.National Solar Mission,ii.NationalMission for Enhanced Energy Efficiency, iii.National Mission for Sustainable Habitat, iv.National Water Mission, v.National Mission for Sustainingthe Himalayan Ecosystem, vi.National Mission on Strategic Knowledge for Climate Change

a. An open-ended intergovernmental expert working group on indicators and terminology relating to disaster risk reduction established by the General Assembly (resolution 69/284) is developing a set of indicators to measure global progress in the implementation of the Sendai Framework. These indicators will eventually reflect the agreements on the Sendai Framework indicators.

Report of the Inter-Agency and Expert Group on Sustainable Development Goal Indicators (E/CN.3/2016/2/Rev.1)

In order, to compare available occurrence of disaster data, state wise, it became necessary to average out data for all variables during the period 2013-2015. It was felt that this could serve as the baseline hence forth, till a comprehensive data assessment mechanism can be evolved for the variables.

Table-4 , presents the DRPI scores and ranking of the States and UT's as of June 2017 (baseline 2013-15 , gap of 2 years) for the 5 criteria separately , based on arithmetic mean of scores of all the variables covered under each Criteria (**Category**) and ranking of states based on mean cumulative scores.(Fig-1)

Fig-1:- DRPI Scores and Ranking of States & UTs

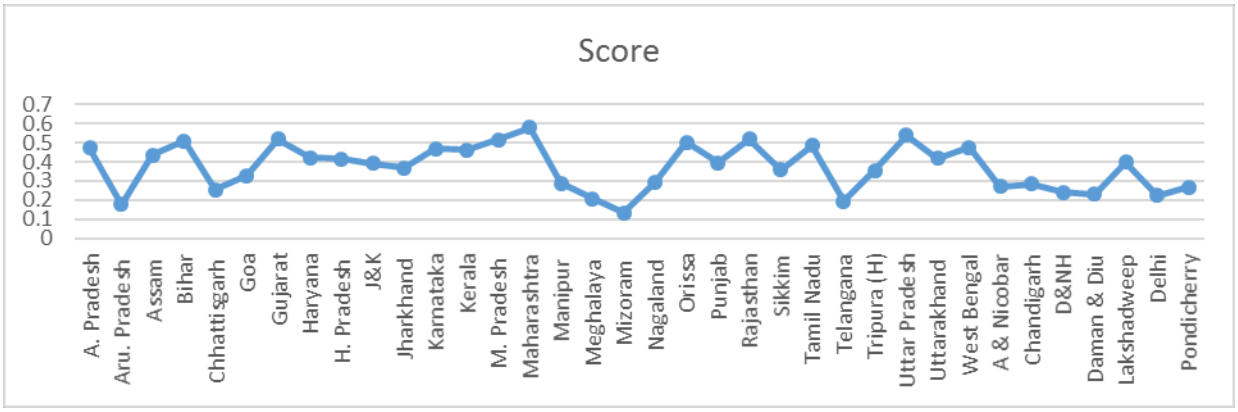


Table-4 :-DRPI Scores and Ranking

S.No	State/UT	Score	Rank
1	A. Pradesh	0.4705	10
2	Aru. Pradesh	0.1758	35
3	Assam	0.4358	13
4	Bihar	0.5086	6
5	Chhattisgarh	0.2535	29
6	Goa	0.3284	23
7	Gujarat	0.5184	4
8	Haryana	0.4210	14
9	H. Pradesh	0.4159	16
10	J&K	0.3901	19
11	Jharkhand	0.3667	20
12	Karnataka	0.4687	11
13	Kerala	0.4614	12
14	M. Pradesh	0.5165	5
15	Maharashtra	0.5793	1
16	Manipur	0.2867	25
17	Meghalaya	0.2062	33
18	Mizoram	0.1343	36
19	Nagaland	0.2958	24
20	Orissa	0.5020	7
21	Punjab	0.3960	18
22	Rajasthan	0.5197	3
23	Sikkim	0.3593	21
24	Tamil Nadu	0.4861	8
25	Telangana	0.1937	34
26	Tripura (H)	0.3545	22
27	Uttar Pradesh	0.5380	2
28	Uttarakhand	0.4201	15
29	West Bengal	0.4758	9
30	A & Nicobar	0.2723	27
31	Chandigarh	0.2854	26
32	D&NH	0.2409	30
33	Daman & Diu	0.2299	31
34	Lakshadweep	0.3982	17
35	Delhi	0.2253	32
36	Pondicherry	0.2685	28

With a DRPI score of 0.5793 being the highest Maharashtra followed by UP, Rajasthan, Gujarat , MP in that order have been ranked as the best performing states respectively.

The **population affected criteria** scores are depicted in **Table-4.1**, for all the states, the SDG index covered are 1.51, 11.5.1 and 13.1.1 and variables considered for measuring the performance are reduction in number of dead, missing , injured and affected, (from the baseline) in 2017.

Three variables; 1.compensation , relief and Ex gratia dispensed ,2.finance for infra and ,3. GDP loss from baseline based on SDG index 1.5.2 and 11.5.2 have been considered for the Criteria Economic Losses. **Table 4.2**

Under the Criteria; Disaster Management Plan , based on 1,5.3, 13.1.2 and 11.b.2 SDG indicators , status of N & SDM plan and Institutional setup, budget allocated and finance spent, average of 5 years(2010-15) have been selected as variables. Based on average and cumulative scores the states and UTs have been ranked (**Table-4.3**). Rajasthan, AP, Guj, Maharastra and M.P are ranked as number 1,2,3,4 and 5th.

