PROJECT DELIVERABLE REPORT

NAIADES

Greening the economy in line with the sustainable development goals

DELIVERABLE 6.4

REVIEW OF NON-ICT PUBLIC AWARENESS AND BEHAVIOURAL CHANGE INTERVENTIONS

A holistic water ecosystem for digitisation of urban water sector
SC5-11-2018
Digital solutions for water: linking the physical and digital world for water solutions

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1. Contents

Summary

The report presents existing evidence in research and practice which summarise the major principles and current developments on non-ICT Public Awareness and Behavioural Change interventions. Firstly, the report focuses on the theoretical background of behavioural change. It thus documents the different approaches to behavioural change interventions. Secondly, it delves on the ways in which behavioural insights have influenced public policy and awareness campaigns. Thirdly, it documents the ways in which behavioural public policy has infolded in the European Union throughout the last two decades. Fourthly, the report summarizes some critical remarks and reflections concerning the use of behavioural insights in public policy and awareness campaigns. Finally, it delves on the specific subject of Awareness and Behavioural Change Interventions in the Water Sector. It first reviews behavioural explanations to water and sanitation practices/decisions. It then summarizes and explains awareness and behavioural change models in the water sector. It concludes by focusing on water, awareness and behavioural change interventions and on the ways in which these can inform NAIDES non-ICT interventions.

1 Introduction

A number of the current societal problems can be directly or indirectly be related to human behaviour. A recognition of the vital role played by behavioural change in finding solutions to societal problems has prompted governments to engage researchers from different disciplines and backgrounds within the scholarships of social and behavioural change to guide policy and advance efficient behaviour change interventions, aimed at behaviour-related challenges (Hagger, Cameron, Hamilton, Hankonen, & Lintunen, 2020; Straßheim & Beck, 2019).

This report presents a review of the literature related to public awareness and behavioural change interventions. Frequently these interventions draw on the work of behavioural sciences such as behavioural economics, cognitive and social psychology. These disciplines systematically analyse the processes underlying human behaviour, through observation and experimentation (Hagger, Cameron, et al., 2020). Through this analysis and in order to understand the ways in which humans behave and make decisions, these disciplines combine knowledge and research methods from the fields of psychology, economics, sociology, and neurosciences. Within these disciplines, behavioural economics is perhaps the one with more influence among policy-makers and consultants, and has become more important within mainstream economics specially after cognitive psychologist Kahneman won the Nobel Prize in Economics in 2002 (Graf, 2019).

The report presents existing evidence in research and practice which summarise the major principles and current developments on non-ICT Public Awareness and Behavioural Change interventions. Firstly, the report focuses on the theoretical background of behavioural change. It thus documents the different approaches to behavioural change interventions. Secondly, it delves on the ways in which behavioural insights have influenced public policy and awareness campaigns. Thirdly, it documents the ways in which behavioural public policy has infolded in the European Union throughout the last two decades. Fourthly, the report summarizes some critical remarks and reflections concerning the use of behavioural insights in public policy and awareness campaigns. Finally, it delves on the specific subject of Awareness and Behavioural Change Interventions in the Water Sector. It first reviews behavioural explanations to water and sanitation practices/decisions. It then summarizes and explains awareness and behavioural change models in the water sector. It concludes by focusing on water, awareness and behavioural change interventions and on the ways in which these can inform NAIDES non-ICT interventions.

2 Methodology

To write this report, we reviewed relevant literature concerning Public Awareness and Behavioural Change interventions. The focus was specifically on Review of non-ICT interventions as they interact with public policy. Special interest was placed in literature concerning the European Union and water conservation interventions. We started with two up-date handbooks on Awareness Campaigns and Behavioural Change Interventions: the *Handbook of Behavioural Change and Public Policy*, published in 2019 by Edward Elgar Publishers and T*he Handbook of Behaviour Change* published in 2020 by Cambridge University Press. We also used databases from the University of Amsterdam to identify additional resources.

3 Behavioural Change: a theory and evidence-based approach

Throughout the early twentieth century neoclassical economics understood people as fully self-transparent decision-makers who behave like homo economicus (economic men). Since the 1950s, and increasingly since the late 1970s, behavioural economists started becoming more and more important within mainstream economics. Drawing from other disciplines such as psychology, they had started rejecting theoretical approaches that understood humans as rational entities. Critical to the theoretical usefulness of homo economicus, behavioural economists argued that the standard economic model of human behaviour was imprecise as it was built on the idea that humans exhibit "unbounded rationality, unbounded willpower, and unbounded selfishness" (Hansen, 2019). Behavioural economists have a different take: instead of and homo economicus, they understand individuals as equipped with what Herbert Simon (1972) has called "bounded rationality". Simon argued that human decision-makers should be understood "less as gods and

more as animals" (Graf, 2019, p. 25). In this sense, behavioural economists substitute the "economic man" with a view of humans as predictably irrational. That is as "choosing organisms of limited knowledge and ability" (Graf, 2019, p. 25).

With the advent of behavioural economics rationality stopped being thought of as the object of study and regulation of human behaviour. Behavioural approaches did not see recurring departures from the predictions of rationality as "anomalies" or failures of the rational man, but instead as systematic biases, resulting from cognitive mechanisms:

> "The picture emerging of human agency ultimately became one of bounded rational, slow reflective agency, imbedded within and fed by fast non-rational automatic processes activated and affected by subtle contextual features that should no matter in principle that is according to the theory of rationality, but yet affect behaviour systematically in practice" (Hansen, 2019, p. 66)

Throughout the period between 1970-2010, developments in the group of behavioural sciences, have demonstrated how human decision-making is not only boundedly rational, but also systematically biased, and habitual. Complex decision making is therefore influenced by cognitive biases that may cause irrational decision patterns. This tends to occur more frequently in unfamiliar and complex decision-making contexts (Graf, 2019; Hansen, 2019). In parallel, the field of social psychology worked on Dual Process Theories in order to explain how the apparently irrelevant features of decision-making contexts influence behaviour. Although there are some differences between these theories, they all explain and predict human behaviour by suggesting that there are two qualitative kinds of reasoning: automatic and non-automatic. Automatic reasoning is however not a reflex, Dual Process Theories argue that automatic processes (such as biases) can be detected through introspection and subsequently blocked through, for example, self-regulation (Hansen, 2019).

In this vein, behavioural sciences explain how and why people can fail to act on their well-informed preferences and subsequently fail to achieve their preferred ends. Different authors (see, Hagger, Cameron, et al., 2020; Hansen, 2019) have then pointed out that, by highlighting and documenting human bounded rationality, bias, and steady habits, behavioural sciences can provide important insights for public policy. It has also being shown how by ignoring behavioural insights and assuming human rationality and assuming the existence of homo economicus, public policies can fail to achieve their intended objectives. Behavioural sciences have emphasized the political and public policy importance of their research. By systematically promoting the concept of behaviour and deeply influenced public awareness campaigns and public policy in general. Behavioural change inspired policies, thus share a similar conceptualization of the citizens whose behaviour is to be regulated (Straßheim & Beck, 2019).

