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TRANSITION FRAMEWORK

TOWARDS FUTURE PRACTICES OF SUSTAINABLE HEATING

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INTRODUCTION

This document reports on the output of the CONSENSUS sustainable energy use Transition Workshop held in October 2011. The aim of the workshop was to develop a Transition Framework containing possible policy, education, research and business interventions to pave the way towards a future of more sustainable heating practices in Irish households. The workshop engaged a range of stakeholders related to the energy sector in Ireland (North & South) from public, private, semi-state and non-governmental organisations. These stakeholders represented a variety of professional backgrounds from architecture and design, to policy, planning and communications.

The Transition Workshop was the final phase in an iterative, backcasting research process. Backcasting is based on the collective development of desirable future visions, followed by looking back (backcasting) to see how a transition towards that future could be achieved. As opposed to other futures techniques, such as forecasting, backcasting is valued for its potential to widen perceptions about sustainability problems and develop trend-breaking, holistic solutions. The CONSENSUS research project uses backcasting in an all-Ireland context as an innovative, creative means of developing alternative scenarios for sustainable household consumption and long-term action plans to work towards their achievement.

PRACTICE-ORIENTED APPROACH

In approaching the problem of home energy consumption, the research adopted a 'social practice' approach that focused on people's use of energy for everyday tasks and household chores. The practice of home heating was taken as the primary unit of analysis as it represents the highest end-use of energy in Irish households accounting for c. 70% of total home energy consumption. The social practice approach contrasts dominant conceptions of human behaviour that tend to overlook limitations imposed by existing technological or social contexts that 'lock' people into patterns of consumption. Instead, this approach notes the variety of social, infrastructural and institutional elements that shape our daily practices. In the context of home heating practices, these elements are; technological (e.g. heating systems, built structure), organizational (e.g. systems of energy provision and regulations) socio-cultural (e.g. temperature norms and expectations) and personal (e.g. heating habits)[1].

BACKCASTING PROCESS

The backcasting process began with a stakeholder Visioning Workshop based on the question; 'what kinds of technological, organizational and socio-cultural innovations can we envisage in the year 2050 that might fulfill the needs of home heating (warmth, comfort, wellbeing) more sustainably? In the Scenario Elaboration phase, proposals from the visioning workshop were developed into three distinct future scenarios depicting more sustainable heating practices [see: www.consensus.ie/publications.html]. Next, an online forum was created to gain feedback from the workshop participants on the scenarios. After this, the scenarios were subjected to a qualitative Sustainability Assessment to analyse their environmental, social and economic implications and Citizen-Consumer workshops were held to assess opinions of everyday users towards the scenarios.

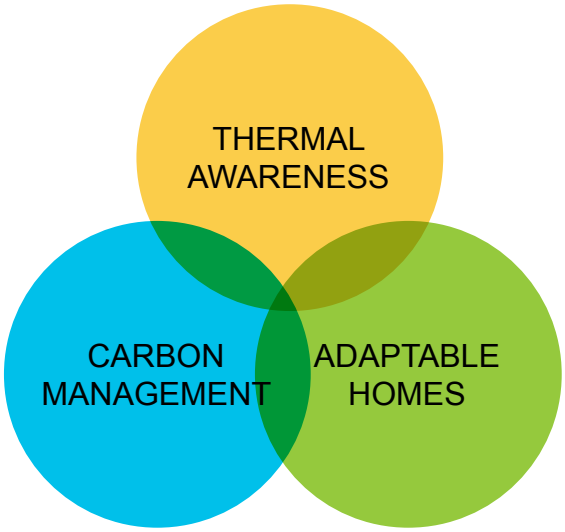
Three 'Promising Practices' were then identified taking into account citizen-consumer feedback and the results of the sustainability assessment. Each Promising Practice focuses on the actions taken by a person to accomplish the task of heating detailing the motivations, technologies and systems of provision that guide their behaviour. The Promising Practices are not blueprints for the future, nor are they stand-alone, separate solutions. Rather, they represent future possibilities for more sustainable heating strategies containing bundles of ideas that may be synthesized or pursued in different combinations. The Promising Practices were presented at the Transition Workshop in October 2011 and participants were asked to think of educational, research and development, community, economic and regulatory interventions that could collectively work towards their achievement.

