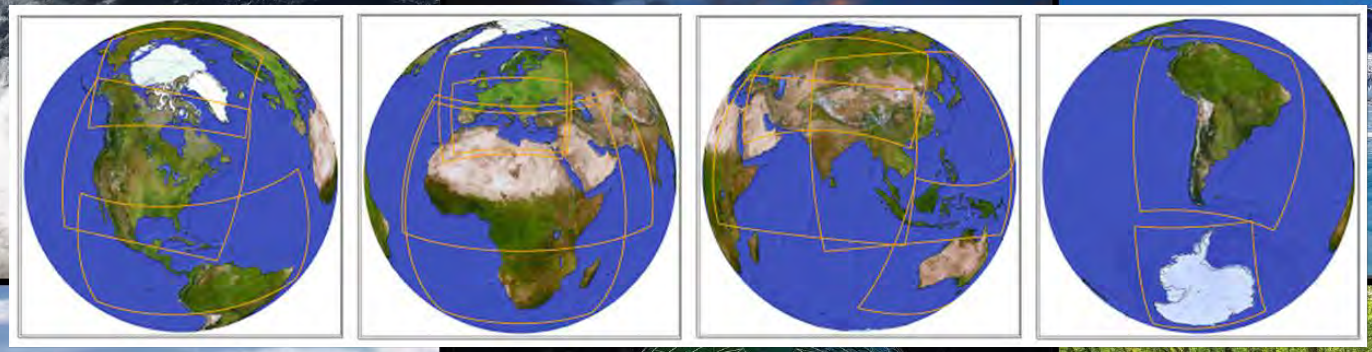


- Arctic CORDEX
- North America CORDEX
- Central America CORDEX

- EURO-CORDEX
- MED-CORDEX
- CORDEX Africa
- MENA-CORDEX

- Central Asia CORDEX
- South Asia CORDEX
- East Asia CORDEX
- South East Asia CORDEX
- Australasia CORDEX

- South America CORDEX
- CORDEX Antarctica

Coordinated Regional Downscaling Experiment (CORDEX)

The CORDEX South Asia Workshop
December 13-15, 2021

Iréne Lake
Director for IPOC at SMHI

ww.cordex.org

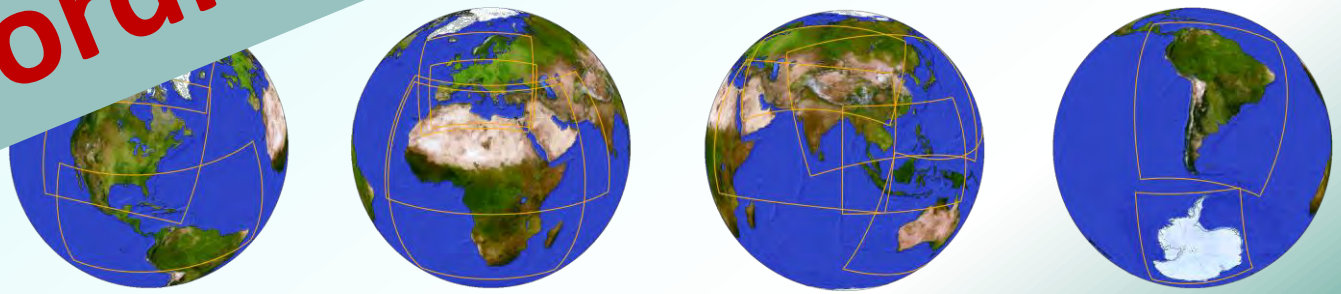
WCRP CORDEX

CORDEX focus/vision

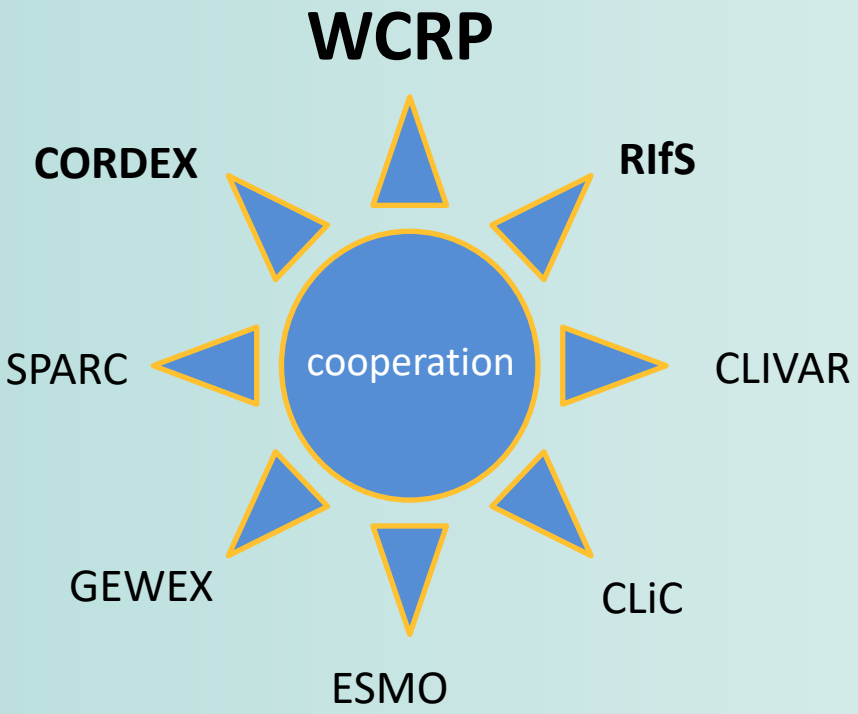
- **Global collaboration**
- **Understanding/knowledge t**
  devel

Platform/facilitator for coordination and cooperation

ffice for CORDEX, SMHI, Sweden



CORDEX and WCRP



"Bridging climate science and society"

CORDEX and the WCRP Strategic Plan

- Fundamental Science/understanding and long-term response. LHA Climate Risk, Digital Earths
- Trans-disciplinary Engagement. LHA Safe landing and LHA Academy.

- Fundamental part of the new CORE project Regional Information for Society
- Envisaged strong partnership with the Earth System Model and Observations new CORE project

Regional Information for Society (RifS)

Societal value of regional climate information

Core principles: Facilitate/catalyze research for actionable information.

