Part C

WATER JOINT PROGRAMMING INITIATIVE

WATER CHALLENGES FOR A CHANGING WORLD

2018 JOINT CALL
Closing the Water Cycle Gap

"Nudges for Economics of Water Tariffs"

"Newts"

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1. EXCELLENCE

1.1 Introduction In the context of increasing tensions around water, water pricing for domestic uses is a key policy to manage and conserve water resource. In practice, the issue is quite challenging for water regulators and service providers, notably because tariffs have to meet several objectives amongst others, affordability, at least on basic needs, full cost recovery including environmental costs and providing incentives to use water efficiently. At the same time, since behavioral change is a key factor in ecological transition, public authorities are considering alternative means of action, most notably nudges. These soft incentives aim to change individual choices by exploiting cognitive bias (behavioral nudges) or by providing information (informational nudges). Experiments demonstrate the effectiveness of nudges resulting in consumption reductions ranging from small to large size effects, depending on the messages sent to households. The fact is that nudges do impact water consumptions and, thus, change the water demand functions of the households (necessarily). The question of "how" matters for tariff performance and its proper design. Far from being substitutable to tariff instruments, it is clear that green nudges, through messages on consumption control and/or tariff understanding (that may be perceived as complex), can improve affordability and pricing incentive effect. The project aims to measure these complementarities and empower stakeholders to fully analyse the effects of policy mix, combining nudges and tariff instruments, on socio-economic performance of Demand Side Management (DSM) programs.

1.2 State-of-the-art and relation to the work programme

The project fits in Theme 2 Strengthening Socio-economic Approaches to Water Management. It targets Sub-theme 2.1 Integrating economic and social analyses into decision-making processes. All items in Sub-theme 2.1 are covered, except "Extreme events", by providing outcomes that are useful for both pricing policy and nudge designs.

State of the Art Increasing Block Tariffs (IBTs) are now a pricing scheme that is commonly used by water service managers. Evolution of regulations and intention to limit impacts of sharp rises in service costs for low incomes explain growing use of IBTs. Basic argument states that IBTs (*i*) by setting low prices for first cubic meters, enable the households to cover their basic needs at socially acceptable economic conditions (universality of service); (*ii*) by setting high prices for high consumption levels, induce households to adopt water-saving behaviors (incentive effect). This pricing policy can be deemed as social as it deviates from other pricing schemes with the intention to make basic water affordable to poor households. It also requires a proper calibration to be financially well-balanced, with taxes charged on high levels of consumption to fund the subsidies paid on first consumption blocks. Lastly, the low price responsiveness of water demand suggests it is possible to finance increases in service costs by putting the burden on large consumers, an operation which is thought-hoped to have little impact on low incomes. Empirical knowledge of water demand functions, such as provided by econometric analysis, show this pricing mechanism is currently not working well with significant difficulties.

1) Social challenges

- Quality of social targeting Econometric models of water demand provide estimates of required volumes of water to cover basic needs. The latter prove to differ widely among households, depending notably on family size, water-using appliances and consumer habits. Therefore a wide spread distribution of basic needs for water exists across the population. The point is that, by setting the thresholds of first blocks, an exclusion error is generated with some households who are charged non-subsidized prices on part of their basic needs. Several studies find that large poor families are strongly over-represented in this category of water users.

- Transfers Calibration of IBTs requires to target the top of the basic needs distribution to limit exclusion errors. This decision incurs large errors of inclusion[1] and the issue of transfers between rich and poor generated by IBTs has to be addressed. Against the common belief, the relationship between water consumption and household income is rather slack with a positive but low correlation, what means that "there are many rich households that use small amounts of water, and many poor households that use large quantities of water"[2]. In this respect, since IBT implements transfers from large to small water-user households, it also entails transfers from low to high incomes. Many studies show that IBTs perform poorly in terms of subsidies targeting of low incomes while high incomes receive a large share of subsidies.

[1] Inclusion error refers to social pricing on part of consumptions that do not meet essential needs.
[2] Nauges C. & Whittington D. [2017], Evaluating the Performance of Alternative Municipal Water Tariff Designs: Quantifying the Tradeoffs between Equity, Economic Efficiency, and Cost Recovery, *World Development*, 91, pp. 125-143.

2) Economic challenges

- Financial risk To limit exclusion risk for large poor families, a natural inclination is to set high thresholds for first consumption blocks and it is uncertain whether sufficient revenue will be obtained to balance service funding. If only the largest consumptions are ultimately over-priced, the amounts involved imply high unit prices on a small segment of large consumers whose responses may induce some sharp decreases in highest blocks consumptions. The risk is to get these large consumers out of their role of financial contributors, thus jeopardizing cost recovery (this difficulty also arises when new charges are planned to be funded by large consumers).

IBTs modulation The possibility for simulating eventual modulated tariff parameters according to family size (Flemish model) and/or household income (means-tested tariffs) appears to be an important asset for water managers. For tariff calibration, these tariff segmentations are interesting options since they provide more accurate instruments to deal with exclusion errors and financial risk that service managers incur with block sizes setting. Nevertheless, they do not solve completely the problem, notably because equipment quality has an impact on water consumptions. Indeed, if high incomes are better equipped in water-saving appliances, their per capita consumption may be low and there are still inclusion and exclusion errors at work when consumption blocks are modulated by family size.

- Incentive effect Some empirical studies show price sensitivity of water demand is higher when households face IBTs, thus the choice of this pricing scheme may generate more attention on water use. However, empirical evidence suggests as well that progressive pricing is not as incentivizing as it should be, with consumers who misperceive IBTs. They tend in particular to think in terms of average price, what can lead them to over-consume with an under-estimation of "marginal price" (the unit price of the consumption block in which household's consumption is located). Thus, a better tariff perception, putting households in better domestic managements, can result in decreased overconsumption[3] and improve incentive effect of IBT. Nudges have good potential to do this.

3) Nudges Several studies evaluate the nudges impact on domestic water consumptions and their conclusions are important for our project scope. The **Behavioral interventions (BI)** carried out are informational nudges focusing on water consumption and tariff perception. The first address failures around usage of water. It includes technical information, usually water conservation tips, and statistical information, most often household's consumption vs. average consumption in the neighborhood. The aim is to inform household rapidly, by benchmarking, about the extent of his water usage but it can work as well on social norms. The second group of messages addresses failures around price of water. It focuses on understanding of the tariff through framing effects. Applied Literature demonstrates that nudges are an active mean to reduce domestic water consumption. They implement decreases between 1%-8%, on average, depending on the messages sent to households. Benchmarking treatments are the most utilised and appear to be the most effective, both in short and long run. Indeed, the long-term impact of one-time social norm BI proves to have persistent effect, albeit rapidly decaying (- 50% after 1 year)[4]. This raises the issue of BI sound management through time to sustain long-lasting effects. Additional evidences suggest that persistence is driven mainly by changes in habit formation rather than investments in water saving devices. Lastly, most studies find BIs are most effective among large water users and wealthy households. It indicates the effectiveness of sub-group targeting in nudging programs towards specific segments of the population.

