Improving The Green Cover in Developing Countries: Experiences From India

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Abstract

In all societies, forests have been offering significant support to the rural life world over. Across all cultures, forests provide food, fuel, fodder, timber, and herbal medicines among others. Nonetheless, with pressure from ever expanding human population to produce enough foodvis-à-vis forest resource as source of foreign exchange, forests in India experienced rapid depletion throughout the colonial time and after independence up to the mid-1980s. In 1970s the Government of India (GoI) decided to involve rural communities in forestry developmentto create employment for communities while conserving forest resources to meet their needs. This did not solve the problem of forest degradation completely. By 1997, only 19.27 percent of India's total land area had forests and trees. The GoI through its Ministry of Environment and Forest,decided to commensurate with other stakeholders and this was seen as a mean to an end in achieving sustainable forestry, while preserving an ecological balance. Currently, there has been positive development for 24.39 percent (which is 801,763.5 km^2) of the total land area ofIndia(3,287,263 km^2),which is committed to forests. The study has been undertaken to identify mechanisms that have been put in place (like development and execution of forestry related policies and acts; increased funds towards greening activities. The stakeholders' increased participation in forestry conservation; improved extension services; use of abandoned and wastelands and development and use of mobile applications have been analyzedfor bringing to light different stakeholders and their roles in improving the green cover. Finally, some of the challenges that are being encountered and how best they are being resolved or minimized are also discussed.

Introduction

India, with a population of 1.21 billion in 2011 (Govt. of India, 2011), and about 1.35 billion peoplepresently (in 2019), has been the second most populous country in the world, residing over an area of 3,287,263 Km^2, which means 17.5 population living on 2.4 percent land (Govt. of India, 2011). Large population is believed to exert enormous pressure on natural resources for various reasons. As population grows, more forestsare clearedto provide land for farming, settlements, mineral exploitation and infrastructure development among others,which contribute in shrinking of forest lands. India's forests arealso not spared as is the case with other developing countries. Up to year 1995, forest land in India was quailing. As per the Government of India records, in 1987 forest cover was 640,819 km^2(19.49 percentof India's total area),which further declined to 639,364 km^2 (19.45 percent) and 638,879 km^2(19.43 percent) in 1991 and 1995 respectively.FAO (2006) pointed out that the expanse of forests has been decreasing rapidly, but the trend has slowed down as compared to the past. With reference to 1991, there was a decrease of 1,455 km^2 in forest cover as compared to 1987 and this represented 0.23 percentdecline during the period 1987 to 1991.A minimum decline of 485 km^2 in forest cover (0.08 percent) was observedduring1991 to 1995period.

Since the Earth Summit of 1992, focus by the international community has been on the need to sustainably manage the forest resourcesThe chiefaimof the United Nation'sForum on Forest,ever since, has been to carry out the goalspushing forachieving SFM (sustainable forest management). United Nations Forum on Forests (UNFF) had set universal objectives on forests that are key to SFM, andamong theseinclude,dealing with the loss of forest cover and alsosourcing finances for the implementation of SFM (Rawat et al. 2008). The UN has gone further to adopt the first ever UN Strategic Plan for Forests (from 2017 to 2030), which providing a framework for global action for sustainably managing all typesof treesat all levels, inside and outside the forests and halting forest cutting and forest degradation (United Nations, 2019). The aim of sustainable forestry is to allow resource utilization without endangering the ability to meet future

generation's needs by putting in place mechanisms for supervision and support that is associated with integration of processes such as management, reform and development.

With the turn of this century, India started registering positive signs of recovering lost green as her forest cover started to expand. In 2001, India's forest cover was 653,898 Km^{2}representing 19.89 percent of the entire geographical area, which further increased to 690,171 Km^2 (representing 21percent), in 2005and 692,027 Km^{2}in 2011 constituting about 21.05 percent of the total geographical area. By 2013,the forest cover of India has increased to 697,898 Km^{2}making about 21.23 percent of the area,whichfurther increased to 701,673Km^{2}representing 21.34 percent of India's total area. In the years between 1995 and 2001 the growth rate of forest cover was 2.35 percent, which increased to 5.55percent during 2001 and 2005; 0.27 percent during the period 2005 to 2011, 0.85 percent during the period 2011 to 2013 and0.5 percentbetween 2013 to 2015 respectively.In 2015, forest cover of India was 21.34 percent, thus increasing by 0.11 percentage. By the beginning of 2018 the total forests and tree cover of India has been estimated at 801,763.5 Km^2 (24.39 percent) of the 3,287,263 Km^2 as the total geographical area (Table 1 and Figure 1).

