SCORE! Sustainable Consumption Research Exchange

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Authors were provided a format and clear instructions for lay-out. Most authors followed these instructions very good, leading to a consistent presentation of most of the individual papers. Due to the large number of papers, the editors were unable to embark on the time consuming process of adjusting any lay-out errors in papers submitted. Papers had to be reproduced here in the lay-out in which they were submitted, and where authors did - or could - not follow our instructions this may have lead to slight inconsistencies in presentation.

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Chapter 9 Designing sustainable system innovation transition for low-industrialised contexts

A transition path towards local-based and long lastingsustainable mobility solutions in African contexts

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1 General framework

Sustainability is a challenge both for "industrialised", "newly industrialised" and "low industrialised" contexts. However there are various paths to achieve this goal in relation to the different types of contexts (Hart and Milstein, 1999): in fact, if in *industrially matured economies* there is the need to reduce the use of resources per "unit of satisfaction" (together with the improvement of quality of life), and in *newly industrialised economies* the aim is to look how they can leapfrog directly towards sustainable consumption and production systems, in *low industrialised economies* the impellent need is to foster the systems of production and consumptions in covering basic needs and providing a subsequent basis for a sustainable growth.

In this framework it is clear that newly and low industrialised contexts need to go through a process of socio-economic growth to reach a socially perceived quality of life similar to that of most developed contexts; and to achieve this goal it is obvious that a redistribution of resources has to take place. However it is important to underline that sustainability is not only a matter of resources redistribution, but it is connected to a wider spectrum of implications and responsibilities, such as: the principles and rules of democracy, human rights and freedom; the achievement of peace and security; the reduction of poverty and injustice; improved access to information, training and employment; respect for cultural diversity, regional identity and natural biodiversity (UN, 2002). In other words we are talking

[1] The paper is the result of a collaboration between the two authors; nevertheless Vezzoli wrote sections 2, 3, 4.1,4.2 and 6; Ceschin wrote sections 1, 4.3 and 5.

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of *Social equity and cohesion* as the promotion of "a democratic, socially inclusive, cohesive, healthy, safe and just society with respect for fundamental rights and cultural diversity that creates equal opportunities and combats discrimination in all its forms" (EU, 2006).

Related to that someone is arguing that "*Product Service System (system innovation) may act as business opportunities to facilitate the process of social-economical development of emerging context - by jumping over or by-passing the stage characterized by individual consumption/ownership of mass produced goods - towards more advanced service-economy "satisfaction-based" and low resources intensive"* (UNEP, 2002), and that *local-based and network structured initiative* (distributed economies), "fed" by renewable sources, on the one hand would reduce environmental impact, and on the other could facilitate a democratisation of resources and energy (Rifkin, 2002; Mance, 2003). When speaking about system innovations someone else is arguing that there is the possibility to manage and influence the transition towards this kind of innovation (Kemp et al., 1998, 2001, 2004).

Within this working hypothesis a project has been set up based on the co-operation of some universities in Africa and Europe. The project is called *University Chairs on Innovation,* and is aimed at creating an European-African network of universities and universities chairs to tackle the issue of the industrial and human resources development in the field of innovation; the final goal is to set up a continuous cooperation between industry and university in order to provide benefits to local industries. The project involves several European and African universities[2] and the *African Union Council of Ministers of Science and Technique,* and it is supported by UNIDO.

Within this project Politecnico di Milano University has established an agreement with the Universitè Polytechnique De Bobo-Dioulasso (Burkina Faso), the University of Zambia and the University of Lagos (Nigeria), for the definition of sustainable pilot projects aiming at the introduction of locally-based and long lasting mobility systems for low income contexts in Africa: a system for drinkable water transportation in Burkina Faso, a system for flour transportation and distribution in Zambia and a system for disabled students transportation in Nigeria[3].

The working hypothesis of this project is that design could have a role in orienting and managing the transition towards the diffusion of system innovations.

[2] European universities involved: Politecnico di Milano University, Graz University of Technology, Delft University of Technology; African universities involved: University of Nairobi (Kenya), Dodoma University (Tanzania), Freetown University in Sierra Leone, Kampala University (Uganda), University of Lagos (Nigeria), Dakar University (Senegal), University of Cape Town (South Africa), Cairo University (Egypt), Universitè Polytechnique De Bobo-Dioulasso (Burkina Faso), University of Zambia.

[3] These three projects represent a series of on-going degree thesis of the Faculty of Design of the Politecnico di Milano University, coordinated by the Research Unit Design and system Innovation for Sustainability (DIS), of the INDACO dept. In particular Livia Martucci is developing her degree thesis on the project for the context of Burkina Faso; Maurizio Bazzi on the project for the context of Zambia; Hazal Gumus on the project for the context of Nigeria.

The background assumptions of this hypothesis is that one possible promising path to achieve SCP is based on the diffusion of (product-service) system innovation approach and of locally based and networked structured initiatives; and that universities may represent promising places for fostering the generation and the experimentation of these new hypothesis, for a subsequent wider diffusion.

Within this framework the paper's objectives are:

1. to present and discuss an hypothesis of *evolutionary transition path* to introduce and diffuse (starting from University research context), sustainable system innovations in low industrialised contexts, in order to provide basis for a local sustainable growth;
2. to outline the convergences and the common elements between the elaborated path and the *Transition Management for Sustainable Consumption and Production* model[4];
3. to discuss the new potential role and field of action that design could have in defining strategies by which innovative sustainable system innovation concepts might be introduced and diffused.

The first part of the text analyses why (product-service) system innovation may be considered an opportunity for sustainability also in low-industrialized contexts, and for which reasons local-based and networked structure initiatives could represent a promising economic model to foster both environmental and socio-ethical sustainability.

The argumentation will then focus on the *University Chairs on Innovation*, and in particular it will be described the hypothesis of *evolutionary transition path*, detailing its key steps, describing how to involve the appropriate stakeholders (Institutions, Universities, Industrial Companies, NGO, local authorities, single persons, etc.), how to set the basis for the development of a pilot project (characterised by being a locally-based and networked-structured initiative), and how to evolve this niche experiment in a self standing and replicable sustainable solution. The similarities and convergences with the *Transition Management model* are discussed.

Finally the text will discuss the potential new role for design in transition management.

