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Statement of Originality

This deliverable contains original unpublished work except where clearly indicated otherwise. Acknowledgement of previously published material and of the work of others has been made through appropriate citation, quotation, or both.

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1 Introduction

This Project AURORA deliverable, D4.1, due 31st May 2024 describes the work done towards the civic local roadmaps in the following locations:

- Madrid, Spain;
- Évora, Portugal;
- Ljubljana, Slovenia;
- Aarhus, Denmark;
- and the Forest of Dean, United Kingdom.

The Grant Agreement describes that depending on the needs by the participants for improving the community habits, the energy communities will prepare a roadmap on the local authority actions requested to facilitate citizens' behavioural changes and encourage a more sustainable energy local environment. Such roadmaps may be informed by a wide range of community and public engagement activities, including where applicable, thermo-photography contests or events, and carbon-sequestration games.

Since the start of the project, effective engagement has taken place in the five areas with both student and municipality based communities. None-sustainable situations in the local environment have been monitored and reported and information and data gained about priorities for action. This deliverable describes the comprehensive work carried out by AURORA partners and a separate roadmap has either been produced or will shortly be produced for each of the areas. The purpose of these roadmaps / sustainability plans / energy action plans / priorities / strategies is to help local authorities (within universities and local districts) to progress actions within their local decarbonisation plans.

Each roadmap will be unique and tailored to each area and will potentially be a call to action for our energy communities' recommendations to be taken into account and be acted upon. It may be that a roadmap asks for ideas to be incorporated into local authority plans and strategies, invest resources in something or support something. By presenting these roadmaps there could potentially be stronger and closer working relationships between the energy communities and the local authorities, and increased progress could be made in reaching net zero / becoming carbon neutral by 2030 or 2050 (dependant on local commitments).



2 Civic Local Roadmaps

2.1 Demonstrator Site – Madrid, Spain

2.1.1 Introduction

The main objective of the Universidad Politécnica de Madrid is to create a sustainability plan for the Campus Sur. This will be a strategic document that establishes the actions and goals that our Campus will undertake to ensure that its operations and activities are environmentally, socially, and economically sustainable in the long term. It is important to note that the aim is to include measures to minimise negative impact on the environment, promote ethical and fair practices with workers and the community, as well as ensure long-term economic viability, addressing areas such as conservation of natural resources, reduction of carbon emissions, waste management, corporate social responsibility, among other aspects.

To achieve this, it is essential to implement mechanisms that ensure the participation of the entire university community, as well as provide resources to ensure its future implementation. For this reason, the Management team has appointed a Sustainability Delegate for the upcoming years, who is not only the person who will ensure the implementation of the actions, but also the person who has led the entire process of creating this sustainability plan.

The starting point to align ourselves with the vision of our organisation, the Universidad Politécnica de Madrid, has been based on three documents that develop its vision regarding sustainability:

- the Declaration on contributions of universities of science and technology to sustainability, issued by CESAER¹ dated on the 20th October 2023, this is a European Organization to which the UPM belongs,
- the commitment of Spanish universities to the 2030 agenda, made by the CRUE² (Spanish Universities Board of Rectors) in November 2021, and
- the environmental sustainability plan of the Universidad Politécnica de Madrid establishes the lines of action that must be considered at the UPM regarding the environment from 2018³.

For the design of the plan, the General Guidelines for Implementing Sustainability in Higher Education Institutions, available in the guide edited by UNESCO in 2023, have been also considered.⁴

2.1.2 Citizen engagement activity

2.1.2.1 Co-creation cafés.

The process of creating this plan involved holding 6 co-creation sessions structured in a café format, with participation from 10 people: 4 student representatives, 2 representatives from the administrative and service staff, 4 representatives from faculty and researchers, the director, and the sustainability delegate. Additional support was provided by 2 individuals from UPM who specialized in guiding co-creation processes.

¹ <https://www.cesaer.org/content/5-operations/2023/white-paper-and-declaration-sustainability/20231020declaration-on-contributions-of-universities-of-science-and-technology-to-sustainability.pdf>

² <https://www.crue.org/wp-content/uploads/2021/11/CRUE-Universidades-Espanolas.-Posicionamiento-Agenda-2030.pdf>

³ <https://sostenibilidad.upm.es/plan-de-sostenibilidad-ambiental/>

⁴ https://unesdoc.unesco.org/ark:/48223/pf0000387008_spa.locale=es



These sessions were organised as follows:

First session: 22nd of February 2024

During this session, the mechanism for creating and designing the plan was explained. Some images from the session are shown in Figure 1. Through a “memory” game we set the key milestones through the history of our Schools which led to positive changes according to the “historical needs”. Some of the participants were too young to have such a vision but it was very useful in understanding how some key actions at due time can decide the future and therefore the challenge we were facing and the importance of working on this plan.

The first activity involved defining what we would like to achieve from this process, whose main conclusions were:

- Tangible and practical ideas
- Learning to be specific
- Specifying
- Making visible what is being done
- Clarifying where we want to go
- Having tools
- Creating a culture of sustainability
- Something everyone can feel
- Harmonising what we talk about, common vision.

The second activity consisted of defining the purpose of creating a sustainability plan for the campus. The main conclusions were:

- Engage everyone
- Go beyond the obvious: waste, consumption, etc.
- Raise awareness
- Create a sustainable, friendly, non-aggressive environment
- Promote viral behaviours
- Have tools to involve the university community
- Integrate sustainability into the university's mission (teaching, research, management, participation)
- Take action, and set an example
- Harmonise the different views of the entire university community, facilitating communication and the means to do so
- Unify proposals.



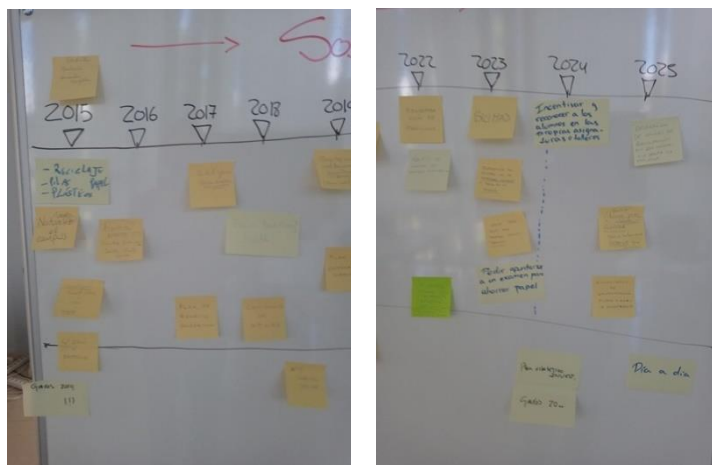


Figure 1. Timeline of key actions we did in the past towards a positive impact on the sustainability of the Campus, and how we imagine the near future.

Second session: 18th of March 2024

During this session, we attempted to define what it means to be sustainable, starting by recalling the general concept of sustainability from its origin (Brundtland Report):

"It is meeting the needs of the present without compromising the ability of future generations to meet their own needs," which implies:

Acknowledging the limits of natural resources and advocating for the conservation of nature

A social dimension, as "sustainable development requires meeting the basic needs of all and extends to all the opportunity to meet their aspirations for a better life," based on values of universality and equity.

Embracing complexity to find "a dynamic balance between population, environmental capabilities, and productive vitality."

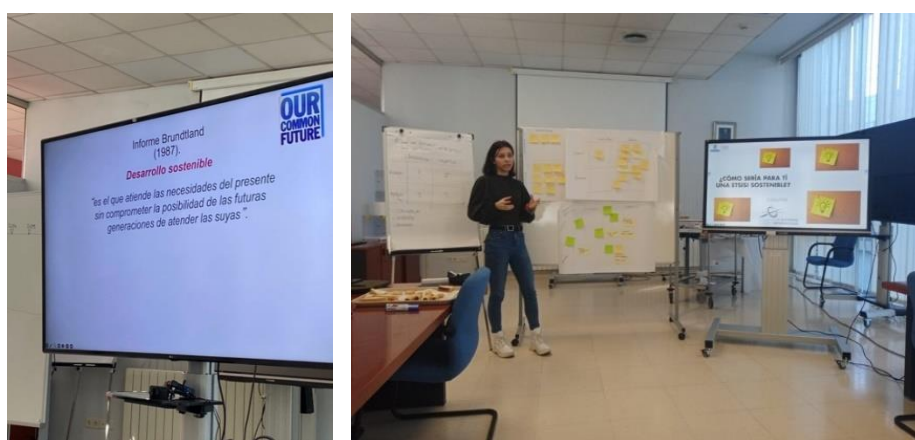


Figure 2. Images from different parts of session 2.



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Later, a brainstorming session was conducted on what I understand as a sustainable campus now (Figure 2). The main definition we aggregate from the individual approaches was:

A university centre committed to ensuring that its teaching, research, and knowledge transfer to society effectively contribute to its sustainable development in various dimensions: conservation and care of the environment, social justice, and economic equity. All this stems from our institutional responsibility to both present and future generations.

The aim this session was to pave the way for a new session, called “break” in which groups would split up to work on the purpose of our plan and its core principles, once the starting point of the definition is set.

Break session-Working groups: 4th April 2024

By groups, work is done to identify the strategic axes of the plan, which will group the different lines of action. The audience was split into two groups. Figure 3 shows the activity of the second group meeting.

Group A: Agustín Yagüe, Alejandro Alonso, Bernardo Tabuenca, Hortensia Benito, Manuel Uche

Group B: Ana Belén Cristóbal, Enrique Becerra, Eva Barquero, Juan Garbajosa, Rafael Miñano

Summary of the strategic axes identified by Group A

- Teaching: A strategic line aimed at identifying the actions needed to incorporate sustainability into all teaching activities. This includes both formal (regulated) and informal (non-regulated) teaching.
- Research: A strategic line aimed at identifying the actions needed to incorporate sustainability into Campus research activities.
- Infrastructure: A strategic line aimed at identifying the actions needed to make Campus infrastructure sustainable.
- Transfer: A strategic line aimed at identifying the actions needed to make Campus transfer activities sustainable.

Summary of the strategic axes identified by Group B

- Teaching: Aimed at ensuring that the training (both regulated and non-regulated) provided at Campus equips individuals to integrate social, health and safety, environmental, and economic implications into engineering practice⁵.
- Research: Aimed at promoting research lines oriented towards sustainable development and ensuring that existing research lines incorporate sustainability criteria (social, environmental, ethical).

⁵ Based on the learning outcomes of EURACE.



- Transfer: Aimed at promoting the communication, use, and creation of value for society from the knowledge generated and the talent within our university community, as well as establishing and consolidating alliances with other social actors.
- Infrastructure/Resources: Aimed at promoting optimal resource management to ensure economic viability, minimise negative environmental impacts (emissions, consumption, waste), and enhance positive impacts by promoting everyday habits of the circular economy.
- University Community: Aimed at fostering active participation from all sectors, creating an inclusive, healthy, and fair social environment that reconciles the professional and personal lives of Campus community members. Coordination with other UPM centres and the UPM strategy will also be promoted, contributing our specificity, and promoting interdisciplinary activities.



Figure 3. Image from the Working group 2.

Third Session: 6th May 2024

During this session, the work carried out by both groups during the break session is shared, reaching a consensus on the strategic axes around which specific actions on the lines of action will now be structured. Finally, we decided to act according to the general mainstream axes of the university to be aligned with top actions: teaching, research, transfer, and infrastructures. We reached an agreement on next steps towards the completion of the plan, which is summarised in Figure 4 and adding the strategic axe of community.



