Role of a Change Actor in the initial phase of transitional projects - Three case studies of energy webs between glasshouses and non-horticultural counterparts in The Netherlands

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Abstract

Though technically and economically challenging, heat exchange between glasshouses and non-horticultural counterparts (here called Energy Webs) has shown to be viable based on a number of feasibility studies for different locations within The Netherlands. The organizational and cultural challenges for such cross-regime co-operations however, seem more difficult to breech. So far there is one Energy Web operational – Greenportkas Venlo (Greenport Glasshouse Venlo). Wageningen UR Glasshouse Horticulture has been involved in multiple initiatives over the past two years to understand and overcome the fixations in the co-operation process. The project was financed by the Dutch ministry of Agriculture, Nature and Food Safety in a program aimed at System Innovation.

Besides interviews with partners of all ten current initiatives of energy webs in The Netherlands, researchers performed action-based research by partnering in three of these initiatives, one of which is Greenportkas Venlo. Interviews were aimed at understanding the dynamics between regimes, being the regimes of horticulture, housing development and energy. The involvement in the current initiatives was aimed at coaching the partners in the initiative with a focus on the participating grower, as well as gaining understanding of the issues at hand from a partners' point of view.

In the initial phase of forming a consortium around the idea of an energy web, the progress heavily depends on the initiator, be it a company, local government or a third party initiator like a consulting firm - Wageningen UR initiated one of the three consortia mentioned. Though this phase is faced with small budgets, since few prospective partners are willing to invest, crucial steps need to be taken to align partners in terms of basic technical knowledge, expected time frames, dynamics of development in housing and horticulture, cultural sensitization, and some bonding between the partners needs to take place. Aligning partners can best be done by an independent, external process facilitator, here described as a 'Change Actor'. In two of the three projects mentioned we took on this role. This Change Actor plays an important role in Strategic Niche Management by coaching the partners in the consortium formation, and using his or her network to protect the initiative (the niche) to develop given the regime dynamics.

Introduction

The liberalization of the energy market in 2003 gave opportunity for the glasshouse horticulture sector to became a new player in the energy sector, resulting in over 2000 MWe capacity in CHP[1] owned by growers in 2008 (M. Ruijs pers. comm.). The use of