2 System innovation as promising approach

In the research arena the debate around Product-Service System or system innovation for sustainability, has proposed that such innovations are favourable also for emerging or low-income contexts and help to tackle the socio-ethical dimension together with the environmental one.

Within this framework the effort started in 2000 by the United Nations Environment Programme (UNEP) is symptomatic. This set up a group of international researchers (from industrialized, emerging and developing

[4] We refer to the *Transition Management for Sustainable Consumption and Production* model developed in the Netherlands by Rotmans, Loorbach and Kemp (see Kemp et al. 1998; 2001; 2004; 2006).

countries)[5] to disseminate world-wide the concept of system innovation, and to start exploring the issue, which can be summed up in the following question: is system innovation (PSS) also applicable in emerging and low-income contexts?

The question arises simply because the development of Product-Service Systems, that had been studied, said and achieved till then, concerned only the environmental and economic aspects, and mature industrialised contexts. It did not refer to the socio-ethical dimension or to emerging and low-income countries/contexts.

This question has been the forerunner of another: (if the answer to the first is affirmative) can a system approach favour the social equity and cohesion qualification of these contexts as well as their eco-efficiency? And if so, with what particular characteristics? The response of the above mentioned international group of experts to these questions, is the following hypothesis: *"PSS (system innovation) may act as business opportunities to facilitate the process of social-economical development of emerging context - by jumping over or by-passing the stage characterised by individual consumption/ownership of mass produced goods - towards more advanced service-economy "satisfaction-based" and low resources intensive"* (UNEP, 2002).

The above hypothesis was supported by the following main arguments (UNEP, 2002)[6]:

1. If PSS are eco-efficient at system level it means that they may represent opportunities, at least at a macro level, for a context with fewer economic possibilities to respond more easily to unsatisfied social demands.
2. PSS offers are more focused on the context of use, because they do not only sell products, but they open relationships with the end user. For this reason, an increased offer in these contexts, should trigger a greater involvement of (more competent) local, rather than global, stakeholders; fostering and facilitating a reinforcement of the local economy.
3. Since PSS are more labour/relationship intensive, they can also lead to an increase in local employment and a consequent dissemination of skills.
4. Since the development of PSS is based on the building of system relationships and partnerships, they may be coherent with a democratic re-globalisation process.
5. Finally, they are coherent with the development of network enterprises on a local base for a bottom-up re-globalisation. This last consideration is quite important since its connection to aforementioned potential for convergences between environmental and socio-ethic sustainability.

[5] The work involved a group of researchers from several countries in the more or less industrialised world; it was set up in 2000 and ended with a publication in 2002 presenting the main achievements (UNEP, 2002).

[6] This hypothesis has also been examined in a series of case studies, collected by the group engaged by the UNEP.

3 Distributed economies as promising economic model

The IIIEE in Lund (see Johansson et al., 2005) indicates that the mainstream economic and industrial model, characterized by centralised and large-scale production units, determines dynamics that undermine sustainability (both on environmental and socio-ethical levels). Examples of such dynamics include:

1. increasing the movement of raw materials and products over larger distances, mainly relying on decreasing transportation costs;
2. distancing production from consumers and thereby hiding the environmental and social costs (Dahlberg et al. 1998);
3. weakening the local actors' possibilities to have ownership and control over their immediate economic environment;
4. distorting or destroying cultural identities;
5. limiting the diversity in regional economic activities.

Besides these disadvantages, Johansson et al. points out that the same characteristics of the production units of being large-scale and centralized limits their ability to respond to a rapidly changing demand.

The promising alternative indicated by the IIIEE is the introduction and diffusion of distributed economies, defined as a "selective share of production distributed to regions where activities are organized in the form of small scale, flexible units that are synergically connected with each other".

On the other side of the ocean similar economic models are described by Euclides Mance, who is approaching the issue from a more solidarity economy background. Mance is talking about solidarity cooperative networks (Mance, 2003): as "network in which units of production and consumption are articulated in nodes enables to self-propagate and self-feed in a solidarity collaboration".

What those two theoretical models have in common is:

1. They are "locally-based" enterprises or initiatives meaning they start from sustainable local resources and needs, but could become open to non-local or global system.
2. They are "network-structured" enterprises or initiatives meaning they can gain critical mass and potentialities by their connections in network.

It has to be remarked that, when looking at distributed economies, the socio-ethical and environmental dimensions are closely linked (Mance, 2001; Rikfin, 2002; Sachs et al. 2002; IIEEE, 2006; Vezzoli, Manzini, 2006; Crul, Diehl, 2006). For example, assuming the hypothesis of distributed energy generation based on solar and hydrogen (e.g. Rifkin, 2002), a decentralised infrastructure supplied by renewable sources, on the one hand would reduce environmental impact, and on the other could facilitate a democratisation of resources and energy, enabling individuals, communities and nations to reclaim their independence while accepting the responsibility that derives from their reciprocal interdependence (self-sufficiency and interdependence).

More in general (i.e. not only in relation to solar and hydrogen derived energy) we can observe that in an interconnected context (in communications, but potentially also in resource management) a principle that double ties the environmental question to social ethics can be

summarised as follows: use primary local, conservative, regenerative (i.e. locally sustainable) resources and introduce decentralised system networks for the extraction, production and use of those resources.

It has also been observed (Sachs, 2002; Sachs, Santarius, 2007) that when they are local, social-economic stakeholders involved in the extraction, transformation and sale of resources, then they pay far more attention to preserving (resource) renewability. The obvious underlying reason is that their economic subsistence depends in the short, but also in the long term on these resources. Therefore they are not in favour to exhaust them quickly.

At this point we can make a further observation: there is a potential convergence between key environmental and socio-ethical strategies that is inherent in re-globalisation models characterised by diffused participation, where locally based networked communities and "network enterprises" (consisting not only of entrepreneurs, but also of users, NGOs, associations, institutions etc.) assume particular value. This theme intertwines with other points of interest in research on so-called forms of alternative economy or alternative enterprises, founded on the concepts of cooperation, collectivity and collaboration (the so-called C factor (Razeto, 2004). In particular, it merges with research on co-operative networks and creative communities (Florida 2002; Manzini, Jegou, 2003; Meroni 2007), characterised by the self-organised activities of aware, critical, motivated citizens who are organized to a greater or lesser extent into networks and solidarity economy districts. In other words, it is linked to work on those forms of sustainable social innovation, i.e. solutions of high social quality and low environmental impact, that spring from active, bottom-up, social participation.

