

## Aberystwyth University

### *Tensions in transformation*

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# 8

## TENSIONS IN TRANSFORMATION

### Participatory Approaches in Sustainable Energy Technology Projects in the UK and India

*Carol Ann Maddock, Vanessa Burholt, Deborah Jane Morgan,  
Khushboo Ahire and Charles Musselwhite*

#### Introduction

Population growth and population ageing present challenges for meeting sustainable development goal (SDG) 13, which calls for urgent action to combat climate change and its impacts. The achievement of SDGs will require action from civil society in addition to science and business (Sachs et al., 2019).

Older people are ‘contributors, casualties, and champions of climate change’ (Haq, 2017, p. 8). Some older people contribute to climate change through carbon-intensive lifestyles, others may be casualties of climate change because they have fewer physical, financial, and/or emotional resources that enable them to recover from or be resilient to extreme weather events (Thomas et al., 2019). However, older people also have much to offer as champions with respect to climate knowledge and actions (Pillemer & Filiberto, 2017).

To date, advances in decarbonisation science and technology have resulted in renewable energy (RE) projects ‘*derived from natural processes (sunlight, wind, rain, tides, waves, biofuel and geothermal sources)*’ (Wee et al., 2012). These projects focus on supply (including knowledge and technology transfer), manufacture, and distribution of renewable energies. Although the supply chain includes ‘demand’ there has been little attention given to older consumers of renewable energies. Public (consumers) are arguably the most important agents of the energy transition: catalysed from the bottom-up (REN21).

In Europe, the Americas and Australia members of the public are increasingly agents of change in the energy transition. Processes in India are generally more top-down with governments expected to play a catalytic role (REN21). Despite a burgeoning body of participatory research involving older people in health and social care settings (Buffel, 2018), there has been less co-created ageing research concerning climate-related activities: the voices of older people are often overlooked in RE research (Devine-Wright et al., 2014). Co-design of research can have multiple benefits in supporting the development and uptake of RE technologies within older populations (Fischer et al., 2020). Moreover, social scientists are well-placed to work with stakeholders (e.g. engineers, policymakers, the public) to

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respond to the challenge: to explore the role of participatory approaches to research with older people, and devise approaches that are fit for purpose in the energy transformation process (Chilvers & Longhurst, 2016).

The chapter will draw on two projects: the Active Building Centre Research Programme (ABC-RP)<sup>1</sup> in the United Kingdom and The Strategic University Network to Revolutionise Indian Solar Energy (SUNRISE)<sup>2</sup> in India to illustrate how older people co-designed elements of these projects with a multidisciplinary team of scientists and researchers.

### Introduction to two case studies

Older people participated in the ABC-RP project in the UK and SUNRISE project in India. However, the participatory approaches were embedded at different levels within the overarching research framework. Table 8.1 outlines project aims, guiding principles, and practices of participation used in both settings. Participation aimed to create positive discourses and shared learning between stakeholders and to improve understanding of the different and possibly competing value sets of those involved (Brown et al., 2014).

#### *Case Study 1: Active building centre research programme*

The Active Building Centre Research Programme (ABC-RP) was funded by the Engineering and Physical Sciences Research Council (EPSRC) as part of the UKRI Transforming Construction Challenge. The ABC-RP project focussed on contributing to a more sustainable built environment mainly via technological developments such as heat storage, building design/optimisation, software development. However, one sub-study used a participatory co-design approach. This was intended to better understand how older people use, interact and are impacted by new energy technologies embedded within active/low-carbon homes.

#### *Research approach*

Underpinning the sub-study was an ethos of doing research ‘with’ rather than ‘on’ participants and ensuring the rights of ‘researched communities’ to be involved in the research. The team sought to respect different expertise and claims to knowledge, to use research processes designed to facilitate participation in different research stages and be transparent about the values informing the inception of the work (Beebeejaun et al., 2014). The research team was cognisant of the ‘diverse, multiple and interconnected ways’ that “publics engage with energy transitions” (Chilvers et al., 2021, p. 250).

