Servicizing Policy Packages for the Water sector

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This deliverable has been summarized to a short version under the same title. The Summary is available on SPREE website and published in print.
Abstract

A policy package is a combination of policy instruments (PIs) designed to address one or more policy objectives, created in order to improve the effectiveness of the individual policy instruments, and implemented while minimizing possible unintended effects, and/or facilitating interventions’ legitimacy and feasibility in order to increase efficiency.

The Water sector is one of the three sectors for which the options and contribution of servicizing to absolute decoupling were examined (the other two sectors are Mobility and Agri-food). Specifically, servicizing the introduction of greywater recycling (GWR) and rainwater harvesting (RWH) were analyzed. Examining the potential in the UK indicates that servicizing the introduction of GWR and RWH does have the potential to contribute to decoupling, both in terms of GHG emissions and in terms of water that needs to be delivered in mains. The decoupling indicator chosen for the mobility sector in this project was chosen to be the ratio between the economic cost and environmental impact (emissions/mains water use) of abstracting, treating, delivering and disposing of water in the servicizing options (GWR&RWH solutions). However, the extent to which such decoupling will materialize is a function of the degree to which such systems are indeed adopted.

To facilitate the adoption of GWR and RWH systems a policy packaging approach is used, whereby different policy instruments (PI) are combined so they will have synergetic effects, and potential contradictions among them are addressed.

The Policy Packages are designed in several steps. First all the PIs that are likely to advance GWR and RWH are identified. Then the potential contribution of each, and the likely cost of implementing it are assessed, in order to identify the most effective PIs – those PIs with the highest potential to both advance decoupling and the implementation of which does not incur excessive cost. Then the pre-conditions for implementing these most promising, “low hanging fruits” are identified, as well as instruments that may facilitate decoupling if enacted with these primary PIs and PIs that have synergetic relations with the primary PIs. On this basis basic packages are formed. In the case of GWR and RWH in the UK, the leading country in this sector study, three basic packages were originally identified, based on the primary tools they use. Then, by using agent-based modeling simulation results and causal mapping an Effective Package is formed. This package accounts for the likelihood of reaching the objective in the most effective way. In the UK some 100 PIs were whittled down to 15 at this stage.

But an Effective Package is not necessarily implementable. Hence, the distribution facets of the Effective Package were identified, as well as the institutions and interest groups that will be involved in the decision-making and implementation stages. To this end the beneficiaries and losers from each PI included in the Effective Package were identified, as well as measures that can attenuate the losses.

1 ‘Policy instruments’ (PIs) and ‘Policy measures’ will be used interchangeably throughout the report.
2 In this report, ‘Absolute Decoupling’ and ‘Decoupling’ are used interchangeably; however, although our aim was to measure absolute decoupling (not relative), we acknowledge that due to the limitation of the case studies scope, we only measure the potential absolute decoupling for the specific value chain included in the case and not for the entire economy sectors.
addition the potential implementation barriers faced by each of the PIs in the package were identified. On this basis the Effective Package was modified, to assure that it is viable – viable package. To this end several PIs were removed from the Policy Packages.

The background conditions, as well as the socio-political circumstances of each country differ. Hence, the viability of the policy package formulated in the UK has to be modified to address other countries’ particularities. In this study the cases of Israel and Galicia, Spain, were examined. In both cases the particular features of the setting required that the list of PIs in the British Effective Packages will be modified. Thus, in both Israel and Spain, water is metered, there is no need to include this PI, which was a central PI in the UK case. Hence, this PI was removed in both the Israeli and Spanish cases. But while Israel is mostly dry, Galicia is the wettest part of Spain. Hence, while Israel focused on GWR, the Spanish team focused on RWH. Barriers to implementation and decision making structures also differ among the countries. In Israel, for example, GWR is not legal at present, and thus a law allowing for GWR (already being discussed) is a pre-requisite for all other PIs. This PI was added therefore to the Israeli viable package. Similarly, in the Spanish case it lack of staff for developing RWH was seen as an impediment and hence subsidies for the social insurance of such staff was added as a PI.

In summary, GWR and RWH can contribute to decoupling, and servicizing can be important for the introduction of such systems. But in order for these benefits to materialize a place-modified Policy Packages are needed. Three viable packages were formulated in the study, demonstrating how a combination of servicizing and policy packaging can contribute to decoupling.
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SPREE Project

SERVICIZING POLICY FOR RESOURCE EFFICIENT ECONOMY

1. Introduction

The Servicizing Policy for Resource Efficient Economy (SPREE) three-year research project was launched in July 2012 under the European Commission’s Seventh Framework Programme (FP7). Its overarching goal is to provide insights into how servicizing can help EU countries to achieve a sustainable and prosperous economy characterized by decoupling of economic growth and social prosperity from inefficient use of resources. Servicizing, which facilitates the transition from selling products to providing services has the potential for addressing such a challenging goal of decoupling and hence was chosen as the core of SPREE research.

Servicizing is defined in SPREE project as a transaction where value is provided through combination of products and services and where satisfaction of customer needs is achieved by selling function of the product rather than product *per se* and/or by increasing the service component of the offer. Servicizing, theoretically, has the potential to bring us closer to decoupling as its realization in practice influences production as well as consumption patterns.

However, servicizing can lead both to increased and decreased environmental, economic and social impacts. Hence it becomes necessary to study the conditions under which servicizing can actually live up to its potential and establish profitable but resource efficient business activities, enhance consumer satisfaction and promote high quality of life. For this purpose, SPREE team applied Agent-Based Modelling (ABM) on the basis of evidence-based data derived from nine case studies in six different countries, in order to evaluate the impact of servicizing systems’ diffusion together with the effects of policies designed to support these systems.

SPREE research focused on the application of servicizing in three sectors: Greywater Recycling and Rain Water Harvesting systems in the Water sector; Car- and bike-sharing systems in the Mobility sector; and Crop protection management solutions in the Agri-food sector. This report focuses on the first of these sectors – the Water sector. Specifically we focus on the introduction of Greywater Recycling and Rain Water Harvesting systems into the built environment.

The “servicizing Policy Packages” are the key outcomes of the SPREE project. The servicizing policy package in the Water sector is based on the project’s accumulated knowledge about options leading to decoupling of economic growth and social prosperity from inefficient use of water resources by introducing greywater recycling (GWR) and rainwater harvesting (RWH) systems through servicizing.

Policy Packages aim to facilitate the successful implementation of servicizing system through several means: 1) policy packaging may reduce unintended effects (such as rebound effects) of individual instruments; 2) the packaging process is expected to increase positive impacts (synergies) among instruments; and 3) by adding or removing policy instruments, the social and political acceptability of controversial instruments may be improved. Thus, it is hoped that the overall effect of the policy package will be greater than the sum of its individual instruments.

The overall aim of a policy package is to increase efficiency – defined as the level of achieving a certain policy goal (decoupling in the SPREE case) per unit of implementation effort, or implementation resources (financial, time, expertise, etc.). To assess the level of efficiency, the research has followed
an evaluation methodology that comprises two levels of analysis. It first examines the economic, environmental and social impacts of policy instruments to promote servicizing and their potential effects on decoupling. In a second stage, the implementation feasibility (implementability) of individual policy instruments is examined. Implementability is measured through the consideration of financial, technical and technological feasibility, and necessary preconditions for the implementation of the policy instrument. Furthermore, SPREE’s research identified institutional settings, political legitimacy, social acceptability and flexibility as important determinants of the implementability of policy instruments.

This deliverable presents the Policy Packages designed in the SPREE project to achieve decoupling in the Water sector, and the main considerations leading to them in the three pre-selected water-sector countries: UK (Water leader), Israel and Spain. Following this introduction, the greywater recycling and rainwater harvesting case is described. Then the policy packaging methodology is described, as well as the implementation of its first stage in the Water sector – the formulation of a basic package. As part of the formulation of an Effective Package an agent-based model (ABM) was used. The results of this modeling effort are then briefly summarized, followed by the description of the Effective Package. This Effective Package was formulated for the UK case. But the implementation of this sector package is not assured. To advance the implementation of such a package it had to be modified for the country-specific attributes. Therefore, in the final part of this report the adjustments made for the Israeli and Spanish cases are presented. These adjustments pertain both to the Effective Package and to the viable package, as the attributes of each country differ.
2. About SPREE Project

The Servicizing Policy for Resource Efficient Economy (SPREE) three-year research project was launched in July 2012 under the European Commission’s Seventh Framework Programme (FP7). Its overarching goal is to provide insights into how servicizing can help EU countries to achieve a sustainable and prosperous economy characterized by decoupling of economic growth and social prosperity from inefficient use of resources. Servicizing, which facilitates the transition from selling products to providing services has the potential for addressing such a challenging goal of decoupling and hence was chosen as the core of SPREE research.

Servicizing is defined in SPREE project as a transaction where value is provided through combination of products and services and where satisfaction of customer needs is achieved by selling function of the product rather than product per se and/or by increasing the service component of the offer. Servicizing, theoretically, has the potential to bring us closer to decoupling as its realization in practice influences production as well as consumption patterns.

However, servicizing can lead both to increased and decreased environmental, economic and social impacts. Hence it becomes necessary to study the conditions under which servicizing can actually live up to its potential and establish profitable but resource efficient business activities, enhance consumer satisfaction and promote high quality of life. For this purpose, SPREE team applied Agent-Based Modelling (ABM) on the basis of evidence-based data derived from nine case studies in six different countries, in order to evaluate the impact of servicizing systems’ diffusion together with the effects of policies designed to support these systems.

SPREE focused on the application of servicizing in three sectors: Greywater Recycling and Rain Water Harvesting systems in the Water sector; Car- and bike-sharing systems in the Mobility sector; and Crop protection management solutions in the Agri-food sector. This report focuses on the Water sector.

The “Servicizing Policy Packages” are the key result of SPREE Project. The Servicizing Policy Packages in the Water sector is based on the project’s accumulated knowledge on the transition towards servicizing and contributes to the development of policies to promote decoupling of economic growth and social prosperity from inefficient use of resources, through the facilitation of greywater recycling (GWR) and rainwater harvesting (RWH).
3. The Water Case – Servicizing Greywater and Rainwater Harvesting Systems

Water is already servicized in most developed countries. Hence the water case study differentiates between ‘first and second level servicizing’. First level servicizing is understood as the process whereby consumers already pay for the water treatment services provided by water companies, including the cost of supply and of treating the water once it has left the household premises since most water is not used as such but merely its quality is changed. This type of standard supply and collection of water for most households is referred to as ‘mains supply’ or ‘mains water’ in this study.

When water is 'used' in a household there will be some differences in the quality of the water, but this does not necessarily mean substantially less water or that all of the 'waste' water is unusable by the household. Indeed some of this water can be cleaned using relatively straightforward processes known as Grey Water Recycling, and then water can be reused. There are also options for alternative sourcing of water (e.g. direct collection of rainwater of Rain Water Harvesting) that can help address different water needs and uses at the household level. These options are broadly considered as 'second level servicizing'.

Following SPREE’s aim to investigate the role of servicizing in decoupling natural resource use and environmental impacts from economic growth, decoupling in the Water sector can be interpreted as weakening the link between economic growth and growth in water consumption. A decrease in mains supply water consumption is assumed to contribute to less negative environmental impacts as less water will be withdrawn from the environment. Thus, it can be assumed that reducing the volume of water supplied via a ‘mains’ system can help reduce these negative environmental impacts. The water case study explores the potential to expand services around grey water recycling (GWR) and rainwater harvesting (RWH) at the household level in order to reduce the use of potable ‘mains’ water in the household to essential uses such as drinking and cooking only.

Water collection, treatment and recycling systems for industrial facilities was considered to potentially have a large impact in reducing negative environmental impacts, but grey water recycling and rainwater harvesting (GWR & RWH) in the industrial sector have already been the subject of numerous investigations, pilot studies, and robust policies and regulation in Europe. Therefore efforts were concentrated on the household sector.

Due to their suitability for implementation with the support of policies and given the potential for large scale effects in reducing negative environmental impacts at a country and EU level if used widely, household-level GWR & RWH systems were chosen among various potential water-efficiency services. Furthermore, it was also considered that GWR and RWH servicing options at a domestic level can potentially have positive economic and social impacts for entire communities in comparison to the conventional water supply model, and thus, that these systems can be used to research the links between water use and well-being, as well as to study the decoupling and social impacts of the system through Agent Based Modelling (ABM). This made GWR & RWH suitable and innovative study systems for SPREE’s Water sector research in the UK.
Therefore, the chosen system in SPREE’s Water Research is: Household Water Management focusing on servicizing options related to the installation and maintenance of in-house GWR and RWH systems in homes, and the types of associated service contracts. The various contract options relate to the fact that there are some initial up-front costs when the required equipment is installed and thus there are different ways these costs can be managed through service contracts. The equipment could even be owned by the service provider (not the consumer) as a fully servicized option. However, the system is also likely to require regular maintenance, such as the cleaning of filters and pumps. A household could undertake these tasks themselves after purchasing the equipment, but may prefer them to be handled as part of a service agreement. Therefore, the Water sector servicizing options studied in the UK are:

1. Small GWR self-installed system - no service contract,
2. Small GWR system installed by a company with service contract for annual maintenance,
3. Small GWR system installed, owned and maintained by a servicizing company, with ownership transferred to household owner at the end of the agreement.
4. Large combined GWR & RWH self-installed system - no service contract,
5. Large combined GWR & RWH system installed by a company with service contract for annual maintenance
6. Large combined GWR & RWH system installed, owned and maintained by a servicizing company, with ownership transferred to household owner at the end of the agreement.

The system will vary depending on whether the home is a house or block of flats, with or without garden, and whether it is located in a dry or wet climate. Thus the study cases in northern Spain and Israel will vary slightly compared to the UK case.

In the UK the focus of the water component of the SPREE project will be upon the South East of England (Figure 1; focusing on the counties of Kent, Surrey, East Sussex, West Sussex, Berkshire and Hampshire) and hence the companies consulted in the project are South East Water, and Thames Water. This region is highly diverse in socio-economic terms and thus provides a good basis for exploring the relationship between water consumption and wellbeing. The region also has some existing providers of greywater recycling and rainwater harvesting systems for the household level.
The main characteristics of the GWR & RWH servicizing study system are:

- Greywater Recycling (GWR) systems collect water from showers, sinks and baths and typically re-use it for toilet flushing and/or garden watering. Water from dishwashing and even clothes washing can also be recycled. How much water is recycled depends on where the water comes from and the size (and location) of storage tank/s. Recycled water will require varying degrees of treatment depending on where it comes from and what it is going to be used for. GWR can be combined with Rain Water Harvesting (RWH).

- RWH systems collect rainwater from roofs, balconies and patio areas, store it and then use it for toilet flushing, garden watering or even clothes washing. When rainwater is used for clothes washing lime-scale build-up in washing machines can be reduced or eliminated.

- GWR and RWH systems may require alterations to the room/s where they are installed (e.g. bathroom, kitchen, loft, and cellar) but they help households to save water and reduce reliance on standard water supply. These systems can contribute to save money on water bills as even in properties where water consumption is not metered at present, trends indicate that water will be metered in the near future.

To assess the degree to which GWR and RWH contribute to decoupling, three possible decoupling pathways were analyzed. These are:
1. economic growth from water consumption,
2. economic growth from emissions/other environmental impacts associated with water consumption, and
3. Well-being (social impacts) from water consumption.