4 UNIDO projects: African-European co-design projects to diffuse sustainable mobility solutions

As said before Politecnico di Milano is involved in an on-going research project called *University Chairs on Innovation*. The project's objective is to set up an European-African network of universities and universities chairs to tackle the issue of the industrial and human resources development. The final goal is to set up a continuous cooperation between industry and university in order to provide advantages to local industries. The project involves several European and African universities and the *African Union Council of Ministers of Science and Technique*, and it runs under the UNIDO's umbrella.

Within this research project the role of DIS research unit of Politecnico di Milano is to cooperate with some African universities (Universitè Polytechnique De Bobo-Dioulasso, University of Zambia and University of Lagos), in order to introduce sustainable mobility solutions for low-income contexts in Africa. In particular:

1. a system for drinkable water transportation in Burkina Faso;
2. a system for crops transportation and distribution in Zambia;
3. a system for disabled students transportation in Nigeria.

All these mobility systems are based on two main strategies: the adaptation of an already prototyped solar-powered light working vehicle[7],

[7] The family of vehicles (called MULO system), has been designed by Fabrizio Ceschin in collaboration with the research of unit *Design and system Innovation for Sustainability* (Politecnico di Milano – INDACO department), and IPSIA "A. Ferrari" of Maranello. The

with zero emissions in use phase; and the design of an evolutionary stakeholder network leading to local-based and stable solution.

In particular the vehicle is a four wheeled hybrid, powered by solar, electric and human power, convertible in four variants: freight transport, people transport, green areas maintenance and vending around.

Figure 1. The designed vehicle (freight transport version).

To reach the aim of the project an hypothesis of *transition path* to introduce and diffuse, starting from University as spin-off actors, sustainable system innovations, has been outlined.

The elaborated *transition path* could be described as a strategic orientation and adaptation of the steps that, starting form an university research context and through a continuous iterative multi-stakeholder learning process (feedbacks), brings to the design of a sustainable solution, to its *experimentation in a pilot project*, its development in a *self-standing solution* and its consequent *diffusion.*

For this reason it has been defined as an *evolutionary transition path*, with the word *evolutionary* meaning an intentionally and oriented adaptation of the solution's evolution, through continuous experimentations. In other words it has been imagined a path and the proper conditions by which all the feedbacks coming from the solution's experimentations are collected by the actors network and used for evolving the solution.

In brief the elaborated *evolutionary transition path* (see figure 1), is based on the definition of the *goals* (to be achieved), and on the definition of a *vision* (of how to achieve these goals); the *vision* determines the *steps* of

prototype has been realized by IPSIA "A. Ferrari" of Maranello. For more info see: www.mulosystem.it.

the transition and the *stakeholders network configuration* needed to carry out each single step; in turn the transition steps influence the *vision* definition and the *stakeholders network* building (in a continuous iterative process).

The *evolutionary transition path* emerged in the projects, is made up by four main steps:

1. Sustainable solution design
2. Pilot project experimentation
3. Self-standing solution development
4. Solution diffusion.

Each of these step can be associated with a specific *stakeholders network* configuration, capable to carry out each single step; it has to be remarked that the definition of the evolution of this stakeholders network represent an important and fundamental element of the whole transition process.

The following text describe each single transition process phase visualized in figure 2: *goals and vision definition*, *stakeholders network building* and the *evolutionary transition path* (with its four steps).

4.1 Goals and visions

As said before the transition path is based on the definition of *goals* and *vision*.

The *goal* of the project is the diffusion of sustainable and long-lasting mobility system in low-income African contexts, based on local resources.
Nevertheless it has to be underlined that the potential consequences of the project are not only connected to the improvement of mobility, but are also linked to the diffusion (within local universities and companies), of competencies and know-how to foster local Sustainable Consumption and Production (SCP), and so to find solution to cover basic needs and setting the basis for a consequent future sustainable growth. For this reason the project could potentially have in future wider benefits than the scheduled ones.

The *vision* to achieve these goals is based on the assumption that for low-industrialised contexts a possible promising path to achieve the goal of SCP is based on the diffusion of *system innovation*, meaning not only a product or technology innovation but the design of products and services and of the stakeholders interaction for a given demand of satisfaction. A system innovation characterized by being local-based (solar-powered for local needs), and network-structured (involving various stakeholders starting from university).

So, the elaborated *vision* to reach the previously mentioned aims is to creating the proper conditions for: co-designing (together with local universities and companies), a sustainable system innovation for mobility solution (characterized by being locally based and network-structured); setting the basis for the realization of a pilot project (to experiment and