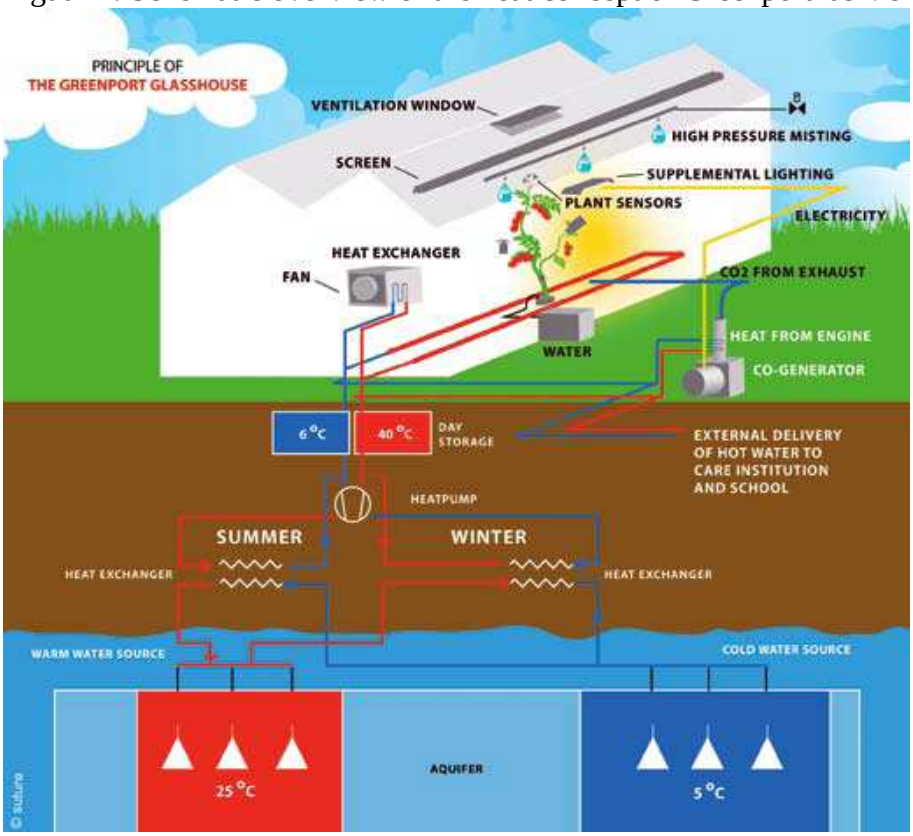
[1] CHP: Combined Heat and Power

CHP made heat exchange between growers interesting when combined with artificial light – the lamps produce year-round heat so the CHP-heat can be shared with just heat-requiring glasshouses. This lead to a number of energy clusters in The Netherlands. At the same time the technique of storing solar heat from glasshouses in aquifers and using it for heating the glasshouses in the winter became available (Andel, 2002). 'Harvesting' solar heat has a potential of reducing energy consumption, and with that carbon emission, by 35 %. Besides that, in 2006 the first geothermic well was drilled, and found very successful.

These different energy sources and experiences with heat exchange inspired different concepts of heat exchange between glasshouses and non-horticultural parties. Since 2003 a number of ten initiatives of energy webs have started, but – as said – only one energy web is operational. Besides the ten mentioned, many growers made rough calculations for possibilities in their specific situation (Velden *et al*., 2007). The year 2009 saw a new interest in energy webs, mostly based on geothermic energy.

The one operational energy web in The Netherlands that started in 2008 uses CHP-heat to supply for a school and a care institute, while using stored solar heat as a base-supply for the glasshouse (figure 1).

Figuur 1: Schematic overview of the heat concept of Greenportkas Venlo.



(Verkerke and Vermeulen, 2008. www.Greenportkas.nl)

Five of the ten initiatives since 2003 have so far been terminated for different reasons, though most of these initiatives seemed technically viable (R. Smit, KEMA, pers. comm.; M. Beke, Bureau Menting, pers. comm.). The environmentally interesting prospects of energy webs brought the Dutch ministry of Agriculture, Nature and Food

safety in 2007 and 2008 to further inquire in the obstacles these initiatives face. Understanding that they can be technically and economically viable, we focused on the process aspects of the consortium formation. We studied these process aspects by getting involved as the process manager in a number of initiatives and by interviewing stakeholders. By becoming a partner in the process, we hoped to get deeper understanding of the obstacles, while the interviews helped in becoming acquainted with the different regimes surrounding energy webs and understanding the different roles of stakeholders.

This article focuses on the process management during the first phase in the process of building energy webs – bringing parties together and creating a common vision. The following phases would be: 2) feasibility study and planning the building process, 3) preparation for realisation (permits, subsidy, financing, contractual agreements), 4) the actual realisation and finally 5) exploitation and trouble shooting (Staalduinen and Vermeulen, 2009).

Tools used

We performed interviews with stakeholders in the field of housing, energy and horticulture. These interviews were aimed at getting some basic understanding of the different regimes and the interactions between them, before getting involved in cases.

In our involvement in the different initiatives we assumed a role based on three concepts of process management, being that of the Acting Director (Acterend Regisseur, Eijnatten *et al*., 2002), the Innovation Broker (Winch and Courtney, 2007 and Klerkx and Leeuwis, 2008) and of the Independent Actor (Vrije Actor, Wielinga *et al*., 2007):

