

GLOBAL ASSESSMENT OF RISK 2009
ASIA COUNTRY & STATE CASE STUDY REPORT

Islamic Republic of Iran

Nepal

Orissa, India

Tamil, Nadu, India

Sri Lanka

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GLOSSARY & ABBREVIATIONS

CPI	Consumer Price Index
DDMA	District Disaster Management Authority
DRR	Disaster Risk Reduction
DS	Divisional Secretariat Divisions in Sri Lanka
EIA	Environment Impact Assessment
FGT	Forster-Greer-Thorbecke family of poverty measures
GDP	Gross Domestic Product
HCR	Head Count Ratio
HDI	Human Development Index
IDP	Internally Displaced Population
IT	Information Technology
KBK	Kalahandi, Bolangir, and Koraput sub-region of Orissa, India
MDGs	Millennium Development Goals
NSDP	Net State Domestic Product
NSDRM	National Strategy for Disaster Risk Management
OSDMA	Orissa State Disaster Management Authority in India
PPP	Purchasing Power Parity
SCs	Scheduled Castes in India
SDMA	State Disaster Management Authority
STs	Scheduled Tribes in India
VDC	Village Development Committees

INTRODUCTION

Asia is emerging as an important locus of economic growth, and meeting many of the global MDGs, especially for poverty. It is also becoming a major concentration of multi-hazard risk. Asia's risk profile is somewhat different from other parts of the world, because of its larger population concentrations, lower but rapidly changing levels of urbanisation and significant agrarian economic structure.

The large populations of many Asian countries and their concentration especially along coasts, rivers and ecologically sensitive areas have led to high risk exposure. Large numbers and concentrations of poor people in rural areas and an increasingly population in informal settlements in urban centres imply that local and regional vulnerabilities are high. The two when combined make for a deadly mix of *intensive risk* in areas located *within* global and regional disaster hotspots and *extensive risk* associated with local concentrations of exposed, vulnerable population and assets spread over a wide geographic canvas¹.

Intensive risk is relatively static in geographical terms, concentrated in seismically active regions, along coastal zones and flood plains and typical cyclone track zones. Concentrations of intensive risk change over time, based on changes in vulnerable populations, economic assets and lifeline infrastructure exposure. These are all changing rapidly in Asia catalysed by rapid population, economic and infrastructure growth and urbanisation.

Extensive risk is more dynamic and geographically diverse, spread across the landscape responding to changes in local patterns of exposure and the dynamics of adaptation and exposure. Many of the hazards that define extensive risk are deeply influenced and modified by human action, technology, economic and social stratification. As a result, it is measured with difficulty and hence has remained largely invisible to official response systems, development interventions and even the media. Nevertheless, extensive risk represents stress accumulation in economic and social systems that degrade their resilience and adaptive capacity and hence in time, both economic and human development.

Exposure to extensive risk appears to be systematically increasing in Asia, due to a greater frequency and intensity of extreme climate events, increasing concentrations of vulnerable populations and assets in high risk multi-hazard locations, including in cities. An operational challenge is that its spatial disaggregation and heterogeneity require more decentralised locally embedded institutions and responses – which large centralised development and DRR bureaucracies are seriously challenged with.

The mitigation intervention set for intensive risk mitigation is rather different across hazard types with mortality due to hydro-metrological shocks possible to reduce through early warning and preparedness and that for earthquakes by a series of structural measures including building strengthening and retrofitting. Intensive events typically lead to destroyed housing and extensive events to more damaged housing. With extensive events growing at a more rapid pace than intensive events the ratios of damage to destruction can be expected to change leading to the need for a series of intervention processes to continually upgrade the housing stock rather than focus only on short-term interventions like large post-disaster reconstruction.

¹ For the purposes of the GAR 2009 analysis a threshold of 50 deaths and 500 destroyed houses was considered both *reasonable* as well as statistically supported partition between extensive and intensive shocks.

This document draws upon the experience of poverty reduction and disaster risk reduction in five case study areas from Asia (Iran, Nepal, Orissa and Tamil Nadu, India and Sri Lanka) to explore the relationship between intensive and extensive risk and poverty to provide inputs into national processes and the Global Assessment of Risk 2009 report.

Asian DesInventar Shock profile

The DesInventar (c. 1970-2007) shock data from South Asia and Iran provides an interesting set of insights²:

- Iran has the highest mortality levels, largely due a concentration of intensive geological events. Orissa and Sri Lanka also have relative high mortality but larger due to intensive hydro-meteorological events. Injury levels are broadly in consonance with the hazard profile. This points to a heterogeneity of hazard risks that regions are exposed to
- Orissa and Tamil Nadu have the highest numbers of houses destroyed or damaged. This is due to both intensive events and a large number of extensive hydro-meteorological events. This points to the differential impact of various hazards on loss of life, building and agriculture. This in turn is catalyses diverse risk-poverty dynamics
- Orissa and Sri Lanka (excluding the tsunami damage) have the largest number of people affected, this is also related to the extensive nature of the hazards they experience

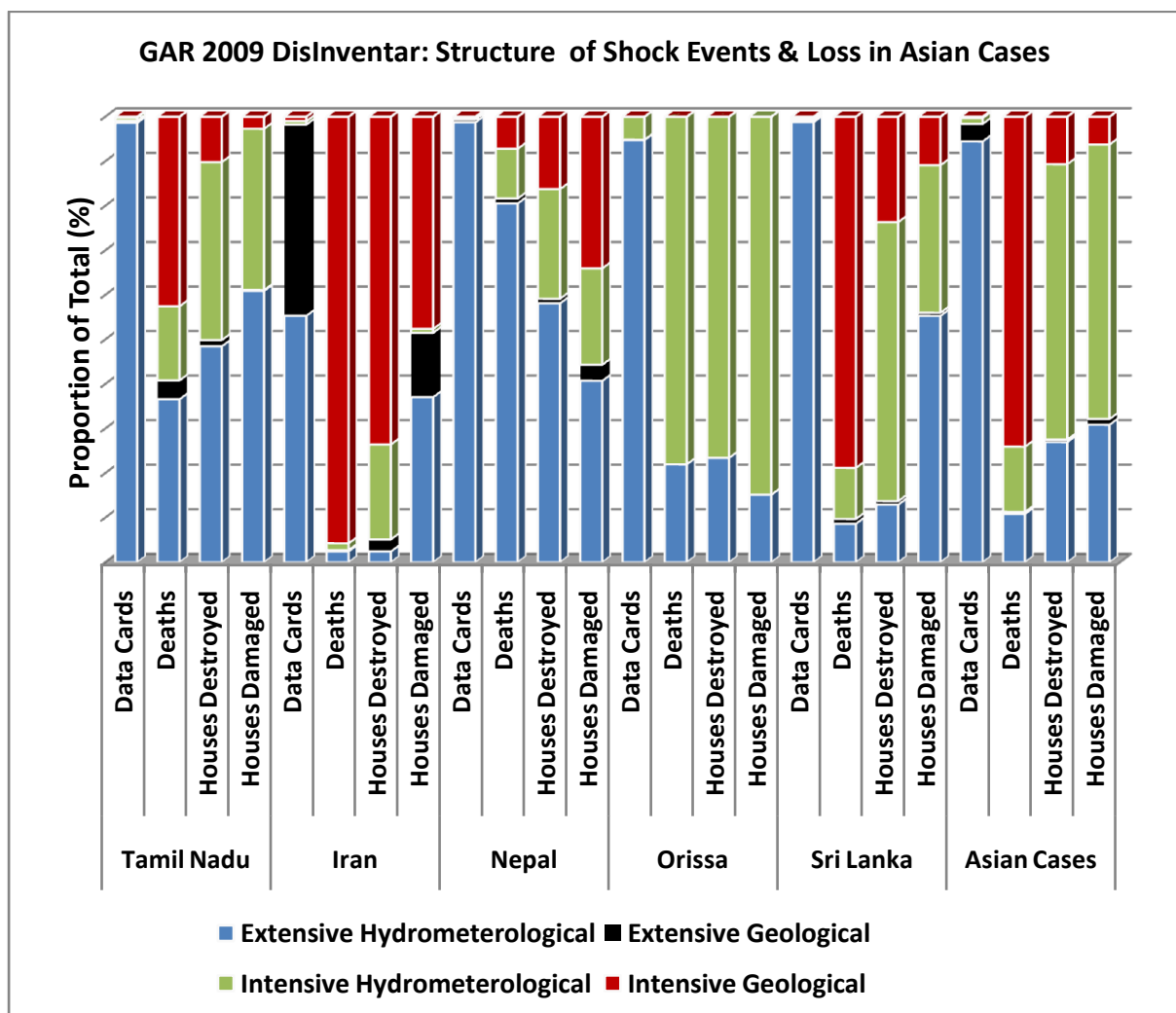
SUMMARY OF GAR DESINVENTAR RECORDS FOR ASIAN CASE STUDY COUNTRIES						
Country / State	Data Cards	Deaths	Injured	Missing	Houses Destroyed	Houses Damaged
Islamic Republic of Iran	3,731	1,37,293	70,996	2,490	1,38,013	3,22,680
Nepal	11,435	10,566	11,366	2,529	1,95,352	1,47,070
Orissa, India	7,699	29,868	13,204	1,204	11,98,954	26,26,365
Tamil Nadu, India	12,494	5,227	4,792	3,105	2,27,110	9,03,354
Sri Lanka	9,861	30,127	12,874	125	2,40,055	4,31,171
TOTAL	45,220	2,13,081	1,13,232	9,453	19,99,484	44,30,640

² For details see http://garisdr.desinventar.net/DesInventar/download/Extensive_Risk_Analysis_Asia.doc

The structure of shock events and loss from these states and countries provides a diverse profile of intensive and extensive risk. Across the sample of 45,220 records, only 1.6 percent was intensive shocks. The bulk were extensive hydro-meteorological (94.5 percent) and the balance 3.9 percent – extensive geological shocks.

Iran was a clear outlier with 44 percent geological shocks. All other regions including Nepal followed the broad pattern of shock structure across the Asian cases.

The most important cause of mortality was intensive geological shocks (74 percent) followed by intensive hydro-metrological shocks (15 percent) and extensive hydro-meteorological shocks (11 percent). Given that the case study regions, with the exception of Iran and Nepal are not fully representative of the earthquake risk in the region, this shows the importance of widespread mitigation measures to address seismic risks and the devastating impact they can have. Similarly in the densely populated flood, coastal plains and coastal areas of Orissa, Sri Lanka and even Tamil Nadu, intensive hydro metrological shocks like cyclones, storm surge and flooding can also have devastating impacts.



Yet, extensive hydro metrological risk also causes a similar order of magnitude of casualties as intensive events that capture media and official attention – a fact that requires urgent policy and agency attention as it is largely invisible.

The pattern of house destruction and damage is almost an inverse of the pattern of mortality and also much larger in terms of absolute magnitude. The most important cause of destruction (62 percent) is intensive hydro metrological shocks; followed by extensive hydro metrological shocks (27 percent) and only then intensive geological shocks (11 percent). At the aggregate level this reflects the total populations, hazard exposure and vulnerability of the buildings in regions such as Orissa and Sri Lanka. This can be expected to have a significant impact on the capital stock of households, especially poor households and the possible decline in quality of housing stock because of the increase in recurrence frequency of these shocks.

Iran and Orissa are both outliers on either side of the spectrum. Iran because of the high proportion (74 percent) destroyed in intensive geological events. Orissa because of the high proportion (77 percent) of buildings destroyed and damaged (85 percent) in intensive hydro metrological shocks. Given the high population concentrations in South Asia in the coastal zone, in flood plains of great rivers and increasingly in urban areas in these highly productive and economically active regions – this trend can be expected to increase.

The surprise is the high proportion of building destruction and damage due to extensive hydro metrological shocks in Nepal (58 and 41 percent), Tamil Nadu (49 and 61 percent) and Sri Lanka (13 and 55 percent). This is low intensity, high cumulative impact incipient risk to be watched as extreme climate events increase in frequency and intensity.

Poverty

The largest concentration of poor people in the world (over 350 million) is located in South Asia. Hence, the global achievement of the MDGs is centrally pivoted around bringing the bulk of these people out of poverty. While considerable progress has been made in this direction, largely due to rapid regional economic growth, targeted poverty reduction programmes, and large scale development and public service delivery programmes, the situation continues to be challenging.

In Orissa, one of India's poorest states both rural and urban poverty increased in numbers and depth over the last decade, with its population of over 15 million rural poor and nearly 3 million urban poor in 2004. Nepal has seen a dramatic reduction in its poverty headcount from 42 percent to 31 percent over 1995-2003, yet the relative and absolute number of the poor is still very large. Sri Lanka has made dramatic strides in addressing both poverty and human development concerns, but ongoing civil strife, the devastating impact of the 2004 Indian Ocean tsunami and some endemic pockets of poverty continue to be challenges. Tamil Nadu, in south India has seen a significant reduction in urban and to a lesser extent rural poverty as it rides on a wave of economic growth, rapid industrialisation and urbanisation and well-delivered public development programmes. But even here there are over 7.7 million poor people in rural and 6.9 million in urban areas. Iran does not publish official poverty statistics, but broad estimates of the population below the notional international \$ 1 per day line, have shown a secular decline to less than 0.3 percent of the population in 2004 in stark contrast to South Asia. Yet, Iran has pockets of considerable vulnerability and poverty.

An increase in the frequency and intensity of both intensive and extensive disasters has been observed in many parts of Asia. In the case study countries, an increasing body of literature and field experience from both development practitioners and disaster risk reduction professionals points to the significant impact that disasters have in pushing households and communities into poverty. It also does not permit them to escape from poverty due to multiple shocks that impact their income, expenditure and assets. In addition, poverty seems to drive people into more vulnerable locations, livelihoods and housing which in turn tend to exacerbate their existing vulnerabilities and further heightens their risk exposure and the impact of future disasters.

Key Research questions

In support of the biennial Global Assessment of Risk (GAR 2009) report, this study used case studies from nine Latin American and five Asian countries and states (Islamic Republic of Iran, Nepal, Orissa and Tamil Nadu in India and Sri Lanka) to examine two key research questions:

- Do natural hazards contribute to or exacerbate poverty?
- Does poverty impact the susceptibility to loss of life, buildings and agricultural assets?

This summary report is based on the findings from the five Asian case studies supported by the UN Regional Centre, Bangkok GRIP and ISDR, Geneva primarily focussed on addressing the first question analytically, due to severe limitations in availability and access to comparable long-range household expenditure and poverty data, except in Nepal. The second question has been broadly addressed using qualitative and policy research methods.

The intensive and extensive risk analysis for these case studies was undertaken using large DesInventar databases that have been created and validated in each of these countries that are also available online³. A summary of key indicators from these databases is provided in the Statistical Annex at the end of the document.

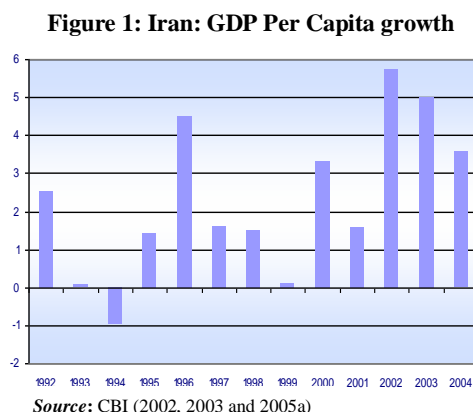
³ See http://garisdr.desinventar.net/DesInventar/download/Extensive_Risk_Analysis_Asia.doc

ISLAMIC REPUBLIC OF IRAN

ISLAMIC REPUBLIC OF IRAN: COUNTRY POLICY NOTE

Development Context, Challenges and Responses

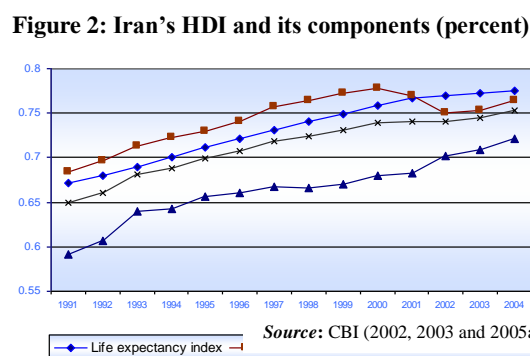
The economy of Iran has experienced considerable developments in recent years, of course with some ups and downs as depicted by Figure 1. Such fluctuations were in great part because of fluctuations in oil export revenues due to changes in the world oil prices. Besides changes in oil revenues, the causes for such a fluctuating economic performance can be traced back in economic impact of the Revolution and the eight-year imposed war with Iraq, among others. It was since the implementation of the First Five-Year Development Plan that Iran's economy managed to improve. Since the economy was under pressure of high population growth in the 1980s, the per capita GDP growth rates during the recovery years after the imposed war are necessary to consider.