The degree to which GWR and RWH servicizing may advance these pathways is the focus of the study. The extent to which GWR and RWH will contribute to this end is a function of the policies pursued. Hence, the policy packaging methodology is used to advance the potential for decoupling through the introduction of GWR and RWH. The assessment of the degree to which the Policy Packages can contribute to this end is undertaken by the use of ABM (see also López-Avilés et al. 2013a and Chenoweth et al. 2013).

In relation to 2 above, the assessment of the environmental impacts of GWR and RWH systems in the UK was carried out using two decoupling indicators:

- Mains water saved, defined here as the quantity of potable water that is not required from the centralized supply system due to installation of a rainwater harvesting and/or grey water recycling system;
- Reductions in greenhouse gas (GHG) emissions linked to a reduction in the supply of potable water from the mains system (i.e. less water abstracted from the environment, treated to potable standards, and pumped/distributed).
4. Policy Packaging – Aim and Methodology

"A policy package is a combination of policy instruments designed to address one or more policy objectives, created in order to improve the effectiveness of the individual policy instruments, and implemented while minimizing possible unintended effects, and/or facilitating interventions’ legitimacy and feasibility in order to increase efficiency" (Givoni et al., 2013). Through a combination of policy instruments, a policy package should result in: meeting targets that otherwise cannot be met with one policy measure alone; by utilizing positive synergy effects between policy instruments while avoiding contradictory effects and reducing negative unintended (side) effects; and by increasing public acceptance of policies (social acceptability) and achieving political compromises (political acceptability) to facilitate implementation. Stemming from the above definition are three, interrelated, objectives that policy packaging strives to achieve: effectiveness, implementability and when combining these two, efficiency.

Policy Packages are constructed of a number of primary and ancillary instruments. According to Givoni et al. (2013), primary instruments’ are directly aiming at achieving the policy goal, thus directly influencing effectiveness. Ancillary (secondary) instruments support the primary instruments by improving their functioning and increasing their contribution to the policy goal, and at the same time have the role of facilitating the implementation of the primary instruments and the package as a whole (for more details see Feitelson et al., 2013 and Matt et al., 2013a). Consequentially, primary instruments are those measures - whether regulatory, economic or informative - which are specifically selected due to their expected immediate effectiveness. Ancillary instruments are those instruments that are employed in order to facilitate the ‘function of one or more primary measures’ (Givoni et al., 2013). These instruments are often necessary to ensure that the net effectiveness of the package is positive (Feitelson, 2003). Ancillary instruments may make the policy package more acceptable and implementable, and therefore improve its net effectiveness.

Building a policy package requires an iterative process of modification and is based on the judgment of those assembling the package and in charge of implementing it, using various methods and tools (see below and Matt et al., 2013b). Primary measures are identified and chosen as the basis of the package. These measures are then supplemented by ancillary measures. Throughout the packaging process additional primary and ancillary instruments will be added, removed, or modified in order to first increase the effectiveness and then the implementability of the package. This process thus occurs throughout the three main stages of the packaging process (the basic, effective, and viable policy packaging stages).

As seen in Figure 2, in order to create a policy package to promote servicizing, several stages of development and refinement are recommended. Following Feitelson (2003), the proposed policy package comprises three segments. Initially, a Basic Package of policy instruments is created. This package is designed in order to directly achieve the desired policy goals. At the second packaging stage, the Effective Package stage, primary and ancillary instruments are added and removed to enhance the net effectiveness of the package. That is, to maximize the benefits of the policy package, while taking into account rebound and other unintended effects (Givoni et al., 2013). A causal mapping
A technique was used to illustrate the mechanism through which a policy instrument will affect the policy target and by that anticipate some unintended effects. Besides the causal mapping, Agent-Based Modelling (ABM) was used, and insights derived from expert interviews and the other Water study’s methodologies in order to better understand the criteria that couldn’t be assessed in the ABM due to the model’s limitations.

In the final stage, the Viable Package stage, social and political acceptability are thoroughly examined, alongside an analysis of possible implementation barriers (other than those related to acceptability and including for example financial, institutional, regulatory and technological barriers). On this basis additional changes (both the addition of ancillary measures or removal of measures which generate substantial opposition) are included to enhance both the acceptability of the package and the likelihood that it will be actually implemented. These three types of packages are detailed below.

Figure 2. The Three stages of a policy package

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3 On the gap between acceptance of a policy and its actual implementation see Bardach (1977).
The Basic Package

The first stage in creating a servicizing policy package is the identification of an initial set of policy instruments. The Basic Package comprises a multitude of policy instruments devised to attain a given policy goal. The Basic Package constitutes the foundation for the Viable Package that will be recommended at the end of the process. A Basic Package will consist of a sub-set of the initial set of instruments that will hopefully be coherent and effective. Thus, once a comprehensive inventory of instruments has been devised, we move to the second stage of the packaging process, the evaluation of individual policy instruments. Once the primary policy instruments have been chosen and evaluated, we can map the relations among them. This procedure supports the detection of the central instruments in the policy package, and those facilitating their effectiveness and implementability, while avoiding contradictions among instruments.

In the SPREE project, we recommend the use of four types of interrelations among instruments. (1) pre-conditions (P) – where the successful implementation of one instrument is wholly contingent upon the prior successful implementation of another; (2) synergetic (S) – where the function of one instrument is enhanced by the presence of another instrument, and in turn enhance the other instrument through a symbiotic effect; (3) facilitating (F) - where one instrument contributes to the operation of the other, but is not otherwise facilitated by the other instruments. In contrast to synergetic relations, facilitation relations are a "one way" rather than "two way" exchange between two instruments. (4) Potential Contradiction (PC) – where the potentially conflicting presence of two or more policy instruments has detrimental effect on the functional capacity of either or both.

Identifying and mapping relations among policy instruments facilitates the identification of instruments central to the basic package. The primary instruments should be as uncontroversial as possible, to which instruments that create positive feedback with other instruments should be added. The Basic Package then should be combined of a multitude of instruments. Those instruments that are easier to implement and have a maximum of positive relations with other instruments are included. These are considered to be the low-hanging fruits. To this, we add the fruits at the top of the tree. Those instruments which high effectiveness in reaching the policy goals but are more difficult to implement. The Basic Package and its components will then be modified in the following packaging stages.

In the Water sector case, the initial set of instruments included some 100 measures. Of these 20 were retained after the evaluation stage, in which the instruments with the highest scores on effectiveness and implementability were identified as those with the highest potential for the basic policy package. Pre-conditions were then identified for these measures, as well as measures that facilitate of have synergetic relationships with other measures. On this basis three basic packages were identified, based on the nature of the measures, i.e. around incentives, regulations and information. These are detailed in the next section.

The Effective Package

The immediate effectiveness strived for in the Basic Package pertains only to the direct effects of the instruments on the policy goals. However, policy instruments may have indirect effects too, as well as
undesirable direct effects. Thus, while the Basic Package is mostly concerned with direct effectiveness, the Effective Package stage is concerned with collateral effectiveness. That is, accounting for unintended effects, including rebound effects. Addressing these effects will improve the collateral effectiveness and thus the net effectiveness of the package (Givoni et al., 2013).

Each policy instrument can potentially lead to a series of unwanted effects. An unintended effect is a consequence that diverges from an authorized or directed policy action. Unintended effects may therefore include both direct and indirect effects like rebound effects (a behavioral response that undermines the initial effect of the policy measure). Careful consideration of potential consequences of a given policy instrument at this stage facilitate the packaging process by mitigating unintended effects, and thus increase its net effectiveness. In SPREE this stage was facilitated by the use of ABM modeling, summarized in the next section, and by utilizing causal mapping. The resulting Effective Package is described in the next section.

The Viable Package

Two broad aims are addressed at the Viable Package stage: One, the acceptability of the policy package is addressed. The packaging process holds potential for making policy instruments more acceptable to the public (mainly groups that are likely or believed to 'lose' from the implementation of the instruments) as well as political and policy actors, and thus increases the chances for successful implementation. Two, the feasibility of the policy package is assessed and addressed. The packaging process thus accounts not only for the acceptability of the package but also for other implementation barriers.4

Evaluating the social acceptability of a package requires conducting an analysis of the distributional impacts of each policy instrument, and the package as a whole. For the purpose of the SPREE project, undertaking distributional analysis requires the identification of all parties affected by the policy package and the individual instruments comprising it, at various spatial scales. At this stage, instruments that are highly inequitable or contested can be modified or removed from the package. Alternatively, additional instruments can be added which make the package more acceptable to those most adversely affected. For example, many regulatory and distributive (fiscal) instruments are considered to be "sticks". In order to make these instruments more acceptable, it is recommended that incentives, or "carrots", which may enhance the overall acceptability of the package be added. Once modifications have been made, we can examine the social acceptability of the package. Social acceptability of policy instruments can be discerned through the examination of perceived acceptability, effectiveness, fairness.

Political acceptability is related but not identical to social acceptability. If a policy package is not socially acceptable, this may affect its political acceptability. Social acceptability relates to those actors who may not be strongly represented in political circles. In contrast, political acceptability examines the positions of those actors who are represented in the political arena. These may include policymakers and politicians, economic interest groups, and non-governmental organizations. In order to assess the political acceptability of a given instrument or package of instruments, for each actor, the

4 On the nature of these barriers and a typology of them, see Bardach (1977).
inherent interests that drive the instrument or package have to be assessed. Such analysis shows that policy actors hold diverging interests, beliefs, power and attitudes towards the policy package. The political actor assessment and strategies to deal with political actors (see full details in Matt et al., 2013a or 2013b?) provide a framework for creating a politically acceptable package of policy instruments. Once the interests and beliefs of policy actors have been gauged, and a strategy to address each actor decided, we can act to make changes to the policy package. These changes will address to a greater degree the interests of stronger actors that overall oppose the package, because of what it tries to achieve, what is included in it (like a specific instruments) or for other and not directly related political considerations, while also aiming to accommodate (to a lesser degree) the interests of politically weaker actors.

Alongside the acceptability analysis, an assessment of package feasibly (and each instrument included in it) is required before the Viable Package in decided on. To this end the following need to be assessed:

- **Financial viability:** Is the package financially viable? Can instruments be added or removed accordingly to ensure financial viability?
- **Technical know-how:** Are all technical conditions in place to ensure the successful implementation of the policy?
- Institutional barriers: Are there any institutional barriers that were not addressed at previous stages that need to be taken into account?
- **Technology availability:** Are all necessary technologies in place for the implementation of the package?

Clearly, the political power structures, financial setups, institutional structures, technical know-how, and even gainers and losers are likely to vary across geographical settings. Hence, while the basic and Effective Package s were formulated for the UK as the Water sector leader, the viable packages have to be differentiated by setting (country). Thus, in the Water sector case the viable packages were prepared for the UK, and also for Israel and Spain. While ABM results were utilized for the first two countries, the Spanish case was prepared with no ABM runs, due to time and pecuniary constraints. This allows us to analyze the benefits of utilizing the ABM.

The policy packaging process followed in the Water sector is akin to that outlined above. In this section we first summarize briefly the basic packages. Then, in the next section we focus on the process of identifying the Effective Package.

The process of selecting the basic Policy Packages (PPs) for the Water sector followed a series of steps in which approximately 100 Policy Instruments (PIs) were outlined, scored according to effectiveness and implementability, reviewed according to relevance for the study case, and cut down to a list of 20 Policy Instruments with the most potential. A Matrix of relationships among pairs of instruments (i.e. synergies, pre-conditions, facilitation and contradictions) was created, and pre-conditions for other policies as well as high-scoring measures – ‘Golden Measures’ and ‘Low-Hanging Fruits’ - were identified. ‘Bad’ instruments (contradictions) and any mistakes identified in the relationships were eliminated in the second phase of this process that aimed at grouping policy instruments and identifying patterns. Three distinct Basic Policy Packages were identified centred around ‘carrots’ (incentives), ‘sticks’ (regulations) and ‘sermons’ (information, awareness).

A list of the policy instruments considered for the Basic Policy Packages is included in Appendix A, and Figures 3 to 5 illustrate each of the three Basic Policy Packages and the relationships between policy instruments.

The first policy package is led by Building Regulations aimed at making it compulsory for all new homes to install GWR&RWH systems plus the associated enforcement of these regulations. Given the many interrelations identified among numerous policy instruments that can be included in this package to support regulations as drivers, these instruments have been grouped in four sub-categories that make the description of the package easier to understand. These categories are: regulation measures, information measures, funding measures, and Research & Development (R&D) measures. The relationships among these measures are depicted in Figure 3. In this figure, as all following figures, PC stand for pre-conditions, whereby the PI cannot be implemented unless another PI (the precondition) is put in place first, S stands for synergetic relations between the two measures, and F for facilitating relations, whereby the facilitating measure enhances the effectiveness of the facilitated measure.

The second policy package is led by Incentives, namely, Tax breaks aimed at encouraging the installation of GWR&RWH systems by consumers. This policy package is depicted in Figure 4 below. The third policy package, depicted in Figure 5, is led by Information, namely, public information campaigns and other awareness raising activities aimed at encouraging consumers to install GWR&RWH systems. These information activities have synergies with funding for GWR&RWH in schools, public building and social housing which helps to raise awareness about these systems as prototypes or pilots.

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Figure 3. The Regulation-based Basic Policy Package
Figure 4. The Incentive-led Basic Policy Package
Figure 5. Information-led basic policy package

- Raising awareness about sustainability of water resources and GWR&RRWH among businesses and the public by Government
- Funding GWR, RWHT and/or combined GWR&RRWH in schools, public buildings and high density sustainable social housing
- Public information campaigns encouraging households to collect and use rainwater and recycle grey water, i.e. encouraging the installation of RWH and GWR systems
- Different water pricing for different sectors (e.g. water for agriculture and domestic sectors cheaper than for industry)
- Sponsorship of GWR&RRWH systems
- Universal water abstraction licensing (water from wells, rivers, lakes, other)
- Stricter water abstraction limits for existing licensed users
6. The Water sector Policy Packaging Process: From the Basic to the Effective Package

Once the basic packages were formulated, they were evaluated using both causal mapping and the ABM. The causal mapping is used to identify unintended effects, while the ABM is used to assess the effects of the Policy Packages. On the basis of these analyses the basic packages were modified to form the Effective Packages. This process, and the resulting Effective Packages are described in this section. Further details on the Water sector Policy Packaging process including consultation with main UK stakeholders are reported in López-Avilés et al. (2013b, 2013c and 2013d).

6.1 The Unintended Effects of the Basic Policy Packages Identified by Causal Mapping

Each proposed policy instrument outlined for the Basic Policy Package(s), may have some unintended effects that could influence whether or not that instrument or the group of instruments within which the instrument is included effectively achieve the overall objective of the policy. There can also be unintended effects affecting other policy domains. Therefore, when creating Policy Packages, a causal mapping approach was used to anticipate these unintended effects. The following examples illustrate the causal mapping analysis used to identify the main unintended effects of proposed policy instruments for the Water sector study.

One of the unintended effects identified was that funding/tax breaks/subsidies for GWR &/or RWH systems could result in less funds available for other initiatives/subsidies including in other policy domains such as less funds for energy efficiency measures (see causal mapping in Figures 6 and 8). But this effect is difficult to estimate and cannot be quantified.

Other unintended effects identified include rising building costs if regulations make it mandatory for all new homes to include GWR and/or RWH systems (see Figure 7), and also the potential reduction in profits for water companies as a result of subsidies and grants (see Figure 8).

