

Assessing climate-induced migration in India data sources and scenarios

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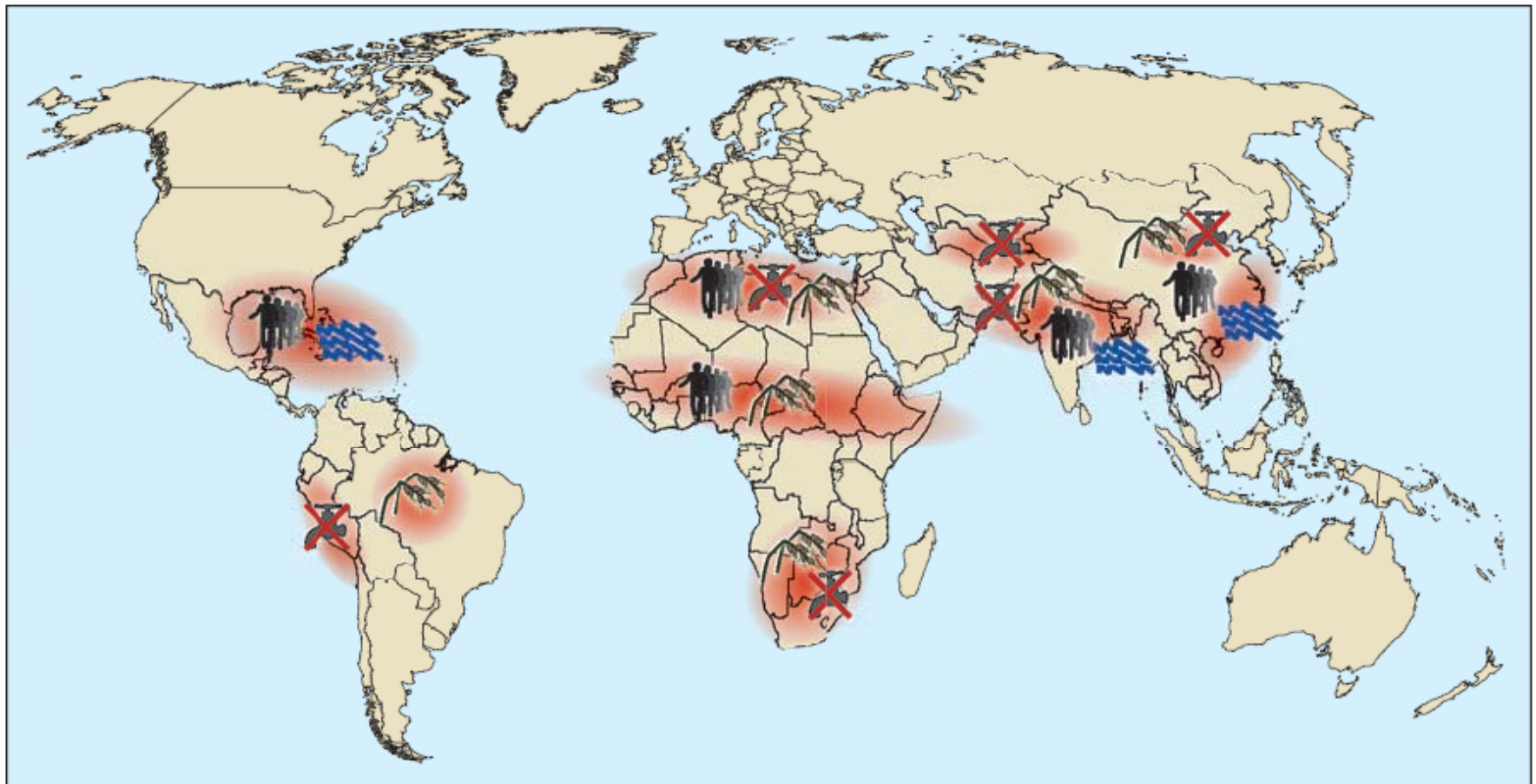
CC And Migration Pathways

