Chapter 6

The dual challenge of sustainability transitions[6]

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Abstract

In this chapter we argue that sustainability transitions include two challenges: on the one hand achieving a long-term change to various technologies and infrastructures, while on the other hand ensuring that values and consumer criteria change simultaneously. Transitions that fail to do so will disappoint in the end. We review two sustainability-oriented transitions where criteria have changed: the hygienic transition around 1900 and the waste management transitions at the end of the twentieth century. While in these cases people's values, perceptions, and criteria changed as part of the transition, this does not seem to apply to sustainable mobility and energy, where the main target is decarbonisation. What is missing is a reconsideration of individual mobility and energy use.

6.1 Introduction

The notion of transitions (Geels, 2002, 2005, Grin et al., 2010) has emerged as a theoretical response to major socio-economic challenges including depletion of natural resources and global warming. The idea is that systems of transport, agriculture, and energy have to be superseded by other systems. Such sweeping transitions have occurred in the past, for instance in the shift from sailing boats to steam ships in the nineteenth century (Geels, 2002) or the change from coal to natural gas in the Netherlands in the 1960s (Rotmans et al., 2001). And thus, the argument goes, they may happen again.

Such systemic changes have been studied by evolutionary researchers, historians, and scholars in the fields of science, technology, and society. Frameworks such as the multi-level perspective (Geels, 2002, 2005) and strategic niche management (Kemp et al., 1998) highlight both the persistence of incumbent regimes and their vulnerability. The general message is that it is possible – based on an understanding of the systemic and dynamic properties of existing and emerging systems – to guide or actively encourage a transition from the current to a new system. Doing so is a major challenge, however, that goes well beyond the capability of governments and individual actors.

In this chapter we argue that sustainability adds an additional challenge. The idea of sustainability transitions not only includes the challenge of orchestrating a *change of system* (transport, agriculture, energy) but also *a change in the criteria* that actors use to judge the appropriateness of products, services, and systems. In the transition from sailing ships to steam ships fuelled by coal, for instance, the criteria for choosing ships did not change dramatically. Both types of ship competed in terms of tonnage, reliability, and speed, as sailing ships had done for decades or even centuries. In the transition from coal to gas, the basic aspects on which technologies had to compete did not change dramatically either, in terms of price, ease, and reliability.

For sustainability transitions to occur, however, criteria need to change dramatically, or transitions run the risk of not being sustainable due to rebound effects and other impacts. For instance, the transition from combustion engines to electric vehicles, which is now being intensively studied, will only be sustainable when not only the nature of the vehicles changes (powered by fossil fuel or electricity, respectively), but also the way in which they are used. In other words, the values and practices of mobility need to change as well. Today’s cars are bought on the basis of speed, range, reliability, and “image”. In our society it is normal to own a car and use a car for almost every trip. Looking at alternatives, electric vehicles address two problems that stem from the intensive use of cars (noise and pollution), but they do not address problems of congestion and safety, while the intensive use of electricity and batteries raises additional problems. Moreover, an unanticipated effect of the development of batteries for cars is their use in bicycles. Unless electric bicycles are used for longer trips that are currently made by cars, this represents a negative development, especially if the bicycles are used to make additional trips. Therefore the assumption of individual, material-intensive mobility as well as the need for mobility has to be reframed.

6.2 The hygienic and waste management transitions

Two socio-technical transitions, in which criteria changed dramatically, bringing society closer to sustainability goals, were the *hygienic transition* and the *waste management transition*, described in Geels and Kemp (2007). The hygienic transition concerned a shift from cesspools to integrated sewer systems, motivated by hygienic concerns. In the Netherlands, the transition occurred over a period of 60 years (1870–1930). In the absence of toilets, most people relieved their bowels in public spaces, dumping urine and excrement on streets and (city) canals. The middle and upper classes had personal in-house privies, where excrement was collected in cesspools that were emptied a few times a year to serve as fertiliser. The transition which involved major health and nuisance benefits was a slow process. Unlike in the UK, Germany, and France, the sewer option was not used in the Netherlands before 1893, because of a battle between different systems (with sewers competing against a barrel-collection system and the Liernur pneumatic system). In 1938, 47% of all municipalities in the Netherlands had sewers. Comfort and convenience were important drivers, as were the new criteria for public hygiene. Costs at first impeded the introduction of the sewer system, but with growing affluence this became less and less of an obstacle. It was not an easy or obvious transition. Today some criticise the sewer system on environmental grounds for using drinking water to flush toilets and for the high energy consumption in waste-water treatment.

