

Urban regeneration as a strategic instrument for a design-based relocation of energy

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Abstract

The article is about the issue of energy transition, and in particular the potentiality of the regenerative approach as an opportunity to implement design strategies aimed to improve energy efficiency and in general to obtain high performing local systems. The energy transition, considered as a necessary breakthrough that was for too long time procrastinated, involves a process of technological, productive, political and cultural change towards new forms of social organization, production and use. This process, which began in a critical and experimental way in the 70s and continued in the 90s of the twentieth century, is now accelerating mainly because of strong growth of developing countries that have globally increased the consumption of energy reserves. The gradual depletion of fossil energy resources pushes up the price of energy to an increasingly marked turbulence in world markets. Also without an appropriate technological/scientific response, societies anyway have to change their production levers towards more sustainable methods able to avoid tragic human consequences, being the world population driven to count 9 billion people by 2100. The energy problem is, in fact, closely linked to the food problem, the environmental problem and to the scarcity of water resources worldwide. Whether the man will invent a new way of producing energy or not, in both environmental and economic scenarios an energy transition will however take place. What distinguishes the two scenarios are mainly the consequences of the transition on the world population. Jeffrey D. Sachs identifies three steps that are necessary to transition. The first step is linked to the improvement of energy efficiency, which means using less energy to achieve the same level of welfare. The second one is to go to solar, wind, hydro, nuclear (if we'll really find effective methods for the disposal of dregs, Ed.), geothermal and other forms of energy that do not rely on fossil fuels. Finally, as long as we continue to rely on fossil fuels, we have to capture CO2 emissions before they end up in the atmosphere (Sachs, 2014).

As happened for food and wine productions and as is now happening for the manufacturing productions, even the energy production and distribution systems are strongly reevaluating the concept of proximity. Local production methods are intended both as a way to produce close to the place of use and as sizing of the production according to the real needs of a community or in general of a specific place. We are therefore witnessing the transition from an highly centralized energy system to configurations characterized by a greater spread, networks that will be less vulnerable and more effective, all connected to small and self-sustainable smart grids, always capable to be well controlled.

1. Saturation vs regeneration

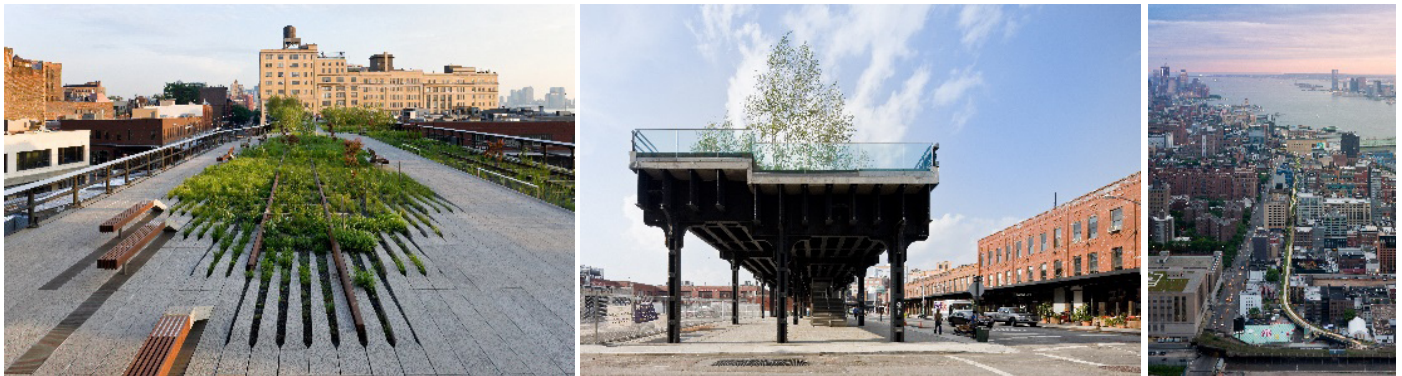
Starting from reconstructions made necessary after the devastations of World War II, the urban areas exponentially accelerated their expansion, incorporating industrial areas, small towns and rural areas in a constant process of growth. An expansion often uncontrolled, spontaneous or badly regulated that produced social dispersion and that also invaded areas previously destined for agricultural productions. This motion has produced a gradual loss of identity of the city and a new logic of polarization determined more to the functions that to a development oriented to the livability of the places. Are so born commercial districts, dormitory towns, business quarters and productive areas. Today there is no more space to invade and de-industrialization of urban areas has led to the existence of big areas than can be re-planned, regenerated. These places are located within the nucleus of the city and in areas which are strategic (no more marginal because

