LOCAW

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RESEARCH REPORT

LOW CARBON AT WORK

Modeling Agents and Organizations to achieve Transitions to a Low Carbon Europe

LOCAW WP7
Final report - public seminars and final expert seminar

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Executive summary

The LOCAW project has aimed at identifying the complex determinants of everyday practices in the workplace, as well as the ways in which practices from one life domain influence those in another, in order to be able to provide a thorough account of the barriers to and drivers of transitions to sustainable practices in organizations. It has focused on three categories of practices, chosen for their relevance to achieving reductions in greenhouse gas emissions (GHGs): consumption of materials and energy; waste generation and management, and work-related mobility. In order to advance understanding on the determinants of everyday practices within large scale organizations, LOCAW undertook multi-method empirical research on the following dimensions:

a) analysis of the patterns of production and consumption in the workplace with their resulting GHG emissions;

b) analysis of the organizational strategies to reduce emissions and EU regulations regarding the "greening" of their production processes.

c) analysis of everyday practices and behaviours at work of employees and factors influencing it on different levels of decision-making within the organization.

d) the relationship between behaviours and practices at work and behaviours and practices outside work.

e) the patterns of interaction between relevant agents and stakeholders in the organization's environment and the resulting barriers and drivers for implementing sustainable practices and behaviours in the workplace.

The empirical research was then used to derive a comprehensive and theoretically-sound account of determinants of sustainable practices in the workplace in the areas mentioned above and in different types of organizations. Six organisations were studied: two heavy industry organizations, two public sector organizations and two private service providers. The project research looked at structural, organizational and individual determinants of practices and at how they interact to create specific contexts that are either supportive of sustainable practices or create specific lock-in situations that hinder the possibilities to effectively carry our sustainable practices.

Furthermore, the conclusions of the empirical research were then used to develop simulations of the case study organizations in which effects of scenarios for transitions to sustainable practices were tested, for the target year 2050. These scenarios were built using participatory back-casting scenario development approaches, with workers of the organizations under study, and by formalizing theoretically and empirically driven conclusions on factors influencing transitions to sustainable everyday practices in organizations. Scenarios included policy pathways that were tested with an agent-based modelling approach. Agent-based modelling was used to both test the assumptions derived from the empirical research as well as to dynamically test policies that could contribute to effective change in everyday practices. Several policies were tested so as to check their effectiveness. Policies were checked separately, in combination, isolated in time and maintained through time.

The LOCAW project has developed a comprehensive impact and dissemination strategy. It has aimed at having significant EU, national and regional policy, practical and scientific impacts, which would further promote the European Union as a worldwide centre of 'research into policy' excellence. These policy recommendations include both important general conclusions about policy mixes and policy intensity (e.g.: showing that mild intensity policies, in combination, can work much better in transforming practices that more restrictive policies), as well as suggestions for policies that would transform practices in organizations. Dissemination targeted relevant stakeholder groups to make sure results reach business, government, academic and third sector groups, as well as the general public.

1 Project context and objectives

The need for transitions to a low-carbon Europe

Patterns of unsustainable production and consumption have been recognized as main causes of climate change. The renewed Sustainable Development Strategy 2006 of the EU states that "the main challenge is to gradually change our current unsustainable consumption and production patterns and the non-integrated approach to policy-making" (European Council 2006, p.2). Despite cross-cutting multidisciplinary research and policy efforts in most European states it has not been possible to achieve significant changes in consumption and production which would reverse or slow down the devastating projections outlined by the Intergovernmental Panel on Climatic Change (IPCC) Fourth Assessment Report (2007) for our ecosystem.

This was also recognized by the progress report on the EU's Sustainable Development Strategy 2008, which concluded that "although a wide range of actions is being initiated, there is only limited evidence in the area of sustainable consumption and production (SCP) that countries are scratching beyond the surface of this fundamental objective" (ECORY p.8). One year later the 2009 Review of the EU´s Sustainable Development Strategy highlights the fact that "despite considerable efforts to include action for sustainable development in major EU policy areas, unsustainable trends persist and the EU still needs to intensify its efforts" (p.15).

While some reductions can be made through recent initiatives including carbon trading and other flexible mechanisms agreed upon under the Kyoto protocol, with some countries overachieving agreed-upon goals (see: European Environmental Agency, 2009), in the long term it is vital to enhance the efforts of individuals, organisations, and societies at large to reduce greenhouse gas emissions through changes in the patterns of production of goods and services as well as regarding their consumption.

Governments have also started to recognize that climate change and its consequences need to be addressed by changing peoples´ behaviour and everyday practices and that technological fixes alone will not be enough. Even where they can play a role, the environmental effectiveness of technological "solutions" is contingent upon the way in which users engage with and deploy them (Midden, Kaiser & McCalley, 2007).

The role of large-scale organizations

Recently, various studies have been conducted that significantly increased our understanding of factors influencing environmental behaviour and related GHG emissions, and ways to mitigate climate change via behaviour changes. However, these studies typically focused on environmental behaviour and energy use in the private sphere. Yet, large organizations are responsible for a significant amount of GHG emissions. An estimation in the year 2000, which considered 8 different categories of sources of GHG emissions (industrial processes, power stations, transportation fuels, among others), showed that the potential contribution of large organizations to global warming over the next 100 years will be highly significant: 72 % CO2, 18 % Methane, 9 % Nitrous Oxide (Emission Database for Global Atmospheric Research, 2000).

The emissions generated by large organizations result from their production processes and the pressures under which they function within our economic system, and from the behaviour of their employees. Following the new EU regulations, national governments have also passed laws concerning emissions and have created policy instruments designed to reduce or compensate the level of emissions of specific organizations in order to reach national and European goals. As a result of these new regulations, organizations have also started to implement mechanisms to reduce their GHG emissions. However, as stated in the EU Sustainable Development Strategy Review 2009, these strategies have not been sufficient to ensure significant reduction rates. To better articulate efforts undertaken by relevant actors towards sustainability, we need to identify the barriers to and drivers of *sustainable changes in everyday practices in the workplace.*

The workplace as an area of everyday life

As a key practice of everyday life, work is a place and space where the sometimes contradictory demands of economic profit and environmental sustainability meet and are negotiated, with the resulting effects on work practices, energy consumption and greenhouse gas emissions. As people spend an important part of their lives at work, within a community of values, norms and everyday practices, it is also the place where identities are negotiated, where individual values are transformed and where sustainability-related behaviour is either promoted and rewarded or hindered and discouraged (Brown, Kirpal & Rauner, 2007).

As production and consumption are intimately related, changing patterns of production and work-related behaviour can not only directly reduce GHG emissions, but can have a significant indirect effect, by influencing what is available

for consumption. If we address changes in production patterns, we will have addressed the upstream causes of environmental problems. This has only recently started to be explored in the social sciences (Uzzell & Rathzel, 2009).

Large employers hold a high potential for change. As a main area of human life, work is vital in fulfilling basic human needs, both economic (survival, protection, affiliation) and expressive (identity, self-actualization) (Brown, Kirpal & Rauner, 2007). This means that changes in *labour regimes* can be highly effective and have the potential to be translated to other domains of life. In spite of this potential, research on sustainable everyday practices at work and on the factors promoting or hindering them has been scarce in the social sciences that are concerned with sustainable lifestyles.

There is a tendency to see work as distinct from the rest of life. Not only do individuals in organizations bring in their values, lifestyles, socio-economic conditions, and multiple identities and find creative ways of adapting to the organizational environment, they are also active agents in creating, maintaining and transforming work practices, and they have the potential to take learned practices from the workplace to their homes and other everyday settings. Workers can have an influence on changing production processes but they can also directly influence consumption practices in other life domains, through carrying out practices from one life domain to another.

Analyzing the determinants of everyday practices

On the basis of the above, LOCAW aimed at developing an in-depth analysis of the determinants of everyday practices in organizations, at structural, organizational and individual levels, and the interactions among them. At the structural level it targeted factors such as regulations and legislation at EU, national and regional levels and market factors influencing organizations. At the organizational level, it looked at organizational cultures and communication processes, as well as at both vertical and horizontal relationships within organisations and how they influence sustainable practices. At the individual level, LOCAW looked at knowledge, motivations (values, social norms, personal norms, identity) and the perceived ability to perform certain behaviors, as reflected in feelings of efficacy.

Besides the understanding of the complexities of practices in organizations, the project also aimed at providing an account of how practices in the different life domains of work and home interact and influence each other, using an actor-centred approach and a perspective of workers as "border-crossers", moving across the lines separating different life domains in everyday life. The research question posed at the outset was: how do people connect practices from one area of life to another and what impact does this have on their identities, roles and everyday practices related to sustainability and the encouragement of low-carbon lifestyles? What conditions need to be in place to make these two settings permeable in terms of taking sustainable practices from one domain to the other? Can we identify general antecedents affecting both behaviour at work and at home? What are the ways in which the relationships between work, domestic life and leisure activities affect people's decisions concerning their GHG emission-relevant behaviors?

A multi-method approach

In order to tackle this, LOCAW employed a multi-method approach. More specifically, it used a life history methodology, in which the individual takes a position as an independent narrator of her/his life trajectory and personal subjectivity (Phoenix 2007, 2008). In addition, literature

analyses and questionnaire studies were conducted to address this question. Although previous research on home – work relationships is substantial, there was little research investigating whether and how work practices, habits, behaviors, norms and values learned in the workplace are transferred into the areas of home and leisure or vice versa.

The LOCAW project has thus aimed at identifying the complex determinants of everyday practices in the workplace, as well as the ways in which practices from one life domain influence those in another, in order to be able to provide a thorough account of the barriers to and drivers of sustainable everyday practices. In order to map the complex picture of everyday practices in organizations, LOCAW has focused on three categories of practices in the workplace, chosen for their relevance to achieving reductions in greenhouse gas emissions (GHGs): consumption of materials and energy; waste generation and management, and work-related mobility. It adopted a multi-method approach to the identification of these determinants, both quantitative and qualitative approaches as well as literature reviews. It undertook a diagnosis of existing practices in six large scale organizations through a combination of focus groups, document analysis, desktop research and interviews with key informers. It then investigated the main determinants through literature reviews, in-depth and life history interviews, and questionnaire studies.

In order to advance understanding on the determinants of everyday practices within large scale organizations, LOCAW undertook empirical research on the following dimensions:

a) analysis of the patterns of production and consumption in the workplace with their resulting GHG emissions;

b) analysis of the organizational strategies to reduce emissions and EU regulations regarding the "greening" of their production processes.

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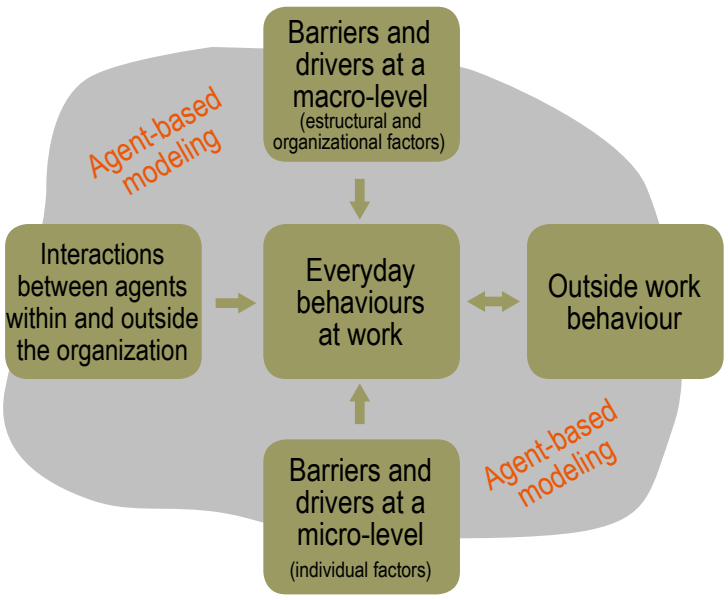
e) the patterns of interaction between relevant agents and stakeholders in the organization's environment and the resulting barriers and drivers for implementing sustainable practices and behaviours in the workplace.



The empirical research was then used to derive a comprehensive and theoretically-sound account of determinants of sustainable practices in the workplace in the areas mentioned above and in different types of organizations under study. As a case of point, six different types of organisations were studied. The project research looked at structural, organizational and individual determinants of practices and at how they interact to create specific contexts that are either supportive of sustainable practices or create specific lock-in situations that hinder the possibilities to effectively carry our sustainable practices. Furthermore, the conclusions of the empirical research were then used to develop simulations of the case study organizations in

which effects of scenarios for transitions to sustainable practices were tested, for the target year 2050. These scenarios were built using participatory back-casting scenario development approaches, with workers of the organizations under study, and by formalizing theoretically and empirically driven conclusions on factors influencing transitions to sustainable everyday practices in organizations. Scenarios included policy pathways that were tested using an *agent-based modelling* approach. Agent-based modelling was used to both test the assumptions derived from the empirical research as well as to dynamically test policies that could contribute to effective change in everyday practices.

2 Case studies in LOCAW

The project set out to study three types of organisations: Heavy industry companies, public sector organisations, and private companies in the field of natural resources/energy. The two heavy industry case studies were **Volvo Trucks** and **Royal Dutch Shell plc**. The particular focus of the analysis in the heavy industry case studies was in the development of a rich understanding of the relationships between workers, management and trade-unions, as well as an in depth understanding of the relationships between work and home. The two public sector organisations were the **University of Corunna** and the **Municipality of Groningen**. There are clearly differences between the overall purpose of these two types of organisations - municipalities have a purpose of delivering democracy and implementing structural policies at the local level, whereas the overriding purpose of universities is the delivery of education and research. Nevertheless, both serve important societal functions and both have a key role as potential frontrunners in leading transitions to a low-carbon society (promoting sustainability within their own organisation, but also through green public procurement and the promotion of low-carbon businesses in communities). The two private companies in the field of natural resources/energy studies were **Aquatim** and **Enel Green Power**. Both of these cases study organisations provide public utilities (water and wastewater treatment for Aquatim, and renewable electric energy for Enel Green Power), and deal with resource consumption areas of particular relevance from a transition-to-sustainability point of view. All of these organisations are described briefly in the following sections.