1 Given the level of existing research focusing on long-term scenarios for renewable energy development and grid decarbonisation, CONSENSUS focused on heating solutions integrating passive, direct body heating, and behavioural solutions that do not rely on conventional central heating powered by centralized energy sources.

PROMISING PRACTICES

VISION FOR 2050

In the year 2050 people's heating practices are characterised by:



1) THERMAL AWARENESS

Awareness of personal heating needs and home temperature levels shapes heating practices. Advanced thermal clothing and direct body heating (via 'smart heating vests') play key roles in delivering warmth and there has been a re-evaluation of heating and cooling comfort levels. Householders monitor room temperature levels and adapt their heating strategies accordingly.

2) CARBON MANAGEMENT

Individuals actively manage their personal carbon budgets and their consumption practices (including home heating) are influenced accordingly. All goods and services have an associated carbon cost. Specialised ICT provides carbon costs and records personal carbon usage. Householders check their energy displays to track their costs, benchmark against neighbours, and manage their energy using appliances. Eco-points for purchase / use of low carbon goods and services are awarded for environmentally friendly behaviour.

3) ADAPTABLE HOMES

Passive housing reduces the need for fossil fuel powered heating and bioclimatic, living architecture contributes to positive energy gains, regulating flows of air and warmth within houses. Home-owners actively adjust interior spaces according to the number of occupants present and modular home units allow long-term adjustability. This reduces the need for space heating and maximises material efficiency. Home spaces are reduced in size with compensation through communal spaces.

TRANSITION FRAMEWORK DEVELOPMENT

Following the Transition Workshop, the interventions recommended by participants to work towards the 2050 Promising Practices were further elaborated. This document presents these interventions in a visual timeline over short (2012-2020) medium (2020-2035) and long (2035-2050) time scales. Interventions are categorised according to the following different types:

- Ⓟ **Policy** (e.g. economic tools, design and building regulations)
- Ⓔ **Education & Engagement** (e.g. educational programmes, community initiatives & awareness)
- Ⓡ **Research, Technology & Business** (e.g. Research & Development, economic investment)

The document concludes with a list of **challenges and drivers** as identified at the Transition Workshop that may impact the implementation of the Transition Framework. A note is also provided on the potential **actors** that would need to be engaged in order to carry forward the recommended Transition Framework.