#### *Methods used to co-design research*

The sub-study brought together a mix of people with different knowledge and expertise (lived and experiential) across sectors and disciplines. This group contributed to a research design that could challenge traditional scientific approaches and address the complex nature of sustainability challenges (Essén & Östlund, 2011; Norström et al., 2020).

An Expert Panel (EP) comprised of older people ( $n = 6$ ) and an Advisory Board (AB) with a mix of lay older adults ( $n = 3$ ) and co-opted members ( $n = 7$ : members of stakeholder organisations such as National Energy Action (NEA), Public Health, Housing Learning and Improvement Network (LIN), Care and Repair Cymru) were established. These groups

Table 8.1 Overview of case studies

<i>Key project steps including participatory activities</i>	<i>Active building centre research programme ABC-RP (3/2020– 9/2022)</i>	<i>Strategic university network to revolutionise Indian solar energy SUNRISE (9/2017– 3/2022)</i>
Project aim	To develop tools and technologies to ensure buildings of all scales contribute to reduce carbon emissions and a more sustainable built environment.	To build a long-term, global, sustainable energy collaboration; develop/evaluate low-cost solar technology; research capabilities UK/India teams; apply the technology to real-life contexts.
Aim of participatory approaches	To inform and advise on planned research activities intended to understand tenants' wellbeing outcomes of move/retrofit to low-carbon homes.	To ensure the views of diverse community members are heard in defining the space and functionality of a planned community building to meet community goals; embedding processes of participation and empowerment. Capture and share learning via project-wide knowledge transfer.
Guiding principles	National Standards for Public Involvement in Research (NIHR, 2018).	National Standards for Public Involvement in Research and Public Involvement, Principles of Engagement, Remit and Strategy for SUNRISE (PIPERS for SUNRISE).
Level at which participation occurred within overarching research project.	Sub-study planning level. Sub-study reports to overarching research project.	PIPERS for SUNRISE adopted by the overarching research project at: (i) Strategic level (organisational structure); (ii) Operational level (demonstrator villages – community end-users); (iii) Learning and knowledge transfer (other projects).
Participation	An Expert Panel (EP) and Advisory Board (AB) recruited to sub-study. AB advised on strategic research plans, activities and the underpinning conceptual model that informed research design (Figure 8.1). EP tested methodological approach, contributed to design and tested data collection tools (e.g. surveys, interviews) and lay marketing materials.	Participatory arts-based approaches conducted in a rural Indian village – intended to develop individual, collective and structural processes of empowerment resulting in identification of meaningful solutions to community needs (Coy et al., 2021). Results incorporated into a social development action plan designed to inform building design, purpose, and maintenance.

supported the research activities with residents of new build or retrofitted social housing homes throughout Wales. An advert posted on the Centre for Ageing and Dementia Research (CADR) Cymru website,<sup>3</sup> social media platforms and the Health and Care Research Wales Involvement Network<sup>4</sup> facilitated recruitment to lay positions. The advert detailed the purpose of the posts, time commitment and monetary reimbursement.

The members of the EP were expected to be involved in the design and testing of questionnaires and interview schedules. These would be used to capture data including financial, health and social wellbeing relating to tenants' personal/household energy use and broader impacts (e.g. fuel poverty, health impacts). EP members offered advice on public engagement, especially how this may be achieved through their networks.

EP and AB members were recruited who had expertise or interest in low-carbon housing technologies and/or energy efficiency schemes, fuel poverty, housing (particularly social housing), or health and wellbeing. The AB members also had relevant experience meaning they were able to contribute to the strategic research plans and activities, troubleshoot research problems and use their networks to support knowledge translation and research impact beyond project completion. Members of the EP and AB were expected to prepare for and contribute to meetings. Appointments were initially for one year with the potential to continue for a further 6 months. All opted to continue for the full project duration.

Terms of reference setting out mutual expectations for AB and EP roles were agreed. There were planned learning and networking opportunities for the entire team (including researchers) through seminars and workshops on aspects of the active build technologies and site visits to active buildings.

