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Lantern



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Executive summary

The SWEET consortium Lantern is a national research consortium dedicated to advancing Switzerland's energy transition through real-life experimentation, stakeholder engagement, and interdisciplinary collaboration. Anchored in Switzerland's Energy Strategy 2050 and Long-Term Climate Strategy, Lantern promotes energy sufficiency, efficiency, and renewable integration across living, working, and leisure environments.

By mobilizing eleven thematic and transversal work packages (WPs) and operating in five Living Labs across Switzerland, Lantern tests co-designed interventions tailored to local contexts. These interventions address sustainable mobility, retrofitting and housing, smart energy use, low-carbon tourism, flexible working models, and energy communities. The consortium brings together researchers, municipalities, industry partners, and civil society actors through inclusive, participatory methods.

Over the past three years, Lantern has established solid foundations for Living Lab governance, methodological harmonisation, and capacity building—facilitating over 20 experimental interventions. Highlights include a behavioural shift observed in Winterthur's 31-day mobility challenge, the launch of the Treeps app for low-carbon travel, participatory retrofitting strategies in Geneva and Lucerne, and the development of tools like the Mountain Tourism Fresco and Persona profiles to better target user engagement.

Lantern's vision is to accelerate a just, participatory, and systemic energy transition. Through collaborative tools, real-world interventions, and stakeholder-driven design, it aims to bridge science and society, ensuring energy transition solutions are not only innovative but equitable and actionable.

Zusammenfassung

Lantern ist ein nationales Forschungskonsortium zur Förderung der Energiewende in der Schweiz mittels praxisnaher Interventionen, dem Einbezug von Stakeholdern und interdisziplinärer Zusammenarbeit. Verankert in der Energiestrategie 2050 und der langfristigen Klimastrategie der Schweiz fördert Lantern Suffizienz- und Effizienzstrategien sowie die Integration erneuerbarer Energien in den Bereichen Wohnen, Arbeiten und Freizeit.

Mit elf thematischen und transversalen Arbeitspaketen (WPs) und fünf Living Labs in der ganzen Schweiz testet Lantern gemeinsam entwickelte und an lokale Kontexte angepasste Interventionen. Diese umfassen nachhaltige Mobilität, Gebäudesanierung, intelligente Energienutzung, kohlenstoffarmen Tourismus, flexible Arbeitsmodelle und Energiegemeinschaften. Das Konsortium bringt Forscherinnen und Forscher, Städte, Industriepartner und zivilgesellschaftliche Akteure mit inklusiven und partizipativen Methoden zusammen.

In den vergangenen drei Jahren hat Lantern eine solide Grundlage für die Governance von Living Labs, die methodische Harmonisierung und den Kompetenzaufbau geschaffen - und mehr als 20 experimentelle Interventionen ermöglicht. Zu den Highlights zählen die beobachteten Verhaltensänderungen durch die 31-Tage-Mobilitäts-Challenge in Winterthur, die Lancierung der Treeps-App für klimafreundliches Reisen, partizipative Sanierungsstrategien in Genf und Luzern sowie die Entwicklung von Instrumenten wie dem Mountain Tourism Fresco und den Personas zur gezielten Nutzeransprache.



Die Vision von Lantern ist es, die Energiewende gerecht, partizipativ und systemisch zu beschleunigen. Mit kollaborativen Tools, Interventionen in der Praxis und praxisorientiertem Ansätzen will das Konsortium eine Brücke zwischen Wissenschaft und Gesellschaft schlagen - für Lösungen, die nicht nur innovativ, sondern auch fair und umsetzbar sind.

Résumé

Lantern est un consortium national de recherche dédié à faire progresser la transition énergétique en Suisse à travers des expérimentations concrètes, la mobilisation des parties prenantes et la collaboration interdisciplinaire. Ancré dans la Stratégie énergétique 2050 et la Stratégie climatique à long terme de la Suisse, Lantern promeut la suffisance énergétique, l'efficacité et l'intégration des énergies renouvelables dans les cadres de vie, de travail et de loisirs.

En mobilisant onze paquets de travail thématiques et transversaux (WPs) et en opérant cinq Living Labs répartis en Suisse, Lantern teste des interventions co-conçues adaptées aux contextes locaux. Ces interventions portent sur la mobilité durable, la rénovation et l'habitat, l'usage intelligent de l'énergie, le tourisme bas carbone, les nouveaux modèles de travail et les communautés énergétiques. Le consortium rassemble chercheurs, collectivités, partenaires industriels et acteurs de la société civile autour de démarches inclusives et participatives.

Au cours des trois dernières années, Lantern a établi des bases solides en matière de gouvernance des Living Labs, d'harmonisation méthodologique et de renforcement des capacités – permettant plus de 20 interventions expérimentales. Parmi les faits marquants figurent des changements de comportement observés lors du défi mobilité de 31 jours à Winterthur, le lancement de l'application Treeps pour des voyages bas carbone, des stratégies de rénovation participative à Genève et Lucerne, ainsi que le développement d'outils comme la Fresque du tourisme de montagne et les profils Persona pour mieux cibler l'engagement des usagers.