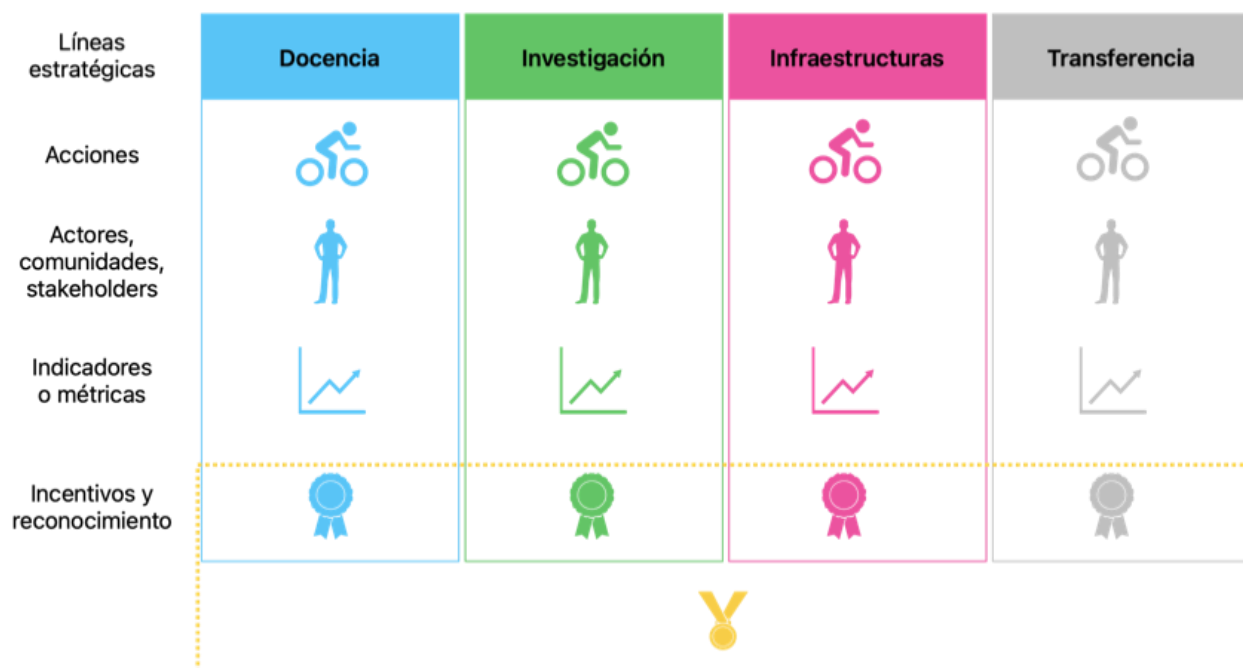


Figure 4. Scheme to follow-up in order to complete the roadmap.

Break Session: 20th May 2024

Again, the groups met and work separately to complete and include concrete actions on the defined strategic lines according to the scheme defined in Figure 4.

At this point, both teams were encouraged to consider the suggestions, recommendations, ideas, etc., received from the students in the "carbon sequestration game": the painters' exhibition together the panel for expression mentioned in the following section.

Along figure 5,6,7 some examples on the work carried out are shown. Figures are depicting the actions, although we also set priorities, stakeholders, and incentives. Just for the sake of space we do not include the figures on actions on transfer and "transversal actions" although they are duly commented below.

As for teaching (Figure 5) we highlight actions about the collection of datasets related with our campus sustainability monitoring, make the datasets public and use such datasets in different subjects. It is also remarkable the decided encouragement of bachelor's and master's Degrees on sustainability via awards or grants for students, the identification of the level of SDGs promotion in each subject and an analysis on how to be more aligned with them; for instance, AURORA prepared exercises for acquiring competences related to Linear Algebra and Data Science by providing real cases on energy behaviours, prices, subsidies, etc.

As for research (Figure 6) we highlight actions on a decided visibility of the research we made related with sustainability in non-formal events like "Science & Pizza" where researchers and students can be more comfortable and the analysis on how our Doctoral Degree on Smart Cities can be more flexible to accept more interdisciplinary profiles beyond ICT Engineers in order to cover the interdisciplinary know-how from the new professors and researchers coming to our Campus.



Nombre	Docencia
Descripción	Tiene como objetivo que la formación (reglada y no reglada) que se imparte en la ETSISI capacite para integrar las implicaciones sociales, de salud y seguridad, ambientales y económicas en la práctica de la ingeniería informática.
Acciones	Ordenadas por prioridad en el corto (antes 2024-09), medio (curso 24-25), largo plazo (2025 en adelante)
Doc.AC1	Identificar y visibilizar asignaturas en donde ya se trabajan competencias de sostenibilidad y ODS. Determinar líneas prioritarias anuales para el próximo curso basándose en el diagnóstico de esas actuaciones previas.
Doc.AC2	Reconocimiento a los TFT relacionados con sostenibilidad (premios TFX con impacto)
Doc.AC3	Identificar y planificar el apoyo a los estudiantes y PDI para la realización en el TFT de la reflexión sobre los impactos y aspectos sociales, ambientales y éticos : talleres, recursos, asignaturas de proyectos,...
Doc.AC4	Apoyo de las credenciales EELISA en asignaturas o actividades realizadas (y visibilizarlo)
Doc.AM1	Ofertar pool de TFGs, TFM s basados en líneas prioritarias anuales (promover la participación en las convocatorias UPM Sostenibilidad u otras)
Doc.AM2	Planificar y desarrollar de talleres de concienciación y de actuación en el marco de la sostenibilidad que aporten/complementen lo que no se ve en asignaturas
Doc.AM3	Promover que haya asignaturas que trabajen con casos de uso ETSISI , p.ej. datasets basados en métricas reales de la ETSISI, que permitan abordar acciones prioritarias anuales y concienciar a stakeholders (estudiantes, PDI,...)
Doc.AM4	Identificar y planificar el modo de mejorar el trabajo sistematizado de competencias transversales : pensamiento crítico, pensamiento sistémico, trabajo colaborativo, creatividad, etc.
Doc.AM5	Que la organización docente (horarios, calendario académico) facilite la participación en actividades extra-académicas, a ser posible en sintonía con los otros centros del campus.
Doc.AL1	Certificación orientadas a actores (credenciales) y que estén lideradas por técnicos expertos en sostenibilidad, apoyo de las credenciales EELISA en asignaturas o actividades
Estaría dentro de la política de comunicación general	Publicar un pool de acciones orientadas a la integración de la sostenibilidad en la docencia
Estaría cubierta con AC1, , determinar líneas prioritarias ...	Identificar el modo de integrar formación complementaria de sostenibilidad y ética tecnológica en el currículo, programas de sensibilización sobre reciclaje informático, conceptos de economía circular, etc.

Figure 5. Priority Actions for teaching

Nombre	Investigación
Descripción	Tiene como objetivo promover y visibilizar líneas de investigación orientadas al desarrollo sostenible y que las líneas de investigación ya existentes incorporen criterios de sostenibilidad (social, ambiental, ética).
Acciones	Aportaciones de Ana Belén Cristóbal (correo-e, pues no pudo asistir a la reunión)
Inv.AC1	Identificar y personas y proyectos en donde ya se investiga en temáticas relacionadas con la sostenibilidad. Determinar líneas prioritarias anuales para el año en curso basándose en el diagnóstico de las actuaciones previas
Inv.AC2	Visibilizar/Difundir la investigación de la ETSISI vinculada con sostenibilidad. Utilizar vídeos, canal YouTube, Two Minutes Paper (ya hay una iniciativa UPM de tesis en 3 minutos, los TFT de MH) o bien exposiciones de poster. Continuidad de Ciencia & Pizza .
Inv.AM1	Organizar talleres (workshops) en conferencias, seminarios, etc.
Inv.AM2	Fomentar proyectos de investigación centrados en tecnologías verdes, eficiencia energética, y desarrollo sostenible.
Inv.AM3	Crear alianzas con empresas y otros centros académicos para proyectos de investigación conjuntos.
Inv.AM4	Proponer tesis doctorales en el contexto de la sostenibilidad. Promover/facilitar la admisión en nuestros programas de doctorado de temáticas/perfiles transversales e interdisciplinares (Smart Cities, por ejemplo).
Inv.AM5	Publicar artículos en revistas, congresos y capítulos de libros
Estaría dentro de la política de comunicación general	Publicar un pool de acciones orientadas a la investigación
Esto es más de plan estratégico de la ETSISI	Mapa de dónde estamos como escuela respecto a los indicadores que da la UPM en investigación y a donde queremos llegar.
Comentario personal Rafa	No sé si las acciones de medio plazo (AM) corresponden a la escuela, pues las veo más de los propios grupos de investigación. Quizás, lo que sí puede hacer la escuela es crear espacios de diálogo con ellos para conocer cómo incluyen la sostenibilidad en sus líneas de investigación (temáticas, criterios,...) y a partir de ahí identificar posibles acciones de apoyo.

Figure 6. Priority Actions for research



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As for infrastructures we can sum up that this is the line where more strong and innovative actions have been identified. These go from the creation of metrics and methods to quantify impacts, for instance: kg of rubbish generated by category to know if we are performing well on waste management, from the promotion of healthier habits such as walking routes along the campus with other community members instead of being sat at the canteen.

Nombre	Infraestructura								
Descripción	Tiene como objetivo promover una gestión óptima de los recursos para garantizar la viabilidad económica, minimizar los impactos negativos en el medio ambiente (emisiones, consumos, residuos) y potenciar los positivos promoviendo hábitos cotidianos de economía circular.								
Acciones	Incorpora las aportaciones de Ana Belén Cristóbal y del mural de la exposición DS								
INF.AC1	Determinar líneas prioritarias anuales para el año en curso basándose en el diagnóstico de las actuaciones previas								
INF.AM1	Optimizar consumos (agua, electricidad, calefacción, papel, ...). Implementación de un sistema de apagado automático de radiadores en función de la temperatura. Uso de papel reciclado para los exámenes y documentos administrativos. Instalación de fuentes de agua potable para reducir el uso de botellas de plástico. Compartir de forma visible (pantallas) los consumos de la escuela, poner algún reto para a ver si conseguimos bajar un x% el próximo año, etc. Revisar los consumos de tanto ordenador en las aulas: asignatura de análisis y álgebra, no los necesitan o solo puntualmente, y al final hay muchos ordenadores encendidos para que la gente esté jugando online. Programas de ahorro de agua en baños y cocinas. Sensibilización sobre el uso responsable del agua entre la comunidad universitaria.								
INF.AM2	Identificar métricas de referencia para monitorizar recursos (agua, basuras, KW de consumo ...). Hacer partícipes a los estudiantes del montaje de sistema de testeo y monitorización de consumos a tiempo real. Se puede hacer de forma muy fácil con dispositivos IoT sin inferir en el contador de la distribuidora y conectándolos a la WIFI de la Escuela para que envíen datos. Contar con el personal de mantenimiento para colaborar.								
INF.AM3	Energía. Implementar sistemas de gestión energética en los edificios. Discriminar gastos contadores de electricidad. Colaboración con AURORA. Promover el uso de energías renovables. Cargadores para vehículos eléctricos (¿y si los de monopatinos los fabricamos nosotros?). Programas de eficiencia energética para reducir el consumo de electricidad y calefacción. Auditorías energéticas periódicas para identificar y corregir ineficiencias.								
INF.AM4	Mejorar la gestión de residuos . Más papeleras con separación. Promover disminuir consumo de plásticos (fuentes agua). Programas de reciclaje y reducción de residuos en todo el campus. Talleres de reparación de dispositivos electrónicos, i.e reparación/sustitución de pantallas en móviles, reparación de cables de los cargadores que se rompen con el uso: aprender a soldar, organizarlo AURORA con las asociaciones y profes que quieran.								
INF.AM5	Habilitar espacios que faciliten la colaboración								
INF.AM6	Espacios verdes. Campus zona verde protegida de referencia en la UPM y Madrid (aprovechar los estudios que ya hay realizados). Gestión de colonias, plagas (proceionaria, cotorras, gatos). Gestión de árboles (enfermedades, talas, ...). Plantación de más flores y árboles en el campus. Creación de un cierre forestal alrededor del campus para reducir el ruido y la visibilidad del tráfico. QR con explicación de las distintas especies de plantas que hay en el campus (había un proyecto en UPM sobre eso). Instalación de sistemas de recolección de agua de lluvia para el riego de jardines. ¿Y si lo fabricamos nosotros con los estudiantes y la empresa de jardinería?								
INF.AM7	Zona deportiva (accesos con carril bici, duchas, ...). Ruta alrededor de la Escuela. Hay gente que sale a andar alrededor de la Escuela 20-25 minutos. ¿Podríamos incentivar este hábito de algún modo?								
INF.AM8	Promover hábitos cotidianos sostenibles/hábitos de consumo responsables entre estudiantes y personal.								
INF.AM9	Arreglar la calle del parking. Personas del campus han sufrido daños por caídas en dicha zona.								

Figure 7. Priority Actions for infrastructures

Within transfer actions ranged from sessions on social and sustainable entrepreneurship to the promotion and looking for funds, resources, or networks to put into action those bachelor's and master's Degrees related to sustainability. For instance, the UPM Go system thesis awarded this year, is ready to work just by copying the code in a server. It is a pity that nobody has had the interest of insisting on putting into action this student's work. And finally, the axe of community refers mainly to social sustainability actions rather than environmental aspects. This is why we do not expand on it.

Fourth Session and closing session: 10th June 2024.

This session will take place after sending this deliverable, but it will consolidate a unique plan by joining the work done by both teams, referring also to the stakeholders the priority of the actions, performance indicators and incentives.



2.1.2.1 Carbon-sequestration game

The Technical University of Madrid decided not to use the thermophotography contest as a means of engaging the university community in the sustainability plan. We preferred for this activity to be more individually and freely focused, allowing people to scan the environment they wished with their cameras. We considered the expression panel to be more useful, where ultimately 77 different contributions were collected. The explanation of the thermophotography contest is found in other technical documents of the AURORA report (D4.2).

