D 7.6 – RRI Protocol

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EXECUTIVE SUMMARY

This report constitutes the final RRI assessment of the PARENT project. It is based in prior deliverables into RRI and social acceptability (esp. D3.1, but also D2.1), on report from PARENT Living Labs and pilots, main project documents and participation in project meetings. It starts by providing a brief outline of the concept of RRI, and explains how this has been adapted to the PARENT project. Specifically, the PARENT RRI considerations took special notice of user studies, studies of participatory design, and the Living Labs approach chosen by PARENT (and JPI Urban Europe). Drawing on the literature in these fields, the report proposes a two-by-two analytical grid (Table 1), dealing with (respectively):

- Deliberation, anticipation, reflexivity, participation,
- Energy behaviours and habits,
- Energy monitoring systems as means towards certain ends (sustainability, energy savings)
- Smappee and VEA 'as such'.

The report then goes through some main aspects relating to the Living Lab in each of the three cities, and makes comparisons and analysis. It concludes that PARENT as a whole observed and implemented several requirements important to RRI, from discussions of energy futures to engagements with users and local stakeholders. It succeeded in exposing a number of crucial societal as well as scientific perspectives to each other, thus opening up broader discussions on a number of issues. More and better integration of societal as well as scientific perspectives *could* have taken place across the three Living Labs. Yet, this potential was hampered by practical and unforeseen difficulties, specifically the disappearance of the main project partner. The best lessons and practices to emerge from the project pertain to the ways the partners went about building of trust and relations with local participants, communities and stakeholders. As such it is a good example of how RRI can and should be implemented in Living Lab based projects.

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List of Abbreviations

Abbreviation	Description
WP	Work Package
LL	Living Lab
EMS	Energy Monitoring System
Partner Abb.	Description
VUB-IES	Vrije Universiteit Brussel – Institute for European Studies
BLP	Blue Planet AC
UU	Universiteit Utrecht
RES	Resourcefully
SVT	University of Bergen, Centre for the Study of the Sciences and the Humanities

1   Introduction

This report represents the main documentation of Responsible Research and Innovation (RRI) in the PARENT project. It comes out of a sustained focus on RRI and social acceptance throughout PARENT, where it was the specific task of the Bergen team. The report utilizes analytical distinctions made in previous deliverables (esp. D3.1, D2.1, D2.2, D6.1 and D7.1). It merges some of these into an analytical grid (Table 1) for assessing the kind of distributed and socially embedded form of technical experimentation represented by PARENT. In the JPI Urban Europe strategic programme (JPI 2019) such experimentation is conceptualized as a Living Lab approach (sometimes abbreviated LL), and this concept was also adopted by the PARENT project (see section 4). The analysis and assessment of RRI is therefore adapted to this living lab approach, and taking into account the ways in which it became implemented in each of the three cities (Amsterdam, Brussels, Bergen). A note on language and project design may be relevant for the reading of this report: in PARENT the Living Lab was closely connected to a 'pilot' in each of the three cities. The pilot represented the practical implementation of energy saving technologies together with local residents and users. The Living Lab was then the broader evaluative and organizational structure within which the pilots became implemented and continuously assessed. This assessment was typically carried out by a steering committee for each pilot. This means that in this text, we refer to a generalized 'Living Lab approach', but this was always embedded in the pilot. According to the project proposal, the combination of Living Labs (LLs) and the pilots would ensure local embedding of the pilots, and increase engagement: 'Engagement of multiple stakeholders at multiple levels with a view to inform them, seek their feedback and integrating it into the development of the platform' (PARENT 2016). This also means that the two concepts are used interchangeably in this report, but also in the project documents to which it makes reference.

2   RRI as a concept

Responsible Research and Innovation (RRI) is one among several ways in which improved relations, interactions and communications between research, innovation and societal actors, have been implemented during the later years (Von Schomberg 2011, 2013, 2019, van Der Hoven 2014, Guston 2013, Stilgoe et al. 2012, Owen 2015). A number of different approaches and conceptions exist (cf. Rommetveit et al. 2019, cf. Von Schomberg and Jenkins 2019), and RRI is applied in different places and contexts, such as laboratories, agenda setting and research funding, and in innovation projects such as the JPI Urban Europe. In D3.1 we have provided a basic outline of some key features of RRI as they apply to PARENT:

- The main goal of RRI is to embed societal concerns more firmly within research and innovation projects. This can come about by facilitating a broader debate about the goals and means of innovation, and by bringing more actors into deliberation. It also means close observation of compliance with basic rights, such as those of dignity, privacy and informed consent.

- It is future-oriented, and frequently aims at future-oriented research, innovation and development projects. A main aim of RRI is to instigate broader deliberation over desirable and non-desirable futures, as enabled through research and innovation.

- Its aim is to render innovation both more socially acceptable and sustainable. These are normative concepts, and very difficult to measure. Some concretization can be obtained through the sustained focus to build collective capacities aimed at *anticipation* (of possible future challenges and outcomes), *reflexivity* (by introducing more issues and concerns), *participation* (by involving more actors), and *deliberation* (by explicitly encouraging and enabling broader discussion) (cf. Stilgoe et al. 2012).

- It takes aim at both the *process* and *products* of research and innovation (cf. von Schomberg 2013). Hence, it may be directed at PARENT as a process, broadly considered as a research project that is situated within wider social, cultural, governance and environmental contexts. And, it aims at the *products* thereby enabled, in this case mainly the PARENT platform and the Smappee energy monitor. Yet it is important to remember that these are enabled through connection with energy grids and systems, with new forms of energy management, with digital communication (wi-fi, Internet), and to some extents within an emerging ecology of renewable energies (especially photovoltaics). It is thus not straightforward, to delineate the product or process of assessment.