The fourth criteria , District plan ,comprises of four variables namely status of District plans, esp disaster prone and capacity build up to reduction in disaster numbers from baseline,, reduction in economic losses and human lives.(**table-4.4**)

The fifth and the final Criteria is Agri-Area under the SDG index 2.4.1 and comprises of 4 variables; Agri Vulnerability, Disaster plan for Agri area affected due to disaster and GSDP loss due to disaster.(**Table-4.5**).

Taking into account the current coverage of data sets and the state of risk assessments, the use of baselines based on observed historical losses might prove to be the most feasible option for the moment. As we are aware, risk assessments and models based on scientific information provide countries immensely useful tools in other spheres of DRR planning and hence need to be discussed.

6. Disaster Score Card (DSC)

The draft Disaster Score Card (DSC) proposed for India in a study sponsored by the MHA[18], is designed to be a facilitating tool to identify the strong and weak areas of disaster risk management in each State and Union Territory of the country.

Applying a mix of tools, indicators and proxy indicators on which global database is available on a fairly large number of countries various think tanks have been quantifying the risks and resilience of countries and ranking them globally. A few

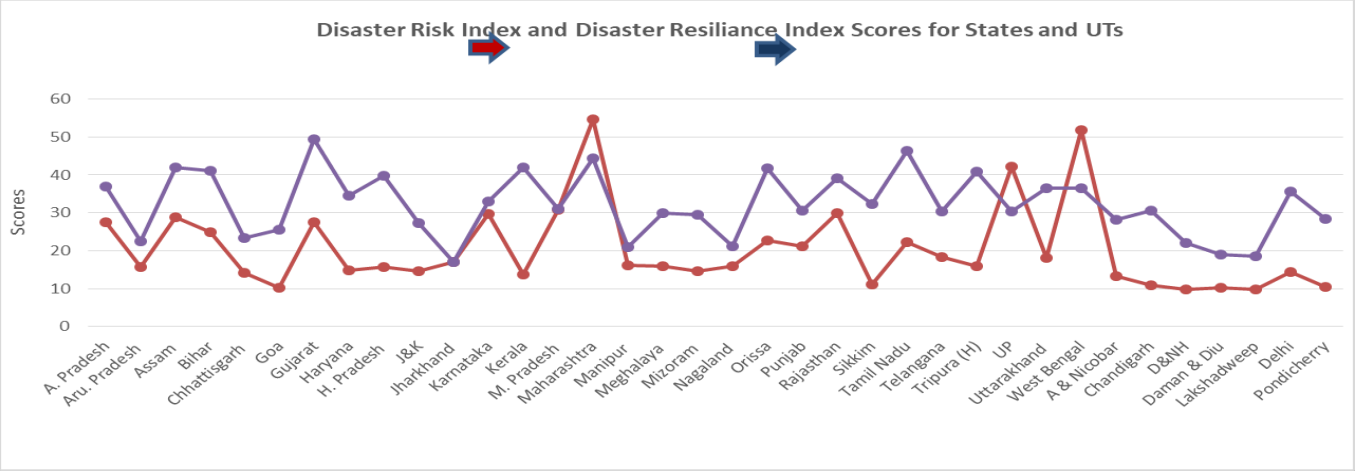
such initiatives include the works of UNU-EHS[19], Germanwatch[20], Maplecroft[21] and TERI[22]. While disaster risk and resilience indicators have been developed at global and national levels similar initiative are missing at the sub-national level.

The composite Disaster Score Card proposed for India factors both **Disaster risks and Disaster resilience**. Disaster Risk Index is calculated in two stages: (a) calculating the multiplier of hazards, vulnerabilities and risks; and (b) discounting the multiplier with capacities. Disaster resilience index is calculated by adding the scores obtained by States/ UTs on each of seven aggregate indicators on the basis of quantitative norms for evaluation and assigning weights on the scores as explained in methodology of the study. Scores obtained by the States/UTs were rescaled to(a) 10 to calculate 'capacity' for working out Disaster Risk Index and(b) 100 to calculate 'resilience' for working out Disaster Resilience Index.(Table-5)

Maharashtra has the highest Disaster Risk Index of 54.75 in a scale of 100, followed by West Bengal (51.78), Uttar Pradesh (42.24), Madhya Pradesh (30.79), Rajasthan (30.04), Karnataka (29.82), Assam (28.75), Andhra Pradesh (27.58), Gujarat (27.44), and Bihar(24.99).

Gujarat tops the list of States in disaster risk resilience with overall Disaster Risk Resilience Index of 49.3 in a scale of 100 followed by Tamil Nadu (46.3), Maharashtra (44.3), Assam and Kerala (41.9), Odisha (41.7), Bihar (41.2) and Tripura (40.8). Among the Union Territories Delhi tops with a score of 35.7. None of the States has scored the level of 50% in disaster resilience.(fig-2)

Fig-2:-. Disaster Risk Index and Disaster Resilience index Score card ranking of States & UTs



The national average score of disaster resilience is 32.17, with State average of 33.6 and UT average of 32.1. 13 States and 6 Union Territories score less than national average.

