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Strategies for the Promotion of Affordable Rural Housing



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Definitions

Sustainable development: Sustainable development has been defined in many ways, but the most frequently quoted definition is from *Our Common Future*, also known as the Brundtland Report:

“Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.” (Brundtland 1987)

Frugal innovation: “The term was initially discussed in the context of emerging markets, giving non-affluent customers opportunities to consume affordable products and services suited to their needs. However, the meaning of frugal innovation is fuzzy. Further, the increasing appearance of frugal innovation in developed markets challenges

Sustainable Development Goal 11

earlier definitions that often characterised frugal innovation particularly in the context of emerging markets.” (Weyrauch and Herstatt 2017)

“Make cities and human settlements inclusive, safe, resilient and sustainable.”

“11.C Support least developed countries, including through financial and technical assistance, in building sustainable and resilient buildings utilizing local materials.” (UN 2018)

Circular economy:

The EC is a paradigm that aims to generate economic prosperity, protect the environment, and prevent pollution, thus facilitating sustainable development. That is why this model is based on the principle of 3 Rs (reduce, reuse, and recycle), applicable to the entire life cycle of products (Yuan et al. 2008) and sustainable design strategies (Prieto-Sandoval et al. 2017).

Introduction

In this entry, we summarize some of the strategic elements necessary to develop a rural housing that

is sustainable and affordable. It is worth remembering that this is Goal 11 of the United Nations Sustainable Development Goals for 2030.

Some projects and applied policies are mentioned.

A parallel is made between the strategies in developed and emerging countries, since each of these influences the way of explaining the topic.

Rural housing is currently being neglected not only by its owners, who usually abandon them to move to large cities, according to the annual report of the United Nations published in 2017: “As more and more people move to urban areas, cities typically expand their geographic boundaries to accommodate new inhabitants. From 2000 to 2015, in all regions of the world, the expansion of urban land outpaced the growth of urban populations. As a result, cities are becoming less dense as they grow, with unplanned urban sprawl challenging more sustainable patterns of urban development” (UN 2017).

United networks and nongovernmental organizations have focused their efforts on developing countries; however, the abandonment of rural areas and their housing is a global problem.

Some countries have developed policies to encourage the abandonment of the countryside, but in spite of this, the exodus to the big cities continues.

Sustainable Rural Housing

In this chapter, some aspects of the current world economy that intervene in the development of rural areas are related; however, it is important to highlight that each country has its elements that affect the way in which rural areas are developed, in this development aspects, economic, political, cultural, etc.

Sustainable rural housing is considered an important index in rural development. Designing and incorporating sustainable housing indexes is especially important in rural planning as an essential instrument to express the physical, socioeconomic, and environmental aspects of sustainable housing. Sustainable development must take into account the promotion of the level of economic,

social, environmental, technical, and physical standards of rural houses. The concept of sustainability is so important now that any new discussion about development is incomplete if this aspect is not taken into account (Farahani and Jahansoozi 2018).

Sustainable Rural Policies

The policies affect the rural territory depending on the level of social and economic development; then some aspects are summarized taking into account the region and the relevance of the developed topics.

To ensure agricultural land in rural territories is managed sustainability, environmental assessment is needed to support decision-making by both policy makers and local stakeholders. Decisions concerning the management of rural territories should be based on sustainable concepts (Gibson 2006).

It was found that each country depending on their problems created strategies, from the normative and from the political. Among the most detailed are as follows: The Chinese government has always focused on solving problems related to agriculture, rural areas, and the peasants. Since the first 5-year period, laws and regulations have been enacted to improve the environment of farmers' lives. In recent years, there are still some problems. There is a gap between imbalance and proper development and the growing needs of people for a better life. In February 2018, the 3-year action plan was launched to promote the improvement of the rural environment. How to build green rural housing is one of the key points of the plan (Ling and Dong 2018).

