Discovering Pathways to Sustainability: Small Communities in Transition

by

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ABSTRACT

Driven by concern over environmental, economic and social problems, small, place based communities are engaging in processes of transition to become more sustainable. These communities may be viewed as innovative front runners of a transition to a more sustainable society in general, each one, an experiment in social transformation. These experiments present learning opportunities to build robust theories of community transition and to create specific, actionable knowledge to improve, replicate, and accelerate transitions in real communities. Yet to date, there is very little empirical research into the community transition phenomenon. This thesis empirically develops an analytical framework and method for the purpose of researching community transition processes, the ultimate goal of which is to arrive at a practice of evidence based transitions.

A multiple case study approach was used to investigate three community transitions while simultaneously developing the framework and method in an iterative fashion. The case studies selected were Ashton Hayes, a small English village, BedZED, an urban housing complex in London, and Forres, a small Scottish town. Each community was visited and data collected by interview and document analysis. The research design brings together elements of process tracing, transformative planning and governance, sustainability assessment, transition path analysis and transition management within a multiple case study envelope. While some preliminary insights are gained into community transitions based on the three cases the main contribution of this thesis is in the creation of the research framework and method. The general framework and method

developed has potential for standardizing and synthesizing research of community

transition processes leading to both theoretical and practical knowledge that

allows sustainability transition to be approached with confidence and not just

hope.

To Carole

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BACKGROUND

Introduction

The importance of community participation, in sustainable development has been recognized at least as early as the Brundtland Report and the idea was further developed in Local Agenda 21 (Warburton, 1998). Of course, there have long been communities intent on seeking alternatives to mainstream society for various purposes (Schapiro, 1962) and the idea of creating urban utopias is not new (Miles, 2008). Alternative communities based at least partly on environmental ideals became quite common the 1960's, some of them surviving until today (Dawson, 2006; Miles, 2008). More recently however, the idea of sustainable communities has moved more into the mainstream from its marginal status on the periphery of western society. In reaction to the erosion of community by the rise of individualism, globalization and commercialization over the last fifty years (Putnam, 2001) and in response to escalating persistent, inter-related, global social and environmental problems community based solutions may offer a way forward. Many hundreds of community based sustainability transitions have been initiated in the last decade, mostly in Europe, N. America and Australasia. Government, especially in the U.K., has recognized the possibility of communities being an effective driving force for sustainable development and has been an important source of funding for some (Seyfang & Smith, 2007), though perhaps also because it relieves them of the responsibility and places the burden on others (Alexander, Hope, & Degg, 2007).

This thesis concentrates on the possibility that community based

sustainability transitions offer useful knowledge to support transformation of

society from its current unsustainable state to one of sustainability. These

communities may be viewed as front runners or "site[s] of innovation for

sustainability" (Seyfang & Smith, 2007), each one an experiment in social

transformation. What can be learned from this rich seam of information about the

process of transition and critically, how can this knowledge be used to accelerate

and reproduce the most beneficial and desirable results in other communities? The

overall concept behind this research is to combine inductive, empirical study of

transitional communities with theoretical models of transformative change to

produce practical knowledge that is directly applicable in the field. Ultimately, the

goal is to produce actionable knowledge and a practice of evidence based

transition, towards which this thesis is just a first step.

Research Questions and Contribution

In line with the overarching goal that this research contributes to, the

following research questions are asked:

1. What outputs did the transition community produce and how effective
   were the outputs at increasing community sustainability?

2. How did the transition community produce the outputs?

3. How closely does the transition process conform to the transition
   management approach?

4. What should other communities do to make their transitions more
   successful?

The general research strategy consists of a multiple case study with an emphasis on theory building as opposed to theory testing. The research is very much exploratory as there is very little empirical research on community based sustainability transitions to build on (Middlemiss, 2008). While empirical studies of sustainability transitions abound for various units of analysis (e.g. community, city, region) they tend to focus on accomplishments and not process, and those that do analyze process tend to do so in a way that is specialized and not generally reproducible. To build knowledge of transitions empirical studies producing data that is robust and consistent are needed. Baty's (2010) multiple case study of sustainable transitions at city level is an exception to this and provided conceptual seeding for this thesis. Middlemiss's (2008) work has similarities to the current work in that it creates a framework of community contexts, mechanisms and outcomes for the purpose of building research across case studies in a generalized manner. However, it is more specifically designed for linking community action to individual sustainable behavior and it does not analyze process in detail.

Given the lack of prior work on which to model community transition case studies a fifth research question must be added:

5. How should we do research to understand how community transitions work?

A large part of this thesis has gone into answering this question. The primary contributions of this work then are twofold: (1) the development of an analytical framework and method for the empirical study of community transition

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processes; and (2) a multiple case study of three community transitions using the aforementioned method.

Communities in Transition

What is meant by a "community transition" or more precisely, a small, place based, community sustainability transition? For the purposes of this research, community is defined as "a place-oriented process of interrelated actions through which members of a local population express a shared sense of identity while engaging in the common concerns of life" (Theodori, 2005). This definition does not necessarily constrain the size of the community: it could equally well apply to a city or a village, thus the "small" qualifier is used to emphasize the importance of personal relationships. Warburton describes community as being about "relationships between people" and "relationships between people and the place in which they are located" (Warburton, 1998) of which the former will be stronger in smaller communities. Personal relationships matter because they can translate into "caring" for others, or neighborliness (Warburton, 1998), which can begin to break down the culture of individualism and build community values in its place (McIntosh, 2008). Strong communities however, are not necessarily sustainable communities but they are more likely to be so than weak communities (McIntosh, 2008). The attachment to place is also important for sustainability as the place that people live in is their most immediate connection to the environment (Warburton, 1998), whether it is through litter, smog, noise, the weather, the view, the park, the local wildlife or whatever else.

The second part of the unit of analysis for this research is that the community should be in a "sustainability transition". This is taken to mean here that the community, or a community within the community, is part of a deliberate attempt to change the community towards a more sustainable future, or create a new community that is more sustainable than the current standard for new construction.

Community transitions exist in many forms. Some of them belong to movements, with internal communications, organization and operation, others to looser umbrella organization or peer networks, while some are independent. Some examples are: Transition Towns which have a strong localization focus aimed at creating more resilient, capable and sustainable communities (Brangwyn & Hopkins, 2009); EcoVillages which make community and spirituality central to their mission and developing sustainable lifestyles and infrastructure around it (van Schyndel Kasper, 2008); New Urbanism (www.newurbanism.org) which constructs community oriented urban developments with the expectation that this will in build stronger communities; community land trusts empowering communities through property rights (Bailey, 2010; Mackenzie, MacAskill, Munro, & Seki, 2004). See Table 1, Appendix A for a list of types. While these communities and others like them do not all have sustainability as their primary objective, they do all have some sort of transition targeting relatively small, place based communities as their aim, and where sustainability was not the original motivation, it may become an important goal.

The choice of "small" communities for this research then, arises from their propensity to sustainability and the current trend for action that is apparent at this scale. However, there is another reason for focusing at small scale, and that is that small communities are assumed to be easier to study than large. Baty's (2010) case study of cities showed the difficulty of analyzing complex phenomenon like transitions at this scale. Neighborhoods, villages, small islands and towns may be better research subjects than cities, regions or countries because their smallness makes them simpler: they have less data and less noise, there are fewer actors and interactions, more people have greater knowledge of the entire system, and they are more accessible.

These communities do not exist in isolation. To varying degrees they depend on neighboring or "host" communities, they function within the context of local and national government, they utilize general infrastructure, services and amenities, and they are influenced by the prevailing societal landscape. This places a limitation on the degree to which they can become sustainable and may be an important factor in determining what the optimum size should be of a community pursuing sustainability. BioRegional estimate it might be somewhere around populations of 2,000 to 5,000 (M. Peacock, personal communication, January 13, 2011). But transition communities may also be an influence on their surroundings as well as being influenced by them, and may exert sufficient pressure on the host systems to bring about change. For some community transitions wider "regime change" is an explicit part of their purpose: to change the existing institutions, norms and standards to support mainstream movement

towards sustainability. This "activism" may also extend to deliberate efforts to replicate transitions in other communities. Thus transition communities may seek to advance sustainability in three ways: through internal growth, through replication, and through regime change. In addition to "purpose" other characteristics of transition communities are defined in Table 1.

Table 1.

Transition Community Dimensions

Dimension	From	To
Purpose - Is the community seeking regime change? (Seyfang & Smith, 2007)	**Active** – deliberately pursues institutional change and seeks to initiate new communities (external growth).	**Passive** – Is focused on 'intrinsic' benefits only and is agnostic to wider change.
Dispersal - How is the community contained within or coexisting with other communities? Closely related to the growth model.	**Concentrated** – the community is spatially contiguous residing within clearly definable physical boundaries. There is no spatial mixing with another 'non-transition' community.	**Dispersed** – the transition community exists within a 'host' community and members are dispersed throughout it.
Growth - Assuming internal growth is desirable and possible how does the community increase its population?	**Migration** – the community must attract new members who deliberate move to become part of it. This is the same as an *'intentional' community*.	**Conversion** – the transition community seeks to convert the population of the host community to join it.

Transition Management

According to transition theory, fundamental change to the structure of society moves through distinct phases, typically over a period of $1 - 2$ generations, and can be one of two types: evolutionary, in which the outcome is

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not planned, and teleological, in which a specific goal is sought (Loorbach & Rotmans, 2006). Transition to a sustainable society is clearly of the goal seeking type. Transition management attempts not to directly implement change, but to manage properties of the system and the process, through experimentation, learning and anticipation, in order to steer the overall direction and accelerate change towards the goal (Loorbach & Rotmans, 2006). The transition management framework operationalizes transition management theory into a prescriptive method for initiating and managing sustainable transitions of socio-technical systems (Loorbach, 2007). The approach focuses on creating "protected" space to allow "innovation niches" to operate, in which experiments in alternative culture, structures and practices can take place relatively unhindered by the "regime", where the regime is the dominant set of culture, structures and practices, or in other words, the standard "rules of the game" (Rotmans & Loorbach, 2010). The most promising innovations are selected from the niche and policy measures are taken to assist their deployment into the mainstream (Rotmans & Loorbach, 2010).

Transition management then, might be a means by which community transitions can be diffused into mainstream society. Seyfang and Smith (2007) identify community transitions as "social" innovation niches. Kemp and Martens (2007) point to the use of transition management as an appropriate approach to sustainable development but note that its application to date has tended to be confined to sectoral projects, water or waste management for example, and question its ability to change culture and behavior. But relying on technocratic

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solutions alone is unlikely to be a viable long term strategy for attaining sustainability as they do little to change upstream drivers such as excessive consumerism and unbounded economic growth (Ehrenfeld, 2008; Wiek, 2010). In reality, the social and technical sides of socio-technical systems are not separable. Geels (2005, p. viii) sees technology as a "heterogeneous configuration of elements that work" in which "social and technical aspects are always intertwined and constitute each other". Focusing transition efforts on one or more discrete socio-technical systems will have unknown wider societal outcomes (Ehrenfeld, 2008; Shove & Walker, 2010). If the goal is societal transformation, then the subject of transition should be the entire social system and not just specific sectors of it. Loorbach (2007) describes two cases in which transition management is applied more generally to regional scale societal systems but application at small community level is, to my knowledge, new.

Wiek (2010) draws on concepts from transition management and other planning and governance approaches that have been developed over the last decade or so to create a synthesized template for transformative planning and governance for developing strategies for the transformation of regions and cities and, why not also small communities? The template embodies several key principles: long term future orientation; systemic understanding of problems; sustainability as a guiding concept; future visions and pathways from the present; and stakeholder participation.

Neither of these approaches has been empirically validated. If we assume however that the theory on which they are based is valid then it follows that

successful community transitions might be expected to exhibit the same operational principles, though not necessarily known to the transition community. If more successful community transitions tend to correlate positively with transition principles than less successful community transitions then this would be a validation of transition theory. A negative correlation could suggest the theory is invalid or more likely, that there are multiple ways to achieve successful transitions.

Community Transition Concepts

Before describing details of the analytical frameworks used some basic concepts of community transitions used throughout the thesis need to be established. Community *transitions* consist of the transition process and the transition substance as shown in Figure 1. The transition's purpose is to effect change in the community that leads towards the goal of sustainability. Typically transitions do this by executing *projects* to produce *outputs* where an output is some substantive change in the community. The output of a project consists of one or more *components*. Outputs vary from a single, easily identifiable component to a complex, multi-stranded basket of components. Output components are direct, tangible changes in the community "system" that may be structural or behavioral in nature, but they are deliberative. For example, closing a road or banning driving every Wednesday are structural changes (infrastructural and regulative) whereas asking people to "Walk on Wednesdays" is a deliberative, direct action, behavioral change. Component implementation may take place at a discrete point in time or over an extended period, in some cases several years.

Output components may result in further changes to the system or *outcomes*, intended or not, that may occur immediately following implementation or lag behind it. In the above example, increased pedestrianism may result from either of the structural changes. The eventual cumulative change resulting from an output is the sum of all direct and indirect changes resulting from the implementation of all the components.
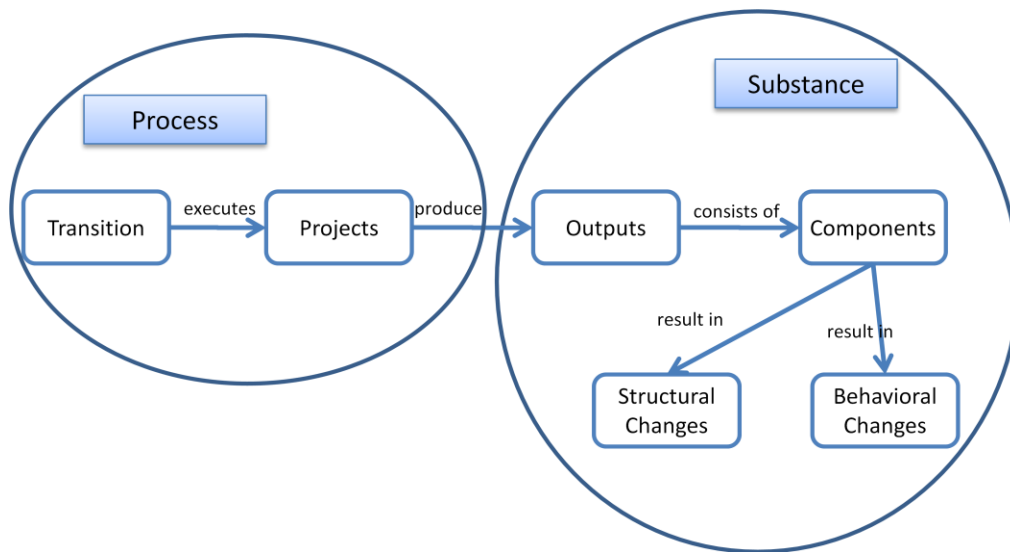
Figure 1. Community transition concepts.

A simple hypothetical example may help to explain these concepts further. A transition community executes a traffic reduction project aimed at reducing high street traffic congestion. The traffic reduction project output consists of a new parking fee component which takes effect immediately on its implementation. Over some time following implementation high street traffic declines and pedestrianism increases. The outcomes of the project then are: (1) new parking regulations; (2) less traffic; and (3) more pedestrians. The elements of this example are: the *project* (traffic reduction); the project *output* (traffic

reduction); the output *components* (implement parking fee); the project *outcomes*

consisting of *structural change* (regulations) and *behavioral change* (driving,

walking).

RESEARCH DESIGN

Overview

The overall research method follows that of the typical multiple-case study method described by Yin (Yin, 2003) and shown in Figure 2 in which cases are selected and data collection instruments designed around the research question, an independent single case study is conducted and analyzed for each case, and the findings from each of the single case studies are compared and conclusions made.
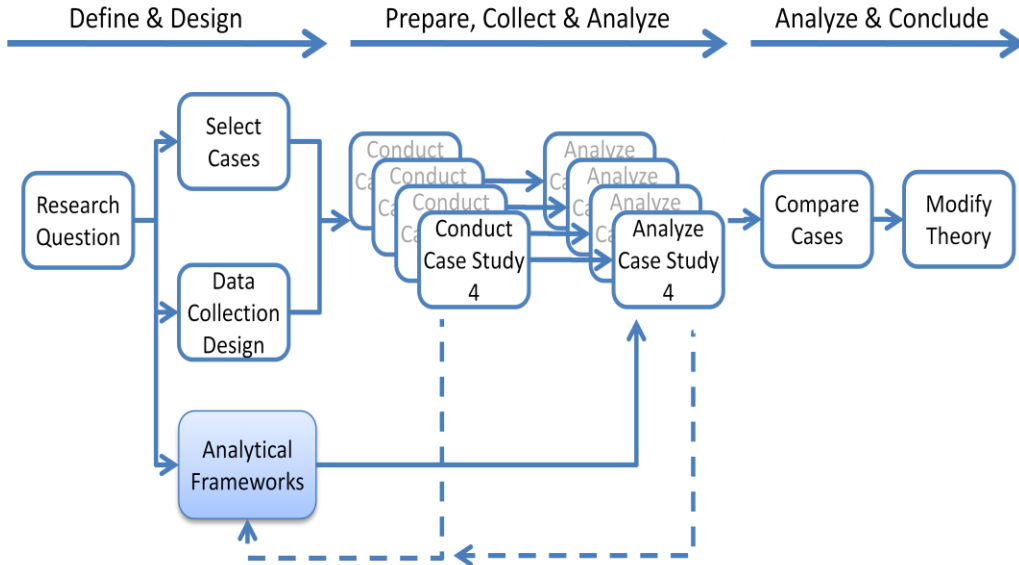
Figure 2. Multiple-case study method. Adapted from figure 2.5 in Case Study Research: Design and Methods (p50), by R. K. Yin, 2003, Thousand Oaks, Calif: Sage Publications. Copyright 2003 by Sage Publications Inc. Adapted with permission

A case study research strategy was chosen because it is most suited to the nature of the research. Yin recommends using case studies when "a how or why

question is being asked about contemporary set of events over which the investigator has little or no control" (Yin, 2003, p. 9). Attempting to understand how successful transitions work is research of an explanatory type (it is a "how *question*"), focused on live and active communities (is *contemporaneous*), and can only be studied in-situ in its real-world context (*no investigator control*). Multiple case study was selected over single case study because of its ability to produce more robust results: conclusions are stronger when arrived at from independent cases and findings are more generalizable when originating from two cases of differing context (Yin, 2003, p. 53). Grin et al. (2010, p. 99) also note that case studies allow "detailed process tracing" and "exploration of patterns" which is important for investigating transition phenomena.

Case Selection

Selection of cases for study was based on criteria relating to the unit of analysis (small, place based communities engaged in a sustainability transition) and practical considerations. The criteria are described in Table 2. The number of cases was targeted at between five and eight thereby providing sufficient cases for possibilities of "literal replication" and "theoretical replication" across cases as recommended by Yin (2003, p. 53). However, the nature of the research is more exploratory than theory testing and no attempt has been made to select cases based on hypothesized controlling variables.

Table 2.

Case Selection Criteria

Criteria	Description
Sustainability Transition	The community, or a significant subset of the community, is trying to change the community to become sustainable or in the direction of sustainability.
Place Based	Community members reside within and identify with a common area bounded by well defined geographical features. This excludes communities of interest.
Spatial Extent	Roughly rural < 5,000 ha, Urban < 500 ha. The community should be small enough in area that members can routinely interact on a daily basis and be familiar with the whole area. This could be defined as "walking scale" but this might not be totally accurate in larger area, rural communities.
Total Population	$50 < P < 5,000$ This is the total number of people residing within the community boundaries. Minimum population is important to lend credibility to the initiative and for it to have some wider significance.
Transition Participation	The level of participation, i.e. to what extent is the population actively engaged in the transition. This is important for the initiative to have significance and credibility but exactly what this level should be is an arbitrary choice. It will also vary depending on the type of initiative and phase of transition. Transition Towns for instance, as dispersed conversion transitions, start as a small group with the intention of growing until the transition subpopulation approaches the total population. Intentional communities however, as concentrated migration transitions, may begin with a transition subpopulation equal to the total population and grow the total population while keeping participation high. It is also important to allow for communities early in transition that may have low participation because they only recently started. The degree of participation can also vary from total non-participation through to full time activist. Thus the absolutely minimum participation needs to be considered on a case by case basis but as a loose guideline it should at least be 10 people active on a weekly or greater basis. Below this, questions of significance and credibility become increasingly relevant, regardless of other considerations.
Transition Initiated Date	The date that community transition began. This should be no later than 2008 or there will be little data to collect and analyze.

Criteria	Description
Location	The community is accessible and realistic for travel, which is constrained by time and budget. The set of cases should all be from the same country.
Agreeable	The community needs to be willing and able to participate.

Conducting the Single Case Study

Case data collected consists of documents, literature, observation notes and interview transcripts. Site visits are part of the case study in order to conduct face-to-face interviews and to gain first-hand experience of the community and place. Falleti (2006) recommends in-depth analysis of primary sources for the detailed familiarity with the case it produces. Generally, two interviews are conducted at each site with community members closely involved or familiar with the transition and its history. Interviews are about two hours long and consist of a mixture of open and closed ended questions. The questions are loosely designed around transition management theory as this is where the research was most strongly focused at that stage however, they are also general and open enough to allow the interviewee to provide a great deal of data on the transition. The interview questions are listed in Appendix B.

Using interview data, documents, literature and follow up emails a case chronicle is compiled consisting of a chronological table of events and activities. Each entry in the chronicle consists of the *date*, a *narrative* (description and notes on the action), the *action* (what happened), the *actors* (who was involved), the *motivation* (why was it done), the *inputs* (what factors shaped the particular form of the action), and the *outcome* (what impact did it have on the community or

outside the community, i.e. the "regime"). The purpose of the chronicle is to create a general database of the transition process that supports various higher level analyses for the current research but potentially future studies as well. The chronicle then should be as complete as possible and ideally, not filtered by the researcher compiling it. In practice this is very time consuming and some amount of selectivity on what to include is necessary, the most common being level of detail. The data entered in these chronicle fields are specific to the case being documented. Compiling the chronicle on one hand is straightforward descriptive documentation but it also begins the analytical process, starting with the breakdown of the narrative into actions, actors, motives etc. Chronicle analysis continues with the mapping of case specific actions and actors to general analytical framework categories.

Analyzing the Single Case Study

The analytical method is embedded within the single case study part of the overall research method shown in Figure 2. The same process is applied to each case, taking raw case data as input and converting it into a generalized form aligned with the research questions. As Langley put it, the task is to move "from a shapeless data spaghetti toward some kind of theoretical understanding that does not betray the richness, dynamism and complexity of the data" (as cited in Grin et al., 2010, p. 99). The data produced by the analysis is in a form that lends itself to comparison across cases. This is standard procedure for multiple-case studies (Yin, 2003, pp. 49-50).

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The specific analytical method used needs to take into account the

essential nature of the research question being asked: how can communities

become sustainable. It attempts to do this by pursuing three basic lines of inquiry:

1. What did they (the community) do?

2. How did they do it?

3. How successful was it?

"*What did they do?*", or just "*What?*" refers to the changes in the

community produced by the transition process. This is the substantive difference

in the state of the system (the community) before and after some transition event.

The "*What*" is important because if transitions are to be evaluated for their

effectiveness at moving towards sustainability then there needs to be something

tangible to evaluate.

 "*How did they do it?*" or just "*How?*" refers to the actions that led to the

completion of a project and the production of outputs. This is the transition

process as opposed to the transition substance (the "*What*"). The "*How*" is

important if an understanding of how to reproduce desirable transition outcomes

(or avoid undesirable outcomes) is to be obtained. Understanding how an output

is produced is not concerned with implementation details but is focused on the

"process that unfolds over time" (Grin et al., 2010, p. 99), of which

implementation is usually just the last in a complex series of steps involving

multiple, diverse actors and activities.

"*How successful was it?*" or just "*Success?*" refers to how successful in

terms of sustainability a project is judged to be. An appraisal of success (or

failure) is important as ultimately the objective is to understand how to reproduce successful results.

There are no prior case studies to my knowledge, single or multiple, with a similar unit of analysis (small communities transitioning to sustainability) that use an analytical framework that is generalizable and reusable and that aligns with these basic lines of inquiry. There are many studies of individual and multiple community transitions but they do not adequately generalize to an extent that makes them transferable and they do not address all three of these questions. Valid in their findings and interesting as they may be, these studies cannot lead to robust theory while they remain in the specific realm of unique cases and do not attempt to link process to substance to outcomes in a reproducible manner. A major part of this thesis therefore, is directed towards the development of an analytical method to support the needs of the immediate research but also that can be used in future studies to test and further develop community transition theory.

Analytical Method for Community Transitions

A general method for analysis of community transitions is developed as part of, and used directly in, this thesis. The usefulness of this method however, extends beyond the current research to future case studies of community transitions for purposes of testing and further developing community transition theory.

The overall analytical method is shown in Figure 3. Taking case data as input, a process of filtering, classifying, and mapping converts the data into a generalized form structured around the three basic lines of inquiry (What, How &

Success) that can be compared directly across cases. There are three important aspects to the overall process: (1) the splitting and the recombining of the process into two analytical channels , one analyzing process (*How*) and the other analyzing substance (*What* and *Success*); (2) the structuring of the analysis and the data is related to the community transition concepts of projects, outputs and components described above; (3) the use of multiple analytical frameworks to support systematic and generalized structuring of data in ways that are relevant to the end needs. Existing analytical frameworks are used when available and new ones developed when they are not.
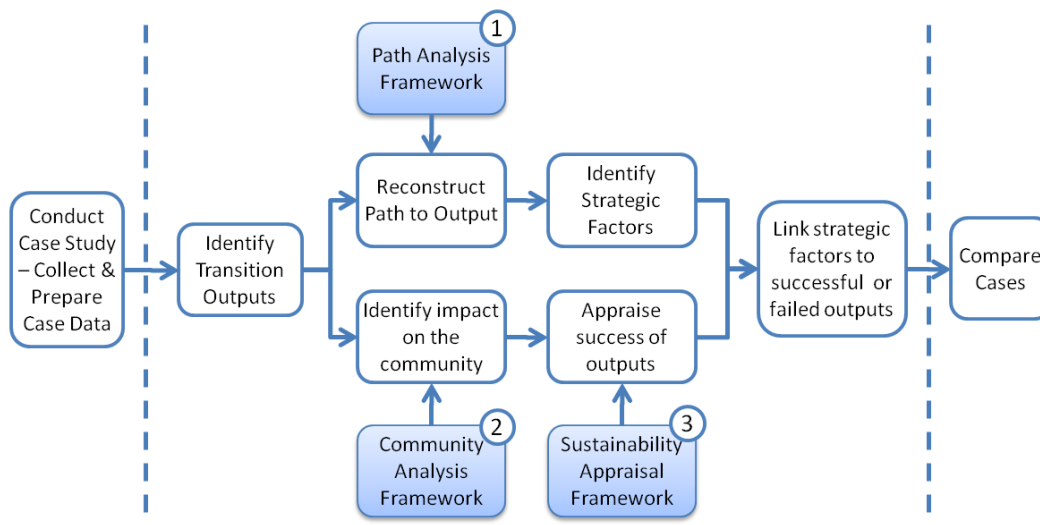
Figure 3. Single case analytical method.

Using the case data collected and prepared in conducting the single case study, transition outputs are identified. The outputs correspond to projects that the transition community executed which, within cases and across cases, vary greatly in their scope, magnitude and nature. Where it is not clear if some accomplishment is the only component of a single component project or if it

belongs to a bigger project it is generally added to the larger project. However, large projects with many output components that are too highly aggregated to allow informative analysis at the output level are split into multiple outputs, keeping more closely related components along implementation or structural lines together.

Taking the lower analytical branch first, (the transition substance), the process proceeds as follows:

1. Components of project outputs are identified by scanning the case data. Components are the products directly implemented during the project. After identification, they are used to construct a more in depth analysis of both direct and indirect changes to the system (the community) using the community analysis framework (2). See Community Analysis Framework for more detail on this framework.

2. Community impacts are mapped onto the sustainability appraisal framework (3) by identifying which sustainability indicators may be influenced by them.

3. An appraisal of the change in the identified sustainability indicators using the sustainability appraisal framework (3) provides an indication of the movement towards (or away) from sustainability relative to the state of the system before the output was implemented. See Sustainability Appraisal Framework for more details on this process.

4. At the end of the transition substance analysis, for each transition output there will be:

- Output components

- A descriptive analysis of the impacts on the community system

- Identification of sustainability indicators influenced by the impacts

- An appraisal of the change in each identified sustainability indicator

Now taking the upper analytical branch (the transition process), the process proceeds as follows:

1. The transition path to the output is reconstructed in reverse from case data. Paths for all outputs are merged to create an overall transition paths chart. Paths identify major conjunctions of activities, actors, intermediate outputs and barriers in a time dependent sequence. See Transition Path Analysis Framework for a more detailed description.

2. Using the transition paths chart and case data, rich narratives are written describing aspects of the path to each output salient to an understanding of how the output was accomplished such as important collaborations, enablers, and barriers.

3. Key strategic success or failure factors that led to the output are identified from the rich narratives.

4. At the end of the transition process analysis, for each transition output there will be:

- A transition path chart.

- A rich narrative.

- Strategic factors

The final step in the analytical method is to combine the results from the lower (substance) and upper (process) analyses at the level of transition output. For each output, the appraised change in sustainability, as represented by a subset of sustainability indicators, can be associated with the key strategic factors that led to the output. More specific mapping of indicators to strategic factors however, is not possible with the method used here because strategy applies to the whole process in which multiple transition components are not independently produced but are the result of integrated projects.

Community Analysis Framework

The purpose of community analysis framework is to understand where in the community changes are happening as a result of transition outputs. At least as important as the structural aspects of communities (e.g. technical, architectural, infrastructural) are the behavioral aspects: what people do, for it is the actions of people, driven by "upstream" needs, desires and rules that utilize the "downstream" services that the structure provides (Wiek, 2010; Wiek, Kay, Boone, & Ledlow, 2010, pp. 14-15). Wiek's (2010) Activity – Supply framework (Figure 4) centers on activities and their corresponding supply systems thereby addressing "actor-structure dichotomy" and is used here for descriptive analysis of transition induced change. Wiek et al. summarize the features of the framework as follows:

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The horizontal structure of the framework comprises of eight activity

domains and corresponding supply systems. The rationale behind this set

of activity domains is that they cover about 90% of the personal time

budget. Cutting across these activity domains and supply systems are

community values including health, safety, quality of the natural

environment, and so forth (vertical structure) (2010, p. 15).

ACTIVITY | SUPPLY SYSTEM

Working — Commercial Buildings Energy & Water Infrastructure

Housing — Residential Buildings Energy & Water Infrastructure

Mobility — Transportation Infrastructure &Options Energy Infrastructure

Eating — Food Production & Distribution Systems Energy & Water Infrastructure

Educating — Schools Community Colleges Energy & Water Infrastructure

Recreation — Sports Facilities Entertainment Services Energy & Water Infrastructure

Communicating — Commercial Buildings Telecommunication Infrastructure

Shopping — Commercial Buildings Services Energy & Water Infrastructure

SAFETY | HEALTH | CULTURAL IDENTITY | ENVIRONMENTAL QUALITY

Figure 4. Analytical framework for community based sustainability research

(Wiek, 2010)

Sustainability Appraisal Framework

Sustainability appraisal is used to evaluate the relative change in the

sustainability of the community as a result of transition. The sustainability

appraisal framework used for this purpose consists of analytical and normative

parts. The analytical part consists of a set of sustainability indicators and the

normative part, a set of criterion for judging sustainability. The combined normative-analytical framework provides a structure and a process by which to appraise the change in sustainability resulting from a transition output.

The term sustainability appraisal is deliberately chosen over sustainability assessment to differentiate the processes used and the comprehensiveness and degree of rigor applied in evaluating sustainability. Sustainability assessment is a much used term referring to a "vast diversity" of practices, something that Gibson (2006) has attempted to address by proposing a move towards "comprehensive adoption and more consistent application of the requirements and processes". Although drawing on some of Gibson's requirements, the sustainability evaluation here is not a full assessment à la Gibson and is therefore referred to as an appraisal.

Sustainability is a normative concept and it is therefore important to define the standards by which an evaluation of sustainability is made. For the sustainability appraisal here, a modified version of Gibson's (2006) set of core criteria for sustainability assessment is used (Table 3).

Table 3.

Criteria Used For Sustainability Appraisal.

Indicator	Description
Socio-ecological system integrity	Establish and maintain the long term integrity of socio-biophysical systems.
Livelihood sufficiency and opportunity	No-one is denied the means for a decent life or opportunity to improve
Intra & Intergeneration equity	Gaps in sufficiency and opportunity between rich and poor are justifiable and the opportunities and capabilities of future generations are protected.
Resource maintenance & efficiency	Growing demand is met and socio-ecological damage reversed by doing more with less.
Socio-ecological civility & democratic governance	Sustainability is a core value of all citizens and organizations, and openness and a high degree of participation are priorities in governance.
Precaution & adaptation	Risks of serious or irreversible socio-ecological damage are avoided; Anticipatory governance prevails.

Notes: Adaptations from Gibson' (2006) criteria are: (1) Intra and inter generational equity merged into a single criterion, (2) Immediate & long term integration is not included.

The sustainability indicator set is not a comprehensive indicator set for communities and neither are the indicators in the set carefully crafted and finely tuned like good indicators should be. Instead, it is a set of sustainability indicators roughly hewn from the case data material as analysis and framework development proceeds together. As outputs are analyzed using the community analysis framework, provisional sustainability indicators that represent the identified impacts on the community are created and added to a 'global' list of indicators. In this way an indicator set is built up and refined that represents all of the changes

across all of the cases. The list is presented in summary form in Table 4 and more detailed indicator definitions are given in Appendix C.

Table 4.

Community Transition Sustainability Indicator Set.

Indicator	Description
Access to basic services & amenities	Equitable access to services and amenities such as daily groceries and household needs, health service, education, green space and information
Biodiversity	The quality of the natural environment, directly related to its ability to support biodiversity and other ecosystem services.
Car Dependency	The degree to which community members' well-being and general welfare depend upon having access to and using a car.
Community Assets	Anything that is useful or of value to the community.
Employment	Direct employment created (or supported) in the community.
Energy use & CO2 emissions	The amount of energy used and CO_2 it produces.
Food production	The amount of food produced by community members or the local food industry and the methods of food production. Thus local, low impact food is generally more desirable than centralized, industrially produced.
Health & wellbeing	Access to and use of resources that improve health and wellbeing.
Local Economy	The strength of local economy that the community is part of where local businesses, diversity and integration are generally desirable aspects.
Low impact consumerism	Choices to reduce consumption of consumer products and to make ethically and environmentally responsible consumer product choices.
Participatory Governance	The degree, level and effectiveness of democratic participation by community members in governance of the community.
Social Cohesion	The degree of "solidarity, trust and association" (Bryden & Geisler, 2007) among the community.
Social Housing Provision	The degree to which the community provides for the housing needs of low income and special needs members.
Sustainable Wood Fuel Resource	Management of local woodland as a sustainable fuel resource.
Utility Bills	The significance of utility bills as part of the household budget

Indicator	Description
Waste Production	The amount of waste sent to landfill and the amount recycled or composted.
Water use & waste water treatment	The total amount of water used by households, the amount of that coming from the water provider and the amount of wastewater discharged to the utility provider.

Sustainability appraisal of a transition output proceeds by individually appraising the sustainability indicators that apply in each of the community domains impacted by the transition output. The impacts across community domains are identified and described in the community impact analysis step. Indicators may apply across multiple impacts within the domain. As an example, the *Energy Use & CO$_2$ Emissions* indicator in the Housing domain would be influenced by both an energy saving behavior campaign and by installation of a community renewable electric grid implemented together as part of a single project. If there is no suitable indicator available in the global set a new one is created or if appropriate, an existing one generalized to make it fit. Once identified, data relating to the change in the indicator are sought and an appraisal made.

