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TWINNING TO SUSTAINABLE ENERGY TRANSITION

WP3: VIRTUAL TECHNICAL TRAINING, DEVELOPMENT OF SOFT SKILLS & VISIBILITY

DELIVERABLE 3.4 – Report on Citizen Engagement Events & Policy Roadmap

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History of changes

Version Number	Date	Brief Description of changes
1.0	9/3/26	First version
1.1	23/3/26	Second version incorporated the results from the Final Conference
1.2	30/3/26	Final version incorporated feedback by all partners

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Executive summary

This document responds to the commitment in the Description of Action to report on citizen-oriented engagement activities and to formulate a roadmap that gives a direct role to policy makers, high-emitting sectors and citizens in the sustainable energy transition. In the original project design, particular emphasis was placed on dialogue with energy communities in Crete, possible synergies with Europe Direct, and the wider societal acceptance of geothermal energy, carbon capture and storage (CCS), and geological hydrogen storage.

TWINN2SET implemented citizen and public engagement through a broader portfolio of formats than originally foreseen. A particularly representative example was the citizen-engagement workshop organised during the 40 Years FORTH celebration, which combined keynote speeches with a public photography exhibition on sustainable energy transition and climate change, as well as a cultural programme, thereby expanding the project's outreach beyond conventional workshop formats. Alongside the dedicated citizen-engagement event organised in Chania in September 2023 in the context of the 40-year anniversary of FORTH, the project and the Institute of Geoenergy/FORTH reached wider audiences through open workshops, public exhibitions, Researchers' Night participation, conference and webinar presentations, specialist media coverage, FORTH scientific retreats, collaborative dissemination with other European projects, participation in the Regional Committee for Hydrogen in Crete, and a final Short Conference on Geoenergy and Energy Transition.

This broader engagement portfolio also included the two TWINN2SET Summer Schools, which functioned not only as capacity-building actions but also as outward-facing stakeholder engagement formats. The 1st Summer School on Energy Transition, organised in Chania on 1–5 July 2024, combined technical and non-technical lectures, interactive workshops and joint lectures delivered in collaboration with the 2nd Hydrogen Summer School in Kozani, thereby creating a clear synergy with the Green Skills for Hydrogen initiative and its coordinator (CLuBE). The 2nd Summer School on Energy Transition & Geothermal Energy, held in hybrid form from 30 June to 4 July 2025, further broadened this role by bringing together students, researchers, experts and stakeholders through lectures, laboratory visits and knowledge exchange. This cross-project synergy was further formalised through the MoU signed on 1 July 2024 between FORTH/IG and CLuBE to connect TWINN2SET and Green Skills for Hydrogen through joint upskilling and reskilling activities, common keynote hybrid speeches and joint dissemination actions.

This broadened approach is consistent with the project's quadruple-helix logic and with the wider communication strategy foreseen in the application, which targeted citizens, energy communities, industry, policy makers, financial actors and the scientific community.

The policy roadmap proposed is organised around six pillars: (i) governance and regulatory readiness, (ii) research, data and testing infrastructure, (iii) industrial uptake and regional demonstration, (iv) social acceptance and citizen engagement, (v) skills and human capital for the green economy, and (vi) finance and market formation. The recommendations are intentionally framed for Greece and Crete, but are also relevant to wider European cooperation in geothermal energy, CCS and underground hydrogen storage. The roadmap

emphasises that scientific excellence alone is not sufficient: ***sustained transition requires public trust, regulatory clarity, investment mobilisation, place-based innovation ecosystems and credible channels for dialogue between research institutions, industry, public authorities and citizens.***

1. Introduction and purpose

TWINN2SET was conceived as a capacity-building and networking action to strengthen the scientific excellence, visibility and policy relevance of the newly established Institute of Geoenergy / FORTH in the interconnected domains of geothermal energy, carbon capture and storage, and underground hydrogen storage. The application made clear that energy transition is not only a technical or scientific challenge. It is also institutional, economic and social. For that reason, the work plan included both citizen engagement and policy-oriented outputs, culminating in Deliverable D3.4.

The purpose of this report is therefore twofold. First, it documents the citizen engagement and broader public-facing activities through which the project communicated its themes and results beyond the core scientific consortium. Second, it translates the project's experience and evidence into a policy roadmap for a fair, regionally grounded and innovation-oriented sustainable energy transition, with specific attention to the Greek and Cretan context.

The document deliberately treats “citizen engagement” in a practical and evidence-based manner. It reports not only the single event as a citizen-engagement action, but also the broader set of open, public or policy-facing events that helped TWINN2SET engage non-academic stakeholders. This framing is useful because the project's implementation appears to have expanded beyond the narrow format of community dialogues and moved toward a richer mix of exhibitions, public lectures, open workshops, public science events and collaborative dissemination.

2. Citizen engagement in the original TWINN2SET design

The TWINN2SET application placed citizen engagement within Work Package 3. Task 3.3 explicitly stated that sustainable energy transition cannot become inclusive or mainstreamed without the active support of communities and citizens, especially in relation to technically sensitive themes such as geothermal energy, CCS and hydrogen storage. The original plan foresaw two interactive dialogue events targeting energy communities in Crete, with the Minoan Energy Community mentioned as an indicative example. The application also envisaged an additional event in synergy with Europe Direct, where climate and energy transition topics already form part of the agenda.

