Abstract

Co-cli-serv (Co-development of place-based climate services for action) explores novel ways to transform climate science into action-oriented place-based climate services to engage, enable and empower local communities, knowledge brokers and scientists to act locally. It seeks to identify future information needs and the nature of the climate science needed to address the local communities' concerns, aspirations and goals in view of climate variability and climate change.It will develop a novel approach for co-constructing climate services to support local planning and adaptation decision-making. Co-cli-serv will establish a collaborative relationship between climate science and local communities in five representative case studies across NW Europe; (i) Bergen in Norway; (ii) Brest and the Golfe du Morbihan in France, Dordrecht and surrounding area in the Netherlands, and communities along the Wadden Sea in Germany. The project will engage a wide spectrum of actors from local government, to the tourism industry, to local NGOs and to professional associations. It aims to proactively connect climate science with local communities, using local narratives as an entry point, and vision planning and adaptive pathways as co-construction locus. Central in Co-cli-serv's approach is its focus on narratives of change as a localisation device. Narratives give meaning to facts and scientific calculations. They turn 'matters of fact' into 'matters of concern'. Grounded in such narratives, vision-based scenarios will be developed by employing an incremental and community-led strategy, enabling the identification of current AND future knowledge needs. The project will experiment with art–science–policy integration in the case studies. Building on existing climate science and practices, Co-cli-serv will instigate and sustain community dialogues to co-construct place-based climate services. It takes systematic critical reflection on knowledge quality as the central activity in interfacing climate science and local governance.

Executive summary

Co-cli-serv develops and explores novel ways to transform state-of-the-art climate science into **action-oriented place-based climate services** that can be integrated with social understandings and practices of coping with change at the local scale in Europe, with a regard for climate variability and change in the context of other pressing social and environmental changes. At the core of Co-cli-serv approach lies the potential to **identify future information needs and the nature of the climate science that may be needed by local communities**. To this end, the project will develop, test and evaluate a suite of concepts, methods and tools for **co-constructing climate services** in support of local planning and decision-making, such as adaptation to climate and other environmental and societal changes.

Co-cli-serv will establish a collaborative relationship between climate science and local communities in **five representative case studies across NW Europe**; (i) Bergen in Norway; (ii) Brest and the Golfe du Morbihan in France, Dordrecht and surrounding area in the Netherlands, and communities along the Wadden Sea in Germany. While most climate services initiatives focus on 'co-producing' useful information within discrete epistemic communities of experts/policy clients, **this project engages a wider spectrum of actors, active in various aspects of local planning and adaptation**, from local government, to the tourism industry, to local NGOs and to professional associations. Co-cli-serv will mobilise a transdisciplinary consortium to recognise, engage and empower local communities, knowledge brokers and scientists. This collaboration will be facilitated by innovative approaches and tools, developing and using **participatory incremental scenario design** to jointly reflect on the role of climate information and climate services in a place.

Over the past decade, coproduction of climate services has emerged as an important theoretical lens and prerequisite for making sense of the complex and messy scientific, social and political processes of turning climate information into useable climate products for local planning and adaptation.

Empirical studies to develop and evaluate the required novel modes of coproduction are scarce. Co-cli-serv responds to the urgent need for the **systematic empirical study of practices of climate services**. It will move beyond the state of the art, as it has been designed to: (1) **engage in theoretical innovation** on the coproduction of climate services and (2) contribute to **systematic empirical study of practices** of climate services as coproduced, structured according to an evaluation framework that reflects processes and frameworks of coproduction. It will do so by rising to the challenge of **proactively connecting climate science with local communities**, using **local narratives** as an entry point, and **vision planning and adaptive pathways as co-construction locus**. These are the overarching goals of the project.

Central in Co-cli-serv's approach is its **focus on narratives of change**, past, present and future as a localisation device. Grounded in such narratives, vision-based scenarios will be developed, enabling the identification of current AND future knowledge needs. Taking account of existing climate science information and practices, Co-cli-serv will instigate and sustain community dialogues to co-construct place-based climate services. It takes systematic critical reflection on knowledge quality as the central activity in interfacing climate science and local governance. To maximise learning, Co-cli-serv will evaluate and document the processes of multi-source dliberative knowledge production.

The starting point is the **localising** of knowledge needs and knowledge supply. Localising is a two-way-interaction between science and local communities in specific places (the five case areas of Co-cil-serv). During this interaction, the definitions of 'local' and 'global' have to be re-negotiated, and the understanding of climate change has to be extended from a scientific concept towards a locally meaningful one. People do not live in an abstract climate; instead, they live in so-called weatherworlds that structure the seasons and the rhythm of life, shape everyday practices, serve as archives for individual and collective memory, and are woven into the dreams of the future. Narratives play a crucial role in connecting private and public realms, as well as scientific and local perceptions of the 'weatherworlds' we commonly inhabit. **Narratives give meaning to simple facts and scientific calculations. They turn 'matters of fact' into 'matters of concern'**. Co-cli-serv will lay the groundwork to systematise the use of narrations to help to transcend the oppositions of science and local knowledge, of nature and culture, of global and local – this to develop climate services.

