



**Assessing the intangibles:
the socio-economic benefits of energy Efficiency**

**Assessment Frameworks for Multiple Impacts of
Energy Efficiency**

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1. Introduction

This document reports on progress in Work Package 2: Intangibles of the INBEE project. Specifically it reports decisions about theories of change (T2.2) and existing frameworks for assessment (T2.3). Other work within Work Package 2 is reported in a separate report: D2.3: Intangible benefits of energy efficiency.

The main author for each piece of work is identified. However, contributions in terms of reviewing have been made by other members of the INBEE team.

2. Theories of change relating to energy efficiency

Author: Ruth Mayne, Environmental Change Institute, University of Oxford

2.1. INTRODUCTION

Projects, programmes and policies which aim to improve energy efficiency are underpinned by explicit or implicit theories of change. This report provides a broad review of a range of theories (and where relevant frameworks and research findings) that relate to the routine actions and investment decisions of individuals and organisations. The aim is to enable policy makers and practitioners to better understand (a) the change assumptions underpinning different types of energy efficiency policies and programmes (b) the factors shaping energy efficiency investment decisions and routine behaviours and (c) the implications for the design of future energy efficiency policies and programmes. The review will also enable INBEE researchers to identify and discuss the ‘change assumptions’ underpinning the INBEE case studies and draw out any implications for the development of a more general approach to dealing with multiple impacts of energy efficiency.

Conventionally many energy efficiency policies and programmes (see glossary) have been underpinned by physical, technical and economic models (PTEM) of change. These emphasise the provision of information, technology and the prevailing economic incentive structure as key influences on energy efficiency, reflecting the dominant paradigm of rational choice theory. In recent years a number of theoretical contributions from socio-psychology, social learning, social practice, and socio-technical theories have highlighted the wider social and cultural contexts in which energy use is embedded, explore how this can constrain or enable energy efficiency improvements individuals or organisations and to a lesser extent have sought to draw out the implications for policies and programmes.

2.2. OVERVIEW

Different change theories or models seek to understand and/or change the different elements (causal factors or actors) that influence individuals’ and organisations’ energy –using practices (and

hence, for the purposes of this note their energy efficiency investment decisions and routine actions). These elements have been categorised in various different ways by different theorists. Drawing and building on social practice theories (Shove and Pantzar, 2005; Schatzki, 2002; and Gram-Hanssen, 2010) we categorise them in the following way:

- Ideas/meanings - e.g. personal values, attitudes, beliefs, preferences, intentions, cultural beliefs.
- Competencies – e.g. individual agency (personal power); knowhow, skills, resources; group and organisational capacity;
- Standards and rules - e.g. interpersonal, group, institutional norms/rules/incentives/policies (including government policy)
- Materials - e.g. availability and cost of technologies, infrastructures, buildings and appliances
- Power relations - personal, interpersonal, societal; visible, hidden, invisible. ¹
- Socio economic structures - e.g. income, class, tenure, ethnicity, gender.

Each of these six categories of elements of practice is linked to (and interdependent with) all the others, suggesting a web of connected elements, which underlies this theoretical understanding of social practice (

social practice (

Figure 1).

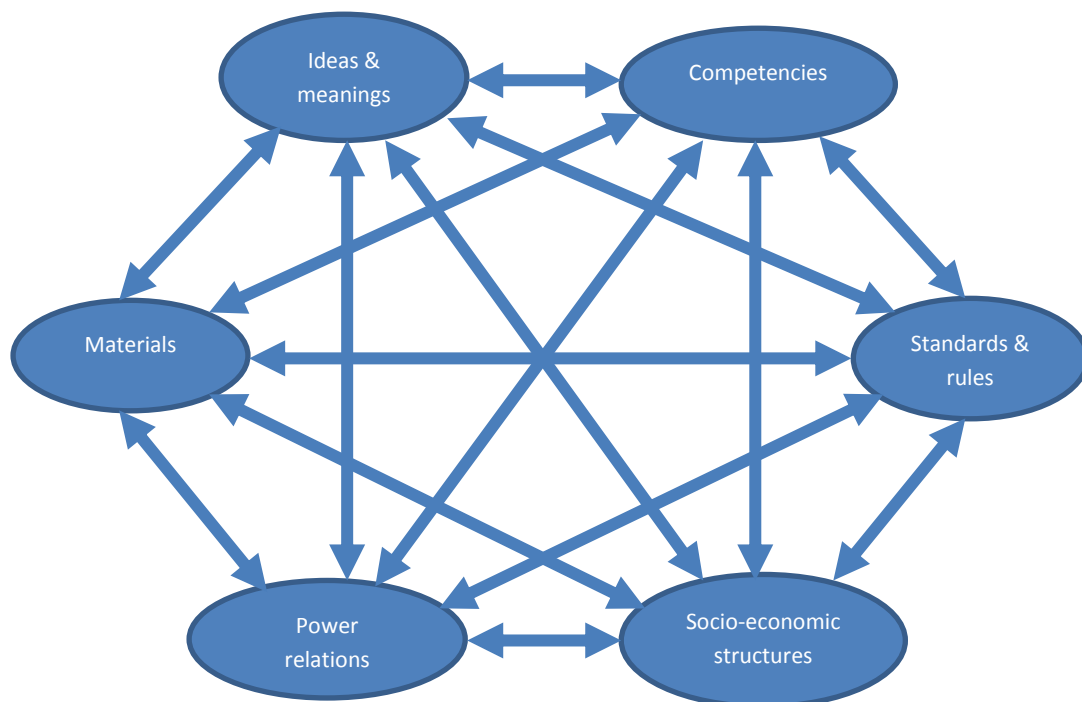


Figure 1: Interdependent elements of social practice

¹ Power relations and social economic structures are not normally separately identified in social practice theories. We have added them here as other aspects of the literature indicate that they play an important influence on energy use which may not be explicitly taken into account in the other elements.

Drawing on Giddens (1984) it is understood that ‘elements’ may be either causal variables or outcomes of people’s (energy-related) actions depending on the change pathway involved. They may also operate at different levels and there may be interactions and feedback loops between the different types of elements at different levels (see below). In practice, the strength, direction and type of influence (i.e. enabling or constraining change) will vary according to the particular energy efficiency investment decision, routine action and context.

Following the Multi-Level Perspective (MLP) of Transition theory we also group the identified elements into different system levels. (Hargreaves et al 2013). Whereas MLP groups the elements into niche, regime and landscape according to their differing degrees of structuration or resistance to change (Hargreaves et al 2013), we use a slightly different grouping in order to reflect the different level and type of change interventions that change agents need to use to improve energy efficiency:

- Individual level – rational choice theory, socio-psychological and behavioural theories.
- Interpersonal, group and organisational level– social learning, communities of practice, institutional and organisational theories.
- Structural level – physical, technical and economic models; sociological and cultural theories; social network analysis; theories about power relations and policy change.
- System level - involving interactions between elements and levels – actor network, socio technical, social practice, socio technical theories and the Multi-Level Perspective of Transitions theory (MLP).

The elements, levels and implications for the design of energy efficiency policies and programmes are outlined in the table below. Both the categorisation and summaries of change theories outlined below inevitably involve some over-simplification as the theories and models come from different traditions, have different ontological assumptions about causal agents and mechanisms (Geels, 2010) and may include differing combinations of levels or elements. Moreover, some of the theories and models focus more on understanding the various elements shaping energy using-practices including EE, while others focus more on understanding historic change processes that underpin current practices or the purposive change strategies needed to change them, or a combination. However, there is not the scope in this review to explore the overlaps, interconnections or contradictions between the theories instead, the note focuses on the practical insights the different theories offer for policy and programme design.

2.3. COMPARATIVE SUMMARY OF THEORIES

Table 1 summarises the theories reviewed later in this report. This review of theories highlights how conventional energy efficiency policies and programmes, which focus solely on information, technical and economic incentives, are unlikely to result in the widespread uptake or proper use of energy efficiency improvements unless accompanied by complementary interventions that simultaneously address the other social and cultural elements operating at different levels. Ideally system wide approaches are needed to address the full range of elements that shape energy efficiency decisions and routine actions through mutually reinforcing interventions by multiple actors at different levels and sectors.

| Level | Theory | Key elements | Implications for energy efficiency policy and programme design |
|---------------|--|--|---|
| Individual | Rational choice theory | <i>Ideas</i> : individual preferences | <ul style="list-style-type: none"> • Provision of relevant information, technologies and financial incentives • Address secondary 'barriers' beyond cost e.g hassle factor |
| | Socio-psychological & behavioural theories | - <i>Ideas</i> : personal values, intentions, perceptions of social norms - <i>Competencies</i> : personal agency, knowhow, skills, routines. | <ul style="list-style-type: none"> • 'Attractive' messengers • Well-designed 'nudges' and regular prompts • Framing of messages (e.g. values, salience) • Norm appeals • Provision of practical advice and support |
| Interpersonal | Social learning; communities of practice; social network theory | - <i>Ideas</i> : perceptions of social norms - <i>Competencies</i> : personal agency, knowhow, skills routines; & group capabilities. - <i>Standards & rules</i> : group norms | <ul style="list-style-type: none"> • Networking, skills shares & peer to peer mentoring between groups • Regular provision of energy feedback • Group/community action (communities of geography, identity or interest) & learning groups • Mapping, widening, deepening &/or building social networks |
| | Organisational & policy change models | <i>Standards & rules</i> : organisational norms, rules, incentives <i>Competencies</i> - group concern & capabilities | <ul style="list-style-type: none"> • Use of organisational rules/norms/incentives to influence employees' routine actions. • Joint working, service and infrastructure provision • Government policy framework & financial incentive structure that supports local delivery agents |
| Structural | Physical, technical, economic (PTEM) | <i>Materials</i> : availability, design & cost | <ul style="list-style-type: none"> • Public R & D, product labelling and price incentives are important elements of policy |
| | Cultural theories | <i>Ideas</i> : societal cultural beliefs | <ul style="list-style-type: none"> • Consistency between EE & economic growth messages & policies • Social marketing, education, media • Participatory awareness raising & action groups |
| | Socio-economic theories | <i>Socio economic influences</i> : income, class, tenure, gender, ethnicity | <ul style="list-style-type: none"> • Inclusive & representative governance structures • Relevant & accessible policy and programme design that addresses barriers to participation |
| | Power theories | <i>Power relations</i> : personal, interpersonal, societal power | <ul style="list-style-type: none"> • Strategies to address visible, invisible & hidden resistance • Strengthening change agent' sources of power • Processes of group reflection, learning & capacity building |
| | Policy change theories | <i>Standards & rules</i> : government rules & policy <i>Competencies</i> : government concern & capability | <ul style="list-style-type: none"> • A mix of persuasion (evidence, lobby, dialogue); modelling of solutions; & pressure (coalition/movements building, media, public campaigns) to influence government policy. |
| Systems | Social practice & socio technical theories (including Multi-Level Perspective) | <i>Interactions</i> : between different elements and/or levels | <ul style="list-style-type: none"> • Mapping & understanding societal factors & actors that enable/constrain investment decisions or actions • Innovative visioning, steering, learning, experimentation to nurture 'niche' innovations. • Mutually reinforcing change interventions by different actors at different levels & sectors. • Supportive government policy framework & financial incentives |

Table 1 Summary of change theories and implications for energy efficiency policy and programme design

2.4. IMPLICATIONS FOR ENERGY EFFICIENCY MULTIPLE -BENEFITS APPROACHES

The review of change theories also has implications for the use and design of energy efficiency multiple benefits approaches policy and programmes. We identify some of the possible emerging implications from the review below (NB. This is not an exhaustive list).