TRANSITION FRAMEWORK

Towards Future Practices of Sustainable Home Heating

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	Short (2012 - 2020)	Medium (2020 - 2035)	Long (2035 - 2050)
THERMAL AWARENESS	Ⓟ Warmth Optimisation Manuals with BERs	Ⓟ Temperature indicators in rooms required (colour coding)	
	Ⓟ Regulations for upwards limit on indoor temperature levels	Ⓟ Body heat vests' & 'cosy coats' financial incentives	Ⓔ Education for energy' school sustainability syllabus
	Ⓟ Advanced heating controls accompany roll-out of smart energy meters	Ⓟ Thermal ratings required for clothing	Ⓔ Consciousness of personal & room heating needs
	Ⓔ Education and communications; healthy heat, clothes before heating	Ⓔ Practical skills - adaptive body heat, self-sufficiency.	Ⓔ Temperature responsive clothing & spaces
	Ⓡ ESCOs* focused on delivery of results (warmth & efficiency)	Ⓔ Thermal performace uniforms & workwear mainstreamed	
	Ⓡ R&D advanced thermal performance clothing & 'body heat vests'	Ⓡ R&D - material science for temperature responsive clothing	
CARBON MANAGEMENT	Ⓟ Smart energy meters roll-out, time of use pricing, demand management	Ⓟ Carbon allowances - applied to home energy use & transport	Ⓟ Personal carbon allowances - extended to all products & services
	Ⓟ In-home-energy-displays', touch-screen home energy controllability	Ⓟ Tax products to reflect their carbon, social and environmental impacts	Ⓟ LCA footprint of all products & services
	Ⓟ Research on personal carbon allowance	Ⓔ Formal education on carbon budgeting in school syllabus	Ⓔ Energy 'compliance courses',
	Ⓔ Educational campaign with smart meters, support teams, phone apps	Ⓔ Energy suppliers - benchmark home energy use & set targets	Ⓔ Publicising of consumption levels on area and household basis.
	Ⓔ Community projects for energy efficiency	Ⓔ Sustainability Reward Cards	Ⓔ Eco-points rewarded to individuals with low carbon footprints.
	Ⓡ R&D: ICT personal carbon budget control, informaiton & management	Ⓡ Integrated energy management systems, carbon allowance link with IHD	
ADAPTABLE HOMES	Ⓟ Area-based, nationwide retrofit		
	Ⓟ Building regulations enforced, Carbon Neutral 2013	Ⓟ Passive Haus building regulations (remove need for heating)	
	Ⓟ Tax incentives - interest relief for low carbon homes	Ⓟ Bioclimatic architecture (connecting & adapting with environment)	Ⓟ Bioclimatic buildings, adaptive and responsive to environment
	Ⓟ No new build (sweat existing assets)	Ⓟ Long-life, loose fit, adaptable interiors	Ⓟ Guest aparments
	Ⓔ Campaign to promote retrofit - placcards to improve visibility	Ⓟ Floor space restrictions	Ⓟ Requirement for communal spaces, services & sharing
	Ⓔ School retrofit & renewable energy programme	Ⓔ Spread of communal facilities in densely populated areas	
	Ⓡ R&D Design for adaptable space & bioclimatic, living architecture		
EXISTING POLICY	Smart Meters & IHD systems 2016-2020, Carbon Neutral new build 2013.	EU 2020 targets (20% renewable energy, 20% reduction in energy use, 20% reduction in greenhouse gas emissions from 1990 levels).	EU 2050 target of 85-90% reduction in emissions (from 1990 levels)

LEGEND

Ⓟ Policy
Ⓔ Education & Community
Ⓡ Research & Business

*ESCO = Energy Service Company

THERMAL AWARENESS

SHORT-TERM (2012 - 2020)

- **Warmth Optimisation Manuals –** accompany Building Energy Ratings (BERs) and provide house-specific, easily understandable advice on how to operate the heating controls in the home and optimize energy use together with effective behavioural adjustments.
- **Regulations set upwards limit for indoor temperatures provided by heating technologies -** Heating technologies should not heat rooms above 18°c given the potential for large carbon reductions from a reduction of just 1°c in temperature controls[2]. Regulations counter the trend of escalating expectations for indoor warmth above the current average of 22°c.
- **Advanced heating controls with smart energy meters**- Potential to accompany smart meter installation with upgraded heating controls to enable homeowners to better understand their heating systems, and allow increased controllability; easy – on/off buttons directly on radiators (to be accessible remotely online and via In-Home-Displays at a later date).
- **Education and communications – 'healthy heat' & clothes before heating.** Educational campaign on effective operation of thermostats to avoid loosing heat and money. Build awareness of appropriate levels of warmth linking to campaigns on healthy lifestyles and potential GP information on 'healthy heat' practices. Campaign to encourage use of extra layers rather than instantly turning on the heating.
- **ESCOs focused on the delivery of end-results (warmth & efficiency) –** shift in the logic of energy supply companies to focus on the delivery of end results (warmth, energy and cost efficiency) rather than maintaining a focus on the delivery of energy itself. This engages companies in active carbon reduction strategies and the orchestration of demand management strategies involving awareness; education and energy efficiency retrofit programmes (potentially matched with government funding). Users can prepay for energy in alternative units such as 'hours of heating delivered' to help manage their energy usage.
- **R&D Advanced thermal performance clothing & 'body heat vests'** – R&D to develop advanced thermal performance day wear. Focus research on the development of 'cosy coats' for warmth indoors, and 'body heat vests' powered by renewable or kinetic energy for direct on-body heating.

