

The Role of Indian Entrepreneurship Ecosystem in the Era of Climate Change

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Abstract

Entrepreneurship depends on an environment that fosters new ideas. Previous research on the entrepreneurship ecosystem has enhanced the origin of entrepreneurship and made entrepreneurs interact with external business environments. Hence, this conceptual framework aimed at connecting the entrepreneurship ecosystem with the five big dimensions of biological concepts which reflected on how entrepreneurship is responsible for climate change. It also discussed the general outlines of Entrepreneurial Ecology theory. The researcher used biological analysis to investigate the characteristics of entrepreneurial activity, and it led to ecological analysis. The study also went through other analysis to describe concepts more deeply. It suggested that the government should promote the education of the entrepreneurship ecosystem in higher educational institutions and universities and include traditional knowledge in the context of biodiversity and ecology. It would help human interactions with the natural environment and secure inter-generational equity.

Keywords : Biodiversity, climate change entrepreneurship, entrepreneurial ecology, entrepreneurship ecosystem

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Entrepreneurship is the continuous procedure of identifying, creating, and recognising the possibilities to develop value through innovation (Churchill, 1992 ; Landström, 2008). It has been observed as an essential element in furnishing the economy (Acs, Desai, & Hessels, 2008; Wong, Ho, & Autio, 2005). The Global Entrepreneurship Index – GEI (Ács, Szerb, Lafuente, & Lloyd, 2018) provided a simple platform for analyzing entrepreneurial ecosystems grounded on three essential premises. First, agents have undertaken and controlled entrepreneurship activities based on incentives. Second, an organised framework condition has influenced a particular action. Third, entrepreneurship ecosystems have complex, multifaceted structures within which many elements collaborate to build systems performance. Thus, the systems approach investigates relations between specific changes in environment, and entrepreneurship is acknowledged as a social system.

It observed that most of the researchers paid their attention to defining an ecosystem, including culture, institutions, and networks (Acs, Stam, Audretsch, & O'Connor, 2017; Lowe & Feldman, 2017; Spigel & Stam, 2017). However, only a few studies relate the ecosystem to climate change. The paper intends to seek a conceptual view of the ecosystem and examine how society and private sector business entrepreneurs inter-relate with the biological concept. Entrepreneurs are more closely related to the environment. The researcher has tried to correlate the entrepreneurship ecosystem with the continuously changing climate. This conceptual paper described the relationship of entrepreneurship to the biosphere.

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Theoretical Framework

(1) Climate change entrepreneurship in India

Climate change is a widely known problem that developing communities have been facing for many decades. The increasing temperature, inconsistency in precipitation, and extreme weather events have already begun to impact the economic performance of states. It is also affecting the lives and livelihoods of poor people. The main focus of each developing country is reducing poverty. However, climate change and its effects will continue to create risk if environmentally friendly practices are not adopted to cut it back.

Furthermore, India is liable to be the most vulnerable to climate change among countries. In the country, a number of poor people depend on natural resources like rain for their livelihoods. The World Bank supported the Indian government on both adaptation and mitigation. On adaptation, the World Bank has acknowledged a pilot project in Andhra Pradesh to advise communities in drought prone areas to access their adaptability to fluctuating precipitation. It has assisted two coastal cities in making sound strategies to deal with the problem of increasing sea levels. The World Bank is additionally helping India in changing its water management practices. It suggests the consequences of adverse global climate change while also fostering agreement with key stakeholders and architecture institutions that can fulfill multiple needs equitably and efficiently across various river basins (Lvovsky, Mahul, & Makino, 2019).

The bank has started work on a low carbon growth strategy for mitigation. It has initiated ways to maximize renewable energy access and improve energy efficiency while completing economic objectives and carrying modern energy to 400 million population who could not access electricity. For commercial purposes, the Indian government has targeted to produce 5 million tonnes of green hydrogen by 2030. One of the primary criteria for the nation's ecologically sustainable energy security is to replace fossil fuels in the future with Hydrogen and Ammonia as sources of renewable energy (Ministry of Power, 2022). India can advance a portfolio of strategic climate investments with a practical approach and knock into plenty of financial instruments that are accessible to change the economy to more resilient growth and a low carbon path.

(2) Five big areas that reflect climate change due to entrepreneurship

It is impossible to create a 100% pollution-free environment when so many industries operate. Economic development aims to improve living standards, create jobs for individuals, and increase the possibilities of a degraded environment. Highly polluting industries such as thermal power plants, coal mines, cement, sponge iron, steel & ferroalloys, and fossil fuels produce toxic gas emissions, and pollutants. These have become hazardous, causing irreversible damage to our ecology and the environment, and affect the carrying capacity of the environment. Hence, the researcher relied on a five-dimensional analysis based on previous studies (Frederick, 2011).