Similarly, authors such as Gilad and Kaish (1986) have argued that it is only through the empirical study of human behaviour that governments would had a better chance of judging whether public policy achieves the goals its proponents intended. One of the most influential works in public policy is that of Thaler and Sunstein (2008) who introduced the concept of "nudge". These authors argued that since unfortunate decision-making patterns are the result of human bounded rationality, bias, and steady habits, they can be "nudged" towards a better one. This can be done by one incorporating behavioural insights about the same kind of boundaries, biases and habits into the choice architecture surrounding that behaviour. Choice architectures are the contexts (physical, social, and psychological aspects) that influence human choices (Straßheim & Beck, 2019).

4 Different theories behind behavioural change interventions

This section of the review addresses different approaches of behaviour change which have been applied to identify behavioural determinants, predict behaviour, and inform the development of behaviour change experiments, and interventions.

4.1 The Theory of Planned Behaviour

The Theory of Planned Behaviour (TPB) has been used as a framework for behaviour change interventions. Within the TPB framework, motivation for behaviour change can be achieved in two ways: through self-generation; as in when a person decides to engage in a behavioural change, and motivating/encouraging people to engage in an anticipated behaviour (Ajzen & Schmidt, 2020). Among the elements that define TPB, special attention should be paid to the action involved, the context in which the action occurs, and the time frame within which the action takes place. TPB, posits that an intervention must first of all be designed to effect behavioural, normative and regulate beliefs related to the promoted behaviour – to a level where the interventions is able to produce considerable changes in behaviour and where subjective norms can be anticipated (Ajzen & Schmidt, 2020). The use of the TPB framework can deliver information about the different characteristics that inspire a behaviour of interest and also deliver information about resources and limits that can inspire people to adopt an alternative plan (or change their behaviour).

4.2 Social Cognitive Theory

Social Cognitive Theory (SCT) is also been developed as a framework to transform behaviour. SCT has two main principles: the principle of learning by observation and the principle of learning in social contexts. Within this framework, environmental reinforcement and individual reinforcement are necessary to sustain behaviour over time. Luszczynska and Schwarzer (2020) identify seven techniques that form the core of SCT; (1) modelling or demonstration of behaviour; (2) provision of instructions on how to perform a behaviour; (3), provision of general encouragement to change behaviour; (4) prompting barrier identification; (5) setting graded tasks; (6) prompting intention formation; and (7) provision of information on consequences. The core strength of SCT lies on constructs such as self-efficacy and outcome expectations. Luszczynska and Schwarzer (2020) argue that SCT is a response to behaviourism, forms the basis for other theoretical developments, and also serves as a principal approach that guides the interventions intended to change behaviour.

Future research should go beyond the mere study of linear direct effects of SCT concepts and behaviours to the consideration of the more complex operating structures of change (Hagger, Cameron, et al., 2020). The theory has been widely applied and has shown success, however it is possible to identify certain weaknesses. Emotion-related and nonconscious processes, for example, are not considered. Besides, the causal process and the theorized interplay of the concepts, are not explicitly recognized – and this situation makes it difficult to make precise and specific predictions. Also, there is no detailed collection of assumptions or projections that offers a conclusive, systematic representation of the entire theory from which effective behavioural change approaches can be established. Critiques also suggest that, because some elements of the theory have not been explicitly explained or laid out in depth, the theory should be considered as a framework that directs ideas on behavioural effects instead of it being recognized as theory of concrete predictions (Luszczynska & Schwarzer, 2020).

4.3 Common-Sense Model of Self-Regulation

The Common-sense Model of Self-regulation defines how beliefs, emotions, action plans, and assessments of improvement toward behavioural goals can impact behaviours in intimidating or perilous circumstances (Cameron, Fleszar-Pavlović, & Khachikian, 2020). The model provides a thorough framework for understanding behaviour in such (intimidating or perilous) circumstances and recognizes cognitive, emotional, and behavioural processes that can be triggered to change behaviour. In this vein, model emphasizes the roles of individuals' common-sense beliefs about threats and rules for coping decisions: "perceptions of threat cues simultaneously activate problem-focused self-regulation via efforts to control the threat itself and emotion focused self-regulation via efforts to manage distress-related arousal" (Cameron et al., 2020, p. 61). Because the main emphasis of the model is on health-related behaviours, the model has been applied with the purpose to promote behaviours such as genetic testing for disease risk; cyclical behaviours such as flu vaccinations; and lifestyle habits such as wearing sunscreen.

4.4 Self-Determination Theory

Self-determination Theory is a meta-theory that assumes a needs-based, organismic method to acknowledge human behaviour. It involves the provision of an understanding to the fundamental needs and conditions in a person that prompts a motivated behaviour. Contrary to social cognition and motivational theories this theory also focuses on quality of the motivation as the main cause of change rather than on only the quantity of the motivation (Hagger, Cameron, et al., 2020; Hagger, Hankonen, Chatzisarantis, & Ryan, 2020). Also, the emphasis on a person's sources of motivation and the relating of behaviour to psychological needs makes this theory different from other theories. One major principle of the self-determination theory is that, when rewards are introduced in circumstances where people are already motivated intrinsically, the perception of "cause" of their behaviour can be shifted from the main interest in a mission to the reward – this undermines the intrinsic motivation. The theory differentiates between two general classes of motivation: (1) autonomous; which is characterized by motives for a behaviour that is self-approved and voluntary and (2) controlled; defined as a behaviour motivated or determined by external events or pressures. The theory is composed of interlinked "mini theories" which in turn focus on the identification of the main concepts and processes that relate to specific characteristics of the motivation and its background. Hagger, Hankonen, et al. (2020) enumerate three of these mini theories that are particularly relevant to sustained behaviour and behaviour change.

(1) Cognitive evaluation theory; this involves the concept of intrinsic motivation. Intrinsic motivation involves an engagement in actions or behaviours for their essential satisfaction with no dependence on outside reward eventualities or support.

(2) Organismic integration theory; this covers the differentiation between intrinsic and extrinsic forms of motivation through an expansion of the supposed locus of causality. It also summarises the procedures which determine the kind motivation experienced during the performance of a specific task.

(3) Basic needs theory; this further proposes three main psychological needs which support the ideal functioning and wellbeing. These include the need for autonomy, the need for competence and the need for relatedness.

