# *An evolutionary perspective on the economics of energy consumption: the crucial role of habits*

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**Abstract**:

The climate change issue imposes us not only to change the way we produce and convert energy but also to modify current energy consumption patterns. A substantial body of literature has shown that our behaviour is often guided by habits. The existence of habits - not fully conscious forms of behaviour - is important as it contradicts rational choice theory. Their presence thus calls for the setting of new instruments as it is difficult to expect consumers to be capable of exercising control over their consumption of energy in reaction to given incentives. This is further increased in our perspective where the current carbon-based *Socio-Technical Systems* constraints and shapes consumers' choices through structural, cultural, social and institutional forces. Habits being potentially "counterintentional", they can be considered as a form of behavioural lock-in that may explain continued increase of energy consumption. Policies should thus specifically address the performance context of habits.

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## 1. Introduction

More than a century ago, Thorstein Veblen wrote *"At the same time men's present habits of thought which tend to persist indefinitely, except as circumstances enforce a change. These institutions which have so been handed down, these habits of thought, point of view, mental attitudes and aptitudes, or what not, are therefore themselves a conservative factor. This is the factor of social inertia, psychological inertia, conservatism"* (Veblen 1899, pp.190-191).

The least we can say is that the work of Thorstein Veblen is very enlightening for any one who is interested in economic analyses of the climate change problem (which is often seen as one of the most challenging issue that our civilisation will have to face during the 21st century). Two different elements allow us to make that statement. First, through highlighting the importance of historicity and its embeddedness in a wider institutional and social environment, Veblen can be considered as a precursor of the "path dependence" approach pionneered by David (1985) and Arthur (1988)[1]. This approach and its related concept of technological lock-in sheds a very insightful light on the economics of climate change as it has been shown extensively in a previous paper (Maréchal, 2007).

[1] Veblen's contribution is acknowledged in the conclusions of David's article (see David, 1985, p. 336).

Second, as illustrated by the introductory quote, Veblen's analysis touches upon the idea that individuals have certain habits and behaviours that are conditioned by experience (see also Veblen 1919, p. 79). This notion of habits provide an interesting starting point in building an analytical framework that departs from the rational choice model that has clearly been misleading in providing guidance for climate and energy-related policy-making.

In line with this context, the goal of this paper is to further explore the role played by habits in the field of energy consumption while also integrating those insights on habits into a broader evolutionary view of the economics of energy. The idea is to show how the two aforementioned insights from the work of Veblen are interrelated in that they reinforce each other. To put in other words, the objective is to provide a clear picture of habit development while also showing how habits serve to maintain the incumbent "locked-in" socio-technical system that rely on the use of fossil fuel energy.

The next section provides a brief overview of the issues at play in standard economic analyses of energy consumption building on the illustrative example of what has been termed the "energy paradox". Section 3 then describes the broader evolutionary framework within which the analysis of the habit concept is performed. In section 4, we show why habits are important to take into account in the field of energy consumption and how they fit into our broader framework. In section 5, we try to provide a functional definition of habits. Section 6 then concludes by looking at ways to break unsustainable habits in the field of energy consumption.

## 2. Mainstream economic analyses of energy consumption and the energy "paradox"

The unequivocal link between climate change and anthropogenic activities that has been recently been reaffirmed in the IPCC[2] Report (2007) requires an urgent, world-wide shift towards a low carbon economy (STERN 2006 p. iv). Considering that energy-related emissions amounts to a substantial part of global greenhouse gas emissions[3], this shift inevitably implies not only to change the way we produce and convert energy but also to modify current energy consumption patterns.

Insisting on the fact that energy consumption does matter *per se* is crucial as, for the past 25 years, the focus of energy policies have clearly been on energy efficiency (i.e. increasing the energy service for the same unit of energy) rather than on energy conservation (Wilhite et al., 2000 ; Harris et al., 2007). Even though energy efficiency might be one way to reduce energy use, focusing solely on "bringing in" more efficient technologies could turn out to be counterproductive if it serves to sustain unsustainable patterns of consumption (one such counterproductive effect being the well-known "rebound effect[4]").

The focus on energy efficiency as a way to tackle energy-related environmental issues such as global warming is obviously linked to the prevalence of a somewhat techno-centrist view (or "technology optimism" as Wilhite (2007), p. 23, puts it) where future technologies will solve the problem by providing consumers with more efficient ways of using energy. This view has consecrated energy efficiency as an *end* in itself rather than as a *mean* (i.e. towards a reduction of energy use).

[2] The Intergovernmental Panel on Climate Change (IPCC) is a UN-based body of experts.
[3] Energy-related GHG emissions make up 80% of total GHG emissions in EU-27 (EEA, 2007).
[4] For a good definition and overview of the rebound effect, see, for instance, Berkhout et al. (2000).

But there is another equally important causal factor: the dominance of the "rational choice" model in economics. First, as we argue in Maréchal (2007), the notion of efficiency itself is the inherent focus of traditional economics which reduces human beings to their mechanical properties[5]. Indeed, the traditional economic paradigm (also known as the *Homo Oeconomicus* paradigm[6]) rests on the very Cartesian idea that the left hemisphere of the neo-cortex (specialised in analytical abilities and computational operations) is dominant. This explains why efficiency is "at the centre stage of neoclassical economics" to the detriment of efficacy, a "fundamental economic problem – one that cannot be found at all in the neoclassical research agenda" (Dopfer (2005), p. 25). Furthermore, the simple aggregation rule (based on the concept of the "representative agent") contained in the theoretical framework of traditional economics makes that macroeconomics (centred on the idea of optimal equilibrium) "has shifted steadily from questions of distribution and institutions to an almost exclusive concern with market efficiency" (van den Bergh and Gowdy (2003), p. 65.).

