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Energy Research and Cleantech

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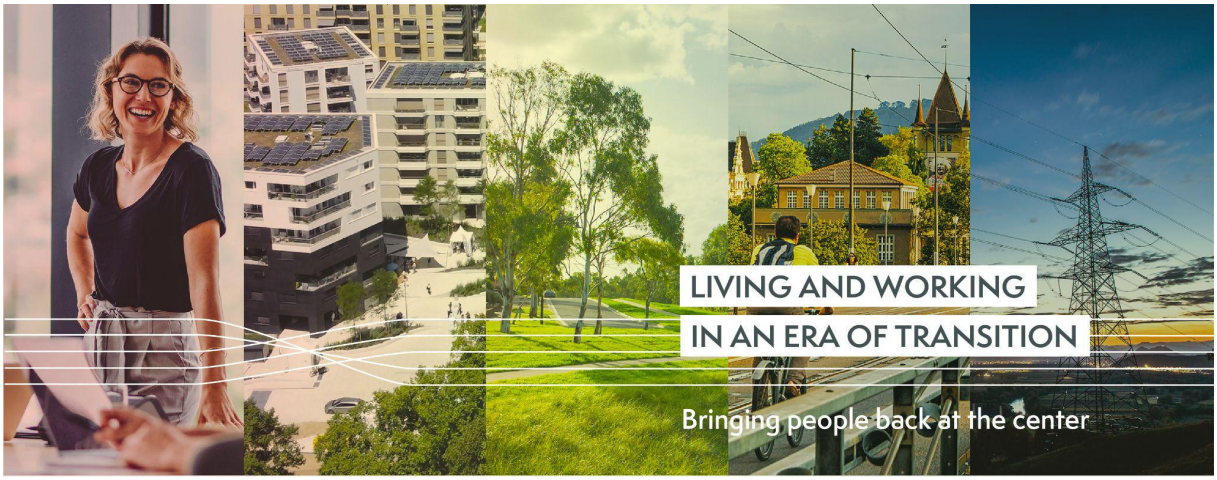
Highlights Report Year 2

SWICE



sweet swiss energy research for the energy transition

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Highlights

The main highlights during the reporting period were the following:

1. **POLICY**
   - Mobility Aspects in Energy Labelling: Definition of report on integrating mobility, tele- and coworking aspects into Switzerland's energy labelling system, emphasizing the SNBS sustainable building standard.
   - Energy and Indoor Environmental Quality Standards: Finalization of a report on key performance metrics and regulatory aspects for IEQ, offering strategies for balancing energy efficiency and indoor environmental quality.
   - Decent Living Energy Model: Creation of a DLE model for Switzerland to estimate energy requirements for human well-being across sectors.
   - Swiss Habitat Provisioning Framework: Definition of a framework evaluating individual energy use, socio-economic characteristics, housing, and commuting conditions.
2. **INTERVENTIONS**
   - Living Lab Co-creation Interventions: Development of interventions in various Living Labs (Lokstadt, Open Spaces LLs, Suurstoffi, Smart Living Lab) and establishment of a social hub in Eglantine (Morges).
3. **METHODOLOGY**
   - Living Lab Toolkit and Coordination Group: Development of a Living Lab toolkit and establishment a Living Lab Coordination Group (LLCG) to support SWICE LLs.
   - Meta Action Plan: Formulation of a Meta Action Plan showcasing LL activities across SWICE Work Packages using a Miro board.
4. **DECISION-SUPPORT TOOLS**
   - Sustainability Behavior Framework and Typology: Development of a framework and tools for understanding and fostering sustainability-relevant behavior, including a lifestyle typology.
   - Behavior Assessment Questionnaire: Design of a questionnaire to assess sustainability-relevant behaviors, lifestyle typology, and behavioral spillover effects.
   - Prototype Mobile Application: Creation of an app for passive and anonymous collection of mobility patterns, aiding in qualitative data collection on energy behaviors.