Relation to the work programme - Combining nudges and tariff policy Nudges are often regarded as substitutes for tariff instruments but they could be a good way to improve pricing policies as well. To our knowledge, this issue has not been investigated to date, with all economic methodologies, and this is precisely what the Newts project proposes to do. In particular:

- Econometric estimation of households' water demand provides information on joint distribution of basic needs, tariff perception and demand responsiveness within the population. This knowledge is essential to inform stakeholders as regards water pricing. Among others, it enables (1) to assess, through the use of various indicators, the affordability of the current tariff and its more or less incentive character; (2) to calibrate IBTs optimally, in a well-defined sense, by distinguishing different analytical frameworks according to tariff instruments that can be used (for instance, modulating consumption blocks by family size and/or unit price by income levels); (3) to assist

[3] These reductions in over-consumption may be substantial with a decline of over 10%. See Binet M-E., Carlevaro F. & Paul M. [2014], Estimation of Residential Water Demand with Imperfect Price Perception, *Environmental and Resource Economics*, 59(4), pp.561-581.

[4] Bernedo M., Ferraro P.J. & Price M. [2014], The Persistent Impacts of Norm-Based Messaging and Their Implications for Water Conservation, *Journal of Consumer Policy*, 37 (3), pp. 437-452.

in closing financial equilibrium of the tariff system, in a broad sense with the budgeting of specific programs (assistance for overdue payments, investments in water and wastewater systems, protection of aquatic environments) in various regulatory frameworks (for instance, whether or not external financing can be mobilized to fund water services). In particular, given (2) and (3), it is possible to design "optimal" IBTs at full cost recovery with the introduction of an eco-tax structure.

- A well-designed nudge policy, putting households in better domestic managements, can enhance social and incentive effectiveness of IBTs. Nevertheless, by impacting water consumptions, nudges change water demand functions as well. Since there is a connection between econometric analysis and applied behavioral literature, this requires investigations, which could result in significant synergies leading to water management decision-making improvement. Technically, the question is whether a nudge acts through a reduction in captive consumption (top estimated basic needs of the households) and/or an increase in sensitivity of demand and/or a change in tariff perception. Identifying these transmission channels is crucial for assessing how water pricing is improved by BIs. Further, because a proper calibration of IBT depends on water demand characteristics, it may change with BI and the same applies for revenues and quality of financing (given the capping of fixed parts often introduced by national regulations, decreases in consumption can imbalance financing of water services). From DSM perspective, assessing the contribution of nudges could not be implemented without knowledge of water demand functions.

The project aims at studying all these interactions and enabling stakeholders to analyze the effects of policy mix, combining nudges and tariff instruments, on socio-economic performance of DSM policy. From an operational point of view, it consists in developing a micro-simulation model, based on econometric estimates of household water demand, with a dashboard of indicators to measure affordability, incentive effect, economic welfare, distributional effects and cost recovery. The model will be used to infer the effects of nudges on the performance of current water pricing (that should be improved), through their effects on household water demand functions. Coupled with a mathematical optimization software, it will allow to determine optimal mixed policies that can be regarded as suggesting possible ways of improvements for local DSM policy.

In view of these elements related to social and incentive effectiveness of water demand management policies, the project contributes to implementations of SDG 6 (Targets 1, 3 and 4) and WDF (Article 9). Besides, the project contributes also to the implementation of SDG 13 (Targets 1 and 3). Indeed, the impact of climate change suggests water price will continue to increase sharply in coming years, due notably to the financing of investments in infrastructures in order to address changes in rainfall and streamflow variability. Beyond the issue of social acceptability (that matters), financial sustainability of the water management system requires that these price increases do not impact the poor disproportionately, otherwise developing unpaid debts risks. Lastly, the project addresses certain items of Sub-theme 2.3 to inform stakeholders on the results and cooperation opportunities (workshop envisaged in Brussels, and participation to local events in the countries represented by partners).

1.3 Objectives and overview of the proposal

Specific Objectives The project specific objectives were defined as follows:

(1) Evaluation of the socio-economic performance of water pricing by means of appropriate indicators, using household water demand estimated through econometric methods. Four case studies in geographically unequal destination will be used for applications.

(2) Promotion of nudge approach to improve the socio-economic performance of existing water pricing schemes, through their effects on estimated water demand functions.

(3) Improvement of local pricing schemes by supplementing possible tariff adjustments with appropriate and well targeted behavioral interventions (BIs).

(4) Development of 4 dedicated Decision Support Tools (DSTs) tailored to the case studies to be used by stakeholders involved in water management, for diagnostic, simulation and projection purposes. The DST has potential for replication and further exploitation beyond the duration of the project and the targeted destinations.

(5) Contributions to ongoing discussions on green nudges policies and charging schemes for water service considering the challenge of climate change and improved access to water in Europe and in particular Africa.

(6) Increasing awareness and visibility of innovative methods of experimental economics and of econometrics with the aim to share the possible advantages of the outcomes for the public water authorities and private sector actors.

1.4 Research methodology and approach

Innovative research approach The research work is organized in three basic stages. In Step 1, the nudges will be designed and tested in the lab (WP1). At the same time, water demand functions of the households are estimated (WP2) and socio-economic performances of local current tariffs are measured with regards to the objectives of WFD and SDG (WP3). Within Step 2, nudges are carried out in the fields (WP4) and resulting changes in water demand functions are estimated (WP2). The nudge effects on the performance of local current water tariffs will also be measured (WP3). The Step 3 identifies recommended ways of improving local DSM policy, by means of policy simulations, mixing nudges and tariff instruments (WP3). To ensure exploitation of the results and dissemination of these social and economics methodologies, guidelines, handbook and simplified version of the micro-simulation models are prepared along the 3-year project (WP5).

Research methodology To achieve successful implementation of these steps, various methodologies related to econometrics of water demand, experimental economics and evaluation analysis (with micro-simulation) will be combined as listed below. Their practical implementation and schedule are described in part 3 of the proposal.

- Econometric estimation Using statistical data, econometric methods allow estimating households' water demand functions. The Stone-Geary approach is often used in the literature. This modelling breaks down water demand into two parts. The first is a captive component that is not affected by changes in prices or income. It varies with family size, habitat characteristics, … and constitutes an upper bound estimate of basic needs. The second is a variable part that depends on income and tariff parameters. Its specification enables to infer perceived prices (through Shin's formulation or a nested model) and sensitivity of demand to changes in tariff parameters (fixed charge, thresholds of consumption blocks, unit prices within each block). Lastly, econometric methods enable to infer how water demand functions change with BIs, by examining their effects on these three factors.

- Socio-economic assessment of DSM policy Several areas need to be investigated with affordability, incentive effect, monetary transfers, economic welfare and costs recovery (including funding risk). Each area will be assessed in detail through several indicators to complete a socio-economic dashboard. The latter includes common indicators as well as some "new" relevant measures used in other areas of economics (see section 1.5). Concerning BIs specifically, the scoreboard will be complemented by a cost-benefit analysis, following the guideline of Whittington & Nauges[5] (moral and psychological costs are taken into account).

- Experimental economics The nudges effects on water consumptions are examined through decontextualized lab experiments, including students and virtual goods, and both field-in-the-lab and field experiments where participants are households facing concrete tasks. The first experiments are laboratory economic incentivized-experiments where participants choose a water consumption level under different tariffs schemes. In the first one, 240 subjects are exposed to different degrees of information (Task 1.2). The nudge to test is a marginal price recall to help participants in making optimal consumption choice. The second deals with time dimension to calibrate the nudge frequency (how often should the messages be delivered ?) and measure persistence (300 subjects, Task 1.3). These nudges with other BIs are subsequently carried out in the field in Saint Paul (France, 6,000 subjects, Task 4.1), Gijon (Spain, 2,000 subjects, Tasks 4.2) and Sfax (Tunisia, 2,000 subjects, Task 4.3). Their impacts on water consumptions are measured by means of treatment effects in randomized experiments. Moreover, two additional lab experiments are conducted relating to analyse the diffusion of nudges across social networks and neighbors (Task 1.4) and continue the persistence analysis (Tasks 1.5).

