Health, Risk and Climate Change: Understanding Links Between Exposure, Hazards and Vulnerability Across Spatial and Temporal Scales (HERCULES)

Climate related health risks are not yet thoroughly understood. We know that climate change related health risks will be distributed unevenly, with some population groups being more likely to suffer the adverse consequences. Urban populations, especially in socially and economically disadvantaged areas, are likely to be particularly vulnerable to the unfavourable effects of climate change due to already existing exposure to for example, air pollutants and social stressors.

What are the specific socio-environmental preconditions that make citizen groups in disadvantaged areas vulnerable to climate change? What are these preconditions, and how are they spatially distributed in cities? What type of actions ought to be taken in order to improve the adaptive capacity and resilience of Finnish cities under climate change? While adaptation within cities has been advancing, there is little knowledge of how adaptation is being implemented and how effective it is. As impacts of climate change are projected to worsen over time, the current adaptation measures may become insufficient, or inappropriate.

HERCULES begins from the standpoint that climate change directly influences on individuals' well-being and health, but that this often happens through long-term, complex, and often concealed processes, including broader trends of urban development.

We shall examine how the spatial pattern and intensity of health-relevant climatic hazards and other environmental exposures have changed since the 1980s, and how these will change during the coming decades. For this, we shall use extensive high-resolution data on climate and land-use, and sophisticated modelling.

We shall combine the exposure data with seven extensive Finnish health cohort data. This will allow us to unveil how health and health-related risk factors develop over the life course in changing living environments and consequently, what are the most important

environmental exposures affecting health outcomes. An improved understanding of the connections between exposure, vulnerability, and health combined with detailed data of the environmental and socio-economic conditions will allow us to assess spatially the climate related health risks in the six biggest cities in Finland (Helsinki, Espoo, Tampere, Vantaa, Turku, and Oulu).

We shall formulate associations between environmental and health data, and build an open climate risk database, which allows stakeholders to visualize graphs, maps, and animations of health risk distributions. The historical timelines will allow us to identify key policy areas with the urban sphere and develop a policy instrument typology, which will be used to develop a dynamic pathways model of different policy outcomes and broader trends of urban development, individuals' behaviour, and climate policy.

HERCULES will push the state-of-the-art scientific knowledge of urban health risks to a new level and catalyse chances for improved evidence-based decision making for healthier urban environments under changing climate.

More information:

Jukka Käyhkö, University of Turku (jukka.kayhko@utu.fi)
Sirkku Juhola, University of Helsinki (sirkku.juhola@helsinki.fi)
Jussi Vahtera, University of Turku (jussi.vahtera@utu.fi)
Antti-Ilari Partanen, Finnish Meteorological Institute (antti-ilari.partanen@fmi.fi)

Heat and Health in the Changing Climate (HEATCLIM)

Central feature of the ongoing climate change is a gradual increase in ambient temperature. The predicted increase is not homogeneous, but northern areas will warm up the most. Not only will the mean temperature increase, but heat waves will become more frequent and intense. High summer-time temperatures pose a significant risk to health even in the current-day climate in northern areas as well. The severity spectrum of adverse health effects of heat is wide: exposure may increase mortality or the use of health care, or just cause symptoms restricting daily activities. The total burden of disease caused by heat is poorly known.

Societies are able to adapt to climate to some extent. Protective measures are needed on both national and local level to adapt to the on-going changes in climate. Management of indoor conditions is the most important adaptive measure, but health can also be protected by affecting behaviour. Cost-effective adaptation requires targeting measures especially towards vulnerable population groups. Both biological and social factors, and their complex interactions, may lead to increased vulnerability.

The overall objective of the project is to produce new knowledge on the effects of high temperatures on human health in northern areas, and to provide cost-effective and socially acceptable solutions to adapt to climate change. The consortium project is genuinely multidisciplinary, covering natural, health, and social sciences and engineering, which enables versatile approaches to research questions. Project is coordinated by the University of Eastern Finland; other participants are Aalto University, Finnish Meteorological Institute, and Finnish Institute for Health and Welfare

During the project, epidemiological analyses of health register data will be performed to evaluate the effects of heat and heatwaves on morbidity and mortality, and to identify susceptible population groups. Social and economic determinants of heat vulnerability will be evaluated using a questionnaire study, complemented with interviews and scenario work. A field study, including environmental and physiological measurements, will be conducted to

create thermal comfort models for vulnerable population groups, and to evaluate the efficiency of local cooling methods. Climate modelling will be conducted to improve heat wave predictions for early warning systems and climate scenarios, and to calculate of cooling capacity needs in future climate.