Faits marquants

Les principaux faits marquants pendant la période de référence ont été les suivants:

1. **POLICY**

- Aspects de mobilité dans le système de certification énergétique : Rédaction d'un rapport sur l'intégration de la mobilité, du télétravail et du coworking dans le système de certification énergétique de la Suisse, en mettant l'accent sur la norme de construction durable SNBS.
- Normes d'énergie et de qualité environnementale intérieure : Finalisation d'un rapport sur les principaux indicateurs de performance et les aspects réglementaires pour la qualité environnementale intérieure dans les normes existantes, proposant des stratégies pour équilibrer l'efficacité énergétique et la qualité environnementale intérieure.
- Cadre de provisionnement de l'habitat suisse : Définition d'un cadre évaluant l'utilisation individuelle de l'énergie, les caractéristiques socio-économiques, le logement et les conditions de déplacement.
- Modèle énergétique Decent Living Energy : Création d'un modèle DLE pour la Suisse afin d'estimer les besoins énergétiques pour le bien-être humain dans tous les secteurs.

2. **INTERVENTIONS**

- Interventions de co-création en Living Lab : Développement d'interventions dans divers Living Labs (Lokstadt, Open Spaces LLs, Suurstoffi, Smart Living Lab) et création d'un social hub à Eglantine (Morges).

3. **MÉTHODOLOGIE**

- Boîte à outils Living Lab et Groupe de coordination : Développement d'une boîte à outils Living Lab et mise en place d'un Groupe de coordination des Living Labs (LLCG) pour soutenir les LL SWICE.
- Plan d'action au niveau Méta: Formulation d'un plan d'action au niveau Méta présentant les activités des LL à travers les packages de travail SWICE à l'aide d'un tableau Miro.

4. **OUTILS D'AIDE À LA DÉCISION**

- Cadre et typologie de comportement en matière de durabilité : Développement d'un cadre et d'outils pour comprendre et favoriser des comportements adéquats dans une perspective de durabilité, y compris une typologie des modes de vie.
- Questionnaire d'évaluation des comportements : Conception d'un questionnaire pour évaluer les comportements durables, la typologie des modes de vie et les effets de débordement comportemental.
- Application mobile prototype : Création d'une application pour la collecte passive et anonyme des schémas de mobilité, aidant à la collecte de données qualitatives sur les comportements énergétiques.

Highlights

Die wichtigsten Highlights während des Berichtszeitraums waren die folgenden:

1. POLITIK

- Aspekte der Mobilität im Energielabeling: Abschlussbericht über die Integration von Mobilität in das Energielabeling-System der Schweiz, Schwerpunkt auf dem SNBS-Nachhaltigkeitsstandard für Gebäude.
- Energie- und Standards für die Qualität der Innenraumumwelt: Abschlussbericht über wichtige Leistungskennzahlen und regulatorische Aspekte für die Innenraumluftqualität, Bereitstellung von Strategien zur Balance von Energieeffizienz und Qualität der Innenraumumwelt.
- Schweizer Rahmen für die Bereitstellung von Lebensraum: Definition eines Rahmens zur Bewertung des individuellen Energieverbrauchs, der sozioökonomischen Merkmale, der Wohnbedingungen und der Pendelbedingungen.
- Modell für angemessenes Wohnen und Energie: Erstellung eines DLE-Modells für die Schweiz zur Schätzung des Energiebedarfs für menschliches Wohlbefinden in allen Sektoren.

2. INTERVENTIONEN

- Co-Creation-Interventionen im Living Lab: Entwicklung von Interventionen in verschiedenen Living Labs (Lokstadt, Open Spaces LLs, Suurstoffi, Smart Living Lab) und Einrichtung eines sozialen Hubs in Eglantine (Morges).

3. METHODIK

- Living Lab Toolkit und Koordinationsgruppe: Entwicklung eines Living Lab Toolkits und Einrichtung einer Living Lab Koordinationsgruppe (LLCG) zur Unterstützung von SWICE Living Labs.
- Meta-Aktionsplan: Formulierung eines Meta-Aktionsplans zur Darstellung von LL-Aktivitäten in den SWICE-Arbeitspaketen unter Verwendung eines Miro-Boards.

4. ENTSCHEIDUNGSHILFEN

- Nachhaltigkeitsverhaltensrahmen und -typologie: Entwicklung eines Rahmens und von Tools zum Verständnis und Förderung von für die Nachhaltigkeit relevante Verhaltensweisen, einschliesslich einer Lebensstil-Typologie.
- Verhaltensbewertungsfragebogen: Entwicklung eines Fragebogens zur Bewertung von für die Nachhaltigkeit relevante Verhaltensweisen, Lebensstil-Typologie und Verhaltensauswirkungen.
- Prototyp Mobile Anwendung: Entwicklung einer App zur passiven und anonymen Erfassung von Mobilitätsmustern zur qualitativen Datensammlung über Energieverhalten.