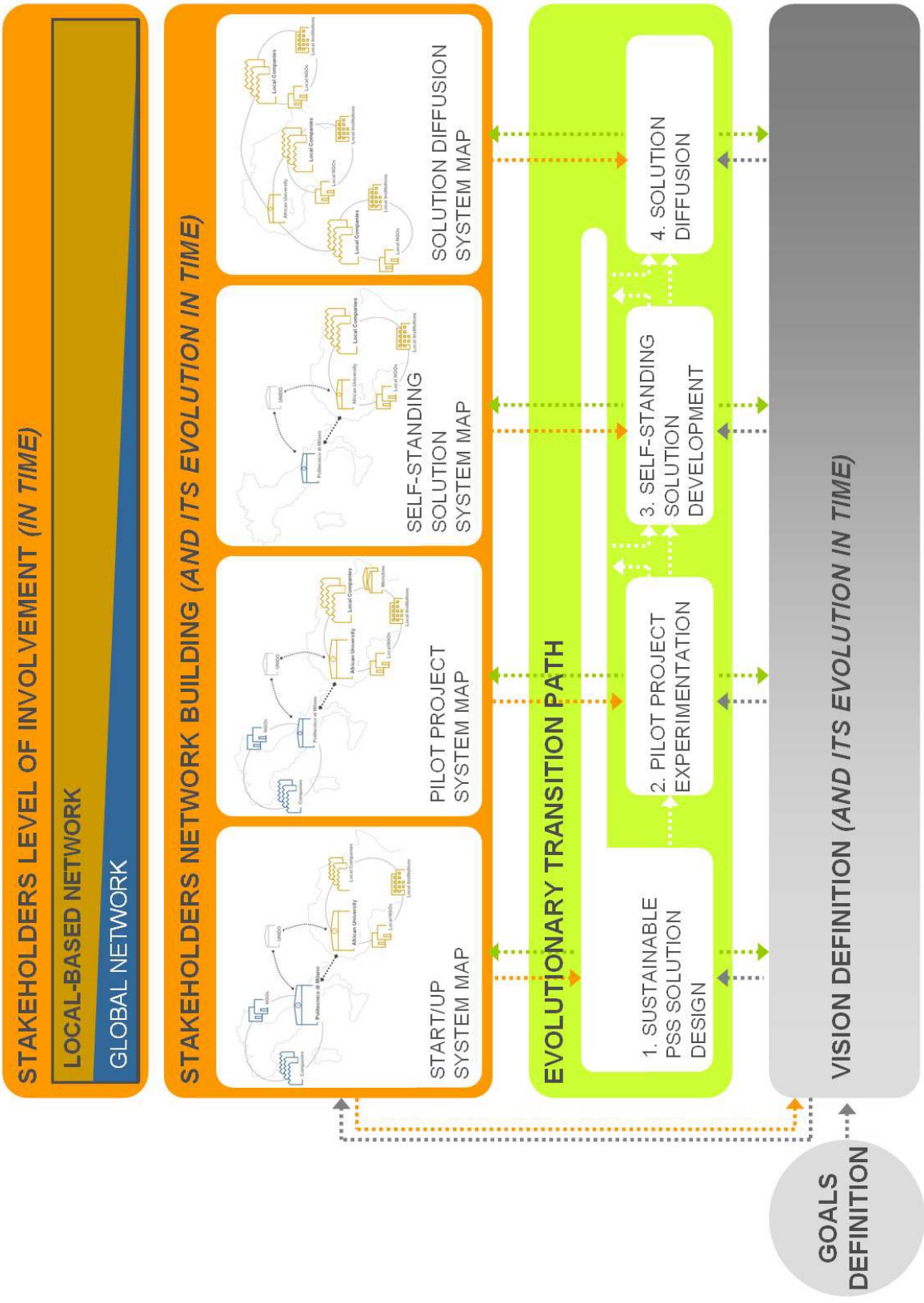

Figure 2. The model describing the elaborated *evolutionary transition path*.

learn); and for developing this pilot project in a self-standing solution (capable to be easy to diffuse in similar contexts). On the other hand the *vision* is based on the adoption and adaptation (in an open source modality), of the previously mentioned solar and human powered vehicle.

In other words the *vision* idea is to foster local universities and companies in the adoption of a system innovation approach and of local-based and network-structured initiatives, through the experimentation of sustainable solar-based mobility solutions.

4.2 Stakeholders network building

It is clear that, to tackle the previously mentioned aims, a multi-stakeholder and multi-disciplinary approach is required. In other words a strong involvement of different stakeholders along the entire process, and a capability in managing, analysing and elaborating information coming from different fields are needed.

Therefore the identification of the stakeholders (their roles, motivations and mutual interactions), is a fundamental aspect not only in the solution design but also in setting the proper conditions to support this process, and afterwards for realizing the pilot project, implementing and diffusing it.

As said before the project starts from a university research know-how and role, and so this institutions represent the “start-up” core of the network. In order to make official these relationships, three single collaboration agreements has been signed between Politecnico di Milano and Universitè Polytechnique De Bobo-Dioulasso (Burkina Faso), University of Zambia and University of Lagos (Nigeria).

The aim of this agreement is the mutual cooperation between the universities, in order to set up the basis for the local generation of innovative sustainable solutions and their diffusion. For this reason the project is characterized by being “open source”, and in fact Politecnico di Milano provides to the African universities all the specifications related to the solar and human powered vehicle (MULO System project).

The universities advantage of being part of the network is the possibility of sharing and gaining knowledge, as well as the opportunity to test promising hypothesis.

Around the universities’ collaboration, a multi-stakeholder network was built up, including both Italian and African actors. The network is made up of:

1. *African Companies*, because they have to be linked with the local universities in order to implement innovative ideas and push their diffusion; being involved in that kind of project means having the opportunity to be supported in the development of new business strategies and to have access to knowledge to foster their potentialities.
2. *Italian Companies*, because they can contribute in knowledge transferring, and therefore in fostering the African industrial development; they are interested in being part of the network because they agree in the final goal and because of a possible reputation comeback.
3. *NGOs*, because they can operate on the territory as intermediaries for the acquisition of preliminary information and contacts with

local communities, suppliers etc; they are interested in take part in the network because they agree in the project's final aim, and therefore there could be a reciprocal support.

4. *Local Administration and Institutions*, because they could encourage and support the development of bottom-up experiment initiatives in self-standing and diffused solutions.
5. *Users*, of course, because they will experiment and use the solution and so they have to be involved starting form the design process.

All these actors take part (with different roles and levels of involvement), in a process of co-production of knowledge and co-design of the transition path. They agree in the *transition goal*, but they can indicate different *visions* to reach that goal; this means that the *transition vision* could be modified and adjusted in relation to the inputs/suggestions coming from the different stakeholders.

In other words, the consequence of having an enlarged co-design process is that more stakeholders implies more ideas, inputs and opinions, and therefore there is the necessity to find an effective way for managing the dialogue between the stakeholders and for organising all the information provided by each of them.

Nevertheless it is very important to underline that the stakeholders involvement is not an action that starts and ends in the beginning of the process, but is a continuous and iterative activity along the entire transition process. That means that there is the need to plan not only which actors include but also when involve them (in which phase of the transition path), and at what kind of level they have to be involved. For example in the beginning of the project universities play a key and fundamental role (setting up and coordination of the stakeholders network; coordination of the co-design process), but their level of involvement will decrease along the transition path because they leave to the local companies the due to diffuse the designed and tested solutions.

It has been said that the definition of the stakeholders network evolution has to be properly planned; for this reason it is possible to argue that this process can be considered an out-and-out design activity. In this sense, as it is possible to see in figure 1 and as will be explained in the next section, four different actors configurations have been drafted, in relation to each single transition step.

4.3 The evolutionary transition path

As said before the elaborated transition path is made up of four main steps, and for each step a specific stakeholders configuration has been delineated. In the following text these steps are described.

