Green Energy and Green Culture. Managing the Italian Situation

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Abstract

European policy for renewable energy and waste reduction is a priority. At country-level there is the necessity to support and implement the diffusion of a green culture: sustainability requires economic, environmental and also social care. Institutions are the infrastructures able to manage eco culture and to preserve a stable environmental condition for a well-being vision.

The aim of this work is to offer an overview of the level of renewable energy in Italy. This country has several natural sources which are not fully utilized yet and this lack shows a managerial gap and some limits in the diffusion of a sustainable culture.

Keywords: Green Energy, Green Culture

1. INTRODUCTION

The different geographic distribution of environmental externalities leads to social and economic inequalities among geographic areas, as well as problems of distributional equity, which require reconsideration.

The increase in global energy demand generates intensification in renewable energy to protect the environment and improving people's well-being. These actions require the introduction of green technologies and the use of green sources for diversifying activities.

At the European level, efforts are made to reduce environmental’s damage introducing measures to control the ecological impact of activities. Green innovation (de Medeiros et al., 2018) preserves the ecosystem offering a more sustainable solution. In this context a firm with a well-set green culture has a competitive advantage that would enable to achieve better eco-performances (Olsthoorn et al., 2001). This green benefit could be a firm's different ability to think and be sustainable adopting eco-skills and greener solutions (Qi et al., 2012).

Entrepreneurial green culture is a capability; in particular it is an organizational ability that becomes a true code and business value for both internal and external stakeholders (Wang, 2019).

Montresor and Quatraro (2019) and Giudici et al. (2019) argue that the likelihood of developing new eco-technologies in a specific area depends on past and present local green activities, although regions diverge in their ability to diversify and adapt to technological change and to develop new green activities.

European areas show a different capacity to create and develop new sustainable products due to an unequal distribution of specializations (Corradini, 2019; Tanner, 2016). Regional capabilities determine the process of local diversification: the industrial, technological, and green sectors in an area develop and express new actions in the place (Hidalgo et al., 2018). Eco activities in particular are complex because they can arise from innovations, that could contain also not green knowledge, but is embedded in a core economic sector and includes political and social interests (Barbieri et al., 2020; Makitie et al., 2018). A strong local policy generally needs the contextual presence of cognitive and complementarity proximity and a green policy also requires strong relational and social capital. Knoben and Oerlemans (2006) argue that because cognitive proximity is included in organizational one, routines are shared even among actors that are geographically distant. Spatial localization defines the area by exploiting only local expertise: the greater the level of local cognitive proximity, the higher the likelihood of introducing and sustaining a new green policy. In addition,
through the promotion of interregional complementarities, all countries could address the problems linked to the introduction of a new green technology. Sustainability and environmental responsibility become an even clearer goal when linked to digital innovations. However, sustainability needs a strong green organizational culture for having an eco-competitive advantage. This type of culture is an intangible resource based on values and habits that must be disseminated both in the work situation (green training for employees) and be part of civic sense. One of the economic theories that best fits green culture is that of social exchange (Emerson, 1976; Robertson and Barling, 2017), and it is based on elements such as reciprocity, trust and equity. The aim of this work is to analyze the energy sustainability of Italy (Morelli et al., 2022) through the level of clean energy produced. In section 2 we recall the main economic theories, while in section 3, the main characteristics of sustainable firms are quickly presented and the energy sector in Italy is investigated (section 4). Section 5 concludes the work.

2. THEORETICAL BACKGROUND
Green culture should be part of an economic system that prioritizes the development and use of low-carbon sustainable goods and services. It has strong cultural values, beliefs, and practices that influence the way individuals and societies interact with the natural environment, underlying which are links based on historical, economic, and political forces and elements.

One goal of the green economy is to reduce negative environmental impacts, foster growth and economic and social development. Green culture and environmental sustainability recognize and reduce the causes of environmental degradation by promoting conservation, preserving ecosystems, and encouraging more responsible behavior that aims to achieve greater collective and personal well-being. Therefore, change can exist if there is a green culture and responsibility. The spread of sustainable value should be promoted and supported by institutions, media, education, and ad hoc policies. Social sustainability creates a more equitable, efficient and resilient society in which collective and individual well-being is embedded in innovative systems and inclusive social institutions. The socio-cultural aspect is related to each country. The multidimensionality of well-being includes the green vision and is common to all territories. This element involves a collective cultural change and invokes concepts such as sustainability, equity, and development on which the codes of conduct are based.

