



Provided by the author(s) and University of Galway in accordance with publisher policies. Please cite the published version when available.

Title	Developing (Tele)work? A multi-level sociotechnical perspective of telework in Ireland
Author(s)	Hynes, Mike
Publication Date	2016-09-21
Publication Information	Hynes, Mike. (2016). Developing (tele)work? A multi-level sociotechnical perspective of telework in Ireland. <i>Research in Transportation Economics</i> , 57, 21-31. doi: http://dx.doi.org/10.1016/j.retrec.2016.06.008
Publisher	Elsevier
Link to publisher's version	http://dx.doi.org/10.1016/j.retrec.2016.06.008
Item record	http://hdl.handle.net/10379/6254
DOI	http://dx.doi.org/10.1016/j.retrec.2016.06.008

Downloaded 2024-04-28T22:00:20Z

Some rights reserved. For more information, please see the item record link above.



Developing (Tele)work? A multi-level sociotechnical perspective of telework in Ireland

Abstract

The ubiquitous nature and use of technology in contemporary societies continues to transform lives and work environments. At the same time, transport continues to be a major source of harmful emissions. Telework has been suggested as a means to reduce unnecessary work-related travel, including the daily commute. Telework occurs when Information Communication Technologies (ICTs) are applied to enable work be accomplished at a distance from the location where results are needed. However, despite its promising nature and early optimistic predictions, telework has largely failed to capture management and workers' attention and imagination. Using a Multi-Level Perspective (MLP) on sociotechnical transitions approach, this study reveals why telework continues to remain a 'niche' practice dominated by a small set of industries, managers and workers. The paper builds on MLP thinking with a view to highlighting behavioural, cultural, and political aspects of socio-technical transitions and their interactions, which are frequently limited in classical MLP thinking. The failure to enrol additional niche-actors, the dominance of traditional forms of working and automobility, and the absence of policy and lack of legitimacy, all act negatively to keep telework from emerging from the niche to the regime level and becoming established as a more mainstream practice.

Keywords

Telework; Multi-Level Perspective; Sociotechnical Transitions; Ireland.

1. Introduction

There is international scientific consensus that human activities continue to adversely affect our planet (IPCC, 2014). Transportation remains a major user of energy and consumer of the global petroleum stocks, while also creating air and noise pollution, significantly contributing to anthropogenic climate change through carbon dioxide emissions (EEA, 2014; Sims *et al.*, 2014). These damaging environmental impacts, in addition to (sub)urban sprawl, have increased over the past number of decades to a point where current patterns of mobility are considered unsustainable (EPA, 2015). Between 1990 and 2007 transport emissions grew in Ireland, with emissions in 2007 137% higher than in 1990 (Department of Transport, 2008). Since 2007 transport emissions have decreased somewhat, due largely to the economic downturn¹. Ireland's reliance on the automobile continues to cause concern, with half of all Irish people using this mode of transport to travel journeys of less than 2km and three out of four journeys outside of Dublin made by car (CSO, 2015). Such levels of car dependency should not be viewed merely as an issue of environmental sustainability due to the consumption of non-renewable resources and production of GHGs responsible for global warming; it is also an issue of economic and social sustainability. Efforts to reconcile the desire for economic growth with aspirations for greater social justice and better environmental protection have shaped international policy agendas, with sustainable development being widely articulated as 'development which meets the needs of the present without compromising the ability of future generations to meet their own needs' (WCED, 1987). The term sustainable transport came into use as a natural follow-on from sustainable development, and is used to describe modes of transport, and systems of transport planning, which are consistent with wider concerns of sustainability.

Contemporary environmental concerns, such as resource efficiency and climate change, present formidable environmental, societal, and economic challenges and addressing these may only be realised by deep structural changes in transport, energy, food, and other systems (Grin, Rotmans, Schot, Geels, & Loorbach, 2010). Termed 'sociotechnical transitions', this involves changes in the overall configuration of transport, energy and food systems, including technology, policy, markets, consumer practices, infrastructure, cultural meaning and scientific knowledge (Elzen, Geels, & Green, 2004). These elements are reproduced, maintained and transformed by actors such as policy designers and politicians, companies and industries, consumers, civil society and researchers, and as such these transitions are complex and long-term processes comprising numerous actors working together (Geels, 2011). There is also need to address the complex issues of sustainability transitions on multiple levels and dimensions in which it manifests. The multi-level perspective (MLP) has emerged as a prominent middle-range framework for analysing sociotechnical transitions to sustainability (cf. Rip & Kemp, 1998; Geels, 2011). For transport research, the MLP offers a heuristic for analysing interactions between industry, technology, markets, policy, culture and civic society (Geels, 2012).

However, there is a gap in the MLP literature given it often fails to afford adequate attention to human agency in its systemic approach to change. Insufficient consideration is given to highlighting behavioural, cultural, and political aspects of socio-technical transitions and the strong human interventions and the deliberations of practitioners, politicians, activists and others involved in such change. Therefore, building upon an MLP sociotechnical transition approach, this paper investigates telework² in Ireland and critically explores its potential for curbing the 'consumption of distance' (Heisserer & Rau, 2015). The following sections outline

¹ Given the strong relationship between growth in transport emissions and the economy in Ireland, it is reasonable to assume that as the economy recovers transport emissions will again increase without sustained policy action and further intervention.

² In this paper, we define telework as a sociotechnical system comprising of interactions between actors, ICTs and other technologies, competencies, context, policy, domestic and other social relations, and aspects of organisational structures and processes.

the methodology used and provide an overview of the MLP approach. Section 4 outlines the potential for telework and investigates its sustainability credentials, followed by a discussion of telework in Ireland in section 5. Section 6 presents research data from Ireland that captures current telework practices, in addition to providing insights into such worker's lives, and section 7 uses the MLP heuristic to analyse and interpret the development of telework. This will also include a unique representation of telework in light of such analysis and understanding. Section 8 draws some conclusions about the potential and future for this way of working.

2. Methodology

To evaluate telework's scope and impacts an extensive desk study investigation of literature and publicly available documents was conducted. Using a set of pre-established criteria regarding quality of sources, the research engaged with key national, European and international publications on policy and practice, regulation, and broad evidence of public debates and discourses deemed relevant for this study. Existing national and European telework statistics complemented this material. In addition, the researcher engaged a qualitative method of inquiry to better understand telework and actual teleworker's lives. While the desk study and available statistics provides a broad overview of existing telework environments, qualitative research is an attempt to 'see through the eyes of research participants' and allow deeper and more personal views of the practice emerge from the study (Bryman, 2016: 405). This qualitative element of research consisted of 16 semi-structured, in-depth interviews with teleworkers. Interviewees were selected to reflect the range of teleworkers operating in Ireland (cf. MRBI, 2002); nine male and seven females, a mixture of management, employees, and self-employed, and between the ages of 25 and 65 years of age. The interviews focused mainly on personal, domestic, social, technical, and environmental issues individuals contend with when working from home, thus providing a deeper focus on human agency in telework practice. Interviewees were asked to reflect on their experience and knowledge of telework and were invited to broaden any aspect of the discussion if desired, and this allowed for the structure of the interviews to vary at times.

3. Understanding the multi-level perspective on sociotechnical transitions

Within the field of transition theory an important strand of research pertains to Geels' (cf. 2002) advocacy of a multi-level perspective (MLP) to analysis the development and entrenchment of technology and technological systems within society. Broadly speaking, the MLP conceptualises dynamic patterns in sociotechnical transitions, differentiating three separate levels to analyse change; the niche (micro) level, the regime (meso) level, and the landscape (macro) level (Rip & Kemp, 1998; Geels, 2002; Geels & Schot, 2007). It is grounded in the proposition that transitions are non-linear processes that result from the interplay of multiple developments at these three analytical levels (Rip & Kemp, 1998; Geels, 2005b). Niches are 'protected spaces' such as R&D laboratories, subsidised projects, or small markets, involving heterogeneous actors such as users, producers and public authorities, who are willing to support and champion emerging or unique innovations (Brown, Vergragt, Green, & Berchicci, 2003). Novelties emerge over time from this level as niche-actors work on radical innovations that depart from existing deep-rooted regimes. Niche practices might gain momentum as they become more generally accepted through learning processes, or benefit from the expansion of social networks that lend them legitimacy. In contrast, the sociotechnical regime (first proposed by Winter & Nelson, 1982) forms the 'deep structure' that accounts for the relative stability over time of an existing sociotechnical system. The system elements are reproduced, maintained and transformed by various social groups and actors and become embedded at the sociotechnical regime level, which entails rules that coordinate and guide perceptions and future actions (Geels, 2012). Sociotechnical regimes incorporate firms, engineers, policy makers, special interest groups, in addition to civil society, thus helping to overcome the tendency to single out one set of actors as pivotal to stability and success. Finally, the sociotechnical landscape constitutes the wider context which influences regime and niche dynamics (Rip & Kemp, 1998). The landscape level

includes both the intangible aspects of social values, political beliefs and world views, and the tangible facets of the built environment, the media, and macro-economic trends (Geels, 2012). These combine to form an external context with the greatest degree of structuration that is beyond the control of individuals and sets of actors and as such cannot be influenced in the short-term (Geels, 2011). The three levels – niche, regime and landscape - form a nested hierarchy (Figure 1). Transitions are frequently a long-term process and complete system-change can often takes some considerable time to take hold. They are often co-evolutionary in nature and not driven by single factors but involve slow developments between multiple dimensions. The trajectory of possible sociotechnical transitions assumes the pace of change varies between levels.