Considering the dependence of agricultural products on rainfall, and bearing in mind the vast drought in this period, the low share of agriculture in Iran's GDP further dropped, from 14.3 percent in 1991 to 13.7 percent in 2004.

The recovery of per capita growth rates between 1991 and 2004, compared with the low (and in some years, negative) rates of the previous decades, was mainly due to a steep drop in population growth. On top of that, considerable measures have been taken during the implementation of development plans aimed at an expansion of economic growth, control of inflation, reduction of foreign debt and budget deficit, enhanced utilization of existing economic capacities, unification of the foreign exchange rate and reduction of economic vulnerabilities caused by external shocks.

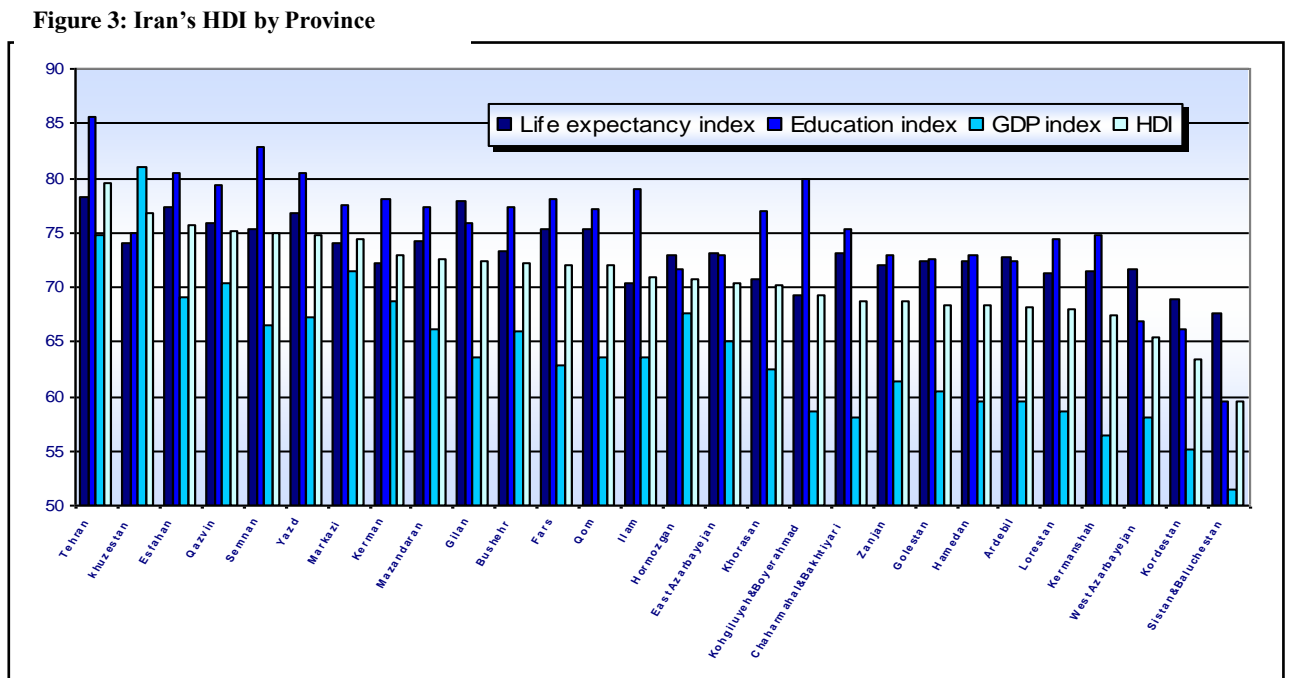
The Human development indicators provide insights into Iran's development. Of the three HDI components: the education index experienced lower growth compared to the other two, namely per capita GDP and life expectancy at birth (Figure 2). The GDP index, despite its ups and downs due to fluctuations in oil income, enjoyed the highest growth and has been the driving force of the HDI. Moreover, owing to the importance of and special attention paid by government to health, its significant investment in health infrastructure particularly in less developed and rural areas, Iranian life



expectancy improved considerably. This is further highlighted by a smooth trend of the life expectancy index. The education index also experienced an increasing trend, though less rapid than the other two components of HDI.

The Iranian economy is seriously challenged in attempting to meet the economic and social needs of a growing population. It will therefore simultaneously confront both a high supply of labour and population ageing in the near future. A large number of young people are ready to enter the workforce, together with an increasing flow of migrants to large cities and economic centres. Therefore, new economic and social opportunities and services like decent and secure livelihoods and enhanced education and health services will be required.

A study of human development and its components, disaggregated by provinces, provides a picture of regional disparity and the need to pay due attention to the regional redistribution of development resources (Figure 3).



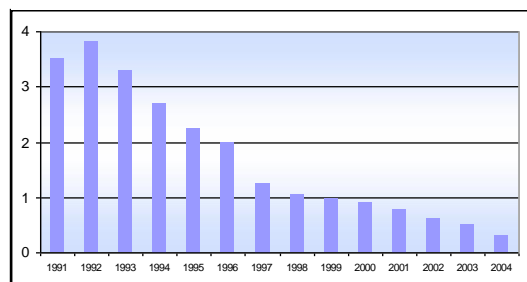
Source: SCI (2002a); Ministry of Education (2004); LMO (2000); Ministry of Science, Research and Technology (2004); Alizadeh et.al. (2000).

In the following pages, the hypothesis that natural disasters have an important contribution in such a regional disparity is tested.

National Poverty Profile

From a merely economic point of view, a commonly used indicator of poverty is the percentage of population under the PPP one dollar per day poverty line. On this basis, poverty in Iran has decreased annually by about 17.2 percent in average (Figure 4).

Figure 4: Iran's Population with expenditures under \$1

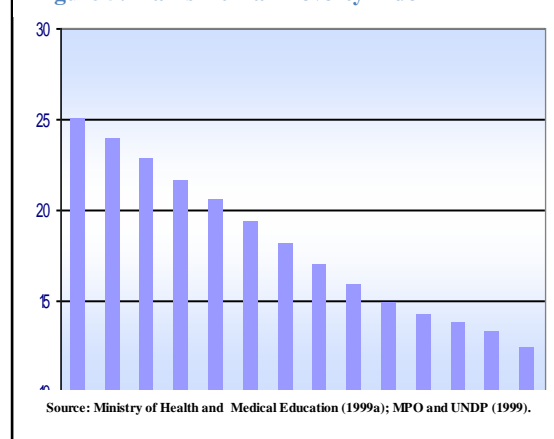


Source: SCI (2004c and 2004f); MPO and UNDP (1999 and 2004).

While in 1991 about 3.5 percent of the population had daily expenditures lower than one dollar this proportion was limited to 0.3 percent of population in 2004. Certainly, this trend accelerated from 1992 to 1998. However, it slowed in the following years and even increased in 2000 due to significant increases in consumer prices from 1997 to 2000. It reverted to its decreasing trend due to supportive policies in following years, which brought about improvements in people's access to basic public health and education services due to considerable decline in inflation rates starting from 1999.

In Iran, in contrast with income poverty which is subject to considerable fluctuations, human poverty is following a stable decreasing trend (Figure 3). The difference between the fluctuating trend of income poverty and the stable trend of human poverty indicates that, in spite of decreasing purchasing power (mainly due to increasing inflation) from 1998 to 2001, household expenditures for provision of human necessities have been increasing.

Figure 5: Iran's Human Poverty Index



Source: Ministry of Health and Medical Education (1999a); MPO and UNDP (1999).

Overall, implementing comprehensive programs aimed at improving welfare indicators and access to public services in recent decades have resulted in improvements in living standards of people in need in Iran. This has come in particular through improvements in the level of social services despite significant fluctuations in foreign income from oil exports. The quality of national human capital has witnessed significant improvements such as a reduction in under-five mortality, improved access to safe drinking water, higher adult literacy and improved enrollment ratios at different educational levels, particularly in rural areas.

Disaster Intensive and Extensive Risk Profile

Due to its geo-climatic situation, Iran is a natural disaster prone country. Based on DesInventar, 6,559 natural hazard events were recorded in Iran for the period of 1986-2007, which caused 74,019 deaths and 508,301 buildings affected (damaged or destroyed). During this period, on an average each year, 3,365 people were killed and 23,105 buildings were affected by natural hazards.

Earthquake was the most intensive hazard in 1986-2007 accounting for 53 percent of total events. Flood accounting for 38 percent of all events was in the second rank. Other hazards, which accounted for 9 percent of events, were as follow: storms (3.0 percent), landslides (1.9 percent), thunder storms (1.4 percent), snowstorms (1.0 percent), hailstorms (0.9 percent), drought (0.5 percent) and forest fire (0.4 percent). Except for floods, the upward trend of climatic hazards is evident from 1986 to 2007. Landslides and storms are the major contributors to this pattern.

Geologic events represented 53 percent of events, but were responsible for 95 percent of recorded mortality and 73 percent of buildings affected. While climatic events represented 47 percent of events causing 5 percent of mortality and 27 percent of buildings affected.

Drought, earthquake, flood and storm have been the most important hazards of the country in terms of causing losses of lives and property. Earthquakes have been responsible for 95 percent of total mortality and 73 percent of buildings affected, followed by floods, which account for 4.5 percent of total deaths and 23 percent of buildings affected. The Rudbar-Manjil earthquake (1990) and Bam earthquake (2003) were mega disasters of last two decades accounting for about 90 percent of total death. Floods in Loretsan (1991), Tehran (1987), Golestan (2001) and Kerman (1993), which totally killed 1,036 people, put the flood among top 10 killer hazards of Iran for the period of 1986-2007. Drought has affected the people more than all other hazards and accounts for 37 million affected people around the country, mostly in Sistan Baluchestan, Fars, Bushehr, Yazd and Kerman provinces. The Guno typhoon (2007) affected more than 160 thousand people in Sistan- Baluchestan province.

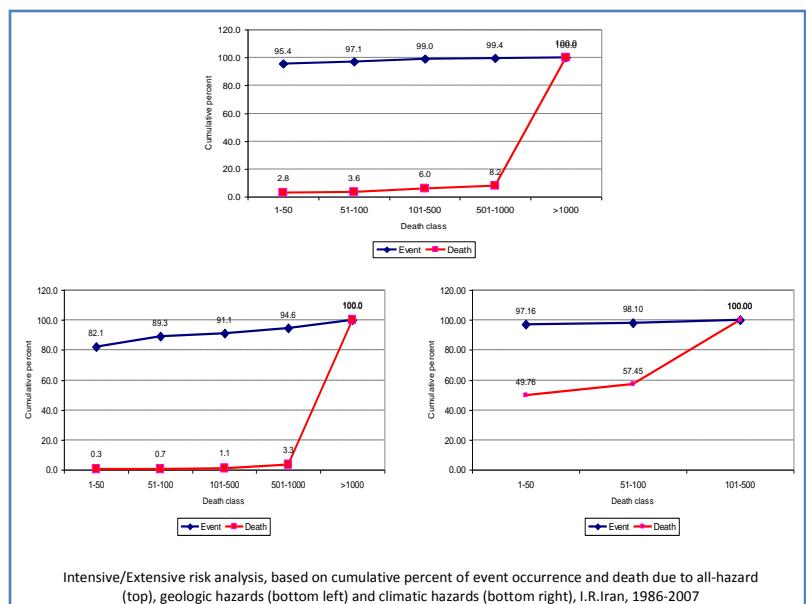
The mortality trend, in general, indicates a 27 percent decrease in period of 1997-2007 compared to 1986-1996. While occurrence of geologic hazard shows increasing trends up to 126 percent, but no change in climatic hazards is observed, mortality trend reveals 25 percent and 59 percent decrease due to geologic and climatic hazards, respectively. Reasons for the declining trend in number of geo-hazard induced deaths despite an increasing number of events is because of improved detection and reporting systems, increased public awareness and evacuation measures following pre-shocks of the Manjil and Rudbar earthquakes. The

timely evacuation before a major shock reduced the large potential death toll in Lorestan Earthquake of 31st May 2006.

Despite wide dispersion of most hazard risks across the country, there is still a concentration in a small number of provinces. The least hit provinces by natural hazards, i.e. Zanjan, Markazi and Ghom, have experienced 1 to 5 natural hazard events per year. At the other end, Fars and Kerman provinces experienced 23 to 32 hazards per year. Only about 8 percent of Iran’s Shahrestans (districts) had no recorded natural hazard events for the 1986-2007 period. Numerous provinces, including South Khorasan, Kerman, Fars, Esfahan, Khuzestan, Lorestan, Kermashah, Ardebil, Gilan, Zanjan, Ghazvin, Golestan and North Khorasan experienced at least 10,000 buildings damaged or destroyed from 1986 to 2007. Gilan and Zanjan were the most affected provinces.

Intensive and extensive risk analysis revealed that less than 1 percent of hazard events were responsible for 92 percent of total death and 62 percent of buildings affected. Considering cut-off of 50 death and 500 buildings affected, 96 percent and 90 percent of events account for 3 percent of total mortality and 10.5 percent of total buildings damage or destruction, respectively. This pattern is mainly due to two major earthquakes of Rudbar-Manjil (1990) and Bam (2003). Considering the GAR extensive risk cutoff, 98 percent and 92 percent of climatic events account for 50 percent of total mortality and 32 percent of buildings affected.

Figure 6: Iran cumulative Intensive & Extensive Event Occurrence (percent)



Poverty-Risk Relationship

The mortality and the number of buildings destroyed or damaged over 1991-2006 were considered key variables that could explain the indirect impact of disasters on human poverty. The models used indicators such as household expenditure to measure the economic impact of disasters. This study uses a wide definition of poverty that goes beyond conventional economic poverty metrics based on the conceptual frame of human poverty that integrates economic, social, cultural and environmental factors.

For a number of technical reasons, Iran does not officially calculate or report poverty. While some rough estimates of the percentage of poor people are reported, they are based on the international poverty line definitions of \$1 and \$2 expenditures per person per day.

The basic econometric model used is:

$$\Delta c_{it} = \alpha_{it} + \beta_{1i}(Death)_{it} + \beta_{2i}(Buildings)_{it} + \beta_{3i}(Family\ Size)_{it} + \varepsilon_{it}$$

Where Δc_{it} is differences in real expenditures of the urban households in i th province at time t (adjusted for prices using the urban CPI), $(Death)_{it}$ and $(Buildings)_{it}$ are the number of human losses per thousand populations and buildings damaged or destroyed, respectively, due to natural disasters in i th province at time t , and the variable $(Family\ Size)_{it}$ is included as a factor affecting people's economic well being in many poverty studies.

The coefficients of the number of death as well as the number of buildings damaged or destroyed for the most disaster-prone provinces were significant. This suggests that in these provinces, natural disasters play a main role in economic disruptions of people's lives. In particular, Ardebil, Chaharmahal-o-Bakhtiari, Lorestan, Mazandaran, Khorasan, Hormozgan and Yazd are the disaster-prone provinces where the estimated coefficients in number of death, number of damaged and destroyed buildings, or both were significant and consistent with the study hypothesis.

Based on differences in demographic, climate, and style of life contexts across provinces, the results should be interpreted province by province. In Chaharmahal-o-Bakhtiari, for instance, natural disasters (usually in the form of floods) have disturbed people's economic well being by increasing the mortality rather than via physical damage. In Hormozgan and Yazd, on the other hand, disasters affect living standards through the destruction of buildings and houses.

An unexpected result is the positive effect of building damages and destructions on the economic well being of people in Mazandaran, Khorasan and Lorestan. The best explanation is that after exposure to intensive disasters a considerable financial aid was offered by the government, public charity institutions as well via soft bank loans to reconstruct damaged and destroyed buildings and improves their services which eventually resulted in the affected households becoming better-off.

The coefficient of family size has a theoretically right (positive) and statistically significant sign in a number of provinces, including East Azerbaijan, West Azerbaijan, Khorasa, Mazandaran and Hormozgan. This means that larger families enjoy increasing returns to scale.