they have been incorporated by growth). How Ezio Manzini says: "The contemporary metropolis now seems to be a saturated habitat. And since there is no more an empty "elsewhere" to colonize, we know that every idea of the future, any proposed development will only be a reorganization of what we find in it today. In other words: every image that we can get about the habitats of tomorrow is, more than ever, conditioned by what was done yesterday, by what we have defined as the "prior factors" in the definition of habitat. The idea (completely abstract, but which has strongly influenced the collective imagination) of the Enlightenment engineer who designs from scratch the ideal city must be replaced by that of the *bricoleur* who uses (in a creative way, if he is able) what is there; decontextualizing it and giving it new meanings and new features". (Manzini, 1997)

So it is possible to state that "the space of today is full of

spaces of yesterday" (Salvemini, 2006). This means that, in a conscious or unconscious way, the territory is composed by artifacts made in the past, in different periods, and since ancient times a constant reorganization has been practiced, a layering of interventions related to the evolution of the meanings and social functions related to the place. The practices of juxtaposition of elements in the past were made according to different logics and with outcomes sometimes positive, sometimes negative. The first effort in this direction is in recognition of this heritage, in the acquisition of awareness of the built environment and the "selection" of what it is advantageous to regenerate.

tion. These are vulnerabilities that the project must protect and enhance, since their disappearance or any segregation in respect to the continuity of the urban landscape or, on the contrary, their trivialization and subsequent homogenisation to the context, could finally break the thin thread of memory that binds the past to the future and so the Man to the city "(Bosco, 2012). The interventions of regeneration are different from solutions that impoverish places, from recycling practices that negate the development and growth, but are occasions of contemporary reinterpretation of spaces and artifacts and their renewed relationship with the users and, more generally, with functions they contain. It is necessary,



Diller Scofidio+Renfro, Highline regenerated linear park, New York US, 2006-2014.

The contemporary scene is a patchwork of past scenarios; a set of historical components having different size, different symbolic weight. Elements or buildings that sometimes have been preserved in their form and function, other times they have been updated, reclaimed or distorted, or improved in their performative ability, or totally changed in function, other times they have been abandoned and left in ruins. The term regeneration so does not mean a simple restructuring operation, a soft make-up or worse a cannibalization of the existing. Regeneration is a new birth; the outcome of a research work, of a deciphering activity and a respectful taking in responsibility of the existing, an environmental recovery in cases in which we operate in polluted areas, the finding of new semantics of the place - the construction of new meanings, new symbolic contents and new features - but also a technological upgrading in the perspective of sustainable development; a philosophical reuse rather than a mere building practice. Antonio Bosco (2012) notes that, "in reference to the consolidated city (...) there exist, in its interior, spaces, buildings or elements of urban furniture that assume a paramount importance in the definition of the places. Their importance is related to their symbolic importance, but it can also result from other characteristics that affect the way of life of the people, recreational aspects or the intensity of perception that makes them signs of orientation and identifica-

therefore, a renaissance through new fertilizing acts, which produce territory again and new relationships between human settlements and environment. In these territorializing acts there is the germ of a genuine and lasting sustainability of development of a research that brings back to life the virtuous relationship, the alliances between nature and culture, between culture and history (Magnaghi, 2010).