Indicator definitions identify the sustainability criteria that may apply to an indicator. Appraisal of an indicator's value in a specific output / domain context involves the researcher subjectively rating the change in each criterion on a four point scale using the guide lines shown in Table 5. Criteria within the indictor are rated individually. Negative ratings are possible where the change led to a decrease in sustainability. A maximum score of 18 is therefore possible only

if an indicator scores 3 in all 6 criteria. This will not happen with the current

indictor set because there are no indicators in which all six criteria apply.

When appraising a change, saturation throughout the community is

considered and not just the change that occurred within those who participated.

So, for example, two communities achieve a 10% reduction in CO_2 emissions

among transition participants, which by most reckonings is a moderate

achievement, scoring 2 in each of the criteria that apply to this indicator.

However, if the first community has a high participation rate and the second

community a low participation rate then the rating is adjusted to represent change

at the overall community level. The first community keeps its score of 2 but the

second community's score is reduced to a 1 or perhaps a zero, reflecting that the

overall change in the community is low or even negligible. As a rule of thumb,

community participation is estimated at high if above 75%, medium if between

25% and 75%, low if below 25% and negligible if below a few percent.

Table 5.

Sustainability Appraisal Rating

Amount of change	Rating Value
No change or negligible change	0
Small change	1
Moderate change	2
Substantial change, up to the maximum	3

The appraisal method is far from perfect. It does however: indicate if the sustainability is changing; the direction it is changing in; and a rough magnitude of the change. There are some specific points that need to be made:

- The appraisal is relative, not absolute. It does not say anything about a case's absolute state of sustainability and it therefore follows that it cannot be used to compare cases and conclude that one case is more or less sustainable than another.

- The appraisal is relative to a case specific baseline. The baseline is different for each case and it depends on the transition type. For in-situ transitions acting on an existing community the baseline would normally be the state of the community prior to transition beginning. For a new community, one that did not exist before, the baseline is taken to be the state of the neighboring community and the local area. An alternative baseline might be the state of the residents prior to the community being created but this would be very difficult to determine.

- While ratings can be added to arrive at aggregate changes in sustainability the results are not strictly logical in that three small changes are not necessarily equivalent to one large one.

- Appraisal ratings are not based on the size of community. If a small community and large community both substantially decrease their car dependency they are both rated at 3. This suggests it is much more difficult for larger communities to transition than smaller ones.

Transition Path Analytical Framework

Process Tracing

The transition path analysis framework is used to analyze the transition process within individual cases with the objective of gaining insight into the causal mechanisms that result in transition outputs. The framework follows aspects of the process tracing method that has emerged as a tool in political science (Falleti, 2006) that Falleti states "incorporate[s] historical narratives within highly abstract theories and explanations". Process tracing attempts to explain "the outcomes of interest by going back in time and identifying the key events, processes, or decisions that link the hypothesized cause or causes with the outcomes" (Falleti, 2006) and is particularly suited for researching phenomena that involve "temporality, critical junctures, and path dependence". As noted by Geels and Schot (2010, p. 99), transitions are such phenomena and process tracing is therefore an appropriate method for their investigation.

Process tracing is applicable for either theory testing (process verification) or theory building (process induction) objectives (Bennett & George, 1997). The state of research into community sustainability transitions has not yet produced any theory and the transition path analytical framework developed here is therefore of the process induction type, supporting exploratory research aimed at building theory. Transition management theory (Loorbach, 2007) however, focuses on socio-technical transitions more generally, and does to some extent inform the framework.

The challenge in the current research is in operationalizing process tracing for use in the community sustainability transition field. This is done in an iterative fashion in parallel with performing the analysis. The salient points of the method and supporting framework are:

- Tracing backwards from transition outputs to reconstruct the sequence of events and activities (the transition output path).

- Tracing back to the transition's point of inception or to a point of convergence with other transition output paths.

- Focusing on activities, actors and barriers.

- Generalizing types of outputs, activities, actors and barriers

- Aggregating activities and events to a similar level of detail across cases

- Producing a graphical representation of the transition path

- Creating a rich narrative

Transition Path Reconstruction Process

Figure 5 illustrates the basic workflow and work products used in the path analysis process. Starting from a transition output the sequence of events and activities that led to its implementation are identified and plotted on two levels of intermediate trace charts before being transformed to the final transition path chart. The sequence to the output is subjectively reconstructed in reverse by the researcher using the case chronicle as a primary source of reference. The chronicle contains useful information on events and activities but it does not link them: this relies on the researcher's familiarity with the case developed during

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data collection and preparation. Reverse reconstruction has the advantage that it narrows the choices of where you can go: there is more certainty of the events and activities that immediately precede and are necessary for a particular step. Forward reconstruction on the other hand, opens up many more possible routes to take, many of which are not necessary in getting to the destination of interest (the transition output). The disadvantage with reverse tracing is that 'wrong turns' and "dead ends" that were made by the transition community will be omitted from the path and potentially important observations missed.
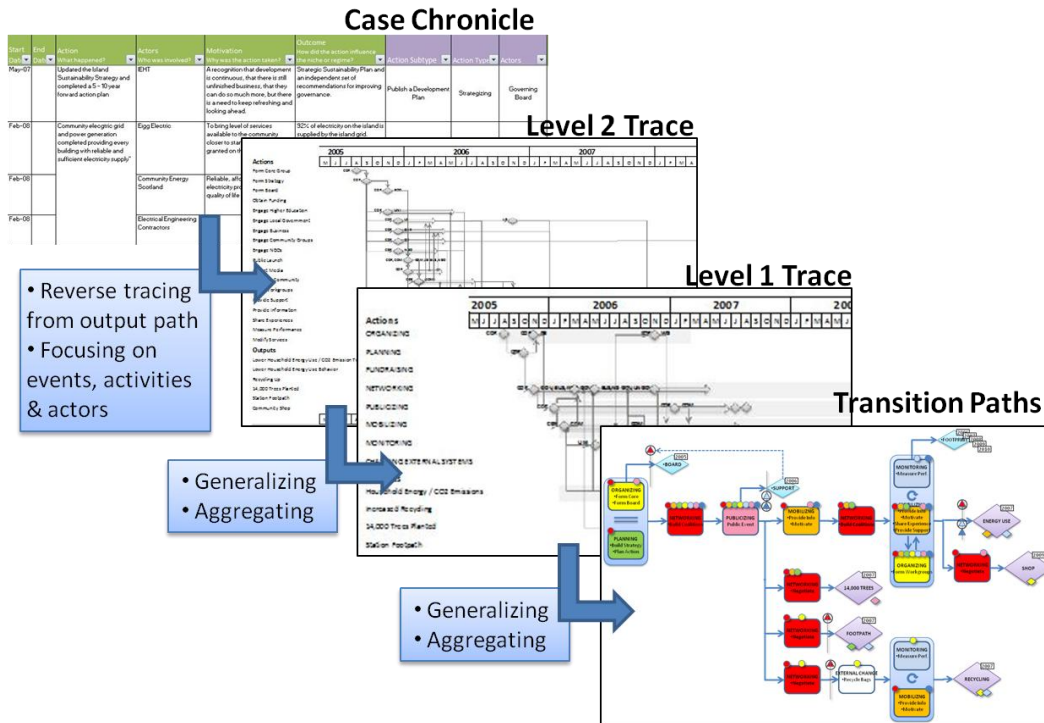
Figure 5. Transition path analysis process

The trace charts are Gantt style charts plotting activities, events and outputs on a time axis using shapes in Microsoft Excel and then linking the shapes with connecting lines. Activities and actors are generalized through three levels of

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detail from the chronicle through two levels of trace before being transposed to the final transition path chart. This could probably be streamlined but it would be much more difficult to jump directly from the chronicle to the final chart: the intermediate steps incrementally approach the desired level of detail and generalization. From the level 1 (highest level) trace a list of activities leading to each output is generated and from this a skeletal transition path chart is constructed and the details (actors, types, barriers) filled in.

Transition Path Analytical Framework Dimensions

Process tracing needs to be structured with a specific orientation towards the research objective. The current research is concerned with establishing a knowledge of how community sustainability transitions produce outputs. Community transitions are the result of people interacting and doing things. To understand how this results in a particular effect it follows that the types of interactions that take place and the types of people or groups of people interacting are important, as is the sequence of interactions. Thus these are the primary dimensions of the transition path framework: activities, actors and sequencing; that come together in the transition path chart as a collection of directionally related conjunctures. Sequencing captures the concept of path dependency but less so temporality. Generalized sets of activities (Table 6) and actors (Table 7) iteratively distilled from specific, detailed events are used to characterize who was involved and what did they do. Other aspects of the framework are barriers that prevent or limit the effectiveness of an action and the type of outputs that are

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produced. The framework captures the type of barrier (regulative, technical,

behavioral etc.) and if it was overcome.

Table 6.

Transition Path Analytical Framework Activities

Activity	Description
Networking	Working with other organizations to achieve short term or long term, specific or general, objectives. Includes building coalitions, negotiating, participating in peer groups.
Mobilizing	Getting community members to participate in the transition through providing information, holding motivational events, providing support.
Planning	Identifying goals and objectives and how they are to be achieved through identification of future actions, their sequence and timing. Includes strategy building, high level decision, shorter term action planning.
Organizing	Organization of people and resources, their acquisition (recruitment), use, direction, and control. Includes creating organizational structures, appointing staff, project management, financial management, etc.
Monitoring	Measuring or monitoring the system's current state and performance.
Publicizing	The outward dissemination of information about what the transition community is doing, what they have achieved, what they plan to do. This may be to raise the transition's profile, for transparency, for advocacy or for numerous other reasons.
Fundraising	Raising funds from business sponsorship, government grants, public appeal or any other source.
Changing External Systems	Changing of external systems or services by external agents that has an effect on the transition community. For example, bus routes are changed.

Table 7.

Transition Path Analytical Framework Actors

Actors	Description
Core Group	A relatively small group at the ore of the transition, providing leadership, vision, practical skills and knowledge, and management
NGOs	Mission oriented non-profit organizations. May be local to national to international in scope, volunteer, grass roots or highly professional in nature..
Business	Commercial organizations, ranging from local business, through national and multinational enterprises.
Government	Government administrations an elected representatives, ranging from local (e.g. county councils) to national (e.g. Scottish or U.K. government) to supra-national (e.g. the E.U.).
Higher Education	Universities, colleges.
Community Groups	Other community led and staffed groups in the community such as gardening clubs, Women's Institute, church groups, sports clubs. Also includes community schools.
Community Members	Individuals who are part of the community undergoing transition, though not necessarily involved in (or even aware of) the transition activities.

Table 8.

Transition Path Analytical Framework Barrier Classes

Barrier Class	Description
Regulative / Governance	A law or regulation prohibits an action, an administrative procedure takes too long or is excessively demanding, or the decision making process is opaque and exclusive. Also includes institutionalized norms such as professional standards.
Technical	A deficiency or failing of available technology prohibits an action.
Infrastructural	A lack of or deficiency in infrastructure (common, shared physical structure) prohibits an action.
Service	A lack of or deficiency in service provision prohibits an action.
Behavioral	Cultural and behavioral norms probibit an action.
Ecological	Protection of ecosystems may prohibit an action, or from another angle, a lack of or deficiency of ecosystem services may be the problem.
Economic	The action is too expensive.

Table 9.

Transition Path Analytical Framework Output Classes

Output Class	Description
Regulative / Governance	A change to laws, regulations, procedures, organization etc.
Technical	A change to technical components of a system or a reconfiguration of system components.
Infrastructural	A change to the common, shared physical structures and system of the community
Service	A change to the services provided to the community
Behavioral	A change in community behavior
Ecological	A change to ecological systems in the community

Transition Management Analytical Framework

The final analysis of each case is to make an appraisal of its similarity to theoretical principles of transition management. Transition management theory draws on insights from complex systems theory and governance theory (Rotmans & Loorbach, 2010). According to Rotmans and Loorbach, effective management of a transition should conform to the set of principles which are summarized in Table 10 and to which two additional principles have been added: *Selective participation* and *Applying normative principles of sustainability*. Using knowledge of the case data a subjective appraisal against each principle is made and a rating of 0 is given for no fit or very little fit, 1 for partial fit and 2 for a good fit.

Table 10.

Theoretical Principles of Transition Management (Rotmans & Loorbach, 2010)

Theoretical Principles TM	Description
creating space for niches	Creating and maintaining a protected environment that allows a small core of agents to emerge and operate differently from, and free from interference and influence by the regime. Thus a niche is formed that to some degree is out of alignment with the dominant structures, cultures and practices. Outputs from the niche, i.e. what it produces and supports, would not survive long or even begin to form outside of the protected environment. Freedom from interference and influence is also a matter of degree with some factors being easier to escape from than others.
focus on forerunners	Frontrunners are agents who are innovators, strategists, visionaries. People who can break free from and think beyond the dominant structure, culture and practices. They are the leading agents of change. Focusing on frontrunners means bringing the right combination of agents together into a protected space (an "arena") where they can interact and maximize their collective potential.
guided variation and selection	Keeping a diverse set of innovative options open for as long as possible, avoiding premature selection and potential lock-in. Experimentation provides information to help make decisions and select some options over others. Flexibility is maintained which may result in redundancy and inefficiency. There is a tension between variation (creating a diverse and balanced portfolio of pathways and experiments) and selection, which limits variation to within the transition criteria.
radical change in incremental steps (guided by a long term vision)	Radical change is the ultimate goal of transitions but it does not happen through abrupt forcing. Instead, directed incremental steps work within the capacity of the existing system to absorb change and adapt, moving the whole system towards the goal. Such directed incremental change may also take advantage of potential "tipping points" where a small incremental step destabilizes the system and leads to acceleration towards the goal. Implicit in this principle is the establishment of a long term guiding vision by which agents are guided in their actions. The vision evolves in response to insights gained from new knowledge, experience or events.

Theoretical Principles TM	Description
learning-by-doing and doing-by-learning	Social learning, or second order learning, differs from direct knowledge creation in that it reframes perspectives and changes the transition goals and transition process through interaction and reflection. Individuals or groups question and reflect on the values, assumptions and policies that drive their actions and through this change them. Inductive and deductive approaches to experimentation are used to modify ideas and theories that apply back to the overall transition management but interaction with other actors through transition activities is also an important source of social learning.
multi-level approach, multi-domain approach	An integrative approach. An understanding of the system as a multi-level (e.g. individual - household - neighborhood - city - state - national) and multi-domain (e.g. economic, cultural, technological, ecological, institutional) that operates on multiple timescales (e.g. fast - slow) is important for identifying patterns and mechanisms of change and for identifying how these patterns and mechanisms may be influenced.
anticipation and adaptation	Anticipating future trends and developments is a key element of transition management as is acting on that information to keep the transition (substance and process) on track. Monitoring the system is important to provide information to help identify such trends and for evaluation. Anticipation is the basic steering mechanism by which the transition navigates towards the goal.
empowering niches	Niches are empowered as they gain resources such as knowledge, finances, and competencies, exemption of rules and laws, and influence of policy. Empowerment may also refer to the degree of control that the niche has over decision making.
Selective participation	TM is defined as a multi-actor process in which individuals and representatives from government, societal organizations, business, knowledge institutions and intermediary organizations participate. All actors influence in some way societal change and governance of activities must therefore be participatory. The participatory approach is deliberately selective based on narrow and temporary consensus on problem definition and long term ambition amongst frontrunners. Short term consensus is limited thereby allowing involvement, innovation and creativity to flourish

Theoretical Principles TM	Description
Applying Normative principles of sustainability	Long term vision and short term action should be driven by normative principles for sustainable development integrated across all sectors (Loorbach, 2007, p. 80).

The transition management principles are quite detailed in nature and the distinction between some of them can be subtle. For example, *anticipation and adaptation* and *learning-by-doing and doing-by-learning* both have to do with monitoring performance of the system (substance) and the transition (process) and adapting to stay on track. The difference is that the former is first order learning whereas the latter is second order. The difference between *creating space for niches* and *empowering niches* is subtle too, the former deriving from the concept of *emergence* in complex systems theory and the latter from *co-evolution* (Rotmans & Loorbach, 2010, pp. 144-145). For this reason, appraisal against transition management principles may be too esoteric to be practically useful. As an alternative appraisal Wiek's (2010) transformative planning and governance methodology is also used. In particular the four methodological steps are used: (1) creating and crafting sustainability visions; (2) historical and current state system analysis; (3) scenario construction and sustainability assessment; and (4) backcasting and testing of intervention and transition strategies. These have been modified to simplify them further, ignoring scenario construction and subdividing backcasting and testing into two steps. The adapted transformation process steps are in Table 11. Using knowledge of the case data a subjective appraisal against

each method step is made and a rating of 0 is given for no fit or very little fit, 1 for partial fit and 2 for a good fit.

Table 11.

Adapted Transformative Planning and Governance Steps

Visioning	Creating and crafting sustainability visions
Analysis	Historical and current state system analysis
Intervention	Building transition strategies and intervening
Evaluating	Testing of intervention strategies and transformative process

RESULTS

Case Selection

Data collection for compiling a short list of case candidates was based on readily available internet sources such as the community's website, press or online magazine articles. The short list is shown in Table 12. As can be seen from the short list, the cases are all in the United Kingdom in either Scotland or England. The conditions between Scotland and England – including funding available to community groups - were judged to be sufficiently similar to allow cases from both of these countries. The U.K. was chosen as a suitable region for the study because of the abundance of interesting cases, their relative proximity, and ease of travel: it would have been substantially more expensive and time consuming to perform field work on a set of U.S. cases.

Table 12

Case Selection Short List

Community	Country	Move-ment	Setting	Type	Start	Pop
Isle of Eigg	Scotland	CLT	Rural	Island	1997	86
Isle of Gigha	Scotland	CLT	Rural	Island	2002	158
Findhorn Foundation	Scotland	EV	Rural	Village	1962	450
Biggar	Scotland	TT	Rural	Village	2007	~2000
Portabello	Scotland	TT	Urban	Suburb	2005	-
BedZED	England	PC	Urban	N/Hood	2002	~200
Ashton Hayes	England	GCN	Semi-Rural	Village	2005	919
Forres	Scotland	TT	Semi-Rural	Town	2007	9,500

CLT: Community Land Trust; EV:EcoVillage; TT: Transition Town; PC: Planned Community; GCN:Going Carbon Neutral

From the short list Portabello was eliminated due to no response to inquiry and the Isle of Gigha was eliminated due to similarity to the Isle of Eigg. The six remaining cases formed the set of cases to be studied. Brief descriptions of the cases follow.

- *Isle of Eigg* – A community land trust formed following a public donor supported buyout in 1997. Governed by residents through a board of directors, the community has achieved a long list of sustainable development accomplishments in areas of housing, education, livelihoods, ecological restoration and resource management, renewable energy, and transport (www.isleofeigg.net).

- *The Findhorn Foundation* – an EcoVillage intentional community that began in a caravan park in 1962 and has grown to be an ecological‑spiritual center of worldwide renown. Sustainable values and living are expressed through "ecological building, renewable energy systems, waste water treatment, local organic food production, currency and LETS schemes, decision-making processes". It has active business development with links to the wider community as well as being a leading educational center. Spirituality has always been a cornerstone of the community. (www.findhorn.org)

- *Biggar* – a small commuter town that set a target in 2007 of becoming Scotland's first carbon neutral town. It later joined the Transition Town movement. They have worked on raising awareness in the community, have initiated a weatherization program in conjunction with local utilities, started a community garden, rideshare and shopping bag project (www.cnbiggar.moonfruit.com). Further inquiry into Biggar revealed that the transition failed to take off and was disbanded in 2009.

- *BedZED* - a 99 unit low ecological footprint housing development designed to encourage sustainable living. Developed by a private‑non-profit partnership, now managed by The Peabody Trust non-profit housing association, tenure is a mixture of private ownership, rental and worker occupied and also includes commercial workshop space (http://www.bioregional.com/what-we-do/our-work/bedzed/).

- *Forres* - a small Scottish town that became a Transition Town in late 2007. A handful of enthusiastic volunteers have grown to become a significant presence in the community. They have worked at raising awareness in the community of the climate change and peak oil threats and have implemented community gardens, farmer's market, and carbon reduction and other projects and are currently working on community energy generation (www.ttforres.org).

- *Ashton Hayes* - is best summed up in their own words:

  Located in rural Cheshire, Ashton Hayes is a well knit community of about 1000 people that is aiming to become England's first carbon neutral community. We started our journey in January 2006 and since then we have already cut our carbon dioxide emissions by 23% - by working together, sharing ideas and through behavioural change. We are about to start work on our community owned renewable energy power station. (www.goingcarbonneutral.co.uk).

Conducting the Single Case Studies

The six selected cases were all visited in December 2010 – January 2011. One to two days were spent in each community and two interviews were completed in each case with the exception of Findhorn Foundation where only one interview was completed. All interviews were recorded. To maintain interviewee anonymity real names have not been used.

Not all cases have been used in the research. Interviews from four of the cases were transcribed and chronicles produced: Ashton Hayes, BedZED, Forres

and the Eigg. Three cases, Findhorn Foundation, Biggar, and Eigg were not used. The main reason for not using all cases was lack of time. The decision to omit Findhorn Foundation was based on the somewhat different character of this community. The Findhorn Foundation is a living, working community with many aspects that are relevant to the current study. It differs from the other five communities however in that it is an intentional community, made up of a large proportion of temporary visitors paying to participate in the many short and long term residential educational and experiential programs. The visitors and long term residents originate from all over the world. This is a unique community that stands out from its neighboring communities (including Forres). The other cases are all "mainstream" communities. At this exploratory stage of research having one obviously dissimilar case was unlikely to help in case comparison and generalization. The other omitted case, Biggar, was chosen to be left out because this is a case of a failed transition. While this is an excellent opportunity to learn from failure, again, at this stage in the research it was decided to concentrate on the four "successful" transitions. Leaving Eigg out was a late necessity due to time constraints.

Ashton Hayes

Introduction

Table 13.

Ashton Hayes Transition Profile

Transition Began	2005	
Current Status	Active	Just completed two new major projects in 2011 not included in the current study
Purpose	Active	In addition to pursuing internal goal, is very active helping other communities and has been active lobbyist of national government
Dispersal	Moderately concentrated	A majority of the community are supportive of the transition and participate in its programs (Alexander et al., 2007).
Growth	Conversion	The transition grows by conversion of non participating community residents
Community Population	919	2001 census (*Ashton Hayes Parish Plan 2009*, 2009, p. 8)

The essence of the Ashton Hayes transition is captured in its goal, which is quite simply for the village to become carbon neutral. Garry Charnock, one of the initiators made this appeal to the community at the public launch event:

We are trying to see if this community can work together to become carbon neutral, we don't know how to do it, nobody has ever done it before, would you join with us on this journey (R. Green, personal communication, January 8, 2011).

Overall, it is seen as a long term transition that they approach with incremental steps without preconceived, fixed notions of how it will be

accomplished. The core group agreed on a simple two stage strategy early in the transition that reflects the uncertainty they had about meeting the challenge they had set themselves.

1. In the short to medium term, encourage villagers to reduce energy usage through individual and household level change.

2. In the longer term, investigate larger scale community CO_2 reduction schemes and pursue the most promising of these.

Summary of Transition Outputs Sustainability Appraisal

The Ashton Hayes transition outputs are summarized in Table 14. Details of the sustainability appraisal are in Appendix D.

Table 14.

Ashton Hayes Transition Outputs and Sustainability Appraisal

Output	Components of Output	Sustainability Indicators [a]	Domains	ΔS
HOUSE-HOLD ENERGY USE	⇒ Energy saving behavior ⇒ Energy saving technology ⇒ Renewable energy generation	↓ Energy use & CO_2 emissions ↓ Utility Bills ↑ Social Cohesion	Working Housing Mobility	*13*
TREE PLANTING	⇒ 14,000 trees planted	? Energy use & CO_2 emissions ↑ Biodiversity ↑ Sustainable Wood Fuel Resource	Cross Cutting	3
STATION FOOTPATH	⇒ 400m path to station	? Energy use & CO_2 emissions ↓ Car Dependency	Mobility	*2*
RECYCL-ING	⇒ Improved recycling system	↑ Waste Production	Housing	2
COMMUN-ITY SHOP	⇒ Community shop	↑ Employment ∅ Energy use & CO2 emissions ↑ Social Cohesion ↑ Access to basic services & amenities ↑ Community Assets	Mobility Commun-icating Shopping	4

[a]Resource use is relative to pre-transition baseline or national averages
ΔS = Appraised Change in Sustainability
Indicator Changes: ↑ increased; ↓ decreased; ∅ negligible; ? unknown

The breakdown of sustainability appraisal by sustainability criterion (Figure 6) shows a small sustainability gain widely spread across all criteria but more concentration in *socio-ecological integrity* and *resource maintenance & efficiency* reflecting decreased energy and fossil fuel use. Distribution across

domains (Figure 7) is strongest in *housing* with *eating, educating* and *recreating* having no change.
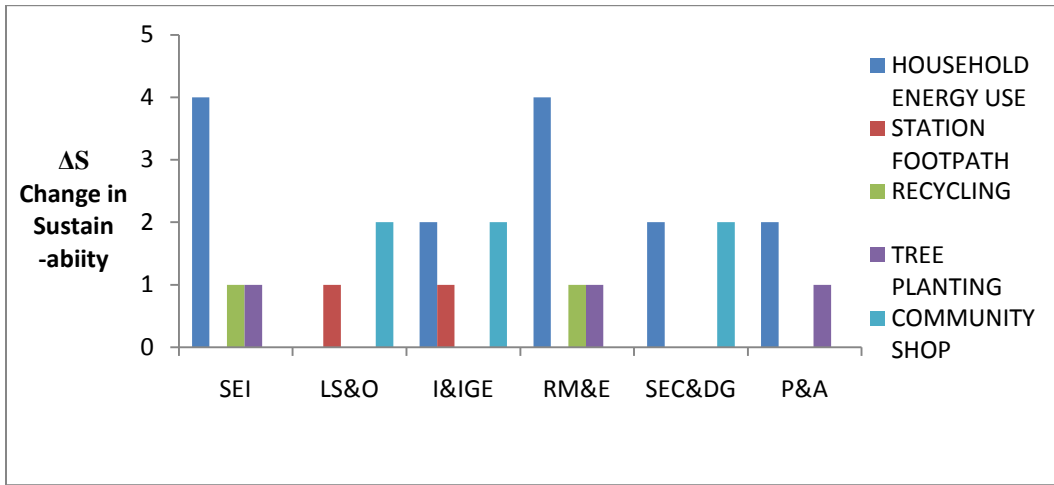
Figure 6: Ashton Hayes sustainability of appraisal of outputs by sustainability criterion.
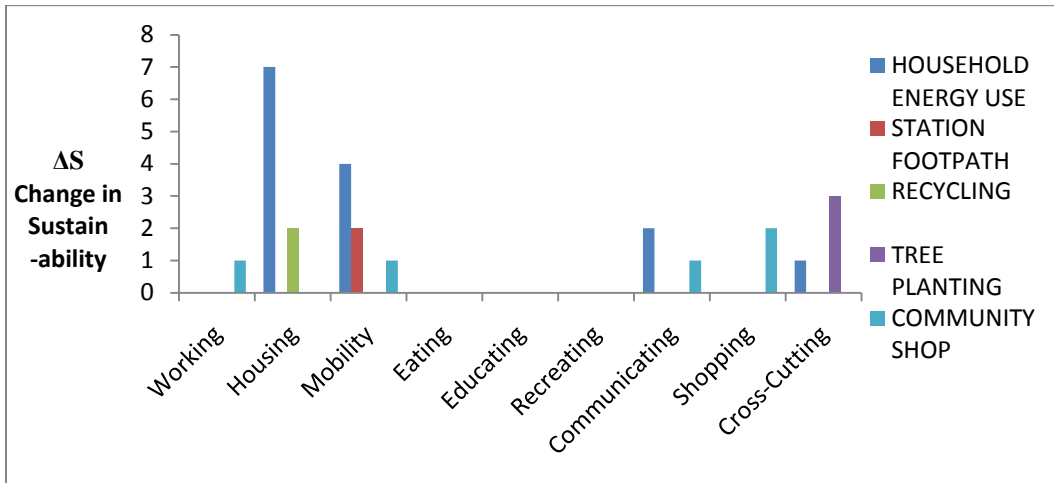
Figure 7. Ashton Hayes sustainability appraisal of outputs by domain.

Analysis of Transition Outputs

Household Energy Use

Villagers were asked to do whatever they could to reduce their energy use overall and increase their energy from renewable sources. A breakdown of the output using the Activity – Supply System analytical framework is shown in Table 15.

Table 15.

Ashton Hayes HOUSEHOLD ENERGY USE Output Analysis

Domain	Supply System / Service	Activity
Working	*No Impact*	• Villagers carried over their energy awareness and reducing from community life into work (Alexander et al., 2010; R. Green, personal communication, January 8, 2011a). However, there is no data on the effect on the employing organization and in most cases this is outside the community.
Housing	• No or low cost (with rebates) technology upgrades such as replacing light bulbs or shower heads, or insulating walls. • More expensive changes such as new windows, solar water heaters, or wood burning stoves have also been made	• Behavioral changes such as turning off lights when not in use or adjusting thermostats.
Mobility	• Villagers are replacing old cars with more fuel efficient cars (R. Green, personal communication, January 8, 2011).	• Being a semi-rural community with few amenities and limited public transport it has been very difficult to cut down on car use (M. White, personal communication, January 7, 2011). • Villagers have reduced the number of flights by 37%. Much of this has been employment related (Alexander et al., 2010; R. Green, personal communication, January 8, 2011).

Domain	Supply System / Service	Activity
Commun-icating	*No Impact*	• Awareness of energy use has become part of the village culture. "We didn't talk about our gas bills between one and other but now we do" (R. Green, personal communication, January 8, 2011). The high participation in the energy reduction activities has led to increased interaction across the community – "There's a positive social aspect to the project as well… I have conversations with people I used to know only by sight. Groups in the village interact a bit better: the WI, the gardening club, the church, the school." (Harrison K. in Anderson, 2007).

Sustainability indicators impacted by the HOUSEHOLD ENERGY USE output are

- *Energy use & CO$_2$ emissions* – substantial reduction. Household carbon emissions have been between 20 and 23% lower than the 2006 baseline every year since 2007. Most CO$_2$ emissions reductions are from eliminating flights, mostly employment related, with substantial reductions from building energy use too but overall, there is no discernible reduction in emission from cars so far (Alexander et al., 2010).

- *Utility Bills* – lower electricity and natural gas bills follow from reduced consumption and, for low or no cost changes, are progressively beneficial to lower income households (*inter & intra-*

generational equity). However, this equitable outcome is partly

counteracted by greater long term cost benefits being only accessible

at greater initial outlay that is out of reach of lower income

households.

- *Social Cohesion* – increased, and positively with respect to

  sustainability. There has been a cultural shift in the community to

  incorporate energy use and issues like climate change into everyday

  thinking.

Tree Planting

Tree planting as a carbon sink was initially identified as solution to carbon

neutrality but later discounted due to uncertainty about the science (R. Green,

personal communication, January 8, 2011). A breakdown of the output using the

Activity – Supply System analytical framework is shown in Table 16.

Table 16.

Ashton Hayes TREE PLANTING Output Analysis

Domain	Supply System / Service	Activity
Mobility	• 14,000 trees were planted around the village on farmland and private estates. Nothing is known about the plantations such as the type of trees, the land they were planted on, who owns them or will there be public access. • The trees will eventually be coppiced (sustainable firewood production) (R. Green, personal communication, January 8, 2011).	• There are no data on any activities related to the plantations.

Sustainability indicators impacted by the RECYCLING output are

- *Energy use & CO$_2$ emissions* – unknown.

- *Biodiversity* – increased. Not knowing anything about the nature of the plantations not much can be said about how they will impact local ecosystem services. A sweeping assumption is that they will increase biodiversity.

- *Sustainable Wood Fuel Resource* – increased. The plantations will eventually be used as a renewable fuel source increasing *resource management & efficiency* and *precaution and adaptation.*

Station Footpath

Prior to 2007 there was no footpath to the train station just outside the village. Villagers would have to walk on the road and move on to the verge to avoid passing vehicles, or drive to the station. Cheshire County Council constructed the footpath following a request from the core group. This was a long standing wish of the community and the core group saw it as an important contribution to Going Carbon Neutral by making public transport more accessible. A breakdown of the output using the Activity – Supply System analytical framework is shown in Table 17.

Table 17.

Ashton Hayes STATION FOOTPATH Output Analysis

Domain	Supply System / Service	Activity
Mobility	• Cheshire County Council constructed a 400m footpath from the village to the train station.	• Pedestrians can now safely and cleanly walk to the station from the village. The 2009 parish plan reports anecdotally that the path has been successful in increasing the use of the train service (*Ashton Hayes Parish Plan 2009*, 2009, p. 14).

Sustainability indicators impacted by the STATION FOOTPATH output are

- *Energy use & CO$_2$ emissions* – negligible. There is no data on the effect on CO$_2$ emissions but any effect is very small as overall, is no discernible reduction in emission from cars so far (Alexander et al., 2010).

- *Car Dependency* – slightly reduced. The lack of public transport is stated as the "worst thing about living in Ashton Hayes" by many villagers (*Ashton Hayes Parish Plan 2009*, 2009, p. 14). Making it easier to use the existing public transport may be considered to have a small effect on *inter & intra-generational equity* and on *livelihood sufficiency & opportunity* sustainability criteria as it increases mobility options in general and expands the places of employment that can be reached for those without a car. However, the anecdotally observed increase in train service use may be in addition to car use and not in

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place of. Improved access also does nothing to improve the actual train service, which is very basic, slow, and limited in destinations.

Recycling

On discovering that "our recycling was 23%, it's pretty appalling" the core group decided this was an area they needed to improve on (R. Green, personal communication, January 8, 2011a). Cheshire County Council made simple changes to the recycling system to make it more effective in response to requests from the core group. A breakdown of the output using the Activity – Supply System analytical framework is shown in Table 18.

Table 18.

Ashton Hayes RECYCLING Output Analysis

Domain	Supply System / Service	Activity
Housing	• Provide surplus bags to householders so they don't run out. • The council weighs the recycle truck from each village and provides the data to the core group.	• Villagers responded to the changes by increasing the recycling rate to 36%.

Sustainability indicators impacted by the RECYCLING output are

• *Waste Production* – decreased.

Community Shop

The existing village shop was going to close so the community stepped in to take it over. A breakdown of the output using the Activity – Supply System analytical framework is shown in Table 19.

Table 19.

Ashton Hayes COMMUNITY SHOP Output Analysis

Domain	Supply System / Service	Activity
Working	*No Impact*	• The shop employs a full time manager and 2 part time employees who are assisted by community volunteers.
Mobility	*No Impact*	• The shop avoids car trips to the supermarket with an increase in the number of villagers travelling shorter distances to shop reported (Alexander et al., 2010).
Shopping	• The previously privately owned village shop was taken over by the community. • The shop provides access to basic day to day groceries and goods • As far as possible the refit was done using recycled materials (M. White, personal communication, January 7, 2011). • The shop tries to be an outlet for local produce (M. White, personal communication, January 7, 2011).	*No Impact*
Communication	*No Impact*	• The shop is a village focal point and casual meeting place.

Sustainability indicators impacted by the COMMUNITY SHOP output are

- *Employment* - increased. The shop provides two jobs to the

  community that would otherwise have been lost.

- *Energy use & CO2 emissions* – no change. While the shop might be

  responsible for the avoidance of some car trips, the annual survey

shows no overall reduction in carbon emissions from cars (Alexander et al., 2010).

- *Social Cohesion* – increased. This does not necessarily translate into sustainable behavior but in Ashton Hayes it does seem to be a factor, contributing to *socio-ecological civility & democratic governance.*

- *Access to basic services & amenities* – increased. This is especially important for *inter & intra-generational equity* in the community by not disadvantaging those without cars (any more than they were already).

