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ABSTRACT

Climate change presents significant risks to long-term economic growth and socioeconomic development in developing economies. Thus the response to climate change necessitates major revisions around how economies are structured and how they function. The Observer Research Foundation organised a symposium on the subject, "The New Economy of Climate Change", on 15 March 2016. This Special Report builds on the key themes presented by the panellists, and draws policy lessons from the same.

Observer Research Foundation (ORF) is a public policy think-tank that aims to influence formulation of policies for building a strong and prosperous India. ORF pursues these goals by by providing informed and productive inputs, in-depth research and stimulating discussions.



I. INTRODUCTION

Economists often preface their involvement with issues of climate change by calling it "the mother of all (negative) externalities." Economic growth trajectories across the world, since industrialisation began a couple of centuries ago, have been highly carbon-intensive. However, the downside of high carbon emissions are significant and it has become fashionable to call the current epoch of geological evolution, the "anthropocene." The fact that economic development needs to be sustainable is now recognised as a given truth; last year the agenda of sustainable development was formalised when the Sustainable Development Goals were adopted at the United Nations.

While this reorientation towards sustainability is indeed welcome, the fact is that a lot of change has already occurred in the global climate. It is this 'new normal' of clear and present climatic risks that must be considered in any nation's economic trajectory, at the level of both its constituent markets and in its macroeconomics. At the same time, poverty alleviation remains the greatest priority for developing economies. Thus the challenge lies in the imagination of an economic framework that adapts to, and mitigates induced climatic risks while guarding the basic agenda of nation-building and economic development.

Two main issues stand out when it comes to imagining this "new economy of climate change": recovering from adverse climatic events, and resilience to minimise the impacts of a changing climate. The former is directed at *ex post* impact of climate disasters, while the latter is directed at making infrastructure less susceptible to climate-induced disasters. Insuring individuals and communities against climate risks is, in principle, a straightforward matter. Consider insurance against extreme events: the principal challenge is pricing loss from such events by estimating their probability. Viewed from this perspective, climate change risk is no different from any other "high-impact/low-probability" risk, except that in case of climatic change, risks accrue and "build up" over time. Insurance against extreme events would work for incidents like the 2005 Hurricane Katrina that devastated large parts of the US Gulf coast although a significant portion of the losses from this event were uninsured. Of course, losses associated with extreme events are huge, so these events need to be infrequent enough to make annual premiums affordable. Then there are issues around insuring against "non-extreme" events – like erratic rainfall or heat waves. How does one insure vulnerable sections of the population against them, especially as these groups are often not part of standard insurance or finance markets? The problem in India is the largely informal nature of the agricultural sector, which leaves this section of the population most vulnerable to weather effects in terms of disrupting their livelihoods.

Infrastructure finance remains a major challenge for India, as it embarks on a programme of rapid economic development. The current (12th) Five Year Plan estimates that India needs US\$ 1 trillion in investment towards physical infrastructure like roads, power, and railways. The traditional route of bank finance for infrastructure projects is one of the reasons behind the current stress on the Indian banking sector. It goes without saying that if one expects infrastructure to be resilient to adverse climatic changes, it could make infrastructure growth more expensive by raising financing costs if such is offered on a short-term investment

basis and does not account for the long-term cost of capital which incorporates risk to capital value. There is therefore a clear need to diversify finance sources away from banking and to the bond market, both on-shore and off-shore. The key challenges are to facilitate resilient infrastructure finance through "green bonds," a market whose size has almost quadrupled since 2012. The lack of a developed municipal bond market in India makes issuance of non-recourse revenue bonds by local authorities a challenge.

For both insurance and infrastructure, India faces serious problems on both demand and supply sides. The fundamental challenges when it comes to developing a new economy around climate change in India is reforms of the financial sector, and raising income for vulnerable communities. Put differently, the challenges around climate change mitigation and adaptation must be situated within the broader context of economic reforms.

CLIMATE INSURANCE

The premise of insurance is that it is possible to accurately model the probability of a certain adverse event happening and then share the risk either over time or over different stakeholders. In case of insurance familiar to most-health, or life for instance – ways to calculate underlying probabilities have been in place for a long time. Mortality tables are a key example. In the case of climate change, there are several methodological problems, the principal one being that climate is a non-linear, interacting, complex system. A consequence of this is that the probability of losses from climate change can be extremely difficult to model accurately. This is not just an abstract technical point. Suppose that insurers were selling insurance against adverse climate events: They would have to possess fairly good point estimates of the probabilities in question since if these were estimated incorrectly, the solvency of the insurers would be brought to question. The estimation of probability of losses is an area where climate change specialists, financial economists, and insurers can collaborate towards fruitful work. Even for insurance against non-extreme climate events such as through weather indices, the lack of integrated data systems means that there is little reliable data to price climate indices products. There is of course the ongoing issue of access to financial services and the scale of insurance required—which necessitates innovation in insurance products such as microinsurance. A consequence of this lacuna is insurance mis-pricing, translating to prohibitive premiums and, in turn, preventing widespread adoption of weather insurance. The creation of integrated data systems will require distributed terrestrial observation statements – which, in turn, will require investments in infrastructure.