### *Results of co-designing research*

The researchers and nine applicants for the AB and EP posts visited a low-carbon/active home within a new social housing development in the second month of the project. This provided an opportunity to view the renewable technologies in situ, meet some of the researchers, hear about the research, lay roles and ask questions. Subsequently, three attendees became lay members (2EP and 1AB). This was the only 'in person' event held before public health COVID19 restrictions in Wales prevented similar activities for the 18 months of the sub-study.

All planned meetings subsequently shifted to an online video conferencing platform. Two separate two-hour workshops for the EP and the AB were held allowing introductions, presentation of the overarching research project, the sub-study aims, expectations of all parties and practical arrangements for ongoing updates, meeting durations, times and reimbursement for their time (NIHR, 2018). The pace of these meetings was set by the groups.

At the AB meeting, additional members were identified. Personal contacts in public health for instance meant that previously futile attempts to recruit were now successful. An additional lay member from a tenants' housing association was recruited bringing current relevant experiences. Although the AB and the EP were intended to provide different functions and meet separately, as the project unfolded this became less feasible. The two groups were combined when two EP members could no longer continue due to ill health. Reduced EP members and increasing familiarity with video conferencing meant that the combined EP/AB meetings were manageable. There were seldom more than 12 people attending the videoconference at any one time. Use of the chat function and raising of real/virtual hands

to speak ensured equitable opportunities to participate. Detailed meeting notes and action summaries were distributed afterwards and all (attendee/non-attendees) alike were encouraged to contribute opinions to these via email and this worked well. We continued with this format for the remaining four meetings. Specific activities (e.g. piloting tools) were carried out by willing group members between meetings.

Meeting arrangements were fine-tuned over the project. For example, the duration of meetings and breaks, and the format of documents were adjusted. Videoconference meetings were recorded and shared with those unable to attend. Furthermore, all group members were able to reflect and respond to the discussion in their own time. New ways of working made this option more accessible. Between meetings, the research team progressed actions that had arisen and updated the group via email bulletins.

### *Testing the conceptual model*

The key research question was ‘Will a move to, or retrofit to achieve a low carbon home have an impact on the financial, health and social wellbeing of residents who have moved/retrofitted?’ During the first EP meeting a conceptual model (Figure 8.1) depicting potential pathways to wellbeing (health, social and economic) was presented. The EP examined the ‘value’ of being warm and comfortable at home from their perspective and how this may be contrasted with other stakeholders’ perspectives. The meaning and value of home, thermal comfort and how this may vary according to personal circumstances were explored in detail. Our research aimed to redress any potential imbalance caused by considering success in terms of economic and technological outcomes (Burton et al., 2011), by focusing on

## Conceptual Framework:

well-being outcomes, domains & (cost/value) benefits of low carbon homes

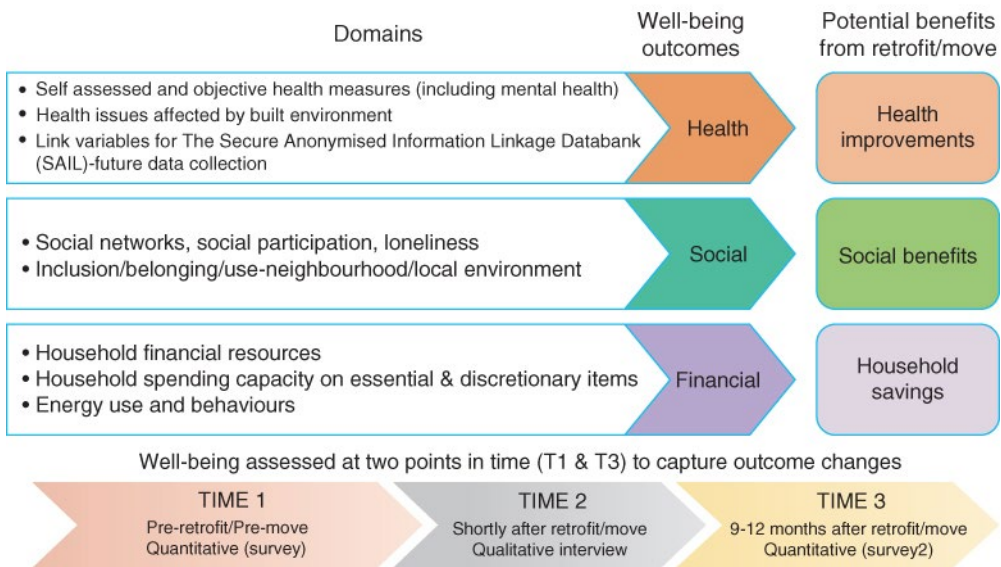


Figure 8.1 ABC-RP conceptual framework.