MEDIUM-TERM (2020 - 2035)

- **Temperature indicators required-** required display of temperature indicators (in degrees celsius or simple colour ratings) in all rooms. Householders observe temperature changes and set heating accordingly. Alternatively heating can be programmed to activate at a set level. Heating does not heat above a maximum standard of 18°c. This builds awareness of personal warmth needs, how they relate to space temperature, and the heating responses individuals should pursue.
- **Thermal ratings required for clothes –** Day wear (rather than high fashion clothing) is required to have thermal ratings indicating their insulating / warmth capacity.
- **Practical skills in adaptive body heat, and efficient energy use** – Skills for self-sufficiency, mending and up-cycling clothes to improve their thermal performance, and awareness of thermal ratings is taught at workplaces, schools and at open public courses. Eco-points are rewarded for attendance (see 'sustainability reward card' concept, p.g. 8).
- **Thermal performance uniforms & workwear mainstreamed –** Breathable thermal clothing is promoted, launched through the development of practical school uniforms and the cultivation of norms for more casual, comfortable workwear. Likewise in summer, air-conditioning is disapproved of, and lightweight informal wear is promoted (especially removing the requirement for men to wear tight shirts and ties in workplaces). Well-known designers are engaged in making new workwear and uniforms and public figures are engaged in their promotion. The aim is to counteract the trend for devolution of temperature control to heating / cooling technologies both in the home and in other public spaces.

2 It is estimated that a 1°c reduction in indoor temperature can reduce energy usage by 10% (HM Government, 2050 Pathways Analysis, July 2010).

- **R&D Material science for temperature responsive clothing** – R&D for intelligent clothing that responds to personal and environmental conditions and temperatures, creating optimum feeling of comfort. Investigate possibility for linking with room temperature indicators.

LONG-TERM (2035 - 2050)

- **Education for energy –** entire overhaul of school curriculum with 'education for energy' a core primary and secondary school course. Subject integrates learning on energy and sustainability issues and practical energy efficiency behavior advice.
- **Temperature responsive clothing & spaces –** Clothing adapts according to personal and room temperature. Potential synhronisation between clothing, room thermostats and heating devices.
- **Conscious of personal & room heating needs –** Population is conscious of wellbeing and its relation to heat levels and often choose, low-tech adaptive warmth solutions.

CARBON MANAGEMENT

SHORT-TERM (2012 - 2020)

- **Smart energy meters-** nationwide rollout of electricity and gas smart meters between 2016-2020 (as part of National Energy Efficiency Action Plan in RoI and as set out in The UK Low Carbon Transition Plan in NI). This allows time of use pricing and demand management.
- **In-Home-Displays (IHD) –** installation of IHD with smart meter programme[3]. All aspects of IHD functionality should be accessible online to permit remote control and management. The system should feature home floor-plans showing heating, lighting and all energy-using products, allowing touch screen control and programming. IHDs to show levels of energy consumption, costs, and associated carbon footprints. IHDs to contain information and online links to energy efficiency grants.
- **Personal carbon allowance research** on appropriate quotas to set in accordance with international and national carbon reduction targets. Examine social, environmental and economic implications and develop a plan for implementation.
- **Educational campaign to accompany roll-out of smart meters & IHDs -**Necessary to accompany the installation of smart meters & IHDs with information on how to optimize their operation. Potential establishment of support teams for the elderly and those with physical or mental impairments and the development of demonstration videos and smartphone apps to instruct on smart meter usage.
- **Community projects for energy efficiency –** funding and support for community-led projects aimed at assisting people in the management of their energy consumption and promoting consideration of carbon footprints (in advance of introduction of carbon allowances). Innovative schemes may include for example local renewable energy projects, local awareness campaigns and retrofit initiatives (potential link with Tidy Towns, An Táisce Green Homes, or Transition Towns networks).
- **R&D ICT for operation of personal carbon budgets** – research optimum means to track personal carbon usage and develop appropriate technology and devices for carbon budget management.

MEDIUM-TERM (2020 - 2035)

- **Carbon allowances** – initially applied on home energy use (according to size & number of occupants) and individual transport allowances.

3 The Commission for Energy Regulation (ROI) have recently indicated that In-Home-Displays are likely to form part of the smart meter installation (see: Consultation on the Proposed National Rollout of Smart Metering, November 2011, www.cer.ie).