The same task also foresaw the development of a roadmap for sustainable energy transition that would include a list of recommendations and assign a direct role to high-emitting sectors, policy makers and citizens. The ultimate aim was to provide a pathway for fair transition, national wealth generation and wider exploitation of high-skilled employment opportunities linked to the green economy.

The proposal's wider dissemination and communication logic reinforces this design choice. The targeted audiences explicitly included heavy-emitting industries, regional and national policy makers, financial actors, energy communities in Crete, and the wider public. The communication plan further mentioned local press, European events, local exhibitions and

fairs, and participation in MSCA and Citizens / Researchers' Night. In other words, D3.4 sits at the intersection of outreach, dialogue, policy uptake and public legitimacy.

3. Implemented citizen engagement, public outreach and policy-facing events

Table 1 below distinguishes between core citizen-engagement actions and complementary public-facing activities that broadened the project's societal reach.

Date / period	Activity	Format and audiences	Contribution to D3.4
03.10.2022	Workshop on "Gender aspects of energy transition"	Open workshop in Chania; public/social dimension of energy transition	Early project-level engagement on fairness, inclusion and societal dimensions (20-25 participants)
21.07.2023	Online webinar: How to prepare a successful proposal for widening actions	Open online webinar; research and policy-oriented audience	Positioned TWINN2SET publicly as a case study in widening and energy transition
28.09.2023	Citizen-engagement workshop during FORTH 40-year anniversary celebrations	Public-facing event in Chania, in Greek; linked to climate change and energy transition	Core documented citizen-engagement activity under Task 3.3 (over 40 participants)
2022 & 2024	FORTH Scientific Retreat participations	Institutional scientific retreat with exhibition/open-public components	Broadened visibility of TWINN2SET within FORTH and to external audiences
2023–2025	External conference, webinar, summit and media presentations	Public, professional and policy-facing audiences; specialist media readers	Extended visibility and policy dialogue on hydrogen and energy transition
1–5 July 2024	1st Summer School on Energy Transition	5-day summer school in Chania; students, young researchers, experts and external stakeholders; included joint lectures with the 2nd Hydrogen Summer School in Kozani	Training-based public and stakeholder engagement; strengthened outreach on energy transition themes and created formal synergy with Green Skills for

			Hydrogen / CLuBE (30 participants)
27.09.2024	Researchers' Night participation	Public science event; general public, students, families, https://researchersnight.gr/en/2024-3/	Science communication and awareness-raising
26.09.2025	Researchers' Night participation	Public science event, https://researchersnight.gr/en/2024-3/	Continuation of public outreach trajectory
28-30.11.2025	Innovation Days / InnoDays participation	Exhibition / innovation-outreach format	Broader public and innovation ecosystem engagement (approx. 60-70 visitors from our booth)
30 June–4 July 2025	2nd Summer School on Energy Transition & Geothermal Energy	Hybrid summer school; students, researchers, experts and stakeholders; lectures, lab visits and knowledge exchange	Consolidated the project's skills-and-engagement dimension and extended dialogue on geothermal energy and sustainable transition beyond the core consortium (35 participants)
07.2025	Participation in the Regional Committee for Hydrogen in Crete	Regional governance interface linking authorities, research bodies, chambers and stakeholders	Policy-facing implementation path for dialogue on hydrogen and transition in Crete
30.06.2025	Joint DESSERT–TWINN2SET workshop: Synergies for Impact	Open workshop with roundtable and Q&A; researchers, stakeholders, policy/industry audiences	Strengthened policy-facing dissemination and public showcase dimension (approx. 15 participants)
31.07 & 09.09.2025	TWINN2SET–DESSERT Memorandum of Understanding	Formal cooperation instrument for joint dissemination, knowledge exchange and events	Strengthened sustainability and cross-project outreach synergies
19.03.2026	Final short conference on Geoenergy and Energy Transition	Final conference / public-policy dialogue format	Culminating event for project achievements and roadmap discussion (approx. 50 participants)

3.1 Early public dialogue on the social dimension of transition

Although the workshop on “Gender aspects of energy transition” belongs formally to the soft-skills workstream rather than Task 3.3, it is still relevant for D3.4 because it addressed

the fairness and inclusiveness dimensions of sustainable transition from the outset of the project. The workshop was announced as the first project workshop and was hosted in cooperation with the Technical University of Crete. In policy terms, it helped establish that the transition should be evaluated not only through technical feasibility but also through questions of equity, participation and social justice.