Logarithmic model specifications provided better results for Iran than linear ones. Disaster variables were found to have a significant negative effect on the economic well being of

people, especially in Ardebil, Khorasan, Khuzestan, Fars, Kordestan, Golestan and Gilan, most of which are highly disaster-prone provinces. The estimation results for family size also show considerable improvements for Ardebil, Tehran, Khorasan, Fars, Kordestan, Gilan and Lorestan, where the coefficients have a negative sign and are statistically significant.

For most provinces, the elasticity of household expenditures with respect to building damages and destructions has been estimated between -0.01 and -0.04, indicating a small effect of disasters on people's well being. However, it is notable that Khorasan, Kordestan, Golestan and Gilan, which suffer most from disasters, as the elasticity is estimated in a higher range from -0.13 to -0.31. This is in large measure because disasters affect the people of these provinces through physical damage to buildings and infrastructure rather than mortality. For almost all provinces, the effect of mortality on people's welfare has been less than that of physical damages, in the respective elasticity range: -0.02 to -0.11.

Do Disasters Affect Social Well-Being?

Besides the effect of disasters on economic well being, as measured by household expenditure, people may also be affected by natural disasters through socio-economic processes, especially via health and education.

The models used estimated differences in the health and education status across provinces as a function of disaster-related human and physical losses as well as other conventional variables such as the average household expenditures on health and the family size as presented below.

$$Health_i = \alpha_i + \beta_1(Death)_i + \beta_2(Buildings)_i + \beta_3(Health\ Exp.)_i + \beta_4(Family\ Size)_i + \varepsilon_i$$

$$Education_i = \alpha_i + \beta_1(Death)_i + \beta_2(Buildings)_i + \beta_3(Education\ Exp.)_i + \beta_4(Family\ Size)_i + \varepsilon_i$$

Since disasters affect social processes only in long term, data for the two disaster-related variables are based on a 16-year accumulation, while data on health and education expenditures and family size were based on 16-year averages. Data on the health and education variables refer to the final year of the study time period across 28 provinces.

While building destruction and damage does not affect life expectancy at birth, the number of death due to disasters has a very small impact. This is reasonable as life expectancy at birth should not be easily affected by a human and physical losses due to disasters. Life expectancy is lower for provinces with larger average size of the family. This is because larger families spend less on healthcare per member of family. A reliable conclusion from this section of the study is that health indicators have a significant and negative relationship with family size. However, social capital is not directly affected by natural disasters, at least in the short run. In particular, there is no evidence of theoretical and statistical significance the impact of natural disasters on education.

Policy implications and Recommendations

Iran's hazard and risk profile provides insights worthy of being considered in DRR policy development. While earthquakes are responsible for 90 percent of death due to all natural hazards in Iran, this has been based on a limited earthquake catalogue – hence, a large future earthquake could skew the expectations considerably. High levels of seismic risk, high building vulnerability across much of the country along with high population density in urban areas places Iranian communities at high risk to earthquakes. A focused set of policies including developing and enforcing a techno-legal regime, large-scale structural mitigation measures supported by soft loans and technical services, strengthened engineering inspections, along with raising public awareness and strengthening response capacity have been undertaken effectively by Iran.

As decreasing mortality trend over the two periods of 1986-1996 and 1997-2007, despite the increasing trend in hazard exposure can be attributed to improved and more effective risk management. However, additional resources and knowledge to improving building resilience to earthquakes and institutionalizing these measures need to be urgently attended to.

Hydro-meteorological shocks in Iran have been increasing in line with the global trend over the last two decades for which data is available. There is growing evidence that communities are exposed to extensive small scale. Since policy makers often respond decision makers only respond to mass media headlines from intensive events, there is a concern that extensive events are ignored, underestimated and are even underreported.

An increasing in extensive risks will require the strengthening of local disaster management systems at provincial and district levels and enhancement of community-based. Fortunately early warning functions well for most climatic hazards in Iran. The successful experience of early warning during the Guno typhoon has strengthening the acceptability of investment in early warning systems.

The most crucial need is that of strengthening the capacities of affected communities to rebuild their livelihoods rather than the provision of non-targeted, subsidies or aid to the affected population. This would help avoid dependency, strengthen well-being and increase resilience particularly to extensive risks caused by hydro-meteorological hazards.

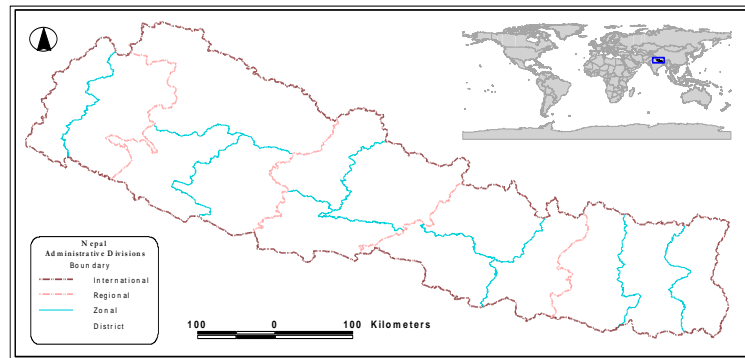
NEPAL

NEPAL: COUNTRY POLICY NOTE

Development context, challenges & responses

A combination of rough topography, steep slopes, active seismicity, concentrated monsoon precipitation, intense agriculture in the hills and deforestation has made Nepal a natural disaster hot-spot. Nepal ranks 11th in the world in terms of vulnerability to earthquakes and 30th with respect to floods. Most frequent disasters are floods, landslides, epidemics, fires, earthquakes and other weather related disasters, causing heavy loss of human lives and property especially buildings and infrastructures.

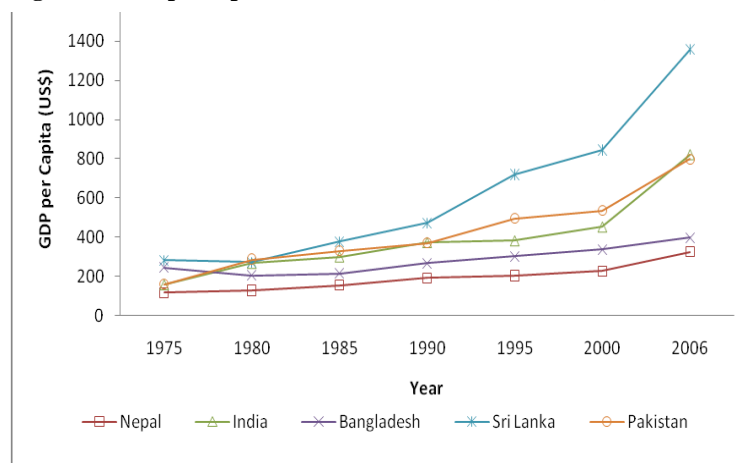
Figure 7: Nepal – location and administrative divisions



Nepal’s population in 2006 was estimated at 25.9 million, which increased two-fold over 1971-2001. Only 14 percent of the total population lives in urban areas in 2001. Demographic indicators show that there is a gradual improvement in education, health and other socio-economic conditions including life expectancy over the past decades.

Nepal’ GDP per capita (PPP) is US\$ 1,550, is the lowest among South Asian countries, with an gap with the neighbouring countries in recent years. Nepal’s population below poverty line is 31 percent and the portion of population with less than 1\$/day income is 24 percent. Intensification of violent conflict in last decade is partly responsible for Nepal’s slow growth rate.

Figure 8: GDP per capita trends in South Asia (1975-2006)



Nepal is largely a rural country, in which about 84 per cent of the national population lives in villages. Agriculture is the main source of livelihood for the majority (66 percent) of the rural population. However, this sector contributes only 36 percent to the nation’s GDP. Nepal’s high poverty rate is related to the relatively small rural share of the national income. Nepal’s

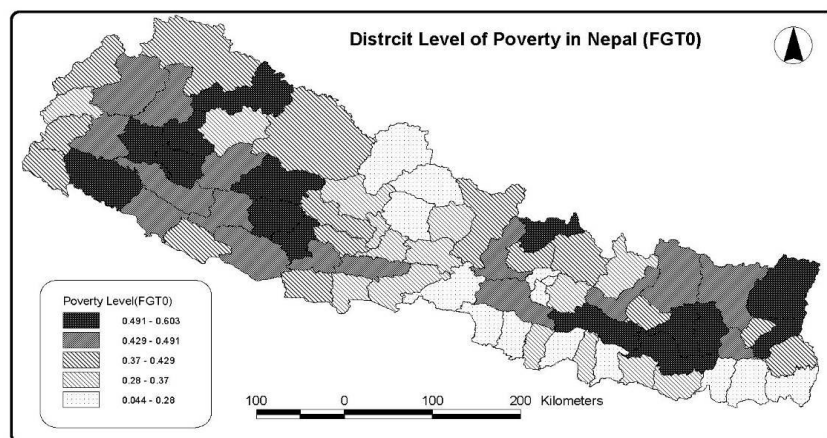
difficult mountainous terrain, lack of access to the sea, and susceptibility to natural hazards are key factors that continue to hamper the development of a globally competitive economy. Low levels of human and physical capital, weak government institutions, and political instability are other important factors that continue to constrain the economy.

The government has tried to meet some of these challenges by promoting broad-based growth, social sector development, inclusive development processes and good governance. The current three year interim Plan gives continuity to the poverty reduction approaches and also tries to address problems associated with post-conflict reconstruction.

Poverty profile & dynamics

Nepal experienced a dramatic reduction in poverty between 1995/96 and 2003/04 by bringing poverty down from 42 percent to 31 percent. The decline in poverty depth (P1) and poverty severity (P2) was even more impressive suggesting that even among the

Figure 9: Nepal - Distribution of poverty rates across districts, 2003



poor, there was an improvement in living standards. However, compared to a reduction of 56 percent in the urban poverty rate, the rural poverty rate declined by only 20 percent. Similarly, the real mean per capita urban expenditure is more than double that in the rural areas; indicating a high disparity in living standards between the urban and rural areas of Nepal. The bulk of Nepal's poor lives in rural areas.

Among Nepal's five development regions the mid and far western regions are much poorer than the rest of the nation. Among ecological regions, the hill and the terai regions have the highest and lowest poverty rates. There was also a 21 percent increase in inequality in Nepal between 1995-2003 far greater within rural areas compared to urban areas.

In 2003, the annual per capita expenditure of Rs. 25,387 for the richest quintile almost seven times greater than the annual per capita expenditure of the poorest quintile. The richest experienced the highest increase in per capita expenditure (both in absolute terms and in percentage terms) over 1995-2003.

According to the data from the 2001 Census, Nepal's adult literacy rate is only 48 percent. Furthermore, the literacy rate for women (35 percent) is almost half of that for men (62 percent).

There has been a progressive improvement in early childhood survival in recent years. Yet, children in Nepal are particularly vulnerable to malnutrition which is especially acute among

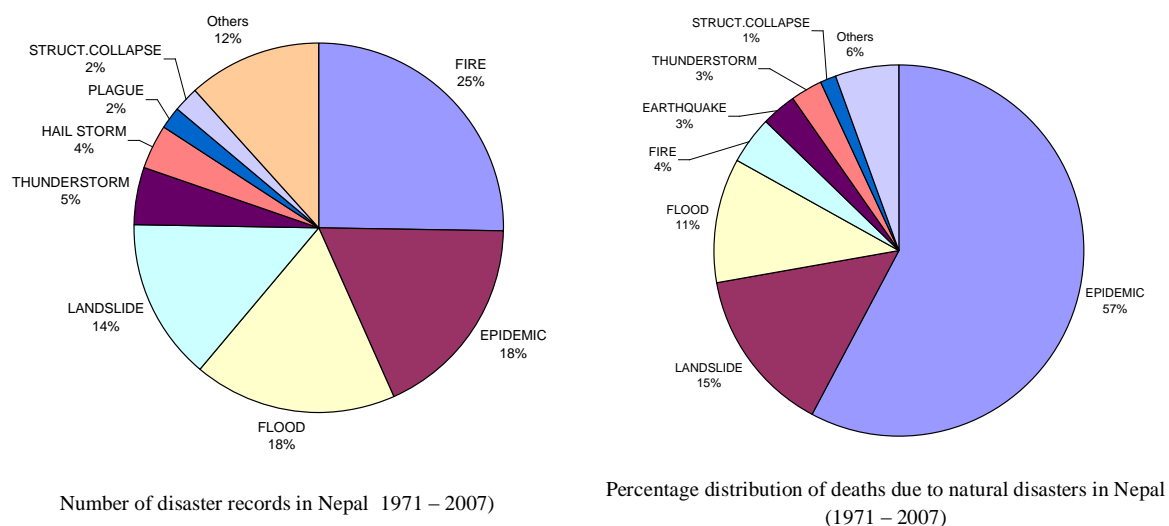
girls, with 49 percent of children under five being stunted and 20 percent being severely stunted. Similarly, wasting prevails among 3 percent of the children, 39 percent of children under age five are underweight and 11 percent are severely underweight.

Location, gender, caste/ethnicity, and income-based exclusions are conspicuous determinants of poverty in Nepal.

Disaster, intensive and extensive risk profile

Due to geologic, geomorphologic and hydro-meteorological factors, Nepal faces a multitude of natural hazards. Avalanches, glacier lakes outburst floods and snow storms occur frequently in the high Himalayan region, while flood, landslides and cloudbursts are mostly prevalent in the mountains. The plains of Terai in the south suffer from annual sheet flooding and droughts. Fires are prevalent in the mountains. The whole country falls in a highly seismic zone.

Figure 10: Number of natural disaster events in Nepal (1971 – 2007)



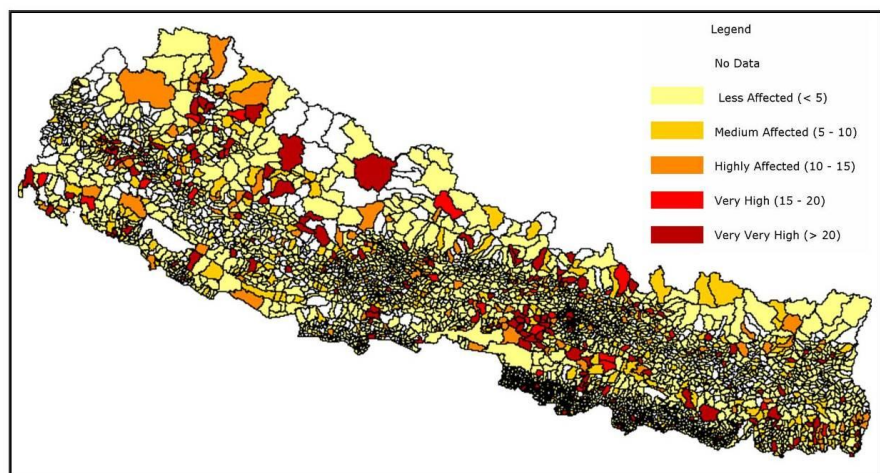
A DesInventar disaster Database for the 1971-2007 s period hows that the country has suffered from a variety of hazardous events – a total of 15,388 data-cards of hazard events has been prepared, indicating an average 415 annual events. A total of 27,256 deaths with further 2,995 missing, 54,182 injured, 345,923 houses damaged or destroyed, 847,647 ha of crops damaged and 735,981 livestock lost during the 37-year period. Of these events, fire constituted 25 percent of events, and epidemics, flood, and landslide constituted 18 percent, 18 percent and 14 percent respectively. Mortality, however, is 57 percent due to epidemics, 15 percent due to landslide, and 11 percent due to floods.

An upward trend, both in terms of number of events, deaths, and building damage and destruction is evident over the “relatively calm” 2001-2007 period. Hydro-meteorologic hazards, such as landslide, flood and drought show a strong seasonality. Most of these events occur during the monsoon months from mid-June to mid-September. Fire in settlements and epidemics also occur mostly during the summer monsoon months.

Applying the GAR cut-off criteria for distinguishing intensive and extensive risk events, 94 (0.6 percent) events are found to be intensive and 15,265 (99.4 percent) as extensive. Most of the Intensive events are epidemics (45 percent), floods (31 percent), fires (10 percent) and landslides (10 percent). There were only two earthquake in the study record.

Disastrous hazard events are extensively distributed across the country, although the southern Terai plains show relatively large concentrations of hazards, mainly due to the prevalence of flood, fire, and drought. Only the higher Himalayan region where population is sparse and the likelihood of hazard reporting is low, show a relatively low concentration of disasters.

