

# SUSTAINABLE INNOVATION - NEW ECONOMIC CONCEPT REQUIRED BY SUSTAINABLE DEVELOPMENT

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## Abstract

*Following the concept of sustainable development and standard economics, we find innovation presented as one of the most important factors of world economic growth. Although most authors focus their research on sustainable development, this paper will instead focus on sustainable innovation. The paper converges on studying innovation from the perspective of sustainable development and sustains several theoretical results in order to show the importance of adopting innovation process which respects sustainable goals. The paper it is also focused on analyzing the importance of creating sustainable innovative products or services within the constraints of economic, environment and social issues. The paper concludes by enhancing the understanding of the sustainable innovation power in economic environment development, correlated with social and natural environment.*

**Keywords:** Sustainable innovation, development, sustainability, innovation process, innovative products

## Introduction

In the late 1960s, the National Environmental Policy Act (NEPA), American environmental movement became the progenitor of the contemporary global sustainability movement:

*"...to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans."*<sup>1</sup>

Sustainable development is a concept based on intergenerational equity - that is, the current generation must not compromise the ability of future generations to meet their 'material needs' and to enjoy a healthy environment.<sup>2</sup>

For instance, a desideratum of the sustainable is to create a balance between the apparently opposite objectives of economic growth and environmental protection, with the issues of social equity. Sometimes the solution results of the balancing objective have been disappointing, designed in policy ineffective.

Sustainable development is a normative concept which is incorporating economic, ecological and social objectives. In economic development we have to take into consideration that the *importance of innovation for development is increasing with time.*<sup>3</sup> It is important to understand the importance of innovative process or goods and services in a sustainable development.

The purpose of this work is to identify and analyze from a theoretical perspective the innovations in a sustainable environment by defining the concept of *sustainable innovation*. Based on literature review the current study intends to make understandable the role it plays this topic in economic and natural environment.

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<sup>1</sup> NEPA and Environmental Planning: Tools, Techniques, and Approaches for Practitioners, CRC Press, 2008.

<sup>2</sup> Batie, Sandra S. "Sustainable Development: Challenges to the Profession of Agricultural Economics." *Am. J. Agr. Econ.* 71:5 (1989) p. 1084.

<sup>3</sup> Verspagen, B. (1991). A New Empirical Approach to Catching up or Falling Behind. *Structural Change and Economic Dynamic*, 2 (2), pp. 359- 380.

If sustainable development is *the pursuit of growth subject to environmental constraints*<sup>4</sup> then innovative process can't take place without respecting constraints, furthermore an innovative product or service can't be achieved without respecting the constraints of economic, environment and social issues.

From this perspective, sustainable innovation it is and it will be an important factor which may be consider as a primary need for achieving sustainable development on a long term. Therefore, the paper discusses the interdependence between innovation, environment, social and economic stability, when constraints are implied.

### **Sustainable Innovation: a linkage between innovation and sustainability concept**

Taking into consideration the economic literature and analyzing our society, we note that innovation plays an important role in economy and consumer life. *During the 20<sup>th</sup> century, innovations have produced revolutionary effects on the locus of capital, labor and productivity – we need only look at the changes produced by the airplane or the computer to convince ourselves of this.*<sup>5</sup>

Innovation is a search process characterized by less regularity in its outcome. Production and innovation are interdependent.<sup>6</sup> Innovation is the key of economic growth and producers are investing in innovative products to increase profits. In our days innovation is an accelerating process, and today's innovative products may become the "old products" of tomorrow.

Along with profit like a primary target, an innovative producer is important to have sustainable goals. In an innovation process is important to have linked targets for issues such as pollution, carbon emissions, social and economic problems. According to John Hagel III, we are in the midst of a vast global flow of ideas, innovations, and opportunities for profit through collaboration.<sup>7</sup> It is important to work "together and to pull out of ourselves more of our true potential, both individually and collectively" like he said, but in addition it is important to work for our present and future welfare without compromising the welfare of the future generations.