CC is predicted to lead to more migration by

- reducing agricultural potential,
- increasing extreme weather events
- destroying low-lying coastal areas

Major concerns in India are

- Sudden onset events such as glacial lake bursts, floods and cyclones likely to impact the Northeast and Himalayan regions of the country as well as the densely populated flood plains of major rivers (TERI/DFID 2009, Revi 2009). Glacial retreat in the Himalayas will jeopardize the water supply for millions
- Cyclones and storm surges could devastate coastal cities including the mega cities of Mumbai and Chennai, as well as other million-plus cities such as Vishakhapatnam and Surat; cities will receive migrants from rural areas where livelihoods are damaged by climate change . This is likely to put greater pressure on scarce housing, water, sanitation facilities, and energy service (Kelkar and Bhadwal 2007).



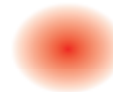
Conflict constellations in selected hotspots



Climate-induced degradation of freshwater resources



Climate-induced decline in food production



Hotspot



Climate-induced increase in storm and flood disasters



Environmentally-induced migration

Figure 1

Security risks associated with climate change: Selected hotspots. The map only shows the regions which are dealt with in this report and which could develop into crisis hotspots.

Source: WBGU

CC Impacts in India (contd)

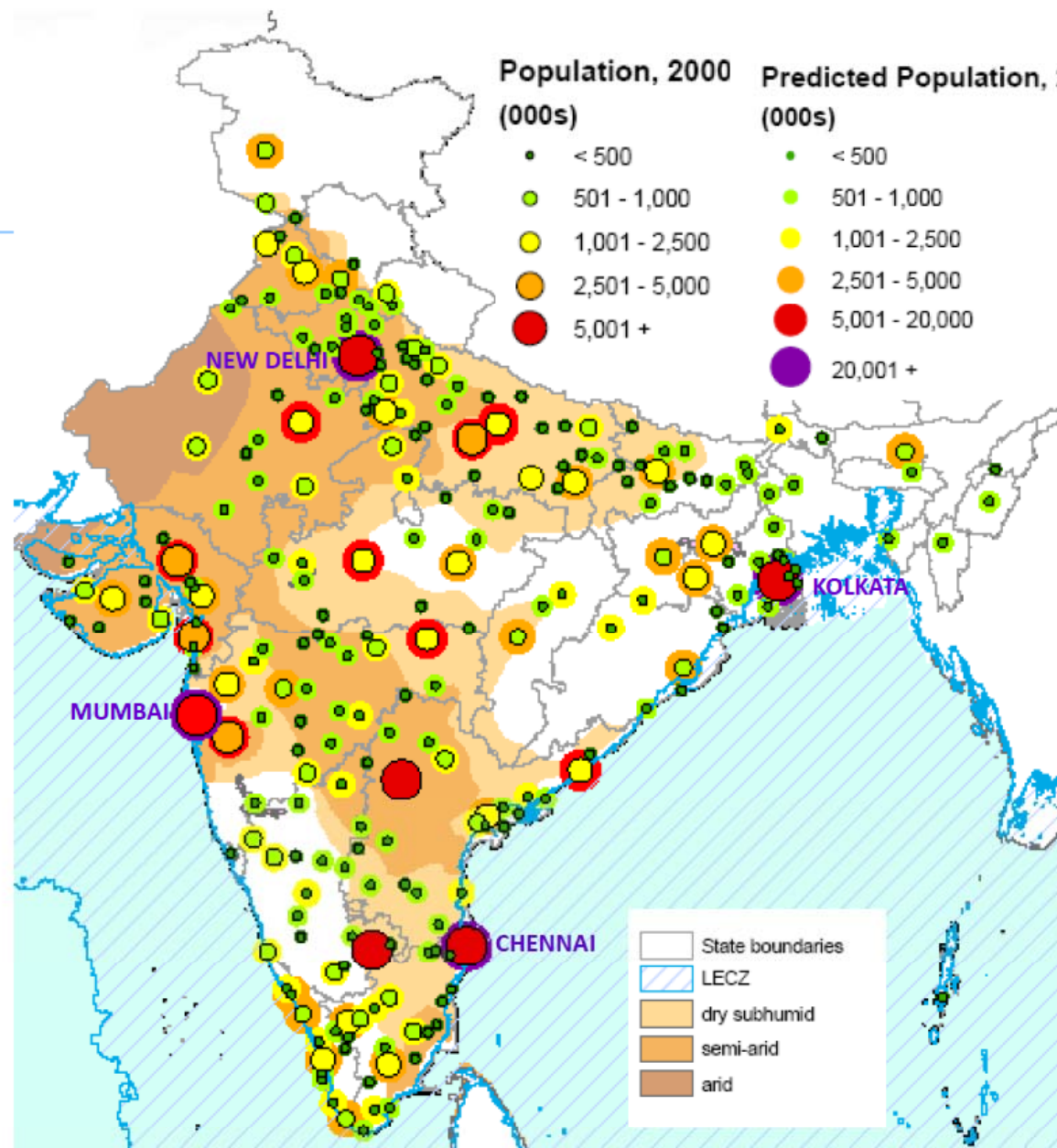
- Sea level rise and cyclones will affect the Bay of Bengal especially the Sunderbans mangroves (Brown 2008: 12; Morton, Boncour & Laczko et al. 2008) where 88% of the people depend on cultivation and forestry. Andhra Pradesh was hit by a cyclone in 1977 killing more than 14000 people; in 1999, Orissa was hit by a super-cyclone killing over 10,000 people. Many more were displaced (Rajan 2011).
- Flooding is likely to increase along major rivers such as the Ganges, the Brahmaputra in the north; Mahanadi, Godavari, Krishna in the south; Indus in the west; and along the northeastern and eastern regions from Assam and West Bengal to Andhra Pradesh and Tamil Nadu (Revi 2008). Northern and west India have already been exposed to frequent floods (De Dube and Prakasa Rao 2005).