Cox Architects, Kurilpa Bridge, Brisbane AU, 2009.

2. The evolutionary localization and the self-sustainability of the places

The achievement of local self-sustainability is closely related to the concept of independence, of self-determination of communities or otherwise to the theme of self-government of energy and food production, in accordance with the environmental needs of the place. The Russian philosopher Peter Kropotkin in the early twentieth century studied with ecological awareness the economic and social issues in relation to the physical environment and resources. He judged negatively the general abandonment of agriculture in favour of the urbanization of the peasants. According to Kropotkin in order to oppose to the abandonment it is necessary to reconsider the land as a common heritage, to put agriculture at the center of production activities, so developing organic intensive cultivations in urban and suburban areas starting from the traditional and local agricultural crops and strengthen them with modern technologies. Communities could easily get to forms of self-sustainability of food and then of energy productions with a greater spread of work, and encouraging short chains of mutual production/consumption, able to contain the brokerage market phases and therefore to contain prices. In short, he introduced many aspects that are nowadays proposed in current practices and in the modern debate about the strategic importance of short supply chains in strengthening local development. The theories of Kropotkin about mutuality in agricultural-manufacturing industry influenced many authors of the utopian culture as Morris, Huxley, Orwell, Schumacher, Ward, Chapman and a part of the history studies and theories of Anglo-Saxon urban planning (Mumford Howard, Geddes, Jack). (Scudo, 2011)

The modern problem of the environmental crisis connected to a consequential anthropological degeneration was already anticipated by the German philosopher Martin Heidegger in his essay *Building Dwelling Thinking* (1954) in which it is programmatically debated the theme of the relationship between places, spaces and philosophy of living. The same themes have been recently analysed by Cornelius Castoriadis. According to the Turkish philosopher, that is considered one of the theoretical fathers of the movement for the happy degrowth, the price to pay for freedom is the abandonment of the economy as the central value. The contemporary choices are originating irreversible depletion of the environment and of the resources that are not replaceable and they are also arousing the anthropological destruction of human beings, turning them into producers and consumers beasts, in brutalized subjects. The goal of the durability is to build a civilization of social welfare, based on a more equal division of wealth. The durability depends to the economic allocations and in general to a more conscious management

of resources. In this sense, it is growing the need of places to emancipate themselves from external constraints such as the public debt, the dissipation of financial resources among different geographical areas, the protective barriers imposed by richer countries, the restrictions on access to knowledge. It is then introduced the need to assess the cost-effectiveness in social terms rather than just through the economic criteria of profit.

The ecological durability may be made possible with the help of the following levers:

- to increase the carrying capacity of the planet by exploiting the potential of different ecosystems;
- to limit the consumption of fossil fuels and other resources and products easily exhaustible or potentially dangerous for the environment, replacing them with other renewable, safer and/or abundant ones;
- to intensify the research for clean and efficient technologies in terms of the use of natural resources for the development of urban, rural and industrial contexts;
- to define rules for adequate protection of the environment and, for this purpose, to set up the necessary institutional arrangements and proceed to the choice of the right combination of economical, legal and administrative instruments.

The spatial (or geographical) durability depends on a better balance between town and country, and on a well-planned distribution of human settlements and economic activities, with an emphasis on the following issues:

- to avoid of excessive concentration in the metropolis;
- to avoid of destruction of fragile ecosystems by Man;
- to promote a modern agriculture and regenerative cultivations to small farmers by providing them with appropriate technical means, funds and market access;
- to promote the possibility of decentralized industrialization.