However, some contestants provided us with observations about the campus. The most notable was made by a student from the School of Computer Science, as shown in Figure 8. The student monitored the workstations in classrooms that have a desktop computer for each student, noticing that the screens of the computers in the School of Computer Science emit more heat than the screen of their own laptop. This led him to the conclusion that we could improve energetically by replacing these desktop computers with laptops, assuming a similar energy consumption for the CPU.

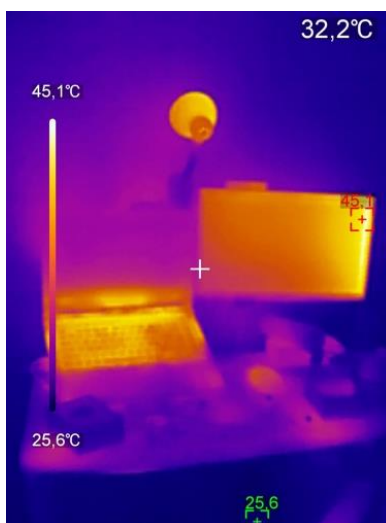


Figure 8. Thermography made by a student from some installations of our Campus

In addition to this, broader engagement with the university community was carried out in the following format: An art exhibition was organised in collaboration with the "Circle of Solidary Painters" Association, aiming to denounce environmental degradation and raise awareness about the need for sustainable development. This exhibition started on March 22nd, "International Water Day," and ended on March 30th, "Zero Waste Day." It was free to attend and featured 20 artworks displayed in the main hallways of the Campus. A feedback panel was set up so that all members of the community could express their ideas on what would constitute "a more sustainable Campus Sur." (Figure 9). This aimed at being the "carbon-sequestration" activity we commented in the Grant Agreement.





Figure 9. Images from the Sustainability Exhibition and panel for expressions.

From such an engagement we could organise the demands of the community as can be seen in Figure 10. As commented previously, these inputs were considered for the generation of the plan.

Enviromental Sustainability				
Consumptions	Green Spaces	Waste	Energy	Water
Implementation of an automatic radiator shutdown system based on temperature .	Planting more flowers and trees on campus.	Installation of more waste bins with separation of waste .	Installation of chargers for electric vehicles, bicycles, etc...	Installation of rainwater collection systems for garden irrigation.
Use of recycled paper for exams and administrative documents.	Creation of a forest enclosure around the campus to reduce noise and traffic visibility.	Recycling and waste reduction programs throughout the campus.	Promotion of the use of renewable energy in campus facilities.	Water-saving programs in bathrooms and kitchens.
Installation of drinking water fountains to reduce the use of plastic bottles .	Development of gardens and green areas for recreation.	Workshops for repairing electronic devices, e.g., screen repair/replacement for mobile phones, repair of charger cables that break with use: learning to solder.	Energy efficiency programs to reduce electricity and heating consumption.	Awareness-raising about responsible water use among the university community
Promotion of responsible consumption habits among students and staff, i.e. why all computers at clases must be switched while is not requested for the subject.	Routes around the Campus: walking for talking.		Periodic energy audits to identify and correct inefficiencies.	
Social Sustainability				
Relationships	Belonging	Gender	Participation	Campus Accessibility
Spring Festival.	Distribution of university hoodies and t-shirts.	Awareness campaigns for gender equality ("for me, every day is March 8th").	Encouragement of student participation in the Student Council.	Improvements in pedestrian and cycling infrastructure.
Installation of foosball tables and ping-pong tables.	Creation of a sense of community through events and activities.	Increase in the number of women in academic and administrative positions (although I must admit I'm unsure about this).	Transparency and communication in decision-making processes	Connection with Valdebernardo and Vallecás.
Creation of a calisthenics park.	Easy access to school merchandise. In Aurora, we wanted to buy some as gifts, but nobody knew if there was anything left.	Workshops and talks on gender equality and diversity		Expansion of the metro line to Segovia and Madrid Norte.
Renovation of sports facilities (outdoor football field). Placement of more picnic tables. Organization of regular social and sports events.				Increase in the frequency of the E bus line

Figure 10. Summary of the actions detailed in the panel for expressions.



2.1.3 Impact of citizen engagement

UPM has established a detailed roadmap to enhance the sustainability of daily activities on our Campus Sur, supporting other initiatives by our Rectorate and the Madrid City Council aligned with the Cities Mission. The key impact of this roadmap lies in its co-creation with the very people affected by these actions. While both UPM and the Madrid City Council have shown a commitment to environmental sustainability on our campus, they had not previously consulted the community about the actual needs of the campus.

This citizen engagement approach is a more responsible decision-making process. To avoid conflicts, the roadmap is anchored in the strategic axes that govern the university's activities. Thanks to citizen participation, the concept of social sustainability has emerged. Although social sustainability is effectively included in the Sustainable Development Goals (SDGs), it is an area the AURORA team had never addressed by us in a roadmap, as our routines focused primarily on environmental sustainability.

We know that implementing these actions on social sustainability will ensure the continuity of our extensive work, not only to educate on energy issues but also to foster social cohesion. Our interest in this area is evident throughout the numerous reports we have submitted. We strive to bring together members from different groups or students from various programs in our activities, always conducting them in open spaces to encourage participation and asking students to lead initiatives.

This inclusive approach ensures that our sustainability efforts are comprehensive and impactful, benefiting both the environment and the social fabric of our community.

2.1.4 Summary of key priorities in civic local roadmap

As previously mentioned, our civic local roadmap has a dual focus, addressing both environmental and social sustainability. There are five strategic axes under which all activities, stakeholders, and key performance indicators (KPIs) are being finalised. Given the extensive nature of the plan, which will guide our campus actions over the next three years, all activities have been prioritised from 1 to 3 based on their importance and urgency.

This prioritisation will be clearly outlined in the final document. For instance, as shown in Figure 5, the codes for actions indicate their timeline: AC for short-term actions, AM for medium-term actions, and AL for long-term actions. This structured approach ensures that the most critical and urgent activities are addressed first, providing a clear roadmap for achieving our sustainability goals.

2.1.5 Further actions

After the session on the 10th of June, the plan will be produced as a final document which will serve our sustainability manager to act in the coming years, starting from the beginning of the next academic course.



2.2 Demonstrator Site – Évora, Portugal

2.2.1 Introduction

The AURORA team in Évora, has hosted several citizen engagement activities throughout AURORA. There have been several kinds of activities, presential and online in cooperation with other entities that the AURORA team in Évora has partnered along the project. At the early stages, the team started to host those events only at the university premises. however, once the Renewable Energy Community had to be shifted and started advancing with the Red Cross in Évora the team decided to broaden the scope of such events to reach the local community given the reach of Red Cross being external to the Academia. For that purpose, a group named Sustainable Action Group was created to engage with the local community, creating several events and a WhatsApp group to engage closely with the interested community and to serve as a mean to keep the members informed of actions being developed and of relevant news related to energy and sustainability.

During this period, a partnership was established with SEYN association – Sustainable Energy Youth Network to further promote and debate energy topics with whom several masterclasses and workshops were hosted and are planned for the upcoming months.

The University of Évora is part of the European consortium EU GREEN, a partnership funded by the European Commission, led by the University of Extremadura in Spain, and which includes eight other higher education institutions located in Portugal, Sweden, Poland, Italy, France, Germany, Ireland, and Romania, with the University of Évora being the only Portuguese institution in this alliance. The EU GREEN alliance places social responsibility at the centre of its mission as a guiding principle, with a vision that goes beyond building a European University, aiming to implement a concerted strategy for training citizens and developing innovative research that contributes to the favourable evolution of local and/or regional ecosystems. EU GREEN is based on a true sustainability perspective, which encompasses the economic, social, cultural and environmental dimensions of the term and their mutual impact, in an approach closely aligned with the Sustainable Development Goals (SDGs) in all its four main missions: education, research, innovation and service to society. EU GREEN's four-year strategic objective is to create a European centre for education, research and innovation in sustainability that goes beyond the borders of the consortium and acts at a global level to provide solutions to local or regional challenges that can be replicated at a global level.⁶

The EU GREEN alliance objectives align perfectly with the objectives of AURORA, and therefore AURORA team in Évora is aligning and concentrating efforts altogether with the coordination of EU GREEN in Évora to develop a concerted strategy to promote a great sense of social responsibility in the academia and seeking to expand it to the local community.

2.2.2 Citizen engagement activity

The AURORA team in Évora has hosted several meetings with citizens either presential or hybrid. In the scope of the partnership with SEYN, actions have been realised outside of Évora, in zones considered areas of fair energy transition in which sustainability is being promoted.

⁶ <https://www.uevora.pt/en/university/alianca-eu-green>



Sustainable Action AURORA Masterclasses

How to produce photovoltaic energy at home?	Januray 16, 2024
How does a battery work? Energy storage solutions	February 15, 2024
How to start a Renewable Energy Community?	March 5, 2024
Minimizing Impacts of PV Plants: Solutions and Best Practices	April 18, 2024
Energy Efficiency: How to Reduce Your Electricity Bill?	May 14, 2024

Esta sessão é organizada pela Sustainable Energy Youth Network (SEYN), pela Ação Sustentável AURORA da Cátedra de Energias Renováveis da Universidade de Évora e pela Drive Impact no âmbito do projeto #SomosEnergia

First public meeting with students (09/03/2022)

This meeting was hosted to present AURORA to the students, highlighting what was intended with the project and to seek the interest of the students in the activities that were being planned to promote energy capacity and sustainability in the campus. Additionally, it was presented the objective and the possibility for the students to own their own energy and take their hands on the energy transition through the investment in the creation of a Renewable Energy Community.



O projeto AURORA. "Alcançar uma nova Consciência Energética Europeia", faz parte do programa "Horizonte 2020" da União Europeia. O projeto envolve incentivar a adoção de comportamentos mais sustentáveis por parte dos cidadãos, em diferentes países: Dinamarca, Inglaterra, Eslovénia, Espanha e Portugal, na nossa universidade! O objetivo é atingir a meta da UE de redução de emissões de carbono em 55 %, no prazo de uma década. Um objetivo ambicioso pelo qual todos devem lutar.

No âmbito deste projeto, a Universidade de Évora passará a ter uma comunidade de energia renovável. Isto é, irá produzir a sua própria energia a partir de um campo solar fotovoltaico com uma capacidade prevista até 200 kW. A eletricidade produzida será para a comunidade académica.

Este campo solar fotovoltaico será financiado por um método de *crowdfunding* em que estudantes, docentes, investigadores e funcionários podem investir com valores tão pequenos como 20€, recebendo depois ao longo do seu tempo de vida o retorno do seu investimento com ganhos.

O projeto AURORA não pretende apenas a instalação de um campo solar fotovoltaico financiado pela comunidade académica, mas também que a comunidade académica se torne ativa na mudança para um estilo vida mais sustentável.

Além disso, cada contribuidor terá também uma aplicação para *smartphones* que permite monitorizar a sua própria pegada ecológica, incluindo emissões médias de carbono consoante os comportamentos adotados, como o tipo de transportes utilizados, forma de climatização da casa, energia consumida, etc. Esta aplicação permitirá entender melhor quais os impactos das nossas atitudes e como nos podemos tornar mais sustentáveis, através de recomendações personalizadas.

Contudo, todas estas ferramentas e medidas devem ser definidas em conjunto com a comunidade académica e pretendemos o envolvimento ativo de todos neste projeto.

Queremos conhecer a tua opinião e as tuas ideias!

- De que formas gostavas de receber o retorno do investimento nesta comunidade solar?
- Como gostavas de participar ativamente neste projeto?
- Como chegar a toda a comunidade académica e local para divulgar o projeto e os seus objetivos?
- Que funcionalidades deve ter esta aplicação?

Queremos ouvir-te! Junta-te a nós na sala 135 no Colégio Luís António Verney, no dia 9 de março às 16h.

www.aurora-h2020.eu



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101036418.

Innovation Cafe (18/05/2022)

In May 2022, we hosted an Innovation Cafe where there was an interesting discussion followed by presentation from our researcher Dr. Luís Fialho. Prof. Alexander Gerber from INSCICO also led a talk about individual energy behaviour and how a mobile app could help to change that. The participants also filled out a survey about what they would like to see in the app.

1st Citizens Researcher Meeting (15/02/2023)

The 1st citizens Researcher meeting was dedicated to address the current dire climatic situation that the world is facing, presenting the problem, explaining how AURORA wants to contribute on tackling climate change and discuss with the attendance how can one, as an individual, have an impact. The attendance stated their concern and that they believe that a change is necessary and showed interest in what AURORA was seeking to offer in terms of knowledge dissemination to promote energy capacitation to the common citizen.

