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Highlights Report Year 2

Lantern



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The authors bear the entire responsibility for the content of this report and for the conclusions drawn therefrom.



Highlights

The main highlights during the reporting period were the following:

1. **Empowering the Energy Transition through Living Labs.** The consortium developed an online program aimed at fostering a shared understanding of the effective establishment, management, and expansion and evaluation of Living Labs.
2. **Establishing Methodological Baselines for Co-creation.** We established a dual baseline for methodological developments through a literature review and mapping of methods used by the researchers on the Living Lab Integrative Process (LLIP).
3. **Unveiling Household Energy Demand Flexibility.** We developed a centralized survey designed to delve into the potential for flexibility in household energy demand, facilitated by automation, data sharing, and the reconfiguration of home energy practices.
4. **Building New Sustainable Working Models and Energy Consumption Framework.** Regarding energy in working environments, a key discovery was the uncertain impact of working models on energy usage, which is influenced by both the organizational context and individual behaviors.
5. **Mobility in Lugano: From Constraints to Opportunities.** Through a survey conducted in the strongly car-centric region of Lugano, we identified key constraints affecting public transport and cycling, such as low flexibility, frequency, time-space coverage, as well as safety concerns.
6. **Promoting energy cooperations: a comprehensive review.** We conducted a comprehensive literature review on energy co-operations in Europe, focusing on the period 2018-2023 and using top-tier journals.
7. **Towards Low-Carbon Holiday Travel.** We conducted a comprehensive study on holiday travel behaviour, focusing on the potential of low-carbon and energy-efficient alternatives.
8. **Co-creating a “Mountain Tourism Fresk”.** In collaboration with an alpine destination, we developed the Mountain Tourism Fresk, a novel climate education game aimed at raising awareness and guiding tourism actors towards low-carbon destination planning.
9. **Creation of conceptual framework and indicator framework.** We conceptualised an impact assessment framework that follows a participative and formative approach, co-designed within Lantern, involving multiple actors working in Living Lab projects.
10. **International visibility of Lantern.** Lantern members are now part of the leadership in the ENoLL Energy and Environment working group and have held speeches at the Science Summit @ United Nations General Assembly and at the Open Living Lab Days in Barcelona.



Faits marquants

Les principaux faits marquants (résultats, défis, apprentissages, etc.) pendant la période de référence ont été les suivants :

1. **Renforcer la transition énergétique grâce aux Living Labs.** Le consortium a développé un programme de formation en ligne visant à favoriser une compréhension commune de la mise en place, de la gestion et de l'expansion efficaces des Living Labs.
2. **Établir des bases méthodologiques pour la co-création.** Nous avons établi une base de référence pour les développements méthodologiques par le biais d'une revue de la littérature et d'une cartographie des méthodes dans nos recherches sur le Processus Intégrés de Living Labs (LLIP).
3. **Révéler la flexibilité de la demande énergétique des ménages.** Nous avons développé une enquête centralisée conçue pour explorer le potentiel de flexibilité de la demande énergétique des ménages, facilitée par l'automatisation, le partage des données et la reconfiguration des pratiques énergétiques domestiques.
4. **Construire de nouveaux modèles de travail durables et un cadre de consommation d'énergie.** Une découverte clé de nos recherches a été l'impact incertain des modèles de travail sur l'utilisation de l'énergie, qui est influencée à la fois par le contexte organisationnel et les comportements individuels.
5. **La mobilité à Lugano : des contraintes aux opportunités.** Le groupe de recherche sur la mobilité a identifié les principales contraintes affectant les transports publics et l'usage du vélo, telles que le manque de flexibilité, de fréquence et de couverture spatio-temporelle, ainsi que les problèmes de sécurité dans la région de Lugano, fortement centrée sur la voiture.
6. **Promouvoir les coopérations énergétiques : un état de l'art.** Nous avons réalisé une analyse documentaire complète sur les coopérations énergétiques en Europe, en se basant sur la période 2018-2023 et en utilisant des revues scientifiques de premier plan.
7. **Vers des voyages de vacances à faible émission de carbone.** Nous avons mené une étude complète sur le comportement des voyageurs en vacances, en se concentrant sur le potentiel des alternatives à faible émission de carbone et à haut rendement énergétique.
8. **Co-design d'une "Fresque du Tourisme de Montagne".** En collaboration avec une destination alpine, nous avons développé une Fresque du Tourisme de Montagne, un jeu éducatif novateur sur le climat visant à sensibiliser les acteurs du tourisme et à les guider vers une planification de destination bas-carbone.
9. **Création d'un cadre conceptuel et d'un cadre d'indicateurs.** Nous avons proposé un cadre conceptuel d'évaluation d'impact qui suit une approche participative et formative, co-conçue au sein de Lantern en impliquant de multiples acteurs travaillant dans des projets Living Lab.
10. **Visibilité internationale de Lantern.** Des membres de Lantern font désormais partie de la direction du groupe de travail ENoLL sur l'énergie et l'environnement, et ont tenu des discours au Sommet de la science à l'Assemblée générale des Nations Unies et aux Open Living Lab Days à Barcelone.