CC Impacts in India (contd)

- Gradual onset changes to the annual monsoon will affect agriculture; drought and water stress likely (Black et al 2008; German Advisory Council on Global Change, 2008) It has been estimated that climate change could lead to a decline of around 20 million tonnes (25%) in rice production and over 30 million tonnes in wheat (30%) in India during 2000–2050 (Rosegrant et al. 2009)
- Longer and more frequent droughts and water stress have been reported in western and central India (Mall et al. 2006). Drought is a known driver of seasonal migration (Rogaly et al 2002; de Haan et al 2003).

City size: India, 2000-2050

- In 2000, India has 6 cities of 5M+
- By 2050, India will have 4 20M+ cities
 - 3 of these are coastal
- And, another 11 cities of over 5M persons
 - All of which are either in arid or coastal zones!



Combining Migration Statistics With Climate Data

- It has been suggested that population data when overlaid with environmental data could provide a useful way of assessing climate induced migration
- Censuses are an essential source for the identification of populations vulnerable to Climate change and environmental disasters (Balk and Yetman, 2004)
- Censuses provide useful information for the measurement of internal migration (Rodriguez and Busso, 2009).

Estimates Of Climate-induced Migration In India

Migrants due to Sea Level Rise (TERI and Indian Census data)

- Greenpeace India estimates that 125 million people would be displaced by the end of the Century if its business as usual.
- If temperature increase is limited to 2 degrees then 5 million will be displaced.

Migrants (assuming phased movement)			
India			
	2100 1m	2100 3m	2100 5m
2010	23,723	33212	42,701
2015	36,850	51591	66,332
2020	149,675	209545	269,415
2025	316,617	443264	569,911
2030	589,419	825186	1,060,954
2035	1,209,244	1692942	2,176,640
2040	2,221,491	3110088	3,998,684
2045	3,607,278	5050189	6,493,100
2050	4,365,833	6112166	7,858,499
2055	5,259,326	7363057	9,466,787
2060	6,313,208	8838492	11,363,775
2065	7,557,351	10580292	13,603,232
2070	9,026,801	12637521	16,248,241
2075	10,762,637	15067691	19,372,746
2080	12,812,968	17938156	23,063,343
2085	15,234,067	21327694	27,421,321
2090	18,091,665	25328331	32,564,997
2095	21,462,425	30047395	38,632,365
2100	24,027,847	33638986	43,250,124

