Getting ready with REDD+ strategy for India

Reduced emissions from deforestation and degradation, along with conservation and sustainable management of forests, together known as REDD+, is an innovative mechanism to address climate change. The mechanism is expected to contribute to mitigation actions in the forestry sector by way of undertaking five activities in the developing countries: (a) reducing emissions from deforestation; (b) reducing emissions from forest degradation; (c) conservation of forest carbon stocks; (d) sustainable management of forests; (e) enhancement of forest carbon stocks. Recent decisions in the meetings of the United Nations Framework Convention on Climate Change (UNFCCC) call on the developing countries to develop: national strategies and action plans, national forest or forest emission reference levels, and transparent national systems for monitoring and reporting of conservation and emission reduction efforts. Also, the countries are required to follow the environmental and social safeguards, such as conservation of biodiversity and natural forests is required through full participation of indigenous peoples, local communities and other stakeholders.

Some countries have already initiated their REDD+ readiness programmes and pilot projects at the domestic level. Taking into account the readiness of global donors for REDD+ actions, a gradual implementation approach is needed for India also. For this purpose, the Government of India has established a REDD+ Cell in the Ministry of Environment and Forests (MoEF) with the task of coordinating and guiding REDD+ related actions at the national level, and discharging the role of guiding and collaborating with the State Forest Departments (SFDs) and other institutions for this purpose.

There is an urgent need for developing a REDD+ strategy and action plan for the country. We have to come up with a broad framework of REDD+ according to UNFCCC guidelines. Different collaborating partners like the MoEF, SFDs and research institutions need to be brought under one umbrella to carry out this task. They should collectively prescribe ways to mainstream REDD+ in overall forest management of the country and define mechanisms to create and strengthen a set of enabling conditions for its smooth implementation. Specific actions required to be taken for this purpose are:

- Framing the architecture of REDD+ by prescribing roles of Central and State Governments, local authorities and communities.
- Identifying drivers of deforestation and degradation and mechanisms for addressing them.
- Estimating GHG emissions and removals and establishing robust monitoring systems for setting up forest reference emission levels and forest reference levels.
- Ensuring sustainable management of forests by identifying environmental, social and economic criteria by developing Safeguards Information Systems.
- Capacity building of all the stakeholders involved in the REDD+ process.
- Piloting REDD+ projects.

Finally when this framework is ready for the country, we need to start implementing the strategy after incorporating lessons learnt from pilot projects. Thereafter, quantification of REDD+ benefits should be done and means for arranging REDD+ finance should be explored in addition to defining the benefit-sharing mechanisms. Apart from executing pilot projects, capacity-building can also be undertaken under this programme. The ambitious Green India Mission of the Govt of India and Compensatory Afforestation Management and Planning funds offer good opportunities to finance strategy development and piloting REDD+ in India.

To conclude, REDD+ is a highly innovative way to mitigate climate change through carbon sequestration and sustainable development. India has contributed a lot to this mechanism in the international negotiation process. However, there is an urgent need for the country to get ready with a national strategy at the earliest, so as to start implementation of this mechanism for the benefit of environment and sustainable development in the country.

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Tunicate bloom in the Obhur creek of Jeddah coast, Red Sea

Salps (order: Salpida; class: Thaliacea; subphylum: Tunicata) are commonly found on the surface of equatorial and temperate waters. The most abundant concentration of salps can be found in the Southern Ocean[1]. Salps are barrel-shaped planktonic tunicates[2]. They pump the water using their internal feeding filters[3] for both their movement[2] as well as for feeding on phytoplankton[1]. They are multicellular organisms exhibiting exceptional growth rate (10% per hour) by consuming plankton during phytoplankton bloom and occupy a prominent position in the food web.