- The previous point also entails that a strong tendency within RRI research and practice is a focus of bringing actors closer together, in aligning their various contributions with respect to societal goals. This means that there is a strong emphasis on cross-sectorial and interdisciplinary collaborations in RRI research and practice (Rommetveit et al. 2019). Hence, the ways in which PARENT incorporates such collaboration, and the ways in which it may work

3   How we conceived of RRI in PARENT: user studies and co-creation in Living Labs

The above already entails a certain interpretation of RRI. Within the PARENT project RRI was situated within an ambitious plan towards societal acceptability that also included ethics and privacy considerations. Specifically, it was to be conceived through an approach based in Living labs, whose specific aim was to produce more community-based and participation-based forms of energy reducing behaviors. As such, it was almost exclusively aimed at the user-side of energy-systems. This was expressed in basic statements of the project's aims and goals, as exemplified in the following:

> "The PARENT project gives you the opportunity to reduce your household energy consumption and engage in your local community. Using smart meters, we will analyse your energy consumption and provide tailored information, tips and activities aimed at increasing your household energy efficiency. We will develop a **participatory platform for energy management and organise workshops to encourage involvement and support among the local community.**" (PARENT website http://www.parent-project.eu/)

> "The new platform will be developed in a **constant interaction with stakeholders via Living Labs. The project will adapt to local specificities, demographic make-ups and capacities of three target cities** – Amsterdam, Bergen and Brussels – where pilots and living labs will be held." (PARENT project workplan, Project N.646453)

3.1   User studies

This entailed that, in Deliverable 3.1 and other related deliverables (esp. D2.1), we situated the questions of RRI in close connection to Living Labs as a more or less specific approach to embedding research and innovation in society, and in close relation to *studies on users.* Early on, we circulated a short text on 'social acceptability, mainly taken from user studies, and these were later repeated in D3.1. We used this as a means for introducing the need, highlighted in the RRI literature, to 'turn the table' or shift perspective: from innovators and agenda setters (i.e. policy makers) to users, local communities and concerned publics. Through users studies we introduced a number of considerations and hesitations, of relevance to the goals of PARENT. These considerations from the short text on social acceptability and D3.1 bears repeating, as they can be used to concretize our final evaluation of the RRI dimensions of PARENT:

-    'There is a strong tendency within main policies as well as the technical literature to focus on early adapters (such as prosumers), and to presuppose that other users will act accordingly (Schick and Gad 2015, Webb et al. 2014). Yet, the 'laggards' or slow adopters may interact with and adopt the technology in very different ways from the early adaptors.

- For similar reasons there is a strong tendency to prioritise resourceful users, typically people living in more affluent neighbourhoods, and to expect that, once these adopt new energy behaviours, others will do so as well. However, members of other socio-economic groups are highly likely to behave and interact in other ways (Graham and Marvin 2001). Issues of social justice or 'social sorting' (Lyon, Ed. 2002) are therefore quite central to smart energy policies and projects, but are frequently ignored.

- There is … a strong tendency to ignore the strong role of habit and custom in everyday life: family routines and established household orders (Strengers 2013, Marres 2012, Shove and Walker 2014). However, such routines and orders are typically results of quite complex interactions and intersect with a number of factors, such as the normal time schedules of the inhabitants (when do the children come home from school? What routines for cleaning clothes? When is the house cleaned, how is food purchased, stored, prepared and consumed, when does the family gather to enjoy some time off, watch TV, etc.). Here, factors such as pricing and digital information are not necessarily the most relevant but occur together with a host of other factors.

- Energy policies are strongly influenced by prevailing (political, industrial) power structures. There is a strong consensus in the literature that the main interests present in smart energy policies are those of the utilities and network operators (Strengers 2013, for a fuller list of references, see D2.1 and D3.1).

- People will frequently take a strong interest in a new gadget, but after a while this interest may fade. Hence, people may forget about the meter after an initial phase of fascination (Naus et al. 2015).

- Acceptance of a new technology, such as a smart meter, typically also depends on the public institutions and processes, such as standard setting and making of regulations, through which the technology is introduced. This was clearly seen in the Dutch case (Hoenkamp 2011, Cujpers and Koops 2011), where initial regulations and standards (developed by the Dutch Ministry of Economic Affairs) were rejected by a coalition of different civil society actors, privacy lawyers and politicians. Mainly because privacy concerns had been ignored, but also due to an initial lack of consumer interface on the meters, smart metering policies were rejected. In terms of implementation, the Dutch roll-out was set back several years, and standards and regulations had to be re-made almost from scratch. This problem is also dealt with in the short text on WP2 as the Collingridge dilemma and the need for 'upstream engagement'. Furthermore, this story is a typical example of the case for early inclusions of ethical, legal and social aspects into technology policies (cf. van den Hoven 2014).'

3.2   Participatory design

Related to the above, in D2.1, a Pilot Protocol (D6.1) and a Living Lab protocol (D7.1), we highlighted aspects relating to co-creation and participatory design. We perceived of these as compatible, and indeed related, to the RRI-approach, since this can also be seen as shaped by concerns relating to co-creation, 'co-production', participatory and values sensitive design (cf. van Den Hoven 2014). For instance, D7.1 laid out basic considerations relating to preparation, execution and evaluation of Living Labs; D6.1 described basic steps and considerations to be taken throughout the related pilot projects in each city:

• Ensure observance of Responsible Research and Innovation (RRI)
• Guarantee representativeness of households
• Adjust pilots to local conditions
• Determine responsibilities of project partners
• Acquire equipment necessary to run pilots
• Set forth conditions for evaluating pilots results via Living Labs
• Develop a template for consent for participation in research

These considerations are important for the main body of this report, which will be on the execution of Living Labs and Pilots in the three cities of Brussels, Amsterdam and Bergen, and also taking into account the above considerations of RRI, social acceptability and user perspectives.

Finally, as a way of operationalizing the above considerations, D3.1 made a basic distinction between acceptability (in principle) and acceptance (in practice). It stated how:

First, the in-principle 'acceptability' qua legitimacy and ethical 'rightness' of policies, regulations, applications and developments in the three cities. This may be termed a normative level, that nevertheless refers to empirically verifiable events, especially as these make up public decision making and reasoning about smart meters and smart energy. Secondly, we refer to de facto 'acceptance', mainly in terms of the ways in which people, in their everyday practices interact with smart metering devices and applications: whether they actually change behaviours, and whether new forms of interactions stabilise and can be discerned in the medium or long term. Thirdly, the preceding levels of analysis form the backdrop for how we assess the VEA in terms of Responsible Research and Innovation (RRI) and general acceptability of the PARENT interventions into ongoing policy developments and practices.