Secondly, the perfect rationality principle has rendered any question on energy demand trivial as it could be taken for granted. Based on this kind of framework, the goal is then to provide economic agents (considered as optimising machines) with the correct information to persuade them to invest in energy-efficient measures. To put in other words, the rational choice model has paved the way for the current state of policy-making where decision-makers "obsessively invoke "incentives" as the panacea for any given social problem" (Hayes, 2007).

And energy policy is no exception to that trend as can be illustrated by the debate around the "no regret" emission reduction potential also known as the "Energy paradox"[7]. For instance, after having fiercely argued against the existence of such an untapped potential of profitable energy-efficient investments at the beginning[8], economists then resorted to the traditional view of "market failures" that lead to erroneous market signals. Accordingly, policy-makers were told to correct those failures by providing judicious incentives (among which "getting the price right", "providing accurate information", and "facilitating access to capital" are the most common measures).

But again, empirical studies have shown that the picture is not as simple as thought by economists and that there are other obstacles to profitable energy-efficient investments that are of a different nature than economic market failures (see the limits of, for instance, market forces in de Almeida, 1998; of energy labels in Gram-Hanssen et al., 2007; of price signals in Meier and Eide, 2007). Non-economic barriers - which have mostly been neglected by energy economists - are thus an important part of the explanation and would require a wider range of policies (i.e. beyond those aiming at correcting market failures) to be implemented if decision-makers wish to tap the "no regret" potential.

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[5] This is explained by the fact that the traditional framework turned mechanical mathematics into the new Mecca of economists - a choice obviously made to the detriment of biology, the other potential Mecca of economics (Hodgson,1993b; Foster, 1997). We discuss the Newtonian/Cartesian legacy of mainstream economics in more details in section 3.

[6] This refers to the theoretical representation of the economic agent on which the traditional economic model is founded. It sees economic agents as self-interested and perfectly rational individuals that maximise their utility based on perfect information and through using their capacity to ordinate their preferences.

[7] An emission reduction potential is said to be "no regret" when the costs of implementing a measure are more than offset by the direct or indirect benefits (not including climate-related benefits) it generates based on traditional financial criteria. The most obvious non-climate benefits are those arising from reduced energy bills. For a brief overview of the debate, see Maréchal (2007).

[8] The reason for this initial opposition lies in the theoretical incompatibility between the *Homo Oeconomicus* paradigm and the existence of profitable investments not being spontaneously undertaken. "Locked" in their theoretical background, economists were thus quite sceptical about the evidence coming from engineer-type bottom-up studies (see DeCanio, 1998).

Given that the focus on efficiency and the "incentives obsession" have failed in delivering energy reductions, it suggests that turning to an alternative framework of analysis could provide an insightful alternative. This is all the more so since the traditional economic model of rational choice - on which the "efficiency-incentives" view is clearly founded - is being strongly questioned by scholars from different academic disciplines (see Gowdy and Erickson 2005 for a brief overview of recent sources of criticism). As shown in the thorough review on sustainable consumption undertaken in Jackson (2005), all the three key assumptions contained in the rational choice model - namely rationality, individuality and self-interest - have been challenged.

For instance, there is a substantial empirical literature demonstrating that the self-interested and rational *Homo Oeconomicus* does not quite exist in reality (see the abundant empirical literature dealing with actual economic behaviour of economic agents in Fehr and Gächter 2000; Henrich et al. 2001). More particularly, experimental studies in the realm of "neuroeconomics" (i.e. experimental studies expanded to include measures of biological and neural processes involved during economic activities) have shown that economic decisions are partly guided by feelings and thus emotionally coloured (Camerer and Lowenstein, 2004).

Needless to say, this empirical evidence should be fully acknowledged in analyses that deal with the behaviour of economic agents like, for instance, in the field of energy consumption (where such "anomalies" are observed).

## 3. Description of our evolutionary framework of analysis

Given that Economics developed "along some paradigmatic lines determined by the cultural crucible in which the stuff of our mind is initially mixed" (Perlman and McCann, 1998, p.2), it was thus strongly influenced by the climate of Newtonian mechanistic science that was reigning at that time. More precisely, the triumph of Newtonian economics first materialised with the "marginalist revolution" instigated by William Jevons in response to the critics made about the classical model only working with "objective" values. But Cartesian rationalism eventually gained the upper hand after the work of Léon Walras on "General equilibrium" which served for post-War economists to enthrone deductive methods and mathematics rules of analysis as the corner stones of Economics. Borrowing from Perlman and Mc Cann (1998), mainstream Economics[9] – that is nothing else than the coupling of the "marginalist revolution" with Cartesian "logical rigor" – is marked with a strong Newtonian/Cartesian imprint.

As it is claimed in Foster (1997) p. 432, this Newtonian/Cartesian legacy makes that we are left with a linear and a-historical paradigm in economics insofar as it does not "depict a process unfolding in history". All together, the Newtonion/Cartesian influence on Economics has led to a model that could be called "mechanistic reductionism". Indeed, not only does it explain whole economies on the basis of one sole agent/firm – through the assumption of the "representative agent" – but the characterisation of that agent/unit is reduced to its mechanical properties (it is viewed as an optimising machine).

[9] By mainstream economics, we refer to the Walrasian model of economics (i.e. the general equilibrium framework) which consists of the theoretical synthesis of the Marshallian approach with marginal production theory and the rigorous precision of mechanical mathematics. It can be dated back to the second half of the 20th century with the work of economists like Milton Friedman.

Having acknowledged this and bearing in mind the fact that the core assumptions of traditional economics about the behaviour of economic agents are at odds empirical evidence (Dopfer 2004, p. 186), the choice of an evolutionary-inspired line of thought is rather straightforward.