Highlights

Die wichtigsten Highlights während des Berichtszeitraums waren die folgenden:

1. **Förderung der Energiewende durch Living Labs.** Das Konsortium hat ein Online-Programm entwickelt, welches ein gemeinsames Verständnis für die erfolgreiche Einrichtung, Verwaltung, Erweiterung und Evaluation von Living Labs fördert.
2. **Erarbeitung von methodologischen Grundlagen für die Ko-Kreation.** Wir haben eine Grundlage für die methodische Vorgehensweise geschaffen, indem wir die einschlägige Literatur ausgewertet und die in unserer Forschung verwendeten Methoden des Living Lab Integrative Process (LLIP) systematisch erfasst haben.
3. **Untersuchung der Flexibilität der Energienachfrage von Haushalten.** Wir haben eine Umfrage entwickelt, um das Potenzial für eine flexible Energienachfrage in Haushalten zu erforschen, die durch Automatisierung, Datenaustausch und die Umstellung der häuslichen Energieverbrauchspraktiken ermöglicht wird.
4. **Untersuchung des Zusammenhangs von neuen Arbeitsmodellen und Energieverbrauch.** Eine wichtige Erkenntnis in Bezug auf den Energieverbrauch am Arbeitsplatz waren die ambivalenten Auswirkungen von neuen Arbeitsmodellen auf den Energieverbrauch, der sowohl durch den organisatorischen Kontext als auch durch individuelle Verhaltensweisen beeinflusst wird.
5. **Mobilität in Lugano: Von Hindernissen zu Chancen.** Anhand einer Umfrage in der stark autoorientierten Region Lugano haben wir die wichtigsten Hindernisse für den öffentlichen Verkehr und den Veloverkehr ermittelt, wie z. B. geringe Flexibilität, Häufigkeit, zeitliche und räumliche Abdeckung sowie Sicherheitsbedenken.
6. **Förderung von Energiekooperationen: Eine umfassende Übersicht.** Wir haben eine umfassende Literaturanalyse zu Energiekooperationen in Europa durchgeführt, wobei wir uns auf den Zeitraum 2018-2023 sowie auf hochrangige Fachzeitschriften konzentriert haben.
7. **Hin zu CO₂-armen Urlaubsreisen.** Wir haben eine umfassende Studie über das Urlaubsreiseverhalten durchgeführt und uns dabei auf das Potenzial von emissionsarmen und energieeffizienten Alternativen konzentriert.
8. **Co-Design eines "Mountain Tourism Fresk".** In Zusammenarbeit mit einer alpinen Destination haben wir das Mountain Tourism Fresk entwickelt, ein neuartiges Klimabildungsspiel, das darauf abzielt, das Bewusstsein zu schärfen und die Tourismusakteure hin zu einer kohlenstoffarmen Reiseplanung zu leiten.
9. **Erstellung eines konzeptionellen Rahmens und eines Indikatorensystems.** Wir haben ein Rahmenwerk für die Wirkungsabschätzung konzipiert, der einem partizipativen und formativen Ansatz folgt und an dem mehrere Akteure aus den Living Lab-Projekten beteiligt sind.
10. **Internationale Sichtbarkeit von Lantern.** Lantern-Mitglieder sind nun Teil der Leitung der ENoLL-Arbeitsgruppe Energie und Umwelt und haben Vorträge auf dem Wissenschaftsgipfel der Generalversammlung der Vereinten Nationen und bei den Open Living Lab Days in Barcelona gehalten.