FORTH
INSTITUTE OF ECONOMICS

1st TWINN2SET Workshop on Gender aspects

Monday October 3rd

Gender aspects of energy transition
The transition to low-carbon energy systems is essential to meet global commitments to mitigate climate change. However, greening energy systems does not necessarily make them fairer, more inclusive, or more equitable. It is indeed essential to understand how widespread low-carbon technologies affects gender equality and social justice. It appears that renewable energy projects alone are not sufficient to achieve gender and social justice, as energy interventions do not automatically address structural dynamics in socio-cultural and socio-economic contexts. If existing power asymmetries related to access and distribution of resources are not addressed early on, the same structural inequalities will simply be repeated and transferred to new energy systems. TWINN2SET will shed light to these issues by having dedicated workshops that will attempt to give answers to:

- How energy poverty can be eliminated by increasing women's access and control over sustainable energy products and services
- How countries and regions can reshape their policy to have more gender-responsive energy access
- How access to productive resources can be increased by women-owned and -led businesses
- How women working in the energy sector can have a successful career advancement through workplace policies and practices support recruitment
- How continuous monitoring and policy formulation can empower gender equality in energy sector

15:30 – 15:50: Welcome & introduction to the workshop series
Prof. R. Gholami, UIIS

15:50 – 16:30: Section 1 - Empowering Women
- *Prof. Vasiliki Geropanta, Chair of the TUC Gender Equality Committee*
- *Dr. Maria Klapa, Chair of the FORTH Gender Equality Committee*

16:30 – 17:30: Section 2 - Energy Future and Women Leadership
- *Prof. Sofia Stamatakis, President of the FORTH/IG Scientific Committee*
- *Dr. Evi Batra, President of the ASSOCIATION of GREEK WOMEN SCIENTISTS*

17:30 – 18:30: Section 3 - Young Woman in Energy Sector
- *Prof. Dora Luz Marin Restrepo, University of Stavanger*
- *Mrs. Vayanna Makri & Mrs. Chrysoula Tallarou, FORTH/IG ESRs*

18:30 – 19:00: *Summing up – end of workshop 1*

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Figure 1: 1st Workshop on Gender Aspects

3.2 Public visibility through open webinars and conference presentations in 2023

Already in the first year of implementation, TWINN2SET speakers participated in public-facing conferences and webinars. The project newsletter records presentations at the 8th Balkans Energy Summit, the Hydrogen & Green Gases Forum, the online webinar on successful widening proposals, and the 2nd International Conference on Raw Materials and Circular Economy. The publications list further confirms an intervention by the Coordinator Mr. Emmanuel Stamatakis in the widening-actions webinar on 21 July 2023, as well as talks on hydrogen, training needs and the role of renewable gases in transportation.

Already in the first years of implementation, TWINN2SET speakers participated in public-facing conferences, webinars and specialist media outputs, such as

- presentations at the 13th FORTH Retreat 2022, the 8th Balkans Energy Summit, Energy Norway 2023, the Hydrogen & Green Gases Forum, the online webinar on successful widening proposals, and the 2nd International Conference on Raw Materials and Circular Economy.
- Coordinator's intervention in the widening-actions webinar on 21 July 2023 and his presentations on hydrogen-related transition topics in 2023.
- Public visibility was strengthened further through the Innovation News Network article on TWINN2SET and through hydrogen-related presentations by Dr Stamatakis at the Hydrogen Summit / Boussias conference series in 2023 and 2025.

Taken together, these actions show that TWINN2SET used external forums, sectoral events and specialist communication channels to familiarise wider audiences with its themes and

to position FORTH/IG within the policy-relevant debate on hydrogen, CCS, geothermal energy and subsurface storage.

3.3 Core citizen-engagement event under Task 3.3

On Thursday 28 September 2023, within the framework of the 40 Years Anniversary of FORTH, the 1st TWINN2SET Workshop on citizen engagement took place at the Vlissidis Theatre in Chania. The event was conceived as an open, public-facing outreach action combining keynote speeches, dialogue on sustainable energy transition, and cultural activities aimed at broadening societal engagement.

In addition to the keynote interventions, a public photo exhibition was co-organised with photographs taken by FORTH/IG staff on the theme of sustainable energy transition and climate change. The event was also accompanied by a live piano concert for the silent film *City Lights* by Charlie Chaplin, thus creating an interdisciplinary format that linked science, society and culture. The keynote speakers of the event were the President of FORTH, Professor Nektarios Tavernarakis, and the Scientific Director of IFPEN, Dr Olga Vizika-Kavadia.

This broader design substantially enhanced the citizen-engagement dimension of the action, as it created a more accessible and attractive setting for the wider public and connected energy-transition discourse with visual and cultural means of communication.