The cultural durability seeks to promote change in cultural continuity, translating the concept of eco-development in a number of local solutions, specific to each ecosystem, cultural context and site. In this perspective, the development must be seen as a function of a limited territory and viable and relevant projects, that local communities are able to manage in autonomous and independent way. Andreas Kipar (1993) takes on five integrated objectives as a reference for the environmental remediation. These objectives concern the maintaining and the development of the ecological potential of territories, of the morphological and aesthetic quality of the landscape, of the social quality, of the quality production for environmental purposes, of the functional quality of the space for connections on a sharing grid. One of the fundamental steps made by the European Community for the definition of a common course for sustainable devel-

opment is the Aalborg Charter stipulated in Denmark on May 27 1994. European signatory cities declared "(...) that sustainable human life on this globe cannot be achieved without sustainable local communities. Local government is close to where environmental problems are perceived and closest to the citizens and shares responsibility with governments at all levels for the well-being of humankind and nature. Therefore, cities and towns are key players in the process of changing lifestyles, production, consumption and spatial patterns." (Aalborg Charter, 1994)

The so called territorialist approach underlines that the problems of sustainable development put in the foreground the territorial heritage in its environmental, urban, cultural and social aspects as fundamental elements for the long-lasting production of wealth. To counter the deterritorialization processes, the territorialist approach refers sustainability to the activation of virtuous systems of relationships between the three components of the territory: the natural environment, the built environment and the anthropic environment. The production of high-quality spaces (and not just of environments) is the precondition of sustainability, since the production of the territory is taken as the basis of the production of wealth. The concept of sustainable development is related not only to the reproducibility of natural resources (environmental sustainability), but also to complex interactions of the non-hierarchical organization of territorial and urban systems (regional sustainability), to the consistency of production systems with the enhancement of the territorial and the development of local entrepreneurship (economic sustainability) and the growth of self-government of local societies (social and political sustainability). This approach intends to pursue all these forms of sustainability and it takes the promotion of local self-sustainable development as the key element of its action, where the term 'local' aims to highlight the exploitation of land resources and the identity of the place, while 'self-sustainable' indicates the importance of a search for rules of settlement, economic and socio-political regulations able to produce local homeostasis and long-lasting balances between natural environment, built environment and anthropic environment. It is assumed therefore an autopoietic system; that is capable of self-generating, self-sustaining and so to be independent from external forces. The purpose of planning doesn't concern only with environmental protection, but with the overall quality of the territory and life activities. If the modern production considers the inhabitant as the consumer of a product (the house) the territorialist approach intends to give back to the inhabitant an active role of direct manufacturer of goods, places and meanings. Local self-sustainable development goes then understood as the development of cultures, economic subjects and techniques that can synergistically activate self-entrustment, care of basic needs

and promotion of eco-development, such as the growth of local societies, respect for differences and cultural specificities, identifying ways of living based on new principles such as self-determination, the production of wealth referring to the territorial values, achieving the equilibrium of the ecosystem at the local scale. The territorialist approach differs from all other approaches to sustainable development (including the Ecological Economics) for a greater attention to local items and because it considers environmental sustainability inseparable from the cultural, social, political and economic sustainabilities. In particular it is not suggested to consider technological efficiency as the decisive factor to address the serious ongoing process of environmental degradation. The dematerialization of products and energy conservation and the development of new and more efficient techniques for the disposal and recycling of materials can only help to slow this process, but these methods are not sufficient to recreate the culture of self-sustainability and care of the land which can really produce a change of direction. "The sustainability of the territory cannot in fact be entrusted to machines and technology-directed economies, it can be obtained only through a regained environment wisdom and through the production of the territory by the inhabitants" (Magnaghi, 1997).



TNO, SolaRoad, Prefabricated PV system for urban paving, Amsterdam NL, 2014.

