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Transition Pathways Towards a Sustainable, Low Carbon Europe Developed by Pupils and Professionals Across 6 EU Countries

Paper for the “InContext Scientific Conference on Pathways, Scenarios and Backcasting for Sustainable and Low Carbon Lifestyles: Comparing Methods, Cases and Results”

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Abstract

There is an *a priori* argument that those who are affected by a decision should have a say in that decision. In terms of intergenerational equity, as well as the need to implement whatever Transition Management (pathways, trajectories) implementation is to take place, young people should therefore be included in the decision-making process, be this for ethical or operational reasons. Given the socio-cultural context, the changing nature of technology etc., Generation Z is likely to have very different notions of their specific future, and the way sustainability and low-carbon lifestyles are evolving within this. This implies the distinct possibility that (older) experts may devise and shape transition pathways towards greater sustainability and less carbon-intensive lifestyles, but may do so without the inclusion of, and in a direction that those who are destined to live (in) these futures may find difficult to accept, let alone actively pursue. In short, not involving young people in the Transition Pathways and Management agenda poses a genuine governance deficit, as well as an implementation challenge.

To understand how young people conceptualise their future in low-carbon sustainability terms, and how they conceive suitable visions of their futures, CRISP (an EU project to Creating Innovative Sustainability Pathways), 24 visioning and backcasting workshops were held in Greece, Hungary, Lithuania, Norway, The Netherlands and the UK. The resulting workshop-level visions, which produced over 1500 ideas and suggestions across the workshops, were then condensed into 3 pan-European Visions yielded three archetypical visions, namely Local Community, I-Tech, and One Ethical World.

Following this, a new methodology was developed and applied in 17 workshops across the aforementioned countries, engaging young people and experts in developing suitable pathways towards the realisation of the above visions. Both phases were done in conjunction with 3 specific sectors, namely household energy, individual mobility and food. After an outline of the visions, this paper outlines the pupils' perception, followed by an exploration of the resulting pathways for the three visions across the three sectors.

Introduction

In a fast paced world, where the consumption of resources has been amplified, the use of raw materials has been intensified and population continuous to grow, the ability of future generations to have access to the resources and be able to enjoy a comfortable life is at stake. This has been recognised as a major concern and many initiatives are now driven towards sustainable development. The concept of sustainability and sustainable development has been around for decades, but only relatively recently did it attract mainstream attention and became one of the top priorities of the green agenda. For sustainable development to be achieved, a holistic, integrated and suitable approach is required to better portrait the problem and find a solution that is viable and long-term. This is because, sustainable development is subject to the interconnections between ecological, economic and social-cultural characteristics, and for it to be realised, cooperation of all relevant stakeholders, whether this is government, industries, institutions, communities and individuals, is highly required.

There remains substantial obstacles for a more fundamental change (be this in pace or direction) towards more sustainable living at the individual level, with many common problems that can be divided into lethargy, difficulties in translating ethical behaviours into sustainable activities, the perception of myopic change in the face of the need for global transition, game theory dilemmas, scepticism towards the need for such change, availability of alternatives (and technologies) and a sense of detachment between policy, practice and long-term visions. Therefore, interactions between relevant stakeholders at different levels and the reinforcement of initiatives towards sustainable development are important as it acts as the forerunner in achieving the transition towards sustainability. However, such interactions and subsequent transitions are complex because of the dynamics and interconnections between cultural, social, organisational, economic and technological changes and of the uncertainty of future predictions that affect stakeholders and the society in general (Quist and Vergragt, 2006). Of course, the larger the required change, and the longer the time-frame, the greater the uncertainties, and thus the greater the need for greater social inclusion in the deliberations. To deal with this complexity, action to foresee, or at least make sense of, long-term sustainability which then allows to develop visions of suitable future has been proposed (Berkhout, 2005; Rotmans, 2005; Wiek, Binder and Scholz, 2006). Following these visions of the future, transition pathways that describe specific actions toward such future vision have to be developed.

These transition pathways however, are not easy as they have to take into account pragmatically the dynamics and interactions between different levels, actors and niches and the complexity that is associated with them. Only then, transition pathways can provide an efficient and reliable approach towards a desirable and sustainable future. The development of transition pathways typically involves the participation of experts, and relevant stakeholders who have the knowledge and expertise to grasp and deal with the complexity of such processes. However, the involvement of young people in the development of such visions and their transition pathways is of great importance as well - it is their future that will be affected by the pathways, and they will experience the necessary changes for the achievement of a sustainable future. The need for young people to participate in the development of policies and strategies and subsequent implementation has also been supported in many studies (cf. Wyn and Dwyer, 2012).

