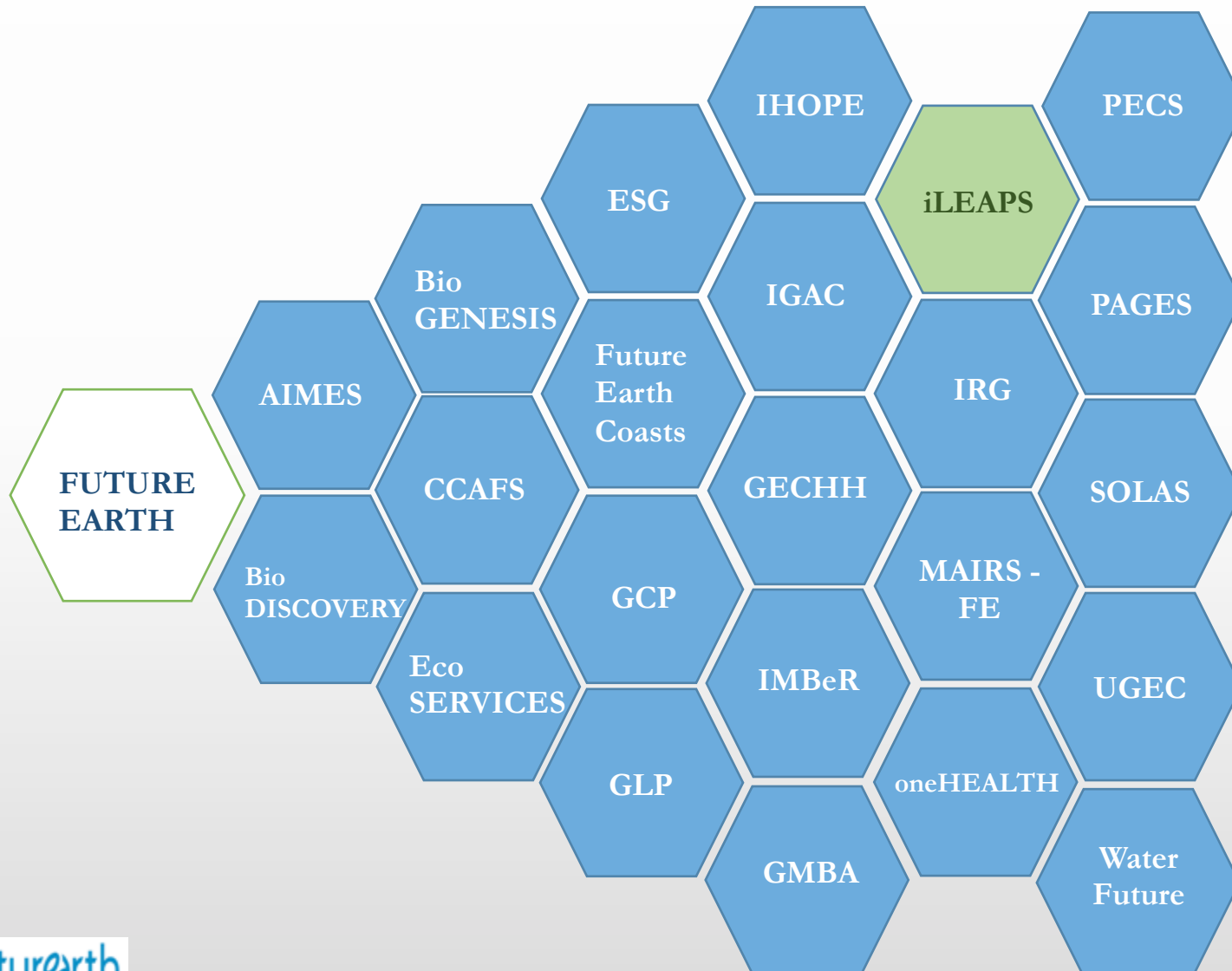


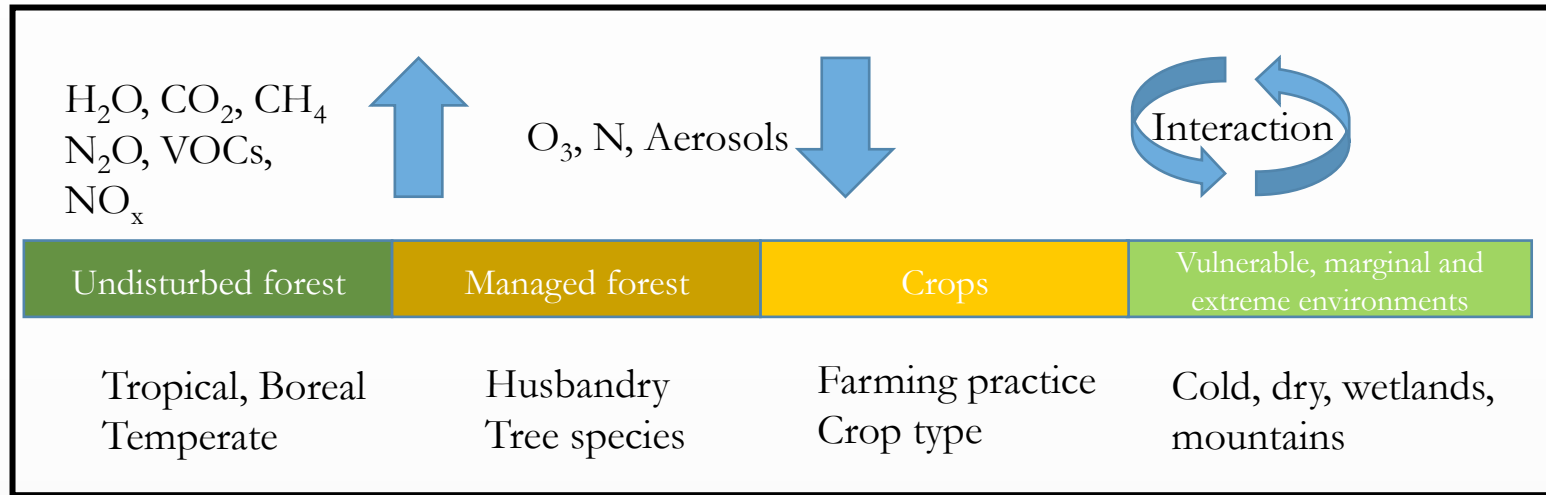
Integrated Land Ecosystem Atmosphere Process Study



- is a **network** to link iLEAPS scientists to key societal challenges related to Health, Biodiversity, Climate, Food and Fuel security
- acts as a **communication hub** and coordinator of world-wide scientific research in the field of ecosystem-atmosphere exchanges
- promotes **scientific excellence** through developing international science initiatives that are multi-disciplinary
- promotes **leadership** in science through capacity building in developing countries as well as through their Early Career Scientists network

iLEAPS as a Future Earth Global Research Project





1. **Changing land-use and farming and forestry practice** affects the **atmospheric chemistry, air quality and climate**
2. Anthropogenic changes in **atmospheric chemistry** affects **plant productivity**
3. **Vulnerable and marginal ecosystems** will be affected by **changes in climate**
4. **Ecosystems** emit **short lived carbon** and its impact on the **atmospheric chemistry**

Co-Chairs

Eleanor Blyth (Europe: UK):