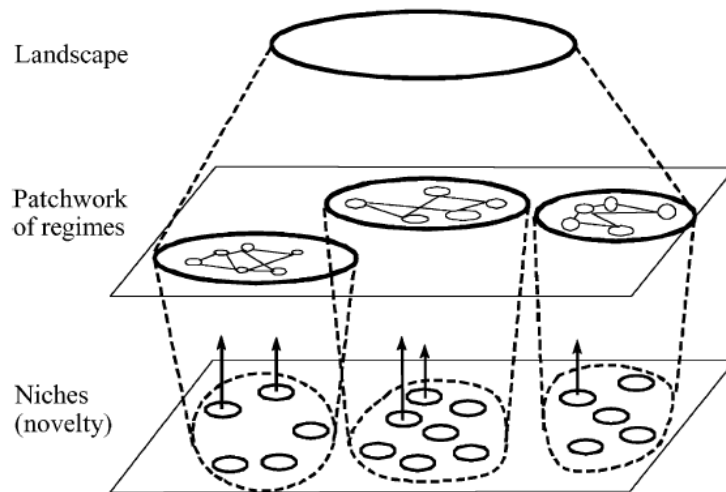


Figure 1 – The multiple-levels as a nested hierarchy (Geels, 2002)

Figure 2 offers a representation of how the three levels interact dynamically in unfolding sociotechnical transitions. Change occurs as result of the outcome of linkages between developments at multi-levels. Radical innovations break free from the niche level when ongoing processes at the level of regime and landscape create a possible ‘window of opportunity’ (Geels, 2002: 1262) as a result of various tensions and misalignments. For instance, climate change, the consumption of substantial amounts of fossil fuels, and air and noise pollution, are all currently putting pressure on transportation systems triggering the potential for change in technical heuristics and public policy. When tensions exist radical innovation may take advantage and break through into the mass market, entering competition with existing systems which they may eventually replace. Further opportunities may be created by tensions in the sociotechnical regime itself or, indeed, by shifts at the landscape level which places downward pressures on the regime. There may also be negative externalities in the regime, altering user preferences or imposing stricter regulation, which creates problems for existing systems (Geels, 2005b). Once established, the new system replaces the old regime which is accompanied by changes on broader dimensions of the sociotechnical regime, but this frequently takes some time and happens in a gradual fashion. Once established, the new technology or sociotechnical system is accompanied by changes in regulations, infrastructure, user practices, and industry structures (Geels, 2006). A newly settled sociotechnical regime may also, therefore, contribute to changes and influence developments at the broad landscape level.

Increasing structuration
of activities in local practices

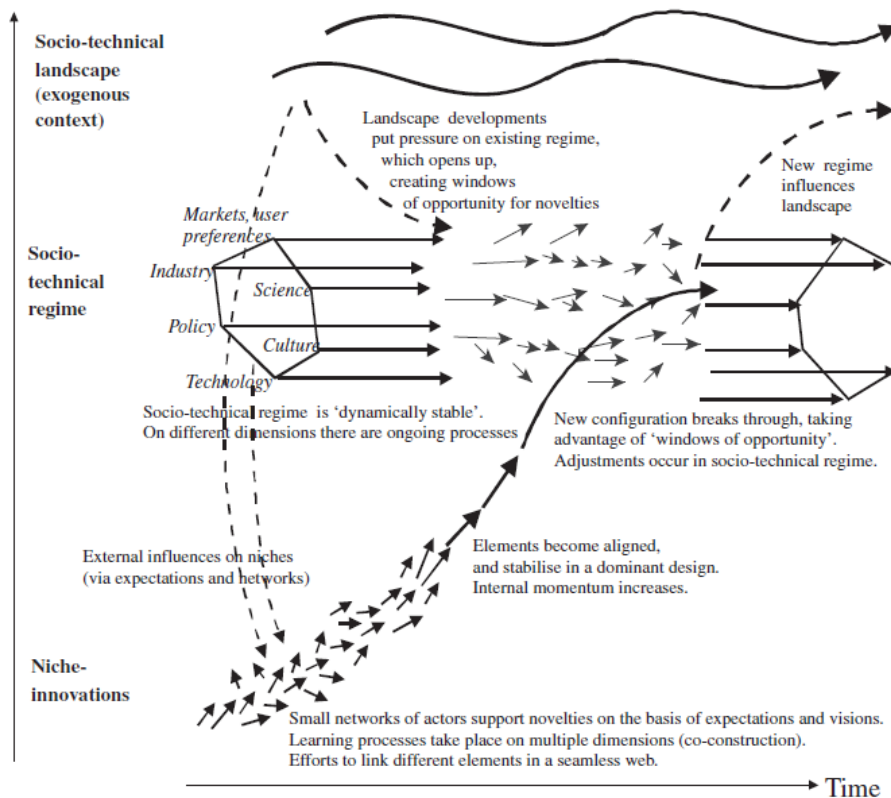


Figure 2 - MLP on transitions (Geels, 2012)

Aspects of the MLP approach have been subject to criticism including minimising the role of agency (Smith, Stirling, & Berkhout, 2005), its bias towards bottom-up change (Berkhout, Smith, & Stirling, 2004), in addition to argument about its epistemological and ontological status (Genus & Coles, 2008; Shove & Walker, 2010). In addition, while the MLP has a strong temporal orientation the spatial dimension has been less elaborated. Transport considerations, for instance, encompass not only the local but also national and transnational dimensions:

Although many dimensions of the automobility regime are national or international (e.g. highway infrastructure, traffic regulation, fuel taxes, mobility culture, engineering and transport planning expertise), some dimensions are local, e.g. parking fees, road maintenance, local policing, congestion charging, urban planning, and access to city centres. Subaltern regimes such as bus, light rail and cycling also have strong local dimensions (e.g. subsidies, concessions, right of way, special bus or cycle lanes). So, within national mobility regimes there can be local variations, especially at the urban level, that create deviation from the mainstream (Geels, 2012: 474-475).

Despite these limitations, its usefulness for analysing change through a sociotechnical systems lens has been clearly demonstrated in areas such as transport and mobility (Whitmarsh, Swartling, & Jäger, 2009; Van Bree, Verbong, & Kramer, 2010; Geels, Kemp, Dudley, & Lyons, 2011), energy (Verbong & Geels, 2007; Nye, Whitmarsh, & Foxon, 2010), water (Geels, 2005a; Van der Brugge, Rotmans, & Loorbach, 2005), food and housing (Shove, 2003; Smith, 2007). In the context of this particular research, it is important telework is investigated and analysed at a number of different levels to gain a broader understanding of the barriers and pressure impinging upon its development. The MLP approach offers a suitable framework, therefore, to evaluate its overall impacts and reach, but some consideration for improving orthodox MLP thinking with regards to understanding telework adoption and development will be provided.

4. Telework: what's in a name?

Work takes up a substantial share of many people's daily lives so transformations in the nature and organisation of work have significant impacts on development, production, and consumption processes. Telework is a flexible working arrangement which enables employees work from home or over-distance through the use of Information Communication Technologies (ICTs); a case of moving the work to the workers rather than moving the workers to work (Nilles, 1998). The search for a universally accepted definition and classification of telework that is suitable for academic research has been the source of contention and debate (Baruch, 2000; Sullivan, 2003; Wilks & Billsberry, 2007). Indeed, there are an abundance of terms used interchangeably with telework³. Moreover, many definitions are based on different technical, geographical, organisational, legal and contractual criterion, prompting some to conclude it is inappropriate to define telework along any single parameter or element (Huws, Korte, & Robinson, 1990). In the US, the term 'telecommuting' focuses on the wage earner's commuting patterns and its rationale lies in society's reduction of transport time and traffic pollution (Quorstrup, 1998), but this may be too narrow a focus and an overemphasis on transportation (Sullivan, 2003).

