Greater Kashmir

Why trees matter?

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Humans have cut down the biggest and the best trees. In the last few decades, more than one billion acres of forests have vanished, with the rate of cutting, burning and clearing showing no signs of abating. What does that mean for the genetic fitness of our forests? No one knows for sure, for trees and forests are poorly understood on almost all levels though being on the front lines of our lives. And when the woods suddenly start diminishing, we feel it's time to pay attention as the common consequence has been hotter and uncertain weather and the loss of precious ecological services. Trees are also the planet's heat shield. They keep the concrete and asphalt of cities and suburbs 3 to 5 or even more degrees cooler and protect us from the sun's harsh UV rays. Studies have estimated that the die-off of shade trees can cost hundreds of millions of dollars for air-conditioning

Trees are not merely pleasant sources of shade but a potentially major answer to some of our most pressing environmental problems. We take them for granted, but they are a near miracle. In a bit of natural alchemy called photosynthesis, for example, trees turn one of the seemingly most insubstantial things of all — sunlight — into food for insects, wildlife and people, and use it to create shade, beauty and wood for fuel, furniture and homes. What we do know, however, suggests that what trees do is essential though often not obvious. Decades ago, it has been discovered that when tree leaves decompose, they leach acids

into the water that helps fertilize plankton and when this plankton thrive, so does the rest of the food chain.

Trees are greatly underutilized as an eco-technology. "Working trees" could absorb some of the excess phosphorus and nitrogen that run off farm fields. In World, millions of acres of mined land have been reclaimed through strategic tree growth. Phytomining with trees is a recent concept to reclaim polluted waters. Environmental protection/improvement can thus not only save money but can earn it. One of the best examples can be derived from New York where more than $6 billion was saved by paying farmers only $1 billion while changing the management of runoff to reduce the water pollution, rather than build a $7 billion wastewater treatment plant that would have cost between $300 million and $500 million a year to operate.

Trees are nature's phytoextracters, capable of cleaning up the most toxic wastes, including explosives, solvents and organic wastes, largely through a dense community of microbes around the tree's roots that clean water in exchange for nutrients, a process known as phytoremediation. Tree leaves also filter air pollution. Many studies have found that more trees in urban neighborhoods correlate with a lower incidence of asthma.

The researchers have long studied what they call "forest bathing." A walk in the woods, they say, reduces the level of stress chemicals in the body and increases natural killer cells in the immune system, which fight tumors and viruses. There are strong evidences that anxiety, depression and even crime are lower in a landscaped environment. The Japanese Ministry of Agriculture, Forestry and Fisheries even coined a specific term shinrin-yoku (relieve stress and improve health) by spending time in forests.

A report by Economics of Ecosystems and Biodiversity (TEEB) released recently shows that bees and other insects jumping from flower to flower in the wild provide an essential service for crop production, valued at a whopping $200 billion. Interestingly not a single bee has ever sent us an invoice and that is the part of a problem, because most of what comes to us from nature is free, because it was till date never invoiced, priced and traded in markets. Hence this broken financial system needs to be reformed so that the forest and the valuable services it provides are incorporated into every decision and transaction.

Trees also release vast clouds of beneficial chemicals. On a large scale, some of these aerosols appear to help regulate the climate; others are anti-bacterial, anti-fungal and anti-viral. We need to learn much more about the role these chemicals play in nature. For instance one of these substances, taxane, from the yew tree, has become a powerful treatment for breast and other cancers. Aspirin's active ingredient that comes from willows is largely used in the drug industry. Betula (Birch) yields a unique phytochemical - betulinic acid which inhibits growth of malignant melanoma, cancers of the liver and the lung and

HIV-1 at a very early stage of the viral life. Similarly thousands of medicines have a plant origin.

Trees, of course, sequester carbon dioxide, a greenhouse gas that makes the planet warmer. There is also a powerful and financially viable argument that by increasing plantation forests we can earn livelihood through carbon trading even while conserving trees . This type of concept to earn environmentally viable livelihoods has originated from the Koyoto Protocol of 1997. To be precise the Carbon credits are measured in tons of carbon dioxide (CO_2) and each credit is equivalent to one ton of CO_2, with a monetary value equal to the cost of polluting the air. Placing a value on carbon aims to prevent it from being emitted in the first instance and to make its removal from the atmosphere financially viable. The monetary value of carbon credits vary significantly based on the credit type, carbon exchange platform, market maturity, buyer knowledge/education and supply and demand. The recently released State of the Forest Carbon Markets report, by FAO finds that a total of 30.1 million metric tons of carbon dioxide equivalent (Mt CO_2e) are contracted across the primary and secondary markets with total transactions of US $178 million. The historical scale of the forest carbon markets has already climbed to 75 MT CO_2e, valued at an estimated US $432 million with projects impacting more than 7.9 million hectares in 49 countries of the world.

Forest carbon reserves stored in trees and forests can thus be monetized and sold as offsets to greenhouse gas emitters who need them to comply with regulatory emission limits, or who voluntarily want to reduce their carbon footprint. These offsets typically are sold by industrial companies that have reduced their emissions below a government-imposed cap. The offsets equal the emissions below the cap; their price is determined by supply and demand. Thus under the Carbon Farming Initiative (CFI), farmers and land managers can earn carbon credits by storing carbon or reducing greenhouse gas emissions on the land. These credits can be sold to people and businesses wishing to offset their emissions. The buyers are thus companies whose emissions are above the cap; the offsets are subtracted from their excess emissions, enabling them to avoid penalties. There is also a voluntary market where companies and individuals buy offsets to reduce their carbon footprint.