Punti salienti

I principali punti salienti (risultati, sfide, insegnamenti, ecc.) del periodo di riferimento sono stati i seguenti:

1. **Potenziamento della transizione energetica attraverso i Living Lab.** Il consorzio ha sviluppato un programma di formazione online volto a favorire la comprensione di come si crea, gestisce e sviluppa in modo efficace un Living Lab.
2. **Costituzione delle basi metodologiche per la co-creazione.** Abbiamo stabilito una base di riferimento per le attività metodologiche, attraverso una revisione della letteratura e una mappatura dei metodi utilizzati nelle nostre ricerche sul processo integrato dei Living Lab ("living lab integrative process" LLIP).
3. **Misurazione della flessibilità della domanda energetica delle economie domestiche.** Abbiamo sviluppato un'indagine per approfondire il potenziale di flessibilità della domanda energetica delle economie domestiche, facilitata dall'automazione, dalla condivisione dei dati e dalla riconfigurazione delle pratiche domestiche di consumo energetico.
4. **Costruzione di nuovi modelli di lavoro sostenibili e connessione con il risparmio energetico.** Una scoperta importante circa l'energia in contesti lavorativi è stata quella di come valutare l'impatto incerto dei modelli di lavoro sull'uso dell'energia, influenzato sia dal contesto organizzativo ("facility management") sia dai comportamenti individuali (organizzazione del lavoro).
5. **Mobilità a Lugano: dai vincoli alle opportunità.** Attraverso indagini condotte nella regione di Lugano, fortemente dipendente dall'automobile, abbiamo identificato le principali criticità che riguardano il trasporto pubblico e la bicicletta, quali scarsa flessibilità e frequenza, ridotta copertura spazio-temporale e la mancanza di sicurezza.
6. **Promozione delle cooperazioni energetiche: una rassegna completa.** Abbiamo condotto una ricca review della letteratura sulle cooperazioni energetiche in Europa, concentrando sul periodo 2018-2023 e facendo riferimento a riviste di alto livello.
7. **Verso vacanze a basse emissioni di carbonio.** Abbiamo condotto uno studio completo sui comportamenti relativi alle vacanze, concentrando sul potenziale delle alternative a bassa emissione di carbonio e alta efficienza energetica.
8. **Co-creazione di un "Mountain Tourism Fresk".** In collaborazione con una destinazione alpina, abbiamo sviluppato il "Mountain Tourism Fresk", un nuovo gioco di educazione sui temi del clima volto a sensibilizzare e guidare gli attori del settore del turismo nel pianificare destinazioni turistiche a basse emissioni di carbonio.
9. **Creazione di un quadro concettuale e di indicatori.** Abbiamo sviluppato un quadro concettuale per la valutazione dell'impatto, accompagnato da i relativi indicatori, basato su un approccio partecipativo e formativo, co-progettato con il consorzio Lantern e il coinvolgimento di attori esperti di progetti Living Lab.
10. **Visibilità internazionale di Lantern.** I membri di Lantern fanno ora parte del comitato direttivo del gruppo di lavoro ENoLL su Energia e Ambiente e hanno tenuto discorsi allo Science Summit all'Assemblea Generale delle Nazioni Unite e agli Open Living Lab Days di Barcellona.



1 Highlights of the reporting period

Empowering Energy Transition through Living Labs. The Lantern has developed an online program aimed at fostering a shared understanding of the effective establishment, management, and expansion of Living Labs. Significant strides have been made in initiating Key Performance Indicators (KPIs) for Living Labs and establishing data sharing structures. We dedicated the past year to strengthening the role of Living Labs as pivotal players in the energy transition through the site visits.

Establishing Methodological Baselines for Co-creation. We focused on establishing a baseline for methodological developments through mapping of methods used by the research work packages on the Living Lab Integrative Process (LLIP). A Delphi method-derived approach comprising interviews, questionnaires and a focus group was implemented to harmonize research and practice expectations and create consensus among researchers and practitioners both inside and outside Lantern. Key outputs include a visual map and list of methods used in each LLIP phase and a working paper on consensus-building in multidisciplinary teams. The research identified the need to focus on methods for overcoming barriers, as well as how to integrate cooperation partners early-on in the methodology. These deliverables, presented at the Open Living Lab Days 2023, have significantly advanced methodological objectives and provided a common baseline for consortium members, fostering coordination and collaboration as well as promoting the LLIP methodology at an international level. They also served to co-create the Lantern Capacity Building Programme, focusing on methods and tools.