The story of the transition in waste management from 1970 to 2000 also shows a change in values, practices, and criteria that define what “waste” is and how it should be handled.[7] Before 1970, waste management consisted primarily of landfilling, a task carried out by municipal authorities. Getting rid of waste was the primary concern, with waste material also being used to fill up ditches and create land for housing. This changed in the 1970s: waste and the absence of good waste management practices received increasing attention. Environmentalists criticised governments and business about the way waste was being managed, while local resistance to new landfill sites grew. The 1972 Report to the Club of Rome about limits to growth, together with the oil crisis in 1973, drew attention to the scarcity of raw materials. The important change that we should emphasise is that waste disposal was increasingly seen as a problem

[7] In Geels and Kemp (2007), the change in waste management system is referred to as a transformation instead of a transition. In Geels and Schot (2007), a transformation is a special type of transition, one in which regime actors respond to landscape pressures by *modifying the direction* of development paths and innovation activities. Gradually a new system grows out of the old one, through cumulative adjustments in a new direction.

instead of as a solution. Special legislation for waste was developed and provincial authorities were charged with putting an end to the (uncontrolled) dumping in landfills and to benefit from economies of scale for incineration. An important cognitive institution was the famous “waste hierarchy” proposed in the parliamentary motion brought forward by Ad Lansink in 1979, known as Lansink’s Ladder. The waste management hierarchy ranged from prevention, through re-use (of products), recycling (of materials) and incineration (with energy production) to landfilling as the last option.

The new criteria for waste were further consolidated when the Dutch government opted for a *differentiated waste-stream* approach in which certain types of waste (notably paper and glass) were singled out for recycling. Despite these intentions for upgrading waste practices, many waste management activities only occurred at a small scale and did not result in effective environmental protection. Concerns about non-sustainable waste management did not disappear and reached a peak in the 1980s, following the discovery of leaking landfills (Vogelmeerpolder) and contaminated land (Lekkerkerk and Griftpark). Waste scandals often figured as news items in the 1980s. At the end of the 1980s, the Dutch waste management system was in a state of crisis because of capacity problems stemming from growing quantities of waste and reduced capacity. The system was reviewed by a specially created committee (the Landelijke Coördinatie Commissie Afvalbeleid) which concluded that the current organisational structure was too fragmented, dispersed, and small-scale. It argued for the creation of a national organisation to oversee and manage waste volumes and to keep disposal costs under control. Their advice resulted in the creation of four waste regions and the Waste Management Council (AOO), which would play an important role in the modernisation of the waste system.

Thanks to a range of measures (such as the ban on 32 waste streams for landfilling, a packaging covenant, and higher tariffs for landfilling), the amount of waste being landfilled fell from 14 million tons in 1990 to 5 Mton in 2002 (a total reduction of 9 Mton). Today, all landfills have advanced systems of soil protection and methane extraction systems. In the same period, the incineration capacity increased gradually, from 2.2 Mton in 1980 to 4.9 Mton in 2000. Recycling increased from 23.5 Mton to 45.3 Mton between 1985 and 2000. Also the total number of landfill sites decreased significantly the last decades (see Figure 6.1 and 6.2).