4.5 Habit Theory

Habits as described by Habit Theory are cue-action relations in memory, that are triggered when signals/cues are detected (Orbell & Verplanken, 2020). Habits according to this theory are thus cue-dependent, they are activated when a cue is detected (Cue-Contingent), but they operate independently from goals and rewards. These characteristics make habit theory a powerful instrument that can be used for the development of a sustainable behaviour change intervention. Habits are developed when environmentally salient and observable features instead of those that need conscious considerations and attention are developed. Establishing habits takes time, and requires the adequate intervention follow-ups that can detect the asymptotic development of involuntary association in memory and to establish the right dimensions of interventions needed to create a lasting behaviour change (Orbell & Verplanken, 2020).

Habits are capable of ensuring that innovative desired behaviours are endorsed constantly and always remembered. Nonetheless, the development of new habits occurs slowly and it requires that (1) specific behavioural needs are identified and learned, so as to allow interventions to be performed easily with no resistance and a conducive environment. (2) the identification of a vital cue/signal and (3) forming and enacting a strategy or commitment for a specified period, to execute a vital action when a cue is triggered (Orbell & Verplanken, 2020). Habits are a strong basis for behavioural change resistance, therefore it (habit) concentrates on either avoiding the triggering of a saved cue-response linked in memory. This happens through the reduction of exposure to the signal or by avoiding the execution of the usual response through disregard of the signal, through deliberate response suppression or through the substitution of a response. Habit Theory further argues that habits are discontinued or deactivated when individuals are faced with changes in their environment or when there is a change context (Orbell & Verplanken, 2020).

4.6 Ecological Models

Ecological models can also be used for understanding and altering of behaviour from early-childhood to adulthood. Ecological models have been designed to understand and shape human behaviour at the individual, social, and environmental levels (Salmon, Hesketh, Arundell, Downing, & Biddle, 2020). Such models are usually matched with specific theories that concentrate on moods, beliefs and behaviours. Ecological models have been mainly applied in the identification of various stages of influence, through an exploration of connections or factors that impact behaviour. In the ranks of behaviour change research, ecological models have been used mainly at the initial phases of the behavioural epidemiology framework, to assist in framing an understanding of behaviours and goals for interventions. The models have also been used to guide and produce a structure for interventions and targets (Salmon et al., 2020).

4.7 Integrated Theories

According to Hagger and Hamilton (2020), the different theories that have being used to predict/inform behaviour change and the concepts of which they cover, present difficulties in the integration of research and also hampers efforts designed towards the identification of the main sets of concepts that may account for the difference in targeted behaviours in related settings and populations. Another problem related to the theories of behaviour change presented in this chapter also involves the failure of the sets of concepts/constructs and the related procedures to account for a practical percentage of the difference in behaviour. Theory integration provides a well-designed solution to these challenges, by breaking down concepts or constructs of same or equal content across theories and the integration of extra concept and related procedures to attain theories that provide enhanced extrapolative skill at minimum cost (Hagger & Hamilton, 2020). Examples of theory integration models that addresses such gaps include the major theorists' model and willingness model. Among others, theory integration helps to address the voids or borderline conditions of theories that puts restrictions on their ability to describe behaviour. Theory integration also aids in the management and reduction of excessiveness across theories through the identification of sets of core constructs, which are ideally efficient in forecasting behaviour.

5 Behavioural Change and its influence in public policy

Behavioural public policy needs to be seen as part of a much broader historical movement to regulate citizen's behaviour. By the time in which behavioural change insights started influencing public policy, global public policy had been deeply shaped by Keynesian, especially during the 1970s and subsequently by rise of neoliberal ideas in the 1980s (Hansen, 2019). Behavioural insights pointed to the inability of rational approaches to public policy, which saw humans as inherently rational, to cope with complex problems, policy failures and variations in compliance (Straßheim & Beck, 2019). Howlett (2019) summarizes a number of "compliance problems" or barriers to compliance faced by public policy, including incentive and sanction problems, where incentives (positive or negative) are insufficient to ensure compliance; monitoring problems; resource problems; autonomy problems (where targets do not have the power to make decisions to comply); information problems; attitude problems where communities are mistrustful to comply; and herding effects where people follow their peers without considering alternative actions.

Traditionally, public policy made use of laws, financial incentives and educational measures, which aimed to address the rational *homo economicus*. That is, the decision-maker who was supposed to rationally evade punishment, maximize gains and behave in accordance with certain principles. By contrast, behavioural experts draw on academic experiments and publications in behavioural science fields: mainly behavioural sciences, psychology or neurosciences (Ciriolo, Loureno, & Almeida, 2019). Authors drawing on behavioural insights argue that the lack of behaviourally informed foundations of public policy was behind the inability of rational regulation to effectively address problems that are ultimately rooted in non-rational aspects of human behaviour, such as the obesity epidemic (Straßheim & Beck, 2019). While behaviour causing these problems are often intentional, psychological factors seem to cause an irrational departure from the norms of rational decision-making that we do not rarely intuit. In this context, behavioural insights offered new opportunities for the state to intervene and increase compliance among the population (Hagger, Cameron, Hamilton, Hankonen, & Lintunen, 2020; Hansen, 2019).

As behavioural insights gained ground among public policy studies, there was an increase in think tanks and consultancies. They have also made marked progress in providing an alternative view of human behaviour providing the foundations of the new emerging paradigm of Behavioural Public Policy (Hansen, 2019). It is worth noticing how in the case of behavioural public policy science (behavioural sciences such as behavioural economics, cognitive and social psychology) is asked to provide evidence for political/administrative decisions and how scientific expertise has become a major source of the political legitimation of public policy. From a general perspective, behavioural public policy includes every policy initiative that is tested, informed or at least aligned to evidence from behavioural research: "Behavioural public policy thus includes all means and modes of public policy aiming at influencing individual or collective behaviour by using insights" (Hansen, 2019, p. 65). The World Bank, the European Commission and the United Nations have all documented their efforts to implement behavioural insights and public awareness interventions in a wide variety of policy areas such as development, taxation, energy, mitigation of climate change, sustainable consumption, pensions, public health, employment, poverty, gender mainstreaming and anti-corruption policies (Hagger et al., 2020; Straßheim & Beck, 2019). In 2015 the World Bank published its yearly World Development report stressing the need for an expanded understanding of human behaviour and in 2017 the OECD published behavioural insights and public policy, lessons from around the world. Inter and transnational organizations such as USAID, AusAID, UNICEF, the World Health Organization, and the UN and NGOs and multinational organizations are playing an important role for the diffusion of behavioural approaches in regions like Africa (Graf, 2019).