On the one hand, this is due to the fact that Evolutionary Economics can be said to have developed partly with the aim of correcting the "scientific failure" of traditional theory in explaining why economic agents do not always act as optimising machines. This can be illustrated by the seminal book of Richard Nelson and Sidney Winter[10] where profit-maximising behaviour of firms is replaced by a view largely inspired by Herbert Simon's "bounded rationality". In adapting to their limited capabilities, agents adopt decision "routines[11]" to simplify their decision process and ensure satisfactory results (Nelson and Winter, 1982).

On the other hand, it is also important to note that the other cornerstone of the evolutionary framework in economics obviously lies in its different interpretation of economic change. In fact, as claimed in Dopfer (2004, p. 178), what is exogenous in traditional economics "*comprises the endogenous core of evolutionary economics*". Given that it focuses on economic dynamics resulting from innovation, selection and accumulation, Evolutionary Economics may offer new insights in the framing of environmental policies (van den Bergh et al. 2006). We will show in our analysis that together with its departure from the perfect rationality hypothesis this shift of focus towards a better understanding of economic dynamics renders Evolutionary Economics an inevitable theoretical ground in setting up policies for sustainable energy consumption.

In line with Veblen's above-mentioned concept of cumulative causation and with the more recent work of Geoffrey Hodgson that shows how economics became "progressively more reductionist and formalistic" (Hodgson, 1993a, p. 251), the main idea from our approach that is important to underline is that, contrarily to the rather deterministic and linear view that prevails in mainstream economics, economic change is better pictured as a process of cumulative, double (downward and upward) and interactive causation (van den Bergh and Gowdy 2003; Corning 1997, Hodgson, 1997).

As it has extensively been shown to be the case of some socially-acquired characteristics of human beings that are better explained by group level analysis (Henrich 2004), the sole selection operating at the individual level can not serve to explain what exists and happens today. This group-level approach (as opposed to analysis focusing on individual units) is very insightful for analysing energy consumption which, as we will show, can be better understood through a framework allowing for circular and self-reinforcing interactions between economic agents. In other words, through this framework, consumption dynamics involve processes that see individuals interacting with an emergent population in a self-reinforcing manner.

In this context, the added value of the evolutionary perspective of economic change is thus that it stresses its historically-contingent nature (because causation is cumulative) and highlights the role played by systemic interdependencies (because causation is double and interactive). As illustrated in Veblen (1915) through the example of British small wagons, systemic interdependencies imply that technologies can no longer be seen as isolated but

[10] Even though there has always been economists interested in the evolutionary tradition (such as Thorstein Veblen or Joseph Schumpeter), the book titled "An evolutionary theory of economic change" is often considered as having founded "modern" evolutionary economics (Arena and Lazaric, 2003).
[11] Routines are a key concept in Evolutionary Economics which refers to regular and predictable patterns of behaviour.

rather as belonging to technological systems. Those systems can be defined as "interrelated components connected in a network or infrastructure that includes physical, social and informational elements" Unruh (2000, p. 819). Adding the fact that technologies are also dependent upon and connected with the wider range of cultural, organisational and institutional aspects of their environment that enable them to work together, we end up with what Geels and Kemp (2006) call *Socio-Technical Systems* (STS)[12] or what Unruh (2000) calls *Techno-Institutional Complexes* (TIC)[13]. This can be illustrated with the case of the automobile, whose expansion required parallel developments in supporting industries (steel, glass, etc.), infrastructures (service station, roads, etc.) and academic research and lobbies (see the work of Flink, 1970 and 1988).

This intertwining of different elements that characterises STS sheds light on the potential inertia of such systems as once historical conditions have lead to the emergence of a STS their multiple components contribute to stabilise the system in a self-reinforcing manner. The nature and type of a STS is thus dependent upon the path followed[14] and is further perpetuated through the interactions of its multiple elements. Positive feedbacks act as a sort of snowball which results in the locking-in of the incumbent STS following a path-dependent co-evolutionary process.

This view is of great importance for energy-related issues in at least three different ways. First, it has been shown in Grubler (1998) that the last two centuries could be viewed as the succession of mainly three STS, all three of them being based on a source of energy[15].

Second, as notice by Shove (2005), the view that technologies are embedded in a strongly influential social context of institutions makes that consumption is shaped by (whilst also shaping) technological constraints.

Third, since the emergence of a given STS (such as the current carbon-based one) is historically contingent[16] and thus not only governed by optimality, it may be that it is based on an inferior design of technology as first claimed in the pioneer work of Paul David on the QWERTY case (David, 1985). Even though we consider the evidence[17] as making a case important enough to at least take it into account, there has been an extensive debate on that hypothesis of inferior design among experts (mainly due to the difficulty of proving counterfactual superiority). Yet, in our case, we are "fortunately" faced with enough scientific evidence that climate change is caused by the accumulation of GHG emissions to deem it

[12] It should be noted that a "system" is a network of *elements* whereas a "regime" is a network of *peoples*. Socio-technical regimes serve to maintain and stabilise socio-technical systems (see Geels and Kemp 2006).
[13] Here again it is interesting to note how Veblen's work is insightful as he already touched upon similar ideas. In fact, its notion of "cultural complex" coupled with the materialist determinism his work is imprinted with leads to a view that is very close to Unruh's TIC.
[14] In line with the concept of "path-dependence" which refers to the fact that technological systems follow specific trajectories that it is difficult and costly to change (Arthur 1983 ; David, 1985). As shown in Arthur (1989), these trajectories depend on historical circumstances, timing and strategy as much as optimality (i.e. the main focus of traditional economics). As defined in Puffert (2002), p 282, a path-dependent process is "one in which specific contingent events – and not just fundamental determinative factors like technology preferences, factor endowments and institutions – have a persistent effect on the subsequent course of allocation".
[15] From 1800 to 1870, the dominant STS was composed of steam, iron and canals; then over the 1850-1940 period it was progressively replaced with coal, railways, steel and industrial electrification; and this last cluster has in turn been shifted to a STS made of oil, roads, plastics and mass electrification between 1920 and 2000.
[16] That means that a completely different STS could emerge from a similar context depending on how things happen in the beginning. For instance, railway gauges would probably be of a different width, were Stephenson born in another mining district (Puffert, 2002).
[17] Most notably the evidence gathered in Cowan (1990) on light water reactors and in Scott (2001) on the lock-in of the British railway system into a small wagon system.

necessary to find ways to unlock out of the current carbon-based STS without having to discuss about its potential technological (or else) inferiority.