2.4.1. Communications

- Cobenefits can be used to identify and communicate with a wider range of stakeholders (beyond those with a specific mandate to reduce carbon emissions) who might benefit from energy efficiency policies and programmes.
- Messages about the *societal and environmental* co-benefits of energy efficiency can be used to (a) strengthen peoples' and organisations' intrinsic – or altruistic- motivations to invest in energy efficiency and change routine actions, and (b) reduce the tendency of people to use the financial savings from energy efficiency to increase consumption of other energy consuming goods (i.e. to reduce some forms of 'rebound').
- Messages about the *personal* economic, social or health co-benefits of energy efficiency can be used to engage and motivate individuals and organisations to invest in energy efficiency and change routine actions (Gupta et al, 2015), but should avoid being presented as the primary or sole reason for action and avoid messages that identify money saving with high status consumption even if this is 'green' as this may crowd out intrinsic motivations (Crompton, 2010).
- 'Rebound' effects from energy efficiency policies and programmes (i.e. when people in cold homes use financial savings to increase their warmth of their home) can be 'reframed' as a positive co-benefit.
- Co-benefit approaches can be used to help 'bust' negative cultural myths about energy efficiency/saving e.g. that it involves deprivation, less comfort, poorer lighting quality etc.

2.4.2. Joint working

Co-benefits approaches can be used to identify and engage a wider range of stakeholders to help promote or implement energy efficiency policies and programmes (beyond those with a specific mandate or direct interest in doing so) and strengthen joint working on energy efficiency by helping:

- Achieve a better mutual understanding of what different stakeholders care about and how they might benefit from improved energy efficiency.
- Strengthen the business case for programmes and ways of working which achieve multiple benefits.
- Tailor communication messages and policy and programme design to interests of different stakeholder.
- Identify and 'use' a wider range of 'messengers', 'role models' and contexts where energy efficiency information, nudges, norm appeals, capacity building, behavioural interventions, practical advice etc. can be delivered e.g. health workers and GPs, home visits by other front line workers such tenants officers, community policy officers, fireman; estate agents and landlords; careers or skill agencies; Children's Centres.

2.4.3. Programme Design

- Relevant co-benefits can be included in the aims and objectives of energy efficiency policy and programmes, as well as energy and carbon reductions, to widen their relevance and attractiveness.
- Co-benefit approaches can be used to identify and help ensure fair distributional impacts from energy efficiency policies and programmes thereby increasing their legitimacy, building a sense of common purpose and reducing potential public resistance. Ensuring a fair distributional impact means balancing strategies to reduce the emissions of higher emitters with strategies to enable low income households to benefit from the co-benefits of improved energy efficiency. This requires the provision of financial and practical support.
- Energy feedback mechanisms could potentially include information about energy efficiency co-benefits e.g. such as cost savings, health improvements, job creation, economic benefits.

2.4.4. Policy

- That co-benefits are used to strengthen the case for strong and supportive energy efficiency government policy and financial incentive structure.

Thus the review's findings suggest that to be effective multiple benefits' approaches to energy efficiency needs to go beyond top-down communication and social marketing approaches and instead be used as way of increasing mutual understanding, collaboration and where possible joint working with a wider range of stakeholders than those traditionally involved in EU to achieve common economic, social and environmental goals. This may at times require providing reciprocal support for stakeholders on non energy efficiency agendas.

2.5. INDIVIDUAL DIMENSIONS OF ENERGY USE

We start by reviewing a number of theories that focus on individuals as the key causal agent in achieving energy efficiency uptake and use.

2.5.1. Rational Choice Theory

Rational choice theory, which underpins much conventional economic thinking, has exerted a dominant influence on our understanding of consumer behaviour and thus also policy making regarding energy efficiency. It focuses on individuals as the key unit of analysis and assumes that their decisions and behaviours are based on (a) rational decision making (b) their subjective preferences and (c) self-interest aimed at maximising personal utility.

Consumer preference theory (e.g. Samuelson, 1938; Begg et al., 2003; Lancaster, 1966; Jackson, 2011) assumes that consumers maximize their expected utility based on: the relative price of goods (including substitutes); their 'available income; their preferences; and the products' characteristics. Thus it is understood that energy efficiency may be improved by influencing individual preferences through the provision of information, technologies and financial incentives.

Information, technologies and financial incentives do play an important role in influencing simple purchasing/investment decisions by individuals and organisations. A mix of energy supplier

obligations, grants and subsidies have, for example, helped achieve widespread uptake of energy efficiency improvements for households in recent years in the UK (DECC, 2012). The important role that financial incentives can play is also evident in the rapid uptake of micro-generation technologies as a result of the introduction of the Feed in Tariff (DECC, 2012).

However, as we see below a limit of rational choice theory is that it defines the individual narrowly (as a consumer), without taking into account other [social] aspects of being human (Devine Wright and Devine Wright, 2005) that also influence our behaviours. (See section 1.2 below). It therefore neglects the influence of a range of social and cultural factors that influence energy related practice at different levels (See table 1). Nor does it investigate the origins, nature, or validity of people's preferences (why we want what we want) or how they develop or evolve over time (Jackson, 2011).

Therefore the 'success' of PTEM policies and financial incentives in promoting uptake of energy efficiency measures depends in many cases on a range of complementary interventions which also address social and cultural influences at different levels. (See Table 1). These may be provided by energy suppliers and/or other 'intermediary' organisations or local delivery agents such as Local Authorities (See Table 1).

Summary:

- **Level:** individuals
- **Key elements/influences:** -ideas (individual preferences); materials (availability, design & cost of technologies, goods & services)
- **Possible implications for policy and programme design:**
 - Providing people with the right information, technologies, and financial incentives can influence "consumers" one off investment decisions but needs to be accompanied by complementary interventions (see below)
 - However, these interventions are less likely to influence routine behaviours: evaluations of behavioural interventions shows that financial incentives can be useful to overcome specific barriers or to encourage one-off behaviours (e.g. attending a meeting) but on their own their effect is short lived and may override altruistic motivations if they are very large (Bartram 2009).

2.5.2. Socio-psychological and behavioural theories

Social psychology and behavioural economics also focuss on individuals as the primary unit of analysis but in contrast to rational choice theory highlight that domestic consumers do not always behave rationally or act primarily as utility maxi-misers, that the role of price is often weak and that other [social] factors may be important predictors of behaviour (Eyre,1997). Thus rational choice theory is understood to be either incomplete or misguided. Some of the non-rational and/or social influences on individual 'consumer choice' that have been highlighted by this research are discussed below.

Heuristics - Research has shown that in practice people's ability to process information – or cognitive ability – is 'bounded' or limited. That is, individuals often do not have the information, cognitive ability or time to make informed rational decisions. In practice, they often use a variety of heuristics, or rules of thumb particularly when information is complex or where there is uncertainty (Simon, 1957). Their decisions are not always fully rational. For example, there is evidence that people tend to underestimate the importance of future rather than short term gains which makes

the promotion of long term worthy causes difficult (O' Donoghue, 2000). They also tend to underestimate the likelihood of future events, and overestimate the likelihood of events that they can easily imagine, or have recently experienced (Kahneman, 2002). Our direct experience with an issue or attitude may increase its salience and consequently the potency of the attitude and the level of consistency between attitude and behaviour (Crano 1955). In addition people may simply deny information that is uncomfortable (Cohen, 2001).

Values –Our behaviours may also be influenced by our sub-conscious values, which can be understood as guiding principles and relatively stable characteristics that are constructed relatively early in life and which therefore may not be fully conscious or rational. Stern's 'Value - Beliefs - Norms' theory, for example, sees values as underpinning both beliefs and attitudes, which along with personal norms then influence behaviours (Stern, 2000). A number of psychologists have sought to show how behaviour is shaped by various altruistic - e.g. social and environmental – values, rather than merely self-interested ones as assumed by rational choice theory (e.g. Schwartz, 1977; Cialdini et al, 1990). Schwartz identifies a comprehensive set of ten different types of value, which are recognized across cultures and have a coherent 'circular' structure of relationships (Schwartz, 1992). He groups them into 'self-enhancing' and 'self-transcendent' values, and 'openness to change' and 'conservatism'. Self-enhancing values relate to financial rewards, power, achievement, security, and hedonism, and are largely external to the person. In contrast, self-transcendent values, such as benevolence and universalism, are seen as stemming largely from internal value systems that are independent of social expectations, even if they may initially have been internalised from social norms. Altruistic and self-interested values are present in all people, but only exert a significant effect on behaviours if activated, for example, by increasing awareness of the consequences of their actions on others and/or the likelihood of being held responsible (Schwartz, 1977). Altruistic and self-interested values are understood to act in opposition to each other. Some evidence suggests that appealing to self-interested values such as social status, power, or envy in order to promote pro-environmental behaviours will 'crowd out' altruistic pro-environmental or social motivations and thus be counter-productive in the long run (Frey and Jegen, 2001). So, for example, appealing to people to install insulation only on the grounds of money saving may lead to them using financial savings to increase consumption of other goods or services (the rebound effect – see section 4.1 below). Recent research indicates that many people - whether in disadvantaged or wealthier communities - are motivated to reduce their energy use for a mix of self-interested and altruistic reasons (but often require financial and practical support to translate concern into action) (Gupta et al, 2015).

Framing- Connected to values, cognitive scientist George Lakoff describes 'frames' as unconscious mental structures which structure our ideas and concepts, and shape how we reason, perceive and act (Lakoff, 2004). Our frames are partly influenced by deep rooted cultural influences which we discuss below. Thus people are also strongly influenced by the way information is presented to us or 'framed'.

Emotions - Social psychology shows how emotions can also influence individuals' behaviours. For example we build affective relationships with products and respond at an emotional level to choices about what to buy and how to behave (Darnton 2008), and a large part of the marketing industry is built upon appealing to emotion. A thorough account of the influence of values and emotions is found in Jackson (2005).