The introduction of a green innovation recalls unwritten rules and ethical codes that determine local behavior and policy, directly involving the area of social uncertainty (York and Lenox, 2014). An adequate socio-cultural support activity for the population creates territorial cognitive legitimacy and compensates for the uncertainty linked to the green introduction. The diffusion of both specific knowledge for a new successful green industry, and socio-political information suitable for the acceptance of a new business idea, are the bases.

Economic, social and environmental sustainability develops on interconnected paths that are in balance when economic growth is accompanied by a strong civic sense and a system of environmental protection. Along the dimension of the interconnection-section, the limits of each path are expressed and resolved. This mechanism would make it possible to achieve long-term sustainable economic growth. Inputs that come from the outside and which take the form of strong solicitations produced by sources such as Industry 4.0, could undermine each path. Therefore, digital tools should be included in the multi-level sustainability mechanism, so that there could be several advantages in terms of efficiency in the use of resources, increased productivity, waste reduction. Thus, the entire value chain would benefit thanks to the dematerialization and the more extensive economic accessibility of the outputs.

2.1 A model of sustainability
The tools of Industry 4.0 can favor the development of a network of environmental management value, and with the use of instruments such as blockchain and wireless, the integration of renewable sources and the improvement of the efficiency of renewable materials would be achieved (Faheem et al., 2018; Huang et al., 2017). The possibility of obtaining more efficient materials and greater energy sustainability in the different production phases, with a consequent compression of emissions, leads to an upgrading in the entire socio-economic sustainability. Although in literature there is no single definition of social sustainability (Vallance et al., 2011; Coleman, 1988), it can be considered as the ability of a society, a community, a country to
organize itself socially through structures. At the base there is a social infrastructure (Eizenberg and Jabareen, 2017), suitable to improve subjective and collective well-being. Sustainability has a social and economic dimension, and an efficient and socio-innovative infrastructure is the link between the social and economic spheres. Institutions, with regulations, laws and policies, promote these infrastructures (educational, welfare, environmental, health, etc.) according to the needs that emerge. They can also be considered an indicator of social development, as they lead to social stability and security. In practice, the techno-sustainable development of an area is determined and driven by a number of elements (labor force, business atmosphere, population, etc.) that require efficient social capital-intensive infrastructures suitable for generating higher quality of life and individual well-being. Infrastructure is an intermediate link for development that is socio-economically sustainable, which also requires the presence of environmental sustainability, since in an efficient long-term vision; the preservation of stable environmental conditions is the pre-requisite for a better life. (Figure 1).

Fig. 1: A theoretical model of efficient sustainability

![Diagram](https://www.ijmsbr.com/sustainability_diagram.png)

The mechanism works only if green culture is part of all the areas. Eco culture includes values, practices, and lifestyles in which environmental protection and sustainability are a priority (recycling, renewable energy, waste reduction, etc.), and they are implemented through cultural changes, increased public awareness and supported for environmentally friendly policies. Moreover, from public-private interaction, sustainability is established in an area through green culture and social cohesion, and local social capital supports strategic planning that would otherwise fail.

The social diffusion of a green culture and the opportunity to preserve environment stimulate the debate on renewable energy and sustainable development.

The theory of participatory sustainability (Robinson, 2004) which also includes the perception of the impact of a particular project on the population helps in disseminating green information.

3. SUSTAINABILITY AND FIRMS

A sustainability mechanism acts if firms are included in the global competition, which, in turn, is included in the digitization process. The phenomenon of Industry 4.0 and related enabling technologies prioritizes the speed of competitive reaction by breaking downsize barriers. This implies especially for digitized small and medium enterprises the possibility of competing with larger rivals. Digitalization makes explicit effects not only on dynamism (digital speed and lowering of structural size) but also on strategic management, and
smaller firms, although digital, still accuses the size limit. However, a digital firm is successful if it adapts internal skills, activates digital security mechanisms, and makes appropriate organizational-managerial changes. The machine learning mechanisms inherent in the digital age enable information systems to capture data at an increasing rate, and algorithms generate additional added value determined by improved management efficiency. Also, for environmental sustainability, the winning green digital enterprises will be those that have a core-green vision and adopt innovative paradigms.

In the digital paradigm, therefore, competition is not simply the minimization of costs, but it is an innovative and dynamic process based on strategic differences.

For small digital firms, the size limit is still a constraint, and the need to show adequate strategic capacity to face digital competition pushes smaller firms to a clusterization. In fact, cooperation, and the consequent competitive advantage that enterprises in clusters usually register, find in geographic concentration and sector’s specialization the correlation to compete.