- *Community Assets* - increases the resources of the community and its capacity to manage them. Managed in a sustainably oriented way and returning benefits to the community, the shop is an important contribution to the community's *socio-ecological civility & democratic governance*.

Transition Path Analysis

The complete reconstructed transition path for Ashton Hayes is shown in Figure 8. It is broken into the segments identified in Table 20:

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Table 20.

Ashton Hayes Transition Path Segment To Output Map

Segments	Output
1	(STARTUP)
1,2	HOUSEHOLD ENERGY USE
1,3	TREE PLANTING
1,4	STATION FOOTPATH
1,5	RECYCLING
1,2,6	COMMUNITY SHOP
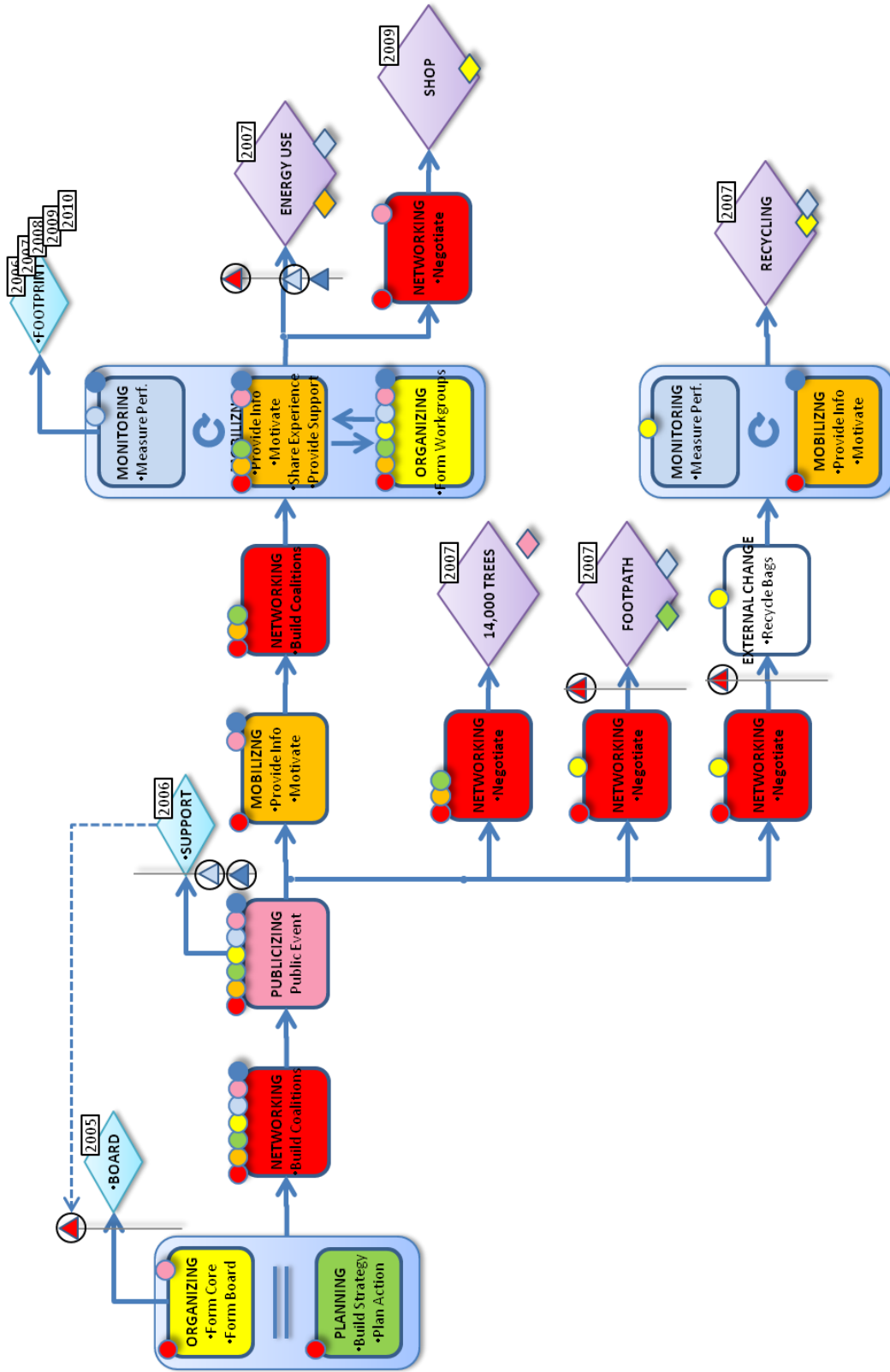
Figure 8: Ashton Hayes transition path. (See Appendix E for legend).

Startup (Segment 1)
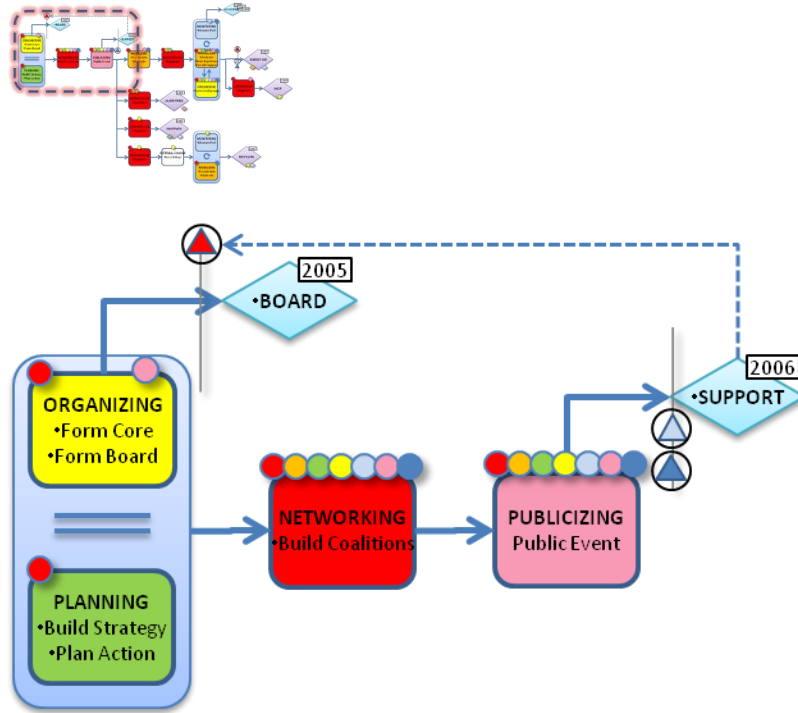
Figure 9: Ashton Hayes transition path segment 1(STARTUP)

Segment 1 (Figure 9) is common to all of the Ashton Hayes transition

outputs. It began with conceptualization and culminated in a grand public launch

event in January 2006. Aside from bringing together the key individuals who

formed the core group around the initial concept this initial 'startup' segment

established several elements that were crucial in underpinning the subsequent

pathways and achievement of outputs.

1. Engagement of key stakeholder groups in a way that secured their buy-

   in.

2. Obtaining a democratic mandate to proceed.

3. Establishing legitimacy and credibility.

There was a great deal of networking and behind the scenes activity but the critical event that brought everything together to achieve these aims was the grand launch. It got numerous actors (local businesses, local government, NGOs, universities) to publicly pledge their support to the idea, foremost among them being Cheshire County Council who said "we are going to back this basically" (R. Green, personal communication, January 8, 2011). The large public turnout responded favorably to the proposal and put pressure on government and politicians in attendance to support it and satisfied the parish council[1] that this was something they must endorse. The parish council accepted the initiative as a formal sub-committee, giving it additional legitimacy as well as administrative support. The involvement of Chester University as a partner added credibility. All of these factors related to each other and amounted to a very positive start but the biggest factor was perhaps the very clever use of local to national, newspaper, radio and television media to project the story positively. Media attention has been a characterizing feature of the transition since then that has undoubtedly helped to gain favor with local (and national) government who want to avoid being seen as obstructive and to share some of the limelight, to attract interest and offers of 'help' from businesses who want the exposure, and to motivate community

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[1] Parish councils are the lowest level of local government in England. Ashton Hayes Parish Council serves the residents of Ashton Hayes and has direct dealings with the county level government (Cheshire County Council) on matters relating to the village.

Household Energy Use (Segment 2)
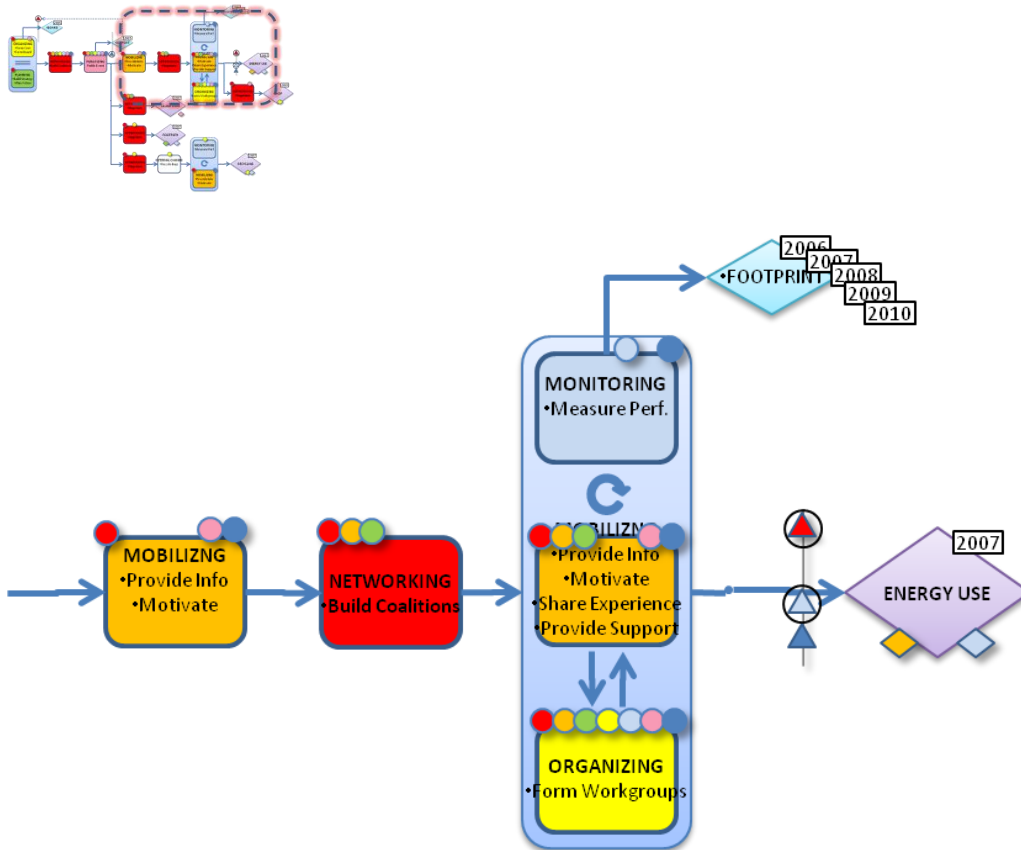
Figure 10: Ashton Hayes transition path segment 2 (HOUSEHOLD ENERGY USE)

The first point to note about segment 2 is that it suggests a linear path to a discrete output. In fact, the ENERGY USE output, which is a distributed process, not a concrete entity, began soon after the January 2006 launch and has continued to the present although the intensity of activity was probably greatest during 2006 and 2007. The preliminary steps of the segment consisted of MOBILIZING the community to act which was initiated by the launch event and followed up with email and website communication, meetings and general chatter, plus NETWORKING with NGOs (Energy Saving Trust) and local businesses who

provided information, demonstrations, and services on energy efficiency and renewable energy.

Overcoming BEHAVIORAL Barriers to lower ENERGY USE.

Ashton Hayes has had significant success in getting the community to change their behavior related to energy use and developing energy 'awareness' to unusual heights. This has been achieved through a multi-pronged "viral" mobilizing approach backed up with feedback data shown as the MONITORING – MOBILIZING – ORGANIZING activity group in Figure 10 and described as follows:

- *Providing Information* – Keeping people informed of what is going on, events, energy saving tips and such like through the website and email. Also, providing results of energy use activity, for example posting individual utility bill data on the website. When the survey data were available overall results were made known to the whole community and individual households were given their own results privately, highlighting where savings could most easily be made.

- *Providing Support* - putting on demonstrations, holding carbon clinics, providing help when needed.

- *Motivating* - Media attention, guest speakers, visits from politicians and making a film all contributed to the motivation of the community. Community motivation turned into action and results. This in turn continued to attract attention and accolades reaching national and even international audiences.

- *Sharing experiences* - People were talking to each other about what they had done and how effective it was. Successful practices diffused through the community.

- *Monitoring* – Motivation encouraged participation in annual surveys which in turn yielded better data. Presenting the data back to the community added to motivation as people could see that what they were doing was making a difference. It also highlighted to them where they could make improvement.

- *Organizing* - Motivation led to more volunteers wanting to get more involved. Organizing volunteers into workgroups (e.g. the carbon clinic group) helped to make the workforce more effective.

Thus what seemed to be happening was something like a self-organizing system with an emerging property of energy saving behavior.

Overcoming ECONOMIC Barriers to lower ENERGY USE. There is considerable scope for households to reduce carbon emissions at no or little cost but a point will be reached where the cost of energy saving or renewable energy generation technologies will become prohibitive for many households. "It is very, very difficult for individual homes to come up with the amount of money required to invest in the technology" (M. White, personal communication, January 7, 2011). This barrier still stands. Ashton Hayes did work with organizations like the Energy Saving Trust and utilities to make sure any available assistance such as house insulation rebates was known to residents.

Overcoming REGULATIVE Barriers to lower ENERGY USE. There
is evidence that Ashton Hayes was becoming more capable of overcoming local
building regulations. Alexander et al. (2007) point to the granting of permission to
install the demonstration wind turbine and solar panel on the school. Green
(personal communication, January 7, 2011) tells the story of the couple who were
given permission to build a radically designed 'Gaia house' that they had been
unable to get from any other authority. Thus it appears that the community was
becoming empowered in its dealings with local government (Alexander et al.,
2007). Contributing factors to this empowerment may have been the democratic
mandate behind the initiative that was so publicly demonstrated at the launch and,
cognizant of the high profile media attention, the desire by Cheshire County
Council to avoid bad publicity that might result from rejecting requests. In
addition to these pressures on local government to respond positively, Ashton
Hayes was bringing benefits to the council and the politicians in the form of
publicity and interest from national politicians and government. Aleaxander et al.
(2007) also point out that this empowerment may also be interpreted as
communities doing the work of government for them, so there is good reason for
local authorities to lower a few barriers.

Key points contributing towards this outcome were:

- Using a complex combination of mobilization, monitoring and
  feedback ("viral" mobilization).

- Community empowerment through popular, political and media
  support.

- Positive engagement with local government

Tree Planting (Segment 3)
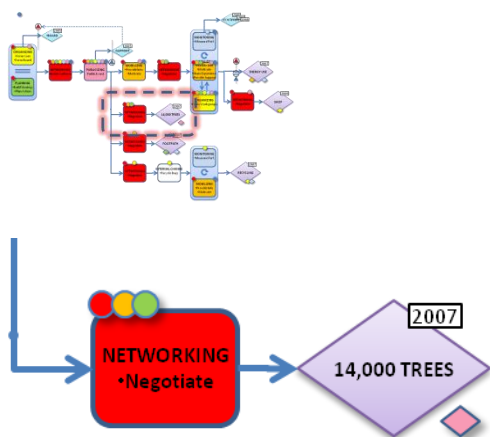
Figure 11: Ashton Hayes transition path segment 3 (TREE PLANTING)

Following the launch (and even prior to the launch) the core group negotiated with local landowners and silvicultural businesses to further the tree plantation objective (Charnock, 2007) (Figure 11). It was a straightforward physical (ecological) output but it needed land, a supply the trees, labor and an agreement on ownership and long term management. There is little information available on this project but these negotiations seem to have been successful despite there being no funding, drawing instead on the creation of benefits for each party and collective goodwill toward the community. Eventually, 14,000 out of a target of 16,000 trees were planted before the idea was mothballed due to doubts about the validity of the science around CO_2 emissions of plantations (R. Green, personal communication, January 8, 2011a).

Key factors contributing to the TREE PLANTING output were:

- Designing multi-party deals based on the creation and distribution of diverse benefits rather than standard market transactions ("social entrepreneurship").

- Goodwill towards the community.

Station Footpath (Segment 4)
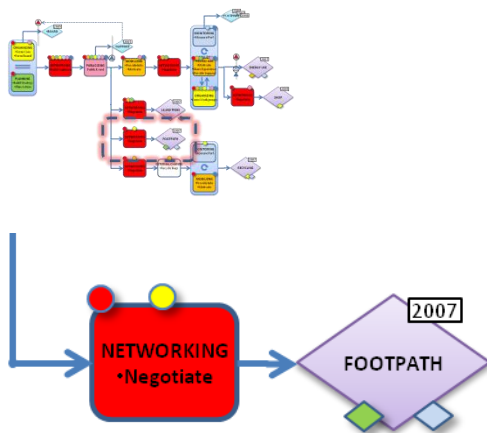
Figure 12: Ashton Hayes segment 4 (STATION FOOTPATH)

The path segment leading to the STATION FOOTPATH output (Figure 12) is very similar to TREE PLANTING. A period of negotiation between a limited set of parties follows directly on from the launch. In this case the negotiation was between the core group and Cheshire County Council where the core group made a request for a footpath to the station. The same request had been made on more than one occasion before and had been unsuccessful but this time the council agreed. This again seems to be a good example of empowerment of the community. Where before the council could safely dismiss the request without consequence, they now had to think about the political and professional

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ramifications arising from the public commitment of support they gave to the community at the launch, the democratic mandate given to the transition by the community, and the continued interest of local and national media.

Key factors contributing to the STATION FOOTPATH output were:

- Community empowerment.

- Positive engagement with local government

Recycling (Segment 5)
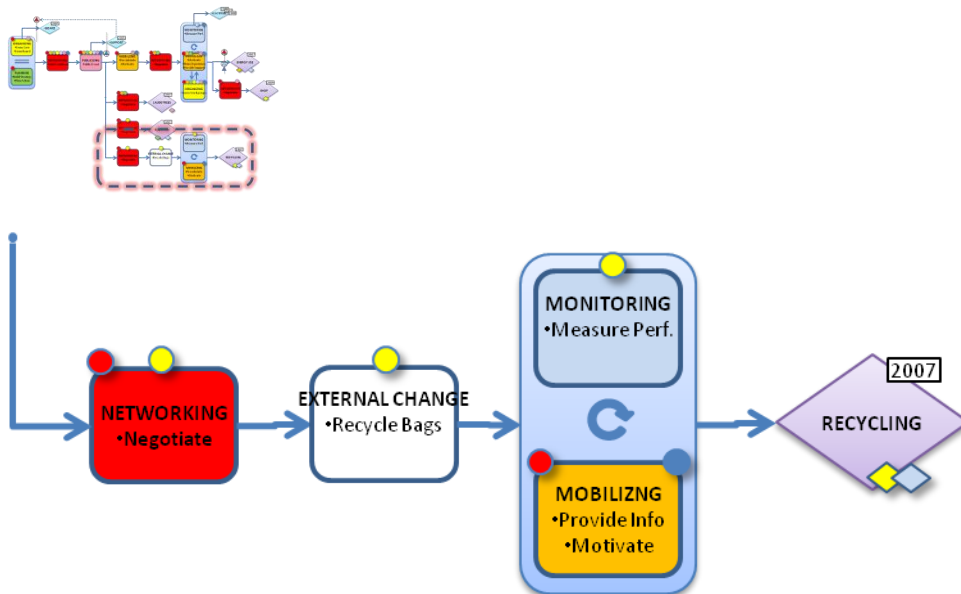
Figure 13: Ashton Hayes transition path segment 5 (RECYCLING)

The path segment leading to the RECYCLING output (Figure 13) has similarities to the STATION FOOTPATH output in that it involved lobbying Cheshire County Council to get something done. In this case the request was to make modifications to the recycling system that the core group believed would increase the recycling rate. The council agreed. Again, as with planning

permissions and infrastructure construction, this may be attributable to the community's empowerment.

Following the changes, there was activity similar to the energy use reduction mobilization, where information was provided to the community (what are we doing, why are we doing it, what has changed etc.) as well as performance data (the council now supplied village recycling data by weight). The regular performance feedback data helped to motivate community members to increase their efforts but it was also publicized on the website along with other villages' data to create inter-village competition which further motivated community members.

Key factors contributing to the STATION FOOTPATH output were:

- Community empowerment.

- Positive engagement with local government

- Mobilization through feedback and competition

Community Shop (Segment 6)
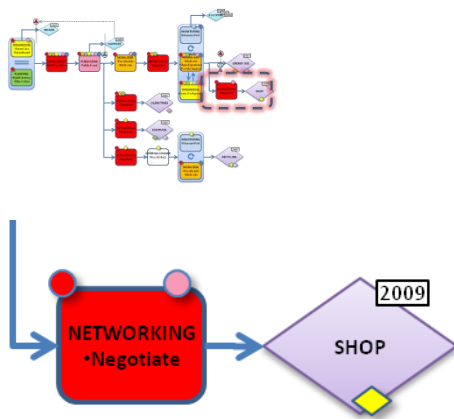
Figure 14: Ashton Hayes transition path segment 6 (COMMUNITY SHOP)

The COMMUNITY SHOP output came about through effective community governance.

- A problem was anticipated (the existing owner alerted the parish council she wanted to close the shop),

- The parish council asked some community members to investigate the impact and make recommendations

- A new community group was formed to work towards taking over ownership of the shop

- The Going Carbon Neutral group because of synergetic aims and helpful capabilities.

While the shop takeover might have happened in an earlier time, there is a suggestion that the community's experience with Going Carbon Neutral had increased its confidence and desire to do more for itself. The shop development may be "an example of people being receptive to the idea of something new because of things they'd already done" (M. White, personal communication, January 7, 2011) and according to Green "what we are looking at is … the empowerment phase of the whole community, but not just for carbon neutrality" (personal communication, January 8, 2011).

The shop was not just seen as an important amenity for the community but also as an opportunity for synergetic development with the Going Carbon Neutral group. Not only in avoiding car trips to the supermarket but in its potential to develop in other directions such as supporting local producers.

Key factors contributing to the COMMUNITY SHOP output were:

- Cross group development of synergetic community opportunities

Transition Management Appraisal

An appraisal of how well the Ashton Hayes transition process conforms to transition management principles is shown in Table 21.

Table 21.

Appraisal of Ashton Hayes Similarity to Transition Management Principles

Theoretical Principles TM	Appraisal Notes
creating space for niches	Partial - becoming a parish council subcommittee created a protected environment to a limited extent. Empowerment w.r.t. Cheshire Council gives Ashton Hayes more leeway than other communities might be expected to receive. Also, may have influenced national level policy in favor of supporting community based action, such as DECC funding, feed-in tariffs.
focus on forerunners	Yes - the core group has strong leadership, motivational and visionary qualities. They are innovative in the way they mobilize and work with the community to accomplish tasks - social, not technical, innovation. They challenge the existing order.
guided variation and selection	Partial - the accomplishments have been diverse: across domains (e.g. housing, mobility, shopping) and supply systems (e.g. energy, transport). Although the primary transition criterion is carbon neutrality, selection of projects has not been narrowly constrained to directly address this. However, the 'portfolio' of projects is not deliberatively designed: it is more opportunity driven
radical change in incremental steps (guided by a long term vision)	Yes - the, actions have taken have all been relatively small and non controversial. Their rules are to be apolitical and to ecourage people to participate but there is no criticism for not doing so. Overall, it is a 'softly softly' approach of small steps intended to build support and momentum and to avoid conflict and resistance. They do not have grand plans and do not impose solutions. The 'carbon neutral' goal is their mission, but not a vision: they have no preconceptions of the end state will consist of.
learning-by-doing and doing-by-learning	No - There is some reflection on what they are doing and the effect it is having (e.g. Alexander et al. evaluate the project from a sustainable development perspective (2007)) but this has not so far noticeably caused them to change their goals or approach. There has been no real linking of transition theory to practice and attempting to learn from this.
multi-level approach, multi-domain approach	No - while it is not accurate to say they do not have an understanding of the systemic nature of what they are trying to change, they have not systemically analyzed them.

Theoretical Principles TM	Appraisal Notes
anticipation and adaptation	Partial - They have used the annual survey results to inform future actions. The survey indicated that the household energy use tactic quickly reached its limit and so they switched their attention to other tactics (i.e. renewable generation).
empowering niches	Yes - the project has remained under community control and ultimately can be stopped by the community if they wish. They have formed a relationship with local government that ensures they get heard and can often get the help that they need. Their use of the media gives them a powerful voice. Nationally, they have established networks that give them input to decision making - they have become part of the discourse.
Selective participatory process	Yes - the project is essentially community driven as represented by a small, self selected core group. It is open to question and scrutiny (through the parish council) and does not deny volunteers who want to contribute, on condition that they are willing to make the commitment and take the responsibility that goes with it. Business and higher education participate as partnerships and local government is often engaged. So overall, there is a healthy mix of participants.
Normative principles of sustainability	No - while in practice there is nothing suggest that the core group is not generally aligned with sustainability principles there are none defined nor is there an explicit commitment to sustainability in general, only to becoming carbon neutral.

An appraisal against transformative planning and governance method steps is shown in Table 22.

Table 22.

Appraisal of Ashton Hayes Similarity to Transformative Method Steps

Step	Appraisal
Visioning	No – other than the mission statement to become carbon neutral, no desirable future vision has been created.
Analysis	No –There has been no attempt to systematically understand the system's current or historical state.
Intervention	Yes – There has been a lot of activity to intervene in the system either directly or indirectly.
Evaluation	Partial – Monitoring of carbon footprints is used to inform future transition actions.

Outlook for Ashton Hayes

The current study really only tells the first chapter of the Ashton Hayes story. Although the household energy use activity stabilized round about 2008 the transition team has not been idle. With their strategic partners (University of Chester and EA Technology) they have been working on a community energy scheme that has been recently completed (www.goingcarbonneutral.co.uk). With the help of £400,000 funding from the U.K. Department of Energy and Climate Change they have constructed a low carbon playing field pavilion powered by solar panels in collaboration with other community groups and initiated an electric car club with a car acquired from Nissan, also powered by solar. The grant will also be used to install renewable energy generation on the school. A another aspect of this work is the creation of a not for profit pro bono professional services organization in the City of London called "Carbon Leapfrog" that takes on community projects and provides financial and legal services that Ashton

Hayes were closely involved in through Garry Charnock (R. Green, personal communication, January 8, 2011). These types of services are essential to overcome the regulative and economic barriers in establishing community energy schemes. The DECC funding is obviously critical to these outputs but it can be seen again that the transition team use collaboration with strategic partners, other community groups and "social entrepreneurship" to maximize opportunities.

Ashton Hayes see the way forward from here being strongly influenced by the need to find revenue sources and mechanisms to achieve results that do not depend on government grants which constrain and drain the flexibility and human resources of the transition team (R. Green, personal communication, January 8, 2011). Feed in tariffs from community energy will generate revenue (although the U.K. government just announced cuts to this program (Macalister, 2011)) and Ashton Hayes has built considerable social capacity that will no doubt help them find a way forward. Another challenge Ashton Hayes face is their reliance on a small number of key people who have given huge amounts of time on a voluntary basis.

Summary of Ashton Hayes Transition Strategic Factors

Summary results bringing the sustainability indicators together with the transition path strategic factors for each output are presented in Table 23.

Table 23.

Ashton Hayes Strategic Factors Contributing To Successful Outcomes

Output	Sustainability Indicator	Strategic Factor
ALL		⇒ Entrepreneurial core group ⇒ Strong local government support ⇒ Low funding ⇒ Bottom-up, grass roots ⇒ Diversity of actors
(STARTUP)		⇒ Early engagement of key stakeholders ⇒ Obtain democratic mandate ⇒ Establish legitimacy and credibility
HOUSEHOLD ENERGY USE	↓ Energy use & CO_2 emissions ↓ Utility Bills ↑ Social Cohesion	⇒ Using a complex combination of mobilization, monitoring and feedback. ⇒ Community empowerment through popular, political and media support. ⇒ Positive engagement with local government
TREE PLANTING	? Energy use & CO_2 emissions ↑ Biodiversity ↑ Sustainable Wood Fuel Resource	⇒ Social Entrepreneurship ⇒ Goodwill towards the community.
STATION FOOTPATH	? Energy use & CO_2 emissions ↓ Car Dependency	⇒ Community empowerment. ⇒ Positive engagement with local government
RECYCLING	↑ Waste Production	⇒ Community empowerment. ⇒ Positive engagement with local government ⇒ Mobilization through feedback and competition

Output	Sustainability Indicator	Strategic Factor
COMMUNITY SHOP	↑ Employment ∅ Energy use & CO2 emissions ↑ Social Cohesion ↑ Access to basic services & amenities ↑ Community Assets	⇒ Cross group development of synergetic community opportunities

Indicator Changes: ↑ increased; ↓ decreased; ∅ negligible; ? unknown

BedZED

Introduction

Table 24.

BedZED Profile

Transition Began	1995	
Current Status	Completed	Following completion of construction in 2002 and residents moving there has been no change other than maintenance since 2003.
Purpose	Passive	The community's purpose is passive.
Dispersal	Concentrated	All residents are participants, many of them passively, some more actively.
Growth	None	Growth is not possible (physically constrained and all residents are participants)
Community Population	220	(Chance, 2009)

BedZED or Beddington Zero Energy Development[2] is a mixed occupancy, housing and office development in the working class suburb of Hackbridge in the London Borough of Sutton. It was purposely designed and built on a brown field urban site with two goals in mind:

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[2] More accurately zero fossil energy or zero net CO_2 emissions

1. To create a sustainable, urban community.

2. To demonstrate to government, the construction industry and the public, that sustainable housing can compete in the mainstream housing market.

Simply put, the first aim was to make sustainable living "easy, attractive and affordable" (BRESCU, 2002) by creating an environment that enables residents "to live more sustainably, perhaps even within their share of the earth's renewable resources, without sacrificing a modern, urban and mobile lifestyle" (Lazarus, 2003). The second aim is experimental to some extent, from which lessons are to be learned and applied to future projects, and interest and growth in the sustainable housing market stimulated. In practice however, the scope for experimentation was very limited given that the buildings were to be occupied by real people to whom BedZED is home, and not a living laboratory.

Achieving the first goal, a sustainable community, was predicated on a three tiered design concept ("BedZED," n.d.), which may be broadly characterized as technical, behavioral and social, each one assumed to lead to greater levels of sustainability by building on the lower tiers (Figure 15). The second goal, demonstrating competitiveness and attractiveness of sustainable housing, would be achieved through approaching the project on a commercial basis and making the three design tiers appealing to the mainstream.

Tier 3 - Social	•Site designed to create a strong community which, in combination with tiers 1 & 2, will lead to further sustainable development
Tier 2 - Behavioral	•Homes, site and facilities designed to encourage residents to make more sustainably choices
Tier 1 - Technical	•Physical infrastructure and buildings with intrinsically low ecological impact.
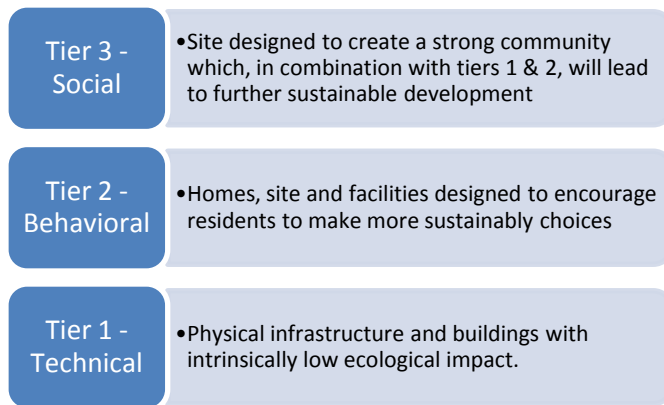
Figure 15: BedZed tiered design concept linked to sustainability outcomes

The development core group consisted of a small group of visionary, entrepreneurial, and innovative individuals and their respective organizations.

- Bill Dunster, architect and founder of Bill Dunster Architects (BDA), a green architecture practice.

- Pooran Desai, director and co-founder of BioRegional, an eco-entrepreneurial organization.

- Dickon Robinson, director of development at Peabody Trust, London's biggest housing association and registered social landlord[3] with a "long-term commitment to innovation in construction, providing high-quality affordable housing and minimizing fuel poverty" (BRESCU, 2002).

Dunster, who after building his own 'zero energy' home had the vision of a larger scale zero energy community, developed the sustainable urban community concept further and the strategy to realize it with Desai. BDA would

[3] A Registered Social Landlord is an independent, not for profit organization that provides property development and management services to tenants receiving government housing support.

provide design and construction expertise while BioRegional's would "ensure that sustainability was considered at every step" (Hodge & Haltrecht, 2009, p. 2). The coalition was completed by Peabody who would be project developer, owner and long term manager. In addition to the three core partners, Sutton Council was also an important player through their active support driven internally by a strong green lobby (Minton, 2001).

Summary of Transition Output Sustainability Appraisal

The BedZED transition, summarized in Table 25, essentially produced one large, aggregated output: a new housing and office complex. Reporting results at such a highly aggregated level is not very informative so for greater resolution the main output is disaggregated into three largely independent outputs - energy, water, and "community" - any of which could conceivably have been left out of the overall design without greatly affecting the others. The energy and water outputs are physical systems mostly independent of the residents that map directly to energy and water supply systems of the Activities – Supply Systems analytical framework and to the first tier (technical) of the BedZED design model. The "community" output integrates site, buildings and residents and maps to various elements in the Activities – Supply Systems analytical framework and to the second (behavioral) and third (social) tiers of the BedZED design model. Details of the sustainability appraisal are in Appendix D.

Table 25.