An incentive-based PI focusing on Tax Breaks (e.g. Figure 9) was found to have less impact as an incentive for low-income households. Policy instruments about information, awareness and promotion of GWR and RWH systems were found to have minimal or no unintended effects.
Figure 6. Causal Mapping of PI (Incentive): funding of GWR and RWH for new social housing

Direct funding → GWR & RWH systems installed → Reduced consumption from mains → Less water use per GDP and per capita

Economies of scale → Reduced cost of GWR & RWH systems → Less water use per GDP and per capita

Possible demand by private consumers and possible retrofitting

Reduced general revenue to other users

Figure 7. Causal Mapping of PIs (Regulations): compulsory to install GWR and RWH in new housing

Legislation and enforcement → GWR & RWH systems installed → Reduced consumption from mains → Less water use per GDP and per capita

Economies of scale → Reduced cost of GWR & RWH systems → Less water use per GDP and per capita

Possible demand for retrofitting

Raising building costs but no effect on house prices

Possible demand for retrofitting
Figure 8. Causal Mapping of PI (Incentive): means-tested subsidies for GWR and RWH

- Subsidies
  - Reduced cost to consumer of GWR & RWH systems
  - GWR & RWH systems installed
  - Economies of scale
  - Reduced cost of GWR & RWH systems
  - Reduced cost to consumer of GWR & RWH systems
  - Less water use per GDP and per capita
  - Possible demand for retrofitting

Figure 9. Causal Mapping of PI (Incentive): tax breaks to install GWR and RWH

- Tax breaks
  - Reduced cost to consumer of GWR & RWH systems
  - GWR & RWH systems installed
  - Economies of scale
  - Reduced cost of GWR & RWH systems
  - Reduced cost of GWR & RWH systems for the poor
  - Less water use per GDP and per capita
  - Possible demand for retrofitting

General revenue affected or reduced profits for water companies
6.2 Preliminary Effective Package

The aim of the effective policy package(s) is to increase effectiveness of the overall policy goal (i.e. absolute decoupling). The effective policy package is concerned with net effectiveness by addressing or limiting any unintended effects that might have been identified. Therefore, on the basis of assessing ABM results and identifying unintended effects, the process of creating the effective policy package(s) involved modifying the basic policy package(s) by adding, removing and/or modifying policy instruments. Adding ancillary (secondary) instruments was also considered in order to facilitate the function of one or more PIs thus affecting the policy goals indirectly (e.g. by facilitating implementation).

With the above aims in mind, the effective Policy Packages were created based on the modifications to the basic policy package derived from the causal mapping. In essence, the causal mapping, with inputs from the ABM results, led to the identification of PIs that should be added, removed or modified.

For example, it was anticipated that providing ‘Funding for Research and Development’ will have limited effects on the overall policy aim of reducing water consumption at a household level or per capita, in relation to GDP, especially in the short to medium term. Thus, this policy instrument was removed. It should be noted that R&D could have a major impact over the longer term, but here the assumption of impacts is over the short to medium term.

Trials were considered as part of the way to bring GWR and RWH systems to the point where they can be sold in the world market, thus trials were considered to be part of the process of building awareness about the positive aspects of GWR and RWH systems. A number of information and awareness PIs are included in the PPs and it was considered that trials were not going to add significantly to existing information-led initiatives, thus the PI on trials was also removed.

The PI on different water prices for different economic sectors was considered to have only limited indirect effects on potentially reducing water consumption at household level, which is the object of the SPREE Water research, and thus this PI was also removed. Similarly, when considering the PI on water pricing bands linked to volume of water consumed independently from the customer being in one economic sector or another, this PI was also removed as it was considered that this PI will have little effect at the household level.

Increasing water prices overall (potable water supply and foul water removal and treatment) for all sectors of the economy and all consumers remains included in the PPs as the main PI tackling water pricing and very much linked with the regulatory PI on implementing universal water metering, also included in the PPs.

The effects of producing clear water bills were discussed as the effects of this PI were thought to be unclear, but it was agreed that this policy instrument might help to promote GWR and RWH systems by providing details of bills for ‘mains’ supply water consumption versus bills for both ‘mains’ water
and GWR&RWH systems. Thus this PI was left in with some clarification about its meaning, and it is considered as an Information PI.

The PI on Research and Development of activities related to smart water metering was also removed as its effects were considered to be too remotely linked to the aims of this research’s main policy goal of reducing water consumption at household level. Universal water metering was considered to be a much more essential PI to consider in the UK Water PPs.

The PI pushing for universal abstraction licenses was also removed as most abstractions from rivers, lakes, and the ground are already licensed in the UK, and so this policy instrument would only affect a small number of unlicensed abstractions from wells thus having minimal effects on the SPREE water case study in the UK. However, it should be noted that this PI could be relevant for cases such as Galicia in Spain where it is understood that approximately half of all domestic water supply comes from wells, rivers/streams and other sources that might be licensed or not.

Stricter abstraction limits, on the contrary, could have great implications for water companies in relation to water availability, storage, fixing leaks and eventually on the price of water to be charged to customers in the UK. Thus this PI was included in the PPs although its direct impacts in terms of effects on ABM agents and properties were impossible to quantify. Thus this PI has not been modelled in the ABM.

The Policy Instrument on Sponsorship of GWR and RWH systems was amended to clearly indicate that the idea of this PI is for companies to sponsor the systems, thus the PI now reads company sponsorship of GWR & RWH systems.

The analysis of policy instruments based on effectiveness and implementability undertaken in an earlier phase of this study meant that PIs around subsidies were eliminated, as it was considered that these would be difficult to implement in the UK. However, when revising the Basic PP a PI specifically on subsidies for low-income households was added on as it was considered important to ascertain (at least theoretically) the effects that subsidies would have in promoting the uptake of GWR and RWH systems.

It was also noted that the Basic Information-led Policy Package (Figure 5) could be integrated within the other two packages, and the information measures would then be considered as ancillary measures facilitating implementation of regulations and incentives. Therefore, two distinct Effective Policy Packages were identified for the Water sector case study based on the PIs. One is led by Incentives and the other is led by Regulations, but both packages include Information instruments and may include some instruments from each other (e.g. there may be some regulatory instruments in the Incentives-led package and vice-versa). The Effective PPs are depicted in Figures 10 and 11 below.
Figure 10. The Incentives-led Effective Policy Package for South East England, UK

(F=Facilitation relation; S= Synergy relation)

6. Implement universal water metering
7. Increased price of potable water and sewage collection and treatment
8. Clear and transparent bills and cost models for GWR, RWH and mains water
9. Promoting GWR & RWH
10. Tax breaks to encourage the installation of GWR & RWH systems by consumers
11. Public information campaigns for households to collect and use rainwater and recycle grey water (RWH & GWR systems)
12. Company Sponsorship of GWR & RWH systems
13. Raising awareness about sustainability of water resources and GWR & RWH
14. Funding local authorities to install household-based GWR & RWH systems in all new social housing
15. Subsidies for low-income households to install GWR & RWH systems

**Lighter shade means the Incentives-led Effective Policy Package may include these instruments or not**
The policy instruments comprising the Effective Policy Packages for South East England, UK are:

1. Building regulations: Compulsory for all new properties to include GWR systems
2. Building regulations: Compulsory for all new properties to include RWH systems (in blocks of flats, RWH in common roofs, balconies, etc.)
3. Direct provision of funding to local authorities to install household-based GWR & RWH systems in all new social housing projects
4. Enforcement (including warnings, fines and prosecution) of GWR & RWH conditions in planning and building regulation permissions
5. Funding GWR, RWH and/or combined GWR & RWH in schools and public buildings
6. Implement universal water metering
7. Increase the price of potable water and sewage collection and treatment
8. Produce clear and transparent bills and cost models for GWR, RWH and mains water for consumers' benefit
9. Promoting GWR & RWH
10. Tax breaks aimed at encouraging the installation of GWR & RWH systems by consumers
12. Company sponsorship of GWR & RWH systems
13. Raising awareness about sustainability of water resources and GWR & RWH among business and the public by Government
14. Public information campaigns encouraging households to collect and use rainwater and recycle grey water, i.e. encouraging installation of RWH & GWR systems
15. Subsidies for low-income households to install RWH & GWR systems

*Policy instruments were numbered at the early stage of the Basic Policy Package and each instrument 'kept' its serial number throughout the process, allowing to trace back of the instruments included in the various stages of the Policy Packaging.*

It is expected that each of the two Effective PPs represented in Figures 10 and 11, and detailed above will benefit from some regulatory, incentives and information policy instruments to maximize their effectiveness. Therefore, the two Effective Policy Packages were modelled in the ABM with some variations to include elements from each other (depicted as oval-shapes with dashed outline in Figures 10 and 11).
6.3 Evaluating and Modifying the Effective Package s Utilizing the ABM Results

The ABM results for the Water Base-case in the UK are discussed in detail in the Water Feasibility Country Report for the UK and suggest that: 1) the implementation of GWR and RWH systems at the Household level leads to decoupling water consumption and detrimental impacts on the environment, and 2) Servicizing GWR & RWH has great potential for increasing the uptake of these systems and for furthering decoupling between water consumption and negative impacts on the environment. Thus, a number of policy instruments designed to promote GWR and RWH were defined, and based on the Incentives-led and Regulations-led Effective Policy Packages described in previous sections (see Figures 10 and 11), ABM simulations were run that provide insights in the context of refining the Effective Policy Packages.

It should be noted that in order to quantify the effects of individual PIs in the ABM, PI 11 on creating stricter water abstraction limits for existing licensed users was deemed by the ABM team to have little direct effect on the agents defined for the UK’s Water model. The ABM already takes into account a reduction in consumption of mains water as a result of more GWR&RWH systems being adopted, and there were limitations on how to model the effect that PI11 would have on Water Companies that are existing licensed users. Thus this PI was not included in the ABM although it is considered significant for the wider work on policy packaging.

After a brief description of ABM and its use in SPREE, the ABM outputs for the two Effective Policy Packages are described followed by a discussion of the most significant observations resulting from running individually each of the Policy Instruments in the ABM.

6.3.1 On Agent-based modelling (ABM)

Agent-based modelling is a relatively new simulation method with which not only the physical part of complex systems (technology, infrastructure, etc.) but also the social part (behavior of individuals and organisations) can be analysed. As the developments within complex socio-technical systems are subject to many uncertainties, ABM is used for exploration rather than for prediction, i.e. to explore possible future development pathways. To date, ABM has been applied in various disciplines, including economics, sociology, geography, political science, anthropology, linguistics and even social history.

One of the main strengths of ABM is that social behavior of and interactions between individuals and organisations can be taken into account explicitly, by representing them as autonomous agents. An agent-based model therefore consists of agents, objects and the environment. Agents are entities that have individual properties and behaviour. They make decisions and interact with each other. Objects are passive entities that may represent any other relevant concept in the system under consideration. The environment provides the context for the interaction between agents and objects. In an agent-based simulation, the model runs step-by-step activities and decisions by all the individual agents. System-level patterns then emerge (evolve) as a result of the agent interactions and serve as the knowledge produced by the ABM for consideration and evaluation.
6.3.2 ABM Use in SPREE

In the SPREE project, agent-based modelling has been incorporated as a main methodology for the purpose of studying the potential of servicizing and servicizing policy to reach Absolute decoupling (economic growth in conjunction with environmental impact reduction) in various sectors, because it allows for the consideration of the role of consumer behavior and business behavior in the economic and environmental developments of industrial sectors. These developments are characterized by business strategies and consumer preferences, among others, which can be captured in an agent-based model. Furthermore, a generic (domain-free) ABM of servicizing systems can be used to represent and simulate servicizing in various sectors. In SPREE, the sector specific ABM enables the exploration of different individual policy instruments and importantly Policy Packages in different simulation runs to gain better understanding of their likely effects.

To develop the SPREE Water sector ABM the water experts specified the relevant businesses, consumers, products, services, and production and consumption processes, including the associated costs and environmental impacts. This resulted in the base-case model, which simulated the 'world' – the interactions between agents, objects and the environment - without the presence, or implementation, of any policy instrument or package. At the next stage, various policy options (instruments) were specified and inserted into the model, as well as Policy Packages, to test their potential to promote decoupling through servicizing. The instruments and packages tested in the model were those considered most promising by the domain experts in the Basic and Effective Package s stage of the Policy Packages design process. Thus, the main role of the ABM in the SPREE project is to support the design of Policy Packages by simulating the effects of different Policy Packages.

The main simulation outputs of the SPREE ABM to assist with the above are business profits, consumer expenditures, product and service market shares, product and service volumes and prices, supply-chain GDP, system-level environmental impact, and consumer preference fit (indicating satisfaction with product/service quality). By comparing the supply chain GDP and the system-level environmental impact outputs for different policy scenarios, the potential for absolute decoupling through servicizing can be extracted. Naturally, these results should be interpreted in view of the model and data assumptions in place.

The ABM results for the Water Base-case in the UK suggest that: 1) the implementation of GWR and RWH systems at the Household level leads to decoupling water consumption and detrimental impacts on the environment, and 2) Servicizing GWR & RWH has great potential for increasing the uptake of these systems and for furthering decoupling between water consumption and negative impacts on the environment.

Results for individual Policy Instruments simulated in the ABM have been examined and classified for the purpose of assessing which policies have the highest and lowest impacts in terms of achieving the goal of promoting GWR&RWH and thus reducing CO₂ emissions and mains water consumption, while maintaining or increasing revenue (GDP) in the GWR&RWH Supply Chain compared to the business as usual (Base-case) scenario.
It should be noted that ABM results show that all PIs lead to the revenue (Supply Chain GDP) increasing or remaining the same as in the business as usual scenario, while there is a reduction in negative environmental impacts. The two single policies with the greatest impact in terms of increased revenue (Supply Chain GDP) are the instruments on compulsory installation of GWR and RWH systems.

6.3.3 ABM Results

Results from ABM simulations are examined in this section in comparison to the UK’s Water Base-case (representing the present situation in the UK) for the Incentives-led Effective Policy Package, which comprises Incentive Policy Instruments 3 (funding to local authorities to install household-based GWR &RWH systems in all new social housing), 5 (funding GWR & RWH systems in schools and public buildings), 10 (tax breaks for the installation of GWR&RWH systems), 12 (sponsorship of GWR&RWH systems) and 15 (subsidies for low-income households to install RWH & GWR systems), plus ancillary/complementary PIs 6 (universal water metering), 7 (increased price of potable water and sewage), 8 (clear and transparent bills for GWR&RWH and mains water), 9 (promoting GWR&RWH), 13 (raising awareness about sustainability of water resources and GWR&RWH), and 14 (public information campaigns encouraging households to collect and use rainwater and recycle grey water and install GWR&RWH systems).

A number of ABM simulations corresponding with different combinations of PIs were also run and a combination of Information-led PIs (i.e. PI8 -clear and transparent bills for GWR&RWH and mains water-, 9 -promoting GWR&RWH-, 13 -raising awareness about sustainability of water resources and GWR&RWH-, and 14 -public information campaigns on GWR&RWH systems-) plus policies 6 (universal water metering) and 7 (increased price of potable water and sewage) is also examined in this section in comparison to the Base-case and Incentives-led PP. When describing the findings for this simulation, this will be referred to as Metered & Priced-up mains Water Policy Package.

Results when running the Incentives-led and Metered & Priced-up mains Water Policy Packages indicate an increase in profits over time compared with the Base-case (representing the present situation in the UK). For the Incentives-led PP, the Water Company experiences the most significant increase in profit, whereas for the Metered & Priced-up PP, the overall trend for the Water Company is a decrease in profit over time.