> Acting Director: a person or institute who operates on behalf – is mandated by – of the initiators of the process. In our cases we were mandated by the grower and the housing corporation or other heat-consumer to direct the process. However, we were financed by an external party (government). Some aspects of the Acting Director (A.D.) would be: the organisation or person is not the central player, the A.D. is able to understand and use developments, the A.D. is able to envision and share future prospects without getting trapped in detail, the A.D. does not have an own agenda, but rather keeps the parties active in achieving the goals.
> The role as Acting Director can be seen as an intermediate form of process management between 'Steering' and 'Facilitating' as drawn by Loeber (Anne Loeber, 2004). The person Steering, manifests leadership through setting the course of the consortium, while the Facilitator unites the initiatives within the group towards a collective goal.
> Innovation Broker: an organisation acting as a member of a network of actors in an industrial sector that is focused neither on the generation nor the implementation of innovations, but on enabling organisations to innovate.
> Independent Actor: person with expertise in the required area, but no direct involved in the consortium. The person will participate by performing interventions in the process aimed at keeping the parties active and geared towards the collective goals. Qualities of an Independent Actor would be: networker, process qualities, expertise in the required area, being able to intervene to better the 'energy' and coherence in the group.

In all cases we contributed not only support in process management, but also technical and economic expertise as well as knowledge of plant physiology and crop production – our core competence.

Insights in Strategic Niche Management helped to understand the dynamics between regimes and the impact of these dynamics on individual initiatives. We acknowledged that an energy web is an innovation coming from 'outside' (glasshouse horticulture) that tries to find a niche within the established regimes of housing and energy – two regimes that consist of large organisations compared to growers, and that have a history of co-working. In all cases we worked with one or two parties from the housing-regime, being the local government and a housing corporation. In our cases we did not directly encounter organisations that typically work in the energy regime.

We used the model given in figure 2 to understand niche-situations (Geels, 2002).

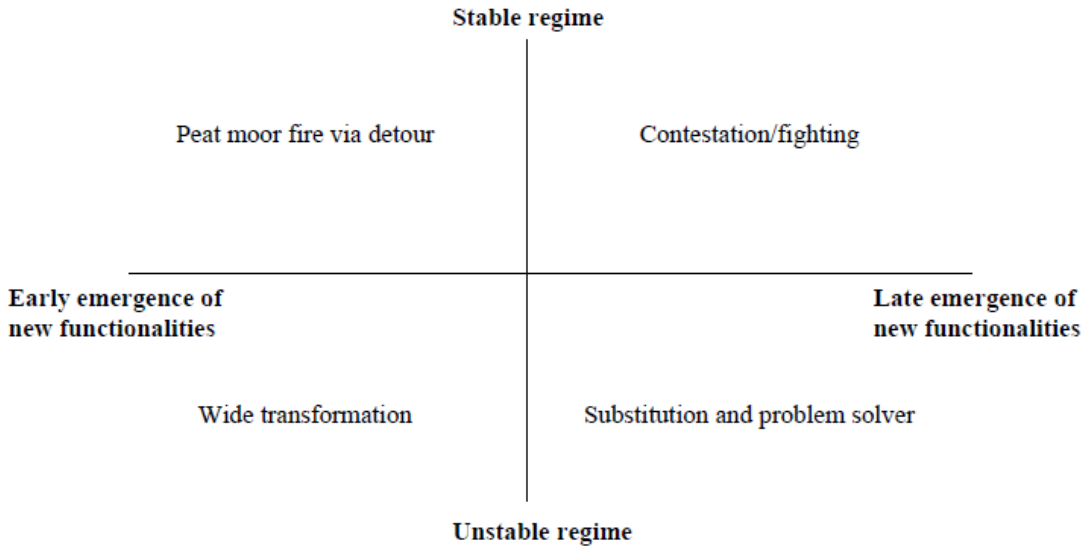


Figure 2: Four patterns in early phases of transitions from one stable regime to another (Geels, 2002: 342)

The vertical axis differentiates between a stable regime and an unstable regime. The horizontal axis indicates the moment when a new functionality of an innovation (novelty) emerges. The four patterns that emerge from crossing the axis are described as:

- 'Peat moor fire via detour': the novelty emerges in the context of a stable regime. Because there are no problems at the level of regimes, there is little stimulus for regime actors to invest resources in the technology. The new markets are initially small and offer no threat to the existing regime. The new technology is further developed in the new markets 'below the surface', as a peat moor fire.
- 'Contestation/fighting': the novelty emerges in a stable regime. The novelty emerges in existing markets (existing functionalities) and has to fight head-on with existing technology in the context of existing performance dimensions (contestation).
- 'Wide transformation': the novelty emerges in the context of an unstable regime. Regime actors may look for new technical options, and niche actors

try to link their novelty to the problems as a possible solution. Transformation and co-evolution occur early in the process;
- 'Substitution and problem solver': the novelty emerges in the context of an unstable regime. The new technology emerges in existing markets, where it substitutes the existing technology. Existing regime actors are interested because it enables them to deal with specific problems.

(Descriptions taken from Raven, 2005)

Regime Dynamics

The housing and energy regimes are both in a transition towards energy sustainability. The housing regime is forced by ever stringent regulation to reduce energy consumption per house (EPC[2]) and on a local level (EPL[3]). According to stakeholders lower EPC- and higher EPL-scores can only be achieved in local energy concepts rather than further isolation of houses of individual installations like micro CHP (pers. comm. T. Goosens, Essent). The energy regimes therefore needed to diversify. Some examples of diversification would be:

- In order to build more energy-efficient house-concepts, the energy company Eneco designed a processes tool that involved al the relevant parties, such as the project developer, the planner, the local government, the builders and infrastructural contractors.
- Diversification in energy sources from the current dominance of gas to sources like wind, water, waste and bio fuels.
- New companies entering the energy market. Several technical installers have entered the market with new energy concepts based on a variety of heat sources, examples would be BAM Duurzaam BV and DEC (Volker Wessles).

The interviews added to this insight with four observations on the position of energy web-initiatives in relation to the regime players:

- Energy webs can be technically and economically viable. Multiple cases were shown to be viable. Yet a range of factors have prevented the realisation these webs so far – besides the pilot project Greenportkas Venlo. These obstructing factors varied widely. Some examples would be: competing sustainable concepts, changes in the building process, bankruptcy of the participating grower, changing visions on the energy concept between the partners.
- The traditional energy-regime players seemed reluctant to participate in heat-projects with growers, whereas new parties in the energy market were eager to co-work. An example of this would be the cooperation between an installer (DEC) and the agricultural lobby organisation (LTO-Noord Glaskracht).
- The building process is the leading process for housing development. This building process includes ground acquisition and consortium formation, technical planning, political decision making, contractual agreements, issues that evolve between contract partners or between local government and partners. An energy concept needs to fit in this process, and it needs to add value for all parties involved ('what's in it for me') (pers. Comm. Bas van de Griendt, Rabo Bouwfonds). In our projects we focussed on relatively simple building processes with few partners involved.

[2] EPC = Energyprestatiecoefficient (Energy Performance Coefficient). In 2006 this was set at 0.8 for new development. Lowering this target means better energy performance.

[3] EPL = Energy Performance at Location – a score of 10 means a zero net use of fossil energy. An EPC-score of 0.8 results in an EPL of 6.6.

- Project developers sell houses, while housing corporations rents out houses. This means that the added value of an energy-concept is different for both type of partners. A project developer needs to abide by the national regulation of the EPC and EPL, and wants to get margin on their higher investment for the energy installations. A housing corporation is on top of EPC and EPL motivated by lower living costs for its renters and has a societal obligation to build more sustainable houses.

The first observation confirmed the aim of our research: focus on process innovation rather then technical or economical innovations.

The last three observations made us aware of the market dynamics of housing development. Because of these observations we started the initiative in AckersWoude (see below) with the housing developing agent rather than the growers – would this initiative answer to the agents' 'what's in it for me?' It did, and so we continued.