Producing innovative products/services in a sustainable development requires a sustainable innovation. Based on scheme of sustainable development: at the confluence of three constituent parts<sup>8</sup>, we have identified sustainable innovation like in the next figure:

<sup>4</sup> Batie, 1989:1084.

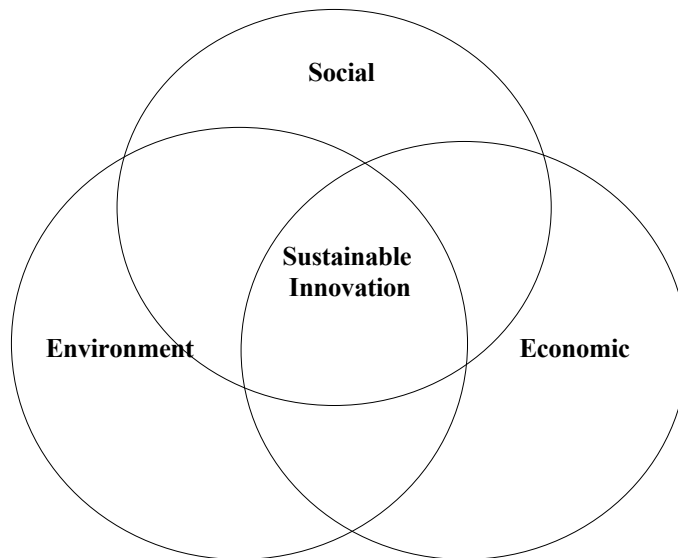
<sup>5</sup> Jhon H. Holland, Innovation in Complex Adaptive Systems. Some Mathematical Sketches, **Santa Fe Institute**, Sfi Working Paper: 1993-10-062.

<sup>6</sup> Bengt-Åke Lundvall, Product Innovation and User-Producer Interaction, Industrial Development Research Series No. 31, Aalborg University Press, 1985.

<sup>7</sup> Guy Isaac, Joseph Levy, Alexander Ognits, The Benefits of the New Economy. Resolving the global economic crisis through mutual guarantee, ARI Publishers, Toronto, Edition: January 2013.

<sup>8</sup> Zaman Ghe., Goschin Z., Multidisciplinaritate, interdisciplinaritate și transdisciplinaritate: abordări teoretice și implicații pentru strategia dezvoltării durabile postcriză, Economie teoretică și aplicată, Vol. XVII, No. 12(553), 2010.

UCN 2006, *The Future of Sustainability. Rethinking Environment and Development in the Twenty-first Century*, Report of IUCN Renowned Thinkers Meeting, 29 - 31 January 2006. [http://cmsdata.iucn.org/downloads/iucn\\_future\\_of\\_sustainability.pdf](http://cmsdata.iucn.org/downloads/iucn_future_of_sustainability.pdf).



**Figure 01:** Sustainable Innovation - based on UCN 2006 Source

When we are referring to producer, we speak about individual or organization concerned with the production of goods and services; after all we are dealing with human beings that are taking part in the economic process. In economic process, consumer is not the only human being, behind organization there are and there always be, people. If we imagine the market like a theater play, we can see that all the participants on the market are actors with different role, but in the end there are all human beings. In real life, even if we are producer or consumer, we all face, at global level, with climate changes, deforestation, biodiversity loss and water shortages. These types of changes affect everybody, even if we refer to producer or consumer, consequently we should pay more attention to the concept of sustainable development.

Manufacturing of innovative products is at a stage that needs resources, and it is important to think of them and act in a sustainable manner. To face off the limited supply of natural resources and the impact of growth on the environment, the producer needs to set aspirational goals on a long-run economic growth and to pay more attention to a sustainable production.

Within the area of environmental management, according to United Nations Environment Programme, the Cleaner Production network has stressed the need for the promotion of cleaner production processes and preventive environmental strategies<sup>9</sup>.

Innovation and sustainability, in the economic environment, have to be interconnected and in order to ensure long-term success and as well as a healthy economy that takes into account both environmental performance and social responsibility.