The model shows a noticeable increase in the expenditure of low-income non-metered groups: ‘struggling families’ and ‘struggling empty-nesters’ as would be expected from the implementation of policies based on universal water metering and higher prices for water, or policies on subsidies, tax breaks and other funding. There is also an overall steady increase in the revenue of the Supply Chain overtime, especially in the case of the Incentives-led PP.

The model also indicates that with both the Incentives-led and the Metered & Priced-up PPs, there is a decrease in the market share for the most popular system in the Base-case: the small GWR system with maintenance, in favor of the GWR&RWH servicized system. This indicates that Consumer groups decide to choose a different consuming model in favour of the servicizing model especially when economic incentives are available, and therefore, there is an increase in the servicizing rate (the sum
of service market shares). The servicizing rate is much higher with the Incentives-led PP than in the Base-case scenario.

With the Incentives-led PP, the ‘No offer’ option (no GWR or RWH system) is significantly reduced which indicates that if economic incentives are available there is willingness among consumers to use GWR and RWH systems.

With the Incentives-led PP, all systems sell over time and the average product prices for GWR & RWH systems, including for the servicized small GWR and large GWR&RWH systems are consistently lower than in the Base-case simulation. On the other hand and unlike in the Base-case simulation, with the Metered & Priced-up Water PP, the small GWR system with maintenance stops being sold, and prices become slightly more expensive for this product, and prices for the servicized systems remain stable over time but also slightly above the prices in the Base-case simulation.

It should be noted here that results from the Base-case simulation indicate that the main factors when choosing to adopt GWR and RWH systems at household level are firstly economic, with prosperous consumer groups more inclined to adopt these systems than consumers struggling financially. Among wealthy consumers, choosing the type of system depends on its size and price in relation to family size. After the economic factors, households with metered mains water supply are also more inclined to adopt GWR and RWH systems than unmetered households, and even consumer groups that are struggling financially show some interest in the cheaper small GWR system if their water supply is metered.

In both the Incentives-led PP and the Metered & Priced-up Water PP simulations, the number of product/service units used among metered ‘prosperous families’ and ‘wealthy empty-nesters’ increases, while fewer product/service units are used among non-metered ‘prosperous families’ and ‘wealthy empty-nesters’. Similarly, the number of product/service units used among financially struggling consumer groups shows a slight increase among metered ‘struggling families’ and ‘struggling empty-nesters’.

In comparison to the Base-case simulation, results for the Incentives-led and Metered & Priced-up PPs indicate that even with financial incentives in place, the pattern continues to be that the wealthier consumer groups adopt more GWR and RWH systems, and that it is the metered consumers who are more likely to adopt GWR and RWH systems rather than the non-metered consumers.

This increase on the number of service units used among wealthier groups represents an increase from approximately 2000 units to approximately 8000 units of the servicized large GWR&RWH system in the Metered & Priced-up Water PP simulation. On the opposite side of the spectrum, the number of services used among the struggling groups decreases to reflect fewer small GWR systems with maintenance and small servicized GWR systems in use.

In the Incentives-led PP simulation, the number of service units used represents an increase from approximately 2000 units to approximately 6000 units of the servicized large GWR&RWH system, and approximately 3500 units of the servicized small GWR system.
In terms of negative environmental impacts, there is a decrease in CO₂ emissions overall as a result of both the Metered & Priced-up, and Incentives-led Policy Packages. The reduction in emissions is especially noticeable with the Incentives-led package. Significantly, the largest gains in terms of emissions reduction are made among ‘non-metered’ consumer groups, especially ‘prosperous families’ and ‘wealthy empty-nesters’, and also ‘struggling empty-nesters’ and ‘struggling families’ in that order, despite the fact that the non-metered consumers are the least likely to adopt GWR&RWH systems. This finding supports the drive to meter water consumption for all households, and suggests that non-metered consumer groups can be target groups to prioritise in order to help reduce CO₂ emissions.

Similarly in terms of Water consumption per consumer, the overall pattern is that the consumption of non-metered groups significantly comes down in comparison with the Base-case scenario, and matches the lower consumption rates of the metered consumer groups. With the Metered & Priced-up PP, the pattern still remains that the wealthier consumer groups adopting large GWR&RWH servicized systems, are the ones with the lowest water consumption per capita (approximately 8-9 million litres) compared to the groups that struggle financially with a water consumption of approximately 11.4 million litres per consumer. With the Incentives-led PP, water consumption for all groups decreases to between 7.3 and 7.8 million litres per consumer to reflect the fact that all consumer groups can choose to adopt the most efficient GWR&RWH systems as a result of economic incentives.

In relation to lifestyle fit, the best scores are observed with the Incentives-led PP simulation compared with the Base-case scenario for all consumer groups, especially among non-metered groups, both wealthy and struggling financially. This is believed to be linked to the fact that non-metered groups including less prosperous consumers can choose to opt for a superior system (i.e. the large servicized GWR&RWH system) that fits their lifestyle as a result of tax-breaks and other economic incentives.

Figure 12, illustrates that with the implementation of the Incentives-led Policy Package while CO₂ emissions decrease, the overall revenue (GDP) in the Supply chain is greater than in the business as usual (Base-case) scenario, which shows decoupling between economic growth and negative environmental impacts.
In Figure 12 the black line represents the business as usual (Base-case) scenario and the red line represents the Incentives-led scenario (top graph); and also the modelled environmental impact (CO₂ emissions) for the business as usual (Base-case) scenario shown by the black line and the Incentives-led scenario represented by the green line (bottom graph).

Results from ABM simulations are also examined in comparison to the UK’s Water Base-case for the Regulations-led Effective Policy Package 2, which comprises Regulatory Policy Instruments 1 (building regulations: compulsory all new properties to include GWR systems), 2 (building regulations: compulsory all new properties to include RWH systems) and 4 (enforcement of GWR&RWH conditions in planning and building permissions), plus ancillary/complementary Pls 8 (clear and transparent bills for GWR&RWH and mains water), 9 (promoting GWR&RWH), 13 (raising awareness about sustainability of water resources and GWR&RWH), and 14 (public information campaigns encouraging households to collect and use rainwater and recycle grey water and install GWR&RWH systems).

Results when running the Regulations-led Policy Package indicate a great increase in profits over time compared with the Base-case (representing the present situation in the UK) for all Producing Businesses especially for the private and dedicated GWR&RWH businesses. For PB1 (Water Company) results indicate a slightly decreasing trend in profit over time.
The model shows a very significant increase in the revenue of the Supply Chain overtime as would be expected from the implementation of policies regulating the compulsory installation of GWR&RWH systems.

ABM model simulations also indicate that when only Information based policies are implemented (e.g. 8 - clear and transparent bills for GWR&RWH and mains water, 9 - promoting GWR&RWH, 13 - raising awareness about sustainability of water resources and GWR&RWH, and 14 - public information campaigns on GWR&RWH systems), there is a decrease in the market share for the most popular system in the Base-case scenario: the small GWR system with maintenance, in favour of the large GWR&RWH system.

In the case of the Regulations-led PP, the products and services around the small GWR system are no longer preferred and stop being used, while the preference is for the large GWR&RWH system. Significantly, there is a growing trend for the adoption of the large GWR&RWH system with maintenance, and even a greater preference for the large servicized GWR&RWH system, which after the first 25 years of the simulation stabilises having around 60% of the market share. This indicates that Consumer groups decide to choose a different consuming model in favor of the Servicizing model, and therefore, there is a huge increase in the servicizing rate (the sum of service market shares).

The second system most regularly sold becomes the large GWR&RWH system with maintenance as mentioned above. The average service price for the servicized GWR&RWH system remains higher than the price for the large servicized GWR&RWH system in the Base-case simulation throughout the simulation period of 100 years.

In the Regulations-led Policy Package simulation, the number of service units used among metered ‘prosperous families’ and ‘wealthy empty-nesters’ increases the most while approximately half fewer product units are used among the equivalent non-metered consumers despite regulation for new built houses. Furthermore, in the Regulations-led simulation the number of service units used among financially struggling consumer groups also shows an increase especially among metered ‘struggling families’ and ‘struggling empty-nesters’. This supports the need for metering water consumption and for regulations to reach all consumer groups.

In contrast with the Regulations-led scenario, ABM simulations based on Information policies only show that it is the wealthy consumers who choose to use servicized GWR&RWH systems, especially the metered consumers rather than the non-metered consumers. This indicates the strong driver that Regulations can have to reach all consumer groups, not only the wealthy.

In comparison to the Base-case simulation, results for the Regulations-led Policy Package indicate that with regulations in place there is an increase on the number of products/services used among wealthier groups from approximately 2000 units to approximately 8000 units of the servicized large GWR&RWH system. On the opposite side of the spectrum, there are fewer small GWR systems with maintenance and small servicized GWR systems in use as mentioned before.

In terms of detrimental environmental impacts, there is a significant decrease in CO₂ emissions overall for all consumer groups as a result of the Regulations-led Policy Package. Similarly in terms of Water
consumption, the overall pattern is that the water consumption per consumer significantly comes down in comparison with the Base-case scenario among both the metered and unmetered consumer groups under a Regulations-led scenario. Thus water consumption for all consumer groups is approximately on the 3 million litres per consumer mark if Regulations are implemented compared to up to 17 million litres of mains water consumed per consumer among non-metered groups in the business as usual scenario (Base-case).

In contrast with the Regulations-led simulation, when only Information policy instruments are used, the pattern is that the wealthier consumer groups are the ones adopting more large GWR&RWH servicized systems, and thus these groups are the ones with the lowest water consumption per capita (approximately 8-9 million litres) compared to the groups that struggle financially with a water consumption of approximately 11.4 million litres per consumer.

When looking at Information-led policies, it is significant that the largest gains in terms of reducing emissions are made among ‘non-metered’ Consumer groups, especially ‘prosperous families’ and ‘wealthy empty-nesters’, and also among ‘struggling empty-nesters’ and ‘struggling families’ in that order. These findings in terms of water savings and emissions reductions support the drive to meter water consumption for all households regardless of what other regulation to promote GWR&RWH in new buildings is in place, and suggest that non-metered consumer groups can be target groups to be prioritised in order to help reduce CO₂ emissions.

In relation to lifestyle fit, the best scores are observed under the Regulations-led scenario compared with the Base-case scenario for all consumer groups. When Information-led policies are considered, the best lifestyle scores are observed among both the metered and non-metered ‘prosperous families’ and ‘wealthy empty-nesters’. This is believed to be linked to the fact that these consumer groups benefit from information available and can afford to opt for a superior system (i.e. the large servicized GWR&RWH system) that fits their lifestyle.

Figure 13 illustrates that with the implementation of the Regulations-led Policy Package while the CO₂ emissions decrease, the overall revenue (GDP) in the Supply chain is much greater than in the business as usual (Base-case) scenario, which shows decoupling between economic growth and negative environmental impacts. Even in the simulation driven by Information policy instruments (see Figure 12), similar trends are observed, although the revenue of the supply chain is not as large, and the reduction in emissions is not as great as with the Regulations-led PP, which therefore represents a much more effective set of policy instruments.
Figure 13. ABM results illustrating: revenue (GDP) in the Supply chain for the UK Water study case

In Figures 13 and 14 the black line represents the business as usual (Base-case) scenario. The red line represents the Regulations-led scenario (top graph) in Figure 13 and the information-led scenario in Figure 14. These figures also model the environmental impact (CO\textsubscript{2} emissions) for the business as usual scenario as the black line, while the green line represents the Regulations-led scenario (bottom graph) in Figure 14 and the information scenario in Figure 14.
Figure 14. ABM results illustrating: revenue (GDP) in the Supply chain for the UK Water study case

Although similar results are observed for the Incentives-led and Regulations-led PP simulations (and even to an extent for simulations based on Information policies only), it is worth pointing out that in the Regulations-led simulation the number of products used among financially struggling consumer groups shows an increase especially among metered ‘struggling families’ and ‘struggling empty-nesters’ as would be expected. This is in support of the need for regulation, and suggests that prioritizing these groups in order to install GWR&RWH servicized systems can have great effects in terms of decreasing negative environmental impacts.

Table 2 summarizes the ABM results for the UK case. In the first column the ABM simulation results for the Base Case are presented. Then, in the second column these results are compared with those of the effective policy package, in terms of emissions, supply chain GDP, amount of water consumed per consumer, types and number of tools and service units used and environmental impacts (embedded CO2 emissions).

Based on the results summarized in Table 2 and the interpretation of various combinations of policy instruments, it is considered that optimum results may be obtained if both relevant incentives and regulations are combined in a single Policy Package.
Table 2. Summary of ABM outputs for the UK Water Base Case compared to simulations with Effective Policy Packages

<table>
<thead>
<tr>
<th>ABM outputs</th>
<th>ABM simulation for the Base Case of GWR &amp; RWH systems in the UK</th>
<th>ABM simulation for the Base Case of GWR &amp; RWH systems in the UK, with Incentives-led Effective Policy Package added (all incentives, plus info/awareness &amp; water metering &amp; pricing policy instruments)</th>
<th>ABM simulation for the Base Case of GWR &amp; RWH systems in the UK, with Regulations-led Effective Policy Package added (all regulations, plus info/awareness policy instruments but no water metering &amp; pricing Instruments)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental impact – embedded CO₂ emissions compared to Base Case (current scenario)</td>
<td>c. 70,000 Kg of CO₂ linked to large GWR &amp; RWH (main market share through the simulation)</td>
<td>↓ Decrease from Base Case to c. 50,000 Kg mark (with minor fluctuations)</td>
<td>↓↓ Decrease from Base Case to c. 41,000 Kg of CO₂ linked to large GWR &amp; RWH (main market share through the simulation)</td>
</tr>
<tr>
<td>Supply Chain GDP (Revenue in £) compared to Base Case (current scenario)</td>
<td>Approximately on the £40,000 mark for the first 25 years and then c. £30,000</td>
<td>↑ Similar to Base Case on £40,000 for the first 25 yrs then modest increase to c. £55,000 on average</td>
<td>↑↑↑ Increase from £40,000 Base Case to above £400,000 for first few years, then c. £300,000 and £225,000 last 50 yrs</td>
</tr>
<tr>
<td>Amount of Water consumed per consumer (liters) for each consumer group</td>
<td>Ranging from 7.9 million litres per consumer for wealthy families with metered water supply, to 17 million litres per consumer for low income families with unmetered water</td>
<td>↓↓ Between 7.2 and 7.8 million litres per consumer depending on consumer group</td>
<td>↓↓↓ Between 3.2 and 3.4 million litres per consumer depending on consumer group</td>
</tr>
<tr>
<td>Type &amp; Number of tools used over period and type</td>
<td>Small GWR with maintenance: 340 Large GWR&amp;RWH with maintenance: 9</td>
<td>↑↑ Small GWR with or w/o maintenance: 606 Large GWR&amp;RWH with or w/o maintenance: 107</td>
<td>↑↑↑ Large GWR&amp;RWH: 318 Large GWR&amp;RWH maintenance: 86</td>
</tr>
<tr>
<td>Type &amp; Number of service units used over period (years of system service)</td>
<td>Small GWR: 2,000 (among wealthier groups and some among metered low income families) Large GWR &amp; RWH: 2,000 (mostly among wealthier groups)</td>
<td>↑↑ Small GWR: 3,500 Large GWR &amp; RWH: 5,800</td>
<td>↑↑↑ Choice of system - Large GWR &amp; RWH: 8,100 (fewer small GWR systems with maintenance or serviced in use)</td>
</tr>
<tr>
<td>Lifestyle</td>
<td>same as Base Case</td>
<td>✓ Improvement in comparison with Base Case</td>
<td></td>
</tr>
<tr>
<td>Environmental impacts (embedded CO₂ emissions - Kg) over time per consumer group</td>
<td>Between 17,000 and 34,000 Kg per consumer depending on consumer group</td>
<td>↓↓↓ Between 16,000 and 16,800 Kg per consumer depending on consumer group</td>
<td>↓↓↓ Between 8,100 and 8,600 Kg per consumer depending on consumer group</td>
</tr>
</tbody>
</table>

Arrows represent ↓ for decrease and ↑ for increase when comparing the relative output values of different scenarios, i.e. Base Case compared to simulations with Policy Packages added on. More arrows up or down indicate larger or smaller increase/decrease than under other policy scenarios by comparison. All figures, for example No. of Service units and litres of Water consumed, are rounded up. ✓ for improved ‘Lifestyle fit’ over time and - no improvement in ‘Lifestyle fit’ over time in relation to the Base Case (currently).
6.3.4 The Effect of ABM Results on the Effective Package

Results for individual Policy Instruments simulated in the ABM have been examined and classified for the purpose of assessing which policies have the highest and lowest impacts in terms of achieving the goal of promoting GWR&RWH and thus reducing CO₂ emissions and mains water consumption, while maintaining or increasing revenue (GDP) in the GWR&RWH Supply Chain compared to the business as usual (Base-case) scenario.