Vinayak Sinha (Asia: India):

Land surface in meteorological and hydrological models

Atmospheric chemistry: VOCs & OH reactivity

Members

Sally Archibald (Africa: South Africa)

Aijun Ding (Asia: China)

*Silvano Fares (Europe: Italy)

Tetsuya Hiyama (Asia: Japan)

Meehye Lee (Asia: S. Korea)

Sebastian Leutzinger (New Zealand)

*Miguel Mahecha (Europe: Germany)

*Ben Poultner (USA)

Sirkku Juhola (Europe: Finland)

*David Odee (Africa: Kenya)

Allison Steiner (USA)

Xuemei Wang (Asia: China)

Vegetation and fire ecology, adaptation of savanna ecosystems

Atmospheric chemistry & air pollution – aerosols

Interaction between plant ecosystems and the atmosphere.

Ecohydrology, hydrometeorology, human-natural interactions

Atmospheric chemistry & air pollution – ozone, VOCs

Global change impacts on plant communities

Extreme climate events & ecosystem-atmosphere interactions

Global carbon & methane cycles

Socio-economics, urban issues, adaptation of social systems

Tropical forestry & agroforestry systems

Atmospheric chemistry & land-surface processes

Atmospheric chemistry & air pollution

Ex Officio

Garry Hayman (iLEAPS IPO, UK)

