Scenarios for Climate Change and Health Analysis in Finland

Report of the CLIHE Virtual Workshop on Scenario Co-ordination, 16 December 2020

Edited by Timothy R. Carter, SYKE (CHAMPS project), tim.carter@syke.fi

Summary

A virtual workshop on Scenarios for Climate Change and Health Analysis in Finland was held on 16 December 2020 in the context of the Climate Change and Health Academy Programme (CLIHE). Its purpose was: (1) to exchange information between consortium projects in CLIHE on scenario planning and anticipated needs; (2) explore opportunities for collaboration and exchange of data and scenarios and (3) discuss possible co-ordination in the use of a shared scenario framework and common choice of core scenarios to support research in CLIHE. The workshop was attended by about 30 participants from a cross-section of CLIHE projects. It included introductory presentations on the National Adaptation Plan for Health and Social Welfare and on the framing of scenarios for climate change analysis as well as presentations on data and scenario needs in seven of the CLIHE projects: ALL-IMPRESS, CHAMPS, Diseases-on-Wings, ECOCIDE, HEATCLIM, HERCULES and VECLIMIT. Three break-out groups were held to discuss aspects of (1) socioeconomic scenarios, (2) climate and related scenarios and (3) scenario combinations. Some of the key messages emerging from the workshop are as follows:

- More cross-programme interactions of this kind should be encouraged.
- There are clear opportunities for shared efforts in data and scenario compilation, documentation and exchange.
- Collaboration would be valuable for developing research methods of participatory scenario development.
- There is merit in selecting a set of core RCP-SSP scenarios for common use across CLIHE projects.
- Outcomes of the workshop should be reported to CLIHE researchers and interested stakeholder groups.
- A concrete next step could be to prepare a data and scenarios questionnaire for establishing the main data and scenario requirements in different projects.

Background

The Climate Change and Health Academy Programme (CLIHE) is investigating the impacts of climate change on human health and well-being in order to enhance the knowledge base for designing appropriate adaptation responses. CLIHE runs from 2020 to 2023 and comprises seven research consortium projects and three international joint research projects.

An important requirement shared across most projects is the need for *scenarios*. These are important tools for characterising future environmental and socioeconomic developments of importance for the health and social welfare sector under a changing climate in the coming decades. Due to the severe impacts of the current Covid-19 crisis on working practices for research in general, and on the health sector in particular, a planned kick-off meeting for all CLIHE projects could not be arranged during the first year of the programme and has been deferred to January 2021. However, for an issue such as scenario development and selection, there can be clear benefits in early cross-programme collaboration.

The desirability for co-ordination across CLIHE in the specification of scenarios was recognised in the workplan of one of the projects led by the National Institute for Health and Welfare (THL): CHAMPS (Climate change and Health: Adapting to Mental, Physical and Societal challenges). It was argued that such co-operation might be beneficial for individual projects, to avoid unnecessary duplication of effort, and for the programme as a whole, to encourage some level of cross-programme scenario consistency. It was also proposed that CHAMPS should arrange a joint Workshop on this issue during Year 1, building on a previous sectoral scenarios Workshop held in 2019[1].

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[1] Workshop on "Climate change and the social and health sector in Finland - scenarios to support research and decision-making", SYKE, 14 May 2019 (Academy of Finland PLUMES project).

As such, and in order to gauge opinions from other projects in CLIHE, a short questionnaire was prepared in CHAMPS and mailed to other project leaders and scenario experts in June 2020. This asked if individual projects intended to apply scenarios and might consider aligning their activities by adopting a core set of common, shared scenarios across CLIHE. It also inquired whether they would be interested in participating in a scenarios workshop for discussing the choice of CLIHE scenarios.

From the positive responses received from those projects that replied, it was decided to proceed with the organisation of a virtual Workshop, which took place on 16 December 2020. This document provides a concise summary of the proceedings and the key conclusions that emerged.

Purpose and structure

The purpose of the workshop was threefold:

1) to exchange information between CLIHE projects on scenario planning and anticipated needs for data, projections, methods and criteria for scenario selection;
2) to explore opportunities for collaboration and exchange of data and scenarios; and
3) to discuss possible co-ordination in the use of a shared scenario framework and common choice of core scenarios to support research in CLIHE.