The sustainable use of land and water is crucial. A solution to sustainable water management was implemented by the *Abellon Clean Energy Company* in India which has established a 3 MW solar plant to practice agriculture under solar panels to address the food and energy security of a rural community. The water used to wash the solar panels to maintain efficiency by removing dust irrigates the agriculture that produces under the panels. This provides 24–34 tons/hectare/year of agriculture produced by reusing 78,000 rupees of water per year and capturing 250 tons of CO₂ in

vegetables as food. The 3 MW solar project is registered under the Clean Development Mechanism (CDM) under the United Nations Framework Convention on Climate Change (UNFCCC) which reduces 0.1 million tons of CO₂ emissions over 25 years compared to fossil fuels. Solar farms around the world have the potential to sequester 143,000 MTCO₂ through vegetation, producing 100,000 MT of agricultural products that are produced annually. The efficient use of natural resources requires the facilitation of local policies (Patel et al. 2018).

It is important to mention that the infrastructure and services within urban areas of developed countries have established reliable definitions of resilience and their dependence on various factors as an important way to achieve sustainability in these energy systems. However, the evaluation, design, construction, and maintenance of energy systems located in rural areas in emerging economies present additional difficulties because there is no clear theoretical framework for such circumstances (Mazur et al. 2019). Knowledge transfer and innovation (KT & I) are vital for sustainable rural development. The European Rural Development Policy (RDP) has a long tradition of innovation in rural areas. In particular, in the 2007–2013 programming period, some measures have been explicitly directed to support KT & I in agriculture and rural outcomes. The imbalances come both from decisions and from the upward capacity to attract and spend EU funds (Bonfiglio et al. 2017).

Sustainable Construction

The sustainable and low-cost constructions are possible, thanks to the reintroduction of materials such as earth and wood; the different typologies and techniques have made it possible to be key elements in the strategies proposed. In architectural design, the frugal innovation concept is new; although without being in the initial objectives of the research, the final results incorporated the basic concepts of frugal innovation, incorporated in the sustainable development. The first formal definition of sustainable development was established in the UN document known as the Brundtland Report, a document that established

the base of sustainable development in worldwide, and defining it like: “meeting the needs of the present without compromising the ability of future generations to meet their own needs” (Brundtland report WCED 1987). It has been adapted to the needs of each field of study. Consequently, the International Union of Architects (UIA) and the American Institute of Architects (AIA) in Chicago in 1993 defined the principle of sustainability in its Declaration of Interdependence for a Sustainable Future, with the following commitment: “to place environmental and social sustainability at the core of our practices and professional responsibilities” (UIA/AIA 1993).

Currently, the Building Services Research and Information Association (Association for Information and Research Facility Buildings, BSRIA) has defined sustainable construction as “the creation and management of healthy buildings based on ecological principles and the efficient use of resources” (Kibert 2009). In addition to the previous definitions, recognized practitioners, as Norman Foster + Partners, have defined sustainable architecture as “the creation of buildings that are efficient in terms of energy consumption, health, comfort and flexibility in use and are designed to have a long life” (Foster 2003).

Currently the earth used as building material in Latin American countries has been rediscovered, thanks to their sustainable characteristics and its history. Moreover, the earth as a building material is economical and has easy accessibility for users. Designers should envisage “simple” products that can be synthesized with a minimal number of components and/or features for minimizing resource consumption (Balkrishna 2017). The urge to design products for all-round sustainable development has led to the advent of methodologies such as design for circularity. These approaches, which are rooted in sustainability, conserve materials by reusing, recycling, and reducing mechanisms, controlling material throughput through each stage of product life cycle, and offering a mix of products and services that cater sustainable to the needs of society, respectively (Ghisellini et al. 2016).

Economic Issues

The economic aspects of rural housing promotion vary; however, the relationship between frugal innovation and sustainability is undeniable, and for this reason it is addressed in this entry.

Low Cost

The frugal innovation as a manufacturing concept has focused on industrial processes that have three basic factors, low cost in materials, low cost in manufacturing, and minimal features with basic functions. The frugal innovation has been used by large multinationals, mainly in China and India, to achieve low-cost products development in these countries; companies not only apply the three factors but also establish local organizational structures that allow development that are tailored to specific needs and are developed with the technology available in each country; this translates into boosting local R & D, with local knowledge about the product to be developed (Gassmann and Han 2004).