Some elements are fundamental to the existence of a cluster and these are collaboration among firms, which in turn enhances other elements such as trust and social capital, competition and intra-group and extra-group relations, and innovation. Network’s activities are corroborated by genuine mutual interests (cluster culture) that are fostered and supported by intangible assets such as trust and social capital. Therefore, although there is a specific interest underlying each business activity, equitable sharing ensures both benefits for each actor in a cluster and the rapid detection of some distortions.

In a cluster, there is a supportive relationship (trust) that is based primarily on quality and efficiency, which ensure that network units strengthen relationships and faster transfer of know-how and information. The rapid dissemination of information improves organizational learning and enables the development of innovative approaches that make the cluster more efficient. In fact, sharing dynamics and common problems leads more quickly to find a solution for the single unit and the entire group. In such a journey, digital tools promote the rapid circulation of knowledge and facilitate communication and learning. The collaborative approach on which a cluster is based develops a range of benefits that benefit all members of the network, including complementarities, relationships and links with stakeholders, and marketing activities. Although the convergence of each unit is interest-based, sharing and preserving it provides benefits to each one in the cluster.

Green innovations and corporate sustainability also fall under the umbrella of innovation 4.0 (Albort-Morant et al., 2017). Industrial competition suffers from new environmental regulations and innovative green consumers. Innovation 4.0 is disruptive and radical, requiring significant structural changes that push firms to invest systems for production, data acquisition, storage, and analysis. The cluster and related business models can play a key role for small and medium-sized enterprises that historically cannot easily invest in new technology. In a green network, it is possible to think of each unit contributing its expertise and making it available to others. This would be a true model of collective green leadership, which finds in the network structure the mechanism for sharing common green intelligence and culture.

Environmental awareness underlies green innovations that appear one of the critical factors of entrepreneurial success (Chiou et al., 2011). A green innovation presupposes the use of an approach that transform traditional practices into sustainable ones (Calza et al., 2017). According to what is shown in our theoretical model, there is no green innovation if there is no green culture within the firm. This, in turn, presupposes a strong entrepreneurial’s ability to adapt to new environmental requirements imposed by policies and markets. A change, therefore, comes through an adaptive and organizational culture within the firm, which creates the prerequisites for a green culture and a smooth introduction of eco innovation. Firms that have a strong attitude to change (culture and adaptive-organizational capacity), will react more quickly and successfully to external change (green policy), and will be more inclined to green innovation. This idea is corroborated by several empirical studies (Singh et al., 2020; Zhang et al., 2019; Tang et al., 2018; Huang and Li, 2017; Kucukoglu and Pinar, 2015), that underline the importance of environmental performance.

4. ENERGY AND GREEN SECTOR

Although the decrease in greenhouse gas emissions generated in the aftershock of the pandemic Covid-19 can be viewed positively for the welfare of the planet, the environmental emergency remains. Indeed, significant improvement requires long-term generalized structural change. The pandemic and Russia-Ukraine war effects have also highlighted a growing demand for energy in all countries. Emergence and
need show that there is a requirement to ensure access to affordable, reliable and modern energy services, and that greater use of renewable energy sources is desirable.

The situation in which the energy market imposes a new geopolitical arrangement, in which dependence on a single gas supplier results in a lock-in situation for most European countries. In addition, energy digitization has generated a decrease in the cost of renewable energy in the face of an increasing increase in gas in all countries (Gurrieri et al., 2023). The current uncertainty on energy supply and fluctuating energy prices require the introduction of renewable energy, and a rapid clean energy transition. The increasing use of renewable energy would minimize carbon emissions by about 8.2 percent by 2050 (Oliveira and Trindade, 2018). The natural factors from which to derive clean energy are sun, wind, water, earth heat (geothermal), plant materials (biomass), and ocean waves. Differences in oceans’ temperature can also produce thermal or mechanical energy, which, in turn, can be converted into energy for transportation.

The report of the Global Electricity Review 2023 calculates that by 2030 Europe will be able to produce more than 45% of renewable energy for its needs. Italy stands in the last European positions for renewable energy. In Fig. 1 it is possible to see electricity’s generation in Europe.

**Fig. 1: Electricity sources in Europe**

![Electricity sources in Europe](image)

Source: Ember, 2023

It is possible to observe that coal, gas and nuclear are the main electricity sources in Europe. But, starting from 2010 there is an increase of the use of natural sources, probably due to the implementation of green policies.