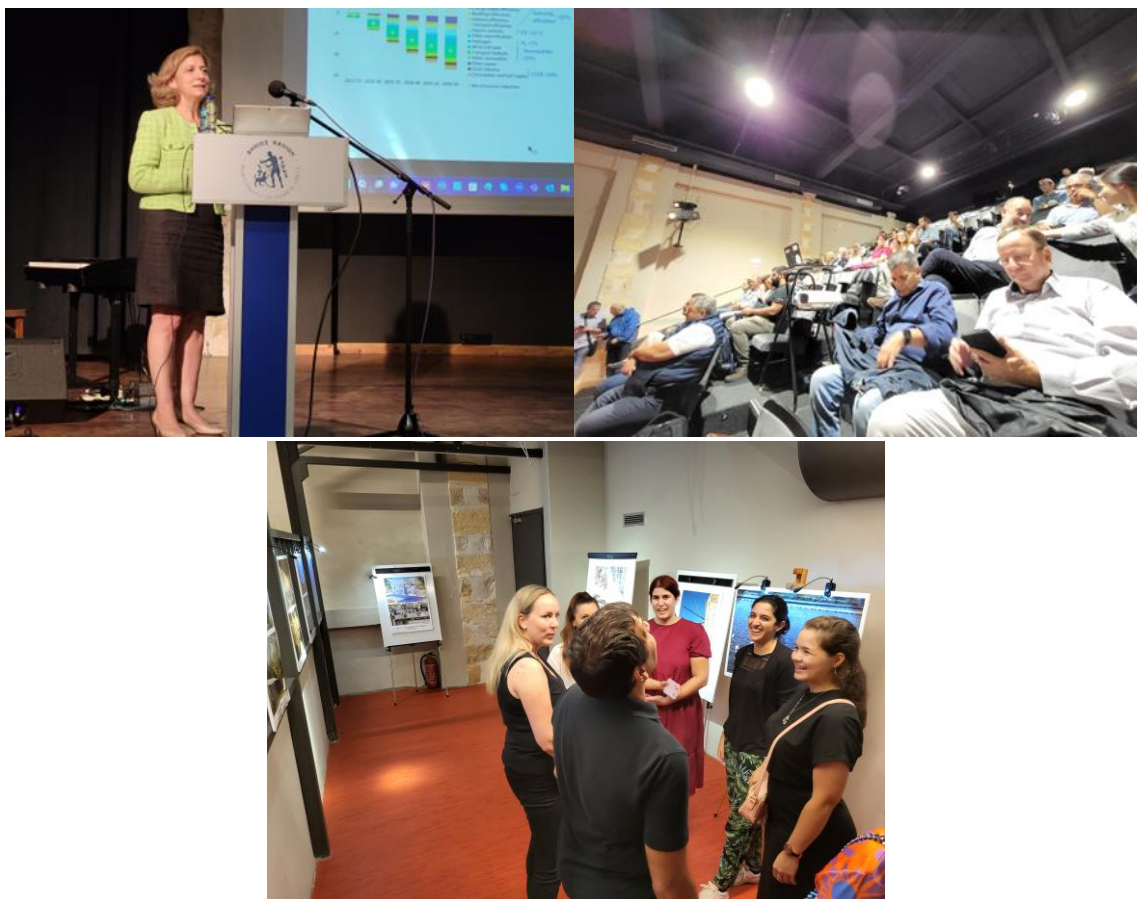


Figure 2: 40 Years Anniversary of FORTH

3.4 Researchers’ Night as a science communication channel

FORTH/IG decided to participate every year in Researchers’ Night and that, in the 2024 edition, more than 3,000 people visited FORTH’s premises, including the institute’s booth and posters. TWINN2SET-related presentations were communicated to the general public. This pan-European science event became a recurring channel for public awareness-raising on sustainable energy-transition themes. Researchers’ Night is particularly valuable because it reaches school pupils, students, families and members of the wider public who would not normally attend a specialised energy conference or technical workshop.



Figure 3: Researchers’ Night

3.5 Exhibitions, fairs, Innovation Days and FORTH retreats

The application anticipated participation in local exhibitions and fairs as part of the project's social engagement and communication strategy. FORTH/IG has participated in open workshops and exhibitions, explicitly mentioning Innovation Days as part of its outreach profile. The Innodays event was open to general public and took place between the 28-30 of November 2025 at the International Exhibition Center of Crete in Gournes, Heraklion Crete. Approximately 60-70 visited our booth during the 3-days event .



Figure 4: Innodays

In addition, TWINN2SET-related visibility was strengthened through active participation in the 13th FORTH Scientific Retreat in Heraklion in July 2022 and the 14th FORTH Scientific Retreat in Ancient Olympia in October 2024. These retreat formats were not limited to internal scientific exchange: they also included exhibition or open-public components and served as platforms for showcasing FORTH research achievements, discussing synergies and situating TWINN2SET within a wider institutional and societal context. Together, these formats demonstrate that TWINN2SET moved from narrow project communication into broader innovation-facing and public-science visibility.

3.6 Summer Schools as training-based stakeholder and citizen engagement

Although the Summer Schools were primarily conceived as training and capacity-building actions, they should also be recognised in D3.4 as part of TWINN2SET's broader citizen- and stakeholder-engagement strategy. This is because they opened the project to audiences beyond the core consortium and created structured opportunities for knowledge exchange with students, young researchers, experts and external stakeholders.

The 1st Summer School on Energy Transition was organised in Chania on 1–5 July 2024 (73 online registrations) by FORTH/IG in collaboration with the Technical University of Crete. Its five-day programme combined technical and non-technical lectures, interactive workshops and joint lectures held in collaboration with the 2nd Hydrogen Summer School organised in Kozani. The project's own dissemination material explicitly acknowledged the collaboration with the Green Skills for Hydrogen team and CLuBE, showing that the event served not only educational purposes but also cross-project outreach and ecosystem building. This synergy was reinforced institutionally through the MoU signed on 1 July 2024 between FORTH/IG and CLuBE. The MoU explicitly aimed to connect TWINN2SET with the Green Skills for Hydrogen project through joint upskilling and reskilling programmes in energy transition and hydrogen, common keynote hybrid speeches during the Summer Schools, and joint dissemination actions.