As the pilots actually begin we foresee a gradual transition: from the first in-principle acceptability, towards the more concrete level of PARENT and the VEA platform. Since we are still in early stages of PARENT, it is natural that we start out with a more general overview

of the contexts into which the VEA will enter (however incomplete), and retain an open mind as to the potential directions of our findings as soon as we start interacting with users.[1]

Table 1: RRI analytical grid for PARENT.

	Acceptability	*Acceptance*
Process	**Deliberation, anticipation, reflexivity, participation** - Energy futures: agenda framings and imaginations - Power and institutions: social justice, social sorting - Inclusion: representativeness, consideration of vulnerable groups	**Energy behaviours and habits** - how are they conceptualised by the PARENT team? - project adjusted to local conditions? - how do they play out amongst participants? - can changes to energy behaviours be observed?
Product	**Means and ends** - Smappee and VEA as tools for sustainable and inclusive societies? How do these play out over time? - Does interest (and engagement) persist, or do they decrease with time? Is there a loss of interest? (as described by user studies)	**Smappee and VEA** - user evaluations - privacy and informed consent (template and procedure)

4   Living Labs as a way of embedding RRI and social acceptability

The above considerations entail a way of operationalizing RRI in PARENT: we first provided a general outline of RRI; we then further operationalized in relation to user studies and participatory design. These approaches (RRI, user studies, participatory design) may all be said to belong to the 'analyst's', or evaluator's perspective: this report uses them to evaluate

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[1] D3.1 also laid out a more nuanced throretical framework, based in science and technology studies (STS) approaches to infrastructures, and pragmatic theories of justification. These were mainly relevant for the Bergen team's research interests, and will not be reiterated here. They are relevant, however, as a way of more firmly embedding RRI, which is typically under-theorised, within philosophical and empirical approaches.

certain aspects of PARENT. Yet, one further aspect needs to be introduced, this time pertaining to the project itself: PARENT took a general approach of implementation through Living Labs'. The ways in which a 'Living Lab' was implemented in three cities through three (different) pilots is thus central to the ways in which RRI can be assessed. In the remainder of this report, we shall therefore pay attention to the different ways of implementing a Living Lab in the three pilots. This requires some further 'operationalization'. This time it is not aimed at the analyst's or evaluator's perspective, but on the ways in which the PARENT project was implemented in the three cities.

Bulkeley and Castán Broto (2013) highlight how such experimental spaces (whether they represent something actually new or not), have emerged as main responses for cities and governments for experimenting with new solutions to problems of climate change adaptation and mitigation, urban sustainability and resilience. Discussions are whether Living Labs constitute something genuinely novel, or whether they are mere continuation of existing approaches such as demonstration projects (cf. Skjølsvold and Ryghaug 2015). Yet, what is arguably new is the intensified focus on novel forms of partnerships, including 'science – society – business – society – collaboration' (JPI 2019) in the JPI Urban Europe Living Lab approach.

Whereas frequently technology-centered, and strongly inscribed with recent discourses of ICT innovation, authors typically highlight how Living Labs are not just focused on technologies but also 'issues of consumption, behaviour and lifestyles' Voytenko et al. (2016, 46). This is well in line with the research undertaken in PARENT, since it is centered on an ICT-enabled device (the Smappee) and a platform (VEA), intended to come together with changing energy behaviors, energy saving measures and consumption habits.

Also well in line with the PARENT project is the open-ended character of the project: there was no uniform prescription for carrying out the Living Lab that would enable for easy coordination or comparison across the three cities. This is also a frequent theme in the literature on Living Labs:

There is no uniform definition, or established practical understanding, of a 'Living Lab'. According to Hyysalo and Hakkarainen (2014) 'a living lab is an open ended, sustained and complex coproduction arrangement'. In JPI Urban Europe's 2019 Strategic Research and Innovation Agenda, it is characterized in terms of the needs that it is intended to satisfy: *a space for policy experimentation … for participatory development of new approaches, for testing new roles and new governance models under real-life conditions but still within manageable frameworks* (JPI 2019).

As also frequently highlighted in the literature (ibid), Living Labs are geographically situated and shaped by local conditions. This may be seen as an enabling factor: the above-mentioned flexibility enables great variation and adaptability across locations and national cultures, and such variation is rather to be expected (cf. Jasanoff 2004). It thus follows that the different approaches taken by the three city teams, was no great surprise. At the same time, it

depended on specific conditions and developments pertaining to the PARENT project in particular (further specified below).

As can be gleamed from the above short accounts, there are decisive overlaps between RRI, participatory design and the Living Lab approach: both highlight dimensions relating to broader participation and societal and technical experimentation. These are expressed in shared uses of concepts such as 'co-creation', co-production, participation and engagement. The differences can be found in the goals or purpose specifications of each. Whereas the Living Lab approach is innovation-centered and so seeks to include more actors into innovation and development, RRI expands somewhat on this focus by also including questions about the overall goals of innovation, the process and products of innovation.

In what follows we shall pay attention to: first, the overall design of PARENT, then the ways in which the Living Lab was implemented in each city. In order to do this, we use the criteria and considerations outlined above: we include a process dimension pertaining to the implementation of the Living Lab in the three cities, and a product dimension (i.e. the Smappee and the VEA). Within our analytical grid (below) these are mapped on to the acceptability and acceptance dimensions as outlined above. We underline that the below grid is heuristic, and must be adjusted to any specific context. Several of the dimensions overlap and cannot really be evaluated separately, and the final overall evaluation must depend on such holistic evaluation.