Irrespective of the term or definition used, there are three common elements essential to telework; the temporal and spatial dimensions, and the use of ICTs (Baruch, 2000; Kerrin & Hone, 2001). Workers are not restricted to a centralised location to perform their work, and this is achieved by the use of new networking technologies and methods of communications. The time spent working remotely can vary between occasionally to always. While it is clear ICT has increased the amount of work occurring in other places than the centrally-located office or worksite, there is a need to provide a working definition of telework for this particular study. The Central Statistics Office in Ireland suggest a teleworker is 'a person who work from home and could not do so without the use of a computer with a telecommunications link' (CSO, 2003). Moreover, in line with previous research, teleworkers utilise this method of working informally and as an occasional practice rather than part of official, full-time policy (McGrath & Houlihan, 1998). The aim of this study is to investigate issues of social and environmental sustainability and the need for reducing commuting to and from work. The focus is on the numbers of traditionally non-mobile worker adopting telework practices and thus allowing normally centrally-located workers the occasional opportunity to work from home, and understanding the pressures and barriers to such work behavioural change this brings.

Teleworking has been suggested as an approach to help organisations reduce their infrastructural and utilities costs (Egan, 1997; Van Horn & Storen, 2000; Lister & Harnish, 2009), as a way of responding to employees' need for an enhanced work-life balance (Shamir & Salomon, 1985; Hilbrecht, Shaw, Johnson, & Andrey, 2008), a strategy for workers to care for dependents (Hartig, Kylin, & Johansson, 2007; Hilbrecht *et al.*, 2008), or the greater inclusion of individuals with disabilities who have been previously excluded from the workplace (Hesse, 1995; Anderson, Bricout, & West, 2001; Bricout, 2004). Telework has also been proposed as an approach to reducing air and noise pollution, and traffic congestion in urban areas through the reduction or elimination of the daily commute to and from work (Irwin, 2004; Banister, Newson, & Ledbury, 2007; Dwelly & Lake, 2008), and efforts to tackle climate change should accelerate trends towards these more flexible, distributed organisations (WWF, 2009). It has been suggested telework could result in annual savings of over 3 million tonnes of carbon and cut costs of £3 billion for industry, business, and society at large (The Carbon Trust, 2014). However, whilst it has been promoted more as an economic instrument; is telework also an effective tool for reducing environmentally harmful work-related mobility or does it simply shift environmental and social impacts, and their costs, from the worksite to the home?

³ Telecommuting, flexiworking, mobile or distance work, homeworking, telecottage workers; these are just some of the terms used to describe telework. Indeed, in Ireland the original term used was eWork (or electronic work).

The use of ICTs does not in itself invariably lead to travel suppression (Mokhtarian, 1990, 1991; Marvin, 1997; Mokhtarian, 2003) and there are additional environmental consequences from the need to change or update technological equipment, infrastructure, living space, and other such lifestyle adjustments (Arnfolk, 2002; The Guardian, 2009). Indeed, under certain conditions, teleworking can lead to additional mobility and energy consumption, while employees can also be confronted with additional transport costs (van Lier, de Witte, & Macharis, 2014). Telework has blurred the lines between work and home, with work 'extensification' and intensification invading the domestic sphere (Currie & Eveline, 2011: 535). Understanding of its real social and environmental impacts and consequences is limited as research has tended to concentrate on implementation, adoption, and growth of telework programmes (Bailey & Kurland, 2002; Kitou & Horvath, 2003). In the absence of further research, the environmental credentials of telework remain somewhat unclear (Rhee, 2009; Santos, Behrendt, & Teytelboym, 2010; Hynes, 2013b).

Inquiries into the environmental consequences and sustainability of telework in Ireland have mainly concentrated on the potential to reduce private car use in the form of less commuting, and there is no universally accepted method for assessing all the sustainability implications of individuals choosing to telework. A teleworker, for instance, may consume more energy at home if their house would otherwise have been unoccupied, though the extent to which home energy use is offset by decreased workplace energy consumption has not been sufficiently investigated. Nevertheless, conventional wisdom would suggest telework can suppress or eliminate the daily commute, thus diminishing the negative environmental consequences of avoidable travel. The potential environmental benefits of telework needs better investigation to avoid promoting telework's ostensible tendency to reduce air pollution by reducing the magnitude of daily commuting only to find other harmful effects offset these gains. Nevertheless, telework has failed to capture widespread attention and traction and remains firmly at the niche level. To better understand this we need to gain an understanding of telework through the perspective of practitioners.

5. Telework in Ireland

The foremost national telework data, from an Irish perspective, was published some thirteen years ago in the *Quarterly National Household Survey* in which a mere 3.5 per cent of the workforce were considered teleworkers (CSO, 2003). It profiled the typical teleworkers as male, Dublin-based, highly educated professional, in the services sector, aged between 20 and 44 and working only part of their time from home. Indeed, further research would concur telework is dominated by managerial, professional and technical workers, suggesting telework reflects social status (O'Connell, Russell, Williams, & Blackwell, 2004; Haddon & Brynin, 2005). Telework is more common among knowledge workers such as software programmers, designers, and engineers and these sectors are more disposed towards adopting the practice (Bailey & Kurland, 2002). Ireland continues to see growth in many of these sectors (OECD, 2014) and thus is an ideal site for telework to prosper.

More recently, the *Telework in the European Union* report investigated rates of telework across the European Union, particularly in the context of the *European Framework Agreement on Telework* (Eurofound, 2010). This report revealed that the rate of teleworking in Ireland was 4.2 per cent of the workforce, with the European average standing at 7 per cent. An earlier study suggested an even smaller proportion of individuals in the European workforce engaged in teleworking, averaging at 4.1 per cent (OECD, 2008). Across Europe these reports uncovered a marked difference in regional, national, and even local and organisational terms. The figure for teleworkers within the EU had been expected to triple by 2010 (Bates & Huws, 2002) but the actual figure has fallen well short of these optimistic expectations. Why is this the case, and why have some countries increased their share of teleworkers while other seen stagnation or, indeed, decline in the practice?

In the context of European Employment Strategy, the European Council invited members to negotiate agreements to modernise the organisation of work across the community resulting in the *European Framework Agreement on Telework* (Europa, 2002). This agreement was not required to be ratified through a European directive but could be transposed through non-legally binding implementation routes. Most countries elected to discharge their obligations through binding bipartite collective agreements, many taking place between unions and employers. However, Ireland elected implementation through soft law mechanisms. These were non-binding and voluntary arrangements and provided information about telework in light of national work regulations in order to facilitate the application of the European Framework Agreement (EIRO, 2010). It was stated:

In Ireland, the government published a code of practice in 2000 that was updated in light of the European Framework Agreement. A number of Irish trade unions have also issued unilateral guidelines based on the European agreement to be used for negotiating telework arrangements with employers. However, company-level collective agreements incorporating telework issues have not yet been reported (EIRO, 2010: 8).

With arrangements such as the Telework Agreement, the type of governance this entails represents a disappointing development for Europeans who wish to see decent levels of employment protection put firmly in place (Prosser, 2011). In Ireland, such 'light touch' regulation has hampered telework's development, and the absence of regulation that gives it legitimacy in the eyes of management and workers acts as a strong institutional barrier to its growth and adoption (Hynes, 2014b)⁴. Moreover, more recent announcements by Yahoo CEO Marissa Mayer (Surowiecki, 2013) and Best Buy (Lee, 2013) to discontinue their telework arrangements within their respective organisations, in addition to Google's CFO Patrick Pichette's counterintuitive anti-telework stance (Amerlan, 2013), suggests a potential reversal in trends worldwide.

6. Telework and Teleworkers Lives

Why has telework remained a marginal work practice despite national and European efforts to mainstream it? Focusing on accounts provided by teleworkers in Ireland, at least 5 related reasons emerge; telework's lack of legitimacy due to the absence of regulation, the ad-hoc arrangements that have ensued, the lack of support from management, the absence of training or direction, and the dominance of the existing regimes of automobility and traditional way of working. First, the meagre uptake of telework in Ireland can be partially attributed to an absence of practical legitimacy for this method of working amongst policy-makers, business leaders, and indeed workers and their representatives (Hynes, 2014b). In interviews, teleworkers spoke of telework as exceptional and working from home is not widely discussed within, and indeed outside, their respective organisations. There was no evidence of networking amongst teleworkers and no evidence of enrolment, or willingness to enrol, additional actors to the practice. One teleworker reflected on the issue and felt rates were indeed insignificant:

...no I don't think it's promoted at all, I certainly have heard absolutely nothing with regard to teleworking [*Teleworker 12, female, aged 30-35, employee*].