Lantern porte une vision d'une transition énergétique juste, participative et systémique. À travers des outils collaboratifs, des interventions concrètes et une conception guidée par les parties prenantes, il vise à rapprocher la science et la société, en garantissant des solutions à la fois innovantes, équitables et applicables.

Riassunto

Lantern è un consorzio di ricerca nazionale dedicato ad accelerare la transizione energetica della Svizzera attraverso sperimentazioni reali, il coinvolgimento degli attori locali e la collaborazione interdisciplinare. Ancorato alla Strategia Energetica 2050 e alla Strategia Climatica a lungo termine della Svizzera, Lantern promuove la sufficienza, l'efficienza e l'integrazione delle energie rinnovabili negli ambiti della vita quotidiana, del lavoro e del tempo libero.

Mobilitando undici pacchetti di lavoro tematici e trasversali (WPs) e operando attraverso cinque Living Lab sul territorio nazionale, Lantern testa interventi co-progettati e adattati ai contesti locali. Gli ambiti di intervento includono mobilità sostenibile, riqualificazione delle abitazioni, uso intelligente dell'energia, turismo a basse emissioni, nuovi modelli di lavoro e comunità energetiche. Il consorzio riunisce ricercatori, enti pubblici, partner industriali e attori della società civile attraverso approcci inclusivi e partecipativi.



Negli ultimi tre anni, Lantern ha costruito solide basi per la governance dei Living Lab, l'armonizzazione metodologica e la formazione delle competenze, facilitando oltre 20 interventi sperimentali. Tra i principali risultati figurano i cambiamenti comportamentali osservati durante la sfida dei 31 giorni sulla mobilità a Winterthur, il lancio dell'app Treeps per i viaggi a basse emissioni, strategie partecipative di riqualificazione a Ginevra e Lucerna, e lo sviluppo di strumenti come il Mountain Tourism Fresco e i profili Persona per migliorare il coinvolgimento degli utenti.

La visione di Lantern è quella di accelerare una transizione energetica giusta, partecipativa e sistemica. Attraverso strumenti collaborativi, interventi sul campo e processi progettuali guidati dagli stakeholder, il consorzio intende costruire un ponte tra scienza e società, offrendo soluzioni innovative, eque e realizzabili.

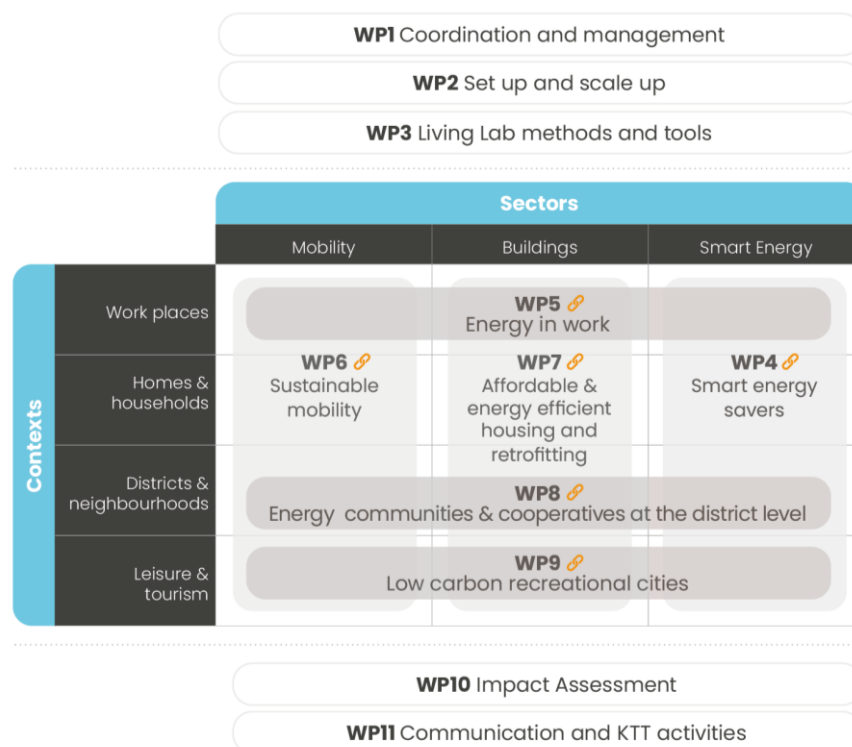


1 Work programme overview

Lantern (“Living Labs as Interfaces for the Energy Transition”) is an interdisciplinary and transdisciplinary consortium that develops and tests real-world interventions to accelerate Switzerland’s energy transition. Its overarching goal is to produce actionable, participatory solutions for decarbonisation by focusing on energy sufficiency, efficiency, and renewable integration in urban and regional contexts.