Companies that want to commit and start in their subsidiaries should understand that the main characteristic of frugal innovation is high benefits for the customer with very low production costs. The road to its implementation involves the creation of local R & D teams and the construction of a local infrastructure to facilitate the work of these R & D teams (Zeschky 2011).

People at the grassroots level have been developing a growing number of frugal innovations (FIs). Many of them do not have formal education and access to science and technology. Open innovation (OI) has been studied and implemented in the context of large companies, small- and medium-sized companies, or high-tech industries (Hossain 2016).

Frugal innovation has become a paradigm of low-cost technological development, which in the case of rural housing is necessary as an element that facilitates access to sustainable and affordable rural housing. However, the concept of sustainable development has numerous variables, but a common denominator, which is based on growth and social welfare; it must ensure the conservation of environmental resources by the present generation, for the benefit of future generations. The materials used in the construction exert

environmental impact caused by the extraction, processing, transport, use, and disposal. This impact occurs on the global and regional level affecting the climate, biodiversity, and health of people.

In developing and emerging countries, the construction of low-cost rural housing is an unavoidable need, which is why many research projects have focused on improving and retaking construction with materials used over many centuries, such as soil and the wood (Calderon 2019).

Developed Countries

Visions of alternative and more sustainable energy systems are commonly associated with the development and innovation of renewable energy technologies. Geels (2002) points out that the transition of the regime is affected by a set of technological, socioeconomic, organizational, political, institutional, and specific dimensions of the region that can be triggered by niche developments. In fact, the transition to a sustainable energy regime is strongly influenced by regulatory and governance frameworks that extend from a global scale to a local scale. That sets limits and incentives for the direction in which the energy transition can evolve (Roesler and Hassler 2019).

In countries such as Germany, different proposals for applied research have been developed that aim to develop the implementation of renewable energies in rural communities. In 2000, the first bioenergy village, developed together with the inhabitants of the village by an interdisciplinary team of scientists at the Interdisciplinary Centre of Sustainable Development (IZNE) of the University of Goettingen in Juehnde located at the south of Lower Saxony, was developed (Schmuck and Schultz 2002). The people of this area of Germany developed systems of biogas burning, these areas were called bioenergy villages, the energy is taken from the public network, and the hot water generated is distributed to each of the homes; in winter they used plants that they worked with biomass (Ruppert et al. 2013).

Several working groups were formed that were initially moderated by university team scientists and in which the inhabitants of the zones participated. These groups included, for example,

“agricultural resources” and “heat distribution” (Wüste et al. 2012) In this research, objectives were developed that sought to improve sustainability without leaving aside the economic interests of the community, involving leaders and scientists in a project of regional impact and with great benefits for the environment.

It is suitable to make a relationship between political and economic development; in the German example, the working groups in which the community leaders supported the implementation of a new energy system were allowed to arrive at a sustainable solution; without the support of the governmental sectors and the community leaders, the project would not have fulfilled its objectives.

In the United States, it is difficult to determine aspects that encompass the entire country; each state has its own policies and economic autonomy; based on the case of New England, this summary of the main characteristics could be made:

- Many rural places are challenged by unaffordable and inadequate housing.
- The federal safety net provides good options for many rural residents struggling with housing costs, but the programs are often insufficiently funded to reach all residents in need.
- In rural communities with scenic amenities, the draw of second-home owners and retirees restricts housing options for local working families. Land use regulations to preserve the scenery in these places limit options for developing affordable housing.
- Policy makers and practitioners should consider innovative ways to improve and leverage existing housing stock in order to expand affordable, high-quality options for local working families (Carson and Mattingly 2017).

Developing Countries

In developing countries, access to affordable rural housing becomes more complex depending on the country, geographic and economic aspirations influence policy, and unlike developed countries, it is normal to find corrections and governance problems that make more complex to apply policies of sustainable development in the construction of rural housing.