This engagement empowers young people in being responsible and accountable of their actions, and ensures the inclusion of a wide variety of concerns, insights and reflections, that delivers consistent and well-thought decisions (Carlsson-Kanyama et al 2008). Involving young people also offers a greater chance that they are more agreeable to the changes; they may in fact become more pro-active in contributing to these, or even committed and insightful in proposing new, more drastic ones. Also, the generational gap that underlines the difference in how young people perceive their future as opposed to the elders creates a degree of an uncertainty as to whether the transition pathway will be able to lead society to its future destination. As such, the inclusion of young people to the process of transition pathways development is essential for their successful implementation in the future. However, the unfortunate reality is that those

involved with shaping these futures (older experts) are typically unlikely to live in these futures, and, worse still, *vice versa*.

This paper demonstrates the importance and practice of young people participation in the development of transition pathways by involving young people alongside with experts in the development of pathways towards a sustainable, low carbon Europe. The aim of the paper is to present the pathways developed and highlight the main actions that have to be undertaken for the future visions, that each pathway leads to, to be realised.

Background

For the development of transition pathways, a number of different approaches can be followed. Although, these approaches share some similarities, differences also emerge as a result of the stakeholders involved, the dimensions considered or the steps taken. The most prominent methodologies for the identification of transition pathways towards transition visions, are the backcasting methodologies and the multi-level framework (Smith and Stirling, 2010; Quist 2007).

Backcasting, a methodology introduced in the 1970s, was originally proposed by Amory Lovins as a technique for long-range energy planning called 'backwards-looking analysis'. A few years later Robinson proposed the term 'backcasting' that has remained until today (Robinsons, 1982; Quist and Vergragt, 2006; Mander et al. 2008; Kok et al. 2011; Carlsson-Kanyama et al. 2008). Fundamentally, backcasting is a process during which a future end-point is typically defined by a diverse group of stakeholders, which then considers present objectives and ways through which the defined future end-point, or vision can be attained (Figure 1).

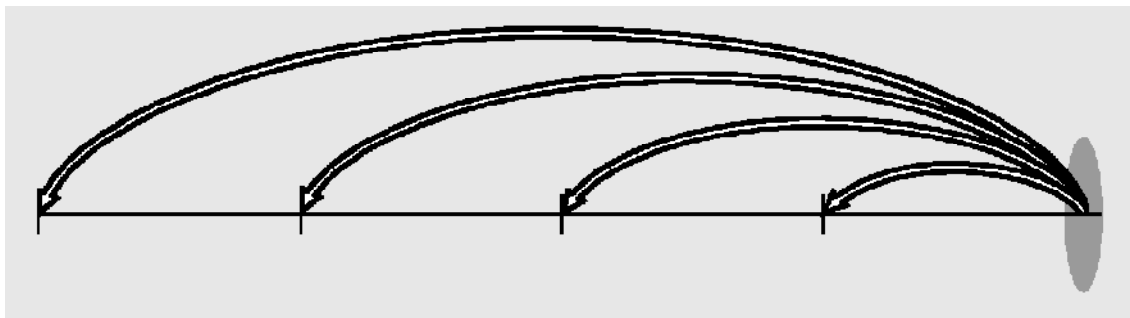


Figure 1: Backcasting representation (Rotmans, 2001)

In the literature there is a long list of studies in which interactive, participatory backcasting is proposed and/or used as a suitable and useful method to explore transition pathways (van de Kerkoff and Wieczorek, 2005; Quist and Vergragt, 2006; van den Kerkoff, 2004; Rotmans, 2001; Jansen 2002; Carlsson-Kanyama et al. 2008). The success of this method relies on its potential to include a broad selection of stakeholders, a variety of visions and a number of participatory and analytical exercises, making it a promising and innovative tool (van de Kerkoff and Wieczorek, 2005; Quist and Vergragt, 2006). However, there is ambiguity as to how backcasting can be translated in different studies as it can constitute a conceptual or holistic level, a level of social or multi-actor processes, a level of an overall approach or a level of specific steps within an overall approach (Quist and Vergragt, 2006). To clarify this, Quist and Vergragt (2006) proposed a five-step methodological framework for participatory backcasting:

- Strategic problem orientation
- Construction of sustainable future visions or scenarios
- Backcasting
- Elaboration, analysis and defining follow-up and action agenda
- Embedding of results and generating follow-up and implementation.