BedZED Transition Outputs and Sustainability Appraisal

Output	Components of Output	Sustainability Indicators [a]	Domains	ΔS
LOW ENERGY HOUSING	⇒ Passive energy design ⇒ Onsite renewable generation ⇒ High efficiency appliances ⇒ Visible metering	↓ Energy Use & CO_2 emissions ↓ Utility Bills	Housing	*15*
LOW WATER HOUSING	⇒ Rainwater collection ⇒ Grey water recycling ⇒ High efficiency appliances	↓ Water Use & Waste Water Treatment ↓ Utility Bills ↑ Biodiversity	Housing	*10*
COMMUN-ITY	⇒ Mixed income & backgrounds ⇒ Mixed occupancy type ⇒ Integral recycling ⇒ Community allotments & composting ⇒ Community playing field, pavilion & square ⇒ Cycle paths and marginalized roads & parking ⇒ Neighbor interaction ⇒ Car club, limited parking, parking fees, proximal public transport	↓ Waste Production ↑ Social Housing Provision ↓ Car Dependency ↑ Food production ↑ Health & wellbeing ↑ Social cohesion ∅ Participatory Governance ∅ Energy use & CO2 emissions / transport	Housing Mobility Eating Recreating Commun-icating	*8*
GREEN WATER TREAT-MENT PLANT	⇒ Green water treatment plant discontinued	↑ Water Use & Waste ⇓ Water Treatment	Housing	*-3*
COMBINED HEAT & POWER	⇒ Combined heat & power plant discontinued	↑ Energy use & CO2 emissions	Housing	*-3*

Output	Components of Output	Sustainability Indicators [a]	Domains	ΔS
MEMBR-ANE BIO-REACTOR WATER TREAT-MENT PLANT	⇒ Experimental membrane bio-reactor water treatment plant installed	↓ Water Use & Waste Water Treatment	Housing	*3*

[a]Resource use is relative to local averages

ΔS = Appraised Change in Sustainability

Indicator Changes: ↑ increased; ↓ decreased; ∅ negligible; ? unknown

The breakdown of sustainability appraisal by sustainability criterion and domain (Figure 6 and Figure 7) show most of the sustainability gain to be in the housing domain and to be distributed over *socio-ecological integrity*, *inter & intra-generational equity*, *resource maintenance & efficiency*, and *precaution & adaptation* sustainability appraisal criteria. The sustainability gain in *socio-ecological integrity*, *resource maintenance & efficiency*, and *precaution & adaptation* can be broadly attributed to the low building energy use and renewable energy generation whereas in *inter & intra-generational equity* it reflects the socially equitable aspect of the housing.
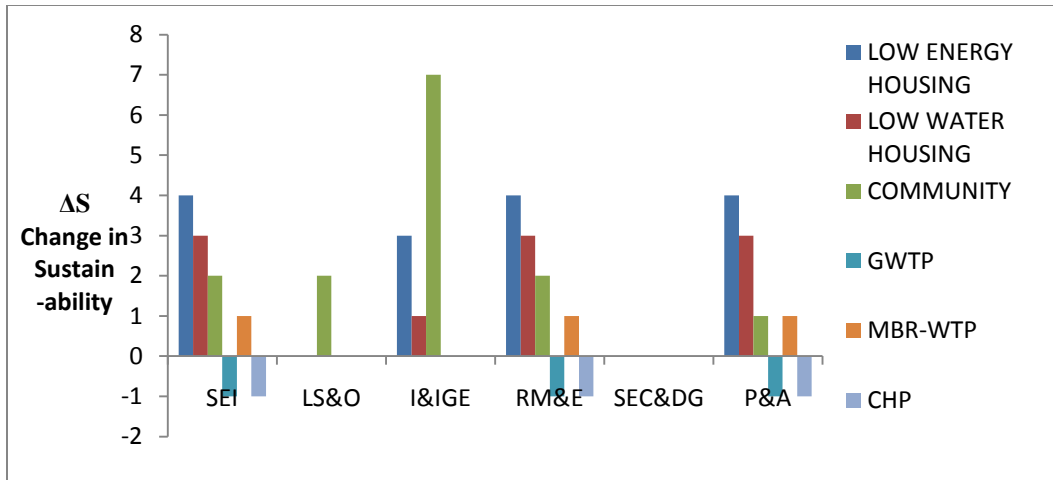
Figure 16: BedZED sustainability appraisal of outputs by sustainability criterion.
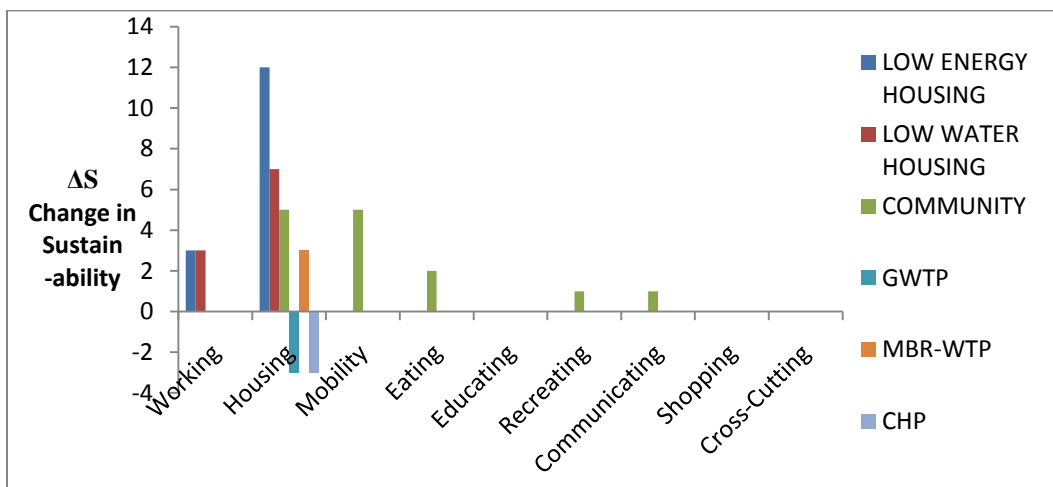
Figure 17: BedZED sustainability appraisal of outputs by domain.

Being a new community there is no prior state to compare with, so, the baseline against which the change in sustainability is appraised is taken to be the local or in some cases the national average. This is a valid approach given that the aim of BedZED is to create a 'mainstream' sustainable community but it is not perfect in at least two respects. First, there are significant demographic differences between the BedZED and local populations where BedZED has a higher proportion of both social housing tenants and middle class professionals

than the more working class Hackbridge community and second, there is uncertainty about whether new residents have modified or have not modified their previous lifestyle when they moved to BedZED.

Analysis of Transition Outputs

Low Energy Housing

Low Energy Housing is a technical and infrastructure output which, along with the Low Water Housing output, forms the main part of the first tier (technical) of the BedZED design model that aims to create a physical environment with intrinsically low ecological impact. For energy, the objective is to create an energy supply system with zero net CO_2 emissions so that from a resident's perspective "you don't have to think about it, you're not even aware of it" (sustainable housing manager at environmental charity in Lovell, 2008) and you would have to actively work against the system to not benefit from it (Lovell, 2008). The design solution was to maximize the use of passive energy sources, minimize the use of 'active' energy in the building, and meet the residual energy demand from onsite renewable energy generation. A breakdown of the output using the Activity – Supply System analytical framework is shown in Table 26.

Table 26.

BedZED LOW ENERGY HOUSING Output Analysis

Domain	Supply System / Service	Activity
Housing	⇒ Passive thermal & lighting design ⇒ Wind driven ventilation ⇒ Visible energy metering ⇒ High efficiency appliances ⇒ Solar Photovoltaic electricity generation ⇒ CHP heat (water & space) and electricity generation from sustainable woodchip fuel (see separate CHP output as due to operational problems it was eventually discontinued).	⇒ There is some evidence that residents interact with the building in ways that interfere with the effective operation of passive thermal control through installation of blinds, or opening or closing of inner and outer windows (Chance, 2009) which can lead to over or under-heating. Reasons for this include increasing privacy because of the 'socially open' design (Lovell, 2008), using rooms for unexpected purposes, or for security (Hodge & Haltrecht, 2009, p. 19). Residences have also been reported to overheat in the summer (ROOF, 2007; Slavin, 2006) even when operating as designed.

Sustainability indicators impacted by the LOW ENERGY HOUSING output are

- *Energy use & CO$_2$ emissions* - building energy use per person (electricity and heating) is 60% less than the local average, with 20% supplied from renewable source (solar PV) and while the CHP was running the site was a net energy producer and with negative CO2 emissions (Hodge & Haltrecht, 2009). This reduces ecological damage from fossil fuel extraction and combustion (*socio-ecological integrity*), conserves finite resources (*resource management & efficiency*) and vulnerability to fuel supply (*precaution & adaptation*).

- *Utility Bills* – residents have substantially lower energy costs than U.K. average (Lazarus, 2003) which is progressively beneficial to lower income households (*inter & intra-generational equity*).

Low Water Housing

Low Water Housing is a technical and infrastructure output playing a similar part to the Low Energy Housing output in the first tier (technical) of the BedZED design model that aims to create a physical environment with intrinsically low ecological impact. The design solution for water was to maximize the use of rainwater and water from onsite recycling, minimize the use of water in the building, and to meet the residual demand from the water utility. A breakdown of the output using the Activity – Supply System analytical framework is shown in Table 27.

Table 27.

BedZED LOW WATER Output Analysis

Domain	Supply System / Service	Activity
Housing	⇒ Green roofs ⇒ Rainwater collection ⇒ High efficiency appliances ⇒ Onsite 'green' water recycling, also included as two other outputs: (1) the GWTP (green water treatment plant) which was eventually discontinued due to operational problems; and (2) an experimental MBR (membrane bio-reactor) plant, subsequently installed as a replacement. ⇒ Pervious paving	

Sustainability indicators impacted by the LOW WATER HOUSING

output are

- *Water Use & Waste Water Treatment* - water use per person is 50% of the local average, about 17% is from recycling (Hodge & Haltrecht, 2009) increasing *resource management & efficiency, socio-ecological integrity,* and *precaution & adaptation.* There is zero wastewater discharge: surplus recycled water is discharged to a ditch (Hodge & Haltrecht, 2009) and pervious paving eliminates runoff. This lessens the load on conventional treatment system (*precaution & adaptation*).

- *Utility Bills* – residents have lower water costs than the U.K. average (Lazarus, 2003) contributing to *inter & intra-generational equity*.

- *Biodiversity* – The excess treated water is discharged into surrounding ditches and wetlands. increasing biodiversity (*socio-ecological integrity*).

Community

This output relates to the second (behavioral) and third (social) tiers of the BedZED design model that aim to encourage more sustainable lifestyles through an integrative design of site and facilities that seeks to make sustainable choices convenient for residents. There are many components to this output, many of which could be treated as smaller outputs in themselves, but due to their integrated nature and implementation (i.e. all of the system & service components were produced around the same time as part of the overall project), it would have been difficult to separate out them out. The breakdown of the output using the

Activity – Supply System analytical framework in Table 25 however helps to

understand this output in more depth.

Table 28.

BedZED COMMUNITY Output Analysis.

Domain	Supply System / Service	Activity
Housing	$\Rightarrow$ Marginalized roads & parking $\Rightarrow$ Integral recycling system $\Rightarrow$ Neighbor facing layout of homes and common walkways $\Rightarrow$ Public spaces (village square, allotments, pavilion) $\Rightarrow$ Mixed tenure consisting of private ownership (50%), employment related (25%) and social housing (25%)	$\Rightarrow$ Recycling appears to be greater than local average (Hodge & Haltrecht, 2009, p. 32) but many residents are apathetic towards recycling (P. Plum, personal communication, January 8, 2011). $\Rightarrow$ Frequent resident interaction you would have to actively work hard against to avoid (P. Plum, personal communication, January 8, 2011). $\Rightarrow$ Grounds commonly used for socializing (P. Plum, personal communication, January 8, 2011). $\Rightarrow$ Low income households have access to high quality, affordable housing.
Mobility	$\Rightarrow$ Cycle paths $\Rightarrow$ Marginalized roads & parking Car club - The car club was the first in the U.K. and had 50 members in 2004 with utilization increasing from 15% to 35% from 2003 to 2004 (Department for Transport, 2004, pp. 123-124). $\Rightarrow$ Limited, fee based parking Close to train & bus services	$\Rightarrow$ Car ownership and miles driven is much less in BedZED than the local average and residents also use public transport more (Hodge & Haltrecht, 2009, p. 38). $\Rightarrow$ High air transport use $\Rightarrow$ Parking off-site to get around on-site restrictions
Eating	$\Rightarrow$ Community allotments $\Rightarrow$ Community composting Rooftop & balcony gardens	$\Rightarrow$ Less food grown than local average (Hodge & Haltrecht, 2009, p. 29). $\Rightarrow$ Organic food choice common but not predominant (Hodge & Haltrecht, 2009, p. 30)
Recreating	$\Rightarrow$ Playing field but poor quality Pavilion	$\Rightarrow$ The pavilion is a popular resource used by BedZED and Hackbridge community (Hodge & Haltrecht, 2009, p. 34)
Cross Cutting Activities		

Domain	Supply System / Service	Activity
Governance	⇒ Traditional landlord – tenant or factor – private owner property management structure between Peabody and residents. ⇒ A resident association represents residents' interests	⇒ Poor participation in residents' association. (P. Plum, personal communication, January 8, 2011). ⇒ The residents' association would like to direct more effort into sustainable development of the community but it spends all of its time dealing with tenant – landlord issues (P. Plum, personal communication, January 8, 2011). ⇒ Residents perceive Peabody to be poorly responsive to issues (Hodge & Haltrecht, 2009, p. 36; P. Plum, personal communication, January 8). ⇒ Peabody has been dismissive of residents' attempts to take more control and responsibility (P. Plum, personal communication, January 8, 2011).

Sustainability indicators impacted by the COMMUNITY output are

- *Waste Production* – slight increase due to recycling and composting appearing to be greater than local average (Hodge & Haltrecht, 2009, p. 32).

- *Energy use & CO2 emissions / transport* – no change overall. CO2 emissions are slightly more than the surrounding average due to the high number of flights taken by residents more than negating the reductions from low car use and miles. However, neither of these transport behaviors (high flight use or low car use) appears to have been a result of living in BedZED but that "it is likely that tenure is a

more important influence on car ownership than any environmental imperative" (Hodge & Haltrecht, 2009, p. 26).

- *Car Dependency* – increased by the range of transport options available that allow many residents to live in BedZED without a car.

- *Food production* – slightly increased since residents choose organic produce more often than the surrounding average, helped by the organic grocery delivery service. However, despite the resources residents have at hand, food production (on-site allotments and composting, access to balcony or roof gardens), less food is grown in BedZED than the surrounding average (Hodge & Haltrecht, 2009, p. 29).

- *Health & wellbeing* – slightly increased by use of pavilion for fitness classes and generally pleasant and safe grounds. Generally, people really like living in BedZED for many different reasons (M. Peacock, personal communication, January 8, 2011; P. Plum, personal communication, January 8, 2011), be it the architecture, the peacefulness, the sustainability, the child friendly environment, the neighborliness (Hodge & Haltrecht, 2009, p. 35). However, there is little to suggest that this translates into greater sustainability.

- *Social Housing Provison* – substantial increase. The mixed tenure housing and mobility options make BedZED strong in the *inter & intra-generational equity* criterion which it does in three ways: (1) it provides basic needs (housing); (2) it reduces stratification of society;

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and (3) it avoids 'sustainable' housing only being for those who can afford it.

- *Social Cohesion* – higher as evident from residents reporting strong community as what they like best about living in BedZED and residents knowing 20 neighbors on average (Hodge & Haltrecht, 2009, p. 35). However, this in itself does not necessarily translate into sustainability. Arguably, the trust and security among residents does increase social equity by providing mutual social support and lead to greater, although unrealized, governance capacity.

- *Participatory Governance* – no change. There is a suggestion that with greater responsibility, residents could manage the site more satisfactorily, greater interest and participation among residents could be achieved, and more attention and action focused on sustainable development (P. Plum, personal communication, January 8, 2011).

GWTP (Green Water Treatment Plant)

The original water supply system of the main construction included an on-site waste water treatment plant and recycling of water. This has been separated out as a distinct output because of its eventual discontinuation due to operational problems. A breakdown of the output using the Activity – Supply System analytical framework is shown in Table 29.

Table 29.

BedZED GWTP Output Analysis.

Domain	Supply System / Service	Activity
Housing	⇒ The GWTP, a turbo reed bed, activated sludge system, based on Living Technology Ltd's Living Machine (Lazarus, 2003, p. 26), was taken out of operation due to cost and energy inefficiencies compared to off-site utility sewerage treatment (Hodge & Haltrecht, 2009, p. 24).	⇒ There was no impact on residents.

Sustainability indicators impacted by the GWTP output are:

- *Water Use & Waste Water Treatment* – increased. An additional 15 litres of water per day per person being was taken from the water utility and all waste water (87 litres per day per person) was now discharged off-site (Hodge & Haltrecht, 2009, p. 24). Although this detracts from sustainability achievements (*socio-ecological integrity, resource maintenance & efficiency,* and *precaution & adaptation*) there is no functional impact on residents and negligible difference in cost.

CHP (Combined Heat & Power)

The original energy supply system of the main construction included an on-site CHP plant for supply of heat and electricity from renewable fuel. This has been separated out as a distinct output because of its eventual discontinuation due

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to operational problems. A breakdown of the output using the Activity – Supply

System analytical framework is shown in Table 30.

Table 30.

BedZED CHP Output Analysis.

Domain	Supply System / Service	Activity
Housing	$\Rightarrow$ Technical problems were at least in part due to Sutton Council imposing a mandatory 6 hour nightly shutdown (M. Peacock, personal communication, January 13, 2011; Hodge & Haltrecht, 2009, p. 22). $\Rightarrow$ Energy to replace the CHP heat and electricity is now produced by an onsite natural gas boiler and from the electricity utility (Hodge & Haltrecht, 2009).	$\Rightarrow$ There was no impact on residents.

Outcomes from discontinuation of the CHP were:

- *Energy Use & CO$_2$ Emissions* – CO$_2$ emissions increased due to the replacement of the renewable energy supply with fossil fuel (*socio-ecological integrity*, *resource management & efficiency, precaution & adaptation*).

MBR-WTP (Membrane Bio-reactor Water Treatment Plant)

Continuing the operation and maintenance of the water supply system this output reinstated on-site waste water treatment. A breakdown of the output using the Activity – Supply System analytical framework is shown in Table 31.

Table 31.

BedZED MBR-WTP Output Analysis.

Domain	Supply System / Service	Activity
Housing	$\Rightarrow$ An experimental MBR-WTP was installed by Thames Water replacing the service, at least temporarily, originally provided by the GWTP (Hodge & Haltrecht, 2009, p. 24). .	$\Rightarrow$ There was no impact on residents.

Sustainability indicators impacted by the GWTP output are:

- *Water Use & Waste Water Treatment* – decreased. An estimated 15 litres of water per day per person less is taken from the water utility and all waste water (87 litres per day per person) is now treated and used or discharged on-site. This restores the original sustainability achievements (*socio-ecological integrity, resource maintenance & efficiency,* and *precaution & adaptation*).

Transition Path Analysis

The complete reconstructed transition path for BedZED is shown in Figure 8. It is convenient to break the overall transition path into segments as listed in Table 32. All of the BedZED transition outputs stem from the completion of the construction project and therefore have segments 1 and 2 in common.

Table 32.

BedZED Path Segments

SEGMENT	OUTPUT	DESCRIPTION
1	(STARTUP)	Conceptualization – inception to finding a developer
1,2	LOW ENERGY HOUSING LOW WATER HOUSING	Design & Construction – the construction project
1,2,3	COMMUNITY	Sales / Transfer – residents move in and it becomes a living community
1,2,4	GWTP CHP MBR-WTP	Maintenance – about one year after construction to the present
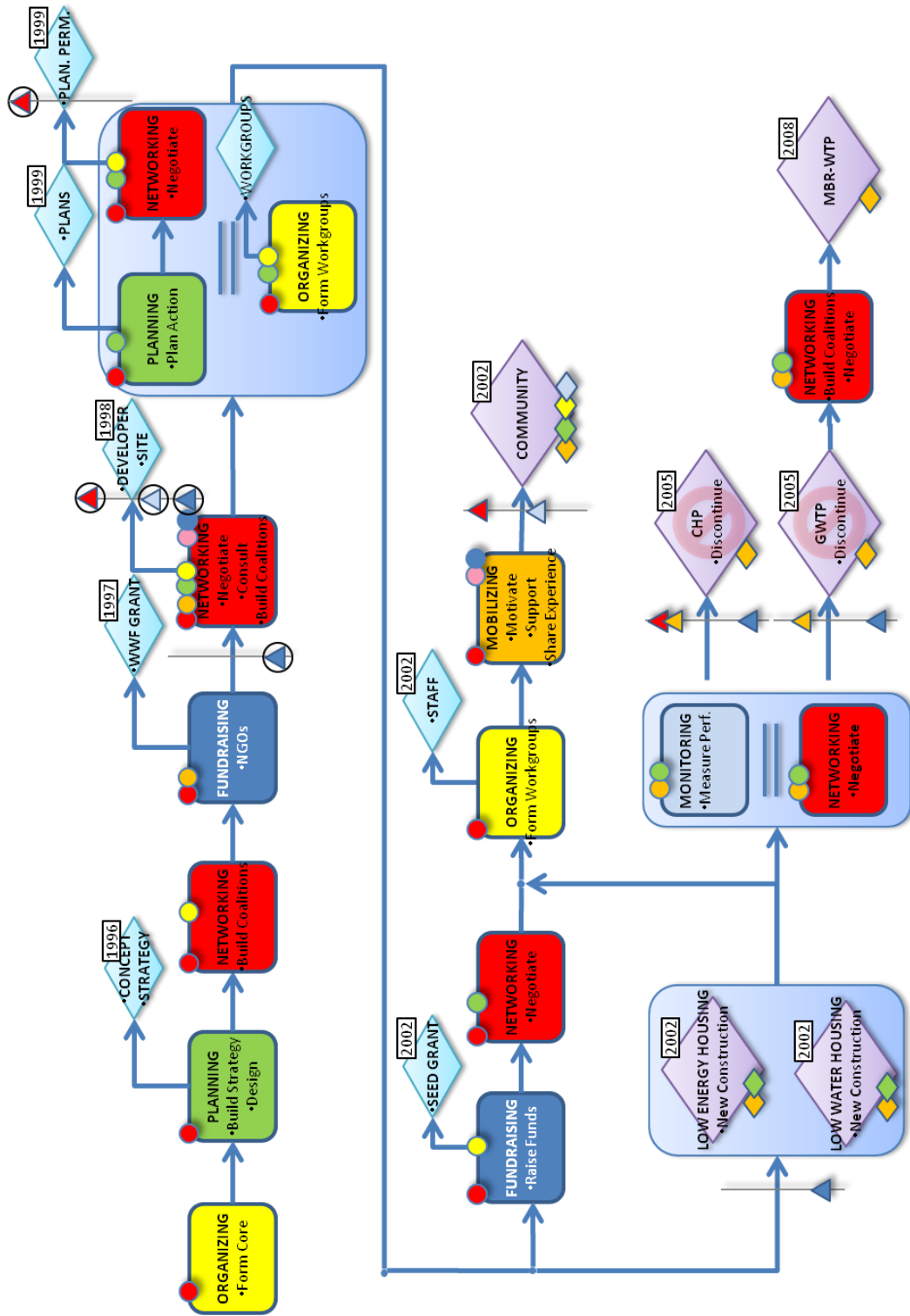
Figure 18: BedZED transition path. (See Appendix E for legend).
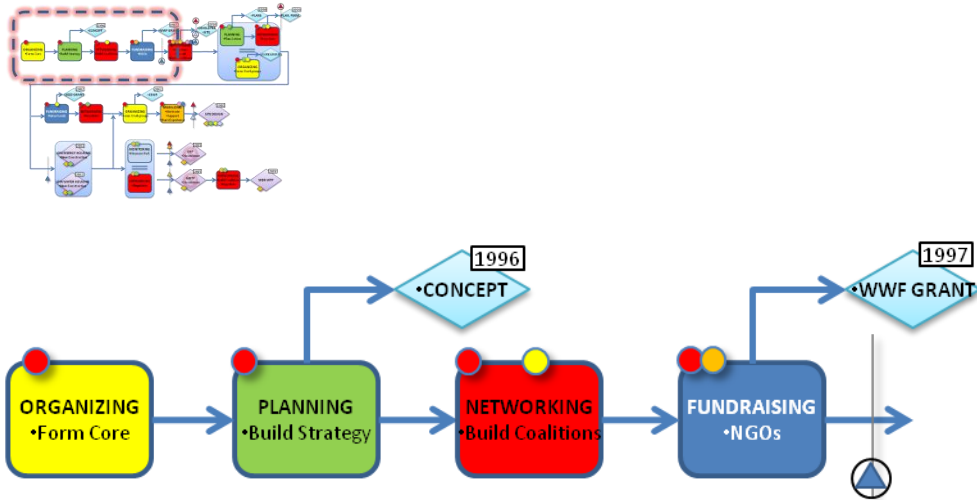
Figure 19. BedZED transition path segment 1 (STARTUP)

The initial segment of the BedZED transition (Figure 19) is about the

formation of an innovation nucleus and the development of a visionary concept

into a marketable proposal. Dunster and Desai and their organizations BDA and

BioRegional came together to form a core group around their complementary

skill-sets of technical know-how and entrepreneurial sustainability to develop the

sustainable community concept further and to build a strategy to take it forward.

The biggest problem was going to be finding a developer willing to fund such an

ambitious and radical project and money would be needed to professionally

develop and market a proposal. BioRegional overcame this economic barrier by

using an existing relationship to obtain funding from the World Wildlife Fund.

BioRegional's existing network was also important in adding Sutton Council as a

partner. Local authority planning difficulties would be perceived as a potential

stumbling block to prospective developers so having a local authority on board

would be advantageous.

Key aspects path this path segment were:

- The formation of a innovative core group

- Obtaining local authority support

- Developing and marketing a proposal

Low Energy Housing And Low Water Housing (Segment 2)
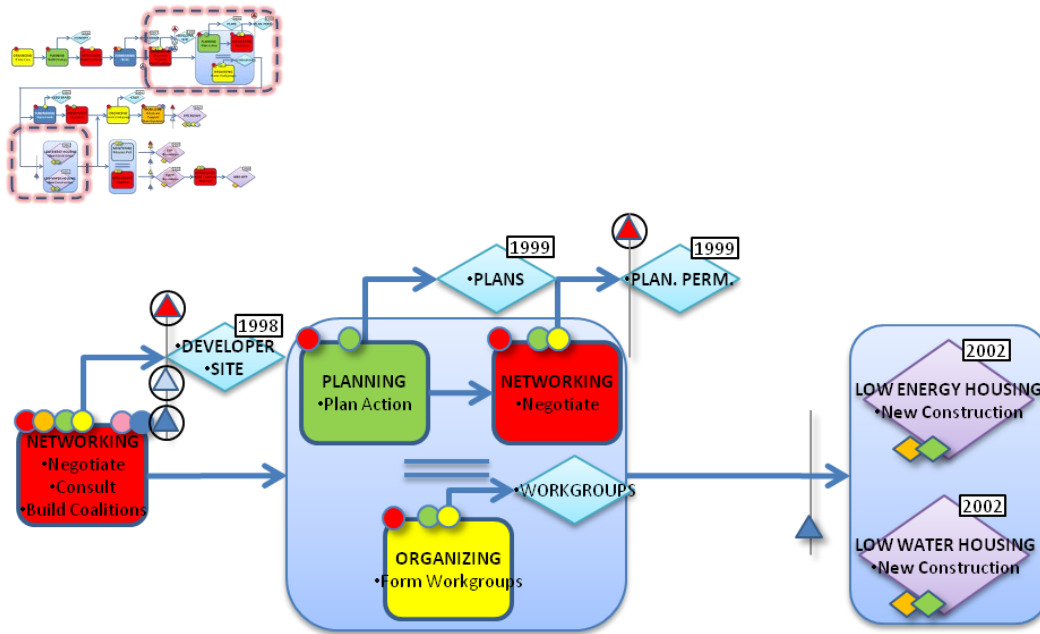
Figure 20: BedZED transition path segment 2 (LOW ENERGY HOUSING,

LOW WATER HOUSING)

Segment 2 (Figure 20) is characterized by an expansion in the

number and type of actors involved, dominated by the core group,

business and government. The outputs of interest from this segment are

the Low Energy Housing and Low Water Housing outputs. These are not

separate constructions but are different aspects of the main construction

disaggregated for analytical purposes. Following an initial period of

NETWORKING to find a developer and a site, the main phase in this

segment was a complex combination of PLANNING, NETWORKING and ORGANIZING activities in which the main tasks were building coalitions and business relationships, developing detailed designs and plans, negotiating contracts and planning permission. Planning permission was granted in 1999 and construction began in 2000. The more interesting actions taken that were important to producing the outputs are described below.

Finding a developer (NETWORKING to overcome cost & norms barriers). Neither BioRegional nor BDA could finance the project or had the capabilities to take long term ownership of it and so BioRegional "spent a long time trying to find a suitable development partner" that could (M. Peacock, personal communication, January 8, 2011). Barriers to finding a developer were twofold: cost and property development norms. Cost was a major barrier because it was high risk (nothing had been done like it before) but also because the requirement to include social housing imposed by Sutton Council, and the objective to keep the end price competitive with mainstream property meant that it was not an attractive prospect in purely market terms. It needed an organization that could not only fund it but that was prepared to put other considerations ahead of financial; an organization that behaved outside the usual standards. Eventually they found the Peabody Trust. The barriers were overcome by perseverance, networking, presenting a convincing case, and building a coalition of organizations with commitments to non market standards and with strongly overlapping interests.

Finding a site (NETWORKING to overcome cost, norms & regulative barriers). The higher construction costs of the project compared to the industry standard meant that costs had to be reduced or values increased in other areas in order to remain competitive overall. Soon after Peabody joined the project Sutton Council alerted the core group to the availability of a site they were selling. Sutton Council accepted a density-for-parking planning tradeoff that increased the site revenue value (Lazarus, 2003, p. 7), and they set a national precedent by accepting a lower bid on the basis that the value of future environmental benefits flowing to the council from the development would make up for the shortfall (BRESCU, 2002, pp. 6-7). Several factors were therefore important in acquiring the site: the partnership already established with Sutton Council; the willingness of parties to look beyond existing standards; and an integrated design approach (where density and parking also relate to the transport system and the water and energy systems that in turn supported the environmental value of the bid).

Technical Innovation (ORGANIZING to develop technical solutions). This is discussed under Segment 4.

Obtaining Planning Permission (NETWORKING to overcome regulative barriers). More planning negotiation with Sutton Council than for a standard construction project was needed to overcome the unique and irregular design features such as pervious paving (M. Peacock, personal communication, January 8, 2011). Generally, Sutton Council was willing to find ways to work around issues, although the requirement for the CHP plant to be shutdown nightly

for 6 hours was a one notable exception. The established partnership with Sutton

Council was therefore important in obtaining planning permission.

Overcoming Escalating cost. Cost overrun during construction was a

barrier that in one respect was not overcome if simply paying the extra cost is

disregarded as being a 'solution' to the problem. The cost of the project is

believed to have exceeded initial estimates of almost £12 million (BRESCU,

2002) by somewhere in the range of £5 million (Lovell, 2008) to almost £11

million (ROOF, 2007). The reasons for the overrun are not known and it is an

aspect of the project that is not well publicized (Lovell, 2008). Had it been a

publicly funded project the overrun would likely have been much more damaging.

Being privately funded was probably an important factor in avoiding adverse

publicity and being able to make the decisions necessary to see it through.

Key aspects of segment 2 were:

- Challenging and breaking down accepted standards and norms

- A strongly supportive local government

- Largely independently funded

Community (Segment 3)
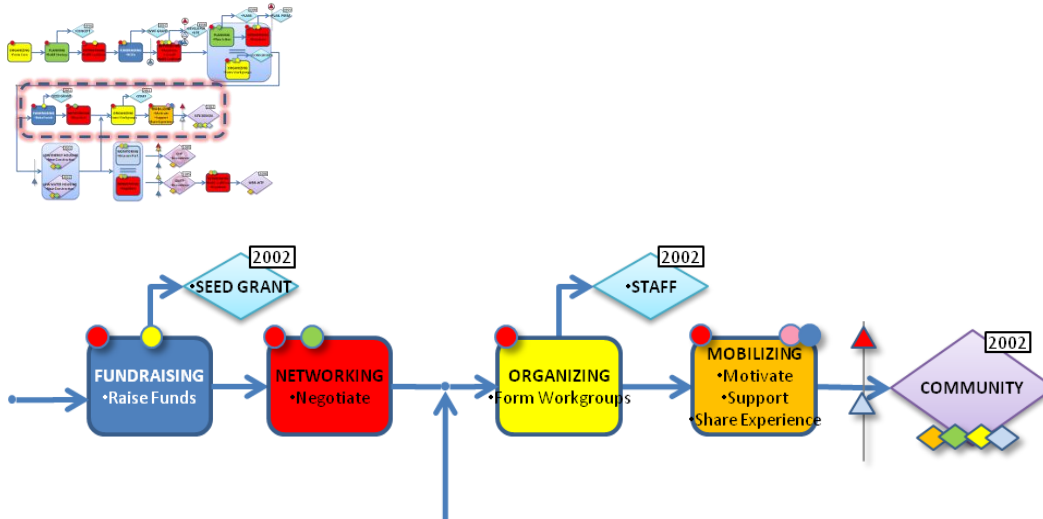
Figure 21: BedZED trasition path segment 3 (COMMUNITY)

The first part of the segment (FUNDRAISING and NETWORKING) activities) took place while construction was being completed and the second part (ORGANIZING and MOBILIZING) after construction. Much of the pathway to the COMMUNITY output then, comes from the design and construction (segment 2) but segment 3 adds to this in a way that tries to steer resident interaction with their surroundings towards more sustainable outcomes. Segment 3 can be thought of as the "soft construction" of community following the "hard construction" of the actual buildings and therefore corresponds to the second and third tiers of the BedZED design model. The more important actions taken towards the output are described below.

Implementing and adhering to guiding principles. From the outset, a systemic approach to design, guided by principles of sustainable development, was central to achieving the project goals and staying on track. It was

BioRegional's "role during the planning and construction stages was to ensure that sustainability was considered at every step" (Hodge & Haltrecht, 2009, p. 2). BioRegional were able to build a coalition around these principles, that may have even strengthened the commitment to sustainability in some respects. For example, the requirement for social housing was initiated early by Sutton Council and strongly supported and extended by Peabody, greatly increasing the social equity outcomes of the development. It is not known if this would have been achieved with different partners. Assigning a party to oversee and direct sustainability seems to have been very important in keeping a balance of perspectives. It also seems that the commitment of partners to sustainability principles was strong even though there must have been many occasions when commercial or professional standards exerted strong pressure in other directions.

Implementing a systemic approach to design. It is clear that the design team put a great amount of effort into holistic design of the "community" aimed at maximizing sustainability. Outcomes such as high density, walkability, social cohesion, low car use, low income households and passive thermal home design are systemically related and neglecting any one of them in design may produce substantially different results. There are numerous systemic linkages interwoven into the design of the complex (BRESCU, 2002, p. 4). The systemic design approach was a result of the innovative thinking, unconstrained by existing standards that BDA and BioRegional brought. Peabody also brought similar thinking with respect to solving social problems of the housing market (Weaver,

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2002). The diversity of the development parties may also have helped to increase the systemic linkages in design by each bringing different aspects to consider.

Developing a Culture of Sustainability. Despite the integrated design, BioRegional saw that new residents would not automatically become models of sustainability as soon as they moved in but that they would need help and encouragement. Prior to residents moving in a government SEED grant was obtained to cover the appointment of a "green lifestyle officer" (GLO) for a period of one year who would motivate and support residents to adopt more sustainable behaviors by providing information, training, and support. The idea "was get the ball rolling and then that knowledge would hopefully be retained in the community" (M. Peacock, personal communication, January 13, 2011). Individuals from BioRegional and BDA organized sustainability oriented social events and residents shared information and experiences in the first year or so, and from all of this, it was hoped that a culture of sustainability would grow (P. Plum, personal communication, January 8). It is thought that this strategy was working but when funding for the green lifestyle officer ended in 2003, and as the pioneering spirit of the first year or two faded and resident turnover began, any early gains were lost and resident apathy and indifference towards sustainability now seems to be the norm (M. Peacock, personal communication, January 13, 2011; P. Plum, personal communication, January 13, 2011).

Consideration of community governance. Although the development was radical in many aspects this was not the case from a governance aspect. There seems to have been an assumption that Peabody's standard governance model

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(landlord or factor to tenant or resident), would be suitable for the new community.

Key aspects of the path to the COMMUNITY output were:

- Create a balanced diversity of interests but united in their commitment to sustainability

- Creative and visionary innovators with competence for systems thinking.