Behavioural public policy is not simply a tool. It raises pressing questions about how we imagine the future relations between science, policy and society in a globalized world. There are three basic strategies for applying behavioural insights in public policy: push, curling, and nudge (Hansen, 2019). Challenged with noncompliance and behavioural problems, policy-makers can choose to *push* in the sense of strengthening the aspects of the choice architecture that provide rational reasons for action beyond what ought to be required from a purely rational approach. The strategy behind push is to surpass any irrational psychological mechanisms which would otherwise give rise to the irrational behaviour observed. The strategy is illustrated by policies substantially increasing tax on alcohol, cigarettes, and other products of self-harm and provide severe or public stigmatization or punishment by law for even minor offences beyond what ought to be required from a purely rational approach. *Curling* is the second behavioural policy approach used by policy makers to change/challenge patterns of irrational behaviour. By curling public policy attempts to weaken, remove and/or counter the activation of the irrational psychological mechanisms that normally give rise to the pattern in question. The curling strategy is illustrated, for example, by the presentation of risky decisions in frames that people better understand, EU's ban on pre-ticketed boxes on shopping website that make it easy to fill online forms by minimizing the number of clicks the user has to perform. This ban is made to aid consumers, mandatory cool down periods while they online shop. Finally *Nudging* is the third, and perhaps most prominent type of behavioural public policy. Based on insights about behavioural biases and mental shortcuts that ease the cognitive load of making a decision, *nudges* specifically target the mechanisms of the cognitive system without resorting to either force or incentives.

> "A nudge is a function of (1) any attempt at influencing people's judgements, choices or behaviours in a predictable way that is (2) motivated because of cognitive boundaries, biases, and habits in individual and social decision-making posing barriers for more people to perform rationally in their own self-declared interests, and (3) which works by making use of those boundaries, biases and habits as integral parts of such attempts" (Hansen, 2019, p. 70)

The concept of "*nudging*" was first developed by Thaler and Sunstein (2008). Nudges are supposed to make use of these biases to steer people's behaviour in the direction of their self-defined interest –mostly by re-designing the decision making environment (choice architecture). Proponents thus argue that policy-makers should become designers of choice architecture.

Thaler and Sustain argue (2008) that public policy-makers can rethink and complement traditional regulations with nudges to influence citizens' behaviour in cost-effective and less ways without restricting freedom of choice, imposing mandatory obligations or changing incentives. They explain how nudges may avoid some of the challenges facing traditional public policies, such as costly procedures, ineffective campaigning, and invasive choice regulation, such as bans. For them, nudges attempt to influence behaviour through the activation of a psychological mechanisms through the modification of contextual features that incentivize irrational behaviour.

Through nudging behavioural public policy aims to better understand the complexity of individual and collective behaviour. The difference between nudging and other public policy tools such as co-production, deliberation, faith-based public services, and social marketing is that nudging both presupposes and exploits the seemingly irrational human behaviours and makes use of cognitive boundaries, biases, and habits to influence citizens to act in their best interests (Straßheim & Beck, 2019). Nudges therefore differ from other policy tools because they do not aim to convince the rational decision-maker (*homo economicus*) by giving him/her reasons to act in a certain way. Laws, for example, address the rational, self-controlled agent threatening him/her with punishment. Economic incentives, in turn, aim to convince the so called selfish utility-maximizing human by promising gains or threatening losses. In a similar way, educational campaigns cater to the rational/educated and strong-willed individual who can live up to certain principles. In a different way, behavioural policy instruments such as *pushing, curling, and nudging* try to influence the decision-maker in more subtle ways. They are designed to influence the outcome of decision-making processes by framing them in particular ways, by changing the architecture of environment of the decision (Graf, 2019; Hansen, 2019). Unlike laws, economic incentives and education campaigns, behavioural policy instruments do not assume actors' rationality and awareness and in turn identify and analyse the variety of environmental and cognitive factors that influence people's preferences and decisions (Hagger et al., 2020). By applying the findings of behavioural research to policy-making, behavioural public policy thus shifts the focus zooming on the human by asking the question: why they behave the way they do?

Behavioural public policy has extensively developed corrective procedures, modes of removing biases and instruments of behavioural intervention to improve collective judgement/thought processes and risk perceptions. It is also important to mention that nudges can be integrated or combined with traditional public policy. It can likewise inform more traditional forms of intervention such as regulations/laws, economic incentives, and education campaigns.

Behavioural public policy instruments developed through randomized field experiments, have been highly relevant in the context of development and sustainability policies. In the field of development policies, behavioural sciences have documented how poverty creates *cognitive burdens* for the poor leading to disadvantageous behaviours such as loss-aversion or procrastination (Straßheim & Beck, 2019). In this vein, development policy has been drawing from behavioural insights and distancing itself from market-oriented policies and from more traditional large-scale state interventions (Howlett, 2019). In parallel, the area of sustainability policies have focused on specific consumption behaviours that are thought to be responsible for the unsustainable patterns that characterize contemporary scenarios. Behaviours such as those involved in household energy use, mobility/transport, food consumption, shopping activities, tourism or waste production have been tested in randomized controlled trials, small-scale labs and field experiments (Ciriolo et al., 2019).

Different authors highlight that future research will have to focus on the potential of nudging in normatively ambitious and empirically complex governance settings. That is, the potential of behaviourally-informed regulations not only to *push/curl/nudge*, but also to protect consumers and citizens through the provision of institutional spaces for citizen's engagement, such as spaces of consultation and deliberation. Tallacchini (2017), for example, have come up with instruments such as Participatory Design and Rights-in-Design in order to democratize and open up choice architectures. These instruments use the word "citizen" rather than "consumer" in order to frame the discourse in a broad political and social perspective, where learning how to collectively contribute to a better society is a primary concern. If regulation is increasingly seen as a learning process citizens should participate in designing this process.

6 The application of behavioural public policy in Europe

At the EU level, the integration of behavioural insights began in 2008 in consumer and competition policy. The application of behavioural public policy can also be traced to the creation of the UK government Behavioural Insights Team in 2010. After this four EU counties, Germany, the Netherlands, France, and Denmark, established behavioural teams. Moreover, the European Commission's in-house science service, the Joint Research Centre (JRC) has created the EU Policy Lab a multi-disciplinary team, and with a Foresight and Behavioural Insight Unit. This Unit is tasked with exploring and re-examining policy issues in the fields of foresight, behavioural insights and policy design (Howlett, 2019).

Specifically, the Unit was tasked with collecting behavioural evidence in the policy areas of financial services and tobacco, energy labelling, online gambling and food information. In order to fulfil these functions, the Policy Lab is supposed to coordinate existing behavioural research capacity at the JRC and EU agencies and to take stock of past experiences with behavioural public policies. To comply with its mandate the Unit (1) organizes thematic workshops on policy issues from a behavioural perspective, (2) offers training modules, and (3) engages with policy implementation problems and solutions from a behavioural perspective (Ciriolo et al., 2019). Since May 2017, the European Commission has also been training public officials in behaviourally-tested interventions in European countries covering a broad spectrum of areas and topics ranging from consumer protection and competition policy, energy and environment, finance and taxation to public health, welfare, and employment.