Science foci: Research for regional information on physical climate system, co-production, social sciences, communication, ethics and values.

Importance of climate change information?

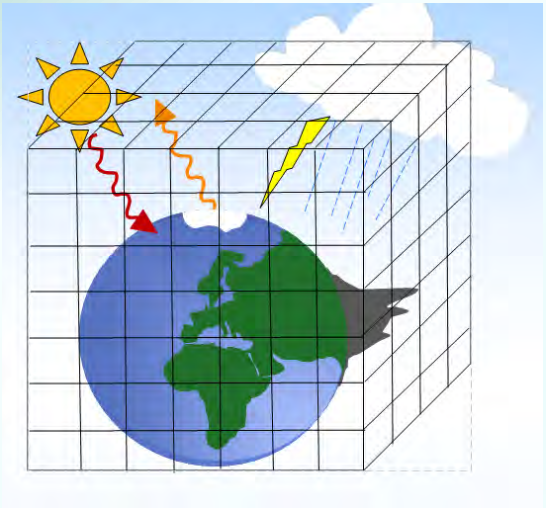
"If you can't measure it, you can't manage it"

Peter Drucker

Data or information?

- **Climate info = messages relevant to users**
- **… backed by clear, robust physical scientific analyses**

+



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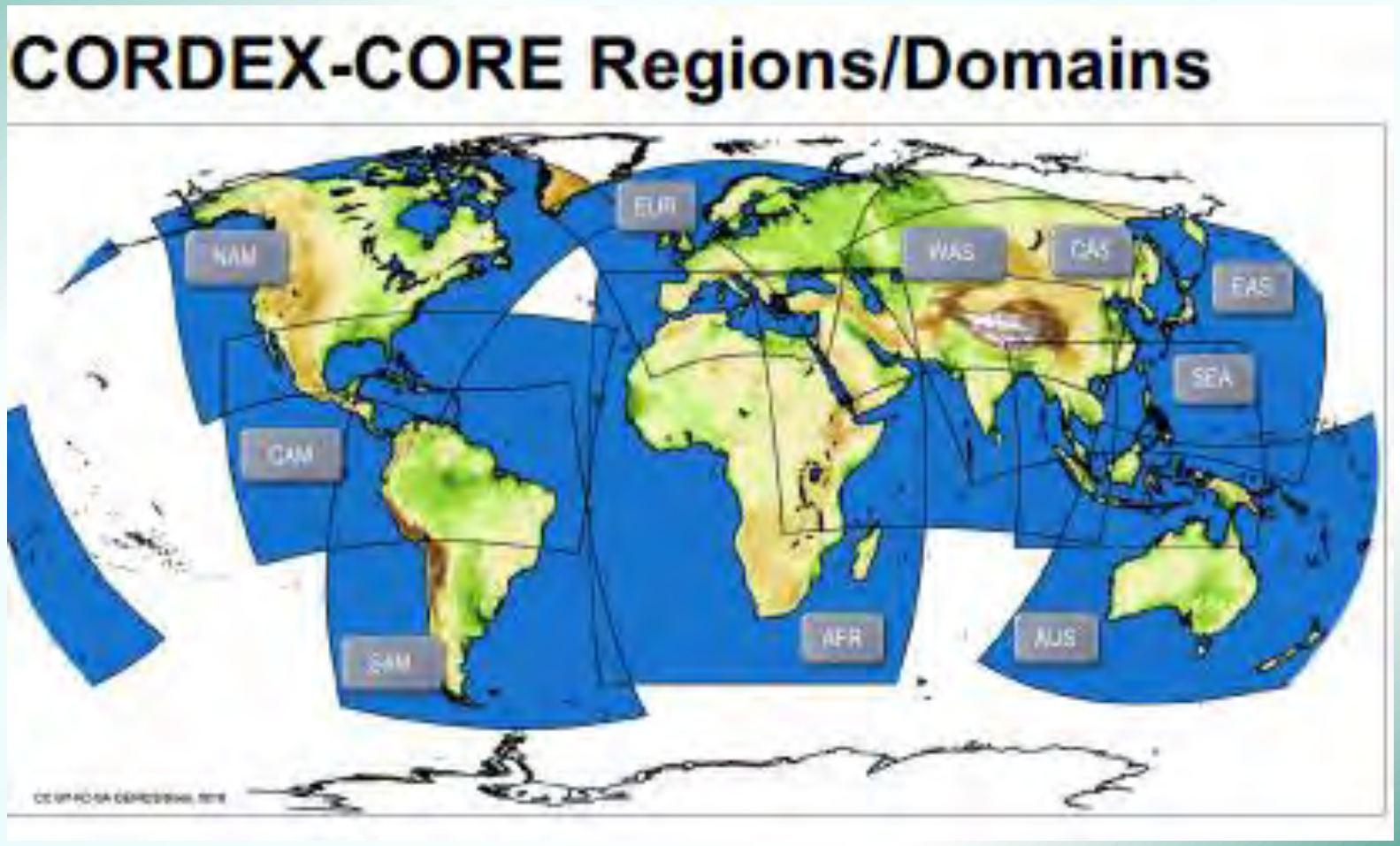
Robust /usable climate information for decisions/VIA

ESGF

is-enes
INFRASTRUCTURE FOR THE EUROPEAN NETWORK FOR EARTH SYSTEM MODELLING



Robust /usable climate information for decisions/VIA

Downscaling of CMIP6

Experiment protocol RCMs is published!