(a) Biodiversity

Entrepreneurs are accountable to a greater extent for the ongoing extinction of species. The researchers pointed out that the destruction of natural habitats will be responsible for the loss of biodiversity on the Earth, which will recover in many centuries. However, humans can overcome economic downfall, energy depletion, or even nuclear war (Wilson, 2002). The biodiversity is responsible for the well-working ecosystem that provides natural resources, including water resources, clean air, soil formations, essential minerals, sustainable climate, and future resources.

Humans have viciously damaged the highly biodiverse habitats from coral reefs to rainforests, and other undiscovered areas. Scientists have observed this situation as the Holocene extinction event, the continuing mass of extinction of species during Holocene. The extinction rate of species has been estimated to be a thousand times higher than natural preceding rates. Brondizio, Diaz, Settele, and Ngo (2019) mentioned that around one million species of plants and animals were extinct because of anthropogenic impacts.

The spirit for enterprising, innovativeness, and technological advancement in creating cities and industries is the

main problem in desertification of the existing living space. It has led to ecosystem imbalance by the depletion of natural resources. Was this what Schumpeter (1942) had in mind when he referred to entrepreneurs as 'Creative destruction agents? Rainforests convert Carbon Dioxide into Oxygen and give life to every living being. However, *necessity entrepreneurs* are the main cause of biodiversity destruction in the 'Lungs of the Earth'.

According to Global Forest Watch, Ecuador lost about 0.4 million hectares of trees from 2001 to 2005. About 0.18 million hectares (30%) of this loss was accounted for between 2012 and 2015. Myanmar has banned the felling of *Tectona Grandis* teak wood due to detrimental effect of its plantation. Myanmar was India's major supplier of wood. The non-native Teak tree has the properties of drawing more than its share of water and nutrients from the soil and worsens the condition when no natural agents quickly decompose its leaves. Thus, someone well said, "Since Teak came, nothing else grows." There is no specific study available on Teak-Avian relationship, though one American research society produced evidence that many bird species moved on or disappeared from Teak plantation areas in Mizoram. In rainforests, it was noticed that only half of the species were left after Teak plantation; even other trees have nests but not Teak.

(b) Population

Asia is the world's largest and most populous continent with more than four billion people. It is influenced by its massive population of 1.4 and 1.3 billion in China and India respectively. It is forecasted that India's population will be more than that of China by 2024. If the present entrepreneurs continuously follow the path of previous generations, it will result in deforestation, burning of fossil fuels, and free dissemination of fertilizers or pesticides will only pollute the environment. That would create unsustainability in the ecosystem for future generations. However, the Global Competitiveness Report (GCR) has mentioned that India is a factor-driven economy categorized by unskilled workers, mainly depending on agriculture and mining or extractive industries (Hanouz, Baller, Browne, Crotti, Battista, Galvan, Geiger, Gaviria, Marti, & Verin, 2016). Lack of technological advancement in the economy restricted quality products in global markets.

Moreover, factor-driven economies are more inclined towards necessity entrepreneurs. *Necessity entrepreneurs* are described as self-employed because of limited job opportunities, and they have no other options for their livelihood, whereas *opportunity entrepreneurs* are those who start their ventures according to existing opportunities, even other employment possibilities are available. The highest rate of necessity entrepreneurship in Asian countries is in India, China, and Indonesia. India has a 46.3% share of necessity-driven entrepreneurship revealed in the report by Global Entrepreneurship Monitor (Shukla, Parray, Chatwal, Bharti, & Dwivedi, 2017). The Global Entrepreneurship Monitor ranks Korea (37/47) below neighbours such as Indonesia (11), Taiwan (13), India (23), and China (29) concerning societal values of entrepreneurship. According to an OECD report, Korea encompasses a 24.4% rate of necessity driven entrepreneurial activities in 2015. The researcher investigated pressures the population has on different effects on entrepreneurial activity in factor-driven countries in Asia and the rest of the regions.

(c) Water

Water is life for every living species on earth. However, mismanagement of water and its resources has severely affected the planet. The real crisis has been faced by people who often live in degraded environments and those who do not get enough safe drinking water due to water scarcity. Enterprises have provided facilities of storage and transport of safe drinking water across countries, but population pressure has been hindering the path of freshwater access to bigger cities. It has given business opportunities to entrepreneurs by investing in safe drinking water for economic growth.