Unveiling Household Energy Demand Flexibility. As part of research on “smart energy users”, we developed a centralized survey to delve into the potential for flexibility in household energy demand, facilitated by automation, data sharing, and the reconfiguration of home energy practices. The survey will be conducted with ca. 250-300 households within the calendar year, with the support of Winterthur and Sion Living Labs. The survey serves as a foundation for further research work, defining smart energy users and automated demand side management (DSM). Drawing from social practice theory and social and environmental psychology theories, it emphasizes the importance of individual capacity and willingness to adapt energy consumption. The survey challenges the traditional reliance on socio-demographic factors as sole predictors of demand flexibility, highlighting the need to consider spatio-temporal practices, competences, and individual values concerning energy management. This nuanced approach aims to provide more accurate insights into the heterogeneous nature of demand flexibility potential. A key aspect of the survey is its focus on energy justice, recognizing and addressing the diverse capacities and socio-economic standings of households. Grounded in social practice theory and environmental/social psychology, the survey illuminates how socio-economic profiles, ownership of smart appliances, competences, and social practices influence households’ readiness to participate in automated DSM programs.

Building New Sustainable Working Models and Energy Consumption Framework. An exhaustive literature review has helped define these working models and their relationship with energy consumption across homes, mobility, and business sites. A key discovery was the uncertain impact of working models on energy usage, which is influenced by both the organizational context and individual behaviors. As a result, our research underscores the importance of enhancing communication between employees and facility managers to maximize energy savings. This highlights the critical role of collaborative efforts, as actions taken by employees and managers of working models may not always have a direct impact on building energy consumption.

Mobility in Lugano: From Constraints to Opportunities. Our research group on mobility has identified key constraints affecting public transport and cycling, such as low flexibility, frequency, and time-space



coverage, as well as safety concerns in the strongly car-centric region of Lugano. The findings underscore carpooling as a potentially promising addition to mobility options and suggest a shift in focus towards practical experimentation with car alternatives within groups of individuals. These insights were gleaned from an in-depth exploration of mobility practices, including a literature review and sixteen semi-structured interviews with a diverse sample of individuals identified via mobility clustering. Leveraging these insights, we initiated a new trans-disciplinary partnership with the 31DAYS Challenge in Winterthur, involving 1,000 individuals until Summer 2024, to rigorously analyse its short- and long-term effects through surveys. The learnings from and cooperation with 31DAYS will enable the launch of a similar activity, potentially with automatic mobility data tracking, in Lugano in Spring 2025.

Identifying and defining a portfolio of collaboration projects. Within the research group on affordable and energy-efficient housing and retrofitting, a set of renovation projects has been identified and defined for collaborating with the City of Geneva. Facing the numerous delays of the retrofitting project of Cité-Jonction, the best option was to move forward with other projects. Instead of a large single retrofitting project including numerous and diverse research projects, Lantern and Geneva's LL will be served with several retrofitting projects including numerous and diverse research projects. Furthermore, these are already funded projects, which means both Lantern and Geneva's LL can immediately start developing their related research.

Defining and setting-up an LL from scratch. A dedicated LL is being defined and set-up in collaboration with the City of Geneva. This set up is supported by a study that will draw up a precise roadmap for implementing the Living Lab in 2024, in particular, a structure and a provisional budget, since this LL has at this stage no budget or structure.

Promoting energy cooperations: a comprehensive review. We conducted a comprehensive literature review on energy co-operations in Europe, focusing on the period 2018-2023 and using top-tier journals. The review identified key dimensions of energy co-operations and derived several findings relevant for the development and implementation of energy co-operation at the neighbourhood level in Switzerland. The results highlight challenges (legal framework, market constraints, lack of expertise) and innovations (trading platforms, blockchain solutions, crowdfunding, etc.) that can promote various forms of energy co-operations, supporting city decarbonization by decentralizing energy, using local sustainable resources, and involving local actors, especially citizens.