According to the OECD<sup>10</sup>, new sources of growth and competitiveness need to be identified, including innovation, green growth, knowledge-based assets, and skills (*“go structural and go green”*) to put our economies back on a strong, inclusive growth path.<sup>11</sup>

<sup>9</sup> UNEP (2012), Global Outlook on SCP Policies: taking action together. (<http://www.unep.org>).

<sup>10</sup> The Organisation for Economic Co-operation and Development (OECD) is an international economic organisation of 34 countries founded in 1961 to stimulate economic progress and world trade. The mission of the Organisation for Economic Co-operation and Development (OECD) is to promote policies that will improve the economic and social well-being of people around the world. (<http://www.oecd.org>).

<sup>11</sup> OECD week2012, New Approaches to economic challenges – a framework paper, Paris, May, 2012

In our days, with new and competitively differentiated products, companies can no longer avoid innovation process; innovations can provide or ensure an important place on the market.

Harmony between the three pillars of sustainable development in innovation process is the best choice in terms of innovation. We can call it "sustainable innovation", which is distinguished from an ordinary innovation by bounding it to the constraints of society, environment and economy. Sustainable innovation is about using innovation to reduce energy consumption, social issues, improve environmental performance and it is a determinant key of economic performance and to our ability to keep innovating. Innovation should be created by taking into consideration the efforts to achieve the goals of sustainable development.

Sustainable innovation is the pulse of economic growth. In sustainable innovation we are studying innovations from more perspectives: technological, economic, environment and societal perspective, to facilitate sustainable societies by producing and consuming in a sustainable way. Therefore, sustainable innovation involves multiple actors such as government, business, educational institutions, groups within society and consumers to use technological goods or service to solve societal issues and to strengthen welfare in the world.

A sustainable innovative system is composed of a series of production practices that are incorporated and interconnected with each another. John Ikerd argues that sustainability is determined by the system as a whole<sup>12</sup>. Such as, to develop an innovative good or service in a sustainable environment involves the working together of more than two factors to produce a better effect than the amount of their individual effects.

Most times, when companies want to innovate or adopt innovations, they overstate the immediate benefits or economic profit in the long-run and they are underestimated the adverse effects, either because they do not know the exact effects of using the innovation in the long term or due to the high costs that would be involve by such an analysis. However without a proper planning, apparently bearing only positive effects, it is possible to observe in time higher negative results, with side effects that could have been avoided by a proper appreciation of these innovations.

In most definitions of sustainability we find long-term benefits to the environment and the economic profitability over a long period of time. The development of new products is the main factor that underlies the requirement suggested by the definition of sustainability and the most important forms it might take it are: innovative process and innovative goods and services.

### **Sustainable innovative process**

An innovative process is the adoption of a new process or a new machine, by the organization, to facilitate the production of goods and services, to obtain the best results from fewer resources in an efficient way and to make the organisation to function in the best way. The innovative process became sustainable when the organisation achieves this improvement by the integration of economic, environmental and social concerns<sup>13</sup>.

Innovative processes are complex and often require a large number of different participants, where human engagement is essential. An entrepreneur that organises the implementation of the innovation is like a visionary with a new idea which identifies important needs for organization.

Advancing technological knowledge has been identified as the single most important contributing factor to long-term productivity and economic growth.<sup>14</sup> As has been noted, sustainable innovation processes is different from conventional innovation, it mainly differs in purpose and

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<sup>12</sup> Ikerd, John E. "Applying LISA Concepts on Southern Farms or Changing Farm Philosophies" *S. J. Agr. Econ.* 23:1 (1991), p. 46.

<sup>13</sup> Uwe Fortkamp and Louise Staffas, Integration of sustainability aspects in innovation processes, A survey as part of the SPIN project, IVL Report B2025, January 2012.

<sup>14</sup> Gruber, N., Keeling, C., Bacastow, R., Guenther, P., Lueker, T., Wahlen, M., Meijer, H., Mook, W. and Stocker, T, Spatiotemporal patterns of carbon-13 in the global surface oceans and the oceanic Suess effect, *Global Biogeochemical Cycles* 13(2), 1999.

direction<sup>15</sup>. For instance, organisations need to invest in a sustainable innovation processes by providing their employees with the right innovation tools or software system, by adopting only those innovations which respect the constraints to achieving sustainable development.

