

# Model Village Development in Indian Himalayan Region: An Overview of Initiatives and Activities

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## ABSTRACT

The rural landscape in India is in need for radical transformation right up to the remote Indian Himalayan region which is already engulfed with many environmental and economic problems. Bringing out the transformation is even more challenging because the Indian Himalayan region is vulnerable to natural disasters like cloud bursts, flash floods, earthquakes and climate change driven by anthropogenic activities. The article explores the concept of eco- smart model villages as initiated by our societal change leaders and how till date they are being practiced and propagated as they serve as milestones for welfare of states and for transforming rural development in India. The most successful eco-smart model villages are described along with their attributes for success. The examples of famous eco- smart model villages show that local change leaders, community participation and financial support in the form of government schemes can revitalise rural development. Thus eco- smart model villages hold the potential to bring about transformation in rural development in India and Indian Himalayan region in particular.

## HIGHLIGHTS

- ① The rural Indian Himalayan region needs a sustainable transformation.
- ② Eco-smart model villages can overcome the environmental and economic problems of Indian Himalayan Region.
- ③ Eco-smart model villages have been initiated by many pioneers in the past that needs to be restudied
- ④ An eco- smart model village becomes a sustainable community who can generate and maintain their own resources and improve their standard of living.
- ⑤ The successful eco-smart villages show that local change leaders, community participation and financial support from government schemes can revitalize the rural Himalayan region.

**Keywords:** Eco-smart model villages, Indian Himalayan region, Rural development

Eco- smart model villages can be defined as human communities living in a socially, economically and ecologically sustainable manner. Eco- smart model villages consist of small scale communities with minimal impact on ecology (Robert and Gilman, 1991). Dawson (2006) has proposed five fundamental principles of eco- smart model villages: 1. Eco-villages are private citizen's initiatives. They're grassroots. 2. Eco - villagers value community living. 3. They are not dependent on

government, corporate or other centralized sources for water, food, shelter, power and other basic amenities. 4. The village people have a strong sense of shared values, often characterized in spiritual terms, and 5. They

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serve as research and demonstration sites and offer educational experience to others. The Global Network of Eco-villages defines eco-villages as “an intentional or traditional community using local participatory processes to holistically integrate ecological, economic, social and cultural dimensions of sustainability in order to regenerate social and natural environments” (www.ecovillage.org).

### Historical evidences of eco-smart model villages

Villages are the fundamental units of modern human civilization. The oldest record of concept of model villages in India dates back to the Gupta period (300-550BC) where villages were self sufficient units (Paliwal, 2005; Eraly, 2011). Foreign invasion by Mongols, Mughals the British and others led to the downfall of these self sufficient units. Post independence *The Father of the Nation*, Mahatma Gandhi envisaged *Gram Swaraj* as model of villages in which he envisioned that all Indian villages will be complete republic, independent of its neighbours for important resources, yet dependent and beautifully interwoven in many aspects of culture and social requirement. Gandhi ji wanted that all villagers should grow their own crops, and cotton for cloth. Cash crops be cultivated in extra land available. They should have their own cattle. Every village should have recreation and playground for adults and children. They should have their own theatre, school and public hall. Every village should have water reserve and potable drinking water supply (Gandhi, 1942). He also observed “If the village perishes India will perish too”. He established “Wardha village (*Sevagram*). He envisaged every village should be self reliant in terms of food, clothing, water, sanitation, housing, education and have a good governance. Equity and social justice promoting human, spiritual ethical and social values.

Earlier India’s first Nobel Laureate Rabindranath Tagore had established “*Sriniketan*” or *Shanti Niketan* in West Bengal. He established the Rural Reconstruction Institute in 1921 and with the help of a sociologist Elmhirst tried to build a model village in a cluster of eight villages to inspire the others to follow suit. The Institute’s main objectives were to increase the knowledge of local people in establishing cottage industry, follow new technology,

promote dairy farming, build cooperation, rural leadership and establish training and demonstration centres. The Rural reconstruction institute also helped the villagers in establishing health centre and education centres and form team of village scouts (*Brati Balika*). A chronological description of efforts of establishing eco-smart model villages in India by visionaries and later the State and Central Government in India is presented in Table 1.

### Recognized eco-smart villages of India

Indian villages are endowed with bio- resources to make them prosper. The National Network on Bio-villages and Community Banking was launched by the M.S. Swaminathan Research Foundation to replicate successful examples of poverty alleviation and natural resource conservation across India. Some of the most talked about list of eco- smart model villages who have actually walked the talk and demonstrated what community can do for a better tomorrow is presented in Table 2.

*Traditional village vs eco-village:* The traditional village does not share resources more or less equally, It does not provide common spaces for all particularly women and children to be together without being saddled with traditional role patterns. The traditional village is based on caste or class division and may not agree on environmental actions which is the main guideline for a eco- smart village. In traditional villages the people aspire to be more like their urban counterpart and improve their economic standard but eco-smart villages are more concerned to reduce their ecological footprint. Eco-smart model village communities need to have a broader vision to include all and strive to create equal opportunity for all and have greater solidarity with ecological living in wholesome manner.