In the case of Latin American countries, there are a series of characteristics that historically have been determinant not only for rural areas but for economic development, among others: corruption, lack of regulations and laws, social inequality, poverty, and ignorance of basics concepts of sustainability. A characteristic of these countries is the earthen bricks and walls that throughout history were material used for rural construction, until in the 50s it was replaced by steel, brick, and concrete because it considered that the earth was a material for construction used by poor people.

Currently, in some countries such as Peru and Honduras, clear regulations have been developed on the use of land as a building material, and in Chile, wood has a whole path, with widespread use and a clear normative. In the case of Colombia, government policies have focused on the improvement of rural housing without guaranteeing the sustainability of these improvements, some research has focused on the development of new materials that use the land as raw material, this year obtained the first patent for the manufacture of a panel on land, and this patent was the result of a research project focused on the analysis and reuse of traditional construction techniques in the rural area of Ráquira, Boyaca, 400 km north of Bogotá. In Latin American countries, materials such as concrete are still a preferred option in the construction of housing, even though their exploitation has caused environmental damages and they are expensive. This situation is affecting the most vulnerable population, especially in developing and not industrialized countries. This entry proposes an ecological and rural housing building innovation: a panel made from natural and low-cost materials for the construction of housing in rural areas of developing countries. The study was developed in Ráquira, a rural region located 120 km from Bogota, Colombia. For the purpose of the project, we were studying about ten samples, and three prototypes of the panels were made. Tests were performed by mixing different materials such as sisal, hay, recycled rubber, wood in very small sections, and wire mesh of steel. In addition, the testing provided additional data about the materials that would give the earth more stability and strength (Calderon 2019).

Despite all the global efforts, 14% of the world's population still does not have access to electricity, while 84% live in rural areas of developing countries. Increasing access to electricity in these rural areas through connection to the grid is considered difficult, expensive, and often economically not feasible in remote rural areas. The Long distances between houses, the difficult terrain with high mountains and a population with low electricity energy projected consumption levels. The low density and poverty of rural communities make investments in a connection to the network highly unfeasible. Independent small-scale electricity technologies are often considered and implemented as an alternative for grid connection in remote rural areas. Independent systems almost always operate with renewable technologies using locally available resources (biomass, river). These approaches are inexpensive. They can meet local needs and can allow the community to participate in energy selection.

Indonesia has promoted the use of solar energy in several rural areas because the connection to the central grid is often limited by geography and costs. The studies revealed a strong desire for rural communities to be connected to the existing power grid. This counteracts the positive impact of the level of sustainability of rural housing projects that incorporate solar energy. It is almost always assumed that a project with low sustainability performance must be replaced by a network connection as soon as possible, but in one of the projects studied at Kampung Cibuluh the community easily decided not to maintain its sustainable and autonomous energy technology, despite that had been operating for 10 years with high sustainability performance. Rural sustainability in this case has a delay due to cultural roots; for the rural population to be connected to a network, it is safer and also offers more energy, with all the environmental implications of the extension of the traditional electricity network (Lestari et al. 2018).

China

China has a very large territory, with a large population of 1,300 million. In 2015, 43.9% of the

population in China lived in rural areas (National Bureau of Statistics of China 2019). The industrial development in China created a widening gap between urban and rural areas; due to this gap, the policy was launched, and new countryside construction was launched in 2005 by the government; this policy increased the financing of rural infrastructure and housing construction (Wan and Ng 2018).

This modernization development model significantly improved rural life and urban-rural integration in several rural areas located near cities and with a flat geography. However, while this model may have achieved a short-term improvement of rural infrastructure and housing with government subsidies and external investments (Wan and Ng 2018), this may not be sustainable in most cases. The poor rural areas of China have the following characteristics:

- Mountainous areas where the distribution of the population is increasingly dispersed.
- Fragile ecological regions, which have severe natural conditions, scarcity of water resources, and frequent natural disasters.
- Low levels of infrastructure development and poor quality of living environments.
- Regions inhabited by minorities.
- Very low educational level.
- Population with a large number of older people and children, due to migration to urban areas to find work. These conditions have helped to preserve several unique regional cultures by limiting external access to their living environments; unfortunately this also contributed to geographic and psychological marginalization.