The innovations, which are adopted by the organization, have to enable employees to complete their tasks more efficiently and effectively in the production of goods or services or to improve existing products and processes. These adoptions lead the organisation to higher profits and to sustainable development. However, in some cases, the adaptation of a sustainable innovation processes over the short run suggests lower profit with the expectation that benefits will be achieved over a longer period of time.

Focusing on long-terms objectives by adopting a sustainable innovation processes can improve environmental quality over time, resolve social issues and to enjoy more economic benefits in time. However, the benefits from adopting sustainable innovation in the production process, must be estimated not only in terms of absolute improvement in natural environmental quality, but also in relative terms, relative to what would have occurred if the innovative process have been continued without not implementing a sustainable innovational processes. Furthermore, the consequences on profitability of such sustainable innovation processes must be estimate not only over a time horizon, but also be evaluated relative to the profitability of a conventional innovation processes over the same time horizon<sup>16</sup>.

### **Sustainable innovative goods and services (Sustainable innovations)**

The concept of sustainability may be defined like a “development that meets the needs of the present without compromising the ability of future generations to meet their own needs.” (Brundtland Commission, 1987)<sup>17</sup>

If we link such definition to sustainable innovations, then sustainable innovative goods and services are also based on intergenerational equity. The current innovations (expressed in innovated products or services) of the actual generation, must not compromise the ability of innovating of the future generations, the resource that they need for innovating products (or services) and have to maintain or improve a healthy environment.

In the '80s, Freeman and Perez propose a new way to classify technological innovation: incremental innovation, radical innovation, new technology systems and new technological models. This classification will serve as foundation for a more complex classifications made by Henderson and Clark<sup>18</sup> (1990) who classify innovations using two dimensions: basic concepts - that capture of the impact of innovation on product components and connections between fundamental concepts and components of a product.

<sup>15</sup> Uwe Fortkamp and Louise Staffas, IVL Report B2025, January 2012.

<sup>16</sup> Debertin David L. and Pagoulatos Angelos, Production Practices and Systems in Sustainable Agriculture, 1995.

<sup>17</sup> Report of World Commission on Environment and Development. Our Common Future, 1987.

\* World Commission on Environment and Development (Brundtland Commission) published its report in 1987 and presented a new concept - sustainable development. The concept helped to shape the international agenda and the international community's attitude towards economic, social and environmental development.

<sup>18</sup> Henderson R.M. & K.B. Clark, Architectural Innovation: The Reconfiguration of Existing Product Technologies and the Failure of Established Firms, Administrative Science Quarterly, 1990.

Figure 02: Classifications of innovation

		Components/ core concepts	
		Reinforced	Overtured
Linkages between Core Concepts and Components	Unchanged	Incremental Innovation	Modular Innovation
	Changed	Architectural Innovation	Radical Innovation

Source: Henderson and Clark (1990)

As we can see, the degree of the innovation process can begin at a minor level, minimal or incremental improvements, to radical changes modifying our way of thinking about a product or service and how to use it.<sup>19</sup>

Analyzing the classifications made by Henderson and Clark, we define:

*Incremental innovation* is the simple improvement of the ensemble. Studies about incremental development processes have shown that the efficiency gained over time is more important than occasionally appeared with radical changes.

*Modular innovation* requires only the change of the fundamental concept. Making changes on the basis of the product but the use remains the same.

*Architectural innovation* involves only changing the links between product components. Merge several components with different benefits in order to make an improvement, a novelty product, but individually these components remain at the same degree of novelty.

*Radical innovation* involves the creation of both, new fundamental concepts and some new links. It refers to the creation of unprecedented products.

The major products and services on the market are innovative products or services that consumers adopt in daily life. Correlating with the sustainability constraints, by respect them, it becomes sustainable innovative products and services.

