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Sustainable transition of electronic products through waste policy

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ABSTRACT

The European Union's Waste Electrical and Electronic Equipment (WEEE) directive makes a challenging case for transition theory and its different aspects, as it represents an ongoing and still open-ended case. At present the objectives of the directive are not met: the amount of electronic waste is increasing, and the resulting waste is poorly managed. With its starting point in the multi-level perspective of transition theory, this case study analyzes how the outcome of the WEEE directive is constituted in the interplay between the somewhat detached regimes of electronics and waste management. The two regimes are described and analyzed together with the underlying regulatory principle of extended producer responsibility, which has guided the design of the directive. Conflicting interpretations of sustainability, in combination with a simplistic understanding and agency introduced from the top-down, has eliminated waste minimization as the main outcome of the directive. The concluding discussions raise the issues of the role of sustainable niche initiatives in electronics compared to multi-regime interaction. Guiding visions may need to be supplemented with other alignment devices in order to support co-evolution of regimes and coherent actions within transition processes.

1. Introduction

When the European Commission adopted the Waste Electrical and Electronic Equipment directive, WEEE (EC, 2002a), in October 2002, the Environment Commissioner Margot Wallström expressed the firm belief that this would be an important driver for sustainable innovation:

> *I am particularly happy that we could convince Member States to strengthen the individual responsibility of producers for the waste from their products. This will be an important incentive to producers to take the environmental consequences into account already when they stand around the design table* (EC, 2002b).

The directive is a governance initiative targeting the whole electronics industry and electronics imports supplying the European market. Although the WEEE directive is an element of EU waste policy, the implementation of the WEEE directive was also expected to push product innovation in the direction of longer life span, ease of repair and dismantling, reusable components and reduced complexity with regard to the amount of materials and components. Although experimental activities aimed at designing for dismantling, ease of repair, recyclability, etc. were attempted on a limited scale, none of these activities seem to be indicators of general trends in the socio-technical regime of electronics today, at least not as a consequence of the new electronic waste regime that has been installed by the member states.

Another important aim of the directive, as waste policy, was to reduce the disposal of WEEE as landfill. Throughout the 1990s, many North European countries implemented legislation banning WEEE disposal as landfill, but it is estimated that at the millennium more than 90% of all European WEEE was still being disposed of in this way (William, 2005). The directive, in combination with higher global metal prices, has in a sense been successful in addressing the landfill issue, since today only about 13% of WEEE is registered as disposed of as landfill or by incineration in EU (EC, 2008). Recycling rates have improved: about 30% of WEEE is now recycled and separated before different categories of waste are sold off as scrap metal, deposited or incinerated (there is still no market for waste plastics). However, it is estimated[1] that about 54% of the discarded WEEE is handled improperly, outside the designated return systems. A major fraction of this amount is illegally exported to third world countries, where poor waste treatment causes drastic local emissions and effects (EC, 2008; Nordbrand, 2009). As a consequence of these dramatic figures, the directive is currently under revision.

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[1] There is a general lack of data for most electronic waste streams to the extent that there is insufficient information to make reliable estimates of unaccounted WEEE – which is nearly 70% of the existing waste (EC, 2008). For available data on EU and global waste streams and composition, see EC (2008), ETC/WMF (2004) and Widmer et al. (2005).

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Although the long-term impact of WEEE is difficult to assess, it is already evident that a radical transition has been achieved – but not in the intended direction. The above Wallström quotation focuses on only one of the expressed aims of WEEE. The measures that have presently been implemented, however, focus more on creating a waste management system than furthering sustainable innovation and engaging actors at different levels in supporting the outlined aims.

Without the filter of history to streamline the analysis, the outcome of the WEEE directive demonstrates the complexities involved in real-life transitions and thereby makes an interesting case for transition theory. The case presents a somewhat fuzzy picture of conflicting agendas and uncertainties of how agency is distributed and how some actions may be aligned while others result in counter-programs and unintended practices and outcomes. In this instance, the WEEE directive is constituted in the interplay between the regime of waste management and the regime of design, production and consumption of electronic products. Waste policy operates in a field where the regimes and intertwined practices of electronics industries, national waste collection, and treatment systems have already established ways of framing sustainable innovation and environmental problems related to waste.

With its outset in the multi-level perspective of transition theory, the case casts critical light on problems resulting from conflicting agendas and how the issue of partly overlapping – but still separate – regimes poses challenges to transition theory. Shared visions play an important role in the development of niches, but they may become quite flexible in the interaction between regimes and thus become subject to broad interpretations when formulated as policy objectives. This leads to a discussion of how supplementary alignment strategies require the constitution of agency at different levels in order to stimulate appropriate co-evolution of regimes.