5   Some methodological considerations and limitations.

There are methodological and conceptual shortcomings to evaluations of this type. Some of these are generic; others are specific to PARENT. In this report we shall not dwell too much on them, but nevertheless mention them:

- Every RRI project depends on self-evaluations. There are no, or few, RRI oversight authorities. Where such exist, they are usually limited to data protection authorities and ethics bodies. Hence, PARENT performs an evaluation of it's own 'RRI performance', and blind spots are to be expected.

- One partner (Bergen) is in charge of the evaluation, and the Bergen team's task in the project was dedicated to 'societal acceptability'. Whereas certain steps towards covering as many aspects as possible of the project were taken, these were not always successful. For instance, we tried to implement participation in the Living Lab meetings of the other partners, but this did not work out for various reasons (language, different time schedules, logistics, etc.).

- The main sources of evaluating the various parts of PARENT are therefore: 1) the pilot and Living Lab reports submitted by the various partners (hence, we get self-evaluations of others' self-evaluations); 2) observations made in project meetings and other main project documents (i.e. circulation of documents with a bearing on RRI dimensions); 3) the official

goals of PARENT, as expressed in the project description. Whereas these sources are limited, they nevertheless enable triangulation and comparison across sources.

- both RRI and Living Labs approaches (including participatory design) denote open-ended processes, whose boundaries are hard to define. As Hyysalo and Hakkarainen (2014) point out, the open-endedness of Living Labs creates problems of comparison between sites: how to draw the boundaries around a Living Lab? How to measure and assess the accomplishment of a Living Lab based approach to one that does not use it? This renders decisive evaluation and comparison difficult, and cautions against decisive and strong evaluations in many cases.

- Finally, we include how, in early stages of PARENT, quite radical changes had to be made to the project. The changes were due to one partner, a start-up company in Barcelona, leaving the project due to bankruptcy. Implications were considerable, since this partner was planned to build the Virtual Energy Monitor (VEA), and also to carry out a pilot in Barcelona. Whereas the latter may not impact much on RRI (since it merely entailed one less city / pilot), the first was crucial. The Barcelona partner was supposed to integrate several of the project dimensions through the design of the VEA. This would have enabled (for instance) implementations of privacy by design, but such plans had to be left out. It entailed a transition to a market based solution (Smappee) to be applied in each of the three remaining cities / pilots. To a greater extent than initially planned, this meant that each city / pilot was left to its own devices in implementing and carrying out the project. Whereas considerable differences were to be expected between the three Living Labs, implications were that integration of effort became somewhat weakened. It also meant that comparison between the different sites was rendered more difficult. This evaluation is thus mainly based on three accounts of the different Living Labs. From there, we nevertheless also include an evaluation of PARENT as a whole.

6   RRI evaluations of PARENT Living Labs.

In this section we provide descriptions and evaluations of each single pilot. They start out by briefly describing the pilot as it occurred in each city, then proceeds to assess the pilot according to the above-described criteria and considerations (see Table 1).

6.1   The Amsterdam Living Lab.

The pilot in Amsterdam was carried out by a mixed team of electrical and computer engineers working on sustainability issues (university of Utrecht), and a locally based (Amsterdam) environmental consultancy, Resourcefully. Although deeply steeped in sustainability research, this team did not contain researchers normally associated with RRI or social acceptability, i.e. social scientists or humanities scholars. The project grew in a bottom-up manner (D6.5), starting first within a houseboat community located at the Borneo Island Harbour area, then gradually growing to incorporate more typical households. The LL initially engaged with prosumers living on houseboats and seeking energy independence from the grid. To this end, they are also seeking improved insights into their own energy patterns, including their 'own local PV patterns' (D6.5, p. 9). Later, the LL also included more average

electricity users with PVs and possibly also some with a normal connection to the grid (D6.5 characterises these participants as 'participants living in apartments and houses with different sizes of PV systems and some with an electric vehicle or electric heat pump'). Hence, the pilot is reported to have included mainly prosumers amongst their participants, and this was the main goal and orientation of this pilot.

The Amsterdam team followed the general pattern of the PARENT pilot, except from one element: in order to better adapt to the local conditions of the houseboat community / PV users, it decided to develop its own online platform, focusing more on the needs of these users.

Deliberation, anticipation, reflexivity, participation

As can be seen the Amsterdam team was quite technically oriented and would not naturally pose its goals or adopted means in terms used in this report. Neither do we find much trace of discussion over, say, 'energy futures', in the Amsterdam team's own pilot report. Yet, there are more than one form of doing 'participation', and there are different ways of contesting and debating energy systems, policies and futures:

In a certain sense the Amsterdam pilot was the most radical in the project, in terms of trying to materially bring about different energy systems by exploring and making them in quite concrete ways together with a community of prosumers (loosely defined as the Borneo Island Houseboat community). The goal of 'energy sovereignty' that underpinned much of the Amsterdam pilot is a powerful counter-frame to main policy agendas, although not necessarily in contradictions with policy agendas (especially in the Netherlands). As demonstrated in D1.4, the Dutch energy system is quite flexible and experimental, with more possibilities enabled by government (local and national) than most other European countries. Energy sovereignty is an agenda and a frame that can be mobilized in a number of contexts, by different actors and in different ways, and clearly relevant to RRI considerations of desirable futures. Thus, this strong emphasis provided a unique contribution and characteristic to the Amsterdam pilot, and to the project as a whole.

Next, the LL was actively engaged at the local and community level, involving a number of different actors. According to D6.5, these included 'community centres, electricity providers, municipalities, system operators, consumers associations and citizens' (pp. 6 – 7).

As reported by the Amsterdam team (D 6.5), the design on the project came with implications for representability and inclusion: it is clear that not 'everyone' was included, and that the pilot depended mainly on existing contacts with people of a middle class background already involved in energy-saving measures of various kinds. No particular attention was given (as far as can be seen) to vulnerable groups, such as people suffering from energy poverty, or to how such groups could be included or better profit from the contributions of PARENT. This way of carrying out the LL can thus be seen as entailing a certain trade-off with the before Amsterdam teams explicit goal of exploring alternative energy futures. Yet, in saying this it should also be noted how the LL entailed an expansion of the 'normal stakeholders', as it also

included more or less 'normal' households and users.