Catastrophe bonds

There is always a residual risk for an insurer that in an extreme event, premiums alone may not cover the loss incurred. This is where catastrophe bonds come in. These are financial instruments where an insurer's risk is "passed on" to investors who essentially bet against these risks – if an extreme event were to come to pass, the investors would lose their entire principal. The investors are drawn to purchasing catastrophe bonds since the interest payments from such investments are typically much higher than that from other kinds of bonds.

After Hurricane Katrina, only one of the nine catastrophe bonds covering the Gulf region in the US was triggered—which means that the catastrophe bond sector in the

US survived the hurricane, though it cost the insurance sector more than US\$40 billion in claims. After Hurricane Sandy, New York local authorities moved Wall Street for catastrophe bonds purchases. There is a healthy appetite for such instruments in the US despite the relatively low ratings of the bonds (rated BB in most cases).

Would such a mechanism work in India? This is unlikely for many reasons. For one, the bond market in India is shallow. The investment culture in India is also such that investors prefer equities over bonds and other fixed income instruments which are often ill-understood, especially by retail investors. In 2014, the General Insurance Corporation of India sought government's permission to issue catastrophe bonds. Even if regulatory bottlenecks around the issuance of such instruments are removed, unless investor risk appetite increases significantly, it is unlikely that catastrophe bonds in India would find many takers.

How to finance insurance?

This may seem like an odd question. After all, people buying insurance pay for insurance! But when it comes to people most likely to be hit by adverse weather events or climate change—like informal farmers—it is unlikely that they have the financial wherewithal to purchase such insurance. A recent study by the Abdul Latif Jameel Poverty Action Laboratory conducted in Africa and South East Asia showed that high premiums for weather-linked insurance is often a deterrent for most farmers in purchasing the same.

Government of India schemes through the Agriculture Insurance Company are welcome, including "Varsha Beema Yojana" (VBY). These schemes are based on weather-linked indices, and are insurance against crop failure. It is unclear what percentage of the "informal" farming sector has subscribed to such schemes – supposedly 35 million farmers are in total covered by AIC. However under the current VBY, subscribers are required to have access to rural financial institutions which, in effect, translates to negative screening. If the goal is to significantly expand insurance access (including those for crop failure due to adverse weather events), the need is for broad-based reforms of the agricultural markets in general by which agricultural income is raised and thereby making insurance consumption possible.

Between subsidies regimes and procurement/distribution policies, such markets have every imaginable distortion which has done little to move Indian farmers up the agricultural value chain. Beyond broad-based reforms, when it specifically comes to insurance, farmers could be encouraged to buy insurance through direct cash transfers instead of indirect income support through agricultural subsidies. In effect, the challenge lies in the integration of crop failure insurance with the recently proposed "Jan Dhan-Aadhar-Mobile" reform system.

There is a need, however, for bolder ideas that go beyond state intervention. One such idea is to leverage commodities derivatives markets as indirect insurance – farmer cooperatives should be formed, and such cooperatives should enter commodities markets to hedge against crop failure through commodities derivatives (like options and futures). The mechanism for such indirect insurance would be the following: an extreme weather event would imply a crop failure, which would then lead to prices of that crop significantly increasing in the commodities market. A hedge in favour of this increase in prices would then act as insurance against crop failure

and, therefore, against weather risks. But were such novel mechanisms to be introduced, they would have to be buttressed through larger financial markets reform questions, including measures to increase retail participation.

INFRASTRUCTURE FINANCE

The basic question in financing resilient infrastructure is that of valuing this 'resilience'. In simplest terms, resilience is durability: resilient infrastructure is that which can withstand climatic shocks. But the added provision of resilience has costimplications. Infrastructure finance is also known to be risky in terms of uncertain return-on-investments, and can be a significant stress on the banking sector. It accounts for 18 percent of all bank finance in India; 31 percent of infrastructure finance is now classified as 'stressed'. Therefore, there is a pressing need to diversify away from bank finance for infrastructure, and to leverage local bond markets. In terms of financing resilient infrastructure, typical instruments include green bonds. Structured finance could also play a significant role.

Bonds and other finance mechanisms

Green bonds form a prototypical mechanism by which funds for environmentally sustainable projects are raised. Standard disclosure and transparency norms for such bonds ensure that investors are assured that proceeds from the bond sales would indeed go towards 'green' projects. Such bonds are either issued on-shore or offshore, either in dollar denomination, or in local currencies. When it comes to green bonds, the main bottleneck globally is a lack of definitional clarity on what green bonds are. (There is no globally accepted definition, beyond heuristics around use-provisions.) Greater definitional clarity and improved guidelines will increase capital investment for resilience projects. There are increasing moves to provide globally agreed green bond standards although these remain at an early stage of acceptance.