The heavy industry: Transforming production

2.1. Volvo

Volvo Trucks is the second largest heavy-duty truck brand in the world with circa 17000 employees worldwide. It has headquarters in Gothenburg, Sweden. The organisation has eight wholly owned assembly plants and nine factories owned by local interests. It produces over 100000 units annually. The company's trucks are sold and serviced in more than 140 countries all over the world. Volvo Trucks manufactures cabs for two of the truck models in Umeå, Sweden, at Volvo Umeverken. The plant has a total area of 300000 m2 and a heated area of 163000 m2. Over 2000 people work at the plant.

It has a maximum annual capacity of 90000 cabs. In 2008 the plant produced 62000 cabs. The production of cabs for Volvo trucks includes a range of activities.

Activities include shearing, slitting, pressing, machining and welding sheet metal into finished truck cabs. Thereafter, the preparation of surface, sealing, coating and interior fitting are undertaken. Volvo trucks has set reduction targets for emissions of carbon dioxide during the production process. Energy consumption and carbon dioxide emissions per truck built dropped by 30 percent between 2001 and 2005. Emissions are calculated on the basis of the production undertaken within the factories and do not include the value chain, i.e. transport to and from the factory. Volvo's goal is to terminate the use of oil and coal for heating purposes entirely. In the Umeå plant ninety percent of the energy consumed in the production process comes from renewable sources.

2.2 Shell

Royal Dutch Shell plc is an Anglo-Dutch oil and gas company with around 87,000 employees operating in circa 70 countries. The company is incorporated in the United Kingdom and has its headquarters in the Netherlands. Shell claims that it aims to meet the energy needs of society in ways that are economically, socially and environmentally viable, now and in the future. The public objectives of the Shell group are to engage efficiently, responsibly, and profitably in oil, oil products, gas, chemicals and other selected businesses and to participate in the search for and development of other sources of energy to meet the world's growing demand for energy.

Shell's areas of business are upstream, downstream, and projects and technology. Upstream business explores for and extracts crude oil and natural gas. Downstream business refines, supplies, trades and ships crude oil, manufactures and markets a range of products, and produces petrochemicals for industrial customers. Projects and technology business manages delivery of major projects and drives research and innovation to create technological solutions. Shell produces 3.3 million barrels of oil equivalent every day. The company runs more than 30 refineries and chemical plants. Furthermore, it has circa 44000 service stations.

Safety, environmental, and social responsibility are argued to be at the heart of Shell's activities. Shell accepted the Kyoto protocol, recognised climate science, set goals to reduce its own GHG emissions and invested in renewables, although this investment has been reduced in recent years. Shell asserts that the best way the company can help secure a sustainable energy future is by focusing on four main areas: natural gas, biofuels, carbon capture and storage, and energy efficiency. Shell has developed a campaign to encourage staff to reduce energy use at work as well as at home: Energy Challenge @ Work.

Public sector organizations

2.3 Universities: Educating citizens
The University of A Coruña, Spain

Universities are key actors in sustainability transitions as workplaces and as learning communities. Their direct and indirect impact on society can be considerable in terms of training citizens who are knowledgeable of environmental problems and who also know how to act in sustainable ways both in their homes an at their workplaces – and are motivated to do so.

The University of Corunna in Spain is a public, and relatively new, university. It was founded in 1989 and it has two campuses: A Coruña (with six different spatial locations) and Ferrol (with two spatial locations). Their staffs today consist of 1,513 faculty and 760 administrative and service personnel. It has 24,554 students divided between the two campuses.

The University users, both staff and students, with their patterns of energy and materials consumption, waste generation and organization-related mobility, have a considerable impact on the environment in terms of GHG emissions. Furthermore, the University plays a key role in the education of citizens in general, and thus has the potential to be an important contributor to a low-carbon Europe. Its direct and indirect impact on society is considerable, as it can educate citizens who are knowledgeable of environmental problems and solutions in our society today and who also know how to act in sustainable ways both in their homes and in the workplace – and are motivated to do so.

Since its foundation, UDC has developed research on issues related to sustainable development and the environment, through research groups working in Environmental Economy, Environmental Law, Environmental Chemistry and Biology, Environmental Education and Environmental Psychology. In order to integrate environmental knowledge from all these fields, in 1997 the University´s Environmental Institute was created. This institute generated several initiatives, some of which were managed by the Vice-Rectorate for the Environment and Infrastructure, and later a new Office for the Environment was created in order to promote sustainable initiatives in the university as a whole.

2.4 Municipalities: Implementing Policies
The municipality of Groningen

Municipalities are also relevant actors in the sustainability debate, since they can have an impact on the formulation and implementation of policies, they can educate citizens, and set an example by promoting more sustainable behaviour of its own civil servants.

The municipality of Groningen in The Netherlands is divided into 10 departments, each of which has different tasks and responsibilities. In the realm of sustainability, the municipality

is, among other things, responsible for implementation of local policies, waste collection, cleansing of the city and support of sustainable environmental projects.

The municipality of Groningen is an organization that has to operate on EU and national sustainability laws and regulations and in a social and economic context. Most of their policies are built on EU and national sustainability regulations. However, the municipality also introduced policies that go beyond these regulations. For example, the municipality defined and introduced additional sustainability guidelines in the domain of travel, energy use, waste generation and purchase. Regarding sustainability, the municipality of Groningen has formulated a general goal of acting as sustainably as possible. In light of this goal the municipality has developed a fundamental vision to become CO_2 neutral by 2035. This goal has been further specified in two main sub-goals: make sustainability a key criterion in all purchase decisions; and reduce direct and indirect energy consumption and carbon emissions.

These goals concern the municipality as an organization, but also the different facilities the municipality is responsible for, such as sport facilities, public transport, and traffic control systems, to name a few. By transforming the municipality to a sustainable organisation, the municipality aims to function as a good example to the citizens and companies of Groningen. Among others, they have started reconstructing their own buildings to increase the energy-efficiency of these buildings. Additionally, they introduced a wide range of policies related to energy use, transport, waste generation and purchase to decrease CO_2 emissions and increase sustainability.

Private companies in the field of natural resources/ energy

2.5 Aquatim

Public service companies can be at the forefront of sustainability transitions being the first in implementing measures to significantly reduce emissions, as they are not subjected to the same pressures as private companies.

Aquatim ensures the provision of water supply and wastewater collection services in Romania and is a regional operating company since 2010. Five subsidiaries were established in order to ensure an efficient operation in the country. The company has a total of 905 employees. At the end of 2012 the company occupied the 36th position out of 39 operators in a national top, with one of the lowest water prices. The two major responsibilities of the company are consumers' health, safety and comfort and the protection of water resources.

The company's commitment for operating performance and quality services is certified by a first class operating license, granted by the National Regulating Authority for Public Utility Community Services, in 2003. The company has implemented since 2005 a quality, environment, health and occupational safety integrated management system, for its line of business. The system is certified by the Romanina Society for Quality Assurance (SRAC), according to the provisions of ISO 9001, ISO 14001 and OHSAS 18001 specifications.

The Aquatim R&D department is focused on identifying solutions for water quality improvement, environmental protection and developing cost-efficient technologies to be applied within these processes. The company has participated as a partner in research programs of excellence (PN II, FP7, CEEX), together with national research institutes and academic institutions. Aquatim is also concerned for consumer's education for a cleaner environment, through the awareness of the threat posed by pollution and water waste. Thus, in recent years, the company has organized many local environmental actions, such as World Water Day, World Environmental Day, Bega Boulevard, and Timisoara Quality Week.

2.6 Enel Green Power

Companies in the renewable energy sector are well-situated to be the site where green innovation emerges and an important part of the solution to our carbon-dependent lifestyles.

Enel Green Power (EGP), founded in December 2008, is the company of the Enel Group dedicated to developing and managing energy generation from renewable sources at an international level, with a presence in Europe and the American continent. In Europe, EGP operates in Italy (where it is the leader in three out of the four technologies on renewable energies: geothermal, hydroelectric and solar), Spain, France and Greece.

Italy is the fourth largest user of renewable energy in Europe. Alternative sources account for 15% of energy generated, and this percentage should significantly increase over the next few years. Major projects are also underway in a number of countries in Eastern Europe. In addition, EGP operates in the United States and Canada, primarily with hydroelectric plants and wind farms, and in Central and South America, primarily with hydroelectric plants.

EGP is world leader in the renewable energy sector, with almost 21 TW/h produced every year, covering the energy consumption of about 8 million families and avoiding 16 million tons of CO_2 emissions every year. EGP generates power from all renewable resources, with a vast balanced portfolio of plants using wind, hydroelectric, geothermal, solar and biomass power. EGP operates the Serre Persano plant (near Salerno), one of the world's largest photovoltaic facilities. In the area of advanced technologies, the Archimede Project by EGP has begun testing the solar thermal generation at the Priolo Gargallo plant (near Syracuse). Starting with Italy's first wind farm, which Enel built in 1984 in Alta Nurra (Sardinia), EGP now operates with a total of 31 wind farms. It also has geothermal plants, located in Tuscany (in the area of Larderello, Pisa, but also in the area of Val di Cecina and in the area of Mt. Amiata). This "Made in Italy" geothermal power technology has now become a worldwide export for EGP. Two EGP biomass projects are already underway: the conversion of the Mercure thermal plant (Basilicata) to biomass and the installation of a new thermal unit at the Sulcis plant (Cagliari) that will be able to use plant waste for fuel.

3 Factors influencing sustainable practices in the workplace

The in-depth analyses undertaken in the first part of the LOCAW project, through multi-method empirical research has led to important insights into the factors influencing everyday practices in large-scale organizations at different levels. These factors can be grouped in the following categories (which can be visualized in Figure 1):

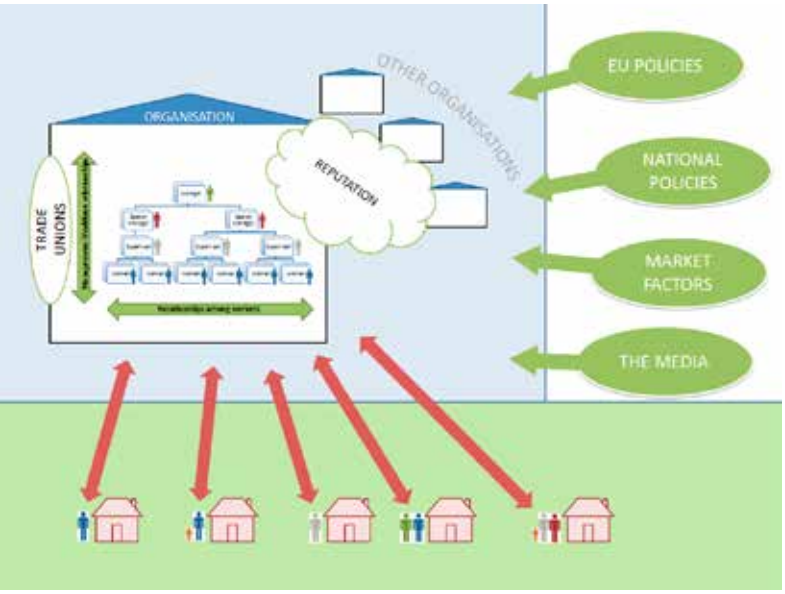


Figure 1. Determinants of everyday practices in organizations

- **Structural conditions set from outside the organisation**. In Figure 1, this is depicted on the right hand side of the diagram. EU policies, national governmental policies, functioning of markets and the media as an important vehicle of reputation are important structural factors influencing the likelihood of sustainable practices at work.

- **Organisational priorities and vertical relationships within the organisation**. In Figure 1, this is depicted within the organisation on the vertical axis. Organizational culture, organizational policies, and norms governing hierarchical relationships in each organization are key aspects here.The degree to which workers are able to control and influence everyday practices, and suggest means by which the production process can be improved environmentally are also relevant here, as is the overall priority given to environmental issues within an organisation.

- **Horizontal relationships among workers**. Understanding the relationships between employees at the same organisational level is crucial in understanding everyday sustainability practices within organisations, as patterns of interaction and the behaviour of others are influential in determining individual behaviour. Depicted in Figure 1 as the horizontal axis *within* the organisation, this theme includes patterns of interaction among workers, horizontal communication processes, and the creation of social norms within organisations.Individual factors are also relevant here, as workers who perform certain behaviours and reproduce certain practices bring their own values, worldviews, motivations and abilities with them.

- **Home - Work - Third Places - Relationships**. Individuals at work are regarded within the LOCAW project as 'border crossers', who move between different domains of life (work, home); thus this is a horizontal movement *between* the organisation and the wider world. The double headed red arrows in Figure 1 depict this process. An important aspect here is understanding the differences between practices at home and at work that might on the surface appear to be similar, but are governed by different 'local' norms or what we also refer to by a rather broader concept of 'logics'. Yet, common factors may underlie behaviour at work and at home, which can be addressed to promote sustainable practices in different domains.

Technological developments, including the tendency to rely on technological solutions only to reduce emissions have emerged as a relevant analytical category.. This (technology) can be thought of as a pragmatic and efficient approach to organisational change and environmental improvement. Indeed, the importance of technological change and efficiency improvement in understanding the future of particular organisations should not be underestimated. However, there is a tendency for future scenarios to be envisaged in a rather 'technocratic' manner, which often fails to acknowledge how important social and psychological factors are in the realisation of low carbon futures within organisations, which demonstrates the importance of this belief and assumption in deciding upon organizational policies to reduce GHG emissions

In the following sections, the main results on these categories of factors influencing sustainable practices in the workplace will be described.

