Activating new companies networks where new flows of material generate internal connections

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Abstract

Actually on the one hand we are witnessing the continuous rise in the price of raw materials and a strong demand for recyclable materials, while on the other hand we are producing more waste, expecially during the production process. In specific the research, in collaboration with Neosidea Group, is about the proposal of an instrument for analysis based on the concept of an open system that would allow the configuration and realization of networks of connections among different companies in geographic proximity, to achieve zero emission by implementing a sustainable management of their wastes. The goal is to design a system for processing information, that can organize data relative to output (waste), input (resources) and local companies. The processing system was also supplemented with the function of geo-locating business is and materials and this provides a solution and that gives not only information regarding new areas of application of the outputs but also determines with precision and localizes by territory the flows of material within a local network whose nodes are represented by the companies present on that territory; this promotes the local businesses and evaluates market opportunities of areas currently not yet exploited according to the systemic approach.

Keywords: software, sustainable local networks, Systems Design, sustainable waste management, sustainable development, output-input, autopoietic system, new local flows of materials, open production system.

1 Introduction

Capitalist development based on the indiscriminate exploitation of resources in the belief that availability is unlimited and has no cost has been the main cause of the emergence and progressive worsening of environmental problems (Ganapini, 1985). In the past 50 years humans have changed ecosystems more rapidly and extensively than in any other period of human history in order to meet the rapidly growing demand for food, water, and timber. In the past 15 years we have consumed more oil than in any other era in the past. At this pace, clearly, the remaining of oil fields will soon be dried up (Angela, 2008). Considering that the Earth is a place of life, we must not allow it to die by continuing to carry out activities that harm it. Therefore it is urgent to restore a lucrative relation between humans and the Earth, based not on its exploitation but on respect and valorization. In other words, we must implement the transition from violence against nature to a rational use of it as soon as possible. On the one hand we are witnessing an irrational exploitation of natural resources and on the other hand there is an unrestrained consumerism race prompted by veiled yet persuasive messages broadcast by the mass media based on the equation that: more consumption = more happiness = more social prestige. This has naturally led to another source of environmental risk in the form of an accelerated increase in the accumulation of residues. Moreover, the short lifecycle of products and society's interests are colliding with environmental concerns. Today we have developed "throwaway" consumer goods for the

sake of convenience but obviously these have a brief useful life duration and therefore they become waste much quicker than durable goods do. Nonetheless, in spite of the large amount of solid urban waste generated by our lifestyle and the system that supports it, the problem of treating/eliminating such waste is starting to be solved by the growing practice of differentiated garbage collection. However too little attention is given to the waste created by the production sector, apparently because it is perceived as far removed from our personal sphere. Fortunately the mass media is starting to give more attention to the impact and proportion this phenomenon has on our lives (Ceppa, Campagnaro et al., 2008). We must wake up to the fact that the growing mass of waste generated by industrial activities is becoming increasing critical as much as it causes serious damage to human health and the environment. Humans have recognized the problem too late and have tried to solve it downstream of the process of using the product. These actions that later proved to be inefficient. This occurred because we have always thought of production processes as a sequence of actions, independent from one another, implemented to produce a commodity. Along with said commodity a huge amount of waste is produced. Said waste is considered an obvious result, along with the finished product, of the manufacturing process. And as such it is accepted. This is why it is useful, nay, necessary to examine all the aspects of the problem and look at the current situation in its entirety.

2 Methodology

Examining a production process in its entirety allows us to reason by links. Consequently we can determine and highlight the numerous links that until now have remained hidden due to an overly linear vision of production among the various entities involved in the whole supply-chain. Systemic thought is based on the model of thinking by connections. To recognize a reality made up of qualities that are often not quantifiable, connections that are apparently invisible but indispensable to life, not “things” but a system of relations that concretize that which we are observing (Barbero, 2008). The basic idea of Systems Design is to observe the mechanisms of the Nature System, in which there is no concept of waste because what one species eliminates is what another species uses for its nourishment. Even surpluses are metabolized by the system itself. If these conditions, essential to any living system, are transferred to the world of production by applying the first principle of Systems Design according to which the waste (output) of one productive system can be used as a resource (input) for another (Bistagnino, 2008), we will be promoting the type of production that moves towards zero emissions. In such a scenario all the actors involved in the production chain will start to reason by connections. Faced with the incapacity to introduce new techniques for managing the problem of waste, we are still using dumps. Nonetheless these should be considered a transitory and temporary solution. Therefore systemic methodology proposes a new approach that stimulates people and companies to reduce all forms of waste and helps valorize the remaining outputs by giving them a new economic and legislative value . This way not only the so-called waste products are elevated to a status of materials worthy of proper, controlled and more sustainable management, but they can "move" within the production chain with new positivity and dignity.

