Improved Resilience to Cyclone Impacts: Climate Smart Disaster Risk Reduction in the aftermath of Cyclone Phailin[1]

Adaptation offers an opportunity to vulnerable sections to protect its economic activities and support sustainable development (Stern, 2007). Adaptation policies when implemented should augment the resilience capacity of the stakeholders by reducing or totally avoiding the damage cost of impacts. The avoided damage would ensure the sustainability of all conventional development policies of the government – past, present and future. Adaptation strategies increase the affected stakeholders' resilience capacity to cope with the impacts without having to compromise with their social and economic welfare.

The recent Cyclone Phailin in November 2013, affected 19 districts in Odisha of the state killing 21 people and affecting 11.9 million people. While loss of life could be kept at a minimum due to advanced evacuation operations carried out by local administration prior to Pahilin's landfall, dwelling houses and over 0.11 million hectares of standing crops were damaged in Odisha. Roads, electricity, telecommunications and water supply were severely affected. Loss of property has been estimated at Rs 217.66 billion. The worst affected districts were Ganjam, Gajapati and Khordha.
Despite the immense loss to property, Phailin underscored the benefits of proactive disaster risk management strategies that were effective in saving millions of life in the state. The state government undertook a well coordinated rescue and relief operation prior to and immediately after the disaster. Some of the anticipated adaptation measures undertaken involved:

- Deployment of state of the order Dopplar radar technology to continuously monitor the exact location, intensity and geographical spread of the cyclone.
- The early warning system helped in alerting all vulnerable communities to take adequate safety measures. The print and electronic media were used to disseminate information on cyclone since a week before its actual landfall.
- The pre alert system aided the central, state and local governments to organize a well coordinated and efficient evacuation and rescue operation in collaboration with the Indian army, air force and navy; National Disaster Response Force and ODRAF.
- Cancellation of holidays of all government employees and keeping them on emergency alert mode during entire period of the cyclone alert. Special cells were established to monitor the situation, helpline numbers were opened and advance teams were deployed to cyclone prone Ganjam, Gajapati, Khordha, Balasore, Kendrapara and Jagatsinghpur districts to help with the evacuation operations.
- Pre-designed cyclone shelters as well as schools and college buildings were used to shelter evacuated stakeholders and their livestock. Food and other essential commodities were arranged to be served to the evacuees while dry relief packets were air dropped to inaccessible and flood affected areas.

In the aftermath of Phailin, proactive adaptation strategies involved:

- Restoration of communication through clearance of debris thereby ensuring the smooth movement of essential commodities to affected areas.
- Restoration of power supply and telecommunication lines in the affected areas.
- Distribution of relief materials in cyclone shelters (cooked food served upto 7 days in these shelters) and air dropping of relief items in areas affected by severe rain in the immediate aftermath of Phailin.
- Ensuring supply of potable water and medical essentials in affected zones to prevent epidemics.

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- Announcement of various subsidy and assistance schemes by government departments like the Department of Horticulture, Department of Agriculture, Department of Rural Development, Department of Health, etc.
- Involvement of local stakeholders in relief distribution and other operations.

The well coordinated and planned disaster risk management strategy of the authorities during Phailin did full justice to its 'zero loss of life' approach and helped save about a million human lives. However, certain breaches in the preparedness plan could still be identified by the vulnerable population during a field survey that was undertaken by ICSD and IWD team members in the cyclone affected areas of Odisha.

The survey carried out in selected villages of Ganjam, Khordha and Gajapathi districts of Odisha where a project on cashew plantation is in progress. 15 villages spread over four blocks were covered by the survey. The survey was conducted in an agricultural zone where all stakeholders are directly dependent on agriculture for livelihood and income generation.

Impact of Phailin in Survey Area

Affected Category	Ganjam & Khorda Project Area	Gajapati Project Area
No. of households affected	500	300
No. of dwelling houses damaged	300	150
No. of cashew trees uprooted	40000	8000
Financial loss due to damage to cashew trees (in Rs. millions)	12	2.4
Area of cropland with standing crops like paddy, millet, etc. damaged (in hectares)	350	172