In the last, integrative step of the project, health impact of heat in different climate, societal and adaptation scenarios will be assessed. Results will be used to guide policy makers on the scaling and targeting of adaptation measures. Central questions to be answered include: How will the burden of disease caused by heat change in Finland because of climate change? Which adaptation options are most efficient considering health effects, costs of the measures, and greenhouse gas emissions? How do the costs of adaptation and health effects affect the Finnish economy?

More information:

Timo Lanki, University of Eastern Finland (timo.lanki@uef.fi)
Sakari Karvonen, Finnish institute for Health and Welfare (sakari.karvonen@thl.fi)
Risto Kosonen, Aalto University (risto.kosonen@aalto.fi)
Kirsti Jylhä, Finnish Meteorological Institute (Kirsti.Jylha@fmi.fi)

DISEASES-ON-WINGS: The effect of climate change on dynamics of zoonoses in migratory birds and bats across Europe

Background

Climate change changes the distribution ranges of species, which leads to novel interaction between species in rapidly altering environmental conditions. These new interactions facilitate the transfer of pathogens from one host species to another. Migratory animals, such as some bat – and bird species can react rapidly to climate change by shifting their distribution ranges towards the poles. These migratory movements allow for the swift transport of pathogens from overwintering area to breeding area and vice versa. So far, the potentially zoonotic pathogens, which may cause harm to humans, have been studied very little in migratory birds and bats in Finland. We also have little information on how climate change will affect exposure to pathogens found in migratory animals. Zoonotic (animal-transmitted) diseases pose at present one of the biggest threats to humans, and outbreaks often occur as consequence of a change in the ecology of the host.

Aims

Our Diseases-on-Wings consortium studies pathogens migrating bird and bat species carry in Europe and aims to predict the effects of climate change on the occurrence of animal-transmitted diseases in Finland. The end-product of the project will be a tool for public authorities, which helps predict the risk posed by zoonotic diseases in changing climatic conditions.

Approach

Our project combines sample collection coordinated by the researchers with citizen science methods. Examples of citizen science methods include the “Faeces depository”, in which citizens perform sterile collection of bat faeces from their attics, and “Intestine goldmine, in

which in cooperation with the Finnish Wildlife agency, we instruct hunters to collect the offal of the birds they have collected for our analyses.
We also utilize European-wide data from natural history museums on distribution and migratory patterns of birds and bats, and medical database information dating back several decades on zoonotic diseases and pathogen diagnostic findings. These data are combined with predictive distribution models of migratory birds and bats and overlaid with pathogen occurrence models.

Diseases-on-Wings is a multi-disciplinary research consortium combining ecological modelling, large observational datasets and microbiological methodology. The consortium shares knowledge to assist in policy making and for the general public.

Further information:

Thomas Lilley, University of Helsinki (thomas.lilley@helsinki.fi)
Aleksi Lehikoinen, University of Helsinki (aleksi.lehikoinen@helsinki.fi)
Arto Tapio Pulliainen, University of Turku (arto.pulliainen@utu.fi)

Climate Change and Health: Adapting to Mental, Physical and Societal Challenges (CHAMPS)

The research consortium CHAMPS studies the potential impacts of climate change on health, with a focus on three interrelated topics. The first relates to mental health impacts associated with seasonal fluctuations in the intensity of daylight and modifying weather effects such as cloudiness and snow cover. The second concerns health impacts of thermal stress, both heat and cold, and the influence of social vulnerability and exposure of the population on the severity of impacts. The third considers the implications of these varied health impacts for occupational health and work productivity.

Mental disorders are the leading as well as an increasing cause of illness and work disability in Finland. Surveys have shown that 40% of Finns experience winter blues during dark winter periods. With winter cloudiness projected to increase and snow cover to decline with changing climate, the resulting darker conditions may worsen these symptoms and make seasonal affective disorders more common. However, while the cause of these disorders can be due to diverse factors, the role of light exposure is still poorly understood. One focus of CHAMPS research is on sleeping problems, which are known to predispose individuals to depressive, anxiety and substance use disorders and are easily affected by the amount, timing and physical characteristics of daylight.