### An overview of concept of eco-smart model villages

Village is defined as a settlement found in rural setting which is larger than a hamlet and smaller than a town. India has 6, 48, 867 villages (Census , 2011). In India more than 75% of its total population live in villages (Census of India 2011). The Father of the Nation, Mahatma Gandhi said “India lives in its villages”. The census defines

**Table 1:** A chronological description of efforts of establishing eco-smart model villages in India by visionaries and later governments

Year	Name of the visionary	Name of the project and place	Salient features
1903	Sir Daniel Hamilton	Scheme of rural reconstruction in Sunderban, Bengal	Establishment of model villages with central cooperative banks and cooperative marketing society.
1921	Rabindranath Tagore	Shantiniketan, Bengal	A cluster of eight villages selected for development of agriculture, cottage industry. Initiated the <i>Brottochari movement</i> (physical education and Yoga for social well being and health for all) and " <i>Shiksha Satra</i> " all round education for all.
1921	Dr. Spencer Hatch	Marthandam, Thiruvananthapuram	Young Men's Christian Association established a demonstration centre at Marthandam to reach out to 100 villages for improving the agriculture, poultry, bee-keeping etc.
1927	Mr. F.L. Brayne	Gurgaon, Punjab	The programme formed trained "village guides" and helped in adopting improved seeds, modern farm implements and methods of cultivation.
1933	Mahatma Gandhi	Sevagram, Wardha	To uplift under privileged villagers and make them self reliant and self sufficient
1945	A.T. Mosher and B.N. Gupta	Indian Village Service in Lucknow and Etah	Assist the Government in developing model villages and translate the village plan into action.
1946	Sri T. Prakasam	Firka Development Scheme in Madras	To attain self sufficiency in basic needs like food, clothing and shelter.
1992	Anna Hazare	Ryalligaon Siddhi	Water harvesting techniques and self-sufficient in irrigation and drinking water and better social prosperity. Has grain bank and milk bank. A model of environment conservation
1998	M.S. Swaminathan Research Foundation	The Information Village Research Project, Pondicherry	To extend benefits of information technology to rural poor, information village shops equipped with computers, telephones and dial up connectivity in ten villages with the rest of the world.
2009-2010	Government of India	<i>Pradhan Mantri Adarsh Gram Yojna</i> , Implemented in 1000 villages of Assam, Bihar, Himachal Pradesh, Rajasthan and Tamil Nadu.	Target villages were having more than 50% Scheduled Caste population
2011	Government of Himachal Pradesh	Mukhya Mantri Adarsh Gram Yojna	Across the state with an allocation of 10 lakhs per village. To ensure integrated development of selected villages with more than 40% scheduled caste and scheduled tribe population. Infrastructure like road network, water supply, sanitation and street light will be developed.
2014	Government of India	Sansad Adarsh Gram Yojna	For preventing distress migration, decent standard of living, easier, faster and cheaper access to markets, social empowerment and cultivate and sustain culture of cooperative living.

Adopted from Mandal (2012) and Bhattacharya et al. (2018) and modified.

**Table 2:** Some well known eco-smart model Indian villages and their attributes (The better India.com, Indian Railways)

Sl. No.	State and Name of village	Attributes/USP (Unique Selling Point)
1	Assam* Shikdamakha	A plastic free village that earned the maximum points in cleanliness sub-index by Union Ministry of Drinking Water and Sanitation. It is also open defecation free (ODF).
2	Madhya Pradesh Baghuvar	Has highest number of biogas plant used as cooking fuel and lighting in the village. Unique method of water conservation to survive drought for several years. ODF village.
3	Kerala Eraviperoor	First <i>Gram Panchayat</i> in Kerala to have free Wi-Fi for the general public. Has ISO-9001 certified Primary Health Centre. It has been recognized as model Hi-Tech green city by the State Horticulture Dept. for its green initiatives.
4	Rajasthan Piplantri	Saving girl child and increasing green cover. Every time a girl is born villagers plant 111 trees and ensures their survival. Set up fixed deposit for girls and parents sign a affidavit that ensures their education. To prevent termite infestation residents plated 2.5 million <i>Aloe vera</i> around them which is now source of livelihood for many residents.
5	Meghalaya* Mawlynnong	Cleanest village in India and Asia, plastic free, spotless path lined with flowers, bamboo dustbins.
6	Telangana Ramchandrapur	Received Nirmal Puraskar from Telangana Govt. in 2004 - 05. Villagers pledged to donate their eyes for visually challenged. All households have smokeless <i>chullahs</i> and toilets and tap water facility. Constructed subsurface dykes on a local river so no paucity of drinking water, every house has two overhead tanks and all used domestic water is diverted to home garden and crop fields.
7	Gujrat Punsari	A text book case study of development due to technology savvy 33 year old <i>Sarpanch</i> . Closed circuit camera, water purifying plants, biogas plant, air- conditioned schools, Wi- Fi, biometric machines in just eight years at the cost of 16 crores.
8	Nagaland* Khonoma	India's first green village. 700 year old <i>Angami</i> settlement which is self sustaining by protection and conservation of natural habitat. Hunting is banned and eco-friendly version of jhum agriculture that enriches soil.
9	Karnataka Kokrebellur	India's rarest species of birds chirp in the backyards of village homes. Shows how birds and humans can co-exist in complete harmony.
10	Andhra Pradesh Gangadevipalli	Every house has bare necessities of life like regular power and water supply from a water filtration plant, community owned cable TV service, concrete well lit roads.
11	Nagaland* Chizami	A model village: <i>Chizami</i> model of development. This model for development was brought about by marginalized women in bringing about the socio-economic transformation rooted in traditional practice of the region.
12	Tamil Nadu Odanthurai	A model village for more than a decade. They generate their own electricity and sell power to Tamil Nadu Electricity Board. Widely acclaimed for welfare scheme and energy self sufficiency.
13	Maharashtra Hiware Bazaar	The village has 60 millionaires and highest per capita income in India. Self sufficient in water requirement since 1995. earlier due to water crisis they changed from water intensive crops to horticulture and dairy farming. Constant water conservation efforts led to rise in ground water level. Today 294 open wells are brimming with water and village brims with prosperity.
14	Maharashtra Payvahir	Best example in India how communities and NGOs can work in coordination to conserve environment and ensure sustainable livelihood for people. In 2014, they were given the "Biodiversity award" by UNDP for turning 182 ha barren land to community forest and then to dense forest. Now they are selling the tree fruits "Organic Sitafal" custard apple and mangoes in Mumbai under the brand name "Natural Melghat"
15	Bihar Dharnai	First village in India to run completely on solar power. Greenpeace launched the solar powered 100 kilowatt micro-grid in 2014, benefits obtained by 2400 people living in Jehanabad district.