Table 1: Geographical coverage of forest area in India (1987- 2015)

Sr. No.	Year	Forest Area (Square Kilometer)	Percent of Total Geographical Area	Percent Growth Rate from Previous Count
1	1987	640,819	19.49	
2	1991	639,364	19.45	-0.23
3	1995	638,879	19.43	-0.08
4	2001	653,898	19.89	+2.35
5	2005	690,171	21.00	+5.55
6	2011	692,027	21.05	+0.27
7	2013	697,898	21.23	+0.84
8	2015	701,673	21.34	+0.54
9	2018	801,763	24.39	+14.26

Source: Government of India, Various State of the Forest Reports.

Figure1. Geographical coverage of forestarea in India (1987- 2015)
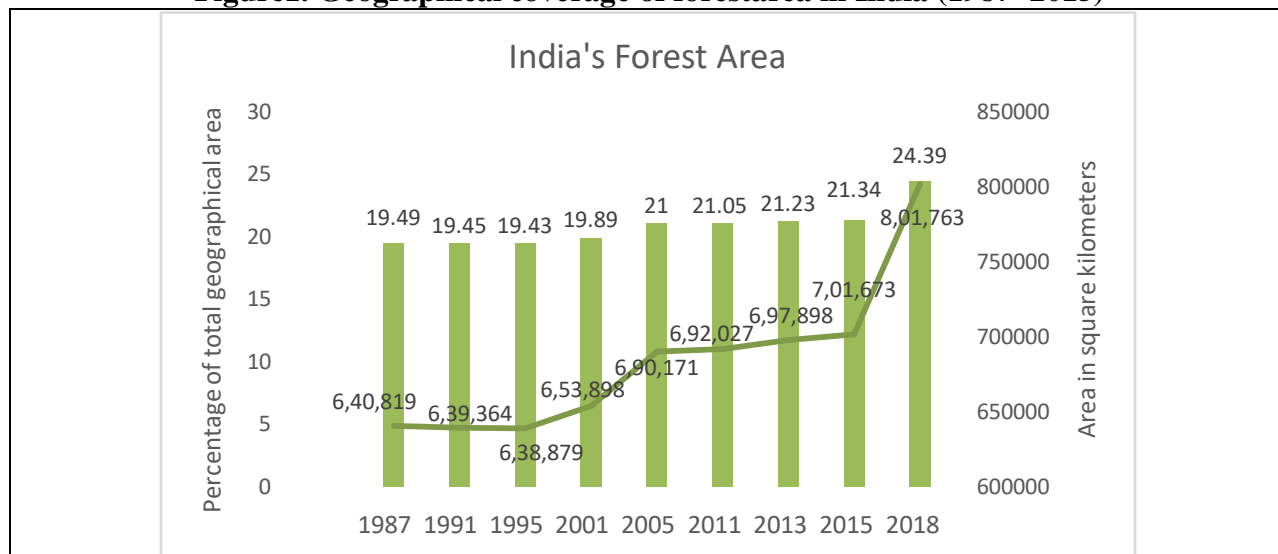
Source: Government of India, Various State of the Forest Reports.

In the backdrop of this positive growth trend of India's forest cover, the study has been undertaken to explore this success story and to share India's experiences in this regard with other developing countries. Present paper is broadly divided into two sections, the firstone to present information on mechanisms put forward by the Government of India to register such a positive trend from reduced forest cover to increased forest cover; andsecond section describingthe probable obstacles impeding the smooth implementation of well-planned programs and what is being done by the government to reduce or eliminate those problems completely.