Following a similar methodological framework, van de Kerkoff and Wieczorek (2005) used the experience gained in the Dutch Climate OptiQns for the Long-term (COOL) project and suggested that interactive backcasting exercises are suitable to facilitate exploration of a variety of visions and pathways towards these visions (van de Kerkoff and Wieczorek, 2005). They highlighted that the selection of these visions must be the starting point of the backcasting exercises. Having selected the visions, participants can then work backwards to the present, where the initiation of discussions will be stimulated and directed in formulating the changes that need to be undertaken, the obstacles that must overcome and the opportunities that must be seized for the visions to be realised (van de Kerkoff and Wieczorek, 2005). These authors also suggested that backcasting exercises can enable participants to distance themselves from their daily interests and concerns, while at the same time making them feel involved in the whole process and becoming aware that their suggestions are important and can have an impact in decision-making (van de Kerkoff and Wieczorek, 2005).

In contrast, Carlsson-Kanyama et al. (2008) reported a participatory backcasting methodology used in their study for the development of pathways towards a sustainable everyday city life in the EU although feasible, was lacking comprehension and completion. They asserted that this was primarily due to the lack of involvement of participants with varied backgrounds, expertise and values, which as a result had an effect in the process. They suggested that for the backcasting process to be successful, an innovative approach must be implemented that would enable participants to distant themselves from their concerns and thoughts and become more imaginative, which resonates with van de Kerkhoff&Wieczoreck's ideas. This would allow the development of a thorough and well-structured plan for realising the visions and understanding the changes that have to be made.

To tackle the challenges posed by the use of backcasting methodology, Kok et al. (2011) in their study on the development of pathways for dealing with the Water Framework Directive (WFD) in Europe, proposed the combination of participative backcasting with exploratory scenario development. This represents a recently introduced method to deal with high uncertainty and complex problems associated with long-term visions. Kok et al. (2011) used exploratory scenario development based on the Story-And-Simulation, whereas the backcasting framework used, was the one developed by Quist and Vergragt (2006). They supported that the combination of the two methodologies provides auseful and comprehensive perspective, and allows stakeholders to develop a set of consistent scenarios by gaining a better understanding of their future.

The combination of backcasting with other methodologies has also been acknowledged and/or applied by Borjeson et al. (2006), Hojer and Mattsson (2000), Eames and MacDowall (2011) and Mander et al. (2008) among others. More specifically, Borjeson et al. (2006) reviewed and discussed the outputs of different techniques being integrated for the development of scenarios/pathways, and provided guidance as to which methodologies are more appropriate depending on purpose. Further, Hojer and Mattsson (2000) in their study supported that backcasting in combination with forecasting can provide a greater insight output because, as they argue, forecasting not only informs on when backcasting is needed, but also determines the backcasts. This recommendation is shared by Mander et al. (2008) who in their study to support the UK to achieve a 60% reduction in carbon emissions, suggested that combining backcasting and forecasting is beneficial for the development of transition pathways towards carbon reduction emissions. Another example of the use of integrated techniques is demonstrated by Eames and MacDowall (2010), who in their exploration of transition pathways towards a hydrogen economy, used a combination of participatory backcasting with multi-criteria decision analysis tool called multi-criteria mapping (MCM). These authors supported that the backcasting approach allowed them to engage and explore the varying interests of stakeholders involved in the process, whereas the MCM appraisal was beneficial in getting an integrated perspective on the sustainability of different hydrogen futures. The inclusion of the multi-level perspective across regime, niches and landscape, in their analysis highlighted the importance of social,

economic, political and technological perspectives in shaping transition pathways. In conclusion, there is methodological evidence and experience that social deliberation can contribute to the development of long-term plans towards large-scale change. This enhances the possibilities that inclusion of young people (and thus non-experts) in such deliberation is beneficial, apart from the prima facie argument that such inclusion is a necessity for reasons of governance, ethics and operational considerations.

The multi-level perspective (MLP) is a recently developed approach that focuses on the analysis of the dynamics of transitions. The term multi-level refers to the interactions between technological niches, socio-technical regimes and landscapes, which constitute the micro-, meso- and macro- levels respectively, of the MLP (Figure 2) (Geels, 2002; Geels, 2006; Foxon et al. 2010; Lachman, 2013). Each one of these levels has a broader meaning. More particularly, the technological niches provide space where learning occurs, and where social networks congregate to support the generation and development of radical innovations. The socio-technical regimes are practices, rules and shared assumptions within which the dominant actors interact with each other and with their environment (Landscape), whereas landscape is the wider space, where social, political and cultural values, economy, demography and the natural environment, and institutions evolve (Geels, 2002; Foxon et al. 2010; Lachman, 2013; Geels, 2005; Rotmans et al., 2001). Landscape is a structural factor that can lead to fundamental changes in socio-technical regimes by influencing the regimes and providing opportunities for niches to be established (Markard et al., 2012).