Source: Field Survey Report

The survey highlighted the severe damages to property and resources in the three districts covered under the survey. Besides major crop damage, the stakeholders also reported damage to power supply lines, financial losses due to closure of cashew processing units, closure of educational institutions and loss of resources in the form of uprooting of trees like teak, mango and cashew. The loss of man days due to the closure of cashew units and the considerable damage to standing crops have severely affected the income generation opportunities of the affected community while simultaneously threatening the future food security of the area. Appreciating the government relief work carried out in response to cyclone impacts, the stakeholders identified certain lacunae in the government risk management operations. These gaps in the relief work included:

- Delay in the availability of relief materials in many places. Further, materials made available are often inadequate.
- Inefficient public distribution systems resulting in uncontrolled price rise of essential commodities.
- Poor repair and restoration of power supply.
- Lack of drinking water supply in most places thereby increasing the probability of epidemics.
- Gap in coordination between various line departments. Data, facts and figures varied at each level resulting in misallocation of relief materials. Further, misutilization of relief materials has also been reported.

Analysis of the risk management strategies adopted by the local and state authorities reveals that most of the **measures adopted are simply relief and rescue measures offering immediate benefits to the vulnerable stakeholders,** e.g. evacuation to cyclone shelters; air dropping of relief materials like dry food, polythene sheets; providing drinking water tankers in affected areas; etc. The nature of adaptation in India in response to extreme events impact has often mostly been reactive. These measures provide short term respite from impacts, failing to build long term resilience capacity of the stakeholders. Apart from deployment of a state-of-the-art early warning system, the Phailin experience highlights the general lack of long term adaptive capacity building that integrates climate impacts into development priorities of providing shelter, education, poverty alleviation, etc.

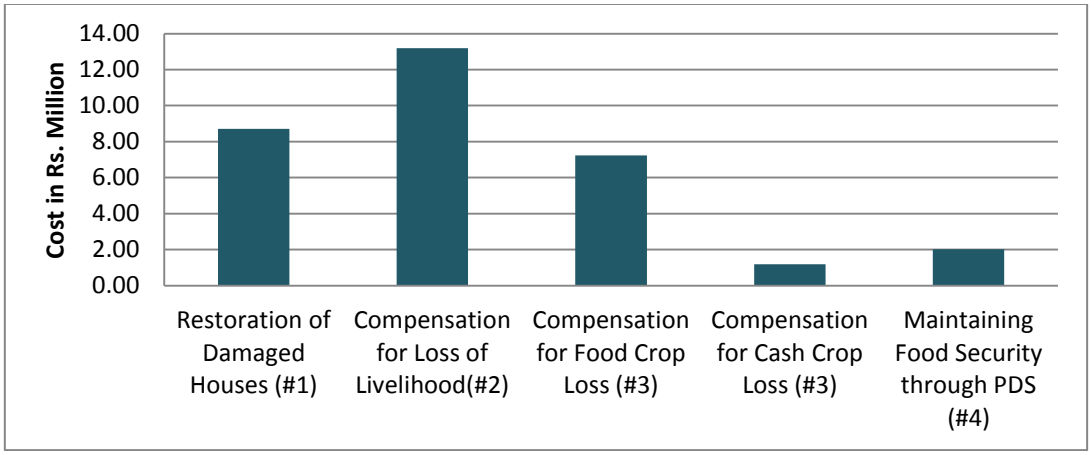
It is possible to identify several barriers to long term adaptive/resilience capacity development in the incumbent disaster management scenario. These involve:

- Prioritizing costs while selecting strategy options to reduce vulnerability.
- Financial constraints as the immediate investible funds required for planned and sustainable adaptation is comparatively higher than reactive relief aid.
- Non-availability of an integrated institutional arrangement necessary to implement sustainable adaptation strategies.

According to the views expressed by the vulnerable population, five adaptation demands have been identified and ranked according to priorities as assessed by the stakeholders (table 3)

- Restoration of damaged dwelling houses,
- Compensation for loss of livelihood,
- Compensation for crop loss and
- Avoidance of threat to food security).

The costs of providing for these services demanded by the surveyed stakeholders has then been assessed from the list of assistances stated in the State Disaster Response Fund and the National Disaster Response Fund of the Government of India for the period 2010-2015 (Ministry of Home Affairs (Disaster Management Divison), Government of India, 2013).