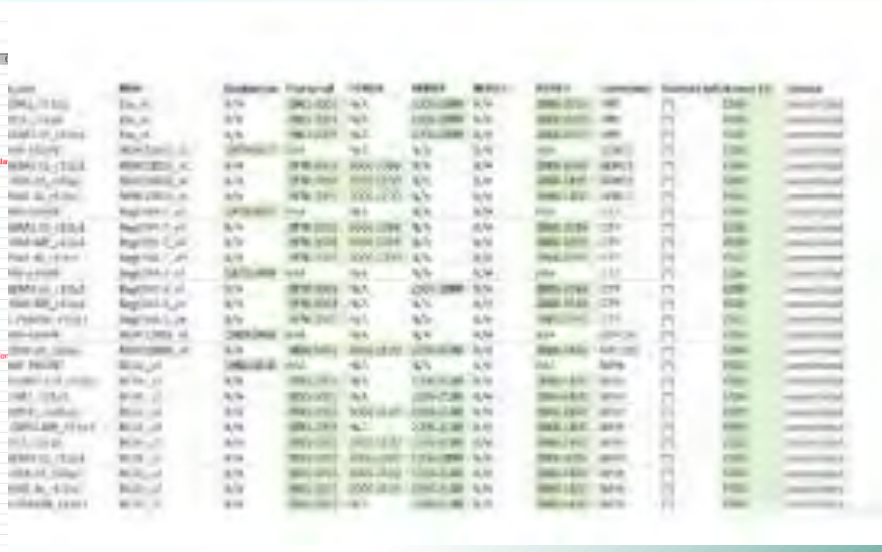
Variable list

CORDEX-CMIP6 Data Request: "Atmospheric" variables (v1)

ag aggregation: i: instantaneous a: averaged over output interval (in model) c: cumulative over sampling period

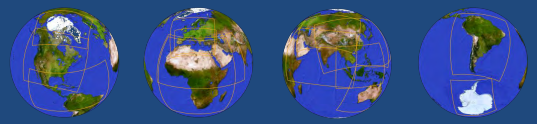
output variable	units	ag	long_name	standard_name	CORDEX-CMIP5 mon	CORDEX-CMIP5 day	CORDEX-CMIP5 6hr	CORDEX-CMIP5 3hr	CORDEX-CMIP6 mon	CORDEX-CMIP6 day	CORDEX-CMIP6 6hr	CORDEX-CMIP6 3hr	CORDEX-CMIP6 1hr	Priority	
tas	K	i	Near-Surface Air Temperature	air_temperature	x	x		x	x	x			x	CORE	3hr -> 1hr
tasmax	K		Daily Maximum Near-Surface Air Temperature	air_temperature	x	x			x	x				CORE	
tasmin	K		Daily Minimum Near-Surface Air Temperature	air_temperature	x	x			x	x				CORE	
ts	K	i	Surface Temperature	surface_temperature	x	x	x		x	x			x		6hr -> 1hr
pr	kg m-2 s-1	a	Precipitation	precipitation_flux	x	x		x	x	x			x	CORE	3hr -> 1hr
prc	kg m-2 s-1	a	Convective Precipitation	convective_precipitation_flux		x		x	x	x			x		3hr -> 1hr + mon
prhmax	kg m-2 s-1		Daily Maximum Hourly Precipitation Rate	precipitation_flux		x				x					
prsn	kg m-2 s-1	a	Snowfall Flux	snowfall_flux	x	x		x	x	x			x		3hr -> 1hr
evspsbl	kg m-2 s-1	a	Evaporation	water_evaporation_flux	x	x	x		x	x			x	CORE	3hr -> 1hr
evspsblpot	kg m-2 s-1	a	Potential Evapotranspiration	water_potential_evaporation_flux	x	x	x								too many ways to calcula
mrros	kg m-2 s-1	a	Surface Runoff	surface_runoff_flux	x	x	x		x	x	x				
mrro	kg m-2 s-1	a	Total Runoff	runoff_flux	x	x	x		x	x	x				
snm	kg m-2 s-1	a	Surface Snow Melt	surface_snow_melt_flux	x	x	x		x	x	x				
huss	1	i	Near-Surface Specific Humidity	specific_humidity	x	x		x	x	x			x	CORE	3hr -> 1hr
hurs	%	i	Near-Surface Relative Humidity	relative_humidity	x	x		x	x	x			x	CORE	3hr -> 1hr
ps	Pa	i	Surface Air Pressure	surface_air_pressure		x		x	x	x			x	CORE	3hr -> 1hr + mon
psl	Pa	i	Sea Level Pressure	air_pressure_at_sea_level	x	x		x	x	x			x	CORE	3hr -> 1hr
tauu	Pa	a	Surface Downward Eastward Wind Stress	surface_downward_eastward_stress		x	x		x	x	x				+ mon
tauv	Pa	a	Surface Downward Northward Wind Stress	surface_downward_northward_stress		x	x		x	x	x				+ mon
sfcWind	m s-1	i	Near-Surface Wind Speed	wind_speed	x	x		x	x	x			x	CORE	3hr -> 1hr
sfcWindmax	m s-1		Daily Maximum Near-Surface Wind Speed	wind_speed	x	x			x	x					
uas	m s-1	i	Eastward Near-Surface Wind	eastward_wind	x	x	x		x	x			x	CORE	6hr -> 1hr
vas	m s-1	i	Northward Near-Surface Wind	northward_wind	x	x	x		x	x			x	CORE	6hr -> 1hr
wsgsmax	m s-1		Daily Maximum Near-Surface Wind Speed of Gust	wind_speed_of_gust		x			x						
clt	%	a	Total Cloud Fraction	cloud_area_fraction	x	x		x	x	x			x	CORE	3hr > 1hr
cltn	%	a	High Level Cloud Fraction	cloud_area_fraction_in_atmosphere_layer		x	x		x	x			x		3hr > 1hr + mon
clm	%	a	Mid Level Cloud Fraction	cloud_area_fraction_in_atmosphere_layer		x	x		x	x			x		3hr > 1hr + mon
cll	%	a	Low Level Cloud Fraction	cloud_area_fraction_in_atmosphere_layer		x	x		x	x			x		3hr > 1hr +mon
sund	s	c	Duration of Sunshine	duration_of_sunshine	x	x		x	x	x			x		3hr > 1hr The WMO definition
rsds	W m-2	a	Surface Downwelling Shortwave Radiation	surface_downwelling_shortwave_flux_in_air	x	x		x	x	x			x	CORE	3hr > 1hr
rlds	W m-2	a	Surface Downwelling Longwave Radiation	surface_downwelling_longwave_flux_in_air	x	x		x	x	x			x	CORE	3hr > 1hr
rsus	W m-2	a	Surface Upwelling Shortwave Radiation	surface_upwelling_shortwave_flux_in_air	x	x		x	x	x			x		3hr > 1hr
rlus	W m-2	a	Surface Upwelling Longwave Radiation	surface_upwelling_longwave_flux_in_air	x	x		x	x	x			x		3hr > 1hr
rlut	W m-2	a	TOA Outgoing Longwave Radiation	toa_outgoing_longwave_flux	x	x		x	x	x			x		3hr > 1hr
rsdt	W m-2	a	TOA Incident Shortwave Radiation	toa_incoming_shortwave_flux	x	x		x	x	x			x		3hr > 1hr
rsut	W m-2	a	TOA Outgoing Shortwave Radiation	toa_outgoing_shortwave_flux	x	x		x	x	x			x		3hr > 1hr
hfls	W m-2	a	Surface Upward Latent Heat Flux	surface_upward_latent_heat_flux	x	x		x	x	x			x		3hr > 1hr
hfss	W m-2	a	Surface Upward Sensible Heat Flux	surface_upward_sensible_heat_flux	x	x		x	x	x			x		3hr > 1hr
mrfso	kg m-2	i	Soil Frozen Water Content	soil_frozen_water_content	x	x	x		x	x	x				
mrso	kg m-2	i	Total Soil Moisture Content	soil_moisture_content	x	x	x		x	x	x				
snw	kg m-2	i	Surface Snow Amount	surface_snow_amount	x	x	x		x	x	x				
snc	%	i	Snow Area Fraction	surface_snow_area_fraction	x	x	x		x	x	x				
snd	m	i	Snow Depth	surface_snow_thickness	x	x	x		x	x	x				
sic	%		Sea Ice Area Fraction	sea_ice_area_fraction	x	x	x		x	x	x				
zmla	m	i	Height of Boundary Layer	atmosphere_boundary_layer_thickness		x	x		x	x			x		3hr -> 1hr + mon
prw	kg m-2	i	Water Vapor Path	atmosphere_water_vapor_content		x	x		x	x	x				+ mon
clwvi	kg m-2	i	Condensed Water Path	atmosphere_cloud_condensed_water_content		x	x		x	x	x				+ mon
clivi	kg m-2	i	Ice Water Path	atmosphere_cloud_ice_content		x	x		x	x	x				+ mon