Figure 5: 1st Summer School

The 2nd Summer School on Energy Transition & Geothermal Energy (44 online registrations), held in hybrid form from 30 June to 4 July 2025, confirmed the continuity of this approach. According to the project website, the event included lectures, laboratory visits, knowledge exchange and participation by speakers, experts, researchers, stakeholders and students. In that sense, the Summer Schools contributed not only to internal competence development, but also to the outward-facing visibility, stakeholder dialogue and public legitimacy objectives that underpin Deliverable D3.4.



Figure 6: 2nd Summer School

3.7 Cross-project public showcase: the DESSERT–TWINN2SET workshop

The joint workshop “Synergies for Impact: DESSERT & TWINN2SET Projects” was held on 30 June 2025 and included project presentations, a roundtable discussion on mutual benefits, an open Q&A session, and wrap-up remarks. The accompanying speech provided by IG/FORTH presents the event as the first joint workshop between the two projects and explicitly highlights shared dissemination, public showcases, policy relevance and the need to build support among SMEs, stakeholders and policy makers. The importance of this event lies less in classical citizen dialogue and more in the project’s maturation toward outward-facing, stakeholder-oriented communication on hydrogen and safe underground storage. This collaboration was subsequently strengthened through a signed Memorandum of Understanding between TWINN2SET and DESSERT, which commits the parties to enhance scientific and educational outcomes, increase visibility and impact through joint dissemination, share non-confidential knowledge and good practices, and organise joint events such as workshops, seminars, fairs, lectures and webinars.

3.8 Final short conference on Geoenergy and Energy Transition

The TWINN2SET application envisaged a one-day final conference aimed at scientists, policy makers, stakeholders and the private sector, including presentations of project achievements, scientific advancements, testimonies from researchers, inputs from advanced partners and the advisory board, and a roundtable on the potential of geothermal energy, CCS and hydrogen storage to enable energy transition. A final short conference on Geoenergy and Energy Transition was successfully organized at the ‘Grand Arsenal’ in Chania on Thursday 19th of March 2026. The event (67 online registrations) was successfully completed with over 50 participants (postgraduate, undergraduate and PhD students, researchers and Post-Docs, employees at the private and public sector and general public). As the project’s closing event, it provided a natural setting to present achievements, discuss the post-project role of FORTH/IG, and connect scientific outcomes with policy and stakeholder perspectives on geothermal energy, CCS and hydrogen-related transition

pathways. This was a highly culminating event where scientific, stakeholder and policy dimensions converged.

Thursday March 19th

Short Conference on Geoenery and Energy Transition

Organizing Committee:
-Prof. Ioannis V. Yentekakis (Director of FORTH/IG), Dr. Spyridon Bellas (Principal Researcher at the FORTH/IG), Dr. Emmanuel Stamatakis (Researcher at the NCSR, Coordinator of TWINN2SET), Dr. Evangelia Gontikaki (Researcher at the FORTH/IG), Mrs Chrysoula Tallarou (PhD Fellow TUC-FORTH/IG)

09:00: Registration
(Moderator: Dr. Emmanuel Stamatakis, Coordinator of TWINN2SET)
10:30-11:00 Welcome -Dimitris Gournis, Professor at TUC & Deputy Director of the FORTH/IG , & Ms. Valente Correia Paula, Project Officer of TWINN2SET Project
11:00-11:30 Jorgo Chatzimakakis CEO, Hydrogen Europe (virtual)

Session 1 - (Moderator: Dr. Emmanuel Stamatakis, Coordinator of TWINN2SET)
11:30:11:45 Dr. Emmanuel Stamatakis, Coordinator of TWINN2SET Project & Researcher at the NCSR, "The TWINN2SET project: Twinning to Sustainable Energy Transition"
11:45-12:05 Dr. Spyros Bellas, Principal Researcher at the FORTH/IG, "Underground hydrogen storage in salt domes of Greece: Geological suitability and prospects for exploitation"
12:05-12:35 Vasilis Gaganis, Associate Professor at NTUA, Ms Renata Kanakaki & Mr Ntemis Diplas (PhD Candidates at NTUA) "Recent advances in optimizing CO2 storage in subsurface reservoirs"
12:35 -13:05 Break

Session 2 - (Moderator: Dr. Spyros Bellas, FORTH/IG)
13:05-13:25 Dr. Georgia Charalampous (Postdoctoral Researcher at the FORTH/IG) & Ms Polyanthi Trimi (Research Associate at the FORTH/IG), "Taxonomic and functional prediction analysis of microbial communities from a geothermal field of interest (Aedipos- Illa)"
13:25- 13:55 Alejandro Escalona Varela, Professor at UIS " Energy security, transition, and climate goals in the Norwegian Continental Shelf, lessons learned from the NCS2030 national petrocentre"
13:55-14:15 Ioannis Vakalas, Assistant Professor at NTUA, "Workflow for Static Modeling of Geological CO2 Storage: The example of the Mesohellenic Basin, Greece"
14:15-14:30 Break

14:30- 15:30 Round table on Geoenery transition (Moderator: Dr. Emmanuel Stamatakis, FORTH/IG)

15:30-15:45 Closing

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Figure 7: Conference agenda



Figure 8: Short Conference on Geoenery and Energy Transition, 19.03.26

3.9 Overall assessment of implementation

Compared with the original DoA, implementation appears to have shifted from a narrow interpretation of citizen engagement, focused mainly on direct dialogue with energy communities and possible Europe Direct synergies, toward a broader ecosystem approach. This broadened implementation is not a weakness. On the contrary, it reflects how a newly established institute can create legitimacy: **by combining targeted dialogue, science communication, specialist media, local visibility, public-facing speaking contributions, regional governance interfaces and stakeholder-oriented events**. In practice, the project complemented the initial idea of energy-community dialogue in Crete with participation in

the newly established Regional Committee for Hydrogen in Crete and complemented the idea of Europe Direct synergies with active collaboration across other European projects, open webinars and sectoral events. The resulting portfolio is well aligned with the project's wider objectives of international visibility, policy uptake, quadruple-helix interaction and long-term sustainability.