**Sustainable Action Release (18/04/2023)**

On the 18th of April, a meeting with the community was held to present and discuss the potential energy communities to be constituted under the AURORA project initiative, either through the donation of funds directly to the University of Évora; or through a partnership with the Red Cross Évora for the creation of a self-consumption energy community

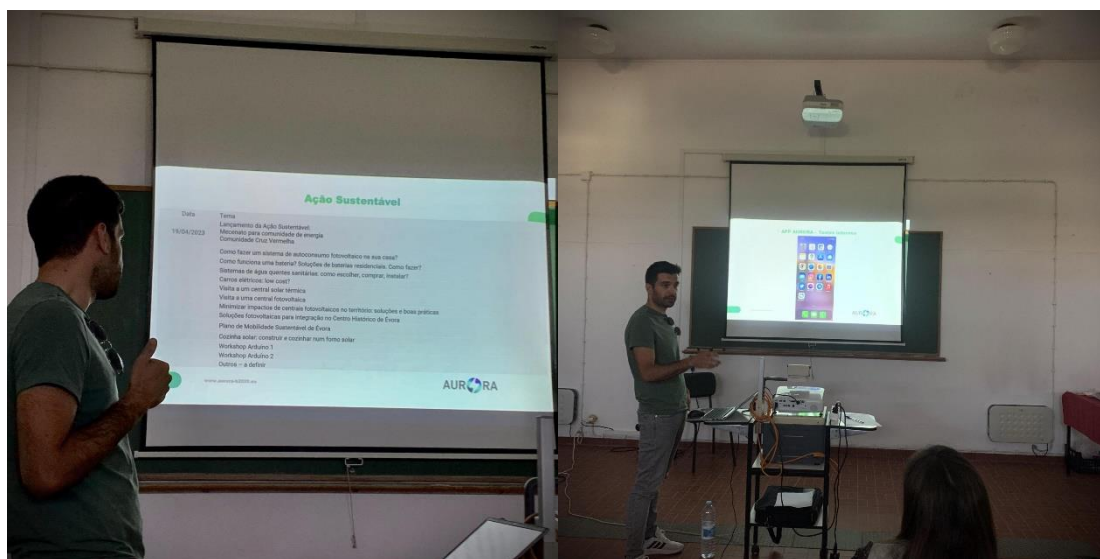


This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101036418.

with benefits in services or products for the participants. The researchers from the AURORA team in Évora informed the community that they are actively seeking other institutions who might be interested in implementing such an approach. The purpose of such energy communities would be to support the decarbonisation of citizens energy consumption. With that in mind, the participation of the audience was requested to help in identifying potential institutions who could be interested in such an approach.

The “Sustainable Action Group” (Grupo de Acção Sustentável) was announced with a roadmap to hold sessions on several different topics such as: How to design and implement a photovoltaic system for self-consumption on our own homes, how do batteries work and what are the residential solutions on the market, thermal systems for residential sanitary hot water systems, electric vehicles, how to minimize the impact of photovoltaic power plants and potential solutions such as agrovoltatics, how to build a solar cooker, a sustainable mobility plan for Évora and other topics. Additionally, visits are being planned to a photovoltaic power plant in Évora and to the Concentrated Thermal Power plant of the University of Évora. Both visits will be technical visits designed to answer questions from the participants and allow them to see inside these facilities which are typically do not allow public access.

The event ended with informal discussions amongst the participants with coffee and cake, discussing other potential topics for future sessions to be included on the Sustainable Action Group roadmap.



1st Sustainable Action: Invest in a photovoltaic panel - Electricity without bill? (03/05/2023)

The Sustainable Action group (AURORA project) promoted on May 3rd the public event on self-consumption with photovoltaic panels, jointly organised with the Parish Council of Évora. With the participation of 15 people, savings, tips, recommendations, and the need to decarbonize our lifestyle were discussed. The topic promoted further discussion with the participants engaging in questions and sharing their views regarding what was presented and the actual status.



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101036418.

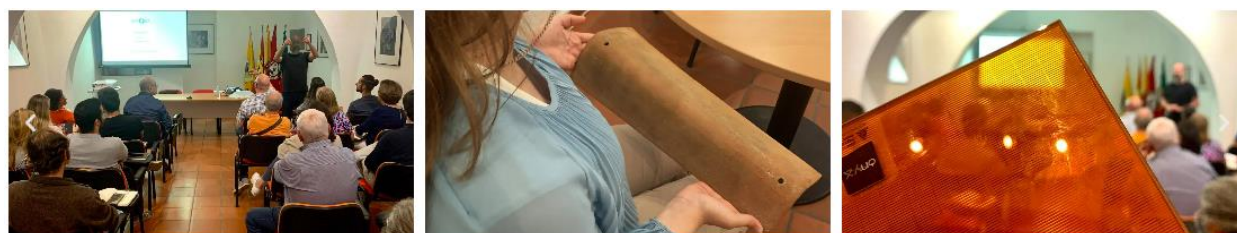


2nd Sustainable Action: Photovoltaic solutions for the historical centre of Évora (18/05/2023)

The Sustainable Action group of the AURORA project promoted on May 18th its second public event! It was presented and discussed with those present the possible photovoltaic solutions for the historical city centre of Évora, namely solar tiles and photovoltaic glass. Product samples were circulated among the attendees so they can have direct contact with the solutions to be implemented under the POCITYF project.

The topic promoted further discussion with the participants engaging in questions about the innovative solution presented and sharing their views regarding what was presented and the actual status.

This topic was of particular interest, considering that the historical city centre of Évora is classified as UNESCO heritage and therefore must abide by specific cultural rules that do not allow interventions that modify the aspect of the city and its buildings.



In late 2023 the AURORA team partnered with SEYN – Sustainable Energy Youth Network and created a roadmap of masterclasses dedicated to the energy transition a sustainability to be held presential and online. This initiative occurs within the framework of the #SomosEnergia project, an initiative led by the Sustainable Energy Youth Network (SEYN) in partnership with Project AURORA, educational masterclasses were held, aimed at promoting knowledge about sustainable and renewable energy.

Masterclass nº1: How to produce photovoltaic energy at home? (16/01/2024)

This masterclass focused on the energy production at home with the use of solar photovoltaics. A framework of the climatic situation was presented, legal framework for the installation of photovoltaics at home, what are Renewable Energy Communities, necessary documentation, standard simulation highlighting the energy savings, practical



examples of installations. At the end, several recommendations for the installation and all the procedure were given and the attendance took the opportunity to clarify their doubts and curiosities. The participants were particularly keen to know more about the energy savings.

Video: <https://www.youtube.com/watch?v=VFHW8lhB4ME&list=PLT9ETXRZhMGIK3TcNhaDuNzE4DRMS23LA&index=3>

Masterclass nº2: How does a battery work? Energy storage solutions (15/02/2024)

This masterclass focused on the how do batteries work, and which solutions exist. A framework of the climatic situation was presented, the current energy challenge in Portugal, legal framework for the installation of batteries at home, what are Renewable Energy Communities, the session proceeded with a highlight of existing technologies, the working principle of a battery, implementation solutions and practical solutions and recommendations for the Acquisition and installation of such solutions.

The session finalised with a debate between participants and attendance, highlighting the future of batteries and their financial viability. One of the participants in the auditorium took the opportunity to discuss with the experts a problem they have with their own battery and the lack of support by the supplier, the AURORA team offered to provide support and see if it is something that could be easily solved without the intervention of the supplier.



Video: <https://www.youtube.com/watch?v=VU0G1rZqrAU&list=PLT9ETXRZhMGIK3TcNhaDuNzE4DRMS23LA&index=2>

Masterclass nº3: How to start a Renewable Energy Community? (05/03/2024)

This masterclass focused on how to start a Renewable Energy Community, focusing on gathering the interest of the people with the presenters explaining the whole process they went through to set up a Renewable Energy Community



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101036418.

in the region of Lisboa, in telheiras. The session was dedicated to explaining the legal framework, what are REC, the benefits of a REC, what is really being implemented in the framework of REC: self-consumption and REC. The event focused on the development of the CER, from an idea to a reality: focusing on engaging people, performing technical simulations for performance of PV, development of internal regulations, business model, how to get participants to adhere, the focus on the socially vulnerable families and the whole licencing process. The session proceeded with a discussion between the participants and the attendance, in which there were clarifications on the process of setting up this REC.

<https://www.youtube.com/watch?v=6rPNiqfvWME&list=PLT9ETXRZhMGIK3TcNhaDuNzE4DRMS23LA&index=3>

Masterclass nº4: How to ensure the social and environmental sustainability of large solar energy projects? (18/04/2024)

This masterclass was dedicated to the social and environmental sustainability of large solar energy projects.

The session started with a framework on the climatic crisis, proceeded with the environmental impacts resulting from the energy projects and the compensation measures.

At the time of this presentation, this topic was very present due to a news piece regarding the environmental impact of a large-scale PV plant which had been aired 2 weeks before. Information was provided to the attendance on how to participate in the public consultations that are made for those projects and how to access environmental impact documentation. Several solutions were presented and discussed, such as agrovoltaics and ecovoltaics. The session ended with a discussion between participants and with the attendance asking further details about the compensation measures and the new emerging solutions.



Video: <https://www.youtube.com/watch?v=UBXDOV5HzSc>

Masterclass nº5: Energy Efficiency: How to reduce your electricity bill. (15/05/2024)

This session was dedicated to energy efficiency measures to reduce the energy bill. The session was focused on the possibilities of funding for energy efficiency measures, considering the different possibilities for socially vulnerable families that can get access up to three 1300+VAT vouchers for energy efficiency purchases. The session focused on the funding program and its application.



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101036418.

Webinar: Connecting light and sustainable development goals (16/05/2024)

This webinar was hosted in cooperation with the EU GREEN alliance and focused on the connection between light (sun) and the Sustainable Development Goals. The presentation connected AURORA with the sustainable development goals, namely with SDG 11 (Sustainable cities and communities) and SDG 13 (Climate Action).

Workshop on Energy Capacity Building: How to reduce the electricity bill with energy efficiency (17/05/2024)

This workshop was held outside of Évora, in Sines, in the scope of the #SomosEnergia project led by SEYN. The event was held in partnership with a social solidarity entity and focused on the energy capacitation and energy efficiency measures and on solar energy as way to reduce the energy bill. The session had great engagement from the audience, with many questions regarding solar energy and energy efficiency measures.



The University of Évora will hold dedicated workshops to thermo-photography at the end of 2024 and during 2025, in partnership with the EU GREEN alliance. Meanwhile, in partnership with SEYN there is photography contest open until the 31st of July in which the participants are asked for a photography that is representative of what they perceive as fair energy transition. In September 2024 the University of Évora and the SEYN will host a good energy party in which the winner will be announced, and the 10 best pictures will be exposed.





2.2.3 Impact of citizen engagement

These events promoted by the AURORA team in Évora have served not only to disseminate AURORA and its mission but mostly to capacitate the participants in many energies related topics, seeking to demystify the energy topic. Many participants have highlighted what is necessary for the common citizen to be more involved and be able to take into its hands the capacity of decision on energy related topics.

The University of Évora is establishing a roadmap with a concerted strategy to train citizens and develop innovative research that contribute to the favourable evolution of local and/or regional ecosystems, based on the true sustainability perspective, encompassing economic, social, cultural and environmental dimensions and their mutual impact, in an approach closely aligned with the Sustainable Development Goals (SDGs) in all its four main missions: education, research, innovation and service to society. This mission is aligned with the EU GREEN strategic objective of being able to create a centre capable of providing solutions to local or regional challenges and for that purpose UÉvora is creating its own plan. The AURORA team is working closely with the EU GREEN team in Évora to keep developing such civic roadmap to the community.



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101036418.

2.2.4 Summary of key priorities in civic local roadmap

In the scope of the University objectives, the local civic roadmap will be based on the true sustainability perspective, encompassing economic, social, cultural, and environmental dimensions and their mutual impact, in an approach closely aligned with the Sustainable Development Goals (SDGs) in all its four main missions: education, research, innovation and service to society.

The map will have clear prioritisation for its measures, ensuring its realisation.

2.2.5 Further actions

A meeting with the EU GREEN coordination in Évora is going to be held in the end of May 2024 to closely engage, discuss, and join efforts for the development and execution the local civic roadmap, benefiting greatly from AURORA's team feedback from all the organised events.



2.3 Demonstrator Site – Ljubljana, Slovenia

2.3.1 Introduction

At the University of Ljubljana, we have adopted a bottom-up approach to establish an organisation that is based on the broadest population of our university - the students. Students are, indeed, the foundation of the future, and they are the ones who are most acutely aware that all activities aimed at sustainable development benefit them and all our descendants the most. We recognise that students are an integral part of our society, constituting the inherently more progressive segment of the entire population. However, we are also cognisant that their voices, despite the advanced ideas they possess, are not sufficiently heard in society. In order to consolidate the diverse initiatives emerging among students in the fields of energy, green transition, and climate change awareness, we have moved towards organising students into a dedicated club. As a result, we have named our local energy community AURORA Ljubljana the Student Energy Club (ŠEK).