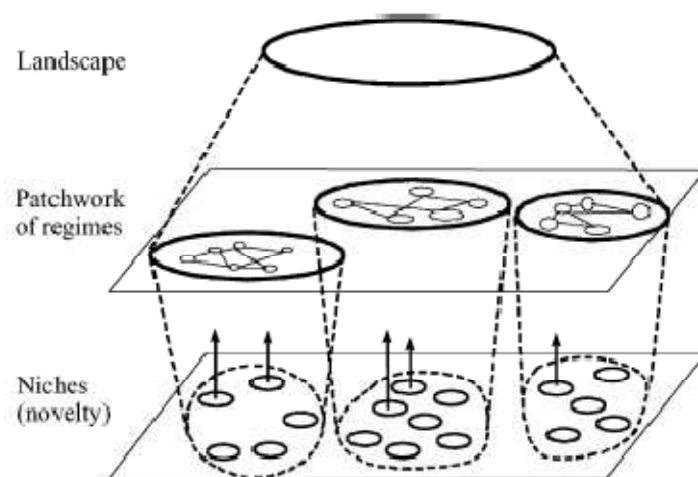


Figure 2: Representation of the multi-level perspective (Geels, 2002)

The MLP has been used for the development of transition pathways by many authors (Geels, 2002, 2005a,b, 2006a,b; van den Ende and Kemp, 1999; Foxon et al. 2010). These studies built, among others, on the work of Kemp, Rip, and Schot (Kemp et al., 2001; Rip and Kemp, 1998). Geels and Schot (2007b) have elaborated how time and interactions between niche-regime-landscape can lead to different transitions which can follow different types of transition pathways. Further, Foxon et al. (2010) have used the MLP and showed that its integration with technological innovation systems can provide a more thorough analytical basis for the development of transition pathways to a low carbon, electricity system in the UK.

The pathways towards a sustainable, low carbon Europe

Creating Innovative Sustainability Pathways (CRISP) is an EU project involving six countries, namely the UK, the Netherlands, Norway, Lithuania, Hungary and Greece, that aims to develop visions of sustainable, low-carbon lifestyles for Europe in 2030, and viable pathways to achieve these. The development of such visions and their corresponding pathways requires profound and fundamental changes across many aspects of society and lifestyles, whilst in many instances

it necessitates radical changes with respect to different practices (household, individual and corporate), networks and infrastructures, structures of governance and decision-making processes, as well as a renewed set of ethical values and cultures.

The theories of Backcasting and Multi-level perspective, described in the background above, have as a result been mingled and used in achieving the development of pathways towards a sustainable and equitable future. Following the principles of backcasting, the first step of CRISP was to define a problem, scope or vision, followed by the objectives, goals and changes that have to be made in order to enable these visions to be realised. This was done with stakeholder fora in each of the participating countries, involving school pupils in their last year of school before being eligible for University. In total 24 workshops were held, with over 50 workshop-specific visions being developed, based on an aggregation of about 1500 individual ideas. These visions were then considered and compared, with a CRISP workshop conducted to synthesise these workshops into a smaller set of overarching end-visions. Three visions were identified and developed, called Local Community, iTech and One Ethical World presenting broad characteristics as follows:

- *Local Community*: Strong regional identity, local production for local consumption, emphasis on social relationships, vegetarianism, social cohesion, individual responsibility, collaborative consumption.
- *One Ethical World*: globalised supply chain, global values are locally interpreted, global healthcare, global governance. Fair trade displaces free trade.
- *I-Tech*: technology and innovation drives everything. Highly competitive world. Risk is replaced by intelligent machinery. Functional food and non-animal derived meat dominates.

A more detailed description of the characteristics of each vision can be found elsewhere. By using the concept of transitions, these visions were then examined under the prism of current and future global and local change, using 2013 as the base year and 2030 as the endpoint, and with focus on mobility, food and household energy (Figure 4). To continue with the social inclusion emphasis, a second round of workshops and seminars were organised – 17 in total - to develop viable pathways towards achieving these visions (Figure 3):

	One Ethical World	Local Community	iTech	Sum
Food	SIFO (Norway) - Expert CEU (Hungary) – Expert CEU (Hungary) - Public	Surrey, (UK) – Expert RUG (Netherlands) - Expert	KTU (Lithuania) - Expert	6
Energy	RUG (Netherlands) - Expert	Surrey, (UK) - Public TNO (Netherlands) - Expert TNO (Netherlands) – Public	SIFO (Norway) – Expert TEI (Greece) - Expert	6
Mobility	Surrey (UK) - Public	CEU (Hungary) – Expert TEI (Greece) - Public	Surrey, (UK) - Public (x2/ parallel sessions)	5
Sum	5	7	5	17

Whilst the majority of the workshops were with pupils of the same age as the first round of workshop, a significant number of workshops were also held with experts in the field of the three sectors. This was done to aid an analysis of the difference between the pathways designed by young people or by experts, as well as their respective views on the process and its outcomes.