Severe weather events such as heatwaves and cold snaps are strongly associated with increased illness and death rates in Finland. This is especially true of vulnerable groups such as the elderly, the very young as well as certain categories of employees in the workforce. By matching health-related impacts to information on population structure and on socioeconomic, occupational and pre-existing health status, CHAMPS studies those populations which are particularly disadvantaged and exposed to extreme weather events. The work, which includes a study of Helsinki, is mapping areas most at risk of adverse impacts

under a range of future scenarios and exploring strategies for adapting to such changing conditions.

Objective assessments of worker productivity such as sickness absence and their related costs due to climate change have been largely lacking. Not only outdoor workers, but also specific occupational groups such as home care workers as well as employees with chronic disease may suffer in extreme weather events from ailments such as heat exposure. With more frequent extremes anticipated, CHAMPS is examining how employees may benefit from proactive countermeasures against health-related impacts of the changing climate.

Awareness in Finland of weather and climate impacts on health (especially mental health) is currently very low, so CHAMPS research is being carried out in close co-operation with stakeholders and decision-makers. For all three topics, CHAMPS is investigating relationships between weather variables and observed mental, behavioural and physical health effects, to better understand the causes of adverse health impacts, and to describe the spatial and temporal distributions of these effects. Novel results are anticipated on impacts of climate change on seasonal mental health via solar radiation, relevant also to other high-latitude regions, and on actions needed to reduce risks of climate change by targeting social inequality, in the Helsinki case study. It is hoped that analyses on issues such as sickness absence will extend understanding of climate change impacts beyond direct health effects to wider societal costs, productivity and quality of life.

More information:

Timo Partonen, Finnish Institute for Health and Welfare (timo.partonen@thl.fi)
Timothy Carter, Finnish Environment Institute (tim.carter@ymparisto.fi)
Marko Elovainio, University of Helsinki (marko.elovainio@helsinki.fi)
Reija Ruuhela, Finnish Meteorological Institute (Reija.Ruuhela@fmi.fi)
Marianna Virtanen, University of Eastern Finland (marianna.virtanen@uef.fi)

Aeroallergens and Immunological Preparedness for Future Climate Scenarios: Implications for Public Health Promotion (ALL-IMPRESS)

One of the first and the most significant health consequences of climate change in Finland will be the increase in pollen allergies and the worsening of allergic symptom. This will have substantial impacts on economy and well-being. A more detailed research on factors behind pollen allergenicity and their interconnections is needed but currently lacking in relation to Finnish climate projections.

The mechanisms by which climate change influences aeroallergens and the incidence and severity of allergies are complex. Whilst CO_2 enhances pollen production, air pollutants, such as PM and ozone, increase the release of allergenic proteins from pollen grains and their symptom-inducing potential. Atmospheric circulation and changing wind patterns affect pollen dispersion and rupture and expose populations to novel allergens. Recent studies suggest increasing trends in season length and pollen amounts of birch. Grasses (Poaceae) are the second most important source of airborne allergens in Finland. Their significance to allergic people will increase, contrary to general global scenarios, since grasses are expected to thrive even better in future Finnish climate, where temperatures are higher, but draughts do not limit flowering. New allergenic invasive plants such as ragweed may increase the exposure to aeroallergens. Ragweed (common ragweed, *Ambrosia artemisiifolia*) pollen already spreads to Finland via long-distance transport and the seeds are coming with corn import but the local climate does not yet support its reproduction.

This project aims to disentangle allergen burden in future Finland and, additionally, to identify and analyze the opportunities for the adaptation to and mitigation of the aeroallergen-related diseases and associated costs. The project will introduce and apply a novel way to interconnect time series data that have remained scattered so far and combine those with advanced measurement and experimental set-ups and future scenario modelling. In short: We will generate a first long-term data describing how meteorological factors are reflected to the pollen and spore concentrations and release of allergens, and how they

associate with the health care use and costs. This information will be complemented by developing novel and validated methods for aeroallergen research. These methods will be applied to study how pollen and its allergenicity will change in different climate projections. All data will be included in a series of model predictions for aeroallergens spread, timing, and aggressiveness. Based on the information collected and analysed in the project, we will make an assessment of how the allergen climate will change over the next decades and what are the potential public health interventions and adaptation measures. The project has great potential for translation of results into practice, including the development of tools needed for more accurate preparation for the avoidance, alleviation and management of allergic disease burden and symptoms. Dissemination of new findings will be secured by active communication with parties of Finnish Allergy Program, Finnish Asthma and Allergy Foundation, health care professionals and decision-makers throughout the study.