Punti salienti

I principali punti salienti durante il periodo di riferimento sono stati:

1. POLICY

- Aspetti della mobilità nei sistemi di certificazione energetica: Completamento di un rapporto sull'integrazione di aspetti legati alla mobilità, il telelavoro e il coworking nel sistema di certificazione energetica della Svizzera, con enfasi sullo standard di costruzione sostenibile SNBS.
- Standard energetici e di qualità dell'ambiente interno: Finalizzazione di un rapporto sui principali indicatori di prestazione e gli aspetti regolatori per la qualità ambientale interna, offrendo strategie per bilanciare l'efficienza energetica e la qualità ambientale interna.
- Quadro di provisioning per l'habitat della Svizzera: Definizione di un quadro di provisioning valutando l'uso individuale dell'energia, le caratteristiche socio-economiche, le condizioni di alloggio e di pendolarismo.
- Modello energetico Decent Living Energy: Sviluppo di un modello DLE per la Svizzera, per le stima dei requisiti energetici necessari a garantire il benessere umano in vari settori.

2. INTERVENTI

- Interventi di co-creazione in Living Lab: Sviluppo di interventi in vari Living Lab (Lokstadt, Open Spaces LLs, Suurstoffi, Smart Living Lab) e istituzione di un social hub a Eglantine (Morges).

3. METODOLOGIA

- Toolkit Living Lab e Gruppo di coordinamento: Implementazione di un toolkit Living Lab e lancio di un Gruppo di coordinamento Living Lab (LLCG) per supportare i Living Lab SWICE
- Piano d'Azione per i Living Lab: Definizione di un piano di azione a livello Meta che illustra, sulla piattaforma Miro, le attività pianificate dei LL attraverso i WP SWICE (WPs).

4. STRUMENTI DI SUPPORTO DECISIONALE

- Quadro per la comprensione del Comportamento Sostenibile: Sviluppo di un quadro teorico e di strumenti per comprendere e promuovere comportamenti rilevanti per la sostenibilità, e elaborazione di una tipologia di stili di vita sostenibili.
- Questionario di Valutazione del Comportamento: Progettazione di un questionario per la valutazione di comportamenti rilevanti per la sostenibilità, la tipologia di stile di vita e gli effetti di ricaduta comportamentale.
- Applicazione Mobile Prototipo: Creazione di un'app per la raccolta passiva e anonima dei modelli di mobilità, facilitando la raccolta di dati qualitativi sui comportamenti energetici.

1 Highlights of the reporting period

1. POLICY

In the framework of the SWICE project, several policy outcomes are expected to be developed to support the Swiss energy transition through a paradigm shift that acknowledges the inseparable link between ecological health and the wellbeing of individuals and communities.

In Y2, a comprehensive technical **report was completed**, focusing on the integration of mobility aspects, including teleworking and coworking, into Switzerland's sustainability standards for buildings and urban planning. The report underscores that critical role of mobility in reducing in energy use and emissions, recommending standards like SNBS and SIA390 to include factors such as accessibility, eco-friendly transportation, and traffic-reducing measures like coworking spaces. It also highlights the growing focus on well-being and social inclusion in building certifications, aiming to enhance both environmental and social sustainability.

Additionally, a provisioning framework for Swiss habitat was defined, which evaluates individual energy use and its inequalities, socio-economic characteristics, housing and commuting conditions, and proposes energy sufficiency interventions. Another significant development was the creation of a Decent Living Energy (DLE) model for Switzerland, designed to estimate the energy requirements necessary to secure human well-being across various sectors.

Furthermore, **a report** on the minimum requirements for Energy and Indoor Environmental Quality (IEQ) in existing standards was finalized. The report provides a detailed analysis of Swiss building regulations and standards that regulate energy efficiency and Indoor Environmental Quality (IEQ). It explores how existing regulations prioritize energy-saving measures but may compromise factors such as thermal comfort, indoor air quality, lighting, and acoustics, which are essential for the well-being of occupants. One of the key compromises identified is, for example, the potential conflict between strict energy-efficiency requirements and maintaining adequate indoor comfort levels. For example, reducing ventilation rates to save energy can negatively affect indoor air quality, which directly impacts occupant health and comfort. The report also highlights the importance of natural daylight in indoor spaces, noting that energy-saving measures like the use of small windows or highly insulated facades can reduce access to natural light. This, in turn, can negatively impact both comfort and well-being. Proper daylighting strategies are essential, as they not only reduce the need for artificial lighting (thus saving energy) but also improve occupants' mood, productivity, and overall health. In this sense, the report calls for a redefinition of regulations to better balance energy savings with human comfort and well-being.