Ciriolo et al. (2019) describe how behavioural insights and studies have been incorporated into behavioural public policy in Europe in different ways (see Table 1).

Behavioural Public Policy in the EU	
Behaviourally tested initiatives	Initiatives being explicitly tested or scaled out after an experiment.
Behaviourally informed initiatives	Initiatives designed explicitly on previously existing behavioural evidence
Behaviourally aligned initiatives	Initiatives that are aligned with behavioural evidence.

Table 1. Behavioural Public Policy in the EU. Source (Ciriolo et al., 2019)

In EU countries behavioural insights have gone beyond nudges and supports more traditional forms of public policy. Ciriolo et al. (2019) present the example of road safety policy where European legislators took inspiration from behavioural studies when they decided in 2006 that wearing seatbelts for all vehicles across the EU should become compulsory. Resistance to wear seatbelts had been explained from a behavioural perspective: people had received the immediate cost of wearing seatbelt as larger than its future (probabilistic) benefit, a gesture called myopia or short-sightedness in the behavioural literary. Behavioural insights also pointed to the fact that people were overconfident that road accidents would only happen to others and thought of the car as a space of freedom and adventure (incompatible with seatbelts).

Likewise, the European Commission also took inspiration from behavioural studies when they decided to intervene in the Internet Explorer competition case, in order to tackle a case of abuse of dominant position. Throughout the early 2010s Internet Explorer was tied to Windows. Instead of imposing fines (monetary sanctions) to the supplier for infringement of European competition law, the EU focused on the "demand side". Users of Windows based personal computers were then provided with the option to choose an alternative browser, via an on-screen announcement. This instrument pushed consumers to make an active choice as to their preferred browser thus tackling the dominant position of Windows/Internet Explorer. The imposition of a simple device (via an on-screen announcement) was much more cost-effective.

Another field where behavioural public policy has been fruitful is the study of newly-liberalized markets, such as those of energy services. Behavioural studies have pointed out how poor consumer outcomes may arise in markets where there are several competing firms. Consumers might feel confused and disempowered amidst the complexity and specific features of the service being subscribed. In view of these studies, in 2010 the European Commission carried out the first behavioural study about consumer' decision-making on retail investment services. This study showed that people struggle to make optimal investment choices, even in simple investment tasks: consumers made worse investment decisions when the optional choice was harder to understand (such as fees framed as percentages) and were anxious about uncertainty, ambiguity and product complexity. The European Commission was then able to rethink conventional regulation and develop better models of economic behaviour by incorporating insights from

behavioural studies that focus on how people actually make choices, instead of how they should make choices (Hagger, Cameron, et al., 2020).

Using such insights European public policy has used price-based approaches such as subsidies to increase the uptake of more energy efficient appliances. Non price interventions have also been used. Specifically, social norms, or rules of behaviour that affect the way humans interact with others by signalling the appropriate behaviour, have been introduced. One of such "social norms interventions" was called O-power and consisted in mailing personalized Home Energy Report Letters comparing users' consumption to that of similar neighbours (Ciriolo et al., 2019). In a similar field experiment researchers examined the effect of feedback about students' electricity and heating usage at a student residence in London. Social norms were used to encourage energy savings: students were emailed weekly energy reports containing a comparison of their energy use to that of their neighbours and energy conservation tips. The results showed a reduction of over 20 percent in overall energy consumption. In this case, since the students did not pay for the energy they consumed, the effect is not driven by cost saving initiatives.

Energy-saving interventions were also introduced in Norway, where the use of labels displaying the cost of the products lifetime energy operating cost (addressing possible biases) together with relevant training of sales personnel increased the purchase of more energy efficient appliances by 4.9 percent. In Switzerland policy makers created an online platform to provide appliances' energy operating cost information (Ciriolo et al., 2019).

Other field where behavioural public policy has been active is that of health risks. In the case of tobacco, an increased in taxation has not led to a substantial drop in demand. Therefore behavioural public policy has helped identify suitable pictures to be associated with text warnings and since 2016, these pictures have been combined with written health warnings and are displayed on all cigarette packets sold in EU member states (Ciriolo et al., 2019).

Despite progress in these fields, the use of behavioural public policy in the EU is not free of tensions, limitations, and constrains. Efforts to nudge citizens in the direction of "good" behaviours have been facing criticism on the supranational level: as the member states are diverse and have different histories and contexts there is not a single vision of what a "good citizen" is or should be (Straßheim & Beck, 2019). Some critiques also highlight how ethical problems appear whenever governments impose their own conception of society. This can be deemed paternalistic, since it undermines individual autonomy and placing too much power and trust in the policy-maker, and preventing communities from pursuing their own subjective vision of the good life (Straßheim & Beck, 2019). The final section of this report addresses other critical reflections on nudging and on behavioural public policy in general.

7 Critical reflections on behavioural public policy

One of the main critiques to behavioural public policy has to do with the long term consequences of its interventions and to the fact that they simplify complex social dynamics. Behavioural public policy can tend to collapse this complexity into one focused area, such as tobacco or energy consumption, without taking into account other dimensions that might influence behaviour such as socio-economic contexts. Some other critiques warn about the possible undermining of democracy. This because, while some argue that behavioural interventions lead the way without prescribing it, others warn about the behavioural agenda's normative understanding can render "technical" issues that should be the debated in the arenas of politics and democracy (Straßheim & Beck, 2019). In this vein, some argue that behavioural interventions which are not introduced through parliamentary legislation but by acts of administrative bodies deeply influenced by consultants and scientific experts, are leading to the depolitization of policy making (Ciriolo et al., 2019).

Some argue that science might be utilized by potentially biased policy-makers to manipulate citizens. Interventions in areas such as public health have, for example, relied on non-transparent measures that end up transferring responsibilities to citizens threatening the promises of the welfare state. The result has been an increasingly focus on promoting individual behaviour change in relation to "lifestyle risks" caused by tobacco, alcohol, and dietary factors (see, Brewisa et al., 2019; Straßheim & Beck, 2019). By focusing narrowly on individual lifestyle choices, behavioural health promotion does not account for the wider socio-

economic determinants of health (Galvin, 2014; Straßheim & Beck, 2019). Policy-makers may be motivated by the fact that health interventions which focus on individual lifestyle risks may be cheaper and easier to implement than the state coordinated (and more expensive) structural policies required to tackle inequality and poverty.

Another source of potential risks might be the digitalization of behavioural policy. Thar is, the use of data on individual behaviour and its contexts, machine learning algorithms and other modes of pattern recognition, in the personalized design of behavioural instruments and regulations. While behavioural public policy argues that the prediction of individual behaviour enables the creation of targeted interventions leading to citizen empowerment, critiques warn that behavioural public policy based on data science might increase problems of individual choice and perpetuate socio-economic asymmetries (Straßheim & Beck, 2019).