More information:

Marjut Roponen, University of Eastern Finland (marjut.roponen@uef.fi), +358 40 356 2521
Mika Komppula, Finnish Meteorological Institute (mika.komppula@fmi.fi), +358 50 520 7500
Annika Saarto, University of Turku (annika.saarto@utu.fi), +358 50 442 0249 (1.1. – 31.12.2020 samuli.lehtonen@utu.fi)

Vector-borne Diseases and Climate Change in Finland: Mapping, Modelling, Mitigation - VECLIMIT

Vector-borne diseases that are transmitted via blood feeding arthropods are posing an increasing health threat to humans in Europe, including Finland. Their incidence and spread are strongly influenced by changes in the environment, in particular climate. The recent emergence of tick-borne encephalitis (TBE) in new areas, increase of reported borreliosis cases, and the threat of introduction of new vectors and pathogens warrants targeted research in Finland.

This consortium (partners from Universities of Helsinki, Jyväskylä and Turku, Luke, NIHW, FFA and FMI) aims to estimate and predict these risks in relation to climate change in Finland.

The ultimate goal is to better understand and quantify factors that drive vector-borne diseases and to provide essential information for intervention strategies. These goals will be achieved by integrating existing, unique long-term data on human disease incidence, dynamics of host communities, vectors and environmental variables, including climate, using modern analysis tools, empirical field studies and predictive spatiotemporal modelling. The methods include unbiased metagenomic screening to observe introductions and spread of vectors and pathogens. Such novel approaches will be used in pilot surveillance projects, together with investigations of wildlife disease outbreaks and serological surveys of humans and other vertebrate species. Additionally, we plan to assess knowledge, attitudes and practice of at-risk population towards vector-borne- diseases, in order to better tailor prevention measures in Finland. Intervention efforts will target tick-borne disease risk areas and include experimental controlling of tick populations by controlling the availability of the large animals they feed on, such as roe deer and white-tailed deer.

This consortium will bring together a unique combination of ecological, microbiological, medical, modelling and climatological expertise and build a network that can be utilized in disseminating scientific results and information, including visual representations of risk areas, to a wide audience.

The generated new knowledge will strengthen preparedness and guide decision making in battling and preventing climate-sensitive emerging vector-borne infectious diseases in Finland.

More information:

Olli Vapalahti, University of Helsinki (olli.vapalahti@helsinki.fi)
Jussi Sane, Finnish Institute for Health and Welfare (Jussi.sane@thl.fi)
Otso Huitu, Natural Resources Institute Finland (otso.huitu@luke.fi)
Eva Kallio, University of Jyväskylä (eva.kallio@jyu.fi)
Hilppa Gregow, Finnish Meteorological Institute (hilppa.gregow@fmi.fi)
Jukka Hytönen, University of Turku (jukka.hytonen@utu.fi)
Antti Oksanen, Finnish Food Authority (antti.oksanen@ruokavirasto.fi)

Effect of Climate Change on Building Design and Indoor Health (ECOCIDE)

Background

As people spend most of their lives indoors, the composition of the community of the microscopic organisms (bacteria, fungi and viruses) that live within our built environment is an important component of our health, through potential impacts on indoor air quality and on the structural integrity of the building. The conditions within building structures will change in the future, for example, due to a change in climate and because of the need to construct more energy efficient buildings and increase use of sustainable materials. Changes in climate, building design and materials can alter the environment of the building, mainly though a likely effect on moisture content and temperature. This change in the building environment can the composition of the indoor microbiota.

Aims

Our overarching aim is to determine how building design interacts with climate change to alter the composition of the indoor microbiota community. We test whether a combination of experiments and numerical simulations can identify potential problems with the design of new builds and renovations of buildings, thereby helping to 'future proof' against the need for excessive renovations in the future. Ultimately, we aim to better understand the interactions between the indoor microbiota, the indoor and outdoor environment, building materials and structural design to improve future sustainable design of buildings.