4. Main lessons emerging from the engagement process

First, public engagement on geothermal energy, CCS and underground hydrogen storage works best when the technologies are not presented as isolated technical solutions but as part of a wider regional development story. The project materials repeatedly connect sustainable transition with jobs, skills, research capacity, industrial decarbonisation and regional opportunities. This framing is more concrete and more relatable for citizens than purely technical descriptions.

Second, social acceptance cannot be taken for granted for subsurface technologies. The project application itself already recognised skepticism among citizens and reluctance among policy makers and investors. The engagement material confirms the practical consequence: communication must address safety, environmental performance, local relevance and long-term benefits in accessible language, and it must do so repeatedly across different formats.

Third, hybrid engagement formats are especially valuable. TWINN2SET combined workshops, cultural/public events, science fairs, conference talks, webinars and cross-project showcases. This diversification is important because different audiences enter the transition debate through different doors: students through Researchers' Night, regional stakeholders through public events in Crete, policy actors through conferences and project showcases, and broader publics through exhibitions, local media and open workshops.

Fourth, collaboration amplifies reach. The DESSERT-TWINN2SET workshop is a good example of how cross-project synergies can extend visibility and translate project results into wider stakeholder conversations. For a capacity-building action such as TWINN2SET, this matters because one of the most durable impacts of the project is not only the science produced, but the networks created around the science.

Fifth, citizen engagement and policy roadmapping should not be treated as separate exercises. The main value of D3.4 is precisely to show that **public dialogue informs the policy pathway**. Concerns heard in public-facing settings about fairness, safety, cost, regulation, trust and regional opportunity, should shape policy recommendations rather than sit in a stand-alone communication chapter.

The experience of the 28 September 2023 event also showed that hybrid science-and-culture formats, such as combining expert talks with public exhibitions and artistic activities, can increase accessibility and public interest in sustainable energy transition themes.

5. Policy roadmap for sustainable energy transition

5.1 Rationale

The TWINN2SET application identified already five major categories of barriers relevant to the adoption of geothermal energy, CCS and underground hydrogen storage: infrastructure and site availability, economic barriers, insufficient regulatory frameworks, social barriers, and market issues. The policy templates reviewed for this draft reinforce the usefulness of structuring recommendations either by thematic pillar or by stakeholder group. For the present deliverable, both approaches are combined.

The roadmap below is designed for the Greek and Cretan context but remains compatible with wider European objectives. It assumes that sustainable transition in this field depends on three parallel conditions:

- I. credible science and testing capacity;
- II. place-based public legitimacy; and
- III. a policy framework that reduces uncertainty for industry, investors and citizens.

5.2 Strategic vision

Greece, and Crete in particular, should build a place-based energy transition model in which geothermal energy, carbon management and hydrogen technologies are developed responsibly, communicated transparently, and embedded in regional innovation ecosystems that connect research organisations, policy makers, industry, finance and citizens.

5.3 Pillar I – Governance and regulatory readiness

- Develop a clearer national and regional policy framework for geothermal development, carbon management and underground hydrogen storage, including permitting pathways, environmental safeguards and public information requirements.
- Create structured consultation channels between research institutions, ministries, regulators, regional authorities and municipalities so that new scientific knowledge can be translated faster into policy and administrative practice.
- Use policy roadmaps and guidance notes to reduce uncertainty for early movers, especially in areas where technology readiness is increasing faster than the regulatory framework.
- Embed stakeholder and citizen dialogue requirements into future demonstration and pilot actions so that social acceptance is not treated as an afterthought.

5.4 Pillar II – Research, data and testing infrastructure

- Support the consolidation of FORTH/IG and similar institutions as national reference points for scientific evidence on subsurface energy systems, environmental impacts and risk assessment.
- Invest in laboratory, modelling and monitoring infrastructure that can produce credible evidence on caprock integrity, geochemical interactions, microbial effects, storage safety and environmental performance.

- Encourage open-data and FAIR-oriented practices for non-sensitive project outputs, in order to improve transparency and reproducibility and to support evidence-based public debate.
- Promote interdisciplinary collaboration linking geosciences, engineering, environmental sciences, economics and social sciences.

5.5 Pillar III – Industrial uptake and regional demonstration

- Launch or support regional pilot and demonstration initiatives that connect research findings to practical use cases relevant to Greece, such as industrial decarbonisation, resilient island systems, and clean hydrogen value chains.
- Create stronger interfaces between FORTH/IG, high-emitting industries, utilities and transport actors so that scientific knowledge can be translated into technology options and investment pipelines.
- Use demonstration projects to generate both technical evidence and public trust, especially in sensitive areas where citizens want proof of safety and local relevance.
- Encourage standards development, shared practices and project-to-project learning at national and European level.