Regions That Will Experience Greatest Outmigration Due To Drought And Sea-Level Rise

Vulnerable Region	Migrant Levels in 2100
West Bengal	~10 million
Coastal Maharashtra (around Mumbai)	~10-12 million
Coastal Tamil Nadu	~10 million
Coastal Andhra Pradesh	~6 million
Gujarat	~5.5 million
Coastal Orissa	~4 million
Western Rajasthan	~1.4 million
Northern Karnataka	~1.3 million
Madhya Pradesh	~1.2 million
Interior Maharashtra	~1 million
Northern Andhra Pradesh	~1 million
Southern Bihar	~1 million

- Up to 80 million people living along the coast may be forced to migrate inland as a result of SLR. In case of a 3 to 5 metre sea level rise, Mumbai and Kolkata could be significantly de-populated. (India Together 2010)

Source: Greenpeace (2008) Climate Migrants in South Asia: Estimates and Solutions

Uncertainty In Predictions

It is difficult to separate out climate change from other drivers of migration. Climate induced migration will depend on a number of factors including:

- The quantity of future greenhouse gas emissions.
- The rate of future population growth and distribution.
- The effectiveness of local and national adaptation strategies (Brown 2008).

Sources of Migration Data in India

Census Data

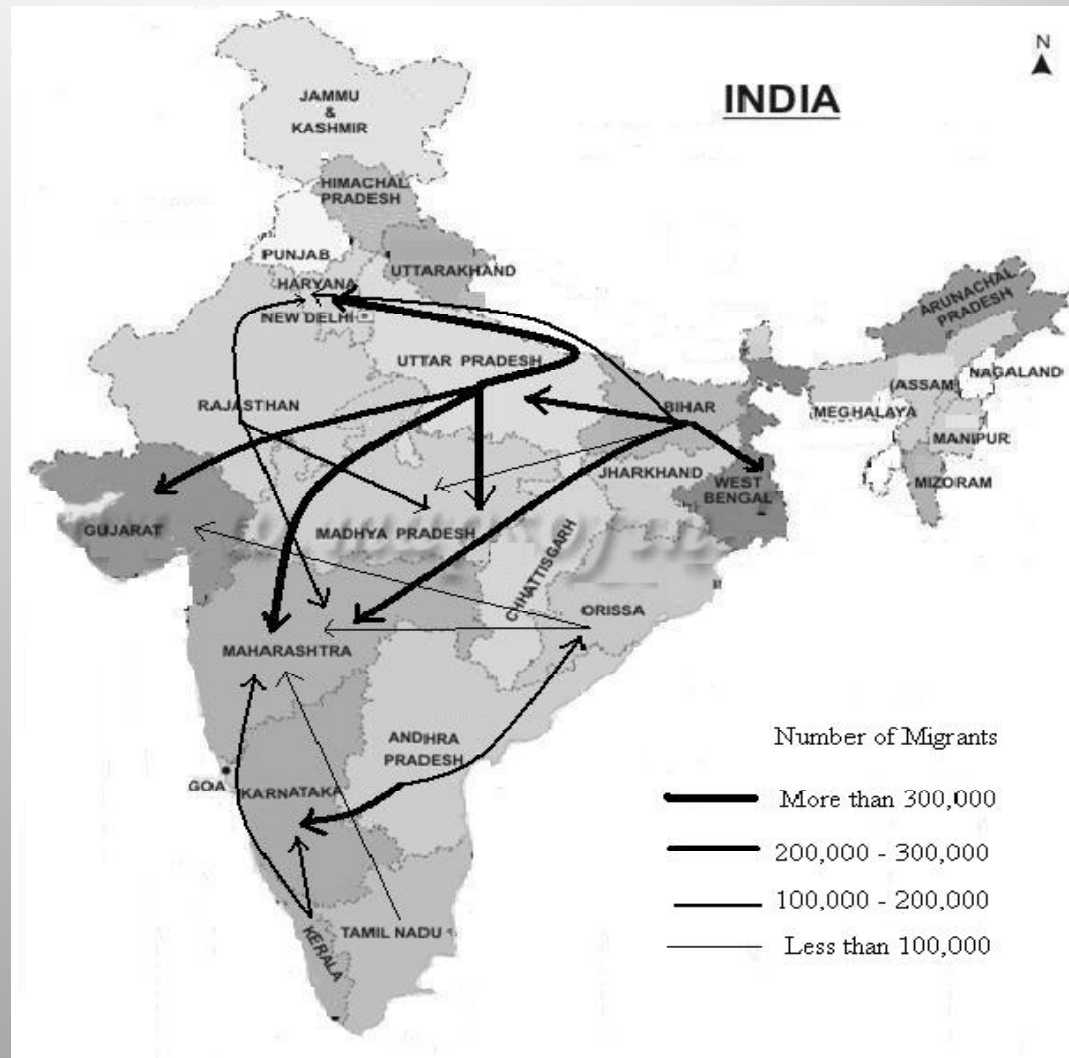
- **Rich source of information on demographic and other socio-economic variables:** the data allow the observation of population growth, births, deaths, female-male ratios, education and literacy, occupation, work participation rate, migration and urbanization, and how and why they vary over time and space, using the district as the unit of analysis.
- **No information on income, consumption levels, or poverty:** need to integrate it with other sources of information.
- **Definition of Migrant:** A person who has moved from one politically defined area to another similar area, provided his/her movement is not of purely temporary nature on account of casual leave, visits, tours, etc.
- **Possibility to observe internal migratory flows** within and across different states.
- However **one major issue** with the Indian census data is that it clubs movement for different purposes together. Therefore the majority of women migrants move for marriage while men move for work.