Micro-simulation - optimization Regarding socio-economic performance of water tariffs, dashboard indicators are measured through micro-simulation, making use of estimated econometric models and relied data sets. Both the latter will be further used to devise optimal policies by optimizing some well-defined criteria for decision-makers in various analytical frameworks[6]. Regarding BIs, micro-simulation is also performed. It is proposed to build a dynamic Multi-agent model taking into account heterogeneity of households regarding perception and pro-environmental attitude, formation of consumption habits and social interactions. This Multi-agent model will be

[5] Whittington D. & Nauges C. [2017], Social Norms Information Treatments in the Municipal Water Supply Sector - Some New Insights on Benefits and Costs, EfD discussion paper, 17-16, Gothenburg, Sweden.

[6] Diakité D., Semenov A. & Thomas A. [2009], A proposal for social pricing of water supply in Côte d'Ivoire, *Journal of Development Economics*, 88, pp. 258-68.

calibrated from results of lab experiments. It can be used for prospective purposes, to outline an appropriate nudging campaign in view of the characteristics of a local territory (according to prevalence of the mentioned factors). Much of the dissemination plan among the stakeholders is structured around these tools.

Study site description The consortium has built up four (4) field study sites, 2 in Europe and 2 in Africa: Gijon (Spain), Sfax (Tunisia), Saint Paul (Ile de La Reunion - France) and Cape Town (South Africa) that has already implemented BIs. The selected sites have in common insufficient and/or irregular water resources, willingness to increase water accessibility to margined social groups and facilitate an optimized water consumption for its inhabitants. The representatives of these sites are also involved in discussions on strategic medium- and long-term plans related to public investment in water management infrastructures and potential impacts of the climate change factors on the water supply.

- **The city of Cape Town** (South Africa, 4 million inhabitants) is in crisis (Day Zero) with drastic conditions. Tariffs have increased very substantially, with differential impacts along the income spectrum, and nudges have been carried out with some effectiveness. It applies also Free Basic Water Policy for indigent people, a pricing scheme that encounters some difficulties at national level. It does not seem to be financially sustainable and may trap some households, eager not paying for water, in water poverty[7].

- **The city of Gijón** (Spain, 300,000 inhabitants) receives high number of visitors especially during the summer season. Although nowadays the water resource pressure is not high, the public administrations prepare scenarios for the water supply capacity system in the near future. A number of new infrastructures were planned to storage water in the region (Caleao dam), but were lately cancelled due to environmental reasons.

- **The city of Saint Paul** (France, 110,000 inhabitants) has water services that encounter difficulties with insufficient resources for much of the year (because of a dry season), a high percentage of low-incomes population (35%) and high water consumptions. The tariff has a strong degree of progressivity and the city has mounting deficits due to many unpaid water bills combined with the legal prohibition of water cuts. Previous econometric works indicate that Reunion households strongly underestimate prices of water.

- **The city of Sfax** (Tunisia, 900,000 inhabitants in 2018) has a semi-arid climate and the mobilization cost of water resources for residential use is very expensive because almost the totality of clean water resource is located in the northwest of the country. It charges a super-progressive pricing with all the water use charged at the marginal price. The socio-economic impacts and the long-term sustainability of such scheme shall be analyzed.

A shared objective for the four study sites is the need to improve their water supply model including, in particular, their pricing scheme. The specificities of each study site will allow to adapt our experiments and simulations and drive conclusions. Lessons learnt and tools developed by the project have strong potential to improve directly the policies and socio-economic schemes situation in these 4 locations and facilitate future similar replication actions in cities or regions with similar issues.

1.5 Originality and innovative aspects of the research (ambition)

(1) Linking nudges and water demand functions To our knowledge, the effects of nudges on water demand functions have not been explored to date, even though it represents potentially a strong tool for the DSM policy design. Through above explained modalities, the project outcomes will facilitate the in-depth evaluation of a nudge via its effects on captive consumptions, price-responsiveness of demand and tariff perception. By identifying these transmission channels, the impacts of BI on socio-economic performance of the pricing system and design of optimal policy mix, combining nudges and tariff instruments, will be analysed. This innovative approach is not implemented by the water managers so far and represents therefore a high potential for exploitation.

(2) Development of new indicators Common indicators of documented social and economic impacts[8] will be supplemented by targeted "new measures" used in other areas of economics. Regarding affordability, these include Sen-type indexes and subgroup decomposable indexes (FGT family, Watts index) that are used in poverty analysis. As regards incentive effect of pricing (which should not be confused with degree of tariff escalation), we propose to build an index close to the ones used in economics of production. The basic idea consists in comparing

[7] Szabo A. [2015], The Value of Free Water: Analyzing South Africa's Free Basic Water Policy, *Econometrica*, 83(5), pp. 1913-1961.

[8] Common indicators include inter alia Conventional Affordability Ratio, Potential Affordability Ratio, errors of exclusion and inclusion (in aggregate and conditional), indicators of incidence (leakage rate), household consumer surplus and distribution of change in it (across deciles of income or some measure of living standards), deadweight loss and degree of cost recovery.

consumption of the household when he perceives perfectly the tariff[9] to its consumption for assessing allocative inefficiency and to various technical variable thresholds, reflecting efficient uses of water-saving equipment, for assessing technical inefficiency[10]. On this basis, subsequent analyses will be performed to infer (*i*) how these inefficiencies are distributed among the population and (*ii*) how these distributions are in turn affected by BIs (to measure water savings thus generated). These measurement and decomposition of inefficiency, making use of information provided by econometric estimate of water demand, will assist in the design of BI campaign with both (*i*) the type of messages that should be sent and (*ii*) the targeting of households that should be nudged. Lastly, redistributive / anti-redistributive impact of IBT's will be assessed through indicators used in economics of taxation (Kakwani index, Reynolds-Smolensky index) to convey information about the equity characteristics of the system.

(3) Nudges to gain visibility Measuring nudge effects on household water consumption by means of treatment effects is now usual. The high level of accuracy, credibility and interoperability with the latest technologies have to be duly considered to assured desired effects and gain in replicability potential by the end-users.

(i) nudge treatment effects - advanced measurements Evidence of spillover effects, from treatment group to control group, has been found with no-nudged households that decreased as well their water use[11]. Accordingly, one has to be cautious concerning usual methods to measure nudges effects that may lead to biased estimates. To address the problem, the project will apply spatial econometric methods to detect in field experiments data existence of spatial spillovers related to social interactions in the neighbourhood.
(ii) the quality of the messages sent to households The point concerns the validity of information conveyed by social norm messages. Thus, in the field of water, a large consumer is not necessarily an over-consumer and suggesting it to him may be a misinformation that incurs social and economic costs (a similar problem arises with small consumers who may have both a wasteful use of water and a below-average household consumption). It is relevant to send the household right information (not necessarily its consumption vs. average consumption of the neighbourhood) and prior econometric estimation of water demand functions can help in a fast and efficient way (a limited amount of information can suffice to position and qualify a household with a high degree of confidence). Nevertheless, since the necessary information is rarely available in customer files of water utilities, it will be necessary to find a nudge allowing the household to locate in a scale of eco-consumption relevant to him specifically (we think in particular of scoring methods).
(**iii**) **the role of new technologies on nudges design** In Spain, some households (250-300) will be nudged through the use of smart technologies for providing real-time information about consumption and marginal price. The trial will assess the advantages/problems of this kind of instruments when managing water resources. In particular, dynamic infographics are expected to be more relevant than static ones, media paper or SMS messaging. But digital nudges might also be perceived as dark patterns, leading to mistrust and hence nullify impacts of BIs.