Such a view was supported by others who echoed an overall negative evaluation of the broad existence of telework and telework schemes. Teleworking was an exceptional practice and way

⁴ The European countries with the largest numbers of teleworkers - Czech Republic, Denmark and Belgium - all elected to implement the Telework Agreement through hard law measures and legislation, while countries with the smallest numbers of teleworks, such as the UK and Ireland, used soft measures (EIRO, 2010).

of working and practitioners were typically unaware of other individuals who worked from home:

...within our organisation locally and nationally I think it's a relatively rare phenomenon [*Teleworker 1, male, aged 25-30, employee*].

Concern was expressed that telework is frequently implemented in an ad-hoc and unregulated manner within organisations, leading to unpredictable and erratic work arrangements. This was largely a result of limited understanding of the practical implications of working from home and the absence of agreement between teleworkers and management. The unpredictability associated with the practice was summed up by one interviewee:

I don't think there's any promotion of it ((telework)) I know here it's seen as it's down to your particular manager if you do it and some managers here would say 'ooh no' [...] here I would say they don't condone it or they don't condemn it's whatever your manager says and if you are as productive as you need to be, but they probably won't take a stance either way they won't say 'ooh we want you to work from home' because then they're just afraid of the cost of it 'ooh I might look for expenses' or 'I might look for...'
[*Teleworker 7, female, aged 40-45, employee*].

A number of interviewees worked for organisations with well-developed corporate cultures endorsing flexible working. Whilst acknowledging their own personal circumstances, these workers felt not enough was being done at national level to encourage or promote telework, or offer advice and direction in this regards:

I don't think there's enough done nationally or the government does enough to encourage it to be honest, or encourage companies and give benefits tax breaks or any of that type of thing
[*Teleworker 15, male, aged 35-40, management*].

In the context of organisational support for telework, the significant role of managers in furthering the adoption process has been stressed (Bardoel, 2003; Peters & den Dulk, 2003). However, many managers remain sceptical of the benefits of this method of work (Pyöriä, 2011). A lack of support from management for the practice was evident in this study. One manager articulated the view that the absence of regulation and adherence to existing legislation was a concern, in addition to mistrust of potential teleworkers. This emphasises poor understanding caused by communications deficiencies and insufficient agreement between workers, their representatives, and management. It was acknowledged she herself did not observe existing employment legislation:

I think people just got so scared when they realised all the implications and they said 'we'll do everything ad-hoc instead because we don't want to acknowledge ((teleworking))' I mean officially I'm not acknowledged as doing this because 1) I'm breaching the amount of hours I do; it breaches the health and safety act if I had to record them all but, 2) the real issue was we didn't want to have a precedent that other people in the agency who wouldn't be productive workers would use
[*Teleworker 11, female, aged 40-45, management*].

This indifferent attitude from employers towards telework was noticeable. In one case, this indifference may be the consequence of employers having no support mechanism, framework or strategy in place for telework or teleworkers:

I don't know is there even a policy within the company but I know for example in the IT end of things they don't telework in the US generally but they do in Europe but I don't know if that just evolved or whether it's actually a policy and from a HR perspective... I don't know why they regard it as people teleworking or whether it's just something that they turn a blind eye to because there's no support structure in place
[*Teleworker 4, male, aged 40-45, employee*].

Telework conditions and arrangements needed to be personally negotiated and agreed, and the practice continues to be the 'gift' of employers and management. This is the consequence of poor regulation and guidelines, and ad hoc arrangements and implementation policies adopted by many organisations. One interviewee told how he:

...put a proposal to them ((senior management)) for two days a week and initially they agreed to one day a week but I just said 'look either two days or it's not going to be practical' [*Teleworker 3, male, aged 35-40, management*].

Such findings are borne out by research which suggests the slow diffusion of telework is a result of the absence of an established contractual framework and a weak 'culture' of teleworking (Pyöriä, 2011). Indeed, supervisors and managers often serve as gatekeepers, deciding whether or not an individual worker has access to teleworking arrangements, and providing a key constraint to its acceptance and adoption (Mokhtarian & Salomon, 1996a, 1996b).

A further impediment to teleworks' development is the absence of training given to workers. Individuals spoke about the lack of advice and training prior to commencing working from home, and the continuing absence of such information. The lack of any formal structure and information acts to de-legitimise telework as a way of working in the eyes of the employer and employee:

...there is no formal training or structure in place, even a reporting structure if something goes wrong [*Teleworker 4, male, aged 40-45, employee*].

Telework is a major change in working organisation but little in the way of preparation for teleworkers is evident. Training and competency in many of the skills and proficiencies required have been largely ignored by organisations, management, unions, and indeed individual workers:

No I wasn't given any formal training, but having said that I didn't request it and don't see the need for it either [*Teleworker 1, male, aged 25-30, employee*].

Management support and training are factors positively related to the intensity of telework adoption and without adequate training provision, the practice may be a short-lived experience as a lack of skills leads to restrictions on when and where employees can work (Venkatesh & Speier, 2000; Illegems, Verbeke, & S'Jegers, 2001). Indeed, it is suggested for telework to be successfully adopted managers need to institute regular training and sensitisation programs for all employees so that an appreciation for the perspectives of teleworkers and non-teleworkers alike can be fully grasped (Golden, 2009).

What is revealed in this study is; there is no clear narrative about the practice and conditions of telework and there is a lack of validity and appreciation about its true impacts and the consequences. Telework remains detached from conventional means of working with little interaction between practitioners even from within the same organisation. It is considered a niche practice by teleworkers themselves, and a method of working that lacks legitimacy and management endorsement or clear understanding. There is no policy, or indeed initiatives, evident that would promote and support the broad development of telework in Ireland as a positive instrument of economic, social and environmental sustainability.

Telework is further hampered by the dominance of the traditional way of working. Travelling to a central location with others to perform tasks and undertake work largely remains unchallenged. Although some workers, such as salespeople and IT personnel, have embraced mobile and distributed working; much of this is task related and proper to the responsibilities they regularly undertake. Automobility and car-centric thinking and decision-making remain a

dominant force in contemporary Irish society. Moreover, there is little indication people choose the practice of telework as the means of reducing their overall consumption of distance, or to diminish their environmental impacts.

7. Discussion: applying an MLP approach to understanding telework

At the turn of the century the Irish Government viewed telework as a 'component and facilitator towards introducing and supporting a new paradigm of work, organisation and trade' (National Advisory Council on Teleworking, 1999: 5). It was anticipated that deregulation of the telecommunication market, technology price reductions and performance improvements, would allow telework become a conventional way of working. However, for telework to ascend from the niche level it is imperative the network of actor support increase over time but, to-date, there is no evident of this in an Irish context. Telework, thus, essentially remains a working arrangement dominated by a few industries, most notably technology and sales (see GlobalWorkplaceAnalytics, 2016). There is little evidence of any significant 'snowballing' or networking effect with regards to telework over the past two decades and, indeed, some evident the practice has retracted somewhat.

The literature on niche innovation distinguishes three social processes; a learning process, the articulation of expectations or vision, and the building of social networks and enrolments of additional actors (Rip & Kemp, 1998). With regards to learning processes, best practice guidelines were developed to support teleworking some sixteen years ago (Irish DoETE, 2000). These predominantly focussed on economic issues at the meso level and largely marginalise social and environmental concerns. No meaningful studies were conducted in the early days of telework's development and these guidelines quickly became outdated as technology, in particular mobile communications, developed. Teleworkers were frequently 'left to their own devices' and ad-hoc and disorganised arrangements ensued, unsupported by any favourable policy regime.

There is feeling of isolation among teleworkers and practitioners adopt unique coping mechanisms and rarely complain about their working arrangements. This can be attributed to the practice's lack of legitimacy and a feeling that to work from home is somewhat the gift of employers. However, teleworkers frequently work longer hours without remuneration and feel obliged to be available to colleagues and management out-of-office hours (Hynes, 2013a). This blurs the lines between work and home and can lead to diminishing levels of work/life balance satisfaction. Many teleworkers are unwilling to speak about their working arrangements either in or outside of their organisation. This limits broader attempts at cross-sectoral innovation and niche co-evolution, which are critical for sociotechnical transitions, and curtails their involvement in decision-making processes with regards to the practice.