Planned simulations



CORDEX vision:

Advance and coordinate science and application of regional climate downscaling through global partnerships



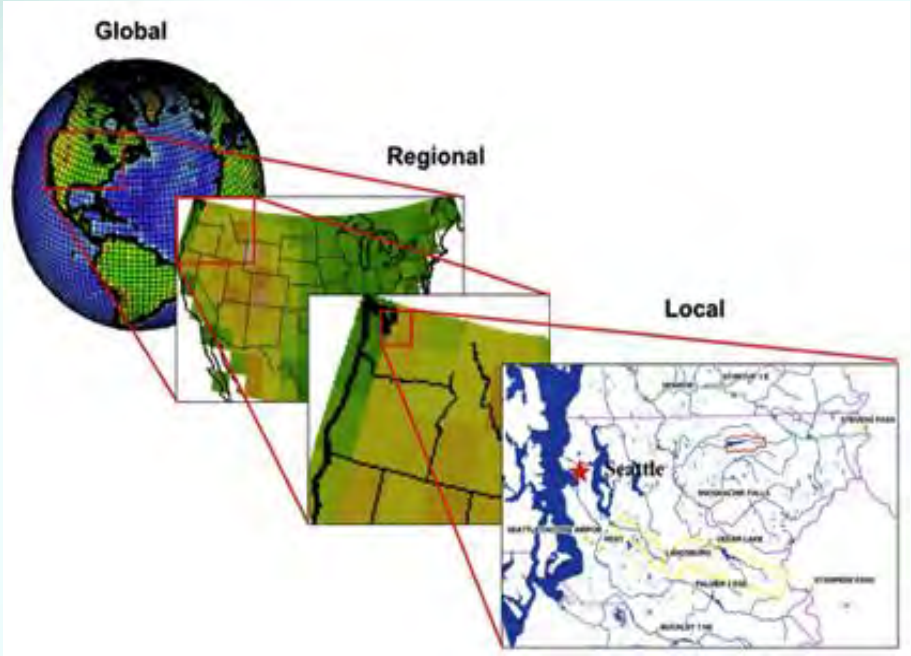
WCRP CORDEX

Coordinated Regional Climate Downscaling Experiment

SMHI

Future challenges in White Paper

- ❑ Smaller domains, convection permitting resolution > risks/VIA - local scales



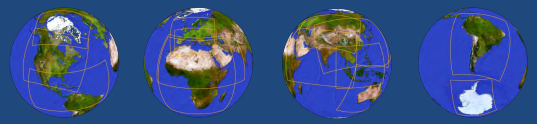
- ❑ Regional Earth System Models (human dimension land use, oceans-sea-ice,…) > increasing complexity?

- ❑ Data and infrastructure
  - ❑ Sub-daily data, increasing data amounts

> computer capacity, compromise resolution/complexity/domain size?

CORDEX vision:

Advance and coordinate science and application of regional climate downscaling through global partnerships