Personal agency - Agency is another important influence on individual energy behaviour. In rational choice theory it is understood in a relatively narrow way, relating to actors' consumption preferences and decision. In the socio-psychological literature, agency (or self-efficacy or personal capability) is understood as 'the conviction that one can successfully execute the behaviour required to produce outcomes' (Bandura, 1977). More simply put, it is a person's belief that they can take meaningful action. This in turn is understood as having an important influence on whether people attempt a given task, how much effort they will expend, and how long they will persist in dealing with stressful situations (ibid.).

'Agency' is understood to be shaped by personal experience and past accomplishments, their observation of others and the effects of action on them, verbal persuasion, and physiological states (Bandura, 1977). Additionally research suggests that people may also be more likely to act if it is clear to them that it is their responsibility, rather than thinking they can leave it to others (Cohen, 2001). And they may be more likely to take action if they make their intentions public through written or public commitments (Cialdini, 2005, Bartram, 2009).

The concept of self-efficacy – or agency - has been incorporated in many 'adjusted' expectancy-value or rational-choice models. The Theory of Planned Behaviour, for example, contains a variable called 'perceived behavioural control', defined as a person's belief about how easy or difficult a particular behaviour is likely to be, which, along with social pressures, influences an intention to act (Ajzen, 1991). Both are seen as having an important influence on behaviours, although this is proportional to the amount of actual control an individual possesses.

As we see below personal agency can be constrained by 'structural' influences such as socio-economic disparities or power relations that limit the choices and opportunities available to individuals. The literature on power, for example, suggests that individuals' sense of agency is also shaped by their internalisation of dominant cultural ideas, values and power relations – or enculturation. This can shape how they think about themselves, their social identity and place in the world, and can prevent them from envisioning possibilities for change, or seeing themselves as agents of change (Lukes, 2005).

Social norms - There is a body of work showing how individuals' preferences and behaviours may reflect their unexamined perceptions, expectations and assumptions about social conventions and what is 'normal' or 'desirable' (Shove, 2003; Whitmarsh, 2011). Evidence suggests that people are strongly influenced by their perceptions of 'social norms' i.e. by how they believe particular behaviours will be viewed by others (Ajzen and Fishbein 1980; Cialdini 1993). Research suggests that people are particularly likely to be influenced by how other people are behaving in ambiguous situations, or in crises (Cialdini, 1993). They are also influenced by people in authority (Milgram, 1974), and by people they like or share commitments with (Kahan, 2010), with the effects of the latter being more lasting (Halpern et al., 2004). People are therefore more likely to adopt pro-environmental behaviours if they think others like them are doing the same. Conversely, they may choose not to act if they think others like them will disapprove, even though they may be personally enthusiastic.

Social identity theory – this theory suggests that consumption practices can be as much a way for people to express social identity and status as a way to fulfil their individual preferences, something which is particularly evident in car choice and use (Tajfel, 1979; Whitmarsh, 2011). So, for example, a person may refuse to use an energy-saving appliance if it doesn't fit with their lifestyle/social

identity. Another implication is that individuals may reject new information (e.g. about climate change), if accepting it would challenge or threaten existing values or social identity (Festinger, 1957, quoted in Halpern, 2004). Indeed, this form of ‘protective cognition’ is believed to be a major cause of political conflict over the credibility of scientific data on climate change and other environmental risks (Kahan, 2010).

Habits, routines - People’s behaviours often reflect unconscious and frequent habits or routines, rather than rational decisions. This is seen as particularly relevant to energy behaviours, due to the ‘invisibility’ of much energy use, and the routine way in which so many environmentally significant behaviours in the household are carried out (Whitmarsh 2011). Triandis’ theory of interpersonal behaviour (Triandis, 1977, quoted in Darnton 2008), for example, places habits as the primary determinant of behaviour (an argument in danger of circularity). There is some evidence that this approach can be more predictive of behaviours than models which prioritize beliefs and intentions, such as the Theory of Planned Behaviour (Ajzen, 1991). In recent years, there has been a shift in the research literature, from seeking to understand individual habitual behaviours to trying to understand the wider *social practices* of which energy behaviours are a part. Social practices are understood to be socially learned and taken-for-granted ways of acting that are acquired through the activities and experiences of everyday life and shaped by a number of influences. We summarise social practice theories below.

Summary:

- **Level** – individuals
- **Key elements/influences** - ideas (personal values, intentions, perceptions of social norms); competencies (personal agency, knowhow, skills, routines)
- **Possible implications for policy and programme design** - An important overall implication from socio-psychological theories is that unless energy efficiency policy and programme also address ‘non-economic and/or non-rational influences on energy use people may not just maintain but increase their energy consumption, even in the face of economic disincentives (Whitmarsh, 2011). Some specific design implications from these theories and research include:
 - *Nudges* - Well-designed ‘suggestions’ that take into account socio-psychological factors can influence individual’s decision making (Thaler and Sunstein, 2008).
 - *Framing* - How energy efficiency messages are framed and communicated is important (Lakoff, 2004) and requires careful thinking about the values you wish to activate, the salience of the issue, the balance of positive and negative messages.
 - *Values* - energy efficiency communication messages that appeal exclusively to extrinsic motivations in a way that emphasizes personal gain such as status (i.e. increased house values) may ‘crowd-out’ altruistic concerns about climate change and wider society.
 - *Norm appeals*- Communicating that other people are investing in energy efficiency or behaving in certain ways can be persuasive, even without supporting arguments. Norm appeals have been shown to influence attitudes and behaviours, when incorporated into messages or when community leaders are used to promote the desired behaviour (Bartram, 2009; Cialdini, 2005; Allcott, 2009).
 - *Messengers* - social identify theory suggests that the messenger who delivers pro-environmental messages, or demonstrates pro-environmental behaviour, can be as important as the message itself (Halpern, 2004). This also suggests that engagement

- may be enhanced by inclusive and representative governance structures that reflect the demography of intended 'beneficiaries' .
- *Agency* - The literature on agency suggests that people should be viewed as actors, at the heart of change processes, rather than passive targets of information or incentives (Darnton, 2008). It also highlights that policies and programmes need to be designed to strengthen individual agency (whether motivation, awareness, confidence, skills or knowledge), and group capacity, where this is lacking (See section on power relations below).
 - *Regular prompts* - Changing routine habits or practices is likely to require repeated and conscious cognitive effort, even if a new behaviour carries substantial benefit (Jackson, 2011). However, while regular prompts can help encourage simple behaviours, but they do not promote attitudinal or motivational change in themselves (Bartram, 2009).
 - *Commitment and goal setting* - Encouraging people to make a commitment appears to be an effective tool to promote behaviour change. Evidence suggests it is more effective when made by an individual than a group, written rather than verbal, public rather than private, and involving a specific rather than a general goal. Combining commitments with feedback appears to be particularly effective (Bartram, 2009).
 - *Multiple interventions* - Initiatives which combine interventions are likely to be more effective than those that only use one (Bartram, 2009). A review of 38 household energy conservation interventions showed that successful strategies involve a combination of antecedent interventions such as commitment, goal setting information and modelling with consequent interventions such as feedback and rewards (Abrahamse et al., 2005).

2.6. INTERPERSONAL, GROUP AND ORGANISATIONAL DIMENSIONS OF ENERGY USE

In this section we summarise theories that emphasise interpersonal relations, collective or organisational dimensions of energy use.

2.6.1. Social learning theory

As suggested above individuals' understandings, choices and behaviours are highly influenced by their interactions with other people and hence also groups of people. Social learning theory emphasises that behaviour change comes about through a social process in which people actively construct or build new ideas or concepts based upon their experience and interaction with others. (Bandura, 1977). A first strand emphasises the ways in which individuals learn and are influenced through their observation of different social 'models', including the behaviour of parents, friends and those portrayed in the media. Importantly, it also highlights how individual behaviours are influenced by group standards (individuals either adhere to them or are ousted from the group) (Lewin, 1952). Linked to this Social Identity theory shows that peoples' behaviours are highly influenced by group identity with individuals facing the sanction of being ousted from the group if they do not adhere to accepted standards (Tajfel 1982 quoted in Jackson 2005).

A second strand of social learning is the way practical know-how is passed on between people through everyday practices (Lave, 1993). This often goes unremarked, as it is so much a part of

normal life, but sustainable living requires skills such as maintenance and repairs, cooking, gardening and organising transport, and these have to be learned through practice and, often, imitation.

A third strand, linked to observational learning, is feedback. Feedback is a necessary element in learning, whether we are learning to walk (and receiving feedback from our nervous system), learning history (in which case we probably need feedback from a teacher), or learning to manage a heating system (when we will be able to learn something from the warmth of our surroundings and the size of our heating bills). Providing feedback can be particularly important in the case of energy as it is invisible.

Related theories of ‘communities of practice’ highlight the processes by which groups of people with shared interests build knowhow through regular interaction (Franklin et al., 2009). Neighbourhood based low carbon communities (LCCs), for example, can be seen as testing out new practices, acting as role models or exemplars, and providing feedback to participants and to funders about the impacts of changes they have made. Research also shows the importance of community events and structured and action learning groups in increasing residents’ motivation, agency and knowhow about how to reduce energy use and change behaviours, among other things (Gupta et al, 2015, Hobson 2003). One possible limit of using social learning and community of practices approaches to promoting energy efficiency is that the social interactions may not extend beyond the communities’ own boundaries. However, countering this other evidence shows that there is extensive learning and networking between low carbon communities (Parag et al, 2013) and also that where resources allow LCCs may also actively seek to engage in partnership working and influence government policy (Gupta et al, 2015).

Summary:

- **Level:** – interpersonal and group.
- **Key elements/influences** – ideas (perceptions of social norms); competencies (personal agency, knowhow, skills routines ; group capabilities); standards & rules (group norms, rules and standards).
- **Possible implications for policy and programme design** - some of the implications of these theories include that:
 - Interpersonal and group (as well as individual) dimensions of energy use need to be altered in order for individuals to change their routine actions and investment decisions.
 - Regular group action and learning groups and projects enable people to (a) model and learn new behaviours (b) build new social norms and (c) increase their sense of individual motivation and agency.
 - Regular energy feedback e.g. via energy displays, smart meters, carbon footprints can raise energy awareness and increase visibility of energy use.
 - Building inclusive and practice-oriented communities can help increase people’s know how, skills and sense of agency, and organisational capabilities.

