



Leveraging Untapped Resources— Local Renewable Energies as Catalysts for Sustainable Living

The challenges of sustainable living are manifold. On a global scale, we must limit the environmental impact of our daily activities, for example, reducing GHG and plastic waste. It is also vital to improve our preparedness for risks such as natural disasters at the local level. Regarding the needs of individuals and families, it is crucial to ensure the security of income, food, clothing, housing, health and education and enable equitable participation in communities and labour markets. Sustainable ways of living can be considered processes that aim to achieve responsible living and reliable livelihoods simultaneously.

To develop the capabilities of local people and groups to achieve these objectives, it is instrumental to re-evaluate and make use of locally available resources and assets. Among many others, renewable energy sources can be a catalyst for local socioeconomic transformation and people's empowerment.

1 In the process of socioeconomic development to date, our lives in cities and communities worldwide have become dependent on resources that cannot be regenerated and must be purchased from external sources, most notably fossil fuels. While external resources such as fossil fuels have had positive effects, such as electrification and improvement of living standards, they have also created vulnerable conditions for many local societies and people's lives.

- a. Excessive use of fossil fuels and forest resources harms the local and global environment, such as by polluting the air, soil and water.
- b. Dependence on externally purchased energy sources means, in other words, a permanent financial outflow from the region to obtain the resources needed for everyday consumption, production and social activities. In less developed or isolated communities, people do not have access to stable electricity, which poses barriers for them to escape impoverished conditions. This leads to the vulnerability of local economies and households as well as financial constraints on the activities of social groups.

- c.** Dependence on external resources deprives local individuals and groups of the capacity to collectively confront local challenges such as nature degradation or social vulnerabilities. People in urban, suburban or rural societies are generally excluded from the technical and social aspects of managing energy and other essential resources. In other words, people have been deprived of the opportunity to create alternative conditions for sustainable living.
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2 The use of renewable energy, therefore, provides many benefits for communities and livelihoods.

- a.** Using renewable energy sources that are available locally reduces dependence on what is bought externally, thus local societies and people can save on their expenditures.
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- b.** These communities can turn the saved costs into stimulating productive activities using local resources, expand opportunities for income generation, and develop more active social activities.
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- c.** Access to locally manageable energy sources often leads to changes in securing other essential needs. For example, people with renewable energy can consider alternative means of producing and delivering food, caring for their health, or learning. Therefore, changes in energy sources realise multiple benefits in everyday consumption and production, such as cost-saving, reduction of environmental impact and strengthened interpersonal ties.
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- d.** Local people and organisations gain experience in managing their energy and other necessary resources. This experience of collaboration can further promote sustainable socioeconomic development and nature conservation.

Many of the SLE projects in the Co-creating Sustainability initiative have identified and use local renewable energy sources.

1 These include local solar photovoltaic, solar thermal, biomass (forest and agricultural waste) and geothermal energies.

a. Solar photovoltaic: Several projects, including those in Armenia, India, Peru and Colombia, installed solar photovoltaic panels as part of their activities. The solar panels provided electricity for households and communities, supporting home appliances, production activities, street lighting and other uses.

b. Solar thermal: the project in Armenia installed solar water heaters in a kindergarten to support the employees. Later on, the warm water was also used for swimming pools for children. In Colombia, technology was also introduced at development points, demonstrating that it is necessary for the wellbeing of families and to provide hot water for the washing of milking equipment and utensils in dairy farms.

c. Biomass and biogas: Projects in rural areas such as those in Colombia and Peru introduced cooking stoves to utilise forest resources. In Colombia, biomass gasification was used specifically as an important technology to take advantage of fibrous waste. The two projects also used biogas digesters for turning animal waste into gas, and for the treatment of gray and black water from human activities and waste. Biodigesters, in addition to producing biogas (methane), are also designed with the objectives of producing high quality liquid fertilizer, improving water cycles in production systems, and harvesting water for use in biogas plants. Renewable energy technologies such as biodigesters decrease pollution, improve the quality of life and generate income.

d. Geothermal heat: The project in Chile used geothermal heat to produce vegetables, firewood and other daily necessities.