2. INTERVENTIONS

The SWICE project endeavours to yield a compendium of best practices drawn from Living Labs and other case studies across various scales, driving towards a transformative intervention outcome with overarching objectives that are as ambitious as essential. The objective of SWICE interventions are to test and validate innovative approaches, grounded in empirical evidence and human-centric design principles.

In Y2, significant progress has been made in preparing and developing co-creation interventions in Living Labs across various locations, including Lokstadt, Open Spaces LLs (Fribourg and Geneva), Suurstoffi, and the Smart Living Lab (Fribourg). Additionally, a social hub has been established in Eglantine (Morges). These activities were accompanied by the organization of several workshops involving different local stakeholders.

3. METHODOLOGY

The SWICE project aims to offer a comprehensive suite of methodologies and toolkits to empower stakeholders, enhance collaboration, foster innovation, and measure the impact of SWICE interventions.

During Y2, several key initiatives were undertaken to enhance the effectiveness of Living Labs (LLs). A comprehensive Living Lab (LL) toolkit and accompanying training materials were developed, alongside the establishment of a Living Lab Coordination Group (LLCG). This effort was informed by a thorough literature review on LLs and co-design approaches, leading to the creation of a toolbox to support SWICE LLs. The toolbox comprises several modules, including Getting Started with a LL (Module 0), Co-design and Implementation (Module 1), Measuring Impact (Module 2), and Scaling Up (Module 3).

The LLCG plays a crucial role in the revised organizational structure of the SWICE consortium, facilitating collaboration between researchers and LL members. Additionally, a Meta Action Plan was formulated to showcase planned LL activities across SWICE Work Packages (WPs), visualized using a Miro board. This plan delineates activities, leading WPs, LL locations, research methods, tools, and participating stakeholders, ensuring a coordinated and comprehensive approach to LL initiatives within the consortium.

4. DECISION-SUPPORT TOOLS

Some outcomes of the SWICE projects will aim to facilitate informed decision-making and foster a systemic approach to energy transition scenarios.
During Y2, a theoretical framework and tools were developed to understand sustainability-relevant behavior and foster behavior change. A sustainability lifestyle typology was crafted, comprising six distinct lifestyle types with unique behavioral drivers and preferences. This typology aids in tailoring interventions and communication campaigns to specific lifestyle segments within Living Labs (LLs). A questionnaire was designed and implemented to assess sustainability-relevant behaviors, lifestyle typology, changes in behavior and well-being, and behavioral spillover effects. This instrument forms the basis for empirical data collection, refining the behavior change framework, and evaluating intervention effects in LLs.
Additionally, a prototype mobile application was created for the passive and anonymous collection of mobility patterns, facilitating qualitative data collection on energy-related behaviors and enhancing communication between experimenters and participants.