- Appointment of a party responsible for ensuring sustainable development

- Appointment of a sustainable lifestyle coach

- The lack of a long term sustainable development plan

- No consideration of new forms of governance

CHP, GWTP, MBR-WTP (Segment 4)
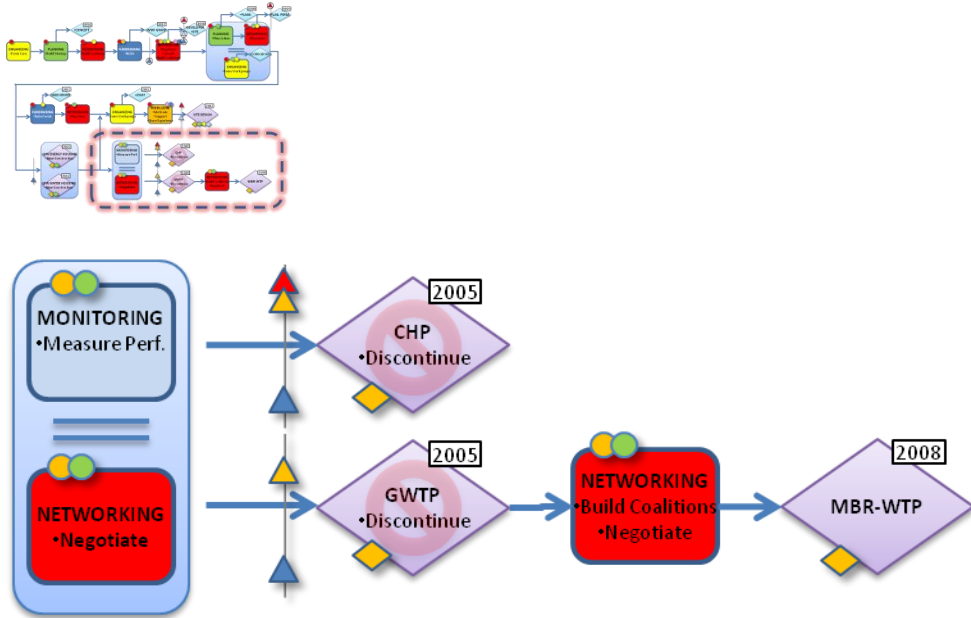
Figure 22: BedZED trasition path segment 4 (CHP, GWTP, MBR-WTP)

The remaining path outputs (CHP, GWTP and MBR-WTP) as shown in Figure 22 all follow directly on from the main construction. CHP and GWTP outputs were both technical failures that followed similar patterns. The immediate path to the discontinuation of these systems consisted of monitoring operational performance and negotiating with the contracted operator to try to resolve the problems and eventually to make the decision to terminate them. However, the roots of the problems lie in the main design and construction phase (segment 2). The reinstatement of on-site water treatment with the experimental MBR system came about following a period of NETWORKING by Peabody to build new coalitions. No such replacement for the CHP has yet been made.

Technical Innovation (ORGANIZING to develop technical solutions). The systems were adapted from very specialized technologies that are not in widespread use. Specialist design and development groups were created consisting of core group, supplier companies, and local government to adapt the technology for the site (Segment 3 – ORGANIZING). While all parties were united around finding solutions that maximized sustainability they also had differing motives and interests that played a part in the failure. The supplying companies were generally interested in getting their innovative technology into practice, not so much for the immediate sales revenue but to use it as a technology proving demonstration to future customers and to learn lessons and improve the technology. BioRegional and BDA on the other hand were driven by the targets they had set for themselves for CO_2 emissions and water use and were therefore perhaps overoptimistic in their appraisal of the readiness of the technology to

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achieve these targets. This seems to have been the opinion at Peabody where "a development manager at the trust, says the project was over-ambitious, using untested technology and a complicated wastewater treatment system that were not economic to run" (Slavin, 2006). Peabody's main concern was a reliable system at an affordable price for tenants. Thus the choice seems to have been to pursue maximum goals when safer, more tried and tested technologies could have provided more reliability but lesser gain. The reasons for this choice however, go further than just naked ambition: the project success would be judged by its achievement of the goals and the development team had to some extent staked their reputations on it. Also, the inclusion of environmental benefits in the site purchase put added pressure on achieving low carbon emission and other environmental goals.

Regulative Barriers. In the case of the CHP plant Sutton Council insisted on the nightly shutdown of the plant for noise reasons and this was a factor in the frequent technical failures of the system, resultant high cost of maintenance, and supplier ceasing trading. The shutdown was damaging but also unnecessary as the equipment was not noisy, but Sutton Council did not relax the regulations (M. Peacock, personal communication, January 13, 2011; Hodge & Haltrecht, 2009).

Key aspects leading to the CHP, GWTP outputs were:

- The use of collaborative technical development workgroups

- The deployment of unproven technology at full scale

Transition Management Appraisal

An appraisal of how well the BedZED transition process conforms to transition management principles is shown in Table 33.

Table 33.

Appraisal of BedZED Similarity to Transition Management Principles

Theoretical Principles TM	Appraisal Notes
creating space for niches	Yes - The support of Sutton Council provided planning flexibility and allowed the site to be purchased by unconventional means. Peabody, as the developer and funder, appear to have been very committed to allowing the project to achieve its aims despite the cost overruns, where a less committed and tolerant developer may have forced many compromises. It was still subject to a great deal of externally imposed control though (legal, professional standards, management etc,).
focus on forerunners	Yes – Dunster, Desai and Robinson have all the characteristics of forerunners as do their organizations. Other frontrunners were companies like Exus Energy and Albion Water.
guided variation and selection	No - the project essentially followed a strict construction project blueprint type of pattern. The goal was defined in great detail and there would have been little flexibility in achieving it.
radical change in incremental steps (guided by a long term vision)	No - the project was radical in design and technologies but very conventional in its implementation. It was a single phase development. While there was a vision of a sustainable community, it was short term to medium term (around 5 years) and it was translated into a blueprint during the design process.
learning-by-doing and doing-by-learning	No - No doubt there was a great deal of first order learning during the project about materials and technologies and design etc. but this learning did not alter the goal or the process. At a higher level, there has been reflection by all parties about the project as a whole, that has been applied to future projects. BioRegional for example, have changed their ideas about what the scale and focus of sustainable development should be.
multi-level approach, multi-domain approach	Partial - The raison d'etre of the project was as a solution (both live and demonstration) to numerous societal problems and many design features exist in response to the problem they are trying to solve. Also, the site design was carfeully integrated in several respects across mobility, social, ecological, and technical aspects to try to achieve outcomes that exceed what more narrowly focused solutions could acheve.

Theoretical Principles TM	Appraisal Notes
anticipation and adaptation	No - While there has been follow up monitoring studies on the results of the project, they were not part of any ongoing, adaptive management. They were just static observations. Response to the poor performance of the GWTP and CHP plant were to some extent adaptive but this was reactive and unplanned.
empowering niches	No - the community has little power over its own affairs or with the regime it exists in (Peabody being the first regime 'layer') and apparently has little interest in having more. At a higher level, the core group and close partners like Sutton Council have grown in strength through the attention attracted.
Selective participatory process	Partial - the core group (BioRegional and BDA) self selected each other and went on to select to Sutton Council, Peabody to create something resembling the main transition 'arena' from which 'arenas of arenas' developed as needed. The selection was functional but very narrow and some decisions may have been top down command control from Peabody instead of consensus.
Normative principles of sustainability	Yes - Both BDA and BioRegional were committed to sustainability as an outcome and made great effort to apply it in the design and the construction process.

An appraisal against transformative planning and governance method steps is shown in Table 34.

Table 34.

Appraisal of BedZED Similarity to Transformative Method Steps

Step	Appraisal
Visioning	NO – no participatory visioning exercise was held although the core group did have a vision of a low ecological footprint community leading 'mainstream' lives.
Analysis	Partial –The project was based on an analysis of urban development in the context of sustainability and building a new community scratch was concluded to be an effective intervention against problems such as urban sprawl and CO_2 emissions.
Intervention	Yes – The project was one large intervention.
Evaluation	No – Wile there have been numerous assessment studies the knowledge obtained has not been used to further the community transition (although it has been used to inform other projects).

BedZED Outlook

There is no development plan at BedZED or any real push for one. In transition terms, the community is stable, meaning it is not in transition. This is unlikely to change until the community decides it is something they want to do which does not appear likely given the apathy and disinterest of most residents (P. Plum, personal communication, January 13, 2011). One possible opening that might make a difference to this is the disgruntlement of residents in general with the property management by Peabody and the moves that some residents have made towards exercising their "right to manage" option in which they would take over management responsibility from Peabody although so far they have hit a stone wall on this (P. Plum, personal communication, January 13, 2011). Such a development would move the community up several rungs on the ladder of

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participation and may lead them on from dealing with routine maintenance issues
to more ambitious and development in the direction of sustainability.

Summary of BedZED Transition Strategic Factors

Summary results bringing the sustainability indicators together with the
transition path strategic factors for each output are presented in Table 35 and
Table 36.

Table 35.

BedZED Strategic Factors Contributing To Successful Outcomes

Output	Sustainability Indicators	Strategic Factors
(STARTUP)		$\Rightarrow$ Forming a visionary & entrepreneurial core group $\Rightarrow$ Obtaining local authority support $\Rightarrow$ Developing and marketing a proposal
LOW ENERGY HOUSING	$\downarrow$ Energy Use & CO_2 emissions $\downarrow$ Utility Bills	Top down, professional & expert driven $\Rightarrow$ Network of technical & professional expertise
LOW WATER HOUSING	$\downarrow$ Water Use & Waste Water Treatment $\downarrow$ Utility Bills $\uparrow$ Biodiversity	$\Rightarrow$ The use of collaborative, technical development workgroups $\Rightarrow$ Challenging and breaking down accepted standards and norms $\Rightarrow$ A strongly supportive local government independently funded
COMMUNITY	$\downarrow$ Waste Production $\uparrow$ Social Housing Provision $\downarrow$ Car Dependency $\uparrow$ Food production $\uparrow$ Health & wellbeing $\uparrow$ Social cohesion	$\Rightarrow$ A core group with a balanced diversity of interests, united by a commitment to sustainability $\Rightarrow$ Use of creative and visionary innovators with systems thinking competence in design. $\Rightarrow$ Appointment of a party responsible for ensuring sustainable development $\Rightarrow$ Appointment of a sustainable lifestyle coach $\Rightarrow$ Challenging and breaking down accepted standards and norms
MBR-WTP	$\downarrow$ Water Use & Waste Water Treatment	$\Rightarrow$ Network of technical & professional expertise $\Rightarrow$ The use of collaborative technical development workgroups

Indicator Changes: $\uparrow$ increased; $\downarrow$ decreased; $\varnothing$ negligible; ? unknown

Table 36.

BedZEDStrategic Factors Contributing To No Change Or a Decrease In

Sustainability Indicator.

Output	Outcomes	Strategic Factor
COMMUNITY	$\varnothing$ Participatory Governance $\varnothing$ Energy use & CO2 emissions / transport $\downarrow$ Food production / household	$\Rightarrow$ No long term sustainable development plan $\Rightarrow$ Failure to consider new forms of governance
GWTP	$\uparrow$ Water Use & Waste Water Treatment	$\Rightarrow$ The deployment of unproven technology at full scale
CHP	$\uparrow$ Energy Use & CO_2 emissions	

Indicator Changes: $\uparrow$ increased; $\downarrow$ decreased; $\varnothing$ negligible; ? unknown

Forres

Introduction

Table 37.

Forres Profile

Transition Began	2007	
Affiliation	Transition Town	
Current Status	Active	Currently completing the second development plan and applying for funding. Actively working on community energy company, completing transition "pavilion" and expanding community gardens (*Transition Town Forres Final CCF Report 2008-11*, 2011)
Purpose	Semi-Active	Active within the Transition Town Network and work with other communities.
Dispersal	Dispersed	At least 5% of community population participate in activities. Active involvement is much lower.
Growth	Conversion	Community participation is slowly growing.
Community Population	9,500	(Piper & Villani, 2009, p. 5)

Forres is a small Scottish town that began its transition in late 2007. Carin Schwartz founded Transition Town Forres (TTF) after reading about the Transition Town movement and discussing it with two acquaintances she had met through the nearby Findhorn Foundation (C. Mustard, personal communication, January 6, 2011). TTF's goals and motives closely align with Transition Towns' of building "local resilience in the face of the potentially damaging effects of Peak Oil and Climate Change" (Piper & Villani, 2009, p. 6) and its aims closely follow the Transition Town model of (Piper & Villani, 2009, p. 9):

1. Developing the sustainability and resilience of the community,

2. Planning to end fossil fuel dependence,

3. Improving the health and empowerment of the community based on ecological and ethical principles

The aims closely interlink and overall seek both physical change such as independence from fossil fuels, and cultural change in the way the community thinks of itself and acts with respect to its local to global relationships and responsibilities. The concept of a resilient community is an important aim of the transition that is not only concerned about being physically prepared for anticipated change but about building the capacity of the community to withstand shocks and adapt to change. TTF has set a timeframe of 20 years to achieve its aims (Piper & Villani, 2009, p. 9).

Summary of Transition Output Sustainability Appraisal

The Forres transition outputs are summarized in Table 14. Details of the sustainability appraisal are in Appendix D.

Table 38.

Forres Transition Outputs and Sustainability Appraisal

Output	Components of Output	Sustainability Indicators[a]	Domains	ΔS
PLASTIC BAGS	⇒ Distribute Fair Trade shopping bags	∅ Waste Production ↓ Low Impact Consumerism	Shopping	*1*
COMMUN-ITY GARDENS	⇒ 70 allotment plots ⇒ No artificial inputs Bees, chickens & composting	↑ Food production ↑ Local Economy ↑ Community Assets ↑ Social Cohesion	Eating	*6*
FARMERS MARKET	⇒ Monthly farmers market	↑ Food Production ↑ Community Assets ↑ Social Cohesion	Eating Shopping	*6*
LOCAL FOOD GUIDE	⇒ Published a directory of local food	? Food Production	Eating Shopping	0
CARBON PLEDGES	⇒ CO_2 emission reduction behavior	↓ Energy use & CO_2 emissions ↓ Utility Bills ↑ Food production ↓ Low Impact Consumerism	Housing Mobility Eating Shopping	7

[a]Resource use is relative to local or national averages
ΔS = Appraised Change in Sustainability
Indicator Changes: ↑ increased; ↓ decreased; ∅ negligible; ? unknown

The appraised sustainability gain of Forres is small but well distributed across all sustainability criteria with the exception of *livelihood sufficiency & opportunity.* Distribution across domains (Figure 24) is concentrated in only 4 out of 9 domains with *Eating* being the strongest.
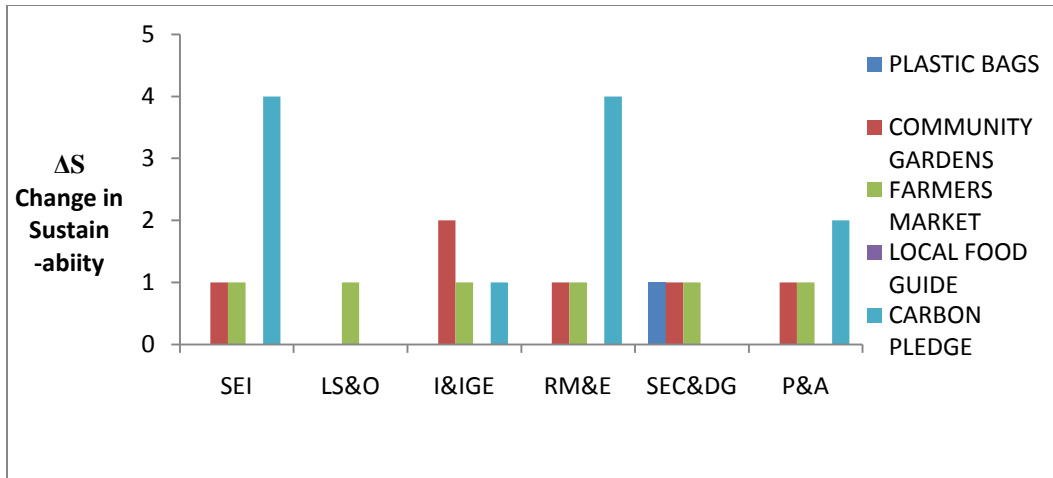
Figure 23. Forres sustainability of appraisal of outputs by sustainability criterion.
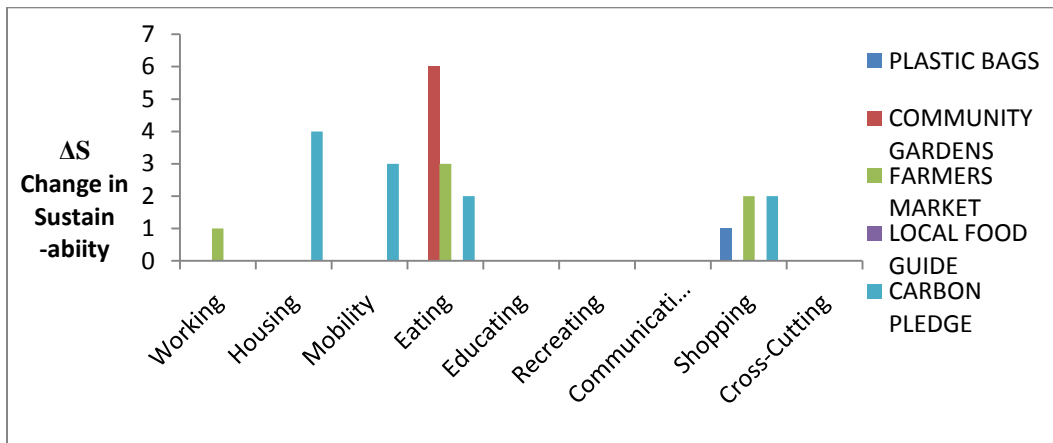
Figure 24. Forres sustainability appraisal of outputs by domain.

Analysis of Transition Outputs

Plastic Bags Output

Transition Town Forres aim to eliminate plastic bags in the town as a

positive step in itself but also because they are highly visible examples of

environmentally damaging behavior. It is hoped that the task of eliminating them

will raise awareness of other issues and encourage people to participate in other

TTF activities (Piper & Villani, 2009, pp. 19-20).

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Table 39.

Forres PLASTIC BAG Output Analysis

Domain	Supply System / Service	Activity
Shopping	⇒ TTF has distributed 5,000 reusable Fair Trade shopping bags (*Transition Town Forres Final CCF Report 2008-11*, 2011, p. 9) through sales and giveaways at TTF events (e.g. carbon clinics), the monthly farmers market, and in numerous retail outlets in the town. The bags carry the TTF brand. That is approximately 1.5 bags per household.	⇒ There is no data on the usage of the TTF bags or if there has been any reduction in plastic bags consumption.

Sustainability indicators impacted by the PLASTIC BAG output are

- *Low Impact Consumerism* - some reduction in this indicator is assumed despite no hard data from which the most important outcome is the raising of socio-ecological awareness and standards of behavior.

- *Waste Production* – a negligible reduction in waster produced.

Community Gardens Output

The COMMUNITY GARDEN output is a community infrastructure improvement providing Forres residents with a physical amenity for small scale agricultural and horticultural activities. The goal of the project is twofold: (1) to increase local food production by residents; and (2) to increase local food growing skills and knowledge in the community (Piper & Villani, 2009, pp. 18-19). A breakdown of the output using the Activity – Supply System analytical framework is shown in Table 40.

Table 40.

Forres COMMUNITY GARDEN Output Analysis

Domain	Supply System / Service	Activity
Eating	⇒ An 11 year lease was obtained from Moray Council on 1.5 acres of common ground and converted it into 14 permaculture style pods (*Transition Town Forres Final CCF Report 2008-11*, 2011, p. 6). ⇒ There is an annual fee of £40 and all residents of Forres are eligible, subject to availability. ⇒ Shared tools, including a tractor	⇒ The plots are fully utilized by 71 gardeners. ⇒ The garden plots are mostly used for growing food, permaculture principles are encouraged and artificial fertilizers and pesticides are not allowed. Gardeners share experiences and there are occasional organized workshops. ⇒ Shared worm bed composting, free rage hens and bee keeping. ⇒ The gardens are also enjoyed by gardeners for their social benefit – organizers are "constantly …commended on how beautiful the community garden is and what a friendly and open space it is" (C. Mustard, personal communication, January 6, 2011).

Sustainability indicators impacted by the COMMUNITY GARDEN output are

- *Food production* / community, low input – slight increase. More people in Forres are now growing their own food than before and using low impact methods. This has benefits of *socio-ecological integrity benefits* (reduced impacts from fossil fuels and artificial agricultural inputs), *resource management & efficiency* (reduced use of finite resources) and *intra & inter-generational equity* (increased access to a source of low cost, healthy food particularly helping lower

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income households). Additionally it increases community resilience to food supply shocks and interruptions (*precaution & adaptation).*

- *Community Assets* – increases the resources under the control of the community and their capacity to manage them. Managed in a sustainably oriented way the garden is an important contribution to the community's *socio-ecological civility & democratic governance*.
- *Social Cohesion* – slight increase through the strong camaraderie among the gardening community (*intra & inter-generational equity).*

Farmers' Market Output

The FARMERS' MARKET output is a community service to "provide opportunities for members of the Forres and other local communities to purchase and/or sell healthy, fresh and locally grown food and other products, as well as providing a vehicle for TTF to promote health and raise awareness of environmental and other sustainability issues" (Piper & Villani, 2009, p. 19). A breakdown of the output using the Activity – Supply System analytical framework is shown in Table 40.

Table 41

Forres FARMERS' MARKET Output Analysis

Domain	Supply System / Service	Activity
Eating	⇒ Monthly market held in a high street location with local traders selling locally produced food and crafts. ⇒ Much of the produce is low input (M. Scarlett, personal communication, January 5, 2011; C. Mustard, personal communication, January 6, 2011)	⇒ An average of 500 visitors per month (approximately 5% of Forres population) (*Transition Town Forres Final CCF Report 2008-11*, 2011, p. 6). ⇒ There is no data on how much produce is sold or the impact on local producers.
Shopping	⇒ The market has created a new public space.	⇒ The market appears to be a popular social event where the community interacts as well as for shopping. Scarlett (personal communication, January 5, 2011) cites two conversations she had with community members at the market.

Sustainability indicators related by the FARMERS' MARKET output are

- *Food production / local* – slight increase. It is assumed that the market has increased demand for local produce although there is no data to confirm this.

- *Local Economy* – slight increase. It is assumed that the market has had a positive impact on the local economy creating employment in food production and distribution in the local area and region.

- *Community Assets* – in its short history the market has become a well established and popular part of town life and can be considered a community asset to some extent.

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- *Social Cohesion* – the market point has become a "focal point" for

  TTF (M. Scarlett, personal communication, January 5, 2011) and it has

  created a new "public space" that increases social cohesion of the

  community.

Local Food Guide Output

The LOCAL FOOD GUIDE output is a community service output

providing Forres residents and the wider regional population with information on

local food. The aim of the guide is to increase interest and demand for local food,

supporting the local economy and encouraging a healthy "Moray" diet.

Table 42.

Forres LOCAL FOOD GUIDE Output Analysis

Domain	Supply System / Service	Activity
Eating	⇒ 3,000 copies of the food guide were printed and distributed free of charge through various outlets. That is approximately one per household (although many will have gone outside the town). ⇒ The guide provides a directory of information on local foods, producers and outlets.	⇒ *There is no data on whether there has been any change in eating or shopping activity.*

Sustainability indicators related to the LOCAL FOOD GUIDE output are:

- *Food Production* / local – no change. Going by the demand and

  reports of very favorable comments, the guide has been very popular

  and indicates a strong interest in local food. However, there is no data

(and it is probably too early to tell) to indicate a change in local food

production.

Carbon Pledges Output

The CARBON PLEDGES output is a behavioral output used by TTF as a

method to measure and reduce community carbon footprints. Using elements

from various NGOs, academic institutions, and other communities that have used

it, 160 households (approximately 5% of the Forres total) have been engaged in

face-to-face interviews to create individual carbon footprints that highlight where

reductions can be most easily achieved. Householders are encouraged to make

pledges on what they will do and a future follow up interview will assess the

result (*Transition Town Forres Final CCF Report 2008-11*, 2011, p. 11).

Footprints are analyzed across categories of energy, food, travel, consumables and

recycling, and pledges are based on behavioral changes that in most cases save the

household money (*Carbon Cutting Challenge Report, October - December 2010*,

2011, pp. 15-20). A breakdown of the output using the Activity – Supply System

analytical framework is shown in Table 43.

Table 43.

Forres CARBON PLEDGES Output Analysis

Domain	Supply System / Service	Activity
Housing	*No Impact*	$\Rightarrow$ Pledges to take actions such as adjusting thermostats or air drying clothes yielded the greatest gain (47%) in the school sample (*Carbon Cutting Challenge Report, October - December 2010*, 2011). $\Rightarrow$ Pledges to reduce waste and increase recycling.
Mobility	*No Impact*	$\Rightarrow$ Pledges such as using public transport more often or walking, taking the train instead of flying, and avoiding unnecessary car trips yielded substantial reduction (29%) in the school sample (*Carbon Cutting Challenge Report, October - December 2010*, 2011).
Eating	*No Impact*	$\Rightarrow$ Pledges such as reducing meat, buying local and organic.
Shopping	*No Impact*	$\Rightarrow$ Pledges to reduce consumption.

Sustainability indicators related to the CARBON PLEDGES output are:

- *Energy use & CO2 emissions* / housing, transport – has decreased. On average, a reduction of 2 MT CO2 per year per household was pledged (*Transition Town Forres Final CCF Report 2008-11*, 2011, p. 11) for the households that tool part. The data is not clear but this appears to be reduction of approximately 15% in household CO_2 emissions. This outcome increases *socio-ecological integrity, resource maintenance & efficiency* and *precaution & adaptation*.

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- *Utility Bills* – has decreased. Implementing the pledges will save

  households money on electricity and natural gas bills and gasoline.

  Pledge actions are all no or very low cost and are progressively

  beneficial to lower income households (*inter & intra-generational*

  equity).

- *Food production or choices* / low input – small increase. Although

  pledges made only a small contribution to CO_2 reductions there are

  other socio-ecological benefits to choosing low input food. Perhaps the

  food choice pledges made have as much or more benefits than the

  farmers' market or the community garden food production.

- *Low Impact Consumerism* – small increase.

Transition Path Analysis

The complete reconstructed transition path for Forres is shown in Figure 8.

It can be decomposed into one common root segment from which each output

branches along similar, though distinct paths. The segments are listed in Table 44.

Table 44.

Forres Transition Path Segment To Output Map

SEGMENT	OUTPUT
1	(STARTUP)
1,2	PLASTIC BAGS
1,3	COMMUNITY GARDEN
1,4	FARMERS MARKET
1,5	LOCAL FOOD GUIDE
1,6	CARBON PLEDGES
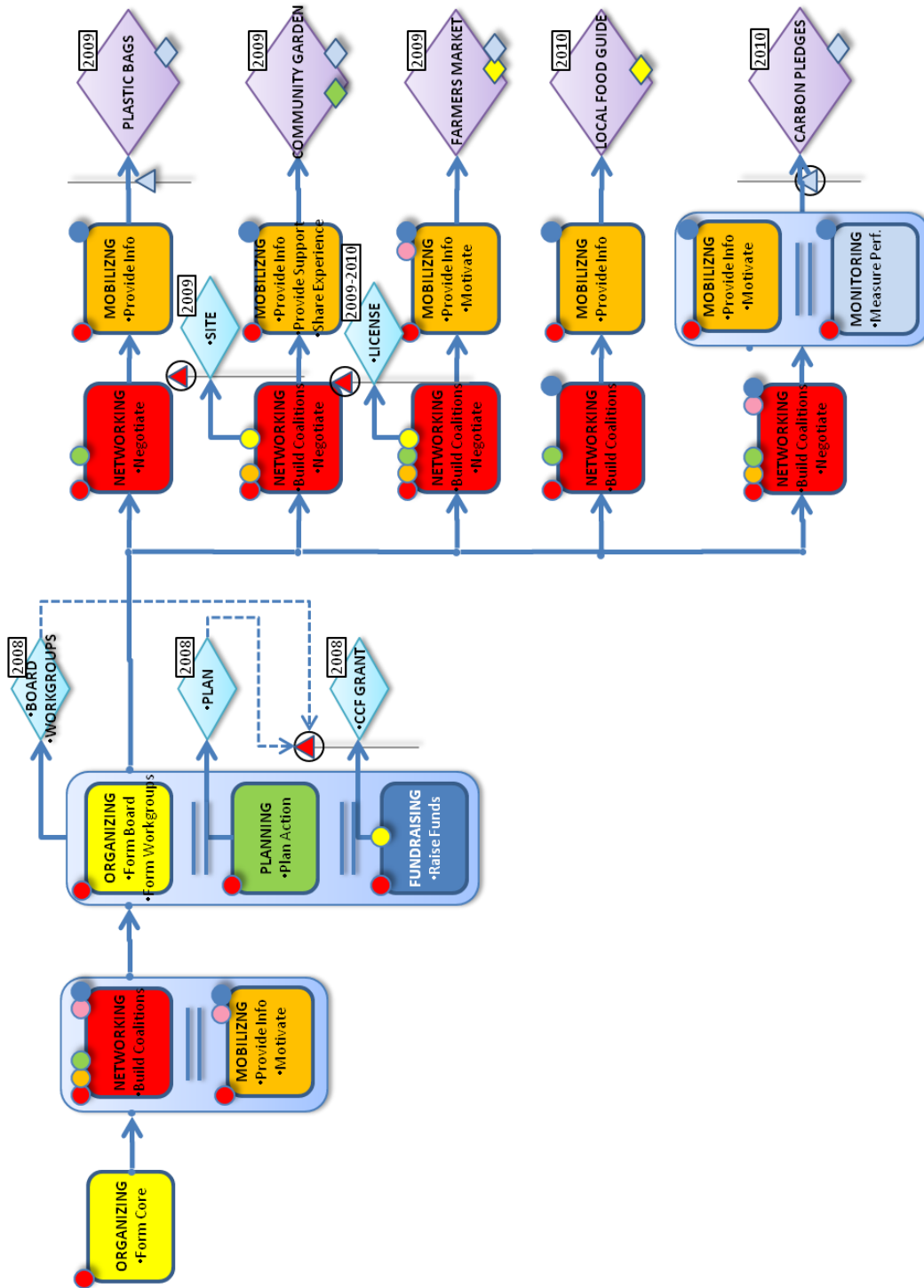
Figure 25: Forres transition path. (See Appendix E for legend).
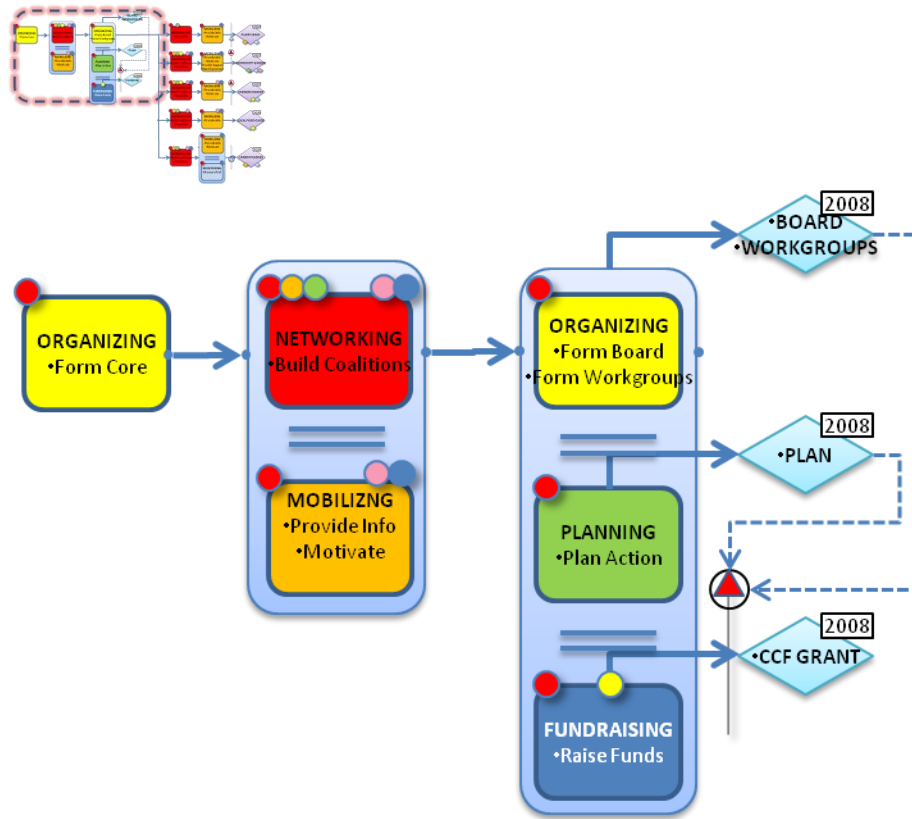
Figure 26: Forres transition path segment 1 (STARTUP).

Segment 1 is common to all of the Forres transition outputs. Following the initial ORGANIZATION there was a period of informal though serious MOBILIZING of volunteers through film nights (C. Mustard, personal communication, January 6, 2011) and NETWORKING to build a network of support with other community organizations, businesses and NGOs. More significant to the course of the transition however, were the three intermediary products that were produced over six months from March 2008:

1. A formal organization structure consisting of a board of directors, a management team, and multiple workgroups.

2. A detailed three year action plan.

3. A Scottish government grant for £184,000 to implement the action plan.

As in indicated by the REGULATIVE barrier to FUNDING in Figure 26 the first two items were prerequisites of the third, i.e. in order to qualify for government funding, the recipient organization had to be a registered company (M. Scarlett, personal communication, January 5, 2011) and had to have a plan clearly stipulating what would be done and how much it would cost. The corollary of this was that the transition was then obligated to adhere to the plan for the next three years. Thus the funding was both enabling and constraining at the same time, perhaps locking the transition into actions that they identified early on more than they would have liked to have been. The commitment to a detailed three year action plan early in the transition is also somewhat at odds with the Transition Town "12 steps of transition" which, in the early stages of the transition recommends "the need to demonstrate visible progress, without embarking on projects that will ultimately have no place on the Energy Descent Action Plan" (Brangwyn & Hopkins, 2009, p. 26). There is no suggestion here that the actions identified in the plan were not well chosen or will turn out to be ineffectual, it is just a procedural observation. There was also a valid reason for it happening this way. A window for the government funding opened in March 2008 and the core group decided it was in their best interest to be in the first tranche of awards and so an application would have to be submitted within a few months.

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The organizational structure and operation of the transition around March 2008 then took a rapid shift from the first few months of informal activity to the very formal organizational and managerial approach needed to form a company with a board of directors, write the grant application and take on the responsibility that goes with a £184,000 grant (M. Scarlett, personal communication, January 5, 2011).

Key actions in segment 1 were:

- Creating a formal organizational structure

- Committing to a short term (three year) action plan

Common pattern of output path segments. Prior to receiving the grant, workgroups (or "hubs" as they are called) began to be created to focus on the different objectives identified in the grant application. On receipt of the grant in October 2008, pathways to each of the five transition outputs followed a similar pattern. Typically there would be a period of networking where a workgroup would engage with outside actors to get information and help, negotiate with them to acquire resources that were needed, or enlist their participation. Following on from this, or to some extent in parallel, the workgroup would be mobilizing the community to actually use, take-up or participate. This pattern is explained for each of the outputs below.

Plastic Bags (Segment 2)
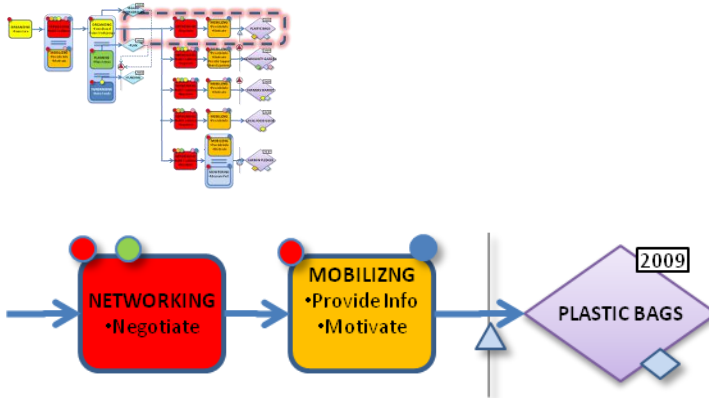
Figure 27: Forres transition path Segment 2 (PLASTIC BAGS)

The path to the PLASTIC BAGS output consisted of NETWORKING (negotiations) with suppliers to order the bags and with local retailers to stock and sell or otherwise them. MOBILIZING the community to take (or buy) a bag was not a problem but motivating them to overcome the BEHAVIORAL BARRIER to discontinuing the use of plastic bags is more difficult. Other than distributing the bags and providing information at that that time, there was no extended motivational or follow up campaign to get people to use them. As noted before, there is no data on the usage of the bags so it is not known by how much the behavioral barrier has been overcome. The transition's development plan identifies indicators to be tracked for the number of bags distributed and the number of outlets carrying them but not for actual use of the bags or consumption of plastic bags by the community (Piper & Villani, 2009, p. 24).