Case descriptions
We participated in three initiatives, here mentioned as Greenportkas Venlo, AckersWoude and Nootdorpseweg. The initiatives had different origins and also our roles varied.

Greenportkas Venlo (Greenport Glasshouse Venlo)
In 2005 a group of experts designed a concept for optimal energy use in glasshouses (KnowHouse B.V., 2005). This concept was then implemented in Venlo in a 3.5 hectare extension along a 3.5 existing glasshouse. The concept was based around heat storage in aquifers for climate control and energy efficiency. Inspired by a local installer and a business consultant the existing CHP of the grower was used to heat the neighbouring school and care-facility (a campus with multiple buildings and a small swimming pool). The total installation went into operation in 2008. The grower received support for both the optimisation of the new cultivation system and the challenges of heat exchange by Wageningen UR Greenhouse Horticulture. The grower is also supported by a peer group of local growers, each with plans for applying the new knowledge in their own firms, and the Dutch SynErgy network (Verkerke and Vermeulen, 2008).

Thus Wageningen UR contributed with expertise on the cultivation system, crop management and coordination of the various aspects of this producer of tomatoes and heat.

AckersWoude
AckersWoude is a new housing development in the city of Pijnacker-Nootdorp. At a meeting on sustainable energy for housing development within the city boundaries in April 2008, Wageningen UR connected with the development agency for AckersWoude. Together with this development agency we decided to make an inventory of possible heat-exchange concepts with the surrounding glasshouses. We interviewed all the growers within a 1.5 km radius, and found much interest in the possibilities of heat exchange. Based on the different energy strategies among the growers we proposed two concepts: one based on CHP, possibly in a network with multiple growers, and one based on heat-cooling storage in an aquifer with a single grower. After two meetings with the different parties it was decided to pursue the

latter concept. The first concept seemed too tedious from an organizational perspective on the growers' side, whereas the second concept had the advantage of climate control in the houses by using aquifers. Upon this decision the involved housing corporation and the one grower took over the initiative that Wageningen UR had started, and subsequently asked us to continue coordinating the process.

Hence our role was to initiate the consortium by organizing the possible participants and guiding a phase of selection to get to the final group, proposing a number of possible energy concepts. After the two main parties took over the initiative, we took on the role of process manager (Acting Director) on behalf of these parties.

The initiative ended in February 2009. By then the grower had changed his energy concept from heat-cooling storage to geothermic heat, and with that had blocked the perspective of climate control with this sustainable technique. The housing corporation on the other side had experienced quite some delay in decision making due to contract issues over the responsibilities for the development. Besides that, the housing corporation was faced with financial challenges of how to make return on investment of energy concepts in social housing, where rent prices are set.

Geothermic heat exchange Nootdorpseweg

The Nootdorpseweg is a street in the outskirts of the city of Pijnacker-Nootdorp. The street neighbours a 5.5 hectare pot plant grower, a swimming pool, a sport facility, a fitness centre and a school. In October 2008 the grower initiated talks on possible heat exchange based on geothermic energy. Wageningen UR was asked to join these talks as a process facilitator. In March 2009 this lead to a combined interest by all parties to perform more detailed studies and insight in possible organisational models. These studies were financed by the Province of South Holland, and managed by Wageningen UR.

Wageningen UR prepared and led the discussions with the different parties and with local officials, and stipulated the process steps that had to be taken. The grower, together with a local installer took control of the technical design and the time frame in which it had to take place.