Towards Low-Carbon Holiday Travel. We conducted a comprehensive study on holiday travel behaviour, focusing on the potential of low-carbon and energy-efficient alternatives. The study, based on qualitative data, identified key leverages for a forthcoming community challenge: (1) providing feedback on one's overall carbon emissions by accounting for both daily life and holiday-making, (2) marketing closer destinations by emphasising their diversity and time-effectiveness of travelling on the ground, and (3) engaging influencers, relevant peers, and tourism intermediaries in promoting low-carbon holiday alternatives. A quantitative study on social norms and the intention to use low-carbon transport for holiday travel revealed how injunctive and descriptive social norms could promote more sustainable leisure transport options.

Co-creating a "Mountain Tourism Fresk". In collaboration with an alpine destination, we developed the Mountain Tourism Fresk, a novel climate education game aimed at raising awareness and guiding tourism actors towards low-carbon destination planning. An updated review of current decarbonisation plans in ski resorts was also published in a handbook on nature-based tourism.

Creation of conceptual framework and indicator framework. We proposed a conceptual impact assessment framework that follows a participative and formative approach, co-designed within Lantern, involving multiple actors working in Living Lab projects. For this purpose, we implemented three work



steps: 1) develop specific Theories of Change (ToC), 2) design an overall conceptual framework, and 3) identify key indicators. On the one hand, this approach ensures that the assessment framework is tailored to the different interventions and experiments and corresponds to the different demands of researchers from diverse academic backgrounds from across the social sciences (such as sociology, psychology, business, economics, anthropology) as well as the wishes and requirements of practitioners as cooperation partners (such as municipalities, utility companies). On the other hand, the approach allows an ongoing evaluation of the different interventions and experiments to continuously reflect on the work, to learn and improve. The contribution also provides lessons learnt, implications, and recommendations of this collaboration regarding the co-development of the assessment framework.

International visibility of Lantern. The themes covered by Lantern are key for the transition across the world. As the IPCC itself has underlined the role of Living labs for the transition in its 6th Assessment Report, Lantern members are taking part to the broader process towards the forthcoming IPCC Special report on Climate Change and Cities. They do so directly and as part of the leadership in the ENoLL Energy and Environment working group, constituted by a large number of Living labs across Europe and beyond active on issues of energy savings and demand reduction, renewable production, smart uses. They have held speeches at the Science Summit @ United Nations General Assembly (online) and at the Open Living Lab Days in Barcelona, in the co-organised session on “Race to zero emissions and pollution: projects, practices and recommendations”.



2 Outputs of the reporting period

Peer-reviewed publications

Author(s), title, journal name, year	doi
Salim, E., Loloum, T. & Bonnemains, A. (2024). Towards decarbonisation plans for ski tourism: examples from the Swiss and French Alps. In Mandić, A., Spenceley, A. & D.A. Fennell. Handbook on Managing Nature-Based Tourism Destinations Amid Climate Change. Edward Elgar Publishing, 133-146.	https://www.e-elgar.com/shop/gbp/handbook-on-managing-nature-based-tourism-destinations-amid-climate-change-9781035311248.html https://www.researchgate.net/publication/382513465_Towards_decarbonisation_plans_for_ski_tourism_examples_from_the_Swiss_and_French_Alps

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

Author(s), title, channel or type of publication, year
Bezzola, Nicolà, Neue Arbeitsmodelle: Bei den Auswirkungen für Mitarbeitende, Unternehmen und Umwelt kommt es aufs konkrete WIE an. Newsletter öbu (19.03.2024), https://www.oebu.ch/news/neue-arbeitsmodelle-bei-den-auswirkungen-fuer-mitarbeitende-unternehmen-und-umwelt-kommt-es-aufs-konkrete-wie-an
Arnab Chatterjee; Philipp Heer, Non-Intrusive Load Monitoring (NILM) with very low-frequency data from smart meters in Switzerland, Data Science for the Sciences Conference, Bern, April 11-12, 2024 [Poster]
Zimmermann, F., Piana V. Where will the COP and it's policies take us next? https://medium.com/@contact_27522/where-will-the-cop-and-its-policies-take-us-next-14882b490d93 - https://www.linkedin.com/posts/sweet-lantern_article-sweet-lantern-activity-7173258522435006465-OMFA/