However, according to a recent study by NITI Aayog, nearly 600 million Indians have been facing severe water crisis, and approximately two lakh people have lost their lives each year due to insufficient safe drinking water. Government statistics have revealed that between 2001 and 2011, the average annual per capita water availability fell drastically from 1.8 to 1.5 million litres. Further, it might be down from 1.3 to 1.1 million litres of annual per capita water in the years 2025 and 2050 subsequently.

Entrepreneurs are also responsible to a great extent for increasing waste in the environment by supplying bottled

water in plastic containers. Past studies have shown that bottled water is more expensive than petrol. The production of plastic bottles contributes to emissions of greenhouse gases. Storing and transporting bottled water across borders impacts the ecology adversely. It is nothing but increasing the gap between water haves and water have-nots in developing countries(Frederick, 2011).

(d) Food

Changing climate disturbs the availability of food on Earth. Because of climate change, farmers have been facing changes like the shift in rainfall patterns, droughts in an appropriate climate area, and sweltering heat that has affected food production across the globe. The main health risks are hunger and malnutrition worldwide. It has been agreed by FAO, IFAD, UNICEF, WFP, and WHO (2019) that around one in nine people cannot afford food necessary for a healthy active life. In most developing nations, 12.9% of people are undernourished, and two-thirds live in Asian countries. Grebmer, Bernstein, Patterson, Sonntag, Klaus, Fahlbusch, Towey, Foley, Gitter, Ekstrom, and Fritschel (2018) specified that the number of malnourished people decreased in Southern Asia, but it has increased in the Western part.

Moreover, economic slowdowns result in unemployment and worsen the condition of individuals. Lack of purchasing power made their life challenging to access the basic requirements for living. These economic shocks create problems such as scarcity of food, especially in countries already suffering from severe food crisis and demanding immediate aid for human welfare.

Over the years, India's GDP has increased significantly and India has shown commendable economic growth . However, 194.4 million (14.5%) people are still malnourished in the country. India holds 103th rank out of 119 countries that were evaluated on three parameters:

(1) Prevalence of wasting and stunting in children

(2) Child mortality rate

(3) The proportion of undernourished under the age of 5 (Grebmer et al., 2018). It means that Indians are suffering due to the problems of hunger and malnutrition.

(e) Energy, pollution, and climate change

The NASA Goddard Institute for Space Studies (2018) mentioned that in the last 100 years the Earth heated up about 0.83° C. Human interference has changed the natural climate of the world. Increasing concentration of atmospheric carbon dioxide (CO₂) has severely affected the earth due to fossil fuel burning over the last century. Other factors like deforestation because of various human activities such as agriculture and industrial development have polluted the environment to a large extent. India is the most populous country, and even a small increase in emission per person will add up to a large amount of CO₂. Polluted air should not be the motivation to reduce carbon emissions, and without having control, global warming will increase extreme weather conditions and take thousands of lives. It will affect Indian farmers the most who are dependent on monsoons.

IQ Air AirVisual (2018) has highlighted that 18 out of 20 most polluted cities are in India, Pakistan, and Bangladesh. However, of the world's 20 most polluted cities, 15 belong to India, including Gurugram and Ghaziabad, followed by the top six cities, namely, Faridabad, Bhiwadi, Noida, and Delhi which are on 11th rank. Day by day, the growing population is liable for the depletion of resources, energy-intensive agriculture pollution, and ecological problems.

The Way to Entrepreneurial Ecology

Entrepreneurs are individuals who come up with new ideas to solve problems and think beyond wealth creation (Verduijn, Dey, Tedmanson, & Essers, 2014). According to Schumpeter (1942), environmental problems were

intrinsically uncertain, and most of them demands for innovation were caused by the obsolete applications of old, polluting, and inefficient technology. Now entrepreneurs need to stimulate social change through sustainable development. Thus, the researcher has taken five big dimensions, that is, biodiversity, population, water, food, and energy that have been affecting climate change. Further, these correlate with entrepreneurial ecology which combines entrepreneurship and environment (Frederick, 2011).

The United Nations Environment Programme (2005) specified that the reason behind environmental degradation was the advancement of the economy. Economic development demands a large amount of raw materials and energy resources as input. This procedure generates waste and ultimately degrades the quality of the environment. Thus, industrial development generally looked like one of the threats to environmental degradation (Cohen & Winn, 2007).

Now, entrepreneurs should think beyond the simple input-output process in the era of sustainable entrepreneurship. They have to include biosphere ecology in their business planning and to think logically that waste is comprised in or embodied in products. The National Geographic society described the biosphere in the Earth. The biosphere ranges from the grounded root system of trees to the high mountain tops, from the dark environment of the ocean trenches to lush green rain forests.