Table-5:- Disaster Risk Index and Disaster Resilience index Score card ranking of States & UTs

S.No	States	DR Index-100	RK	DRSi index-100	RK
1	A. Pradesh	27.58	8	37	11
2	Aru. Pradesh	15.63	21	22.6	26
3	Assam	28.75	7	41.9	4
4	Bihar	24.99	10	41.2	7
5	Chhattisgarh	14.2	26	23.4	25
6	Goa	10.35	29	25.6	24
7	Gujarat	27.44	9	49.3	1
8	Haryana	14.76	23	34.6	14
9	H. Pradesh	15.63	22	39.7	9
10	J&K	14.56	25	27.3	23
11	Jharkhand	17.03	16	17.1	29
12	Karnataka	29.82	6	32.9	15
13	Kerala	13.75	27	41.9	5
14	M. Pradesh	30.79	4	31	17
15	Maharashtra	54.75	1	44.3	3
16	Manipur	16.11	17	21	28
17	Meghalaya	15.88	20	30	21
18	Mizoram	14.71	24	29.6	22
19	Nagaland	15.92	19	21.2	27
20	Orissa	22.68	11	41.7	6
21	Punjab	21.29	13	30.6	18
22	Rajasthan	30.04	5	39.1	10
23	Sikkim	11.11	28	32.3	16
24	Tamil Nadu	22.36	12	46.3	2
25	Telangana	18.25	14	30.4	19
26	Tripura (H)	15.99	18	40.8	8
27	Uttar Pradesh	42.24	3	30.3	20
28	Uttarakhand	18.16	15	36.5	12
29	West Bengal	51.78	2	36.4	13
30	A & Nicobar	13.23	2	28.1	4
31	Chandigarh	10.94	3	30.6	2
32	D&NH	9.91	6	22	5
33	Daman & Diu	10.2	5	18.9	7
34	Lakshadweep	9.72	7	18.6	6
35	Delhi	14.43	1	35.7	1
36	Pondicherry	10.41	4	28.5	3

- **Scores less than National Average**

7. Modified MHA Disaster Score Card

An attempt is now being made by combining the DRI and DRSi scores to arrive at Disaster Score Board ranking of States & UTs. As can be seen, the DRI scores had to be reworked (DRI-C) and an average score (HVE+DRSI scores) calculated (Table-6) to rank the states and UTs. Maharashtra tops the states in DSc board score followed by West Bengal, Gujarat, Assam, UP and Tamil Nadu in that order. The MHA Disaster Score Board now proposed will help ranking the states based on the likely hazards and current preparedness yearly.

As per the DRI and DRSi score avg. detailed in the draft MHA report, Gujarat tops the list followed by Tamil Nadu, Maharashtra, Assam and Kerala.

Table-7 and Fig-3 compares both Disaster Reduction and Preparedness Index (DRPI) and MHA Disaster Score Card(Avg. of DRI(HVE) and DRSi scores) and Fig-3 ranking of the states.

Fig-3:- DRPI and MHA Disaster Score Card.