In this vein, authors such as Straßheim and Beck (2019) and Brewisa et al. (2019) make calls to take the ethics of behavioural change seriously and on a case-by-case basis. Similarly, Lepenies and Malecka argue that, in order to safeguard society from behavioural public policy's potential lack of transparency; an oversight body such as "nudging ombudsman" should be appointed by national parliaments. Moreover, information on the long term effects of policy interventions that have a behavioural approach will contribute to increasing transparency in its use.

8 Concluding Section: Awareness and Behavioural Change Interventions in the Water Sector

8.1 Water and Sanitation: behavioural explanations

Different authors define the *water context*, that is the availability or non-availability of fresh water as intricate phenomenon resulting from political, economic and hydroclimate relations that influence water use and water conservation practices (Gilbertson, Hurlimann, & Dolnicar, 2011; Rodriguez-Sanchez & Sarabia-Sanchez, 2020). Particular water contexts have the ability to affect communities' response to interventions highlighting the need to conserve water. Thus, *water conservation decision behaviour*, is deeply influenced by the particular water context.

Through a comparative study carried out in 20 Spanish cities, Rodriguez-Sanchez and Sarabia-Sanchez (2020) study the interlinkages between water contexts and *water conservation decision behaviours*. For this, they focus on three variables including; the perceived message credibility, water consumption risks, and personal involvement variables. As a process of consumer behaviour, *water conservation decision behaviour* goes beyond perception of a reduction in consumption to include other aspects related to the decision to conserve water. This decision behaviour comprises five stages that relate to the decision-making process:

a) *Problem recognition;* or the awareness of the factors that drive the existing water consumption
b) I*nformation search*; or looking for ways to save water at home
c) *Evaluation of alternatives*; that is, identifying situations that can lead to water conservation
d) *New behaviour*; referring to the implementation of practices leading to responsible water usage
e) *Post-behaviour*; comprising the monitoring of the quantity of water that is used

Rodriguez-Sanchez and Sarabia-Sanchez (2020) employ a regression analysis with partial least squares (PLS) and multi-group techniques to conclude that, in the case of urban Spain, the most significant variable is personal involvement in water conservation practices and that people that live within areas of water scarcity report higher levels of personal involvement and *water conservation decision behaviour*. Moreover, they argue that personal involvement plays a major role in defining *water conservation decision behaviour* within the context of both water scarcity and water non-scarcity. This points out the importance of taking steps to increase individual involvement in the decision-making process, which is in line with consumer behaviour theories. The findings also indicated that, the accuracy of media reports about imminent risks of water shortages plays a vital role in the development of an apparent risk of current consumption.

Also with the purpose of explaining *water conservation decision behaviour,* Trumbo and O'Keefe (2001) study the water conservation behaviour in the communities of the Truckee River Watershed of California and Nevada. Authors draw on the theory of planned behaviour, to model the outcomes of attitudes and social norms on behavioural intention to conserve water. The analysis focuses on the power of environmental values and the promulgation of environmental information, drawing comparisons across communities. An analysis of the responses from the full watershed provided a good account of the intention to conserve water. Based on these findings, authors recommended the need for conservation agents to appreciate the importance of different audiences in information-seeking behaviours and to engage in direct behaviour change efforts for improving water conservation.

In a later study Trumbo and O'Keefe (2007) draw on the theory of reasoned behaviour to model the intention and behaviour related to water conservation, among household members in the community of Reno–Sparks, Nevada (USA). This model takes into account factors such as environmental values, information exposure, and attention to information about water conservation. Authors inquired about the effects of environmental values and information to model the intention to willingly conserve water in homes. Their analysis confirmed that a bulk of the effect attitudes and norms exert on intention and behaviour is related to available information. Although intention does not precisely forecast behaviour in the model, intention does show an indirect outcome on behaviour through information. Findings further indicated that people with pro-environmental values, and previous behaviours consistent with water conservation values, are more likely to pursue and attend to information on water conservation. The way in which people relate to or interact with information greatly determines their inclination toward conservation behaviour. Further, efforts to communicate convincing information that trigger behaviour or behaviour change (such as water conservation) should be founded on the idea or premise that "audiences are active" and thirsty for relevant information.

8.2 Water and Sanitation: awareness and behavioural change models

A number of studies on water consumption models come up with different factors that act or influence water use/conservation behaviour. Jorgensen, Graymore, and O'Toole (2009) propose an integrated social and economic model, which defines a larger number of factors that impact water use behaviours, through an analysis of existing water use behavioural models and existing water use behaviour scholarship. This model stresses the importance of taking into consideration water use behaviours within and outside the household, water use incentives, restrictions to water conservation and other factors. It identifies trust as an important factor that impacts water use behaviour within households. It understands *trust* as an overall approach rather than as a multifaceted concept comprising mental (cognitive), emotional (affective) and behavioural components. The model is based on the premise that mandatory water restrictions help to reduce consumption over a short period, especially when consumers have incentives/motivations to comply. It draws on earlier work by Corral-Verdugo, Frias-Armenta, Perez-Urias, Orduna-Cabrera, and Espinoza-Gallego (2002), which argues that water conservation becomes more pronounced when people realise that water is scarce and when they observe or perceive that others are also conserving water (*through interpersonal/community trust*) and when they trust on the good work of water authorities (*institutional trust*) (Corral-Verdugo et al., 2002).

Institutional trust is an essential variable in any water use model intending to inform management decisions and/or behaviour change interventions. Where the public see water agencies as untrustworthy, they may be unwilling to accept water conservation measures proposed by the entities. Trust also has an impact on the degree of accountability the water agency requires. When authorities explain their decisions regularly, there is a risk that these frequent explanations might negatively affect their capacity to manage efficiently. Therefore, it is vital for water agencies to build an environment of trust so that the public can willingly accept their decisions. In this regard, communication between water agencies/providers and consumers can be regarded as an "umbrella type of demand management strategy" under which other approaches and strategies can be developed.

There is also the need for the trust that, each person within the community is adhering to water restrictions or trying to limit their water use for the benefit of all. Where people perceive that others are misusing or wasting water, their motivation to save water becomes limited. Subsequently, institutional trust and

community trust play an important role in the success of water saving responses and water demand programmes.