- Most migration within India is rural to urban, particularly to Delhi (north), Mumbai (west), Kolkata (east), Ahmedabad (west), Bangalore (south), and Chennai (south) in search of better economic opportunities (Mitra and Murayama 2008).
- Maharashtra (Mumbai) and Karnataka (Bangalore) are the most frequent destinations of inter-state migrants (highest in-transition probabilities).

STATES	A.P.	Bihar	Gujarat	Haryana	Karnataka	Kerala	M.P.	Maharashtra	Orissa	Punjab	Rajasthan	T. Nadu	U.P.	W.B	Total
A.P.	-	0.0102	0.0316	0.0055	0.3818	0.0137	0.0521	0.2446	0.0759	0.0064	0.0132	0.1328	0.0167	0.0156	1
Bihar	0.0146	-	0.0270	0.0427	0.0082	0.0020	0.0979	0.0599	0.0601	0.0617	0.0267	0.0038	0.2122	0.3832	1
Gujarat	0.0212	0.0084	-	0.0066	0.0265	0.0087	0.0916	0.6050	0.0078	0.0092	0.1625	0.0145	0.0260	0.0121	1
Haryana	0.0075	0.0238	0.0194	-	0.0076	0.0020	0.0269	0.0298	0.0032	0.3479	0.3661	0.0032	0.1529	0.0097	1
Karnataka	0.1511	0.0027	0.0174	0.0029	-	0.0636	0.0107	0.6233	0.0028	0.0031	0.0086	0.1010	0.0090	0.0038	1
Kerala	0.0586	0.0097	0.0542	0.0119	0.2345	-	0.0535	0.1969	0.0087	0.0094	0.0224	0.3084	0.0230	0.0089	1
M.P.	0.0237	0.0326	0.0722	0.0136	0.0071	0.0064	-	0.2977	0.0597	0.0164	0.1988	0.0055	0.2501	0.0161	1
Maharashtra	0.0638	0.0040	0.3517	0.0081	0.1827	0.0246	0.2505	-	0.0046	0.0118	0.0294	0.0234	0.0359	0.0095	1
Orissa	0.1513	0.0827	0.0900	0.0074	0.0101	0.0041	0.2366	0.2161	-	0.0119	0.0120	0.0071	0.0258	0.1450	1
Punjab	0.0127	0.0188	0.0254	0.4466	0.0145	0.0042	0.0515	0.0613	0.0054	-	0.1884	0.0080	0.1387	0.0245	1
Rajasthan	0.0237	0.0101	0.2152	0.2078	0.0273	0.0034	0.1822	0.1280	0.0039	0.0748	-	0.0181	0.0867	0.0188	1
Tamil Nadu	0.1858	0.0046	0.0211	0.0038	0.3542	0.2429	0.0166	0.1267	0.0050	0.0058	0.0107	-	0.0129	0.0098	1
U.P.	0.0106	0.0531	0.0731	0.1402	0.0082	0.0019	0.2047	0.2734	0.0049	0.0945	0.0884	0.0041	-	0.0429	1
W.B	0.0385	0.3894	0.0419	0.0211	0.0175	0.0067	0.0816	0.0938	0.1072	0.0274	0.0329	0.0157	0.1264	-	1
Cum. Transition Prob	0.7631	0.6501	1.0402	0.9182	1.2802	0.3842	1.3564	2.9565	0.3492	0.6803	1.1601	0.6456	1.1163	0.6999	-