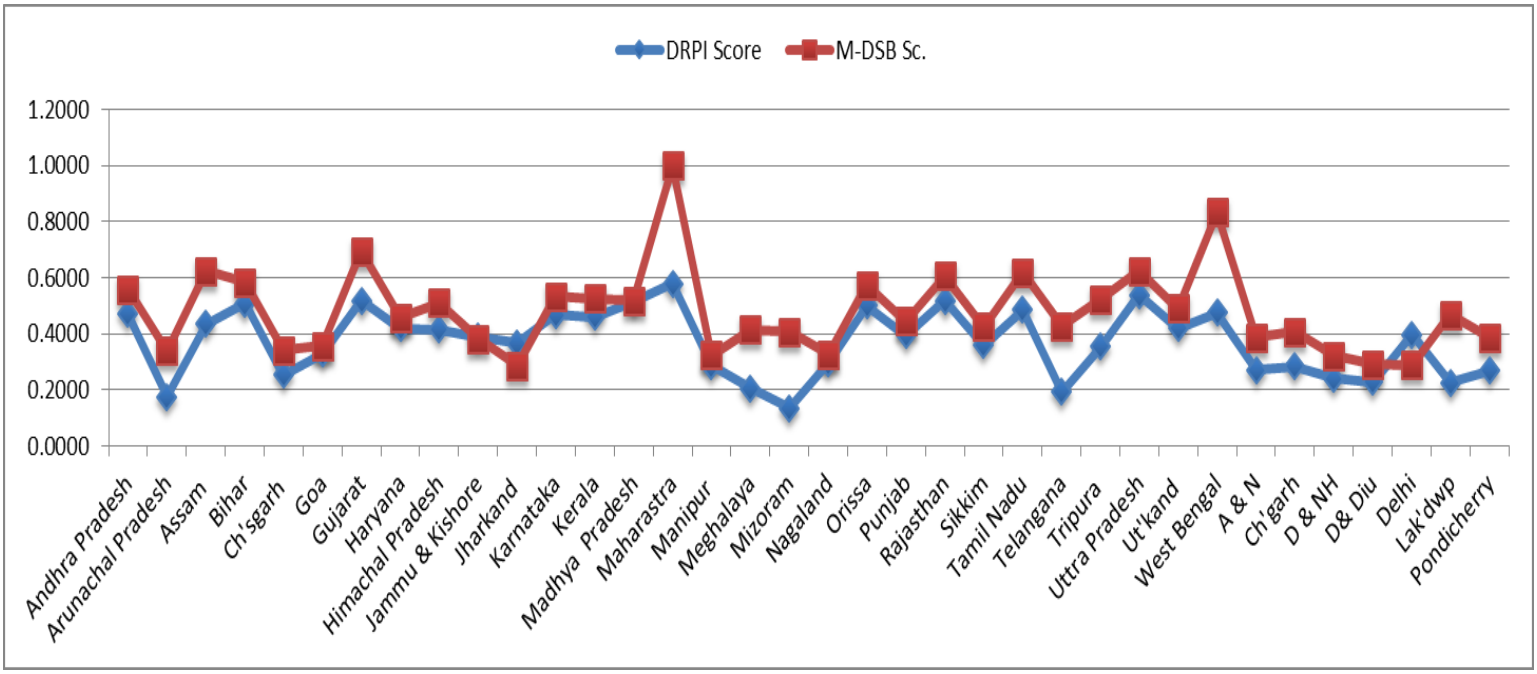


Table-6:-Reworked –(DRI-C)=HVE Score and Score Board Ranking of the States and UTs

N0.	States/Uts	HVE	DRSI	Score Board	Rk
1	A. Pradesh	19.70	37.00	28.35	10
2	Aru. Pradesh	11.70	22.60	17.15	30
3	Assam	21.40	41.90	31.65	4
4	Bihar	18.00	41.20	29.60	8
5	Chhattisgarh	11.30	23.40	17.35	29

6	Goa	10.60	25.60	18.10	28
7	Gujarat	21.00	49.30	35.15	3
8	Haryana	11.70	34.60	23.15	18
9	H. Pradesh	12.10	39.70	25.90	15
10	J&K	11.50	27.30	19.40	27
11	Jharkhand	12.00	17.10	14.55	36
12	Karnataka	21.10	32.90	27.00	11
13	Kerala	11.40	41.90	26.65	12
14	M. Pradesh	21.60	31.00	26.30	14
15	Maharashtra	56.90	44.30	50.60	1
16	Manipur	11.80	21.00	16.40	32
17	Meghalaya	12.00	30.00	21.00	22
18	Mizoram	11.60	29.60	20.60	24
19	Nagaland	11.80	21.20	16.50	31
20	Orissa	16.30	41.70	29.00	9
21	Punjab	14.60	30.60	22.60	19
22	Rajasthan	22.20	39.10	30.65	7
23	Sikkim	10.70	32.30	21.50	21
24	Tamil Nadu	16.40	46.30	31.35	6
25	Telangana	13.00	30.40	21.70	20
26	Tripura (H)	12.30	40.80	26.55	13
27	UP	32.90	30.30	31.60	5
28	Uttarakhand	13.20	36.50	24.85	16
29	West Bengal	48.10	36.40	42.25	2
30	A & Nicobar	11.10	28.10	19.60	25
31	Chandigarh	10.70	30.60	20.65	23
32	D&NH	10.60	22.00	16.30	33
33	Daman & Diu	10.60	18.90	14.75	34
34	Lakshadweep	10.60	18.60	14.60	35
35	Delhi	11.60	35.70	23.65	17
36	Pondicherry	10.60	28.50	19.55	26

Table-7:- DRPI Score and MHA Disaster Score Card.

S.No	State/UT	DRPI Score	RK	MHA-DSB Sc.	DSB RK
1	Andhra Pradesh	0.4705	10	0.5603	10
2	Arunachal Pradesh	0.1758	35	0.3389	30
3	Assam	0.4358	13	0.6255	4
4	Bihar	0.5086	6	0.5850	8
5	Chattisgarh	0.2535	29	0.3429	29
6	Goa	0.3284	23	0.3577	28
7	Gujarat	0.5184	4	0.6947	3
8	Haryana	0.4210	14	0.4575	18
9	Himachal Pradesh	0.4159	16	0.5119	15
10	Jammu & Kishore	0.3901	19	0.3834	27

11	Jharkhand	0.3667	20	0.2875	36
12	Karnataka	0.4687	11	0.5336	11
13	Kerala	0.4614	12	0.5267	12
14	Madhya Pradesh	0.5165	5	0.5198	14
15	Maharashtra	0.5793	1	1.0000	1
16	Manipur	0.2867	25	0.3241	32
17	Meghalaya	0.2062	33	0.4150	22
18	Mizoram	0.1343	36	0.4071	24
19	Nagaland	0.2958	24	0.3261	31
20	Orissa	0.5020	7	0.5731	9
21	Punjab	0.3960	18	0.4466	19
22	Rajasthan	0.5197	3	0.6057	7
23	Sikkim	0.3593	21	0.4249	21
24	Tamil Nadu	0.4861	8	0.6196	6
25	Telangana	0.1937	34	0.4289	20
26	Tripura	0.3545	22	0.5247	13
27	Uttra Pradesh	0.5380	2	0.6245	5
28	Ut'kand	0.4201	15	0.4911	16
29	West Bengal	0.4758	9	0.8350	2
30	A & N	0.2723	27	0.3874	25
31	Ch'garh	0.2854	26	0.4081	23
32	D & NH	0.2409	30	0.3221	33
33	D& Diu	0.2299	31	0.2915	34
34	Delhi	0.3982	17	0.2885	35
35	Lak'dwp	0.2253	32	0.4674	17
36	Pondicherry	0.2685	28	0.3864	26

8. Concluding Remarks

After a careful study of the vast and varying methodologies, including the Environmental Performance Index (PC-EPI) evolved in 2013 in India, updating suggested in 2018 and databases on DRR, a methodology for **Disaster Reduction and Preparedness Index (DRPI)** has been evolved for adoption , which calculates DRP Index Scores for the 16 Variables(data points) for the 10 DRR indicators, grouped under 5 Criteria nationally and for States. The DRP Index could serve as a monitoring tool, to rank states based on their DRR performance and also SDG goals.