- **Tax products to reflect their carbon, social and environmental impacts –** this encourages natural selection of low carbon fuels and sustainable products and makes it easier to manage personal carbon allowances when they area introduced fully by 2050.
- **ICT systems for personal carbon allowances integrated with IHDs –** the population is issued with a dedicated device or software for existing personal ICT (e.g. smartphone) that can be used to scan products / services at the time of use to record carbon expenditure and reveal the carbon cost of an item.
- **Formal education on energy issues & carbon budgeting -** education on environmental limits and carbon budgeting permeated throughout syllabus and promoted by Green Schools (ROI) & Eco-schools (NI) with intra-school competitions.
- **Energy suppliers provide household feedback, benchmarking and energy reduction goals –** Energy Service Companies (ESCOs) provide tailored advice to homeowners (via IHD bills or online) on how to use energy and heating efficiently based on variable prices and temperatures. Provides homeowners with precise goals for percentage reductions in their energy use (& associated bills), praises good behavior and benchmarks energy use against neighbours or homes of equivalent size and occupancy. All bills break down energy end-uses and present consumption in easily understandable units (such as carbon equivalent, hours of use or basic numerical scales, e.g. 1-20 rather than conventional Kwh measurements). Detail is provided on a household's remaining carbon allowance and pre-payment options are available to allow effective carbon budget management.
- **Sustainability reward cards** – Akin to "loyalty cards", consumers earn eco-points upon purchase of sustainable products, use of sustainable services or when they meet their home energy reduction goals. Developed in partnership with retailers and private businesses the eco-points are earned and used for eco-labeled products, repair and second hand shops, borrowing/sharing services, public transport and green electricity providers. This encourages conscious consideration of environmental impacts and rewards green choices with special offers and cost reductions available for participating consumers. Introduces people to the concept of responsible and measured consumption choices in advance of personal carbon allowances.

LONG-TERM (2035 - 2050)

- **Personal carbon allowances –** Personal carbon budgets shape behavior and consumption choices. Extension beyond raw energy use in the home and transport to include consideration of the environmental impacts of all products and services. Drastic reduction in the need for fossil fuel power in homes assists users in staying within their quotas.
- **Life-cycle-assessment (LCA) of all products & services –** in order to develop a carbon cost so that there can be control over carbon allowances. Need to improve on current LCA procedures to incorporate indicators for social sustainability.
- **Energy Compliance Courses –** mandatory exam testing knowledge on carbon footprints and effective carbon management. Compulsory (similar to National Car Test - NCT).
- **Publicising consumption levels –**Information on levels of energy consumption by individual homes and at street and district levels are made publicly available. These can be found online or accessed via smart phone GPS systems.
- **Sustainability rewards scheme linked with personal carbon allowances –** Sustainability reward scheme fully integrated into personal carbon allowance systems. Those who make large advancements to reduce their carbon impact are automatically awarded eco-points.

ADAPTABLE HOMES

SHORT-TERM (2012 - 2020)

- **Area-based retrofit (insulation, boiler replacement, heating control upgrades) -** target zones of older poorly insulated housing, and those suffering from fuel poverty to take advantage of economies of scale (i.e. pro-active retrofit strategy rather than reactively waiting for voluntary uptake on the part of households). Installers are required to provide education for homeowners on how to reduce energy use in their home and maximize the value of their new retrofit. To avail of retrofit grants, homeowners must commit to engaging with the installer and to taking on board their energy reduction recommendations.
- **Building regulations** –As per National Energy Efficiency Action Plan (2010), Carbon Neutral standard for new build is implemented in 2013 in RoI and by 2016 in NI.
- **Tax incentives – interest relief for efficient homes -** Interest relief for first time buyers on energy efficient homes and lower property taxes. Higher taxes on new build encourage the use of existing structures.
- **No new build –** regulations to forbid the construction of new housing if equivalent housing in a location matches the required needs (sweat existing assets).
- **Campaign to promote retrofit and provision of retrofit placards -** emphasis on enhanced comfort and health benefits for homeowners and the minimum inconvenience of home retrofit procedures. In communications the language of "avoided loss" of heat and money is used rather than that of "savings". Placards are placed on retrofitted homes and buildings to provide a visible badge for homeowners that have completed a retrofit and achieved a high level of BER. This measure is intended to activate social norms and enhance social pressure for retrofit. Likewise, an online map marks homes that have been retrofit or those who are seeking to retrofit in order to develop alliances for area based retrofit programmes.
- **School retrofit & renewable energy programme -** prioritization of retrofit funding for school upgrades coupled with education on issues of energy conservation (through Eco-Schools and Green Schools programmes). Installation of renewable energy systems in schools to showcase best practice technology together with energy consumption displays and room temperature gauges in prominent locations to increase visibility of energy use.
- **R&D - research bioclimatic and biomimetic architecture** design principles as applied in the Irish context & space adaptability