After this, the many workshop outputs were grouped into a number of dimensions that aimed to describe and differentiate the changes that are necessary to be taken from a number of different perspectives. These dimensions, namely Structure, Practices and Culture, co-depend in their direction and success and fit within each other following a synergistic behaviour towards each future vision (Figure 3).

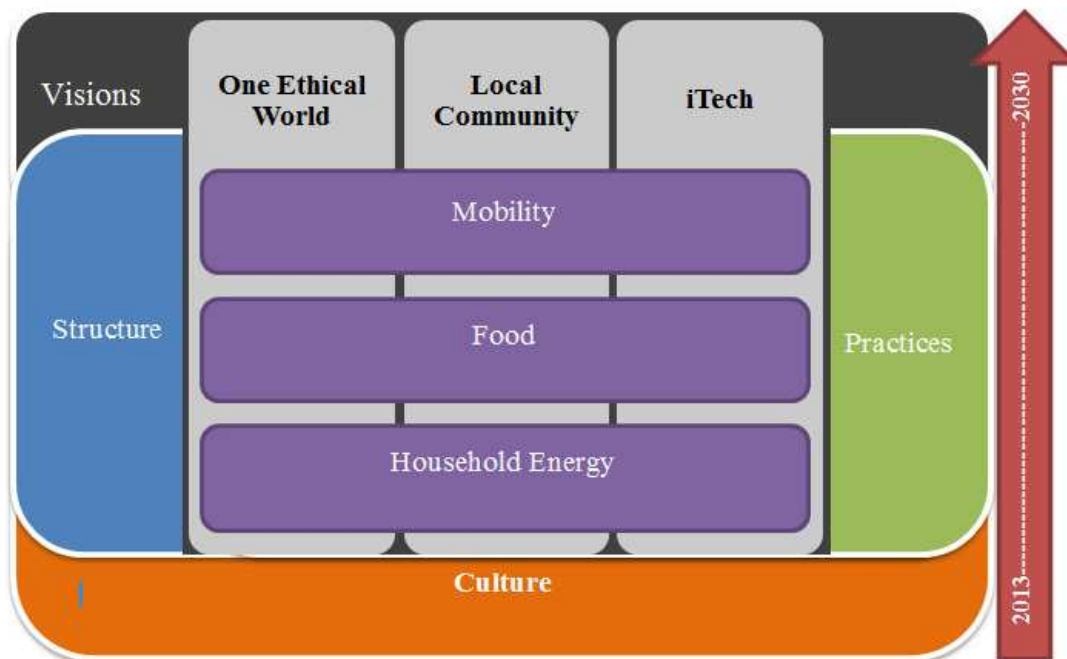


Figure 4: The structure for the visions' pathways

In comparison to the other dimensions, culture is a much more abstract dimension that affects structure and practices and is affected by them in the long-term. The magnitude and direction of the effect of culture depends on history, spatial characteristics, socio-political situation and economic status. Therefore, no specific actions or concepts were distinguished in this dimension as neither a chronological order can define it. This is not to say that culture is irrelevant or meaningless, to the contrary, but it is a dimension that is difficult to “manage” in a deterministic sense, and thus does not sit easily in a task-oriented pathway that features clear delineation and attribution of events with their corresponding effects. Structure and Practices, however, can evolve through time and can be shaped by direct (and directed) interventions. The former dimension has been split into two, with Governance as well as Infrastructure and Networks being the backbone of the realisation and organising of change. Practices represent action and behavioural change towards the achievement of the structured changes, and is influenced by both structure and culture.

Presentation of the pathways

The presentation of the vision pathways based on the three dimensions allows the comparison and assessment of the individual activities of the different pathways. It fosters the analysis of convergent and divergent activities between the pathways and includes the ideas, suggestions and perceptions of the future of professionals and pupils, emerged from the workshop results.

Four phases are distinguished towards the development of the pathways with each phase denoted at a specific time interval. These phases, called Pre-development, Take-off, Acceleration and Stabilisation in ascending order were denoted with a three-year, ten and four-year time interval, respectively, where Take-off and Acceleration was combined for some of the dimensions, notable “practice”. As mentioned, year 2013 was the base year and 2030 the projection year. Based on the common elements between the pathways from a given time interval, different clusters were formed that contained the homogeneous elements that “fit” the development and stream of change (Table 1).