“end-user” values, experiences, energy behaviours and preferences for low-carbon living and the potential wellbeing benefits. As one of the AB members noted:

*Energy can be an abstract concept and it may be hard to equate the value of welcoming and entertaining others into your warm, well-lit home to the cost of ‘energy’ activities.*

[AB-1;Male>50]

### *Design of questionnaires and interview schedules*

At the first meeting, we explored existing skills and knowledge gaps within the EP group relating to survey design and delivery, in order to ensure that EP group members would be adequately supported at future meetings. This gave the group members the opportunity to ask questions and establish what role they wanted to play (e.g. reviewing draft versions of data collection tools). Additionally, at the first meeting, the proposed data collection tools and delivery mechanisms were outlined (e.g. a quantitative survey pre-and post-intervention (move/retrofit) with a qualitative interview post-intervention). Collectively we agreed the best use of time was to use the workshop sessions to thoroughly explore the topics that the interviews and survey should cover. EP and AB members were keen to explore the extent of tenants’ control (perceived or actual) in determining what was installed as part of the retrofit process.

*One of the things we appreciate in our own homes is the autonomy – we get to be in charge and having it adjustable rather than pre-set. I want control over my home and don’t want things done without me having influence over it.*

(EP3; Female >50)

Others were concerned about obligations to use new technologies and the associated assumptions made about older people’s understanding and operational use of the digital interface. For example, members noted:

*[The] assumption is that people can use technology – the view that people are using technology is being stretched – people don’t necessarily want this new technology in their home.*

(EP1; Female>50)

*Not everyone is OK with using a smartphone to control their energy. I’ve only just got one and I’d rather have a remote, like the TV which may be easier for older people.*

(EP2; Male >50)

Similarly, they wanted to know how tenants would be provided with information about how to manage the new technologies as ‘you don’t want to be walking around with a manual for the first 6 months’ (EP3; Female >50)

Subsequently, interview questions were developed with the EP/AB group members that explored motivations, experiences and choices within RE transformations, and accessibility of information and technology. These were refined with the groups via email and video/phone communications over a few months and following piloting of the tools. Marketing materials were developed with group members over the same time frame.

*Co-design benefits to ABC-RP*

The workshops were beneficial in clarifying key actors, processes and for whom and how ‘value’ would be created in a wider return on investment model (Norström et al., 2020). Extensive discussion corroborated our literature review findings, highlighted assumptions, and identified further questions to capture how interventions (RE transformations) could impact tenants. Discussion supported the methodological approach and improved the accessibility of the data collection tools for tenants. An exchange of information between the research team and the AB/EP member’s broader networks was a valuable conduit for involving more older people in co-design.

*Case Study 2: Strategic university network to revolutionise  
Indian solar energy*

SUNRISE is an international project to counter global energy poverty by developing and implementing technology to erect solar-powered demonstrator buildings in off-grid communities in rural India. ‘Principles and Strategy for Public Involvement and Engagement’ (PIPERS)<sup>5</sup> was developed based on a review of best practices. PIPERS was adopted by the project AB early in the project (Feb 2019) and an implementation plan embedded it within SUNRISE at a strategic level, operational level (demonstrator villages) and via knowledge transfer mechanisms to similar projects/communities (Table 8.1).

*Research approach*

PIPERS provided the framework for public participation throughout the SUNRISE project. It was produced in consultation with the SUNRISE AB, operational team and CADR involvement and engagement team. The document also outlined the methods of piloting participatory arts-based research activities in a rural Indian village so that villagers would have an informed input into the use of the building and solar-generated power. Piloting activities was intended to assess if approaches were feasible and viable in sustaining meaningful involvement to identify capabilities and needs.