The Change Actor

We observed a gap – or wall – of differences in culture, markets and type of customers and dynamics. Some anecdotes of these differences would be:

1. The first meeting between the growers in AckersWoude, the project developer and Housing Corporation took place on a warm day in June. As expected the latter parties were dressed in business outfit. Some of the growers however, came straight from their work in the greenhouse, wearing shorts and a dirty t-shirt. It took us some persuasion of the partners on the Housing side afterwards, so they would not end the process there and then. The growers had come across as "disorganised" and not as serious partners. (Note: The grower we continued to work with had taken care to change into a more suitable outfit).
2. The high innovation speed in greenhouse horticulture means that companies are eager to invest and modernise to keep up with competition. Investment horizons for Dutch growers can roughly be differentiated into the following types:

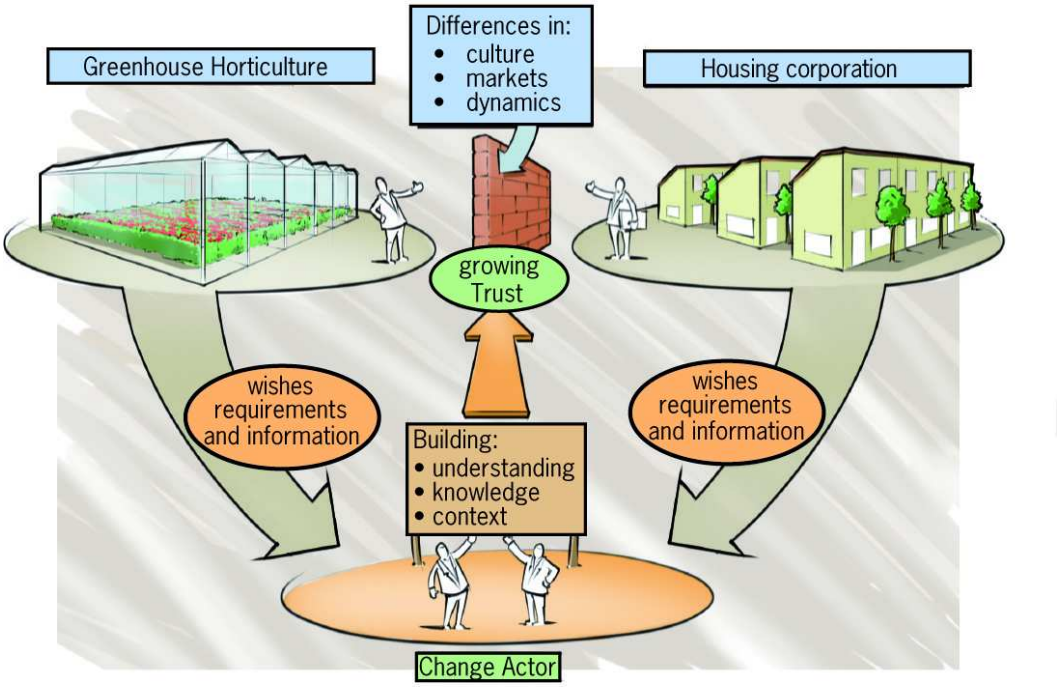
- The investment-horizon of a glasshouse is between 10 and 15 years.
- Investments in energy concepts or technical concepts need to have a pay back time of maximum 5 -10 years.
- A marketing strategy can oversee about five years due to the fluctuating markets of greenhouse produce.

The decision making on housing development on the other hand is a process of multiple years. This process includes political decision making, ground acquisitions, multiple tender procedures for different aspects of the total development, etcetera. These companies can handle delays of months and years. A delay of a number of years however, will severely damage the financial position and market position of a grower.

3. In the case of the Nootdorpseweg we discussed the possibilities of geothermic heat with the directors, owners and technical representatives of the participating organisations. Though the meeting seemed balanced in terms of representation, it wasn't in terms of mandate. Owners, such as the grower and the participating fitness centre, could theoretically decide there and then. Other representatives, such as the school and the swimming pool, still needed to convince a board and had to be equipped to do so. The municipality representatives were again a step further from the end decision making by their political and managerial superiors, whom in their turn had to convince the city counsel. This dynamics meant that the representatives needed to express their concerns and wishes as partner in the project, but also their concerns in convincing their superiors, so that the process manager could assist in their institutional quest.