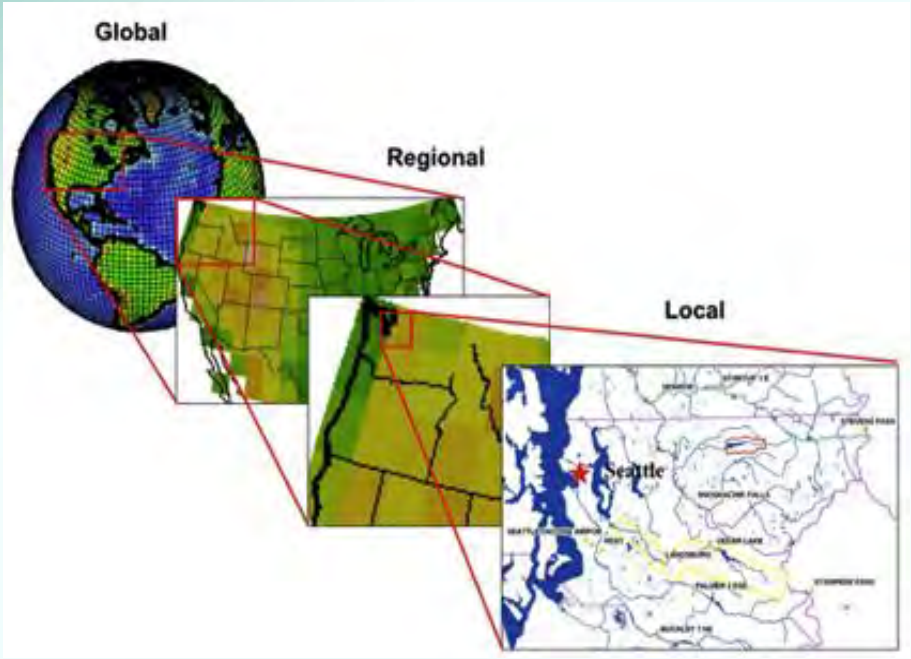


WCRP CORDEX

Coordinated Regional Climate Downscaling Experiment

SMHI

Ongoing White Papers

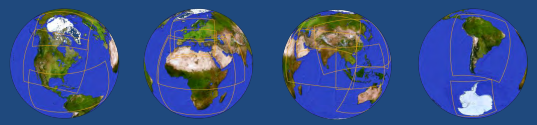


- ESD under development, merge dynamical and statistical

- Bridge to society -coming

CORDEX vision:

Advance and coordinate science and application of regional climate downscaling through global partnerships



WCRP CORDEX

Coordinated Regional Climate Downscaling Experiment

SMHI

Science Plan Implementing White Paper

Understand regional phenomena

Identify drivers, assess impact

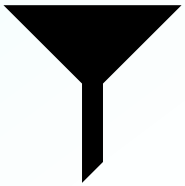
Evaluate, improve, combine downscaling techniques > scientific challenges, societal needs

Coordinated worldwide historical/projections

Capacity building - local expertise/knowledge exchange

Future challenges; White Papers/science Plan

- ❑Small regions, local scales > risks/VIA
- ❑Regional Earth System Models (human dimension)
- ❑Data amounts
- ❑Multiple downscaling approaches
- ❑Distillation – merge, choose, understand
- ❑Capacity exchange
- ❑Societal needs, drivers, assess impacts
- ❑Bridge to society



Climate Change Adaptation is one of the most important tasks facing us!

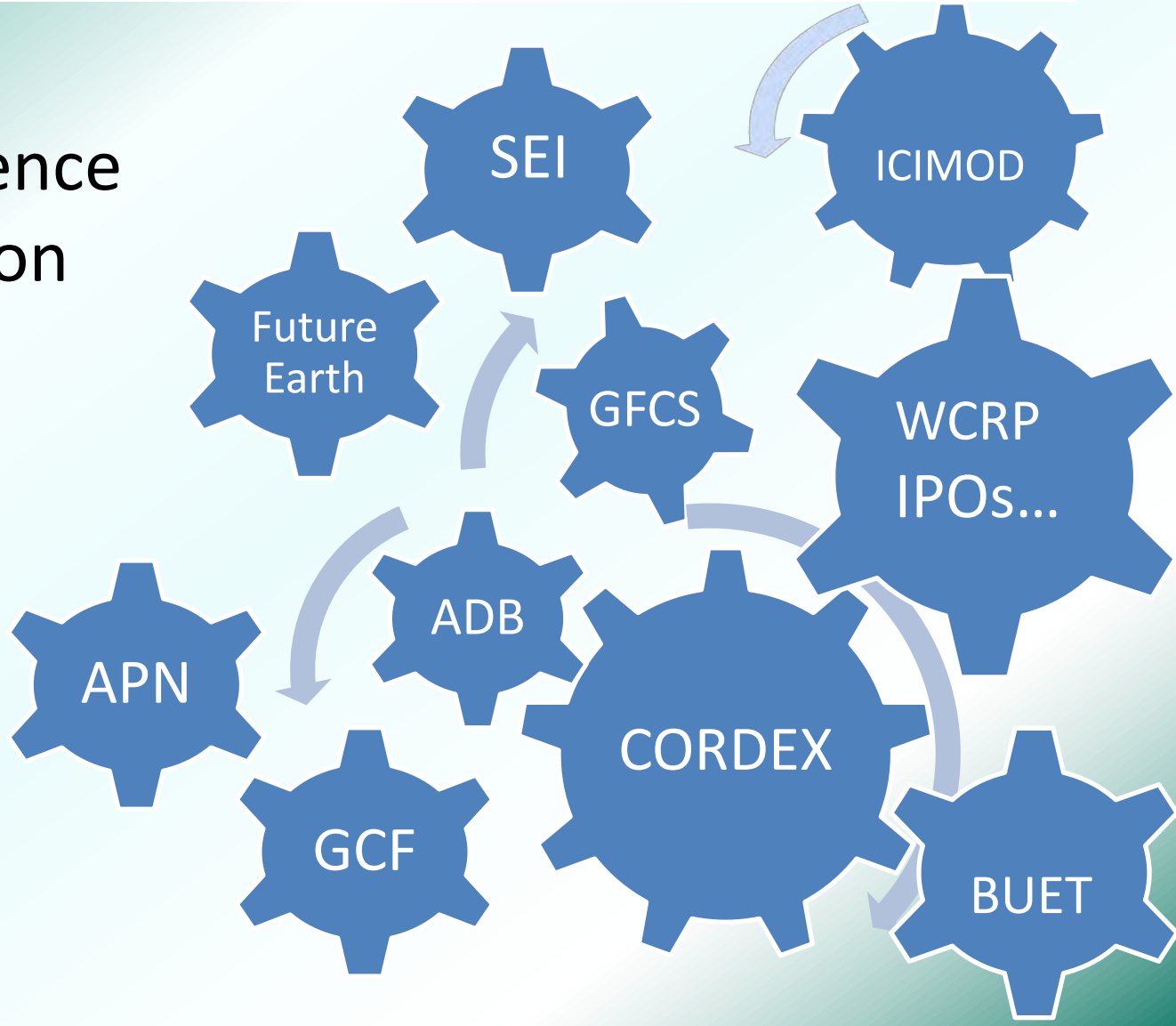
- Do we know what climate we should adapt to?
- There is an illusion by some decision makers that we already know everything about the future climate and can simply focus on "*adapting*"
- Assessing and informing on expected climate change in both the near and far future is an on-going scientific process, and must be an integral part of the adaptation agenda

Application-inspired, Transdiciplinary

Cooperation/partnerships/networking across regions/disciplines

Policy ⟺ Science

Human dimension



How do these combine?