Key aspects points contributing towards this outcome were:

- Using a highly visible, 'symbolic' target to increase awareness of other issues

- Use of promotional type marketing to encourage participation

- Lack of monitoring to track results

Community Garden (Segment 3)
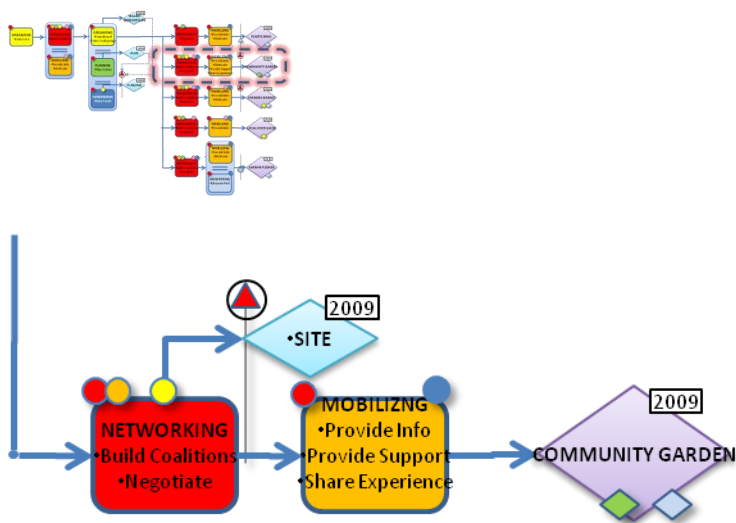
Figure 28: Forres transition path Segment 3 (COMMUNITY GARDEN)

Again, initiating the COMMUNITY GARDENS output consisted of NETWORKING activity to get help and advice on setting up the gardens and negotiations with Moray Council to acquire a lease on the land. Once a site had been acquired MOBILIZING was not a problem: the plots were rapidly taken up on the basis of the information provided through newsletters, website and notice boards. However, the TTF team working on this project did not stop there.

Using support and mobilizing to maximize outcomes. Providing support (training, advice, resources, etc.) and the strong cohesion and sharing of experiences that has developed among gardeners has made sure the gardens have been successful. This added value came about through a high degree of organization, planning for months beforehand and continuing to add value in

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many ways to the basic amenity. The workgroup did not assume that simply acquiring the land and dropping in gardeners would be enough.

Finding land at an affordable price (overcoming an ECONOMIC or REGULATIVE barrier). The biggest problem creating the COMMUNITY GARDENS was obtaining a lease on the land. The 1.5 acre site, about half of which is used for the gardens (the other half will be used for the TTF pavilion) is "common good land[4]". However, although TTF were attempting to use the land (which was unused at the time) for the good of the community, Moray Council were difficult to deal with and were imposing a substantial but standard cost on the lease. "We really found it very hard to think we were using common good land but we had to pay £40,000 for an 11 year lease for a community activity" (M. Scarlett, personal communication, January 5, 2011). Direct NEGOTIATION and appeal failed to move Moray Council on the issue. Scarlett sees this as part of a bigger problem that local government "is not community based, it is not community aligned" (2011) and in this sense this may be interpreted as a REGULATIVE barrier where the existing rules are inappropriate or even unjust (this was common good land that the community were being obstructed from using for the common good). In the end there was no option but to agree to the full cost which was only possible for TTF to do because they had substantial funds (FUNDRAISING in segment 1).

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[4] Common good land is land originally owned by the "burghs" of Scotland for the good of its citizens now held in stewardship by local government since abolition of the burghs in 1975 (Wightman & Perman, 2005).

Key factors contributing to the COMMUNITY GARDENS output were:

- Having substantial funds available

- Direct dealing with unsympathetic local authorities through standard channels was unsuccessful

- Using support and mobilizing to maximize outcomes.

Farmers Market (Segment 4)
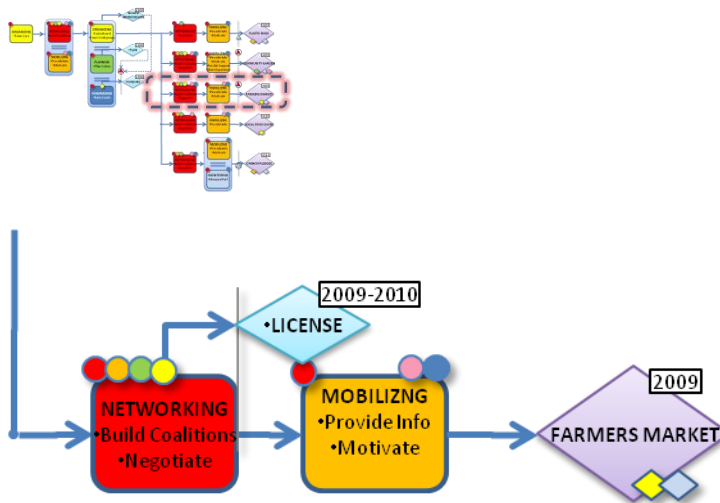
Figure 29: Forres transition path Segment 4 (FARMERS MARKET)

The path segment leading to the FARMERS MARKET output follows the same NETWORKING – MOBILIZING pattern as COMMUNITY GARDENS. Building a network of traders, getting advice from organizations like the Scottish Association for Farmers' Markets and obtaining all the hardware followed by informing the public and mobilizing the small army of volunteers were all essential parts of getting the market up and running. As with the COMMUNITY GARDEN, organization, planning and hard work have been key to making the FARMERS' MARKET successful. Other highlights of path are described below.

Conducting Exploratory Trial Runs. Before the current, regular monthly market on the High Street began in April 2010 a series of trial events were held on a site at the edge of the town to gauge public and trader response and decide what would work best. It was decided to concentrate on food with some crafts, to move to a new site on the High Street and have two markets per month. The first two decisions worked very well but two markets per month was too much and it was dropped to monthly.

Mobilizing the Volunteer Workforce through Community Networks. The market requires a lot of effort: "setting up the farmers market, the permissions, licenses, it was a full time job on its own, and then every time we have a market 15 or 16 [volunteers] are involved in putting it up and taking it down" (M. Scarlett, personal communication, January 5, 2011). The help of other community groups is often received for this job. Mobilizing the volunteer workforce has not so far been a barrier but could easily become one.

Obtaining a license (NETWORKING to overcome REGULATIVE BARRIER). While still at the edge of town site Moray Council insisted TTF widen the vehicular access at a cost of £16,000. When a site was identified on the High Street it took months of wrangling with the local council to get a license. As Mustard says, the "clear barrier we have had is a lot of red tape from the local council. It has been very disruptive, very infuriating" (personal communication, January 6, 2011). There have been other incidents that suggest a combination of individual council officer obstructionism, poor organizational communication and coordination, inappropriate standards and procedures, and possibly even

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professional self-interest as some of the reasons for this barrier (M. Scarlett, personal communication, January 5, 2011; C. Mustard, personal communication, January 6, 2011). The barriers erected by the council have been overcome by nothing more than "doggedness" while TTF has now established some political support and has developed a lot of capacity for dealing with the council (C. Mustard, personal communication, January 6, 2011).

Key factors contributing to the FARMERS' MARKET output were:

- Persistence in overcoming local government obstructionism

- Mobilizing the volunteer workforce through community networks

- Pilots and trials to find what works best.

Local Food Guide (Segment 5)
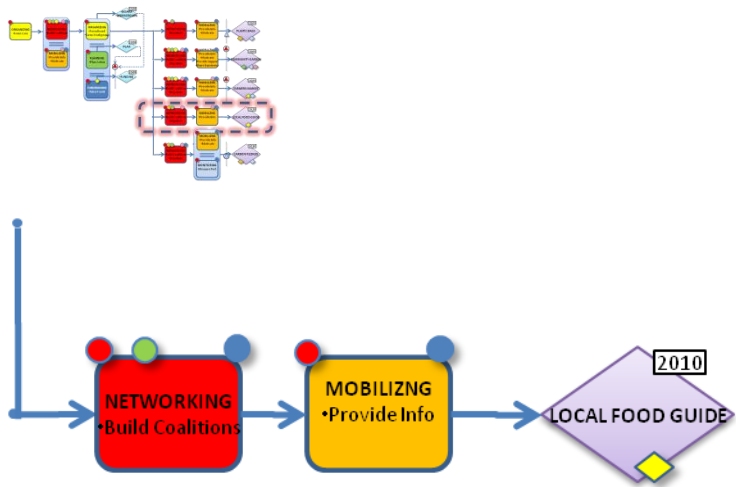
Figure 30: Forres transition path segment 5 (LOCAL FOOD GUIDE)

This output consisted of building the networks to acquire the information and distribute the product, and making it known to the public that it is available, who produced it and why. There are no follow up actions planned in relation to this output (other than a second edition of the guide).

Key factors contributing to the LOCAL FOOD GUIDE output were:

- Performing detailed research to compile and make accessible local knowledge

- Lack of evaluation and monitoring to understand the impact of this output

Carbon Pledges (Segment 6)
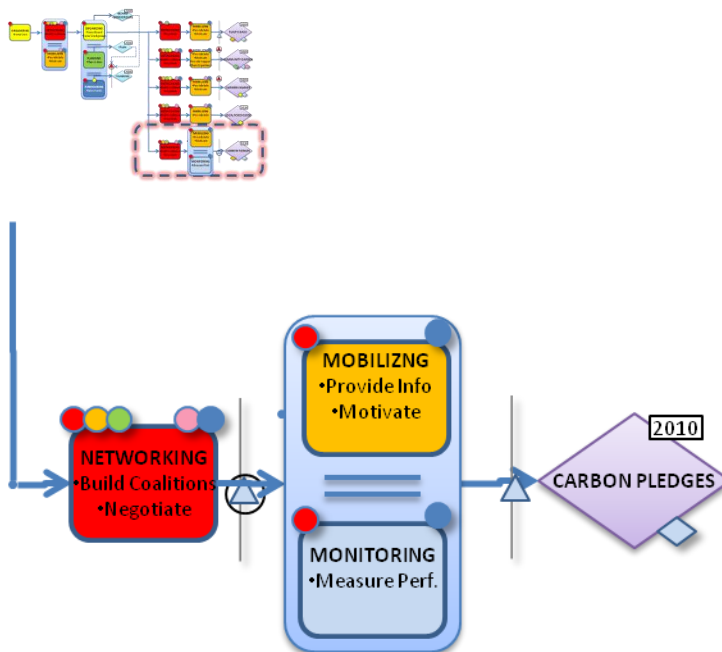
Figure 31: Forres transition path segment 6 (CARBON PLEDGES)

The CARBON CLINIC output first required NETWORKING activities to identify a methodology to use (through contacts with Going Carbon Neutral Stirling, Energy Savings Trust, Edinburgh University and other groups) and to negotiate with local organizations (e.g. businesses, schools) as a means of gaining access to potential subjects. MOBILIZING and MONITORING then ran together where subjects are recruited, their carbon footprint measured and results shown to

them, motivating them to make pledges and to participate in the follow up monitoring to see how they have done. The highlights of the path to this output are described below.

Recruiting Participants (Overcoming BEHAVIORAL BARRIER to participation). Motivating people to participate was a problem. Initial attempts to recruit people "off the street" to participate were not very successful and those who did agree to participate tended to be already low footprint. Working with a local business to be allowed access to employees and running a series of drop in "carbon clinics" in the community center were other methods of recruitment used. The most successful method was to work with two classes in a primary school and integrate the footprinting and pledging with an eight week lesson plan and gaining access to around 40 households.

Labor intensive. Conducting face-to-face interviews with every participant is time consuming. Much of the carbon pledge work was performed by dedicated volunteers but a project management consultancy specializing in community projects was used for the school project.

Overcoming Behavioral Barriers to Reduce Energy Use. The face-to-face pledge system has the advantages of highlighting where to make changes and answering participants questions on the spot, person-to -person. It also lends more weight to the pledge having the participants do it in front of a "witness" and knowing that there will be a follow up.

Key factors contributing to the CARBON PLEDGES output were:

- Using community networks to mobilize participation.

- Integrating projects with educational programs can provide dual benefits.

- A heavy reliance on volunteer workers

- Use of funding to employ consultant staff

Transition Management Appraisal

An appraisal of how well the Forres transition process conforms to transition management principles is shown in Table 45.

Table 45.

Appraisal of Forres Similarity to Transition Management Principles

Theoretical Principles TM	Appraisal Notes
creating space for niches	Partial - the lack of support from Moray Council and the low level of participation in the town means that the transition team have to work extra hard to accomplish tasks and sustain their success. However, despite the barriers, they have succeeded in creating their own protective space.
focus on forerunners	Yes - the core group has initiated significant change in the town. The ideas are not novel but they are social innovations in Forres. It is not also the basic ideas that are new, but the details of their implementation reinforce the break from standards. The allotments for example, were laid out in a permaculture design as opposed to orthodox layouts, and the shopping bags were Fair Trade products.
guided variation and selection	Partial - a broad portfolio directed to local food has been the main focus
radical change in incremental steps (guided by a long term vision)	Yes - the actions have all been relatively small steps but within an overall strategic framework and aims.
learning-by-doing and doing-by-learning	No - There is no strong indication of second order learning taking place. The goals and approach are those of the Transition Town movement and these do not seem to have been seriously questioned or any evaluation of them instantiated. There has been no real linking of transition theory to practice and attempting to learn from this.
multi-level approach, multi-domain approach	No - The standard analysis of the Transition Towns movement was accepted as being applicable.
anticipation and adaptation	No - while attention is paid to how well some individual actions are performing in terms of participation, there is no monitoring of the impact on the community. For example, what impact has the local food guide had, or has the farmers' market resulted in increased demand on local producers? Carbon footprint measuring is providing some data but there is no program for continuous monitoring of this.

Theoretical Principles TM	Appraisal Notes
empowering niches	Partial - the transitions organizational structure, growing support base and participation, and accomplishments are increasing its legitimacy and credibility. It is learning to deal with local government. It has accumulated resources. All of these things indicate growing empowerment, of a community exercising some control over their development.
Selective participatory process	Partial - the project is community driven as represented by a sizeable, self selected core group, with input from and oversight by a separate, though not entirely independent, board. Membership is open and encouraged but to get involved at the core management level or as a project leader some demonstration of commitment and responsibility need first be shown that goes with it. There is no direct representation from business, higher education, government or NGOs in the organization. The core group formed from like minded residents, influenced by the nearby Findhorn Foundation and Transition Town movement. There was no deliberate attempt to create diverse and representative membership although it has always been entirely open to new members. The Board was initially filled from original core group members but there has been a conscious effort to broaden the membership to be more representative of the grater community.
Normative principles of sustainability	Partial - the transition has a set of operating principles, some of which relate to what might be accepted as general sustainable development principles. However, they are incomplete, their normative qualities are not defined and there are no guidelines for their application.

An appraisal against transformative planning and governance method steps is shown in Table 46.

Table 46.

Appraisal of Forres Similarity to Transformative Method Steps

Step	Appraisal
Visioning	No – a participative visioning workshop was performed but after planning and intervention had begun. The visioning results have not been used yet. They do intend using them but have not had the resources to do it yet. Planning has been informed using general goals that are largely borrowed from Transition Towns.
Analysis	No – the standard Transition Towns analysis was accepted as applicable.
Intervention	Yes – a lot of activity on development planning and intervening.
Evaluation	No – there is no follow up assessment of interventions and consequent adaptive response. Carbon footprinting performed as part of the carbon pledges is an exception to this although this is not a long term monitoring.

Outlook for Forres

In addition to the outputs included in the main part of the study, Forres have a raft of other activities, not directly output related and are also actively working on several other projects:

1. *Community Energy Scheme* – an energy workgroup has completed a feasibility study to develop a micro hydro scheme

2. *Expanding Community Gardens* - this is high on priority list but finding land is a barrier

3. *Completing the Transition Pavilion* – a refurbished pavilion next to the community gardens will be a focal point and resource for meetings, training, films, educational events and such like.

Forres are applying for Scottish government funding for 2011 – 2012 while they seek alternative funding and develop revenue sources (*Transition Town Forres Final CCF Report 2008-11*, 2011).

Forres have created considerable momentum in their short history but they have not yet reached the "critical mass" needed for take off, something that Scarlett feels is getting closer but it may take some external stimulus to trigger it (personal communication, January 5, 2011). They also face some significant challenges that they continue to work on.

1. The high reliance on volunteer work is a risk
2. The need become financially independent
3. The need to develop a positive partnership with local government

Summary of Forres Transition Strategic Factors

Table 47.

Forres Strategic Factors Contributing To Successful Outcomes

Output	Sustainability Indicator	Strategic Factor
(STARTUP)		
PLASTIC BAGS	$\varnothing$ Waste Production ↑ Low Impact Consumerism	⇒ Having substantial funds available ⇒ Using a highly visible, 'symbolic' target to increase awareness of other issues ⇒ Use of promotional type marketing to encourage participation ⇒ Lack of monitoring to track results
COMMUNITY GARDENS	↑ Food production ↑ Community Assets ↑ Social Cohesion	⇒ Having substantial funds available ⇒ Dealing directly with unsympathetic local authorities through standard channels had no effect ⇒ Using support and mobilizing to maximize outcomes.
FARMERS' MARKET	↑ Food Production ↑ Local Economy ↑ Community Assets ↑ Social Cohesion	⇒ Persistence in overcoming local government obstructionism ⇒ Using community networks to mobilize volunteer workforce ⇒ Using pilots and trials to find what works best
LOCAL FOOD GUIDE	? Food Production	⇒ Having substantial funds available ⇒ Performing detailed research to compile and make accessible local knowledge ⇒ Lack of evaluation and monitoring to understand the impact of this output
CARBON PLEDGES	↓ Energy use & CO_2 emissions ↓ Utility Bills ↑ Food production ↓ Low Impact Consumerism	⇒ Having substantial funds available ⇒ Using community networks to mobilize participation. ⇒ Integrating projects with educational programs can provide dual benefits. ⇒ A heavy reliance on volunteer workers Use of funding to employ consultant staff

Indicator Changes: ↑ increased; ↓ decreased; $\varnothing$ negligible; ? unknown

CASE COMPARISON

Case Level Comparison

Table 48 summarizes the involvement of different actor groups in each of the cases. In short, BedZED was a professional venture bringing together professional and technical services and resources from business, non-profit and government sectors but with very little community engagement. Ashton Hayes and Forres on the other hand rely on strong community participation, with help from non-profits and local businesses. Whereas Ashton Hayes managed to gain support from their local government Forres have been held back by theirs. Ashton Hayes is the only case in which higher education plays a prominent role.

Table 48.

Cross Case Comparison of Actors

	Ashton Hayes	BedZED	Forres
Core Group	3 community members who interact frequently, informally and fluidly.	Professional partnership between a business and 2 non-profit organizations.	5 to 10 community members formally organized into a management team
NGOs	For specialized knowledge and support	2 core members are non-profits and seed funding was provided by WWF.	For education and training, for specialized knowledge and support.
Businesses	Receive strong support from local businesses. An important partnership formed with one business in particular.	Key partnerships; extensive networking for technical & professional services; specialist 'technology' cross business workgroups	Local businesses engaged peripherally in activities. Some pro-bono support.
Government	Mostly positive relationship with local government.	Strong support from local government	Local government relationship has been a hindrance. Central government provided funding.
Higher Education	Partnership with local university		
Community Groups	Mutually supporting relationship with many community groups, sometimes becoming more extensive collaborations.		Mutually supporting relationship with many community groups,
Community Members	Volunteer workforce; Activity participation;	Participation in early residency period.	Volunteer workforce; Activity participation;

Table 49 summarizes the occurrence of different activities in each of the

cases. Networking features in all three cases as one of the dominant activities

(after startup). This is not surprising given that transition tasks generally require access to all sorts of resources, skills, information, etc. that no single group can provide for itself. What is more interesting is that in BedZED the networking is accompanied by planning and organizing as the other dominant activities but in Ashton Hayes and Forres the accompanying activity is mobilizing. So mobilizing is important in Ashton Hayes and Forres but not in BedZED, though BedZED does feature some mobilizing in segment 3 (Figure 21). This is the green lifestyle officer and BioRegional / BDA social involvement during the community building for the first year after construction. Mobilizing is absent from other parts of BedZED pre-residency because there is no community to mobilize at that time, and post community building, because there is no-one willing to do it. In Ashton Hayes and Forres however, mobilizing plays a part in the startup period as well as a significant part in pathways to some of the outputs (all of the outputs in Forres case).

Mobilizing encourages participation by whatever means possible. It engages the community in collective action, gets them involved, and can instill in them a sense of responsibility and ownership. This is seen in the Forres community gardens where there was a strong program of mobilization to provide workshops, education, and value adding after they were up and running. Mobilization also feeds off results so in Ashton Hayes, as the community were fed back the results of their energy and CO_2 reduction efforts they could see that collectively, the community have achieved much, even though their individual contribution may have been small. So mobilization is an important driver of

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behavioral change (Edwards, 2007; Middlemiss, 2008). As noted in the BedZED results, the effect of removing the mobilizing force in 2003 was a halt, or even reversal, of sustainable community development gains made in the first year, a state that has persisted until today.

If mobilizing were to cease in the Forres garden or in Ashton Hayes would there be a loss in the advances made? While Ashton Hayes are no longer pushing household energy saving with the same vigor as a few years ago, they continue to mobilize in other ways and there has been no decline noted in annual carbon footprint results.

Planning featured in varying degrees and different natures in each case. Planning very broadly refers to any type of consideration given to future actions. In Ashton Hayes planning is loose and informal giving them a great deal of flexibility as they move forward. They do not commit to detailed plans and they make decisions based on what they learn as they proceed and guided by the overarching goal to become carbon neutral. Detailed planning is much more important in the BedZED case and, like any construction project, becomes progressively more specific as the project proceeds until it is complete. In Forres, planning was a major part of the startup and it defined numerous tasks to be accomplished over the next three years. The plan is largely informed by Transition Town guidelines. Organization of work in the cases reflects the different planning approaches. In Ashton Hayes, organizational structure comes and goes depending on what is going on. They recruit volunteers, form workgroups and engage in networks on an as need basis. BedZED created

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technical workgroups across business partners to develop technology sub-

systems. In Forres, workgroups of volunteers were formed around the tasks

identified in the plan and responsibility to complete the tasks delegated to them.

Table 49.

Cross Case Comparison of Activities

	Ashton Hayes	BedZED	Forres
Networking	Occurs throughout. Very diverse during startup then targeted towards outputs	Occurs throughout, mainly with business & local government	Occurs throughout. Quite diverse during startup, then targeted as part of each output.
Mobilizing	Important in gaining community support and then in energy use and recycling outputs	Only during community building output.	Important to build initial momentum and then in each of the outputs
Planning	Light, and only during startup	Important during concept and proposal development and again during design and construction stage, producing blueprint type plans	Detailed planning during startup
Organizing	Flexible, only when needed. At the peak of energy use output volunteers were organized into workgroups.	Important during design and construction to manage development work. Also during community building output.	During startup, organized into formal management and operational structures
Monitoring	Regular monitoring of carbon footprints.	Monitoring of new technology CHP & GWTP.	As part of carbon pledge output.
Publicizing	Used to great effect at startup and interest has been maintained	Not in the direct output path (but used for other purposes)	There has been local publicity but it has not been used as direct tool toward outputs
Fundraising	Not for 'first phase' outputs.	During startup for proposal & marketing and as part of community building	During startup

	Ashton Hayes	BedZED	Forres
Changing External Systems	Minor, as part of recycling output	-	-

Only Ashton Hayes have an ongoing, regular monitoring program consisting of their annual carbon footprint survey performed as a service learning project by the University of Chester. Results from this are used to inform the core team's decisions on future actions and as part of their community mobilizing activities. While BedZED monitored the operation of new technology systems monitoring of overall community "performance" is irregular and does not form any further development purpose. Forres monitoring is part of their carbon pledge output

Cost is an obvious difference between cases but not too much attention should be paid to it. There are many other factors that would need to be considered in a cost analysis such as what other benefits are delivered (e.g. housing in BedZED), what is the return on investment, the value of voluntary labor and payment in kind. From a transition process point of view however, it can be said that BedZED is a capital intensive project that required large financial resource behind it whereas Ashton Hayes and Forres have low capital requirements and low or modest operating expenses. This difference is also reflected in the type of workforces used and type outputs that the cases produced as shown in Table 50 not just at case level but output level.

Table 50

Output Types, Cost and Workforce

Output Types	Expenditure	Workforce Type	Case Output Examples
Technical, Infrastructure	High	Professional	BedZED main construction output, Ashton Hayes footpath
Behavioral, Services	Low	Volunteer, paid staff	Forres community garden and farmers' market, Ashton Hayes energy saving, Forres carbon pledges, BedZED community output

Sustainability Appraisal

Overall change in sustainability over time is shown for each case in Figure 32. As a reminder, the absolute value of change in sustainability is not reliably comparable across cases. Some points stand out from these time charts:

- The long lead time (almost 6 years) before any sustainability gain in BedZED compared to less than 24 months for Ashton Hayes and Forres.

- The rapid increase in BedZED around 72 months from the completion of construction to end of the community building output.

- BedZED has declined since the initial gain due to CHP and GWTP discontinuation with some regain from the MBR-WTP.

- Forres and Ashton Hayes follow a gradual upward trend.
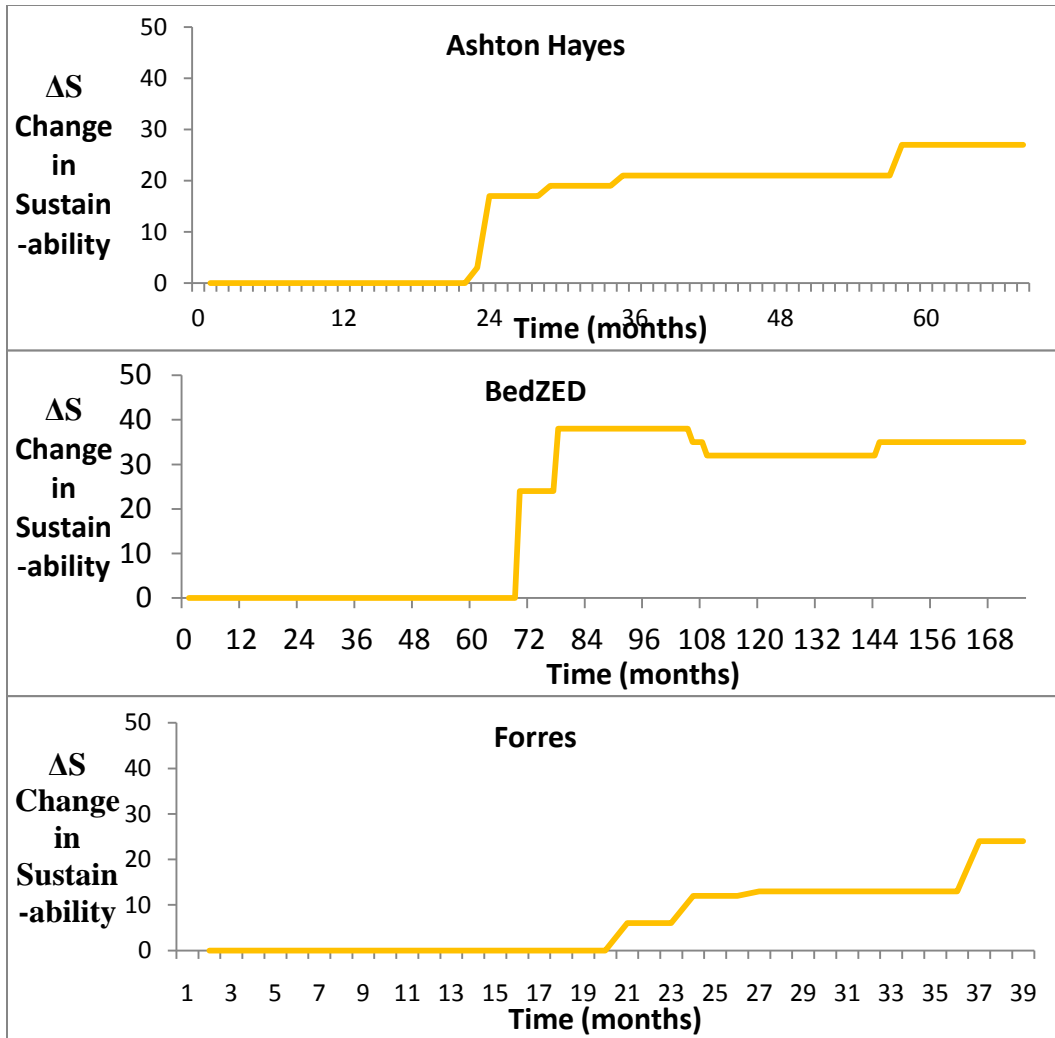
Figure 32: Cross case change in sustainability over time.

Overall change in sustainability across sustainability criterion for each case is shown in Figure 33. Points of note include:

- Ashton Hayes is remarkably well distributed across all criteria.

- BedZED does not make any gain in *socio-ecological civility & democratic governance* reflecting the general disinterest in sustainability among residents and low level of participatory governance exercised and is weak in *livelihood security & opportunity*

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reflecting little economic or employment opportunity created for the community.

- BedZED is particularly strong in *inter & intra-generational equity* due to the social housing provision and strong social cohesion.
- Forres is weak in *livelihood security & opportunity* reflecting little economic or employment opportunity for the community has been created with the accomplishments so far.
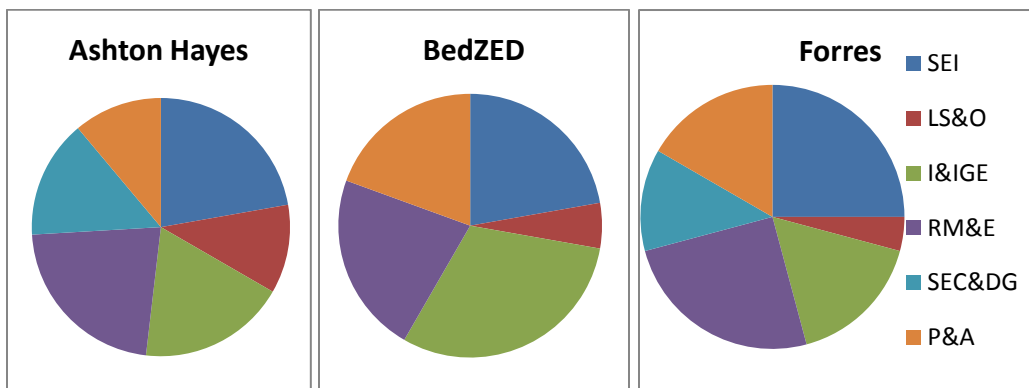
Figure 33: Cross case change in sustainability by sustainability criterion

Overall change in sustainability across community domains for each case is shown in Figure 34. Points of note include:

- Ashton Hayes is dominated by changes in *housing* and *mobility* from the reduced energy use and CO_2 emissions in these domains.
- Change in BedZED is very concentrated in *housing*, reflecting the dominance of the low carbon and low water features of the housing and the social equity in the housing tenure.
- Forres is very strong in the eating and shopping domains reflecting their focus on food.

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- The absence of *educating* from all cases

- The near absence of *recreating* from all cases.
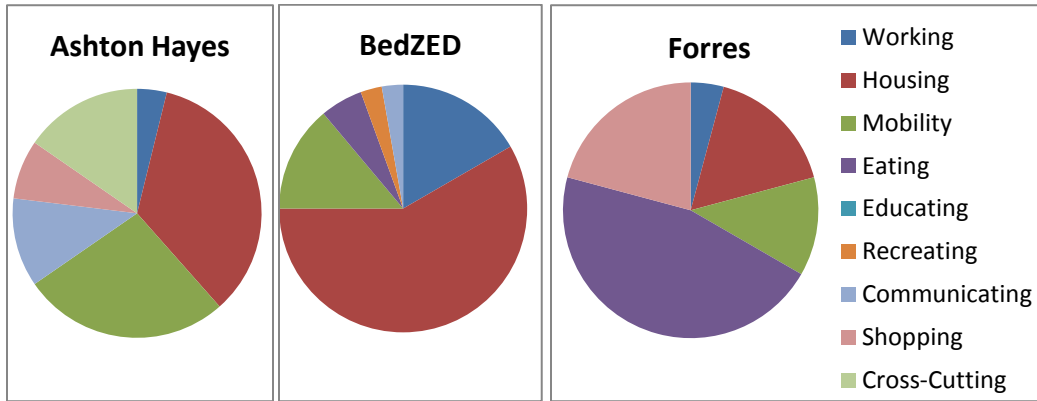
Figure 34: Cross case change in sustainability by community domain

Indicator Level Comparison

To perform more detailed comparison than the overall case level it is necessary to go to the sustainability indicators level. Outputs in this study are unique to cases and so cannot be compared. However, when comparing across an indicator it needs to be remembered that the indicator may have been impacted by more than one output in each case, and more than one component in each output. The change in indicator values for each case is listed in Table 51. Comparisons are not made for all indicators. Of the seventeen indicators seven were only impacted in one case so there is not much to compare except for asking why the other two cases did not have any impact. Indicators scoring very low (e.g. 0 or 1) across cases are not strong comparisons due to the uncertainty involved.

Table 51.

Change In Sustainability Indicator Case Comparison

Sustainability Indicator	Ashton Hayes	BedZED	Forres
• Access to basic services & amenities	1		
• Biodiversity	1		
• Car Dependency	2	5	0
• Community Assets	1		2
• Employment	1	0	
• Energy use & CO2 emissions	10	9	6
• Food production		2	9
• Health & wellbeing		1	
• Local Economy	1		1
• Low impact consumerism			3
• Participatory Governance	1		
• Social Cohesion	3	1	2
• Social Housing Provision		3	
• Sustainable Wood Fuel Resource	2		
• Utility Bills	1	4	1
• Waste Production	2	2	0
• Water use & waste water treatment	0	9	
Grand Total	26	36	24

Car Dependency

Reducing car dependency means providing alternative mobility options and, even better, reducing mobility needs by making services more accessible (Machler, 2010). Three cases touched on this indicator with varying results (Table 52).

Table 52.

Comparison Of Strategic Actions And Factors For Car Dependency Indicator

Case	Output	ΔS	Action Contributing to Indicator Improvement	Strategic Factors (+ Positive, - Negative)
Ashton Hayes	STATION FOOTPATH	2	⇒ Improved pedestrian access to train station	+Strong partnership with local Government +Use popular, political and media support to empower
	COMMUNITY SHOP	1	⇒ Basic service provision within the community	+Intra community group collaboration
BedZED	COMMUNITY	5	⇒ Provision of multiple transport options ⇒ Disincentivize car ownership ⇒ Bring services to the community	+Strategic coalition with balanced interests. +Systems approach to design. +Assign responsibility for ensuring sustainable development. +Appoint sustainability coach +Challenging standards & norms.
Forres	CARBON PLEDGES	0	⇒ Ask for personal commitments to reduce car use in various ways	+Access to Funding +Hiring staff or consultants +Integrate projects with education +Mobilizing volunteer workforce

Ashton Hayes is a very car dependent community due to its rural location. The immediate problems they face in reducing car dependency are structural: poor public transport links and few community located services. They have been able to make small advances in both of these areas by successfully lobbying local government to provide pedestrian access to the train station and by working with other community groups to keep and improve the community's general store. The

relationship with local government, developed early in the transition, was very important in the first action, as was being able to bring pressure to bear on the council through public support, political support and media exposure. The second action was possible through good community governance in identifying a problem (or an opportunity), bringing together community groups to work on it and take effective action. Thus the community have been able to marginally decrease car dependency through marginally increasing both mobility options and accessibility. Both areas of action were possible due to capacity built in the community as part of the overall transitional process. The changes reportedly have led to behaviour change with an increase in train use (*Ashton Hayes Parish Plan 2009*, 2009) and a reduction in distance driven for shopping trips (Alexander et al., 2010). However, these changes are too small to result in any noticeable change in car ownership or CO_2 emissions. Ashton Hayes is continuing to address the mobility issue and will increase mobility options in 2011 by starting a community car club with a solar charged electric car (R. Green, personal communication, January 8, 2011).