Table 1 Phases of the pathways and clusters within each phase based on their common elements

Pre-Development		
Governance	Infrastructure / Networks	Practices
<ul style="list-style-type: none"> • Political Support • Principles of behaviour • Support Industry/Innovation • Education • Strengthen Local/Global Community 	<ul style="list-style-type: none"> • Food Infrastructure - Initiation • Transport Infrastructure - Initiation • Energy Infrastructure - Initiation 	<ul style="list-style-type: none"> • Food Practices - Initiation • Transport Practices - Initiation • Energy Practices - Initiation
Take-Off		
Governance	Infrastructure / Networks	Practices
<ul style="list-style-type: none"> • Consolidate/Relocate Governance • Products and Production Reform • Supporting Innovation 	<ul style="list-style-type: none"> • Food Infrastructure - Roll Out • Transport Infrastructure - Roll Out • Energy Infrastructure - Roll Out 	<ul style="list-style-type: none"> • Food Practices - Roll Out • Transport Practices - Roll Out • Energy Practices - Roll Out
Acceleration		
Governance	Infrastructure / Networks	Practices
Consolidate/Relocate Budgets	(cont. of phase 2)	(cont. of phase 2)
Stabilisation		
Governance	Infrastructure / Networks	Practices
Assessment of Distribution Effects	Food, Transport and Energy Infrastructure Integration	Food, Transport and Energy Practices Integration

For the Infrastructure and Practices dimensions, Phase 2 and 3 are seen as one phase that expands into a 10-year time. This is because many of the activities that are necessary in both dimensions cannot be fully attained in a 5-year period – as for instance, the development of a suitable electricity grid that inevitably will take longer than 5 years to implement. The narrative of the developed pathways towards the three visions is presented below.

The narratives of the pathways

One Ethical World

The pathway towards *One Ethical World* requires in the first phase a number of drastic measures to be taken: On the Governance front, it requires the establishment of the principles of behaviour for enabling the development of global etiquette for business conduct, allowing fair and

equitable trade principles for underpinning policies and reflecting externalities in food prices. It also needs the regulation of industry to encourage incorporation of global, social and environmental responsibility, as part of a wider effort to support industry and innovation. Education is a further important aspect to Governance, for nurturing global understanding and cultivating fairness and cooperation at a young age, but also to ensure higher education translates competencies and insights from research towards their application by future graduates.

The strengthening of the local/global community to develop and subsequently enforce common interests across national boundaries is another requirement. On the Infrastructure side, the pathway requires the development and support of food, transport and energy infrastructure. The initiation of this development necessitates the creation of a food system based on fair trade and food security (food), the development of low carbon modes of transport (transport) and of an integrated renewable energy system (energy). These are reliant on the development of new models of business practice and the mobilisation of young people and consumers, all reinforced by people collaboration and networks. On the Practices level, which is governed by food, transport and energy practices, the pathway requires an increase in vegetarianism (food) and in teleworking and teleconferencing (transport), which can both be stimulated by awareness raising campaigns organised by groups of people and networks.

In the second phase and on the Governance level the pathway requires consolidation and relocation of governance through the enactment of strict food quality controls, accountability of governance and land reform. It also requires production companies to comply with the ethical and sustainable measures of production under reformation plans. On the Infrastructure side, the roll out of food, transport and energy infrastructure requires major improvements to be made with food production and storage based on sustainable standards being only one of them. This opens the way for the practice requirements in terms of food, transport and energy to be revisited and reviewed, in order to enable the introduction of meat free days in the public sector catering, the promotion of zero-waste generation in households (food) and the closure of gas and coal power stations by the supremacy of the use of alternative and renewable energy sources. For the realisation of this stage, however, trust must be put upon the international institutions, people and networks.

In the third phase and on the Governance side, the pathway requires the consolidation and relocation of budgets that will bring fiscal reform and budgeting at global level. On the Infrastructure and Practices level, the roll-out initiated in phase two continues as the time-consuming nature of the activities involved in these dimensions means that more time is allocated into these actions.

In the fourth phase, the pathway requires an assessment of the distribution effects by focusing on the fair distribution of resources, enforcing legislations for the wiping out of any remaining unethical practices in the production and provision of goods, and increasing regional specialisation for mutual benefit. These requirements are set on the Governance level, whereas in the Infrastructure and Practices level the pathway requires an integration of the food, transport and energy support, development and performance, respectively. More specifically, in the infrastructure level, an internationally integrated low carbon transport system, that is clean, efficient, reliable, and publicly and privately available (transport), together with an internationally integrated smart grid (energy) are ultimate goals.