The workshop programme (Annex 1) was structured around two presentations introducing the policy context for research in CLIHE and outlining alternative approaches to scenario development, a set of concise presentations of scenario needs in the seven CLIHE research projects, three break-out groups on socioeconomic scenarios, climate and related scenarios and scenario integration and policy, respectively, and a general discussion on the main findings and possible next steps. The workshop was attended by ~30 participants invited from CLIHE projects, the Academy of Finland and the group preparing Finland's national adaptation plan for health and social welfare.

Context for scenarios

Päivi Meriläinen (THL) presented progress with the development of the National Adaptation Plan for Health and Social Welfare, which is due to be completed in 2022. Based on a 2018 survey of key national sectors for which climate change adaptation planning is required, preparations in the social and welfare sector were found to be weakest (Mäkinen et al., 2020). There are several knowledge gaps to be filled, for example, through research programmes such as CLIHE. The adaptation plan addresses a wide range of subject areas, with scenarios included among the needs identified. A report of about 50 pages will be prepared with possibilities to comment on the draft from Spring 2021 onwards. Communication and implementation of the adaptation plan is scheduled for 2021-2022.

Timothy Carter (SYKE and CHAMPS) presented some overarching issues relating to the framing of scenarios for climate change analysis in the Finnish health and social welfare sector. This was designed to introduce themes to be expanded in the break-out groups (see below). He distinguished four approaches to scenario development for climate change impact and adaptation (CCIA) analysis of potential relevance for CLIHE, which he labelled as: (i) local visions, (ii) adaptation pathways, (iii) SSP based downscaling, and (iv) wild cards (Figure 1):

Carter also reminded participants of the SSP-RCP scenarios matrix conventionally applied by climate change researchers for identifying alternative combinations of socioeconomic and climate projections during the 21st century (Figure 2, and see O'Neill et al. 2020). Researchers are free to select whatever scenario combinations are relevant for their applications, but he argued that there may be benefits in identifying a small, core set of combinations in common across the CLIHE programme.
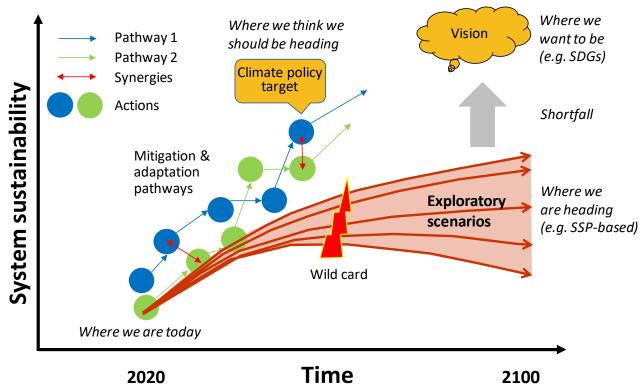
Figure 1: Four approaches to long-term scenario development for climate change impacts and adaptation analysis: visions, adaptation pathways, exploratory scenarios and wild cards (adapted from Holman et al. 2017)

CMIP5 projections	CMIP6 GCMs	SSP / RCP	Sustainability	Middle of the Road	Regional rivalry	Inequality	Fossil-fuelled development
$\Delta T_{2070\text{-}2099}$ *	n	W/m²	SSP1	SSP2	SSP3	SSP4	SSP5
3.5-7.7°C	28	8.5	(grey)	(grey)	(grey)	(grey)	
Not evaluated	24	7.0					
2.1-5.1°C	7	6.0					
1.7-4.9°C	26	4.5					
Not evaluated	7	3.4					
0.8-3.0°C	26	2.6			(grey)		
Not evaluated	10	1.9			(grey)		

* Finland mean temperature change relative to 1981-2010. Range is 5th to 95th percentile for a multi-model ensemble based on CMIP5 – Ruosteenoja et al. (2016)

SSP = Shared Socioeconomic Pathway

RCP = Representative Concentration Pathway

(grey) = Unlikely RCP-SSP combinations – O'Neill et al. (2020)

(green) = CMIP5 RCPs

Figure 2: The uncertainty space for selecting integrated exploratory scenarios for Finland comprising combinations of RCP-based climate and SSP-based socioeconomic projections. Based on O'Neill et al. (2020); Tebaldi et al. (2020) and Ruosteenoja et al. (2016).