Energy behaviours and habits

Due to the before-mentioned composition of the Amsterdam team, the understanding of energy behaviours became defined mainly in technical terms, i.e. as 'energy patterns' and not as 'behaviours' or 'habit'. This may not have had practical implications as much as implications for reporting. Yet, it becomes difficult to discern from pilot and Living Lab reports to what extents, and in what ways, behaviours could be attributed to their involvement with technology or to other factors, such as project activities, local policies, etc.

Offsetting this effect, the Living Lab was very well adjusted to local needs and conditions, as it came out of an already existing community. This ensured, as far as can be seen (including on-site visits to the pilot), good communications and a general willingness to engage amongst participants. This is also confirmed by survey results, documenting how the workshops were highly appreciated amongst participants. In general, this implies that there is tacit as well as explicit acceptance of the activities proposed and introduced by PARENT. It includes acceptance of the general goal of the project, whereas not necessarily agreeing with all project priorities, or with the ways activies were conducted (as for instance expressed in survey responses to question 1c, and reported in D6.5 and D7.5).

It seemed that whereas interest with the pilot was relatively high at the outset of the project, interest and motivation to participate was somewhat reduced as the project proceded. Here, the circulated short and long (D3.1) notes on RRI could have been considered to greater extents, insofar as this particular finding could be considered in advance (and possibly expected) from considering findings from user studies. Yet, this matter was just as much due to overall project design and composition of expertise in the various teams, as to the concrete efforts of the Amsterdam team.

Some participants reported changes to energy behaviours, yet the majority reported 'no significant changes', possibly due to already being involved in optimizations of energy savings.

Means and ends

As implied by the above, the technical and material dimensions of the LL were closely connected to the overall goal of energy sovereignty. This played out favorably in the Amsterdam Living Lab, since it mainly included PV prosumers amongst its participants. From the participant survey results, and from comparisons to results from Brussels and Bergen, it is clear that the Smappee as well as the EMS were useful and instructive means towards the end of energy sovereignty through closer energy monitoring. We say this even as it is clear that also the Amsterdam LL participants suffered some of the same technical problems and glitches as in other LLs. We also observe that the technical and community aspects seem to have come together in constructive ways in the Amsterdam LL, possibly rendering it an ideal case for the deployment of the Smappee and the online monitoring platform.

We nevertheless detect a slight loss of interest also in this case, prompting the question of whether this type of technologies should take this particular shape, requiring quite extensive attention to energy production and consumption, rather than trying to automate some of the tasks.

Smappee and VEA

As already commented above, in the case of the Amsterdam LL, the evaluations of the Smappee and the online platform are quite positive. A likely reason for this is the high interest amongst participants in energy saving (and production), and the quite close fit between these technologies and the needs and interests of (PV) prosumers.

According to D6.5 informed and express consent was taken from all participants prior to installation of the EMS. Data were anonymized and processed according to a specifically designed Data Management Plan.

6.2   The Brussels Living Lab.

The Brussels pilot included contributions from social (political) scientists, lawyers and media scholars, working in collaboration with computer engineers from the consultancy Blue Planet (responsible for setting up and running the VEA online platform). It was the largest Living Lab / pilot of the PARENT project, carried out by the project coordinator. The project team included people familiar with various forms of public and stakeholder engagements. It was carried out through collaborations with local governments in two Brussels communes, Watermael-Boitsfort and Forest. To quite an extent, recruitment depended on using the communication resources of these local communes (such as websites, mailing lists, public announcements, a Facebook campaign, etc.).

As the other pilots / LLs, the Brussels pilot worked by handing out an energy monitoring system (EMS), and by connecting this to an online platform dedicated to greater monitoring, comparison, gameification, etc. of energy behaviours. The stated goal of the pilot was to raise awareness of users towards more sustainable energy behaviours and habits:

'In both communes the project raised raising awareness and empowered individuals to take concrete steps towards reducing energy consumption in their communities. A key target of the PARENT project was to understand if/how technology use has an impact on energy reduction. The Brussels pilot understood that technology must be integrated into the community in order to promote acceptability, it cannot be operating singularly' (D6.2, p. 7).

Following this, the Brussels pilot set out to target, to greater extents than the other two pilots, user behaviours and habits more directly. This became clear, among other things, through a more systematic focus on the gameification elements (D1.5), and 'nudging' techniques.

Deliberation, anticipation, reflexivity, participation

As explained in the introductory parts of this text, the acceptability dimension refers in large parts to desirable (and un-desirable) energy futures. The extents to which such futures, and the agendas in which they come embedded (policy, research funding, innovation projects, civic initiatives) are explicated and explored. The ways in which energy futures are explored, critiqued and debated depends of course on what is defined as the 'default option'. As can be seen in the quote in the previous section, the Brussels team defined the default option towards which it positioned itself as one in which technology is seen as a stand-alone, freely operating agent, working in separation from the human-behavioural factor, and as isolated from community structures.

The Brussels pilot set out its alternative to highly technology-focused ways of promoting community and engagement in energy saving projects (what, for instance, Evgeny Morozov has termed 'solutionism'). As noted in our accounts of user studies, energy transition measures are hampered by a lack of appreciation and articulation of these more human, social and collective dimensions of energy transitions, and so this is a useful target for intervention.

This being said, innovation agendas such as the JPI Urban Europe increasingly recognize these social and human dimensions, and a general focus on 'change' is a common, and much-repeated theme (cf. JPI 2019). It fits within the 'co-production' and 'co-creation' paradigm of JPI Urban Europe, where technology is accompanied by societal and human factors, as drivers of ('co-produced') change. Hence, the Brussels Living Lab expanded on a narrowly defined technological focus, but this is now quite commonplace within the JPI Urban Europe approach to Living Labs, 'smart' development projects and digitalization more generally. Thus, one could say that the energy futures set out in this pilot represent an expansion of, rather than an actual questioning of, agendas and visions such as JPI Urban Europe.