Local Community

The pathway towards the *Local Community* vision requires on the Governance side, the implementation of the principles of behaviour, such as policies to incorporate externalities into pricing and support for "local first" guidance on purchasing, and the support to local industry and innovation to be endorsed, through the promotion of local R&D and the support of local specificity in product design. Alongside this, education is also required in order to foster skills for local sustainable living. An overall strengthening of the local community is required through

an effective engagement and devolution of decision-making power, a facilitation of decentralisation and provision of a governance framework for the promotion of well-being, expansion of local production and consumption and widening of the local markets for exchange and barter common. On the infrastructure dimension, the pathway requires the initiation of the development of food, transport and energy infrastructure. The actions involved in this stage, include the development of local food systems and models of business practice at local level (food), investment in public transport and support for car sharing schemes (transport) and development of local renewable energy systems (energy), among others. This initiation incorporates public involvement in local activities and clubs that is motivated by organised groups and networks. On the Practices dimension, the pathway requires the initiation of the food, transport and energy practices. Better food practices, such as buying local and developing products made from energy efficient and environmentally friendly material (food), competent work conditions, such as teleworking when work not close to home (transport), and efficient houses, which retain the heat/cold and harvest rainwater (energy), are necessary. These practices can be implemented by campaigns that aim to raise awareness, stimulate the local reuse and recycling of components and materials, create enthusiasm around local activities (local eBay's, local tree planting, decentralization of materials recycling and reusing initiatives etc.), and inspire intergenerational interactions. This can be seen in the cultural dimension as a gradual appreciation and acceptance of local values espoused in the practices of people.

In Phase two of the pathway, the requirements on the Governance level, include the consolidation and relocation of governance based on which the community develops a plan for the integration of local sustainable food, energy/housing and mobility needs. Further in the Governance level, the pathway requires products and production reform, for making local production and consumption and home energy generation and insulation, attractive to everyone through the provision of incentives. It also requires the development of local power companies in every municipality and the amplification of household renewable energy generation, to support innovation. On the infrastructure side, it requires the roll out of food, transport and energy development. Tariffs based on road use, use of biofuels and fuel cells for transport, increase in household density and rural industry and development of local smart grids are only some of the measures that are to be taken in this stage. The acceptance of these measures will be stimulated through carbon allowances introduced by local communities and networks. On the practices side, the roll out of food, transport and energy practices involves an increase in vegetarianism, home-cooking and household food-growing in terms of food, as well as an increase in mobility by other means than car, working, living and shopping locally and holidaying in the country in terms of transport. In the area of energy, the roll out involves the communalisation of housing, among others. These practices foresee the elevation of collaborative consumption within people and networks, and the sharing of goods and services locally through the use of technological means.

In the third phase, the pathway requires the consolidation and relocation of budgets that will bring fiscal reform and will allow the siting of financial resources at local level, on the Governance platform. On the Infrastructure and Practices level, there is a continuation of the requirements set in the previous phase, due to the slow rolling nature of the activities involved in these dimensions.

In the fourth phase, the pathway requires an assessment of the distribution effects on the Governance level, whereas in the Infrastructure and Practices level the pathway requires an integration of the food, transport and energy development and practices, respectively.

iTech

The *iTech* vision pathway requires on the time interval between 2013 and 2015 the political support, collaboration and will, and the support of industry and innovation that will enable technological development and application for a sustainable living. Alongside these requirements rudiments on the Governance level, is education, which focuses into providing a

deep understanding of the development and proper use of technology to the specialists and the public, through the use of social media. On the Infrastructure side, the initiation of food, transport and energy development necessitates the creation of public private partnerships that focus on social responsibility by organised groups and networks, and the development of new technologies through the initiation of strong partnerships between private and public sector that aim to give a rise at technological breakthroughs. Linking the IT sector with transport to increase its beneficial outputs and minimise the impacts of the existing high carbon technology, is a key requirement of the pathway towards a sustainable *iTech* vision. The initiation of food, transport and energy practices sees the development of meat substitutes and food pills to cover the needs of the ever increasing population and the ever decreasing resources wasted for food production, as well as the substitution of mobility for work related purposes with teleconferencing and teleworking. These initiatives, supported by organised groups and networks, foresee to increase awareness of resources security and to limit unsustainable energy use by the use of technological advancements.

On the second and third time intervals from year 2016 to 2025, Governance requirements lie on the consolidation or relocation of governance and the support of product production reform by developing global standards for food safety and imposing legislations for technological development. Also on the Governance side, the innovation support requires encouragement of households to install the latest energy generating and energy conversion techniques, and motivation of the local and national government to not only promote the development of technology for sustainable living but its use, too. The roll out of food, transport and energy infrastructure requires among others the production and testing of new food proteins, while networks promote carbon quotas to encourage the rolling. On the practices front, the roll out of food, transport and energy practices requires cultural acceptance of meat substitutes and demand for food pills (food), a car servicing and user-based systems (transport) and increased awareness to overcome aversion to technology and intensify its use by all, for increasing living standards in a sustainable manner (energy). For this to be achieved a collaboration between people is required to retain the trust of people in public-private partnerships and to succeed in updating the technological functioning of neighbourhoods.