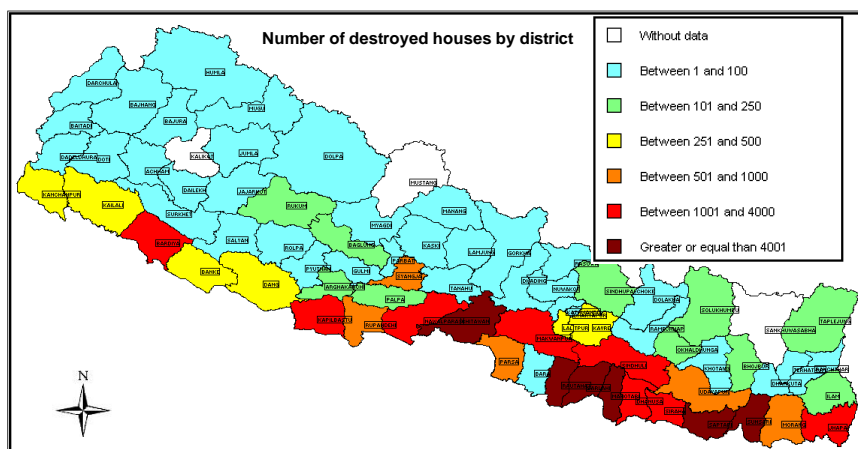
Figure 11: Spatial distribution of death due to natural disasters in Nepal (1971 – 2007)



Thus, as extensive risk have a greater cumulative impact, disaster mortality due to extensive events is strongly seasonal, especially because of the prevalence of epidemics, floods, landslide and fire in the summer and monsoon.

Intensive disasters make up only 0.6 percent of the total disaster events, but are the cause of 23 percent of the mortality and 40 percent of the building destruction. Mortality due to the intensive disasters is 67 percent due to epidemics, 14 percent due to the two earthquake events, 12 percent due to floods, 6 percent due to landslides and less than 1 percent due to fires. In terms of building destruction, intensive floods appears to be the most lethal – causing 49 percent of the building destruction. Earthquakes have a share of 40 percent, fire 8 percent, landslide 5

Figure 12: Impact of flooding on buildings in Nepal

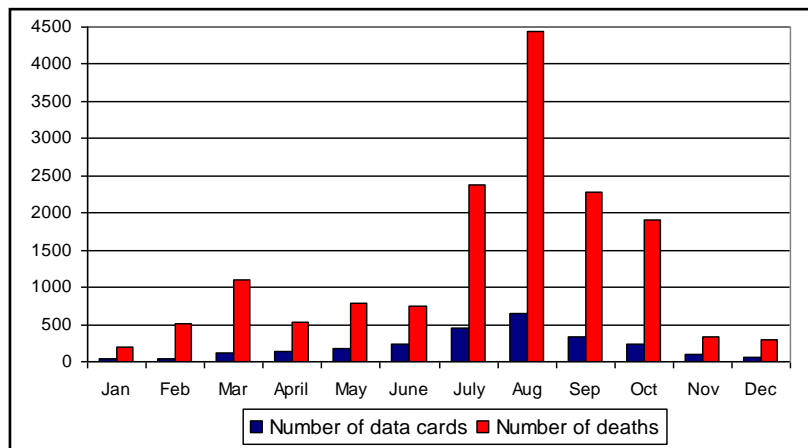


percent due to floods, 6 percent due to landslides and less than 1 percent due to fires. In terms of building destruction, intensive floods appears to be the most lethal – causing 49 percent of the building destruction. Earthquakes have a share of 40 percent, fire 8 percent, landslide 5

percent and forest fire 2 percent of all buildings destroyed. The two earthquake events in the record account for 3 percent of the total mortality and 16 percent of building damage and destruction over 1971-2007.

The large impact of epidemics, which occurs throughout the year with sharp peak during the monsoon, indicates the need to focus on improving public health conditions as a mitigation measure. Earthquakes, although not frequent in the last three decades in Nepal warrant urgent attention for

Figure 13: Seasonality of epidemics in Nepal



mitigation, especially implementation of the building codes and retrofitting, upgradation and strengthening of non-engineered construction that constitute a dominating majority of the existing building stock. Flood preparedness and fire management, and use of landuse planning instruments to reduce the impacts of landslides are areas for expedient policy intervention.

Poverty-risk relationship

Two-way relationship between poverty and natural hazards in Nepal was analyzed using district, ilaka (an arbitrary integration of the lowest level of administrative unit called Village Development Committees [VDC]). A correlation analysis using district level data did not provide clear evidence of a relationship between poverty and aggregate disaster indicators. The highly aggregate nature of district level data could be partly responsible for the lack of significant correlation between variables.

Using ilaka level data and separate indicators for the five hazard events of interest, it was found that areas with more people affected by epidemics in the past have higher poverty, and areas affected more by floods have lower poverty rates, a finding that requires further investigation as there could be multiple possible explanations. Ilaka level data too failed to provide any reliable evidence on the relationship poverty and the likelihood of future hazards. There was some evidence of a link between deprivation and future hazard loss when indicators of nutritional status were used.

Further analysis of ilaka level data using multiple regression models also provided evidence of a positive association between poverty and epidemics and negative association between poverty rate and floods. It also indicated that poverty rates are higher in areas that experienced landslides in the past. In addition, the ilaka regressions confirmed the role of other determinants of poverty, i.e. location, wealth, and demographic composition. They

showed that ilakas located in rural areas and in the mid and far western regions of Nepal had higher poverty rates providing further evidence of the negative impact of location-based exclusion on economic well being. Ilakas with higher levels of wealth were found to have lower poverty rates, while ilakas with higher dependency ratios and larger households had higher poverty rates. Interestingly, poverty was found to be lower in ilakas with larger percentages of female headed households.

The results based on household level cross-section data were consistent with the results observed for the ilaka regressions. Households affected by epidemics and landslides have lower per capita expenditures on average while floods are associated with higher household per capita expenditures. Our analysis reveals that predicted values for P0, P1 and P2 increase by 4.8 percent, 7.8 percent and 9.3 percent respectively as a result of landslides. Similarly, epidemics increase the predicted poverty rate by 3.3 percent, and P1 and P2 by 4.1 percent and 5.3 percent respectively.

Analysis of the household level cross section data suggested that ethnicity-based social exclusion is also a determinant of monetary poverty. This analysis also showed that while households receiving remittances are economically better off, households who rely more on the agricultural sector for their livelihoods tend to have lower per capita expenditures.

While the analysis of panel household data too provided evidence of statistically significant relationships between a number of poverty determinants and poverty, it failed to show any significant association between hazards and poverty. The absence of a statistically significant association between hazards and poverty is probably related to the use of VDC level disaster data in our analysis: this assigns the same disaster indicator value to all households belonging to a given VDC. As a result, the variation in disaster experience across households is not fully captured by VDC level disaster data, which could have masked the true relationship between poverty and disaster shocks.

Policy recommendations

Since epidemics and landslides are associated with higher poverty, steps should be taken to assist households to cope with disasters related to these hazard events. In Nepal, consumption smoothing through the use of credits is a key approach used by poor households to cope with poverty and disasters. The use of largely informal credit sources, is central to the livelihood strategies of poor households primarily for smoothing consumption. Therefore, it seems necessary to strengthen the reach and importance of the formal sector credit sources, such as banks and cooperatives. Further, several micro credit programs in Nepal are specifically targeted towards the poor, the livestock sector being one. This is also a sector that faces high risk of loss in times of disasters. Provision of livestock insurance can be of big help to farmers in managing the risks associated with their livestock. Unfortunately, livestock insurance in Nepal is very limited both in terms of scope and reach.

The importance of micro-insurance in helping poor households to cope with disasters has not been understood and practiced. Affordable insurance is not available for the poor apart from

limited livestock insurance and some life insurance schemes which are usually not affordable by the poorest households.

Another area of policy intervention is social protection. Positive changes in the total expenditure on Social Protection which is only around 2 percent of GDP currently, with less than 50 percent of the amount going to the poor could improve the current scenario in which most poor households need to rely on their own resources to recover from disasters and poverty.

The current Three-Year Interim Plan (2007 – 2009) has taken forward the Tenth Five Year Plan poverty reduction strategy paper for Nepal. It targets the root causes of poverty and has identified commensurate policy instruments emphasizing an increase in public expenditure to assist relief and generate employment as well as on peace building, reconstruction, rehabilitation, reintegration, inclusion, and revitalization of the economy. The need is to implement the adopted approaches, strategies and programs which in spite of the ongoing political and social challenges surfacing during the current transition.

The Interim Plan also emphasizes several strategies and programs targeting disaster risk reduction. A National Strategy for Disaster Risk Management (NSDRM) has been formulated to mainstream disaster risk reduction into the development process thereby joining-up development, poverty and disaster reduction approaches. Implementation and follow up of the Strategy is the most important task, especially in view of positive changes in the support strategies of international development partners.

ORISSA, INDIA

ORISSA, INDIA: STATE POLICY NOTE

Development Context

Orissa, located on India's eastern coast with a population of 37 million (3.6 percent of the national population in 2001) is one of its most vulnerable States in terms of both intensive and extensive risk. It is also one of India's least developed States, with a per capita Net State Domestic Product (NSDP) of Rs. 17,299 in 2005⁴ - about two thirds of the national average, placing it 16th among the twenty large Indian states.

The State's economy is primarily rural (85 percent) and agrarian with 64 percent of the work force but only 36 percent of the State Domestic Product coming from the primary sector. It is also home to a large socially marginal groups of 6 million Scheduled Castes (SCs) and 8 million Scheduled Tribes (STs). Natural disasters have historically had a strong debilitating impact on the food security, livelihoods and living conditions of these marginal peoples.

The state has varied topography across three broad agro-ecological zones. The productive but densely populated eastern Orissa coastal plain is criss-crossed by multiple rivers and large deltas. Its location along the Bay of Bengal exposes it to recurrent cyclones, storm surge and fluvial and pluvial flooding, despite the construction of flood control dams and embankments. Most people in this fertile region draw their livelihoods from agriculture, fishing or more recently aquaculture. North-western Orissa has rocky highlands and rolling hills with low land productivity - but significant mineral deposits. Drought, flooding and high winds are the major hazard risks that this sub-region is exposed to.

Southern Orissa has large mineral concentrations, but is best known for its extensive forests and largely tribal populations that are dependent on them. Wide-scale degradation of forests has resulted in increased vulnerability to drought, floods and localized near-famine conditions. This has help create a situation of extreme and poverty in the Kalahandi, Bolangir, and Koraput (KBK) sub-region of south-western Orissa characterised by repeated drought, high levels of food insecurity and chronic income poverty resulting in absolute hunger, regular distress migration, and periodic allegations of starvation deaths⁵.

Orissa is largely seismically stable, but fires and epidemics are widespread across the state, due to the vulnerable condition of its thatch and earth houses, poor access to safe water, sanitation and health services of a large proportion of its population.

⁴ Economic Survey, 2007-08, Government of India, Table 1.8 from <http://indiabudget.nic.in>

⁵Government of Orissa (2004): *Orissa Human Development Report, 2004*, Government of Orissa, Bhubaneswar, pp. 24

Poverty Profile, Dynamics and Vulnerability

Orissa is one of the states in India, which in spite of rapid national economic growth has experienced an increase in the incidence and depth of poverty over the last decade. This is partially because of structural challenges in the Orissa economy – which is finding it difficult to break out of a low-level agrarian trap. The role of recurrent natural disasters in volatility of primary sector output has not been small.

As a result, Orissa's rural poverty Head Count Ratio (HCR) declined marginally from 50 percent to 49 percent over 1993-2004⁶, while the total number of rural poor actually increases from 14 to 15 million. The incidence of urban poverty increased from 42 to 44 percent over this period with the absolute number of urban poor increasing from 2 to 2.7 million. During this period, rural poverty incidence declined from 37 to 28 percent across India and urban poverty from 32 per cent to 26 percent.

The rural poverty gap index deepened in urban Orissa from 11.4 in 1993 to 14.1 in 2004⁷. The urban poverty gap remained roughly constant at 12. Orissa's urban Gini coefficient in 2004 at 35.4 was much higher than rural areas at 28.5 percent. At 15 percent urbanization in the state is low, but highly iniquitous and concentrated in the coastal districts.

The most backward, developmentally challenged and tribal dominated KBK region in Orissa is resource rich but severely drought prone. A dramatic increase in the poverty HCR for the KBK region from 69 to 73 percent took place over 1993-2004⁸. In northern Orissa with a third of its population as tribals and with low agricultural productivity, rural poverty has also increased sharply from 46 per cent to 59 percent. Coastal Orissa, with 19 percent SCs and insignificant tribal population, is the only sub-region that has observed a decline in rural poverty, from 45 per cent to 27 per cent during this period.

Orissa's HDI at a low 0.40 placed it 11th among the 15 large Indian States in 2001⁹. This is echoed in underlying indicators. As many as 73 out of 1000 children born in Orissa die in their first year, 44 percent of under-three are underweight, 19 percent are wasted and 35 percent are stunted¹⁰. On an average more than half of Orissa's rural women are illiterate while 60 percent of rural SC women and 80 percent rural ST women are illiterate¹¹.

The Scheduled Tribes and Castes are therefore among the most vulnerable population groups in Orissa, within which women, children and the aged are especially vulnerable. The reported impact of natural disasters on these groups are high, with the continuing degradation of their coping capacity due to increasing pressure on their natural resource-dependant livelihoods leading to a continuing series of income and asset shocks. This is exacerbated by low levels of

⁶ 1993-94 HCR from Planning Commission (2002): *National Human Development Report, 2001*, Planning Commission, Government of India. 2004-05 HCR from Government of India, Press Information Bureau (2007): *Poverty Estimates from 2004-05*, March, Government of India, New Delhi (from the website of the India, Planning Commission).

⁷ Statistics in this paragraph are from Himanshu (2007): "Recent Trends in Poverty and Inequality: Some Preliminary Results", *Economic and Political Weekly*, February 10, pp. 497-508.

⁸ Statistics in this paragraph are estimated from the household schedule data of the National Sample Survey.

⁹ The Planning Commission (2002): *National Human Development Report, 2001*, Planning Commission, Government of India.

¹⁰ From 5 National Family Health Survey 3 (2005-06) from the website: <http://nfhsindia.org/factsheet.html> accessed on November 1, 2008.

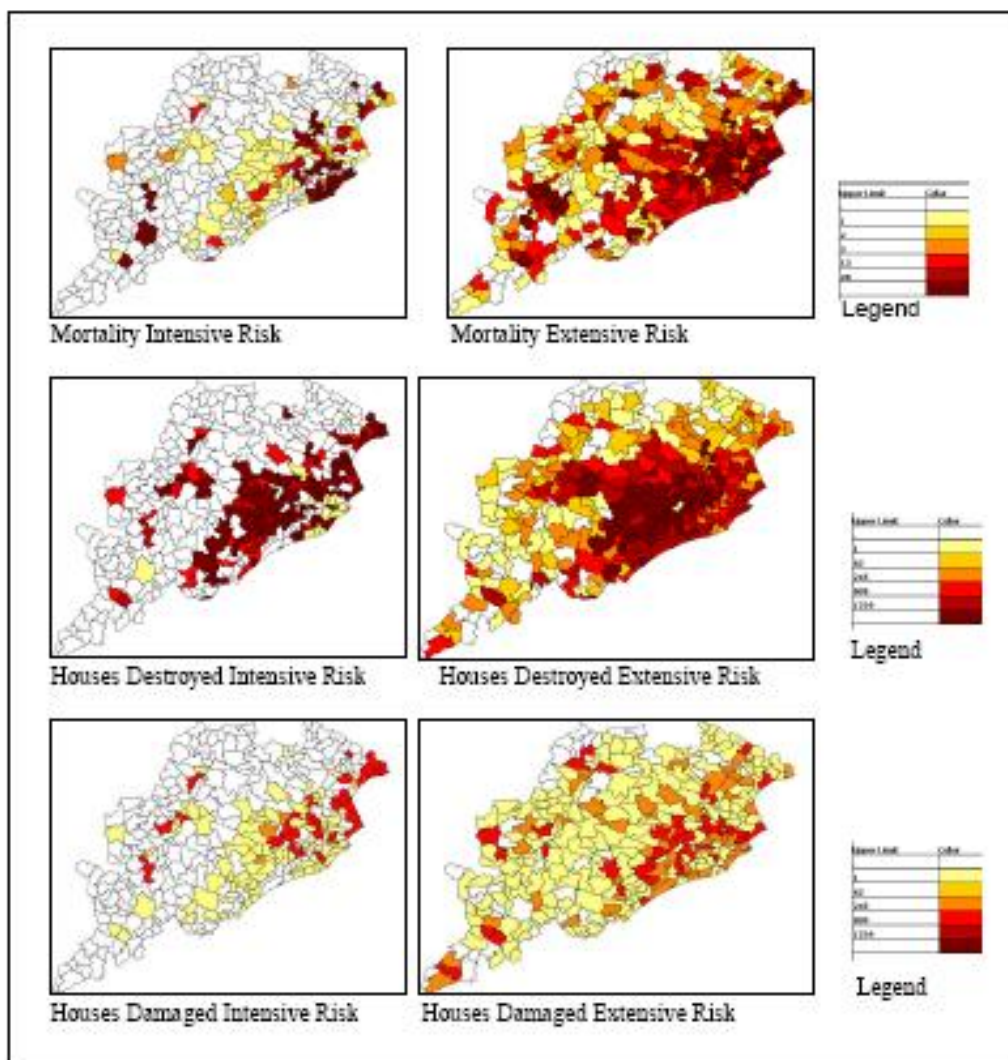
¹¹ 2004-05 data from NSSO (2006): *Employment and Unemployment Situation among Social Groups in India, 2004-05*, NSS 61st Round (July 2004 – June 2005), Report 516, Ministry of Statistics & Programme Implementation, Government of India, October.

human development, infrastructure and public services provisioning and weak institutional capacity to respond.