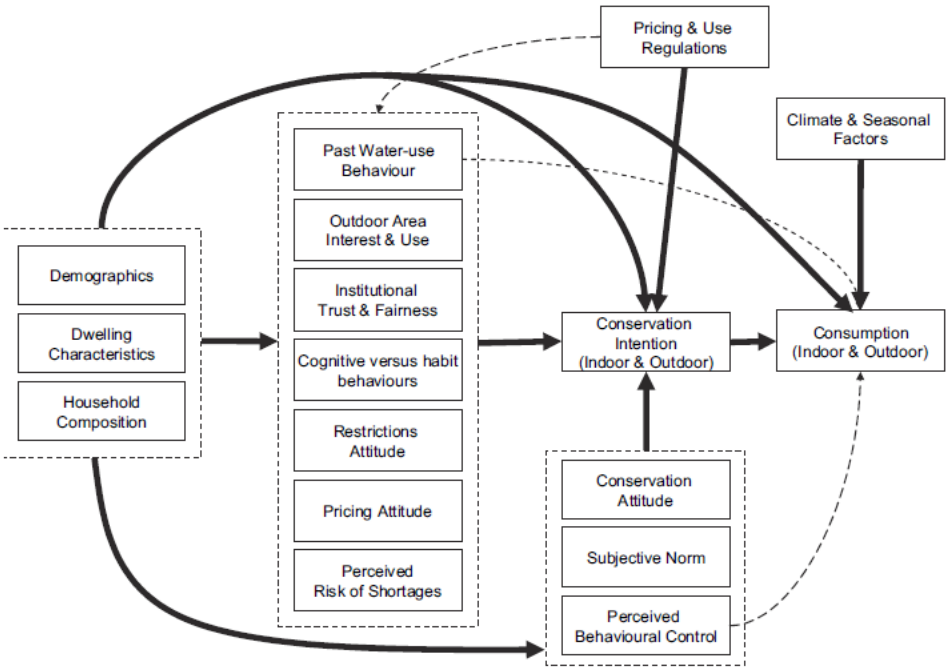

Table 2. Integrated social and economic model (Jorgensen et al., 2009)

The integrated social and economic model proposes that the characteristics of a given population (such as age, income, sex), house size, water using appliances and type and household composition directly influence consumption, conservation intent, trust and apparent or perceived behavioural control and on the range of attitudes, perceptions and habits. The model draws on the Theory of Planned Behaviour and seeks an impact in conservation approaches, individual norms. It aims to achieve anticipated behaviour control on conservation intention. Through the use of this model, Jorgensen et al. (2009) argue that 1) different factors will have different effects on indoor and outdoor water use, and 2) previous water use behaviour, institutional trust, perceptions towards restrictions and pricing and perceived risk of scarcity will not only have an impact on consumption through conservation intention but may also have a direct impact on consumption itself.

Mosler (2012), in turn, developed a The RANAS model "r(isk), a(ttitudes), n(orms), a(bilities), and s(elf-regulation)" for behaviour change interventions for the water and sanitation sector in developing countries. He argues that all infrastructural interventions on hygiene, sanitation, and water in developing countries must be accompanied by programs that generate behaviour change. According to the RANAS model, in order to promote new behaviours interventions need to take into account *five blocks of factors*: 1) risk factors, 2) attitudinal factors, 3) normative factors, 4) ability factors, and 5) self-regulation factors.

In the water and sanitation sector, *risk factors* are all those factors that deal with the understanding and awareness of the health risk. While a person's *perceived vulnerability* refers to the subjective perception of his/her risk of contracting a disease, *perceived severity* is a person's perception of the seriousness of the consequences of contracting a disease. *Attitudinal factors* are those which express a positive or negative stance toward a behaviour. This include, for example, beliefs, such as those related to *costs* in terms of money, time, and effort; and *benefits* in terms of savings, health, or other advantages of the new behaviour. *Normative factors,* in turn, represent individual and social network convictions about a behaviour: there are descriptive norms or perceptions of which behaviours are "normal", injunctive norms or perceptions of which behaviours are approved/disapproved of by relatives, friends, or neighbours (and also by religious, cultural and/or national authorities). *Ability factors* refer to the confidence of a person in her or his ability to perform a new behaviour (including knowledge on how to perform the behaviour). Finally, *self-regulation factors* are those that ensure for the continuance and maintenance of the new behaviour.

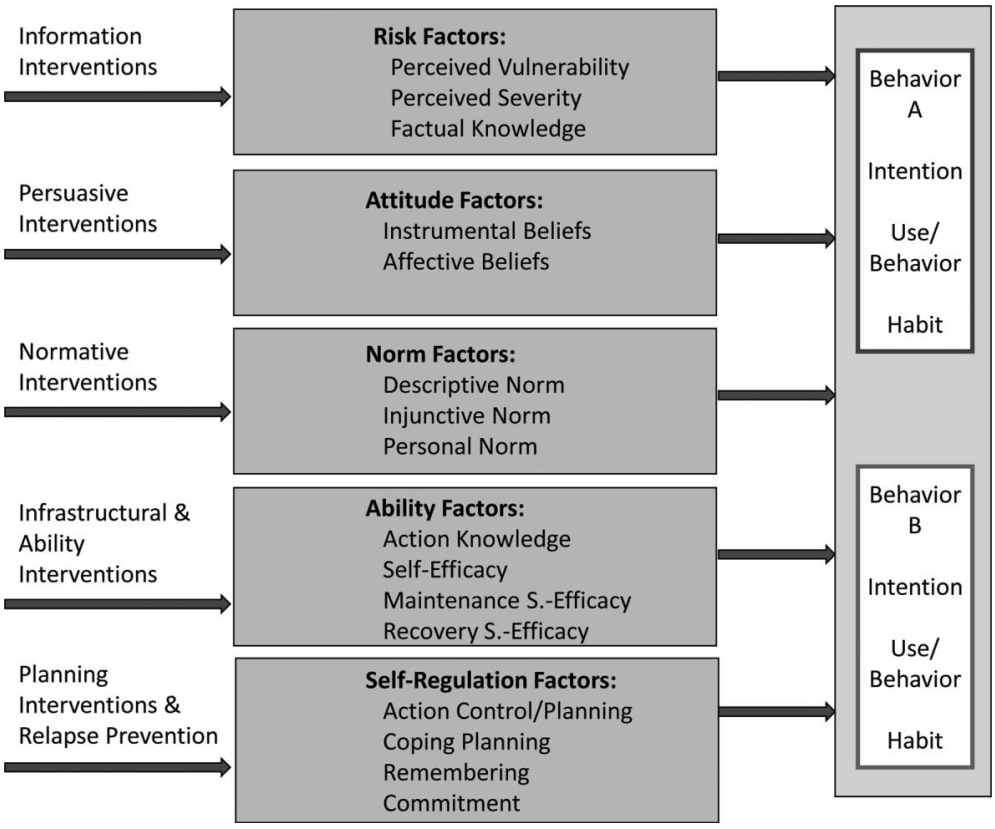

Table 3. The RANAS Model of behaviour change (Mosler, 2012)