The reworked Disaster Risk Index DRI Score-Capacity score (HVE) and the average score (HVE+DRSI) enabled evolving the **Disaster Score Board**. The draft Disaster Score card (DSC) proposed for India in the study sponsored by the MHA, is designed to be a facilitating tool to identify the strong and weak areas of disaster risk management in each State and Union Territory of the country. The MHA Disaster Score Board now proposed will help ranking the states based on the likely hazards and current

preparedness.

The paper also makes the case that effective disaster risk reduction measures will need to play a key role for disaster-prone states in the country in implementation of the post-2015 development agenda in order to prevent the hard-won development gains from being eroded by disasters. As new technologies for data collection have become increasingly available and user-friendly, Monitoring of progress towards proposed goals and targets will benefit from high quality loss data, which is also important for DRR planning and for National submissions under Sendai Framework and SDGs

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Table-4.1 & 4.2:- Population exposed Scores and -Economic Losses

		4.1-Population exposed Scores					4.2-Economic Losses					
S.No	States	Population	Popu.Exp	**Score**	**RK**		State/UT	Compn	Fin-infra	GDP loss	**Avg Score**	**RK**
1	A. P	49386799	3960821	**0.0802**	**12**		A. P	0.33	0.6	0.5518	**0.4939**	**8**
2	Aru. P.	1383727	4428	**0.0032**	**35**		Aru. P.	0.66	0.2	0.1007	**0.3202**	**22**
3	Assam	31205576	2312333	**0.0741**	**16**		Assam	0.66	0.4	0.3361	**0.4654**	**13**
4	Bihar	104099452	23484836	**0.2256**	**3**		Bihar	0.5	0.6	0.4364	**0.5121**	**6**
5	Ch'sgarh	25545198	1180188	**0.0462**	**20**		Ch'sgarh	0.33	0.4	0.3608	**0.3636**	**18**
6	Goa	1458545	23191	**0.0159**	**26**		Goa	0.33	0.2	0.1646	**0.2315**	**27**
7	Guj.	60439692	5481880	**0.0907**	**9**		Guj.	0.5	0.4	0.7184	**0.5395**	**5**
8	Haryana	25351462	2033187	**0.0802**	**13**		Haryana	0.33	0.2	0.4921	**0.3407**	**20**
9	H. P	6864602	132487	**0.0193**	**25**		H. P	0.33	0.2	0.2374	**0.2558**	**26**
10	J&K	12541302	242047	**0.0262**	**23**		J&K	0.33	0.6	0.2438	**0.3913**	**17**
11	Jh'nd	32988134	2563178	**0.0777**	**15**		Jh'nd	0.33	0.2	0.3398	**0.2899**	**23**
12	Kar.	61095297	5669644	**0.0928**	**8**		Kar.	0.33	0.4	0.7125	**0.4808**	**11**
13	Kerala	33406061	3764863	**0.1127**	**7**		Kerala	0.33	0.6	0.5271	**0.4857**	**9**
14	M. P	72626809	6318532	**0.0870**	**10**		M. P	1	0.4	0.504	**0.6347**	**2**
15	Mah.	112374333	15136823	**0.1347**	**5**		Mah.	0.33	0.6	0.9995	**0.6432**	**1**
16	Manipur	2855794	36269	**0.0127**	**29**		Manipur	0.33	0.4	0.098	**0.2760**	**25**
17	Meg.	2966889	39163	**0.0132**	**28**		Meg.	0.33	0.2	0.1134	**0.2145**	**28**
18	Miz.	1097206	5486	**0.0050**	**33**		Miz.	0.33	0.2	0.0875	**0.2058**	**31**
18	Nag.	1978502	20181	**0.0102**	**31**		Nag.	0.33	0.2	0.0995	**0.2098**	**30**
20	Orissa	41974218	2967577	**0.0707**	**17**		Orissa	0.5	0.6	0.4131	**0.5044**	**7**
21	Punjab	27743338	2280502	**0.0822**	**11**		Punjab	0.66	0.2	0.4421	**0.4340**	**15**
22	Raj.	68548437	5339923	**0.0779**	**14**		Raj.	0.33	0.4	0.5795	**0.4365**	**14**
23	Sikkim	610577	2931	**0.0048**	**34**		Sikkim	0.5	0.4	0.092	**0.3307**	**21**
24	T N	72147030	9595555	**0.1330**	**6**		T N	0.33	0.6	0.7616	**0.5639**	**4**
25	Telangana	35193978	2431904	**0.0691**	**18**		Telangana	0.33	0.4	0.5323	**0.4208**	**16**
26	Tripura	3673917	87807	**0.0239**	**24**		Tripura	0.5	0.2	0.1306	**0.2769**	**24**
27	UP	199812341	54089201	**0.2707**	**2**		UP	0.66	0.4	0.748	**0.6027**	**3**
28	Ut'kand	10086292	292502	**0.0290**	**22**		Ut'kand	0.5	0.6	0.2966	**0.4655**	**12**
29	W B	91276115	18592945	**0.2037**	**4**		W B	0.33	0.4	0.7205	**0.4835**	**10**
30	A & N	380581	1066	**0.0028**	**36**		A & N	0.5	0	0.0544	**0.1848**	**32**
31	Ch'garh	1055450	69343	**0.0657**	**19**		Ch'garh	0.33	0	0.1204	**0.1501**	**33**
32	D & NH	343709	3540	**0.0103**	**30**		D & NH	0.33	0	0.0349	**0.1216**	**34**
33	D& Diu	243247	3746	**0.0154**	**27**		D& Diu	0.33	0	0.023	**0.1177**	**35**
34	Delhi	16787941	4866824	**0.2899**	**1**		Delhi	0.33	0.2	0.5249	**0.3516**	**19**
35	Lak'dwp	64473	503	**0.0078**	**32**		Lak'dwp	0.33	0	0.0143	**0.1148**	**36**
36	Pondi	1247953	46798	**0.0375**	**21**		Pondi	0.33	0.2	0.111	**0.2137**	**29**
		1210854977	173082204					Relief +ex gratia				