3.1 Structural conditions set from outside the organisation

Organizations need to be understood from the wider contexts and policy frameworks within which they operate. This includes the European and national policy climate, the wider market conditions, and also the regulatory climate within the particular sector of operation, because they set important preconditions for sustainable behavior. Furthermore, issues relating to the wider governance of low-carbon practices are found to be of critical importance here – particularly issues relating to **legislation and regulation**. Besides, findings from the LOCAW project demonstrate that **reputation** can act as both a driver and a barrier to the occurrence of sustainable practices. Reputation has already been conceptualized in the business and management literature as a main driver of corporate social responsibility practices in private organizations. The building and maintaining of a good reputation is a key element of economic success on the market. Even if economic success is not a key concern of public institutions, reputation has still turned out, in our research, to be a key driver for sustainable practices. Reputation occupies an intermediate position between structural and organizational factors. We decided to include it among structural conditions, as reputation is established in a wider space where different actors exist and develop their activities.

- Legislation and regulation

Regulation is widely considered to be more expensive and less efficient than voluntary action (Freeman & Kolstad, 2007). Nevertheless, studies indicate that while a variety of factors positively influence voluntary environmental management, regulatory pressures are among the most important (Jones, 2010). Also, government pressure seems to be a central source of pressure for sustainable policies of firms (Lindenberg & Steg, 2013).

Legislative and regulatory frameworks were found to be important drivers for sustainability across the case study organisations in LOCAW. EU regulations are very important as they constitute the background against which national and organisational policies are defined, as well as the criteria established by super-ordinate bodies in particular sectors.

However, regulations can sometimes fail to stimulate progress, particularly where they impose fixed limits of environmental impact.

In spite of the fact that they are considered important drivers for environmental improvement, the ways in which they are implemented and controlled allow companies a certain amount of space in which they can adjust the rules to what they perceive as their production needs, especially in the case of transnational corporations. Moreover, while these regulations are there to protect the environment, they seem to be regarded as possible limits to be reached and not exceeded, rather than drivers to raise standards. In this case regulations become *boundaries of permissiveness* rather than *drivers for change*. Perhaps there is an opportunity here to reconceptualise the way regulations are formulated so that they encourage improvement rather than reinforce stasis. Regulatory frameworks should therefore strive to encourage improvement rather than reinforce stasis.

There were also some examples in the case studies of policy conflicts which limited the effectiveness of legislative drivers. For example, stakeholders in Aquatim felt that national policies were sometimes contradictory, creating uncertainty for the organisation in how to comply. In the case of the Municipality of Groningen, domestic policy was seen to constrain the ability of the municipality to achieve its ambitions to generate its own energy; to do so would risk the organisation being classified as an energy producer, resulting in a significant tax burden.

The case studies of heavy industry corporations (Volvo and Shell) highlighted ways in which the unique power relations existing between such organisations and government can limit the influence of regulatory regimes. In the case of Shell, government interests in maintaining production were seen to result in little incentive for the government to enforce penalties for non-compliance since shutting down production could compromise energy supply and result in a loss of tax revenue. Although actual regulations may be quite strict, companies that work in key production or profit areas have some leeway in transcending them. When the controller is dependent on the production of the controlled it seems unlikely that there can be a transformative move towards sustainable production.

- Reputation

There are very few studies at present that empirically examine the link between green reputation and corporate overall reputation, although numerous scholars have suggested that firms can reap benefits from a better environmental reputation (Tang, Lai, & Cheng, 2012). Tang et al. (2012) empirically show a link between corporate reputation and green reputation. The authors find benefits to a firm's economic performance as a result of increased corporate reputation from having a positive green reputation. Fryxell et al. (2004) report that enhancing a firm's reputation is an important driver for Chinese firms seeking ISO 14001 environmental management certification. We can see that previous research suggests that reputation is a competitive advantage for firms and good environmental performance can be a key driver for achieving it (Komarek et al., 2013), and this brings another added value to our results comparing to the current state of the art.

Reputation has a high value for organisations and their success depends on it. Reputational effects were found to be a key driver of sustainability and wider Corporate Social Responsibility practices in transnational corporations, state organisations and private service providers. Whilst in transnational corporations reputation was a primary driver for compliance with regulation, in the state owned organisations and private service organisations emphasis was more often on achieving distinction amongst competitors or comparison groups. The latter situation, where organisations seek not only to be seen to be complying with environmental legislation but to be distinguished by their active efforts to enhance environmental performance, offers significant potential for driving transitions to low carbon economies. However, the strength of reputational drivers may partly depend on the economic incentives for establishing a strong environmental reputation. In the private service providers studied, improved access to funding

(e.g. public funding or the capacity to attract ethical investment funds) was an important dimension of efforts to enhance the organisation's green reputation. In this sense, boosting market demand for low carbon products and services will be critical in harnessing the full potential of reputational drivers for sustainability in the future.

The structural conditions of the political, social and economic environment in which the organizations operate play an important role, also influencing the efforts to maintain a good reputation. Public institutions have a particularly relevant role here, as they need to be responsive to the community, and to be at the forefront in their commitments and practices in terms of reflecting some of the important social goals and values of the wider political system. Some of them are also managed by democratically elected leaders and it interacts in policy-making with other governmental bodies. They depend on public funding and have to respond to social demands. Not being responsive to these social demands can create serious problems for their reputation in the community. These aspects create favourable conditions for the adoption of pro-environmental commitments and practices, given that the wider societal context would also promote them. Our research showed that these conditions can act as both barriers and drivers for transitioning to more sustainable practices.

Creating an environment in which reputation is dependent on environmental performance should therefore be a goal for policy. The crucial step here is moving beyond superficial aspects of image and branding to reputation in a more meaningful sense, i.e. incorporating sustainability and low carbon practices into a company's identity and in workers' everyday behaviours and practices.

The case studies also highlighted the importance of infrastructure at the organisational level (e.g. recycling facilities) and within the wider societal context (e.g. transport and communications infrastructure) in shaping the practices of employees.

3.2 Organisational priorities and vertical relationships within the organisation

- **Need to reprioritise environmental issues**

Prioritisation of the environment in organisations is fundamental to ensuring the adoption of low carbon behaviours in the workplace and beyond. Without prioritisation of the environment in the workplace, employees are less likely to adopt low-carbon behaviours beyond those required to be undertaken as part of the job itself, especially when reward systems are based on non-environmental accomplishments.

Organisations are likely to prioritise environmental issues through one of two main routes. First, organisations might prioritise the environment if they are subject to legislation which mandates reductions in emissions (cf. Lindenberg & Steg, 2013; see above). For example, legislation mandates that more than 11,000 power stations and industrial plants in EU member states report their greenhouse gas emissions through the EU Emissions Trading Scheme. In the UK, many large private and public sector organisations must also report their greenhouse gas emissions annually through the CRC Energy Efficiency Scheme. Second, organisations might prioritise the environment through the adoption of environmentally responsible missions, either as part of concerns relating to corporate social responsibility and/or for cost saving and efficiency reasons (Ruepert, Steg, & Keizer, in press).

A key issue that has emerged from the LOCAW project is the tension between on the one hand giving general priority to environmental issues, and on the other hand prioritising other

issues, particularly economic benefits, rather than the environment.There is no simple solution to this tension, as everyday operational matters are governed by a multitude of competing priorities within an organisation. The non-immediate nature of environmental problems/ outcomes seems to be part of the problem here and one worthy of more research attention in the future, especially when considering that economic short term effects are placed as a key element of reward systems in private organizations. Another problem is the fact that economic incentives encouraging organisations to prioritise the environment and make efforts to reduce greenhouse gas emissions are often (perceived to be) lacking.

Our results show that organisations regard environmental goals as important in their mission and objectives, but in practice these goals often appear to be either at odds with, or secondary to, other goals, in particular profit or safety. There is a need to reprioritise environmental goals in organisations, and to encourage organisations to translate the goals as reflected in their mission and objectives into specific organisational policies and practices. Both formal and informal, and vertical and horizontal communication channels are important in this regard.

One route to overcoming the underlying perception that environmental and economic organisational goals can be antagonistic is to promote the business case for low carbon practices. Many environmental strategies are consistent with direct and indirect economic benefits e.g. through improving efficiency, reducing costs of energy inputs, reputation, and increasing access to external funding sources and enhancing market share. Where organisations can see a clear business case for sustainability, transforming practices is more likely to be seen as good business sense than a solely altruistic endeavour. It is important, however, that environmental actions are not seen only in terms of their potential economic returns, as this can also create a culture of only doing it when there is economic profit. Opportunities create an environmental culture - to embed pro-environmental values and foster an environmental identity at the organisational level - should be embraced in order to create a social environment in which workers feel motivated to engage in low carbon practices and to encourage others to do the same.

- Importance of monitoring and feedback

Monitoring is an important tool for gathering and evaluating information to determine whether organizations are meeting criteria for environmental performance as set by management and various obligations. Without monitoring environmental performance, companies are unlikely to know the extent to which they are impacting on the environment and meeting internal and/or external commitments.

Similarly, staff cannot know the extent to which they are consuming energy and contributing to environmental performance outcomes without these outcomes being monitored and communicated. The absence of such information means that meaningful targets for individually reducing consumption cannot be set, and progress in achieving those targets cannot be evaluated. As such, the monitoring

of practices and environmental outcomes , relating performance to the set goals, and giving feedback of this information to workers is important in efforts to encourage the adoption of low carbon behaviours at work.

In addition, research shows that feedback to employees on their performance can provide staff with a feeling of competence and hence increased motivation to improve performance towards goals and objectives (Luckett & Eggleton, 1991). Different organizations have different monitoring systems, depending on their strategy for achieving their environmental objectives. In the case of the organizations that have adopted an EMS, there are specific monitoring activities. One important component of the international EMS standard ISO 14001 is monitoring and measurement, which involves recording information to track environmental performance (International Organization for Standardization, 2004). However, how to measure environmental performance within an EMS is unclear and practice is generally poor (Brouwer & Koppen, 2008). Environmental audits in EMS do not measure the actual environmental performance.

Our research suggests that systems of monitoring and feedback are integral to the creation of an environmental culture in large organisations, because these increase the everyday visibility of the environmental commitment and agenda of the organization, as well as the importance workers perceive the organization´s management gives to the objective of reducing GHG emissions, yet this was an aspect in which there was seen to be significant room for improvement in the case study organisations.

Monitoring and feedback to decision makers are critical components of performance evaluation. These rely firstly on adequate systems for monitoring being put in place. Also, crucially, they require capacity and expertise within the organisation to interpret results and to adapt policies and actions in light of this ongoing process of evaluation. Feedback to employees may also play an important role in developing an environmental culture which spans the organisational hierarchy. There was little evidence of such feedback in the organisations studied. Previous research suggests that to maximise the effectiveness of feedback to employees this information should be tailored and allow comparisons (e.g. providing employees with feedback which allows them to gauge the performance of their department against others). Organisations should carefully consider the indicators selected to reflect their environmental performance. Monitoring and reporting of *outcomes* (e.g. carbon emissions) is important to evaluate the effectiveness of organisational policy and possibly also to promote individuals' perceptions of outcome-efficacy. However, feedback on the uptake of practices may also be particularly valuable in fostering pro-environmental descriptive norms within an organisation.

- **Organizational division of responsibility for the environment**

The findings from the case studies across the organisational types highlighted the issue of roles and responsibilities for environmental issues within the organisational structure. The research suggests that concentrating the responsibility for environmental management within a single specialised

role or in a dedicated department can be problematic. When such responsibilities are fully devolved to specialists, other workers do not see themselves as having personal responsibility for environmental practices unless they are asked to act by one of these specialists. This aspect points to the potential value of mainstreaming environmental issues throughout the remit of each department in an organisation, to reinforce perceptions of individual and collective responsibility in all areas of activity. However, it is important to qualify this as there were seen to be limits to which mainstreaming environmental responsibilities can be effective; it is important that some individuals are assigned specific roles since a complete diffusion of environmental responsibility across the workforce is problematic in itself. Thus roles should be clear and established across several departments, but their activities should be coordinated from a specialized department in charge of managing the transition to low-carbon practices.

The research suggests that the most effective approach may be to combine the advantages of centralised and specialised responsibility and control with the advantages of decentralised everyday practices. Enabling people on all levels of the organisation to develop and suggest ideas for environmental improvement through participatory mechanisms offers great promise for engaging staff and harnessing the creative potential residing in the workforce. This does, however, require receptiveness on the part of management; a condition which may be more challenging in organisations which adhere to a strict top-down hierarchical structure.

Finally, top-down communications from managers to workers play an important role in structuring social norms. Formal and informal communications from managers and opinion leaders in organisations were identified as central to the development and persistence of positive injunctive norms. Developing effective communication strategies should therefore be considered an important part of implementing environmental policies at the organisational level.

- **Relationships between management and trade unions**

One of our objectives was also to understand relationships between management and trade unions, which represent organized bodies of workers. Trade unions were considered as particularly important and powerful actors, as they play an important role in all types of organizations and many times they vertebrate the organization, have expertise in pushing issues on the organizational agenda and negotiating changes, and can thus exercise important bottom-up pressure for changing production processes and practices in the workplace. Our results revealed that although unions have ideas and suggestions concerning the environment, they are not at the forefront of their concern. Whether they are voiced and become part of the negotiation package with management depends on the commitment of individual unionists. It is not the union as an organisation for whom environmental issues are central, but individuals. Practices are suggested by individual workers, whose environmental concerns are anchored in their life history. If they have important positions in the union, they may be able to transfer these "individual" concerns into union concerns.

The dilemma of having to choose between protecting jobs and protecting the environment runs through all trade union efforts to develop environmental policies. The question is under what conditions this dilemma can be solved. One window of opportunity that has been developed by Volvo workers is the perspective of conversion (Henriksson, 2012). This would combine a strategy of protecting jobs and improving working conditions by giving workers more autonomy, with a strategy of developing products and production process that are environmentally sound.