Disaster Risk Profile

Orissa has been exposed to a series of massive hydro-meteorological shocks over the last two decades. The most devastating were the 1999 supercyclone and 2008 floods, which caused thousands of casualties and impacted the lives of hundreds of thousands. These intensive disaster events are largely concentrated in coastal Orissa. The hidden challenge however, is extensive risk which is spread across the entire landscape of the state, with a declining gradient outward from the densely populated coastal to western and southern Orissa¹².

Figure 14: Spatial distribution of extensive & intensive risk in Orissa



¹² The disaster risk data is from the DesInventar data base. See website: <http://gar-isdr.desinventar.net/DesInventar/thematic.jsp>.

Mortality in Orissa has largely been caused by intensive cyclone and storm surge events, intensive and extensive epidemic outbreaks which have been reported across the state and both intensive and extensive flooding and hydro-metrological events.

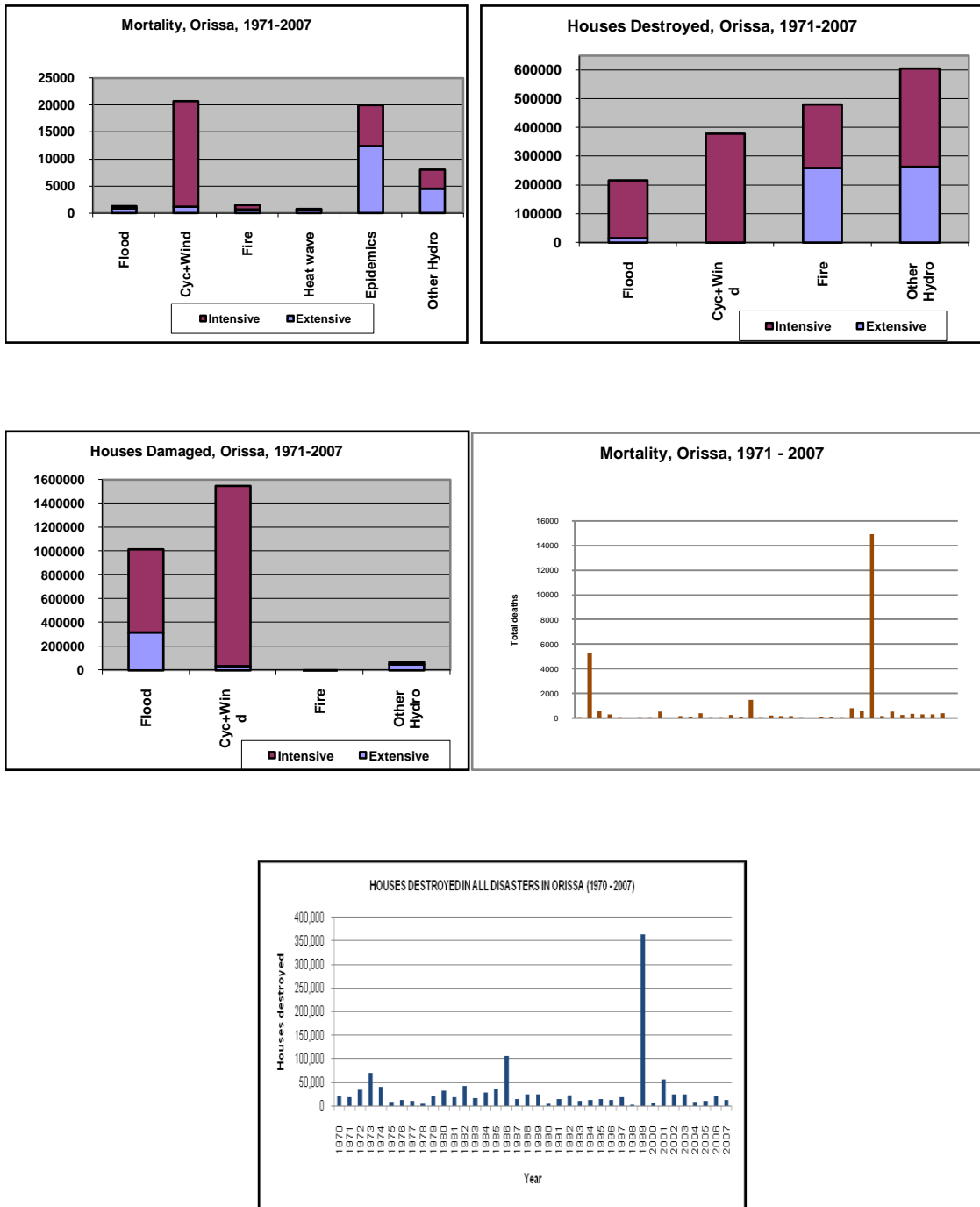
Surge deaths have been especially high due to the high concentration and vulnerability of the large population of coastal Orissa and high intensity of cyclone strike. High mortality due to epidemics could be an outcome of a mix of starvation, poor nutrition and access to health care services, mixed in with inadequate housing and sanitation infrastructure.

In contrast, house destruction and damage has largely been due to intensive cyclone, flood and hydro-metrological events. This is primarily due to the high proportion of earth walled and thatch roofed houses in the state and their locations which are vulnerable to inundation and the impact of high wind. Orissa experiences an exceptionally high proportion of fire destruction of houses, which is an extensive risk, reported across much of the state, due to the marked vulnerability of buildings with thatch and biomass roofs and the high density of settlements that can facilitate the spread of fire rather quickly.

Orissa is exposed to natural hazards that cause loss of life and building destruction in almost every year of the DesInventar record (1970-2007). The most severe intensive shock was the 1999 supercyclone that affected 12.57 million people, killed 9889 people and damaged and destroyed over 1.58 million houses¹³. Given its large and vulnerable population, a large fraction of who are poor, Orissa needs to integrate its disaster risk reduction strategy and interventions with ongoing development and poverty reduction programmes.

¹³ Government of Orissa (2004): *Orissa Human Development Report, 2004*, Government of Orissa, Bhubaneswar, pp. 175.

Figure 15: Mortality, House Destruction & Damage in Orissa (1971-2007)



Poverty-Risk Relationship

The poverty-risk relationship in Orissa is clearly visible to both development and disaster risk practitioners. It is strongly influenced by regional variations in population exposure, vulnerability, house types, access to infrastructure and public services (especially health care), the coping capacity of communities and the institutional capacity of public agencies to respond. Part of the increasing levels of and deepening of poverty in Orissa can be traced to recurrent shocks and the declining capacity of poor household's dependant on agrarian, forest and resource-based livelihoods to cope with both asset and income shocks, without access to an appropriate social safety net.

Due to the lack of disaggregated time-series data especially on household expenditure, assets and shocks, this has been difficult to analytically establish. In addition, the most important extensive risk to much of Orissa i.e. drought is inadequately captured in the DesInventar database. Hence, at best a broad brush practice-based picture of the poverty-risk relationship can be painted.

Southern Orissa, the most socio-economically vulnerable sub-region, which has a high concentration of ST population and increasing poverty, is not prone to cyclones and flood. It is prone to drought and extensive forest degradation, both of which are not captured adequately in available databases.

Coastal Orissa, the most densely settled and most prosperous region in which poverty has been declining, in spite of the high SC population - is most exposed to a mix of flooding, cyclones and storm surge. Here again sub-regional differentials are marked. The northern districts of Bhadrak, Kendrapara and Jajapur, which have low incomes, low urbanization and high proportion of SCs have registered high disaster mortality. Houses destroyed and damaged are concentrated in the urbanized districts of Cuttack, Khurda in Jharsuguda and Sambalpur, the moderately developed Ganjam and less developed districts of Nayagarh and Phulbani. This is largely because of the level of exposure to flooding and surge action (much of this region is only a few metres above sea level) and facing the direct onslaught of cyclonic winds when they strike land.

Since longitudinal household data with shocks is not available for Orissa or India, only a highly simplified set of analytical tests could be applied to examining the risk-poverty relationship in Orissa, using proxies for poverty and district and Block level. The only statistically significant relationship was that between the population living in inadequate temporary housing (typically of earth walls and thatch roofs) and the population affected by floods, cyclone, lightning and fire.

Policy Interventions and Outcomes

Following the 1999 supercyclone, the state government set up the Orissa State Disaster Management Authority (OSDMA) with a wide disaster preparedness and management mandate including: acting as the nodal agency for disaster reconstruction; coordination with

the line departments, bilateral, multi-lateral and UN agencies and state-level NGOs; promotion of disaster preparedness and networking with other disaster management organisations¹⁴.

Following this, effective disaster reconstruction, preparedness and response activities have been undertaken under the aegis of OSDMA including construction of disaster resistant shelters and school building and, community based disaster management and preparedness interventions that have also been decentralised leading to reduced mortality in recent disasters.

While, the State government has responded well to disaster it has been unable to effectively address overall development and poverty reduction challenges. In spite of economic growth over the 1993-2004 period, the number of poor, the proportion of urban poor and poverty depth have increased.

Since, vulnerability is probably the most important link between hazards and disaster risk in Orissa, poverty reduction will be a necessary condition for sustained disaster risk reduction. Disaster risk reduction is clearly not sustainable in a region in which such high levels of poverty prevail. It is possible that risk of disaster induced poverty could have been reduced in Orissa, but there is no analytically rigorous means of proving this because of lack of appropriate and systematic data.

Public policy interventions to reduce deprivation strengthen infrastructure and access to public services on a regular basis; along with risk mitigation via reducing vulnerability are the key to addressing the challenges observed at Orissa risk-poverty interface.

There is an immediate need to establish systematic data collection to map the relationship between disasters and poverty in Orissa, via regular household level expenditure, asset, capabilities and shock surveys. These would also need to track community and village level capabilities and public interventions. These would help track both poverty and risk, help target and monitor the process and impact of public development and risk reduction programmes.

Extensive risks emanating from epidemics can be mitigated by a series of coordinated development interventions: improving food security and nutrition, adopting an inclusive growth model, gender empowerment, improving public health care systems and institutional reform to enable access to these services. Extensive flood risk can be mitigated via better river and basin management practices, early warning systems, improving housing conditions and settlement locations. Risk to cyclones and winds can be reduced by improving housing conditions, the quality of lifeline infrastructure, building a state-wide network of shelters and a community-linked early warning and preparedness system. Above all, governance needs to be improved in Orissa to improve the public expenditure effectiveness, enable accountability and transparency in functioning

¹⁴ From (<http://v3.osdma.org/ViewDetails.aspx?vchglinkid=GL000&vchplinkid=PL000&vchslinkid=SL000>), accessed on October 20, 2008.

Suggested Policy Interventions

A series of coordinated development and DRR policy interventions need to be launched in Orissa, as listed below:

1. Orissa's policy of promoting economic growth derived from the exploitation of natural resources could enhance disaster risk and may need to be re-examined
2. Diversification of the state economy and enabling sustainable livelihood development outside the primary sector would help reduce risk and poverty simultaneously.
3. Upgrading both rural and urban housing stock, improving the quality of new buildings and lifeline infrastructure would reduce vulnerability to hydro-metrological risks.
4. Establishing early warning and community-based response capacity would help reduce mortality. This simultaneous with the improvement in nutrition status and health care access could help reduce the impact of extensive epidemics
5. A series of effective public policy interventions to reduce deprivation along with disaster vulnerability mitigation need to be developed targeting particularly vulnerable regions and population groups in the state
6. Disaster risk reduction should be integrated into major development schemes, new public programmes and private investments via structured risk and vulnerability assessment and mitigation planning
7. The State should continue its largely successful effort at mainstreaming disaster risk reduction efforts via community participation, leading to lowering of event mortality and losses
8. A disaster vulnerability, risk and poverty reduction monitoring mechanism and capacities will need to be established at district and state level

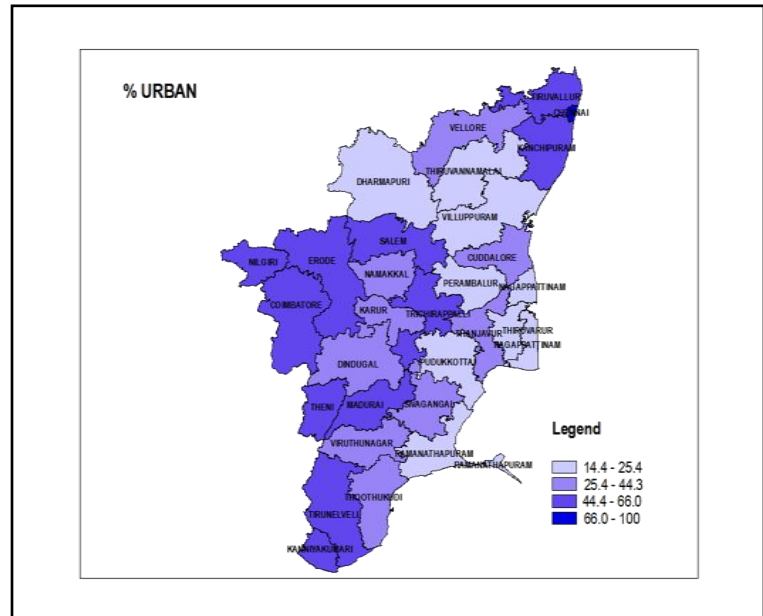
TAMIL NADU, INDIA

TAMIL NADU, INDIA: STATE POLICY NOTE

Development Context

Tamil Nadu with a population of 62 million (6.1 per cent of the national population in 2001) is located at India's southern tip, adjoining the Bay of Bengal. It is ranked 7th of 20 largest states in India, with a per capita Net State Domestic Product (NSDP) of Rs. 29,958 in 2005¹⁵ which is 1.16 times the national average. Scheduled Castes (SCs) constitute 19 per cent of the state's population and Scheduled Tribes (STs) less than 1 per cent. The State's vulnerability to disasters came to the fore during the 2004 Indian Ocean tsunami that caused massive death in the coastal districts.

Figure 16: Urbanisation in Tamil Nadu (2001)



Tamil Nadu is India's most urbanized large State (44 percent) with a diversified economy. The primary sector contributed only 14 percent of NSDP in 2004¹⁶ while accounting for 46 percent of the work force¹⁷, indicating low per capita agrarian income and productivity. The secondary sector contributed 30 percent of the NSDP and employed 26 percent of the work force, while the tertiary sector's output contribution at 57 percent was much higher than its workforce share of 28 percent - indicating the importance of high productivity sub-sectors such as information technology (IT), financial and real estate services to the state economy. Rural-urban income gaps in the State are high because of this sectoral output asymmetry.