Mechanisms put forward by the Government

India has adopted a number of interventions to slow down deforestation and forest degradation that has helped the country to see things turning around. Some of theseinitiatives are discussed below:

Development and implementation of forestry related policies and acts

Forest resources during the colonial era were increasingly commodified while serving the needs of the British Empire. After independence, the resources were stilllooked as source of revenue (Tian et al. 2014). The Ministry of Environment and Forests (MoEF) was formed in 1985 to oversee the implementation of environmental and forestry policies after a recommendation byNational Commission on Agriculture (NCA) in early 1980s. Policies and Acts that came in there after changed how natural resources were managed. Conservation initiatives on

biodiversity and environmentgothuge support from the National Forest Policy (1988) and this marked a complete change in the forest management strategy from a policing approach to peoplecenteredapproach (Government of India, 1988). This has helped to place emphasis on forest on conservation.

The NFP (1988) advocated for planting of trees on bare land and outside forests and alsohelped to stopsponsored supply of crude materials to wood ventures.This policyacknowledged theimportance for people's involvement and led to the formation of peoplecentered forest conservation programme known as Joint Forest Management Programme in 1990 (Mukerji, 2003). This encouraged village committees to take part together with forest departments in for the conservation and management of degraded forest areas. The declining trend of India's area under forest cover was minimized and a reverse was seen in the later years (Singh, 1996).

In addition to the above, the revolution of the country's forest policies, acts and regulations can be looked at as a change from production to conservation, which is tooexpounded by the United Nations Commission on Environmental Development Summitheld at Rio de Janeiro in 1992.The Supreme Court of India's Order (of 1996) made thegovernment to commence two national programmes and these were the National Forestry Action Programme (NFAP, 1999) and the National Afforestation Programme (NAP, 2002) whose goals were to have more land brought under forest and promoting forest conservation (Yasmi et al., 2010).

Furthermore, in the year 2004 the Ministry of Environment and Forests,gave mandate to CAMPA (Compensatory Afforestation Fund Management and Planning Authority) to oversee the compensatory afforestation funds which were collected from user agencies for the management of forests.National Environment Policy (2006)put much emphasis on protection of forests so as to upgrade its biological commitment and profitability (Government of India, 2006).Passing of pro-active forest conservation policies and shift in their management strategies (from timber tothe forest ecosystem)during the last some years and decades, rather, have assisted in checkingthe deforestation, and promotingpreservation and sustainable management of the forests. The Energy and Resources Institutefound that country's forest cover has stabilized, more or less since the eighties and improving (TERI, 2016).

Increased funds for greening activities

Government of India through Ministry of Environment and Forest listed down activities qualifying for grant of financial assistance that broadly are: raising and planting of seedlings; soil and moisture preservation works; creating awareness, and providing training & extension; grass and fodder developmentsincluding silvi-culture and pasture; and renewal of degraded forest through the Ministry of Environment and Forests' guidelines, 1990 (MoEF, 2013). The GoIhas demonstrated political will through the Finance Commission by understanding the importance of forests, hence a need of preserving forest cover. Despite that data on funding figures for the decade age is hard to come by, funding for years 2002 to 2006(for the tenth five-year plan period 2002-2007) shows increasing trend for funds released (Table 2).

Table 2: Afforestation funds 2002-03 to 2005-06 for Joint Forest Management Committees

Year	No. of JFMCs	Project Area	Release (Rs. Crores)
2002-03	8209	405631	151.26
2003-04	7850	283272	207.98
2004-05	3474	107963	233.00
2005-06 (up to 31.3.2006)	2,391	55,232	248.58

Source: http://naeb.nic.in/NAP_glance.htm

In addition to this, twenty-year National Forestry Action Programme (NFAP) with an estimated budget of about 26.5 billion US dollars, for technology transfer and capacity building for attaining the aims of the policy, was launched by the Government (GOI, 2007). NFC (National Forest Commission) suggested that States and UT's with areas of land covered with forests, greater thanprerequisite proportion,must be provided with special incentives for maintaining the forest cover (MoEF, 2013).This propelled states in India to put much energy in forest conservation.