## 4. An evolutionary view of energy consumption : the importance of "habits"

As we have shown in more details in Maréchal (2007), looking at energy-related issues through evolutionary lenses sheds a clearly different light and thus calls for a broadening of current policy-making in the field. For instance, the notion of "bounded rationality is important as it can serve to explain (together with other elements) the energy paradox we mentioned in section 2. In line with those authors that see energy consumption as "the routine accomplishment of what people take to be "normal" ways of life (Shove, 2005, p. 117), a study has shown that consumers' intrinsic (i.e. not determined by market signals) habits and preferences were important determinants of energy-inefficient choices in motor technologies (de Almeida, 1998, p. 650). Accordingly, we can consider that consumers are somewhat "locked in" their (emotionally-based) consumption's routines as illustrated by Simon's concept of docility which refers to the "human propensity for accepting information and advice that comes through appropriate social channels" (Simon, 2005, p. 95)[18]. Starting from the idea that social learning is the most important form of learning of human beings (Tomasello et al., 2005) and that it is impossible to verify every piece of information we consider legitimate (i.e. rationality is bounded), there is some form of "path-dependence" of the information that we use to make our decisions.

Pushing this line of search one step further, a substantial body of literature has shown that - more often than not - our behaviour is guided by habits[19] (i.e. it takes the form of repetitive actions performed with minimum thinking) and thus without the type of cognitive deliberation assumed in the rational choice model. The obvious advantage of adopting this kind of "habits" in decision-making is that it frees up resources than can be devoted to solving non routine-like problems and, as such, it can be said to be a highly rational[20] way of allocating our limited cognitive abilities (Jager, 2003). It liberates the individuals from "the burden of all decisions" (Berger and Luckmann, 1966, quoted in Lindbladh and Lyttkens, 2002).

As it has convincingly been shown in Tversky and Kahnemann (1974), people use a variety of cognitive and emotional heuristics to deal with the impossibility of amassing all possible information and thus tend to make immediate and sometimes not even conscious choices of behaviour. This idea that people are not always fully conscious when they are performing routine-like behaviours is important not only because it contradicts rational choice theory but also because it suggests that the conspicuous (i.e. status displaying) part of consumption might have been overemphasised. As shown in the work of Elisabeth Shove and other sociologists, a non-negligible part of our consumption is inconspicuous (or ordinary)[21]. Much

[18] Simon (2005) explains this concept using the example of hot stoves that we learn not to touch without actually having to experience touching it ourselves.
[19] In fact, in the original work of Nelson and Winter (1982), "routines" are organisational (i.e. relate to firms). It is now standard practice in evolutionary economics to use the term "routine" for collective behaviour and the term "habit" for individual behaviour (Dosi et al. 2000).
[20] Herbert Simon coined the term « procedural rationality » to characterise this use of resource-saving habit-like decision processes.
[21] This does not mean that every energy-related decision and behaviour is inconspicuous. For instance, Wilhite and Lutzenhiser (1997), p. 4, mention that visible energy-efficient measures (e.g. installing solar panels) were more often implemented than less visible ones (e.g. weather-stripping) even though the latter were more economically rational. It is important to note that those conspicuous choices were related to one-shot decisions. As we argue later those types of decisions are different in nature than everyday consumption-related decisions.

of our every day consumption is almost invisible to our peers and even to ourselves (Jackson, 2005). And this is especially so when it comes to energy consumption.

In such a context, it is difficult to expect consumers to be capable of exercising control over their consumption of energy in reaction to given incentives (whether economic or informative). This is further increased in our perspective where the current carbon-based *Socio-Technical Systems* (STS) constraints and shapes consumers' choices through structural, cultural, social and institutional forces such as norms, media, etc. More than "willing" consumers should rather be viewed as partly "locked-in" (Sanne, 2002). Consumers are thus neither fully rational (in the sense of traditional economics) nor omnipotent[22].

In addition, as it comes out of the "circular causation" concept highlighted in our perspective, while choices in energy consumption are being strongly influenced by the existing STS, they, in turn, contribute to reinforce and maintain the incumbent STS. Indeed, if the use of highly automatised behaviours such as habits is undoubtedly "procedurally rational" in stable contexts, it quickly turns into a change-resisting factor when conditions and circumstances vary such that alternative behaviours would yield better outcomes. In line with Carillo-Hermosilla and Unruh (2006, p. 708) who resort to "old institutionalism" to explain the "apparent paradox in the increasing returns and lock-in conceptualisation", we thus consider habits as an additional explanatory factor of long term technological stability.

Paul David, who pioneered together with Brian Arthur the research on "lock-in" processes, already asserted in the mid-80's that path dependencies may arises "in the presence of strong technical interrelatedness, scale economies and irreversibilities due to learning and *habituation*" (David 1985, p. 336 -emphasis added). As mentioned in Barnes et al. (2004, p. 372) only the first two arguments were used in the literature on "technological lock-in[23]" that has followed from the work of David and Arthur to the detriment of the "behavioural" part of the lock-in process. In fact, there is a sort of mutual (i.e. or circular) form of reinforcement that arises from the influences of the STS in shaping behaviour which makes individual form habits in specific ways that are consistent with the STS operating constraints (Hodgson, 2004, p 656). As mentioned in Ramazotti (2007, p. 774), "consumers can only ask for what is available; they cannot demand what is deemed "technically" impossible to produce. These real constraints eventually feed back on mental habits".