The RANAS model thus promotes five intervention techniques corresponding to each factor block. It is worth mentioning that many of the intervention techniques affect more than one factor block. The first are *information interventions* which can tackle specially *risk factors,* this because when provided with information, people should be able to form an understanding of the possible health threats. The second are *persuasive interventions* aimed at tacking *attitudinal factors* by explaining functionality of the new behaviour and present novel and important information regarding it. These interventions are also meant to present the performance of a healthy (new) behaviour as joyful and/or or attaching aversion to an unhealthy old behaviours. The third are *normative interventions* which deal with *normative factors* through modifying the descriptive norms by highlighting norms of non-typical but desired behaviours. The fourth are *infrastructural, skill and ability interventions* aimed at dealing with *ability factors.* These include financial or infrastructural support. Moreover, maintenance of new behaviours can be improved by identifying barriers and planning possible solutions. Lastly, *planning interventions and relapse prevention* are meant to tackle *self-regulation factors.* Relapse prevention skills can be improved by teaching people to anticipate situations where they would go back to old behaviours and identify triggers and barriers. These interventions also introduce daily routine planning exercises including discussions of when and where in the routine the new behaviour can be integrated.

In order to determine the behavioural factors to be changed, practitioners should conduct a survey through a questionnaire in the local language, discussed with people local to the region to make it understandable to the target population. Likewise, interviewers should be trained to understand the questionnaire and the local context. The RANAS model emphasizes the importance of evaluating the effects and the effectiveness of the interventions by conducting a panel survey with the same sample. The target behaviour should be through direct observation. Lastly, practitioners should determine the sustainability of the interventions, measuring new behaviours 6–12 months after intervention.

8.3 Recommendations for NAIADES: Water, awareness and behavioural change interventions

As has been mentioned in previous sections, different governments have established Behavioural Insights Teams. These teams have worked with policymakers to apply insights from the behavioural sciences and encourage "better" water/sanitation practices. Some of these practices have to do with water conservation, others (especially in the development world) are related to the adoption/avoidance of certain practices such as treating water and ending open defecation. Many of these interventions provide different types of information. In the case of water conservation, utilities and state institutions have made experiments through information campaigns.

Information type	Example
Technical advice	Information leaflets containing water-saving tips
Norm-based information	Letters emphasising social identity and prosocial preferences, such as the importance of water conservation and how individual households' effort matters for a community's water conservation
Monitoring device tailored to specific appliances	Devices or labels with technical and conservation information made for refrigerators, showers, washing machines, etc., enabling households to monitor usage at the point of consumption
General feedback	Feedback on total household water use, sometimes including a breakdown by activity
Socially comparative feedback	Feedback comparing water use to the average usage of (similar) neighbours
Emoticon feedback	Happy faces indicating social approval for households whose water consumption is below a community's average, and sad faces indicating social disapproval for those whose consumption is above average

Table 4. Information types tested in water conservation experiments. (Lu, Deller, & Hviid, 2019)

But not all have been public interventions, since the private sector has also provided strategies drawing from behavioural sciences for both private and public clients. In this vein, software such as Opower, C3 Energy, and Water Smart help utilities work on their efficiency goals. They do this by sending targeted messages designed to promote more efficient residential energy or water use[1]. In water conservation experiments, households are usually grouped into different "treatments" and each treatment receives different types of information. By comparing treatment groups to a "control" group that does not receive any intervention, studies can assess whether particular information types reduce water consumption.

In this vein, different studies are conducted to identify the information that will have stronger conservation impacts (Lu et al., 2019). Other studies have compared the responses to similar interventions across socioeconomic sectors (see, Ferraro & Miranda, 2013). In order to evaluate the long-term impact of these interventions Bernedo, Ferraro, and Price (2014) focus on a randomized control trial implemented throughout a 4-month period in 2007 by a water utility in metropolitan Atlanta (US). This utility assigned residential households into four different treatments: a control group, a group that received a message containing technical advice on reducing water use, a group that received both technical advice and an appeal to pro-social preferences, and a group that received the advice, the appeal, and a social comparison contrasting the household's water use in the prior summer to that of the utility's median residential consumer. The messaging campaign was designed to promote conservation efforts during a period of extreme drought in the city. When the intervention was implemented, the utility concluded that while the technical advice message had little impact, the appeal to pro-social preferences and the appeal augmented with a social comparison reduced water use by 2.7% and 4.8%, respectively.

To evaluate the longer-run impacts of the intervention, the authors use data on initial treatment assignment and subsequent water use by including four additional years of available data. They found that the nudge

[1] See www.watersmart.com

had a persistent effect since, while the estimated effect declines by nearly 50% after 1 year, it remains detectable and policy-relevant 4 years later. They also found that the total reduction in water use achieved after the 4-month period targeted by the intervention is larger than the total reduction achieved during the target period. The Atlanta intervention was thus significantly cost-effective (Bernedo et al., 2014).
Despite these efforts, authors such as Lu et al. (2019, p. 484) have recently made calls to study the impact of different awareness and behavioural change interventions since there are currently insufficient studies to "form robust general conclusions and more experimental studies are needed".

In this way, the NAIADES project will seek to carry out interventions with the purpose of conserving water in the city of Alicante and will subsequently undertake an analysis of the impact of said intervention. For this, the project remains aware of the fact that a one-size-fits-all approach may be ineffective and varying intervention by consumption level may be a better option. For this, the specificities of the Alicante context will be considered, as outlined in Deliverables 2.1 and 2.2.

8.4 Links of the non-ICT public awareness and behavioural change interventions to the NAIADES approach

This review contains best practises and guidelines for non-ICT public awareness and behavioural change interventions that can be considered by stakeholders who wish to deploy such interventions as well as for the development of the NAIADES approach; in relation to WP 6.3 (the development of NAIADES application for consumer engagement) and for the Alicante pilot.

In relation to WP 6.3, the analysis in this review servers as a guide for the selection and input of appropriate information that will be displayed (in the personalised nudging engine) to nudge consumers towards efficient water use. Information in this review can serve as a guide and inform the optimal implementation and dissemination of the content of the digital intervention. It encourages developers to consider features that support users' autonomy as much as possible and where appropriate by offering choices and adaptability in the ways people use the digital intervention or carry out the behavioural change. This will help in the achievement of a balance between adapting the content to applicable theoretical variables while giving users the chance to select the information and the relevant support needed.

In relation to the Alicante pilot, the importance of context within which specific behavioural change (for instance goal setting, feedback and monitoring) occurs and that a one size-fit-all approach may not be effective in attaining the sought for behavioural change efforts, highlighted in the review provides insights on the combination of interventions and the impact they will have on water consumers. It espouses for the consideration of the specificities in the Alicante context towards an appreciation of the importance of different audiences in information-seeking behaviours and to engage in direct behaviour change efforts for improving water conservation.

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