Another organizational approach in many aspects similar and anyway focused on the rediscovery of the values of the territory and sustainable development is the so-called Systemic Design. The Systemic Design is based on relationships and on a broad vision of the processes. In extreme synthesis it represents the ability to design a product (or a service) taking in consideration all of its cycle, conceiving it as part of a system that interacts with it. The system uses what is needed and what is not directly useful is no longer seen as a waste, but it becomes a resource for another system. A school of

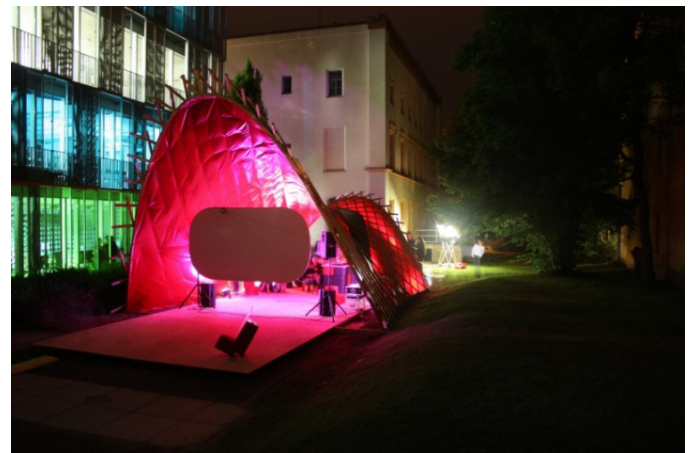
thought that deviates from the theories of happy degrowth, of proposals of reduction, of shrinking, constriction, of generalized impoverishment and denial of progress. As stated by Herman Daly: “while growth provides quantitative expansion of the scale or the size of an economic system, the term “development” refers to the qualitative change of a system that is not dimensionally growing, but it is in balance with its environment”. (Daly, 1997) The debate between sustainable development and convivial decrease, however, rather than requiring an excessive theoretical analysis, requires concentration on multidisciplinary projects, on concrete proposals, choices, solutions, ideas towards improving both the environmental, social and economic values. As the economist Pasquale Persico suggests: “It must born a resilient approach based on social base of reference, which takes care of the possible transformation. It is assumed that the difficulties of the territories and cities can be overcome abandoning the idea of the “City for Projects” and encouraging the concept of a “Regenerative City” that requires the identification of a new social base as a prerequisite of a new territorial weaving that can produce economic and social value.” (Persico, 2013).

3. Towards local produced energy

As often happens, technological innovations have the possibility to pioneering progress in areas of use in which the major fundings for research are destined, and then they can be transferred to more common contexts. The off-grid energy technologies have been previously tested in aerospace engineering to supply energy to the probes, orbiting satellites and bases. Subsequently, these solutions have been adopted for military needs. One example is the K10 Solar Power Station that was developed by Italian companies Warex and CTRS Group. It is a photovoltaic stand-alone modular transportable and repositionable station. A container that can be moved using an ordinary truck and that can hold everything it's needed (photovoltaic modules, structures and components for clamping, control instruments and wiring, batteries for the accumulation) for the creation and the workability of a small power station. The system is designed to operate in extreme climatic conditions, to be easy to install and to manage and to be reliable over time. The base version produces 40,000 Wh every day. In areas of health emergency the produced energy so becomes a vital tool that can be used for purposes that elsewhere might seem basic, but in reality may be fundamental as for example extraction and purification of water, irrigation, refrigeration, communication, lighting or the possibility of setting up small centers of medical first aid.

Bauhaus University faced the theme of local production of

energy in 2010 with the projects Screenhaus.SOLAR and EnergyTerminal.SOLAR. The research team coordinated by Jürgen Ruth designed a self-sufficient outdoor cinema, integrating PV flexible modules on a light and attractive hyperbolic wooden pavilion. Energy Terminals are mobile solar towers that generate electricity with the simplest means possible. As a modern campfire they are a sustainable model of energy for regions with weak infrastructures and high solar time. The three meters high towers are made of nine bamboo poles and a rigid panel that integrates a flat light source. The towers are conceived as recharge stations for every type of mobile device.



Bauhaus University, Screenhaus.SOLAR, off-grid PV outdoor cinema, 2010.



Bauhaus University, EnergyTerminal.SOLAR, solar tower, 2010.