At this stage, it is important to note that such a view obviously contradicts "mechanical reductionism" since it relies on the idea that individuals and institutions (i.e. here under the form of the STS) "mutually constitute and condition each other" (Hodgson, 1997, p. 404). Even though we will further explore the concept of habits which could be seen as focusing on individuals, we intend to do so bearing in mind the broader STS within which those habits develop. The idea is that the current carbon-based STS both constraints and enables the forming of habits[24]. This is in line with recent empirical analysis of energy consumption in Denmark and that display both "similarity and collectivity" as well as "variety and individuality" in behaviours (Gram-Hanssen, 2008, p. 14) as well as with Veblen's acknowledgement of the "varying degrees of ease with which different habits are formed by different persons, as well as the varying degrees of reluctance with which different habits are given up" (Veblen, 1898, p. 108). Assessing individual habits is thus relevant in our framework.

[22] It is to be noted that even though engineer-type bottom-up studies have shed light on the "energy paradox", they share with the traditional approach (i.e. top-down studies based on economic rationality) the absence of socio-cultural influences in their representation of energy consumption (Strang, 1997).
[23] See Maréchal (2007) for an overview of the important insights from this literature for energy analyses.
[24] This idea is obviously strongly connected to Giddens' structuration theory.

Behavioural lock-in under the form of "habits" is important for understanding the continued increase of energy consumption in spite of existing environmental awareness and concern among the population[25]. Indeed, even in cases where people do form intention to perform a given behaviour (e.g. eat more healthily), they sometimes do not implement it because it contradicts existing habits (e.g stop by the fast-food restaurant around the corner). Verplanken and Faes (1999) talk about "counterintentional habits" which, the stronger they are, the more effect they have on behaviour relative to intentions[26]. The failure for intentions to predict behaviour for people with strong habits has been shown to be the case for car use (Verplanken et al., 1998) as well as for food purchases, watching TV news and riding the bus (Ji Song and Wood, 2007).

This may be explained by the fact that - given their automatic nature (i.e directly cued by environmental stimuli) and the minimal cognitive effort they require – habits "assume precedence over more thoughtful actions" (Verplanken and Wood, 2006, p. 93). This is important as in today's society that can be said to be characterised by a feeling of generalised time pressure, people will tend to use simple heuristics such as habits[27]. In fact, the trend towards individualization and the parallel rapid technological and institutional changes that characterises contemporary society engenders a feeling of information overload which renders habits an element enhancing security and comfort (Lindbladh and Lyttkens, 2002). For mainly risk-adverse people, habits can also be considered less risky as outcomes and probabilities are allegedly known with greater certainty[28].

Another reason for the potential persistence of habits lies in the presence of strong short-term rewards that override long term benefits as illustrated by the case of "bad habits" such as smoking where people can not give up the pleasure of a cigarette (i.e. short term reward) even though they formulate strong intentions to quit given the potential health damage it could help avoid (i.e. long-term benefits). This temporal asymmetry can also serve to illustrate the above-mentioned influence of STS and institutions on individual decision-processes like, for instance, in the case of financial markets that make managers develop habits of focusing "on short-term profitability rather than long-term growth and firm survival" (Barnes et al, 2004, p . 373).

Finally, it should be noted that this picture on the pervasiveness of habits is even enhanced through self-reinforcing processes acting both on the general propensity to rely on habits and on the existing habits themselves. On the one hand, the above-mentioned path-dependence of information as well as the tendency to disregard contradictory information[29] make existing habits even more deeply ingrained[30]. On the other hand, at a broader level, people relying on habits adjust their cognitive perceptions, matters of appreciation and normative judgements in coherent structures (Lindbladh and Lyttkens, 2002) which strengthen the idea that the

[25] Concerning the rise of environmental awareness, see for instance the many studies that have used the NEP (New Environmental Paradigm) scale. A survey of a great deal of such studies can be found in Dunlap et al. (2000).
[26] As already suggested in Triandis (1977), p 205, habits thus « become a better predictor of behaviour than behavioural intentions".
[27] Betsch et al. (2004) show the importance of time pressure on the prevalence of counter-intentional behaviour.
[28] As noted in Lindbladh and Lyttkens (2000), this does not preclude the possibility that habitual behaviour can sometimes be more risky like, for instance, the habit of not wearing a seat belt in a car.
[29] Discarding information is a way to solve cognitive dissonance (produced by receiving conflicting information). There is even the presence of what is termed a "confirmatory bias" as people favour and seek out information that confirms their views, beliefs and behaviours (see Faiers et al., 2007, p. 4385). This is in addition to a reduced capacity to detect environmental change in the presence of strong habits (Verplanken and Wood, 2006, p. 92).
[30] As noted in Jager (2003), short term benefits of habits often tend to increase with time.

reliance on habits is dependent upon past experience and conditions[31]. To put in other words, not only do existing habits get more entrenched through time but so does the general disposition to rely on habits.

Given this picture, policies aiming at promoting sustainable energy consumption would thus have to both shift the incumbent STS for it to shape decisions towards the desired direction and also deconstruct habits that this same STS has forged with time (as increased environmental awareness and intentions formulated accordingly are not sufficient in the presence of strong habits).