2 These renewable energy sources have brought the following diverse benefits to local societies:

a. Cost reduction: Some of the projects took place in remote areas, far from urban centres, and with limited fossil fuel resources. While the income sources for the local people and organisations are also limited, the costs of the imported

fuels placed a heavy burden on households, groups and public facilities such as schools. Local renewable energy sources for electricity and heat have greatly helped families by reducing the costs of running facilities.

- b. Promotion of production and income generation:** The availability of cheap energy encouraged local people to seek income generation opportunities. In Armenia, solar fruit driers were introduced to households and a community centre. Later, solar panels powered the upgraded irrigation systems to improve farm productivity.

Armenia

Collaboration of community farmers with university students in bringing solar-powered irrigation to local grain fields

Armenia with its abundance of sunny days has a high potential for solar energy use. However, the national economy largely depends on imported fuels, which creates a risk in terms of security of supply as well as affordability problems for customers such as farmers. The Armenian Women for Health and Healthy Environment NGO (AWHHE) and the Energy Center of the University of Chile collaborated with two local universities—the National Polytechnic University Armenia and the Armenian National Agrarian University—in developing and conducting an optional course for master students. The university students worked jointly with the pilot Solak community members and the private solar energy companies to enable irrigation using water pumps powered using solar panels. Unfortunately, due to the COVID-19 pandemic, the universities and the Solak community were under a lockdown situation for a certain time. In response, online options were put into practice, including messages on personal hygiene for farmers and their families. As a result, 11 farmers were able to use a total of 10 hectares of irrigated land to grow lentils and other high value climate resilient grain crops. Thanks to the new closed irrigation system, the loss of water was reduced to 15% from the original 45%. Installation of solar panels resulted in reducing carbon dioxide emissions by almost 14 tons. The farmers used a mobile application to monitor the energy production and noted electricity savings with great satisfaction. The education partnership then expanded, involving more university students and professors, the private sector (solar energy companies), and the local Water User Association. Thus, by linking the university education process with the needs of community members in the supply of low-cost solar-powered irrigation water, the project promoted sustainable, energy-saving and community engagement lifestyles.



c. Personal and social actions for meeting basic needs: Renewable energy can facilitate many activities that support the basic needs of people and communities. In Peru, electricity provided by the solar system enabled local people to read at night and be more active in learning. In Armenia, the cost of running schools and kindergartens has fallen, allowing children access to schooling during the winter months. Street lighting was also added which made it possible to go out safely at night and connect with the local community.

d. Health and environmental benefits: The project team in Chile piloted the utilisation of geothermal energy in producing high-quality firewood. The pilot results supported dialogs with the local government and firewood producers toward expanding the use of high-quality firewood to mitigate air pollution. The project is also involved in efforts to grow leafy vegetables hydroponically in a geothermally heated greenhouse. If successful, it will substantially benefit the health of local people. In another project in Colombia, biogas from livestock waste is used to reduce pollution loads on local soil and water.



Chile

Use of geothermal energy for mitigating environment and health problems

Being a volcanic country, Chile has high potential for geothermal energy. However, the lack of information on its advantages and high initial cost have prevented broader utilisation of geothermal energy in the country to date. The project team from the University of Chile focused on the direct use of geothermal energy in the form of Geothermal Heat Pumps (GHPs). The project planned to tackle the environmental as well as socioeconomic challenges in the highland regions. For instance, geothermal could contribute to higher quality firewood in the market and mitigate serious air pollution. It could also be used at local farms to provide the energy for leafy vegetable production for delivery to local cities that currently import vegetables from lowland areas at considerable cost. After a delay of several months in coordinating with the local government due to a change in local administration, the project selected a farm near the city which could produce leafy vegetables such as lettuce that can be sold in the city. These facilities brought together local farmers in the experimental production of firewood and vegetables. The local authority also expressed interest in the experiments and explored their potential to contribute to the local economy. Although the consultation process took longer than expected, the geothermal heat pump installed eventually acted as a stimulus for local actors including governments, farmers and firewood producers to explore the possibility of tackling long-standing problems through better utilisation of untapped resources.