BedZED's urban location and new construction make it quite different from Ashton Hayes. Allowing residents to live without a car was considered from the start and is built into the community as both hard and soft design features such as the proximity to public transport, parking restrictions, cycle paths, car club and grocery delivery service. Parking restrictions are not popular but the sustainability aims and principles have been maintained by Peabody, the housing association. The appointment of a sustainability coach, although only temporary played an

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important role in developing the car club (the first in the U.K.) into an effective operation (Department for Transport, 2004). BioRegional partnered with a small business to form the car club and the sustainability coach worked with local businesses for delivery service. However, while the community has much lower car ownership and miles travelled than the local average, this is thought to be due to demographics at least as much by design and choice (Hodge & Haltrecht, 2009, p. 26) but arguably, maintaining a similar quality of life to that enjoyed in BedZED without a car in other locations would be difficult to achieve. Thus, despite the structural orientation away from car ownership and use, BedZED has apparently not significantly changed resident behaviour. BioRegional attribute much of this to the scale of development being insufficient to meet many resident needs and the relatively few services available in the immediately surrounding Hackbridge area but also to the need for continuous active community development to break down behavioural barriers and maximize structural possibilities (Desai, 2008; M. Peacock, personal communication, January 13, 2011). In later projects BioRegional have made the sustainability coach a permanent position (M. Peacock, personal communication, January 13, 2011) and perhaps had this been the case in BedZED car ownership would be even lower than it is.

Forres has consciously not focussed on transport issues yet, as it was not in their first three year plan. However, it has come up in the CARBON PLEDGES output where one of the five areas for carbon emission reduction is transport. The process is time consuming and labor intensive for which Forres have used both

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voluntary and paid workers. The simple behavioural actions pledged include reducing car trips to the supermarket, car pooling and using public transport. Thus, they are appealing to residents to change their behaviour without any structural change to encourage or make it easier for them and so, while there might be some reduction of miles driven, it does not reduce car dependency by improving mobility options or accessibility. The main point of the carbon pledge scheme however, is to reduce carbon emissions as quickly, simply and cheaply as possible. It is not a systemic intervention tool. Forres are aware of this and "are looking at a car pool scheme ...during the past year ...are trying to promote more biking ... are also working with Moray Council [on] bus routes and availability of public transport".

The mobility domain of community life is a complex intertwining of infrastructure, services and behaviour at community, local and regional scales (Machler, 2010). The three cases here illustrate three different approaches each with different outcomes:

- Ashton Hayes used the community's social capacity, much of it built by the transition process, to effect small structural changes that have produced marginal positive behavioral change.

- BedZED used an integrated design approach and partnered with local businesses to build low car dependency potential into the new construction. That potential has been taken up by those who have no choice (lower income households) or those who would choose to

anyway ('keen' residents) but has apparently failed to influence 'mainstream' residents to reduce car ownership or use.

- Forres used persuasion to alter many households transport activities without making underlying structural changes.

From this it would appear that lasting, substantial reductions to car dependency requires both structural and activity change within the community. Ashton Hayes demonstrate that community empowerment is critical for structural change: the development of skills for working with local government and some leverage from political and media support are important factors, the latter is made much easier if the community is visibly behind the transition. Ashton Hayes also exemplify what is possible by integrated, cross group collaboration, taking advantage of opportunities when they arise. In BedZED, social entrepreneurship, brought businesses in to innovate and develop ways to bring services to the community but these can be difficult to take-off and sustain without operational development such as was provided by the sustainability coach. Attention to this latter point seems especially important not just in improving this indicator but across the board: development should not stop when the structural implementation of the change is complete. To maximize the potential of change and keep it in the right direction continuous activation is necessary (see comparison on Food Production).

Energy Use and CO2 Emissions

All three cases specifically target reduction in CO_2 emissions as a goal and took action to do so. It is also one of the few indicators that all cases have made

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some measurement of. Without becoming embroiled in detailed analysis of how they made those measurements and exactly what they mean, the results are presented simply in Table 53 along with the sustainability appraisal.

Table 53.

Comparison Of CO_2 Emissions And Sustainability Appraisals.

	Ashton Hayes [a]	BedZED [b]	Forres [c]
Baseline Reference	2006 survey	Local average	Local average
Baseline Emissions (MT)	14	11.2	14
Current Emissions (MT)	11	9.9	12
Reduction	21%	12%	14%
Community Saturation	100%	100%	5%
Sustainability Appraisal	10	9	6

CO_2 emissions are annual household
[a] (Alexander et al., 2010),
[b] (Hodge & Haltrecht, 2009),
[c] (*Carbon Cutting Challenge Report, October - December 2010*, 2011, *Transition Town Forres Final CCF Report 2008-11*, 2011)

Table 54 shows how each case impacted their Energy Use and CO2 Emissions indicator and what strategic factors were important. Ashton Hayes achieved by encouraging residents to do whatever they then can. The community responded positively and emissions have been 20% to 23% below the 2006 baseline every year since 2007 mostly through air travel and home energy. BedZED reductions are mainly from the intrinsically low carbon footprint of the buildings though this was substantially increased when the renewably fueled CHP plant was replaced with a natural gas boiler. Net reductions from resident activity are zero where below average car use is cancelled out by above average air travel,

and residents appear to have similar behaviors to their pre-BedZED lives. Forres reductions were achieved through individualized resident pledges from around 5% of households mainly by no or low cost home energy and transport behavioral change.

Table 54.

Comparison Of Strategic Actions And Factors For Energy Use And CO2

Emissions Indicator

Case	Output	ΔS	Action Contributing to Indicator Improvement	Strategic Factors (+ Positive, - Negative)
Ashton Hayes	HOUSEHOLD ENERGY USE	10	⇒ Energy saving behavior in home and transport ⇒ Energy saving technology upgrades in home ⇒ Installing home micro-renewables	+ Using a complex combination of mobilization, monitoring and feedback.
BedZED	LOW ENERGY HOUSING	9	⇒ Low energy use building design ⇒ Low energy use appliances ⇒ Renewable energy generation	+ Challenging and breaking down accepted standards and norms + A strongly supportive local government
	CHP	-3	⇒ Replace CHP with natural gas boiler	- The deployment of unproven technology at full scale
BedZED	COMMUNITY	0	⇒ Provision of multiple transport options ⇒ Disincentivize car ownership ⇒ Bring services to the community	+Strategic coalition with balanced interests. +Systems approach to design. +Assign responsibility for ensuring sustainable development. +Appoint sustainability coach +Challenging standards & norms.
Forres	CARBON PLEDGE	6	⇒ Ask for personal commitments to reduce energy use in home and transport through behavior change	+ Access to Funding + Hiring staff or consultants + Integrate projects with education + Mobilizing volunteer workforce

There are contextual differences between the cases but the general

message is that motivating community members to make CO_2 reducing changes

in behavior is an effective method that delivers results quickly, easily and

cheaply, as in Ashton Hayes and Forres. The results can be improved when

residents also make technology changes, as in Ashton Hayes, although there is a

cost barrier to this. This method however, approaches limits as residents'

willingness to make bigger and bigger changes in behavior decreases and they

face the constraints of services and infrastructure on which they depend on.

BedZED also demonstrates the limitation of what building technology alone can

deliver: a "keen"BedZED resident can achieve much more through their mobility

activities, consumer and food choices (Hodge & Haltrecht, 2009). Desai (2008),

from his work on BedZED and other projects concludes that the most progress

towards sustainable communities will be made by focusing on lifestyle and

changing local and regional service infrastructure, supplemented with local or

community scale renewable generation. The cases studied here support this

conclusion.

Ashton Hayes and Forres both achieved results by persuading community

members to participate in taking action but they do so in different ways. Forres

quietly, methodically, and analytically worked its way through one household at a

time with its pledge system, whereas in Ashton Hayes it was a viral, motivational

campaign, though backed up with information and support. They have both been

effective (although longer term results of pledges remain to be seen). Perhaps the

viral campaign method is more suited to a small, close community like Ashton

Hayes than a larger town like Forres. In BedZED, if every resident was keen CO2

emissions would be around 45% below the baseline (Hodge & Haltrecht, 2009)

but there has been nothing being done to pursue this since the green lifestyle

officer finished in 2003.

Food Production

Both BedZED and Forres had explicit aims of residents producing food,

supporting local food producers and making low impact food choices (Hodge &

Haltrecht, 2009, p. 29; Piper & Villani, 2009, p. 29) but with markedly different

results despite providing similar functionality. In both cases residents were

provided with allotments, composting, training and support, access to local

produce, education and encouragement. In addition, BedZED residents all have

access to balcony and rooftop gardens. The difference in food production is stark:

in BedZED "it is clear that the quantity of food grown is not significant and many

of the troughs are empty for much of the year" (Hodge & Haltrecht, 2009, p. 29)

whereas Forres have around 70 gardeners and "have had much fewer drop outs

than the average according to national allotment associations statistics … [and are

constantly] commended on how beautiful the community garden is and what a

friendly and open space it is" (C. Mustard, personal communication, January 6,

2011). The cases are more similar when it comes to choosing local, organic food

through monthly farmers' market (Forres) or weekly on-site vegetable trader and

organic grocery delivery (BedZED). Forres has also worked hard to persuade

many households to make more sustainable food choices through the pledge

system. In Forres the indications are of a vibrant and growing local food culture.

In contrast, BedZED seems to have declined since 2003 (Hodge & Haltrecht,

2009, p. 30; P. Plum, personal communication, January 13, 2011). The cases also

followed quite different paths to their outputs.

Table 55.

Comparison Of Strategic Actions And Factors For Food Production Indicator

Case	Output	ΔS	Action Contributing to Indicator Improvement	Strategic Factors (+ Positive, - Negative)
BedZED	COMMUNITY	2	⇒ Make it easy to choose local, low input food choices (organic deliveries) ⇒ Provide facilities to grow food in the community (Allotments, Private gardens)	+ Systems approach to design. + Appoint sustainability coach
Forres	COMMUNITY GARDEN	4	⇒ Provide facilities to grow food in the community (allotments)	+ Access to Funding + Continue development after immediate implementation - Strong partnership with local Government + Variety of tactics to mobilize participation
	FARMERS' MARKET	3	⇒ Bring local producers into the community (regular farmers' market)	+ Mobilizing volunteer workforce - Strong partnership with local Government + Using pilots and trials to find what works best
	LOCAL FOOD GUIDE	0	⇒ Improve knowledge of local food and where to get it (local food guide)	+ Access to Funding - Monitoring & follow up are needed for evaluation
	CARBON PLEDGE	2	⇒ Ask for personal commitments to make local, low input food choices	+ Access to Funding + Hiring staff or consultants + Integrate projects with education + Mobilizing volunteer workforce

In BedZED gardening and food system interaction were in the most part developed late in the construction by BioRegional with the exception of integrated design balcony and rooftop gardens and the built in household bins for food waste. BioRegional introduced the allotments, community composting, organic food deliveries and a sustainability coach ("green lifestyle officer") whose job it was to encourage use of these facilities, provide training and resources. BioRegional obtained public funding to provide the coach but only for one year. According to Plum the allotments and composting were not "very well managed" (P. Plum, personal communication, January 8, 2011). There were good ideas that BioRegional implemented but despite the effort put in to making it work over the first year, a local food culture failed to take root.

Forres had not had allotments for more than 40 years or a farmers' market for a "very long time" (C. Mustard, personal communication, January 6, 2011) yet within the space of 3 years it now has both and they are thriving. Three key strategic factors that made this possible were the well organized management structure and sharply focused three year plan, substantial funding from the Scottish government's Climate Challenge Fund, and a very committed volunteer workforce. As discussed in the results, the management structure, plan and funding were all co-dependent. While the funding forced the transition team to commit to a three year plan very early it also proved to be very effective at keeping the transition on track, but to make this happen required strong management. The ability to mobilize the volunteer workforce, especially for the farmers' market, is in part due to the strong cross community network that exists

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in Forres but the risk of volunteer burnout is always there (M. Scarlett, personal communication, January 5, 2011). Both the farmers' market and the community garden required substantial dealings with a local government that was in most respects unhelpful and obstructive (M. Scarlett, personal communication, January 5, 2011; C. Mustard, personal communication, January 6, 2011).

So the road to these two products was not easy. Perhaps a key observation and difference in Forres from BedZED though, is how they have been managed since the implementation was complete. There was no assumption that they would simply succeed once they were created. The workgroups that initially developed the garden and the market have continued to operationally manage them and more importantly, continue to develop them and build a sub-community around them. They take on a life of their own. The management of allotments in BedZED was externally imposed to some extent, by BioRegional and the Green Lifestyle Officer and the community never fully took up the mantle with the result that when BioRegional faded out and the funding for the Green Lifestyle Officer ended, so too did the allotments.

Transition Management Comparison

A comparison of case conformity to transition management principles is shown in Figure 35. None of the cases strongly match transition management. BedZED stands out as quite different from Forres and Ashton Hayes, which are broadly similar. All cases featured strongly in the creation of innovative niches (*creating space for niches* and *focus of frontrunners*), especially BedZED which was a very strong innovation nucleus during development. They also all show

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moderate conformance with *selective participatory process* where BedZED carefully selected a core group of experts and professionals but was distinctly lacking in community participation during and after construction, Forres have strong community participation but lack business, government and higher education participation, and Ashton Hayes have a well balance group.

Ashton Hayes and Forres both conform to the idea of *radical change in incremental steps* where both cases are taking small steps towards their long-term, radical goals and they both partially conform to *guided variation and selection* on the strength of their diverse sets of projects. BedZED, on the other hand, has no similarity in these criteria, reflecting that it was a single, large construction project. BedZED also failed to score on *empowering niches* as the community there now has very little power whereas Forres has gained some empowerment and Ashton Hayes substantial empowerment. All cases scored poorly in the reflexive aspects of transition management (*learning-by-doing and doing-by-learning* and *anticipation and adaptation*). Ashton Hayes and Forres do not use a systems based approach (*multi-level approach, multi-domain approach*), something that BedZED did in the concept development and design.

Ashton Hayes

creating space for niches — focus on forerunners — guided variation and selection — radical change in incremental steps… — learning-by-doing and doing-by-learning — multi-level approach, multi-domain… — anticipation and adaptation — empowering niches — Selective participatory process — Normative principles of sustainability

BedZED

creating space for niches — focus on forerunners — guided variation and selection — radical change in incremental steps… — learning-by-doing and doing-by-learning — multi-level approach, multi-domain… — anticipation and adaptation — empowering niches — Selective participatory process — Normative principles of sustainability

Forres

creating space for niches — focus on forerunners — guided variation and selection — radical change in incremental steps… — learning-by-doing and doing-by-learning — multi-level approach, multi-domain… — anticipation and adaptation — empowering niches — Selective participatory process — Normative principles of sustainability

Figure 35: Mapping of cases to transition management principles. Conformance

with principle: 0 = none or weak; 1 = partial; 2 = strong.

Appraisal against transformative planning and governance steps is shown

in Table 56. It can be seen quite plainly that there is little conformity between the

cases and the method steps. All cases are highly active in the intervention step but

do little of the other steps.

Table 56.

Comparison of Transformative Planning and Governance Appraisals

	AH	BZ	FO
Visioning	0	0	0
Current State Analysis	0	1	0
Intervention	2	2	2
Evaluation	1	0	0

DISCUSSION

Understanding Community Transitions

Has the research led to better understanding of community transitions? As already stated, much of this thesis has been concerned with the question of *how to do research* to better understand community transitions, which is of course, a pre-requisite of arriving at a better understanding. The insight into community transitions resulting from the research is therefore weaker than originally hoped for. Of the three cases studied, BedZED was the odd one out and in many ways incomparable to Ashton Hayes and Forres as it is a new community created from scratch as opposed to an existing community trying to change itself. This has made it more difficult to generalize and find patterns across all cases but on the other hand it has provided stark contrasts in some areas that are interesting.

Overall Community Transition Results and Transition Theory

One of the research objectives was to be able to make comparative claims of overall transition successfulness through sustainability appraisal, and use this to test transition theory. The results at overall transition level however, are not strong enough to make any claims in this area with confidence. All of the cases studied have had some success in terms of sustainability gain and given the differences in context and shortcomings of the sustainability appraisal it cannot be clearly said that any one has been more successful than the others. Arguably however, Ashton Hayes and Forres appear to be on a trend that if continued over the longer term of the next five or ten years would put them ahead of BedZED. BedZED's lack of a long term development plan meant that the transition stopped

in 2003. Tentatively then, the grass roots, community based approach, may be more effective than top down, management. This suggestion can also be connected to the transition management appraisal in which Ashton Hayes and Forres both exhibit some degree of long term focus and taking incremental steps (towards radical change) whereas BedZED was a short term, abrupt "forcing". Thus the tentatively more successful transitions have stronger affinity to some transition management principles, but BedZED is stronger in other principles, at least during its development phase, such as creating an innovative niche and rigorous application of sustainability principles. Perhaps some principles are more important than others.

More generally with respect to overall successfulness and transition methods, it can be said that none of the cases has strong affinity with theory. Does this mean that the theory, transition management or transformative planning and governance, is invalid? This conclusion cannot be made, even if the results presented were much stronger, because it is not known if the positive transition trends will continue or if stronger, more rapid, sustainability gain would result from a theoretically disciplined transition approach. The conclusion that can be made is that with further improvement to the research framework and method, especially the sustainability appraisal, and with more cases to compare, there is good potential for testing transition theory at the community level using this approach.

Insights into Community Transitions

On the evidence of the three cases studied, some insights are now described. These begin to identify what might be some of the causal variables relevant to community transitions.

- *Community Participation and Support* –Services or facilities unused are futile, and tasks are not accomplished if no-one volunteers to do them. Significant support, even if only passive, legitimizes the transition's actions. A transition's purpose must be to convince its own community members to join it. A majority of residents in Ashton Hayes participate and in the larger community of Forres a significant number participate, although a relatively small proportion of the population. Both of these communities have very active transitions. BedZED has a residents' association that would like to see more sustainable development of the community but there is no support from the community. (P. Plum, personal communication, January 13, 2011).

- *Continuous Mobilization* – after completion of a task, it is a mistake to assume the job is done. It is important to have an ongoing development program to realize and maintain full potential or at best the output will stagnate and at worst collapse. The contrasting cases of BedZED and Forres's allotments and composting illustrate this.

- *Long Term Development* – Somewhat related to *continuous mobilization* but at the overall transition level, transition communities

need long term goals to guide them. Ashton Hayes and Forres both have long term goals and are working continuously towards them. BedZED on the other hand, had a short to medium term plan to construct a new community but nothing after that. Consequently, BedZED has not changed since 2003.

- *Governance* – the degree of governance in a community, as opposed to government or management (Kemp, Parto, & R. B. Gibson, 2005), may be a factor in its propensity towards taking up the challenge of transition. Ashton Hayes and BedZED represent two ends of a governance spectrum in the cases studied here. In Ashton Hayes the parish council is accessible to residents and public meetings and ballots are not uncommon. BedZED is under traditional landlord management.

- *Funding* – is not strictly necessary but is likely to become so at some point in a transition. Ashton Hayes demonstrates what can be accomplished on a shoestring budget, mostly from local business sponsorship. (Their second phase, which followed on from the outputs included in this study, is substantially funded). Forres however, may have had to pursue different goals if they had not received funding. Government funding however, is to some extent a double edged sword in that it both empowers and constrains.

- *Partnerships* – BedZED and Ashton Hayes both formed strong partnerships, achieving more together than they could alone.

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- *Local Government Support* – local governments are important actors in community transitions because they exert control over so much of a community's existence. It may also legitimize and lend creditability to the transition if the local government is behind it. BedZED quite probably would not have happened without the strong support they received from Sutton Council. Ashton Hayes has been supported by Cheshire Council although they could probably have continued without them. That Forres have accomplished much despite difficulties with Moray Council, goes to show that local government may be a hindrance but perseverance can overcome.

- *Monitoring* – it is important to measure the results of transition actions to determine if they are having the desired effect and to provide information back to participants. This can be time consuming and difficult and is often not done. Forres for example, handed out 5,000 shopping bags and 3,000 local food guides but has no data on what the effect of this has been. Monitoring of carbon footprints has been important in Ashton Hayes's transition being fed back to residents and in guiding future action.

- *Volunteer Workforce* – volunteers are the lifeblood of some community transitions. Maybe even, volunteer workers are a defining characteristic of community transitions? Two of the three cases studied depend heavily on volunteers, BedZED being the exception, where volunteers have played no part.

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Future Research Directions

This study has only scratched the surface of this research field. There is much more to be learned from the cases presented here and the other three cases for which data was collected but is not included in the current analysis. From the somewhat disorganized insights presented here there is a need to move towards a more structured model of community transitions identifying causal variables and mechanisms that lead to successful outcomes. This research has some way to go to approach this end. To move in this direction however there are some pointers arising from the three cases looked at here:

- One direction of future studies should concentrate on dispersed transitions that grow through conversion of their host community, such as Ashton Hayes and Forres. The vast majority of communities already exist and need to be transitioned "in-situ". BedZED, as a newly "constructed" community with (100%) concentration and no room for growth is a special case and does not compare well in many respects with the other two cases. Focusing on this narrower, but large, subset will help to build a specific model which can then be generalized with other types.

- Once key causal variables start to be identified, cases can be re-examined and new cases studied to test the validity of theory.

- Follow the long-term progress of selected cases. Studies should not be isolated snapshots but should be ongoing and revisited to accumulate more data, to refine data, and to make and test predictions.

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- In conjunction with long-term tracking of cases, communities should be engaged in the research as valuable sources of "socially robust" knowledge and as citizen scientists (Gibbons, 1999; Kates et al., 2001)

- Choose the starting point of the transition carefully. In the BedZED case, if the starting point is set to when the residents took occupancy, then the transition would look very different.

Research Design:

The research here is exploratory. There is a need now to build on it to address weaknesses and improve its usefulness. Shortcomings of the research method and likely areas for of improvement described below.

Shortcomings in the Research Method

- Community Capacity Building – the research method is based upon the tangible outputs that the transition directly produces. This excludes less tangible, softer, outputs such as knowledge and individual and social capacity that may be directly produced but are often more subtly and even unwittingly produced by transition activities. These "intangibles" may contribute to sustainability though in less direct ways. This is seen for example in Ashton Hayes in particular where community groups came together to work on the shop projects, or how the core group of a few "normal" people have developed into national and international community advisers, national government lobbyists, City of London deal makers (R. Green, personal communication, January 8, 2011; M. White, personal communication, January 7,

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2011). As another example, Forres have held "skillshare" workshops
to increase individuals' capacity for self-sufficiency in areas such as
local food cooking, sewing, or bicycle maintenance. The difficulty is
in detecting the production of these qualities, measuring them and
discerning their effectiveness. (M. Scarlett, personal communication,
January 5, 2011).

- *Transition Path Dead Ends* - Due to the reverse path reconstruction,
  dead-ends are ignored. The method essentially dismisses such
  activities as irrelevant because they did not directly lead to an output.
  This may be true, but there could be important lessons in such dead-
  ends.

- *Indirect Pathways* – the production of some outputs may be in part due
  to indirect actions. A common example may be Ashton Hayes and
  Forres both participate in peer networking with other communities and
  are active in visiting and helping other communities. This strengthens
  the "movement" of community transitions nationwide and exerts
  upward pressure on government and politicians who may respond with
  policy incentives. The final closing of this loop is that the incentives
  make it easier for transition communities to operate.

Data Collection and Preparation

- *Interview Questions* – Data collection in the current work was
  primarily from interviews and document analysis. Interview questions
  were designed around transition management principles as this was the

research focus at the time the interview was designed. While relevant, these need to be revised. What are the most suitable questions?

- *Alternative Data Collection Techniques* - Other techniques in addition to (or instead of) interview should be investigated for collecting the data such as transition path reconstruction using interactive storyboarding, perhaps in a group context. This was attempted in the current research with one individual but proved to be too difficult and was not repeated.

Analytical Method and Frameworks

- *Sustainability Indicators* – the indicator set developed and used here is very rough. The aim should be to develop a comprehensive sustainability indicator set for small, place based communities. This set should be integrated with the community analytical framework (Wiek's (2010) Activity – Supply System framework), should take account of the type of data that is available from these communities, sufficiency and normative thresholds. Such an indicator set can then start to allow better cross case comparison of transition accomplishments and absolute position with regards to a sustainable state.

- *Sustainability Appraisal* - The appraisal process used here is subjective and only loosely defined. A comprehensive indicator set integrally linked to the community analytical framework will provide a stronger framework within which to define a robust appraisal process. The

process needs to be more strongly linked to the descriptive analysis of transition outputs.

- *Community Analysis of Transition Outputs* – the current use of community Activity – Supply System framework (Wiek, 2010) decomposes outputs into activity domain, structural and behavioral components with cross-cutting value systems (e.g. health, environmental quality, governance) being packed into an added on "cross-cutting" domain. It also does not cleanly differentiate supply systems (e.g. energy, water). More work needs to be done on how to use this framework more effectively. One concrete issue to be dealt with is the current tagging of outputs by a separate classification scheme (technical, regulative, behavioral etc.) that may be better done using the Activity – Supply System framework.

- *Process Tracing* – the methodology as used in other disciplines needs to be researched more thoroughly with the objective of improving the reliability of transition path tracing. The current method is weak in the way it jumps from path data to important conjunctures and strategic factors.

- *Transition Path Analytical Framework* – the multiple levels of activity types and actors used to map specific case chronicle entries to general framework types needs to be refined. One problem, for example, is how to deal with multiple tagging of entries. Strategic factors in the current work lack consistency. A unified, consistent set of strategic

factors needs to be added to the framework. The distinction and

relationship between strategic factors and barriers needs to be clearly

defined.

- *Transition Path Charting* – Evaluation of the usefulness of charts

  produced is needed. Identification of patterns in charts such as

  different forms of path (e.g. linear, radiating, braided etc.) may be a

  useful feature to further develop if such patterns appear to have any

  relationship to general process characteristics or outcomes.

Templates & Tools

- *Database Tool* – A database tool to assist in chronicling and some

  parts the analysis is needed to reduce researcher time. This would also

  support sharing of data between researchers.

- *Process Charting* – intermediate Gantt style charts were used to

  construct time-based representations of transition paths using

  Microsoft Excel. The use of standard project management software

  should be explored for this task.

- *Method Templates* – The case study process is repeated for each case.

  A standard template for intermediate and final work products would

  improve researcher productivity and cross researcher consistency.

Application of the Research

Ultimately, the aim of this research is to apply it in real community

transitions. Sustainability research should not stop at analyzing or theorizing but

should include operationalizing and applying: "scientific exploration, and

practical application must occur simultaneously. They tend to influence and become entangled with each other" (Kates et al., 2001). The current research has not advanced enough to produced recommendations of action for other communities but Table 57 provides a tentative illustration of one form that this might take.

The tentatively suggested actions in Table 57 relate to the transition process, and how conditions that may be needed for successful transition can be created. There is also a need however to identify transition substance: what outputs should transitions produce? The current research has not formed conclusions on this. Some questions that need to be answered to operationalize findings are listed below.

- What transition outputs should a community transition produce?
- Should different outputs be produced at different stages of transition?
- Which community characteristics influence the choice of output to be produced?
- What steps need to be taken to produce specific outputs?
- How should outputs be monitored?

Table 57.

Illustrative Actions to Influence Transition Variables

Transition Variable	Action to Influence Variable	Examples from cases
Community Participation and Support	⇒ Awareness raising activities	Forres shopping bags
	⇒ Networking with other community groups	
	⇒ Informal Educational events (e.g. film nights, guest speakers)	Forres regular film nights
	⇒ K-12 education programs, integrated with action projects	Forres carbon challenge program
Continuous Mobilization	⇒ Appoint sustainability coaches	BedZED green lifestyle officer
	⇒ Delegate ongoing responsibility to community workgroups	Forres community garden 'sub-community'
Long Term Development	⇒ Publicize long term goals	Ashton Hayes 'Going Carbon Neutral'
	⇒ Create a strategic plan	Forres three year plan has long term strategy
	⇒ Create a Vision	
Governance	⇒ Cooperate and work with existing structure	Ashton Hayes with parish council
	⇒ Acquire community assets	Forres community garden, farmers' market
Funding	⇒ Enlist the help of a community grant writer	
	⇒ Network with other community groups and other transition communities for leads and advice	
	⇒ Approach businesses for sponsorship (develop a proposal)	BedZED: BioRegional proposal to find a developer.
	⇒ Direct fundraising	
	⇒ Develop revenue raising transition outputs	

Transition Variable	Action to Influence Variable	Examples from cases
Resources	⇒ Look for business sponsorship	Ashton Hayes receive help from various small businesses
	⇒ Draw on skills and resources of community members	Ashton Hayes receive regular help from marketing consultants and film maker
Partnerships	⇒ Develop early in the transition around strategic plan	Ashton Hayes had commitments from Chester University and Cheshire Council within first few months
	⇒ Network to look for good partnering opportunities	BedZED, BioRegional partnering with Sutton Council and Peabody;
	⇒ Creative 'social' entrepreneurship	Ashton Hayes tree plantations
Local Government Support	⇒ Invite to be a part of the organization (e.g. board member)	Forres now have a local councilor on the board.
	⇒ Invite to be a part of public events	Ashton Hayes had Cheshire Council present at launch.
	⇒ Lobby local politicians for active support	Ashton Hayes have support of local councilor;
Monitoring	⇒ Regular monitoring of key system performance indicators	BedZED perform irregular adhoc studies
	⇒ Design follow up monitoring of all outputs	
	⇒ Engage local university for help offering them service learning opportunities	Ashton Hayes partner with University of Chester
Volunteer Workforce	⇒ Develop a recruiting network	
	⇒ Good organization makes it easier to accommodate new and casual volunteers	Forres hub organization
	⇒ Don't overwhelm new volunteers	Forres tactics

CONCLUSION

This thesis advances the state of research into the phenomenon of small, place based communities engaged in sustainable transition, focusing in particular on understanding the process of transformation. It does this in two ways: (1) the design of an analytical framework and method for investigating the process of community transitions; and (2) use of the framework and method to investigate three community transitions. The main contribution of the work is the provision of a generalized approach by which future research can be standardized and synthesized to create theoretical and practical knowledge of community transitions.

The research design is based on a multiple case study methodology (Yin, 2003) where cases are selected, single case studies are conducted and analyzed, cases are compared, and conclusions made. This work is new in the analysis of the step where single case data is analyzed in two parallel tracks: (1) what outputs did the community transition produce and what impact did they have on the community and its sustainability; and (2) what was the process that the community transition followed to produce the outputs. The tracks are recombined to identify the most effective strategies and outputs. Analysis of outputs is based on Wiek's (2010) community activity – supply system analytical framework and appraisal of change in sustainability using Gibson's (2006) sustainability assessment criteria. Analysis of output process is based on process tracing (Bennett & George, 1997) and uses a newly created transition path analytical framework.

The research method was iteratively developed while conducting and analyzing real case studies. The cases, all in the U.K. are: (1) Ashton Hayes, a rural village with a plan to go "carbon neutral"; (2) BedZED, a low ecological footprint urban housing development; and (3) Forres, a small town and Transition Town member. All three cases were found to have increased their sustainability in a variety of ways through different approaches. Ashton Hayes and Forres, through grass roots community participation, achieved sustainability gain through behaviorally driven reductions in household carbon emissions and development of community assets such as community shop, allotments and farmers' market. In contrast, BedZED was a highly innovative, top-down, professionally managed technical project performed by a coalition of private and non-profit organizations. BedZED achieved sustainability gain through intrinsically low carbon emission and water use building and site design and provision of social housing.

Following limited synthesis of case results some preliminary insights are made into what are important aspects of community transitions. These include: community participation and support; continued mobilization following implementation of outputs; a focus on long term goals; the degree of community governance; the need for funding; building strategic partnerships; local government support; monitoring of impacts; and dependency on volunteer workforce. Tentative suggestions on how communities might influence these variables are suggested. Cases were found to have weak affinity with transition management and transformative planning and governance theory but this cannot be correlated with transition successfulness on the strength of current results

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although such an approach looks to be very promising with more robust sustainability appraisal and the analysis of more cases.

The research method presented here has potential for building robust theories of community transition and developing specific guidelines for applying created knowledge in the field. The ultimate goal to which this research leads is widespread practices of evidence based transitions. The work is still at an early stage. Numerous lines of further research are suggested.

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APPENDIX A

COMMUNITY BASED SUSTAINABILITY ORIENTED TRANSITION

GROUPS

Table 1.

Community Based Sustainability Oriented Transition Groups

Name	Community Description	Movement / Group	Distribution / Founded
Eco-Village (EV)	An intentional community brought together by the desire to live sustainably. Communities hold in common social-economic, cultural-spiritual, and ecological principles but may emphasize them differently.	Global Eco-Village Network (GEN). Aim is to "support and encourage the evolution of sustainable settlements across the world"	Global. 1995 from the uniting of several established ecological communities. 517 total, many have pop<10 or not formed.
Trans-ition Town (TT)	A community initiative to transition existing settlements to a more resilient, local economy in response to the threats of peak oil and climate change.	Transition Network.. Guiding and coordinating organization, develops the transition model and provides support and resources to initiatives, as well as national – global leadership.	Global. 2005. 316 official, 53% in UK, 40% in US, Aus, Can, NZ
Comm-unity Land Trus (CLT)t	Land held in trust by a democratically governed non-profit organization for the benefit of the local community. The main objective is usually affordable housing but is often accompanied by economic and environmental objectives.	National Community Land Trust Network. Provides support and resources to CLT initiatives. Coordinates development of the CLT model among interested parties.	U.S., U.K. Modern movement began in 1970s in U.S. Network formed in 2006. 237 U.S. National CLT members

Co-housing (CH)	A housing development consisting of private dwelling units and community owned facilities, providing a balance between privacy and community. The emphasis is on creation of a strong social environment though greater sustainability is often a secondary consideration. True cohousing should be initiated and designed by the future residents but this may be taken on by a private developer. Managed through consensus decision making.	Cohousing Association (U.S). Donor supported organization that raises awareness of cohousing, coordinates nationwide cohousing activities, and provides support and resources to individual initiatives.	U.S. CoHo/US formed 2003 from The Cohousing Network, formed 1997, 240 total, 100 comple-ted
Planned Comm-unity (PC)	An architecturally designed development aimed at creating a strong sense of community and lowered environmental footprint. May be integrated with commercial and transport aspects of urban planning.	e.g. New Urbanism or Zero Energy Develop-ment. Architectural practices that set new 'standards' for socially oriented urban design and green building, now also integrating agrarianism.	
Zero Foot-print	"Villages Without Borders" project – communities connected worldwide by internet, sharing cultures and comparing carbon footprints. Share experiences and knowledge and how to adapt to climate change.	VWB – Villages Without Borders. Aiming for 5,000 villages	Global, initially England + Canada

APPENDIX B

INTERVIEW QUESTIONS

1. How did the initiative begin?
2. How did you get involved?
3. Why is a transition needed?
4. Did you identify and agree on specific problems in the community and their priority?
5. Was there a common, guiding vision developed
6. Did you identify specific goals that would help get you closer to the vision?
7. Was there a core group of participants?
8. How were core group members selected and why?
9. What skills / knowledge / resources did they bring?
10. Did you identify ways of achieving goals, like specific objectives and concrete actions?
11. What did you try that was new or different in the community?
12. Where did you get ideas for action from?
13. Did you run pilots of ideas? Did you deliberately try things out to find out more?
14. What stages did the process go through?
15. Within each stage, what were the obectives, what were the main activities, what were the main products, who were the main participants, what did you achieve?
16. Within each stage, did it go as planned? If not why? Can you identify specific problems and what you did about them? Can you identify anything that was especially important in achieving your objectives?
17. Did you change the vision or goals as you went along? How did this happen?
18. Did you regularly follow up on how actions were working?
19. Were goals pursued independently?
20. Who was responsible for pursuing goals? How much flexibilitiy did they have?
21. What was the level of a) awareness, b) interest / support, c) involvement (active support), d) participation, in the transition across the community?
22. What other groups did you form links with and what was the nature of the links?
23. What groups were actively involved (e.g. church, schools, community groups, businesses, colleges, local government) in the core group or working groups?
24. Which individuals were especially important? What role did they play, why was it so important?