Obhur Creek of Jeddah coast is known to be a pristine environment with rich diversity of coral reef and its associated organisms. During the regular monitoring of reef ecosystem on 29 January 2013, unusual presence of salp aggregation (Figure 1) from the sea surface to the depth of 15 m was noted. This mass record is being observed in the Red Sea surface after 2007 (ref. 4). It is believed that their occurrence is indirectly beneficial to the coral reef ecosystem because they help to clean the plankton bloom. High density of planktons causes possible oxygen depletion and they adhere to corals resulting in a smothering effect[5]. Salp populations have been reported recently in Southeast Australia[6] due to the adjacent East Australian current and in the west coast of USA due to the California current[1]. Researchers from Scripps

Figure 1. Tunicate bloom. Close-up view of Salp colony.

Institution of Oceanography linked this tunicate bloom with cold water circular current[1]. But we found salps in the confined tropical coral reef environment. Moreover, it is believed that faecal pellets and bodies of salps carry biogenic carbon[3] to the sea floor, and salps are abundant enough to have an effect on the ocean's biological pump[7,8]. Hence, their occurrence and distribution in abundance are not only beneficial for coral colonies, but they also alter the ocean's carbon cycle, and thereby potentially play a role in climate change.

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Adaptive soil management

Adaptive soil management (ASM) is an important doctrine of sustainable agriculture and is the need of the hour for feeding a current population of seven billion people and more in the future. Although the concept of adaptive management was introduced in the late 1970s and has been applied to a wide range of resources and ecosystem management, there is a dearth of knowledge about the interdependencies and interlinking of this concept among academicians, policy-makers and regulatory agencies[1,2]. As a result, this strategy is still applied to various ecosystems without due consideration of the system principles. This letter summarizes a brief outlook on the ecological and economic benefits of ASM so that this concept can be interlinked with a wide range of resource management like adaptive environment management, adaptive nutrient management, adaptive water management, adaptive forest management, adaptive wetland management, etc.[1,2].

Agriculture is often considered as a 'culture' rather than a 'practice' and was predominantly wrought by the cultural practices and traditional wisdom of a particular society. Furthermore, the green revolution together with the subsequent progress in science and technology has contributed immensely to the introduction of mechanization and high-yielding hybrid varieties in agriculture and we have currently reached in an era of molecular breeding and genetically modified crops[3–6]. However, the rapid intensification of agriculture to meet the needs of a growing population[7], changing diets[8] and biofuel production comes at the cost of increased environmental pollution and soil degradation[7,9,10] and reduced carbon stocks in natural vegetation and soils[7]. So there is an intrinsic link between the challenges we face to feed the burgeoning world population and subsequent global environmental issues[4,5]. However, the successful operation of proper management strategies based on sustainability can provide practical solutions for tackling these issues[4,5].

Furthermore, conventional management strategies are based on the local or regional priorities or needs, and mostly targeted on short-term management gains rather than sustainable environmental management[11]. As a result, the uncertainties that will occur during implementation are not adequately addressed, or there is no provision for the allocation of additional resources for tackling an uncertain event or any kind of sudden changes that will happen during the policy implementation stage. Hence, the idea of adaptive management was introduced to tackle the uncertainties in environmental management[11–14].

One of the important arenas of adaptive management is ASM. Soil is a vital part of the biosphere and a primary sink of pollutants. However, it is estimated that approximately 30% of land is degraded or contaminated by various anthropogenic activities[14]. The heavy contamination of soil with noxious hazardous chemicals reduces the quality of soil drastically. Once they enter into the soil, many of the pollutants can redistribute and circulate into other environmental compartments through volatilization, leaching, transport of soil, etc.[14]. On the other hand, unscientific agricultural practices reduce the quality of the soil and threaten the life of soil organisms. Hence, there is a growing need for methods to evaluate soil quality degradation and its changes and sustainable management practices to overcome these issues. Over the last few decades, many efforts have been made to stop the degradation of soil and enhance soil productivity, but the process of adoption of adaptive management in agriculture is slow. Earlier, the soil management practices were projected only for limited benefits. Furthermore, the availability of