2 Outputs of the reporting period

Peer-reviewed publications

Author(s), title, journal name, year	**doi**
Carmeliet, J., and D. Derome. "How to beat the heat in cities through urban climate modelling." Nature Reviews Physics. 2023.	**https://rdcu.be/drKeY**
Chuat, A., Schnidrig, J., Cédric T., and F. Maréchal. "Identification of typical district configurations: A two-step global sensitivity analysis framework." In Conference proceedings, ECOS conference. 2023.	https://doi.org/10.1016/j.energy.2024.131116
Chuat, A., Terrier, C., Schnidrig, J. and F. Maréchal. "Identification of typical district configurations: A two-step global sensitivity analysis framework." Energy, Elsevier. 2024.	https://doi.org/10.1016/j.energy.2024.131116
Kubilay, A., Rubin, A., Derome, D., and J. Carmeliet. "Wind-comfort assessment in cities undergoing densification with high-rise buildings remediated by urban trees." Article in journal. Journal of Wind Engineering and Industrial Aerodynamics. 2024.	https://doi.org/10.1016/j.jweia.2024.105721
Loustau, J., Lepour, D., Terrier, C., and F. Maréchal. "Clustering and typification of urban districts for energy system modelling." In Conference/workshop proceedings, ECOS conference. 2023	https://doi.org/10.52202/069564
Schnidrig, J., Chuat, A., Terrier, C., Maréchal, F., and M. Margni. "Power to the People: On the Role of Districts in Decentralized Energy Systems." Energies, MDPI. 2024.	https://doi.org/10.3390/en17071718
Sützl, B., Strebel, D., Rubin, A., Kubilay, A., Zhao, Y., and J. Carmeliet. "Urban morphology clustering analysis to identify heat-prone neighbourhoods in cities." Sustainable Cities and Society. 2023.	https://doi.org/10.5194/egusphere-egu22-10206
Terrier, C., Joseph L., and F. Maréchal. "From local energy communities towards national energy system: a grid-aware techno-economic analysis." In Conference proceedings, ECOS conference. 2023.	https://doi.org/10.3390/en17040910
Terrier, C., Loustau, J., Lepour, D., and F. Maréchal. "From Local Energy Communities towards National Energy System: A Grid-Aware Techno-Economic Analysis." Energies, MDPI. 2024.	https://doi.org/10.3390/en17040910

Other non-peer-reviewed publications (working papers, press articles, etc.)

Author(s), title, channel or type of publication, year
Balthasar, N., and T. Ohnmacht. "Suurstoffi LL Energy Tour WP6." Report. 2023.
Balthasar, N., Ohnmacht, T., and J. Z'Rotz. "Wie viel CO2 sparen Bewohnende der Suurstoffi durch Home-Office und Coworking beim Pendeln ein?" Press article. Zug Estates Magazine. 2024.
Fischer, K., Hirzel, D., Schneider, S., Tappeiner, J., Schmid, C., Z'Rotz, J. and C. Krucker. "Stand der Zertifizierungsprozesse von Gebäuden und Arealen in der Schweiz und die Bedeutung der Mobilität." HSLU Report. 2024.
Forbat, J., Marlyne S., Evelyn L., and Anton S. "How to evaluate the outcomes and impacts of living labs? Key insights from the literature and implementers." Conference participation. SCORAI conference. 2023.
Khodaei Tehrani, H., Wienold, J., and M. Andersen. "Poster Presentation W2." Poster. "Inside / Out" Daylight in Sustainable Urban Design – Conference, Zurich. 2023.
Lobsiger, E. "Wie kann nachhaltiges Wohnen funktionieren?" ZHAW Impact, 2023.
Schubert, I., Hoerler, R., Z'Rotz, J., Balthasar, N., Arnold, T., Mahler, M., Ohnmacht, T., Schmid, C., Schneider, S., et al. "Focus Group Suurstoffi." HSLU Report. 2023.
Schubert, I.; Hörler, R.; Z'Rotz, J.; Balthasar, N.; Ohnmacht, T.; Sütterlin, B.; Tomic, U.; Arnold, T.; Schmid, C.; Tappeiner, J.; Hostettler Macias, L.; Rérat, P. & Schneider, S. Die «Suurstoffi» als Reallabor - Base-Line Studie, Workshops, Interventionen und Projektausblick. HSLU Report. 2023
Terrier, C., Pina, E., Maréchal, F., "Energy Performance Gap in the Building Sector and its Impact on Investment Decisions for Heating Requirements", SWICE internal report, 2024.
Z'Rotz, J.; Balthasar, N. & Ohnmacht, T. The effects of teleworking on CO2 emissions to commute: Baselining key data in living labs to investigate transformative change. Swiss Mobility Conference SMC 2023, Lausanne.

Invited talks (scientific or broad audience)

Presenter(s), title, name of the event and location, year
Luisa Pastore, SWICE - Sustainable well-being for the Individual and the Collectivity in the Energy transition, Technology Outlook Vernissage, Zurich, 2023
Marilyne Andersen, SWICE - Sustainable well-being for the Individual and the Collectivity in the Energy transition, Climact Seminar, 2023, online.
Luisa Pastore, SWICE - Sustainable well-being for the Individual and the Collectivity in the Energy transition, 4th meeting of the Municipal network, Bienne, 2023.