Meeting Adaptation in Survey Area - Costs and Ranks

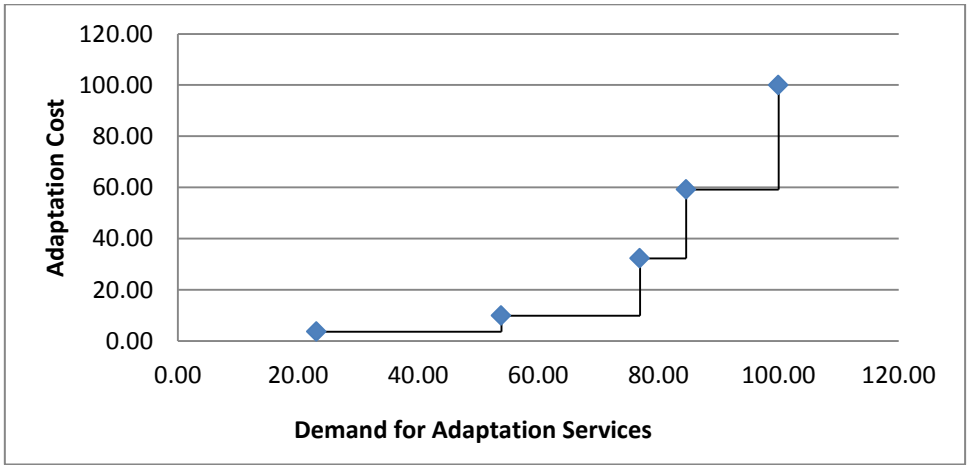
Prioritizing policy options is often based on the cost efficiency of strategies. The rule of cost minimization generally guides policy makers in making strategy choices. In accordance to this rule it is therefore seen that left to a command and control system, there is a high probability of implementing those adaptation options that involve lower costs in lieu of those that provide higher benefit. Thus the most demanded strategies of livelihood protection and repairing of damaged houses have a lower probability of being the first choice for adoption by policy makers than upgrading the PDS system. Thus a top down approach to adaptation policy design and implementation often undermines the stakeholders' perception of welfare maximization leading to suboptimal capacity creation. The same can be analyzed through an adaptation service curve that matches the cost of adaptation service supply against the demand for adaptation services by affected stakeholders.

Calculations for Adaptation Cost Curve

Adaptation Service	Immediate Compensation Cost (Rs Million)	Priority Rank by Stakeholder	% Cost	% Cumulative Cost	% Rank	% Cumulative Rank
Input subsidy + de-silting of land: Cash Crops	1.19	3	3.68	3.68	23.08	23.08

PDS upgradation	2.02	4	6.24	9.92	30.77	53.85
Input subsidy + de-silting of land: Food Crops	7.23	3	22.35	32.27	23.08	76.92
Compensation for house damage	8.71	1	26.92	59.20	7.69	84.62
Income generation Strategies	13.2	2	40.80	100.00	15.38	100.00

Note 1: Adaptation Cost Curve Calculations made on the basis of Table 3
Note 2: % Cost = (Adaptation Service Cost/ Total Cost) x 100
Note 3: % Rank = (Adaptation service Rank by Stakeholders/ Total rank) x 100



Adaptation Services - Cost vs. Demand

Note: The step diagram starts at the bottom left hand corner (i.e. the first lowest data point from left) with the service that requires least investment cost, i.e. input subsidy and land de-silting for cash crops. Each higher step represents the next higher cost of investment and so investment for PDS up gradation is followed by input subsidy and de-silting of land for food crops The fourth lowest data point from left indicates house damage compensation and finally by income generation strategies.

In the Adaptation Services – Cost vs. Demand Curve (ASCD) diagram (fig. 2), the risk intensity of impacts denoted by the cumulative percentage ranks of the adaptation services demanded is measured along the horizontal axis. Along the vertical axis, the cost for supplying the adaptation services and hence improving the coping capacity of the stakeholders is measured. The cumulative percentage cost is used as a measure for the increasing financial burden of adaptation service supply. A low increase in the cumulative rank between two adjacent adaptation services (measured along the horizontal axis) indicates a high risk impact which if addressed immediately will greatly improve the coping capacity according to the stakeholders' perceptions. The cost outlays for each service supplied are already arranged in the ascending order of cost. The ASCD curve therefore indicates the efficacy of adopting a cost effectiveness strategy for choosing adaptation policy options from the direct stakeholders' points of view. From the curve it can be analyzed whether a low cost strategy is actually the best option for maximizing stakeholder benefit or not. It may be argued that the prioritization of services by stakeholders may not be the best ranking for accruing the maximum benefit to them. However, if such an optimum prioritization can be made then the cost benefit correspondence for any service can be obtained from the ASCD.