MEDIUM-TERM (2020 - 2035)

- **Passive House building regulations** – introduced by 2020 for all new build to enable freedom from conventional fossil fuel powered heating systems. Passive homes take advantage of advanced insulation, household positioning, orientation and solar gain and therefore have minimum requirement for mechanical heating. If required, heat recovery ventilation can be installed powered by renewable sources (heat pumps) or green electricity supplier.
- **Bioclimatic architecture principles –** Design code for bioclimatic architecture principles that encourage more direct contributions between the environment and natural airflow rather than passivity which focuses mainly on insulating the building from its environment. The aim is to capitalise upon and match the characteristics of the site (climate, vegetation, topography and geology of the soil, natural light). This extends passive design standards to include consideration of the broader environment and advocates for coherence between the building fabric, its surrounding environment/landscape and technical solutions.
- **Long-life, Loose-fit & adaptable interiors –** Home design codes are created that take into account the transience of occupants and the evolution of homeowner needs over time. Modular units can easily be attached, removed or re-used to match the number of occupants residing in the home. There is a requirement for 're-use and disposal plans' for all new build to demonstrate consideration of life-cycle environmental impacts. For daily adjustments, internal modular walls / dividers can shrink around the occupant depending on number of people present and their location within the space. Consideration of differential heating and lifestyle requirements in different home spaces and in different seasons. Possibility for heating only within the central 'pod' / main living space of the home.

- **Floor space restrictions** – a limit is set for floor space in new homes according to the number of occupants. This is to counteract the trend for larger houses that results in greater overall energy and material inputs.
- **Communal spaces & sharing -** compensate for space reductions in homes and are particularly found in built up areas for communal dining experiences and shared vegetable gardens. ICT improves opportunities for matching space needs with space availability and aids sharing of energy using appliances and devices.

LONG-TERM (2035 - 2050)

- **Bioclimatic buildings- adaptive and responsive to the environment** –Bioclimatic and living architecture enhances connection and blurs boundaries between built and natural environment promoting passive heating.
- **Requirement for communal spaces, services & sharing in built up areas** – planning regulations require new developments to include provision for communal space and shared facilities banks.
- **Guest apartments** – available in more densely developed areas for homes that have smaller internal spaces.

PARTICIPANTS IN THE BACKCASTING PROCESS

A variety of stakeholders from the NGO, public, private and semi-state sectors in the Republic of Ireland and Northern Ireland were engaged in the 'visioning' and 'transition' phases of this research. These participants came from a range of disciplinary fields including engineering, design, business development, planning, architecture, policy, research, advocacy, education and communications. This contributed to the diversity of ideas and collaborative learning amongst workshop attendees. These participants represented various organisations including; government departments, heritage councils, environmental groups, energy agencies, heating device companies, software companies, environmental consultancies, consumer agencies and county council planning, economic development, and public communications units.

CONSENSUS would like to thank all the participants in the research process who kindly contributed their time, expertise and ideas.

CHALLENGES

Administrative/policy: Short-term thinking, lack of attention to demand management, fragmented interventions, lack of clear policy direction for sustainable energy consumption, conservatism in built sector, building legislation restricting novel or environmentally friendly materials /technologies, lack of international climate agreement to replace Kyoto, low carbon costs, inadequate monitoring and enforcement of regulations, low internalization of environmental costs, issues regarding rented property and allocation of responsibility for energy efficiency.

Financial: Capital requirements for retrofit and new technology development, costs associated with evaluation and enforcement of regulations, requirement to demonstrate payback.