Remark On dynamic factors Persistence of nudges is a crucial issue. If BIs have only a short-term effect, they constitute instruments that can be mobilized to manage one-off events, like for instance drought episodes. If they exert effects that are also significant in the long run, they change behaviors in a sustainable way. In this case, they can be mobilized to promote transition to a green economy and, for the reasons explained above, this should not be done without taking into account their impacts on water demand functions. Clearly, the issue and, more generally, the more or less marked effects of nudges receive a detailed response given the importance of social and cultural factors at work. With respect to the project, the following strategy is adopted to measure long-term effects given the three-year timeframe of Newts. We plan lab experiments to analyze persistence at the beginning of the research project. Based on these preliminary results, we will have a 2-year experimental plan, which is relevant time period to infer short and long-term effects in field experiments. Experimental design will deal with persistence by building 2 treatment groups. In the first one, the treatment is continued whereas it is stopped after a while in the second one. The comparison between the two treatment groups is a persistence between measure[12]. Lastly, the estimation of a dynamic model should make it possible to provide a first estimate of long term effects of a regular one-year BI policy through time. The latter strategy is quite relevant for South Africa. As the city of Cape Town carried out nudges in 2016, EPRU will have long time series to infer nudges effects (4 years at the middle of the project).

[9] For instance, by setting the price perception parameter to 0 as in Binet et al. [2014], op. cit.
[10] Similar methods have been proposed in the energy sector. See Filippini M. & L. C. Hunt [2012], US residential energy demand and energy efficiency: A stochastic demand frontier approach, *Energy Economics* 34 (5), pp. 1484-1491.
[11] Jaime M. & F. Carlsson F. [2016], Social Norms and Information Diffusion in Water-saving Programs: Evidence from a Randomised Field Experiment in Colombia, EfD Discussion Paper 16-05, Gothenburg, Sweden.
[12] See Gneezy and Rustichini [2000], "A fine is a price", Journal of legal studies, 29 (1), pp.1-17.

1.6 Clarity and quality of transfer of knowledge for the development of the consortium partners in light of the proposal objectives

To achieve its challenging objectives, the Newts project requires multi-disciplinary expertise in behavioural economics, household water demand econometrics and evaluation of public policies (including environmental and social aspects). It has to be emphasized that the consortium includes European and African actors, which will bring their experience and know-how to share best practices and exchange knowledge to achieve Newts objectives. The paragraph below describes the core expertise of the partners of the consortium as far as relevant for the tasks in the project. It also reveals the diversity of relevant experience of partners, and how their combination of know-how is a key for the project success.

The South African team specializes in applications to climate change, natural resources use and poverty alleviation. EPRU has piloted the nudging programme of Cape Town in 2016[13], that will serve as a major reference for the nudge set-up at the different locations envisaged by the project. It will bring expertise on nudges design, implementation of randomized control trials and feedbacks on operational side of nudge campaigns. French teams have expertise in lab experiments through CREM that specializes in decontextualized experiences, with student subjects, while GAEL draws on a panel of households (real people). Both have developed experimental economics platform that will be used to test some innovative nudges, assist in the proper design of nudges carried out in the fields and provide a useful information for DSM policy simulations. These results will be consolidated in the Multi-agent model, which will be developed by GRANEM to study the transition to a green economy of water, with a nudging campaign adapted to local conditions (importance of social interactions, in particular). GRANEM has already built a similar tool to analyze formation of pro-environmental behaviors in consumption of organic products. With regards to econometrics, CEMOI and OEG have developed expertise, in collaboration with local public authorities to implement the economic analysis required by the EU WFD. The Reunion team specializes in tariff perception, transfers analysis and pricing design. The Spanish team has specific expertise in measurement of basic needs and impact of water-using appliances. OEG has also developed econometrics methods to measure productive inefficiency that will be used here for assessing incentive effect of pricing[14]. The Tunisian partners have recognized expertise on seasonal nature of water demand, water poverty and socio-economic indexes. All partners' skills are necessary to design some sound mixed DSM policy, combining nudges and tariff instruments, making use of the relevant information provided by experimental economics and econometric analysis of water demand.

Knowledge transfer towards project partners and interested stakeholders The academic partners work in close collaboration with the local stakeholders representing public administrations, research centers and private companies. The knowledge of the local and socio-economic conditions is crucial for understanding the factors that frame individual choices ("user-centric" approach) and, accordingly, pinpoint the specific water using habits that should be changed with BIs needs local presence. Coordinated and collaborative efforts aim at ensuring operability of scoreboard indicators to properly meet the needs of stakeholders. It allows to define relevant scenarios for DSM policy simulations with stating of constraints, major objectives pursued, nature of the trade-offs between, possible tariff instruments, additional assistance programs etc.

The building of country-specific models, based on shared methodologies and scoreboard to assess the DSM policy against the goals of WDF and SDG, will assure that all partners will gain knowledge and analytical methods in each of the areas previously mentioned. Knowledge transfers between partners will take place through consortium meetings, task activities, mobility schemes, local work meetings, and collaborative work towards Newts goals.

1.7 Quality of the consortium partners and collaborative arrangements. Capacity of the consortium to reinforce a position of leadership in the proposed research field

Researchers involved in the project have recognized expertise in (1) the field of behavioural interventions, (2) experimental economics that is increasingly used to test the effectiveness of a new policy, and (3) econometrics of households' water demand (see section 4 and the attached CVs of PIs). The recent initiatives the project partners are

[13] For a presentation of these eight BIs, see Brick K., De Martino S. & Visser M. [2017], Behavioural Nudges for Water Conservation: Experimental Evidence from Cape Town, pp. 8-10 and 37-52 (https://www.researchgate.net/publication). It should be emphasized that the selection of nudges that will be carried out in the field will be made by each study site, based on recommendations of the WP1 according to the results of lab experiments and previous econometric works.

[14] Initial work has been done in this respect by Spanish team in the field of water. See Pérez-Urdiales M. [2015], The impact of environmental behavior on the efficiency in residential water consumption, in Managing Residential Water Demand: An Applied Econometric Analysis, Doctoral Dissertation, University of Oviedo.

involved in are described in section 5. The South African team works very closely with the City of Cape Town under a 5-year MoU and with the Western Cape Government by implementing nudges to optimize water consumption in public buildings (government offices, school, etc.). The consortium includes a well-known sociologist, member of the Intergovernmental Panel on Climate Change (for 5th Annual Report), who will analyse the sociological aspect of Newts.

As Newts is an innovative project, combining partners expertise to produce the project results such as the Multi-agent model and microsimulation models which will be available for replicability in other cities, is clearly an asset, which will allow the partners to develop further cooperation in their fields and position themselves as leaders towards their Stakeholders and in the research community.

2. IMPACT

2.1 Impact of the proposal

The proposal contributes to the goals of the Joint Call The project rely on econometrics of water demand to assess the socio-economic performance of tariff systems through a dashboard of appropriate indicators. Simulation and optimization exercises allow to identify improvements/worsenings associated to more flexible pricing mechanisms in every dimension of the WDF. A large range of instruments can be tested in various regulatory analytical frameworks, all consistent with the revised WFD. The selection of a precise solution has to be based on the trade-offs of the decision-maker and, as well, on management costs. The variety of fields that are covered by the dashboard also provides information that can be used to the development of impact investments. With the focus on nudges, the proposal makes use of social sciences as well to develop tools for improving local DSM policy. BIs have a great potential but, for the reasons given above, their contributions should not be assessed without studying their impacts on the households' water demand functions.