**4.1 Italy**

Renewable energies in Italy seem to suffer from low long-term strategic planning. ARERA in 2022 (December 1, n. 540/2022) obliges the installation of a central system controller for new generation structures, but to date the legislation has not yet been concluded. Thanks to the strong presence of natural sources, Italy can produce solar, wind (especially in the South of Italy), geothermal (Tuscany), biomass and water energy. Mutani and Usta (2022) estimate that Italy will have an 80% supply of electricity from renewable sources by 2050. In particular, data predict that solar will be the most exploited natural source (60-70%), followed by natural gas (10-16%) and wind (10-11%). Fig. 2 shows Italy electricity’s generation.

![Electricity generation in Italy](image)
Also, for Italy coal and gas are the main sources for electricity production. The intensification of renewable sources increases in the last ten years thanks to the greater diffusion of green culture and policy. In particular, in the period 2008-2021 there is an increase in the quantity of electricity produced from renewable sources: the greatest production comes from the sun, with a quantity in 2021 equal to 21.4 TWh, followed by biomass 15.9 TWH and wind energy (15.4 TWh). The sun records the highest and growing energy production over the entire period of time, it is greater than the value recorded by other sources, especially in the South and on the islands, as this is a source available for most of the year. However, Italian green production is still low, while natural gas imports are still high.

Figure 3 shows the import of natural gas for the three-year period 2018-2020 measured in Gm3 (horizontal axis). The main countries exporting natural gas to Italy are Russia and Algeria, followed by Norway, Libya and Qatar.

In 2021 the northern regions, among which Lombardy, Piedmont, Veneto and Emilia-Romagna excel, recorded the highest levels of gas supplied and consumed. The situation is different for central and southern Italy, where gas consumption and supply are lower. This difference could be partly attributable to the stricter climate of the northern area, as well as the higher density of population and activity of the northern area compared to the rest of the territory. In Italy there are about 6568 gas concessions throughout the territory and in the north, there is the greatest presence of operators in the sector. Lombardy stands out with 45
operators and 1383 concessions, followed by Veneto (26; 582), Piedmont (25; 978) and Emilia-Romagna (19; 326).

In Italy, photovoltaics are among the most widespread energy production systems, due to the high integration capacity of this system in buildings. ENEA (2022) estimates that 110 TWh of energy are produced annually from renewable sources: 42% of the total renewable energy is produced by hydroelectricity, 20% photovoltaics, 17% bioenergy, 16% wind and 5% comes from geothermal. The possibility of physical self-consumption of the energy produced and of selling the extra energy represents an opportunity for the citizen to be a prosumer. If the idea of being a prosumer is an integral part of the green culture, surely energy from renewable sources would record higher production levels. Moreover, the construction of wind farms (more than 5000) brings noise pollution from the turbines, interference in communications due to the magnetic field created by the turbines, the possible death of rare species in the construction of the park. These problems must be limited.

The strong demand for energy requires a reflection on the possibility of Italy investing more in the natural resources at its disposal. The awareness on the part of governance and citizens pushes towards a new trajectory of sustainable development. However, the socio-economic-environmental components (proposed theoretical model) must act simultaneously. In Italy, an industrialized and digitalized country, green infrastructures are lagging and this lack blocks the virtuous circles that digital and green could trigger. Country's interest in these green sources is due on the one hand to air and land pollution and on the other hand to the desire to support and foster the link between ecological conservation (natural resources) and economic growth.

It is an economy that has a high potential for green production and export. Environmental sustainability is an opportunity to introduce real structural changes that can positively affect GDP and economic growth. In fact, favored by the presence of these strong natural components, through the development and implementation of clean energy interconnections could use and export the green energy produced, with strong positive impacts on growth. Through the creation of energy networks, even rural areas could benefit from connections. The social and environmental sustainability components seem to have greater presence in this country, but the low economic sustainability, due to digital backwardness, actually limits, the possibility of total feasibility of the theoretical model envisioned.

5. CONCLUSION

Eighty percent of the world's energy is still produced from fossil fuels, with high production of carbon dioxide and greenhouse gases. In Italy despite the high level of education of the population and the availability of natural resources, the exploitation of alternative energy sources is still quite limited. The beneficial effects of increased use of energy from green sources would occur not only in terms of safeguarding natural resources and improving the quality of air and life, but also in terms of employment (creation of new jobs), and development of the most disadvantaged areas.

It is presumable that there cannot be a complete substitution between clean and fossil fuel energy, but the benefits of a shift to green would still outweigh the negative effects of greenhouse gases. It also seems clear that, there is no innovation if there is no diffusion of a green culture. Therefore, it is desirable that both among policymakers and the population itself, green civic sense will spread rapidly. Italy can rely on several natural factors that would favor the use of green energy sources.

References