5.6 Pillar IV – Social acceptance and citizen engagement

- Treat public engagement as a continuous process, not as a single event. Science communication, open workshops, exhibitions, local press, citizen dialogues and public showcases should be planned as a coherent portfolio.
- Frame communication around benefits, risks, safeguards and local opportunities in plain language, especially when discussing subsurface technologies that may appear abstract or unfamiliar to non-specialists.
- Work systematically with schools, universities, local authorities, energy communities and civil-society actors to build literacy on the role of subsurface systems in the green economy.
- Maintain visible annual participation in public science events such as Researchers' Night and regional innovation days, using them as platforms for dialogue rather than one-way promotion.

5.7 Pillar V – Skills, training and human capital

- Align education and training with the practical needs of the green economy, including geothermal systems, reservoir characterisation, hydrogen technologies, carbon management, environmental monitoring and science communication.
- Use MOOCs, summer schools, internships and public lectures not only for internal capacity building but also as mechanisms to prepare the future workforce for emerging transition sectors. In the TWINN2SET experience, Summer Schools also proved to be effective engagement instruments, because they linked skills development with wider stakeholder outreach and enabled concrete synergies with other European initiatives, most notably Green Skills for Hydrogen through the collaboration with CluBE and the related MoU.

- Support gender-responsive and inclusive training pathways so that the energy transition expands opportunity rather than reproduces existing inequalities.
- Encourage mobility and co-supervision schemes with advanced European partners to accelerate institutional maturity and researcher development.

5.8 Pillar VI – Finance and market formation

- Mobilise regional, national and European financing instruments for early-stage pilots, research infrastructure and transition-oriented innovation ecosystems.
- Strengthen dialogue with banks, investors, venture actors and public funding bodies so that technically promising transition options are not blocked by information asymmetries or perceived risk.
- Develop stronger techno-economic and business-case evidence for geothermal, carbon management and hydrogen-related applications relevant to Greece.
- Link public funding to clear societal value: emissions reduction, regional development, resilience, knowledge creation and quality employment.

5.9 Recommendations by stakeholder group

Stakeholder group	Priority recommendations	Expected contribution
National government and regulators	Clarify policy frameworks; align permitting and safety rules; support pilots and public information mechanisms.	Reduced uncertainty, faster uptake, higher credibility.
Region of Crete and local authorities	Use regional planning and public dialogue to connect transition technologies with local development priorities and community needs.	Place-based legitimacy and stronger local ownership.
Industry and high-emitting sectors	Engage early with research organisations; explore demonstration opportunities; co-define needs for decarbonisation pathways.	Faster translation from research to use cases.
Research organisations and universities	Strengthen interdisciplinary work, open science practices, and public communication capacity.	Higher-quality evidence and more trusted knowledge.
Financial actors	Develop familiarity with geothermal, CCS and hydrogen opportunities; support projects that combine	Improved access to capital and more realistic business cases.

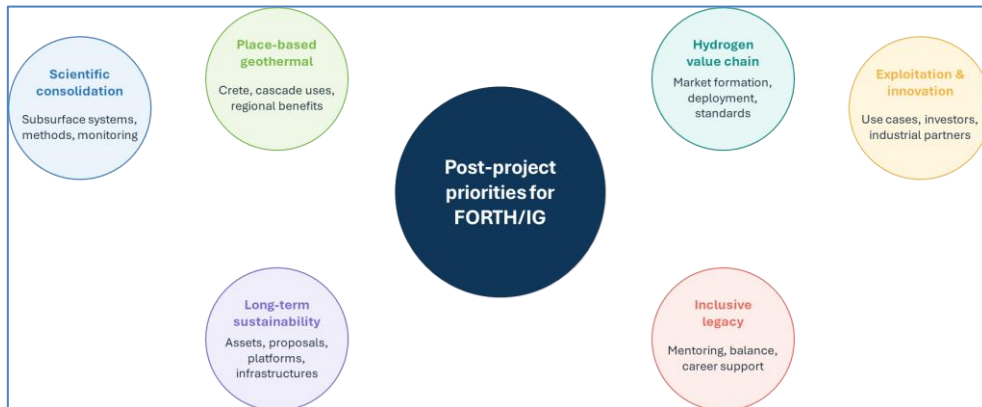
	technical credibility with societal value.	
Energy communities, civil society and citizens	Participate in structured dialogue, public events and consultation processes; raise local concerns and expectations early.	Higher trust, better-informed decisions, fewer social blind spots.

5.10 Indicative implementation policy roadmap

Horizon	Priority actions	Lead actors	Indicative result
0–2 years	Complete pilot roadmaps, public communication plans, evidence repositories, and structured stakeholder forums.	FORTH/IG, ministries, Region of Crete, project partners	Improved readiness and shared agenda.
2–5 years	Develop regional pilots and stronger research–industry–policy interfaces; expand targeted skills programmes.	Research organisations, industry, regulators, funders	Visible transition ecosystem and demonstration evidence.
5+ years	Scale successful pathways, institutionalise consultation practices, and embed subsurface energy solutions within wider transition planning.	National/regional authorities, industry, research ecosystem	Durable policy coherence and broader societal acceptance.