Heading the West

Main Destinations:
Karnataka,
Maharashtra,
Gujarat, Madhya
Pradesh, Rajasthan
and Delhi.



Source of Data: Census 2001 (Singh, Kumar, Singh and Yadava 2011)

Sources of Migration Data in India

NSS Data

NSS 64th Round

1. Definition of Migrant : A household member whose last usual place of residence (UPR), anytime in the past, was different from the present place of enumeration.
2. Information was collected on household migration, migration particulars of the household members, short-term migration, out-migrants, remittances of out-migrants and use of such remittances by the households.
3. Information was collected on short-term migrants who left during last 365 days for 30 days or more but less than 6 months for employment related purpose (including collection of information on destination during longest spell, industry of work, etc.) (NSS Report No. 533 (64/10.2/2))

NSS 55th Round

1. Definition of Migrant: A member of the sample household who had stayed continuously for at least six months or more in a place (village/town) other than the village/town where he/she was enumerated.
2. Collection of such detailed information on migration was not attempted.
3. Information on short-term migration was limited to only identifying those household members who, during last 365 days, had undertaken short-term movements for 60 days or more for employment related reasons. (Report No. 470 (55/10/8))

Short-term Migration

- The NSS rounds (1983 to 2007-08) show a consistent increase in migration rates over five rounds between 1983 and 2007-08 with urban migration rate increasing from 31.6 % to 35.4 % between 1983 and 2007-08 and rural migration rate increasing from 20.9 % to 26.1 %.
- The NSS 55th Round shows that a total of nearly 10.87 million people stayed away from their UPR for work/ seeking work for a period between 2 and 6 months. Of these 8.45 million were resident in rural areas and 2.42 m in urban areas. Among the former, 3.06 million were females and 5.39 m were males.
- The NSS 64th Round shows an increase in short duration out-migration: there were an estimated 15.2 million short-term out-migrants, of whom 12.9 million were male, and 13.9 million were rural out-migrants.
- Interestingly, the socio-economic profile of the short duration/seasonal out-migrants is very different from the other migrants: more likely to be from socially deprived and poorer groups, have low levels of education, and more likely to be engaged in casual work.
- More than two-third of short term out-migrants migrated to urban areas; nearly half (45.1 %) of them are inter-state migrants.

% Occupation at Destination	Rural			Urban		
	Male	Female	Person	Male	Female	Person
Self employed	32.3	14.4	29.6	29.4	9	26.3
Employees	5.2	1.7	4.7	22.5	23.1	22.6
Casual Labour	56.4	58.5	56.7	33.5	18	31.1
Worker	93.9	74.6	91	85.4	50.2	80
Unemployed	3.1	1	2.8	8	5.4	7.6
Force	3	23.5	6.1	5.7	37.7	10.6
Total	100	100	100	100	100	100

Source: NSS Report No. 533 (64/10.2/2)

Nearly 94 of rural male short-term migrants and nearly 75 per cent of the female short-term migrants were workers.