4.3.1 Start-up: sustainable PSS solution design

The *start-up* is based on the collaboration between Politecnico di Milano and the African university. At this stage two different stakeholders networks are organized: the first one around the Italian university and the second one around the African university. As described in figure 3, in the Italian network are involved companies and NGOs; in the African network, beyond

companies and NGOs, are also involved local administration and institution. As said before the actors included in the network should agree in the transition goal, but could have different opinion (visions), of how to achieve that goal. For this reason the first task of the network is to set up a dialogue between all the actors, in order to discuss the vision and adjust its features.

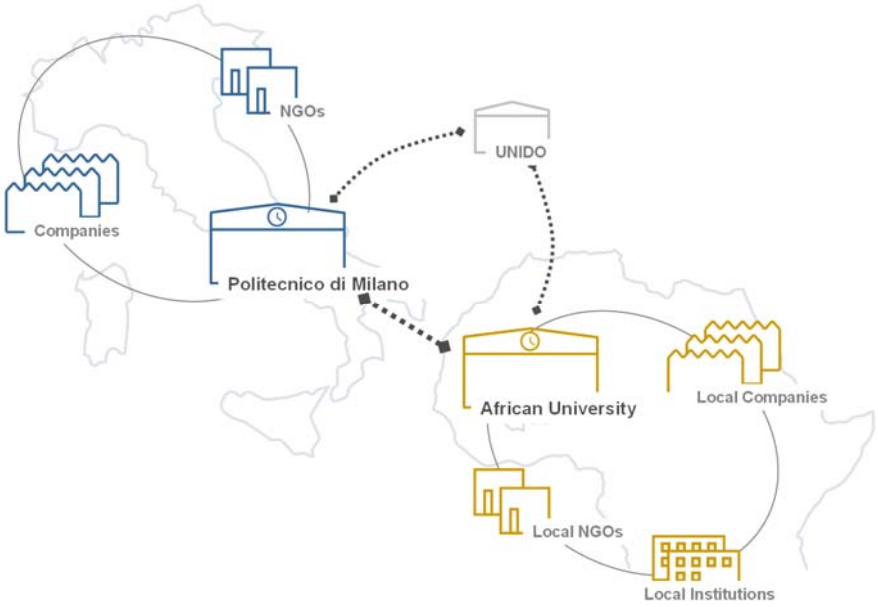

Figure 3. The start-up system map model.

Once redefined the vision, the network aims at: gaining all the needed information related to the context (where the project has to take place), and designing a first set of sustainable solution hypothesis. In other words the network is built-up in order to set the basis for the development of promising solution to be experimented in future.

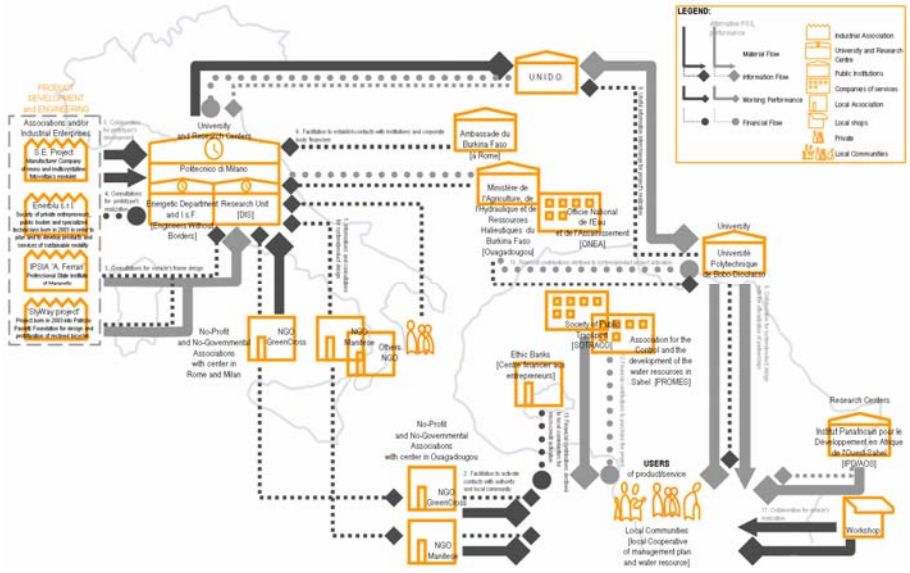

Figure 4. The start-up system map (Burkina Faso project), visualizing all the actors involved (and their relationships), in the beginning of the project.

Related to the needed information it is quite obvious the importance of a deep and detailed understating of the context, in order to comprehend the current situation from a socio-economical point of view as well as from a geographical/environmental point of view. The local university and NGOs, could exploit their knowledge of the territory to support the collection of all the required information (to be shared and analysed with the other stakeholders network).

Figure 3. Some pictures from the report done for the project focusing on the Burkinabé project.

For example, for the Burkinabè project, a study-trip (co-ordinated by the local university), was carried out in the Yatenga province[8] in order to: acquire information on the main competencies, strengths and weaknesses of the local companies and NGOs; understand which are the available materials and technologies for an eventual industrialisation of the solution; analyse the current solutions used for water acquisition, transportation, storage and delivery; comprehend the geographical, climate conditions as well as the urban organization and road conditions.

Figure 5. Some pictures of one of the design workshop held at Universitè Polytechnique De Bobo-Dioulasso (Burkina Faso).

[8] Livia Martucci in December 2007 went in Bobo-Dioulasso (Burkina Faso – Yatenga province) for a 2 months study-trip.

Once adjusted the vision and understood the context characteristics, it is possible to outline, in a co-design process co-ordinated by the two universities, a first set of promising sustainable solutions.

According to the defined transition visions, the elaborated mobility solutions have to be characterized by being a *system innovation* and by being a *local-based and network-structured initiative.* In other words they have to: focus on designing and offering a system of products and services that are together able to satisfy a particular demand; start from sustainable local resources and needs (even if they could become open non-local or global system); gain critical mass and potentialities by their network connections.

The development of these sustainable system innovations is based on a *system design* approach[9], in which the design activity focuses on:

1. developing environmentally sustainable products and services together;
2. promoting and facilitating new configurations (partnership/ interaction) between different "stakeholders", to find innovative solutions able to lead to a convergence of economic, social and environmental interests;
3. promoting and facilitating new sustainable locally-based and network-structured initiatives/enterprises;
4. facilitating a participatory design process among all the stakeholders.