While workers have made suggestions on improving pro-environmental practices in the workplace through their trade unions, they have had no results. As in the case of oil industry

trade unionists, there are more urgent issues that the union is concerned with. The latest development is the decision of Volvo headquarters to move the assembly work in Umeå to Gothenburg and France. This would cost around 600 workplaces in Umeå, which only has 100 000 inhabitants. Such issues have directed the focus of the union to working conditions and the need to defend workplaces. Working conditions, workers' satisfaction and workers' autonomy are necessary, though not sufficient conditions for an environmentally conscious workforce and for the ability of unions to engage in environmental practices. The more workers feel deprived of autonomy at work, the less they will be inclined to care for the environmental impact of the production process. If unions need to put their energy on workers' safety, working conditions and the preservation of jobs they lack the space, energy, and commitment to attend to environmental issues. In a way this mirrors the priority that managers give to profit and product quality in relation to the environment. While all production processes rely on the transformation and usage of nature, neither managers, nor workers have yet included nature centrally into their concern for a successful production.

3.3 Horizontal relationships among workers

- **Horizontal Communication**

The LOCAW project findings identified a number of barriers limiting horizontal communication on environmental issues between employees on the same organisational level and between departments within an organisation. The chief amongst these barriers was the dependence on top-down approaches to environmental change. These were associated with a perceived lack of power over the organisation's environmental impacts on the part of employees. This barrier was particularly salient in the cases of the transnational corporations and in Aquatim, where formal top-down organisational structures precluded employee participation in setting environmental agendas and suggesting actions.

The structuring of environmental roles and responsibilities within organisations was also found to impact on horizontal communication on sustainability between departments at the same level. For example, at the University of A Coruña, where responsibility for environmental issues was the remit of one specialist department, others often felt absolved of responsibility and managers in other departments perceived existing lines of communication to be ineffective. Formal structures for coordination and platforms for participation across departments in an organisation may therefore be necessary to facilitate horizontal communication on environmental issues at the departmental level. This could be achieved by instigating regular meetings amongst intermediate level managers as a forum for discussion and the sharing of good practices.

- **Social norms**

The influence of social norms on individual behaviour has received great attention in mainstream social and environmental psychological research, also with particular attention to pro-environmental, or sustainability related, behaviours (cf. Bonnes & Bonaiuto, 2002). A social norm can be defined as the rule or standard of behaviour shared by the members of a social group. A series of field experiments on littering behaviour carried out by Cialdini and colleagues (1991) showed the importance of distinguishing among various kinds of social norms. They proposed the distinction between *injunctive norms* (i.e., the individual perception of what other people think it should be done in relation to specific social objects) and *descriptive norms*

(i.e., the individual perception of what the majority of others actually do in relation to the same social objects). Injunctive norms involve beliefs about the level of approval or disapproval of others for a specific behaviour, whereas descriptive norms refer to beliefs about the "actual behaviour of others", which may indicate what could be the more "appropriate" behaviour to perform in a target situation (Schultz, Khazian, & Zaleski, 2008).

Social norms relate perceptions of what behaviour is expected or common in a relevant reference group. In a general sense they are what is commonly done or (dis)approved of. They can exert a powerful influence over the behaviours of group members. Analysis undertaken in LOCAW indicates that, in each of the four case studies where questionnaires were administered (University of Coruna, Municipality of Groningen, Aquatim and Enel Green Power) social norms were not generally perceived to support pro-environmental behaviour at work. Personal norms were seen to be more pro-environmental than social (descriptive and injunctive) norms. It is therefore clear that feelings of moral obligation to act sustainably are widespread in the organisations studied.

The research has revealed a number of conditions which influence the transmission of pro-environmental norms within organisation. Across the case studies, those who believed they held an exemplary role in the organization were more likely to carry out pro-environmental behaviours relating to waste management, suggesting that emphasising the role of individuals in modelling desirable behaviour may support the development of pro-environmental norms and practices. Finally, additional analyses suggest that, across case studies, norms transmission behaviour (i.e. encouraging others to act pro-environmentally) was most commonly reported by individuals who identified strongly with their organisation.

- Social Networks

Horizontal relationships in an organization include social networks as a key component. Social networks are an important quality of formal organizations, as previous research has shown that employees tend to be more cooperative and productive when their formal contacts are accompanied by informal ties (Mehra et al., 2001; Oh et al., 2004; Sparrowe et al., 2001; Sparrowe and Liden, 1997).

Despite a general lack of evidence of widespread horizontal communication on environmental issues, the findings did suggest that activity- and place-dependent social networks do have a role to play in influencing everyday pro-environmental practices. For example, interviews at Aquatim indicated that pro-environmental behaviours tend to form in small groups of well-acquainted employees. Talking about environmental attitudes and values at work could be considered to be a type of border-crossing from different domains (home to work), because in relationships at work, employees bring their own attitudes, which were not formed inside the organization due to organizational or structural factors. Social networks were also relevant to developing norms for lower-carbon mobility practices such as car sharing amongst co-workers.

- Individual factors affecting sustainable practices in the workplace

Autonomy is understood to be behavioural freedom. Perceived behavioural control refers to a subjective perception of having control over carrying out a particular behaviour. It is the perceived opportunity to perform a particular behaviour in light of present facilitating or hindering factors. For example, if heating in an office is automated, people who occupy the office have no autonomy over heating control and perceived behavioural control in this respect is nil. In contrast, if recycling bins are provided in an office with instructions about which items to place in which bin, people in the office can be seen to have the freedom to recycle and, given the ease with which they can recycle, it is likely that they will have a high level of perceived behavioural control in this respect.

Concerning the individual factors, our results show that employees' personal norm to behave pro-environmentally at work is activated among employees with high biospheric values and a strong environmental self-identity. This means that people feel morally obliged to act pro-environmentally at work, especially when biospheric values and the environmental self-identity are high. Moreover, when employees have a strong personal norm to behave pro-environmentally at work, they are more likely to use less energy (general and transport-related), participate in more waste prevention behaviour and recycle more. However, the effects on behaviour are rather small, meaning that although employees have a strong personal norm to behave pro-environmentally at work, they do not strongly act upon these feelings of moral obligation. Especially the influence on energy use (general and transport-related) is low (Ruepert et al., forthcoming).. This may be due to differences in the level of autonomy and perceived control workers' have over these different behaviours. A lack of control over centralised heating and cooling systems and constraints on individual autonomy in open-plan offices (e.g. in respect to turning off lights) means that many workers feel that energy use was largely outside their sphere of control. Issues relating to transport infrastructure were often seen to limit autonomy and perceived behavioural control over mobility practices.

Whilst the research suggests that there is a need to remove structural barriers in order to offer individuals greater possibilities for choosing sustainable practices, it also recognises that in some cases removing autonomy in the form of 'choice-editing' can be effective (e.g. through strict procedural rules or technologies such as centrally controlled thermostats and motion sensor lighting). However such approaches should be treated with caution. Both our research and previous studies have shown that environmental self-identity is a powerful driver of pro-environmental behaviour, and may contribute to the transfer of positive practices between life domains and increase the likelihood of transfer of practices between different types of pro-environmental behaviour within a given domain. Actively and freely choosing to carry out pro-environmental behaviours is important to the development and reinforcement of environmental self-identity. Hence, forcing people to act sustainably at work may be effective in promoting the targeted behaviour, but may not encourage workers to engage in other relevant sustainable practices at work, and may thus inhibit sustained sustainable actions in many different areas at work and at home.

3.4 Home – work – third places relationship

- **Transfer of practices between life domains**

Places are governed by different logics. The different domains of work and home have different ends and means and therefore, different logics according to which they operate. They reflect and produce different rules and operating conditions, different goals and purposes, different histories and cultures that govern different places at different times in the context of different social and power relations.

Clark (2000) suggests that the domains of work, home, and leisure can be governed by different norms, values, and behaviours as well as appreciate that individuals are crossing the borders between them on a daily basis. Whether home-work relations are seen primarily in terms of conflict, which might result in a failure to transfer and the need for compensation, or whether they are understood in terms of positive transfer, home-work balance, and mutual enrichment of work and home roles - all research shows that since individuals are "border crossers" their behaviours at work and their behaviours outside work relate to each other.

The transfer of practices between work, home and other spaces is therefore an important factor to consider in efforts to develop understanding of how individuals might be encouraged to adopt pro-environmental behaviour-sets at work, and at home. This section of the report considers evidence from each of the case studies relating to the notion of people transferring practices between domains of work, home, and other spaces as well as their adopting practices that are internally coherent.

Analysis of the questionnaire study in four case studies of public organisations and private companies found correlations between low carbon practices at work and at home, suggesting that common factors may influence both practices at home and at work. However the qualitative case study research in these organisations, along with the in-depth ethnographic research in the heavy industry corporations, indicated that workers indicate that the actual transference of practices between the home and work domains was limited. The research did, however, suggest that when practices *are* transferred, this is most likely to take the form of behaviours adopted in the workplace being carried over to the home domain rather than vice versa.

By analysing the nature of the border between work and home and the meanings individuals associate with crossing that border, the research shed light on the barriers to the transference of practices between the two domains. It became clear that the relationship between workers' practices at home and at work were related to the relationship between workers and management, to the extent that it is not possible to consider these relationships separately. Working within these strictly hierarchical institutional structures was seen to set a context for the development of strong and largely inflexible borders between work and home. The transference of pro-environmental behaviours from home to work is therefore constrained by structural organisational factors when formalised top-down approaches to sustainability deny workers the initiative to adapt their own practices or limit channels for suggestions for improvements to be made and acted on.

The results from the questionnaire study, on the public sector organizations and private companies, show that people who engage in a particular pro-environmental behaviour at work are also likely to engage in this behaviour at home (we cannot directly state the direction of the relationship, thus if pro-environmental behaviour at home leads to more pro-environmental behaviour at work or the other way around). Besides, we found almost no relationship between different types of pro-environmental behaviour (energy use and recycling), which means that using much energy does not mean that one does not recycle (and the other way around). A possible explanation is that people do not see a clear connection between different types of

pro-environmental behaviour, and therefore act not consistently in this respect, while they do see a connection between similar behaviours in different locations (work and home). Another, perhaps more plausible, explanation is that energy use and recycling are influenced by different factors. This means that in order to change pro-environmental behaviour at work we can now argue that it is necessary to focus on different types of behaviour, since there is no spillover between the different types of behaviour. Changing energy use will for example not directly lead to more recycling, these types of behaviour need both to be addressed.

On the other hand the quantitative study showed that in the case studies of heavy industry corporations, a clear differentiation between the logics of home and work was observed. This translates to a divergence between the work and home domains in the structural, social and individual barriers and drivers applying to similar types of pro-environmental behaviour. For example, energy saving at work may be driven by rules but was often limited by the lack of perceived responsibility that was associated with strict top-down hierarchies and/or constrained by structural factors which limit individual control over energy usage. In contrast, at home the individual may have greater control over heating and lighting systems, and greater motivation to reduce energy use due to the cost of fuel. Similarly, whilst formal rules and penalties for non-compliance encourage pro-environmental practices such as recycling at work, this logic does not transfer to the home environment and indeed having to adhere strictly to such rules at work can put some individuals off recycling at home. Recycling, as with other practices, takes on different meanings at home and at work.

In contrast, norms relating to the safety culture at Shell were seen to be transferred from the work to home domain, suggesting that given the right conditions a strongly embedded environmental culture at work may offer possibilities for a positive transfer of practices from work to home.

The research suggests that one of the conditions for the transfer of practices between work and home relates to knowledge acquisition. Training given at work can equip workers with knowledge and skills that are carried by the individual across the border between work and home, thereby increasing self-efficacy at both work and home. Also, given a receptive social environment, environmentally aware individuals can bring ideas about how to improve the sustainability of working practices into the workplace. However, additional barriers such as those discussed above mean that whilst borders may be permeable to the flow of ideas and knowledge, the transference of actual practices is more difficult to achieve.

- **The role of third spaces in the transference of practices between life domains**

Blending between the two areas of work and home occurs not only where work is performed at home or home activities are performed at work, but there are also spaces which are experienced by workers, managers and unionists alike as neither home nor work. These places are particularly important in organizations in which the difference between the work and home domains is more marked, through the organization of the process of production. How important these are for public organizations, for example, or organizations in which borders are not so strong, is still an open question.

In the case of Volvo we have seen that the lunchroom is treated differently by workers and managers than the factory floor. While in the latter, there are different bins for different kinds of waste, no provisions have been made for recycling in the lunchroom. In a similar vein, unionists, who are actively engaged in ecological practices at home and have made suggestions to the management for reducing CO_2 emissions, have not thought of suggesting that the canteen

should be buying ecological, locally produced food. Neither have they enquired about the working conditions of the company which provides the food for the canteen. These examples show that the lunchroom is not treated as a workplace for which managers and unionist take responsibility. Moreover, it is clearly not conceptualised as a space where their concerns and priorities (e.g., working conditions) as union members, have relevance, as it is not seen as part of the workspace. On the other hand, workers report that this is the space where they engage with their colleagues discussing environmental issues that not only relate to the workplace but also the way of life of their colleagues in general, how they use their cars, snow scooters, what kind of toys they buy for their children, etc. In this respect, the lunchroom is similar to the home, where people engage in conversations that are not related to work.

This issue is not confined to the factory canteen. There are other ambivalent spaces in the workplace. For example, many office workers bring their lunch to work (e.g., salads, sandwiches) and eat it in their office simply because they have so much to do; their office thus temporarily becomes a different kind of space with different requirements. If they were at home they might separate out recyclable material (e.g., fizzy drink cans), non-recyclable materials (e.g., some plastics) and food waste, putting each in a different bin. In the office, there may only be a recycling bin or an all-purpose rubbish bin..

Another type of third space is the rig for the off-shore Shell workers. This is the place where they work, but it is also the place where they spend their leisure time, while they remain on the rig after their working hours.

Strong borders, permeability of borders, and third spaces where work and home intersect, are all significant for the question as to the possibility and opportunities for transferring sustainable practices from one domain to another. The fact that the same practices have different meanings in different places and are therefore performed in different ways, and that in turn the meaning of a place is decisive for the way in which workers and managers take or do not take responsibility for sustainable practices raises interesting issues. For example, does this imply that in order to promote the transmission of sustainable practices across borders it is necessary to increase the similarity of places? If so, precisely what does making places similar mean? These are still open questions for future research.