Transnational added-value of the collaboration between consortium partners The consortium is made of European and non-European partners. Each team has specific expertise which is of particular need for other partners. Among the most important, the nudges campaign carried out on a large scale by South Africa (with no counterpart in Europe), experimental economics (mainland France) and econometrics of water demand for tariff design (Reunion Island, Spain and Tunisia).

Mid- and long-term benefits of this collaborative effort Newts aims to improve the management of local water services involved in the project, by helping the decision-making process. Besides, Newts contributes to the development of new integrated indicators to monitor progress towards WDF and SDGs, insofar as there is a matter to consolidate information provided by local dashboards into an aggregate European dashboard. The production of standardised local dashboards, based on econometric estimates of local water demand, should support the Stakeholders skills improvement regarding the socio-economic dimension of the DSM policy.

European and/or International dimension of the research methodologies and approaches The research methodologies can be applied to all countries, and will allow to develop solutions taking local specificities into account. All needed elements to develop DSTs will be available on line. However, replication may require support which can be provided by the consortium partners.

The added-value of the consortium to Water RDI Using econometric methods, Newts studies nudge effects on water demand functions to provide relevant analysis and tools for the design of DSM policy. This includes some reflections on basic issues such as the financial self-sustainability of the service or the Free Basic Water Policy.

The potential impact of the proposed innovative solutions and/or services on business/industries, improvement of social wellbeing and environment Better management of their water uses by households with significant reductions in over-consumptions and water bills. Less pressure on the resource and environmental improvement with reduction of water wastage. Raising public awareness on high water consumption issues through nudges. Development of a smart mobile application (Spain) to provide real-time information on the consumption and marginal price of water; this innovation is likely to spread in the digital services sector. Better management of water resource in the countries. Improved information in the context of the contractual relationship between local authorities and private water companies. Development of a serious game for the training of water managers and students, in a friendly but rigorous framework, on the socio-economic dimension of the management of household water demand.

2.2 Expected outputs

	Expected outputs	Traget groups	Audience	How and When	Success indicators
Interactive and Simulation Tools	**Simulation Dashboards - DSTs tailored for studies site**	Stakeholders involved in the project	Local	Local meetings; throughout the life of the project	4 micro-simulated DSTs for one for each municipality
	Simplified versions of these DSTs (SV-DST)	academics, public decision-makers and stakeholders	International	project website; M18-M36	4 simplified micro-simulated DSTs
	Multi-agent Model	between local authorities and water managers	International	project website; M18-M36	1 Multi-agent Model
	Water monitoring tool	Spanish regions	National	project website; M18-M36	1 Water monitoring tool
Publications, workshops and mobility	**Working papers**	academics, public decision-makers and stakeholders	International	throughout the life of the project	30 academic working papers
	Publications peer-reviewed journals	academics	International	throughout the life of the project	10 to 15 publications
	Workshops	public decision-makers and stakeholders	Local (La Reunion, Spain, Tunisia and South Africa)	M18, M30	8 Stakeholders' days + 1 final event in Brussels + other actions scheduled at international level with the support of SEMIDE / EMWIS.
	Mobility schemes	academics	Local (La Reunion, Spain, Tunisia and South Africa)	throughout the life of the project	7 research stays of 15 days

2.3 Exploitation and communication activities (measures to maximise impact)

***2.3.1 Dissemination of the research results*:** see the table on the next page.

2.3.2 Strategy for knowledge and data management

- **Access to peer-reviewed scientific publications** A plan to provide open access to peer-reviewed scientific publications will be drawn for each country, in accordance with applicable national regulations. The Reunion University is involved in the Open Access Repository HAL.
- **Access to the research program for outsiders** All working papers will be freely available on the Newts website and the same will apply to all computer programs. Any interested persons will be able to replicate the program results, especially the DSTs. The use of the SV-DSTs will be made possible after registration on the project website, to compile statistics on their use.
- **Data protection policy** A data management plan will be defined for each country, in accordance with applicable national regulations. This plan will be set with Data Protection Officers of the academic institutions involved in the project. The SV-DSTs (available on line) use simulated data.

2.4 Market knowledge and economic advantages/return of investment

- **Potential market** All stakeholders involved in water management may use a similar DST, provided they based it on an econometric estimation of local water demand. For instance, more than 10,000 local services are concerned at the French national level. In addition, the results of the program are of interest to sectors where consumers face a problem of obscure units and pricing system serves social and incentive objectives. This is particularly the case for electricity sector, waste management sector, and telecommunications markets (with the implementation of a right to the Internet and recognition of its environmental impact).
- **Potential competitors** Although many models are available on the market, they are built for predicting demand evolution, not evaluating socio-economic performance of DSM policy. Most of them are based on a technico-economic approach and do not take into account the effects of tariff on water consumption. The IWR-Main software (USA) is an exception. It is based on an econometric model of water demand and allows simulating the effect of DSM policies on water consumption. However, its use is not based on an estimation of local demand (users have to calibrate the model to make it compatible with their data). Besides, although a cost-benefit analysis is provided, it does not allow to evaluate the DSM policy towards the objectives of WFD and SDG (unlike Newts project with the production of its dashboard).
- **Economic advantages for Stakeholders involved in the project** They can access the Newts tools, which are not commercially available today. Hence, the DST can be used to define the relevant strategies for local DSM policies.

	Publications	Digital channels	Workshops	Participation to targeted events	Knowledge management & Training
Stakeholders **(in particular public administrations and water utilities)**	**Guidelines** (how to build a DST process) **Handbooks** (how to interpret and understand the econometrics concepts) **Dashboard indicators** Public project **deliverables and reports**	**Project website** (allowing to download free modules for simulations, etc.) **Contributions with targeted project news** to regular water related online newsletters, e.g. Semide/Emwis e-flash (approx. 30 000 subscribers), WssTP, EIP Water, French pôle Acqua-Valley, etc. Project information available on local **water agencies websites** News on consortium **partners'websites and research networks** (ATOM, TEPP, EFD) **e-newsletters** (project results in English, French and Spanish)	**2 local stakeholders days in each Partner country**, ideally linked to some water related event **Final workshop** in Brussels (M36), ideally as a side event of a major water related event **Ad hoc local workshops** with public administration and water utilities (DEAL, ARS, General Council, Regional Council ...), Operators (Veolia, Cise, ...), users associations,) Participation in **science and technology park open days** (e.g. Journées Technopole, etc.)	**selected conferences of public decision-makers, industry and academics** (e.g. pS-Eau, African water association, French annual conference on Evaluation of Public Policies-French Ministry of Economic Affairs, Semide/Emwis) **Seminars** organised by national public bodies and or ONGs (e.g. Savoirs pour Actions seminar - French Ministry of Environment)	**Local training sessions** organized with local water supply agencies (in Reunion Island & Spain). 3 sessions: 1st devoted to nudges, 2nd to econometrics of water demand, 3rd on microsimulation model. Comprehensive introduction of the **simplified version of micro-simulation models for open source** use Consolidated offer of **trainings** by the partners to support the comprehension of water management simulation tools and facilitate the efficient use of the tools (in particular, local water supply agencies)
Academia	Approx. 30 working papers and **10-15 peer-reviewed articles** to selected journals (e.g. Environ.Resource.Econ., Utilities policy, etc.) **Newts-related computer programs**		Organisation of one FAERE symposium	**International and national Congress** (EAERE, WCERE, IMEBESS, North American ESA meeting etc) Seminars (internal & external)	**Lectures at the *International Water Week*** organized by OEG in Spain at M28 targeted to undergraduates and PhD students, in the framework of Erasmus+
Grand Public	At least **4 press releases** per partner		Local public post-nudge intervention consultation	World Water Day Festival of Science	