Further assuming for stakeholder involvement in prioritizing adaptation strategy options is accepted, the chance for unsustainable adaptation still remains. The compensations offered in the event of cyclone impacts under the various government schemes, ensure the rebuilding of the community resources as per the business as usual (BAU) guidelines. Thus a damaged house is replaced by a house of same design and built, while crop compensation does not involve creating capacity that incentivizes investment in agricultural practices that would minimize crop loss in the event of any similar natural hazard in the future. Schemes to generate alternative livelihood options supplementing the existing income from agriculture are also required if maladaptation due to unsustainable adaptation has to be avoided. However, such schemes would require an initial investment that is often greater than the investment required under the BAU scenario.

A quick estimation of costs involved in constructing cyclone resistant houses instead of repairing the existing structures in the survey region corroborate this observation (table 4). The cost estimates for cyclone resistant houses has been approximated as Rs. 105000.00 for a 170 sq. ft. house as per a similar exercise carried out in Bangladesh under a UNDP project in 2012 (UNDP, 2012). The outlay for creating capacity to ensure the long term sustainability of livelihood in the event of extreme events, has been estimated through the minimum cost required to provide primary education and vocational training over a period of 15 years to the affected stakeholders (IDFC Foundation, 2013). In both cases, the initial investment costs are more than five times the costs involved under the existing schemes. However, it has to be realized that in the long run the returns to investments under a sustainable system far outweighs the high initial investment costs, thereby making sustainable adaptation options more economically viable.

Estimates of Cost of Sustainable Adaptation Services

Adaptation Service Demanded	Supply of Sustainable Adaptation Services Suggested	Service Demanded Ranked according to Priority of the affected Stakeholders	Cost of Sustainable Adaptation Services (in Rs Million)	Immediate Compensation Cost (in Rs. Million)*
Restoration of damaged houses	Building cyclone resistant houses	1	47.25	8.71
Compensation for loss of livelihood	School education + vocational training	2	72.00	13.2
Compensation for food crop loss	Input subsidy + de-silting of land	3	NA	7.23
Compensation for cash crop loss	Input subsidy + de-silting of land	3	NA	1.19
Maintaining food security through PDS	PDS upgradation to avoid threat to food security	4	2.02	2.02

Note: NA – Not available. Cost for strategizing for flood and storm surge resistant crops and disseminating knowledge and training on the same is yet to be estimated

Avoiding maladaptation in vulnerable hotspots is crucial if the developmental sustainability of the area has to be ensured. Otherwise, inadequate adaptive capacity would undermine all developmental efforts leading to widespread poverty, income inequities, and proliferation of various environmental, social and economic malaises. Today development goals can no longer be divorced from climate resilience improvement strategies. If the two are treated separately, then a comprehensive sustainable capacity building is impossible. To achieve this complete development status, development strategies will have to be climate smart. Such a climate impact driven development policy would not only help achieve improved economic growth, better social and physical infrastructure, improved social welfare but would also protect vulnerable communities from adverse future impacts by improving their coping capacities through adaptation strategies. There is however a chance of maladaptation being

achieved due to the conflict between the rationality of choosing the best development strategy and the best climate resilient sustainable development policy. To most policymakers best development strategies imply the least cost/ most cost efficient strategy. These costs are estimated from the market valuation of the services provided. But market valuation does not give a correct valuation of the cost of the adaptation service demanded as they fail to internalize the damage cost of impacts. Hence, a market distortion occurs whereby standard development service supplies do not take into account the climate smart development options. Therefore there is need to internalize the climate impact externalities so as to maximize social wellbeing. The best adaptation policy implies the strategy that maximizes coping capacity by minimizing vulnerability to climate impacts. Such a policy may or may not be economic cost efficient, but are however damage cost efficient. The best adaptation takes into consideration local/regional level disaster impacts. Such area specific impact/damage assessment results in policies that maximize the coping capacity of local level stakeholders from future disaster shocks. While optimizing damage cost, this strategy may or may not minimize the economic cost of adoption and implementation and hence may be unacceptable to policymakers. The next best alternative can then lead to maladaptation thereby defeating the purpose of framing adaptation strategies. Therefore, the standard ongoing development goals cannot / may not deliver climate resilient development programmes thereby defeating the entire purpose of sustainable adaptation.