Through its activities and initiatives, the Student Energy Club aims to promote a culture of sustainability and responsible energy use among students, as well as the wider community. This is a critical goal, given the significant impact that energy has on the lives of all residents, whether they are aware of it or not. Overall, the Student Energy Club is a valuable resource for students who are interested in working on energy issues and making a positive impact on the world around them.

The Student Energy Club (ŠEK) is the primary entity for activities within the framework of AURORA Ljubljana. The activities below are generated and led within the scope of the Student Energy Club.

Sustainable living and e-mobility (16/02/2023)

The ŠEK Student Energy Club organised an online lecture on Sustainable Living and e-mobility. The lecture took place as part of ECO Month February, an event organised by the Centre for Extracurricular Activities of the University of Ljubljana.

During the lecture, two experts from the Faculty of Electrical Engineering at the University of Ljubljana presented two areas of sustainable living: the Nearly Zero Energy House and the transition from the internal combustion car to the electric car. The lecture was very well attended and extended to more than two hours due to the questions that followed the formal part. The total number of participants was 91, and most were present for the entire duration of the online event.



Regarding the introduction of electric vehicles, one of the logical conclusions was that the transition from ICE (Internal Combustion Engine) to EV (Electric Vehicle) is most beneficial for individuals who drive long distances. For instance, 50,000 km per year with routine daily commutes and no sudden, unplanned trips more than 200 km from their home charging station. As the cost of new EVs decreases, these conditions will naturally become more relaxed, making EVs economically viable for a broader range of people.



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101036418.

2.3.2 Citizen engagement activity

Hackathon 1.0: Solar energy (19/04/2023)

The most challenging event was the hackathon organised by the AURORA Energy Community named the Student Energy Club ŠEK in cooperation with the renowned EESTEC (Electrical Engineering Students' European assoCiation). The competition included several challenges prepared by three laboratories of the Faculty of Electrical Engineering: the Laboratory of Electrical Networks and Installations (LEON), the Laboratory of Energy Strategies (LEST) and the Laboratory of Photovoltaics and Optoelectronics (LPVO). The event attracted twelve teams of 3 students who competed to create innovative solutions in the field of solar energy. Each group was faced with tasks stemming from these areas. The competitors had to demonstrate their knowledge, innovation, and ability to work as a team.

After the competition, the teams presented their projects and ideas, which was an important part of the evaluation. The presentations were an opportunity for the students to showcase their achievements and explain how they tackled the challenges. The whole event, including the presentations, went on into the evening.



The hackathon challenge was based on the specific example of the town of Medvode, located north of Ljubljana. The competing teams had to consider the current state and the possibilities offered by the given location. The title of the hackathon, Solar Energy, indicates that the objective was to achieve the highest possible degree of solarisation in the town. In doing so, the students also had to ensure the consumption of the solar energy generated both on-site and, more importantly, during peak production times. Therefore, they needed to include consumers of electrical energy such as heat pumps, air conditioning units, and electric vehicles.

The greatest challenge regarding electric vehicles was to ensure that they could be charged during peak solar production times. Solutions to this issue primarily focused on how to provide electric vehicle owners with the opportunity to charge their EVs during working hours under conditions that would be more beneficial than charging at home overnight. The possibilities of V2L (vehicle to load) and V2G (vehicle to grid) were also considered, which could partially alleviate the grid during night-time. The use of batteries was also foreseen, but due to the still expensive technology, it was considered only for "peak shaving" of production and consumption.

Hackathon 2.0: Green Energy Transition of Slovenia (13/12/2023 and 14/12/2023)

In the following academic year, when a new generation of students joined us, we repeated the very successful Hackathon. Once again, it was organised jointly with EESTEC (Electrical Engineering Students' European assoCiation) and with the professional support of the three laboratories of the Faculty of Electrical Engineering: the Laboratory of Electrical Networks and Installations (LEON), the Laboratory of Energy Strategies (LEST) and the Laboratory of Photovoltaics and Optoelectronics (LPVO).

Compared to April, the hackathon has grown both in the number of participants and the length of the event. This time, 12 groups took part in the competition. Each group has 3 students. The April hackathon was a full-day event, but in



December event is two days long. The whole day was dedicated to presenting the challenges and solving them. On the second day, we were in the lecture theatre to see the solutions presented by each group. This was followed by the meeting of the evaluation committee and then the announcement of the winning groups and the award ceremony in the main foyer of the Faculty.



The title of the second hackathon was "Green Energy Transition of Slovenia," which also defined the scope and limitations of the solutions sought. Students were provided with current data on the national energy status, production, and consumption. Their task was to implement as many additional renewable energy sources as possible. Given that the solarisation process in Slovenia is proceeding relatively smoothly, they focused mainly on the transmission and storage of the energy thus obtained. One of the interesting solutions suggested was that by merely increasing the grid connection capacity of the Avče pumped storage hydroelectric power plant, its power or energy storage capacity could be significantly increased. Solutions also included the construction of the Kozjak pumped storage hydroelectric power plant, which could be connected directly to the nearby Drava River hydroelectric power plant. Solutions regarding the regime or timing of electric vehicle charging, which can relieve the grid, were highlighted again. This included V2L (Vehicle to Load) and V2G (Vehicle to Grid) solutions. Wind power plants were also envisaged at wind-exposed locations.

Approach to Incremental Comprehensive Building Renovation (06/03/2024)

From 6 to 10 March, the Dom trade fair took place at the Ljubljana Exhibition Centre. It is the country's largest specialised trade fair dedicated to home furnishing in the broadest sense of the word. Heat pumps and solar power plants were given a strong focus at the fair, due to the energy crisis and also climate change.



There is also a wide range of recuperation systems, presentations on thermal envelopes and everything else that has to do with making living conditions more comfortable.

A summary of all these areas was the topic presented at the fair by AURORA Ambassador Dr Gašper Stegnar from the Jožef Stefan Institute. His lecture, which was organised as an introductory presentation of the accompanying programme entitled "Approach to incremental comprehensive building renovation", attracted a large number of visitors. As the title suggests, the approach presented was the one that is most common in practice – the phased comprehensive approach to building renovation. Very few people think of a complete renovation of a building in one step. It can also be done in stages. However, it is a good idea to follow a specific order of steps so as not to hinder ourselves in the subsequent steps of a gradual renovation. Dr Stegnar presented an example of good practice that can help and inspire future phased investors.



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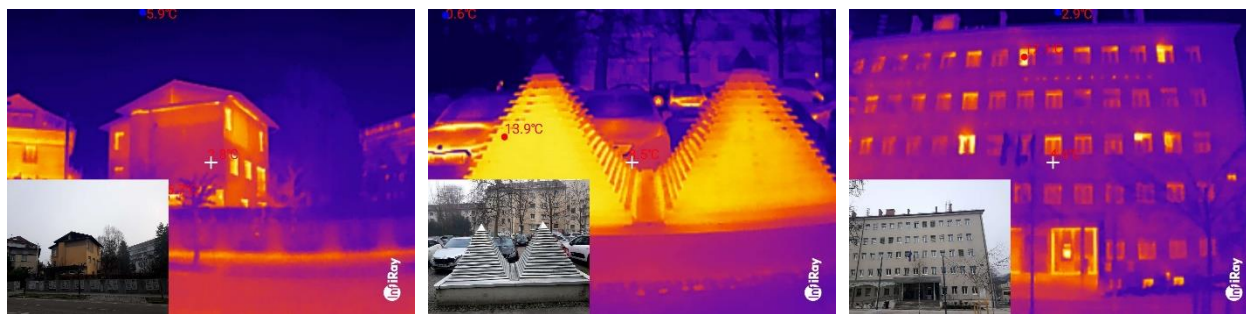
In a more relaxed two-way discussion towards the end of the presentation, it was suggested that such (non-commercial) presentations should also be organised at the local level. By engaging with local residents, it would be easier to implement sometimes quite simple solutions that require relatively little investment for significant energy and environmental benefits.

At the University of Ljubljana, the thermography activity was not organised as a thermography competition, but as a workshop in the form of an excursion around the centre of Ljubljana.

The thermography workshop was organised twice, on 27 February 2024 and, due to a sudden extreme cold snap, also on 18 April 2024. Both workshops were organised in a similar way, as a [guided tour through the centre of Ljubljana](#) to determine the heat losses of different buildings.

Some highlights that were discovered during the guided tour include:

- The cameras helped students to see the levels of insulation across different buildings in the city.
- They found that there was a lot of energy wastage coming from older buildings built in the “energy boom” period of the 1970s. They were also able to identify and compare these buildings with those that had been renovated to be more energy efficient.
- They discovered that renovation (including new thermal envelope) was more common in individual homes compared to public buildings.
- Amongst some of the most energy wasting buildings were important embassies, faculties and various national associations showing that the importance of buildings is not necessarily linked to concern for energy efficiency.



The camera that was used is the InfRay P2 Pro for Android phones.

The workshop led to new services being offered by the AURORA Ljubljana local energy community named ŠEK - Student Energy Club to all students of University of Ljubljana: [WATTOTEKA](#) (free rental of an electricity meter) and [TERMOTEKA](#) (free rental of a thermographic camera). In both services, the devices are borrowed on a one-week loan so the student can take the devices home and measure the energy efficiency of their homes.

The responses from students who were the first to borrow the thermal camera for home use have been interesting. Together with their parents, they finally saw the previously invisible – where most of their heat or energy was escaping. Comments included the suggestion that the use of thermal cameras should be mandatory, just as the annual visit from the chimney sweep is obligatory. In fact, this service could be provided by the chimney sweep to avoid complicating matters with an entirely new service.



Similarly, the same applies to electricity consumption meters. These are now so inexpensive that they should be present in every home. A student proposed that instead of distributing new LED bulbs, the local distributor should rather distribute electricity consumption meters – provided this does not conflict with their interests (?).

2.3.3 Impact of citizen engagement

Only through the involvement of citizens can we identify and recognise the obstacles encountered in implementing some of the already well-known solutions in the energy sector. People are mostly left to commercial education by companies whose primary goal is sales. These companies prefer to market their products as "miracle boxes" that you simply plug in and everything works. This is a highly condescending approach that reduces residents to completely uninformed consumers. One aspect that has been positively highlighted multiple times at our events is local energy offices. These are advisory systems operating at the local level, providing neutral advice not only concerning individual brands but also regarding approaches to heating, for example.

All the previously mentioned activities and events that we organised or co-organised had multiple objectives. They aimed to promote the AURORA project and empower participants in their involvement and activities related to energy awareness and environmental protection. Equally important was the recording of feedback and conclusions from the engaged citizens. This feedback highlights the crucial aspects we must consider when establishing a bottom-up approach. It reveals what the average person needs for their first step, encouragement, or engagement. Sometimes, these may appear as minor details, but they can be the essential first steps on the long staircase of gradual progress towards a green transition. In many cases, it could simply be access to information or the information itself.

We have collected all the feedback from the mentioned events and will use it in preparing the civic local roadmap.

2.3.4 Summary of key priorities in civic local roadmap

The feedback from participants who attended the mentioned events will assist us in preparing the civic local roadmap. These responses provide valuable insights that may initially appear less significant but are crucial in practice for actively engaging citizens in the green transition process. The civic local roadmap will be developed using an approach that, in addition to economic and technical aspects, will also incorporate cultural and social dimensions.

2.3.5 Further actions

After the thermography workshop, we arranged with some of the students to borrow a thermographic camera, as they wanted to see the heat loss in their own homes. Especially students staying in Ljubljana for the week were interested in borrowing it over the weekend.

Based on this very practical experience, which was developed after the thermal imaging workshop, we have decided that all students can borrow both the thermal imaging camera and the electricity meters to take home for the whole week.

In the end, to make it easier to present on social media, we named the issue with the meaningful names WATTOTEKA & TERMOTEKA. From the name it is possible to deduce what kind of service it is and what is the subject of the loan.

WATTOTEKA & TERMOTEKA allow thermographic cameras and electricity meters to be borrowed by as many students as possible, as this is an ongoing activity facilitated by the ŠEK Student Energy Club.