The strategy to embed the pilot through the local communes seems to have worked well, and ensured that a wider set than the 'usual suspects' were included. These were, in addition to local government and citizens / users, people from the energy sector, grid operators and local civil society organisations (such as Homegrade). By actively engaging with these stakeholders throughout several stages of the project, and drawing upon their knowledge and expertise, elements of broader deliberation and anticipation (of local energy challenges) were implemented.

Whereas great attention is not provided to energy poverty as such, the Brussels pilot worked harder than the other two pilots to achieve representativenness of participants, and to engage segments of the population outside of those already concerned with energy saving. This included members of the Forest commune, described as 'located close to the city centre of Brussels, is densely populated and multicultural'. D6.2 comments on the differences between Forest and Watermael-Boitsfort: it was harder to engage members of the first than the last in energy saving activities. Furthermore, 'awarenness' seemed to be already quite high in Watermael-Boitsfort, where citizens were already engaged in other, initiatives targeted at sustainability.

The pilot included a mapping of a wide set of sustainability initiatives in the two communes, and so demonstrates further active engagement with local stakeholders, and contribution to the local partners.

A final point pertains to the framing of RRI issues: The Brussels team defined the RRI dimension as pertaining to 'engagement, empowerment, spontaneity and realism' (D6.2, p. 8-10, 18). Thus, the RRI section of D6.2 deals to large extents with issues pertaining to recruitment. Although important, this is not exactly what was set out in D3,1 or the short note on lessons from user studies; rather, it seems to have been taken from the Pilot and Living Lab protocols, i.e. D6.1 and D7.1. But these do not provide correct representations of what the RRI dimensions are about, and how it has been presented to the project team at large ('empowerment, spontaneity and realism' are not normally part of RRI requirements). Whereas the Bergen team may take some of the responsibility for this apparent lack of communication, the salient points about RRI (and social acceptability) have been highlighted in several project deliverables (D2.1 and D3.1, and the short note on RRI and user studies), and were presented in several of the project meetings.

Energy behaviours and habits

The Brussels team focused quite strongly on the intersections of governance and 'behavioural change', specifically as exemplified through gameification strategies (cf. D1.5) coming out of (amongst others) human-computer interactions (HCI) and marketing and consumer literature. A main theme here, as explained by D1.5, is to 'motivate and engage'. This is then an expansion on, and modest critique of, the 'homo economicus', criticized in the before-mentioned user studies literature. It does not really question the fundamental frame, but rather expands it towards a notion of 'homo ludens'. It paved the way for the most interventionist pilot study within PARENT, since it directly targeted energy behaviours and habits. On one hand this seems to have been effective (since the pilot, in relative distinction to Amsterdam and Bergen, documented actual energy savings amongst its participants; on the other hand, it is, as we explained above, expressive of a strategy that leaves out certain aspects relating to overall framing of the issues. Thus, the question was not asked, as in Bergen and Amsterdam, of alternative ways of creating energy futures.

This said, from the survey results it seems quite clear that pilot participants found the pilot to have been informative and somewhat helpful (cf. D6.2, section 5.1.2). This documents acceptance of the means introduced by project amongst participants, notably for the newsletters and the online platform, which were highly rated in the participant survey.

Similar to the Amsterdam and Bergen pilots, it seems quite clear from the pilot and LL reports that the local embedding was crucial to the successful completion of the pilot. The Brussels took great effort to include local actors and stakeholders in the shaping of their pilot, including in the organization and execution of workshops. It also incorporated a high level of attention to communication strategies and regular interactions (i.e. newsletters every three weeks, not four, as in Bergen). These aspects are highly likely to have strengthened

acceptability and trust through interaction and communication with local actors and communities.

It seemed that whereas interest with the pilot was relatively high at the outset of the project, interest and motivation to participate was somewhat reduced as the project proceded (cf. D6.2, section 5.1.3). Here, the circulated short and long (D3.1) notes on RRI could have been considered to greater extents, insofar as this particular finding could have been considered in advance (and possibly expected) based on the cited user studies.

Means and ends

The responses from participants about the installation and use of Smappee were quite similar to those of the Bergen pilot: people are quite fascinated with the visuals and the possibility of viewing energy consumption in real-time. They see these as promising technologies for future energy management. Yet, they also report problems with the technology, relating to installation and identification of appliances. This is reported by some survey respondents as leading to loss of motivation and interest in using the device.

We detect a slight loss of interest also in this case, prompting the question of whether this type of technologies should take this particular shape, requiring quite extensive attention to energy production and consumption, rather than trying to automate and / or commercialise some of the tasks carried out by the PARENT researchers (i.e. that energy choices are supported by third party service providers using automation and serving larger user groups, thus attaining economies of scale). It is a further reminder that some of the lessons from user studies were of relevance to all three pilots.

Smappee and VEA

As already commented above, in the case of the Brussels LL, the evaluations of the Smappee and the online platform are quite positive. More people used the Smappee than the online platform, and this is convergent with findings from Bergen (Amsterdam is irrelevant here, since it developed a separate platform). This underscores the need for energy advice to be simple and user friendly, preferably operable in real-time and making good use of visuals.

According to D6.2 a template for consent was developed (for the whole project, cf. D2.1 and D2.2) and translated in Dutch, French and English. Informed consent was taken from all participants in the early stages of the pilot and prior to installation of the Smappee/ EMS.

6.3   The Bergen Living Lab.

The Bergen team was mainly composed of social scientists (and one philosopher), although with some knowledge of ICTs, renewables and 'smart' technologies. The team was tasked with studying societal acceptability and RRI for the whole project, and this impacted on the execution of the pilot / Living Lab. The pilot was thus situated in user studies and science and technology studies, in this way making up the perhaps most academically oriented part of

PARENT. Based in these literatures, it is natural to see technological artefacts such as Smappee or an online platform as relational, and as always existing within ecologies of human relations and technological infrastructures, and as strongly influenced by main research and innovation agendas.