In the final phase, the pathway requires an assessment of the distribution effects on the Governance level, whereas in the Infrastructure and Practices level the pathway requires an integration of the food, transport and energy development and practices, respectively. Particularly in the Infrastructure dimension, the development of an integrated public transport system and of a sustainable and reliable energy system is fundamental, whereas in the Practices dimension the pathway realises sustainability to be integrated into every aspect of everyday living.

Conclusions

The paper started by arguing that there is a *prima facie* case for the consultation, if not involvement of young people in the development of long-term visions and their corresponding pathways. This makes intuitive sense, as young people will live in these futures, and the assumption is that people who are involved in shaping change are often more willing to accept it, or, better still, are more enthusiastic about working towards such change. Such support is even more important when it comes to long-term change, where individuals will be required to change, or where deep, structural or radical change is required. Arguably, the threat of Climate Change and the change necessitated by the wider (and deeper) agenda of sustainable development would fit these characteristics well. From this perspective, new methodologies need to be developed to coalesce the need for expert input – to carry the complexities of the current situation as a basis for a realistic pathway towards future change – and the need for young people – to ensure the vision is actually carried by those who will (have to) live in these futures, or have to suffer the consequences of not attaining sustainable solutions for the “sticky problems” their previous generation will leave.

The paper then summarised the process stages of CRISP, where, firstly, young people from 6 EU countries were involved in first developing desirable futures of low-carbon, sustainable living within the sectors of household energy, individual mobility and food. Secondly, they were then collated and synthesised into three overarching visions. A second round of workshops of pupils as well as experts then produced chronological sequences of Plans of Action to develop viable pathways towards achieving these visions. This novel approach to the inclusive development of transition pathways has a number of significant implications:

Firstly, there is existence value in the transition pathways. They are at first hand no less complex or viable than other pathways that were developed. They may lack detail in comparison to others, such as Kok et al (2011), or Sondejker et al (2006), but the authors found no reason why these visions should be discriminated against as viable trajectories for change. The task given in the workshops was, however, conducive towards wider, societal change, which runs counter to more sector-specific pathways (cf Foxon et al 2012, Eames et al 2010 etc) where greater detail require more technical knowledge. In this sense, brevity was an advantage in the design, but the requisite lack of technical detail may pose implementation problems. However, the project showed that young people were able to develop visions and pathways to attain them, and these workshop outputs were structurally no different from those of the expert workshops. As an aside, the comparison of the experiences between experts and lay people is explored elsewhere. However, pertinent to this debate is that the expert workshops to develop pathways were considerably more difficult to facilitate, primarily because experts' quality (and quantity) of contribution depended substantially on whether they tended to agree or disagree with the vision. Likewise, experts found it much more difficult to "think back from the future", especially when they were experts in the technical design of the status quo.

Secondly, as it is possible to develop such visions and pathways, the function of a process to develop transition pathways using experts only should be questioned. The paper has started by arguing that low-carbon, sustainable lifestyles requires deep change of behaviour, which poses a prima facie argument that social change requires societal innovation and dialogue? If so, the role of experts is a changed one, towards a supportive, information-sharing role that is arguably subservient to the deliberations of others. The problem is, however, that workshops where experts and lay people are to work together very easily transcend into an expert workshop, as the technical knowledge held by experts can shift the power to deliberate away from young people to their older experts. There are several possibilities to manage this, none of which has been explored.

Thirdly, the transition pathways followed a common dynamics, dovetailing the transition management framework broadly divided into 4 phases. Within this, there were a large number of activities that were shared between the pathways. This opens up two possibilities, one of which is that the visions are not that different from each other, the other is that the pathways that should lead to the visions are more comparable at the level of the proposed actions than the (diverse) visions would indicate. The authors suggest the latter, following reflections from the workshop panels that some of the activities "we should be doing anyway". If so, the logical conclusion is that some activities are germane to change in the overall direction of low carbon, high sustainability lifestyles, and some activities shape the direction towards specific visions. It is thus likely that the "future we will end up with" is a combination of different pathways leading to somewhat different visions. If so, change becomes a blending process of pathways and visions, and this consideration leads back to the design and original purpose of the visions as crystallisation points for a public debate about which future "we" want, and how we should get there?

Fourthly, and finally, developing transition pathways over a period of only 17 years is a very challenging task. This is less because of timeframe is comparatively short, but because the scale of change at hand requires a fundamental and deep-rooted change which, in the eyes of most participants, is possible, but very radical. The question was raised whether society has the appetite for that kind of change?

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