Co-design & Co-production

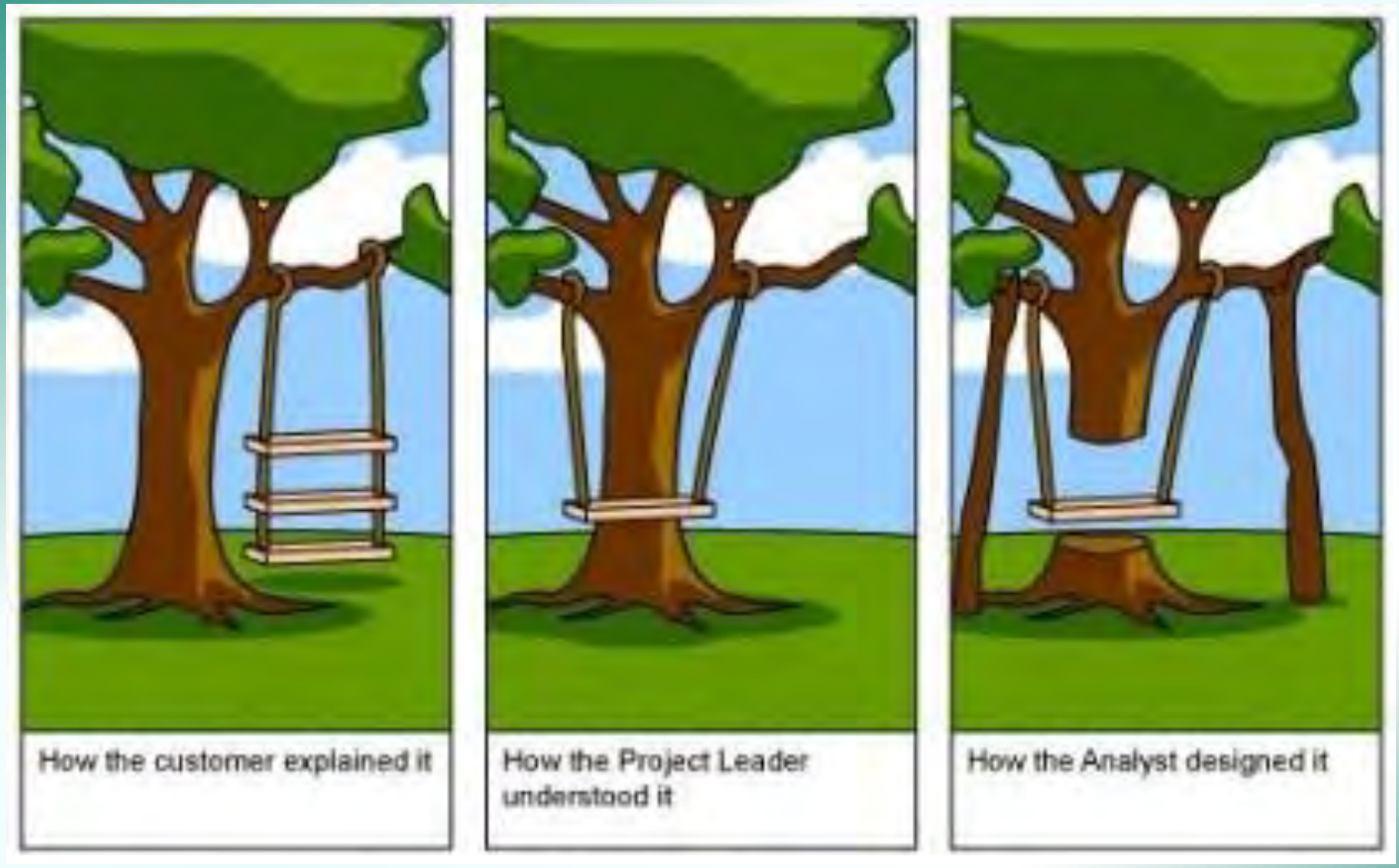
- Joint research proposals, capacity building activities
- Common topics and potential funding opportunities
- Combine existing projects and platforms

Multi-disciplines & Multi-stakeholders

- Cross-cutting global change issues
- Links across disciplines and regional/global
- Engage with policy/community

Synergies

- Interaction and/or cooperation with other relevant groups through information and data sharing


How the customer explained it
How the Project Leader understood it
How the Analyst designed it

WCRP CORDEX

FLAGSHIP PILOT STUDIES

Aerosols

Coupled models

Convection permitting scales

Urban climate

Climate Hazards/Extremes

Land use, land change

Hydrology

Local/regional challenges with large socioeconomic impacts

→ Actionable Climate Information !

CORDEX-FPS: CPTP

Introduction

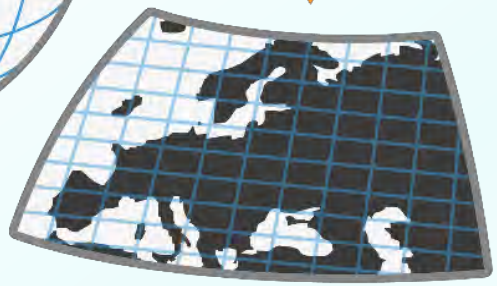
The project CPTP (Convection-Permitting Third Pole), abbreviation for the project "High resolution climate modelling with a focus on mesoscale convective systems and associated precipitation over the Third Pole region", was endosed by WCRP-CORDEX as a Flagship Pilot Study (FPS) in 2019. This project aims to enhance our understanding of the water cycle over the TP region; with an initial focus on assessing model skill in the simulation of convection and precipitation, building towards skillful multi-year simulation of the regional precipitation and hydrological regime. There are two working groups (WGs). WGI focuses on modeling and WGII focuses on data. The two WGs will work closely with each other. This project will be carried out during the period 2020-2024.

This project is a community effort and contribution from anybody in any way and at any time is more welcome. Please contact the lead investigator or group leads for more information (related information can be found below).