3 Output/Input Systemic Software: a tool to generate new networks in which know-how, resources and energy transit

Current production processes do not fully exploit natural resources and discard a significant percentage. To exemplify, think of beer manufacturers that extract only 8% of the nutritional elements contained in barley or rice for the fermentation process (Capra, 2004), while all the

rest of the resource is thrown away as waste. To restrain this phenomenon we need to create an instrument for making the changes needed on the level of the management, organization and procurement of energy and resources. We can start seeing the importance of creating an IT instrument for study and analysis based on the concept of an open-loop system that can help neighbor companies, according to their business purpose or geographical location, to organize themselves into "ecological networks" to achieve production that moves towards zero emissions by means of sustainable management and the valorization of waste. Moreover, profits can be obtained from the sale of these outputs (waste). This would create new flows of material that would connect different companies. These enterprises could reach a condition of reciprocal advantage by allowing the reutilization of the materials put out by their production processes. The constant exchange of information and sharing of knowledge between the players involved allows a continuous systemic culture to spread, along with the concepts of prevention and the ongoing improvement of the environment. In such a system the flows of materials generate internal links and relationships through single local systems can be defined. These systems would connect the various systems on a regional level and ultimately on a global level. Underlying these concepts we find the fundamental ways to procure resources in an ecosystem: the production of material in loco by using energy obtained from the surrounding environment and the importation of material produced and released (Chelazzi, 2004) by other ecosystems. In this specific case the territory being studied is Piedmont Region. Its production is mainly metalworking, textiles, agriculture and cattle breeding. The starting point is to consider that the waste from these production processes, currently thrown away and not valorized, abound in precious resources for other manufacturing activities. According to the systemic methodology, production systems are observed according to their internal and external relations (with related industries), for the purpose of energy use, emissions control, procurement, the transportation of material and the management of outputs on the territorial level. They are redefined during planning and design and the outcome is a complex, ramified, multi-polar and strongly territory-linked operation. In these cases the waste is transformed into a productive resource and new relations are arise between local companies, thereby minimizing the use of external resources and allowing greater clarity in terms of the traceability of the production chains. This also helps determine which local activities can be related in an open-loop production system and what types of outputs can be reutilized by other production categories. From the information given on the MUD (Italian Consolidated Environmental Declaration Form on which companies are required to declare the waste they produce, collect, treat or eliminate, send to be recycled or transport) we can see that currently approximately 142,000 tons of the waste produced per year by agriculture, aquaculture, horticulture, forestry, is used as fuel or brought to the dump or destined to biological-physical-chemical treatments for the purpose of producing compost or mixtures to be eliminated by scattering them on the soil or storing them in permanent warehouses. These practices not only prevent exploiting the intrinsic wealth of these materials optimally but also cause a notable squandering of resources that can be used in other type of production. To prefigure the use of outputs as resources in a new process, we attentively examine the quantities and qualities of waste produced currently on the regional territory of Piedmont and then categorize them according to their physicochemical and biological properties. We then determine possible fields of use for them. The results show the differences and advantages between the current production process according to a linear structure and the new one that proposes an open industrial system. As a matter of fact we find ourselves facing not only a merely environmental issue but discover that there is a possibility to create a network for selling one's outputs. The implementation of these concepts shows us how important it is to create and use an instrument that allows companies to connect to each other and act locally. In specific, we propose the definition, design and realization of a system, the Systemic Software, for processing information based

on evolved technological systems that can acquire, catalog and organize information relative to the productive activities in the area of study, the outputs produced and the inputs required as resources; this data is acquired and organized in terms of quantity, type, quality and geographical location on the territory. All the data are correlated with each other by means of a complex logic. The logic and the algorithms that intervene on the acquired information serve to normalize the structures, allowing them to be interlaced and evaluated by evolved technological instruments which serve to render the information in an intelligible and intuitive format for all of those who interface with the Systemic Software. The consultation of the system was designed by following the systemic approach and made usable by means of Web 2.0 technologies; this approach has made it possible to publish an interactive Web portal as a facility that can be used by operators who want to consult it and interact with it. We start with the premise that the availability of new raw materials must definitely be measured according to type, quantity and quality; but it is essential to also evaluate their geographic location. This is the added value that Systemic Software offers companies and the community in which they are located. The processing system, developed in collaboration with Neosidea Group, was also supplemented with the function of geo-locating business is and materials and this provides a solution and that gives not only information regarding new areas of application of the outputs but also determines with precision and localizes by territory the flows of material within a local network whose nodes are represented by the companies present on that territory: by doing this valorize and encourage local economies and provide an accurate evaluation of market opportunities in areas not yet using and benefiting from the systemic approach. This technology makes it possible to obtain different levels of information regarding new business opportunities related to the companies on the network.