16	Rajasthan Arna Jharna	Eco- community centered village has an ethnographic museum built on the site of an old sand stone mine. Exhibits 160 types of Rajasthani brooms and includes a broom making workshop, serves as a sanctuary for desert flora and fauna and provides home stays for visitors and serves local meals.
17	Pondicherry Auroville & Sadhana Forest	<i>Auroville</i> comprises an utopian spiritual community and is India's best known eco- villages internationally. Founded in 1968 by "The Mother" (French expat- <i>Mirra Alfassa</i> ) <i>Auroville</i> serves as a laboratory for sustainable living. Run courses on natural building and permaculture, serves delicious farm fresh food, <i>Sadhana forest</i> focuses on reforestation.
18	Maharashtra Palghar	" <i>Govardhan Eco- village</i> " A UNESCO World Heritage site run by ISKCON, it focuses on water conservation, green building techniques based on Vedic tradition. Visitors are taught organic farming and yoga.
19	Bihar Kedia village, Jamui	In 2014 Greenpeace India developed the villagers into eco-farming community, Villagers make their own pesticides and fertilizers from natural material, each household has a biogas plant converting agro-waste to energy.
20	Odisha Siddharth village, Bhubaneswar	It is a network of eco-villages with 2 lakh tribal people promoting their indigenous culture, organic farming techniques and farmer training, providing home stays. It is run by Orissa Nari <i>Samaj</i> a federation of 54 tribal women's groups.
21	Gujrat Shaan-e-Sarhad village, Bhuj	Located in the grasslands of Gujrat they are pioneer in promoting sustainable livelihood in rural India. Through a partnership with UNDP, promotes tourism to protect the culture of the region, like traditional mud brick and thatched houses.

\* States situated in IHR.

"villages" or "rural" as those areas where population is below 5000 and population density is less than 400 per square kilometre. In such areas at least 75% of the males of the working population are engaged in agrarian sector (Census of India 2011). Majority of these Indian villages still suffer from poverty, malnutrition, unemployment and migration. Average size of land holding a meagre 1.15 ha (Govt of India 2010-11). In the IHR region this value is even lower and averages to only 0.5 ha. In rural areas only 77.9% households have drinking water facility within or near their house premises, 39.7% have proper sanitation, 55.3% households are electrified (Govt of India, 2017). Primary social infrastructure and access to basic amenities are still lacking in many rural areas. Under such circumstances creation of eco- smart model villages can propel rural development in far flung areas of India including the Indian Himalayan Region. A model village with a stable ecosystem all round may be called an eco-smart village. In the IHR context it may be considered as resilient to natural calamities like landslides, cloud bursts, earthquakes, flash floods, has well protected surrounding forests that supports organic farming and village flora and fauna is balanced in terms of food chain.

***Government of India and other organizations have attempted to create model villages with modern tools and technologies. Some examples are cited below***

1. **National Institute of Rural Development (NIRD)** attempts to make model villages by way of creating rural technology parks. Some of the technologies disseminated by NIRD for rural technology parks are: cost effective housing, solar energy workshop, hand-made paper, vermicompost and culture, home-made products, bee keeping and honey processing, rural sanitation, leaf plate and cup making, natural dyeing, medicinal plant cultivation hand-made soap making etc. NIRD is acting as the implementing agency by providing technical services, providing training and creating marketing platform by organizing *melas* and exhibitions in many states in India.