2.6.2. Social network analysis (SNA)

Conventional economics would suggest that energy efficiency improvements will be diffused by market forces, but more recent thinking has focussed on the way in which they are spread through social networks. (For a review of some of the literature see Scott, 198; and Lucas and Mayne,

2015;). Social network theory (SNT) and analysis highlights how social networks facilitate and constrain the flow of information and resources between actors, and hence also shapes cognitions, opportunities, and behaviours (Tindall & Wellman 2001). By focussing on the social links between people, SNA therefore complements and enriches analysis based on the attributes of individual actors (Tindall & Wellman 2001), groups and/or external structures.

A social network can be defined as a set of entities (people, organizations, etc.) that are connected through their social relationships (friendship, information exchange, or other) (Garton et al., 1997). Networks are seen to consist of both actors (nodes) and the links (ties) between them. SNT emphasises the importance of both the structure of the network and the quality of the interactions between actors within it (Caniels and Romijn, 2008). An important variable affected the quality of ties is their strength i.e. whether they are 'strong' or 'weak ties' (Granovetter, 1973). Weenig and Midden (1991) have shown that information diffusion in two communities was related to the number of network ties in the community, whereas adoption decision (programme effectiveness) were related to the quality or strength of network ties. Social networks have also been found to influence adoption decisions relating to energy efficiency and/or behaviour (Newman and Dale, 2005).

Everett Rogers' 'diffusion of innovations' theory (1995) shows how the diffusion of innovations throughout society is influenced by particular actors (particularly early adopters), communication channels, time and wider social system. At a particular point a critical mass is reached, sometimes known as the 'tipping point', when an invention or new practice 'cascades' through society.

One limit of social network or communication theories is that they provide little explanation or evidence of how innovations or behaviours will spread spontaneously through society where there is resistance to change, such as reduced flying or eating less meat (Darnton, 2008) or where there are structural 'barriers' to action as in case of energy efficiency.

Summary:

- **Level**– structural
- **Key elements/influences** – competencies (network structures)
- **Possible implications for policy and programme design**-
 - Social networks influence individuals' and organisations' awareness of and access to the co-benefits of energy efficiency.
 - To encourage the diffusion of knowledge and resources, and hence the potential adoption of new energy efficiency technologies and related behaviours, policy makers and delivery agents need to understand, shape (widen and/or deepen) and where necessary help build individual and organisational social networks.
 - 'Successful' networks need to:
 - o maintain a diversity of linkages between stakeholders including both bonding links (among members of groups), which can help to maintain trust, and bridging links (between groups), which can help to make resources more accessible.
 - o need weak links to diffuse information and resources and strong ties to influence energy efficiency uptake

2.6.3. Organisational frameworks and models

Organisations can act as important causal agents or mechanisms of energy efficiency routine actions and behaviours. They can (a) exert an important influence on individual energy efficiency routine actions through norms, duties, rules, financial incentives, buildings and technologies identified in previous sections (b) are important energy users themselves and (c) can act as intermediaries for energy efficiency policies or independent delivery agents of energy efficiency programmes.

Organisations as energy users

It is widely recognized in the organizational behaviour and public choice literatures that organizations, firms, and social groups do not behave like individuals. Instead, they exhibit their own dynamics that may contribute to the low level of energy efficiency implementation (See Parag and Janda, 2014 for a brief review of the literature).

One useful analytical framework suggests that energy efficiency and energy conservation actions in organizations depend on the level of “concern” [or ‘ideas’] within the organisation about efficiency relative to other business goals; the “capacity” of the organisation to take action [or ‘competencies’]; and the real-world physical and technical “conditions” of the premises that are to be acted upon [or ‘materials’] (Janda, 2014). The presence or absence of these three variables can be used to recognize variation within organisations and potentially map different policy approaches to encourage energy efficiency or conservation. This characterization also suggests that there is not one kind of firm; there may be at least eight different kinds. Each of these kinds of firms could need a different kind of policy incentive to strive for higher levels of efficiency, resulting in a rough policy segmentation model (Janda, 2014).

(Source: Janda, 2014)

Organisations as energy efficiency ‘delivery’ agents

Organisations may also act as delivery agents of energy policies and programmes and it is increasingly recognised that this can have an important influence on energy efficiency reach and uptake. Various analytical frameworks have been developed about the role of ‘intermediary’ organisations which are seen as acting as brokers, between policy makers, energy providers and consumers. (See Parag and Janda, 2014 for a brief review; Wade et al, 2013; Hargreaves et al, 2013). However, as Parag and Janda (2014) suggest, ‘intermediaries’ may in fact be pre-existing actors with their own independent mandates, agendas and programmes and suggest the term ‘middle actors’ better encapsulates their role. Moreover, care should be taken not to treat middle actor’s organisations merely as agents to deliver or test government policy as they may experience this as ‘exploitation’ which can engender resistance (Hobson et al, 2014).

The number and type of energy related intermediaries and middle actors has been growing in recent years and may include energy suppliers, local authorities, private installers, community groups, energy saving cooperatives. Recent research has shown that local middle actors such as local authorities and community groups can play important roles in relation to residential energy efficiency. These roles may include:

- At downstream level with residents - developing innovatory approaches; engaging and motivating residents; empowering residents; promoting, coordinating or installing the uptake and use of energy efficiency technologies; related behavioural change.

- At midstream level with other actors - catalysing action by other stakeholders, replicating successful innovations, scaling up and mainstreaming innovations through joint working
 - At upstream level with government – influencing national government policy.
- (Gupta et al, 2015; Mayne, 2013) .

Research also shows that different stakeholders have differing strengths and limits:

- Local authorities and a city wide not for profit have capabilities in: engaging residents, installing energy efficiency improvements in homes, and addressing fuel poverty but may find it hard to develop innovatory approaches, empower people or change residents' routine actions or behaviours (Gupta et al, 2015; Butterworth et al, 2011).
- Community groups have capabilities in: engaging residents, empowering people, strengthening social norms and changing energy behaviours, and were also sources of 'niche' social innovation. (Bunt and Harris, 2011; Cox, J. et al, 2010; Seyfang and Haxeltine, 2012; Gupta et al, 2015) however, they can struggle to install energy efficiency measures in people's homes or address fuel poverty.
- The differing strengths of local organisations, and their uneven distribution, capability and reach, highlight the importance of joint and partnership working (Gupta et al, 2015).

The literature on stakeholder identification analysis and management (see supplementary review on this topic in annex by Morgane Fritz) is useful for co-benefits and joint working approaches (Freeman, 2010; Donaldson and Preston, 1995; Mitchell et al,1997; Frooman, 1999).

Summary:

- **Level** – organisational.
- **Key elements/influences** – ideas (organisational cultures); competencies (organisational capabilities); standards & rules (organisational norms, rules and incentives).
- **Possible implications for policy and programme design** – some of the implications of these theories include that:
 - Organisational factors (such as organisational policy, incentive structures, norms and conventions) may need to be altered in order to change employees routine energy efficiency related actions.
 - Joint/partnership working can help enhance the reach and scale of local and other middle actors' energy efficiency programmes.
 - EE policies and programmes need to recognise and support the important energy efficiency roles played by local and other 'middle' actors including by:
 - Properly resourcing their roles – including capital and revenue funding
 - Tailoring interventions to the differing levels of concern, capacity and conditions in different organisations.

2.7. THE STRUCTURAL DIMENSIONS OF ENERGY USE

Another set of theories and analytical frameworks emphasises the role of structural – or contextual – factors in constraining (or enabling) individual agency and choice. Structural factors are understood to be very difficult for individual or collective action to influence. From this perspective

energy efficiency routine actions and investment decisions are understood more as the outcome of structural forces, rather than individual or organisational choice.

Structural constraints – or ‘barriers’ – help explain why changes in values, attitudes or agency do not necessarily translate into actual behaviours including Blake’s (1999) ‘value action gap’ (Figure 2).

Structural factors have been also incorporated into other behavioural models, for example appearing as ‘facilitating conditions’ in Triandis Theory of Interpersonal Behaviours where they are understood to refer to any external factor or internal resource which helps, hinders or prevents a person translating their intentions or habits into behaviour.

Below we look at some of the external or ‘structural influences’ on individuals’ routine actions and investment decisions. Macro-economic theories will be covered in a separate briefing note.

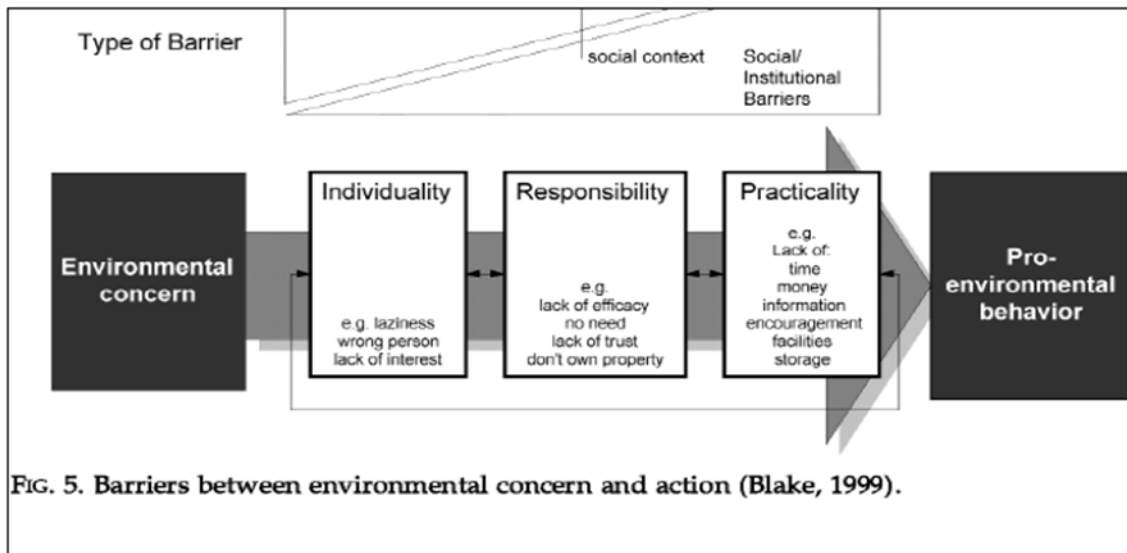


FIG. 5. Barriers between environmental concern and action (Blake, 1999).

Figure 2. Barriers between environmental concern and action (Blake, 1999)

2.7.1. Physical, technical and economic models

Physical, Technical, and Economic Models (PTEM) emphasise the provision of information, technology and the prevailing economic incentive structure as key determinants of energy efficiency improvements, reflecting the dominant paradigm of rational choice theory. In this approach the introduction of innovative technologies follows a sequence from technological research and development to invention, application and diffusion. The role of R & D, technical design, learning curves, labelling, price incentives and markets area all emphasised. If new low-carbon technologies are not widely adopted, this can be seen as a result of ‘market failure’, with the implication that central government needs to correct this. Information, technology and economic incentives can have an important influence on energy efficiency uptake. One of the most successful developments in recent years, for example, has been the introduction of market transformation policy in the EU which involves a comprehensive approach to product standards, labelling, marketing and procurement (Boardman, 2004).