3.5 The role of technological developments

Technological solutions were commonly felt to be central to efforts to reduce the organisations' carbon emissions in all of the LOCAW case studies. In the heavy industries, technological solutions emphasised the product and the technologies of production themselves, whereas the in the less technologically-intensive industries the focus centred more on technologies associated with employees' everyday practices.

Technological innovation is likely to play an important role in the transition to low carbon economies. Whilst eco-innovation in relation to developing new low carbon products may have the potential to significantly reduce the carbon footprint of consumer products, the focus in the LOCAW project has been on the part that technology plays in transforming production processes and services provision in large public and private organisations.

Stakeholders across the case studies considered technological and infrastructural investments as integral to current and future action to improve the environmental sustainability of their organisations. However, this focus on technology can pose challenges to progress through integrated efforts to reduce carbon emissions through behaviour change in addition to infrastructural improvements, particularly when available funds for costly investments are limited.

There are advantages of organisational strategies incorporating technological solutions. By editing the choices of individuals organisations, for example through automated control of ambient temperatures in workplaces and motion-sensor controlled lighting, negative impacts of unsustainable behaviours can be averted. However, where technological solutions are put in place that require individuals to interact with the technology as part of their job, behavioural changes are also often necessary to lock in environmental benefits. Furthermore, a singular focus on technology was seen in some of the case studies to lead to an underestimation of the potential for reducing carbon emissions through changes to practices. This can result in perceptions that when funds are not available to finance investment in technology, the organisation's hands are effectively tied, as well as that individual behaviour changes are not needed, as technology will provide the solutions

Technological change will be particularly important for greening the production process in technologically-intensive sectors such as manufacturing (Volvo), energy production (Shell and EGP) and water services (Aquatim), as highlighted in the interviews and back-casting workshops. The research speaks to the importance of considering human interactions with new technology and consulting employees when putting new technological systems in place. Not only does the manner in which workers engage with technology influence the effect of technology on environmental outcomes at the organisational level, but feedback from workers may play an important part in identifying teething problems with new systems and suggesting solutions to overcome these.

A number of these visions saw information and communication technology as integral to the development of a new way of working centred on remote communication, e.g. through virtual offices and classrooms accessed from home. The decentralisation of working locations was a theme which emerged across the backcasting workshops conducted with stakeholders. This indicates the central role that home-working and decentralised satellite offices/local hubs were seen to play in scenarios of future transitions to low carbon economies. This transformation in the physical location of places of work is reliant on facilitating communications infrastructure. As such, improving access to high-speed broadband will be an important issue for policy at the national and EU levels in order to provide the necessary conditions for widespread adoption of organisational policies relating to home or remote working and for reducing transport demand through increased uptake of virtual meetings through videoconferencing technology. This trajectory has the potential to reduce travel demand and fundamentally change the meaning of the workplace and the nature of the border between the work and home domains. However, we argue that net carbon savings from the widespread adoption of home- and remote-working practices are not guaranteed. A critical approach to this issue, seeking to develop the evidence base on the implications of the outsourcing of emissions from work to home is therefore warranted.

In some cases technology was favoured in order to avert the need for behaviour change through structural changes to the working environment (e.g. by automating heating and lighting systems). However, particularly in stakeholders' future visions, technology was also envisaged to facilitate transformative cultural changes in the organisation.

The focus on technology observed in the case study organisations also highlighted a number of challenges to transformational change at the organisational level. Firstly, in the heavy

industries, a single-minded focus on technology was seen to contribute towards short-termist perspectives; the consequence of these being a de-prioritisation of the development of alternative (and potentially more innovative) solutions for more systemic change. Secondly, the focus on technology was (particularly in the Municipality of Groningen and Aquatim case studies) associated with perceptions that the potential impact of behaviour change is slight in comparison to that of structural and technological investments. This can lead to a neglect of individual practices and the social and psychological factors that shape them. Also, because technological solutions are often expensive and involve long payback periods, in challenging economic times this focus on technology can lead to inertia. As was seen in the Municipality of Groningen, when finance for further investment in technology is not available the organisation may feel that there is little more that they can do to reduce their carbon emissions in the short-term.

4 Developing scenarios for transitions to sustainable workplaces in Europe

After obtaining a comprehensive picture of the barriers to and drivers of sustainable practices in the case study organizations at the present time, LOCAW aimed at building scenarios for transitions to sustainable workplace practices, which would achieve significant reductions in their CO_2 emissions by the year 2050. These scenarios were developed by using a combination of inferences drawn from the empirical research part of the project, described above, and participatory back-casting scenario development workshops in which comprehensive visions were developed for the organization for 2050, as well as alternative pathways to reach them.

Several policy tracks and interventions were then developed from these scenarios to be implemented in the organizational simulations, using agent-based modeling. These policies were tested in different combinations to see their effects on the performing of certain behaviors and related emissions levels, which should yield important insights on the types of policies that are likely to be most effective. Policies were derived targeting changes in the three areas of practices: consumption of materials and energy; waste generation and management, and work-related mobility. More attention was given to those practices responsible for higher emissions, in each organization under study.

Scenarios were narrative, as these are easier to handle by stakeholders, than abstract representations about the future. An important novelty of LOCAW is the fact that it has used back-casting scenarios with organizational stakeholders in order to envision future sustainable visions of the organization within a sustainable regional and European context. This is scarce in back-casting research, and most studies have been developed around future visions of a region or a city, in order to help policy-making for local, regional or national governments. Almost no studies have been done in order to support transformation and sustainable changes in private and

public organizations. LOCAW is thus able to provide policy support for both organizations and government regulators (in the policies they design to target industrial and other emissions), and these policies have been tested in simulations, thus providing a better basis for their level of fitness.

Several policies were tested so as to check their effectiveness. Policies were checked separately, in combination, isolated in time and maintained through time in order to be able to obtain adequate conclusions.

4.1 Agent-Based modelling

Agent-based modelling is a computer-supported tool to simulate complex interactions among different "agents". In LOCAW, an agent-based model is a prototypical simulation of each organization, which includes different types of individuals with different organizational roles, their interactions – represented as a social network following certain rules of interaction that are based on both hierarchical and horizontal relationships, and the environment of the organization, formalized in dimensions such as regulations and structural dimensions.

In LOCAW, the agent-based models had had the following goals:

- To provide a formally represented model of each organisation, the interactions within it and with its environment, for automatic forecasting and policy planning.
- To act as a test-bed for formalised assumptions of the drivers of and barriers to everyday pro-environmental behaviour, thus also being a tool for the integration of the different parts of the empirical research.
- To explore the logical consequences of assumptions and evidence of the dynamics of everyday pro-environmental behaviour.
- To allow the formalisation of the back-casting scenarios developed with case study partners and test different policy tracks derived from them, given the assumptions on key drivers and barriers of sustainable actions at work.

Formal representations of each organisation and the interactions within it provide an internally consistent test-bed with which to examine the various ways scenario interventions affect overall system behaviour as an emergent property of interactions. These provide a 'tool-to-think-with', which may be used as part of wider discussions on the effectiveness of proposed measures. One advantage of agent-based modelling in this regard is that it can be used to make trials that would be infeasible, politically sensitive, or for some reason unethical if tested on a subgroup in the real world. The results of such tests, if evaluated with respect to the assumptions made by the model, could be useful in determining whether real-

world trials should be attempted, or whether the expected effect of the proposed measure is likely to be insufficient to merit exploration outside the domain of the simulation.

Agent-based modelling is also able to provide indicative outcomes from such scenarios, *provided that the assumptions they embed are agreed*. Unlike classical modelling (and in particular of physical systems), modelling social systems must be done with a sense of modesty: there is often more than one way to formalise and represent the qualitative information in the case studies, and verification and validation are not feasible given that we are running the model into the future. However, through incorporating dynamics introduced through such things as norm transmission, or other rules adjusting agents' psychological variables as a result of events that occur in the model, the simulations can show how interventions affect the long-term behaviour of the system.

Some, though not all, of the uncertainty with respect to representation of the systems can be addressed through the use of multiple implementations, which is the approach taken here. If model outcomes are robust to details that may vary from one implementation to another, this should increase confidence in them. Although a detailed description of the scenarios implemented and policies tested is impossible here, a few examples are provided from case-study organizations. The simulations attempted to answer a few extremely relevant policy questions:

- What types of policies are likely to be more effective in transitions to low-carbon work-places: one-time measures or consistent, stepwise policies?
- What are the effects of different combinations of policies?
- What is the required intensity of policy for a sufficiently fast-paced transition to sus-tainable workplaces in large scale-organizations?

4.2 Testing policies for reducing work-related mobility in public organizations: University of A Coruña (Spain) case study

Work-related mobility is responsible for the highest percentage of emissions in the University of A Coruña, according to previous calculations done by the Office of the Environment on a yearly basis. The majority of these emissions are produced by intensive individual car use for mobility and the relatively low use of public transport such as buses or trains, and low use of sustainable mobility options such as bicycle use or walking. The back-casting scenarios developed by the University workers produced a number of interventions and target for reductions in emissions by 2050, which were then tested in the agent-based models. The policy tracks tested referred to:

- Increasing the University staff with a biospheric value profile
- Implementing policies that target structural limitations for car use, thus using top-down "choice editing"
- Implementing policies targeting the increase in the use of alternative transportation means such as bicycle use

In all simulations, technological improvements were also considered, and they were controlled for when isolating the influence of one policy intervention. Policies were tested at one-time and also rolled-out at several moments in time, leading up to 2050.

Hiring staff with a biospheric profile, increasing it by 50 % comparing to current levels, in 2050

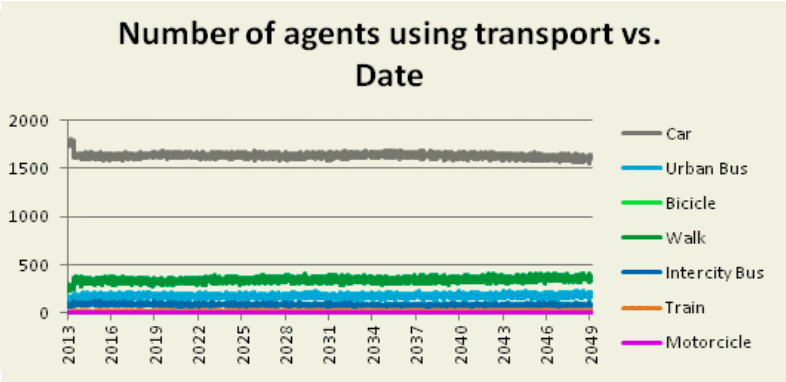


Figure 2. The number of agents (on the Y axis) using each mode of transportation over time, as a result of hiring more personnel with strong biospheric values by 50 % in 2050.

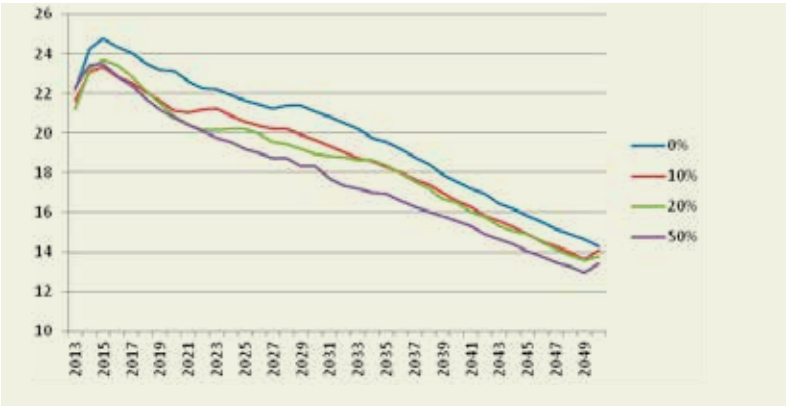


Figure 3. Comparison between carbon emissions in a "business as usual" scenario (blue – maintaining the same proportions of workers as today) and with increases in hiring of biospheric personnel by 10, 20 and 50 % by 2050 (Y axis expresses tons of CO_2).

A few important conclusions can be drawn from the simulations above. First, we can see that hiring more staff with a specific value profile that is more likely to carry out pro-environmental practices in the workplace does not significantly modify the number of agents using the different transport means. This is most likely due to the fact that acting upon one´s values is significantly limited by other personal, social and structural factors in the organization, as the interpretation of the results of the empirical research has suggested (Report on individual factors affecting sustainable practices in the workplace). Further simulations support this reasoning in a dynamically simulated evolution over time. Emissions would be slightly reduced, but further simulations holding technological improvements constant have shown that these reductions disappear almost entirely when considering only the hiring of biospheric staff in isolation, which means that they are rather due to expected technological improvements of the environmental performance of vehicles. Finally, we can see in the last figure that an increase in the hiring of staff strongly endorsing biospheric values when replacing retiring staff of either 10 or 20 % is similar, while an increase of 50 % gives slightly better results, yet the difference with lower rates diminishes over time. The final values of GHG reductions obtained are anyway low, even in the best case scenario (an increase of 50 % in the hiring of biospheric personnel. Simulations thus help us conclude that a hiring policy based on individual value profiles who are more inclined to carry out sustainable practices would not achieve significant results in isolation.

Testing both one-time and consistent over-time policies for reductions of car use for work-related mobility

Back-casting scenarios have also contemplated restrictive measures for the use of cars, such as controlled reductions in parking space, or fees for parking that make it more costly to use the car. The effects of policies for the restrictions of car use were tested. Experiments considered options of policies restricting the use of the car at one time, with no further policy being enforced afterwards, and options considering incremental policies that are maintained across time. Incremental policies have less political and psychological costs (in terms of citizen support, and adaptation) and have the advantage of creating an environment in which a culture favouring sustainable practices is likely to be created, as people start assuming the new conditions as part of their everyday life.