Table 3 below details the Water case Policy Instruments and ranks them from High impact to Very Low impact briefly explaining why the PI has been ranked one way or another based on the impact that the PI has on decoupling between economic growth (Supply Chain GDP) and negative environmental impacts (CO₂ emissions). PIs have also been grouped according to policies with similar impact. The type of PIs is differentiated by color, with green representing the incentives-led effective policy package, orange the regulations-led effective policy package and purple the information /ancillary measures that appear in both PPs. This exercise, together with the ongoing analysis of various combinations of policies will help to determine which combinations are the most successful in terms of achieving decoupling, thus will help to formulate the Final Policy Package (or packages).

It should be noted that ABM results show that all PIs lead to the revenue (Supply Chain GDP) increasing or remaining the same as in the business as usual scenario, while there is a reduction in negative environmental impacts. The two single policies with the greatest impact in terms of increased revenue (Supply Chain GDP) are the instruments on compulsory installation of GWR and RWH systems, i.e. PI1 and PI2 respectively, as it would be expected.

Based on the assessment of the impacts expected from individual Policy Instruments, it is believed that most combinations of PIs in the Water study will contribute to achieving decoupling. However, the Final Policy Package (or packages) are likely to include the PIs that are most effective and viable to implement.
### Table 3. List of Policy Instruments in the Water study case ranked and color-coded according to their impact or effectiveness in reducing negative environmental impacts (CO₂ emissions) and increasing revenue (Supply Chain GDP).  
Green (Incentives-led Effective Package ), Orange (Regulations-led Effective Package ) and Purple (Information measures in both PPs).

<table>
<thead>
<tr>
<th>List of Policy Instruments in the Effective Policy Packages</th>
<th>PI impact</th>
<th>Brief explanation and groups of PIs with similar impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Building regulations: compulsory all new properties to include GWR systems</td>
<td>High</td>
<td>A significant increase in revenue (e.g. from c. £0 to £50,000 on average over the 10 yr period) and a substantial decrease in CO₂ emissions (e.g. 20,000 kg). Similar to PI2.</td>
</tr>
<tr>
<td>2 Building regulations: compulsory all new properties to include RWH systems</td>
<td>High</td>
<td>A significant increase in revenue (e.g. from c. £0 to £50,000 on average over the 10 yr period) and a substantial decrease in CO₂ emissions (e.g. 20,000 kg). Similar to PI1.</td>
</tr>
<tr>
<td>3 Funding to local authorities to install GWR &amp; RWH systems in all new social housing</td>
<td>Medium</td>
<td>A moderate increase in revenue (c. £20,000 on average over the 100 yr period) and a medium decrease in CO₂ emissions (e.g. 5,000 to 10,000 kg). Similar to PI4 and PI5.</td>
</tr>
<tr>
<td>4 Enforcement of GWR &amp; RWH conditions in planning and building regulation permissions</td>
<td>Medium</td>
<td>A moderate increase in revenue (c. £20,000 on average over the 100 yr period) and a medium decrease in CO₂ emissions (e.g. 5,000 to 10,000 kg). Similar to PI3 and PI5.</td>
</tr>
<tr>
<td>5 Funding GWR, RWH and/or combined GWR &amp; RWH in schools and public buildings</td>
<td>Medium</td>
<td>A moderate increase in revenue (c. £20,000 on average over the 100 yr period) and a medium decrease in CO₂ emissions (e.g. 5,000 to 10,000 kg). Similar to PI3 and PI4 but marginally lower revenues.</td>
</tr>
<tr>
<td>6 Implement universal water metering</td>
<td>Low</td>
<td>No change in revenue over the 100 yr period in relation to the Base-case, but some reduction in CO₂ emissions (e.g. 1,000 kg). Similar to PI8.</td>
</tr>
<tr>
<td>7 Increased price of potable water and sewage</td>
<td>Very Low</td>
<td>No impact. No change compared to the business as usual (Base-case) simulation. Same as PI9.</td>
</tr>
<tr>
<td>8 Clear and transparent bills and cost models for GWR, RWH and mains water</td>
<td>Low</td>
<td>No change in revenue over the 100 yr period in relation to the Base-case, but some reduction in CO₂ emissions (e.g. 1,000 kg). Similar to PI6.</td>
</tr>
<tr>
<td>9 Promoting GWR and RWH</td>
<td>Very Low</td>
<td>No impact. No change compared to the business as usual (Base-case) simulation. Same as PI7.</td>
</tr>
<tr>
<td>10 Tax breaks for the installation of GWR &amp; RWH systems</td>
<td>Medium</td>
<td>The same as PI3 and PI4 in terms of moderate increase in revenue.</td>
</tr>
<tr>
<td>11 Stricter water abstraction limits for existing licensed users</td>
<td>Not modelled in the ABM but considered important and thus will be included in the Viable Policy Package</td>
<td></td>
</tr>
<tr>
<td>12 Company Sponsorship of GWR &amp; RWH systems</td>
<td>Medium</td>
<td>A moderate increase in revenue over the 100 yr period and a medium decrease in CO₂ emissions. Similar to PI3, PI4 but marginally lower revenues, similar to PI5 and PI15.</td>
</tr>
<tr>
<td>13 Raising awareness about sustainability of water resources and GWR &amp; RWH</td>
<td>Very Low</td>
<td>No impact. No change compared to the business as usual (Base-case) simulation. Same as PI7 and PI9.</td>
</tr>
<tr>
<td>14 Public information campaigns for households to collect and use rainwater and recycle grey water, i.e. RWH &amp; GWR systems</td>
<td>Very Low</td>
<td>No impact. No change compared to the business as usual (Base-case) simulation. Same as PI7, PI9 and PI13.</td>
</tr>
<tr>
<td>15 Subsidies for low-income households to install RWH &amp; GWR systems</td>
<td>Medium</td>
<td>A moderate increase in revenue over the 100 yr period and a medium decrease in CO₂ emissions. Similar to PI3 and PI4 but marginally lower revenues, similar to PI5 and PI12.</td>
</tr>
</tbody>
</table>
6.3.5 Effective Package: Concluding Observations

Two distinct Effective Policy Packages were identified for the Water sector study case. One is led by Incentives and the other is led by Regulations. Pls based on information-sharing and awareness-rising were included in both Effective PPs as secondary/ancillary instruments. It was considered that information instruments will have little effect on their own, but will facilitate the implementation of regulations and incentives if added to these Pls, thus affecting the policy goal indirectly.

At any rate, the effects of individual Policy Instruments were simulated in the ABM, and results from these simulations were interpreted. Pls were classified for the purpose of assessing which policies have the highest and lowest impacts in terms of achieving the goal of promoting GWR&RWH and thus reducing CO₂ emissions and mains water consumption, while maintaining or increasing revenue (GDP) in the GWR&RWH Supply Chain compared to the business as usual (Base-case) scenario. Among all the Policy Instruments, the ones with the greatest impact were found to be PI1 and PI2 which refer to Building regulations to make it compulsory for all new properties to include GWR systems and RWH systems respectively. However, how efficient these interventions would be in terms of costs to housing developers, local authorities and ultimately to consumers remains to be seen. It is also noted that if funding, subsidies, tax breaks or other financial incentives are provided to encourage the installation of GWR & RWH systems in all new houses, this may mean cuts in other policy domains.

Despite the observed high impact of PI1 and PI2, it is considered that a single policy will not be as effective in achieving widespread uptake of GWR & RWH systems as a set of different policies included in Policy Packages, partly because as stated above, there could be financial constraints to the implementation of high-impact policies such as PI1 and PI2 and other ancillary measures such as information policy instruments can be useful in influencing consumers.

Results from the ABM simulations for the Incentives-led and Regulations-led Effective Policy Packages were examined and indicate a significant decrease in CO₂ emissions and mains water consumption, while the overall revenue (GDP) in the Supply chain is greater than in the business as usual (Base-case) scenario. Results are especially encouraging for the Regulations-led PP simulation. The improvements that both Incentives and Regulations can bring about in relation to the business as usual situation indicate that servicizing GWR&RWH systems can lead to decoupling between economic growth and negative environmental impacts.

For example, in the Incentives-led simulation, the water consumption of all consumer groups lowers to around 7 million litres per consumer and reflects the fact that all consumer groups can choose to adopt GWR&RWH systems as a result of economic incentives. A large reduction in emissions is also shown in the simulation for the Incentives-led PP. For the Regulations-led PP, water consumption of all consumer groups lowers to around 3 million litres per consumer as a result of making GWR and RWH systems compulsory in all new houses.
A key finding of the simulations based on Information policy instruments is that large gains in terms of emissions reduction can be made among ‘non-metered’ Consumer groups, especially ‘prosperous families’ and ‘wealthy empty-nesters’ and also ‘struggling empty-nesters’ and ‘struggling families’ in that order, despite the fact that the non-metered consumers are the least likely to adopt GWR&RWH systems. Similarly, in the Information-led simulations, the water consumption of non-metered consumers decreases to match the lower consumption rates of their equivalent metered consumer groups, but the pattern remains similar to that of the Base-case, in that the wealthier consumer groups are predominantly the ones adopting large GWR&RWH servicized systems, and so they are the ones with the lowest water consumption per capita (approximately 8-9 million litres) compared to the groups that struggle financially with a water consumption of approximately 11.4 million litres per consumer. This compares well with the Base-case scenario with up to 17 million litres per consumer among the non-metered struggling consumers. Thus non-metered consumers can be target groups for reducing negative environmental impacts.

It is considered that optimum results may be obtained if both relevant incentives and regulations are combined. Thus, it is expected that both, the Incentives-led and Regulations-led Effective PPs, may ultimately benefit from having regulatory, incentivising and information policy instruments within each of them to maximise their effectiveness. The analysis of a number of combinations modelled in the ABM including some regulatory instruments in the Incentives-led package and vice-versa is on-going. Hence, the package used as a basis for the viable packages is a combination of both.
7. The Viable Packages

The Effective Package was designed in the UK, with the UK setting in mind. However, some of the elements in the UK setting may not be pertinent in other settings. For example, one of the instruments proposed in the UK policy package is the introduction of universal water metering. But in countries where there is already universal water metering, such as Israel, that is clearly a redundant PI. Thus, before implementing the proposed effective policy package to a specific location it has to be modified to account for the specific attributes of that place.

More importantly, the Effective Package will not be implemented unless something is done to implement it. Many studies have shown that implementation is anything but guaranteed (Bardach, 1977). Hence, action must be taken to advance the implementation of the desired policy package. Implementation has two elements. First, the PIs have to be accepted by decision makers. Second, they have to be implemented on the ground. The viable policy package comes to enhance the probability that the Effective Package will indeed be accepted and implemented. To this end the factors that may impede it being accepted have to be identified and addressed, and the barriers to its implementation have to be realized and overcome.

Thus, the formulation of the viable policy package is comprised of several steps:

1) The winners and particularly the losers from the implementation of each PI must be identified. If possible, the losers should be compensated or action should be taken to mitigate their losses, particularly if it is publically or politically infeasible to advance a policy that adversely affects particular losers.

2) The actors whose support is necessary for the acceptance and implementation of the different measures included in the policy package need to be identified. Once identified, actions that may bring them on board can be proposed. These may be the addition certain PIs or the omission of PIs that may lead them to oppose the whole package.

3) Finally, the barriers to the implementation of the PIs have to be spelled out, so they may be addressed. Hence, the Viable Package is a modification of the Effective Package, which will make the package more acceptable and more likely to be implemented in practice.

The actors involved and the barriers that may impede implementation differ across places. Hence, the Viable Package has to be adapted to the local circumstances. For this reason different viable packages were designed in the Water sector for the UK, Israel and Galicia (Spain). In each case the country specifics were described, followed by modifications of the Effective Package to address the country’s specific attributes. Then the winners and losers of all PIs in the adjusted effective policy package were identified. In the third stage actions that can mitigate the losses incurred by the groups adversely affected were proposed. In the fourth step the barriers to the implementation were identified, and steps to overcome these barriers proposed. Finally, the political acceptability was assessed on the basis of person-to-person meetings with key actors who are closely familiar with decision making processes in the specific locale. On this basis final adjustments were made.
In this section we outline the Viable Package for each of the three cases for which viable packages were prepared in the Water sector. For sake of brevity not all tables are presented. Rather, just the main steps and adjustments are described. Hence, for each country the initial modifications of the effective policy package is described, then the main losers and the actions that may be taken to mitigate the adverse effects are presented, followed by the identification of barriers and actions that may help overcome them. In the final part of each case the Viable Package is described, showing which PIs were retained, which were modified and if additional measures or actions were proposed, these are presented too. In the UK and Israeli cases ABM runs were utilized in the early part of this effort.

7.1 The Viable Policy Package for South East England, UK

The sector effective policy package was constructed with the UK in mind. Hence, the adjustments needed in the first part were limited. However, a number of key ABM simulations were examined and compared with each other with the aim of creating one single Effective PP that would combine regulatory, incentives and information policy instruments (PIs) in order to maximize the package’s effectiveness.

Policy combinations resulting in better values for Supply Chain GDP (no actual figures in £ provided) appear to be the Regulations-led policy combinations or those Policy Packages with a single Incentive PI in, i.e. PI 15 on means-tested subsidies for GWR&RWH systems, but only if the Policy Instruments on mains water metering and pricing are also included. This appears to be one of the Policy combinations to provide the best results overall and it includes all types of Policy Instruments (regulations, information and incentives). Therefore, this was used as the basis for a single Effective Policy Package to be tested for its viability.