Approach

We use an interdisciplinary approach of (1) evolutionary biology and genomics, (2) building physics and (3) materials science, where we use a combination of experimental microcosms, genomics and numerical simulations to simulate and then quantify potential impacts of

building design and climate change on the composition and function of the indoor microbiota.

A national survey on the structural condition of wood-framed houses dating back several decades will be the basis for the project, but these data will be supplemented by examining case studies on public buildings such as health care centres, schools and kindergartens, and traditional log houses. Private house-owners, building and renovation companies, public organizations and regions are invited to provide their buildings as sampling sites. We emphasise the microbiota within building structures as it is in these areas where moisture can accumulate (due to a combination of high humidity and reduced air flow) and where microbial communities can grow unnoticed until a serious 'mould' problem develops. The results of this study offer the basis for large-scale laboratory screening studies of different building materials and how they operate under changing climate conditions.

More information:

Phillip Watts, University of Jyväskylä (phillip.c.watts@jyu.fi)
Filip Fedorik, University of Oulu (Filip.Fedorik@oulu.fi)
Antti Haapala, University of Eastern Finland (antti.haapala@uef.fi)

https://www.jyu.fi/science/en/bioenv/staff-and-administration/staff/watts-phillip

Arctic Community Resilience to Boreal Environmental Change: Assessing Risks from Fire and Disease (ACRoBEAR)

The Arctic has warmed rapidly over recent decades, at around twice the rate of global mean temperature increases. Changes in the high latitude terrestrial environment include observed increases in temperature extremes and precipitation patterns. These increase likelihood of boreal wildfires and changes in appearance and dispersion of natural focal diseases (NFD), such as anthrax or ticks. The goal of the project is to predict and understand health risks from wildfire air pollution and natural focal diseases at high latitudes, and resilience and adaptability of communities across the region to these risks. We use a combination of satellite and in-situ observations, modelling, health data and knowledge, and community knowledge and stakeholder dialogue.

We will:

1. Determine variability and trends in fire-sourced air pollution across three high latitude regions (Alaska, Siberia, Sweden) and the pan-Arctic region, and associated societal health impacts.
2. Connect natural-focal disease (NFD) occurrence and weather conditions, wildfires and disease dispersion.
3. Connect climate variability to increasing risk of fire-induced and NFD-induced health impacts across the pan-Arctic region, and their interactions.
4. Estimate future changes in risks under a range of projected climate scenarios and identify common and competing climate drivers for these risks.
5. Investigate local perceptions and experiences of wildfire and NFD health risks in local communities in Scandinavia, Siberia and Alaska and identify the factors governing societal vulnerability and resilience in the changing environment.

6. Produce a web interface to decision-making needs in order to understand and map these risks historically and to identify adaptation actions under different climate and policy scenarios.

The specific focus of the team in University of Helsinki (UHEL) is to analyse the connection between the dispersal of NFD in the Russian Arctic and the climate change scenarios. This can give new insights into the risk assessment of the appearance and dispersal of NFD in the changing climate. We also contribute to the analysis of dispersion of aerosol particle emissions from the fires.

More information:

Finnish project leader: Tuukka Petäjä, University of Helsinki (tuukka.petaja@helsinki.fi)

Consortium Leader: Arnold Stephen, University of Leeds, UK

The Pollination of Nepal's Micronutrient-rich Crops in a Changing Climate (Micro-Poll)

Three quarters of crop species depend on pollinators, but the service they provide is under increasing threat from climate change. Declines in pollinators are predicted to have negative impacts on human health as key dietary micronutrients in insect pollinated crops such as vitamin A and folate are lost from the diet. This "hidden hunger" is predicted to cause significant global health burdens. Climate change is already affecting pollinators, for example, the geographic range of bumblebees is shrinking as their southern range moves northwards, the synchrony between flowering plants and their pollinators is being disrupted and climate change is predicted to decrease bee species richness by 8-18% in some areas.

Pollinator loss disproportionately harms developing countries, as they are both less resilient to yield drops and more reliant on the micronutrients found in small-scale pollinator-dependent crops. Providing population-wide vitamin supplementation is neither practical nor sustainable in remote parts of the world; instead, diversifying the diet by increasing access to micronutrient-rich fruits, vegetables and legumes could provide a solution.