3. IMPLEMENTATION

3.1 Overall coherence and effectiveness of the work plan

WP n.	WP Title	Duration	Start M	End M	WP Description
WP1	**Nudges set-up, lab experiments and analysis**	36	1	36	WP1 implements the tasks related to Behavioural Economy, and covers the design of nudges, their implementation and analysis of related laboratory experiments, followed by the building of the Multi-agent model, considering the feedback from the lab experiments. **Task 1.1: Nudges design and adjustment** (M1-M24) (Led by GAEL) Review and elaboration of nudges and experiments, followed by adaptation to local parameters **Task 1.2: Decontextualized lab experiments on perception of water tariff system** (M2-M6**)** (Led by CREM) The subjects are students unfamiliar with the object under study (water pricing). **Task 1.3: Field-in-the-lab experiments on perception of water tariff system** (M2-M6) (Led by GAEL) The subjects are households familiar with the object under study (water pricing); the experiments take place in the lab. **Task 1.4: Decontextualized lab experiments on nudges dissemination through social networks and neighbours** (M13-M17) (Led by CREM) **Task 1.5: Field-in-the-lab experiments on persistence and dynamic nudges management** (M13-M17) (GAEL) **Task 1.6: Analysis of experimental results** (M6-M36) (GAEL)- comparison of the results obtained in field and lab experiments. **Task 1.7 Development of Multi-agent model** (M1-M36) (Led by GRANEM)
WP2	**Econometric models and their application**	36	1	36	WP2 applies the Econometrics instruments to estimate water demand functions of the households, to build the Household Water Consumption Microsimulation Model. **Task 2.1: Household Database development** (M1-M6) (Led by LAREQUAD) Databases from the 4 partners' countries are built and serve for econometric estimate of household water demand and tariff simulations. **Task 2.2: Econometrics of household water demand** (M6-M30) (Led by OEG) Estimation of water demand functions of the households using econometric methods (ex-ante and ex-post nudges field implementation) **Task 2.3: Development of Household Water Consumption Microsimulation Models** (M31-M36) (Led by OEG) Combination of econometric estimates of household water demand function and relied statistical dataset to compute the indicators of the socio-economic dashboard

WP3	**Dashboard and Evaluations**	30	1	30	WP3 includes 3 tasks needed to assess targeted local water pricing and DSM policies. **Task 3.1: Creation of the socio-economic dashboard** (M1-M12) (Led by LAREQUAD) Selection and integration of approx. 50 identified indicators to the dashboard with focus on affordability, incentive effect, monetary transfers (equity), economic welfare and costs recovery. **Task 3.2: Socio-economic evaluation of the tariffs system** (M13-M36) (Led by LAREQUAD) Tariff socio-economic performance assessment locally applicable before and after behavioural intervention (nudges). **Task 3.3: Nudges cost-benefit analysis** (M13-M32) (Led by EPRU) This analysis is performed for each country.
WP4	**Simulation models and Guidelines**	36	1	36	WP4 consolidates the outcomes from previous tasks into simplified micro-simulation models, pedagogical sheets and methodological guidelines and procedures to facilitate exploitation of the developed tools and models. **Task 4.1: Simplified micro-simulation model set-up** (M1-M36) (Led by CEMOI) **Task 4.2: Methodological Guidelines and Handbook** (M1-M36) (Led by CEMOI)
WP5	**Nudge case studies**	28	8	36	WP5 represents the implementation of the nudges (field experiments) in Saint Paul, Gijon and Sfax, and the analysis of households/stakeholders feedbacks. **Task 5.1: Field experiment and analysis in Reunion (Saint Paul)** (M8-M36) (Led by CEMOI) **Task 5.2: Field experiment and analysis in Spain (Gijon)** (M8-M36) (Led by OEG) **Task 5.3: Field experiment and analysis in Tunisia (Sfax)** (M8-M36) (Led by LAREQUAD) **Task 5.4**: **Stakeholders and End-users' experience feedback** (M13-M36) (Led by CEMOI).
WP6	**Dissemination communication training and exploitation**	36	1	36	WP6 will put in motion and implement actions to reach out all Stakeholders as well as the civil society **Task 6.1: Dissemination &Communication actions** (M1-M36) (Led by CEMOI) **Task 6.2: Training and mobility schemes** (M1-M36) (Led by CEMOI) **Task 6.3: Stakeholders and Public authorities interactions and Exploitation** (M12-36) (Led by CEMOI)
WP7	**Project coordination & management**	36	1	36	WP7 shall assure high quality project coordination and management as described in the section Implementation **Task 7.1: Technical project coordination** (M1-M36) (Led by CEMOI) **Task 7.2: Financial and administrative management** (M1-M36) (Led by CEMOI)

Deliverable List

Deliverable n°	Title	Related WP	Delivery month	Responsible partner
D1.1	Report on Setting up of Nudge campaigns	1	M18	GAEL
D1.2	Report on Preliminary version of the multi agent model	1	M24	GRANEM
D1.3	Report on laboratory experiments	1	M36	GAEL
D1.4	Report on Final version of the Multi agent model	1	M36	GRANEM
D2.1	Econometric analysis of water demand before nudge campaigns	2	M14	OEG
D2.2	Four micro-simulation models report	2	M36	OEG
D3.1	Report on evaluation indicators dashboard	3	M12	LAREQUAD
D3.2	Report on Nudge cost-benefit analysis	3	M32	EPRU
D3.3	Social-economic evaluations of the tariff schemes and recommendations	3	M36	LAREQUAD
D4.1	Mid-term field experiments report	5	M22	EPRU
D4.2	Report on Analysis of the 3 field experiments	5	M36	EPRU
D4.3	Stakeholders and Household consultation report following field experiments	5	M36	EPRU
D5.1	Report on First prototype of the simplified micro simulation model	4	M18	CEMOI
D5.2	Simplified micro simulation model report	4	M36	CEMOI
D5.3	Guidelines for Decision Support Tool	4	M36	CEMOI
D6.1	Report on mobility and training activities	6	M34	CEMOI
D6.2	Report on interactions with stakeholders	6	M35	CEMOI
D6.3	Report on dissemination and communication actions	6	M36	CEMOI
D7.1	Project quality management plan	7	M3	CEMOI
D7.2	Mid-Term Technical and financial report	7	M18	CEMOI
D7.3	Final Technical and financial report	7	M36	CEMOI

Milestone list

MS1 First Lab experiments running - M4, GAEL

MS2 Conclusions of first lab experiments available - M6, GAEL

MS3 Household database available - M6, OEG

MS4 Field experiments launched - M8, EPRU

MS5 Household water demand functions established (before nudge campaign) - M14, OEG

MS6 Tariff scheme socio-economic evaluation available (before nudge campaign) - M17, LAREQUAD