According to Watson (2008)<sup>20</sup> the governments should set general frameworks to encourage more sustainable innovation. He maintains that the government plays an important role in the support of eco-innovation. It is difficult to measure either the outputs (e.g. in terms of economic returns) or outcomes (in terms of successful innovations) of technology support programmes<sup>21</sup> and sustainable innovation support programmes. However, government technology policies have to do more than fund basic research and development, and internalize the social costs of carbon emissions<sup>22</sup>. Governments can promote innovative products or services by introducing strong policies, creating

<sup>19</sup> Leuca T., Inovație și tehnologie, Universitatea din Oradea, Facultatea de inginerie electronică și tehnologia informației, 2008, pag. 10.

<sup>20</sup> Watson, J. Setting Priorities in Energy Innovation Policy: Lessons for the UK. *ETIP Discussion Paper Series, Belfer Center for Science and International Affairs, Kennedy School of Government, Harvard University.*

<sup>21</sup> Gallagher, K. S., J. P. Holdren, et al. (2006). Energy-Technology Innovation. *Annual Review of Environmental Resources* 31: 193-237, 2008.

<sup>22</sup> Bonvillian, W. Testimony before Congressional hearing on "Establishing the Advanced Research Projects Agency-Energy (ARPA-E) - HR 364", House of Representatives, 2007.

Subcommittee on Energy and Environment, Committee on Science and Technology.

types of constraints that involve environment, economic and social issues to lead to sustainable innovative products on the market.

To solve market problems complying with social and environment norms, the organisations can use sustainable innovative products. The four kinds of innovation come together in large proportion on the market. Even if we refer to radical innovations or to the others type of product/services innovation, we know that the economy is characterized by a multitude of new products launched on the market, of which almost 90% of them do not survive<sup>23</sup>.

To avoid the failure of the innovative products on the market, investing in creating sustainable innovative products represents, first of all, the manufactures interest by increasing their competitiveness on the market. If we just imagine increasing the number of the producers which are investing more and more in an sustainable innovative process or to create sustainable innovative products, in a long time we will be able to achieve a sustainable development at a global level. A sustainable innovation doesn't represents just a benefit for new generations, hence it represent a benefit for the actual economic environment and for the producers profits by decreasing the number of the products that doesn't survive on the market and dcreasing the inefficient use of resources.

A way that All Civil Society Organizations contribute to sustainable consumption and production is to support business in producing and marketing more sustainable products. Consumers can also become agents of change by demanding better quality and more sustainable products and services.<sup>24</sup>

### Conclusions

Sustainable innovations should be regarded as a binder between sustainable development, manufacture and consumer. It merges the consumers satisfaction with the aim of manufacturers by meeting the requirements of sustainable development.

The innovative process, chosen by the producer, must be sustainable to generate a long term development on the market without affecting the welfare of the future generations. As has been noted, this type of innovation is the optimal choice for producer, consumer, on the market and for a healthy economy by using the right amount of resources in developing innovative products.

In conclusion, by adopting sustainable innovation process or creating sustainable products and services, the manufacture will avoid high losses, the limited resources will be efficiently used, increasing the benefits of consumer without affecting the innovative "power" of a future generation or their needs.

The relationship between innovation and sustainable development has received relatively little attention because the definitions of the concept of sustainable innovation largely unexamined. The presented work will possibly shed some light on the concept of sustainable innovation and in the future, the authors intend to evaluate the attitudes of producers regarding the problem of innovating in a sustainable environment.

### References

- Batie, Sandra S. "Sustainable Development: Challenges to the Profession of Agricultural Economics." *Am. J. Agr. Econ.* 71:5 (1989) pp. 1083-1101.
- Bengt-Åke Lundvall, *Product Innovation and User-Producer Interaction*, Industrial Development Research Series No. 31, Aalborg University Press, 1985.
- Bonvillian, W. Testimony before Congressional hearing on "Establishing the Advanced Research Projects Agency-Energy (ARPA-E) - HR 364", House of Representatives, 2007.

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<sup>23</sup> Crawford, C. M. și Di Benedetto A., *New products management*, Ediția aIX-a, New York, Editura McGraw-Hill/Irwin, 2008.