Increased stakeholders'participation in forestry conservation

Stakeholders play a pivotal role as they interact at national and international level and this interaction influences the effective engagement in developmental intervention (Wattoo et al, 2010). In forestry development, examples of stakeholders include individuals living in and around forest reserves, the state through Forest Department, NGOs, CBOs, private sector like estates and industries among others (Agarwal, 2008). The Government of India did realize social forestry is a tool to sustainable forestry. Social forestry is the art and science of raising trees

inside and outside of the natural forest areas and managing existing forests with people's participation and combined with other processes resulting in balanced land use complementary with perspective to supplying varied goods and services to the individualsand to general society. The idea behind social forestry is to create forests on any available lands so that requirements of the society are fulfilled by these forests and pressure on natural forest is thereby reduced (FAO, 2009). In more generalized context, 'social forestry is considered as forestry of the people, forestry by the people and forestry for the people'. There are some states that have contributed to this achievement and the notable few are the three southern states of Andhra Pradesh (2,141 km^2), Karnataka (1,101 km^2) and Kerala (1,043 km^2). This is attributed much to the increased stakeholders' involvement in forestry activities (Gosh, 2018).

Improved extension services

In the last few decades, Forestry extension was realizedas a very crucial tool for forest resources conservation and development. Forestry extension is a requirement for productive forestry conservation and development programmes (FAO, 2006).The GoI saw the better way of protecting forest and its massive diversity through creating awareness among locals of their values and also involving them in protective measures through aggressive forestry extension which was a must for sustainable forest management was to be attained (Agbogidi et al., 2005).This propelled the government to heavily invest both in human resource and environmental education.

National Forest Policy, 1988 (Government of India, 1988) and the later government of India's resolutions on participatory forest management stressed on the need for people's involvement in sustainable forest management. These motivated local communitiesto associate themselves with the forest resource management from which they obtained varied benefits.Communities' engagement provided the opportunity to fill the void by taking care of forest resources,where the hand of the government was not visible.Forestry extension has become the backbone of sustainable forestry in the country. According to Hegde (2017) community forestry programmes such as growing of trees along farm bunds, roadsides and developing tree cover on common lands is helping to create a well-managed forest area.

Use of abandoned land or wasteland to promote afforestation

Wasteland is an area of land that is empty and cannot be used (MacMillan Dictionary, 2019). It isbelieved that the countryhaswasteland with a totaling area of about 129 million hectares which if used could promote sustainable livelihood for majority of the rural unemployedpopulation (Kareemulla et al. 2006). Further, these vast tracts of wastelands have been left un attended for some times and much of them were physically suitable for growing trees. Tree planting on wastelands in the last few decades came as a powerful mechanism for halting the rising misuse of these lands and environmental degradation (Balooni, 2003). Since India has wasteland of about 129 million hectares, and if all this wasteland gets planted with 1,600 trees per hectare with a standard spacing of 2.5 meters by 2.5 meters, there would be about 206.4 billion trees if all survived.

Various tree planting initiatives and use of i-Hariyali app in the state of Punjab

In 2014 Ludhiana was geared to plant 100,000 trees in an hour's exercise, dubbed as Ludhiana Earth Hour, to beat any world record so as to put the name of the city in the Guinness Book of the World Record (EcoSikh, 2019). It was able to plant more than 150,000 plants in that attempt. Next year, in 2015, drive was taken to plant more than 1 crore (10 million) trees in one hour in the state of Punjab, which too was successfully achieved (TOI, 2015). In 2017, the Punjab Livestock and Dairy Development Board (PLDDB) planned to plant 100,000 trees of various species during the monsoon season at the Livestock Experiment Station (LES) Khizerabad with support of Punjab Forest Department (The Tribute, 2017). In addition to the above, the State of Punjab has devised a system of whoever needs to have a firearm should plant 10 trees in any event. Zargar (2019) reported that about 5000 of new licenses and recharges every year would mean that 50,000 new trees will be plated in Punjab's district of Ferozepur district alone.

This mobile phone app 'i-Hariyali' was developed and launched under the 'Tandarust Punjab' mission by the state government of Punjab with the aim of promoting green cover in the state. This application was put forward in June 2018 to ensure clean and green environment in the state. The advantage of this app (i-Hariyali) is that it allows the users to select young tree or saplings from a wide variety of ornamental, medicinal plants and fruit bearing trees from closest government nurseries within Punjab and 15 plants per day per individual could be booked.