*Methods used to co-design research*

Villagers’ scientific literacy was limited, and participatory arts-based methods were particularly important to help participants visualise the topic of study (RE) (Beebejaun et al., 2014), to obtain perspectives on diverse community needs and aspirations and to enable individual, collective and structural processes of empowerment. Necessary permissions and consent were obtained from the required authorities including village leaders (Gram Panchayat)<sup>6</sup>, local stakeholders and community members.

Participants were recruited to take part in the activities (n=53 with 33 women and 20 men), intending to reflect diversity within the village. Of these, eight men and eight women were aged over 50 (some were uncertain of their exact age). Participatory arts-based research activities were delivered in a particular order to facilitate the development of a picture of community capabilities and needs (Figure 8.2). Activities moved from (1) an individual perspective (body mapping), through (2) social connections (convoy model of social relations) to (3) a broader understanding of the range of roles and occupations within the village (occupational mapping). The final session identified participants’ priority



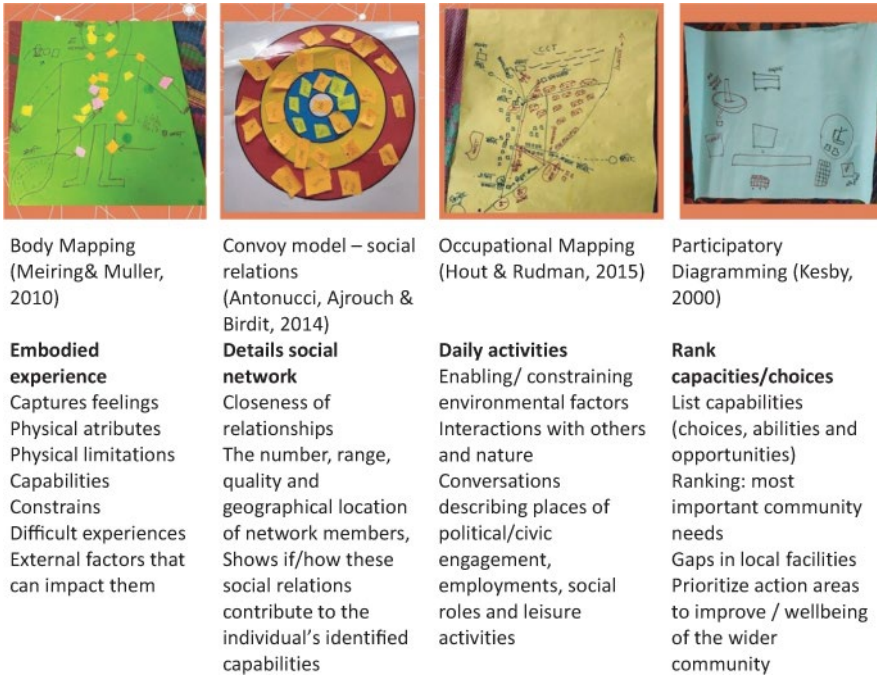


Figure 8.2 Artefacts produced during participatory arts activities. Author Photograph available at <https://www.cadr.cymru/en/pipers-for-sunrise.htm>

action areas (participatory diagramming) and how the SUNRISE building could be utilised to realise some of these ambitions.

Attention was given to the social, cultural and economic context in which the co-design was undertaken. Same-sex groups and three different age ranges were planned to reduce inhibitions when talking in mixed-age/sex groups. COVID-19 public health restrictions impacted participation rates and on-time and availability of people resulting in changes to original designs, while single-sex groups were maintained age ranges were mixed with only the younger men (aged 18–34) separated. The older adults were therefore part of single-sex but mixed-age groups. Research activities were conducted in a community hall which was previously an Anganwadi (pre-school). This was the most convenient place, providing easy access and adequate space and privacy.

### *Results of co-designing research*

Piloting the co-design approach identified some issues to be considered in future rural RE projects, such as reimbursement for time, and the use of particular materials in arts-based activities.