China's poor rural areas faced several challenges in terms of social sustainability:

- Low level of environmental quality built (uncomfortable and unsafe).
- Local construction materials, technologies, and cultures cannot be transmitted or updated due to the depopulation of rural settlements and the impacts of industrialization, resulting in stagnant settlements in a bygone era.

- Limited access to public services, information, and education.
- Low level of participation of villagers during the construction of the city due to top-down management and rural depopulation (Li et al. 2018).

All these problems caused that the Chinese government proposed the construction of “beautiful countryside” in 2013 (Liu and Zhou 2015). This project was based on the summary and criticism of new countryside. Construction was affected by the new theory of rural development. This rural policy especially highlighted the value of natural environments and regional cultures to achieve sustainable rural development (Wan and Ng 2018). Therefore, Chinese rural development must provide adequate economic and social support to a small-scale peasant economy and older farmers so that they can follow sustainable agricultural practices in old age, instead of introducing commercial agricultural enterprises in these areas (Li et al. 2018).

These new policies and rural studies in China echo the eco village concept mentioned above. The eco village concept that emphasizes social sustainability is adequate to maintain the vigor and strong cohesive forces of poor rural areas and increase the capacity of rural residents to control their own lives. The eco village concept respects the unique characteristics, resources, and limitations of poor rural areas and aims to solve the problem through local actions and social capital instead of copying and promoting a model of industrialized agriculture and development (Li et al. 2018).

China has always focused on solving problems related to agriculture, rural areas, and the rural population; laws and regulations have been enacted to improve the living environment of farmers. In recent years, some achievements have been made, but there are still many problems. There is a gap between unbalanced and inadequate development and the growing needs of people for a better quality of life. In February 2018, a 3-year action plan for the improvement of the rural residential environment was launched to

promote rural work to a new stage. How to build sustainable rural housing is one of the key points of the plan (Ling and Dong 2018).

Rural housing in Europe and America is different from that of rural areas in China. First of all, the support system of the municipal pipe network in Western countries is perfect. There is no difference with the municipal conditions of the city. Second, the economic conditions of urban and rural areas are not very different. In some suburbs, housing conditions are better than those in the city. Houses in China do not have a centralized drainage system. Rural economic conditions are behind. The construction level of the building is precarious. Many green building technologies are not suitable for current rural development (Ling and Dong 2018).

Urban and rural areas in China have been two quite separate environments due to two factors, their housing systems and land distribution, being clearly different. This separation has interrupted the free flow of production factors and the link between urban and rural areas, thus widening the urban-rural gap. In prospective it is expected that with the increase in urbanization and the implementation of new reforms in rural lands and housing policies, inequality between urban housing and rural housing can be reduced. (Wang et al. 2020). Due to two main factors, such as high pollution and external pressures, the Chinese government has been implementing policies, reducing CO₂ emissions, and encouraging the use of renewable energy and waste management among others; however, in construction the use of sustainable materials is not widespread, and in the existing literature it is limited to analyzing case studies, and there are no state policies that oblige the sector to mitigate its high pollution rates (Huang et al. 2019).

India

In India, the rural development department has implemented several programs in rural communities through state governments to reduce poverty, generate employment opportunities, develop rural infrastructure, and provide basic minimum services. Policy makers have recognized the importance of rural development. The programs and

measures formulated have the main objective of achieving progress in rural areas. The community development program was the first organized attempt at rural development. The program began on October 2, 1952. It focused on the overall development of rural areas, including agriculture, livestock, roads, communication services, medical care, education, housing, employment, and nutrition (Agrawal 2016). In this country it is worth highlighting the large number of programs initiated by the government for rural development has been the following:

- Pradhan Mantri Gram Sadhak Yojana (PMGSY): The roads are considered vital in any region. The development of roads enables the individuals to promote economic growth and alleviate poverty.
- Swarnjayanti Gram Swarozgar Yojana (SGSY): This program is the single self-employment program for rural individuals, who are poverty stricken and belong to underprivileged and marginalized groups.
- Rural housing (Indira Awaas Yojana): For the survival of the individuals, housing is regarded as the basic requirement.
- DRDA schemes DRDA: Administration has been introduced from April 1, 1999. The primary objective is to effectively manage the schemes and augment their professionalism.
- Training schemes: In the rural development tasks, primarily concerning the alleviation of poverty, training schemes have been acquiring significance.
- Integrated Rural Development Programs (IRDP): The IRDP was launched by the government in March 1976. It is regarded as the major instrument of the government to alleviate the conditions of poverty.
- Food for Work Program (FWP): The FWP was introduced in 1977 by the Janta government with the objective to make provision of employment opportunities to the rural individuals.
- National Rural Employment Program (NREP): It is a redesigned program for the FWP. It has been initiated with the objective of creating additional employment opportunities for the rural individuals, mainly with the help of surplus food grains.
- Rural Landless Employment Guarantee Program (RLEGP): Some of the states, such as Maharashtra and Gujarat, formulated schemes with the main objective of making provision of employment opportunities for the rural individuals, especially the landless.
- Jawahar Rozgar Yojana (JRY): JRY came into existence in April 1989 with the amalgamation of NREP and RLEGP. Under this scheme, it was expected to provide at least one member of each poor family (BPL family) an employment of 50–100 days in a year at a work near his or her residence.
- Antyodaya Yojana: Antyodaya is a term that is formed by the combination of two words, ant which means bottom or end and udaya which means development.
- Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS): Research has indicated that 70% of the individuals belonging to rural communities are experiencing problems in fulfilling their daily needs and requirements (Kapur 2019).

These programs and many other similar programs and plans were implemented by the government to eradicate the problem of poverty and the development of rural areas. Many non-governmental organizations are also working together with the government in the villages. Over the years, many programs have been successful, and many have not been able to take root. While the implementation of these programs improved some aspects of the quality of life of the rural population in India, it is still necessary to promote these programs at a broader level to achieve a broader coverage (Agrawal 2016).

India has implemented a series of programs with the objective of improving the sustainability of its rural dwellings; some of these programs were never implemented and remained in good intentions of the government; since 1977 a dozen programs have been promoted all with objectives and goals similarly; unfortunately for the rural

population, there is no index that determines the fulfillment and effectiveness of these programs.

Conclusions

Rural areas, depending on their geographical location, have several problems. In developed countries, the objective, especially, is that the member countries of the European Union have been subsidizing the generation of traditional renewable energy and encouraging their consumption, as well as the use of local products. The Recycling is an aspect necessary by developing the circular economy. However, in the United States, the change of government has produced drastic changes in its environmental and sustainability policies; these changes in the policies have not yet been quantified and surely cannot be determined until the current mandate ends.

The two Asian giants, China and India, have rural areas that have very specific determinants, geographical, economic, and infrastructure, which have limited their development; however, both in China and in India, programs have been created to reduce the gap between the urban development and rural development. Sustainable rural development is necessary to bring the rural population closer to the levels of development observed in the big cities.. In the case of India, cultural aspects have limited the growth of renewable energy in rural areas; the rural population feels more secure if their home is connected to the existing electricity grid; the cases studied found that the use of energy was abandoned solar when the national network reached the settlements under study.

Latin America does not have major programs that benefit this population, and governments focus on improvement plans for housing and the expansion of existing infrastructure, often without considering the sustainability of these works, despite the existence of regulations that seek to reduce CO₂ emissions in construction.

This is how the future of rural areas depends on the importance that each country gives to its population and the agricultural production derived from it.

Cross-References

- ▶ [Circular Economy](#)
- ▶ [Earthen Construction](#)
- ▶ [Frugal Innovation](#)
- ▶ [Rural Housing](#)

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