2.4 Demonstrator Site – Aarhus, Denmark

2.4.1 Introduction

In Aarhus, we started hosting citizen engagement activities since the early stage of the project. Though the format and topic of the activities vary, the main theme remains to raise awareness of renewable energy and energy consumption among citizens. Some of the activities are hosted as part of another event, for example, the solar-driven car race at the “Leisure Researcher for One Day” (Fritidsforsker for en dag in Danish) at the science museum, while some activities are organised as a separate event by themselves, for example, the public discussion on independence from Russian gas. Participants of these activities span across a wide range of age groups from school children to university students to working adults. In summary, over the last 30 months, we hosted and participated in more than 10 activities under WP4, which attracted participation of more than 600 people in total. Not all these activities are documented in this document, as D4.1 focuses on the activities that are relevant to developing the civic roadmap. Some activities such as thermal photography contests are described in deliverable D4.2.

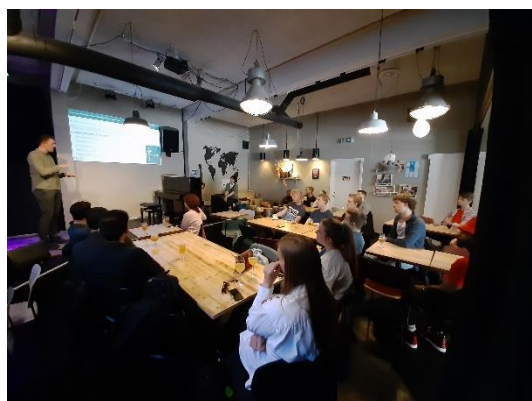
The activities under this Work Package, together with some sessions of the Citizen Researcher Meetings (WP1) help citizens better understand the concept and challenges of energy communities, as can be seen from the feedback from different events. Drawing from these activities, a local civic roadmap is drafted and attached.

2.4.2 Citizen engagement activities to develop civic roadmap

Below is a short summary of these citizen engagement activities that contributed to the development of civic roadmap. Some of them can be found on the local demonstrator [website](#) for AURORA together with other community events and dissemination activities.

1. Public discussion: preparing for the next winter and beyond, 25th April 2022

This activity aimed to engage university students and the general public to reflect on the relevance of energy systems in response to the war in Ukraine. The activity started with two short presentations from researchers from Aarhus University: one focused on the medium to long term implications of cutting Russian gas out from the European energy system, while the other focused on the wind and solar installation target in the Denmark Can Do More II package. Participants then had open discussions on various topics: what is required to be independent from Russian gas, whether the Danish parliament’s target of wind and solar installation is ambitious enough, etc. At the end of discussion, we presented energy communities as a tool engaging citizen in a green transition. About 30 people participated.



2. Meeting with the Futures Lab team at Aarhus Municipality, 2nd September 2022

On 2nd September 2022, we met with the Futures Lab team from Aarhus Municipality. Though this is not in particular a citizen engagement activity, we include it here, as the meeting is an important milestone in the process of developing the local civic roadmap. During the meeting, together with the colleagues from the municipality, we identified that the approach adopted in project AURORA has demonstrative value to help the municipality set more concrete goals and develop action plans for installing more solar photovoltaic panels on the rooftops of buildings in Aarhus. In fact, the outcome from this meeting helps us to set a general goal in the local civic roadmap.

3. Roundtable discussion: what is your role in the green transition, 31st May 2023

This roundtable discussion was organised for both citizens and AURORA project partners. The activity aimed to engage citizens by helping them to reflect on how they can take more ownership in the green transition. It started by a presentation by Erik Christiansen, founder of Copenhagen Solar Cooperative and Middelgrunden Offshore Wind Cooperative and co-author for the Handbook for Energy Communities. Erik shared the history of different types of energy cooperatives in Denmark and the current Danish legal framework for energy communities. Erik also stressed transparent communication as the recipe to successful engagement in energy cooperatives. Steen Luk from the Aarhus Wind Cooperative briefly introduced the on-going project to invite citizens to crowdfund the installation of wind turbines at the Aarhus harbour, followed by a quick update from the AURORA team in Aarhus on the status of the solar cooperative. 45 people participated in the discussion.



4. Visit to Avedøre Energy Community, 14th September 2023

As part of the Smart Energy Systems conference in Copenhagen, a technical tour to Denmark's first energy community was organised. 5 people from Aarhus University attended this tour together with conference participants from other European countries. At the tour, we learnt the framework of Avedøre Energy Community and what their challenges were. Seeing similar energy community projects in Denmark helped the participants to understand the common challenges faced by communities.





5. Case presentation to BSc course on user-driven design project, 21st February 2024

At this course for masters students, we introduced the solar cooperative Universitetets Energifællesskab F.M.B.A (UEF) to 120 students. We presented 2 questions as a case for the students to work on. The first question deals with engagement to citizens with the upcoming rooftop photovoltaic installation. We asked students' help to design a digital display system, which shows the real time energy production and engages people to reflect on their energy consumption behaviour. The second question deals with engagement activities to keep the community lively, after project AURORA ends. Students then had 8 weeks to work on proposals to these questions. Not all our questions were addressed through this exercise by students, but we later had discussions with some students on feasibility of installing electrical vehicle charging points connected to the rooftop solar installation. EV charging points fall out of the scope of project AURORA, but as a solar cooperative, UEF can take the discussion further to their general assembly.



6. Visit to Samsø Energy Academy and energy community on Samsø, 3rd May 2024

We organised a visit to Samsø Energy Academy (EA), which involved 12 participants. The visit started with an introduction of the work of EA and history of their community energy projects. Afterwards, the group visited demonstration at the Ballen harbour, which is an integrated energy system comprising of renewable energy production (wind and solar) and battery storage to balance the daily and seasonal fluctuations of demand for charging of electrical



vehicles and yachts. We also visited the district heating plant, which is jointly owned by local residents and the municipality's car park with rooftop photovoltaic.



7. UEF General Assembly followed by movie screening on community-owned energy (30th May 2024)

For this event, members of UEF showed up for the general assembly (including online participation), where we discussed issues specifically relevant to the association, e.g. progress of the rooftop PV installation, potential changes to the statutes. After the general assembly, the movie *We the Power*, which describes the movement of energy cooperatives and communities across different countries in Europe, was screened, and interested participants from the general assembly stayed on for this activity. A short discussion was held on how we can extend the initiative wider, to not only buildings in AU but also other communities in Aarhus, e.g. owners association of residents in a neighbourhood. It was mentioned that the framework and template for documentation developed through AURORA and UEF's founding process should be circulated and public available. 15 people attended the movie screening and the discussion.

2.4.3 Impact of citizen engagement

The main impact of citizen engagement activities in Aarhus is that more citizens get to know the concept of energy communities. Even though they do not necessarily join the local energy community as members, they gained better understanding on the role of citizens in catalysing the green transition. Some citizens became more engaged and



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101036418.

discovered other problems at the campus, for example, some students discovered the lack of electric car charging facilities on campus and started working on proposals to make changes. While the younger participants such as those before school age cannot act more actively yet, we believe they take the learnings from these activities and become more aware of energy related issues in the future.

Another impact of AURORA and its various activities is on the institutional level. After its initial climate strategy in 2020, which defines the climate target for the university, Aarhus University published a new climate action plan in 2024. In this plan, the inclusion of solar panels on relevant AU roofs is mentioned for the first time. The details on how to realise this is not yet released to the public, but since AU Green works closely with project AURORA team, we are confident that the implementation of the solar cooperative could be an inspirational case study.

These activities which allowed us to interact and engage citizens also produce findings and learnings, which are then crystalised into the civic roadmap on how the municipality can help to increase the presence of energy communities locally.

2.4.4 Summary of key priorities in civic local roadmap

The activities mentioned here, together with some Citizen Researcher Meetings, help us to draft a roadmap to the municipality. The key priorities in the roadmap focus on strategies to foster the growth of energy communities in Aarhus. We have identified the following strategies:

- Define concrete targets for rooftop photovoltaic (PV) capacity and energy community-based PV installed by 2030
- Development of municipality support channels
- Creating awareness
- Local capacity building
- Creating fast track to give citizens access to building information

The detailed roadmap is attached separately.

2.4.5 Further actions

As project AURORA continues, we plan to carry out more citizen engagement activities and repeat some of these that have been done but with different groups of participants. As mentioned in other deliverables, the solar cooperative UEF exists beyond the lifetime of project AURORA, and therefore will be carrying out activities to further engage its members and citizens in the nearby communities.

The roadmap is drafted based on the learnings from our own hands-on experience as well as learnings from various citizen activities. The next step will be to share this roadmap with other associations for feedback before we share with the relevant department in the municipality.



2.5 Demonstrator Site – Forest of Dean, United Kingdom

2.5.1 Introduction

Forest of Dean District Council declared a Climate Emergency in December 2018 and aims to make the Forest of Dean district carbon neutral by 2030. The Council is strongly committed to delivering The Climate Emergency Strategy and Action Plan 2022-2025 and has a Climate Team of officers and leadership at a political level by the Green Party. In September 2024 a review will commence to establish the effectiveness of the current strategy and plan. This will also include identification of outcomes and progress. Furthermore, a phase of community and stakeholder engagement will be undertaken to start to draft the next Climate Emergency Strategy and Action Plan. The work of the AURORA Project and Forest Community Energy, together with the work of Forest of Dean Community Action Partnership (FODCAP), Forest Climate Network, a series of Climathons and others, are key to influencing the Strategy and Action Plan and furthermore, the actions the Council needs to take to become carbon neutral by 2030.

Since the beginning of the AURORA Project and Forest Community Energy, community engagement work took place to develop a roadmap of priority asks, a call to action to the Council in order to support the activities needed to reach net zero by others in the district and actions that the Council can directly take in respect of its own operations.

2.5.2 Citizen engagement activity

Our civic roadmap has been developed from the engagement of citizens across a number of activities in WP1, 3, 4 and 5.

- **Community Drop Ins (November-December 2022).** These were initial citizen research meetings held at the start of the project where the team had open discussions with members of the public about opportunities and challenges for energy projects locally. These have been reported in D4.2. These events engaged with 50 citizens.

For the context of our civic roadmap, we learnt through these initial meetings that there was clear awareness amongst citizens that there is a need to reduce energy consumption and increase renewable energy generation significantly across the district, but that the story that is told about energy transition in the Forest of Dean is relevant to its people and its culture. There was also a clear concern over the inefficiency of the older housing stock in the Forest of Dean not being “fit for purpose”. It was clear from these meetings that local citizens have a great deal of energy awareness, and a clear idea of what can work and not work in the district.

- **Forest Energy Community Initiative workshops – December 2022 – September 2023.** These workshops were mainly focused on the development of our energy community, the review of different potential business models and discussions about the crowdfunding methods. They are therefore classed as WP3 events, however during these workshops, the FCE volunteers worked with the AURORA FoD team and Big Solar Co-op to develop a long list of potential sites for replication of AURORA in the Forest of Dean. By using the CSE-produced Solar Wizard tool and Big Solar Co-op’s expertise, the group have been able to narrow down a list of priority options for rooftop solar PV plants that could be developed beyond AURORA. The progression of this list of potential sites will be a feature of the civic roadmap. There were 11 meetings in total during this time, reaching up to 20 citizens.



What have we learned?



Presentation of key learnings so far at first FECEI workshop.

- **Forest Community Energy meetings – Oct 2023 – May 2024.** Following a step back from discussions about the legal constitution of the energy community and other WP3-related matters, the energy community meetings became more focused on planning other AURORA activities and debating a number of energy-related topics. These meetings are classed as WP1 and are therefore reported and described in further detail in D4.2 as citizen research meetings. There was in total 7 meetings reaching up to 20 citizens.

The topics that have been discussed in these meetings that have fed into our civic roadmap include:

- Using data to identify potential sites for rooftop solar in the Forest of Dean.
- How to support households to use thermography to identify potential solutions to energy inefficiencies in their homes.
- How to support households to access good quality and trusted energy advice locally.
- What are the challenges posed by grid infrastructure restrictions for the progression of new renewable energy generation projects in the district.
- What are the planning considerations we need to consider in the development of renewable energy generation projects and retrofitting of older homes.
- Lack of green skills and trades locally to deliver on net zero.

We learnt from these meetings that by using data, we were able to identify a wide range of roofs suitable for rooftop solar PV projects in the district but that data only tells part of the story - local volunteers are required to engage with building owners and do some “ground truthing” to progress solar PV projects. We also learnt that there is clear awareness amongst citizens that changes are needed to their homes to reduce their energy consumption and carbon footprint but there is a lack of awareness of who to go to for trusted advice. A big topic of debate has been the impact of renewable projects on grid infrastructure, and there is an interest from citizens to understand where the constraints are in terms of local grid capacity in the district. Another lesson has been the concern that citizens feel in terms of there being a lack of skilled traders locally required to support the district to decarbonise at pace and scale.





Group discussions on different energy-related topics at an in person FCE meeting in October 2023.