International Project Office

- Eleanor Blyth
- Garry Hayman
- Victoria Barlow

Membership



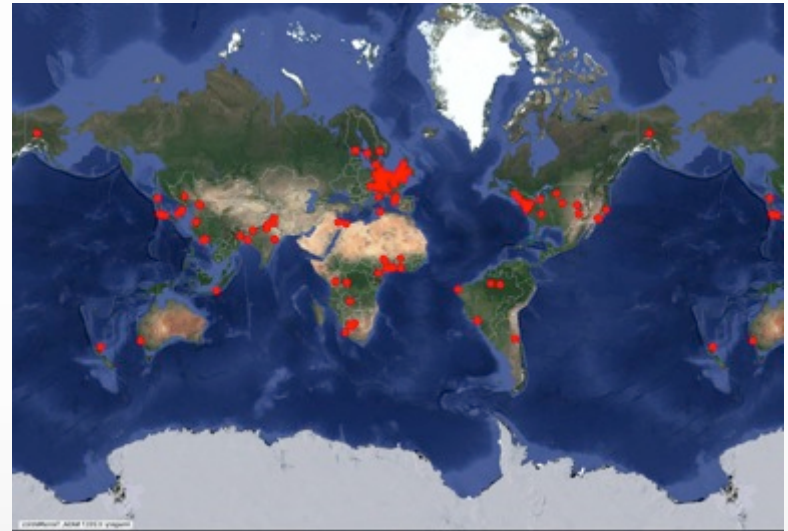
IPO moved from Nanjing (China) to CEH in 2017
Recruited a Project Officer October 2017
700 on our mailing list
275 attended the conference in September 2017
Wide range of geographical spread of attendees

Regional Project Offices:

iLEAPS-Korea – Meehye Lee
iLEAPS-Japan – Tetsuya Hiyama
iLEAPS-China – Xuemei Wang

We are actively organising an iLEAPS-India
We are aiming to build an iLEAPS-Africa

We have a very active Early Career Scientist
Network



Map of conference attendees

Unfortunately reversed!

Mature/Sponsored projects:

IBBI – Fire. ACPC – Aerosols and precipitation. iLAMB – integrated Land Model Benchmarking. GAIA – Atmospheric Chemistry. E3S: Extremes and Society

Teenage Projects:

CANEXMIP: Exploring ways to represent canopy processes in deposition

DataCube: Combining satellite data for land-atmosphere analysis. Global and Regional

New iLEAPS Initiatives:

Role of Methane and Permafrost in permitted emissions for 1.5 degrees warming

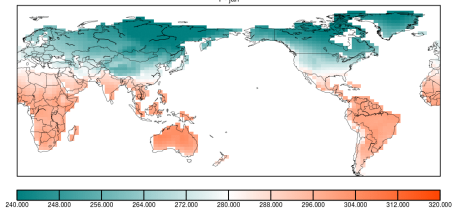
Ozone Impacts (with the International Ozone Commission)

Standardisation of non-GHG flux measurements

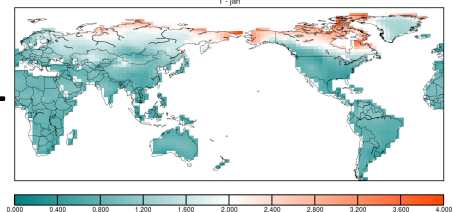
Using manipulation experiments to inform Earth System models

Exploring Nitrogen in Future Earth

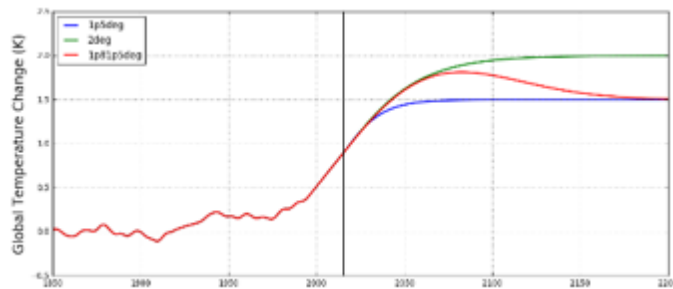
Role of methane and permafrost in permitted emissions for 1.5 degree warming: using and inverse version of IMOGEN