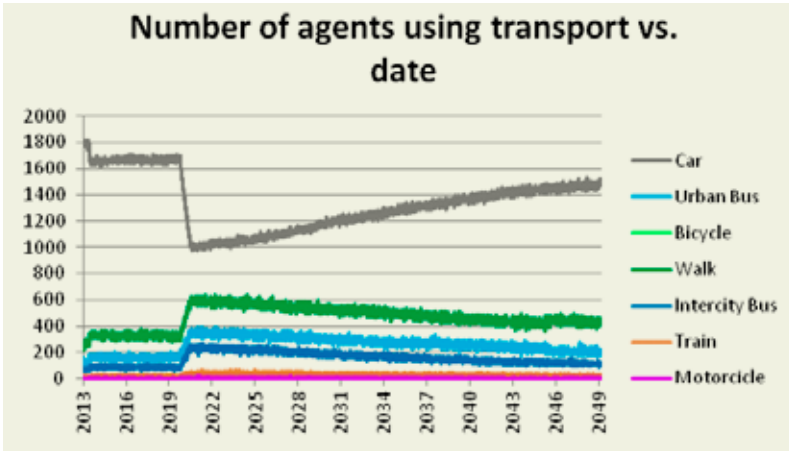


Figure 4. Effects of one-time policy interventions either restricting or making car use less attractive on the number of agents using a certain transport mode.

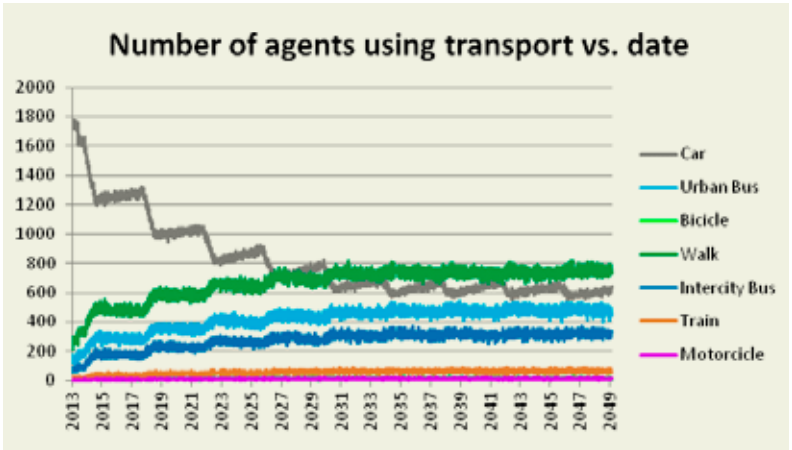


Figure 5. Effects of policy interventions maintained over time, targeting a total reduction of 30 % of car use by 2050 (interventions take place every four years)

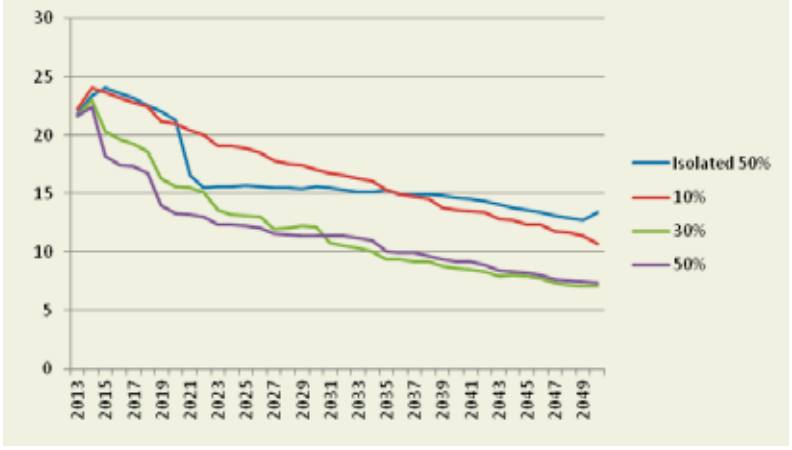


Figure 6. Comparative effects on emissions of car-reduction policies maintained over time, with targets of 10, 30 and 50 % reductions by 2050 (tons of $CO_{2)}$

Simulations for the effects of restrictive policies of car-use reduction have taken into consideration several scenarios: policies intervening at one point in time; policies being maintained over time with progressive interventions targeting reductions of 10 %, 30% or 50 % of car-use (in number of users) as compared to baseline numbers; and resulting emissions estimations for the three targets, with comparison among them.

When applying restrictive policies at one point in time, the first reaction of the agents is to use other transportation means, thus contributing to the overall reduction in emissions. Nevertheless, after this initial reaction, the influence of the social network has as a result a progressive increase in car use, that over time would reach baseline levels again. Social networks are very influential.

When policies are maintained over time, and include progressive interventions at certain intervals, results are far more promising, as agents start taking up other modes of transportation and adapt to the new reality, with the social network working in favour of sustainable goals. Two important conclusions can be drawn from these simulations: 1) that carbon emissions are considerably lower than in the isolated application of policy; and 2) comparisons between the different reduction targets show that applying a more aggressive reduction target of 50 % does not obtained significantly better results than for the less aggressive one of 30 %, which indicates that milder policies can be sufficient for the emissions reduction targets of European organizations. The comparative figure (Figure 6) shows that carbon emissions in the long term are almost the same for both reduction targets of 30 and 50%, both obtained better results than the lowest percentage tested (10%), which in turn is better than the isolated application of the policy even when the influence of the social network is eliminated.

Testing combined policies for transitions to sustainable mobility

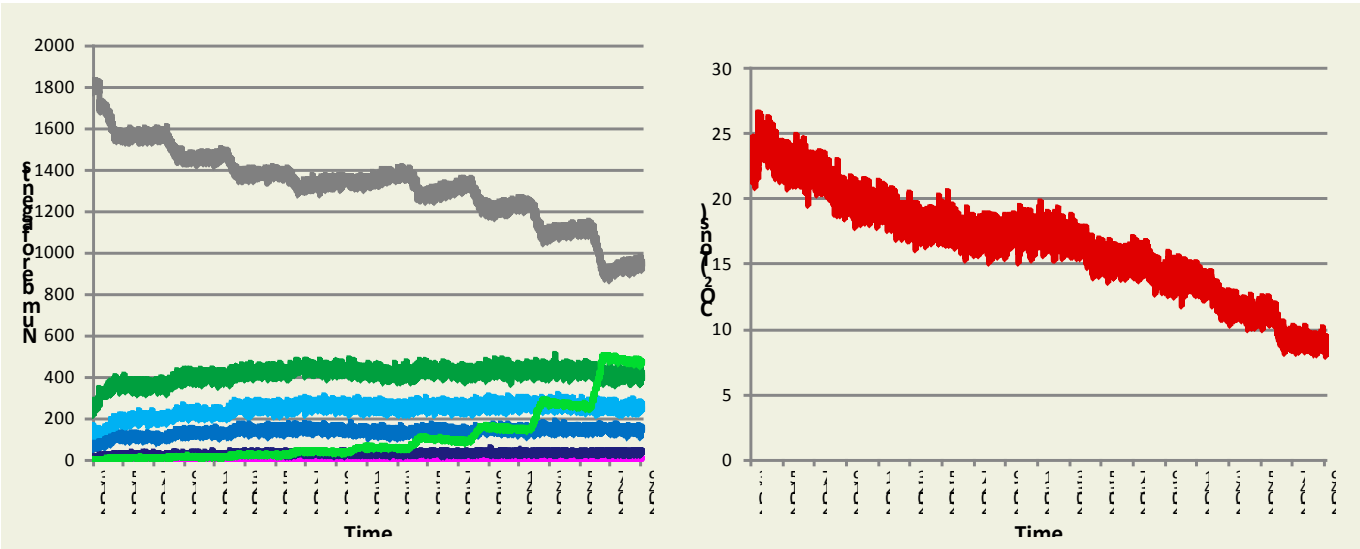


Figure 7. Testing combined policies for transitions to sustainable mobility

The second combination uses two policies that affect mobility, and that change the environment of the agents, doubling the use of the bicycle and reducing the use of the car in the lowest percentage tested (10%). In the figures below, it can be seen that both policies maintain their desired effect in the long term, and that the total emissions obtained are in similar numbers to those of reducing the car in 30%, and thus similar effects can be obtained for a milder reduction in car use, if combined with other policies, such as encouraging the use of the bicycle.

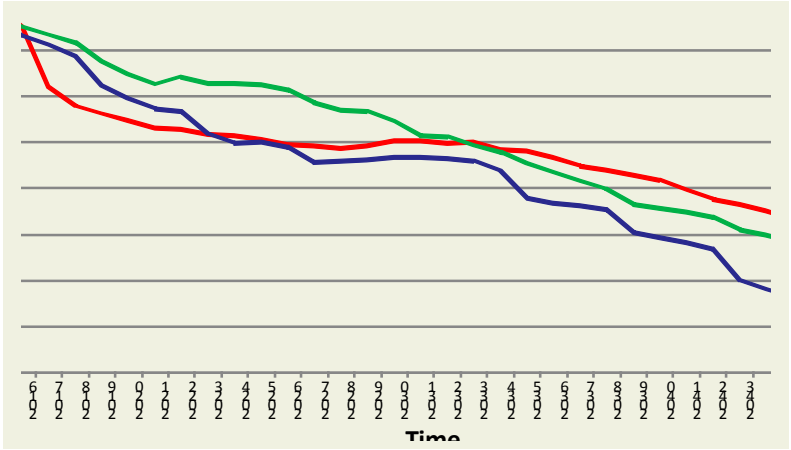


Figure 8. Testing combined policies for transitions to sustainable mobility

The main conclusions from the simulations were:

- Policies **maintained in time** obtain better results than isolated interventions, given the aasumptions made are correct.
- **Combining policies** obtains better results than each of the policies separately.
- **Social networks are very influential** in the long term, and affect considerably the results of the policies.
- **Mild intensity policies can work better than more aggressive policies** for obtaining a more successful sustainability transition.

4.3 Testing policies for reducing work-related mobility in private organizations: Enel Green Power (Italy) case study

The backcasting workshop in the Enel Green Power case study developed three scenarios focusing on technical improvements as the basis for energy saving, with two alternative models to the centralised office as workplace locations. These two decentralised options involved (i) creating out-of-town campuses where employees would live and work ('green office'); and (ii) increasing home working, facilitated by fast internet ('virtual office'). When discussing timings during the backcasting workshop, the decentralised workplace location scenarios were merged into a single scenario. However, as power generation is the main concern of Enel Green Power, in fact the timings in the backcasting workshop were largely focused on this topic rather than changes in everyday behaviour. Further, the model is capable of representing the two scenarios separately, and they provide a potentially interesting contrast. To create a baseline a comparison for each of the three scenarios, a scenario was run in which there were no interventions.

The differences between the four scenario runs are summarised below:

Scenario	Difference from *baseline*
technical	• Energy use of behaviours for which energy consumption data are available reduced by 2% per year from 2023-2033 (inclusive).
green office	• In 2023, introduce a recruitment policy of only employing people with a high biospheric score (>5). • In 2033, move all employees from their current home and work locations to home and work locations on one of three campuses.
virtual office	• For all years from 2033 to 2043 (inclusive), choose a random 10% of the employees not already working at home to now do so

The *technical* scenario is the least interesting, in that, through simply changing the result of performing behaviours, there is no effect on behaviour as modelled. Indeed, the model may be optimistic in this regard since there is a well-documented 'rebound effect' (Greening et al., 2000; Binswanger, 2001; Berkhout et al., 2000) from energy efficiency measures, in which savings made from using less energy are either put into buying goods with higher specifications, or buying more goods. However, this effect is not covered by the empirical data supplied to the model and hence the model does not address the matter.

Figure 8 shows that the *technical* scenario reduces overall energy consumption in comparison with *baseline*, whilst figure JGP2 demonstrates with the example of turning the heating on that the proportion of agents choosing to perform this behaviour is unaffected.

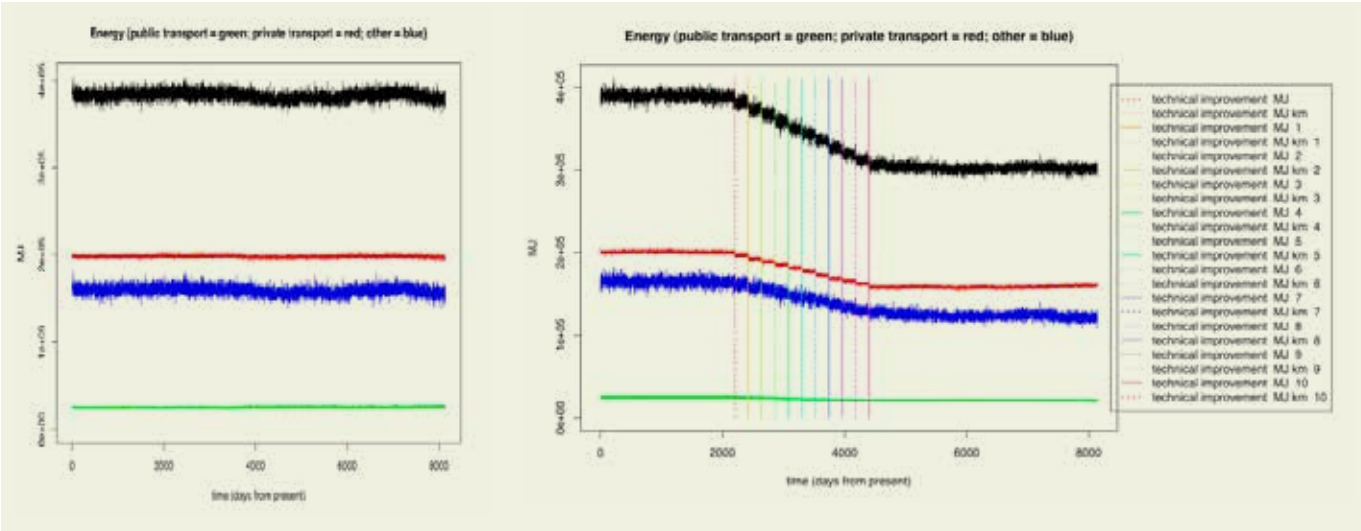


Figure 9. Comparison of overall energy consumption in *baseline* (left) and *technical* (right) scenarios. Private transport and other energy consumption activities (e.g. temperature control) are the biggest drivers of energy consumption.