Seven projects; seven sets of scenario needs

The main objectives, methods and anticipated scenario needs of each of the seven CLIHE consortium projects represented at the workshop were outlined in brief presentations that are available online at the workshop site. Some key points distilled from the presentations are summarised in Table 1. It was observed that even if outcomes of CLIHE projects are not available in time for incorporation in the upcoming adaptation plan, they can still make a concrete contribution to adaptation measures being implemented in the health sector. This is particularly pertinent in the case of those projects for which stakeholder engagement is central (e.g. HERCULES, HEATCLIM and CHAMPS). There was interest in the citizen science approaches being pursued in the Diseases-on-Wings project, for gathering observations of microbiomes from wood pigeons and bat colonies. A question was also raised about the level of synergy and co-ordination among Finnish Meteorological Institute (FMI) researchers, considering FMI's involvement in most of the consortia. It was confirmed that inter-project meetings have already been held at FMI and more are planned in the future. It was stressed that such coordination between CLIHE projects should not be confined to FMI partners alone, but was important more generally.

Break-out groups, final discussion and key messages

Three parallel 30-minutes break-out groups were organised on the following topics:

1) BOG1: SSP narratives & quantification (socioeconomic variables)
2) BOG2: RCP-based climate & related projections
3) BOG3: Combining RCPs, SSPs & policy scenarios

All three groups addressed information needs for scenario development, the scope for sharing of observations, projections and methodological approaches and potential future co-ordination of activities in CLIHE. Reports of the groups are included in Annex 2. Some clear messages emerging from break-out groups and the subsequent discussion session and chat line included:

- *Virtues of cross-programme interaction*. There was general approval of interactions such as this workshop involving different CLIHE and related projects on themes of common interest, such as scenarios. Such events facilitate:
    o briefing and exchange of information on ongoing activities;
    o cross-fertilisation of ideas;
    o identification of common topics of concern;
    o encouragement of complementarity of effort and avoidance of unnecessary duplication;
    o opportunities for cross-programme collaboration on topics like scenarios.
- *Opportunities for shared efforts in data compilation, documentation and exchange*. Statistics and observations describing historical trends and the present-day situation are a fundamental requirement for scenario development alongside projections of future climate and socioeconomic trends (many of these based on model simulations). Data of different types are being collected in all CLIHE projects. This raises several possibilities:
    o Information on the types of data being collected in different projects could be co-ordinated and catalogued across the CLIHE programme (e.g. at a common website).
    o Some common data (e.g. on climate, demography) are clearly needed by many projects, so means for pooling and sharing such data could be explored. Standard datasets could be prepared, but there is a need both to identify and prioritise the data included in such datasets as well as groups and persons willing to co-ordinate such exercises. Some social and health data being collected in individual projects are restricted and quite sensitive, so thought would be needed into whether and how such data might be shared.
    o There is scope for documenting and sharing models and other tools used to process data.
    o A questionnaire could be drafted to survey data and scenario needs among projects.

Table 1: Overview of the main objectives and suggested scenario needs of seven CLIHE consortium projects based on workshop presentations (see hyperlinks)