The goal of the Bergen pilot was therefore to highlight the broader issues and conditions that arise during energy transitions, and the conditions that may hamper or stimulate broader participation. This included questions as to whether ICTs are useful and legitimate tools for such transition. A main research focus of the pilot was on qualitative information and understandings gathered through three rounds of focus groups. Each focus group generally focused on three themes, and their interrelations: 1) technical issues pertaining to the Smappee and the online platform; 2) energy behaviours, and 3) wider acceptability issues, including politics, privacy and ecology. The main phases of implementation can be divided into 1) the installation of the Smappee, and 2) registration to the PARENT platform.

The Bergen Pilot did not set out to recruit a big group of participants, but wanted to focus on limited participation, using appropriate qualitative methods to gain a better understanding of challenges and opportunities relating to sustainability, energy efficiency and energy behaviours. Hence, an initial goal was to have 25 participants. Upon request from the project coordinator, and also seeing a high level of interest following initial invitations, it was decided to increase the number of participants. At the beginning of the pilot's implementation phase (around June 2017), we had a total of 57 registered participants. However, some of these were lost on the way to the actual installation of the energy monitor, and so the final number of active participants came to 46. By November 2017, all of these had installed a Smappee.

Deliberation, anticipation, reflexivity, participation

Since the Bergen team was responsible for the RRI approach of PARENT, it may seem obvious that it complied with RRI requirements. In some ways this was definitely the case: the sustained focus on broader issues and 'energy futures' throughout three workshops ensured a proper discussions and improved understanding of main issues pertaining to energy transitions in western Norway, and in the Bergen area in particular. This broad orientation was well received amongst participants, and so was, in part, validated by them. It has also already yielded results used for academic publications, with more under way, all of which can be said to contribute to the above-mentioned lines of scholarly investigations.

Furthermore, discussions included a number of local stakeholders in addition to citizens: from the local municipality, energy companies, renewables industry, politicians and civil society. An expanded discussion over the goals of technology and policy could therefore be carried out, so far missing in the Bergen area.

Yet, this strength may simultaneously be a weakness: the outcome of deliberations in focus groups may end up in academic publications and reports (such as this one) without much impact. The Bergen pilot was, in this sense, less interventionist than the other two pilots,

choosing perhaps to take more of an observer's point of view. It lacked the technical perspective of Amsterdam, and the intervention into energy behaviors of the Brussels team. The broad focus may also have come with trade-offs for those participants wanting more concrete technical advice. This was indicated in the survey, but was also difficult to provide due to the composition of the team.

The Bergen team could probably have done more to integrate and foster reflections on RRI within the PARENT team as a whole. This relative lack of integration between cities, and the kinds of expertise represented by each team, does not fully live up to requirements of RRI thinking and practice to 'integrate' disciplinary perspectives. Yet, such integration is difficult to achieve and was not unique to PARENT: it is a frequent problem in European projects.

Energy behaviours and habits

The Bergen pilot, being as it were situated in user studies and STS approaches, followed these in broad terms and conceptualized the actions and agency of participants as 'practice' (although one aim of D3.1 and ensuing publications was also to criticize this conception, the aim was not to do away with it altogether). Within these traditions, 'practice' is posed as critical corrective to overtly instrumental conception of users as economic agents ('homo economicus', cf. D3.1). Yet, this conception may have been slightly idealized, as it turned out that quite a few amongst the participants actually favored emerging measures such as real-time energy pricing and automation of tasks. This is not, however, so much a criticism of the user studies literature as a corrective to it, and may be a reflection of overall exaggerated expectations placed on the contributions of users and 'behavioral change' in their counters with large, complex energy and ICT systems. It speaks in favour of a certain modesty on behalf of what such studies can actually contribute (although, as we have also seen, the literature was 'right' about a number of issues discussed in this text, such as: the role of early adapters, gradually fading interest in smart technical gadgets, the shortcomings of homo economicus and the difficulty of putting technologies promoted as 'plug and play' to work).

The Bergen pilot was well adjusted to local conditions, a fact that was probably also stimulated by the relatively modest size of the city when compared to the other two pilots. Apart from including researchers from the area from the outset, it early on engaged with local partners and stakeholders, taking their inputs (about local energy initatives and policies, challenges, etc.), and learning from them. This was helped by a quite engaged participant in the Living Lab from the municipality. It also coincided with the official roll-out of smart meters in Norwegian households, and so got some extra stimulation (also for broader discussions) from the media, and from participants own experiences with installations of smart meters.

As with the other two pilots: whereas interest with the EMS (and, to some extent, the platform) was relatively high at the outset of the project, interest and motivation to participate waned as the project proceeded (cf. D6.4, Annex 1, 2c). To the Bergen team, this did not come as a great surprise, and the team had already pointed out this problem in D3.1 and the short text on user studies lessons.

Means and ends

The Bergen pilot carried out, and documented, quite substantive discussions about the use of this kind of technology for energy savings and sustainability. Focus group discussions revealed how EMS (including online data analytics platforms) are viewed as both promising and problematic with regard to energy savings and usage. This ambiguity about the technical was mirrored in doubts and dis-trust with the institutions (public regulators, energy companies and grid operators) invested with the tasks of implementing them.

The Bergen team detect a slight loss of interest also in interest with the device(s), prompting the question of whether this type of technologies should take this particular shape, requiring quite extensive attention to energy production and consumption, rather than trying to automate and / or commercialise some of the tasks carried out by the PARENT researchers (i.e. that energy choices are supported by third party service providers using automation and serving larger user groups, thus attaining economies of scale). It is a further reminder that some of the lessons from user studies were of relevance to all three pilots.

Smappee and VEA

When we take into account the different locations and the different ways of implementing the different pilots, we still see that findings from the Bergen pilot were quite well aligned with those of Amsterdam and Brussels. It seems clear that prosumers are the ones that may gain the most from this kind of EMS (Smappee), possibly also from online platforms for energy comparison (possibly also including gameification).

Apart from that, and when adding the quite considerable technical glitches and problems: the technology as such was overall accepted and indeed perceived as almost inevitable (yet, as our 'broader' discussions revealed, there is great distrust with the institutions more than with the technology, and main questions pertain to who should actually implement, operate and control it).