## 5. Defining "habits" and assessing the strength of their influence on behaviour

At this stage, it is important to provide a "tentative" definition of the concept of habits as we analyse it. Following Verplanken and Aarts (1999), p. 104, we can see habits as "*learned sequences of acts that have become automatic responses to specific cues and are functional in obtaining certain goals or end states*". It is of crucial importance to note that this definition clearly focuses on habits that intervene at the level of actions (i.e. habits that moderate the relation between intention and behaviour[32]) and not really on the influence of habits on intention themselves. The latter is rather the focus of interest of "old institutional" economists like Hodgson who sees established habits as "a potential basis for new intention or beliefs" (Hodgson, 2004, p. 656). According to this view, the word "habit" can also include habits of thoughts and is thus a generative ground of both reflective[33] and non-reflective behaviour. Hodgson's view of habits as a propensity is interesting as it is "both interactionist and evolutionary" (Hodgson, 2004, p. 658) since humans are considered as socially constructed beings but with different predisposition and aspirations. Again, this shows the adequacy of those habits with our framework (i.e. that rests on the concept of circularity between individuals and population) and with the aforementioned approach adopted in Gram-Hanssen (2008).

This "propensity" concept inspired by Thorstein Veblen is thus also very insightful for the issue of energy consumption. If it can be convincingly argued that every individual have habits (i.e. routinised forms of actions), the attitude towards habits in general (i.e. the idea of relying on habits as a general strategy of decision-making) can be different among individuals as it is clearly shown in the qualitative analysis performed in Gram-Hanssen (2008).

Nonetheless, in the following sections, we will solely deal with "habits" in the sense of Verplanken and Aarts (1999). Accordingly, within the view of habits as expressed in Hodgson (2004), we thus only consider the non-reflective behaviours that are generated by the concept of "habits of thought" that act as "filters of experience". In other words, Hodgson's view of habits would refer to the fact that the process of learning "sequences of acts" can itself be performed in a habitual manner. We are thus closer to "habituation" as a "social mechanism" (Hodgson, 2004, p. 652) than to habitual acts[34].

[31] In addition, note that Veblen (1899), p. 108, asserted that habits were stronger if they were "largely and profoundly concerned in the life process" or "intimately bound up with the life history".
[32] It is important to note that habits in the sense of Verplanken and Aarts (1999) include both the "direct" and "interactive" effect of habits on behaviour as defined in Triandis (1980).
[33] This would thus include rational optimisation as a process that relies on habits.
[34] Even though some formulation contained in Hodgson (2004) are somewhat ambiguous with respect to this distinction. In his view, habits seem sometimes to refer to both the process and the behaviour.

This last dichotomy between actions and thought is essential as it allow us to better depict how the somewhat ambiguous and multi-dimensional term of "habits" fits into the perspective on energy consumption that we described in the previous sections. The clarification is not new as Veblen himself clearly distinguished "habits of thought" from "habits of life". The latter are considered as equivalent to the "habits of actions" defined by C. S. Peirce as "a rule of action" allowing to address "familiar circumstances in an effective way"[35]. As summarised in Waller (1988), p. 114, "Veblen, in contrast to Peirce, focused on the social dimensions of habit, rather than on its individual manifestations". However, this does not prevent us from integrating habits into a broader evolutionary framework since "(h)abits of thoughts are an outcome of habits of life" which are themselves "the indirect product of the technological scheme" (Veblen quoted in Brette (2004), p. 253). As mentioned above, social learning being an essential form of learning, this allows both forms of habits to be handed on and thus may serve to explain the above-mentioned fact that people develop habits that are "compatible with a given material and technical environment although they may not be directly confronted with it" (Brette, 2004, p. 259)[36]. If we add to that picture the notion of circular causality we referred to earlier, we end up with a process with positive feedbacks between habits (i.e. "habits of actions" which will be further explored below), institutions (i.e. "habits of thoughts") and the broader "cultural complex" (i.e. notion similar to the aforementioned STS or TIC).

Insert figure 1 about here

Highlighting the role that habits play in mediating behaviour does not mean that we think there is no room left for controlled or deliberate processes in the causal factors of behaviours[37]. Nor, does it imply that there exists a clear division between automatic and controlled processes. In line with the work of Damasio (1995, 2000) that shows the presence of cortical interconnectivity in the human brain (i.e. in a "communication" zone which thus renders the Cartesian idea of dualism obsolete), it is now clear that mental processes generally involve a mix of automatic and controlled attributes at the same time[38]. In fact consciousness and deliberation accompany the process of automatisation.

Besides, since habits are acquired and learned, they originally require deliberation as free will is essential to memorization[39]. The often quoted "driving metaphor" indeed perfectly illustrates that even though experienced drivers are able to change gears without having to think about it, this cognitive automatism was "acquired through a long learning process in which motivation plays a far from negligible role" (Lazaric, 2007, p. 3). Thus, if it can be said that "consumer behaviour is often mediated by processes that occur outside of conscious awareness" (Chartrand, 2005, p. 209), it could also sometimes be qualified as unconsciously resorting to previously consciously determined evaluation. In sum, we have "intelligent habits" while the general disposition to rely on habits could be considered as a form of "habitual intelligence"[40].

Nonetheless, on the spectrum from control to automaticity, habits clearly lie closer to automaticity (Jager, 2003). Even though we may be aware that we rely on habits and

[35] See Brette, 2004, p. 247-248 for a full discussion of this point.
[36] Translation from French is my own.
[37] We already mentioned above that one-shot decision showing a high degree of involvement were more likely to be taken through a deliberation process.
[38] See the work of Bargh (1996) or more recently Betsch et al. (2004) and Jackson (2005).
[39] As shown by Bargh (1997). It is also important to note that social processes like imitation and conformism are involved in habit forming (Hodgson, 2004, p. 652).
[40] This sentence is connected to Dopfer's sentence on "emotional intelligence and intelligent emotions" (see Dopfer, 2005, p.25).

capable of changing them (which distinguish them from purely automatic behaviours that are more emotionally-based and reflex-type of behaviours[41]), we still do it without little cognitive resources involved. It is thus important to insist on the fact that the strength of a habit depends on the "degree to which the behaviour has been automated and is being performed without cognitive elaboration" (Jager, 2003, p.2-3). Therefore, habits should not be simply equated with frequency of past behaviour. As claimed in Verplanken (2006, p. 639), "whereas repetition is a necessary condition for a habit to develop (…) it is not repetition *per se* that matters".