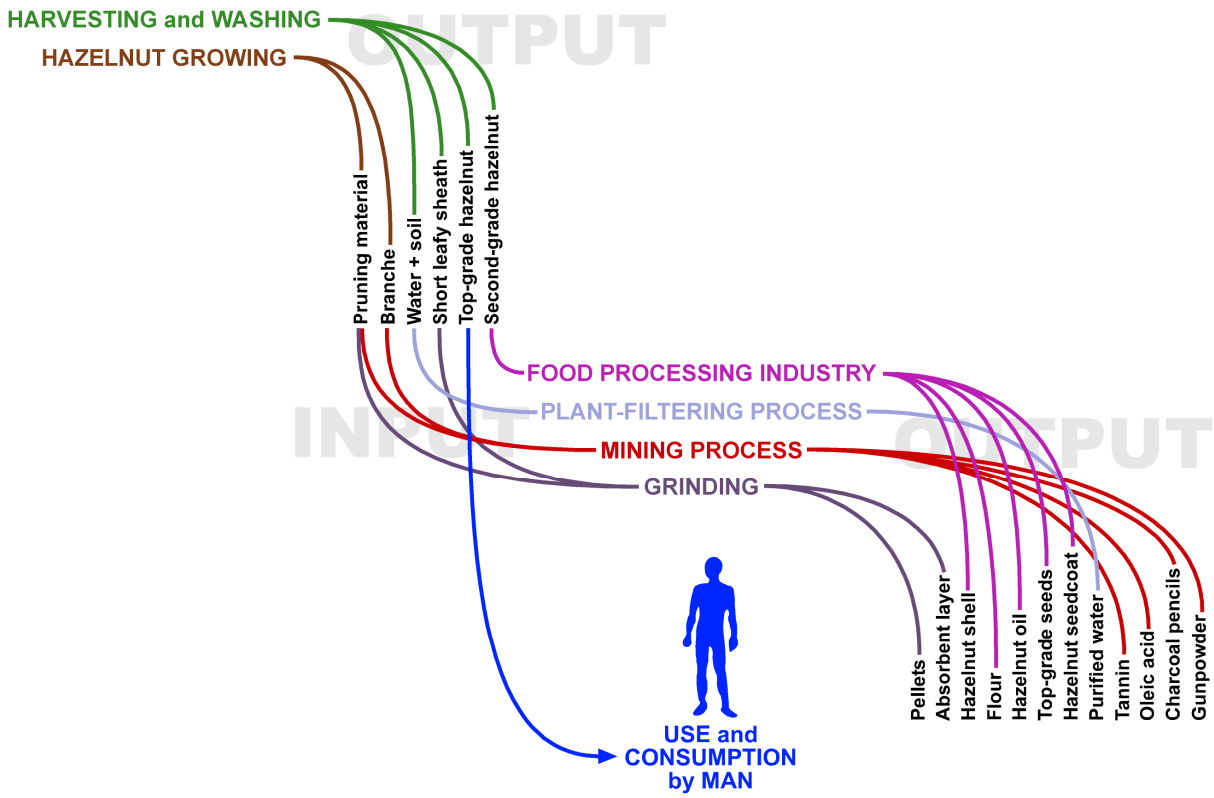

Figure 1: *Example of the creation of new flows of material in a hazelnuts systemic growing. Data are obtained by querying the output/input Systemic Software.*

Thanks to the development of a structured implementation logic based on the systemic vision, the information processing instrument or systemic software, is able to provide further information to set up new production chains and new flows of materials and services in favour of all the businesses who join the initiative thanks to a constant updating and comparison among the systemic logics for reusing materials, local productive activities and the territory itself. With the creation of this software we are proposing a tool that allows operators to contact local companies to procure resources or set up operations to reuse outputs for the purpose of reinforcing the bond with the local territory.

The functions of the systemic software are fourfold:

- producers of waste would be able to determine which local companies could use their outputs as resources in their production process;
- it tells input-seekers which companies produce outputs they can use as resources;
- it informs different producers about new business opportunities on the local territory that have previously remained hidden;
- it is an efficacious instrument for evaluating the entire production process and becomes an instrument for providing feedback.