However, it should be noted that the ABM has been built on assumptions largely provided by the SPREE water team based on consultation with experts in the sector, as well as their own knowledge. Furthermore, the ABM had limitations around what could be modeled (e.g. economies of scale are not taken into account), thus some results can at times appear counter-intuitive especially when comparing combinations of PIs. Thus ABM outputs have been used to influence the definition of the Effective Policy Package but they did not fully determine the definition of the Effective and Viable Packages. Also, due to time constraints ABM simulations were limited, and ‘Expert Judgment’ was used to add two individual PIs believed to add to the portfolio of varied Policy Instruments with potential for analysis of their viability. Therefore, in addition to regulations and the incentive-based PI 15 on subsidies for low-income households to install RWH & GWR systems, it was considered that PI 11 on stricter Water Abstraction Limits for existing licensed users and PI10 on Tax Breaks had to be included for assessment as part of the viable PP. It should be noted that PI11 was not modeled in the ABM due to limitations on how its direct effect on the model’s agents could be represented, but in the same way as PI10 on Tax breaks, PI11 was considered to be potentially viable. Following also ‘Expert Judgment’ PI 12 on Sponsorship was taken out of the PP to be assessed for viability as it was considered that the impact of PI12 would be limited and potentially covered already under PI 9 on promotion of GWR and RWH systems.
Therefore, the Policy Package to be assessed for its viability including consultation with policy / decision-makers, and thus referred to hereon as the Viable Policy Package includes the following Policy Instruments:

1. Building regulations: compulsory all new properties to include GWR systems;
2. Building regulations: compulsory all new properties to include RWH systems;
3. Direct provision of funding to local authorities to install household-based GWR & RWH systems in all new social housing projects;
4. Implement universal mains water metering;
5. Increased price of potable/mains water and sewage;
6. Clear and transparent bills and cost models for GWR, RWH and mains water;
7. Promoting GWR and RWH;
8. Tax breaks aimed at encouraging the installation of GWR&RWH systems by consumers;
9. Stricter water abstraction limits for existing licensed users;
10. Raising awareness about sustainability of water resources and GWR&RWH;
11. Public information campaigns for households to collect and use rainwater and recycle grey water, i.e. RWH & GWR systems;
12. Subsidies for low-income households to install RWH & GWR systems.

For each of these instruments the winners and losers were identified. In each case the way they were affected was spelled out. In Table 4 the losers are summarized, and their losses explained, and the actions that can mitigate these potential losses are spelled out.
Table 4. UK Mitigation Instruments

<table>
<thead>
<tr>
<th>Losers</th>
<th>Main adverse effects</th>
<th>Mitigation actions</th>
</tr>
</thead>
</table>
| Water supply and sewage treatment companies | Both gainers and losers. May lose revenues from selling less water from mains. But can reduce need for new water. | -Minimum service charges to be applied for all consumers to avoid any reduction in revenue linked to the sale of mains/potable water.  
-Fixing leaks across network.  
-Funding for metering infrastructure *(already happening)*.  
-Continue to switching strategy from storage (reservoirs) and desalination to water efficiency measures and fixing leaks *(already happening)*. |
| and/or municipalities                        |                                                                       |                                                                                     |
| Government                                  | Has to fund local authorities for installation of GWR & RWH on social housing, provide mean-test subsidies and loss of tax revenues | -Funding diverted to GWR & RWH from other areas.  
-Increase in taxes to fund this policy area.  
-Regulation passed so that some/all of the cost is passed to developers and buyers of new homes.  
-Health and safety, and Maintenance regulation may be needed. |
| Local Authorities and Building Regulations  | Need to deal with new regulations. May incur additional cost if not refunded from central government. Have to assure maintenance and there may be maintenance and health and safety risks (especially concerning Local Authority-owned properties). | -Additional funding provided.  
-Additional resources (e.g. additional staff) to deal with new regulations.  
-Implementation of maintenance /servicizing services linked to GWR & RWH systems (whether with or without regulation) to ensure the good working order of GWR&RWH systems (life span guarantee), and to minimise Health and Safety risks (e.g. cross-connections between GWR & RWH and mains pipes). |
| bodies                                      |                                                                       |                                                                                     |
| Other policy domains/areas of funding       | Loss of funds due to diversion of funds to GWR & RWH subsidies                   | -Additional funding made available *(from where? See above)*.  
-Increase in taxes to fund other policy areas.  
-Reduction on existing financial incentives in other areas. |
| Buyers of new homes and rest of consumers   | Higher cost of new properties if cost passed on to developers; may raise water cost if on fixed charges at present; maintenance and health and safety risks | -Tax breaks, subsidies, grants to help with cost associated with the installation of GWR & RWH systems if all or some cost is passed on by the developer.  
-Means-tested subsidies for water efficiency systems including GWR & RWH.  
-Information on benefits of GWR & RWH and sustainability of water resources to help change attitudes and choices, especially among consumers with high levels of mains water consumption who |
may pay more as a result of metering.
- Information and choice of maintenance / servicizing services linked to ensuring the good working order of GWR&RWH systems (life span guarantee), and to minimise Health and Safety risks (e.g. cross-connections between GWR & RWH and mains pipes).

Developers
- Higher cost due to compulsory installation. Liability if health and safety issues arise.
- Tax breaks, funding, sponsorship, so that not all the additional cost of installing GWR & RWH systems is absorbed by developers.
- Implementation of maintenance / servicizing services linked to GWR & RWH systems (whether with or without regulation) to ensure the good working order of GWR&RWH systems (life span guarantee), and to minimise Health and Safety risks (e.g. cross-connections between GWR & RWH and mains pipes).

GWR & RWH businesses
- Need to provide improved cost models to compete with conventional systems; potentially issues of responsibility/liability related to Health and Safety risks; potentially greater regulation on business to provide GWR&RWH systems’ maintenance.
- Potential regulation that requires of these businesses to offer maintenance services in order to sell the systems.
- Change in business model extended to the offer of maintenance / servicizing services for all GWR & RWH systems (whether with or without regulation) to ensure the good working order of GWR&RWH systems (life span guarantee), and to minimise Health and Safety risks (e.g. cross-connections between GWR & RWH and mains pipes).

The barriers identified under the social acceptability rubric, as summarized in Table 3, include practical and perception aspects (e.g. whether the systems are safe in terms of health and safety, whether the systems will work or will require a lot of maintenance, and whether they will fit in the space available at home etc.). These considerations are intrinsically linked to technological and financial aspects too (i.e. whether to choose only RWH, or GWR & RWH, whether a combined system would fit and is affordable etc.). Therefore, social acceptability is linked to perception, aesthetics, space, location preference, and financial and technical aspects, and is also intertwined with political acceptability in the context of the UK. Hence, the implications for instruments to be added or removed were defrayed to the next stages, after the implementation barriers and political acceptability were assessed.

The potential implementation barriers, financial, technical know-how, institutional, technological and whether pre-conditions exist were analyzed for each PI separately. These are presented in Table 5. The actions that may be taken to address the barriers identified in Table 5 are presented in Table 6.
### Table 5. Potential Implementation Barriers in the UK

<table>
<thead>
<tr>
<th>Barriers</th>
<th>Financial</th>
<th>Technical know-how</th>
<th>Institutional</th>
<th>Technological</th>
<th>Do pre-conditions exist to implement Pi?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-Building regulations: compulsory all new properties to include GWR systems</td>
<td>Yes</td>
<td>No</td>
<td>Yes (Local Authorities, Build Regs, developers)</td>
<td>No</td>
<td>Yes (political willingness and acceptance by industry)</td>
</tr>
<tr>
<td>2-Building regulations: compulsory all new properties to include RWH systems</td>
<td>Yes</td>
<td>No</td>
<td>Yes (Local Authorities, Build Regs, developers)</td>
<td>No</td>
<td>Yes (political willingness and acceptance by industry)</td>
</tr>
<tr>
<td>3- Direct provision of funding to local authorities to install GWR &amp; RWH systems in all new social houses</td>
<td>Yes</td>
<td>No</td>
<td>Yes (Local Authorities, Build Regs)</td>
<td>No</td>
<td>Yes (source of funding needed)</td>
</tr>
<tr>
<td>6- Implement universal mains water metering</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>7- Increased price of potable water and sewage</td>
<td>Yes (consumers)</td>
<td>No</td>
<td>Yes (Ofwat, Consumers Council Water)</td>
<td>No</td>
<td>Yes (political willingness)</td>
</tr>
<tr>
<td>8- Clear and transparent bills and cost models for GWR, RWH and mains water</td>
<td>No (minimal)</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>9- Promoting GWR &amp; RWH</td>
<td>No (minimal)</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>10- Tax breaks aimed at encouraging the installation of GWR&amp;RWH systems by consumers</td>
<td>Yes (although some tax incentives exist already)</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes (alternative source of revenue needed)</td>
</tr>
<tr>
<td>11- Stricter water abstraction limits for existing licensed users</td>
<td>Yes (linked to potentially more reservoirs)</td>
<td>No</td>
<td>Yes (some areas/water companies)</td>
<td>No</td>
<td>Yes (may require more reservoirs and/or water efficiency measures)</td>
</tr>
<tr>
<td>13- Raising awareness about sustainability of water resources and GWR&amp;RWH</td>
<td>No (minimal)</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>14- Public information campaigns for households to collect and use rainwater and recycle grey water, i.e. RWH &amp; GWR systems</td>
<td>No (minimal)</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>15- Subsidies for low-income households to install RWH &amp; GWR systems</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>Yes (source of funding needed)</td>
</tr>
</tbody>
</table>
## Table 6. Proposed Strategies and Actions to Address Implementation Barriers in the UK

<table>
<thead>
<tr>
<th>Policy Instrument</th>
<th>Barrier</th>
<th>Nature/Extent</th>
<th>Strategies to overcome barrier</th>
<th>Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-Building regulations: compulsory all new properties to include GWR systems</td>
<td>Financial, political and cultural</td>
<td>Requires a large initial investment and operating throughout</td>
<td>Tax breaks, subsidies, grants, loans for developers, Local Authorities and homeowners, Also sponsorship/private funding</td>
<td>Financial Lobbying (politicians, developers, Local Authorities)</td>
</tr>
<tr>
<td>2-Building regulations: compulsory all new properties to include RWH systems</td>
<td>Financial, political and cultural</td>
<td>Requires a large initial investment and operating throughout</td>
<td>Tax breaks, subsidies, grants, loans for developers, Local Authorities and homeowners, Also sponsorship/private funding</td>
<td>Financial Lobbying (politicians, developers, Local Authorities)</td>
</tr>
<tr>
<td>3- Direct provision of funding to local authorities to install GWR &amp; RWH systems in all new social housing</td>
<td>Financial and institutional/ regulation (responsibility for maintenance)</td>
<td>Requires investment by Government to fund PI throughout</td>
<td>Find alternative sources of funding e.g. recruit a sponsor for the system Maintenance mechanisms needed</td>
<td>Financial and institutional/ regulation</td>
</tr>
<tr>
<td>6- Implement universal mains water metering</td>
<td>Financial (minimal) and cultural (consumers)</td>
<td>Requires some investment by Water Companies (happening already) and creating better awareness among consumers</td>
<td>Government to help/fund Water companies/municipalities Awareness-raising among consumers</td>
<td>Financial and cultural (awareness) both already happening</td>
</tr>
<tr>
<td>7- Increased price of potable water and sewage</td>
<td>Financial, political and cultural</td>
<td>Requires consumers paying higher price and some will find this difficult</td>
<td>Work with Consumers Council for Water and OFWAT Subsidise consumers (happening)</td>
<td>Financial (happening) Lobbying (politicians, regulators)</td>
</tr>
<tr>
<td>8- Clear and transparent bills and cost models for GWR, RWH and mains water</td>
<td>Minimal (cultural)</td>
<td>Water Companies and businesses appear to be cooperative</td>
<td>Work with Water companies/municipalities and businesses</td>
<td>Collaboration (happening)</td>
</tr>
<tr>
<td>9- Promoting GWR &amp; RWH</td>
<td>None (minimal)</td>
<td>Already happening e.g. Water Companies</td>
<td>Build on existing work</td>
<td>Collaboration (happening)</td>
</tr>
<tr>
<td>10- Tax breaks aimed at encouraging the installation of GWR&amp;RWH systems</td>
<td>Financial and institutional *</td>
<td>Some tax incentives exist already *</td>
<td>Revise existing tax breaks, ‘Sacrifice’ some tax revenue and find alternative source</td>
<td>Financial and lobbying politicians</td>
</tr>
</tbody>
</table>
by consumers | of revenue to help consumers |Collaboration (happening): Lobbying , Awareness-raising, Financial support for alternatives
---|---|---
11- Stricter water abstraction limits for existing licensed users | Financial, cultural, Pre-conditions: infrastructure (reservoirs) and fixing leakage | Difficult in areas such as London / England’s southeast where fixing leakage and building new reservoirs present planning/logistical and financial problems | Work with Water companies/municipalities to promote ‘demand management and water efficiency’ Change of paradigm /cultural shift to promote water efficiencies. Some funding may be required.
13- Raising awareness about sustainability of water resources and GWR&RWH | None (minimal) | Already happening e.g. Water Companies | Build on existing work
14- Public information campaigns for households to collect & use RW & recycle GW | None (minimal) | Already happening e.g. Water Companies | Build on existing work
15- Subsidies for low-income households to install RWH & GWR systems | Financial and institutional/regulation (responsibility for maintenance) | Government to invest and operate subsidies throughout | Find alternative sources of funding: Loans, Grants, Sponsors Mechanisms for system maintenance needed

*There are already tax breaks available: RWH and GWR systems are listed on the UK Government’s Enhanced Capital Allowance scheme (ECA). The ECA offers developers/procurers tax incentives for a range of water efficiency devices/technologies. The tax incentive applies to both the purchase and installation cost of the technology.*

In order to implement a policy package it is necessary that it will be promoted by somebody with the appropriate standing (both legally and institutionally). In the UK case several potential promoters were identified: the Department for Environment, Food and Rural Affairs (DEFRA) – policy; the Water Services Regulation Authority (OFWAT), the Drinking Water Inspectorate (DWI), and the Consumer Council for Water – pricing regulation; the Environment Agency (EA) – policy/regulations/implementation/enforcement on abstraction, pollution control, flood defence and flood risk management; and Local Authorities and Building Regulations – implementation and enforcement.

To assess the political feasibility of the package, and the likelihood that the potential promoters indeed do so a number of stakeholders were consulted including policy and decision-making actors and the main initiators/promoters of a policy package. These consultees were asked to
comment on barriers to the individual PIs and the way to overcome them. They were also asked to provide their views of the policy package as a whole. A summary table outlining this consultation with political actors is included below as Table 7.

Table 7. UK Political Actors Table

<table>
<thead>
<tr>
<th>Actor</th>
<th>Attitude towards the target (supporting, objecting, abstaining)</th>
<th>Attitude towards the initiating/leading actor(s) (close collaboration, formal relations, conflict)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environment Agency, Water Resources National Policy Manager</td>
<td>Reportedly not their place to support or abstain, but to implement regulation</td>
<td>On-going collaboration</td>
</tr>
<tr>
<td>Water Company (South East Water)</td>
<td>Supporting</td>
<td>Close collaboration</td>
</tr>
<tr>
<td>Water Company (Southern Water)</td>
<td>Supporting?</td>
<td>Formal collaboration?</td>
</tr>
<tr>
<td>Water Company (Thames Water)</td>
<td>Objecting to GWR and RWH regulations</td>
<td>Formal collaboration</td>
</tr>
<tr>
<td>Non-for-Profit/NGO sector (Waterwise) Managing Director</td>
<td>Supporting but lots of issues exist especially around regulations given current political climate</td>
<td>Close collaboration</td>
</tr>
<tr>
<td>Regulatory body OFWAT</td>
<td>Abstaining?</td>
<td>Formal collaboration?</td>
</tr>
<tr>
<td>Regulatory body Consumer Council for Water</td>
<td>Abstaining?</td>
<td>Formal collaboration?</td>
</tr>
<tr>
<td>DEFRA</td>
<td>Abstaining?</td>
<td>Formal collaboration?</td>
</tr>
<tr>
<td>GWR&amp;RWH business: Freewater</td>
<td>Supporting?</td>
<td>Close collaboration?</td>
</tr>
<tr>
<td>GWR&amp;RWH business: Rainwater Harvesting</td>
<td>Supporting?</td>
<td>Close collaboration?</td>
</tr>
</tbody>
</table>

It is considered that there are no barriers (or very minimal) to Policy Instruments around the promotion of GWR & RWH, transparency of cost models for the conventional mains water supply and GWR & RWH systems, and raising awareness about water saving / using water responsibly. However more information will be needed for customers about the availability of potential financial incentives, and GWR & RWH maintenance services and servicizing contracts in order to increase uptake of these systems. This is because a main barrier identified by all stake-holders consulted is the issue of trusting GWR & RWH systems to perform throughout their design life. In relation to this a PI to encourage maintenance and servicizing GWR & RWH systems could help to overcome this barrier.