2. "**State Bank of India (SBI) Apna Gaon**" programme: The programme aims 100 percent financial inclusion and raise all people below poverty line by meeting the credit requirement of all such rural households, promotion of self-help groups and forming farmer's club and linking community services with SBI banking. The bank provides loans for agricultural activities and

starting micro industries and also provides biogas plants and solar lamps.

**3. Seed village programme:** Tamil Nadu Agricultural University is implementing seed village scheme for development and strengthening of seed infrastructure facilities for production and distribution of quality seeds through its three research stations and 13 KVK (*Krishi Vigyan Kendras*) with financial support from Government of India. They are working on production of seed in cluster villages, seeds of high yielding varieties are being used instead of traditional landraces, in order to meet local demands on time and supply at reasonable cost. Final aim is to achieve self-sufficiency and self reliance within the village and take seed to the doorsteps of farmers.

**4. Unnat Bharat Abhiyan (UBA):** IIT Delhi is coordinating an initiative by Ministry of Human Resource Development and has identified 10 village clusters and working out the technologies to solve the most pressing problems of the villages. The *Unnat Bharat Mission* is inspired by the vision of transformational change in rural development process by leveraging knowledge institutions to help build the architecture of an inclusive India. The UBA aims to enable higher educational institutes to work with people of rural India in identifying developmental challenges and evolving appropriate solutions for accelerating sustainable growth.

**5. The Indian Council of Agricultural Research (ICAR)** has taken up model village development under the aegis of "Technology Assessment and Refinement-Institute Village Linkage programme (TAR-IVLP). The interventions were related to animal husbandry and included new breeds, allocations of fodder, feeding practices, pest management etc.

A model for gender mainstreaming in agriculture was developed by ICAR- Central Institute for Women in Agriculture (CIWA) at Giningaput village of Khurda district of Odisha. This model can be used to assess gender access to resources, information services and extension.

**6. Bhartiya Agro Industries Foundation (BAIF):** Also has a vision of self reliant rural India. They have a

comprehensive cattle development programme for providing livelihood to people. They have a centre at every 10-15 km radius with over 1000-1500 families with about 1500-2000 breedable cows and buffaloes.

**7. Border Area Development Programme (BADP):** Ministry of Home Affairs, Department of Border Management are dedicated for development of model villages in border areas. They are keen to develop the border villages into model/smart villages because there is sparse population in the border, these villages need better connectivity, food security, electricity, telecommunication facility and civic infra structure. The rural people also need sustainable livelihood and employment. They also envisage to connect all the border villages with all weather road connectivity.

**8. Through Corporate Social Responsibility (CSR)** many private organizations are adopting villages to transform them to eco-smart model villages. A model village serves as a bench mark and ideal to motivate the neighbouring villages to transform.

**9. Niti Aayog Aspirational Districts:** The National Institute for Transforming India (NITI Aayog) has taken up the transformation of "Aspirational Districts" initiatives and aims to remove the heterogeneity in living standards in Indian villages through a mass movement to transform the backward (aspirational) districts of India. This programme is priority of government of India. The government is committed to raising the living standards of its citizens and ensuring inclusive growth for all - "*Sabka Saath Sabka Vikas*". With states as the main drivers this programme focuses on the strength of each district and aim towards its further improvement, measure the progress and rank the districts. The core areas of focus are 1. health and nutrition 2. education 3. Agriculture and water resources 4. financial inclusion and skill development and 5. basic infrastructure.

**Salient features of eco- smart model village:** A 21<sup>st</sup> century eco-smart model village should consist of several focus areas which can be categorised into four main sectors: 1. sustainability, 2. technology, 3. community involvement and 4. connectivity. Interventions in any one sector will have impact on other sectors as well.

**1. Sustainability:** sustainability is sought in terms of better health with special focus on maternal and child health, Practical and smart education, housing and livelihood. capacity building of all stakeholders, clean drinking water and sanitation and environmental sustainability.

**2. Technology:** Technological interventions are needed in delivery of government services, ICT (Information and Communication Technology) and space technology for helping the farmers, remote sensing for resource mapping and better utilization of existing assets, modernization of land records and biometrics for efficient targeting of services e.g. PDS (Public Distribution System), insurance and disbursement of pension.

**3. Community involvement:** Required for planning of village development, mobilizing resources for the plan with active engagement with elected representatives, monitoring the utilization of government funds and increase accountability and influencing personal and community behaviour.

**4. Connectivity:** Physical connectivity to towns and other places through roads. There should be easy and cheap means of transportation, digital connectivity and mobile connectivity, augmenting power connectivity through off-grid renewable sources and financial connectivity.

Interventions in any one sector will have impact on other sectors as well.

**Indicators of eco- smart model villages:** To assess the socio-economic condition and measure the success of rural development intervention several indicators have been devised (United Nations, 2007). World competitiveness rankings are prepared by International Institute for Management Development (IMD), Switzerland. Different forms and techniques of "weighting" the individual series are used like in Human Development Index (hdr.undp.org). Composite indicators can be developed for a particular region and can be used to rank villages with respect to their progressiveness and assess the socio- economic status of rural areas. Indicators of eco- smart model villages can be grouped into five broad indicator group. They are: 1.