2. Theories of transition, multi-level agency and regime interaction

A basic assumption of transition theories is that socio-technical regimes develop as an intrinsic part of the stabilization of technologies within sectors of society (Garud and Karnoe, 2001). Such stabilizations define certain paths of development, while they also build up momentum and strength to resist change. The identification of regimes and their delimitation is therefore a basic step in the analysis of the transition process, which in ideal terms is often expected to be a process of exchanging one regime with another. When studying transitions empirically, regimes often co-exist in specific relations that are difficult to handle within the analytical framework, as the regimes themselves are theoretical, idealized constructs. A general critique of the multi-level perspective is that there are no rigid guidelines for how to identify regimes and set temporal limitations to transition processes so they appear as recognizable periods of radical change (Genus and Coles, 2008).

In its earliest forms, transition theory emphasized niche innovations as a major source of change and challenge to existing socio-technical regimes (Kemp et al., 2001). With its references to Strategic Niche Management, transition theory was criticized for having a bias towards analyzing bottom-up processes of transformation and the formation of small networks of actors in which niches develop, are assembled in regimes, and eventually influence the formation of larger societal landscapes. These studies of niche development processes emphasized the importance of shared visions, to support niche dynamics and to support feedback regarding regime and landscape processes (Berkhout et al., 2003).

In two respects, the WEEE waste policy initiated by the European Commission is not in accordance with the basic assumptions of the early transition theories: (a) it marks an attempt to catalyze transition dynamics by interconnecting previously independent regimes rather than supporting and interconnecting technological experimentation and (b) it initiates transition through top-down policies rather than supporting emerging bottom-up dynamics.

First, attempts to transform waste electronics involve the partly overlapping regimes of electronics production and consumption, and electronic waste management. We argue that openings for change originate from regime interaction, whereas other developments within the respective regimes may prove to have a conservative effect on the present situation. In this case, the two regimes were never competitive. Previous to the WEEE directive, the regimes were hardly even connected by the electronic end-of-life artifacts themselves, since they figured as products in the production and consumption regime while they were just another waste category in the waste management regime. Interaction between regimes in a multi-level perspective has been studied previously by Geels (2006), who notes a pattern of development from a competitive to a symbiotic relationship in the evolvement of rock and roll music. In Geels' account, regime interaction takes place between a radio-dominated regime and a record-dominated regime. The two regimes interact and eventually co-evolve around the ability of record technology and record player technology to reproduce music inexpensively. One lesson from this analysis could thus be to identify potential common elements in the two regimes that can act to stimulate alignment in a similar manner.

Second, the waste directive – although negotiated and attempting to obtain support from actors in the sectors addressed – is a top-down policy initiative that is completely dependent for its implementation on national regulation and its ability to recruit and align actors at all levels of the socio-technical practices involved. With the growing pressure on available resources and the threats posed by climate change and chemicals, even more policy and top-down initiatives can be expected for the purpose of creating socio-technical transitions. The difficult question of how to induce sustainable innovation has become a core question in relation to environmental governance and transition processes. Therefore, the 'shadow of the state', which orchestrates specific governance networks and provides (re)alignment of complex socio-technical relations with the help of dominant visions and agendas, is crucial (Jännicke, 2000).

Understanding transitions as not necessarily driven from the bottom-up but also initiated at other levels is integrated into the multi-level perspective (Geels, 2002). Here, institutional actors can engage directly at the regime and landscape levels, and elements of top-down action as public opinion, public regulatory policy, and changes in the structure of markets seek to influence existing regimes through inducing and framing innovations at the micro-level and meso-level (Berkhout et al., 2003). Accordingly, transitions occur as the result of interactions between different levels and changes at the regime level are caused either by the built up momentum of niche innovations or through pressure brought about by changes at the landscape level (Geels, 2006; Schot and Geels, 2008). Supplementary top-down measures, based on regulatory interventions or public funding, may help set the stage for a transition, especially in cases where niche innovations strive for survival and are met with resistance from existing regimes.

Difficulties arise in the management of transition processes, because they unavoidably involve actors with contradictory and even multiple interests that are characteristic in the sector targeted in the transition process (Elzen et al., 2004). Already at the government level, the interests in the transition may be conflicting, as we demonstrate in the case of WEEE, where the system for managing waste and distribution of the costs of this waste management sys-