Consortium	Main objectives	Suggested scenario needs
ALL-IMPRESS[1]	To evaluate how the allergen burden (focusing on grasses) will change over the next decades and what are the potential public health interventions and adaptation measures	Climate projections: Variables affecting e.g. growth seasons, growing belts, spread of invasive plants and pollination → Temperature, CO_2; Other potentially interesting projections: Socioeconomic scenarios (land use, biodiversity, health care)
CHAMPS[2]	To analyse: effects of darker winters on mental illnesses, sick leaves and suicides, effects of social factors on heat and cold stress-related health risks now and in the future, and how to reduce negative health impacts of climate change	RCP-based climate variables: (e.g. global radiation, cloud, air pressure, snow depth, windspeed, max, min, mean ´& "effective" temperature, humidity, precipitation); SSP-based narratives, exposure & vulnerability indicators (e.g. of health, demographic, social, economic & technological factors; adaptation pathways; Reference: 1991-2020; 2020; Time horizon: 2060s +; spatial (site to regional council) & temporal (sub-daily to daily) resolution
Diseases-on-Wings[3]	To undertake species distribution surveillance and modelling of birds and bats that carry diseases and to relate this to microbiome characterisations of bird intestine and bat feces samples using citizen science methods	Projections of key climate variables based on RCP trajectories for RCP2.6, 4.5 and 8.5
ECOCIDE[4]	To examine how building design impacts indoor microbiota and to 'future-proof' building design to meet challenges posed by climate change	Future changes in Finland of: climate, building materials and design policy & drivers; Projections for Finland (2030, 2050, 2080)
HEATCLIM[5]	To produce new knowledge on the current and future health effects of heat in different population groups and to provide cost-effective and socially acceptable adaptation solutions	Climate: e.g. daily mean temperature (+min/max), heatwaves, relative humidity; Demographic: e.g. population, age and sex distribution, chronic diseases, employment, single-person households; Technical: e.g. mechanical cooling, passive cooling, all households (by type of housing), social and health care facilities; Economic: national & regional economy, public finance; 18 regions, three future time-points (2070-2079), likely value (+min/max)
HERCULES[6]	To examine past and possible future changes in pattern and intensity of climate-related health risks in six cities: Helsinki, Espoo, Tampere, Vantaa, Turku & Oulu, to develop a dynamic pathways model of different policy outcomes, and to catalyse chances for improved evidence-based decision making	RCP-based climate projections: EURO-CORDEX regional climate model (RCM) with RCP4.5 at 12.5 km grid resolution & daily time resolution; 6 models; current focus temperature; other variables also available; HARMONIE-Climate (HCLIM) RCM data for RCP8.5 at 3 km & 12 km grid resolutions & 1–3 h time resolution downscaled from 2 global models for studying heatwaves and urban heat island (publicly available 2021); Focus on period 2040-2060
VECLIMIT[7]	To quantify, analyse and model climate change-dependent factors affecting the spatio-temporal dynamics of vector-borne diseases (VBDs) in Finland in order to predict and mitigate their effects on human health	Observed climate: FMI: temp (min, max, mean), precipitation (month/season), humidity, snow, growing season – 1 km resolution; WorldClim & CHELSA; Climate projections: WorldClim & CHELSA [CMIP5] - 0.30 seconds gridded GIS-ready format (GeoTiff); four global models; RCPs 4.5 & 8.5; WorldClim-[CMIP6] - 2.5 minutes bio-climatological dataset for 2041-2060, 2061-2080 & 2081-2100; IPSL-CM6A-LR for SSPs 1-26, 2-45, 3-70 & 5-85 Which future model-based projections are best suited for Finland? How does species distribution model performance differ when using alternative sources of climate projections?

[1] Aeroallergens and immunological preparedness for future climate scenarios: implications for public health promotion (UEF, FMI, UTU); [2] Climate change and health: adapting to mental, physical and societal challenges (THL, FMI, SYKE, UH, UEF); [3] Diseases-on-Wings (HU, UTU); [4] Effect of climate change on building design and indoor health (UJ, UEF, UO); [5] Heat and health in the changing climate (UEF, Aalto, THL, FMI); [6] Health, risk and climate change: understanding links between exposure, hazards and vulnerability (UTU, FMI, UH); [7] Vector-borne diseases and climate change in Finland: mapping, modelling, mitigation (UH, UJ, FMI, Luke, FFA, UT, THL, AVIA GIS, BNI)

- *Development of research methods in participatory scenario development*. Projects are using a variety of research methods, some fairly novel and often in conjunction with stakeholders, which might benefit from cross-programme interaction. Items noted for prospective collaboration included exploring:
    - the types of scenarios required to address local and national climate change policy needs whilst still being relevant and comparable at international level;
    - methods of engaging stakeholders in ensuring the relevance, credibility and legitimacy of scenarios for Finland selected in CLIHE, especially relating to socio-economic and technological development as well as policy;
    - the selection of scenarios and their application in research and for informing policy
- *Selection of core scenarios*. Most projects plan to employ some combination of climate and socioeconomic/technical scenarios, in some cases including policy scenarios. There was some agreement that use of a core set of a few standard scenarios across CLIHE projects could be a useful device for aligning studies and providing an opportunity for cross-comparison. This could be based on the RCP-SSP framework described above and preliminary suggestions were aired in BOG 3. An important criterion for scenario selection was that they should embrace a credible range of uncertainties in projections. Another issue related to suitable future time horizons of study during the 21st century. A proposal could be drafted and CLIHE projects surveyed and/or a workshop held for describing and prioritising potential candidate scenario combinations.
- *Reporting of this workshop to CLIHE researchers and interested stakeholder groups*. It was thought to be important to raise the issues of cross-programme collaboration on data and scenarios at the CLIHE kick-off meeting on 13 January 2021. This could be one of the topics of discussion in the Panel as well as by project presenters. A video presentation on scenarios was also proposed at the Workshop, but after further discussion was not thought viable at this late stage, though a video describing CLIHE scenario choices might be very useful at a later stage of the programme.