The visual aspects and the possibility of reading energy consumption in real-time seems quite appealing, although (again) the problem of loss of attention, interest and motivation comes up.

The informed consent protocol was the same as for the rest of the project, and also subject of some discussion within the team. It was translated into Norwegian, and presented to participants well ahead of installation and registration to the online platform. From discussions with participants it turned out that trust would be more easily invested in a small research enterprise, than in large-scale operators and institutions.

No data management pan was developed, since the Bergen team did not as such 'process data'. Data came out of focus group transcriptions and have been anonymized.

7   Overall comparison and RRI assessment

The ways in which the Living Labs were carried out were different, carrying different implications for analysis and assessment. All three pilots had characteristics of being quite open-ended and experimental endeavours, and so are typical of Living Lab projects more generally.

We have highlighted how research problems and problem definitions were articulated in accordance with different local requirements and conditions, with differing constellations of each project team, differing but sometimes also converging uses of the technological applications, and with the scope of the pilots. Based on this, and based on the analytical apparatus outlined in the introductory section, some comparison, analysis and assessment can be carried out. It is clear, however, that such analysis can hardly be definite, and would require more extensive discussions and feedbacks from within the consortium.

Concerning *Deliberation, anticipation, reflexivity, participation*, we see that energy futures are rendered debatable in differing ways: In Amsterdam, a quite technology-centered approach is taken, however, it is one that is simultaneously closely connected to a strong dedication to energy sovereignty as an alternative pathway for development. Whether articulate or not, the LL therefore offered up interesting and relevant prospects with clear relevance for further projects, including also citizen-led initiatives. The Brussels LL posed itself as a counter-point to overtly technology-centered approaches to energy saving. It introduced wider considerations pertaining to community and sociability, but did not as such challenge or explore predominant visions as enacted within agendas such as JPI Urban Europe. In Bergen, a specific focus was on energy futures as these emerge within wider political and institutional contexts and constraints. Within this framing, alternative ways for institutional development and embedding of smart energy technologies were explored and documented.

The different approaches to the LL also came with implications for recruitment and attention to participation by various kinds of groups. Here, the Bergen and Amsterdam LLs were somewhat weak, as they did not really aim for representativeness but rather engagement and interest amongst participants. The Brussels LL did better, by trying to achieve relative representativity, and by explicitly targeting two different Brussels communes.

In all three pilots we also observe difficulties in engaging more vulnerable groups (f.i. people exposed to energy poverty): these are either not represented or. This was most clearly demonstrated by the Brussels pilot, since the inhabitants of Forest seemed to be more difficult to engage than those in the richer commune.

As for *energy behaviours and habits* we have highlighted how each of the teams operate with somewhat different problem articulations and goals, and how these to a considerable extent are embedded in specific disciplinary or scientific fields of research. This means that the ways in which research is pursued, but also reported in project documents, comes with differing implications: the Amsterdam team operates within a mainly technical / engineering understanding of research tasks. This does not have to be negative from an RRI point ofview,

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and potentially negative effects are offset by the close connection to community and energy sovereignty. Yet, this renders RRI reporting somewhat difficult, as reports cannot really be used to single out the various social and community dynamics that influenced the pilot execution. We also described how Brussels and Bergen *did* conceptualise energy behavior. Yet, they did so in different ways, and with slightly different goals: whereas the Brussels pilot wanted to stimulate energy savings through gameification and challenges to participants, the Bergen pilot sought to elicit institutional, market and social conditions with a bearing on smart energy as a way of addressing environmental (climate) concerns.

All three partners worked hard to embed their respective Living Labs within their local communities. This paid off, since participation and engagement was high in all three cities.

Concerning the Smappee and VEA as *means towards the end of energy saving and sustainability* we observe differences first, according to user groups, i.e. whether the users are prosumers or not, whether they are already engaged ('early adapters') in energy saving activities, and the like. For prosumers and early adapters, the Smappee may be directly useful (for some purposes), whereas for other purposes it appears more as a pointer towards future energy systems.
In all pilots there is a tendency towards declining interest with the devices as the project proceeds.

As for the EMS and VEA 'as such': the best evaluations came from prosumers, for whom these kinds of tools may be of direct relevance. Beyond this group we see that valuations differ: positive feedbacks are provided for visuals, idea and design. These aspects are however offset by repeated technical problems relating to installation and recognition of appliances. For RRI, the question would not so much be about the quality of the product; rather it would be about the possibility for reporting about weaknesses and holding producers to account. This was however difficult, since the EMS was provided by a private contractor, not part of the consortium.

All three Living Labs observed and carried out the necessary requirements pertaining to informed consent and data management.

Conclusion: The project as a whole observed and implemented several requirements important to RRI, from discussions of energy futures to engagements with users and local stakeholders. It succeeded in exposing a number of crucial societal as well as scientific perspectives to each other, thus opening up broader discussions on a number of issues. More and better integration of societal as well as scientific perspectives *could* have taken place across the three Living Labs. Yet, this potential was hampered by practical and unforeseen difficulties, specifically the disappearance of the main project partner. The best lessons and practices to emerge from the project pertain to the ways the partners went about building of trust and relations with local participants, communities and stakeholders. As such it is a good example of how RRI can and should be implemented in Living Lab based projects.

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8.1   Project deliverables referenced

D1.4. PARENT deliverable: Smart grid roll-out and access to the metering data: state of the art

D1.5 PARENT deliverable: Handbook of best practices in gamification

D2.1 PARENT deliverable: Definition of the ELSA benchmark

D2.2 PARENT deliverable: Framework for impact assessment against ELSA requirements

D3.1 PARENT deliverable: Scoping paper on societal acceptability and RRI

D6.1 PARENT deliverable: Pilot protocol

D6.2 PARENT deliverable: Report from Brussels pilot

D6.4 PARENT deliverable: Report from Bergen pilot

D6.5 PARENT deliverable: Report from Amsterdam pilot

D7.1 PARENT deliverable: Living Lab protocol

D7.5 PARENT deliverable: Joint pilots and Living Labs evaluation report

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