Nevertheless it has to be underlined that not all system innovations and not all local-based and network-structured initiatives are environmentally and/or socio-ethically sustainable; this means that when designing new systems it is of key importance to adopt appropriate methods and tools[10] that steer the design process towards the definition of sustainable solutions.

We can simplify the design process, dividing it in *system design* (identification of the stakeholders involved, their roles and mutual interaction; definition of the product-service system offer provided by those stakeholder), and *product design* (adaptation of the already prototyped vehicle depending on the specific kind of use, and on the available local resources, materials and technologies).

One example of generated solution, for the project focusing on Zambia, is the following. A local company (with the university support), realize the vehicle (using local materials and technologies), which is given in comodatum of use to a farmers association; the vehicle (moved by solar and human power), is used to collect and transport the cultivated crops to the local markets; part of the earned profits coming from the crops sale are used to pay the cost of the service (which includes also the vehicle maintenance,

[9] In fact, over the last few years, starting with a more stringent interpretation of sustainability (that tells us we must work on radical changes in production and consumption models), attention has partially moved to *design for eco-efficient system innovation*, therefore to a wider dimension than that of the single product (Stahel 1997; Hockerts, 1998; Goedkoop, van Halen, Riele, Rommes, 1999; Lindhqvist, 2000; Cooper 2000; Brezet, 2001; Charter, Tischner, 2001; Manzini, Vezzoli, 2001; Bijma, Stuts, Silvester, 2001; Zaring, 2001; Mont, 2002; UNEP, 2002; Scholl, 2006)

[10] The method and the relative tools used in this project are the ones elaborated in the MEPSS research (Method for PSS development, European research funded by EU, 5FP, Growth).

repair and up-grading), to the local company; when the vehicle is not used it could be exploited to produce electric energy for the village (see figure 6).

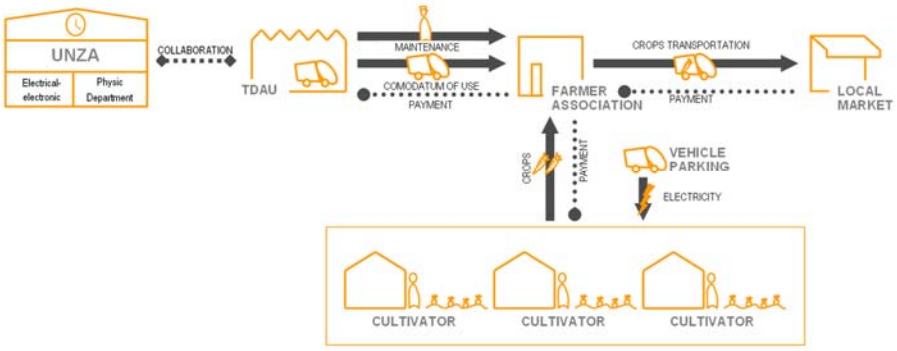

Figure 6. Stakeholders system map showing one of the elaborated solution hypothesis (Zambia project).

It is clear which are the main characteristics of this solution. The producer doesn't sell physical products (the vehicle), but it offers an *enabling platform* (providing the possibility for the cultivators to transport the crops); the producer keep the ownership of the vehicle (and so it has the economic interest in realizing a long lasting product); the initiatives is locally-based (local materials are used to realize the vehicle and local solar energy is used to move it); cultivators' association is a network-structured initiative (and this characteristic enable them to gain critical mass and potentialities). In substance we can say all these characteristics make the hypothesized solution a promising one in terms of sustainability because it could be considered a *system innovation* and a *local-based and network-structured initiative*.

At the moment of the writing of this article, the research project is advanced until this step. For each single project a set of sustainable solution ideas were generated and these ideas are now under discussion within the stakeholders network, to understand which of them could be further developed and tested.

4.3.2 Pilot project experimentation

In the previous step a set of sustainable solution hypothesis were generated. In this phase the promising ones are selected in a co-decision process within the actors network, further detailed and tested in a pilot project experimentation.

If in the previous step the key roles within the network were played by the two universities, in this step is hypothesized that the local companies and university assume the heading of the process, with the support of local NGOs, Institutions and Ministries (see figure7).

At this stage the primary stakeholders network's role is to set the conditions for the pilot project realization. That means that some actors (like NGOs, foreign companies, International Institutions), should act to support, promote and facilitate the local companies and university in testing these promising sustainable solutions (e.g. through financing or sponsorship).

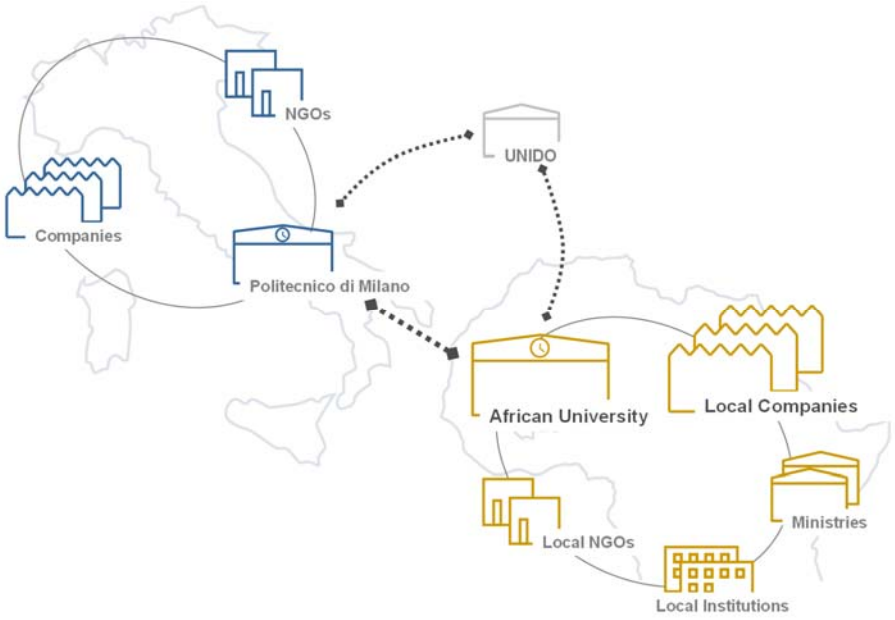

Figure 7. The pilot project system map model.