Other, more specific recommendations can also be found in the break-out group reports in Annex 2. Perhaps the most concrete outcome of the Workshop was a shared commitment to co-ordinate the development and distribution of one or more *data and scenarios questionnaire(s)* for establishing the main data and scenario requirements in different projects. The Finnish Meteorological Institute is already planning to survey needs on the development and provision of climate data and scenarios along with plans for a workshop on the topic. Similar (or integrated) initiatives could be useful for addressing demographic, health and other socioeconomic data important for defining exposure and vulnerability of the health and social welfare sector to climate change.

References

Holman, I, et al. (2017) Modelling Climate Change Impacts, Adaptation and Vulnerability in Europe. IMPRESSIONS Deliverable D3B.2. Available from www.impressions-project.eu

Mäkinen, K, et al. (2020) Implementation of Finland's National Climate Change Adaptation Plan 2022 – A Mid-term Evaluation. *Publications of the Ministry of Agriculture and Forestry* 2020:9, 178 pp, http://urn.fi/URN:ISBN:978-952-366-198-1. Also available in Finnish as Mäkinen et al. (2019) at: http://urn.fi/URN:ISBN:978-952-366-000-7

O'Neill BC, et al. (2020) Achievements and needs for the climate change scenario framework. *Nature Climate Change*, https://doi:10.1038/s41558-020-00952-0

Ruosteenoja, K. et al. (2016) Climate projections for Finland under the RCP forcing scenarios. *Geophysica* 51: 17–50, http://www.geophysica.fi/pdf/geophysica_2016_51_1-2_017_ruosteenoja.pdf.

Tebaldi C, et al. (2020) Climate model projections from the Scenario Model Intercomparison Project (ScenarioMIP) of CMIP6. *Earth Syst. Dynam. Discuss*. 2020, 1-50, https://doi:10.5194/esd-2020-68

Acknowledgements

Annex 1

CLIHE Workshop on Scenario Co-ordination, Wednesday 16 December 2020, 9:00-12:15

PROGRAMME, Wednesday 16 December 2020

08:50 – 09:00	**Virtual workshop open**
09:00 – 09:05	**Welcome to the Workshop and purpose** – *Reija Ruuhela, CHAMPS*
09:05 – 09:20	**Progress with the National Adaptation Plan for Health & Social Welfare** – *Päivi Meriläinen. THL*
09:20 – 10:00	**CLIHE Projects and scenario needs** – *Chair: Reija Ruuhela, CHAMPS* Consortium presentations 5 mins each (depends on consortium participation) Prior distribution of slides (Maximum 3 "content" slides per project) • **VECLIMIT** – *Mika Siljander, UH* • **HERCULES** – *Jukka Käyhkö, UTU* • **HEATCLIM** – *Timo Lanki, UEF* • **ECOCIDE** – *Phillip Watts, JYU* • **DISEASE-ON-WINGS** – *Thomas Lilley, UH* • **CHAMPS** – *Timothy Carter, SYKE* • **ALL-IMPRESS** – *Marjut Roponen, UEF* Each presentation follows on immediately from the previous one Comments in chat line please
10:00 – 10:30	**Discussion on points arising + chat line**
10:30 – 10:45	**Open refreshment break – possible to chat**
10.45 – 11:00	**Framing scenarios for climate change analysis in the Finnish health & social welfare sector** – *Timothy Carter, CHAMPS*
11:05 – 11:35 Three break-out rooms (members agreed in advance)	**Break-out groups** (See table below for participant list and links to rooms) • **BOG1: SSP narratives & quantification (socioeconomic variables)** *Moderator: Emma Terämä, CHAMPS & SOLARIS* • **BOG2: RCP-based climate & related projections** *Moderator: Kirsti Jylhä, HEATCLIM* • **BOG3: Combining RCPs, SSPs & policy scenarios** *Moderator: Jukka Käyhkö, HERCULES*
11:35 – 11:55	**Plenary report back from BOGs 1-4** – *Chair: Timo Lanki, HEATCLIM*
11:55 – 12:15	**Discussion & wrap up** – *Moderator: Timothy Carter, CHAMPS* • Data availability and exchange • Methods • Suggestions for core scenarios • Next steps including CLIHE kickoff on 13 January 2021
12:15	**Close**