Table-4.3 & 4.4:- Disaster Management Plan and District Disaster Plan

	4.3-Disaster Management Plan					
States/Uts	S Plan	Inst. Setup	Budget	Expdt	**Avg.Score**	**Rk**
A. P	1	1	0.8472	1	**0.9618**	**2**
Aru. P.	0	0	0.0612	0	**0.0153**	**33**
Assam	1	1	0.4391	1	**0.8598**	**11**
Bihar	1	1	0.5569	1	**0.8892**	**8**
Ch'sgarh	0	0	0.2519	0	**0.0630**	**32**
Goa	1	1	0.0049	1	**0.7512**	**24**
Guj.	1	1	0.836	1	**0.9590**	**3**
Haryana	1	1	0.3212	1	**0.8303**	**14**
H. P	1	1	0.2177	1	**0.8044**	**18**
J&K	1	1	0.2871	1	**0.8218**	**15**
Jh'nd	1	1	0.4319	1	**0.8580**	**12**
Kar.	1	1	0.268	1	**0.8170**	**16**
Kerala	1	1	0.2182	1	**0.8046**	**17**
M. P	1	1	0.6539	1	**0.9135**	**5**
Mah.	1	1	0.737	1	**0.9343**	**4**
Manipur	1	1	0.012	1	**0.7530**	**22**
Meg.	0	0	0.0244	0	**0.0061**	**34**
Miz.	0	0	0.0142	0	**0.0036**	**35**
Nag.	1	1	0.0083	1	**0.7521**	**23**
Orissa	1	1	0.6519	1	**0.9130**	**6**
Punjab	1	1	0.3711	1	**0.8428**	**13**
Raj.	1	1	1	1	**1.0000**	**1**
Sikkim	1	1	0.0379	1	**0.7595**	**20**
T N	1	1	0.4887	1	**0.8722**	**10**
Telangana	0	0	0	0	**0.0000**	**36**
Tripura	1	1	0.0321	1	**0.7580**	**21**
UP	1	1	0.6416	1	**0.9104**	**7**
Ut'kand	1	1	0.1959	1	**0.7990**	**19**
W B	1	1	0.5075	1	**0.8769**	**9**
A & N	0.41	0.34	0.2400	1	**0.4975**	**28**
Ch'garh	0.48	0.4	0.2200	1	**0.5250**	**26**
D & NH	0.34	0.28	0.1600	1	**0.4450**	**29**
D& Diu	0.22	0.26	0.1600	1	**0.4100**	**30**
Delhi	0.5	0.48	0.2600	1	**0.5600**	**25**
Lak'dwp	0.19	0.28	0.1400	1	**0.4025**	**31**
Pondi	0.42	0.36	0.2300	1	**0.5025**	**27**