However, they often require complementary interventions delivered by intermediary, middle-out or local actors to be successful. PTM’s has little to say about the drivers of energy demand which has

led to the development of Energy Services perspectives (Wilson et al, 2015). Energy Services perspectives helps understand energy demand by highlighting the end uses of energy such as a moving vehicle (mobility), a warm room (thermal comfort), process heat (for materials manufacturing), or light (illumination) (Wilson et al, 2015) and also makes it clear why energy itself is often invisible to end users as they are focussing on the services it provides rather energy use per se.

The absence of understanding of psychological or social influences on energy efficiency uptake and use from PTEM has also led to the development of socio-technical theory outlined below.

Summary:

- **Level** – structural
- **Key elements/influences** – ideas (individual preferences); materials (societal availability of technologies, infrastructures, goods and services); standards & rules (government policy and financial incentive structure)
- **Possible implications for policy and programme design** -
 - Public R & D, product labelling and price incentives are important elements of energy efficiency policy and programmes however they require complementary interventions to address social and cultural influences that can constrain uptake and use.

2.7.2. Theories about cultural influences

As noted above, our unconscious mental frames, values and assumptions influence our routine actions and investment decisions which in turn are influenced by wider cultural beliefs. Cultural beliefs are notoriously difficult to change, and rarely change rapidly except in occasional extreme circumstances such as revolutions and disasters (Jackson, 2005; Knott et al., 2008; Compton 2010) Jackson (2005) has argued that our dominant cultural values of consumerism and individualism are a key constraint on positive energy behaviours. Theories of power relations (e.g. Lukes, 2005) shows how cultural influences are deep-rooted and over time come to be seen as common sense or ‘social facts’. As noted above, social identify theory highlights how consumption is driven in part by the desire for status and social identity, rather than need (Lutzenhiser, 1993). As we see below Social Practice theories show how people can be ‘locked into’ certain (energy using) consumption patterns such as frequent showering and clothes-washing by prevailing ideas of comfort, cleanliness and convenience (as well as by the available systems of provision such as power showers and automatic washing machines) (Shove, 2003; Shove, 2009).

Crompton argues that understanding the factors that shape these values should be a primary focus of public scrutiny and debate. Cultural values are influenced by an array of actors and factors, including government, peers, parents, teachers, opinion formers, marketing and communications, the media, and education (Crompton 2008). Jackson ascribes particular responsibility to government in sustaining consumerist values:

‘In setting the pursuit of GDP growth at the heart of policy, governments have inadvertently created a whole range of situational conditions, institutions and cultural norms which now constrain and shape behaviourGovernments are not just innocent bystanders ...They influence and co-create the culture of consumption in a variety of ways.’ (Jackson, 2011, p 208)

Summary:

- **Level** – structural

- **Key elements/influences on energy use** - ideas (cultural beliefs)
- **Possible implications for policy and programme design** -
 - Cultural values influence people's routine energy actions and investment decision.
 - Government has a particular responsibility in shaping cultural beliefs about energy efficiency both through social marketing messages and its energy policy, but also through its wider policies particularly growth policies.
 - Bottom up participatory awareness raising, action and learning groups and action research can play an important role in altering dominant cultural beliefs by providing safe spaces for people to explore and critically assess cultural and social beliefs relating to energy efficiency

2.7.3. Theories about socio-economic influences

A number of theories or analytical frameworks focus on how socio-economic influences such as class, income, ethnicity, and gender can shape human preferences, agency and behaviours. Marxist theories are particularly relevant here as they tend to emphasise the form of economic organisation as a determining influence on many other aspects of society including ideas, social relations and political and legal systems.

Below we identify some of the way socio-economic factors influence energy behaviours and the uptake of energy efficiency measures:

Social Class

Bourdieu showed how social class in France can shape a person's likes and interests [or preferences], how distinctions based on social class are reinforced in daily life, and how social origin can be a more influential factor than education or economic capital (Bourdieu, 1984). There is also some evidence that inequality drives excessive consumption (Wilkinson and Pickett, 2009), and low self-esteem of some low-income individuals may drive spending on high-status goods (Sivanathan and Pettit, 2010).

Income level

Research shows how income level can:

- Shape individuals' responses to energy prices. For example lower-income households may have a greater preference for rewards in the short term rather than the long term (Halpern et al., 2003). This means that even though financial savings from energy efficiency may be more significant to low income than high income groups, they may be less willing to adopt efficiency measures that only yield financial savings in the longer term, assuming that they can afford the up-front cost in the first place (Vandenbergh and Ackerly, 2008). (Also see forthcoming supplementary review for INBEE on Economic Theories).
- Constrain the access of low income groups to energy-efficient or low carbon technologies, reinforcing economic disadvantage. (Low income families may be more likely to suffer poor quality housing. They may also be more likely to suffer from certain structural constraints such as lack of time, money, encouragement, facilities (see Blake's (1999) 'Value Action Gap' below; DEFRA, 2008) which may prevent them from making energy efficiency improvements to their homes. Private and social tenants rely on landlords to make energy efficient improvements to their homes. Low income families may be more likely to live in areas of high density housing, with poor recycling facilities or kerbside service (RRF 2002, quoted in Jackson, 2005).

- Constrain individual agency. One cross country comparative study by Grant (2001) found that ‘income-based forms of social exclusion are significant’ in Britain and that there is a lower sense of empowerment about the environment among lower income groups than other groups in Britain. Less than a quarter of people in the low income group surveyed felt that they could do anything about the environment. Interestingly, lone parents were more positive than other socially excluded groups, possibly because they feel less excluded than others through their connections with schools and child health clinics, etc. The study also found that low-income groups were less likely to sort their waste and to maintain their cars than wealthier groups. However, these findings need to be interpreted with care as much depends on context and findings from elsewhere show high levels of motivation and agency among low income households (Gupta et al, 2015)

Summary:

- **Level** – structural
- **Key elements/influences** – socio economic influences (income, class, tenure, gender, ethnicity)
- **Possible implications for policy and programme design** -
 - The design of energy efficiency policies and programmes need to be made relevant and accessible to different demographic groups and address barriers to participation (whether relating to lack of time, income, agency or other structural constraints). Failure to do so may exacerbate existing income, health inequalities and associated social problems.
 - Policies and programmes may have more chance of success in enabling low income, vulnerable and disadvantaged to benefit if representatives of these groups are involved in governance structures and the initial policy or programme design as well as implementation (Grant, 2001; Buell and Mayne, 2011).

2.7.4. Power relations

Theories of power emphasise the role of power relations in enabling or constraining individual and organisations choices. Power may refer to an agents' own ‘power within’; their ‘power to’ effect change collectively with others; or their ‘power over’ others (Gaventa, 2006; Rowland, 1997; Miller et al, 2006). Conventional theories of power emphasise power struggles between different groups of actors (whether classes, business, social movements, special interest groups) in pursuing and defending their interest .

Power can be characterised as being exercised in two main ways. ‘Hard power’ is essentially coercive and derives from the use (or threat of) economic sanctions or physical force and is therefore more likely to be associated with government, large companies. ‘Soft power’ is based on persuasion, attraction and/or consent aspects of which a wider range of individuals, groups or institutions may possess . ‘Soft power’ may be derived from factors such as legitimacy (e.g. the numbers or types of people that they represent; and types of relationships they have); knowledge or expertise (e.g. direct experience of an issue or locality); credibility and reputation (e.g. trust, transparency or past performance); reward power (e.g. the ability to offer incentives and publically praise or shame policy makers); or ‘position power’, from being well networked (Mayne and Coe, 2010).

Theories of power also highlight how power may operate through visible influences on regulations and institutional practice; through hidden influences on regulations and institutional practice (behind the scenes); or through invisible dominant cultural ideas, values and social controls. The latter may initially be promoted through state institutions, the media and opinion makers, but over time they become accepted as social factors or basic 'truths' (Lukes, 2005; Rowland, 1997; Miller et al, 2006).

Thus proposed changes to our energy efficiency policies and programmes and investment decisions may generate resistance from incumbent interest groups whether oil companies, electricity suppliers, manufacturing and retail firms reliant on consumer products and who exercise influence over government policy. energy efficiency policies and programmes may also run counter to dominant cultural values and ideas, which may reflect the interests and ideologies of power interest groups or elites (Lukes, 2005) as well as individuals whose social identities are tied up in consumerist lifestyles.

Research highlights the importance of empowering people to help them understand and use energy efficiency and renewable energy programmes (Gupta et al, 2015).

Summary:

- **Level** – structural
- **Key elements/influences** – power relations (personal, interpersonal, societal).
- **Possible implications for policy and programme design** - to help achieve the widespread uptake of energy efficiency change agents may need to:
 - Develop strategies to overcome resistance by vested interests at different levels - whether exerted in a visible, hidden or invisible way.
 - Increase their own sources of soft and hard power (e.g. by strengthening their knowledge/expertise, legitimacy, credibility, numbers) as means of increasing their influence within their own 'communities' (e.g. to attract and engage more people), and vis-à-vis other actors such as local or national government (e.g. to diffuse innovations, enrol partners or influence policy)
 - Help empower other stakeholders and beneficiaries of energy efficiency through e.g.
 - Action research as a means of strengthening individual agency, knowhow and group capacity and strategy; transforming group standards and norms; and helping raise awareness of wider structural influences. Social practice theories may also be relevant here as they emphasise the importance of helping people examine internalised symbolic and social meanings, as well as emotional factors, relating to climate change and lifestyle issues.
 - Group capacity building, mentoring and peer-to-peer learning can also be used to strengthen individual agency and group capacity, and hence increase the success of energy efficiency programmes. In contrast to 'action research' and 'communities of practice' discussed below, capacity building tends to entail the transfer of knowledge from external bodies to community groups and residents. This may include the provision of information, training and practical advice and support as outlined above. This can be very important for community groups, particularly when they need to supplement their existing knowledge and skills (Owens, 2000). But it can also be ineffective and disempowering if it downplays communities' own knowledge. Community-to-

community mentoring and peer-to-peer learning can help avoid this problem, but has sometimes been criticised by professionals for disseminating non-evidence-based information

2.7.5. Theories of policy change

The government policy framework and financial incentive structure is a critical structural influence on both energy efficiency routine actions and investment decisions. As such, it is highlighted by various other theories including the Multi-Level Perspective of Transition Theory (as part of the regime) and is understood to be a key element constituting social practices in Social Practice theories (rules).