As what happened for the agricultural food productions and for production of artefacts thanks to the latest rapid manufacturing technologies, also for energy production there is a strong reconsideration of the idea of local production, self-production, close production, and then of low-impact systems. In this case, the theme of renewable energy use concerns the study of systems that enable local production of

energy and the generation of well dimensioned amounts of energy in places where it is not possible or is not favorable to connect to a traditional power grid. There are in fact large areas - for example in Africa, India, in rural areas of South America, Asia and, in part, in Eastern Europe - where, due to geographical, economic, environmental or technical problems, there is no access to an electricity network or where it is too expensive so it is not practicable in a widespread way. The stand-alone systems (off-grid systems) allow communities to have electricity in remote places, where a possible connection to the national grid may be too expensive or even impossible. This option allows people to use machines and devices in contexts that are isolated or difficult to reach. There are many examples around us that can be listed: road signs, huts or mountain shelters, public lighting in areas that are few densely populated, tools for remote monitoring, irrigation systems on farms, lighting in public parks, the provision of energy for homes in rural areas. It is possible to observe that the places where systems for energy independence have been tested to date are places characterized by geographically and logistically criticalities. For example we could mention the project aimed to enable the provision of a mains electricity grid in the remote Scottish island of Eigg, powered by renewable sources. Previously, the island was not served by mains electricity and the individual houses had wind, hydro or (above all) diesel generators. On 1st February 2008, the Isle of Eigg switched on of the island electrification project, which now makes 24 hour power available for the first time to all residents and business activities on the island. The project is a world leader in the integration of multiple renewable energy sources into an independent grid system to supply an isolated and scattered small community.



Eigg Electric, Centre for energy storage, Isle of Eigg, Scotland, 2008.

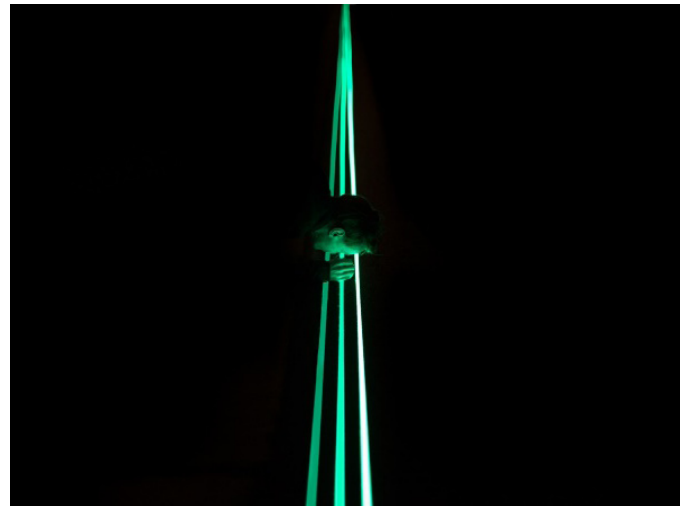


Eigg Electric, Isle of Eigg, Scotland, 2008.

A similar example is the Italian Alpine village of Prato allo Stelvio. For its part, this small municipality, has a long tradition in the energy supply from renewable sources: the commissioning of the first hydroelectric power station and a local energy strategy dates back to 1926. The actual energy grid sees the involvement of citizens, in main part members of the cooperative that manages the local electric plants. The successful formula of Prato distinguishes itself also for the variety of technologies brought into play, which use biomass, solar source, water and wind. The winning strategy characterized by the union of different technologies not only allowed this small Italian municipality to compete at European level, to develop economic activities as tourism and commerce and to avoid the population decrease, but it also permitted its citizens substantial savings in electricity bills. The members of the Energetic Cooperative, representing 90% of the connected users, receive retail prices that are about 30% lower than regular market prices. The village's grid also proved to be less vulnerable than the national one: in 2003 in Italy a big blackout happened (the event was triggered by the falling of a tree) and all over the nation only Sardegna Region, few small islands and the municipality of Prato allo Stelvio didn't have any sort of inconvenience.