Annex 2: Break-out group reports (unedited GoogleDoc transcripts)

BOG1: SSP narratives & quantification (socioeconomic variables)

Moderator: Emma Terämä (VM, CHAMPS/SOLARIS)
Note-taker: Anna Lipsanen (SYKE, CHAMPS)
Participants:
- Emma Terämä (VM, CHAMPS/SOLARIS),
- Anna Lipsanen (SYKE, CHAMPS)
- Timo Lanki (UEF, HEATCLIM)
- Veli-Matti Lähteenmäki (UEF, ECOCIDE),
- *Markus Melin (Luke, VECLIMIT) - not present*
- Marjut Roponen (UEF, ALL-IMPRESS),
- Reija Ruuhela (FMI, CHAMPS)A
- Aleksi Räsänen (UH, HERCULES)
- Mika Siljander (UH, VECLIMIT)
- Filip Fedorik (Oulun yliopisto, ECOCIDE)

Questions:

1. Information needs: What are your socioeconomic (population, age, GPD) and related (health, migration, urbanisation, education...) information & data NEEDS for which projections into the future are likely? (e.g. SSP-based, what variables, time/space resolution, time horizon, qualitative or quantitative)

SOLARIS/ CHAMPS:
Spatially disaggregated population (e.g. within Helsinki metro region); household size; household income - yes, another vote here

HERCULES: Quantitative high-spatial resolution (250-1000 m) SSP-like vulnerability/exposure scenarios for the 6 largest cities to ca. 2040-60 (variables not yet decided)

Level of urbanization - urbanization scenarios

HEATCLIM:

2010-2019 (baseline):

 -2030-39, 2050-59, 2070-79

Official regions, age&sex distribution

National and regional economy, public finance (incl. employment)
Chronic diseases
Building stock
Single-family households
Population in the facilities of social and health care
Migration
Population data current situation: Population density - Grid based analysis - 1 km 2.5 min ca. 4 km
- municipality level aggregated information - SYKE has population grid data!

Spatial resolution varies: Grid based analysis - 1 km 2.5 min ca. 4 km - municipality level aggregated information

Time horizon - current up to SSP 2081-2100

ALL-IMPRESS:
land use regulations, urbanization, chronic (allergic) diseases, age/sex, health care+related finance (2050, 2070, 2100)

ECOCIDE:
Time horizon 2020, 2050, 2100
Building stock + all related

2. Sharing & common approaches: Do you have datasets, projections and approaches that we might SHARE across CLIHE? (e.g. disaggregated population and health information; base year and projection periods; methods to tackle uncertainties)

HERCULES-related:
We have projected heat-related vulnerability (elderly, childhood, gender, economic status, education, immigration, non-employed) with global and EuroSSPs to 2050 or 2100; we downscaled to postal code area level -> we assumed that spatial pattern within the country/NUTS2 remains as it is now (not sure if these can be shared, manuscript in review)

HEATCLIM:
-economic models are available, have no idea about the possibilities of sharing :)
-should be aligned with the HIISI project?

CHAMPS:
we aim to make scenarios on adaptation and acclimatization. We use meta-regression within the DLNM framework. For that purpose we need data that will be determined later on. R-scripts of DLNM are freely available.

Downscaled SSP population data for Europe on NUTS2 level (from the time the first SSPs were introduced) / SYKE

VECLIMIT:

Statistics of Finland population data has been processed in GIS at 1 km 5 km and municipality level - we can share data - very much supporting Open Data

health information: we are creating risk maps for vector-borne-diseases
- ticks TBE - current and future distribution at municipality level - published in Applied Geography:
Modelling habitat suitability for occurrence of human tick-borne encephalitis (TBE) cases in Finland, Ticks and Tick-borne Diseases, (2020), Ruut Uusitalo, Mika Siljander, Timothée Dub, Jussi Sane, Jani J. Sormunen, Petri Pellikka, Olli Vapalahti, 11(5).
- we can share risk map data

ALL-IMPRESS:
Not sharable info/data yet

3. Future co-ordination: *In the coming months, how should we co-ordinate the development of 'CLIHE socioeconomic scenarios'? (e.g. what could YOU do to advance the discussion, WHO would you like to engage with)*

HEATCLIM:
At least a common workspace would be needed (where people can introduce their planned choices)

SOLARIS/CHAMPS:
Consider future projection needs already now when working with past data

VECLIMIT:
Common workspace/ database needed for sure
- and some kind of list - METADATA - who has what and what - including any restrictions to use the data etc.