In 2015, Yes Bank raised more than US\$ 50 million through offshore INR denominated ("masala" type) green bonds, making it a pioneer among private-sector Indian banks funding environmentally sustainable projects. In March 2015, the Export-Import Bank of India issued US\$ 500 million in green bonds, though these were dollar-denominated, unlike Yes Bank's issue. Both issuances point to a larger Indian initiative when it comes to leveraging the bond market for projects related to sustainable development. But both issuances – Yes Bank's as well as Ex-Im India's – were offshore. There is a greater need to issue green bonds domestically; this is essentially a demand-side problem related to the lack of depth in Indian corporate bond markets in general, and a shallow institutional investor base.

Worldwide, a promising avenue in financing resilient infrastructure at the local level is municipal bonds or "muni bonds." They are non-recourse revenue bonds, i.e., bonds backed by revenue streams generated by local authorities for specific projects like roads and utilities. Resilience could be built into muni bonds by factoring in durability costs. For example, for bonds for water distribution networks, measures to reduce risks to these networks could be "written into the bond." Unfortunately, most local municipal authorities in India are not credit-worthy – one panellist in ORF's symposium said a massive 95 percent of Indian municipalities are lacking in credit-worthiness. Poor accounting standards of municipalities contribute to this problem significantly. Municipal bonds in general are a novelty, both on the supply and

demand sides. (Much of the problems with the existing corporate bond market in India also carry over to the muni bonds side.) Political-economy factors also hinder more widespread issuance of municipal bonds, the principal factor being lack of mayoral authority. A few Indian municipalities – Bangalore, Indore, Hyderabad and Chennai – have issued municipal bonds in the past, though they have been backed by their respective state governments to enhance the credit-worthiness of the said municipalities. In 1998, Ahmedabad was the first municipality to issue muni bonds without state guarantee. The Security and Exchanges Board of India – the country's leading financial regulatory – in 2015 issued structured guidelines and regulations for municipalities seeking to finance local projects through the muni bond route.

Another way by which local authorities could choose to finance resilient infrastructure construction, retrofit, or upgrade is through novel structured finance mechanisms. This is a system by which loans to utilities and other stakeholders from local authorities are repackaged into a financial instrument through a special purpose vehicle (SPV). Such securitisation through an SPV would give the local authorities access to money lent to the stakeholders plus the interest stream immediately. The problem with structured finance is the taboo attached to it following the credit default swap debacle that triggered the global financial crisis of 2007-2009. The usual caveats about the immaturity of financial markets in India also apply.

Role of the public sector

Given the extant problems with raising private capital for resilient infrastructure projects domestically, it is clear that the public sector (both domestic and international) ought to play a larger role. To begin with, there needs to be greater enforcement of IFC performance standards in the financing of infrastructure projects, as one panellist noted. While Private-Public Partnership may be the only way forward, there is a need to deploy public funds for pilot projects; the viability of these pilot projects would increase private investor confidence. The fragmented nature of regulation around urban infrastructure also necessitates the need for new nodal agencies that would make the agenda around durable infrastructure more cohesive.

POLICY RECOMMENDATIONS

Five key policy recommendations follow from the preceding discussion.

First, initiatives around resilient infrastructure as well as climate insurance have to be integrated into other national economic development initiatives. For the former, the development of a local bond market with depth is a must; so are demand-side initiatives like increasing investor awareness, and appetite for unconventional products. For the latter, it is an imperative that insurance schemes are built over other rural financial inclusion initiatives. Initiatives around the economic impacts of climate change also have to be in the context of larger national economic priorities and programmes.

Second, when it comes to climate insurance, demand-side problems and supply-side constraints must be matched. The complexity of climate insurance products makes them opaque to Below Poverty Line rural consumers, thereby reducing demand. This has to be redressed from the supply-end by raising consumer awareness about the potential of these products.

Third, when it comes to resilient infrastructure growth, financial authority must be devolved to the local level, although some financial risk is retained centrally. While the Ahmedabad experience with issuing municipal bonds without state government support is welcome, most Indian local authorities have capacity and credit problems in taking similar initiatives. Put differently, mayors should also be financial managers responsible for infrastructure growth and resilience upgrade. At the same time, state governments should step in as guarantors when the credit-worthiness of local authorities is brought into question.

Fourth, given the shallow nature of India's domestic bond markets, more private banks should leverage the offshore "masala route" to issue green bonds. This should mark a structural shift away from dollar-denominated issuance since it adds significant foreign exchange risks on top of the intrinsically risky nature of infrastructure investment, from a return-on-investment point of view. The current favourable environment for FDI inflow into India – in terms of investor confidence – must be leveraged to the fullest extent for green masala bonds.

Finally, a centralist approach to environmental governance has long been a problem in India, which has put undue fiscal strain on the central government. While keeping local realities in mind, capacity building at a sub-national level is an imperative. This should be matched by further devolution of fiscal responsibility, and greater autonomy for local authorities when it comes to making financial decisions.

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