These differences in culture, markets and dynamics require a neutral third party to mediate: the Change Actor. This intermediate – in our cases financed by national or provincial government – understands the wishes of the individual members and collects the technical data of the parties. The Change Actor uses these to assist the process flow and build understanding between the parties. The Change Actor is result oriented, and realises that Trust is essential to obtain results. The main topics for process management were building relationships (trust), developing a correct risk perception for all parties and designing adequate risk management in the technical concept. Figure 3 places the change actor in relation to the partners in the project.

Figuur 3: Role of the Change Actor



During the first phase of the consortium formation the following concerns were found most significant:

- Timing – the alignment of the housing development with the installation and construction at the grower's side.
- The dynamics in the building process
- Guarantee of energy supply – the energy concept needs to cover for calamities, ending clauses and a vision for future development since glasshouses have a shorter life time than houses.

Approaches of a Change Actor

In our three cases we assumed different approaches of our role as a change actor. As mentioned we used the model of Acting Director (Eijnatten *et al*., 2002), with the extremes of 'steering' and 'facilitating' and Innovation Broker (Winch and Courtney, 2007). In all our cases we worked with Independent Actors (Wielinga *et al*., 2007) – often colleagues or experts that helped us reflect on the process and the steps ahead.

In the case of Greenportkas Venlo, our involvement was financed by the grower through subsidised projects. We were asked to support the grower in using the new production system, the semi-closed greenhouse. The grower set out the direction and the goals, our role as process manager was more 'coaching' on items like time management, communication and to a lesser extend on company strategy. Our main contribution is on the technical aspects of the new production system by advising and discussing new approaches for climate regimes with the grower. This can be seen as a more 'facilitating' approach.

In AckersWoude we took initiative based on a clear request from the housing developer. In a sense we had a 'mandate' from this housing developer to study possible energy concepts and to invite growers to participate. We had a strong steering role in the process, both in timing and in content. To keep a high speed in the progress, we made decisions on behalf of the parties, while keeping in touch with

their different demands to know what direction to take. This can be seen as an Acting Director – in between ‘steering’ and ‘facilitating’.

In our third case, Nootdorpseweg, the grower had taken initiative to contact the possible users. Wageningen UR was asked to make some preliminary calculations and to advise on process aspects (secretariat, timing and cultural aspects between parties). In this phase of the process, we had a small facilitating or ‘coaching’ role in the total project. Later on Wageningen UR was asked to facilitate in the organisational- and business development.

In all the projects we contributed both in process expertise and in technical expertise. Being able to deliver technical expertise seemed crucial to our role. It enabled us to quickly organise the necessary expertise and gave us credibility as process manager.

Conclusions

Following figure 2, energy webs can be seen as a Late emergence of new functionalities. The individual techniques are often well understood – CHP, heat-cooling storage, geothermic energy. The process of organising an energy web, however, can be seen as an Early emergence of new functionalities, since the use of a glasshouse as the producer and supplier of heat (and cooling) has not been performed before – except for Greenportkas Venlo. The niche management should therefore be focussed on relationships, stakeholder management, risk perception and risk management.

This niche management needs to take place at the level of the initiative itself, co-working with the partners in the process. It can be performed by what we call a Change Actor. The Change Actor operates on behalf of the parties, while being allowed to steer the process by stipulating choices. The Change Actor needs to be able to inspire people to move forward, to create a level of understanding on differences in culture and dynamics, give enough technical base-knowledge and have a clear picture of the context surrounding the initiative. The Change Actor recognises blockades and can organise people and institutes to tackle these.

For Wageningen UR, being asked as Change Actor was in all cases based on personal relationships and technical expertise, rather than for its process skills. Only on hindsight the parties noticed that the processes at hand were too complex, and specific expertise was required. This underestimation of the complexity of the process (or a ‘do it yourself’ attitude) was previously described by Klerkx and Leeuwis (2008). Besides that Klerkx and Leeuwis noticed that being both a knowledge provider and an innovation broker (role with overlapping functions as our Change Actor) can cause misunderstanding by the actors about the institutes’ position, resulting in lower acceptance.

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