Therefore, the crucial feature that characterises habits[42] (i.e. beyond their necessary "history of repetition") is their automaticity or more precisely "the automatic elicitation of behaviour upon encountering specific cues" (Verplanken and Orbell, 2003, p. 1317). To put it in other words, provided that a habit has been formed through the satisfactory repetition of a given behaviour and that the goal associated with that habit is activated[43], the presence of the specific cue automatically triggers the habitual behaviour[44].

Following the work of John Bargh (1994), automaticity can be considered as displaying four distinct features (the "four horsemen of automaticity"): lack of control, lack of awareness, efficiency (i.e. saving up cognitive resources than can be used for other purposes) and lack of intention. Verplanken and Orbell (2003) provide evidence that habits tend to display the first three features of automaticity, at least to a certain extent (which can serve to distinguish the strength of different habits). For instance, even though habits are controllable in principle, it is often quite difficult to override strong habits such as smoking cigarettes (Verplanken and Faes, 1999). Dijksterhuis et al (2005) as well as Chartrand (2005), provide ample and well documented evidence regarding the minimal awareness that is involved in performing consumer behaviour. Regarding the unintentional feature of habits the picture must be somewhat qualified: if habits can turn to be "counterintentional" (Verplanken and Faes, 1999), the fact that they are functional (i.e. goal-directed) make them intentional (or volitional) to some degree (Polites, 2005). All together, this again shows that, as mentioned earlier, habits are not purely automatic as reflex-type of behaviours could be deemed to be.

## 6. Conclusion: the need to break unsustainable energy "habits"

In our perspective, the important question is thus to assess whether and in what proportion energy consumption is generated by habitual (i.e. not controlled) behaviour. This is obviously an empirical question but based on the three conditions identified in Jackson (2005) – degree of involvement, perceived complexity and degree of constrain - we may suspect this part to be high as claimed by Shove (2005). Indeed, the decisions taken in everyday energy consumption are likely to be considered as having less important consequences than other decisions. According to the work of Tversky, people are more likely to use simple heuristics (such as habits) in such situations. Needless to say, the low complexity of decision tasks related to everyday energy consumption does not require a lot of cognitive effort either. Finally, as we mentioned above, the constraints of today's society (i.e. the feeling of time pressure as well as the information overload that characterise it) tend to favour the use of habits. All together, this suggests that everyday energy-related behaviours do not require much intentional effort to be set in motion such as it has been shown to the case of, for

[41] As noted in Limayen et al. (2001), p. 277, habits are, unlike reflexes, "based in part on the ability of the individual to learn or acquire/absorb the particular behaviour into a cognitive schemata or script".
[42] From now on, habits are to be understood in the sense of Verplanken and Aarts (1999) (unless specified otherwise).
[43] The functionality (or the goal-directed nature) of habits is important as shown in Ouellette and Wood (1998).
[44] Veblen (1899), p. 106, also mentioned the fact that habits were "a method of responding to given stimuli".

example, food consumption of adolescents in Kremers et al., 2007. For Schäfer and Bamberg (2008), p. 213, energy use along with nutrition and mobility are "forms of behaviour that are hardly reflected upon in everyday life".

The existence of habits in domestic energy consumption will most likely limit the effectiveness of incentives as these traditional measures do not specifically address the performance context and the social and structural influences that shape and maintain these habits. For instance, the efficiency of information campaigns will be reduced by the presence of the above-mentioned "confirmatory bias" in information search displayed by people with strong habits. Efficient energy policies should thus be designed with the aim of disrupting unsustainable habits. Starting from the very definition of habits, it seems straightforward that breaking existing habits will require change in environmental cues and/or induced deliberation while time and repetition will be needed to promote alternative habitual behaviour.

Since habits can be seen as the automatic cuing of behaviour induced by stable features of performance context[45], analysing the habit-triggering cues in the field of energy consumption is a first step towards disrupting existing habits. Indeed, as noted in Verplanken and Wood (2006), p. 9, "the dependence of habits on environmental cues represents an important point of vulnerability". Following Ji Song and Wood (2007)[46], the main context cues include physical surroundings, social surroundings, temporal perspective, task definition, antecedent states.

As far as household energy consumption is concerned, physical location is obviously an important environmental cue. Accordingly, economic incentives aimed at improving energy efficiency would probably be more effective if supporting information was specifically targeted towards new residents (whose previously-determined habits have been perturbed with the change of physical location) than they would be among the population of incumbent residents. This is supported by the evidence contained in Wood et al. (2005) that shows how a change of location would induce decisions to be more in line with intentions that with habits.

Beyond the importance of cues, we also saw that the persistence of habits could be partly explained by the presence of short-term rewards coupled with what we called the problem of "temporal asymmetry". Besides disrupting the performance context of habits[47], another policy measure that could also turn out to be effective would be to reduce the direct rewards experienced when performing the habitual behaviour. Jager (2003) provides some interesting examples of such rewards-reducing strategies like, for instance, applying nasty substances on fingernails to avoid biting them or the use of anti-alcohol pills.