Ecology is a network of ecosystems among species at different organisation scales (Boulding, 1970). Academicians described ecology as a material point of view in which a product is transferred from the biosphere into production and then discarded when its value becomes zero (Boulding, 1966). However, Braungart, McDonough, and Bollinger (2006) said, "*Less bad is not good enough.*" In an interview, Braungart stated that materials get used repeatedly until they remain valuable. Then there is the question of whether you can return it to nature or is it biodegradable? Is this the only source of nutrients for organic systems? Then the issue remains how easily the product can be dismantled or materials can be reused.

Frederick (2011) stated that entrepreneurs destroyed the ecosystem and devalued biodiversity and every substance of life that nature provided us. People have ignored the valuable living ecosystem of nature and paid more attention to reducing the number of dead resources through recycling. Now, society has to implement some necessary protocols to discourage the effects of negative entrepreneurship. Furthermore, positive entrepreneurship should focus on adding value to the environment rather than on disposable materials, eliminating designed waste or duplication. Therefore, optimistic entrepreneurs should create a healthy system and do green inventions to improve biophysical and social revolution.

Research Agenda

Extensive literature has revealed that entrepreneurs play a significant role in transforming a more socially and environmentally sustainable world. Yet, there are multiple cases of entrepreneurs who have taken earth's natural resources with liberty and have created risks for the planet (Frederick, Kuratko, & O'Connor, 2015; Penn, 2003). However, previous studies have shown how interaction among entrepreneurs and other related components can establish the circumstances for long-term entrepreneurial success (Baumol, 1990; Daly, 1993; Frederick et al., 2015; Underwood, 1998). So far, no comprehensive approach to the entrepreneurship ecosystem has stressed on its interdependent aspects in the Indian context.

This research aimed at correlating the entrepreneurship ecosystem with the five dimensions of biological concepts, which reflect how entrepreneurship affects climate drastically. The researcher also discusses the basic principles of an entrepreneurial ecology theory. This conceptual paper aims to describe entrepreneurship and its relevance to the biosphere.

Research Methodology

In this study, the researcher has systematically reviewed previous studies. The study was conducted from January 2022 to March 2022. The theoretical research introduced the concept of climate change entrepreneurship, leading to five major areas representing change in climate due to adaptability of entrepreneurship. Biological analysis was used to

investigate the characteristics of entrepreneurial activity, such as stability, competition, and the ecological process of invasion, succession, and dominance. An approach like ecological analysis was obtained to understand resilience, resistance, persistence, and variability.

Physical infrastructure influences environmental changes that serve to function and stimulate the new business establishment and exit due to some unavoidable circumstances (Bennett, 2019; Galkina & Kock, 2011). The present research has also used spatial analysis to look at the effect of physical infrastructure on entrepreneurship in the context of climate change. Finally, the author has gone through the material flow analysis, which evaluates the flow of materials and energy, as well as metabolism studies and ecological footprints that entrepreneurs leave behind and how they affect climate change.

Discussion

The process of entrepreneurship has a different perspective, and it transformed over time (Baumol, 1990; Frederick et al., 2015). As Kuratko, Morris, and Schindehutte (2015) stated that new opportunities for entrepreneurship theory will be based on both expanding the contexts of entrepreneurship and a deepening of the existing theoretical approaches.

Entrepreneurs are a vital element of any developing economy. Adaptability, innovation, persistence, and biodiversity are the major dimensions that flourish entrepreneurship. But what is 'biodiversity'? From plants to giant trees, from deserts to the evergreen rainforests, and from boundless oceans to high-rise mountains. Also, a small individual's garden, meadows or green company sites are altogether called biodiversity. Entrepreneurship can be a threshold to conserve biodiversity or the earth's natural resources to benefit our economy and society.

The natural ecosystem provides livelihood to 70% of India's population in the form of food, shelter, health, and fossil fuel. India ranks among the top 10 countries that are species rich globally. The nation has sustained 7-8% of species recorded in the world. Many business ventures admire nature as a never-ending source of inspiration but do not consider it in day to day business activities. However, biodiversity is essential to maintain the balance of the environment and for the variety of services, including pollination and water purification or other resources that nature provides.

Furthermore, initiative has already been taken by many entrepreneurs. They have restructured their business model to face competition in the market and protect the environment. Such as, Gloria Asare Adu is the creator of Global Bamboo Products Limited, who has developed an innovative way of turning bamboo into charcoal. The bamboo serves as firewood or other fossil fuels, but its briquettes burn much longer than firewood, produce more heat and less smoke. This method preserved the forest, reduced emissions, and health risks from indoor fires (UNFCCC, 2018).