(Govt. of Punjab, 2019). By July 2018, lot of success had been reached in this regard. About 2.7 lakh downloads of the app from Google Play Store have been made, 2.6 lakh of different tree species have been ordered, 10 lakh plants have been collected within 45 days (The Tribute, 2018). This is a breakthrough in forest restoration in India and could be an exemplary IT driven afforestation drive to be followed by other developing countries.

In addition to the above, during the 550th Prakash Utsav of Sri Guru Nanak Dev Ji (the founder of Sikhism), the government of Punjab decided to plant 550 trees in every village by Sept 30, 2019. The cerebration took tree planting to nine villages and meaning that about 4,950 were planted. Thereafter, the remaining 432 villages still falling under Fatehgarh Sahib planted about 237,600 saplings (The Tribune, 2019). As per census of India (2011), there are 12,581 villages in Punjab. If all villages would be reached with the cerebrations, it is projected that about 6,919,550 trees (around 7 million) could be planted. Government also planned to convert the tree plantations under MGNREGS scheme, where each household is encouraged to plant and manage 100 trees and earn Rs1,940 per month for the survival of all the trees, and if survival rate is less, proportionately lesser amount to be provided (TOI, 2019). In another initiative, Government officials in Ferozpur district of Punjab have come up with a way of making people's passion for keeping firearms to protect environment. At least 10 saplings are to be planted and proof of their survival to be submitted for getting license for firearms (Zargar, 2019). All these initiatives for tree planting will certainly help India to experience increased forest and tree cover.

Tree planting initiatives in other states of India

Mitigating the global climate change effects and adhering to India's pledge to increasing its green cover to 33 percent of its total area, 'Green India' campaign has been initiated by the Government and many other initiatives are being undertaken by central and state governments (Government of India, 2019). In 2016, about 800000 volunteers from Uttar Pradesh joined hands to plant 50 million trees in a single day as part of pledge fulfilment made at Paris Climate Conference in 2015 (Howard, 2016). In Madhya Pradesh in 2017, about one and a half million volunteers, planted over 66 million trees in just twelve hours (The Independent, 2017). The CBS News (2019) reported that in 2019 more than 1 million people planted over 220 million trees in the northern state of Uttar Pradesh for combating climate change menace and improving the

environment. Now a competition has started among various government and private agencies to make records or achieving laurels in going for greening India. These are good efforts towards green India campaign, but need to be further strengthening them towards getting the tree survivals, which will ultimately lead to increased forest cover in the long run and a move towards sustainable development.

Obstacles encountered and the Government's efforts

Several problems and obstacles are also being encountered in meeting the expectations from initiatives to make India green. These problems are affecting the positive outputs from various initiatives being undertaken by Government and other agencies. Some of these are discussed below.

Peoplehesitant to offer their wasteland to afforestation

India has about 129 million hectares of wasteland that could be put to use by planting trees on them.The GoIhas been developing fuelwood plantations for the local poor and the landless. By 2000, only about 9 percent of the villages with wastelands had been assisted due to either unwillingness of someVillage Panchayats (village councils) and localbodies to allow their wastelands to be used for community plantations (Hegde, 2000). This therefore impedes the anticipated afforestation work (Balooni and Singh, 2006).

Poortree plant survival rate

This is a challenge that is being faced while implementing greening programmes. Global climate change is directly impacting the survival of planted saplings as rains come late and stop early, before the planted saplingsaregrown (Rattani, 2018). Likewise, it is alsofound that increased levels of carbon dioxide triggers heat wave, which is responsible for aiding beetles and wood ants to eat roots and stems of trees to kill them by starvation. These, despite massive effort put to afforestationwork, survival rate of planted saplings is jeopardized,apart that data is hard to find.

Continued pressure on forest resources for fuelwood.