While most cost-benefit analyses look at natural resources such as gold, timber and food that are extracted from forests, these products only account for one-third of the total economic value provided by the forest and tree infested habitats. Other benefits "ecosystem services," such as pollination, filtering drinking water and wetlands and providing flood protection make up the other two-thirds. We are at a stage now where the rate of loss of ecosystem services and the rate of loss of biodiversity is so severe we cannot treat them as mere externalities of economics.

The global value of these ecosystem services from trees and forests in 1995 was estimated to average 33 trillion$ US /yr. Using the same methods as in the 1995 , the total global

ecosystem services in 2011 were re-estimated at $145 trillion/yr indicating a reduction of 4.3–20.2 trillion $/yr during this period due to land use change from forestry. Global estimates expressed in monetary accounting units, such as this, can be useful to highlight the magnitude of eco-services. These models can be applied at multiple scales to assess changes resulting from various scenarios and policies that effected wilderness and deforestation of our forests (J&K) which have decreased by about 37% during the last century. Further, in our conditions many eco-services are best considered as public goods or "common pool resources", so conventional markets will often not be best institutional frameworks to manage them. However, these services must be valued, and in fact we need new, common asset institutions to better take these values into account.

India has a great potential to enter into the booming market of ecosystem services, which can be traded in tens of billions of dollars each year. But a potential pool of offsets has been largely left off the table — only few States are very serious to accurately quantify the carbon credits with "Himachal" already taking a lead on this front. However, there is yet no reliable and transparent system to ensure the outreach of these benefits to local communities. Further, as renewable energy adoption remained slow, India's coal-fired energy emissions and carbon intensity have rose at 8.2 and 0.7 per cent respectively. Driven by a double-digit growth in demand for coal; as power consumption increased, India has introduced a nationwide carbon tax of 50 rupees (less than $A1) per ton of coal (both produced and imported). This tag is; however, very less compared to $A25.40 per ton in the international market. Being the fourth largest emitter and expected to be the fastest growing economy, India's carbon intensity management will play an important role in determining world's ability to limit the global temperature rise to two degree Celsius by the year 2100. To participate actively India will need to pump trillions of dollars ($) between 2015 and 2030 for implementing adaptation actions through carbon farming with agriculture, forestry, fisheries, water resources and other ecosystems. Interestingly, as emissions have no boundaries, the carbon neutral states in North Eastern and North Western India like J & K etc can bargain to have a share by establishing carbon sinks for marketing. A formal price tag on selling/buying emmisions is thus the most efficient way to encourage afforestation/reforestation which contribute in mitigating climate change.

The State of Jammu and Kashmir is richly endowed with diverse forest resources which play an important role in preserving the fragile ecosystem of the region. Being the largest land based resource in the State, forests are pre-eminently a mainstay of economy with immense potential not for supporting livelihoods and alleviating poverty but also for providing many ecological and environmental services. Comprising 51% of its land under woods, the Kashmir region has 46.34% of its forest area belonging to the commercial category with a significant portion (53.66%) being delineated as un-commercial by excessive extraction of timber, unabated grazing, encroachments and diversion of forest land for non-forestry purposes. This un-commercial forest land requires millions of plants for

reforestation and thus can be put to use for earning carbon credits and other ecosystem services. In addition to this the presence of trees outside the forests (TOF) all across the valley can also be used to capture more and more carbon and constitute the biggest carbon industry to boost the economy of the State.

The opportunities for this type of biological carbon capture in Kashmir are very promising through plantation of some fast growing tree species viz. willows and poplars which can sequester lot of CO2. For instance a study on white willow (S. alba) has reiterated that this species can store up to 292.98 tons of C ha-1 and sequester around 1075.24 CO2e tons ha-1. The profitability using profit function model in this study indicated that carbon trading with willows in Kashmir is a viable option with net annual profit of Rs 29,926 and 30,654 (ha-1 yr-1) at a discounting factor of 12% and 10% respectively.

Similarly poplars can also prove as efficient carbon sinks by sequestering more carbon than is released. For instance a study has revealed that the net annual carbon sequestration by Populus deltoides is about 8 Mg C ha-1 yr-1. The fast growing plantations of poplars thus being very efficient carbon sinks can be exploited for their huge potential in crediting carbon to generate revenue under Clean Development Mechanism (CDM). Considering the population of poplars in Kashmir (10-15 million) with a volume of 5.179 million m3 and biomass of 26.82 million tons this species has the potential to sequester around 45.28 million tons of CO2e from the atmosphere.

Putting an arbitrary value of $5 per ton of carbon, the current standing value of poplar plantations (alone) in terms of carbon credits could be around $ 226 million (excluding timber value). Thus enhancing carbon sequestration through commercial plantations of these two species can alone prove to be a long term future policy option for sustained carbon storage program in Jammu and Kashmir with further scope for expansion as permanent marketable carbon sinks owing to the availability of thousands of Km2 of waste land that could be used for plantation forestry. This un/underutilized area can be developed into a permanent carbon sink and exploited for marketable carbon credits. Further, despite having the distinction of being a "Carbon Positive State", Jammu and Kashmir is losing foreign funds worth millions of rupees meant for conservation of environment vis-à-vis marketable carbon credits by delaying its entry through planned strategies. Thus quantifying standing carbon pools of TOF and their ability to sequester carbon dioxide will provide a basis for earning "carbon credits" for our State.

The biggest challenge will however be changing the mindset of politicians and policy makers to commercialize standing trees to improve the livelihoods of the poorest poor

Source: http://www.greaterkashmir.com/news/opinion/why-trees-matter/202021.html