The traditional way of working, i.e. travelling to a central location to perform tasks, remains the dominant working practice regime in contemporary society. In the most recent census almost 1.7 million workers in Ireland indicated they travelled various distances to work (CSO, 2012b).⁵ National labour force participation was recorded at just over 1.8 million (CSO, 2012a). Indeed, the census indicated a significant decrease in the numbers of people who worked from home. A total of 83,326 individuals stated they worked mainly at or from home in April 2011, a 21.2 per cent decrease on the figure of 105,706 recorded in 2006. Of these workers, 44.9 per cent worked in agriculture, 46.5 per cent worked in the services sector, and a mere 8.7 per cent worked in Industry (CSO, 2012a). There is little evidence to suggest this regime is under threat, with some indication the traditional way of working has even consolidated its dominant

⁵ This was a slight decrease from the 2006 Census figures. However, this was largely reflective of the significant fall in the number of people in employment over that five year period, principally as a result of the global financial crisis and a deep recession that hit Ireland as a consequence. This followed a period of uninterrupted growth between 1986 and 2006 in the number of persons commuting to work.

position over the recent past. Working at a central location has been deeply embedded since the beginning of the industrial revolution and remains unchallenged despite the fact many knowledge workers perform tasks and work in jobs where the resultant outputs are not necessarily needed at that particular location. More recently, globalisation has facilitated the greater development of transnational distributed teamwork where employees from different countries and region interact and perform tasks cooperatively. In these circumstances centrally-located working is not a prerequisite. Despite this, centrally-located working remains unchallenged as the dominant regime.

There is little indication the dominance of the automobility regime is under threat in the immediate future. Ireland has repeatedly been classified as one of the most car-dependent European countries (Commins & Nolan, 2010; Campaign for Better Transport, 2011) and transport-related exclusion experienced by car-less rural and urban households remains a significant problem (Rau & Hennessy, 2009). Car dependency refers to transportation and land use patterns that favour car use, providing limited alternatives or sustainable modes of transport such as public transport, cycling and walking. In such cases, urban design of cities and towns adapt primarily to the needs of the car in terms of movement and space. In Ireland, car dependency is inherently resource intensive and generates a lifestyle with negative impacts on public health, undermining the quality of life of all citizens (Wickham, 2006). High numbers of workers continue to commute to and from work in a car while the numbers using public transport fell by 20 per cent (CSO, 2012b). The country remains highly car dependent and although a discourse of sustainable transport was evident during the recession transport policy design has once again become dominated by road construction (Rau, Hynes, & Heisserer, 2015). An announcement by the Irish Government in July 2012 of a €2bn 'off-balance-sheet' stimulus package to support 'job-rich' and 'shovel-ready' infrastructure construction projects appears to signpost this (Minihan, 2012).

There is no evident of any negative externalities threatening the dominance of either of these regimes.⁶ In addition, there is limited attention given to behavioural, cultural, and political aspects of socio-technical transitions and their interactions in established MLP approaches. In the case of telework in Ireland, an asymmetry of power relations is evident, which allows employers and management retain ultimate discretionary authority over the success or failure of telework arrangements and schemes. The state has withdrawn from any decision-making position in this regards, giving total freedom to organisations to adopt or reject telework. An existing neo-liberal state, chronic car-dependency, and a lack of telework policy or regulation reflect classic shallow Ecological Modernisation thinking (Hynes, 2014a). Whilst there was some evidence of rhetoric promoting telework in public discourses in the past, little in the way of practical application and implementation is now apparent. Instead, individual organisations are given sole and absolute autonomy over any such working arrangements, leading to a stagnation of the practice in general.

Building on the MLP on transitions diagram provided in figure 2, the following representation of telework in figure 3 offers an interesting and unique insight into the pressures and barriers that have prevented its development.

⁶ In the case of the traditional way of working and automobility, these negative externalities might come in the form of the financial commitment of ongoing commuting and rising motoring costs, changes in working conditions or terms of employment, the relocation of work, or, indeed, a recognition of the social and environmental costs of commuting by car.

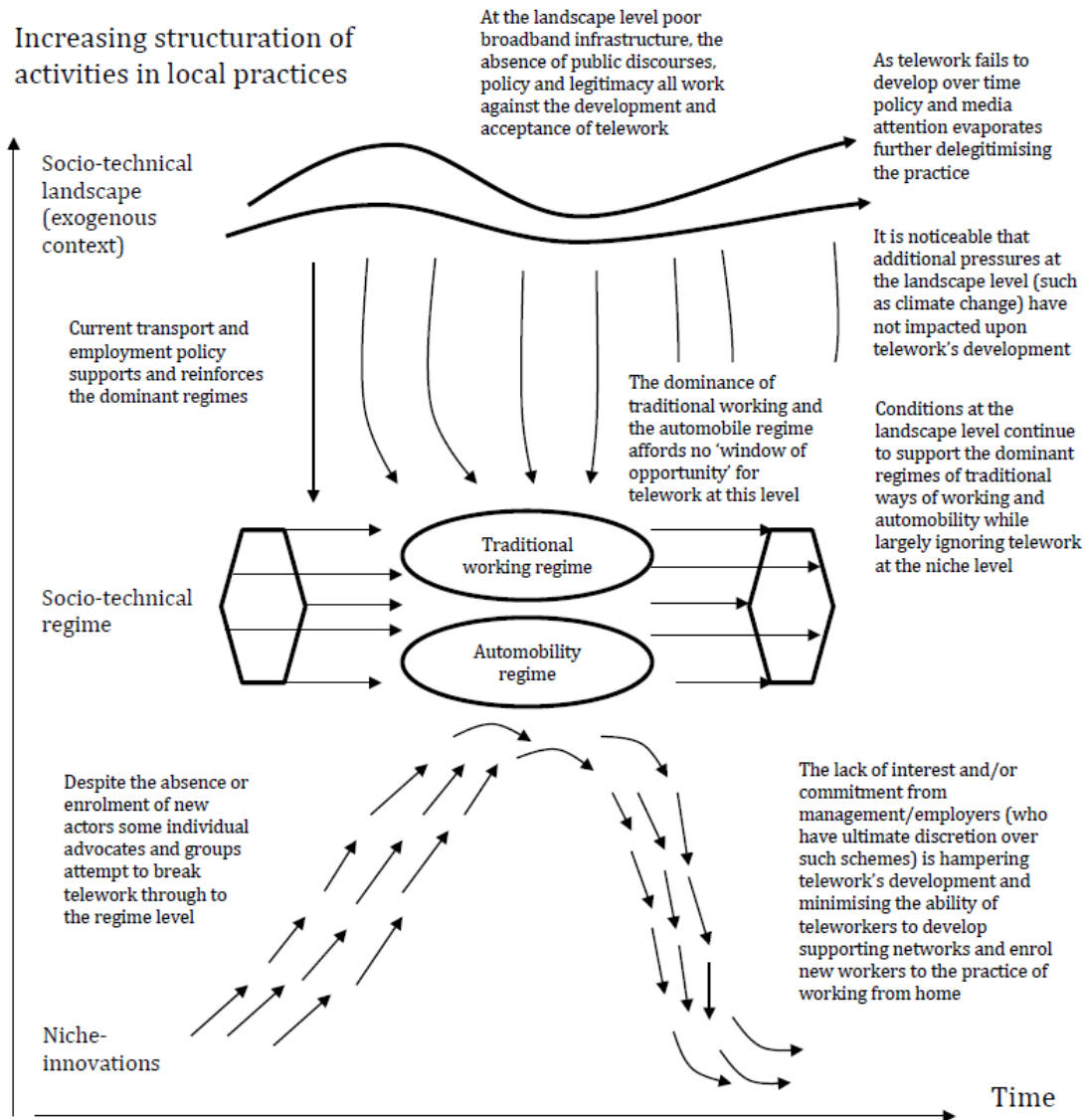


Figure 3 - Multi-level perspective on telework

At the landscape level there is little evidence the early rhetoric associated with the emergence of telework as a method of working has produced any tangible results with regards to its practical development, implementation and broad adoption. In an Irish context, telework has failed to capture the working public’s attention despite early optimistic predictions and forecasts. It remains a peripheral practice and its social and environmental impacts and consequences continue to be unclear, a key reason for this being the lack of practical regulation, direction and research. For telework to develop a good broadband infrastructure is essential, but rural areas of Ireland rank among the worst-served regions of Europe (McGreevy, 2015). No additional infrastructure or applications specifically designed with teleworkers in mind has been developed over the recent past, and the political will to better understand the main social and environmental issues and regulate with this in mind is lacking. At the landscape level, telework has begun to disappear from the agenda of decision-makers, policy designers, and the mainstream media largely due to a lack of understanding of the real issues involved and a paralysis with regards to the direction to take. Moreover, there is no requirement on organisations in Ireland to develop mobility plans or for crisis planning, which could afford opportunities for telework’s development and implementation. Indeed, the nebulousness of the approach to telework in Ireland is reflected in the (lack of) prominence given to the practice in

the recent *Croke Park Public Service Agreement*.⁷ Telework was mentioned once where it was proposed:

...options for [teleworking] or redeployment (in line with the agreed redeployment arrangements) *may be considered where feasible* (Department of Public Expenditure and Reform, 2010) [emphasis added by the author].

There was no reference to telework in the follow-up renegotiated *Croke Park II Agreement* or the *Haddington Road Agreement*. The council and forum setup to support Government decision-making with regards to telework concluded its work in 2003, and the informational website and portals have been shut down for some time now.⁸ This lack of support has been previously highlighted in a study that also suggested that government had a vital role to play in teleworks development (Donovan & Wright, 2012: 14).