First, in relation to reimbursement for time, millions of people in India engaged in the informal wage sector do not receive a decent living wage. While some older people accrue enough financial assets throughout their lives or have access to alternative sources of income and are able to retire, others, less financially secure have to work until they are physically unable to continue. The latter represents the situation of many older villagers, thus

engaging in research during the day (in the harvesting season, and peak time for migration during monsoon and summer) would entail a loss of wages.

Second, in relation to using particular materials in arts-based activities, older women were reluctant to use pens/paper. As such, pilot recommendations in PIPERS had suggested using traditional tools such as those used in some traditional art forms using rice powder and sticks. However, combining age groups in workshops due to COVID public health restrictions meant reassessing this. In particular, there were concerns that the traditional art methods may be considered outdated by younger people and result in them making fun of older people's depictions of solar panels/wells. However, as rapport developed over the sessions the experience and knowledge of the older adults were valued by younger people, resulting in greater intergenerational cooperation. Older women asked the younger ones to draw the artwork following their illustrative stories to capture issues important to them. All groups created art-based outputs with lively discussions and clear preferences decided on for the positioning (next to a school) and functions (electric mills, rice husking machines and refrigeration units) of the demonstrator building.

The artefacts produced during the activities were used as visual prompts to encourage the participants to discuss their thoughts and to reflect on their physical/mental health, social relations, livelihood and aspirations. Additional participant commentaries supported the research process (Coemans et al., 2015). These illuminated community needs and capabilities and fed into the wider community and project discussions. The participatory approaches helped boost older participants' confidence, develop leadership, and plan strategies for a common purpose to address the issues that mattered to them, resulting in the specifically purposed demonstrator building.

### *Co-design benefits to SUNRISE*

Ultimately, the participatory arts activities used in the field (alongside survey data gathered as part of the research) informed a social development action plan (SDAP). This 'living' plan incorporates identified needs and proposed solutions into the design, purpose and planned maintenance of the solar-powered building. The plan represents the interaction between the communities, researchers and stakeholders and details the repurposing of the building in response to communicated needs and issues.

An interdisciplinary 'Community Involvement Working Group (CIWG)' established at the strategic level ensured that the SDAP could be progressed quickly: key CIWG members straddled the operational-strategic groups. Enhanced knowledge and confidence of villagers participating in research activities facilitated involvement in ongoing negotiations around the construction and functionality of the SUNRISE building alongside local SUNRISE project partners, community leaders, other villagers and NGOs operating in the village.

Key changes in building functionality were instigated by the community participation activities and facilitated by the mechanisms of communication (through community to operational and strategic project levels) that provided wider project understanding and support for change. The SUNRISE building was always intended to be a community resource that could benefit villagers. For example, it was envisaged it would be used for socio-economic development and providing support in agricultural activities, a venue for NGOs to provide skills training and to enhance health facilities. The building was not originally intended to provide electricity to individuals and homes. However, as a result of the participatory arts-based activities and the co-design of the research the building was repurposed so that

it could provide individuals (without access to electricity) mobile charger points, and a ‘borrow a battery scheme’ supporting lighting for homes. Hence, through the co-design activities, villagers were able to be an integral part of the research and development process and to collectively take action to address the issues around their everyday livelihoods and longer-term aspects of wellbeing.

### **Comparison of the two case studies**

As the two case studies demonstrate, participatory research can be undertaken at different stages of a project. Both case studies were underpinned by the UK National Standards for Public Involvement in Research (NIHR, 2018). In the SUNRISE project the standards were incorporated within a robust guidance document (PIPERS) that included definitions of public involvement, engagement and participation and the theoretical underpinning of methodological approaches planned that were adopted at project level. In contrast, in the ABC-RP project, the standards were adopted at sub-study level and were not integrated into the overarching study. This meant that there were missed opportunities for older people to influence aspects of project design at an earlier stage. For example, the EP/AB made recommendations on improving the interface of new technologies and/or how they may be better introduced into homes to better suit the needs of an ageing population. If these recommendations were adopted as the project developed (rather than fed into the project on completion) this may have improved the experience for older tenants receiving and using new technologies in their homes. In contrast, earlier involvement of the community in participatory research in the SUNRISE project led to changes that met the needs of the community from the outset.