Therefore this system can give useful and reliable information regarding one's current production process: if you enter the type of waste produced by your company as a search criterion, and the Software gives no results for possible reutilization of your outputs, this means your current production process makes waste that cannot be reused or recycled. It means your company produces items by using inputs and processes that do not comply with the vision of an open system. Therefore we have observed the need to implement certain changes within the production line, for example to reassess current inputs and substitute them with others that are more environmentally sustainable. Essentially we are proposing an IT network at the service of the environment, a web that speaks to the earthly roots of humanity and the deep need for a revived attention to nature and the resources it offers. The huge amount of data obtained by using Systemic Software is a precious asset and a vital platform for scholars of the environment, researchers, ecologists, public agencies, local administrators and, obviously, for entrepreneurs. The last mentioned actors will be able to work in a more sustainable way.

4 Conclusions

The greatest innovation offered by this approach consists of raising the awareness of producers that the problem of waste can be solved by activating complex relations in which the outputs of one productive process connect the nodes, which are local companies, of a network in which know-how, well-being, material and energy transit. The advantages of such approach are environmental and economic; among these the most important goal is to reduce the cost of waste treatment and therefore increase the profits from selling the company's outputs, reducing environmental costs, such as the consumption of energy, pollution and traffic caused by the transportation of materials; the use of already existing materials in loco removes the need to exploit virgin raw materials. The advantages of such an instrument are that they: improve usability, facilitate use and satisfaction, expand the potential area of users, improve the use of technological resources and local resources, raise the quality of life of society whose health depends on the way it relates to the environment hosting it, valorize the potentialities of the local territory and of the economy itself. The

proposal of a technological support of this type arose from the consideration that this “virtual” web allows us to react more rapidly when confronted with environmental issues, involve different areas of users, and have a positive influence on decisions and actions taken by public institutions as well as on producer companies. It is an indispensable instrument for gaining thorough knowledge about one's own territory, discovering and valorizing its potentialities by sharing the knowledge of different people and entities and enabling collaboration participated in by all of the actors involved. We are talking about "an ecological and systemic web", made for the human (Boscarol, 2003) dimension that can create a positive growth-promoting relationship among its users and to elaborate flexible and creative solutions thanks to the capacity to involve all of the interested parties through rapid technological means that are continuously being developed. The combination of the systemic approach and this technological support instruments improves understanding of the environmental and the economic benefits generated by a systemic nonlinear territorial productive culture which enables us to transform waste into materials worthy of a proper rational use. Such an approach is aimed at an optimal management of the waste/materials. More importantly it aims at the profitably reutilization of these materials. This reinforces the concept that effective environmental protection is not in conflict with the economic growth of enterprises. And it also demonstrates that optimal management of the input-production-output circuit is made possible by improving the use of natural resources by recovering and valorizing outputs.

References

Angela, P., Pinna, L. (2008), La sfida del secolo: energia. Mondadori, Milano.

Barbero, S., Campagnaro, C. (2008), Dai sistemi viventi ai sistemi industriali aperti. A review, Slowfood n. 34, Slow Food Editore, Bra (CN), 106-108.

Benyus, J. (1997), Biomimicry: Innovation inspired by nature. Morrow, New York. 9-10.

Bistagnino, L. (2008), Ispirati alla natura. Slowfood n. 34, Slow Food Editore, Bra (CN). 104-105.

Boggio, F., Dematteis, G., Memoli, M. (2008), Geografia dello sviluppo. Spazi, economie e culture tra ventesimo secolo e terzo millennio. UTET, Torino.

Boscarol, M. (2003), Ecologia dei siti web. HOPS, Milano.

Capra, F. (2007), The Science of Leonardo. Doubleday, New York. 358-361.

Capra, F. (2004), The Hidden Connections. Doubleday, New York.

Ceppa, C., Campagnaro, C., Barbero, S., Fassio, F. (2008), New Outputs policies and New connection: Reducing waste and adding value to outputs. Changing the change Conference, July 10-12. Turin.

Charvet, J.P. (2004), L’alimentation dans le monde - Mieux nourrir la planète. Larousse, France.

Chelazzi, G., Provini, A., Santini, G. (2004), Ecologia dagli organismi agli ecosistemi. Casa Editrice Ambrosiana, Milano.

Eldredge, N. (1998) Life in the Balance. Humanity and the Biodiversity Crisis. Princeton University Press, Princeton. 68-72.

Frey, M. (1995), Il management ambientale. Franco Angeli Editore, Milano.

Ganapini, W. (1985), La risorsa rifiuti. ETAS Libri, Milano. 150-152.

Mességué, M. (1999), Sauver la terre pour sauver l'homme. Robert Laffont, Montréal, Canada.

Pauli, G. (1996), Breakthroughs-What business can offer society. Epsilon Press, Surrey, UK.