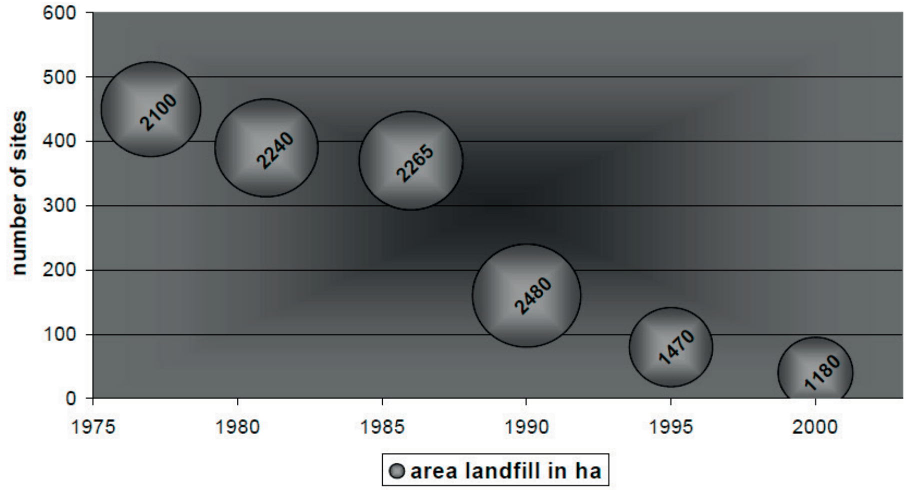

Figure 6.1 Reduction of landfill in The Netherlands (Source: AOO)

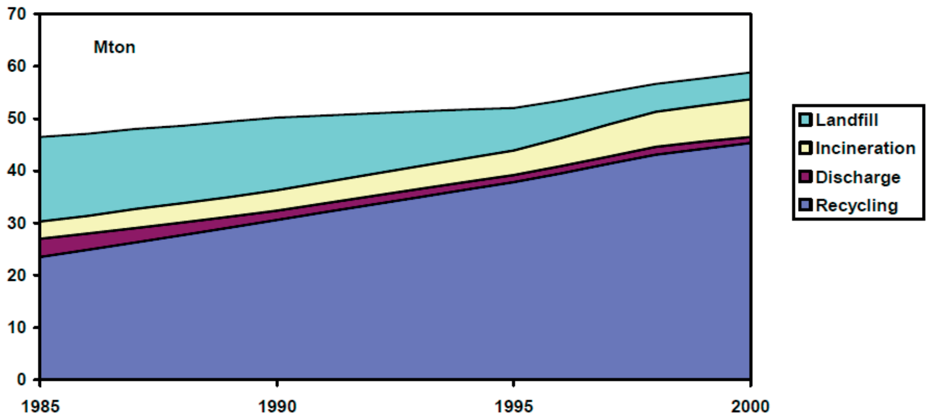

Figure 6.2 Changes in waste management in The Netherlands (Source: AOO)

The transformation of the waste management system is often viewed as the result of policy. Such a view, although not “wrong” per se, overlooks how policy itself was the result of various changes: the growing volumes of waste, the waste scandals in the 1980s and early 1990s, and, in particular, changes of perception, in which waste became “a waste of resources”. In addition, the waste scandals helped to close down old incinerators and build better ones.

The AOO as an institution of governance played an important role in the transformation process. Negotiations between different tiers of government and with private waste companies took place within the AOO, with the actors agreeing on the general direction of creating a modern and efficient system of waste management with less waste being landfilled. Although officially opposed to incineration, the environmental movement did not focus on this aspect because they understood the bigger picture, i.e. the high costs of advanced systems of incineration necessitated a high tax on landfilling burnable waste, which encouraged waste prevention and recycling. The waste companies were happy with the larger scale at which they could operate. The reorganisation of the sector was seen as a blessing by the AOO, as major companies from North America, including Waste Management Inc. and BFI, took control of small companies. The large companies were committed to full compliance and had a strong incentive to respect the law.

In this transformation, new “sustainability” criteria were incorporated formally in law and informally in the waste management practices of companies and consumers separating their waste. The reorganisation of the waste market suited the interests of big waste companies, and environmentalists were happy with the incentives for prevention and recycling being created through laws and waste taxes negotiated within the AOO. However, the system did not manage to radically alter product features in terms of design for assembly and re-use. The final waste goal was therefore not achieved because of opposition from product manufacturers and because consumers did not seek products with second-life components.