Government shapes routine actions and investment decisions of individuals and organisational practices through (a) energy efficiency policy framework and incentive structure and (b) by altering the wider structural influences on energy efficiency investment decisions and routine actions e.g. through policies affecting growth/markets, cultural values, income distribution, social structures, and institutional practices.

Rational theory, and more recently socio-psychological and behavioural theories have had an important influence on government policy. However, as this review shows policies and programmes that seek to promote the voluntary uptake and use of energy efficiency by individuals and organisations face a complex task. As a recent House of Lords Science and Technology Committee report on behaviour change concluded that, while ‘nudges’ had the benefit of respecting individual freedom and costing little to implement, there was as yet no evidence of their cost-effectiveness, and that:

non-regulatory or regulatory measures used in isolation [our emphasis] are often not likely to be effective and that usually the most effective means of changing behaviour at a population level is to use a range of policy tools, both regulatory and non-regulatory (HoL, 2011).

However, government policy is rarely based on evidence only as it results from the interaction of interests, ideas, institutions and socio-economic forces. (Sabatier and Jenkins 1993). These may include: interest groups/coalitions; expert policy networks; dominant ideologies; short term electoral interests; and financial/budgetary constraints internal incentive structures and turf wars; public attitudes etc.

There are a range of theories explaining policy change. One model of policy change which gained particular currency in recent years suggests that change is most likely to come when the policy stream (persuasion), problem stream (public priority) and political stream (ideological battles, power shifts) are aligned (Kingdon, 2003; Parag and Eyre, 2010). In recent years there has been increasing attention played to the role of networks and relations in influencing government policy. The Policy Advocacy Coalition Framework (Sabatier and Jenkins 1993), for example, emphasises the importance of policy advocacy networks. A major study of business regulation also highlights the important role of dialogue, modelling and reciprocation between different governments in achieving regulatory change (Braithwaite, 2000).

Summary:

- **Level** – structural

- **Key elements/influences** – ideas (ideologies, cultural beliefs); standards and rules (policy framework and financial incentive structure); competencies (government capabilities).
- **Possible implications for policy and programme design** -
 - A strong and supportive government policy framework and financial incentive structure is needed to change individual energy behaviours within institutions and overcome structural constraints on energy efficiency uptake.
 - Legal bans or obligations can provide a quick and direct route to changing individuals and organisations routine actions as has been shown in the case of drink-driving and smoking legislation, and may in turn contribute to changes in attitudes. However, there are concerns that regulation may provoke public resistance until or if climate change becomes more salient to people.
 - Achieving policy change is likely to require a purposive change strategy by coalitions of actors involving a mix of persuasion (evidence/lobby), coalition building and public pressure and that takes into account and addresses different types of power (see below) (Mayne and Coe, 2010).

2.8. SYSTEM LEVEL THEORIES ABOUT THE INTERACTIONS BETWEEN DIFFERENT INFLUENCES

The extent to which individuals are free to make their own choices, or how far they are bound by the external social structures in which they live, has been a long standing debate in the social sciences (Jackson, 2011). Various theorists have, however, sought to move beyond this dichotomy and instead focus on the interactions between personal agency and social structure. In these understandings structures can be both influences on, and outcomes of, individuals' actions. (e.g. Giddens, 1984; Bourdieu, 1990 (quoted in Jackson 2005)). Below we summarise a number of theories informed by this understanding and which focus on interactions between the different 'elements' shaping energy use identified in previous sections.

2.8.1. Actor Network Theory (ANT)

There is growing emphasis in the literature on the interaction between technologies and human behaviour. ANT provides an analytical framework for studying people and their physical environment as parts of a socio-technical system. It focuses particular attention on the material world, and its most distinctive proposition, compared to other social theories of change, is that inanimate objects can shape the reality of complex socio-technical systems just as much as human actions can (Latour 1991, Law 1992). In other words it takes account of the 'agency of things' as well as of actors. The analytical approach proposed by ANT is to assume nothing at the outset and to assign equal importance to both human and non-human actants. This is not to deny that humans have inherent characteristics that inanimate objects do not share – language, intentionality, reflexivity. Rather, ANT is a deliberate attempt to separate the analytical tool from moral or ethical debates and so allow the complex inter-dependence of the non-human and the human to emerge more fully. Thus conventional, routine behaviours is just one possible outcome among many of a process of 'translation' among people and things in an actor-network (Killip, 2011).

2.8.2. Social practice theories

Social practice theories highlight how energy behaviours and use are part of wider social ‘practices’, rather than just conscious individual choices. Social practices are understood to consist of different elements – values and norms (images), materials (products and technologies), know how (skills and competences), and institutionalised rules – which interact and co-evolve within their wider surroundings (Shove and Pantzar, 2005; GramHanssen, 2010). From a social practice perspective people do not usually use energy consciously, but rather carry out a range of social practices – such as washing, cooking, showering, eating, transport – which happen to use energy. Individuals are ‘carriers’ of practices but also have the capacity to change the practices by the way they perform them’. These ways of knowing and acting in the world are learned through the activities and experiences of everyday life. They are ‘social’ because they are influenced by what is considered to be normal or desirable behaviour in a society, and they can become embedded in societies even when their original purpose can no longer be recalled (Bourdieu, 1984).

Focussing on social practices can reveal how a person may refuse to use an energy saving appliance not just because it doesn’t fit with their lifestyle/social identity, but also because it doesn’t fit with their accustomed standard of comfort or their time-space routines; or because they are unfamiliar with how to use it or don’t trust the providers. Similarly individual decisions to adopt positive behaviours like recycling or reduce car journeys are as likely to depend upon the existence of appropriate local facilities as much as individual attitudes, and the availability that reliable public transport places constraints on travel choices.

The value of a practice-based approach is that it highlights the hybrid constitution of what are conventionally known as ‘human behaviours’. The importance of social norms, technological infrastructures and embodied habits are given prominence alongside cognitive elements such as choices, attitudes or values. Rather than seeing individuals as navigating through a series of opportunities and constraints, practice-theory highlights the historical socio-technical context in which individuals or groups of people are embedded.

One limit of these theories to date is that they have mainly been used to understand the elements constituting energy practices rather than how to change them.

2.8.3. Socio-technical theories

Socio technical theories (e.g. Rip and Kemp, 1998) emphasise the wider social systems in which technologies are embedded. Unlike the conventional PTEM approaches outlined above socio-technical theories recognise that technologies used by individuals and organisations and embedded in wider social and economic systems (Rip and Kemp 1998). Socio-technical systems are understood to be made up of key elements including: materials (resources, technologies, and infrastructures), actors (firms, industries, public actors, societal groups etc.), institutions (norms, incentive structures, vested interests) and rules (formal regulatory, cognitive, normative) (Verbong, 2010). These elements are understood to have their own dynamics but are also highly connected to each other.

Change may come about as a result of interactions and co-evolution between the different elements (Geels, 2004). Socio-technical analysis therefore draws on a range of theories to understand change including social-psychology, institutional, sociological, in addition to theories of technical innovation

and diffusion. Thus while energy efficiency policy on lighting and appliances has led to significant reductions in usage per appliance or light, overall domestic electricity consumption in the UK has continued to rise due to the proliferation of energy using devices in our homes (Willis and Eyre, 2011). This experience points to the need for energy policy to pay greater attention to the behavioural and social dimensions of energy demand (Bergman and Eyre, 2011). As one paper puts it 'Buildings don't use energy – people do'. From this perspective, buildings and technologies may enhance or reduce the impact of people's energy-related choices, but peoples' choices also remain fundamentally important (Janda, 2009). This is not to discount the significance of technology and infrastructure, but to put it in perspective.

2.8.4. Transitions Theory

Transitions theory seeks to understand how complex and intermeshed systems change over time. It offers an interdisciplinary perspective on the interactions between technology and society at micro, meso and macro level, drawing on science, the sociology of technology, institutional theory and innovation.

The Multi-Level Perspective (MLP) of Transition theory is a framework for understanding the complex and multidimensional nature of transitions. It highlights how system elements at different degrees of structuration (or resistance to change) interact and co-evolve to constrain (or enable) change (e.g. Geels and Schot, 2007). It postulates that transitions come about through interactions between niche innovations (micro-level innovations); socio-technical regime (meso-level norms and practices); and the landscape (macro-level economics, cultural values, demography and natural environment that actors can only influence in the long run). In this approach system change is generally seen as very hard to achieve, but may occur when niche-innovations build up momentum, e.g. through the demonstration effect, price/performance improvements, and/or support from powerful groups. Changes in the 'landscape' can put pressures on a socio-technical regime, and destabilisation of the regime then creates windows of opportunity for niche-innovations to spread (e.g Geels, 2004; Geels and Schot, 2007).

Niche-innovations are seen as particularly important potential sources of change. These may be developed by small networks of dedicated actors, often outside the mainstream, and may require initial period of protection or 'incubation' (Geels and Schot, 2007). Successful innovations may influence the regime through scaling up (Kemp et al 1998). The initial focus was on technological niches but this has broadened to include socio-economic niches which may include community energy (Seyfang and Haxeltine 2010; Rotmans et al., 2001; Moloney, 2010). Recent research has investigated how niche actors at county level have sought to scale up innovations, the challenges they face and the implications for policy (Hamilton et al, 2015) .

Transition Management provides a related, reflexive research and policy tool for managing long term transitions at system level involving: coordination across multiple levels, sectors and actors long term thinking, innovative visioning, steering, learning and experimenting and planning creating or nurturing social and technological niches which offer desirable alternatives (Rotmans et al., 2001, Smith et al., 2005). Transition 'arenas' are platforms where actors can interact and facilitate these processes (Kemp and Loorbach, 2006). Strategic Niche Management is a research and practical tool for nurturing niche innovations. Three processes have been identified as important for the successful emergence and growth of niches: management of expectations (through shared visioning); building of social networks; and learning processes at multiple levels (Kemp et al, 1998). These three

processes are inherently messy and wicked (i.e. they require constant management and do not have ultimate ‘solutions’), a quality which is common to many real-world situations. For strategic niche management, it is possible to think in terms of a constantly evolving balance between policy dilemmas (Table 2).