Infrastructural 2. Economic 3. Farming 4. Cultural and 5. Environmental indicators. According to International Development Organizations indicators on rural development need to be based on 1. published statistics 2. consistently collected 3. comparable areas and 4. using the same unit of measurement and based on clear definition. Indicators should be sensitive to changes and trends over time (Bryden, 2001). Bhattacharya and Ponnasamy (2017) has identified the indicators of model villages adopted by various ICAR institutes according to their progressiveness after certain developmental interventions were done in those villages with the aim to develop them into model villages. Table 3 and 4 provides a list of indicators given by World Bank and FAO respectively (World Bank, 2000; FAO, 1988a, 1988b, and 1988c). Wang *et al.* 2012 developed a Rural Transformative Index (RTI) based on three assessing indicators: 1. The rural development level 2. The rural transformation level and 3. The urban- rural coordination level. Similar approaches can be adopted both at local and national level to ensure success of rural development interventions.

This article is based on review of literature conducted to initiate a new five year transformative project entitled, "Community driven eco-smart model village development to improve livelihoods and foster ecological security in the Himalaya" by the author. The present article is based on desk study involving compilation of literature from various sources like central and state government documents, project reports, research papers. books and articles.

### ***The Indian Himalayan region context and Need of developing eco-smart villages in IHR***

The Indian Himalayan region stretches over 2500km in length and 80-300 km in width and rises to a height of 8000m amsl. Temporal and spatial variations caused by geographical diversity have resulted into marked differences in climate and physiography and consequent differences in biotic elements. Over 170 ethnic communities inhabit the region. The region is characterized by sparse population, undulating terrain, tiny and scattered land holding, scanty irrigation opportunity, agro-pastoral economy, low

**Table 3:** Rural Development Indicators listed by the World Bank (World Bank 2000):

1. Basic Data		
<ul style="list-style-type: none"> <li>➤ Annual GDP growth (%)</li> <li>➤ Rural population (millions)</li> <li>➤ Rural population (%) of total</li> <li>➤ Population density, rural (people/sq km arable land)</li> <li>➤ Rural life expectancy (years)</li> <li>➤ GNI per capita (rural)</li> </ul>		
II. Enabling environment for rural development		
II. 1. Policies and Institutions	II. 2. Markets	II. 3. Infrastructure
<ul style="list-style-type: none"> <li>➤ Agricultural subsidies (%) of total</li> <li>➤ Agricultural tariffs (%)</li> <li>➤ Fiscal decentralization (%) of budget transferred to local government</li> <li>➤ Food Price Index</li> <li>➤ Independence of local courts</li> <li>➤ Land Gini Coefficient</li> <li>➤ Local government elections</li> <li>➤ Number of farmer's organization</li> </ul>	<ul style="list-style-type: none"> <li>➤ Agricultural raw materials exports</li> <li>➤ Food imports</li> <li>➤ Food exports</li> <li>➤ Employment in agriculture, female (% of female labour force)</li> <li>➤ Agriculture household net disposable income as a percentage of all household disposable net income.</li> <li>➤ Net disposable income per agriculture household member compared to that of members of all households</li> <li>➤ Gross rural domestic savings</li> <li>➤ Percentage of rural households with access to formal credit services in financial institutions</li> <li>➤ Number of market outlets for agricultural input produce</li> <li>➤ Rural labour force, employed</li> </ul>	<ul style="list-style-type: none"> <li>➤ Rural roads (%) of rural population with access to motorable roads all year round</li> <li>➤ Rural population with access to electricity (%)</li> <li>➤ Rural population with access to communication (%) radio, telephone, newspaper and computers.</li> </ul>
III. Broad based Economic growth for rural poverty reduction		
III. 1. Poverty	III. 2. Agriculture	III. 3. Non-farm
<ul style="list-style-type: none"> <li>➤ Rural per capita income</li> <li>➤ Rural poverty gap ratio</li> <li>➤ Proportion of rural population below \$1 purchasing power parity (PPP) a day.</li> <li>➤ Rural poverty head count ratio (% of rural population below poverty line)</li> <li>➤ Rural per capita dietary energy supply (calories per day)</li> <li>➤ Rural infants with low birth rate (% of births)</li> <li>➤ Rural child malnutrition (% of children under five who are stunted)</li> </ul>	<ul style="list-style-type: none"> <li>➤ Agricultural gross value added 9% of total GDP)</li> <li>➤ Agricultural gross value added (Average annual growth, 1980-2000)</li> <li>➤ Agricultural productivity (gross value added per worker, 1995 US \$)</li> <li>➤ Number of farm households (narrow definition)</li> <li>➤ Number of farm households (broad definition)</li> <li>➤ Food production index (1989-91= 100) and index per capita</li> <li>➤ Irrigated land (% of crop land)</li> <li>➤ Cropland/arable land (%)</li> <li>➤ Cereal yield (kilograms per hectare)</li> <li>➤ Cereal yield (average annual growth)</li> </ul>	<ul style="list-style-type: none"> <li>➤ Rural gross fixed capital formation (% of GDP)</li> <li>➤ Rural labour force, employed in non-farm activities</li> <li>➤ Share of rural women employed in the non-agricultural sector (% of total employment in sector)</li> <li>➤ Growth of non agricultural GDP</li> <li>➤ Number of rural businesses</li> <li>➤ Number of non-agricultural jobs created (annual)</li> </ul>