	4.4-District Disaster plan			
State/UT	Dist Plan	capacity	**Avg. Score**	**Rk**
A. P	0.35	0.37	**0.3600**	**22**
Aru. P.	0.4	0.226	**0.3130**	**26**
Assam	0.55	0.419	**0.4845**	**8**
Bihar	0.55	0.412	**0.4810**	**10**
Ch'sgarh	0.5	0.234	**0.3670**	**19**
Goa	0.3	0.256	**0.2780**	**28**
Guj.	0.65	0.493	**0.5715**	**5**
Haryana	0.6	0.364	**0.4820**	**9**
H. P	0.9	0.397	**0.6485**	**1**
J&K	0.45	0.273	**0.3615**	**21**
Jh'nd	0.3	0.171	**0.2355**	**36**
Kar.	0.6	0.329	**0.4645**	**11**
Kerala	0.55	0.419	**0.4845**	**7**
M. P	0.5	0.31	**0.4050**	**17**
Mah.	0.7	0.443	**0.5715**	**4**
Manipur	0.3	0.21	**0.2550**	**32**
Meg.	0.6	0.3	**0.4500**	**13**
Miz.	0.6	0.296	**0.4480**	**14**
Nag.	0.3	0.212	**0.2560**	**31**
Orissa	0.8	0.417	**0.6085**	**3**
Punjab	0.2	0.306	**0.2530**	**33**
Raj.	0.6	0.391	**0.4955**	**6**
Sikkim	0.4	0.323	**0.3615**	**20**
T N	0.4	0.463	**0.4315**	**16**
Telangana	0.3	0.304	**0.3020**	**27**
Tripura	0.85	0.408	**0.6290**	**2**
UP	0.4	0.303	**0.3515**	**24**
Ut'kand	0.5	0.365	**0.4325**	**15**
W B	0.55	0.364	**0.4570**	**12**
A & N	0.4	0.281	**0.3405**	**25**
Ch'garh	0.4	0.306	**0.3530**	**23**
D & NH	0.3	0.22	**0.2600**	**30**
D& Diu	0.3	0.189	**0.2445**	**34**
Delhi	0.4	0.357	**0.3785**	**18**
Lak'dwp	0.35	0.186	**0.2680**	**29**
Pondi	0.2	0.285	**0.2425**	**35**

Table- 4.5:- Agriculture Area

4.5 Agriculture Area									
State/UT	Ag.V 10	score	Dist	Ag.D.Plan	score	GSDP loss	Score	**Avg.Sc**	**RK**
A. P	2.96	0.2960	13	13	1	97211	0.0734	**0.4565**	**6**
Aru. P.	0.15	0.0150	21	14	0.667	245.83	0.0002	**0.2273**	**32**
Assam	2.06	0.2060	33	22	0.667	16435.26	0.0124	**0.2950**	**30**
Bihar	2.84	0.2840	38	38	1.000	28855.6	0.0218	**0.4353**	**7**
Ch'sgarh	2.65	0.2650	27	27	1.000	23708.72	0.0179	**0.4276**	**10**
Goa	0.91	0.0910	2	2	1.000	6493.76	0.0049	**0.3653**	**19**
Guj.	4.52	0.4520	33	25	0.758	111687.52	0.0844	**0.4313**	**8**
Haryana	2.14	0.2140	22	19	0.864	50147.16	0.0379	**0.3718**	**16**
H. P	0.45	0.0450	12	12	1.000	11742.92	0.0089	**0.3513**	**22**
J&K	0.41	0.0410	22	22	1.000	11415.88	0.0086	**0.3499**	**23**
Jh'nd	0.98	0.0980	24	24	1.000	25597.88	0.0193	**0.3724**	**15**
Kar.	4.38	0.4380	30	29	0.967	80194.8	0.0606	**0.4884**	**5**
Kerala	2.14	0.2140	14	14	1.000	58829.96	0.0444	**0.4195**	**11**
M. P	6.23	0.6230	52	50	0.962	56361.2	0.0426	**0.5424**	**4**
Mah.	7.51	0.7510	36	33	0.917	225408.68	0.1703	**0.6126**	**1**
Manipur	0.34	0.0340	16	6	0.375	2109.8	0.0016	**0.1369**	**34**
Meg.	0.4	0.0400	11	11	1.000	3103.8	0.0023	**0.3474**	**24**
Miz.	0.26	0.0260				1404.76	0.0011	**0.0090**	**36**
Nag.	0.23	0.0230	11	8	0.727	2626.12	0.0020	**0.2508**	**31**
Orissa	2.13	0.2130	30	30	1.000	36587.32	0.0276	**0.4135**	**12**
Punjab	2.07	0.2070	22	19	0.864	43807.12	0.0331	**0.3679**	**17**
Raj.	7.18	0.7180	33	33	1.000	63790.72	0.0482	**0.5887**	**2**
Sikkim	0.19	0.0190	4	4	1.000	1441.44	0.0011	**0.3400**	**26**
T N	2.33	0.2330	32	31	0.969	116633.72	0.0881	**0.4300**	**9**
Telangana	2.37	0.2370	31	9	0.290	4380.6	0.0033	**0.1769**	**33**
Tripura	0.39	0.0390	8	1	0.125	118513.08	0.0895	**0.0845**	**35**
UP	6.52	0.6520	75	75	1.000	16397.08	0.0124	**0.5548**	**3**
Ut'kand	0.51	0.0510	13	13	1.000	95156.32	0.0719	**0.3743**	**14**
W B	2.91	0.2910	23	18	0.783	1031.52	0.0008	**0.3581**	**21**
A & N	0.08	0.0080	3	3	1.000	49.6	0.0000	**0.3360**	**27**
Ch'garh	0	0.0000	1	1	1.000		0.0000	**0.3333**	**29**
D & NH	1.03	0.1030	1	1	1.000	251.32	0.0002	**0.3677**	**18**
D& Diu	0.85	0.0850	2	2	1.000	90.00	0.0001	**0.3617**	**20**
Delhi	2.25	0.2250	11	11	1.000	11125.35	0.0084	**0.4111**	**13**
Lak'dwp		0.0000	1	1	1.000		0.0000	**0.3333**	**28**
Pondi	0.39	0.0390	4	4	1.000	939.47	0.0007	**0.3466**	**25**
						1323775.31			

Disaster Reduction and Preparedness Index (DRPI) a tool to Monitor progress made by the states in India in Disaster Risk Reduction and related Sustainable Development Goals (SDGs)