Fortunately, pollinator declines can be reversed, at least locally. Moreover, if the effect of climate change on pollinators is understood, habitat management can be used to mitigate against its effects. There is evidence of climate change, pollinator declines and micronutrient deficiency in our focal country Nepal and our research vision has four components: 1) to predict the effect of climate change on crop pollinators in Nepal; 2) to predict the ensuing impact on crop production and micronutrient intake; 3) run a field experiment to test the resilience of insect pollinated crops to climate change; 4) develop a policy and education package to mitigate the effects of climate change on crop pollination and micronutrient intake.

Working with health professionals in Nepal, our international team of natural scientists and health scientists will provide information and innovative solutions for an understudied impact of climate change on human health.

More information:

Finnish project leader: Tomas Roslin, University of Helsinki (tomas.roslin@helsinki.fi)

Consortium Leader: Jane Memmott, University of Bristol, UK

Health Effects and Associated Socio-economic Costs of Increasing Temperatures and Wildfires - A Global Assessment

On-going climate change will have widespread impact on virtually all parts of human society and environment. Particularly devastating are the extreme episodes, such as heat waves, storms, cold spells, etc. Considering heat waves, the risk of vegetation fires increases during periods of extreme heat and no rain, which can cause strong air pollution. Extreme heat increases the rates of death (mortality) and can exacerbate various diseases (morbidity). When heat coincides with air pollution, synergistic effects on human health can be stronger than that caused by air pollution or high temperatures alone. The health risk varies by region, population vulnerability, urban and rural environment and other factors. Populations at highest risk include older adults, children, socially isolated individuals, and individuals with chronic diseases.

HEATCOST, an international project lead by CICERO (Norway), will investigate the connection between extreme weather events, first of all, heat waves, with occurrence and strength of vegetation fires, finally evaluating the impact of the combined weather and air pollution on human health. Specifically, HEATCOST will connect global changes in cardiovascular and respiratory mortality and morbidity due to extreme heat and air pollution (including the impact of wildfires) under selected climate scenarios. The study will use both actual air quality and weather observations from the past and model computations covering both past and the future. Special attention will be given to satellites, which provide comparatively uniform data all over the globe.

Facing the climate- and pollution- related challenges, human society need to adapt to the new conditions, but can also act pre-emptively in order to reduce the stress and its impact. Health effects due to heat and air pollution are largely preventable but the adaptation measures should

be tailored to limit both the stress on sensitive groups and the individual vulnerability. HEATCOST will consider a variety of adaptation strategies and estimate the associated costs.

HEATCOST builds on the on-going Horizon-2020 project EXHAUSTION, which quantifies the health effects of climate change in Europe. HEATCOST will expand to the global scale and quantify the health risks attributable to heat and air pollution (with a focus on air pollution from wildfires) in the main parts of the world.

More information:

Finnish project leader: Mikhail Sofiev, Finnish Meteorological Institute (Mikhail.Sofiev@fmi.fi)

Consortium Leader: Kristin Aunan, The Centre for International Climate and Environmental Research (CICERO), Norway

Challenging the Climate Crisis: Children's Agency to Tackle Policy Underpinned by Learning for Transformation (CCC-Catapult)

There is emerging consensus that lack of effective climate leadership, combined with institutional inertia and confused governance mechanisms, is resulting in widespread climate indifference or extremism. CCC-Catapult seeks to co-create new knowledge through the 'eyes and ears' of children, teachers and other supporters of learning on how they situate and make sense of their lives in relation to climate complexity and cultural shifts. Our multidisciplinary mixed methods project aims to critically examine educational, worldview and intercultural influences on children's climate and environment-focused learning and agency at a time when 'eco-anxiety' is starting to become a defining characteristic of the climate emergency. The objectives of the project are to:

(1) explore sense making and existing and potentially new social norms, worldviews, possible tensions and ecoanxieties among European youth aged 15-17

(2) explore how young people understand the value-action gap in tackling the climate emergency and co-create a vision for transformed climate education for closing the gap

(3) deep map insights and actions to enable transformation

(4) co-develop a methodology and toolkit to better link education and worldview knowledge with policymaking

(5) co-deliver and evaluate a set of research-informed activities inside and outside of educational settings

(6) co-develop policy and practice focused recommendations.