Vision-based scenarios are required to arrive at common framings of the climate and other changes affecting a place, and to identify the most credible, salient and legitimate information to support adaptation and planning. Co-cli-serv will advance scenario-based approaches by employing an **incremental and community-led strategy** to develop local scenarios, with the **local communities' concerns, aspirations and goals at their root** – while integrating these local scenarios with quantitative climate scenarios. Co-construction helps communities face local environmental issues in ways that **promote trust-building, empowerment, joint learning (e.g. from and with the each other's framings), opportunities to develop safe deliberation spaces, and provision of a unique context to identify knowledge gaps**. Co-cli-serv's incremental scenario design is explicitly designed to capture key knowledge gaps and translate them into **climate information and climate service needs**. These methods will be rooted in both local vision development and external environmental factors. Co-cli-serv takes existing climate science information and practices into account while recognising and addressing the difficulties of transferring scientific findings into local practices of sense-making, planning and adaptation. **A roadmap will be drawn, outlining needed development and the potential development pathway**. Rather than working in an ivory tower, the Co-cli-serv consortium will strive to connect existing practices and available knowledge to the project's innovative developments. Co-cli-serv will move beyond the state of the art by evaluating components of local climate services against stakeholder needs and associating them with other (non-scientific) knowledge claims. The potential and limits of local climate services will bei dentified.

Investigating and sustaining community dialogue with climate services is essential for makingt hese more meaningful in a place, particularly where narratives form the entry point for co-construction. **Artists are ideally placed to challenge existing narratives and to provoke the exploration of novel narratives.** The intermeshing of nature and culture, emotions and reason around weatherscapes implies that approaching local climate through science must be put into perspective by a more intuitive approach that seeks to represent the world as perceived by the senses. Such an approach has been achieved by including the arts in social dynamics together with scientific research and innovation. **Co-cli-serv will experiment with various art forms** during the co-construction process, to explore the modes through which art forms may be mobilised in a joint enquiry dynamic. Co-cli-serv will move beyond the state of the art by (1) applying art and science approaches to culturally relevant climate co-construction process (2) contributing to progressive construction of **experiments in art–science–policy integration** geared at enabling action to combat climate change and in support of climate change adaptation. In exploring new modes of co-constructing climate services, Co-cli-serv further looks at corresponding criteria for **assessing knowledge quality**, using a **checklist-based guidance approach**. Within a transdisciplinary co-construction collective, each member of the community has a responsibility to contribute their own knowledge and to appraise the quality of the knowledge provided by others. This process of extended peer review evolves through dialogue, with quality appraisal structured by formal criteria or tools agreed on within the community. These **criteria of quality extend beyond narrow criteria of single scientific disciplines** to encompass broader notions of what constitutes quality knowledge, including its fitness for purpose, the people producing it, the process used to produce it, and the final knowledge product. This permits

Co-cli-serv concepts and tools to be evaluated according to appropriate measures, so that a statement can be made about their value in the case studies and their transferability to other settings. Within Co-cli-serv, **particular attention will be given to uncertainties, their treatment and their shared understanding**. Co-cli-serv will move beyond the state of the art by enabling and promoting **systematic critical reflection on knowledge quality as central activity** in interfacing climate science and local governance through the co-creation of place-based climate services.

Cases

Bergen, Bryggen, the old wharf of Bergen, is a reminder of the town's importance as part of the Hanseatic League's trading empire from the 14th to the mid-16th centuries. The Hanseatic eague established a total of four overseas Hanseatic Offices, Bryggen being the only one reserved today. Bergen has a long tradition in surface water management. The city has managed tis rather well so far, but existing water systems are about to reach their limit of capacity, andmany will have problems in the future, due to climate change.

Dordrecht, the Isle of Dordrecht (99 km2), in the west of the Netherlands, is enclosed by rvers and is at a fluvial crossroads, with river channels connecting it to Rotterdam and to the outhwest Delta. It contains the city of Dordrecht (119,000 inhabitants) and surrounding aricultural and nature areas. Most areas are about 1.5 m below sea level and are protected by dikes. The Isle also contains unembanked areas, such as the historic harbour, which floods occasionally.

German Wadden Sea coastline: Climate change is considered as a threat to Northern Germany's coastline and to the National Park and UNESCO world heritage site of the Wadden Sea. The ecosystem of the Wadden Sea is already undergoing change. Coastal protection, dike maintenance and coastal zone management, beach nourishment and other strategies provide potential for dispute about the future of the Wadden Sea region. For the project, we will choose a case study from East or North Frisia.

Golfe du Morbihan, The Gulf of Morbihan (115 km2) is a natural harbour on the coast of the Département of Morbihan in the south of Brittany, France. Dotted with many islands and islets and covering 100 km2, it is a popular tourist destination, and it has been designated a 'Regional natural park'. The Gulf of Morbihan is the setting for a multi-thousand-year history (dating back to the Palaeolithic) of continuous human occupation; thus since time immemorial, humans have influenced the territory. These natural and cultural riches make it a coveted space whose balance is fragile and threatened by different pressures, including climate change.

Saint-Pierre quarter in Brest, the Saint-Pierre quarter in Brest, is mostly structured around post-war housing projects. Following Brest's extensive destruction in 1944-45, the former commune of Saint-Pierre-Quilbignon became the site of a major reconstruction combined with housing development to house those displaced by the war. Today it houses a highly multicultural community that is facing the two challenges to Brest: deindustrialisation and relative economic downturn. As such, it gives access to a very particular weatherscape, made of memories of a past in which local and global are intertwined, where its inhabitants' nostalgia for various pasts is hampering the ability to foresee the future.