Table 2. Policy dilemmas for niche development (Schot and Geels 2008: p. 549)

| | | |
|--------------------------|---|---|
| Expectations, visions | Be flexible, engage in iterative visioning exercises; adjust visions to circumstances and take advantage of windows of opportunity. | Be persistent, stick to the vision, persist when the going gets tough. |
| Learning | Create variety to facilitate broad learning. | Too much variety dilutes precious resources and prevents accumulation. It also creates uncertainty and may delay choices/commitments (by consumers, policy makers). |
| Learning | Upscaling through bricolage strategy and stepwise learning. Disadvantages: (1) slow, (2) incremental steps. | Upscaling through breakthrough strategy and big leaps to achieve success rapidly. Disadvantages: (1) danger of failure, (2) mis-alignment with selection environment. |
| Network | Work with incumbent actors, who have many resources, competence and ‘mass’. Try to change their agenda, visions. | For radical innovations, it is better to work with outsiders, who think ‘out of the box’ and have new ideas. Incumbents have too many vested interests and will try to hinder or encapsulate radical innovations. |
| Protection | Protection is needed to enable nurturing of niche-innovations. | Do not protect too long and too much. This might lead to limited exposure to selection pressures (and the danger of creating white elephants). |
| Niche-regime interaction | Wait for ‘cracks’ in the regime, and then vigorously stimulate niche-innovations. Until such windows of opportunity arise, niches should be nurtured to facilitate stabilisation. | Use niche experiences to influence perceptions of regime actors and actively create cracks in the regime. |

Summary:

- **Level**– system
- **Key elements/influences** – interactions between elements and levels
- **Possible implications for policy and programme design** - Taken together these theories suggest that mainstreaming the uptake and efficient use of energy efficiency will require a mutually reinforcing mix of change interventions and processes by actors at multiple levels in multiple sectors to influence (a) the different constitutive elements that make up social practices and (b) different factors at niche, regime and landscape. In practical terms this might involve:
 - Investigating and understanding the different factors and actors enabling and constraining particular energy efficiency investment decisions or routine actions that need to change (using this review).

- Using creative lateral thinking to understand how to influence the different elements that constitute social practices rather than focussing on influencing individuals attitudes, preferences and choices alone.
- Innovative visioning, steering, learning, experimentation to develop and nurture niche social-technical innovations.
- Implementing, catalysing and coordinating a mix of mutually reinforcing change interventions by different actors at different levels and sectors.
- A supportive national policy framework and financial incentive structure that
 - nurtures social and technological niches.
 - provides additional government support and financial incentives including for capital investments and revenue funding.
 - addresses the wider practice and system elements that constrain change.

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3. Definitions/glossary

Energy efficiency – is a way of reducing the amount of energy required to provide energy services. Something is more energy efficient if it delivers more services for the same energy input, or the same services for less energy input.

Types of energy efficiency policies [for buildings] - may include

- Information and promotion – to inform individuals of the costs and benefits of production and consumption choices and behaviours, and to highlight new and more desirable ones
- Voluntary agreements/targets with commercial or public sector organisations
- Price signals, incentives and financing – taxes, subsidies or public grants to encourage/discourage certain technologies, goods, services or behaviours e.g. capital grants, revenue funding, Feed in Tariffs, carbon taxes, emissions trading,
- Regulation – to make certain technologies, goods, services, or behaviours illegal or compulsory, e.g. regulation to hasten the retirement of highly polluting plants; building codes; minimum standards/labelling for buildings, electrical appliances or vehicle emissions; energy supplier obligations
- Government provision of infrastructure or services - e.g. public transport, recycling facilities, installation of energy efficient measures, conditions for public procurement.
- Publicly funded R & D into more energy efficient technologies, behaviours etc.
- Monitoring, auditing and compliance

Types of energy efficient programmes [for buildings]:

- Individual level interventions:
 - Information and signposting
 - Norm appeals
 - Feedback/sense making through energy display monitors, smart meters, carbon footprints, thermal images
 - Home energy assessments
 - One to one advice through surgeries or home visits
- Group/organisational level interventions
 - Complementary social learning/behavioural interventions with residents e.g. through information group action and learning programmes
 - Organisational energy assessments, employee engagement and energy management programmes.
 - Coordinated area wide delivery of energy efficiency measures to people’s homes (may be local authority led, multi-agency, partnerships)

Energy efficiency investments – may relate to the purchase, investment in, maintenance, lease of energy-efficient appliances, technologies, goods or services by individuals or organisations.

Energy efficient routine actions: - may relate to the efficient routine use of energy-using appliances, technologies, goods or services by individuals or organisations e.g. showering, clothes washing, driving, and going on holiday.

4. Appendix 1: Literature on stakeholder identification

Author: Morgane Fritz, University of Graz

4.1. DEFINITION OF STAKEHOLDER

To identify stakeholders, one may first want to define what a stakeholder is. A stakeholder is commonly defined as an actor that affects or is affected by a decision or action (Freeman, 1984). As underlined by various researchers (e.g. Reed et al., 2009; Donaldson and Preston, 1995), a variety of definitions derived from Freeman (1984) and no common agreement has been reached yet. In an environmental context, the term stakeholder has been defined for instance as “polluters” and “victims”, where polluters affect the environment and the victims, directly or indirectly (Coase, 1960). This definition does however not address stakeholders that can have a positive effect on a specific issue such as NGOs. In addition, there is a variety of stakeholders to consider in the “operating environment” (Freeman et al., 2010) e.g. government agencies, customers, suppliers and in the “broad environment” (Harrison and St John, 1998) e.g. sociocultural forces, technological change. In this context, the definition of Donald and Preston (1995) seem more complete: “Stakeholders are identified through the actual or potential harms and benefits that they experience or anticipate experiencing as a result of the firm's actions or inactions”. But the latter definition is based on the company perspective. When applying it to the policy-building context, it is not necessarily or not only the firm’s actions or inactions that matter but also the government’s actions or inactions or the ones of other stakeholders.

4.2. OVERVIEW OF THE STAKEHOLDER ANALYSIS FIELD

Stakeholder analysis, also known as stakeholder mapping, is a large field of study that is used for strategic decision-making. Stakeholder analysis is primarily meant for practitioners, especially companies. It is considered as an appropriate tool to detect and solve issues that require a multiple stakeholder involvement, e.g. when the liability and the impact of an issue cannot be attributed to a single stakeholder (Bryson, 2004). Since maximising profits and satisfying shareholders is one of the main purposes of a company, stakeholder analysis started with this perspective (Simmons and Lovegrove, 2005). However, several authors underlined that companies have to meet the requirements and needs of many other stakeholders not only to secure their market shares, but also to secure other important attributes such as their viability or their brand reputation (e.g. Donaldson and Preston, 1995; Wolf, 2014).

Stakeholder analysis and management can help organisations go far beyond the financial perspective and help them “meet their mandates, fulfil their missions and create public value” (Bryson, 2004) and hence coordinate and provide as much benefits as possible to all the company’s stakeholders (Evan and Freeman, 1993, pp.102-103; Freeman et al., 2007). Indeed, companies are nowadays under increasing stakeholder pressure (Wolf, 2014) and must not only know who their stakeholders are but must also manage their relations with them well to create wealth on the long term, which implies including stakeholders in strategy-making (Post et al., 2002). Among such stakeholders, governments play for instance a particular role to ensure that businesses do not harm

the environment and the society (Kotler, 2011). Many large companies voluntarily integrated stakeholders into their decision-making process and sustainability reporting (via e.g. the Global Reporting Initiative, the ISO 26000 Guidance Standard on Social Responsibility, or the UN Global Compact).

Due to the variety of stakeholders in place and their different degree of responsibility regarding a specific problem, some categorisations have been created in order to help companies build their strategies more easily. Several authors contributed in this regard to the identification and categorisation of stakeholders that can be internal or external to the company² (Beringer et al., 2012; Cotterell and Hughes, 1995; Cova and Salle, 2005); direct or indirect³ (Frooman, 1999; Newman and Lamming, 1995); primary or secondary⁴ (Carroll, 1996; Clarkson, 1995; Cleland, 1998; Freeman et al., 2007). It is based on their stake in the organization (ownership, economic or social stake) or their influence (formal, economic or political power) that they can be classified (Harrison and St John, 1998). Stakeholder analysis has also been commonly categorised into two perspectives, namely instrumental and normative (Harrison and St John, 1998, p.48). In the instrumental perspective, the drivers for conducting the analysis are the benefits the company can obtain (e.g. limit risks, improve reputation). In the normative perspective, the drivers are rather based on values and ethics principles (e.g. stakeholder recognition and involvement). Another commonly used classification is the “stakeholder salience” from Mitchell et al. (1997, p.853-854) where “definitive stakeholders” can be distinguished from others (dormant, discretionary, demanding, dominant, dangerous, dependent or non-stakeholder) based on their power, legitimacy and the urgency to satisfy their needs. Some authors support that any actors that influence or manage decision-making in companies shall be involved in the stakeholder analysis like “shareowners, governments and others” (Preston and Donaldson, 1995). These definitions and categorisations are supposed to support the stakeholder analysis.

Among the scientific literature, one huge debate is to define which stakeholders shall be taken into consideration (e.g. Reed et al., 2009). Kochan and Rubenstein (2000, p.373) underline for instance that such stakeholders shall be the ones that provide the company with resources that are necessary to its success; the ones that are directly affected by the company’s activities; and the ones that can have a considerable positive or negative impact on the company.

After analysing and classifying stakeholders, the company can then build its stakeholder strategy. Here also several researchers contributed to the field and suggested to develop the company strategy based on the high or low power and interest of the stakeholders (Eden and Ackermann, 1998), which results in four possible strategies: keep satisfied, manage closely, monitor

² Internal: employees, managers, owners; external: suppliers, society, government, creditors, shareholders, customers

³ Direct stakeholders have a clear voice in the organization, can state their objectives clearly, e.g. shareholders, customers, employees, trade unions, local communities. Indirect stakeholders have no official conduit, enterprise has to infer what the objectives of these stakeholders might be, e.g.(indirect) suppliers from other parts of the world, a single customer of a large company, the employees' landlords, mortgage lenders and creditors.

⁴ Carroll (1996) defines primary stakeholders as those that have formal, official, or contractual relationships with the organisation (e.g. management, strategic partners, shareholders, strategic clients, staff) and secondary stakeholders as all others (e.g. clients, competitors, vendors, associations, government, media, banks). Freeman et al. (2007) count among primary stakeholders the following: the firm, the suppliers, the financiers, the communities, the customers and the employees; among secondary stakeholders the following: consumer advocate groups, special interest groups, media, government and competitors.

and keep informed. Other researchers follow the same logic with other criteria (e.g. interest and influence according to Lindenberg and Crosby, 1981 in: Reed et al., 2009) that lead to similar strategies (e.g. protect, good relation, low priority, monitor). Harrison and St. John (1998) consider as key stakeholder categories the organisation itself⁵ where internal stakeholders are a key to competitive advantage; the “operating environment”⁶ that contains stakeholders that can influence the organisation and that the organisation can influence too; and the “broad environment”⁷ where the possible opportunities and threats linked to political, economic, social and technological changes according to Porter (1985) can be identified, but upon which the organisation has no significant power (Harrison and St. John, 1998, in Freeman et al., 2010, p.105).