For example referring to the project focusing on Zambia it has been imagined (see figure 8), that NGOs could act partly financing the experiment, and that foreign companies could provide particular needed components and sponsor the project. In other words these pilot projects could not be immediately economically self-standing, and so one of the network's role is to design/define how it could be possible to support these experimentation (until they become self-standing solutions).

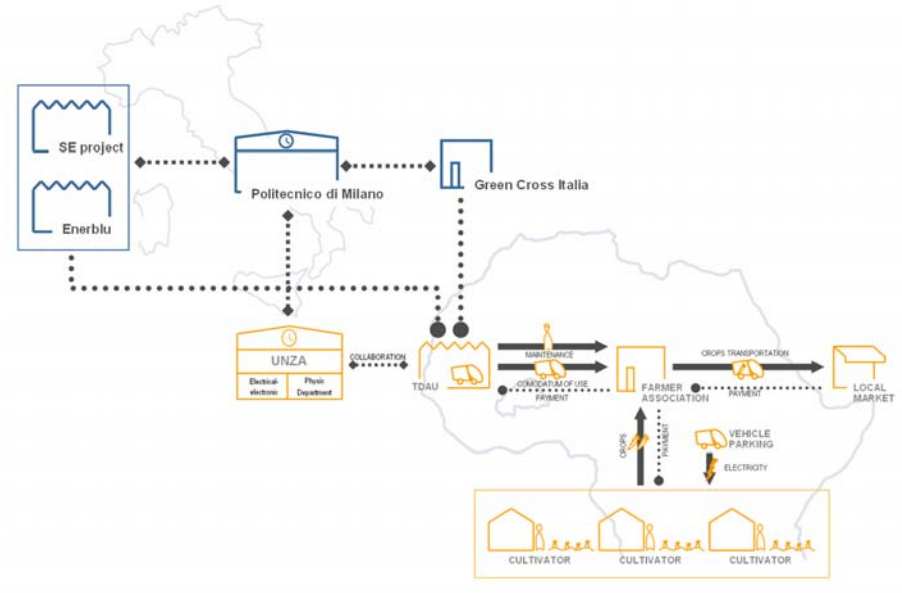

Figure 8. Stakeholder system map of the pilot project experimentation (Zambia project).

This experimentation is fundamental in order to understand if the solution does work, which are its advantages and critical points. It is a continuous iterative learning process involving (with different role) all the stakeholders in setting the conditions for the pilot project realization, analysing the pilot project experimentation results, and proposing modifies and integrations. In other words it is a process of positive and negative feedbacks that may lead to the adjustment not only of the pilot project characteristics but also of the vision. Moreover these pilot projects could represent an optimum "window" because of its potential to show sustainable innovations ideas to wider communities (Vezzoli and Penin, 2006). In this sense they could be used not only for experiment ideas, but also for attracting new potential financiers and in general interested actors.

4.3.3 Self-standing solution development

The pilot project learning process is finalized in setting the conditions for the evolution of the experiment in a self-standing solution. In other words what has been learnt during the experimentation should brought to the adjustment of the characteristics of the solution, and to the definition of the modalities by which it can become economically sustainable and self-standing (without the external financial support of NGOs and foreign companies).

At this stage in fact it is hypothesized (see figure 9) that the local-based network become autonomous, with the local companies assuming a key and primal role, and the universities acting in monitoring the solution and collecting feedbacks.

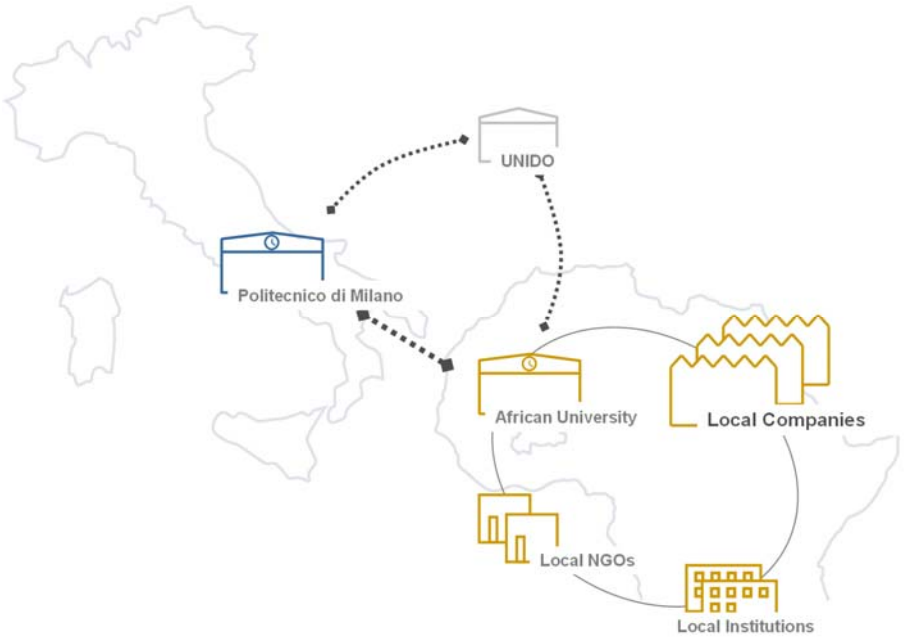

Figure 9. The self-standing solution development system map model.

4.3.4 Solution diffusion

At this point the solution could be replicated in other similar contexts (with the needed adaptations). In other words the key features of the solution could be copied, modified, integrated and adapted in relation to the specific context's needs and characteristics. That could potentially bring to a proliferation of sustainable mobility system solutions.