Drought is the most serious hazard, with 23 of the 30 districts being drought prone. The urbanized districts of central coastal Tamil Nadu (Chennai, Thiruvallur and Kanchipuram, Cuddalore and Nagapattinam), Kanyakumari in the southern region, and the north-western districts of Salem and Dharmapuri are all highly prone to floods. The entire coastal belt, in particular southern Tamil Nadu is prone to cyclones and high winds with 50 cyclones striking this region over 1990-2005¹⁸. While Tamil Nadu is exposed to limited local seismic risk, the

¹⁵ Economic Survey, 2007-08, Government of India, Table 1.8 from <http://indiabudget.nic.in>

¹⁶ State income data in this paragraph from <http://www.tn.gov.in/dear/State%20income.pdf> accessed on October 11, 2008.

¹⁷ Employment data in this paragraph from 2004-05 data from NSSO (2006): *Employment and Unemployment Situation among Social Groups in India, 2004-05, NSS 61st Round (July 2004 – June 2005)*, Report 516, Ministry of Statistics & Programme Implementation, Government of India, October

¹⁸ Data compiled by the UNDP's Disaster Risk Management Unit, India.

entire eastern coastal belt and the southern tip was impacted by the tsunami. In short, a large part of the State is multi-hazard prone.

Vulnerability is also high in Tamil Nadu as more than half the population resides in rural areas with very low incomes, highly vulnerable to drought and other income shocks. The relatively high level of urbanization appears to be inducing a number of new vulnerabilities to flooding, fire and industrial accidents that are poorly understood, and hence inadequately addressed.

Poverty Profile, Dynamics and Vulnerability

Tamil Nadu's has been more successful in poverty reduction than many Indian states, particularly with respect to urban poverty. The rural poverty Head Count Ratio (HCR) declined significantly from 32 to 23 percent over 1993-2004, while the urban HCR fell faster from 40 to 22 percent¹⁹. Consequently, the number of rural poor declined from 12 to 7.7 million and urban poor from 8 to 6.9 million. The depth of poverty declined by 50 percent over this decade from 7.3 to 3.7 in rural areas and from 10.2 to 5.3 in urban areas²⁰, with a significantly higher depth than in rural areas. This is corroborated by the 2004 urban Gini coefficient of 36.1 being higher than the rural Gini at 32.2.

Tamil Nadu with a Human Development Index (HDI) of 0.53 in 2001 is 3rd among India's 15 largest states²¹. The state has made considerable progress in raising its HDI from 0.47 in 1991, because of rapid improvements in income and education. Rural female literacy was 55 per cent and that of female SCs 44 percent, compared to 45 and 32 percent for India²². Tamil Nadu's performance on health delivery however, is weak, with its Infant Mortality Rate (IMR) being 36 per 1000 children born compared to Kerala at 15²³. In 2005, 25 percent of the under-3 were stunted, 22 percent wasted and 33 percent underweight²⁴.

Strong differentials still exist in Tamil Nadu with 31 percent of the Scheduled Caste (SCs) being poor in rural and 40 percent in urban areas, nearly twice the mean HCR in urban and 50 percent higher than the mean rural HCR²⁵. Economic growth does not seem to be trickling down to the most vulnerable, in spite of a long history of pro-poor programmes and policy interventions.

¹⁹ 1993-94 HCR from Planning Commission (2002): *National Human Development Report, 2001*, Planning Commission, Government of India. 2004-05 HCR from Government of India, Press Information Bureau (2007): *Poverty Estimates from 2004-05*, March, Government of India, New Delhi (from the website of the India, Planning Commission).

²⁰ Poverty depth, severity and Gini coefficient data from Himanshu (2007): "Recent Trends in Poverty and Inequality: Some Preliminary Results", *Economic and Political Weekly*, February 10, pp. 497-508.

²¹ The Planning Commission (2002): *National Human Development Report, 2001*, Planning Commission, Government of India.

²² 2004-05 data from NSSO (2006): *Employment and Unemployment Situation among Social Groups in India, 2004-05*, NSS 61st Round (July 2004 – June 2005), Report 516, Ministry of Statistics & Programme Implementation, Government of India, October.

²³ Economic Survey, 2007-08, Government of India, Table A-123 from <http://indiabudget.nic.in>

²⁴ From 5 National Family Health Survey 3 (2005-06) from the website: <http://nfhsindia.org/factsheet.html> accessed on November 1, 2008.

²⁵ From website: tribal.nic.in/STATISTICS/pdf/table10.pdf accessed on October 12, 2008.

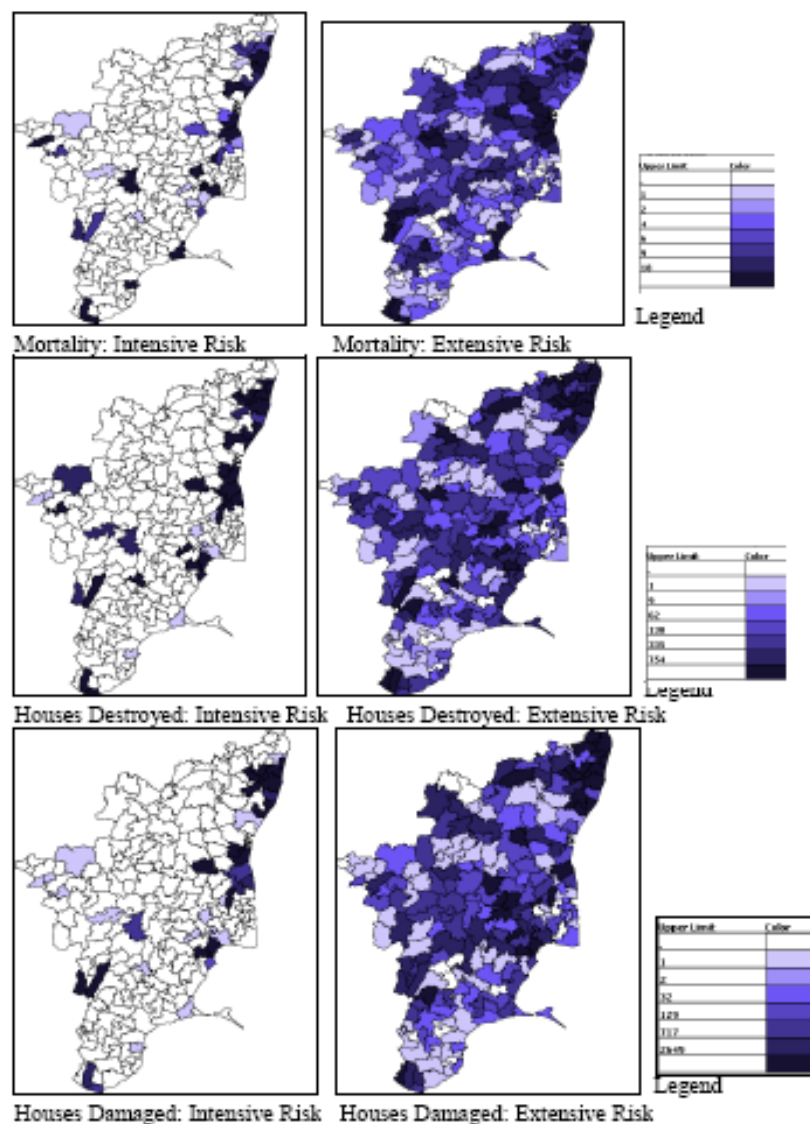
Differential vulnerability, especially of marginal groups like the SCs, women and children continues to be a serious challenge in Tamil Nadu, as the patterns of mortality and loss during the 2004 tsunami indicated. With a rapid build-up of urban population without adequate infrastructure or public services, urban vulnerability can be expected to increase.

Disaster Risk Profile²⁶

Extensive disaster events have caused widespread damage in Tamil Nadu. Cumulatively they have caused more mortality, destruction and damage to houses than intensive events. Almost all of the state is exposed to extensive risk. This is primarily due to the widespread incidence of drought, fires and epidemics across the state due the limited coverage of irrigation, poor quality of some of the housing, high urban densities and weak health care delivery systems.

The most serious recent intensive event was the 2004 Indian Ocean tsunami that tends to skew the loss record considerably. Intensive risk is concentrated in areas along the coast and pockets in the Nilgiri hills.

Figure 17: Spatial Distribution of Intensive & Extensive risk in Tamil Nadu



Tamil Nadu: Block-level Intensive and Extensive risk profile

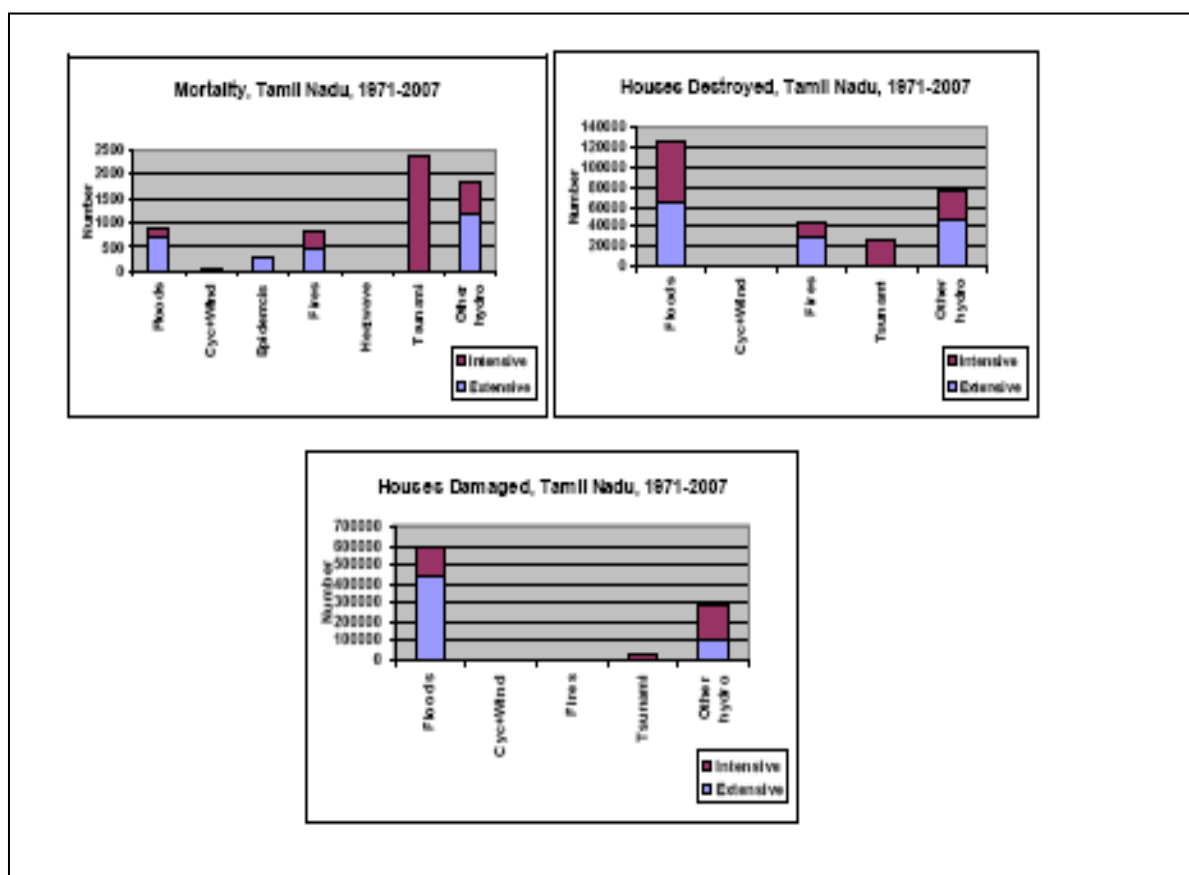
²⁶ The disaster risk data is from the DesInventar data base. See: <http://gar-isdr.desinventar.net/DesInventar/thematic.jsp>.

Intensive events have contributed most to mortality in the state, especially the 2004 tsunami. On the other hand, much of the housing damage and destruction has been caused by extensive events such as floods, fires and other hydro-meteorological risks.

Tamil Nadu has a long history of chain tank based irrigation, which has largely fallen into disuse. The catastrophic failure of tanks, flooding in silted channels and rivers during extreme weather events including cyclones are among many causes of flood damage.

Pockets of extensive risk are concentrated around Tamil Nadu’s urban centres, due to high population densities, the location of informal settlements and poor drainage infrastructure and services.

Figure 18: Mortality, House Destruction & Damage in Tamil Nadu (1971-2007)



Disaster induced mortality is relatively low in Tamil Nadu compared to other Indian states, except for extreme intensive events like the tsunami. House destruction is however, much more common. Floods cause the largest share of house destruction and damage but much less mortality. Tamil Nadu has a long record of strong pro-poor State welfare programmes which could have contributed to lowered vulnerability to extensive risks like flooding.

Poverty-Risk Relationship

The poverty-risk relationship is more difficult to establish in Tamil Nadu than other Indian states, partially because of the dramatic reduction in poverty incidence and depth, the demographic transition that the state is going through and the strong interventions that have been made in most areas of human development, except possibly in some related to health.

An increasing level of urbanisation and the transition from farm to non-farm employment are well on their way in Tamil Nadu, which also has a higher share of industrial in total employment than many Indian states. Hence, the impact of drought, which used to be scourge leading to famines and mass migrations as recent as the early 20th century, is much less than before.

The availability of data on urban risks in the state is weak, as DesInventar does not distinguish between urban and rural areas. Therefore, unbundling emergent risk-poverty relationships in urban Tamil Nadu is not possible at this point in time. Analysis is further constrained by the absence of disaggregated time-series data on household expenditure, assets and shocks and official district poverty data for India and Tamil Nadu.

However, Block level analysis for the throws up interesting results:

- Share of temporary houses in total houses with Deaths due to extensive floods ($r=0.22$) and Deaths due to floods ($r=0.15$)
- Extensive Flood deaths is explained by share of temporary houses (at 1 percent significance) and total houses (at 0.5 percent significance²⁷) and an R^2 of 0.091²⁸
- Cyclone & wind caused damages to the houses explained by share of temporary houses (at 1 percent significance), total houses (at 1 percent significance), share of SC population (at 5 percent significance) and literacy rate (at 3 percent significance) and an R^2 of 0.091²⁹.

More detailed investigation is required to try and map the changing pattern of poverty-risk relationships in Tamil Nadu as it makes its way through multiple complex transitions in urbanisation, per capita income growth, economic structure, upgradation of housing and infrastructure and improvement in the delivery of some public services.

²⁷ The total houses used as control variable for the size.

²⁸ This is EGLS (Estimated Generalised Least Square) Model of random effect variant, where districts have been used as dummies.

²⁹ This is Ordinary Least Square (OLS) regression model.

Policy Interventions and Outcomes

Tamil Nadu is not commonly perceived as a disaster prone state. This analysis indicates that nearly all Blocks in the state have been affected by extensive disasters since 1971. Most coastal Blocks and some hill areas have also been affected by intensive events like cyclones, flooding and the tsunami.

Following the 2004 tsunami, the Government of Tamil Nadu has adopted a Disaster Management Policy (DMP), and put in place a Disaster Management Programme which envisages the establishment of a state Disaster Management Authority (DMA). The DMA will serve as a nodal agency with a wide mandate to facilitate, coordinate and monitor disaster management and to help converge disaster management and development planning.

The aim of the state DMP is to mitigate the impact of all kinds of disasters on the loss of lives, property, critical infrastructure and economic and development activity. It seeks to replace a conventional reactive relief approach by a proactive approach and to develop a new culture of prevention, preparedness and rapid disaster response. Preparedness, response and restoration plans have been prepared for most hazard types for the state.

Tamil Nadu has been implementing the Drought Prone Area Programme (DPAP) and watershed development programmes to deal with recurrent drought. Their limited impact is an indication of the need for a shift of strategy towards greater environmental sustainability. It will also be essential to capture drought impact in the state DesInventar dataset.

There is an immediate need for systematic data collection to map and track the dynamic relationship between disaster and poverty, via sample household expenditure, assets, capabilities and shock surveys. Panel data that tracks these variables at set intervals and after major events would enable a much better understanding of how disaster risk reduction could be mainstreamed into ongoing development programmes as suggested in the Eleventh Five Year Plan.

Updating the DesInventar dataset to provide a rural-urban break-up would be of considerable importance for Tamil Nadu, as it rapidly urbanises. Very little is known about urban disasters in the state, except that urbanized districts have a higher incidence of fire and flooding than less urbanized districts. Urban flooding is largely caused by inappropriate and non-conforming land uses and poor drainage that needs to be mapped and monitored. Urban public health is a major issue in Tamil Nadu, with high levels of extensive public health shocks being reported. This would logically lead to the preparation of City Disaster Risk profiles and Management Plans for major urban centres in Tamil Nadu and their integration into urban development and management processes and governance framework.