Among the operating and broad environment, governments for instance have the power to change companies’ behavior towards more sustainable practices by providing guidance or implementing regulations. As stated by Camilleri (2015) in the case of the European Union, the role of governments in ensuring sustainable corporate practices shall be reinforced since it benefits the governments themselves, the companies and the society as a whole and companies shall be active in engaging with governmental bodies. Via their request for more transparency in sustainability reporting, customers and end-consumers can also influence companies’ behavior (Camilleri, 2015), and even supply chains (Zhu and Sarkis, 2007; Wolf, 2014), towards more responsible practices. But when considering a specific issue, there is never only one person, group of persons or organisation that can be solely responsible for it (Bryson, 2004). There is hence a need to consider more holistic approaches and enlarge the scope and applications of stakeholder analysis to other research fields than corporate management such as Not for Profit organizations, politics and ethics (Bryson, 2004).

Hence besides the abundance of contributions to the stakeholder analysis field, this paper sheds lights on two specific issues: 1) the available tools remain difficult to use to produce reliable results for several reasons, and little attention has been given to the differentiation between stakeholder identification and stakeholder analysis, which are two different steps (Reed et al., 2009). Stakeholder identification is particularly suffering from a “lack of precision in the methods applied” and the related results can easily be “biased or a consensus may not be reached” (Reed et al., 2009). There is hence a need to elaborate more robust approaches to avoid such a drawback since the whole stakeholder analysis derives from stakeholder identification. Additionally, 2) stakeholder analysis has been largely used from a corporate perspective (Freeman et al., 2010) putting the company at the centre of all analysis. There are however some signs in literature that stakeholder analysis can also help at a regional, governmental or international level for stakeholders involved in policy-making, policy management and ethics (Bryson, 2004) like NGOs, IGOs or governments, especially in the environmental field (Freeman et al., 2010). Identifying and analysing stakeholders in a policy-building context would help understanding a problem better, finding appropriate solutions more easily by highlighting possible synergies for instance (Riker 1962, 1986 in Bryson, 2004; Baumgartner and Jones 1993 in Bryson, 2004), and building more adequate “policies, plans and programmes” that would benefit the “common good” (Bryson, 2004). As stated by Freeman et al. (2010, p.117), “the notion of sustainability [...] seems to hold the potential to engage more strategists in stakeholder-based thinking. Sustainability is a multidimensional construct that involves all of the key stakeholders, as well as the environment and society at large”. They furthermore highlight that in a

⁵ Owners/board of directors; managers; employees

⁶ Government agencies and administrators; customers; activist groups; local communities; financial intermediaries; unions; competitors; suppliers

⁷ Sociocultural forces; technological change; global political/legal forces; global economic forces

network, one stakeholder may have several roles with the different related stakeholders (e.g. competitor/collaborator) (Freeman et al., 2010, p.118).

Hence, in this paper, where the focus is set on a product or substance, it is argued that the stakeholders that matter depend on the product/substance under consideration and shall be analysed case by case instead of using a fixed set of stakeholder categories. This is all the more relevant as stakeholders may play different roles at a different time and depending on their place in a supply chain.

4.3. STAKEHOLDER IDENTIFICATION: STATUS QUO AND REQUIREMENTS FOR A SUCCESSFUL STAKEHOLDER IDENTIFICATION

According to Freeman (2010), analyzing stakeholders is the process of identifying and categorizing them. After defining the goals of the research, stakeholder identification shall hence be the starting point for a stakeholder analysis (Reed et al. 2009). Stakeholder identification involves the use of different data types (primary and secondary) by for instance interacting with experts in the field of study, conducting focus group discussions, analyzing available literature and documents or existing sets of stakeholders when the field has already been investigated (Calvert, 1995 in Reed et al. 2009; Chevalier and Buckles, 2008 in Reed et al. 2009). According to Reed et al. (2009), typologies in the field of stakeholder analysis can be categorized as follows: 1) identifying stakeholders; 2) differentiating between and categorizing stakeholders and 3) investigating relationships between stakeholders. Reed et al. (2009) underline that one main issue in stakeholder analysis is that research mostly focuses on the above-mentioned step 2) and 3). Step 1) is rarely described in detail. According to their work, the most commonly used methods for the identification of stakeholders are focus groups, semi-structured interviews, and snow-ball sampling. These methods need specific resources and have strengths and weaknesses. They usually require little and cheap resources; they facilitate the understanding of complex issues; but they may be time consuming; a consensus may not be reached; and results can also be biased (Reed et al., 2009).

Reed et al. (2009) specifically point out the problem that many approaches simply use predefined stakeholder categories and do not necessarily investigate further what the selected experts can bring to the identification step. Hence Reed et al. (2009) also reviewed what has been written to improve the crucial step of stakeholder identification. Based on several researchers, they highlight the importance of integrating an iterative process in the identification of stakeholders to avoid, among others, the bias of a top-down approach in stakeholder identification (Dougill et al., 2006; Prell et al., 2008) and address the need for stakeholder inclusiveness, e.g. to make stakeholders participate in the process and identify their interests (Reed et al, 2009; Hart and Sharma, 2004 in Reed et al. 2009). This is meant to avoid identifying only obvious stakeholders and forgetting about others such as local or sector-specific stakeholders. The importance of an iterative process in stakeholder analysis in general is also highlighted by Bryson (2004) to “aid strategic thinking and acting” on the basis of Lynn (1996) and Bardach (1998). According to Bryson (2004), “stakeholder analyses must be undertaken skillfully and thoughtfully, with a willingness to learn and revise along the way”. Since identifying stakeholders is part of stakeholder analysis, this applies also to this first step.

Mitchell et al. (1997) also contribute to methods for stakeholders identification based on “relationship attributes” that are: power, legitimacy, and urgency. This approach enables to define boundaries and priorities for the preparation of the stakeholder analysis but does not enable to visualize the issues of inter-related supply chain stakeholders. Also, since the list of stakeholders may be long and complex, some authors developed criteria (e.g. geography, demographics) to define the boundaries for stakeholder identification (Clarke and Clegg, 1998 in Reed et al. 2009). All stakeholders may be identified but not all of them may have a crucial stake for the company (Preston and Donaldson, 1995). However, it is important to know all stakeholders since their stake, influence and power may change over time (Achterkamp and Vos, 2007).

But according to Frooman (1999), most of the work done in relation to stakeholder identification consists more in building stakeholders categories than suggesting really how to identify them. Bryson (2004) contributes to bridging the gap of stakeholder identification by presenting fifteen different techniques that can support this process. Each technique is described in details with regards to the resources needed and the different steps to apply them. Among the presented techniques, several build on the traditional perspective of considering a stakeholder, often a company, in the centre or as a starting point for the analysis. One of them - the stakeholder issue inter-relationship diagram (Bryant, 2003) - takes a different perspective and identifies stakeholders from “issues perspective”, which is close to the procedure proposed in this paper. Knowing and understanding the issue under consideration is essential to identify the related stakeholders (Dougill et al., 2006; Prell et al., 2008, in press, in Reed et al., 2009), that is why the procedure suggested in this paper also takes into account this contribution. However, this technique places at the centre an “issue” and analyses only the stakeholders that can affect this issue directly, leaving apart indirect stakeholders and the broad environment that are not directly linked to the issue under consideration. However, this technique underlines an important requirement which is to specify the diverse interests stakeholders have, especially when using arrows, since they may highlight a potential conflict or cooperation. But, this technique and the other fourteen ones are only based on “unstructured brainstorming processes” as highlighted by Salado and Nilchiani (2013). In order to serve practitioners and allow replicability, a detailed procedure is hence still needed.

According to the approach of Chevalier and Buckles (2008, pp.165-177), Reed et al. (2009) emphasize the need for multiple and flexible methods depending on the research focus. In this sense, Chevalier and Buckles (2008, pp.165-177) suggest a comprehensive list of the different applicable methods for stakeholder identification and a rainbow diagram to categorize and classify them “according to the degree they can affect or be affected by a problem or action”. These suggested methods are the identification of stakeholders by experts or other stakeholders; the selection of stakeholders that answer an advertisement or announcement; census data; information related to major events, or a checklist. However, this approach can still be biased during the selection process and may omit important stakeholders. If the identification of stakeholders is biased, then the whole analysis will produce biased results. Since then however, few researchers have been digging the issue of stakeholder identification that still lacks of rigor (Reed et al., 2009). Recent researches that contribute to filling this gap can be found for instance in the Information and Technology (IT) field. According to Salado and Nilchiani (2013), some authors investigated how to structure brainstorming to identify stakeholders in this sector (e.g. Vries et al., 2003). They however

also use pre-defined categories⁸ and classify them according to the relations defined by Mitchell et al. (1997, p.853-854). On the basis of Ballejos and Montagna (2008), Salado and Nilchiani (2013) also highlight the need not to only identify which types of stakeholders are in place, but also which are their roles. Time may also be an issue since the roles of stakeholders can change from a period to another (Achterkamp and Vos, 2007). Time, role and type of stakeholders are for Salado and Nilchiani (2013) important factors to identify stakeholders and they recommend a system thinking approach to do so, as well as the development of a visualisation tool (e.g. "systemigram"). Such a system thinking approach and the avoidance of the use of pre-defined categories of stakeholders, is, according to them, a key to to avoid bias or omission of stakeholders and rather highlight the specificities of each system.

Among various research fields, there is hence still a need for a rigorous procedure to identify stakeholders. In order to serve multiple stakeholders, such a procedure shall not focus only on the company perspective, but rather take a holistic approach. Additionally, it is essential that such a procedure integrate iterative steps to reduce the risk of bias and the omission of stakeholders. Due to the complexity of today's environment, it is relevant to build tools that enable to visualise and hence understand better the relations between stakeholders themselves and between stakeholders and the issue under consideration (Bourne and Walker, 2006). Such tools shall also enable to visualize the different roles stakeholders may play in the present and in the future since these roles may change. One way to take these requirements into consideration is to integrate more rigorous methods like literature reviews, surveys, focus groups or interviews as well as a supply chain perspective into the procedure of stakeholder identification. This paper takes as a basis the categorization of stakeholder analysis typologies from Reed et al. (2009), and builds on existing methods and tools used for stakeholder identification to propose a procedure for stakeholder identification (see Fig.2) that takes into consideration the requirements identified in the literature namely the need for:

iterative processes;

definition of stakes;

taking into account the time dimension (present and potential stakeholders);

visualization tool; and

more holistic view by using systems thinking.

⁸ Stakeholders that can "be benefited or affected by the system, namely production chain, end users and related organizations, designers, physical system, inspection agencies, regulators, research and consultancy, education, and representative organizations." (Vries et al., 2003)

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