The UK National Standards for Public Involvement in Research provided a benchmarking structure to identify areas of good practice and opportunities for improvement within both projects. The practical aspects of the participatory approaches used in co-designing the research are contrasted in Table 8.2.

### **Lessons learned across the two cases**

It is important for researchers to share the difference that participatory approaches to co-designing research with older people can make and where improvements can be made.

What worked well:

- Time spent exploring lived experiences and different knowledge and value systems of intended beneficiaries challenged some assumptions. There were ‘drivers to decarbonise’ at government level and at project level, while intended beneficiaries were more concerned about affordable heating or facilitating community spaces to support livelihoods. The adoption of PIPERS from the outset and across project hierarchies within the SUNRISE project facilitated greater opportunities for negotiating change. The co-design opportunities facilitated greater understanding of what energy use meant to older adults elucidating insights to be incorporated into plans for change (Itten et al., 2021).
- Opportunities to share understandings throughout both wider projects within reporting frameworks and conferences revealed the different and sometimes competing value sets of those involved within the studies and were useful. Sustainable energy transitions will

Table 8.2 Meeting the NIHR public involvement in research standards

NIHR standards <i>public involvement</i>	ABC-RP	SUNRISE
Inclusive opportunities	<p>😊: Recruitment and selection of an Expert Panel and Advisory Board; roles clearly defined with equal emphasis on lived and work-based experiences; reimbursement for time £25 vouchers, travel and subsistence paid for in-person meetings; Alternative media (zoom, phone, email) offered. Tasks allocated according to interest, experience and willingness to perform them.</p> <p>😞: Reliance on digital forms of communication excluded older people without technological products or expertise.</p>	<p>😊: Local NGOs familiar with the community supported a diverse recruitment strategy. Updates about research were conveyed in advance through the key informants in the village. Arts-based activities used to reduce inequities associated with low scientific literacy</p> <p>😞: No financial reimbursement for participation and time lost from productive activities; this was likely to limit participation of the most impoverished participants.</p> <p>More traditional materials (familiar to older people) could be incorporated into arts-based activities in future.</p>
Working together	<p>😊: Meeting times, durations and formats jointly agreed. Meetings documented, recorded and shared decisions with contributions valued and acknowledged including final reporting.</p> <p>😞: Useful suggestions regarding improvements to design or functionality of technologies on home visits although fed back were outside other sub-study remit to gather/alter (potentially missed opportunities).</p>	<p>😊: Convenient times and places used for participatory activities to fit around agricultural responsibilities. Seating arrangements and frequent breaks considered comfort and mobility issues. Refreshments were provided with some taken away for family members. Feedback on community requirements fed into social development (joint) action plan (SDAP).</p> <p>😞: Times and durations of activities are difficult to suit all with many demands on participants' time-flexibility required; consider lengthening the overall time frame with shorter sessions.</p>
Support and learning	<p>😊: Initial in-person site visit was invaluable in viewing technologies in action, meeting the team and asking questions. Access to video-platform meetings initially required instructions and practice but as all learned together this aided rapport building. Meeting recordings and notes helped understanding. Additional learning opportunities regularly signposted via bulletins.</p> <p>😞: The planned seminars and workshops could have supported additional learning and prompted questions and wider networking.</p>	<p>😊: Briefing visits were crucial in developing an understanding of the geographic, environmental, socio-economic and cultural aspects of the community. NGO's knowledge and connections provided additional information to aid required permissions.</p> <p>😞: Timing (harvest) and restrictions meant opportunities to explore arts methods in more detail and greater movement around the village for understanding daily activities/roles was more limited than planned.</p>

Table 8.2 (Continued)