Suggested Policy Interventions

A series of coordinated development and Disaster Risk Reduction policy interventions need to be launched in Tamil Nadu, as listed below:

- Almost all of Tamil Nadu is exposed to multiple extensive risks such as drought, epidemics, fires and floods. A shift of attention to these risks from more charismatic intensive risks like the 2004 tsunami needs to be enabled, especially if the risk-poverty link has to be broken
- Tamil Nadu is a highly urbanized state. Hence, more than other states attention needs to be paid to understanding urban hazard risks and vulnerability and integrating mitigation measures into ongoing urban development and renewal programmes.
- Disaster risk reduction should be integrated into major development schemes, new public programmes and private investments via structured risk and vulnerability assessment and mitigation planning
- Tamil Nadu's disaster monitoring system needs to be upgraded to capture drought impact and also separate urban from rural disasters to enable more focused interventions and policy responses
- A monitoring mechanism that undertakes longitudinal household-level surveys to map the disaster-risk relationship, especially the differential impact on the SCs and other vulnerable groups will need to be established.
- A hazard and region-specific mix of disaster risk reduction and mitigation measures to reduce vulnerabilities, mainstream a "do no harms" approach into existing development programmes will need to be identified via district and urban disaster management and mitigation plans. These should be translated into action via the State Disaster Management Authority (SDMA)/District Disaster Management Authority (DDMA) structures being established in Tamil Nadu.

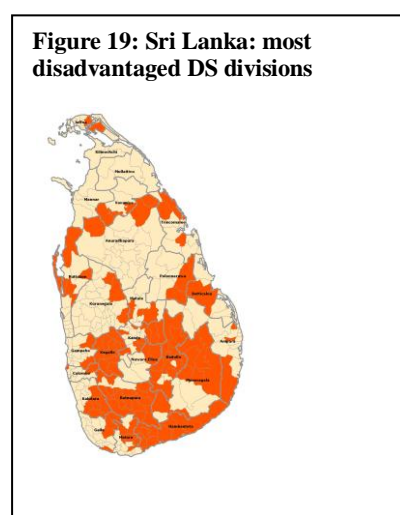
SRI LANKA

SRI LANKA: COUNTRY POLICY NOTE ³⁰

Development Context, Challenges and Response

Sri Lanka is a densely populated, culturally diverse and natural resource-rich South Asian island country of 65,525 sq km. Its population of about 20 million is made up of Sinhalese (74 percent), Tamil (17 percent) and Muslims (8 percent). The country's population pyramid, with increasing aging is closer to that of developed countries with only 25 percent of the population below 15 and the potential working population (15-59 years) making up about 63 percent of the total.

Due to a long-history of significant public expenditure in health and education, Sri Lanka's Life expectancy of 72, is also close to that of developed nations. In 2007 it was ranked 99th globally with a Human Development Index of 0.743, underpinned by universal primary school enrolment, impressive literacy rates and high gender equality.



Sri Lanka is poised to meet or possibly exceed the Millennium Development Goals (MDGs) before 2015. However, significant challenges remain in reducing income poverty, improving the geographic distribution of economic growth and achieving quality (World Bank, 2008) of services. The government has hence, identified 119 most-disadvantaged Divisional Secretariat Divisions (DS) to focus its longstanding poverty reduction programmes. The internal Sri Lankan security situation however remains a major challenge, undermining economic growth and development potential. Two decades of armed conflict combined with the December 2004 Indian Ocean tsunami have caused heavy destruction and widespread human suffering. An effective

poverty and risk mitigation strategy for Sri Lanka would need to address these contextual challenges.

Sri Lanka is seeking to eradicate poverty and malnutrition across all regions and strata of society and promote peace and sustainable human development while protecting its environment which is prone to natural hazards and disasters. A pro-poor growth strategy incorporating a rights-based approach; macro-economic stability; legal and institutional reform for good governance; and social justice with equitable and efficient service provision, will need to be implemented to meet the above goals.

³⁰ Prepared as a draft Sri Lanka contribution to the Global Assessment Report (GAR) on disaster risk reduction. Please do not distribute, copy or use the information as the document is being cleared with respective Government authorities for content – Contact: ananda.mallawatantri@undp.org

Poverty Profile and Dynamics

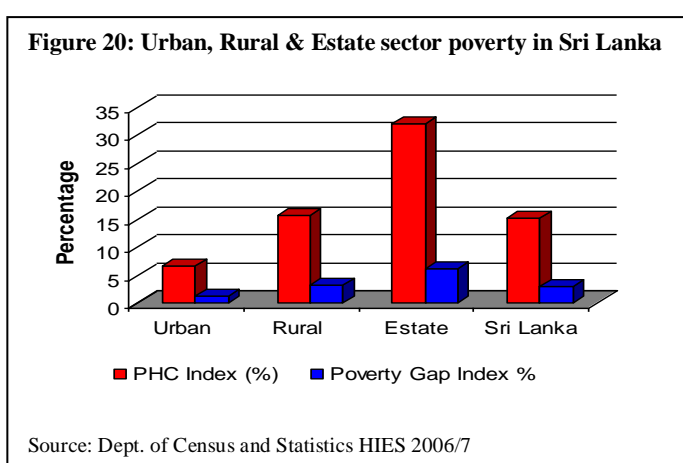
Sri Lanka's mixed development policies over the last four decades and the ongoing conflict in its northern and eastern provinces have influenced its contemporary economic and poverty profile. With growth averaging over 5 percent in the last decade, mean per capita income reached USD 1,617 in 2007. About 6 percent and 42 percent of the population earns less than USD 1 and

USD 2, respectively and inflation rate is 14.7 percent (Central Bank of Sri Lanka, 2007). There are however, significant disparities in current levels of economic development between the commercialized Western province (with 50 percent GDP share in 2007) and the rest of the country. Rural areas contribute 82 percent to the poverty while the estate / plantation sector contributes only 11 percent. The overall poverty head count declined from 26 percent in 1990 to 23 percent in 2002 and further to 15 percent in 2007, while it increased from 21 to 32 percent in 1990-2007 in the estate sector.

A large share of Sri Lanka's internally displaced population (IDP) due to the civil conflict and tsunami has also fallen into poverty. Official figures may not reflect the prevailing poverty levels of these populations, which are largely resident in the northern and eastern provinces of Sri Lanka, as data availability is poor.

Disaster, Intensive and Extensive Risk Profile

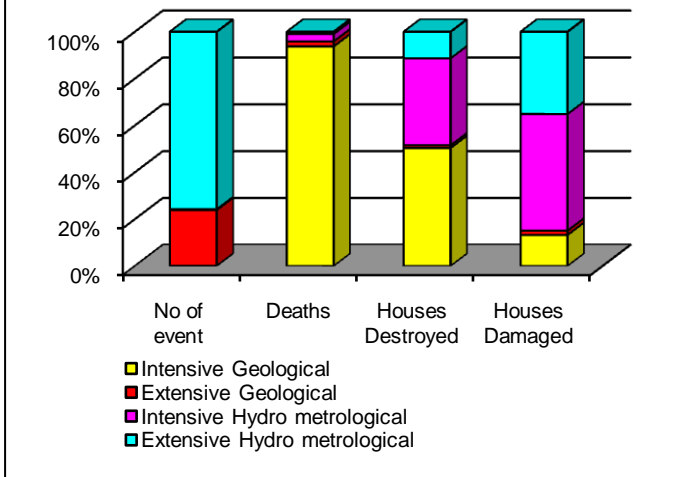
The Sri Lanka DesInventar disaster inventory, compiled at DS level from media reports, has over 4,000 records. Of this, 76 percent are due to hydro-metrological and the remaining 24 percent to geologic events.



Sri Lanka: DesInventar Disaster profile (1974 – 2008)								
Events			Deaths		Houses Destroyed		Houses Damaged	
Type	Number	%	Number	%	Number	%	Number	%
Geological	964	24	32,032	96	58,965	52	56,860	15
Hydro-meteorological	3,065	76	1,363	4	55,392	48	318,463	85
Total	4,029	100	33,395	100	114,357	100	375,323	100

Sources: <http://www.recoverlanka.net/data/dataportal.html> and www.desinventar.lk

Figure 21: Sri Lanka Intensive and Extensive Risk profile

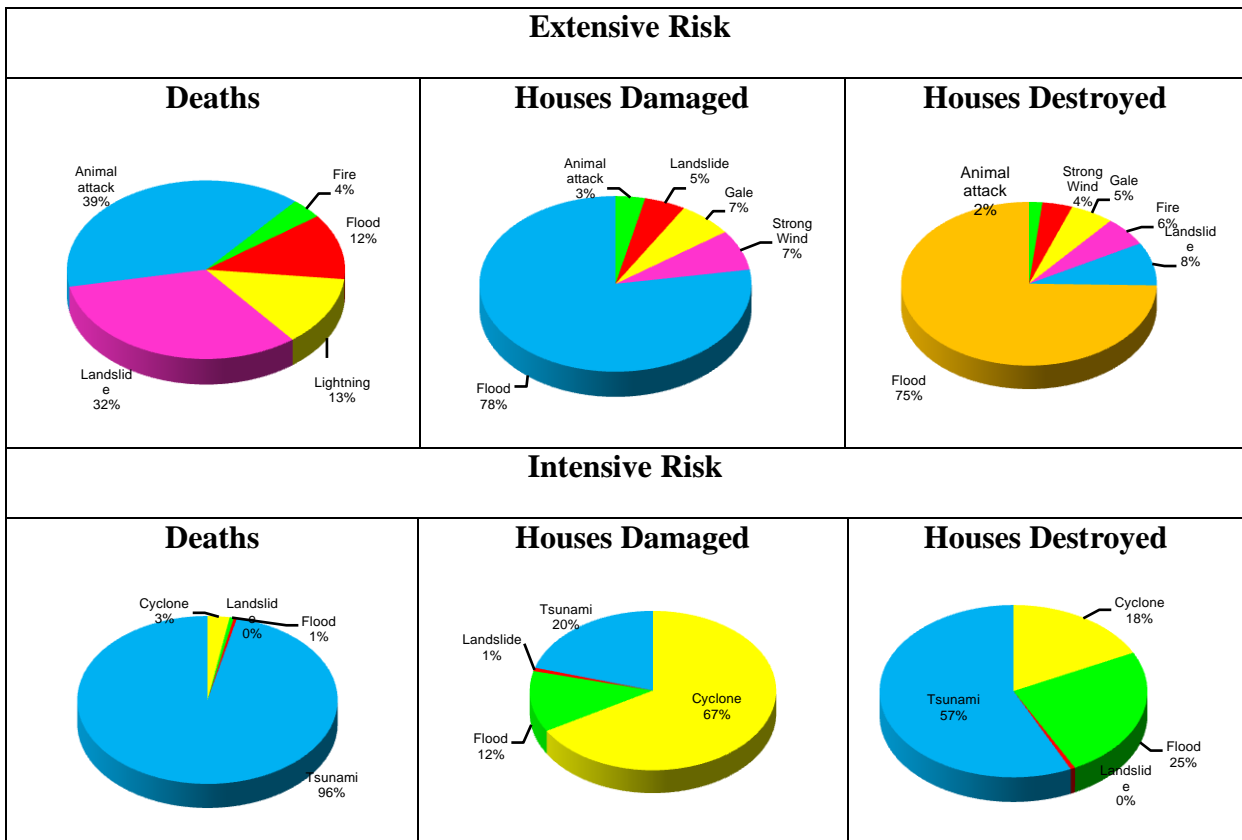


As per GAR guidelines, most of Sri Lanka’s disaster events are extensive, but some highly intensive events like the 2004 tsunami tend to skew the distribution, with an over 90 percent share of the fatalities. The tsunami also accounted for 49 percent and 13 percent of all houses destroyed and damaged (from 1977 to 2008).

Hydro-metrological events are responsible for 48 percent of the houses destroyed and 85 percent of the houses damaged over 1977-2008.

Animal attacks (864 deaths) and landslides (719 deaths) are the main extensive hazards jointly accounting for 71 percent of reported deaths. Flood and lightning accounted for 263 deaths (12 percent) and 278 deaths (13 percent). Property damage due to extensive disasters are highest due to flooding accounting for about 75 percent of all reports, followed by landslides and strong wind events.

Figure 22: Sri Lanka Extensive & Intensive Event impact



Among intensive events, the 2004 tsunami caused the highest proportion (96 percent) of deaths and also accounted for 57 percent of houses destroyed and 20 percent of houses damaged. Cyclones were responsible for damaging over 157,000 houses (67 percent) and about 17,600 (17 percent) of the houses completely destroyed. Intensive floods contributed to the destruction of about 24,800 (11 percent) houses and about 29,300 (25 percent) of the houses damaged.

Spatial Distribution of Hazards

The spatial distribution of all hazards at Divisional level across Sri Lanka indicates that intensive risks are more localized whereas extensive risks are widely distributed across the country. This is true both of mortality and house destruction.

The national patterns of intensive risk concentration are closely related to flood and cyclone risk, once the impact of the once-in-a-millennium tsunami is removed from the data set.

It is therefore important to understand the underlying causes of each major hazard type, to help identify their possible linkages with vulnerability and poverty and possible mitigation measures. Addressing extensive risk in Sri Lanka would therefore require a more decentralized strategy that strengthens capacity and interventions at the local level.

Floods

Intensive and extensive floods events during Sri Lanka’s two (southwest and northeast) monsoon seasons, cause death and destruction of houses almost each year, with a mild increase in frequency over the last decade. The most intense floods in 2003 affected over 1.2 million people. South-western Sri Lanka is more urbanized, with poor urban drainage that often causes flash flooding. In contrast, a large number of tanks in eastern Sri Lanka act as drainage basins reducing the risk of flooding, which is primarily due to heavy monsoon rain.