8. Conclusions

Work constitutes a human activity that significantly shapes the biophysical environment through the consumption of resources such as fuels, water and clean air, as well as the production of waste. Physical mobility related to paid work outside the home has been identified as a key source of harmful emissions, with car-based commuting causing significant environmental and social damage in Ireland and elsewhere. While the technology to work from home has been widely available for some time, there is continuing reluctance and apprehension on the part of many employers, and indeed employees, to embrace telework. By providing a stronger emphasis on behavioural, cultural, and political aspects, and building upon a multi-level sociotechnical transitions perspective in relation to evidence from Ireland, it is clear the practice of telework remains firmly anchored at the niche level. The lack of interest and/or commitment from employers and management, who hold ultimate discretionary powers over such schemes, is hampering telework's development and minimising the ability of teleworkers to develop supporting networks and enrol additional niche-actors to the practice. The dominance of the traditional way of working severely limits the possibility of 'windows of opportunity' opening at the regime level for telework to exploit. In addition, the automobility regime remains stable further preventing telework from developing. At the landscape level, the lack of an adequate broadband service and of policy or regulation with regards to telework in Ireland is leading to haphazard and disorganised approaches to working this way, compounding already complicated work and domestic arrangements. Thus, the wider context for telework is severely restrictive in terms of its development and widespread acceptance.

There is need for further studies on telework on multi levels to fully appreciate its impacts and consequences. Moreover, a stronger emphasis on behavioural, cultural, and political aspects of socio-technical transitions and their interactions will reveal some obvious pressures and barriers to change, and indeed strengthen the MLP perspective. There is need for more longitudinal research to ensure any environmental sustainability gains brought about by telework are properly evaluated, in particular in relation to possible consumption changes in transport, energy, water, food, and technology use, and if these are (or can be) offset by diminishing consumption in the workplace. Right across Europe actual teleworker numbers are mixed with adoption rates in some countries better than others. There is no clear understanding of why this is so or any great willingness to investigate the reasons why. Therefore, the challenge is to identify key indicators and conditions that permit the practice to flourish in ways that have positive social and environmental effects. A greater understanding, in this regard, will

⁷ The *Croke Park Agreement* was an agreement between the Irish Government and various public sector unions on pay and conditions. It was followed by two further rounds of negotiations; *Croke Park II* and the *Haddington Road Agreement*.

⁸ The official Irish Governmental telework information portals - www.e-Work.ie and www.telework.ie - are no longer accessible online, nor have been for some time.

contribute to improved policy design in the future. Furthermore, comprehensive interviews with policymakers and key decision-makers seem appropriate with regards to their knowledge and position in relation to telework. In light of an (over)emphasis on economic factors inherent in much of the rhetoric of continuous growth, a focus on issues of social and environmental sustainability of telework will provide a more nuanced perspective. It is only then a proper evaluation of the practical benefits of the practice of working from home can be made, and if indeed it is a goal worth pursuing.

References

- Amerlan, D. (2013). *The Real Problem In Working From Home (It's Not What You Think)*. New York, NY: Forbes Magazine, 24th June 2013.
- Anderson, J., Bricout, J. C., & West, M. D. (2001). Telecommuting: Meeting the Needs of Businesses and Employees with Disabilities. *Journal of Vocational Rehabilitation*, 16 (2), 97-104.
- Arnfolk, P. (2002). *Virtual Mobility and Pollution Prevention - The Emerging Role of ICT Based Communication in Organisations and its Impact on Travel*. Library at the IIIIEE, PO Box 196, 221 00 LUND.
- Bailey, D. E., & Kurland, N. B. (2002). A Review of Telework Research: Findings, New Directions, and Lessons for the Study of Modern Work. *Journal of Organizational Behavior*, 23 (4), pp. 383-400.
- Banister, D., Newson, C., & Ledbury, M. (2007). *The Cost of Transport on the Environment - The Role of Teleworking in Reducing Carbon Emissions*. For: Final Report for Peter Warren and Meabh Allen (BT) from the Transport Studies Unit, University of Oxford. Oxford, UK. [retrieved from www.tsu.ox.ac.uk/pubs/1024-banister-et-al.pdf].
- Bardoel, A. E. (2003). The provision of formal and informal work-family practices: The relative importance of institutional and resource dependent explanations versus managerial explanations. *Women in Management Review*, 18 (1/2), 7-19.
- Baruch, Y. (2000). Teleworking: Benefits and Pitfalls as Perceived by Professionals and Managers. *New Technology, Work and Employment*, vol. 15 (no. 1), pp. 34-49.
- Bates, P., & Huws, U. (2002). *Modelling eWork in Europe: Estimates, models and forecasts from the EMERGENCE project*. For: Report 388, Institute for Employment Studies. Brighton, UK. [retrieved from <http://www.employment-studies.co.uk/pubs/summary.php?id=388>].
- Berkhout, F., Smith, A., & Stirling, A. (2004). Socio-technological regimes and transition contexts. In B. Elzen, F. W. Geels & K. Green (Eds.), *System Innovation and the Transition to Sustainability: Theory, Evidence and Policy* (48-75). Cheltenham, UK: Edward Elgar.
- Bricout, J. C. (2004). Using telework to enhance return to work outcomes for individuals with spinal cord injuries. *NeuroRehabilitation*, 19 (2), 147-159.
- Brown, H. S., Vergragt, P., Green, K., & Berchicci, L. (2003). Learning for sustainability transition through bounded socio-technical experiments in personal mobility. *Technology Analysis & Strategic Management*, 15 (3), 291-315.
- Bryman, A. (2016). *Social Research Methods*. Oxford: Oxford University Press.
- Campaign for Better Transport. (2011). *Car Dependency Scorecard 2011: The Top European Cities for Sustainable Transport*. For: Campaign for Better Transport. London, UK. [retrieved from <http://www.bettertransport.org.uk/system/files/european-car-dependency-scorecard-2011.pdf> (accessed 9th February 2012)].
- Commins, N., & Nolan, A. (2010). Car Ownership and Mode of Transport to Work in Ireland. *The Economic and Social Review*, 41 (1), 43-75.
- CSO. (2003). *Quarterly National Household Survey: Module on Teleworking*. For: Central Statistics Office. Dublin 2, Ireland. [retrieved from <http://www.stile.be/wp5/QNHS%20release%20module%20on%20Teleworking.pdf>].
- CSO. (2012a). *Profile 3: At Work*. For: Central Statistics Office. Dublin 2, Ireland. [retrieved from <http://www.cso.ie/en/media/csoie/census/documents/census2011profile3/Profile.3full.doc.for.web.sig.amended.pdf>].
- CSO. (2012b). *Profile 10: Door to Door*. For: Central Statistics Office. Dublin 2, Ireland. [retrieved from <http://www.cso.ie/en/media/csoie/census/documents/census2011profile10/Profile.10.Full.Document.pdf>].
- CSO. (2015). *National Travel Survey 2014*. For: Central Statistics Office. Dublin 2, Ireland. [retrieved from <http://www.cso.ie/en/releasesandpublications/ep/p-nts/nationaltravelsurvey2014/overview/>].