The feedback received from AB (see deliverable D1.1) confirms that TWINN2SET closure should be treated not as an endpoint, but as a transition toward a more durable institutional positioning of FORTH/IG. Across their individual recommendations, several common priorities emerge. First, the Institute should continue consolidating its scientific niche in subsurface energy systems, especially geological hydrogen storage, CO2 storage and geothermal energy. Second, greater emphasis should now be placed on deployment relevance, industrial demand, infrastructure interfaces, standards and regulatory certainty, so that project knowledge can contribute to real adoption pathways. Third, the exploitation dimension of the project should be strengthened by translating scientific knowledge into clearer innovation, business and investment propositions. Fourth, the project’s legacy should include stronger place-based strategies for Crete and Greece in general, linking subsurface expertise and geothermal resources with regional development priorities and societal involvement. Finally, the Board highlighted that gender inclusion should remain a

visible and structural priority in the post-project phase, with practical mechanisms supporting the active participation and advancement of women scientists and professionals in the energy-transition ecosystem in Greece. These priorities are well aligned with the original exploitation and policy logic of the project.

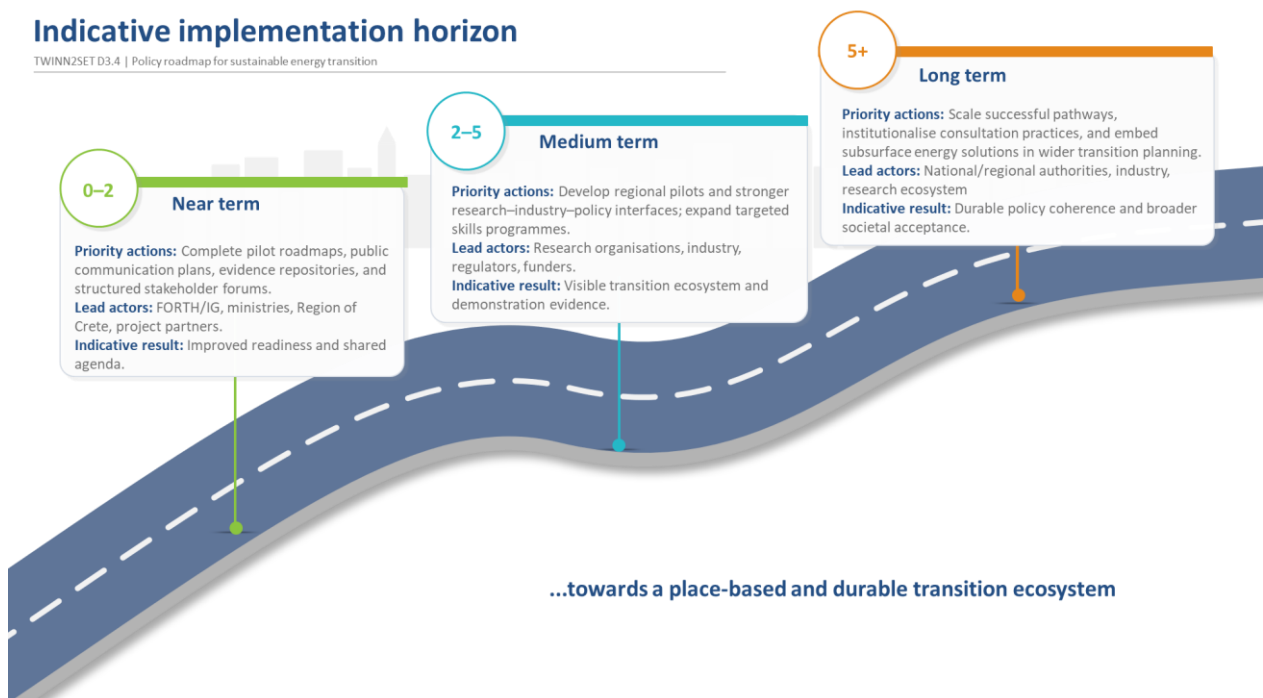


Advisory Board conclusions at a glance - TWINN2SET is moving from capacity building to strategic consolidation, with science, place, markets, innovation, sustainability and inclusion acting as mutually reinforcing priorities.

Overall, AB feedback confirms that TWINN2SET has laid important foundations for future scientific, policy and innovation impact. The challenge for the Consortium, and especially for the Coordinator, is now to build on these foundations through strategic follow-up actions, long-term partnerships, stronger interfaces with industry and policy makers, continued citizen and stakeholder engagement, and the systematic embedding of inclusion and sustainability in the Institute’s next phase of development. This is fully consistent with the project’s ambition to bridge science, policy, industry and society in support of sustainable energy transition.

Indicative implementation horizon

TWINN2SET D3.4 | Policy roadmap for sustainable energy transition



6. Conclusions

The central conclusion is that TWINN2SET has contributed not only to scientific capacity building, but also to the gradual construction of a public and policy conversation around geothermal energy, CCS and hydrogen-related transition pathways. The project's engagement practice suggests that societal acceptance and policy readiness can be strengthened when research institutions communicate consistently, engage beyond their core scientific community, and connect technological themes to local and regional development narratives.