Indrani Chandrasekharan[a] and Bhagyam Chandrasekharan[b],

Contact Details of Authors

1. **Dr. Indrani Chandrasekharan**
   Former Adviser Planning Commission
   9048, C-9, Vasant Kunj, New Delhi
   Telefax: 91-11-26125129
   Mail: indusekh@gmail.com

2. **Dr Bhagyam Chandrasekharan**
   Knowledge Management Analyst,
   World Bank Group, Chennai, India
   Telefax: 91-44-24446193
   Mail :bchandrasekharan@worldbank.com

(Indrani Chandrasekharan),011-26125129

Sendai Framework Indicators

A set of 38 indicators was identified to measure global progress in the implementation of the Sendai Framework for Disaster Risk Reduction. The indicators will measure progress in achieving the global targets of the Sendai Framework, and determine global trends in the reduction of risk and losses.

Global target A: Substantially reduce global disaster mortality by 2030, aiming to lower average per 100,000 global mortality between 2020-2030 compared with 2005-2015.	
A-1 (compound)	Number of deaths and missing persons attributed to disasters, per 100,000 population.
A-2	Number of deaths attributed to disasters, per 100,000 population.
A-3	Number of missing persons attributed to disasters, per 100,000 population.
Global target B: Substantially reduce the number of affected people globally by 2030, aiming to lower the average global figure per 100,000 between 2020-2030 compared with 2005-2015.	
B-1 (compound)	Number of directly affected people attributed to disasters, per 100,000 population.
B-2	Number of injured or ill people attributed to disasters, per 100,000 population.
B-3	Number of people whose damaged dwellings were attributed to disasters.
B-4	Number of people whose destroyed dwellings were attributed to disasters.
B-5	Number of people whose livelihoods were disrupted or destroyed, attributed to disasters.
Global target C: Reduce direct disaster economic loss in relation to global gross domestic product (GDP) by 2030.	
C-1 (compound)	Direct economic loss attributed to disasters in relation to global gross domestic product.
C-2	Direct Agricultural loss attributed to disasters. *Agriculture is understood to include the crops, livestock, fisheries, apiculture, aquaculture and forest sectors as well as associated facilities and infrastructure.*
C-3	Direct economic loss to all other damaged or destroyed productive assets attributed to disasters. .
C-4	Direct economic loss in the housing sector attributed to disasters.
C-5	Direct economic loss resulting from damaged or destroyed critical

	infrastructure attributed to disasters.
C-6	Direct economic loss to cultural heritage damaged or destroyed attributed to disasters.
Global target D: Substantially reduce disaster damage to critical infrastructure and disruption of basic services, among them health and educational facilities, including through developing their resilience by 2030	
D-1 (compound)	Damage to critical infrastructure attributed to disasters.
D-2	Number of destroyed or damaged health facilities attributed to disasters.
D-3	Number of destroyed or damaged educational facilities attributed to disasters.
D-4	Number of other destroyed or damaged critical infrastructure units and facilities attributed to disasters.
D-5 (compound)	Number of disruptions to basic services attributed to disasters.
D-6	Number of disruptions to educational services attributed to disasters.
D-7	Number of disruptions to health services attributed to disasters.
D-8	Number of disruptions to other basic services attributed to disasters.
Global target E: Substantially increase the number of countries with national and local disaster risk reduction strategies by 2020.	
E-1	Number of countries that adopt and implement national disaster risk reduction strategies in line with the Sendai Framework for Disaster Risk Reduction 2015-2030.
E-2	Percentage of local governments that adopt and implement local disaster risk reduction strategies in line with national strategies.
Global target F: Substantially enhance international cooperation to developing countries through adequate and sustainable support to complement their national actions for implementation of this framework by 2030.	
F-1	Total official international support, (official development assistance (ODA) plus other official flows), for national disaster risk reduction actions.
F-2	Total official international support (ODA plus other official flows) for national disaster risk reduction actions provided by multilateral agencies.
F-3	Total official international support (ODA plus other official flows) for national disaster risk reduction actions provided bilaterally.
F-4	Total official international support (ODA plus other official flows) for the transfer and exchange of disaster risk reduction-related technology.
F-5	Number of international, regional and bilateral programmes and initiatives for the transfer and exchange of science, technology and innovation in disaster risk reduction for developing countries.

F-6	Total official international support (ODA plus other official flows) for disaster risk reduction capacity-building.
F-7	Number of international, regional and bilateral programmes and initiatives for disaster risk reduction-related capacity-building in developing countries.
F-8	Number of developing countries supported by international, regional and bilateral initiatives to strengthen their disaster risk reduction-related statistical capacity.
Global target G: Substantially increase the availability of and access to multi-hazard early warning systems and disaster risk information and assessments to the people by 2030.	
G-1 (compound G2-G5)	Number of countries that have multi-hazard early warning systems.
G-2	Number of countries that have multi-hazard monitoring and forecasting systems.
G-3	Number of people per 100,000 that are covered by early warning information through local governments or through national dissemination mechanisms.
G-4	Percentage of local governments having a plan to act on early warnings.
G-5	Number of countries that have accessible, understandable, usable and relevant disaster risk information and assessment available to the people at the national and local levels.
G-6	Percentage of population exposed to or at risk from disasters protected through pre-emptive evacuation following early warning.