- Currie, J., & Eveline, J. (2011). E-technology and work/life balance for academics with young children. *Higher Education*, 62 (4), 533-550.
- Department of Public Expenditure and Reform. (2010). *Public Service Agreement 2010-2014 (Croke Park Agreement)*. Dublin 2, Ireland: Government Publications.
- Department of Transport. (2008). *2020 Vision - Sustainable Travel and Transport. Public Consultation Document*. For: Government Publications. Dublin 2, Ireland. [retrieved from <http://www.epa.ie/pubs/reports/air/airemissions/EPA%202015%20GHG%20Projections%20Publication%20Final.pdf>].
- Donovan, D., & Wright, A. (2012). *Teleworking: An Examination of the Irish Dichotomy*. Irish Academy of Management Conference 2012, 6th-7th September 2012, National University of Ireland, Maynooth.
- Dwelly, T., & Lake, A. (2008). *Can Homeworking Save the Planet? How Homes can become Workspaces in a Low Carbon Economy*. London, UK: The Smith Institute.
- EEA. (2014). *Adaptation of transport to climate change in Europe: Challenges and options across transport modes and stakeholders*. For: European Environment Agency. Copenhagen, Denmark. [retrieved from <http://www.eea.europa.eu/publications/adaptation-of-transport-to-climate>].
- Egan, B. (1997). *Feasibility and Cost Benefit Analysis* Paper presented at the International Telework Association Annual International Conference, June, Crystal City, VA.
- EIRO. (2010). Telework in the European Union. [Website] *European Industrial Relations Observatory Online*. Accessed 20th March 2012 [retrieved from http://www.eurofound.europa.eu/eiro/studies/tn0910050s/tn0910050s_4.htm].
- Elzen, B., Geels, F. W., & Green, K. (2004). *System Innovation and the Transition to Sustainability: Theory, Evidence and Policy*. Cheltenham, UK: Edward Elgar Publishing.
- EPA. (2015). *Ireland's Greenhouse Gas Emission Projections 2014-2035*. For: Environmental Protection Agency. Co Wexford. [retrieved from <http://www.epa.ie/pubs/reports/air/airemissions/EPA%202015%20GHG%20Projections%20Publication%20Final.pdf>].
- Eurofound. (2010). *Telework in the European Union*. For: European Foundation for the Improvement of Living and Working Conditions (Eurofound). Dublin 2, Ireland. [retrieved from <http://www.eurofound.europa.eu/eiro/studies/tn0910050s/tn0910050s.htm>].
- Europa. (2002). Teleworking. [Website] *Summaries of EU legislation*. Accessed 20th November 2011 [retrieved from http://europa.eu/legislation_summaries/employment_and_social_policy/employment_rights_and_work_organisation/c10131_en.htm].
- Geels, F. W. (2002). Technological transitions as evolutionary reconfiguration processes: a multi-level perspective and a case-study. *Research Policy*, 31 (8), 1257-1274.
- Geels, F. W. (2005a). Co-evolution of technology and society: The transition in water supply and personal hygiene in the Netherlands (1850-1930)—a case study in multi-level perspective. *Technology in Society*, 27 (3), 363-397.
- Geels, F. W. (2005b). Processes and patterns in transitions and system innovations: refining the co-evolutionary multi-level perspective. *Technological forecasting and social change*, 72 (6), 681-696.
- Geels, F. W. (2006). Major system change through stepwise reconfiguration: a multi-level analysis of the transformation of American factory production (1850-1930). *Technology in Society*, 28 (4), 445-476.
- Geels, F. W. (2011). The multi-level perspective on sustainability transitions: Responses to seven criticisms. *Environmental Innovation and Societal Transitions*, 1 (1), 24-40.
- Geels, F. W. (2012). A socio-technical analysis of low-carbon transitions: introducing the multi-level perspective into transport studies. *Journal of Transport Geography*, 24 471-482.
- Geels, F. W., Kemp, R., Dudley, G., & Lyons, G. (2011). *Automobility in transition?: A socio-technical analysis of sustainable transport*. New York, NY: Routledge.

- Geels, F. W., & Schot, J. (2007). Typology of socio-technical transition pathways. *Research Policy*, 36 (3), 399-417.
- Genus, A., & Coles, A.-M. (2008). Rethinking the multi-level perspective of technological transitions. *Research policy*, 37 (9), 1436-1445.
- GlobalWorkplaceAnalytics. (2016). Latest Telecommuting Statistics. [Website] Accessed 3rd May 2016 [retrieved from <http://globalworkplaceanalytics.com/telecommuting-statistics>].
- Golden, T. D. (2009). Applying technology to work: Toward a better understanding of telework. *Organization Management Journal*, 6 (4), 241-250.
- Grin, J., Rotmans, J., Schot, J., Geels, F., & Loorbach, D. (2010). *Transitions to Sustainable Development: New directions in the study of long term transformative change*. New York, NY: Routledge.
- Haddon, L., & Brynin, M. (2005). The character of telework and the characteristics of teleworkers. *New Technology, Work and Employment*, 20 (1), 34-46.
- Hartig, T., Kylin, C., & Johansson, G. (2007). The telework tradeoff: Stress mitigation vs. constrained restoration. *Applied Psychology*, 56 (2), 231-253.
- Heisserer, B., & Rau, H. (2015). Capturing the consumption of distance? A practice-theoretical investigation of everyday travel. *Journal of Consumer Culture*, (published online on 23 September 2015, DOI: 2010.1177/1469540515602304).
- Hesse, B. W. (1995). *Curb Cuts in the Virtual Community: Telework and Persons with Disabilities* (418-425). Paper presented at the Proceedings of the 28th Annual Hawaii International Conference on System Sciences, Hawaii.
- Hilbrecht, M., Shaw, S. M., Johnson, L. C., & Andrey, J. (2008). 'I'm Home for the Kids': Contradictory Implications for Work–Life Balance of Teleworking Mothers. *Gender, Work & Organization*, 15 (5), 454-476.
- Huws, U., Korte, W. B., & Robinson, S. (1990). *Telework: Towards the Elusive Office*. Chichester: Wiley and Sons.
- Hynes, M. (2013a). *Mobility Matters: Technology, Telework, and the (Un)sustainable Consumption of Distance*. PhD, National University of Ireland Galway, Unpublished [available at <http://hdl.handle.net/10379/3814>]. [retrieved from <http://hdl.handle.net/10379/3814>].
- Hynes, M. (2013b). What's Smart About Working from Home: Telework and the Sustainable Consumption of Distance in Ireland? In C. Fowley, C. English & S. Thouësnny (Eds.), *Internet Research, Theory, and Practice: Perspectives from Ireland* (225-243). Dublin, Ireland: Research Publishing.
- Hynes, M. (2014a). Consuming Distance or (all) Consuming Work? The case of Telework In A. R. Davies, F. Fahy & H. Rau (Eds.), *Challenging Consumption: Pathways to a more Sustainable Future* (81-98). London, UK: Routledge.
- Hynes, M. (2014b). Telework Isn't Working: A Policy Review. *The Economic and Social Review*, 45 (4), 579–602.
- Illegems, V., Verbeke, A., & S'Jegers, R. (2001). The organizational context of teleworking implementation. *Technological Forecasting and Social Change*, 68 (3), 275-291.
- IPCC. (2014). *Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]*. Geneva, Switzerland: Intergovernmental Panel on Climate Change (IPCC).
- Irish DoETE. (2000). *e-Working in Ireland: New Ways of Living and Working: Code of Practice*. For: Department of Enterprise Trade and Employment. Dublin 2. [retrieved from <http://www.djei.ie/publications/enterprise/2000/e-work/index.htm>].
- Irwin, F. (2004). *Gaining the Air Quality and Climate Benefit for Telework*. For: World Resources Institute. U.S. Environmental Protection Agency and the AT&T Foundation. [retrieved from <http://www.distributedworkplace.com/DW/Research/Gaining%20the%20Air%20Quality%20and%20Climate%20Benefit%20from%20Telework.pdf>].

- Kerrin, M., & Hone, K. (2001). Job seekers' perceptions of teleworking: A cognitive mapping approach. *New Technology, Work and Employment*, 16 (2), 130-143.
- Kitou, E., & Horvath, A. (2003). Energy-Related Emissions from Telework. *Environment Science Technology*, 37 (16), 3467-3475.
- Lee, S. (2013). Best Buy ends work-from-home program. *CNN Money*, 5th March 2013, New York, NY, Cable News Network. A Time Warner Company. [retrieved from <http://money.cnn.com/2013/03/05/technology/best-buy-work-from-home/index.html>].
- Lister, K., & Harnish, T. (2009). *Undress for Success: The Naked Truth about Making Money at Home*. Hoboken, NJ: John Wiley & Sons.
- Marvin, S. (1997). Environmental flows: telecommunications and the dematerialisation of cities? *Futures*, 29 (1), 47-65.
- McGrath, P., & Houlihan, M. (1998). Conceptualising Telework: Modern or Postmodern? In P. J. Jackson & J. M. V. D. Wielen (Eds.), *Teleworking: International Perspectives* (56-73). New York, NY: Routledge.
- McGreevy, R. (2015). Ireland's broadband black spots. *The Irish Times*, Saturday 14th April 2015, Dublin, Ireland, The Irish Times Ltd. [retrieved from <http://www.irishtimes.com/life-and-style/ireland-s-broadband-black-spots-1.2103169?mode=sample&auth-failed=1&pw-origin=http%3A%2F%2Fwww.irishtimes.com%2Flife-and-style%2Fireland-s-broadband-black-spots-1.2103169>].
- Minihan, M. (2012). Major Roads in Galway and Wexford included in €2bn plan. *The Irish Times*, Tuesday 17th July 2012, Dublin, Ireland, The Irish Times Ltd. [retrieved from <http://www.irishtimes.com/news/major-roads-in-galway-and-wexford-included-in-2bn-plan-1.537345?mode=sample&auth-failed=1&pw-origin=http%3A%2F%2Fwww.irishtimes.com%2Fnews%2Fmajor-roads-in-galway-and-wexford-included-in-2bn-plan-1.537345>].
- Mokhtarian, P. L. (1990). A Typology of Relationships Between Telecommunications and Transportation. *Transportation Research Part A: General*, 24 (3), 231-242.
- Mokhtarian, P. L. (1991). Telecommuting and Travel: State of the Practice, State of the Art. *Transportation*, 18 (4), 319-342.
- Mokhtarian, P. L. (2003). Telecommunications and Travel: The Case for Complementarity. *Journal of Industrial Ecology*, 6 (2), 43-57.
- Mokhtarian, P. L., & Salomon, I. (1996a). Modeling the choice of telecommuting: 2. A case of the preferred impossible alternative. *Environment and Planning A*, 28 (10), 1859-1876.
- Mokhtarian, P. L., & Salomon, I. (1996b). Modeling the choice of telecommuting: 3. Identifying the choice set and estimating binary choice models for technology-based alternatives. *Environment and Planning A*, 28 (10), 1877-1894.
- MRBI. (2002). *e-Working in Ireland: Survey into e-Working Companies*. For: Market Research Bureau of Ireland Ltd on behalf of eWork Action Forum. Dublin, Ireland. [as reported in E-Work in Ireland]. [retrieved October 2013 from <http://www.employment-studies.co.uk/pdflibrary/394.pdf>].
- National Advisory Council on Teleworking. (1999). *New Ways of Living and Working: Teleworking in Ireland*. For: Department of Enterprise Trade and Employment, Report of the National Advisory Council on Teleworking. Dublin 2, Ireland. [retrieved from <http://www.djei.ie/publications/trade/2003/teleworking.pdf>].
- Nilles, J. M. (1998). *Managing Telework: Strategies for Managing the Virtual Workforce*. New York, NY: John Wiley & Sons.
- Nye, M., Whitmarsh, L., & Foxon, T. (2010). Sociopsychological perspectives on the active roles of domestic actors in transition to a lower carbon electricity economy. *Environment and Planning A*, 42 (3), 697-714.
- O'Connell, P., Russell, H., Williams, J., & Blackwell, S. (2004). *The Changing Workplace: A Survey of Employees' Views and Experiences*. Dublin: National Centre for Partnership and Performance.