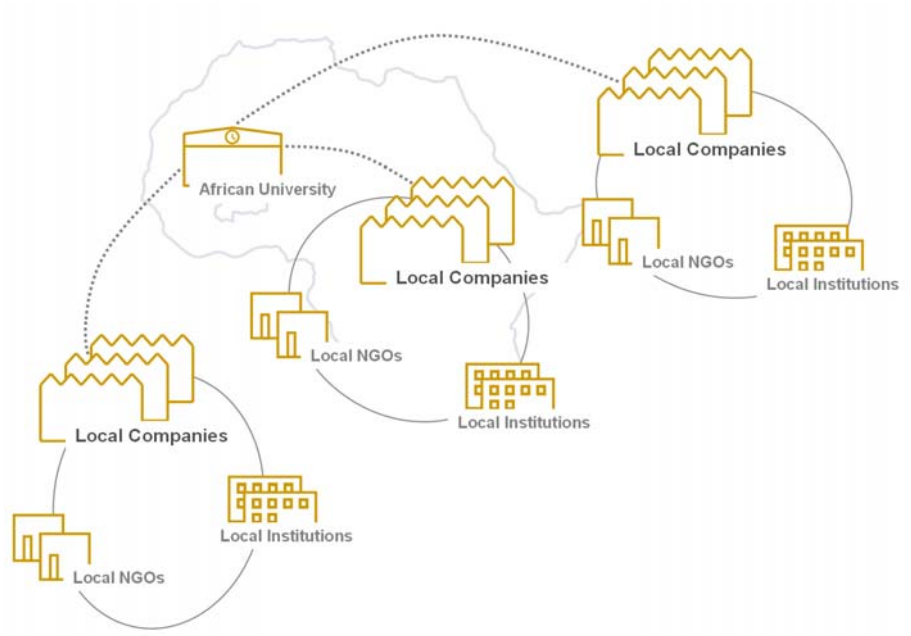

Figure 10. The solution diffusion system map model.

In this sense the local university (see figure 10) could act as a platform to facilitate the diffusion of the solution (and its consequent adaptation), in other similar contexts. It has to be underlined that this can be imagined because of the project is undertook in an open-source modality.

In addition a last consideration is that the hypothetic *solution diffusion* could have influences not only limited to the mobility sector. In fact it can be supposed that the diffusion (within local universities, companies and local institutions), of competencies and know-how to foster a *system innovation approach* and *local-based and network-structured initiatives*, could facilitate itself the transition towards SCP.

5 Convergences with the *transition management* model

The transition path previously outlined presents convergences and common elements with the *Transition Management for Sustainable Consumption and Production* model developed in the Netherlands by Rotmans, Loorbach and Kemp.

But which are the characteristics of the Dutch model? In brief , the model of *transition management* "tries to utilize innovative bottom-up developments in a more strategic way by coordinating difference levels of governance and fostering self-organization through new types of interaction

and cycles of learning and actions for radical innovation offering sustainability benefits" (Kemp et al., 2006).

It is a cyclical and iterative process, consisting in four main activities:

1. establishing and further developing a transition arena for a specific transition theme;
2. development of long-term visions for sustainable development and of a common transition agenda;
3. the initiation and execution of transition experiments and projects;
4. and the monitoring and evaluation of the transition process, goals, policies and learning effects.

It is characterized by being a multi-level governance process, in which three different levels are managed and integrated: the strategic level (processes of vision development, strategic discussions, long-term goal formulation); the tactical level (processes of agenda-building, negotiating, networking, coalition building); operational level (processes of experimenting, project building, implementation).

The elaborated *evolutionary transition path* seems to have several convergences and similarities with the Dutch *Transition Management* model.

First of all both the models adopt a long-term goal thinking (determining sustainability visions), and a short-term goal action (determined by short-term possibilities), to orient and influence the transition process towards the defined objectives. In other words the two models define what they want to reach in the future, and provide a support for the strategic orientation and adaptation of the path to achieve the envisioned conditions.

Moreover both the models are characterized by adopting a multi-stakeholder and multi-disciplinary approach, even if it has to be underlined that we are talking of an open and flexible participatory process, in which the typology, role and level of involvement of the various actors change during the path, in relation to the specific short-term goals.

Furthermore, the two models are based on strategic experiments, which are used to test and verify hypothesis, learn from the results and give visibility to the project itself. We could say that these experimentations are the core element of the transition process because represent an effective instrument to learn and get positive and negative feedbacks, and a potential "window" to show promising sustainable ideas to wider communities.

Finally both the models are oriented towards system discontinuity, and indicate that the pursuit of this discontinuity involves the adoption of a design attitude that should operate on a system innovation level.

On the other hand it is clear that the transition management model is a strategy to pursuit a wide change, involving complex stakeholders networks and different transition experiments at the same time; while the elaborated transition path is much more focused on system innovation in specific context themes. In other words the amplitude of the theme in the *evolutionary transition path* is focalised in a specific unit of satisfaction (e.g. mobility solutions for drinkable water transportation in Burkina Faso), while in the Dutch model the theme is wider (e.g. mobility solutions in the Netherlands).

Moreover the transition management model adopts bottom-up and top-down actions, while the elaborated transition path has been thought especially to pursuit initiatives starting from a university research context. In this sense the Dutch transition model seems to be much more open and flexible to combine the two types of approaches.

6 A new potential role for design in transition management?

At this point a proper question could be: both in the *transition management* model and in the *evolutionary transition path*, which role could be played by design?

Before it has been underlined the importance of adopting a general design attitude to pursuit system innovation. In this sense design could result strategic not only in the definition of the system innovation characteristics, but also in the drafting and adapting in time the stakeholders interaction path, in order to set the basis for the introduction and proliferation of that kind of innovations.

In other words design could play a key role not only in orienting and supporting the design process towards the definition of environmental and socio-ethical sustainable solutions, but also in the *designing* of the proper conditions to foster the dissemination of these solutions, and so in *designing* innovative stakeholders interactions and their evolution in time to achieve wide dissemination of system innovations.

In particular, within a complex and adapting system of multiple actors, design could result fundamental in identifying proper stakeholders (defining their role and level of involvement along the transition path), defining their sustainable interactions, and facilitating the strategic conversation between all of them. In this sense design can provide methods and tools[11] to support and facilitate the dialogue and the interaction between different actors (in order to facilitate the process of definition of the transition vision), and to support processes of co-design.

The on-going projects shows the hypothesis of a potential role for the design. Better still it pones some working hypothesis to be verified: in which way is it possible to orient the development of the production and consumption structures towards a more satisfaction-based service economy characterized by locally based and networked structured initiatives? In which way this kind of transition could be managed? Which key actors have to be involved and which has to be their specific role?

This area of design research is complementary of other research efforts more focused on product design for low-income countries, but seems worth of being further investigated through applied bi-regional research.

[11] For example, design tools for the development of *Sustainability Design Orienting Scenarios* (SDOS) and *Service notation tools* for the strategic convergence of different stakeholders towards sustainable solutions (Jegou, 2006); as well as qualitative brainstorming tools focused on the devising of partnership/interaction between eco-efficient valid stakeholders (Vezzoli, Tischner, 2005).

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