IV. Natural Resource Management and Biodiversity	
<ul style="list-style-type: none"> <li>➤ Forest area (% of total land area)</li> <li>➤ Rural protected area (% of total land area)</li> <li>➤ Annual deforestation (% change, 1990 - 2000)</li> <li>➤ Ratio of rural protected area to maintain biological diversity to rural surface area</li> <li>➤ Annual freshwater withdrawal (% of total resources)</li> <li>➤ Agricultural withdrawal (% of total freshwater withdrawal)</li> <li>➤ Emissions of organic water pollutants (Kg. per day)</li> </ul>	
V. Social well- Being (Education and Health)	
V.I. Education	V.2. Health
<ul style="list-style-type: none"> <li>➤ Rural illiteracy rate (%)</li> <li>➤ Rural literacy rate (% ages 15 - 24)</li> <li>➤ Ratio of rural literate females to males (% ages 15- 24)</li> <li>➤ Net rural enrolment ratio in primary education (% of relevant age group)</li> <li>➤ Ratio of rural girls to boys in primary, secondary and tertiary education (%)</li> <li>➤ Proportion of rural pupils who reach grade 5 (% of grade 1 students)</li> <li>➤ Rural primary completion rate (% of relevant age group)</li> </ul>	<ul style="list-style-type: none"> <li>➤ Prevalence of HIV/AIDS (% of rural adults, age 15 - 49)</li> <li>➤ HIV prevalence among pregnant rural women (ages 15 - 24)</li> <li>➤ Percentage of rural population 15 to 24 years old with comprehensive correct knowledge of HIV/AIDS</li> <li>➤ Prevalence of child malnutrition (% of rural children under 5 years)</li> <li>➤ Per capita calorie consumption</li> <li>➤ Immunization rate, measles (% of rural children under 12 months)</li> <li>➤ Rural maternal mortality ratio (per 1000 live births)</li> <li>➤ Rural infant mortality rate (per 1000 live births)</li> <li>➤ Proportion of rural births attended by skilled health staffs (5 of total)</li> <li>➤ Rural population with access to improved sanitation (%)</li> <li>➤ Rural population with access to improved water source (%)</li> <li>➤ Rural population with access to health services</li> <li>➤ Per capita caloric consumption</li> <li>➤ Under five mortality rate (rural per 1000)</li> </ul>

Adopted from Bhattacharya et al. (2018).

**Table 4:** Primary rural development indicators given by FAO (FAO, 1988a, 1988b, 1988c)

Themes	Indicators
(A) Poverty alleviation with equity	<p><b>Income/Consumption</b></p> <ul style="list-style-type: none"> <li>➤ Percentage of populations in households with per capita income below the poverty line.</li> <li>➤ Percentage of income accruing to each fractile (decile/quartile) of the population</li> </ul> <p><b>Nutrition</b></p> <ul style="list-style-type: none"> <li>➤ Percentage of children aged 1-5 years in groups less than :                             <ul style="list-style-type: none"> <li>➤ 80% weight for age, 90% height for age, 80% weight- for height</li> </ul> </li> <li>➤ Percentage of under nourished population</li> </ul> <p><b>Health</b></p> <ul style="list-style-type: none"> <li>➤ Infant and child mortality rate</li> <li>➤ Percentage of the population in villages/communities with at least one health auxillary</li> </ul> <p><b>Education</b></p> <ul style="list-style-type: none"> <li>➤ Adult literacy rate</li> <li>➤ Primary school enrolment and completion rates</li> </ul>

	<p><b>Housing</b></p> <ul style="list-style-type: none"> <li>➤ Percentage of rural households with specific housing facilities e.g. piped water, electricity and sanitation facilities</li> </ul> <p><b>Access to community services</b></p> <ul style="list-style-type: none"> <li>➤ Percentage of population living in villages/communities with access to potable water, public health services, primary schools.</li> </ul>
(B) Access to land, water and other natural resources	<p><b>Access to community services</b></p> <ul style="list-style-type: none"> <li>➤ Percentage of number and area of agricultural land holdings by size groups and tenure.</li> <li>➤ Percentage of heads of rural households without land</li> <li>➤ Average wage rate of agricultural labourers</li> <li>➤ Rate of employment and under-employment</li> <li>➤ Percentage of landless agricultural labourers to the population economically active in agriculture.</li> </ul>
(C) Access to inputs, markets and services	Percentage of rural households receiving institutional credits
(D) Development of non-farm rural activities	Percentage of economically active population engaged in non-agricultural activities in the rural areas
(E) Education, training and extension	Number of rural (including agricultural) extension personnel per 1000 holdings/households
(F) Growth	Annual rate of population growth

Adopted from Bhattacharya et al. (2018).