6.3 Sustainability criteria for the transitions to sustainable mobility and energy, and the problems of introducing them

Compared to the hygiene and waste transitions, the transition to sustainable mobility and sustainable energy can be expected to be much more difficult because the systems for automobility and fossil-fuel based energy are much more deeply embedded. Both car mobility and cheap energy are viewed as basic rights. The criterion of affordability – so important for users and governments – conflicts with sustainability because affordable mobility and energy stimulate mobility and energy use. In this respect, the low operating costs of electric cars are an undesirable feature, as this will continue to foster mobility and energy use. Likewise, improved public transport may temporarily decrease the use of cars but can also be expected to stimulate mobility.

We argue that transitions that do not fundamentally change the criteria on which decisions are made are unlikely to lead to sustainability. In their famous article on the framework of evolutionary economics, Nelson and Winter (1977) coined the notion of “natural trajectories”, referring to long-term regularities like mechanisation in the 19th century or miniaturisation since the 1960s. Their argument is that while individual innovations will follow routines and heuristics (within firms), the general tendency of such innovations, e.g. to replace manual labour by machines, is more general, across firms and decades. Phrasing it like this enables us to delineate the natural trajectory of cars as an increase in volume, weight, and mileage. This has to change through a different appreciation of mobility.

The choice of criteria is best accompanied by visions of sustainability for mobility, food, energy use, housing construction, and other resource-using products and practices. A useful attempt to define sustainable mobility has been provided by David Banister in a prize-winning paper published in *Transport Review*. Sustainable mobility is based on the following elements: reasonable travel time rather than travel time minimisation, reducing the need to travel (through working from home), seeing transport as a valued activity rather than derived demand, achieving a modal shift (especially to walking and cycling), lower levels of pollution and noise from transport, greater energy efficiency, more efficient use of infrastructures (through higher vehicle occupancy and demand management), and increasing the quality of places and spaces (Banister, 2008). Some of the elements are already being used by transport experts and authorities, while others are not. It is difficult to ban car use and create space for other modes of transport, because such changes meet with opposition from car drivers and shop owners. A second problem is that the principles have to be applied for a long period to really take effect..

The need for policies that are unpopular with consumers brings us to another theme, which is effective governance in a consumer society. In the 19th century, choices about the remaking of society were largely put into the hands of engineers and politicians, who decided about needs and ways to meet them (for an illustrative analysis of public water supply proposals in Paris, see Graber, 2007). In a consumerist society, it is the consumer needs that dominate. The question then is: can we remake ourselves as part of a process of remaking society? Better technology does not produce better people, and it is wrong to expect too much from technology. There is a role for self-imposed constraints to reduce our impacts on the environment and others. This is the hardest element of the sustainability transition challenge. Efforts to facilitate sustainable mobility have to be reconciled with rival societal aspirations such as the pursuit of faster and more convenient forms of travel (Cohen, 2010, p. 459).

Politically, green values have been incorporated into every party programme, but green issues compete with other issues. There has been a call for eco-centred politics (Dobson, 1995) but green issues have not taken precedence over other issues, and are unlikely to do so. Green technologies benefit from ecological modernisation strategies, but green growth is simply another form of growth; what we need is an ethos of moderation based on restraint, respect, empathy, and self-actualisation. These are overarching criteria and values, making it easier to establish product-based criteria. The interaction effects of criteria are a topic of research within ICIS (being studied in the POLFREE and TRANSIT projects).

The overall conclusion is that sustainability has to be taken up in a more consistent way than at present. Catering to people's desire for comfort, convenience, and low costs may not lead to sustainability transitions. In our view, sustainability transitions require that people accept constraints and are willing to live and behave differently. Transitions are always accompanied by changes in values and beliefs, as shown by the examples of hygiene and waste. Some elements fit in with sustainability, while other elements do not. Thus far, we do not see fundamental changes in values and beliefs in the case of mobility and energy. A change in criteria can occur through cultural change, prices, and new and better knowledge. The processes by which such changes occur is a topic for further analysis, and the aim of this chapter is to put this topic on the agenda of sustainability transitions research.

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