Over 70 percent of India's rural folkrelies on fire wood for theirdailydomestic energy demands (World Bank, 2006). This means that the population is still exerting enormous pressure on the forest resources, which is resulting into forest degradation. In order to address this problem of

over-reliance on fuelwood for energy, GoI through the Ministry of Petroleum and Natural Gas,hasinitiated Pradhan Mantri LPG Scheme 'Ujjwala Yojana' that provides free Liquefied Petroleum Gas (LPG Kitchen Gas) connections to families in rural remote areas (IISDIRAD, 2016). This is helping to provide access to clean and efficient energy to the large rural masses and there is a need of reaching all rural communities so as to completely cut off use of firewood.

Increasing demand for timber

Hegde (2017)has estimated that the requirementfor timber is increasingat a faster rateand this demand would be increasing three foldfrom 58 million cubic meters to 153 million cubic meters from in 2005 to 2020. This extreme demand   for timber is putting much pressure on forest resources which could result in depletion of extractable forest in the next few decades rendering India lesser green cover. To reduce pressure on local forests created by demand for forest productslike timber and poles in the country, the GoI is exploring sources for import from South East Asia and Africa (Business Line, 2019). Despite this, India's major source of timber is sourced illegally from Southeast Asia (Shrivastava, 2016).

Occurrence of Forest fires

Forest fires are one of the largest threats to green cover. It is burning uncontrollably on lands coveredsolely or in parts by timber, bush, grass, grain, or other vegetationwhich is flammable (USLegal, 2019). These are dangerous not only to the forest wealth but also to biodiversity, the ecology and environment of any region. In India, these fires are common during summer, when the forests become littered with dry leaves and twinges that often break into uncontrollable flames combusted by the slightest spark. It is worrying to note that forest fires increased by 2.58 times between 2011 and 2017; and the number of such incidents have increased from 13898 to 35888 during same period where more than 1.5 lakh forest fires (Table 3) have been reported (Government of India, 2018).

Table 3: Forest fires occurrences in India between 2011 and 2017

Year	Forest Fire occurrences
2011	13,898
2012	29,362
2013	18,451

2014	19,045
2015	15,937
2016	24,817
2017	35,888
TOTAL	**157,398**

Source: Government of India, various reports.

Despite these problems, fire is detected anywhere within India by NASA's Moderate Resolution Imaging Spectro-radiometer (MODIS) and Visible Infrared Imaging Radiometer Suite (VIIRS) satellites which helpthe forest officials tolocateexactly where forest fire has occurred (Smetacek, 2018). The Divisional Forest Officer is notified and deploys a fire-fighting team. It cannot be denied that these fires before they are put-off they destroyor cause damage to tree of various sizes.

Continued demandfor agriculture land

There is an increased requirement for food to feed the expanding population which is puttingpressure on forest area. Researchers have found that about 5 million hectares of woodlands i. e. about 7 percent of the total forest area of India has been converted into farming landfrom early sixties to mid-eighties, and if this process of cutting is not stopped, many fold greater woodland would be brought under agricultural land. To reduce food crisis which puts much pressure on forest land, India has adopted a number of ways which aims at enhancing food productionthrough promoting intensive agriculture, providing more irrigation facilities, encouraging use of soil conservation practicesand establishing excellent food crop distribution system through controlling over pricing on food by government agencies.

Summing Up

The study found out that there are some notable mechanisms which are put in place by the Government of India to reduce forest degradation and promote its green cover. Taking steps towards making India's pledge a reality, various initiatives have been taken by central and state governments. Sooner or later, these initiatives are bound to be fruitful and surely, India would increase its forests and tree cover to one third of its total geographical area, which is considered to be a pre requisite towards achieving sustainable development goals. Such initiatives includedevelopment and implementation of stringent forestry related policies and acts; increased

stakeholders' participation in forestry conservation; improved extension services; and use of abandoned and wasteland to promote afforestation and so on. Apart from these initiatives, certain challenges,which are beingencountered while implementing various programmes (likeunwillingness by communities to allow government to use their wastelands, poor plant survival rate, continued population pressure on forests for fuelwood, increased demand for timber, forest fires, shortage for land for agriculture etc.)are in some cases affect achieving speedy progress towards greening India further. Experiences of India's improvements in its green cover, could be lessons for other developing countries forpursuing and achieving such feats and attaining sustainable development goals.

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