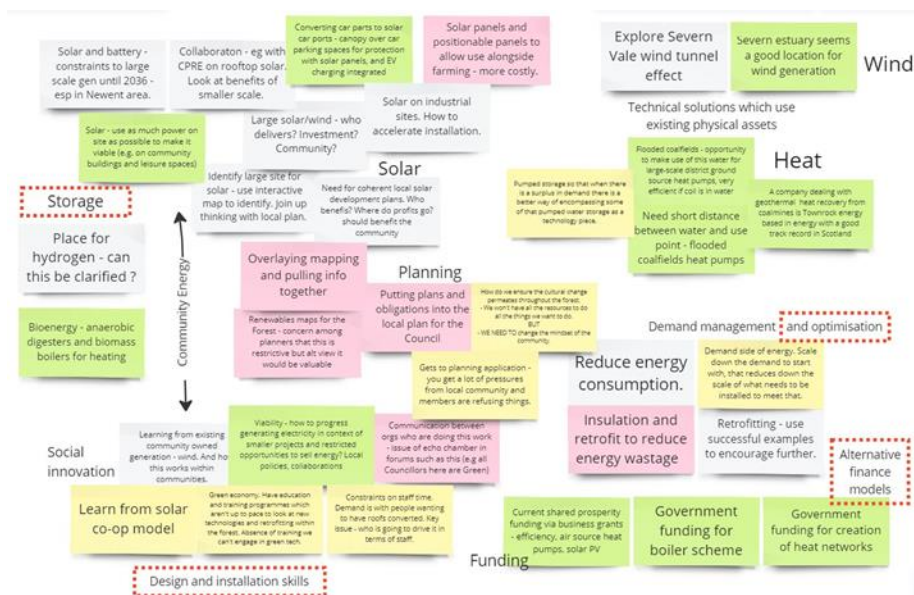
- **Forest Community Energy public engagement event – September 2023.** This was a citizen research meeting held for the public where various aspects of energy were debated across a range of activities to engage local residents. The event reached 40 local residents. As this counts as a WP1 citizen research meeting, it has been reported and described in further detail in D4.2.

For the context of the civic roadmap, this event highlighted a number of challenges and opportunities reflected by citizens to be featured in the roadmap including around the issues that local householders face in terms of retrofitting their homes, the appetite for community-level renewable energy plans and approach for doing this. The retrofit stories table was a big success, with many attendees saying that peer to peer learning and sharing of experiences when it comes to such a complex topic as housing retrofit is valuable and should be happening more in future events. The Future Energy Landscape workshop as a bottom-up approach to community renewable energy plans was successful with several attendees asking for more in-depth workshops on this in other parts of the district.

- **Training and workshop on delivering energy advice at a community level – January 2024**
This was an event that took place to support the thermographic activities being run in WP4. As this was more discussion focused, and less hands-on, it is reported as a citizen research meeting (WP1) and described in further detail in D4.2. The event was attended by 5 citizens. In the context of the roadmap, discussions that took place at this event highlighted the challenges and opportunities for households accessing energy advice locally and how we can enable a successful and replicable thermographic loan service. Learnings from this and the thermographic activities described in the section below will feed into our roadmap.
- **Rural Climathon webinar and workshop – April 2024.** These events are reported as WP4 and described in more detail in D4.2. These events brought together key stakeholders locally (included representatives from the council and our energy community as well as others such as grid operators and business owners). The events reached up to 40 citizens and key stakeholders. The Climathon was co-hosted by AURORA partners, the National Innovation Centre Rural Enterprise (NICRE) and the Countryside and Community Research Institute (CCRI) team at the University of Gloucestershire.



In the context of our roadmap, this event was key to discuss some of the challenges highlighted in previous events to other stakeholders and decision makers and co-develop solutions. Some of the highlights of this event that have fed into our roadmap include: the need for transparent grid constraint information to support renewable energy project developments, and the need for a one stop shop of energy-related advice and information for people to access.



The above is a digital post it note chart developed by attendees of the webinar to start discussions on challenges and potential gaps/solutions for low carbon/net zero energy transition in the Forest of Dean.



This flipchart shows the results of a voting process deciding what "solution" will get worked on during the Climathon.



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101036418.

- **Thermography activities and Energy Cafes – December 2023-April 2024.** From December 2023 to April 2024, the AURORA FOD team and FCE ran a series of thermography-related activities:
 1. Thermography demonstration event – December 2023. This was a hands on demonstration of thermographic cameras at a local community centre. The event reached 12 people. As a WP4 event, it has been reported and described in more detail in D4.2.
 2. Thermographic camera loan service pilot scheme – February 2024 – April 2024. Thermographic cameras were used by 10 local citizens over 3 months. This has been reported in more detail under D4.2. described in more detail under D4.2.
 3. Energy Cafes – Feb-March 2024. These two events reached 23 local citizens and are described in more detail in D4.2.

Feedback was sought through feedback forms and we ran some reflection sessions during citizen research meetings with our energy community. Key lessons are reported in D4.2. The following lessons are highlighted as important for the development of our roadmap:

- Thermography has been demonstrated as a useful and engaging tool for driving forward changes in behaviour and low cost actions to reduce energy wastage in homes and other community spaces. There is appetite for this to be made available across the district.
- Many older homes in the Forest of Dean have areas of heat loss that can be simply remedied through raising awareness of the low cost measures available to households (including draught proofing strips, hot water pipe lagging, repair of window frames, radiator reflector panels, downlight covers for uninsulated areas in the loft around light fittings).
- Lack of options for Forest of Dean residents living in inefficient older and traditional homes. These homes are difficult to insulate and sometimes impossible given strict planning regulations in the UK. When it is possible, it can be very expensive. Some residents expressed feeling scared of what the cameras will show as they can spot problems they cannot act on. Residents need to be supported to find sources of advice and funding to help install measures in their homes by signposting residents to local energy advice services.
- Severn Wye Energy Agency's Warm and Well service for fuel poor households is well known, however there is lack of awareness of services available for non-grant funded households (the "able to pay" market).

2.5.3 Summary of key priorities in civic local roadmap

Our civic local roadmap is titled "Forest Community Energy Priority Asks". The document is focused on energy as a key theme and is framed around areas that are important for our energy community and the citizens we have engaged with through our activities delivered under different work packages and reported above. The roadmap is split into three key priorities for Forest of Dean District Council to consider:

1. Increase rooftop solar PV projects in the Forest of Dean
2. Support households with retrofit and home energy advice
3. Support the growth of community energy activities in the Forest of Dean

Each priority is broken down into challenges, opportunities, and call to action for the Forest of Dean District Council. All of these points have been pulled out of discussions with citizens across the activities referred to in previous sections.



2.5.4 Further actions

Our intention is to have a review session with Forest Community Energy to discuss the roadmap and finalise it in the summer before we present it to the Forest of Dean District Council. It is important that we ensure the energy community feel they own the document.

The document will be presented to key decision makers at the council in time for their review of the council's Climate Emergency Strategy.



3 Conclusion

In summary, this report demonstrates the comprehensive, meaningful and substantial student and community engagement that has taken place since the beginning of the project, by all AURORA partners. The citizen engagement has been high quality and impactful across the board. It is clear that there is a great deal of enthusiasm and determination from citizens for green energy transition and broader sustainable development goals. This results in an aspiration for individuals themselves to change behaviour and lifestyle, and a recognition of the importance of institutions such as university administrations and local municipality authorities to take priority action.

A range of participatory and engagement techniques and formats were used by all AURORA partners with many different formats and locations (both online and presential). Both formal events (lectures, talks, debates), and informal events (stalls at events, social event discussions, community drop-in sessions), have gleaned a vast amount of information and data to create the foundation of each roadmap. It is also important to recognise that partnership working with other organisations, networks, associations, and co-operatives has added value and results to this work. All five AURORA partners have collaborated with a range of other local partners which has added increased knowledge, expertise and capacity to our citizen engagement endeavours. Key highlights and specific successes from each partner are as follows.

Madrid, Spain

The AURORA team in Madrid conducted thorough citizen engagement, workshops, sessions, and events to develop the roadmap. The roadmap will be a 'strategic sustainability plan' for the UPM Campus Sur. Crucially, this roadmap will inform the strategic planning and policy at the university in respect of sustainability. The 'priority actions' for teaching, research and infrastructure include social sustainability and environmental sustainability in the broader sense of Sustainable Development Goals (SDGs). Additionally, the call to action to improve the sustainability of daily activities on Campus Sur will be aimed at not only the UPM Rectorate but also Madrid City Council. There will be effective prioritisation in the roadmap based on importance and urgency.

Évora, Portugal

AURORA partners leading on citizen engagement and the road map in Évora delivered a vast number of vibrant events both at university premises (target audience students) and local community-based events within the city. A variety of formats were used such as masterclasses, workshops and debates. The 'Sustainable Action Group' was formed to tackle energy and sustainability. A strong partnership with SEYN (Sustainable Energy Youth Network) delivered successful engagement and is ongoing. The University of Évora is part of EU GREEN – an alliance that places social responsibility at the centre of its mission and is aligned with Sustainable Development Goals (SDGs). Topics have included energy capacity and sustainability in the campus, home photovoltaics and battery storage solutions, thermal systems for residential hot water, agrovoltaics and sustainable mobility. A focus on individual decarbonisation and strategic level decarbonisation for the historical centre of the city was developed. The roadmap will provide clear prioritisation measures for sustainability for the university and municipality.

Ljubljana, Slovenia

Effective youth participation techniques using a bottom-up approach established a very active and enthusiastic organisation to enable students' voices and ideas on sustainability to be heard. The Student Energy Club (ŠEK)



focuses its energy on renewable energy solutions, green transition and climate change awareness. A comprehensive range of workshops, lectures and discussions on topics such as sustainable living and e-mobility took place. The Hackathon 1.0 on innovative solutions to solar energy in the town of Medvode and the Hackathon 2.0 on green energy transition of Slovenia, focussing on transmission and storage, generated great ideas to incorporate in the road map. The competitive element to this format enhanced idea development and iteration. Both these events were in partnership with EESTEC (Electrical Engineering Students' European association). The importance of building renovation, incremental approaches and the installation of home heat pumps and solar power has been identified as an important part of the roadmap.

Aarhus, Denmark

Citizen engagement has been successfully delivered by AURORA partners since the beginning of the project in Aarhus. Common themes were raising awareness of renewable energy and energy consumption. A wide range of citizens have been involved, including school children, university students and adults. Important debates took place in energy security and national wind and solar installation targets set by the Danish parliament. Meetings with Futures Lab team at the Aarhus municipality has been of great value and has informed the roadmap, in addition to the workshops with students. Visits to other energy communities and green energy power plants in Denmark have helped highlight good practice and innovative ideas in practice. For the road map, specific problems and issues were identified at the campus such as the lack of electric car charging facilities. The roadmap will be a call to action for Aarhus University and to strengthen its Climate Strategy, and will, in addition, give key priorities for action for the municipality in respect of support and fast track access to building information to enable more rooftop solar.

Forest of Dean, United Kingdom

The focus of the roadmap in the Forest of Dean will be to influence the next iteration of Forest of Dean District Council's Climate Emergency Strategy and Action Plan. Since the beginning of the project, a wide range of community drop-in events, workshops, discussion groups and meetings took place and Forest Community Energy was formed. There has been effective partnership working to add value and enhance citizen engagement, with Forest of Dean Climate Action Partnership (FODCAP), Forest Climate Network (FCN) Big Solar Co-op, and via FCE hosted events. The Climathon, hosted in partnership with the National Innovation Centre Rural Enterprise (NICRE) and the Countryside and Community Research Institute (CCRI) team at the University of Gloucestershire, was particularly impactful. Emerging themes were reducing energy consumption, increase renewable energy generation across the district and the inefficiency of older housing stock. Support for households with access to good quality and trusted energy advice locally and lack of green skills and trades locally to deliver on net zero were highlighted. The roadmap, 'Forest Community Energy Priority Asks' will focus on three key priorities and actions for Forest of Dean District Council to take, to ensure a legacy for the AURORA project and sustainability for the district.



Copy of the roadmaps already available in final version

1. Forest of Dean District Council
2. Aarhus University

Forest Community Energy: Priority Asks



Priority 1:

Increase rooftop
solar PV projects
in the Forest of
Dean



Priority 2: Support
households with
retrofit and home
energy advice

Priority 3: Support
the growth of
community energy
activities in the
Forest of Dean



The following roadmap is aimed at Forest of Dean District Council. The roadmap has been developed by the AURORA FOD project team and Forest Community Energy. The roadmap has been developed using the findings from citizen engagement events, and discussions with key stakeholders throughout the course of the AURORA project so far. The roadmap is split into three key priorities. Each priority outlines key opportunities, blockers and challenges, and actions.