Socio-cultural: Number of homes predicted to grow from 1.6 to 2.8 million by 2050, population growth expected to be 5 million by 2021 in Ireland, low drive for energy reduction behaviour[4], resistance to carbon budgets, raising expectations for indoor temperature control and spread of air-conditioning, low political support for environmental action, lack of social pressure for sustainable lifestyles, resistance to new advanced thermal clothing and smart vests due to engrained clothing preferences, fuel poverty.

Technological/business: Lock-in from existing top-down energy infrastructure, little innovation for alternative heating solutions, low rate of renewable electricity development in grid, few design requirements for efficiency in homes & products, low availability / uptake of smart energy management devices and clothing, technological complications regarding personal carbon budget systems.

DRIVERS

Administrative/policy: High price on fossil fuel & carbon, trend for internalization of carbon costs, advancement of polluter pays principle, expansion of EU policy for sustainable energy consumption, binding targets for consumption reduction, replacement of Kyoto with more stringent legislation, long-term planning integrating holistic measures for sustainability, enforcement and advancement of energy efficiency regulations, enhanced corporate responsibility.

Financial: Economic growth and availability of capital, investment in energy sector and sustainable energy consumption strategies.

Socio-cultural: Social support and drive for greater regulation and green behavior, greater individual responsibility for action to reduce environmental action, enhanced visibility and controllability of energy consumption, mainstreaming of green behaviour, socially unacceptable for environmentally damaging behaviour.

Technological/business: High level of grid efficiency improvements and renewables penetration, investment in & nurturing innovations for energy efficiency that are price competitive, green innovation drive.

Environmental: Climate change advancements, greater energy insecurity (current fossil fuel dependency is 91% in RoI, and 99% NI).

ACTORS

Due to the variaty of actions in the Transition Framework, involvement of and alliances between a range of societal actors (governmental, civil society, NGOs and private sector) would be required. Holistic approaches are required that marry technological efficiency improvements with the stimulation of socio-cultural changes towards the goal of ‘sufficiency’ (sufficient levels of consumption for environmental and social wellbeing). As such, education, policy, research, and business and technology agendas need to be integrated to promote a broader transition towards sustainable energy consumption. This will require advancements in collaboration across government departments, with one central department (e.g. Department of Energy) playing a key role in the development of long-term strategy and integrating cross-departmental work (in for e.g. the Departments of Education, Environment, Employment, and Finance).

4 A Consensus nationwide survey showed that more than half the population do not attempt to reduce their energy use in their homes. See: Lavelle et al. (2012) Consensus Lifestyle Survey Energy Consumption (www.consensus.ie/publications.html).

ABOUT AUTHORS

RUTH DOYLE

Ruth is a PhD researcher on the CONSENSUS project and is based in the Geography Department of Trinity College Dublin. Her research is concerned with sustainable home water and energy consumption in Irish households and uses a participatory backcasting approach to design innovations and action plans for more sustainable consumption practices. Prior to this research, Ruth spent over two years working as an environmental communications consultant after completing an undergraduate degree in Geography BA(Mod). In this role, she specialised in public consultation on infrastructure projects and environmental awareness campaign design and delivery.

PROFESSOR ANNA DAVIES

Anna is Director of the Environmental Governance Research Group within the School of Natural Sciences at Trinity. She is the Principal Investigator of CONSENSUS, an EPA-funded all-Ireland research project examining creative measures to transform household consumption practices, including heating. For more than 12 years she has conducted research and published more than 40 articles and books in the field of environmental governance including the role of public participation in environmental policy making. She is currently an independent member of the National Economic and Social Committee, the RIA Geographical Sciences Committee and is on the editorial board of Local Environment and Geography Compass.

ABOUT CONSENSUS

CONSENSUS (**Cons**umption, **En**vironment and **Sus**tainability) is a four-year collaborative research project involving Trinity College Dublin and the National University of Ireland, Galway. It examines four key areas of household consumption that currently impact negatively on the environment and inhibit our ability to achieve sustainable development across both Northern Ireland and the Republic: energy, water, food and transport.

The CONSENSUS project focuses on four key themes:
1. How to measure and evaluate consumption
2. How incentives for sustainable behaviours can be developed
3. Identifying the links between consumption, health and wellbeing
4. How matters of household consumption are being governed through institutional practice and participation.

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WWW.CONSENSUS.IE