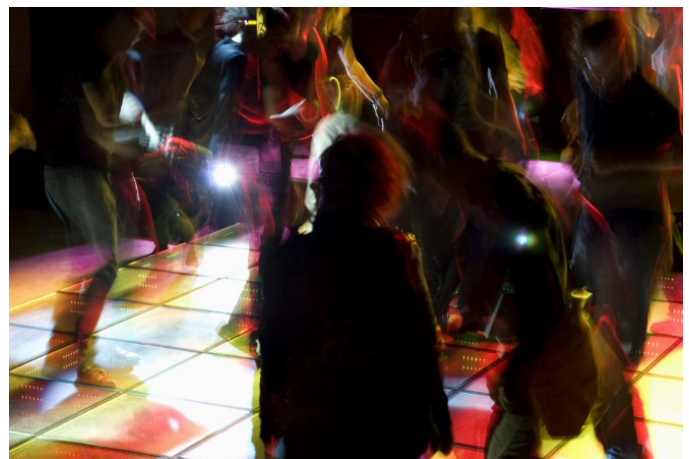
Solar Century, Blackfriars Bridge solar roof, London UK, 2014.



Daan Roosegaard, Glowing Lines, Smart Highway, 2012.



Infrabel and Enfinity, Solar tunnel, Brasschaat BE, 2011.



Daan Roosegaard, Sustainable Dancefloor, Sustainable Dance Club, Rotterdam NL, 2008.

There are some regeneration experimental projects that used the built environment to create multifunctional green energy local stations. For example we could mention the Brennero Photovoltaic Barrier, built in Italy integrating PV modules on an highway's prefabricated acoustic barrier, the Solar Tunnel that was realized by Infrabel in Belgium in 2011, the photovoltaic covering of the Blackfriars Bridge that was inaugurated in London in 2014 and the SolaRoad, a challenging project by TNO concerning a way to create a prefabricated PV urban paving system. Other interesting design proposals are the ones by Dutch architect Daan Roosegaard, who adopts dynamic paints, interactive lighting technologies (active or passive), and energy harvesting mechanisms to obtain multifunctional and poetic landscapes.

5. Conclusions

The energy question, namely the global debate about the sources of energy supply and their exploitation, is a highly complex issue that inevitably involves several disciplines and which now requires courageous choices even if they are anyway forced by the exponential global environmental depletion. It is important to note that a peculiarity of the design-oriented approach to the energy question can be the focus for the value of use of the proposed solutions. Design can face the problem from the point of view of the needs of the users, their demands, the contexts and the modes of use, rather than from the sources and logics of sale. Design has also the role to support a progressive refinement of needs with radical innovations in the world of products, systems and services that will be able to counteract a growing waste of resources. From the contemporary context also emerges the necessity of the redefinition of key concepts as "social

need", "limit" and "risk" in order to tend to an higher level of resilience of territories. If governments will not be able to recognize the different needs that different populations have and to support a national economic development research for social equity in the satisfaction of basic needs we will face increasingly harsh social crises.

In conclusion we can state that it is wrong to conceive the energy transition simply as a replacement of sources. Thanks to the exploitation of renewable resources, the concept of the spread of production of electricity is returning very current. Energy production is more and more becoming local, socially accepted and directly connected to the use and in the near future communities will need efficient, safe, tangible, simple

and clever solutions that will avoid any kind of soil consumption and that will involve different disciplines (as architecture, urbanism, industrial design, civil engineering, but also the sciences of materials, ICT and political economy). We have to begin to conceive energy as something precious, something that is not taken for granted, something that we have to produce when and where we need, something that has to be managed in a more ethical way, but also something of that we will be proud to have lovingly produced all by ourselves and to share with our neighbour, like a good homemade jam pie. Characteristics of scenarios that seemed to be overcome, or at least valid only in times before to the massive expansion of networks for global transportation of energy.

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