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Renewable energies empower local people to review and change their living conditions. Local communities and people often work together to discover and utilise renewable energy sources. Another substantial effect is the accumulation of joint collaborative experience in communities through undertaking activities, which builds social capital that can support further collaboration.

a. Renewable energy can bring together local people with critical skills. In

Chile, local farmers collaborated on a geothermal firewood production facility and greenhouse hydroponics. In Peru, women with low literacy rates played a central role in activities.

b. Renewable energy can engage people who are or have not usually been central to communities. In Colombia, young people have become interested

in introducing new technologies such as photovoltaics and have started collaborating with the middle-aged and older residents, who had previously been the main focus of community activities. The Armenian project facilitated collaboration between engineering students and farmers. Small farmers including the female-headed families with unstable access to credit and irrigation water joined the training sessions on production and marketing and worked with students to install solar-powered irrigation. In Peru, women with low literacy rates played an essential role in the community and have become a driving force for change.

c. Renewable energy can encourage people to partner more broadly. In Armenia,

solar-thermal dried fruit production was implemented not only by individual farmers but also by women's resource centres. Local leaders shared their experiences and tested techniques with the local population. Awareness of the project's success spread to the surrounding areas, and a training programme set up since has attracted many participants.

Women leading the use of solar energy in isolated communities

Many native communities in the remote areas of Peru lack electricity, which hinders access to information to diversify income generation sources, and urges them to remain dependent on unsustainable ways of heating and lighting such as using firewood. Access to electricity through simple and effective solutions can lead to unexpected improvements in the lives of native communities and contribute to development of the region. Photovoltaic systems reduce lighting costs, provide the possibility of revenue, support teaching activities through providing light and electricity, and also reduce fire hazards and pollution indoors compared to traditional kerosene-based lighting. This project has demonstrated that solar-electrified villages can be technically and economically self-sufficient.



The project enabled about 56 homes to receive electricity from solar energy. The participating farmers, as well as semi-illiterate women, drawing on their knowledge of natural resources and skills, were able to lead sustainable development within the community. The result was a mitigation in climate change realised through reduced fossil fuel use and halting of unsustainable exploitation of biomass energy resources. The project included initiatives that enabled better access to modern energy-related technologies, as well as introduced solar energy for electrification, pumping, cooking, water heaters and dryers.

In carrying out these activities, with the aim of the communities themselves taking the leading role, committees were set up to develop and plan key activities, including for equipment installation, maintenance and fee collection. Such structures were needed owing to the temporary presence of the project team members. Several illiterate or semi-literate women were selected as leaders of the consultation and management processes through an inclusive process, and now handle maintenance and repairs of the equipment. The project, taken as a whole, can be said to have brought about everlasting changes for the inhabitants of the concerned remote villages, and in effect has changed their lives.

The above cases illustrate how renewable energy sources support local initiatives for sustainable ways of living. The project teams used the acquisition of renewable energy sources to engage with a diverse range of people both within and outside communities, launch collective actions to address specific local challenges related to sustainability, and place local people at the centre of efforts to realise responsible living and reliable livelihoods.

With such benefits in mind, the following points are suggested as key considerations for managing or supporting local actions utilising renewable energy sources.

1 **Renewables provide multifaceted benefits for local ways of living.** Renewable energies are not solely fuel substitutes; they help people reduce costs, enable the production of a wide range of necessities, help to diversify income-generating activities, and can be used for tackling many local sustainability challenges.

2 **People at both the local and external level play vital roles.** Diversifying the use of energy resources requires creativity, knowledge and skills. It is essential to engage local people, since they are familiar with their surroundings and know how they can benefit from alternative energy sources, as well as provide external personnel with the requisite expertise—in terms of knowledge of technologies, funding and management—to realize the full potential of energy resources.

3 **Inclusivity is the key.** The voices of the vulnerable and marginalised populations are instrumental in understanding local sustainability challenges since they can provide a different perspective of the situation and are aware of the value and potential of renewable energy sources to suit their contexts. Furthermore, ensuring the processes involved in the use of renewables are inclusive can lead to self-empowerment as well as increased levels of cooperation, which thus contributes to resilience in local societies. Therefore, any efforts aimed at identifying the use of renewables at the local level should prioritise inclusiveness and collaboration with the most vulnerable and marginalised of society.

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by Atsushi Watabe, Gohar Khojayan, Juan Gammarra, and Marcelo Matus
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