NIHR standards public involvement	ABC-RP	SUNRISE
Communication	<p>😊 A variety of flexible forms of communications (e.g. email, phone, videoconference). Lay terminology used in technical discussions. Agendas, minutes and notes were provided promptly. Requests for feedback on surveys etc. were given as much time as possible.</p> <p>😞: In-person events may have supported wider project communication and additional networking opportunities.</p>	<p>😊 The local dialect, language was used and respected throughout the activities (including information and consent). Arts-based methods facilitated individual and group communication and participation. Initial discussions with the community members via local NGO helped in building trust and rapport.</p> <p>😞: Separating age ranges within groups as planned may have opened-up other discussion areas not covered. Gender-matched researcher/group may have made certain topics easier to discuss (e.g. health concerns).</p>
Impact (on co-design of research)	<p>😊: Co-design impacted positively on accessibility of marketing and data gathering tools and added nuance to findings' interpretation. Briefings on value of warm/comfortable homes to whole project highlighted personal and technical requirements. AB/EP members reported benefits to their networks from sharing their learnings.</p> <p>😞: COVID-19 public health restrictions impacted on planned seminars. Possible adaptations to technologies/design in other sub-studies based on this co-design approach not capitalised on.</p>	<p>😊: Co-design of the research fed into the purpose and function of the building. Communities could collectively take action to address the issues around their everyday livelihoods.</p> <p>😞: COVID-19 public health restrictions may have limited access to more vulnerable individuals -but working with NGOs in the village reduced this risk.</p>
Governance	<p>😊: Standards were adopted at sub-study level and were not integrated into the overarching study.</p>	<p>😊: Embedding PIPERS at strategic project level made a difference to wider project understanding. Ultimately the SDAP influenced the use, location, timing of construction and maintenance of the demonstrator building. The CIWG ensured actions reported at strategic level were implemented.</p>

require governance structures that facilitate involvement of citizens throughout (Lennon et al., 2019) as was attempted within the SUNRISE project.

- Changes to ways of working caused by COVID-19 public health restrictions demonstrated that hybrid ways of working offered flexibility. Multimedia materials and asynchronous contributions were preferred by some participants.

Improvements needed:

- All potential exclusionary practices should be explored and mitigated at the outset of co-designing research. For example, online working requirements (ABC) and the negative impact on productive wage labour (SUNRISE) potentially excluded some older people from participating. Without representation from diverse and underrepresented groups circumstances may be worsened (Axon & Morrissey, 2020). Adequate time, recompense and working with for example NGOs already operational within communities can help with this.
- Careful planning and flexibility of participatory approaches used such as timeframes and activity durations should account for specific requirements (e.g. seasonal considerations, grandparent caring responsibilities around school holidays).
- RE transitions should be based on shared values, resources and understanding of needs. More extensive opportunities for co-production/public participation embedded throughout projects are recommended. This could be supported by agreement of a set of principles or standards. Participatory methods should always consider the specific context of each project to be successful. Meaningful participation implies scope for negotiation within the project, and clear role definitions and governance structures can facilitate this. Therefore, time taken from the outset to agree the best approach can help develop trust, both for current and future RE transitions (Lennon et al., 2019).

The case studies demonstrated that renewable energy technologies can be applied in different spaces from community buildings to individual homes. There are often multiple people and agencies involved within the design, development, installation, maintenance and use of technologies requiring an understanding of processes, relationships between actors, and planned and desired use of technologies. The costs and measures of success for academics, and public and private sector organisations (e.g. vital to the project's implementation) do not necessarily resonate with the value and successful outcomes as defined by intended beneficiaries. The importance of deliberative and inclusive citizen participation in RE projects has been emphasised (Haggett, 2010). Individual, collective and structural processes of empowerment through research co-design should be considered as a method of shifting power. Older people have much to share, they can be the drivers of improvements and social innovation around research and programme design and delivery which can impact positively their lives and their communities.

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## Notes

- 1 <https://abc-rp.com/>
- 2 SUNRISE – Solar Power For All ([sunrisenetwork.org](http://sunrisenetwork.org))
- 3 <https://www.cadr.cymru/en/>
- 4 <https://healthandcareerresearchwales.org/researchers-support-and-guidance-researchers-develop-research-idea/involving-public-your-research>
- 5 SUNRISE public involvement strategy (2).pdf
- 6 A Gram Panchayat is the local self-government organisation in India

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