<sup>24</sup> UNEP (2012), *Global Outlook on SCP Policies: taking action together*. (<http://www.unep.org>).

- Daly, H.E., "Sustainable development from concepts and theory towards operational principles," in K. Davis and M.S. Bernstein (eds) *Resources, Environment and Population: Present Knowledge, Future Options*, New York and Oxford: Oxford University Press, 1991.
- Debertin David L. and Pagoulatos Angelos, *Production Practices and Systems in Sustainable Agriculture*, 1995.
- Gallagher, K. S., J. P. Holdren, et al. (2006). *Energy-Technology Innovation*. *Annual Review of Environmental Resources* 31: 193-237, 2008.
- Gruber, N., Keeling, C., Bacastow, R., Guenther, P., Lueker, T., Wahlen, M., Meijer, H., Mook, W. and Stocker, T, *Spatiotemporal patterns of carbon-13 in the global surface oceans and the oceanic Suess effect*, *Global Biogeochemical Cycles* 13(2), 1999.
- Greenacre P., Gross R. and Speirs J, *Innovation Theory: A review of the literature*, ICEPT Working Paper, May 2012.
- Guy Isaac, Joseph Levy, Alexander Ognits, *The Benefits of the New Economy. Resolving the global economic crisis through mutual guarantee*, ARI Publishers, Toronto, Edition: January 2013.
- Ikerd, John E. "Applying LISA Concepts on Southern Farms or Changing Farm Philosophies" *S. J. Agr. Econ.* 23:1 (1991) pp. 43-52. (p. 46).
- Hartwick, J. M. "Natural Resources, National Accounting and Economic Depreciation". *J. of Public Econ.*, 43, 1990, pp. 291-304.
- Henderson R.M. & K.B. Clark, *Architectural Innovation: The Reconfiguration of Existing Product Technologies and the Failure of Established Firms*, *Administrative Science Quarterly*, 1990.
- Poole, M.S., A.H. van de Ven, K. Dooley, and M.E. Holmes, *Organizational Change and Innovation Processes, theories and methods for research*, ed. O.U. Press. 2000.
- Jhon H. Holland, *Innovation in Complex Adaptive Systems. Some Mathematical Sketches*, Santa Fe Institute, Sfi Working Paper: 1993-10-062.
- Leuca T., *Inovație și tehnologie*, Universitatea din Oradea, Facultatea de inginerie electronică și tehnologia informației, 2008, pag. 10.
- Rennings, K. & Ziegler, A., *Environmental innovations and economic success of companies Paper for conference: Green roads to growth in Copenhagen*, 2006.
- Nelson, R., *The co-evolution of technology, industrial structure, and supporting institutions*. *Industrial and Corporate Change*, 1994.
- *NEPA and Environmental Planning: Tools, Techniques, and Approaches for Practitioners*, CRC Press, 2008.
- *OECD week2012, New Approaches to economic challenges – a framework paper*, Paris, May, 2012.
- *Report of World Commission on Environment and Development. Our Common Future*, 1987.
- UCN 2006, *The Future of Sustainability. Rethinking Environment and Development in the Twenty-first Century*, Report of IUCN Renowned Thinkers Meeting, 29 - 31 January 2006. [http://cmsdata.iucn.org/downloads/iucn\\_future\\_of\\_sustainability.pdf](http://cmsdata.iucn.org/downloads/iucn_future_of_sustainability.pdf).
- UNEP (2012), *Global Outlook on SCP Policies: taking action together*. (<http://www.unep.org>).
- Verspagen, B. (1991). *A New Empirical Approach to Catching up or Falling Behind*. *Structural Change and Economic Dynamic*, 2 (2), pp. 359- 380.
- Uwe Fortkamp and Louise Staffas, *Integration of sustainability aspects in innovation processes, A survey as part of the SPIN project*, IVL Report B2025, January 2012, [www.ivl.se](http://www.ivl.se).
- Watson, J. *Setting Priorities in Energy Innovation Policy: Lessons for the UK*. ETIP Discussion Paper Series, Belfer Center for Science and International Affairs, Kennedy School of Government, Harvard University.