Whereas there does not seem to be any obvious similar strategies in the field of domestic energy consumption, policy-makers could turn to their counter-parts which aims at increasing the rewards attached to the alternative behaviour. An example of such a strategy is also provided in Jager (2003) who mentions the Dutch policy of placing waste nets along the roads in order to turn correct waste disposal into a rewarding game. Making the alternative behaviour more rewarding seems to provide an interesting point on which to found

[45] For an overview of studies that show the ways in which behaviour is influenced by performance context, see, for instance, Dijksterhuis et al. (2005), Chartrand (2005) and Wood et al. (2005).
[46] Their list is mentioned by the authors as coming from the literature on « situational variables » in consumer research.
[47] A good example of a perturbed habit context is the 8-day closure of a freeway that lead to the development of a new script-based travel mode choice (Fujii and Gärling, 2003).

sustainable energy measures. This is confirmed by the answers provided by respondents that have taken part – on a voluntary basis - in the Brussels Energy Challenge as it is the very notion of "challenge" that is considered to be most "interesting" aspect of the proposed policy[48]. The participants also considered the idea of challenge as a facilitating factor in implementing their behavioural change on a daily basis. In fact, as mentioned in Matthies et al. (2006), p.94, commitments strategies (i.e. as the Brussels Energy Challenge) enhances "self-satisfaction as a result of acting in accordance with personal values" and therefore increases "the cost of not acting".

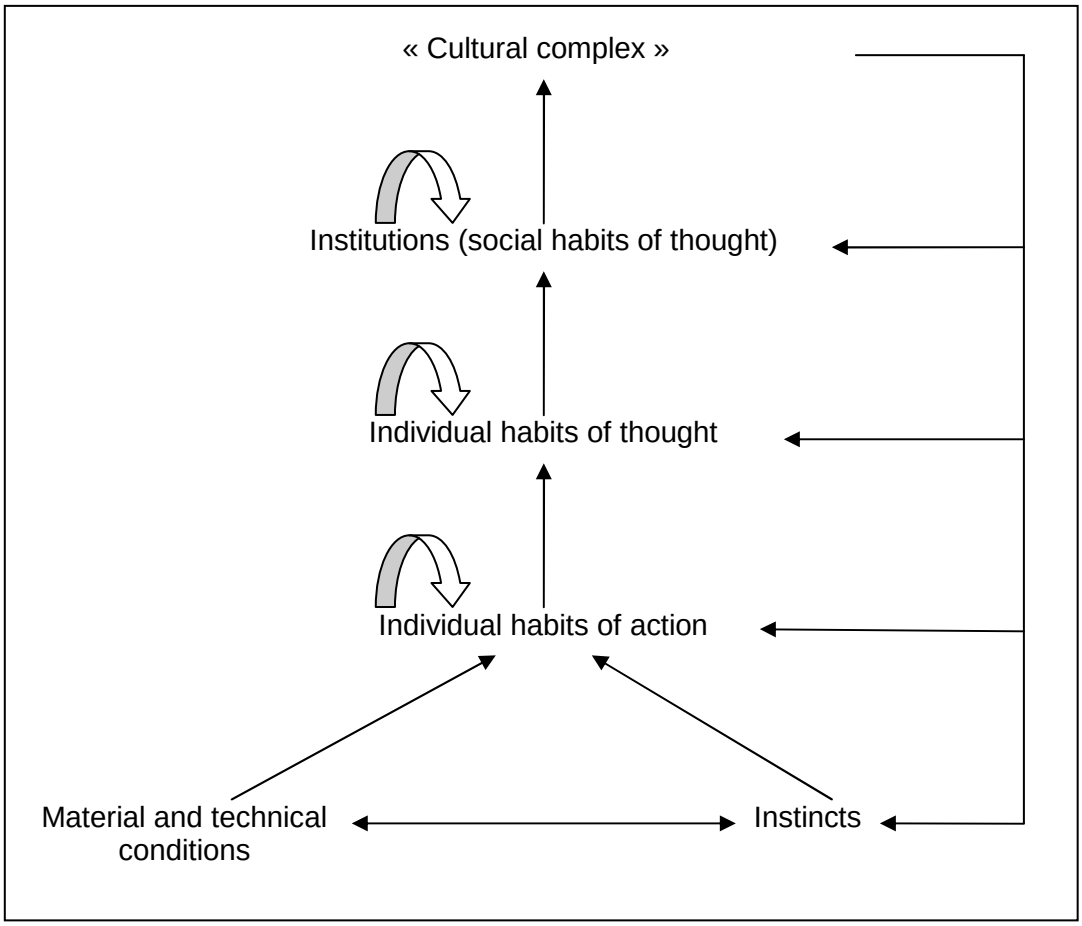
Another strategy that builds on predictions from social identity theory and social comparison theory is the use of comparative feedbacks. These have been shown to increase the performance through raising motivation in a study of two units of a metallurgical company (Siero et al., 1996). In one unit, employees received information about energy conservation, had to set goals and received feedback on their own conservation behaviour. In the second unit the only difference was that they also received information about the performance of the other unit. As expected, employees who received comparative information saved more energy[49].

Finally, it is important to recall the context within which habits develop. Bearing this is mind, it is obvious that disrupting an unsustainable habit of energy consumption is only a first step as policy-makers must also ensure the new (more sustainable) behaviour is tested, adopted and maintained. As mentioned in Matthies et al.(2006), p. 104, "a temporary situational change as a defrosting of habits can only lead to a long-term change to new behaviour if the evaluation of the new behaviour is positive, which require that the internal and external determinants are in favour of the new behaviour". Within our framework, this clearly means that external aspects (i.e. wider societal, cultural, institutional and technological aspects) must be taken into account. Policies should be aimed at helping consumer "to escape the restrictions imposed on their knowledge by the mental habits they have acquired" (Ramazzotti, 2007, p. 776).

[48] It has a 9.06 on a scale ranging from 1 to 10 anchored by « not at all interesting » to "very interesting ». For instance, "the feeling of acting individually to fight against a global issue" has a score of 8.30 whereas the score of "individual follow-up" is of only 5.60. The complete result can be found in the June 2007 Report (in French) on www.defi-energie.be

[49] The authors note that it is "remarkable that behavioural change took place with hardly any changes in attitudes" (Siero et al. 1996, p. 245).

**Figure 1: Veblenian process of institutional self-reinforcement**




*Source*: adapted from Brette (2003, 2004)

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