MS7 Nudge impact on household water demand functions evaluated - M30, CEMOI

MS8 Simplified microsimulation model available - M36, CEMOI

GANTT CHART

Description / Months	Year 1												Year 2												Year 3											
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
WP1 Nudges set-up and lab experiments deployment and analysis																																				
T1.1 Nudges design and adjustment																		D1.1																		
T1.2 Decontextualized lab experiments on perception of water tariff system																																				
T1.3 Field-in-the-lab experiments on perception of water tariff system																																				
T1.4 Decontextualized lab experiments on nudges dissemination																																				
T1.5 Field-in-the-lab experiments on persistence & dynamic nudges management																																				
T1.6 Analysis of experimental results																																				D1.3
T1.7 Development of multi-agent model																								D1.2												D1.4
WP2 Econometric models and their application																																				
T2.1 Household database development																																				
T2.2 Econometrics of household water demand														D2.1																						
T2.3 Development of Household water consumption microsimulation model																																				D2.2
WP3 Dashboard and Evaluations																																				
T3.1 Creation of the socio-economic dashboard												D3.1																								
T3.2 Socio-economic evaluation of the tariffs system																																				D3.3
T3.3 Nudges cost-benefit analysis																																D3.2				
WP4 Case studies																																				
T4.1 Field experiment and analysis in Reunion																																				
T4.2 Field experiment and analysis in Spain																						D4.1														D4.2
T4.3 Field experiment and analysis in Tunisia																																				
T4.4 Stakeholders and End-users' experience feedback																																				D4.3
WP5 Simulation models and Guidelines																																				
T5.1 Simplified micro-simulation model set-up																		D5.1																		D5.2
T5.2 Methodological Guidelines and Handbook																																				D5.3
WP6 Exploitation, dissemination, communication and training																																				FW
T6.1 Dissemination & Communication																																				D6.3
T6.2 Training and mobility schemes																																		D6.1		
T6.3 Stakeholders and Public authorities interactions and Exploitation																																			D6.2	
WP7 Project Coordination & Management																																				
T7.1: Technical project coordination																																				
T7.2: Financial and administrative management			D7.1															D7.2																		D7.3
Milestones				MS1		MS2	3	MS4						MS5			MS6													MS7							MS8
Progress monitoring	KoM			Ex1				PM1					Ex2					PM3			Ex3			Ex4			Ex5			Ex6			Ex7			PM6
Mobility schemes						Mb1					Mb2		Mb3					Mb4				Mb5			Mb6			Mb7								

MS1 Milestone D21 Deliverable PM Project meeting Ex ExCom confcall FW Final conference

Mb1: Mobility stay Tunisia to France Mb2: Mobility France to Spain Mb3: Mobility France to South Africa

Mb4: Mobility Spain to South Africa Mb5: Mobility Tunisia to Spain Mb6: Mobility France to Spain Mb7: Mobility France south Africa

3.2 Appropriateness of the management structure and procedures, including quality management

Each partner of the project is represented in the **Executive Committee** (ExCom), chaired the **Coordinator**. It is the decision-making body of the project that discuss on technical orientations and coordinated actions. The Coordinator ensures the scientific and technical excellence of the project implementation and its outcomes. He is responsible for the financial management and contracting, external interactions, and formal relations with Water JPI. The **WP leaders** are in charge of implementing the tasks envisaged in their WP, and report on the progress, ensuring a proper and timely execution and submission of the deliverables. A **Stakeholders group** will be set up to establish close links with different actors of the water management chain during the project. Some of the members of this group can participate in the ExCom so that their specifications can be taken into consideration.

Four consortium meetings bringing together researchers and stakeholders are scheduled: Kick-off meeting at M1 in Grenoble (4 days), 2nd meeting at M8, in Rennes (France), 3rd meeting at M18 in La Reunion (France), the final meeting at M36 in Angers (France). In addition, several ExCom conference calls are also planned (see Gantt).

For efficient project management, several underlying activities will have to be carried out during the project duration. **Quality management** will include the identification of the procedures needed; All management procedures will be included into the quality management plan delivered at month 3 (D7.1).

As a Management tool, an online collaborative workspace will be set up and used to support efficient collaboration between the Partners. For an appropriate Information flow, the management will rely on a wide array of communication support tools, such as phone-, web- and video-conferencing, and mailing lists, for addressing technical or management issues. The Consortium decision-making process is aimed at building consensus throughout the project with the activities of one Partner not having adverse effects on the activities of another partner. In the event that disputes or differences arise that cannot be resolved, the management process shall be described in the Quality management plan. Where the dispute concerns IP, the dispute can be raised to the Coordinator which can request the assistance of the EC IPR Helpdesk.

In order for the consortium to succeed in achieving its objectives, the project duration will be 36 months. From the **financial strategy** perspective, the estimated total costs needed to carry out all the tasks presented in Section 3 is **1 190 916 €,** with a total requested funding of **534 886 €**. The **total Person-month amounts to 184.35** (permanent and non-permanent). Personnel costs is the main direct cost item with 765 730.5 €. Equipment, Travels & subsistence and consumables amount to 182 295 €. The subcontracting costs (for lab and field experiments) amount to 178 200 €. Overheads (indirect costs) are applicable according to each national funding agency.

3.3 Risk management

Risk assessment will be performed and discussed at each ExCom conference calls and whenever needed throughout the project duration. The following risks have been identified.

Risk description	Mitigation / Contingency actions
Reactance and defiance effects of the targeted end-users to nudge information.	Nudges may be perceived as patronizing or guilt-inducing. The mitigation action will be full transparency about the aims pursued and an open communication to population. Prior to nudges, interventions organised by local water companies are planned on study sites.
Reluctance of local administrations to provide access to data potentially interesting for the case studies	This risk is very low as the water utilities are members of the Stakeholders group and participate to the definition of project goals (Ref.: letters of support and interest)
Stakeholders reluctance towards the suggested tools	Regular progress reporting to the stakeholders are scheduled, by means of electronic dissemination and dedicated meetings and participation to selected events
Under-performance of partners or conflicts among partners	Regular reporting and continuous monitoring will avoid eventual underperformance going unnoticed and enable the timely elaboration of corrective measures

3.4 Potential and commitment of the consortium to realise the project

The consortium is composed of recognised universities in Europe and Africa based on previous bilateral and multilateral cooperation. The academic partners are involved in regular interactions with the water public authorities and private entities and take into consideration their specific needs, constraints and opportunities. The commitment of the participating organisations is expressed through in-kind effort for all envisaged activities. A number of tasks and actions from the project will be complemented by national or regional initiatives, always avoiding any duplication of efforts or funding.

4. DESCRIPTION OF THE PARTICIPATING RESEARCHERS

Partner Number, according to Part A	Research Team Members (for personnel include name, position and affiliation)	General Description
Coordinator - CEMOI **Dr. Michel PAUL**	Prof. Nicolas Moreau, CEMOI	Panel data - Evaluation of public policies - Applied microeconomics
	Dr. Diakité Daouda, Lecturer and Researcher, CEMOI	Social pricing of water - Tariff design - Residential water supply - Microeconometrics
	Dr. Olivia Ricci, Lecturer and Researcher, CEMOI	Poverty and vulnerability indicators (Fuel poverty) - Applied econometrics
P1 - CREM **Prof. Laurent Denant-Boemont**	Dr. Sabrina Hammiche, Vice-Dean of the university of Rennes, Lecturer, CREM	Behavioural economics - Experimental economics - Project assessment - Evaluation methods
P2 - GAEL **Prof. Marie-Estelle Binet**	Dr. Paolo Crosetto, Researcher, INRA, GAEL	Experimental and behavioural economics – Consumption and production choices under complex situation choices Prize of the best article of the year in Experimental Economics. 2016 A theoretical and experimental appraisal of four risk elicitation methods, with A. Filippin, 2016, Experimental Economics, 19:613-641
	Dr. Laurent Muller, Researcher, INRA, GAEL	Behavioural economics - Consumption behaviours - New experimental methods
	Stéphane Labranche, Associate researcher - Grenoble Institute of Political Studies, IPCC	Environmental sociology - Climate change - Individual behaviour changes Expert for ONERC for the guidelines of the 6th IPCC Report Member of IPCC-IPCC, Vol.3, 5th Report Holder of the Energy-Climat Chair of IEP Grenoble 2014. Empowering customers to save energy by informative billing, Intelligent Energy - Europe (IEE), UE - European Program, Responsible for the sociological part Award of the « European political science network in teaching excellence and innovation ». 2006 Paul-Painchaud 2011 Prize
P3 GRANEM **Prof. Xavier Pautrel**	Prof. Emmanuelle Augeraud-Véron, GRETHA	Dynamic system modeling applied to economics
	Dr. Masha Pautrel, Lecturer, GRANEM	Theoretical modeling of agent's heterogeneity - Spatial econometrics