General notes:
- Population estimates and predictions challenging to work with - 250m population data available from SYKE
- Usage of data from Tilastokeskus (the ones you can get your hands on)
- HERCULES 6 cities in focus but SSP forecasting 2050-2100 to heat related vulnerability indicators (only partly related to HERCULES) - some kind of SSP and other socioeconomic scenarios can be further applied

Key messages and further needs:
- What data is available from various institutes that CLIHE projects can use and apply in their work?
  - SYKE has population grid data that can be used in e.g. VECLIMIT
- What socioeconomic data is needed for CHAMPS work - this can be further discussed within the project
- More specific scenario workshop needed next year? At least a common workspace or a database would be useful
- PLUMES workshop results to be published in 2021→ building on them for common CLIHE narratives & scenarios
- Register based (historical data) is what many projects are using - accessibility and sharing of data?
- Forward looking aspects to be started on later on the projects - consider future projection needs already when working with the past data

BOG2: RCP-based climate & related projections

Moderator: Kirsti Jylhä, HEATCLIM
Note taker: Stefan Fronzek (SYKE, CHAMPS)
Participants: Kirsti Jylhä (FMI, HEATCLIM), Stefan Fronzek (SYKE, CHAMPS), Juha Aalto (FMI, VECLIMIT), Aitor Barbero Lopez (UEF, ECOCIDE), Antti Haapala (UEF, ECOCIDE), Natalia

Korhonen (FMI, HEATCLIM), Erika Toivonen (FMI, HERCULES)

•ALL-IMPRESS: Aeroallergens and immunological preparedness for future climate scenarios: implications for public health promotion (Mika Komppula, FMI)
•CHAMPS: Climate change and Health: Adapting to Mental, Physical and Societal challenges (Stefan Fronzek, SYKE)
•DISEASE-ON-WINGS: The effect of climate change on dynamics of zoonoses in migratory birds and bats across Europe (Thomas Lilley, UH)
•ECOCIDE: Effect of climate change on building design and indoor health (Aitor Barbero Lopez & Antti Haapala, UEF)
•HEATCLIM: Heat and health in the changing climate (Kirsti Jylhä & Natalia Korhonen, FMI)
•HERCULES: Health, risk and climate change: understanding links between exposure, hazards and vulnerability across spatial and temporal scales (Antti-Ilari Partanen & Erika Toivonen, FMI)
•VECLIMIT: Vector-borne diseases and climate change in Finland: mapping, modelling, mitigation (Juha Aalto, FMI & Ravi Kant, UH)
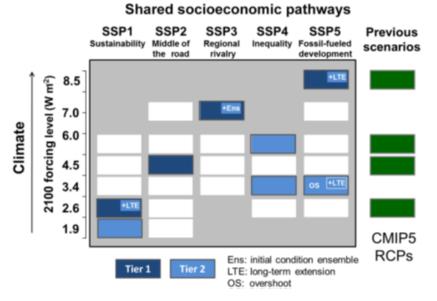
Questions:
1. **Information needs**: How can we **best draw up** a list of **climate and related data and projections needed** (or requested) by consortia (e.g. what variables, time/space resolution, time horizon) so that these can be **prioritised**.

2. **Sharing & common approaches**: Are there some **common datasets, projections and approaches** (e.g. baseline and projections periods; methods of capturing key uncertainties, core set of projections, CMIP5 vs. CMIP6) that **we might wish to agree on across CLIHE**?

3. **Future co-ordination**: **How** should work to **co-ordinate** climate and related projections for CLIHE be continued in the coming months and **by whom**?

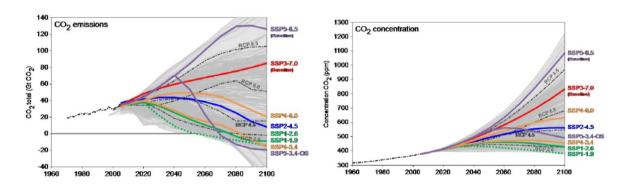**Our main objectives in this breakout group**:
- Networking
- A start of information gathering
- Plans for future collaboration

Towards:
- Forming a set of core climate and related scenarios for CLIHE.