The chain from global to local

- from data to knowledge to societal benefit -

EC EARTH



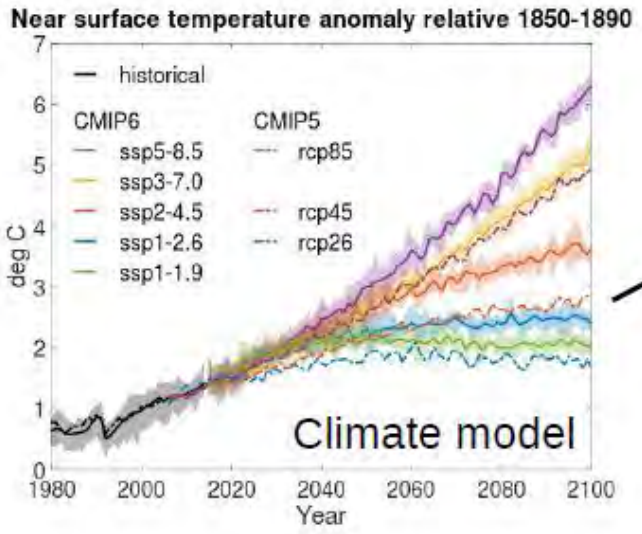
HCLIM 12-25 km
CORDEX standard

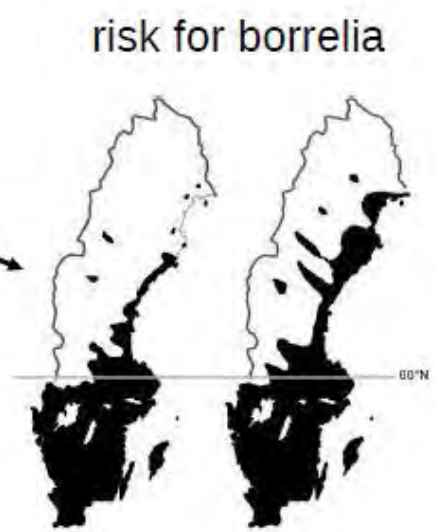
HCLIM 1-3 km
CPM

Spreading of diseases related to climate

Project CLAIRE on spreading of

- zika, dengue och west nile-fever
- tick-based borrelia infection
- seasonal and climate-dependent patterns of for Covid-19

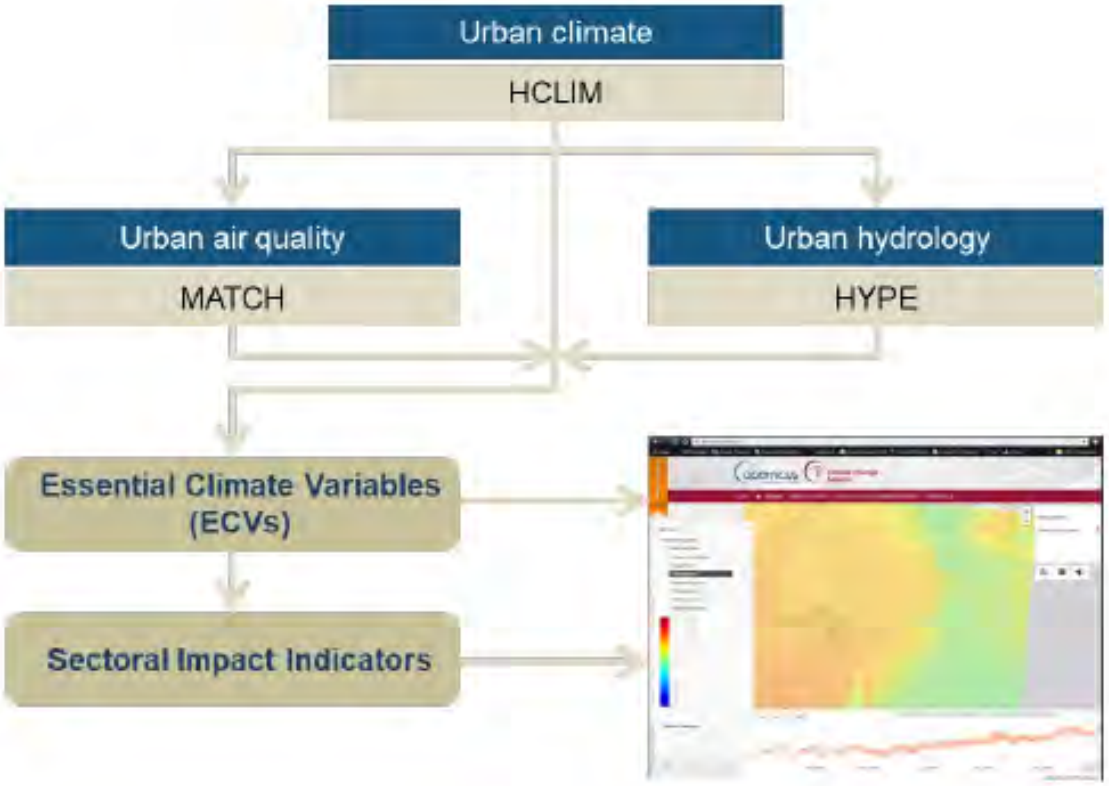




Climate on the km scale

HCLIM, 1 km

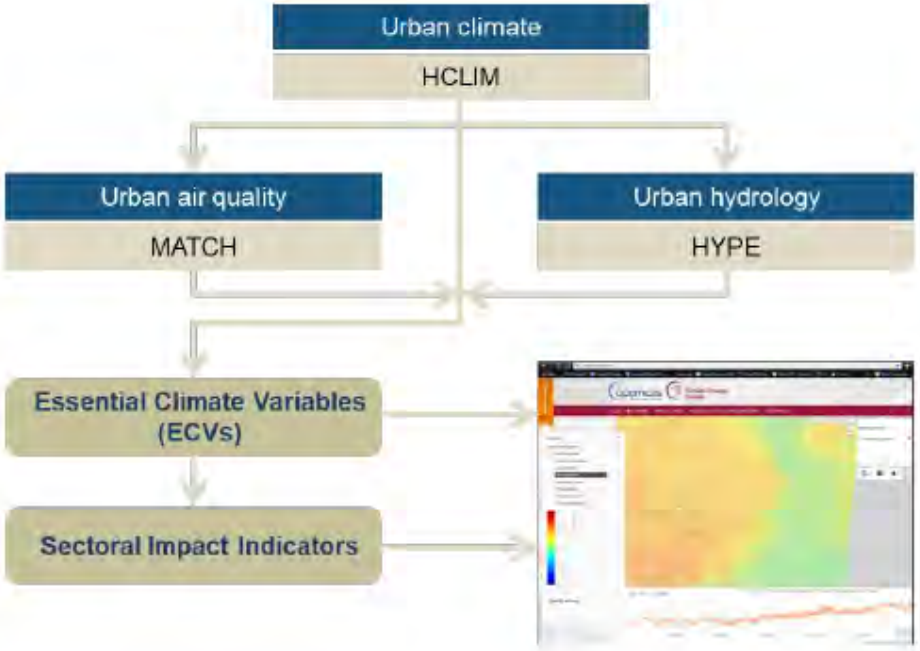
Example: UrbanSiS project for Copernicus Climate Services