25. How did you make decisions?
26. What resources did you use to help with the process or with implementation and where did they come from? E.g. financial, material goods, labor, skills & knowledge, networks, community, natural?
27. What contact with local government was there? Were they sympathetic / supportive? What concrete support in the form of resources did they provide?

APPENDIX C

SUSTAINABILITY INDICATOR DESCRIPTIONS

Access to basic services & amenities

Equitable access to basic services and amenities are fundamental to sustainability. Aside from basic needs such as such as clean air, water, food and shelter, this indicator is aimed at services and amenities such as daily groceries and household needs, health service, education, green space and information.

- *Inter & Intra-generational equity* –the provision of basic services and amenities in the community at fair cost and equal terms improves well-being and general welfare of all community members.

Biodiversity

This is a very broad indicator that essentially encompasses the quality of the natural environment, directly related to its ability to support biodiversity and other ecosystem services.

- *Socio-ecological Integrity* – this is one of the few indicators that might positively increase this criteria as opposed to reducing negative impact.

Car Dependency

The degree to which community members' well-being and general welfare depend upon having access to and using a car.

- *Inter & Intra-generational equity* - Access to a wide range of affordable transport options and proximity to common destinations reduce the need to own a car and especially benefit low income households.

- *Precaution & Adaptation* - Access to a wide range of affordable transport options and proximity to common destinations lower vulnerability to fuel supply and price.

Community Assets

The meaning of asset here is not the usual strictly economic / legal term of property of economic value, but is more generally, anything that is useful or of value to the community.

- *Socio-ecological Civility & Democratic Governance* – Community control of assets increases the community's possibilities to use resources in ways that provide optimal benefits to the community. It reduces dependence on centralized systems of governance and production where interests are rarely well tuned to those of individual communities.

Employment

This indicator refers to direct job creation in the community. This includes employment created as a direct result of transition outputs such as a community shop output creating jobs for a manager and a worked. It may also include employment created as part of the transition process, as long as it is within the community and under the direct management of the transition. So for example, hiring a local administrative worker to help with project administration would count, but hiring an outside contractor to install house insulation would not. The latter however, might be judged to help the local economy. There is a grey area in this distinction but it is necessary to draw a line somewhere.

- *Livelihood Sufficiency & Opportunity* – Creates or supports jobs for for community members.

Energy use & CO2 emissions

- *Socio-ecological Integrity* – Fossil fuel extraction and combustion have damaging upstream and downstream socio-environmental impacts.

- *Resource Maintenance & Efficiency* – Using less energy conserves limited resources of energy.

- *Precaution & Adaptation* - Lower dependencies on resource inputs make households less vulnerable to supply interruption and price increase.

Food Production

This indicator takes in both commercial in the bioregion and personal / community food production in the community. For commercial local food production this indicator is closely related to the Local Economy indicator that takes in economic aspects of local food system, from production, processing, distribution & retailing, plus services. It is assumed that local consumption is a major component of a 'strong' local food system, i.e. the food is not primarily produced for export. Food production by individuals or small groups for private consumption. Production may take place on private land (e,g, their own household) or communal areas (e.g. allotments). In addition to the criteria noted below community gardens / allotments may also contribute to the Community Asset Indicator.

- *Socio-ecological Integrity* - Reduces upstream and downstream impacts associated with 'food miles' fossil fuel use. However, depending on the production methods used it may increase impacts in other ways.

- *Inter & Intra-generational equity* – Privately grown food provides access to fresh, nutritious food at low cost.

- *Resource Maintenance & Efficiency* – Low input production methods conserve non-renewable raw material (hydrocarbons, phosphorous etc.). Increased demand for local food may result in expansion of farmland.

- *Precaution & Adaptation* - Reduces local vulnerability to interruption of food supplies due to resource shortage and price.

- *Livelihood Sufficiency & Opportunity* – Creates jobs and opportunities within the food sector of the local economy.

Health & Wellbeing

- *Intra-generational equity* – Access to sports and recreational facilities, to open space and natural environment, clean air, away from smells and noise.

Local Economy

The local economy in most cases expands beyond the community and benefits to the community are less direct than the Employment indicator that deals with direct community job creation.

- *Inter & Intra-generational equity* – Support for local business and people in the form of physical and financial resources, skills training and networks lowers the barriers to start and grow a business and increases workforce capabilities.

- *Livelihood Sufficiency & Opportunity* – A strong local economy creates jobs and economic opportunities within the community.

- *Precaution & Adaptation* – A strong local economy produces many of the basic goods and services needed by the local population and reduces vulnerability to interruptions to supply and dependency on centralized systems of production.

Low Impact Consumerism

Consuming less and choosing ethically and environmentally responsible produced goods. Disposable products such as bottled water and plastic shopping bags are more than just waste production: they typify a culture that is not sustainable. Demand for consumer products (e.g. clothes, electronics, furniture, appliances) has huge global social and environmental impacts. This indicator is related Waste Production, being more of the upstream behavioral driver than the 'end of pipe' flow rate.

- *Socio-ecological Integrity* – Reduces upstream impacts caused by consumer goods manufacturing and distribution. Locally, disposable products foul the landscape through littering and can be directly damaging to wildlife.

- *Inter & Intra-generational equity* – improves labor rights and conditions for consumer goods workers.

- *Precaution & Adaptation* - We don't know the long term impact of plastic in the environment.

- *Socio-ecological civility & Democratic Governance* – The throw-away society is the very antithesis of how responsible, sustainable citizens should behave in most perspectives on sustainability.

Participatory Governance

To what extent and to what level is the community engaged in its own governance. Is there an organizational structure and process supporting democratic, participation in governance? Do the people use it? Is it effective? How much control does it provide? This indicator is closely related to Arnstein's (Arnstein, 1969) ladder of participation.

- *Socio-ecological civility & Democratic Governance* – increases the democratic governance part of this criterion but not necessarily the socio-ecological civility. However, when communities have access to participate in effective governance it is much more likely that issues such as social and environmental responsibility become a part of the community's values.

Social Cohesion

How strong is the community? What is the degree of "solidarity, trust and association" among the community, factors that when low are "likely to have

lower levels of well-being and general welfare" (Bryden & Geisler, 2007). Social cohesion

- *Intra-Generational Equity* - Social cohesion provides greater well-being and general welfare in the community.

- *Socio-ecological civility & Democratic Governance* – While social cohesion may develop in a direction that increases sustainable values and behavior it does not always do so. However, without it, the likelihood of sustainable values and behavior is much lower.

Social Housing Provision

The degree to which the community provides for the housing needs of low income and special needs members.

- *Inter & Intra-generational equity* – Ensuring access to secure tenure, high quality, affordable housing to lower income families meets a basic need and a significant social problem in many communities, urban and rural.

Sustainable Wood Fuel Resource

Communities may have possibilities for developing woodland as a sustainable source of fuel, in addition to other ecosystem services benefits it can provide. Ecological aspects of the resource (e.g. biodiversity) and social aspects (e.g. as a leisure resource) are covered by other indicators.

- *Resource Maintenance & Efficiency* - a local renewable fuel resource increases the community's potential for energy self sufficiency.

- *Precaution & Adaptation* - a local renewable fuel resource provides resilience to future energy supply disruption.

Utility Bills

Not considered here is that money saved will more often than not be spent on something else that will have an impact in other indicators that might exceed the original impacts.

- *Inter & Intra-generational equity* - Lower utility bills and other basic household overhead expenses benefit everyone but are progressively beneficial to lower income households.

Waste Production

In many ways this is the downstream counterpart of Low Impact Consumerism indicator. It includes consideration of how much waste the community send to landfill and how much is recycled and composted.

- *Socio-ecological Integrity* - Reduces upstream impacts associated with raw material production and downstream impacts of waste management and land-filling.

- *Resource Maintenance & Efficiency* - Reduced waste and increased recycling conserves limited resources of raw materials and landfill. Reduced waste and increased recycling increases resource efficiency of primary industrial production processes.

Water Supply & Waste Water Treatment

- *Socio-ecological Integrity* - Reduces upstream and downstream socio-environmental impacts associated with water supply and waste water treatment.

- *Resource Maintenance & Efficiency* - Conserves limited resources of water.

- *Precaution & Adaptation* - Lower dependencies on resource inputs make households less vulnerable to supply interruption and price increase.

APPENDIX D

SUSTAINABILITY APPRAISALS

Ashton Hayes

Table 2.

HOUSEHOLD ENERGY USE Sustainability Appraisal

Domain		SEI	LS&O	INTRA-GE	RM&E	SEC&DG	P&A	TOTAL
Working	• Energy use & CO2 emissions	2			2			4
Housing	• Energy use & CO2 emissions	2			2		2	6
	• Water use & waste water treatment				0		0	0
	• Utility Bills			1				1
Mobility	• Energy use & CO2 emissions							0
Eating								0
Educating								0
Recreating								0
Communicating	• Social Cohesion			1		1		2
Shopping								0
Cross-Cutting	• Participatory Governance						1	1
Total		**4**	**0**	**2**	**4**	**2**	**2**	**14**

Table 3.

STATION FOOTPATH Sustainability Appraisal

Domain		SEI	LS&O	INTRA-GE	RM&E	SEC&DG	P&A	TOTAL
Working								0
Housing								0
Mobility	• Energy use & CO2 emissions	0			0			0
	• Car Dependency		1	1				2
Eating								0
Educating								0
Recreating								0
Communicating								0
Shopping								0
Cross-Cutting								0
Total		**0**	**1**	**1**	**0**	**0**	**0**	**2**

Table 4.

RECYCLING Sustainability Appraisal

Domain		SEI	LS&O	INTRA-GE	RM&E	SEC&DG	P&A	TOTAL
Working								0
Housing	• Reduced landfill and raw material processing	1			1			2
Mobility								0
Eating								0
Educating								0
Recreating								0
Communicating								0
Shopping								0
Cross-Cutting								0
Total		**1**	**0**	**0**	**1**	**0**	**0**	**2**

Table 5.

TREE PLANTING Sustainability Appraisal

Domain		SEI	LS&O	INTRA-GE	RM&E	SEC&DG	P&A	TOTAL
Working								0
Housing								0
Mobility								0
Eating								0
Educating								0
Recreating								0
Communicating								0
Shopping								0
	• Local biodiversity	1						1
Cross-Cutting	• Sustainable Wood Fuel Resource				1		1	2
Total		**1**	**0**	**0**	**1**	**0**	**1**	**3**

Table 6.

COMMUNITY SHOP Sustainability Appraisal

Domain		SEI	LS&O	INTRA-GE	RM&E	SEC&DG	P&A	TOTAL
Working	• Employment		1					1
	• Local Economy		1					1
Housing								0
Mobility	• Energy use & CO2 emissions	0			0		0	0
	• Car Dependency			1				1
Eating								0
Educating								0
Recreating								0
Communicating	• Social Cohesion					1		1
Shopping	• Access to basic services & amenities			1				1
	• Community Assets					1		1
Cross-Cutting								0
Total		**0**	**2**	**2**	**0**	**2**	**0**	**6**

BedZED

Table 7.

LOW ENERGY HOUSING Sustainability Appraisal

Domain		SEI	LS&O	I&IGE	RM&E	SEC&DG	P&A	TOTAL
Working	• Energy use & CO2 emissions	1			1		1	3
Housing	• Energy use & CO2 emissions	3			3		3	9
	• Utility Bills			3				3
Mobility								0
Eating								0
Educating								0
Recreating								0
Communicating								0
Shopping								0
Cross-Cutting								0
Total		**4**	**0**	**3**	**4**	**0**	**4**	**15**

Table 8.

LOW WATER HOUSING Sustainability Appraisal

Domain		SEI	LS&O	I&IGE	RM&E	SEC&DG	P&A	TOTAL
Working	• Water use & waste water treatment	1			1		1	3
Housing	• Water use & waste water treatment	2			2		2	6
	• Utility Bills			1				1
Mobility								
Eating								0
Educating								0
Recreating								0
Communicating								0
Shopping								0
Cross-Cutting								0
Total		**3**	**0**	**1**	**3**	**0**	**3**	**10**

Table 9.

COMMUNITY Sustainability Appraisal

Domain		SEI	LS&O	I&IGE	RM&E	SEC&DG	P&A	TOTAL
Working	• Employment		0					0
Housing	• Waste Production	1			1			2
	• Social Housing Provison			3				3
Mobility	• Energy use & CO2 emissions	0			0			0
	• Car Dependency		2	2			1	5
Eating	• Food production	1		0	1		0	2
Educating								0
Recreating	• Health & wellbeing			1				1
Communicating	• Social cohesion			1				1
Shopping								0
Cross-Cutting								0
Total		**2**	**2**	**7**	**2**	**0**	**1**	**14**

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Table 10.

GWTP Sustainability Appraisal

Domain		SEI	LS&O	I&IGE	RM&E	SEC&DG	P&A	TOTAL
Working								0
Housing	• Water use & waste water treatment	-1			-1		-1	-3
Mobility								0
Eating								0
Educating								0
Recreating								0
Communicating								0
Shopping								0
Cross-Cutting								0
Total		**-1**	**0**	**0**	**-1**	**0**	**-1**	**-3**

Table 11.

CHP Sustainability Appraisal

Domain		SEI	LS&O	I&IGE	RM&E	SEC&DG	P&A	TOTAL
Working								0
Housing	• Energy use & CO2 emissions	-1			-1		-1	-3
Mobility								0
Eating								0
Educating								0
Recreating								0
Communicating								0
Shopping								0
Cross-Cutting								0
Total		**-1**	**0**	**0**	**-1**	**0**	**-1**	**-3**

Table 12.

MBR-WTP Sustainability Appraisal

Domain		SEI	LS&O	I&IGE	RM&E	SEC&DG	P&A	TOTAL
Working								0
Housing	• Water use & waste water treatment	1			1		1	3
Mobility								0
Eating								0
Educating								0
Recreating								0
Communicating								0
Shopping								0
Cross-Cutting								0
Total		**1**	**0**	**0**	**1**	**0**	**1**	**3**

Forres

Table 13.

PLASTIG BAGS Sustainability Appraisal

Domain		SEI	LS&O	I&IGE	RM&E	SEC&DG	P&A	TOTAL
Working								0
Housing	• Waste Production	0			0		0	0
Mobility								0
Eating								0
Educating								0
Recreating								0
Communicating								0
Shopping	• Low impact consumerism	0				1	0	1
Cross-Cutting								0
Total		**0**	**0**	**0**	**0**	**1**	**0**	**1**

Table 14.

COMMUNITY GARDEN Sustainability Appraisal

Domain		SEI	LS&O	I&IGE	RM&E	SEC&DG	P&A	TOTAL
Working								0
Housing								0
Mobility								0
Eating	• Food production	1		1	1		1	4
	• Social Cohesion			1				1
	• Community Assets					1		1
Educating								0
Recreating								0
Communicating								0
Shopping								0
Cross-Cutting								0
Total		**1**	**0**	**2**	**1**	**1**	**1**	**6**

Table 15.

FARMERS' MARKET Sustainability Appraisal

Domain		SEI	LS&O	I&IGE	RM&E	SEC&DG	P&A	TOTAL
Working	• Local Economy		1					1
Housing								0
Mobility								0
Eating	• Food production	1			1		1	3
Educating								0
Recreating								0
Communicating								0
Shopping	• Social Cohesion			1				1
	• Community Assets					1		1
Cross-Cutting								0
Total		**1**	**1**	**1**	**1**	**1**	**1**	**6**

Table 16.

LOCAL FOOD GUIDE Sustainability Appraisal

Domain		SEI	LS&O	I&IGE	RM&E	SEC&DG	P&A	TOTAL
Working								0
Housing								0
Mobility								0
Eating	• Food Production / Local							0
Educating								0
Recreating								0
Communicating								0
Shopping								0
Cross-Cutting								0
Total		**0**	**0**	**0**	**0**	**0**	**0**	**0**

Table 17.

CARBON PLEDGES Sustainability Appraisal

Domain		SEI	LS&O	I&IGE	RM&E	SEC&DG	P&A	TOTAL
Working								0
Housing	• Energy use & CO$_2$ emissions	1			1		1	3
	• Utility Bills			1				1
Mobility	• Energy use & CO2 emissions	1			1		1	3
	• Car Dependency		0	0				0
Eating	• Food production	1			1			2
Educating								0
Recreating								0
Communicating								0
Shopping	• Low impact consumerism	1			1		0	2
Cross-Cutting								0
Total		**4**	**0**	**1**	**4**	**0**	**2**	**11**

APPENDIX E

TRANSITION PATH CHART LEGEND
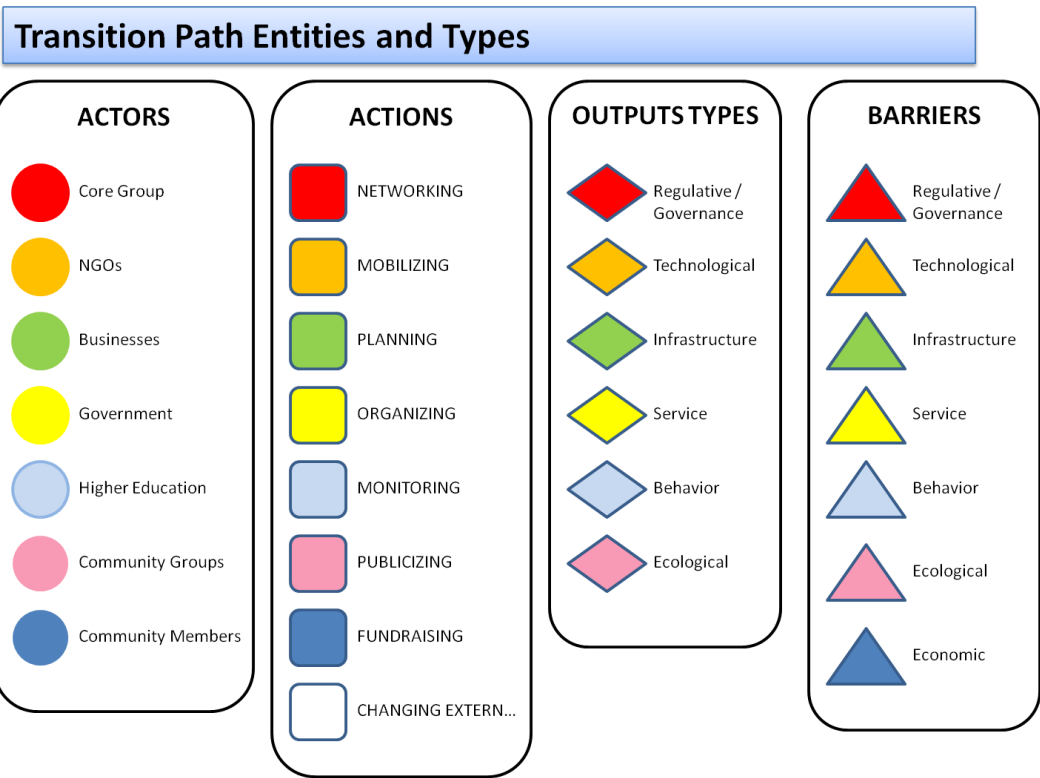
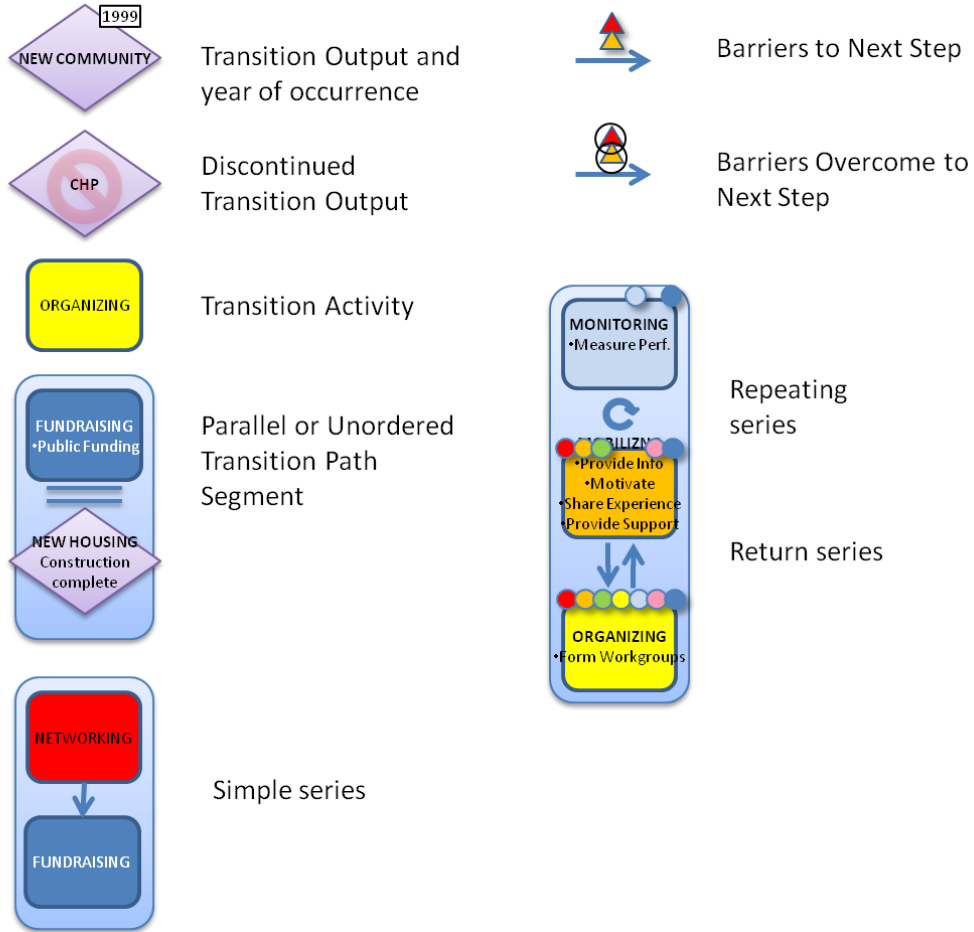*Figure 1:* Transition Path Chart Legend, Entity and Types

Figure 2: Transition Path Chart Legend, Elements

APPENDIX F

SUMMARY DESCRIPTIONS OF PATH ACTIVITIES BY CASE

Ashton Hayes, Path Segment 1 - STARTUP

ORGANIZING, Form Core Group, Aug-05, CORE
GC takes his idea of a carbon neutral village to his friends in the pub . "He thought they would think he's a complete nutcase but to his surprise they all said well we're all quite worried about it [climate change] too" (R. Green, personal communication, January 8, 2011).

PLANNING, Overall Strategy, Oct-05, CORE
The core group begin to form an informal strategy based around a some principles of democratic support, institutional authority, stakeholder engagement, financial independence and adaptability, and they recognized a need for administrative support. A short action plan was produced in Dec 2005 that was primarily about forming partnerships and obtaining the parish council's support

ORGANIZING, Form a Board, Nov-05, CORE
The core group made a request to the parish council (PC) to formally support the transition to gain legitimacy. The project was accepted as a subcommittee of the parish council, the lowest tier of government in England, on condition of a public meeting to demonstrate the community supported the transition.

NETWORKING, Build Coalitions, Nov-05 to May-06, CORE, GOV, NGO, BUS, CG, UNI
The core group did a lot of networking over a period of a few months to build strategic numerous partnerships. The most enduring, that lasts to this day, is between the core group, University of Chester and EA Technology. Other important relationships established at this early stage were with Cheshire Council, the Energy Saving Trust, numerous local businesses and landowners, numerous community groups (e.g. the Women's Institute, the local primary school).

PUBLICIZING, Hold Public Event, Jan-06, CORE, GOV, NGO, BUS, CG, UNI, COM
The public launch in Jan 2006 was attended by 400 people (out of a population of 1000), local businesses, universities, local government, local and national politicians, and media. The project was presented as an invitation: "we are trying to see if this community can work together to become carbon neutral, we don't know how to do it, nobody has ever done it before, would you join with us on this journey? ". The 'invitation' to become carbon neutral was accepted positively. No other initiative has ever attracted so much interest in the community.Press releases before the event were widely distributed. There was a large media presence representing newspapers, radio, television, local and national. Politicians were not allowed to use the event as a platform. Public support was seen as critical to the success of the transition. It was also required as a condition of acceptance by the parish council.

MOBILIZING, Motivate, Jan-06, COM
The public launch event had a significant motivational effect on the community.

MOBILIZING, Provide Information, Jan-06 onward, CORE, COM
The core group told the community what they wanted them to do at the launch event and followed this up with email broadcasts, website and general word of mouth.

Ashton Hayes, Path Segment 2 – HOUSEHOLD ENERGY

(STARTUP), Feb-06, COM

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Many community members responded to the challenge immediately following the launch. "we had asked everybody not to do anything until after the survey but prior to the survey everybody started doing things – it was amazing, it just sort of got people going".

NETWORKING, Mar-06 to May-06, COR, BUS, NGO, COM
The core group worked with the Energy Saving Trust and Cheshire Council to explore ideas for community energy generation and making the village an energy test bed. In May they held a renewable technology fair with EA Technology open to the public with displays to homeowners and presentation of community plans for demonstration solar and wind turbine. Public opinion on the plans was positive.

MONITORING, Monitoring, May-06, COM, UNI, COR
University of Chester following help from the University of East Anglia conducted the first annual carbon footprint survey and analysis as a student performed service learning project. There was high participation rate in the survey indicating high interest and motivation.

MOBILIZING, Provide Information, Jul-06, UNI, COR, COM
Results for the whole village were made public and individual results provided to each household privately, highlighting where they could most easily make savings.

MOBILIZING, Share Experiences, Jul-06 onwards,
There were meetings / social events that were kept light and fun and people in the village started to make energy use part o the village culture: "We didn't talk about our gas bills between one and other but now we do"

MOBILIZING, Motivate, Jul-06 onwards, COM, COR
Media attention, guest speakers, visits from politicians and making a film all contributed to the motivation of the community. This in turn attracted more attention.

ORGANIZING, Form Workgroups, Nov-06, COR, WG
Volunteers, now up to 25, were organized into workgroups including a carbon clinic and a carbon sink group. The carbon clinic group provided practical advice and help to villagers. This increased village mobilization.

MOBILIZING, Motivate, Jan-07, COR, COM, BUS, GOV, NGO, CG
300 villagers, plus invited guests and media, attend the 1st anniversary and premier of the movie made by a (professional filmmaker) village resident.

MONITORING, Monitoring, May-07, COM, UNI, COR
University of Chester conducted the second annual carbon footprint survey and analysis as a student performed service learning project. Again, there was high participation rate in the survey indicating high interest and motivation.

MOBILIZING, Provide Information, Jul-07, UNI, COR, COM
Results showed a 20% decrease in carbon footprint since the baseline

The pattern of activity continued for another year or two with the 3rd carbon footprint survey in 2008 indicating 23% below baseline but subsequent years have been flat between 20% and 23%.

Ashton Hayes, Path Segment 3 – TREE PLANTING

NETWORKING   Negotiate, Jan-06 to May-06, CORE, BUS, NGO, UNI
Negotiate a deal with local farmers and other landowners, local silvicultural business to plant trees as a carbon sink. (There is no information on the nature of the deal). Also work with University of Edinburgh on how many trees would be needed and with local environmental consultancy RMK and the University of Chester about an aerial survey to assess the carbon sinks around the village.

Ashton Hayes, Path Segment 4 – STATION FOOTPATH

NETWORKING, Negotiate, Mar-06, CORE, GOV
Members of the core group met with Cheshire Council to talk about the village plans and request a 400m footpath be constructed from the village to the station. At the public launch the council had announced they would do anything they could to help the village. This has been requested before but without success. In Nov-06 the council announced that they had allocated funds for the footpath.

Ashton Hayes, Path Segment 5 – RECYCLING

NETWORKING, Negotiate, Mar-06, CORE, GOV
Members of the core group met with Cheshire Council to talk about the village plans. It is not known if it was this meeting or a later one that the core team asked teh council to modify the recycling system by using the bags differently as they had identified this as a reason why recycling was low. The council agreed and made the change

CHANGE EXTERNAL SYSTEM, Change external system, Aug-06,
Cheshire Council change the recycling system as requested.

MONITORING, Monitor, Aug-06, CORE, GOV
Cheshire council provide recycling data back to the core group and information on other villages.

MOBILIZING, Providing Information, Sep 2006 onwards, COR, COM
The core group provide recycling data back to the community as a total for the village and put out the challenge to reduce it.

MOBILIZING, Motivating, Sep 2006 onwards, COR, COM
An inter-village recycling competition takes hold and motivates communities to do more.

Ashton Hayes, Path Segment 6 – COMMUNITY SHOP

NETWORKING, Build Coalitions, Jan-06 onwards, COR, CG
The core group worked closely with many local community groups providing mutual support whenever it was needed.

NETWORKING, Build Coalitions, Feb-09, COR, CG

The core group build a partnership with a new community group formed to establish a community shop as the existing shop is closing. AHGCN provide some cash support to the shop group and in exchange get a display in one of the corners. The loss of the shop would reduce the social amenities of the community but it was also realized it was more important than that, that it was connected to energy use and other things - it was a sustainability issue. "I think there is a 4th phase developing which is the influence on the sustainability of the entire community ... It's amazing actually how it is causing cross fertilization between different groups..the community cohesion phase is what I call it" was how Garry Charnock put it (R. Green, personal communication, January 8, 2011).

BedZED, Path Segment 1 - STARTUP

ORGANIZING, Form Core Group, 1996, CORE
BDA & BR meet and form a core group around Bill Dunster's vision of creating a sustainable urban community

PLANNING, Overall Strategy, 1996, CORE
Develop the sustainable community concept further and plan overall approach

PLANNING, Action Plans, 1996, CORE
Begin looking for strategic partners, especially a property developer and a local authority

NETWORKING, Build Coalitions, Jan-97, CORE,LG
BioRegional open discussions with Sutton Council about the possibility of of a sustainable housing development. Sutton Council who are politically disposed to the concept and willing to support it.

FUNDRAISING, Fundraising, Jun-97, CORE,NGO
BR use their existing contacts with WWF to obtain funding to develop a proposal, find a developer and find a site.

NETWORKING, Build Coalitions, Mar-98, NGO
With the funding help from WWF, BR were able to find Peabody Housing Trust, a social housing association (not for profit) with special interest in affordable housing for low income families, who ageed to to become a partner in the scheme as the primary developer.

NETWORKING, Build Coalitions, 1998-1999, BUS
Other key development partners were Arup engineering consultants for building physics, Gardiner & Theobold (constrution surveying and management) and Ellis & Moore (engineers) and other more standard construction service providers.

NETWORKING, Negotiations, 1998, BUS, GOV
Negotiating the land purchase deal with Sutton Council required agreement to allow future environmental benefits to be built in to the bid, allowing a lower price offer to be acepted.

NETWORKING, Consult, Jun-98, CG
Public consultation informed the Hackbrige community about the proposed development and let them have input into the plan.

PLANNING, Action Plans, 1999, CORE,BUS
Detailed site design and construction plans were created based on input from BDA, BR and PB, plus local community groups, local government and construction consultants.

NETWORKING, Negotiations, 1999, CORE,LG,BUS
Due to the irregular nature of the construction plans numerous detailed planning issues had to be worked out with SC planning department. Privisional planning permission was granted in June 99 and final permission in Dec 99.

ORGANIZING, Form Workgroups, 1999, COR,LG,BUS
Specialist development teams were formed around the water recyling system (Albion Water), the energy system (Exus) and the photovoltaics system (BP Solar).

FUNDRAISING, Fundraising, Jan-02, CORE,GOV
BR obtained funding from SEED to provide a green lifestyle officer for the first year.

ORGANIZING, Form Workgroups, Apr-02, CORE, WG, BUS
A green lifestyle officer was appointed for the first year to promote and suport green living in the new community and to develop the car club by working with Smart Moves Ltd and residents.

ORGANIZING, Form Workgroups, Apr-02, COM
Residents formed a Residents' Association to collectively manage their common community interests.

MOBILIZING, Provide Support, Apr-2002 to Mar 2003, WG,COM
The GLO would do things like provide coupons for the local bike store, getting plants for residents' gardens, put on bike repair and gardening workshops. She also spent 1.5 days per week developing the car club.

MOBILIZING, Motivating, *Apr-2002 to Mar 2003,* CORE,COM
BDA & BR (both are now located on-site) organized events like Friday night social gatherings with a green / sustainability interest in the first year.

MOBILIZING, Motivating, *Apr-2002 to Mar 2003,* COM
Attracting residents to the new development was not a problem. Private residents (50%) seem to have heard about it through word of mouth, local press or sheer chance - there did not appear to be any big sales drive necessary.

MOBILIZING, Sharing Experiences, Apr-2002 to Mar 2003, COM
In the first year or two there was a strong pioneering spirit in the community and sharing experiences was a part of that.

BedZED, Path Segment 2 - GWTP
MONITORING, Measure Performance, 2002-2005, NGO,BUS
The operation and maintenance of the GWTP system was contracted to Albion Water, the main system designer. Over time it became apparent that the system performance was not ost effective: it required much more maintenance than planned, produced more sludge than expected and used more energy than conventional offsite treatment.

NETWORKING, Negotiating, 2003- 2005, NGO,BUS
Following negotiations between PB and Albion, the operation of the GWTP was discontinued in June 2005 because it was not cost effective to operate.

BedZED, Path Segment 3 - CHP
MONITORING, Measure Performance, 2002 – 2005, NGO,BUS

The operation and maintenance of the CHP system was contracted to Exus Energy Ltd, the main system designer. Due to technical issues, in part caused by regulative requirements, the system performance was not cost effective: it required constant on-site maintenance and was frequently down.

NETWORKING, Negotiations, 2003 -2005, NGO,BUS
Exus Energy ceased trading and therefore operation of the CHP plant could not continue after March 2005.

BedZED, Path Segment 4 – MBR-WTP
NETWORKING, Build Coalitions, Jun-08, NGO,BUS
PB look for replacement on-site water treatment plants. Thames Water agree install and operate a 'membrane bio-reactor' on-site water treatment plant as a 3 year research project. Started in June 2008.

APPENDIX G

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APPENDIX H

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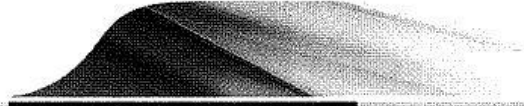
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Date:	12/16/2010
Committee Action:	**Exemption Granted**
IRB Action Date:	12/16/2010
IRB Protocol #:	1012005804
Study Title:	Communites in Sustainability Transition

The above-referenced protocol is considered exempt after review by the Institutional Review Board pursuant to Federal regulations, 45 CFR Part 46.101(b)(4) .

This part of the federal regulations requires that the information be recorded by investigators in such a manner that subjects cannot be identified, directly or through identifiers linked to the subjects. It is necessary that the information obtained not be such that if disclosed outside the research, it could reasonably place the subjects at risk of criminal or civil liability, or be damaging to the subjects' financial standing, employability, or reputation.

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