Partner Number, according to Part A	Research Team Members (for personnel include name, position and affiliation)	General Description
P4 University of Oviedo - OEG **Maria A. García-Valiñas**	Prof. David Roibas Alonso., OEG	Efficiency and productivity analysis, Health economics, Environment and natural resource Economics. - "Measuring Welfare Losses from Interruption and Pricing as Responses to Water Shortages: An Application to the Case of Seville", with M. García-Valiñas and A. Wall, Environmental and Resource Economics, 2007, 38, 231-243. - Roibas, D., Garcia-Valiñas, M.A. and Fernandez-Llera, R., "Measuring the impact of water supply interruptions on household welfare", Environmental and Resources Economics, 2018, pp. 1-21.
	PhD to be hired	Survey analysis - Database construction and exploitation
P5 - LAREQUAD **Dr. Hatem JEMMALI**	Younès BEN ZAIED, LAREQUAD	Times Series - Forecasting methods - Seasonal cointegration - Econometrics of water demand "Modelling seasonality in residential water demand: the case of Tunisia", with Marie Estelle Binet, Applied Economics, 2015, 47(19),1966-1983.
	Dr. Bouslama ABDELKADER, LAREQUAD	Sustainable water demand management - Hydro-economic modelling - Database management PhD 2016: Sustainable management of groundwater: hydro-economic modeling of the SASS Basin, University of Tunis
	Prof. Mohamed Salah MATOUSSI, émérite, LAREQUAD	Water demand - Survey methodologies - Poverty analysis Consultant Sahara and Sahel Observatory, 2010-2015 Water Degradation: The Case Of Tunisia. En Collaboration, in The Cost of Environmental Degradation: Case Studies from the Middlle East and North Africa, 2010, The World Bank
P6 - EPRU **Prof. Martine Visser**	PhD to be hired	Database construction - Panel data - Econometrics of demand

5. CAPACITY OF THE CONSORTIUM ORGANISATIONS

Partner Number (Organisation Name)		General Description
Coordinator - Centre d'Economie et de Management de l'Ocean Indien - CEMOI	**Role and main responsibilities in the project**	**Econometrics of water demand** (Tariff Perception) - Panel data - Data analysis - **Evaluation** (Transfer analysis, Tariff design) - Conducting the field experiment in Saint Paul – Dissemination , Communication, Exploitation WP leader
	Relevant publications and/or research/innovation products	- Diakité D., "A proposal for social pricing of water supply in Côte d'Ivoire", in collaboration, Journal of Development Economics, 2009, 88, pp. 258-68. - Participation in REVE project (Sustainably **RE**ducing energy poV**E**rty - REVE-ANR-14-CE05-0008) - ReNovRisk-Impact-RE0013567 (Measurement of macroeconomic costs of cyclone damage in Indian Ocean zone, ERDF program).
P1 – Centre de Recherche en Economie et Management CREM	**Role and main responsibilities in the project**	Nudges design - Decontextualized lab experiments - Gender dimension
	Key research facilities, infrastructure, equipment	Labex-Em platform including 24 computers and 2 servers and one application developer
	Relevant publications and/or research/innovation products	Denant-Boemont L., "Patience and Time Consistency in Collective Decisions", Experimental Economics, 2017, 20(1), 181-208**.**
P2 - Laboratoire d'Economie Appliquée de Grenoble GAEL	**Role and main responsibilities in the project**	**Nudges conception** - Field-in-the-lab experiments - Comparison of experiments (lab vs. in the field)
	Key research facilities, infrastructure, equipment	Standard lab experiment platform and field experiment platform using real people (16 computers and a complete back office)
	Relevant publications and/or research/innovation products	Label 5 project, French Health Ministry, analyze the impacts of nutrition labeling schemes on nutritional quality of Household food basket
P3 – Groupe de Recherche Angevin en Economie et Management GRANEM	**Role and main responsibilities in the project**	**Multi-Agents model** - Spatial Econometrics
	Relevant publications and/or research/innovation products	E. Augeraud-Véron, "Solving internal habit formation models through dynamic programming in infinite dimension, in collaboration", Journal of Optimization Theory and Applications, 2017, 173(2), pp. 584-611. Masha Pautrel, "Environmental spillovers and their impacts on Housing prices: A spatial hedonic analysis", in collaboration, Revue d'Economie Politique, 2016, 216 (5), pp. 921-945

Partner Number (Organisation Name)		General Description
P4 - University of Oviedo OEG	**Role and main responsibilities in the project**	**Econometrics of water demand** (Measure of basic water needs - Impact of water using equipment - Productive inefficiency) - **Evaluation** (Affordability - Incentive effect of water tariff), Conducting the field experiment in Gijón (Spain).
	Relevant publications and/or research/innovation products	- Pérez-Urdiales, M., Garcia-Valiñas, M.A., "Efficient water-using technologies and habits: A disaggregated analysis in the water sector", Ecological Economics, 2016, 128, pp. 117-129. - Garcia-Valiñas, M.A., Martínez-Espiñeira, R. and González-Gómez, F.J, "Affordability of residential water tariffs: Alternative measurement and explanatory factors in southern Spain", Journal of Environmental Management, 2010, 91(12), pp. 2696-2706 - project supported by Spanish Ministry of Economy and ERDF on Economic growth and environmental behavior (ECO2016-75237-R)
P5 - Laboratory for Research in Quantitative Development Economics LAREQUAD	**Role and main responsibilities in the project**	**Econometrics of water demand - Time series** (Seasonality - Forecasting methods) - **Evaluation** (Water poverty index building), Conducting the field experiment in Sfax (Tunisia).
	Relevant publications and/or research/innovation products	Younes Ben Zaied, "Modelling nonlinear water demand: The case of Tunisia", in collaboration, Economics Bulletin, 2017, 37(2), pp. 637-644. Younes Ben Zaied, "Modelling regional water demand in Tunisia using panel cointegration second generation tests", Journal of Quantitative Economics, 2015, 13(2), pp. 237-251
P6 – Economics Policy Research Unit EPRU	**Role and main responsibilities in the project**	**Nudges design - Experimental setting and design - Randomized control trials and treatment effects**
	Relevant publications and/or research/innovation products	- Visser. M., "Social capital, cooperative behavior and norm-enforcement", Journal of Behavioral Economics and Organization, 2012, 81 (2), pp. 341-354 - "What is Fair? An experimental Guide to Climate Negotiations", with K. Brick, European Economic Review, 2015. 74, 79-95. - Research Chair of the African Climate Development Initiative (ACDi)