NSS 64th Round –Stylised Facts On Migration In India

-In 2007-08, 326 million people (28.6 %) were migrants by the UPR: 67.6 million male migrants and 258.4 million (79.3 %) female migrants (census adjusted figures). Of these female migrants, 82.8 % migrated for marriage.

- 43% of Indian population live in households which have sent out (at least) one migrant

- International migration seems to apply to a relatively small portion of population, whereas much a stronger role seems to be played by internal migration (whether intra-state or inter-state) among Indian households.

- 8 (2) of 14 most populous states in India are among the 10 poorest (richest) states, according to the MPCE level. (Source: Authors' Calculation)

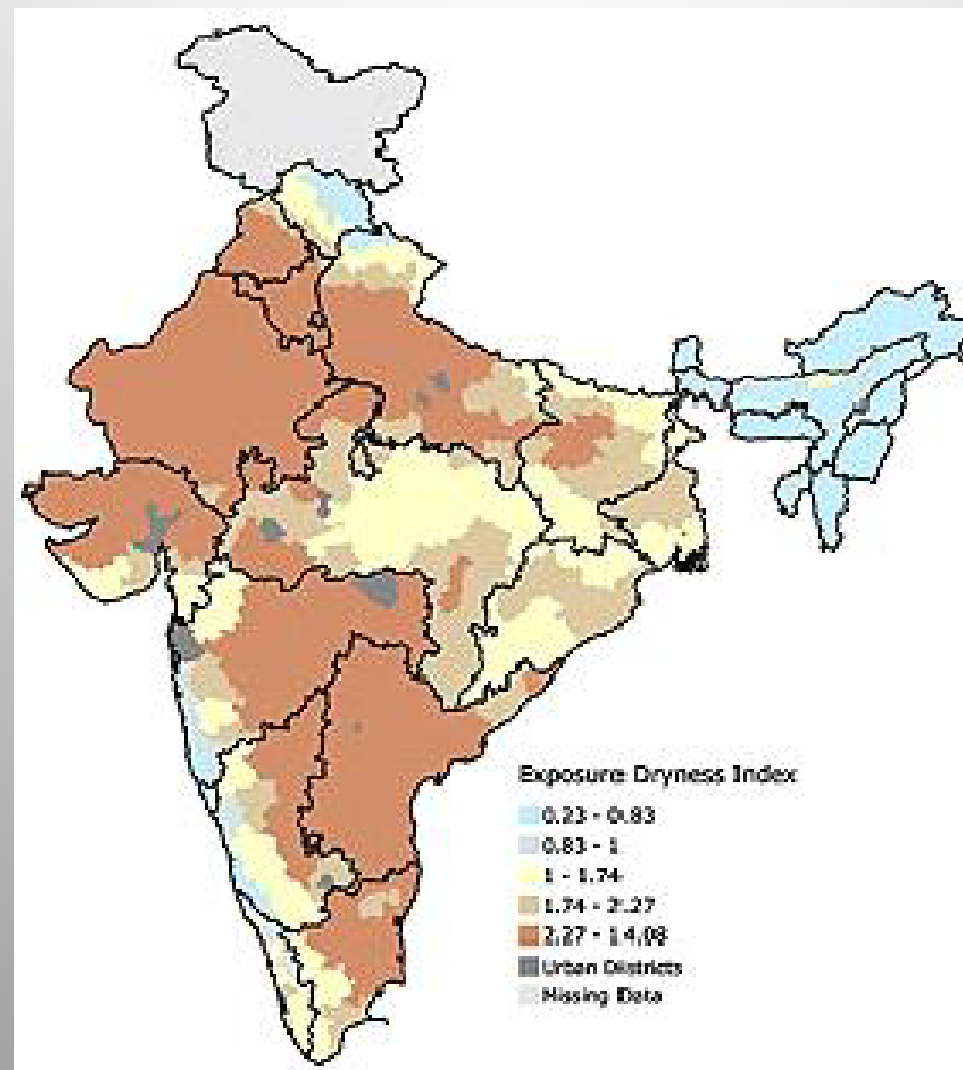
State of India/ Analysis	Mean MPCE	Median MPCE	Coeff. Variation	No. Hhlds	% Migrant Hhlds	% Intra- State	% Inter- State	% Internat.
Uttar Pradesh	774.35	623.12	72.51	12603	51.65	32.07	26.87	1.45
Maharashtra	1303.34	903.33	125.38	10,044	40.90	35.69	5.98	1.92
Bihar	658.22	552.17	68.64	8785	37.39	11.42	29.10	0.98
West Bengal	966.76	681.63	129.46	8770	43.98	29.85	17.12	1.37
Andhra Pradesh	1096.52	786.00	96.87	8,702	39.50	30.41	7.12	5.19
Tamil Nadu	1127.69	842.00	84.46	7,089	41.23	28.92	9.23	6.11
Rajasthan	973.12	789.20	68.15	5494	50.25	35.93	20.15	3.37
Karnataka	1136.44	774.17	142.21	5,240	41.28	34.26	7.16	2.19
Orissa	777.59	560.77	110.57	5180	49.03	30.93	22.78	0.56
Gujarat	1224.46	984.00	70.14	5,157	37.33	30.64	4.65	3.76
Madhya Pradesh	824.00	656.00	72.84	4717	47.36	37.25	12.36	0.81
Kerala	1570.40	1170.33	94.98	3515	54.45	32.55	14.51	22.70
Punjab	1557.80	1240.50	82.37	3191	47.95	23.94	15.29	17.77
Jharkhand	821.85	636.20	71.41	3082	31.12	12.65	19.50	0.62
Arithmetic Mean	1058.04	799.96	92.14	6540.64	43.82	29.04	15.13	4.91