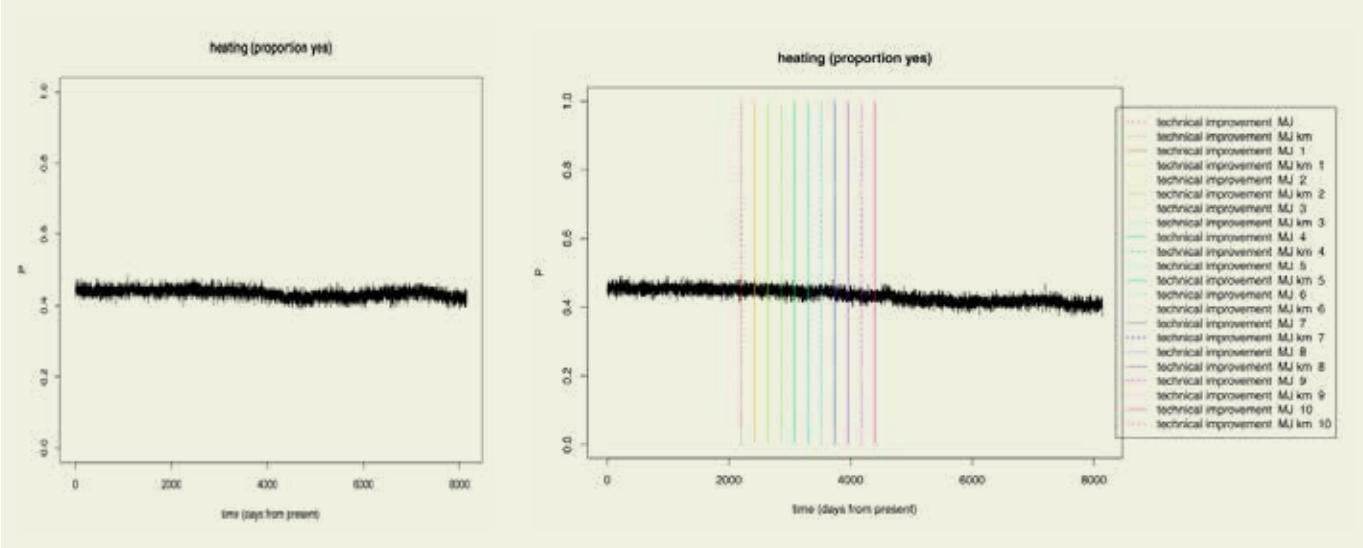


Figure 10. Comparison of proportions of agents turning the heating on at work in the *baseline* (left) and *technical* (right) scenario.

Figure 11. Transport energy use in the *virtual office* scenario. (Black time series: total; red: private; green: public)

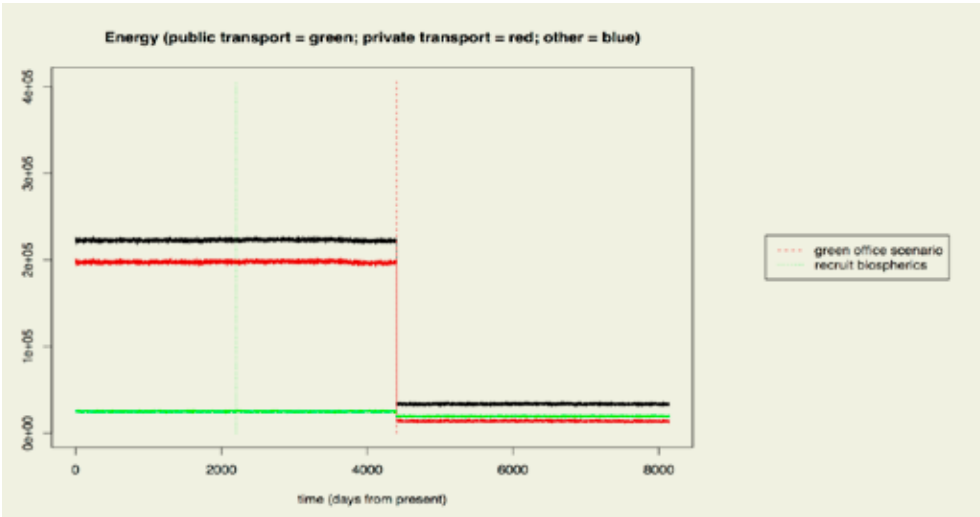


Figure 12. Energy use for transport in the *green office* scenario. (Black time series: total; red private; green public)

Figures 11 and 12 show the energy use for transport in the *virtual* and *green office* scenarios, which chiefly achieve reductions through cutting out commuting. The *virtual office* scenario assumes a gradual shift in working patterns over an eleven-year period rather than a single wholesale move of the entire workforce. The interesting difference between the two scenarios is therefore the policy of recruiting individuals with high biospheric scores, something that is only mentioned in the *green office* scenario. The introduction of this policy (around day 2200 – see vertical green dashed line in Figure 12) has no appreciable effect on energy use for transport. The reasons are apparent immediately from the correlation map in Figure 13: biospherism is only weakly correlated with any transport behaviours (for only one is it significant by any normal scientific standard), and hence unlikely to be a significant variable in a decision tree pertaining to transport. In particular, as is apparent from Figures 11 and 12, commuting is the most significant driver of transport energy use based on the data used in this case study, and the decision tree for that behaviour (Figure 14) does not use biospherism as an explanatory variable at all; neither does that for driving in an energy efficient way in this context.

However, this is not to say that recruiting biospherics is an ineffective policy when considering areas of pro-environmental behaviour outwith transport. Washing clothes without using a full load is driven by biospherism (Figure 15), and as Figure 16 shows, recruiting biospherics in the *green office* scenario leads to fewer agents washing clothes without having a full load than in the *virtual office* scenario where this policy is not implemented.

These points highlight the following:

- The drivers of pro-environmental behaviours are different. 'Sustainability' is not something to be treated as a single entity to be managed in a particular way, but a composite of various everyday practices.

With respect to transport, it is structural factors that lead to the biggest gains in the Enel Green Power case study. The lowest tercile in the discretised responses predicted by the decision tree for commuting (Figure 14) has a range for using the car from never to almost always [1, 6]. Hence, appealing to the psychological drivers of avoiding the use of the car has a limited scope to reduce emissions and energy use.

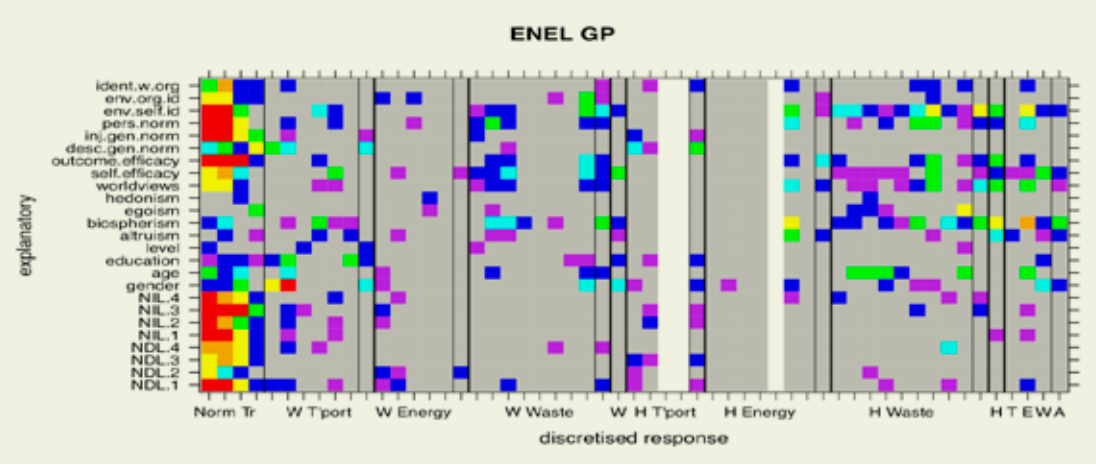


Figure 13. 'Correlation map' between explanatory and response variables in the Enel Green Power case study in which correlations are shown as coloured squares. Vertical lines separate groups of response variables; thin vertical lines separating aggregated response variables from their preceding disaggregated ones. (Hence, the first three groups of variables are norm transmission, work transport, and aggregated work transport.) 'W' is all aggregated work behaviour; 'H' all aggregated home behaviour; 'T' aggregated transport; 'E' aggregated energy use; 'W' aggregated waste; 'A' aggregate of all behaviours. Colours are: red ($P < 0.00001$), orange ($P < 0.0001$); yellow ($P < 0.001$); green ($P < 0.005$); cyan ($P < 0.01$); blue ($P < 0.05$); purple ($P < 0.1$); grey ($P \geq 0.1$); white (data not available or p-value not computable).

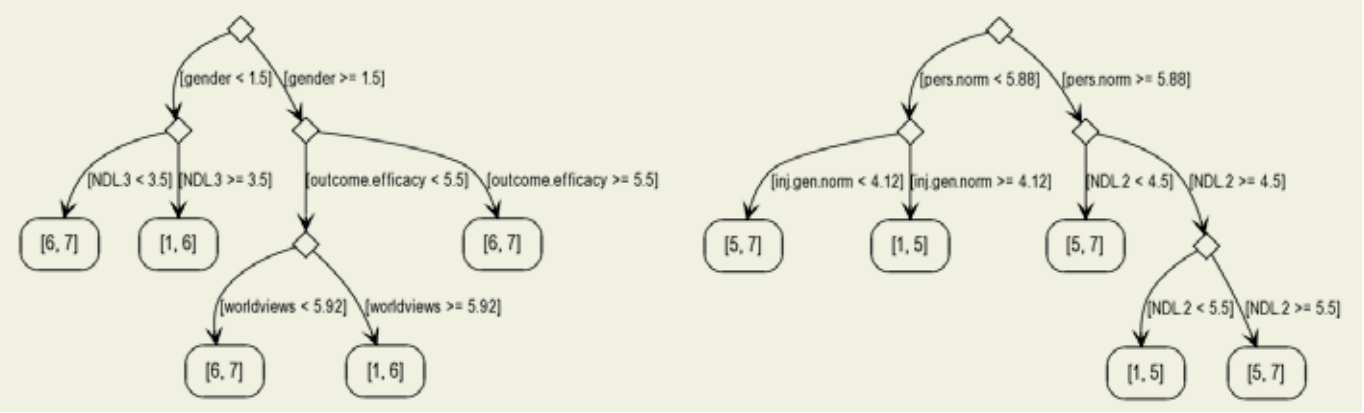


Figure 14. Decision trees for commuting by car (left: 1 => never; 7 => always) and driving in an energy efficient way (right: 1 => never; 7 => always).

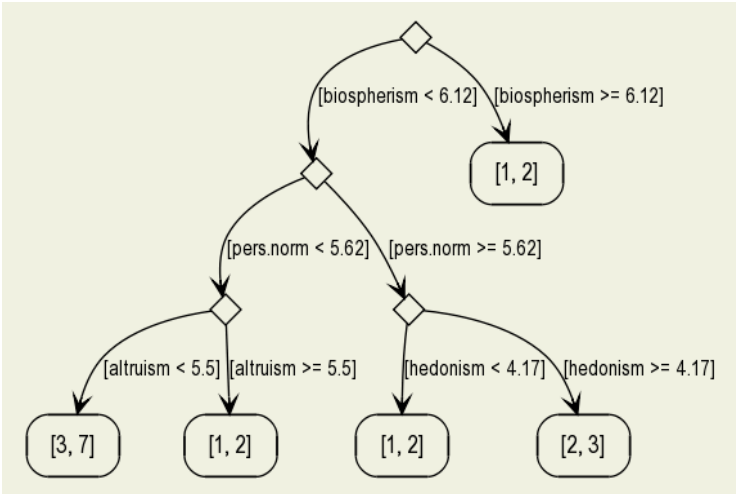


Figure 15. Decision tree for washing without using a full load (1 => never; 7 => always)

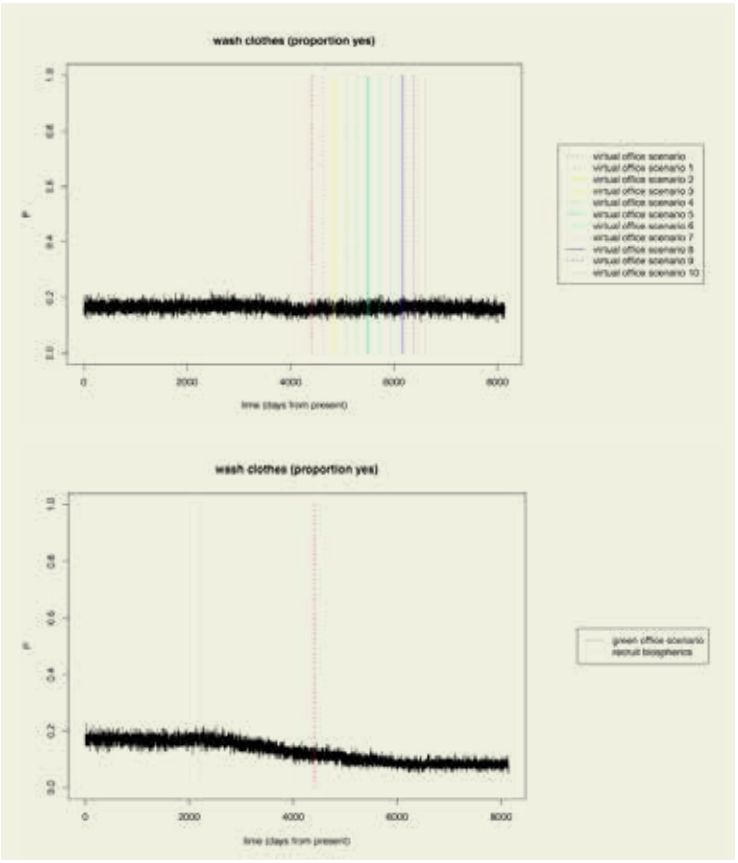


Figure 16. Proportion of agents choosing to wash without a full load in the *virtual* (left) and *green office* (right) scenarios.