Financial barriers have been identified mainly in relation to economic incentives such as PIs 3 on funding for local authorities to install GWR & RWH systems, 10 on tax breaks, and 15 on
Subsidies for low-income households to install RWH & GWR systems. However, abstraction limits which are regulatory measures are inherently linked to water efficiency (including fixing leakage) and storage (including building reservoirs), and these present major planning, logistical and financial barriers. Some financial barriers may be overcome to some degree by providing sponsorship (e.g. for Local Authority projects), loans and grants, and further/improved tax breaks.

Tax breaks as a policy instrument is thought to also face practical and institutional problems with its implementation as seen on similar schemes such as the Green Deal for energy efficiency in the UK. Local Authorities installing RWH & GWR systems in social housing projects may also encounter barriers to do with responsibility and the safety of the systems (health risks posed by cross-connections between GWR & RWH and mains pipes), although it is considered that these barriers can be overcome with the correct maintenance/servicizing of the GWR & RWH systems.

Financial, political and cultural barriers linked to mains water metering and increasing the price of potable mains water and sewage collection and treatment are possible to overcome, and this is already happening. Government, regulators and water companies are working together to progressively introduce universal mains water metering in England, although more work needs to be done with consumers across in order to rise mains water and sewage bills.

The main barriers identified are linked to the political and financial acceptability of regulatory policy instruments around the compulsory installation of GWR and RWH systems in new housing stock. It is considered that in addition to financial and institutional barriers to do with monitoring and enforcing these regulations, these measures would impose a heavy financial burden that would have to be absorbed either by developers and/or Local Authorities (owners of newly built social housing) and new buyers. The maintenance of the systems over time will also add to the financial implications and will mean that a system is needed to ascertain the safety and sustainability of GWR and RWH systems over time. In addition to the financial barriers, it is thought that these measures will have little acceptance in the building and water industries, and among home-owners and the public in general, with cultural and financial barriers against regulation turned into a political barrier.

Finally to mention that there appear to be some barrier against regulating (limiting) abstraction licenses based on tradition/culture/historical rights. Abstraction limits regulation may affect water companies/municipalities among others and it may involve shifting the paradigm from water storage to promoting demand management and water efficiency. There are also financial and political barriers associated with this policy measure that would require building and fixing infrastructure as part of mitigating its effects. Less water abstracted from the environment for treatment and supply may also mean building more reservoirs to store water during high flows and the rainy seasons, and the existing infrastructure (reservoirs and pipe network) will need investment to fix leakages. In addition to the financial burden, this may be difficult in areas such as London and the heavily urbanised southeast of England, where building new reservoirs presents planning and logistical problems. Work with water companies/municipalities to promote this change of paradigm and overcome existing problems is on-
going, including moving towards desalinising and greywater recycling at large scale in southeast England.

Based on the assessment of feasibility and political acceptability described above, a number of changes have been made to the Final Viable Policy Package. The Policy Instruments around Regulation for compulsory installation of GWR and RWH systems in all new houses (PIs 1 and 2) have been removed as the current political climate in the UK will not accept further regulation at present, and the consensus among consultees is that these regulations are not realistic at the moment and they would face lack of support at political, institutional and implementation levels, regardless of what actions are proposed to overcome existing barriers.

On the other hand, it is concluded from the stake-holder consultation, that even without Regulations, more consumers may voluntarily opt to install GWR and RWH systems if more information is made available on potential financial incentives, and if GWR & RWH maintenance services and servicing contracts were to become available. A main barrier identified by all stake-holders consulted is the issue of trusting GWR & RWH systems in terms of health and safety and in terms of performance throughout their design life. Therefore, actions to overcome these barriers have been translated into a new policy instruments (PI 16 on Regulation/Guidance to encourage maintenance and servicing of all GWR & RWH systems installed) and action 17 on additional funding for Local Authorities that will need to enforce any regulation leading to increase uptake of GWR & RWH systems. The final policy package and the changes that were made from the initial package are presented in Figure 15.

The Policy instruments comprising the Viable Policy Package South East England, UK are:

3. Direct provision of funding to local authorities to install household-based GWR & RWH systems in all new social housing projects
6. Implement universal water metering
7. Increased price of potable water and sewage
8. Clear and transparent bills and cost models for GWR, RWH and mains water
9. Promoting GWR and RWH
10. Tax breaks to encourage the installation of GWR & RWH systems by consumers
11. Stricter water abstraction limits for existing licensed users
13. Raising awareness about sustainability of water resources and GWR & RWH
14. Public information campaigns for households to collect and use rainwater and recycle grey water, i.e. RWH & GWR systems
15. Subsidies for low-income households to install GWR & RWH systems
16. Regulation/guidance on maintenance /servicing of GWR & RWH systems to ensure their good working order (life span guarantee), and to minimise Health and Safety risks (e.g. GWR & RWH and mains pipes cross-connections)
17. Additional funding for Local Authorities to deal with planning and enforcement of new regulation /guidance for GWR & RWH systems
7.2 The Viable Policy Package for Israel

Israel is a semi-arid state. The northern part enjoys a Mediterranean climate, with long dry summers and mild wet winters, while the southern part is arid. Moreover, the country suffers from frequent successive droughts (Amiran, 1994), which are expected to become more frequent and severe due to climate change. Hence, rainwater harvesting is not deemed feasible, given that the amount of rain in most parts of the country is meagre, and there is much uncertainty regarding rainfall in any particular year. Thus, in the Israeli case rainwater harvesting was not considered.

The main effort to address freshwater scarcity and variability is through seawater desalination and wastewater recycling. Israel has built a series of extra-large seawater desalination plants along its Mediterranean shore, and is a world-leader in wastewater recycling, with over 80% of its wastewater being recycled to agriculture. Prior to the onset of large-scale desalination Israel has built a national water system whereby water is conveyed from the north to the south. Seawater desalination is energy-intensive, as is water conveyance in the national water system. Currently Israel uses approximately 4 KWh per cubic meter of water. Hence, by
reducing the amount of water that will be delivered in the mains through greywater recycling there is a potential for substantial energy saving.⁶ The Israeli case thus focused exclusively on greywater recycling.

Greywater recycling is currently prohibited in Israel. However, there is an active greywater coalition promoting it. This coalition succeeded in proposing legislation allowing greywater recycling in the last Knesset (parliament) session. But as the government collapsed this effort will need to be renewed in the present Knesset. Hence, an additional PI was added to the effective coalition – legislation allowing the installation of GWR systems. Interestingly, in the draft legislation that was proposed servicing was mandatory, mainly due to maintenance and safety considerations.

Israel has long advanced water conservation measures. By legislation from 1955 all water use has to be metered. Hence, Israel has universal metering for many decades. Thus the PI calling for such metering is redundant in Israel. Similarly, Israel has high water tariffs by world standards. These have evoked public outcry in recent years, following the corporatization of municipal water and wastewater systems. Hence, increase in price of potable water and wastewater was also deemed as infeasible in Israel. As water is rationed and abstraction is strictly controlled the ability to implement stricter abstraction limits for existing users was also seen as unpractical in the Israeli case. Finally, no new social housing has been built in Israel in the last two decades. In practice, the state has been selling social housing rather than building new social housing. Thus, the direct provision of funding for installing GWR in social housing was seen to be of little benefit in the current Israeli context.

The remaining policy measures, plus the additional legislation that allows GWR, are the initial effective country-adjusted policy package.

The Policy instruments comprising the Viable Policy Package for Israel are:

1. Building regulations: Compulsory for all new properties to include GWR systems
2. Clear and transparent bills and cost models for GWR and mains water
3. Promoting GWR
4. Tax breaks to encourage the installation of GWR systems by consumers
5. Raising awareness about sustainability of water resources and GWR
6. Public information campaigns for households to collect, use and recycle grey water with GWR systems
7. Subsidies for low-income households to install GWR systems
8. Legislation regarding the installation and use of GWR systems

The PIs were categorized into two set of Policy Packages: PIs marked by green are termed: Incentives-led Policy Package, and the PIs marked by Orange termed: Regulations-led Policy Package. PIs in Purple color are information/ancillary measures that are common to both PPs.

⁶ According to a report prepared by Ecofinance for the Israeli Greywater Coalition (an advocacy group promoting greywater) the expected energy saving due to greywater recycling may amount to 10,935 million KWH, mainly due to the deferment of seawater desalination.
For each of the instruments an analysis of potential beneficiaries and losers was conducted. The adversely affected parties, the way they are affected, and instruments that may mitigate the adverse effects incurred by each party are summarized in Table 9.

Most of the mitigation measures in figure 8 incur cost. Most of these will have to be borne by the national government. However, as greywater recycling defers expenditures on seawater desalination plants, there are substantial pecuniary savings for the Israeli Water sector from greywater recycling. Hence, it was assumed that as long as the expenditures on GWR, and particularly the government expenditures, do not exceed the cost of seawater desalination plant deferment, the money necessary for GWR can be made available.

Table 9. Adversely Affected Parties from GWR in Israel, and Measures to Mitigate the Adverse Effects

<table>
<thead>
<tr>
<th>Losers</th>
<th>Description</th>
<th>How would they be affected</th>
<th>Mitigation Instruments</th>
</tr>
</thead>
</table>
| Water companies | companies involved in the supply of water (drinking water facilities, wastewater treatment facilities, sewer and all related infrastructure) | The installation of GWR systems will result in less water consumption and lower revenue. | Sponsorship of professional strategic consulting to help compensate the loses  
Give the water companies the option to operate as a service provider in the GWR systems market (sell or maintenance service)  
R&D grants for developing new technologies to treat sewage which includes sewage from GW sources (and thus is harder to treat) |
| Health department | Responsible for public health in the country including: hospitals, medical institutes, licensing in health related professions, legislation, etc. | Once a law permitting installation of the GWR systems is legislated the health department carries the responsibility in case of morbidity. The health dep. will need to supply policies, regulations and enforcement methods | More job positions in the field of testing water quality  
Grant for advertising and marketing the role of the ministry in the system |
<table>
<thead>
<tr>
<th></th>
<th>People who seek to buy apartments</th>
<th>If system installation will be mandatory in addition to the high cost of the real estate they would need to face the additional cost of the system</th>
<th>Tax breaks for purchasing green housing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apartments purchasers</td>
<td></td>
<td>If installation is mandatory- they will face more expenses, more approvals and bureaucracy and more employees and professionals- they will need to charge more for each apartment therefore be less appealing to purchasers</td>
<td>Tax breaks for building green housing Grants for marketing their green project to assist with sales</td>
</tr>
<tr>
<td>Building contractors</td>
<td>Building and selling apartments- (looking to minimize expenses to offer competitive price )</td>
<td>Tax breaks will result in less taxes therefore reducing their income</td>
<td>Full or partial monetary compensation from the government</td>
</tr>
<tr>
<td>Municipalities</td>
<td>A public agency or corporation with administrative powers</td>
<td>If subsidies will be given the government is facing an enormous investment</td>
<td>The compensation for the government on subsidies that might be given and different sponsorships offered as mitigation for other losers, is the fact that in the long run if GWR systems will be used throughout the country- fewer desalination plants will be needed</td>
</tr>
<tr>
<td>Government</td>
<td>Control and make decisions for the country (in charge of the country's budget)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The potential implementation barriers, financial, technical know-how, institutional, technological and whether pre-conditions exist were analyzed for each PI separately. These are presented in Table 10. The actions that may be taken to address the barriers identified in Table 10 are presented in Table 11.
### Table 10. Potential Implementation Barriers in Israel

<table>
<thead>
<tr>
<th>Barriers</th>
<th>Financial</th>
<th>Technical know-how</th>
<th>Institutional</th>
<th>Technological</th>
<th>Do Pre-conditions exist in order to implement the instrument?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Building regulations: compulsory all new properties to include GWR systems</td>
<td>Yes</td>
<td>No</td>
<td>Yes Government, (Local Authorities, Build Regs, developers)</td>
<td>No</td>
<td>No (lack of legislation)</td>
</tr>
<tr>
<td>8. Clear and transparent bills and cost models for GWR, RWH and mains water</td>
<td>No (minimal software adjustments)</td>
<td>No</td>
<td>Yes (water companies)</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>9. Promoting GWR</td>
<td>Yes (advertisement costs)</td>
<td>No</td>
<td>Yes, Define the responsible agent</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>10. Tax breaks aimed at encouraging the installation of GWR systems by consumers</td>
<td>Yes (decrease in tax income)</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No (some new tax instruments/procedures need to be designed)</td>
</tr>
<tr>
<td>13. Raising awareness about sustainability of water resources and GWR among businesses and the public by Government</td>
<td>Yes (campaign costs)</td>
<td>No</td>
<td>Yes, Define the responsible agent</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>14. Public information campaigns encouraging households to use recycle grey water</td>
<td>Yes (campaign costs)</td>
<td>No</td>
<td>Yes, Define the responsible agent</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>15. Subsidies for poorer households to install GWR systems</td>
<td>Yes</td>
<td>No</td>
<td>Yes, Define the responsible agent</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>16. General legislation to allow GWR</td>
<td>No</td>
<td>No</td>
<td>Yes (division of responsibilities)</td>
<td>No</td>
<td>No (no agreement among relevant ministries)</td>
</tr>
</tbody>
</table>
The main barrier in Israel is at present is the lack of legislation (PI #16). This is clearly a pre-condition for any GWR policy. A graywater enabling law was advanced in the previous Knesset. The new elected Knesset (2015) will have to continue with this legislative process. The new legislation will set the requirements for the installation and maintenance of GWR systems. It is expected that the new law will require all GWR system to be installed under servicized agreement.