Climate on the km scale

HCLIM, 1 km

Example: UrbanSiS project for Copernicus Climate Services



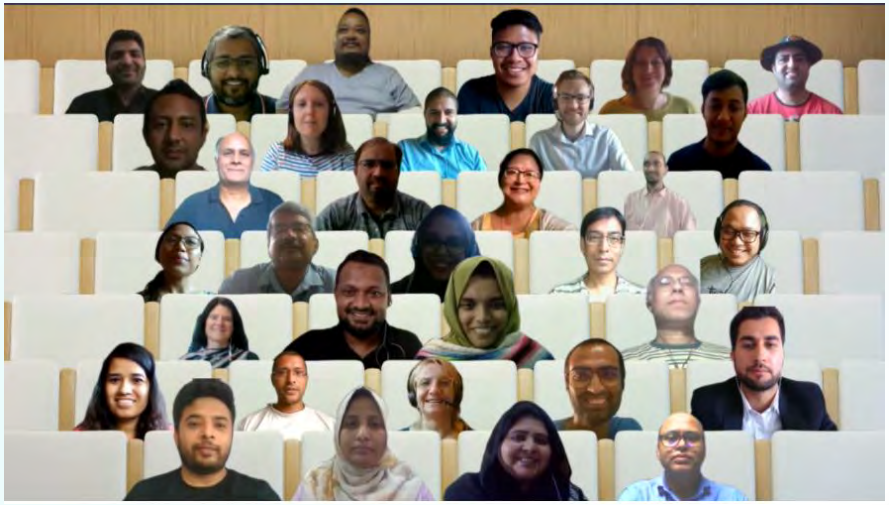
resolution **1x1km²** **1h**

- Health sector
  - Air quality
  - Heat stress
  - Discomfort
- Energy sector
  - Energy consumption
  - Solar energy
- Infrastructure sector
  - Flooding
  - Green infrastructure
  - Transport
- Non-sector specific indicators

Climate impact; hydrology, land use, urban

Air quality, extreme temperatures and health

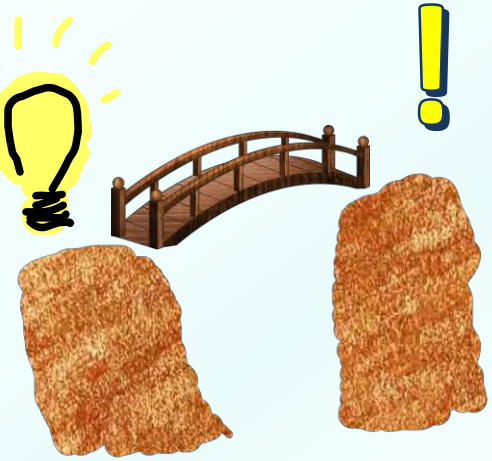
Contributions to IPCC 1.5

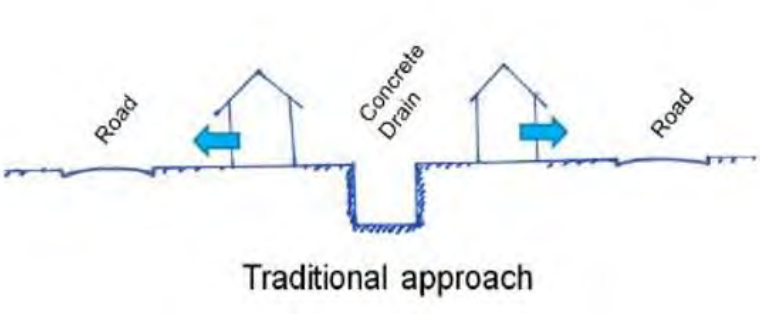


‘CORDEX is very crucial for IPCC‘, Panmao Zhai , chair IPCC WGI

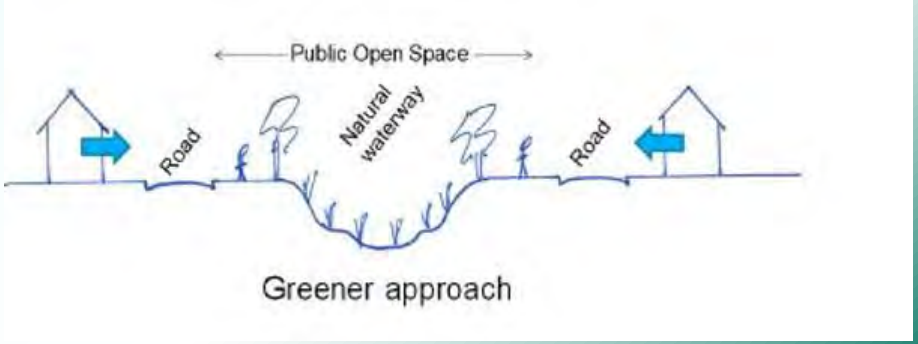
Co-design & Co-production

With/without knowledge...





Action/future!!!?



ICRC-CORDEX 2023

Hybrid; Physical/online
Regional hubs

Organization Committee
Scientific Committee

If you want to go fast, go alone, but if you want to go far, go together

Thank you!!


WCRP
CORDEX
Coordinated Regional Climate Downscaling Experiment
s
h
communicate
r
e