Proceedings of conferences

Author(s), title, channel or type of publication, year
Bär, R, Rosset, J., Yilmaz, S. Piana, V., Moser, S., Boogen, N. Grieder, M. Integrated Impact Assessment of Living Labs. Conceptual Framework, Approach and Methods applied in the LANTERN project. In Proceedings of OpenLivingLab Days Conference. (2023) https://boris.unibe.ch/190534/1/B_r_et-al_2023_Integrated_Impact_Assessment_of_Living_Labs__Conceptual_Framework__Approach_and_Methods_applied_in_the_LANTERN_project.pdf
Henriksen, I.M, Strömberg, H., Branlat, J., Motnikar, L., Garzon, G., Kuch, D., Yilmaz, S., Skjolsvold, T.M.. The Role of Gender, Age and Income in Demand Side Management Acceptance: A Literature Review. In Proceedings of the BEHAVE Conference, Maastricht. (2023) https://www.behave2023.eu/home/proceedings
Fiona Zimmermann, Joelle Mastelic, Anton Sentic, Debora Frei , Evelyn Lobsiger-Kägi, Nadine Späni, Dr. Timo von Wirth, How to build consensus between multidisciplinary teams on methods and tools for co-designing interventions in the energy transition through Living Labs. A review of the Living Lab Integrative Process methodology using a Delphi method based approach in Open Living Days 2023 Proceedings (p. 234-241). https://openlivinglabdays.com/wp-content/uploads/2023/10/OLLD-2023-Proceedings.pdf



Piana Valentino et al., Contributions to the energy research debate from the Swiss Social Sciences and Humanities Energy Research Group (3rd Workshop), Lulu Publisher, ISBN 9781446792872.
Loloum, Tristan, Social justice as a response to the energy crisis?, in Piana et al. (2023).
Wemyss, Devon, Integrating collaboration and Living Labs into SSH, in Piana et al. (2023).
Zimmermann, Fiona, How to build consensus between multidisciplinary teams on methods and tools for co-designing interventions in the energy transition through Living Labs, in Piana et al. (2023).
Ponomareva, Anastasia, Living labs, local energy coalitions and participatory urbanism: overlaps, synergies and advantages for the energy transition, in Piana et al. (2023).
Zimmermann, Fiona, How to build consensus between multidisciplinary teams on methods and tools for co-designing interventions in the energy transition through Living Labs, in Piana et al. (2023).
Sahakian, Marlyne and Piana, Valentino, Threats and opportunities of the energy crisis for a just energy transition, in Piana et al. (2023).
Brueckmann, Gracia and Piana, Valentino, Inputs for modelers and policymakers from the SSH workshop, in Piana et al. (2023).

Invited talks (scientific or broad audience)

Presenter(s), title, name of the event and location, year
<i>Anton Sentic / Vicente Carabias</i> presenting WinLab, the Living Lab from Winterthur as practical example at Innoday 2023, public innovation promotion Switzerland on 29.3.2024 Innovation Park ZH
<i>Anton Sentic</i> holding a keynote speech on WinLab – a growing Living Lab within Smart City Winterthur at the oPEN Lab General Assembly on 2.5.2023 online
<i>Vicente Carabias</i> introducing WinLab at NOIC National Open Innovation Camp on 6.-8.9.2023
Roger Bär, Integrated Impact Assessment of Living Labs. Conceptual Framework, Approach and Methods applied in the LANTERN project. OpenLivingLab Days Conference and Barcelona 2023
<i>Selin Yilmaz</i> , Development of a comprehensive integrated impact assessment tool for Living Labs, SCORAI-ERSCP-WUR Conference, Wageningen, 2023
Arnab Chatterjee, VIA Visionaries: Exploring Swiss Energy Systems with Arnab Chatterjee, Boston/Youtube, 2024
Piana Valentino, Cop 28, il giorno dopo. Serviranno 30 anni per liberarsi dalle fonti fossili?, <i>La Transizione Ecologica(raccontata da chi la fa)</i> , ISTUD European colloquium, online, 21 February 2024.

Other outputs

Brief description
Co-organisation of the OLLD session on “Race to zero emissions and pollution: projects, practices and recommendations” session https://openlivinglabdays.com/race-to-zero-emissions-and-pollution-projects-practices-and-recommendations/