- OECD. (2008). *Directorate for Science, Technology and Industry Committee for Information, Computer and Communications Policy/OECD*. Paris, France: Broadband and the Economy, Ministerial Background, Organisation for Economic Co-operation and Development. Report DSTI/ICCP/IE(2007)/Final.
- OECD. (2014). *Employment and Skills Strategies in Ireland, OECD Reviews on Local Job Creation*. Paris: OECD Publishing.
- Peters, P., & den Dulk, L. (2003). Cross Cultural Differences in Managers' Support for Home-Based Telework A Theoretical Elaboration. *International Journal of Cross Cultural Management*, 3 (3), 329-346.
- Prosser, T. (2011). The Implementation of the Telework and Work-related Stress Agreements: European Social Dialogue through 'Soft' Law? *European Journal of Industrial Relations*, 17 (3), 245-260.
- Pyöriä, P. (2011). Managing Telework: Risks, fears and rules. *Management Research Review*, 34 (4), 386-399.
- Quortrup, L. (1998). From Teleworking to Networking: Definitions and Trends. In P. J. Jackson & J. M. V. D. Wielen (Eds.), *Teleworking: International Perspectives* (21-39). New York, NY: Routledge.
- Rau, H., & Hennessy, C. (2009). The Road to Sustainable Transport: Community Groups, Rural Transport Programmes and Policies in Ireland. In J. McDonagh, T. Varley & S. Shortall (Eds.), *A Living Countryside?: The Politics of Sustainable Development in Rural Ireland* (pp. 361-379). Farnham, UK: Ashgate Publishing Ltd.
- Rau, H., Hynes, M., & Heisserer, B. (2016). Transport policy and governance in turbulent times: Evidence from Ireland. *Case Studies on Transport Policy*, 4 (2):pp. 45-56.
- Rhee, H.-J. (2009). Telecommuting and urban sprawl. *Transportation Research Part D: Transport and Environment*, 14 (7), 453-460.
- Rip, A., & Kemp, R. (1998). Technological Change. In S. Rayner & E. L. Malone (Eds.), *Human Choice and Climate Change, Volume 2* (327-399). Columbus, OH: Battelle Press.
- Santos, G., Behrendt, H., & Teytelboym, A. (2010). Part II: Policy instruments for sustainable road transport. *Research in Transportation Economics*, 28 (1), 46-91.
- Shamir, B., & Salomon, I. (1985). Work-at-Home and the Quality of Working Life. *Academy of Management Review*, 10 (3), 455-464.
- Shove, E. (2003). *Comfort, Cleanliness and Convenience: The Social Organization of Normality*. Oxford, UK: Berg Publishers.
- Shove, E., & Walker, G. (2010). Governing transitions in the sustainability of everyday life. *Research Policy*, 39 (4), 471-476.
- Sims, R., Schaeffer, R., Creutzig, F., Cruz-Núñez, X., D'Agosto, M., Dimitriu, D., et al. (2014). Transport. In O. Edenhofer, R. Pichs-Madruga, Y. Sokona, E. Farahani, S. Kadner, K. Seyboth, A. Adler, I. Baum, S. Brunner, P. Eickemeier, B. Kriemann, J. Savolainen, S. Schlömer, C. von Stechow, T. Zwickel and J.C. Minx (Ed.), *Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* Cambridge, United Kingdom and New York, NY: Cambridge University Press.
- Smith, A. (2007). Translating sustainabilities between green niches and socio-technical regimes. *Technology Analysis & Strategic Management*, 19 (4), 427-450.
- Smith, A., Stirling, A., & Berkhout, F. (2005). The governance of sustainable socio-technical transitions. *Research policy*, 34 (10), 1491-1510.
- Sullivan, C. (2003). What's in a Name? Definitions and Conceptualisations of Teleworking and Homeworking. *New Technology, Work and Employment*, 18 (3), 158-165.
- Surowiecki, J. (2013). The Financial Page: Face Time *The New Yorker*, 18th March 2013, New York, NY, Condé Nast. [retrieved from <http://www.newyorker.com/magazine/2013/03/18/face-time>].
- The Carbon Trust. (2014). *Homeworking: Helping businesses cut costs and reduce their carbon footprint*. For: The Carbon Trust. London, UK. [retrieved from <http://www.carbontrust.com/media/507270/ctc830-homeworking.pdf>].

- The Guardian. (2009). Does teleworking really cut emissions? Title: *The Guardian: Environmental Blog*. Accessed 2014 [retrieved from Guardian News and Media Limited].
- Van Bree, B., Verbong, G. P., & Kramer, G. J. (2010). A multi-level perspective on the introduction of hydrogen and battery-electric vehicles. *Technological Forecasting and Social Change*, 77 (4), 529-540.
- Van der Brugge, R., Rotmans, J., & Loorbach, D. (2005). The transition in Dutch water management. *Regional Environmental Change*, 5 (4), 164-176.
- Van Horn, C., & Storen, D. (2000). Telework: Coming of age? Evaluating the Potential Benefits of Telework. *US Department of Labor, Washington, DC* 3-32.
- van Lier, T., de Witte, A., & Macharis, C. (2014). How worthwhile is teleworking from a sustainable mobility perspective? The case of Brussels Capital region. *EJTIR*, 14 (3), 244-267.
- Venkatesh, V., & Speier, C. (2000). Creating an effective training environment for enhancing telework. *International Journal of Human-Computer Studies*, 52 (6), 991-1005.
- Verbong, G., & Geels, F. (2007). The ongoing energy transition: lessons from a socio-technical, multi-level analysis of the Dutch electricity system (1960–2004). *Energy Policy*, 35 (2), 1025-1037.
- WCED. (1987). *Our Common Future*. Oxford, UK: Oxford University Press.
- Whitmarsh, L., Swartling, Å. G., & Jäger, J. (2009). Participation of experts and non-experts in a sustainability assessment of mobility. *Environmental policy and governance*, 19 (4), 232-250.
- Wickham, J. J. R. (2006). *Gridlock: Dublin's transport crisis and the future of the city*. Dublin: New Island.
- Wilks, L., & Billsberry, J. (2007). Should we do away with teleworking? An examination of whether teleworking can be defined in the new world of work. *New Technology, Work and Employment*, 22 (2), 168-177.
- Winter, S. G., & Nelson, R. R. (1982). *An Evolutionary Theory of Economic Change*. Cambridge, MA: Belknap Press.
- WWF. (2009). *From Workplace to Anywhere: Assessing the Global Opportunities to Reduce Greenhouse Emissions with Virtual Meetings and Telecommuting*. For: World Wildlife Fund. Solna, Sweden. [retrieved from <http://www.worldwildlife.org/who/media/press/2009/WWFBinaryitem11939.pdf>].