Two Indian climate entrepreneurs, Arun Shenoy and Mandar Kaprekar have done a tremendous job. They established the Green India Building Systems and Services company. They developed geothermal heat exchange-based air-conditioners that save upto 60% energy and 100% water as compared with conventional building cooling systems. Now, they have a full-fledged company with 80 staff, offices in Mumbai, Bangalore, New Delhi, and Singapore, and 85 corporate clients across India. The company earned the Global Cleantech Innovation Award in 2017 given by the United Nations Industrial Development Organisation and the Global Environment Facility (UNFCCC, 2018).

One of the examples of climate change and losing biodiversity has witnessed lower agricultural yields, soil erosion, depleted water resources, and increased flooding. In the early 1970s, Uttarakhand's forest areas were stripped by industrial logging. The state faced the consequences of severe monsoon flood that killed 200 people. Thus, the poverty alleviation programme aims to create opportunities for a livelihood without exploiting resources for the vulnerable sections of the society who mainly depend on nature (Ministry of Environment, Forest, and Climate Change, 2019).

Many researchers discussed that all ecosystems provide invaluable services for human well-being. Local communities, particularly the poor and vulnerable sections of society are often perceived to be the major contributors to environmental degradation. However, uncontrolled urbanisation, technological and industrial developments, inappropriate mining, and the appropriation of wetlands for construction are the main things that have damaged the sustainability of such ecosystem services.

India's increasing population also encounters a massive demand for fossil fuels resulting in rising emissions. According to the data, 5% of carbon emissions increased in India in 2016. The researchers stated that India's two-third part is yet to be built. They have also mentioned that India alone accounts for high-carbon emissions that will contribute to a large chunk of pollution of the world's future emissions and make it challenging to keep global warming well below 2°C, the internationally agreed danger limit (European Commission, n.d.).

However, Schumpeter's entrepreneurs can pull us out of the crisis by using their creative energies. Economic downturns could play a significant role in the entrepreneurship ecosystem by releasing labour and capital from sick units to the young generation. Thus, they can access existing resources in a new inspiring way (Schramm, 2008). It motivates individuals to do things more efficiently and emphasize on minimising waste. Some researchers claim that innovation is the only element that transforms scrap into valuable products.

Implication of Practices

The study suggests that government should promote education of the entrepreneurship ecosystem in higher educational institutions and universities and also include traditional knowledge in the context of biodiversity and ecology. Traditional knowledge refers to medicinal and other properties of plants and animals, benefits for healthcare, and different essential needs. The young generation should be given knowledge about the inherent value of biodiversity for environmental and human purposes. Educate the vulnerable section of society about conservation and sustainable use of the elements of biodiversity to ensure quality of the entrepreneurship ecosystem. It will help human interactions with the natural environment and secure intergenerational equity.

The researcher suggests that in the era of industrial entrepreneurship, entrepreneurs should keep the environment in mind while making business plans. In the present context, business entrepreneurs need to think ecologically about the biosphere because reusing, reducing, and recycling is not the option to dispose of waste.

Conclusion

In the present study, the researcher paid attention to the major aspects of the entrepreneurship ecosystem and tried to explain what consequences humans have faced because of the unplanned exploitation of resources. Entrepreneurship is a viable tool to alleviate poverty for economic growth but imitative practices of entrepreneurship affect the environment negatively. The same old methods and technology damaged the ecosystem, resulting in climate change. However, innovation has made individuals use scarce resources rationally. The entrepreneurial ecology shows a new path for emerging entrepreneurs without threatening the environment. Thus, innovation will play a role as a bridge between environment and entrepreneurship development without affecting the environment.

Limitations and Scope for Future Research

Entrepreneurial ecology is a new emerging field which relates entrepreneurship to the environment. Entrepreneurship makes a sustainable combination of the physical and social environment. Education of entrepreneurship ecology in universities worldwide has been playing a significant role and contributing something new to traditional knowledge for the development of the economy and society. Future studies can focus on university education, government policies, and private business sector combined with the Indian entrepreneurial ecosystem. It will give a better insight into the Indian entrepreneurship ecosystem. It is a limitation and future studies may incorporate an entrepreneurial ecosystem in universities for a deeper understanding of the entrepreneurial ecosystem.

Authors' Contribution

Richa Agarwal has done all the research work, while Swati Pundir has contributed to editing the manuscript under the supervision of Professor A. K. Pokhriyal. His expert comments enriched the work.

Conflict of Interest

The authors certify that they have no conflict of interest with any organisations or any financial and non-financial interest in the subject matter discussed in the study.

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