The consortium includes 17 academic partners and 5 Living Labs (in Lucerne, Lugano, Sion, Winterthur, and NEST-EMPA). The partnership spans engineering, social sciences, environmental sciences, policy, architecture, and urban planning, fostering collaboration across disciplines and sectors.

Work Packages Structure



The programme embeds co-creation with stakeholders through the Living Lab Integrative Process (LLIP), user-centred tools like Personas, and feedback loops that link empirical interventions with conceptual models.



2 Progress of activities

The third year marked a transition from problem exploration to implementation and early-stage evaluation. Key developments included:

- **Living Lab Set-Up and Intervention Planning:** All five Living Labs completed their set-up phases. Medium-term interventions are being defined with stakeholders, leveraging a proactive, participatory planning process.
- **Methodological Harmonisation:** WP2 and WP3 developed capacity-building platforms and a shared toolbox (including the Morphological Box and the Persona Tool). Reflexive monitoring and storytelling methodologies were introduced to enhance learning.
- **Interdisciplinary Collaborations:** Scenario planning and survey alignment between WP4, WP5, and WP6 fostered cross-sectoral analysis of energy use at home, work, and for mobility.
- **Stakeholder Engagement:** Engagement strategies were tailored using the “What’s in it for me?” (WIIFM) approach. For example, the Lucerne Campus LL launched a student competition, while Sion LL facilitated dialogues between city officials, cooperatives, and residents.
- **KTT and Communication:** The podcast series “Radiant Energy,” social media campaigns (30,000+ impressions), and joint webinars with the SWEET consortium SWICE expanded public engagement and cross-consortium dialogue.

Despite strong progress, several challenges emerged:

- The discontinuation of national P&D funding led to the redesign of several interventions.
- Coordination complexity and administrative workload required streamlining of internal processes.
- Stakeholder engagement remains a resource-intensive task across WPs, particularly under uncertain legal and financial contexts (e.g. community energy under the Mantelerlass).



3 Highlights of outputs

Below are selected outputs demonstrating Lantern's contribution to scientific knowledge, stakeholder empowerment, and behavioural change:

Smart Energy User Segmentation: Assessing the flexibility potentials of household energy consumption is being evaluated from multiple perspectives: from the technology, household member, community, and system levels. At the home technology level, forecasting models were developed to predict flexibility based on the operation of heat pumps, showing improved accuracy when integrating submetering and thermal data. On the individual level, an interdisciplinary survey (1800+ respondents in 5 regions) captures both the technical and social capacity of households to provide flexibility, forming the foundation for data-informed clustering of "smart energy users". Combined with smart meter data, these clusters can help inform DSO strategies and co-design of tariffs. At the community level, an agent-based model simulates peer-to-peer local electricity markets with fairness constraints, helping to evaluate behavioural incentives and equity in energy trading. Finally, at the system level, a resilience framework combining deep learning and building co-simulation was implemented to assess the robustness of household flexibility across building types and climate scenarios. Building on these insights, the Smart Energy User Segmentation framework is being operationalised with partner DSOs and Living Labs to co-design differentiated DSM offers and dynamic tariffs, enrich existing household personas and case studies with flexibility descriptors, and develop targeted engagement strategies that match the socio-technical capacities of each user profile.

Working Models and Energy Use – Scoping Review: A systematic scoping review explored how emerging working models—such as hybrid, remote, and flexible work arrangements—impact energy use in office environments. The results provide a conceptual foundation for ongoing interventions and were submitted to Energy Research & Social Science.

31-Days Mobility Challenge: Collaboration with the City of Winterthur and SBB revealed measurable shifts in car use intention and ownership. A spin-off "welcome mobility package" engaging new inhabitants in trying multi-modal mobility options is planned for experimentation in Lugano.

Cool Down Project in Nursing Homes: Passive cooling solutions using multisensory design were piloted in Lucerne. Despite data collection challenges, early feedback highlights the relevance of low-tech retrofit strategies. Because they act on perceived temperature and residents' sense of control rather than relying on energy-intensive cooling hardware, they offer a fast, low-cost and replicable way to protect highly vulnerable populations in buildings where installing or operating high-tech HVAC systems is often impractical or prohibited.

Energy Community Co-Design Tools: The Morphological Box was adapted for participatory workshops and tested to map citizen energy preferences and legal constraints. Workshops brought together LANTERN researchers and Living Lab managers in an expert workshop in Lucerne, neighbourhood residents, local authorities, distribution utilities and energy consultants in the Lucerne (QUBE II) and Sion Living Labs, and members of the international Living Lab community at the Open Living Lab Days in Timisoara, all working on concrete questions around setting up neighbourhood energy cooperations within evolving Swiss and European regulatory frameworks.



Mountain Tourism Fresco & Treeps App: Participatory workshops and a gamified app leveraging social norms and social media challenge traditional tourism practices, encouraging carbon-conscious travel choices. A randomized controlled trial is underway to assess impact.

Integrated Impact Assessment Framework: A generic, modular impact assessment framework tailored to Living Labs was published and is guiding harmonised data collection across WPs.



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