Most consumers in Israel are not familiar with GWR systems. Therefore, it is extremely important to raise public's awareness while informing them about the potential advantageous of the system and the option to save water and money. In parallel it is important to provide

<table>
<thead>
<tr>
<th>Policy Instrument</th>
<th>Barrier</th>
<th>Nature/Extent</th>
<th>Strategies to overcome barrier</th>
<th>Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Building regulations: compulsory all new properties to include GWR systems</td>
<td>Financial (raising housing costs), political and cultural</td>
<td>Requires a large initial investment and operating throughout</td>
<td>Legislation, Tax breaks for contractors or subsidies for home buyers, financial compensation for municipalities/water companies</td>
<td>Financial, Lobbying</td>
</tr>
<tr>
<td>8. Clear and transparent bills and cost models for GWR, RWH and mains water</td>
<td>objections of Water Companies and businesses may not be cooperative</td>
<td>Financial, Political</td>
<td>Negotiate with Water companies /municipalities</td>
<td>Collaboration new regulation</td>
</tr>
<tr>
<td>9. Promoting GWR</td>
<td>Financial</td>
<td>Raising awareness</td>
<td>Using media advertisements</td>
<td></td>
</tr>
<tr>
<td>10. Tax breaks aimed at encouraging the installation of GWR</td>
<td>Financial and institutional (implementation)</td>
<td>Financial, Political</td>
<td>Tax breaks for contractors/home buyers/system users</td>
<td>Financial</td>
</tr>
<tr>
<td>13. Raising awareness about sustainability of water resources and GWR</td>
<td>Financial, Cultural</td>
<td>Need to change cultural perspectives</td>
<td>Developing an effective campaign</td>
<td>Running a campaign</td>
</tr>
<tr>
<td>14. Public information campaigns for households to use GRW</td>
<td>Financial, Cultural</td>
<td>Need to change cultural perspectives</td>
<td>Developing an effective campaign</td>
<td>Running a campaign</td>
</tr>
<tr>
<td>15. Subsidies for low-income households to install RWH &amp; GWR systems</td>
<td>Financial and institutional /regulation (responsibilities)</td>
<td>Government to invest and operate subsidies</td>
<td>Find financial resource</td>
<td>Providing Subsidies</td>
</tr>
<tr>
<td>16. Legislation</td>
<td>Lack of consensus</td>
<td>Political</td>
<td>Lobbying, professional committees</td>
<td>Lobbying, nomination of expert committees</td>
</tr>
</tbody>
</table>
them with information regarding technical characteristics of the systems, its maintenance requirements and available maintenance and servicizing contracts. Customers should also be acknowledged with all the incentives that are provided by the government and the municipalities for installing the system. Marketing campaigns will be designed in order to bring the public all the information related to the system, its advantages and its potential to assist in solving Israel water deficit.

Financial barriers have been identified as the implementation of the GWR systems may lead to a short term increase in property prices. This should be mitigated by providing tax exemption for “green -houses”. Contractors will gain specific grants to market their GWR equipped houses as Green-Houses. Once being legalized and promoted GWR systems are expected to generate the government a total saving of NIS 6.95 billion as the need for desalination will decrease.

As noted in the UK case, the implementation of GWR in Israel will also require a promoter. The main initiators and promoters of the subject at present are the members of the grey water coalition, a team of professionals - researchers and scientists, engineers and a former senior economist from the Ministry of Health and Environment that have combined to promote responsible use of grey water in Israel. The coalition is promoting regulation of the subject law and supplying the ministry of Health with studies related to the safety of the GWR systems.

The success of the greywater coalition in advancing GWR in Israel, as well as the implementation of such systems depend on the attitudes and positions of the key actors in the political arena. Based on meetings with various key players, or ex-players, in the water arena, the attitudes of the key players were identified. These are summarized in Table 12.

Table 12. Attitudes of Political Actors in Israel toward GWR

<table>
<thead>
<tr>
<th>Actor</th>
<th>Attitude towards the target (supporting, objecting, abstaining)</th>
<th>Attitude towards the initiating/leading actor(s) (close collaboration, formal relations, conflict)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ministry of health</td>
<td>objecting</td>
<td>Formal relation</td>
</tr>
<tr>
<td>Municipalities and water companies</td>
<td>Supporting (but hesitating)</td>
<td>Formal relation</td>
</tr>
<tr>
<td>Ministry of construction and housing</td>
<td>supporting</td>
<td>Formal relation</td>
</tr>
<tr>
<td>Ministry of the Environment</td>
<td>supporting</td>
<td>Formal relation</td>
</tr>
<tr>
<td>Finance Ministry</td>
<td>abstaining</td>
<td>Formal relation</td>
</tr>
</tbody>
</table>
The shifts from the sectorial policy package to the Israeli Viable Package are outlined in Figure 16. In this figure the measures that were deleted are crossed out, while an additional PI was added (PI 16). The arrows outline the facilitating and synergizing relationships (no contradictions were found), indicating also in Israel that there would be a single viable package.

Figure 16. The Viable Policy Package for Israel

(F=Facilitation relation; S=Synergy relation)

7.3 The Viable Policy Package for Galicia, Spain

Most of Spain suffers from acute water shortages. However, Galicia, at the north-western most part of Spain is the wettest part of Spain. Thus, no droughts have affected the area in recent decades, in contrast to the rest of Spain. Thus while GWR and RWH are allowed by the national government there has not been an incentive to install them in Galicia. Still, the consciousness of the public regarding water scarcity has improved. Given the relatively high rainfall (approximately 1300 mm per year on average) and the lack of incentives to conserve water the emphasis in Galicia was placed on the re-introduction of RWH systems into new housing. Hence, the first two policy instruments were modified. The target PI was defined.
thus as: “Building regulations: compulsory to include RWH systems in public buildings (schools, hospitals, government buildings), new blocks of flats and big single houses that have more than 250 m² and a land area of 1,000 m²”.

Due to the high awareness of water scarcity in Spain, in general, all houses are metered, as in Israel. Hence, also PI 6 was removed. Similarly, subsidies for low income households was removed, as the emphasis is on new development.

<table>
<thead>
<tr>
<th>The Policy instruments comprising the Viable Policy Package for Spain are:</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Building regulations: compulsory to include RWH systems in public buildings (schools, hospitals, government buildings), new blocks of flats and big single houses that have more than 250 m² and a land area of 1,000 m²</td>
</tr>
<tr>
<td>3. Direct provision of funding to local authorities to install household-based RWH systems in all new social housing projects</td>
</tr>
<tr>
<td>7. Increase the price of potable water and sewage collection &amp; treatment</td>
</tr>
<tr>
<td>8. Produce clear and transparent bills and cost models for RWH and mains water for consumers' benefit</td>
</tr>
<tr>
<td>9. Promoting RWH</td>
</tr>
<tr>
<td>10. Tax breaks aimed at encouraging the installation of RWH systems by consumers</td>
</tr>
<tr>
<td>11. Stricter water abstraction limits for existing licensed users</td>
</tr>
<tr>
<td>13. Raising awareness about sustainability of water resources and RWH among businesses and the public by Government</td>
</tr>
<tr>
<td>14. Public information campaigns encouraging households to collect and use rainwater and recycle grey water, i.e. encouraging installation of RWH systems</td>
</tr>
<tr>
<td>16. Subsidy for companies to hire the staff necessary to develop a new business lines based on maintenance of RWH. The subsidy is aimed at avoiding the cost of the Social Insurance of those workers for a specific period</td>
</tr>
</tbody>
</table>

The “winners” and “losers” from the PIs were then identified. But defining winners and losers is not simple since water consumers may perceive that limiting water consumption or increasing water prices affects them negatively. However, in case the policies are effectively implemented they may have access to water saving systems paying less and also preserving the environment. In addition, the overall society may benefit from a better use of water as a scarce natural resource.

In the case of water companies / municipalities that are responsible for the life cycle of the water there is also some controversies. In principle, since their business is to provide water the implementation of the package may mean a reduction in their profits due to less water provided. However, if water service is not considered a source of profits or business but just a public service then the water companies and municipalities should be seen as winners because they may provide the service using fewer resources, which is good for the environment. There is also the chance to cause the shift to servicizing models. In this way, companies offering RWH systems may achieve higher profits by saving water.
In Table 14 the main potential losers are presented, as well as the approach that needs to be taken to reduce the adverse effects.

Table 14. Adversely Affected Parties in Galicia, and Approaches to Mitigate these Effects

<table>
<thead>
<tr>
<th>Losers</th>
<th>Description</th>
<th>How would they be affected</th>
<th>Mitigation Instruments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Companies</td>
<td>Companies involved in the urban water cycle (Drinking water facilities, Wastewater treatment facilities, sewer network and supply network)</td>
<td>Fewer revenues in the short time. If the consumers shift towards water saving technologies, the companies will see reduced its incomes</td>
<td>The aim is to minimize the revenue loss for these companies, so we think it is necessary for these companies to shift to servicizing models. One way could be to offer a subsidy to hire the staff necessary to develop a new business line based on maintenance of RWH. The subsidy would consist of avoiding the social insurance of those workers for a period of 3 years.</td>
</tr>
<tr>
<td>Private consumers</td>
<td>Consumers at households</td>
<td>More restrictive legislation, increases prices and difficulties to implement the systems</td>
<td>The package includes a whole set of measures aimed at promoting the acquisition of RWH systems by the consumers. In this way they save money and water. For instance, policy instrument 10 and some information measures can help to offset the negative effects of other instruments (higher prices of potable water, for instance).</td>
</tr>
<tr>
<td>Large Consumers</td>
<td>Public buildings, large water consuming buildings</td>
<td>More restrictive legislation, indirectly increase of taxes</td>
<td>The package includes a whole set of measures aimed at promoting the acquisition of RWH systems by the consumers. In this way they save money and water. For instance, policy instrument 10 and some information measures can help to offset the negative effects of other instruments (higher prices of potable water, for instance).</td>
</tr>
</tbody>
</table>

In the next stage the barriers that may impede the implementation of the measures were identified. Only a few PIs were expected to face barriers which may impede their implementation. In Table 15 the instruments which may face barriers are noted, as well as the actions that may help overcome these barriers.

Table 15. Barriers to implementation and measures to address them

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Barrier</th>
<th>Nature/extent</th>
<th>Strategies to overcome barrier</th>
<th>Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>P.I 3 - Direct provision of funding to local authorities to install household-based RWH systems in all new social housing projects</td>
<td>Financial</td>
<td>Lack of necessary funds</td>
<td>Increase the available funds</td>
<td>Increase the water and sewage related prices</td>
</tr>
<tr>
<td>P.I 11 - Stricter water abstraction limits for</td>
<td>Institutional</td>
<td>Development of specific regulations</td>
<td>Involve the stakeholders in the</td>
<td>Raise awareness of all the stakeholders (companies,</td>
</tr>
</tbody>
</table>
In general, the implementation of the policy package is affected by financial and institutional obstacles. First of all, regarding the implementation of new regulation and setting higher prices for water and sewage means that some efforts are required to enforce their compliance. Institutional barriers are also important to make into law stricter water abstraction limits.

There are also some financial barriers, especially affecting those instruments that consist of providing public funding for diffusing these technologies, such as measures 3 (direct provision of funding to local authorities to install household based RWH systems in all new social housing projects) and 11 (tax breaks for consumers). The way to overcome these financial barriers may consist of achieving neutrality through other instruments (such as higher prices for potable water and sewage). It is worth noting that in 2010 the Regional Government set a tax on water consumption on order to fund various water-related actions such as sewage disposal and construction of waste water treatment plants and wastewater reuse, as well as river management schemes. The overall aim of this tax is to promote the efficient use and saving of water. In this context, if RWH servicizing wants to be promoted, the tax should be clearly oriented towards investment in this type of services, as they are also water saving systems.

In the final stage the main actors were identified and analyzed. Augas de Galicia is the organism responsible for water service management in the Galician government. There are three companies that provide water services in Galicia. They should be clearly involved in the strategy in order to effectively implement it. In addition, it is necessary to promote the collaboration between the water companies and the water saving system suppliers. There are not many water saving system suppliers in Galicia but there are some of them in Spain. Their attitudes toward the installation of RWH and toward each other are summarized in Table 16.

**Table 16. Attitudes of Main Actors in Galicia**

<table>
<thead>
<tr>
<th>Actor</th>
<th>Attitude towards the target (supporting, objecting, abstaining)</th>
<th>Attitude towards the initiating/leading actor(s) (close collaboration, formal relations, conflict)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Augas de Galicia (regional public organism for public water management)</td>
<td>Supporting</td>
<td>Close collaboration</td>
</tr>
<tr>
<td>Regional Ministry of Treasure (Consellería de Facenda)</td>
<td>Objecting</td>
<td>Formal relations</td>
</tr>
<tr>
<td>Water companies / municipalities</td>
<td>Supporting / objecting</td>
<td>Formal relations</td>
</tr>
<tr>
<td>Water saving system suppliers</td>
<td>Supporting</td>
<td>Close collaboration</td>
</tr>
<tr>
<td>Consumers</td>
<td>Objecting / abstaining</td>
<td>Formal relations / conflict</td>
</tr>
</tbody>
</table>
One of the possible impediments is the lack of incentives and know-how of the current companies operating in Galicia to supply and maintain RWH systems. Hence, in the Viable Package an additional PI is introduced: subsidization for companies to hire the staff necessary to develop a new line of RWH supply and maintenance. The subsidy is intended to cover the social insurance of these employees for three years.
8. Conclusions and Recommendations

The introduction of both GWR and RWH systems into the built environment may lead to decoupling. By introduction of such systems less water has to be conveyed through mains, thereby reducing the pressure on water resources and saving the energy that is used to convey and pump water. However, not in all settings is the introduction of both types of systems feasible. In arid or semi-arid environments, such as along the Mediterranean, precipitation may be meager and variable to rely on RWH systems. Similarly, in areas with low pressure on water resources GWR systems may be deemed as superfluous and carrying health risks.

Due to the health concerns associated with both GWR and RWH the professional maintenance of such systems is crucial. Servicizing is thus a crucial for the introduction of such systems. Essentially, through servicizing both the building and maintenance of such systems is carried out by professionals, who take responsibility for the performance of such systems. Hence, servicizing should be viewed as integral for the introduction of such systems, and for their decoupling benefits.

However, the introduction of both GWR and RWH is not simple. In each case it faces obstacles, and requires that Policy Packages be used. The most effective and realistic policy instrument is a requirement that such systems be compulsory in all new buildings. However, such regulations are insufficient in and of themselves. They have to be complemented by a number of additional instruments. In all cases some promotion of such systems is needed to facilitate their introduction, as most households and developers are unaware of the potential and requirements of such systems, and may balk at the requirement to introduce them due to perceptions regarding their health ramifications. Also some sort of incentives, mainly tax breaks for houses with such facilities, can reduce opposition to their introduction.

But beyond these instruments, which seem to be desirable in all circumstances, there is a need to consider additional instruments that are likely to vary across settings. Thus, if there is no universal water metering such metering should be introduced. Similarly, if there are no companies with the necessary expertise measures have to be taken to encourage companies to gain the find the appropriate personnel or train its employees. Furthermore, it is essential that the agencies and companies that dominate the water provision scene will be on board. Yet the nature of these agencies and/or companies varies across settings. Thus, it is essential that the policy package will be adapted to the local circumstances.

From a methodological perspective, it has been shown that the policy packaging process as outlined in this study is implementable, and that ABM can be of assistance, both to assess the degree to which different policy instruments and packages contribute to decoupling, and to examine the likelihood that the policy package will indeed perform over time as desired.

In this study generic sector-wide Policy Packages were formed. Yet, each was formed with a specific context in mind. In the Water sector case the generic basic and Effective Packages were identified for the UK case. But as noted above, the basic features of the cases led to the need to adjust also the Effective Package to each case. In practice, it thus seems that packages
should be determined directly with the appropriate setting in mind. That is, also the basic and Effective Package s will be determined on a country or regional basis.

In conclusion, the introduction of GWR and RWH systems should be encouraged. To this end promotion campaigns may be helpful. Moreover, such systems should be promoted through servicizing, in order to alleviate health concerns and assure proper maintenance. But the way to do so is place specific. The policy packaging approach advanced in this study is readily applicable in different settings, and should be applied in each locale where such a systems are introduced. But not everywhere will it be feasible to use ABM, due to the expertise and efforts this requires. But as the Spanish case shows, it is possible to advance the Policy Packages also without the ABM. Hence the inability to run a full ABM mode, despite its likely contribution, should not prevent the introduction of servicized GWR and/or RWH systems.
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