Figure 23: Sri Lanka Spatial Distribution of Risk

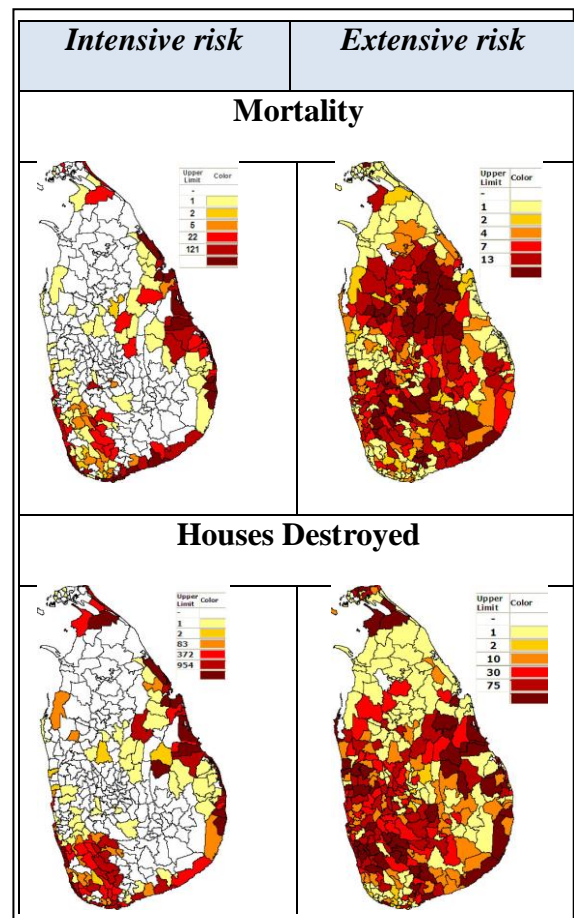


Figure 24: Sri Lanka: Houses destroyed and damaged due to Floods

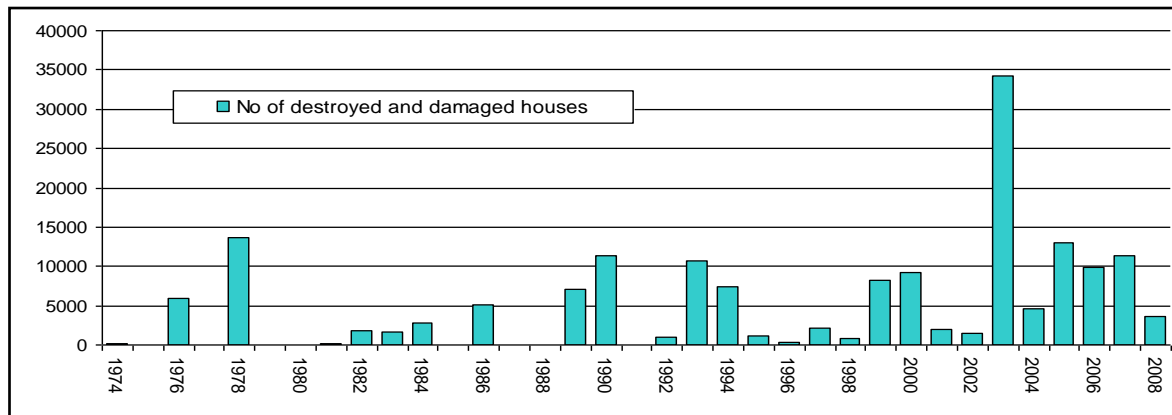
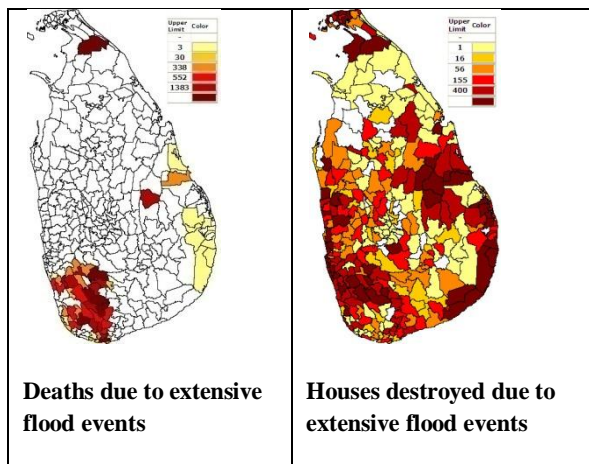


Figure 25: Sri Lanka Death & House Damage by Floods



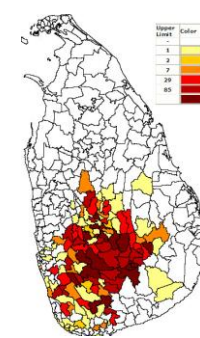
Apart from the highlands, flooding is distributed across the island with a high concentration along the eastern and western coasts. Flood damage to buildings is concentrated in riverine, low-lying and coastal areas.

Improved land use planning and local government zoning process can help reduce flash flood risk. Addressing the drainage implications of proposed infrastructure projects is another area that needs attention.

Landslides

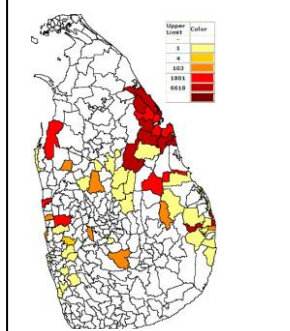
Landslides often coincide with monsoon induced flooding. The frequency of landslides is on the increase in Sri Lanka due to increased rainfall intensity and ongoing development activity, including agriculture on steep hill slopes. Almost all landslide events are extensive in nature. Both landslide deaths and housing damage patterns show a similar geographic spread. Improved water storage systems, house building practices and road construction in hill areas appropriate drainage management on steep hill slopes can significantly reduce landslides. Identification of the most severe landslide prone areas and relocation of vulnerable communities may also be necessary.

Figure 26: Sri Lanka: Houses destroyed by landslides



Cyclones

Figure 27: Sri Lanka: Houses destroyed by cyclones

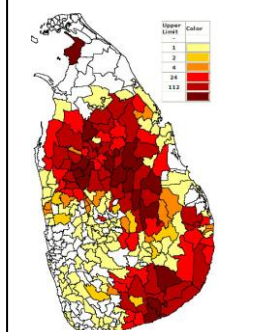


Almost all cyclone events in Sri Lanka have been intensive. Most fatalities and destruction of houses are along typical cyclone track that extends from eastern to western Sri Lanka. Majority of cyclones originated in the Bay of Bengal during the northwest monsoon over the September to December period and have entered the country between Trincomalee and Batticaloa in the eastern province. Cyclones affect poor more due to the weaknesses in their housing constructions and inability to withstand the winds and intensive rains typically followed by floods during cyclone events. Wind barriers could reduce the crop damage to a certain extent. Effective preparedness, awareness, early warnings and building designs are the

key areas needing attention to reduce cyclone risks

Animal Attack

Figure 28: Sri Lanka: Houses destroyed by animal attacks

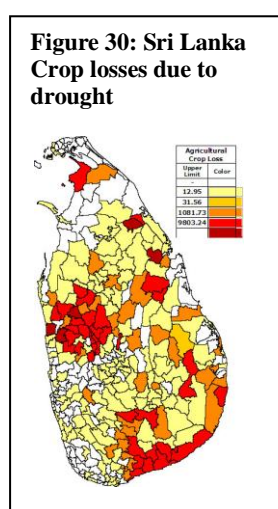
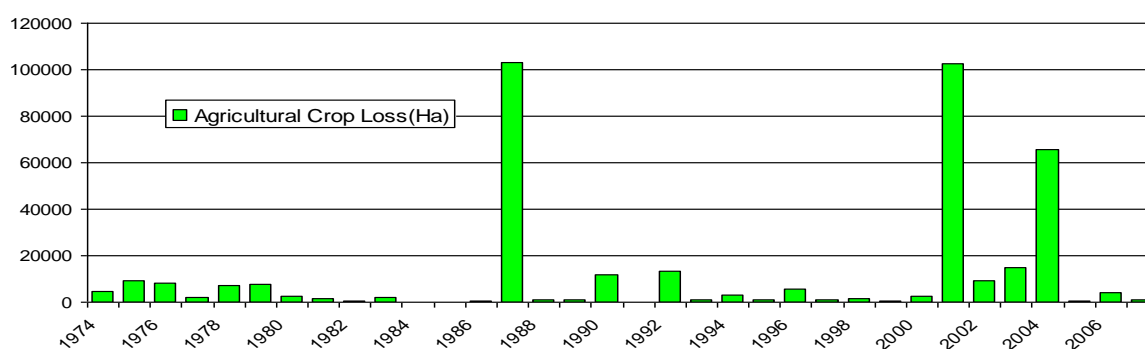


Sri Lanka is exposed to the unique risk of animal attack, with a high number of deaths and destruction of houses caused by wild elephants that come into conflict with human populations. The clearing of elephant habitat for agriculture and resettlement and an increase in elephant population has led to a rise in attack frequency primarily in the north, central and southern provinces. The affected populations are often the poor engaged in subsistence agriculture. Addressing the risk due to animal attack needs a comprehensive approach that include, land use planning; review and changing resettling policies; relocating a selected group of vulnerable populations; systematic control of elephant population; social safeguards; and managed physical barriers that include electric and bio fences.

Drought

Drought in Sri Lanka is a typical extensive risk, with a shows a large number of people being intermittently affected, with a peak of 3 million in 2001. Agriculture crop loss typically follows the geographic and temporal patterns of drought.

Figure 29: Sri Lanka Agricultural Crop Losses



Drought is spatially concentrated in north-western, parts of north central, south and south-eastern Sri Lanka. The country’s extensive tank and irrigation system helps mitigate drought impact. However, many tanks and reservoirs need de-silting to improve their retention capacity. Rainwater harvesting and improved and more efficient irrigation systems are also being introduced to mitigate agricultural drought. Economic impacts of droughts depends on the type and extent of crop loss, quality and quantity of drinking water, national resource availability to import food (especially rice) and loss of revenue from export crops. Mitigation measures include agricultural insurance to cushion shocks.

Poverty-risk relationship

Sri Lanka provides some initial evidence that disasters do affect the poor, when data at Divisional level is examined. District level analysis provided less conclusive results.

Division-level correlation analysis using actual damage or death data up to year 2002 (www.disinventar.lk) and poverty data for year 2002 (www.statistics.lk) revealed a range of strong and weak relationships between flooding and landslide shocks and poverty as listed below.

Flooding

- Strong correlation (0.847 at 1 percent significance) between poverty and house damage
- A less strong correlation (0.404 at 1 percent significance) between poverty and people affected
- A weak correlation (0.203 at 1 percent significance) between poverty and extent of paddy damaged

Landslides

- A less strong (0.465 at 1 percent significance) between poverty and houses damaged

No significant correlation was observed between poverty and drought and a very weak relationship with extreme wind effects. There is some evidence that poor people are more susceptible to landslides than the non-poor due to the geographic spread of poverty and the hazards. Lack of household panel data is the main constraint in testing the hypothesis that disaster shocks induce and deepen poverty.

Policy Recommendations

Poverty has a direct and indirect influence on the vulnerability of populations living in hazard prone areas in Sri Lanka. Incorporation of disaster risk reduction in poverty reduction policies and sector development strategies can benefit sustainable development and pro-poor economic growth.

Understanding the extent and spatial distribution of key disasters; the socio-economic status of vulnerable groups; characteristics of the climate, land use and landscape and geomorphology and the water regime will help to improve joint development planning for disaster mitigation and service delivery to vulnerable groups. In that context, a number of policy related recommendations can be made:

1. Areas identified as most vulnerable to flood, droughts, landslides and cyclones can be brought under special management zones to introduce best practices on land use, building regulation, construction and service delivery and also to target improved resources management, emergency response planning and awareness development
2. Poverty reduction programmes should not only focus on the groups below poverty line but also on the groups that may fall into poverty as a result of disasters. There is a sizeable population hovering just above the poverty line, who risk falling into poverty due to unforeseen or external shocks such as inflation, loss of employment, death of primary earner that can be caused or catalysed by natural or man-made disasters
3. Disaster Risk Analysis and mitigation planning should be integrated into the design and financing of infrastructure projects such as roads, dams and landscape modifications in high risk areas with vulnerable populations. One way to do this is to extend the present Environment Impact Assessment (EIA) process to include a more detailed hazard risk and vulnerability assessment at project approval stage and educate and promote public participation in decision making on projects.
4. Invest in decision making tools such as hazard and vulnerability profiles for different hazards and training of potential users in their effective use
5. Analysis of the poverty–disaster interface to help in understanding disaster impacts on poor populations. Present household socio-economic data level needs to be strengthened by developing panel data, including intermittent shock surveys. Data on landscape and

land use data, geological and hydrological features and characteristics at high spatial resolution will need to be made accessible to enable appropriate analysis.

6. Poverty data in Sri Lanka is not available in conflict affected areas as well as at the required coverage and frequency in other areas. The next national household survey and other periodic baseline data should be modified to address these concerns.
7. National budgetary process should investigate the costs and benefits of investing in disaster risk reduction vs. response. Improving disaster prevention may help Sri Lanka attract investments as it would mitigate risk to external shocks to businesses and poor and vulnerable employees

CONCLUSION

Asia is emerging as the pivot of global economic growth, bringing hundreds of millions of people out of poverty, meeting the MDGs, enabling the joining-up of the development and disaster risk reduction agenda and hence, sustainably mitigating future climate change risks.

Within Asia, the primary focus of disaster risk reduction has been on post-disaster recovery and rehabilitation following devastating intensive events like the 2004 Indian Ocean tsunami. This is important, especially given the large numbers of people, assets, lifeline infrastructure and economic activity at risk to intense earthquakes, cyclones and storm surges and sometimes floods. Nevertheless, the scale and success of these programmes tends to skew political attention and the flow of limited financial, human and institutional resources towards a few intensive disaster events at the cost of a much larger number of small extensive events.

This study shows that extensive risk embedded in thousands of smaller events is not only widely dispersed across the landscape, but affects a much larger number of people. If this impact is cumulated over time, it often leads to greater loss of assets and possibly livelihoods than extensive events. If found more widely prevalent, this finding will imply the need for a fundamental reorganisation of the design of development and poverty reduction strategies and interventions, and also a significant shift in the somewhat insular current functioning of many DRR programmes.

Linked and as important, when examined at local scale (e.g. the development Block in India, the Sharestan in Iran, the Ilaka in Nepal and DS division in Sri Lanka) is the unfolding of the fine grained relationship between poverty and disasters – just as the narratives of large numbers of development and DRR practitioners have indicated over a decades. This is in spite of great limitations in the availability of quantitative time series data on poverty and shocks within Asia, which has only been partially remedied by the creation of DesInventar databases for the study countries and states.

Poverty, disaster risk reduction and development appear inextricably linked at the micro-level as community-based development and DRR praxis have indicated for a long while, mediated largely by the multiple vulnerabilities of households, communities and local institutions. Yet, in Asia at least, considerable additional quantitative and qualitative analysis; new measurement processes and methods will need to link micro-level risk-poverty dynamics via state-level processes (as observed in Orissa and Tamil Nadu) to macro-level national policies, mandated institutions and programmed interventions.

A range of possible interventions have been identified to engage with the poverty-risk interface across the Asia case study countries and states including:

- Promoting economic and livelihood diversification, especially outside the primary sector and other especially vulnerable economic sectors
- Targeting poverty reduction programmes not only at the poor, but also disaster risk reduction at those who could fall into poverty as a result of shocks

- Strengthening national and state-level social protection programmes to provide lifeline support to the poor while recovering from shocks and to prevent them falling into or deepening their poverty
- Strengthening institutional, market and credit linkages to enable the development of truly sustainable livelihoods for the poor
- Strengthening local development, DRR and CBDM capacities especially to enhance resilience and address extensive climate-related risks
- Establishing the economic rationale and the costs and benefits of investing in joined-up or independent poverty and disaster risk reduction interventions
- Based on this, the joining-up national and state level development and DRR policies at national and state level and enabling convergence at the levels at which the mitigation actions or risk crystallises. This would not only imply reform of existing programmes but their decentralisation, if extensive risk mitigation is central objective
- Integrating disaster risk analysis and mitigation planning into the design and financing of development programmes and infrastructure projects
- Upgrading both rural and urban housing stock, improving the quality of new buildings and lifeline infrastructure
- Responding systemically to the significant public health challenges that are linked to risk in Asia
- Establishing appropriate disaster vulnerability, risk and poverty reduction monitoring mechanisms and capacities at state and lower levels
- Building an understanding and capacity to address both intensive and extensive risks in urban areas

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STATISTICAL ANNEX

SUMMARY OF DESINVENTAR DATA FOR ASIAN CASE STUDY COUNTRIES / STATES

Country / State	Risk Type	Event type	Data Cards	Deaths	Injured	Missing	Houses Destroyed	Houses Damaged
Tamil Nadu, India	Non-GAR	Geological	3	183	27	88	568	255
	Extensive	Hydro-meterological	12,325	1,847	2,406	2,578	109,869	550,346
	Extensive	Geological	62	213	59	18	3,171	1,703
	Intensive	Hydro-meteorological	81	839	224	300	90,511	326,994
	Intensive	Geological	23	2,145	2,076	121	22,991	24,056
Iran	Extensive	Hydro-meteorological	2,065	3,389	14,704	243	3,379	119,705
	Extensive	Geological	1,601	375	27,072	1,720	3,729	46,569
	Intensive	Hydro-meteorological	29	2,099	956	2	29,420	2,800
	Intensive	Geological	36	131,430	28,264	525	101,485	153,606
Nepal	Extensive	Hydro-meteorological	11,295	8,513	4,444	2,529	113,580	59,936
	Extensive	Geological	72	116	592	0	2,001	5,300
	Intensive	Hydro-meteorological	49	1,180	80	0	48,062	31,811
	Intensive	Geological	19	757	6,250	0	31,709	50,023
Orissa, India	Extensive	Hydro-meteorological	7,298	6,572	6,917	1,108	281,154	398,913

Country / State	Risk Type	Event type	Data Cards	Deaths	Injured	Missing	Houses Destroyed	Houses Damaged
	Extensive	Geological	6	0	0	0	3	11
	Intensive	Hydro-meteorological	395	23,296	6,287	96	917,797	2,227,441
Sri Lanka	Non-GAR	Geological	9	1,005	113	0	9,674	4,659
	Extensive	Hydro-meteorological	9,745	1,801	1,421	84	30,416	242,128
	Extensive	Geological	33	561	328	0	1,634	2,148
	Intensive	Hydro-meteorological	40	2,383	99	41	147,072	144,923
	Intensive	Geological	34	24,377	10,913	0	51,259	37,313