Priority 1: Increase rooftop solar PV projects in the Forest of Dean

Opportunities

- There is support from Forest of Dean residents for non-domestic rooftop solar PV projects (these types of projects are more favourable than large scale ground mounted solar farms) and bulk buying schemes to encourage more domestic rooftop solar and make it more affordable and accessible for households.
- A list of potential sites for rooftop Solar PV has been co-produced with Big Solar Coop, FCE and the Centre for Sustainable Energy. Once confirmed, these will collectively provide 447kWp, save the organisations 55t per year in carbon emissions, and half a million pounds in energy bills over the next 20 years. Some of these sites have already been assessed as not viable for Big Solar Coop but can potentially be passed onto Gwent Energy CIC and/or Gloucester Community Energy to develop further. Some sites are suitable to host panels under the Big Solar Coop model but require local volunteer support to progress further to site design and building owner engagement.
- Forest Community Energy volunteers are keen to progress new projects, and several are working actively with Big Solar Coop to develop new sites for solar PV.

Blockers and challenges

- Multi-stakeholder and legal complexities – complex land and building ownership and tenancy structures can make rooftop solar PV projects challenging to progress. In some cases, there is uncertainty in who owns the building, land, or who the tenant is, meaning that support from lawyers is often required and the process can take a long time.
- Community energy groups may have the drive and good will to progress new projects but often lack the time, technical and legal knowledge as well as experience to progress more complex projects. Maintaining engagement and retaining volunteers can be challenging and requires coordination.
- There are grid capacity issues in the North of the district that could prevent new projects from being developed.
- There is a lack of capacity in the local market for solar PV installations which will make it challenging to install solar PV at the scale and pace required to reach net zero.
- Changes to planning regulations mean that some systems (over 50kWp) require an application for 'Prior Approval' from the local planning authority. This is a new regulation which applies for non-domestic solar PV systems that would usually be classed as "Permitted Development". This may delay the progression of new installations.
- There are many traditional and potentially listed buildings in the Forest of Dean, which require additional planning compliance. This may limit the potential size/feasibility of rooftop solar on these buildings.

Key actions

- Support new community energy groups (such as Forest Community Energy) with: effective knowledge gathering at the beginning of projects (in particular transparency around ownership and tenancy structures for council owned buildings and land), training to develop legal and technical capacity and skills, paid project management support to build relationships with land owners and decision makers, manage legal processes and funding to develop new projects. One way of doing this would be to employ someone at the council with a key role in coordinating and supporting community energy practitioners locally.
- Support the development of community led renewable plans which feature rooftop solar. An approach that could be used is [Future Energy Landscapes](#).
- Engage with landowners, building owners and tenants in non-domestic buildings across the district to highlight the benefits of rooftop solar. Ensure that messaging is targeted to appeal to different motivations such as reduction in energy bills, reduction in carbon emissions and support of the overall decarbonisation of electricity in the district.
- Build the local market for solar installations – this could include funding training opportunities for new tradespeople and engaging the Forest Economic Partnership.
- Ensure that grid capacity issues in the Forest of Dean are considered in the development of the Gloucestershire Local Area Energy Plan and that transparency and training on grid constraints are provided to community energy practitioners by National Grid Electricity Distribution.
- Support the developed relationship that FCE and FDDC have with Big Solar Coop from the AURORA project to help progress larger scale rooftop solar PV projects in the district – this could include encouraging local people to invest in the Big Solar Coop share-offer, sign up as volunteers to develop new projects or progress existing ones, and engage local building owners to get in touch if they are interested in hosting PV systems.
- Ensure the Forest of Dean District Council planning department are made aware of the new regulation around applications for ‘Prior Approval’ for solar PV systems under Permitted Developments to ensure unnecessary delays are avoided.
- Ensure that supportive policies for rooftop solar (including community-owned rooftop solar) are included in the local plan for Forest of Dean – including policies in support of community owned schemes.
- Lobby national government for stricter planning regulations encouraging rooftop solar on new developments, and more lenient planning regulations to support rooftop solar installations on traditional/listed buildings.
- Support the development of local bulk buying schemes (for example, working with the [Solar Together](#) scheme) to enable households to access solar PV in a more affordable way.
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Priority 2: Support households with retrofit and home energy advice

Opportunities

- Existing energy advice provider – Severn Wye Energy Agency – can provide households with advice on energy efficiency and accessing grants for home improvements and low carbon measures. The Warm & Well service is well established and known about locally.
- Forest Community Energy members are interested and keen to support households with relevant information to take on energy efficiency and saving behaviours and home improvements.
- The AURORA project and Forest Community Energy have piloted a thermal imaging camera loan service which resulted in positive feedback from a local community centre and residents. There is enthusiasm for a roll out of this service to other parts of the district – something which will be progressed by the AURORA project going forward.

Blockers/challenges

- There is a lot of information and offers coming from national government, local installers, advice organisations and community groups – in some cases, local residents have expressed a lack of trust and confusion over the spread of misinformation (particularly online) and potentially the selling of services from “cowboy installers”. This is potentially having a counter-productive impact on the willingness of households to engage in the retrofit of their homes and services available locally.
- There is a lack of skilled tradespeople to deliver retrofit at the scale and pace required for the district’s transition to net zero.

Actions

- Help to promote the services offered by Severn Wye Energy Agency and others to help local households understand what they can access. For example, it has been noted that whilst the services on offer for fuel poor or grant funded households is known locally, there are many that are not aware of the services on offer for the able to pay market or landlords. Forest of Dean District council can promote more information and advice services aimed at able to pay market, landlords, and people in off-gas and traditional properties.
- Support the development of a one-stop shop of information on energy efficiency and energy saving tips, grants and services for home energy efficiency surveys and improvements. This one-stop shop should be online and in person and include outreach to ensure that everyone in the district is accessing information.
- Support the roll-out of a thermal imaging loan service from public buildings such as libraries following a similar model to what Forest Community Energy and the AURORA project piloted from the Sling & District Recreation Club (and what services developed by South Gloucestershire and North Somerset councils).

- Support community groups to run their own thermal imaging loan services by enabling access to local funding and training to develop these services.
- Support the development of a local market for retrofit including the skilling up of tradespeople through funded training opportunities (working with the Forest of Dean Economic Partnership, University of Gloucestershire and Accxel Construction School), run or support local community groups to run “meet the installer” events.
- Support peer to peer learning locally by running or supporting local community groups to run Green Open Homes style events – council can support with engagement, funding, coordination.

Priority 3: Support the growth of community energy activities in the Forest of Dean

Forest Community Energy is a network of local residents in the Forest of Dean who have a mutual interest in driving forward local energy projects and supporting households access information and support to save energy in their homes, reducing costs and cutting carbon emissions. The group has been set up and supported by the AURORA project.

Forest Community Energy, and potentially new community energy groups, have the passion to develop and run projects that could support the council’s activities to decarbonise electricity and heat at scale across the district, as well as support residents to take on actions in support of a transition to net zero (such as retrofitting their homes, or investing in local solar projects).

The council can support them (and other community energy groups and practitioners) with:

- Access to paid coordination and project management support.
- Funding to develop projects, including for feasibility studies for larger capital projects
- Connections to key stakeholders and new project “enablers” locally including building owners, planning department, Big Solar Coop, and other local installers...
- Training and capacity building particularly around: technical and legal aspects of renewable projects, governance and legal incorporation, retrofit and energy efficiency skills (including for traditional buildings).

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Local civic roadmap Aarhus

In the scope of project AURORA, various activities have been held with the aim of engaging citizens and raising their awareness of energy-related issues. In particular, we focused on energy communities as a tool catalyzing the European energy systems with active citizen participation. In Aarhus, there is already a climate action plan of achieving carbon neutrality by 2030. However, there is little mention of installing solar panels on the rooftops of buildings in the city, despite the emphasis on switching to renewable energy sources. In addition, active involvement of citizens through tools such as energy communities is not specifically mentioned in the plan.

In order to address this gap and share our learnings from project AURORA, this roadmap is drafted. The roadmap is mainly drafted by team members of project AURORA, drawing from our own experiences setting up an energy community at Aarhus University, combined with learnings from various engagement activities, including visits and discussions with citizens who are interested in the topic or who have had experience setting up energy communities in Denmark. These activities have been described in the main D4.1 report.

The goal of this roadmap is to list and prioritize strategies that will help the municipality to grow citizen engagement through energy communities. Below is a summary of the strategies that we have identified.

- Define concrete targets for rooftop photovoltaic (PV) capacity and community-based PV installed by 2030

Even though the newly-built buildings are already starting to include rooftop solar PV systems during the construction stage, there are great amount of older buildings in Aarhus, which have great potential for rooftop solar PV installations. The municipality should make feasibility studies to investigate how much rooftop in the city is available for the installation of PV systems, taking consideration of the orientation of buildings, surrounding environment, age of buildings, etc. A concrete target for PV capacity installed by 2030 should be defined from these feasibility studies. Among the rooftop PV capacity, a target for community-owned PV installation should be included.

- Development of municipality support channels

As citizens form energy communities, professional help is required, e.g. legal expert who is familiar with the legal framework can provide knowledge at the starting stage. Since not all bottom-up communities have the necessary resources to hire a legal consultant, it is advisable that such support rests with the municipality, possibly within a dedicated team. Currently there is no such team at the municipality, so it is advisable that the municipality starts to form a team or engages associations such as Vedvarende Energi.

Another support channel that the municipality can further develop and provide is a crowdfunding platform which is compatible with energy communities. Right now, Aarhus municipality already provides crowdfunding platform for projects that are initiated by citizens. Based on our discussion with the team who develops and runs the platform, this platform does not necessarily support the set-up of energy communities or cooperatives.

To the best of our knowledge, other commercial crowdfunding platforms available in Denmark do not support the constitution of energy communities either. Further improvement of the existing crowdfunding platform to include possibility for energy communities or development of new platform can be the next action for the municipality to take up.

The third support channel that the municipality can further develop or improve is the allocation of funding or other support for citizen groups who are keen to initiate their energy community projects. As communication is important in the constitution of energy communities, such funding support can help citizens to organize activities to engage fellow community members, such as neighbors, to get involved in the community project in the early stage.

- Creating awareness

In our opinion, awareness spans across different sectors. Most importantly, we should focus on raising awareness among citizens on energy communities as an opportunity for them to be part of the green transition regardless of availability of resources. This requires the municipality to disseminate information and knowledge about successful cases of energy communities. Secondly, it is important to raise awareness among industry practitioners, e.g. solar installation contractors. The reason for this is due to the unique structure of community energy projects. In the crowdfunding process, usually a subscription to shares, also called a reservation process, is carried out, before the project cost or size is finally confirmed. Participants of energy communities are asked to initially contribute a small amount to indicate their interest in the project, and this indication is non-binding. As the core team finds out the project cost and adjusts the project size, participants may decide to not continue with the project anymore, which in turn affects the project size. Awareness on how community energy project is organized and henceforth flexibility with the interaction between energy communities and installation companies should be well understood, and the municipality can carry out various activities to pave the way for this.

- Local capacity building

Based on our own experience and discussions with others who had set up energy communities, dedicated personnel with appropriate knowledge is usually required at the start-up stage of the communities. Therefore, local capacity building and training is important. Possible actions for this strategy include but not limited to: development and circulation of guidelines and templates, courses or workshops, visits to other energy communities, etc. In particular, a step-by-step guide on how to create an energy community will be helpful. Templates for documentations, for example, statutes of energy cooperatives, documents for reserving and buying shares, should be created and stored on public accessible portal.

In addition to the guideline and documentation template, the municipality can invite people who have experiences with energy communities to workshops and courses, in order to facilitate the sharing of experiences and lessons learnt. One such group of experts are from Samsø Energy Academy. As part of project AURORA's contribution to this, we plan to invite the Future Labs in Aarhus municipality and citizens involved in the

newly formed energy community (“Sol over Brabrand”) in Aarhus to share our own learnings.

- Creating fast track to give citizens access to building information

In the process of evaluating feasibility for rooftop solar photovoltaic installations, certain information of the building is required, e.g. drawings of the roofs, original static calculations. Even though some building information is already available on the digital archive, it is difficult to find such information for older buildings, which is the majority of the building stock in the city. As a result, citizens have to write to the municipality to request for such information, and the response time could take up to a month or longer. As a solution to this, we suggest a fast track to access building information be established, e.g. dedicated email account where citizens could write such requests to, or even further digitalization of the building documentation archive.

In summary, we identified main strategies that the municipality can adopt to foster the constitution and growth of energy communities in the Aarhus region. Even though citizens are the main drivers of in the movement of energy communities, certain support from the municipality makes the process easier, e.g. legal advisers and funding support to kick start the engagement activities. In addition, the municipality should focus on capacity building and raise awareness to encourage citizens to take part in the movement.

It is worth mentioning that at the time of submitting this document, this draft roadmap is yet to be reviewed and finalized by other citizen groups and associations in Aarhus.