From Tim: This figure may be out of date with regard to the "infeasible" combinations (in grey). Check the NCC paper I cited for a different interpretation of this, but I am trying to get a definitive, up-to-date view of this from the IAM community of modellers and will get back to you on it when I hear. There are contradictory interpretations in different literature. However, this version seems too restrictive. Note also, that for mid-century projections, the grey areas are less relevant. The infeasibility refers to the situation in 2100.

- CMIP6 model data under new **SSP1-2.6 (low), SSP2-4.5 (medium), SSP3-7.0 (high), SSP5-8.5 (high)** scenarios
- High-resolution EURO-CORDEX model data under RCP4.5 and HCLIM model data under RCP8.5 scenarios (also RCP4.5 available)
- Building energy reference year hourly weather data for the future under RCP2.6, RCP4.5, RCP8.5 scenarios (based on CMIP5 model data) - also 30-year hourly data available by request for Vantaa, Jokioinen, Jyväskylä and Sodankyl
- Antti Haapala, ECOCIDE: hourly temperature and humidity projections for future decades, depending on (at least few) different climate scenarios localized on some regions/city areas in different parts of Finland
- Recommendations for model and scenario choices, when to use global and when to use regional climate models
- Survey among CLIHE projects to collect information about climate data needs, maybe a website that collects links to climate datasets and guidance
- For some analysis, it may not be possible to use a large number of climate scenarios, it would be good if smaller choices can be related to the full uncertainty e.g. represented by CMIP6
- Several projects probably focus on mid-century, some analysis will also go until 2100
- Mid-century differences between RCPs are not so great, but these become more important towards the end of the century
- Is a program-wided nested approach of scenario selection possible?

BOG3: Combining RCPs, SSPs & policy scenarios

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General discussion

- How many combinations might we want to use? Range of socio-economic and climate futures. Time horizon that we are working with. Mid century projections for climate are not that different from each other, only towards the end of the century. Whereas, with SSPs there are big differences already by mid-century.
- Actual quantification of SSPs until the end of the century in the projects? Open issue
- Application of RCP-based data is much clearer in the projects
- Main idea is to develop qualitative SSPs for health sector in Finland with maybe trend arrows etc. for some aspects
- SSPs are more of a stress test of policies, not policies as such
- Stakeholders views and wishes affect the choices
- If SSPs are not quantified there is little possibility to use the narratives in e.g. modelling studies. Whereas, with RCPs there is no problem with this.

Questions:

SOME KEY MESSAGES ARE HIGHLIGHTED WITH BOLD UNDER EACH QUESTION

1. **Capturing uncertainties:** What aspects of future uncertainties should be highlighted for selecting combined RCP-SSP scenarios of socioeconomic and climate drivers?
- For example 2 SSPs as core scenarios e.g. **SSP1** vs **SSP3**, green world vs rivalry, though SSP4 and SPP5 offer very interesting insights; all have different implications for the health sector
- For climate maybe also 2, an upper and lower
- Middle of the road SSP? Might it be considered as the "best bet"? Probably not but rather look at a plausible range between an upper and a lower.
- From a **stakeholder point of view the contrast approach may cause problems** but rather look at the middle of the road SSP&RCP and leave the contrast aspect to researchers.
- What are the uncertainties going from global to a regional scale?

2. **Sharing & common approaches**: Should common approaches be sought for addressing future policies (climate, health or wider) in CLIHE (e.g. in relation to SSPs and to ongoing policy targets)?
- It would be nice to have certain **common data sets** to be used across the projects, population etc. Good for decision makers as well to be able to assess results across projects applying same data (for comparability)
- Stakeholder developed scenarios (developed e.g. by different cities) could be interpreted in the SSP context by the researchers
- Helpful for policy work

3. **Future co-ordination**: Is there a need to co-ordinate aspects of CLIHE scenario development in the coming months and if so, how can this be achieved?
- We definitely need **another scenarios session/workshop** etc. as many of the projects have only recently started to think about these things. After this workshop the projects could think about this further and another workshop in a couple of months time could offer more answers.
  - There is interest from individual projects
- **Developing common methods** among the projects **for quantifying SSPs** for needs of e.g. modelling studies