5 Potential impact of LOCAW

The LOCAW project has developed a comprehensive impact and dissemination strategy right from the start. The strategy included provisions for wide dissemination of the project to relevant stakeholder groups and included plans for scientific, socio-economic and wider public impact. It has also aimed at having significant EU, national and regional policy, practical and scientific impacts, which would further promote the European Union as a worldwide centre of 'research into policy' excellence.

The objective of formulating policy to generate sustainable practices is one of the priorities in which the EU has put great effort from the publication of the EU's Sustainable Development Strategy in 2001, which has been updated until 2006. LOCAW has aimed at providing action guides for state administrators and decision-makers, which include schemes for promoting sustainability via evidence-based concrete actions and policies susceptible of being evaluated. The results of LOCAW have been translated into policy recommendations that can significantly advance the objective of transitions to sustainable practices in organizations. The application of these recommendations could have a direct utility in universities, local administrations, and large scale organizations in general.

These policy recommendations include both important general conclusions about policy mixes and policy intensity (e.g.: showing that mild intensity policies, in combination, can work much better in transforming practices that more restrictive policies), as well suggestions for new policies that would transform important determinants of sustainable practices in organizations. The latter ones are accessible in a separate report on Policy recommendations, publicly accessible on the webpage, and they have also been distributed to relevant stakeholder in a final project seminar held in Brussels. Emails will be sent to relevant organizational stakeholders across Europe with links to this document. These recommendations can be of use for decision-makers at different government levels, as well as for organizational managers that want to support transitions to low-carbon practices in their own organizations.

http://www.locaw-fp7.com/userfiles/Final%20Seminar/policy.pdf

The policy recommendations are specific suggestions for decision-makers to transform the context in which organizations operate, through regulations and legislation, and organizational norms and interventions at a general level. But through the in-depth research that it has undertaken the LOCAW project has also significantly advanced the knowledge-base on determinants of sustainable practices in organizations, as well as on the barriers of and drivers to transitions to sustainable organizations and communities. This is evidenced in two book chapters that have been published in recent volumes about green organisations; one of which focuses on how to encourage organisations to adopt sustainable policies (Lindenberg & Steg, 2013), while the other provides a theoretical analysis of individual factors promoting pro-environmental actions in the workplace (Ruepert et al., in press). In addition, a first empirical paper on the results of the questionnaire studies conducted in the case study areas will be submitted to a peer reviewed international academic journal soon (Ruepert et al., forthcoming). A paper on the role of trade unions and global environmental change has already been published in a high-impact peer review journal (Uzzell & Räthzel, 2011). Quiet a high number of symnposia were

organized at international conferences and there are a few already submitted and accepted for this year. A list is provided at the end of this report. As such, knowledge developed in LOCAW can contribute to the formulation of consumer policies in Europe, including interventions to reduce consumption in workplaces and ensuring favourable conditions for the transference of practices from one life domain to another, thus enhancing the effectiveness of interventions at any level.

LOCAW has taken an innovative approach to the issue of consumer behaviour and how this is related to sustainable development. As the *EU Consumer Policy Strategy 2007-2013* states, "confident, informed and empowered consumers are the motor of economic change as their choices drive innovation and efficiency." (http://ec.europa.eu/consumers/overview/cons_policy/doc/EN_99.pdf). The EU consumer policy seeks to support consumers with the information and skills necessary to make informed choices about consumer products and services. It has been acknowledged in the EU's *Sustainable Development Strategy 2008* that in most European states it has not been possible to achieve significant changes in consumption behaviour. One of the reasons for this is that current policy formulations largely have an individualistic focus, i.e., the problem is conceived as one of individual consumer behaviour which should be addressed by means of education and information. The LOCAW project has assumed a more complex approach that focuses on organizational systems and the intricate relations among different agents, providing a novel way of approaching sustainable behaviour, through interventions at systemic levels. Workplaces are important areas of life and thus interventions in workplaces can be especially effective. Developing sustainable practices at work can then be translated into everyday behaviour at home, under the right conditions.

The project has advanced the state of the art of our understanding of (un)sustainable human everyday behaviours, with particular reference to workplace activities and consumption / production processes from a scientific perspective. It achieved this by investigating the role of *macro political and economic developments* for *micro-level sustainability practices* in a variety of social, economic and political contexts which represent a range of European experience. LOCAW also advanced the state of the art of the current predicting models of environmental behaviour, investigating the role of the work context and specifically the influence of the corporative sustainable policy in promoting ecological behaviour in the workplace. It provides not only an analysis of how companies and state organizations deal with sustainability policies from an organisational or structural perspective, but also from the view of workers and their environmental perceptions, identifying the mediator variables driving or constraining sustainable behaviour at work. Furthermore, being inter-disciplinary, the research has benefited not just one academic discipline but several. Consequently, the research challenged the *compartmentalisation of present research* into different disciplines and approaches. By situating 'sustainability' within the whole life experiences and trajectories of individuals we can understand the inter-relatedness of a range of facets of social and economic life, which both national and EU policies need to take into account in order to be effective.

According to the Communication of the Commission to the European Parliament, the Council, The European, Social and Economic Committee, and the Committee of the Regions: "**Towards a comprehensive climate change agreement in Copenhagen**" [SEC(2009) 101] and [SEC(2009) 102], it is becoming increasingly clear that climate change is going to have the most serious impacts in developing countries, and developed countries should continue to take the lead in reducing emissions, in particular in the immediate future. The position of the EU includes the idea that the developed countries should commit to adopting low-carbon development strategies, in a credible pathway to limit the country's emissions through nationally appropriate mitigation actions that cover all key emitting sectors. LOCAW has also worked with key organizational stakeholders, where possible, to develop effective strategies for organizational change, in four different ways:

- First, LOCAW has facilitated organizational workshops using a back-casting scenario development methodology, to create visions of the future for the case study organizations and to define appropriate pathways to reach them, with the identification of relevant actors that should be involved. Reactions of organizational stakeholders have been very positive, and the LOCAW experience, described in the Report on the back-casting scenarios can be an example for other organizations that might one to implement this *participatory tool for future-mapping and transition management.* Besides the development of the scenarios, the LOCAW project has worked with simulations, through agent-based modelling, to test different scenarios and pathways, and thus organizational stakeholders can derive interesting lessons on how their envisioned scenarios might work if implemented.

- Second, LOCAW has reached an agreement with one of the case study organizations, the University of A Coruña, to work together on the implementation of specific measures to support transitions to sustainable practices in the University, thus having a direct impact.

- Third, LOCAW has published a document on policy recommendations that can be of great use to policy makers in general. Also, wide scientific dissemination ensures that other researchers working on these issues are knowledgeable of the findings of LOCAW and they are in a position to further share our results and recommendations with organizations in which they are involved or with which they work.

- Finally, the establishment of the *International Project Advisory Group* has not only secured a broad network of expertise to inform the project at all stages, but was also invaluable in ensuring LOCAW findings are disseminated to international academic and policy opinion-formers.

By looking at the role of relevant actors in the sustainability debate, LOCAW has contributed to creating a link among universities, local governments and industry, generating a communicating system of shared responsibility to deal with climate change. Agent based models were used to study the possible large scale effects of introducing low carbon strategies in the workplace, in large organizations. If policy makers are to benefit from research the deliverables must not only be *useful* but also *useable*. Too often research findings are not 'translated' into a form that is useable by those in government or in large scale organisations. Consequently, LOCAW has ensured several outputs that are useable for policymakers both in state and private organisations. This has been ensured in two key ways. First, universities, local governments and companies were considered vital collaborators and partners in this project, and they were involved in every stage of the work. Second, the Project established a series of public seminars with wider groups of stakeholders in participating countries, who commented on the planning, design of the study, the interpretation of the results and their dissemination. Both groups ensured that the research is 'fit for purpose', i.e., useable as well as useful.

The main dissemination activities of LOCAW consisted of a series of fivepublic seminars, including a final seminar in Brussels presenting final project results, presentations at conferences across the life of the project, scientific publications, and joint events with other EU projects funded under the same call.

LOCAW has organized five public seminars, four in different participating countries in the project and the fifth in Brussels, where final results were presented to European stakeholders. Each time, local and regional stakeholders were invited to participate, including policymakers, business representatives, trade unionists, NGOs and researchers from other disciplines and projects. The stakeholder seminars were very productive events in LOCAW. They fulfilled the twofold purpose of constant feedback from stakeholders to project results and continuous

dissemination of the research to those that could benefit from it. Feedback was incorporated into the project and allowed for the refinement of theories, methodologies and conclusions on the go. The dissemination was considered useful by stakeholders who expressed their interest that these types of projects and in-depth research could be done to help public and private organizations, both businesses and governments to further generate the virtuous policy loops that can promote sustainable practices at the workplace, in such a way as to also enhance efforts to reduce emissions in households.

A framework for effective participation was used in all the seminars. This framework is based on an extensive body of research on the factors influencing participation in diverse groups of stakeholders and in expert-non-expert discussions. Furthermore, the seminars targeted stakeholder groups and issues that were relevant for each of the stages of the project. Members of government were targeted from the early stages of the project. LOCAW considered it essential to establish a constant connection with government representatives at regional and local levels, as they are responsible for potentially translating research results into policies and regulations that structure the environment in which the organizations operate. Also, as they lead organizations themselves, they benefit and are early adopters of research conclusions on sustainability. Representatives from the case studies and beyond were also targeted, and LOCAW was successful in a few instances in actually convincing organizations (e.g.: the University of A Coruña) to be frontrunners in implementing some of the project conclusions, as mentioned above.

A wider dissemination event was organized as a LOCAW final expert seminar in Brussels, in December of 2013. This event was opened to participants from different types of organizations and academia, and included talks and presentations from the LOCAW members, but also from invited speakers that have studied related topics. International and national government representatives, international unions and business organizations have been invited along with officers from the EU. Feedback from the participants is included into the final report.

LOCAW presented its final Project results and conclusions to a diverse group of stakeholders that included European officers, Brussels-based third sector organizations, businesses and representatives of other related research projects. Presentations were filmed and they are available on the Project website (http://www.locaw-fp7.com/index.php?pagina=final_seminar), as well as on the coordinating group´s website (the People Environment Research Group from the University of A Coruña: www.people-environment-udc.org). Also, a project vídeo summarizing main project results will be available soon via the same media.

Professor José M. Peiró (LOCAW International Advisory Board)

LOCAW Final Seminar. Brussels, Spanish National Research Council (CSIC), 10-December-2013.

Preparation of this Seminar has been a long process in which the different teams have been involved from April 2013. All of them considered this last meeting as an opportunity to go beyond the scientific community. It is with this purpose in mind that we opted, since the very beginning, to open dissemination to four fundamental stakeholders and their different levels:

- Policy-makers at multiple levels
- Think tanks & civil society
- Trade unions & Business
- The scientific community

One of the main aims of an FP7 project is to give high-quality feedback to decision and policy-makers, based on research results and expert interpretation of them. Our efforts were thus focused on communicating the event to MEPs and EC representatives working on the topic. Members of the Committees on the Environment, Public Health and Food Safety were invited to delegate attendance to their advisors or assistants with expertise in environmental issues. Members of Science and Technology Options Assessment (STOA) were also invited to do the same. Regarding the European Commission we targeted the following Commissioners and DGs: a) Environment; b) Research Innovation and Science; c) CLIMA; d) Employment, Social Affairs and Inclusion; and e) Mobility & Transport. The European Environment Agency, the Institute for Environment and Sustainability of the Joint Research Centre (Ispra, Italy), and the UNEP Regional Office in Geneva as well as the UNEP National Committees (NATCOM) were also contacted.

There was cross-fertilization between the different projects granted within the same call, INCONTEXT and CRISP, through exchanges of knowledge in seminars and joint conference events, as well as within the newly created SCORAI platform, which resulted in interesting discussions and consultations on the commonalities and differences among projects within the same Call of 2010. One of these joint events was organized during the ERSCP (European Roundtable for Sustainable Consumption and Production) in Bregenz, Austria, thus allowing the three projects an opportunity to disseminate their research to a wide audience of scholars, business and third sector representatives, and the other involved a seminar organized in Rotterdam, by the InContext project, also involving a wider participation of scholars in sustainable consumption and production.

LOCAW has also contributed to building capacity for research in transitions to sustainable organizations and lifestyles by promoting international training of young researchers, through the organization of two international seminars on specific methodologies used within the project. With regard to employment, LOCAW has employed new research and management staff, contributing not only to counteract the trend of decreasing number of researchers in some of the participating countries (those which have been more affected by the financial crisis), but also to incorporate high quality researchers to the common European space, with their corresponding added value for social profit. It also strengthened international collaboration between team members.

The consortium cannot guarantee that LOCAW will have an economic impact because that depends on whether our recommendations to policymakers will have an influence on the process of policy making. However, the research results do provide actionable guidelines for policymakers to devise policies that are tailored to the needs of workers and at the same time to the needs of the environment.

The discussions at the various climate summits since the start of the LOCAW project suggest the need to act at the European level. Climate change does not respect national boundaries and therefore a collective response will be vital if we are to devise international as well as national and regional strategies aimed at the mitigation of climate change, the adaptation to changing environments and the reduction of suffering especially in respect of physical and mental health, food insecurity, eco-migration, and consequential impacts upon employment and economic growth. The present research has provided a trans-national framework such that policy development in relation to climate change will be able to incorporate an understanding of the relationship between environmental behaviour at work, and changing sustainability practices. Finally, the project has opened a new research agenda on the role and significance of organizations and more specifically workplaces in transitions to low carbon societies in Europe. Further research is much needed on this topic, as well as further testing of the different pathways and policy options for transforming workplaces once they are put in place.

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