All India Analysis	Mean MPCE	Median MPCE	Coeff. Variation	No. Hhlds	% Migrant Hhlds	% Intra- State	% Inter- State	% Internat.
	1062.83	787.00	99.32	125578	42.96	28.86	15.65	3.15

What microstudies tell us

- Microstudies show high and increasing levels of short term migration esp seasonal and circulation. Drought, flooding and deforestation are important drivers.
- Panel data in 12 villages in Andhra Pradesh and MP show seasonal/circular and commuting on the rise and permanent migrants in a minority (Deshingkar et al 2009). Rate > 75% in remotest village.
- ICRISAT village-level studies over three decades in two villages of Mahabubnagar district, Andhra Pradesh show that both seasonal and permanent migration have increased during the reference period (Deb et al., 2002).
- Research in several villages in the southern tribal districts of Madhya Pradesh show migration rates between 65% and 75% (Mosse et al 2002, Virgo 2003).
- High levels of migration from drought prone districts in Orissa – 60,000 people migrated in 2001 (Wandschneider and Mishra 2003)

68 To 70% Area Of The Country Is Prone To Drought In Varying Degrees



Microstudies (contd)

- A majority will migrate within their own countries where they have existing cultural or ethnic bonds.
- Migration further afield likely to follow established historical connections
- Permanent migration is usually not the first adaptive response
- Periods away get longer during crisis but may shorten once crisis is over
- People do return even after natural disasters e.g. floods in Bihar and cyclones in Orissa and Andhra Pradesh

Conclusion

- Poorer people (those who are more vulnerable to the adverse impacts of climate change) tend to migrate shorter distances and for shorter periods of time (Srivastava 2003, 2005).
- Evidence of growing seasonal and circular migration (Deshingkar and Farrington 2009) – coping with drought and floods which is likely to increase/continue as comms and transport improve
- Rural households are more diversified than official statistics suggest (Lanjouw and Shariff 2002, Farrington et al 2006) – therefore perhaps less vulnerable to gradual onset change
- Alarmist projections need to be revised through the use of multiple data sources.

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