**Table 5:** Some well known established and under establishment eco-smart model villages in the IHR and their initiatives

Sl. No.	State and Name of village	Attributes/USP (Unique Selling Point)
<b>Established:</b>		
1	Nagaland Chizami	A model village: Chizami model of development. This model for development was brought about by marginalized women in bringing about the socio-economic transformation rooted in traditional practice of the region. The model focuses on health issues, women's rights, community programmes, food security and environment conservation. Now they are working on millet based bio-diverse agriculture as millets are integral part of Naga culture and highly climate resilient and nutritious crop.
2	Nagaland Khonoma	India's first green village. A 700 year old <i>Angami</i> settlement which is self sustaining by protection and conservation of natural habitat. Hunting is banned and eco-friendly version of jhum agriculture is practiced that enriches soil.
3	Tripura 26 model aquaculture villages out of which 10 are in tribal areas	Department of Fisheries, Govt of Tripura demonstrated and trained villagers in reclamation of water bodies and provided various models of aquaculture inputs.
4	Mizoram Khawalailung	A model village for peace and development. Like most Mizo villages it is community maintained, disciplined and clean. Visitors are stunned at the self governing mechanisms and high literacy rate. It is also known for its social and cultural development and spread motivation among the people on social mobilization of village community.
5	Meghalaya Mawlynnong	Cleanest village in India and Asia, plastic free, spotless path lined with flowers, bamboo dustbins.

6	Meghalaya Tyra	A hamlet in East Khasi hills, adopted by <i>Nehru Yuva Kendra Sangathan</i> , an autonomous body under the Ministry of Youth Affairs and Sports, to develop into Youth Model Village. Thrust area: ODF, improve sanitation, education of children, sustainable agriculture and skill development.	
7	Manipur Phayeng	Model carbon positive eco- village. Declared model village under SAGY and PMGSY.	
8	Manipur Mapao Zingsho	A model village that protects environment through cleanliness, garbage bins placed on roads, houses well maintained and decorated with traditional craft work and painting, engaged in sustainable farming.	
9	Assam Shikdamakha	A plastic free village that earned the maximum points in cleanliness sub-index by Union Ministry of Drinking Water and Sanitation. It is also ODF village.	
10	Assam Chinatolly village cluster	They have achieved expertise in Tea plucking and organic pest control in tea as their economy is based on Tea. ODF, has library and study centre, conducts career guidance programme and spoken English classes	
11	West Bengal Hills Tinchuley, Darjeeling	A self sufficient eco-urban village developed by the World Wildlife Federation. They have floriculture, forest nursery, bio- composting, vermi- composting facilities. Virgin forest trees are home to numerous exotic birds.	
12	Sikkim Assangthang model villages	Developed by the Rural Management and Development Department, Govt of Sikkim, situated 8 km away from Namchi with thrust on eco-tourism, have typical Sikkimese style houses and solar lighting.	
13	Sikkim 16 model villages 2 each in 8 districts of Sikkim	All villages equipped with standard processing and treatment of solid waste, Sikkim rural is also 100% ODF from 2008. Leader in plastic waste management, and organic cultivation.	
14	Jammu & Kashmir Habbi	First tribal model village, comprises of smart classes in schools, better roads, electricity and water facility.	
15	Ladakh Tamakchik	First eco-model village, developed by Ladakh Environment and Health organization. Has developed organic farming and is known for authentic Ladakhi food and traditional culture. The Student Association for Village Environment (SAVE) maintains cleanliness and hygiene in the village.	
16	Leh Saboo	Awarded the " <i>Nirmal Gram Puraskar</i> " under " <i>Nirmal Bharat Abhiyan</i> ". The entire village infrastructure was destroyed in 2010 flash flood and cloudbursts. Today rebuilt to have public information system, common facility centre for small processing units, playground, parks etc, Well known for vegetable, tomato and apple juice making.	
<b>Model villages under establishment</b>			
1	Arunachal Pradesh	53 villages	Border Area Development Programme (BADP) is developing 53 villages as model village. One each in border blocks.
2	Jammu & Kashmir	119 villages	Under Prime Minister's Reconstruction Programme (PMRP) 119 villages in J&K are being upgraded to model villages at an estimated cost of 120 lakhs per village.
3	Himachal Pradesh	5 model eco villages, Charau in Shimla, Deonthal in Srimaur, Damru in Kinnaur, Bhanjararu in Chamba, Tipra in Bilaspur and 5 model villages in Kullu (Shleen, Jara, Khadagad, Kadaun and Dalash).	Thrust on environment sustainability, protection and conservation of natural water resources, adoption of sustainable agri- horti practices, spring rejuvenation through landscape approach, use of biogas, solar light, heater and solar fencing and solid waste management.