In the project we will develop and conduct a survey as well as participatory case studies in the home countries and cities of participating Universities (England (Bristol), Ireland (Galway), Finland (Tampere) and Italy (Genoa)). The Finnish case study focuses on co-creating and modeling culturally responsive and worldview aware climate education.

More information:

- Finnish project leader: Inkeri Rissanen, Tampere University inkeri.rissanen@tuni.fi
- Consortium leader: Lindsey McEven, University of the West of England, Bristol, UK

An Approach for Innovative Climate Learning, Evaluation and Action in Neighbourhoods (CLEAN cultures)

In climate policies, bottom-up initiatives by individuals and communities have been seen essential in increasing acceptance of climate actions. Yet, conventional strategies addressing these groups often fail to provoke a change in perspectives and actions. Facing local people with climate threats in their own surroundings may tackle climate related prejudices and initiate transformative learning processes. CLEAN cultures project studies through case studies how broadening the perspective at a micro-level may trigger action, and how it may evoke political bottom-up driven decisions. In the study, two innovative aspects are combined: First, neighbourhoods facing local climate-related challenges are studied as target groups, and invited to engage in a process that consists of iterative and interactive periods of impulses, discussion, and reflection in order to unlock the local capacity to address the problems. Second, in this process, the neighbourhoods are confronted with novel and unconventional impulses, triggering their emotions, followed by workshops, where we will explore together their thinking and their (developing) view of problems and solutions, exploring the local social knowledge and capital. Through this, neighbourhoods will be enabled to broaden their view on climate change and their possibilities to (re)act responsibly on climate change related concrete problems. The project yields results at three levels: an effective change in perspectives at the level of the neighbourhood; a generic transferable methodology for stimulating such processes in other neighbourhoods; and a set of recommendations for the micro- and meso-level climate policy-making.

More information:

- Finnish project leader: Laura Sokka, VTT Technical Research Centre of Finland Ltd, laura.sokka@vtt.fi
- Consortium leader: Gudrun Lettmayer, Joanneum Research Forschungsgesellschaft mbH, Austria gudrun.lettmayer@joanneum.at

Solidarity in climate change adaptation policies: towards more socio-spatial justice in the face of multiple risks – SOLARIS

In light of current knowledge, mitigation policies, as they stand, are insufficient to deal with the levels of climate change projected. Significant adaptation measures across sectors will be critical in tackling climate change-related consequences in our societies. Climate change adaptation needs to address physical impacts, but the measures need to be designed in a way that they take into account social, political and spatial aspects and realities.

Implementation of climate change adaptation measures is likely to face challenges in relation to several factors, such as the legitimacy of decision making, solidarity and social justice. Discussion is needed on how social and spatial inequalities and ability to address adaptation are taken into account in the implementation of climate change adaptation policies and measures.

Active participation and involvement of affected citizens is desirable. This is particularly true for floods, which are the most prevalent natural hazard in Europe. Flood risk is expected to increase significantly due to changes in not only climate related but also socio-economic factors.

This project aims to understand how possible injustices in climate change adaptation occur, who is advantaged or disadvantaged, and in what manner and how inequalities are addressed in adaptation policies. This enables developing and implementing future adaptation policies as socially acceptable and just as possible.

Research together with the locals and local governments

In this project we will evaluate the design of policy instruments and their implementation, local governance and on-going projects from the viewpoints of solidarity and social justice. With examples from flood risk management, we will evaluate policy design and action to mitigate harmful risk and unwanted impacts, and to achieve better preparedness.

We will utilise empirical research with two hands-on case studies per country. In the case studies we will assess how social justice is taken into account in local adaptation policy processes, and how different population groups are involved and able to participate. In addition, we explore innovative outreach activities such as video and artistic production in support of broad and equitable participation.

New information on the social dimensions of climate change adaptation

Through this project we will produce new information and understanding of factors involved in social justice of climate change adaptation policies. We unravel how to govern such factors, and take them into account in decision making processes. We will utilise participatory methods and coproduction of knowledge in cooperation with local decision

makers, officials and citizens. This will support the local community, their agency, and experience of being heard as part of a bigger process.

More information:

- Finnish project leader: Emma Terämä, Finnish Environment Institute, emma.terama@ymparisto.fi
- Consortium leader: Mathilde Gralepois, University of Tours, France, mathilde.gralepois@univ-tours.fr