4.	Uttarakhand	<p>Jakhlol</p> <p>Veerpur Khurd in Dehradun and Mala in Pauri</p> <p>10 villages in Bageshwar block, 3 each in Garur and Kapkot block</p>	<p>First model village to be turned into a tourist attraction.</p> <p>Model Ganga villages. They are adopted by Ministry for Drinking Water and Sanitation in association with GIWA (Global Interfaith WASH Alliance). These villages will have solid and liquid waste management facilities, drainage systems, ground water recharge, modern crematoria, and cultivation of medicinal herbal and shrub. 4270 villages in Uttarakhand including 4515 Ganga villages are ODF.</p> <p>For creating 191 model villages in 13 district at Central Govt cost. Govt has released 20.45 crore. Work on drinking water, cleanliness, health and nutrition, social security, roads, housing, electricity, biogas, agriculture, Information and Communication Technology and capacity building is in progress.</p>
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agricultural productivity, and less access and use of modern technologies (Negi *et al.* 2015). It is one of the 34 biodiversity hotspots with 32 percent endemic flora and has huge reservoir of water with home to over 9000 glaciers and origin of majority of perennial rivers of north India that influence the well being of the Indo-Gangetic plains. The Himalayas contribute to the security of its people and economic development of the country therefore the region deserves priority for action for environmental conservation and sustainable development (Negi *et al.* 2015). Due to its typical geographical position the IHR is infested with many environmental and developmental problems like accelerated soil erosion and landslides, deforestation and land degradation, scarcity of fodder and fuel wood, forest fires and human wildlife conflicts. The region is characterized by rainfed farming with declining soil fertility and crop yield, water scarcity for household use, increasing wasteland, Invasion of alien weeds, lack of infrastructure and market for processing and sale of farm produce, limited job opportunities and lack of civil amenities.

**What should be a model village in IHR context**

The Indian Himalayan region has its own bio-physical and socio-economic characteristics. Major part of Himalayan mountains are under forest cover (41.5%). Villages are cradled in between forest and agricultural land therefore sustainable management of environment and sound ecological applications are needed to sustain the villages of fragile young Himalayan fold mountains.

In the Indian Himalayan region (IHR) majority of villages are facing problems like non availability of potable water, absence of proper sewerage, solid waste problem (agro waste), shortage of power, low budget allocations to *Gram Panchayat* and lack of technical knowhow. Therefore these villages need eco-friendly and economical options to tide over the unfavourable situations and hence development of eco- smart villages are needed in India and across the Indian Himalayan region in particular. Green concepts which are eco- friendly energy conserving and conserves nature also is required. An eco- smart model village should be sustainable, eco- sensitive, energy efficient, climate responsive, user friendly and cost effective. For development of rural areas Government of India has initiated various developmental schemes e.g. *Swachha Bharat* Mission for sanitation, *nirmal gram* scheme, *bharat nirman* scheme, Mahatma Gandhi *tantamukti* scheme, *garibi nirmulan* scheme, *mahila bachat gat*, and *rojgar* guaranty scheme in line with the sustainable development goals SDG 2030. These schemes are being implemented for solving particular problems in villages and reach target of SDGs but a holistic environmental planning to achieve sustainable development is lacking. Therefore eco- smart model villages will be a holistic approach towards village development in the IHR.

An eco - smart model village in the Indian Himalayan region should have good education facility, better infrastructure, proper sanitation facility, health facility, waste management, renewable energy, environment protection, clean drinking water, resource use efficiency particularly natural resources. The community should

be capable of involving themselves usefully to local governance process, encourage entrepreneurship through capacity building and exploring livelihood options within the village and build a happy environment. An eco-smart model village will not only have a sustainable agriculture but also be able to do e-marketing of their produce through internet and raise the standard of living.

In addition to having all the characteristics of eco-smart model villages like the rest of India, the villages of the IHR face many hazards and therefore they need to be trained and made self-reliant to cope up with the natural disasters. Some of the natural hazards that a Himalayan village face perpetually are cloud bursts and flash floods, landslides and road blockade, snow avalanche, earthquake, drought, attack by insects and pests and Human wildlife conflicts. Limitations in use of modern technology due to topography and climate apart from fragmented land holdings and rainfed agriculture also impedes development. Therefore the Indian Himalayan villages should also have preparedness towards disasters made climate resilient. In the IHR rural areas are not uniform therefore eco-smart model village development has to be applied in combination with a location based approach. Some of the eco-smart model villages establishment drive in the IHR are presented in Table 5. Good governance and innovative approaches need to be transferred to Himalayan villages with local customization and execution of programmes need to be carried out in mission mode with time bound targets (Tambe *et al.* 2020).

## CONCLUSION

Development of an eco-smart model village entails designing of activity which is considered an excellent example of replication. The examples cited in the article indicate that the villagers need to act as decision makers, partners and beneficiaries with multi-sectoral, multi-functional integrated developmental activity. An eco-smart model village becomes a sustainable community who can generate and maintain their own resources and improve their standard of living by strengthening their livelihood, infrastructure and services. There are many government and state government schemes that

are working towards social and economic upliftment of villages but very few programmes to secure the ecology and conserve biodiversity of the villages. The villages of IHR are endowed with natural resources and these need to be used sustainably keeping in view the carrying capacity concept and create eco-smart model villages with ecological balance towards a secure future. They also need to be provided safety and security through disaster management and climate smart activities. The examples of famous eco-smart model villages show that local change leaders, community participation and financial support in the form of government schemes can revitalise rural development in India and IHR. Thus eco-smart model villages hold the potential to bring about transformation in rural development in India and Indian Himalayan region in particular.

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