Climatology



$\Delta T \times$ Anomaly



Prescribed Temperature Anomaly

Pattern Scaling of Met Data

Radiative Forcing Power

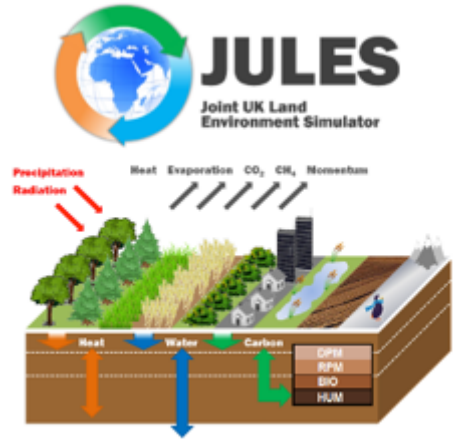
IMOGEN⁻¹

JULES Estimates Land Carbon Exchange

Atmospheric Composition

Permissible Anthropogenic Emissions

Simple Ocean Uptake Model



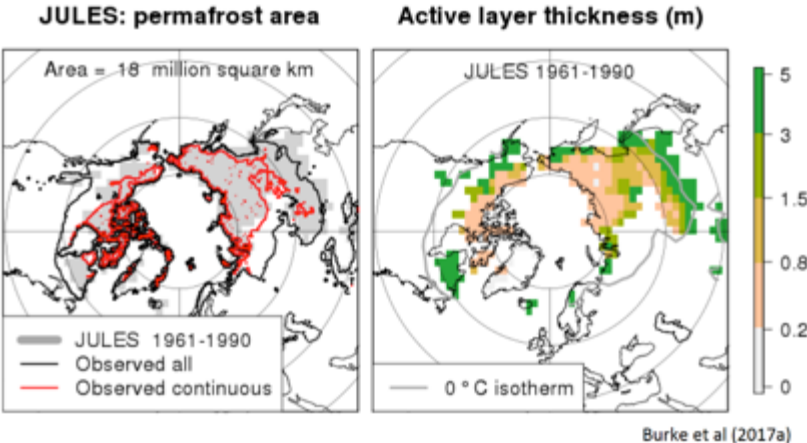
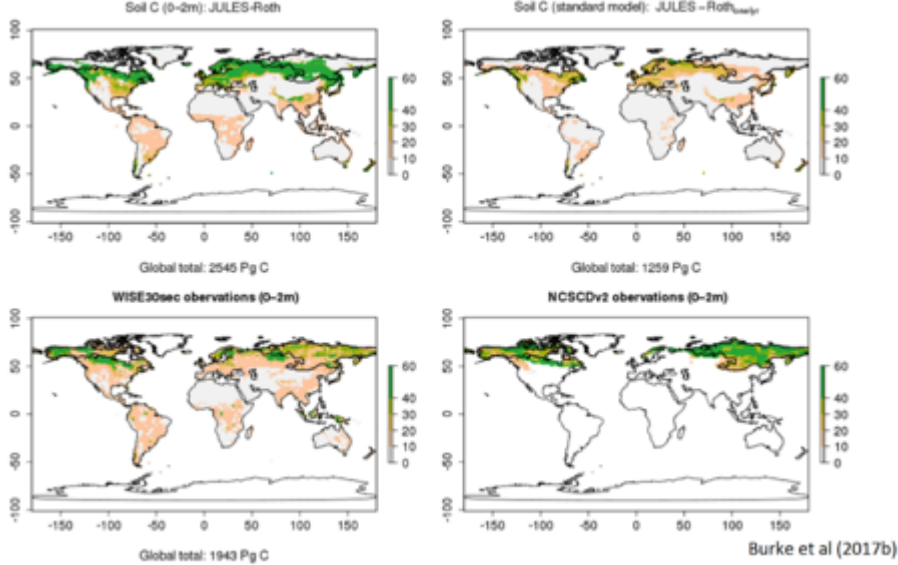
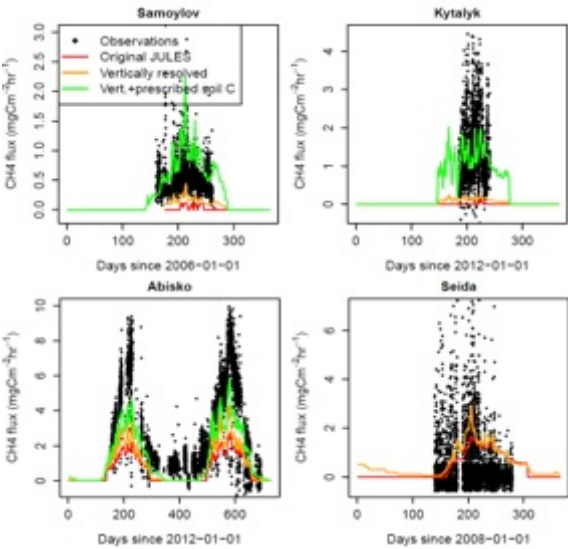
Comyn-Platt, Hayman, Huntingford, et al., 2017: "Permafrost and natural methane feedbacks limit emission budgets to 1.5 or 2.0°C of warming", submitted.



Permafrost/Wetlands: JULES-IMOGEN model developments

Layered soil carbon scheme

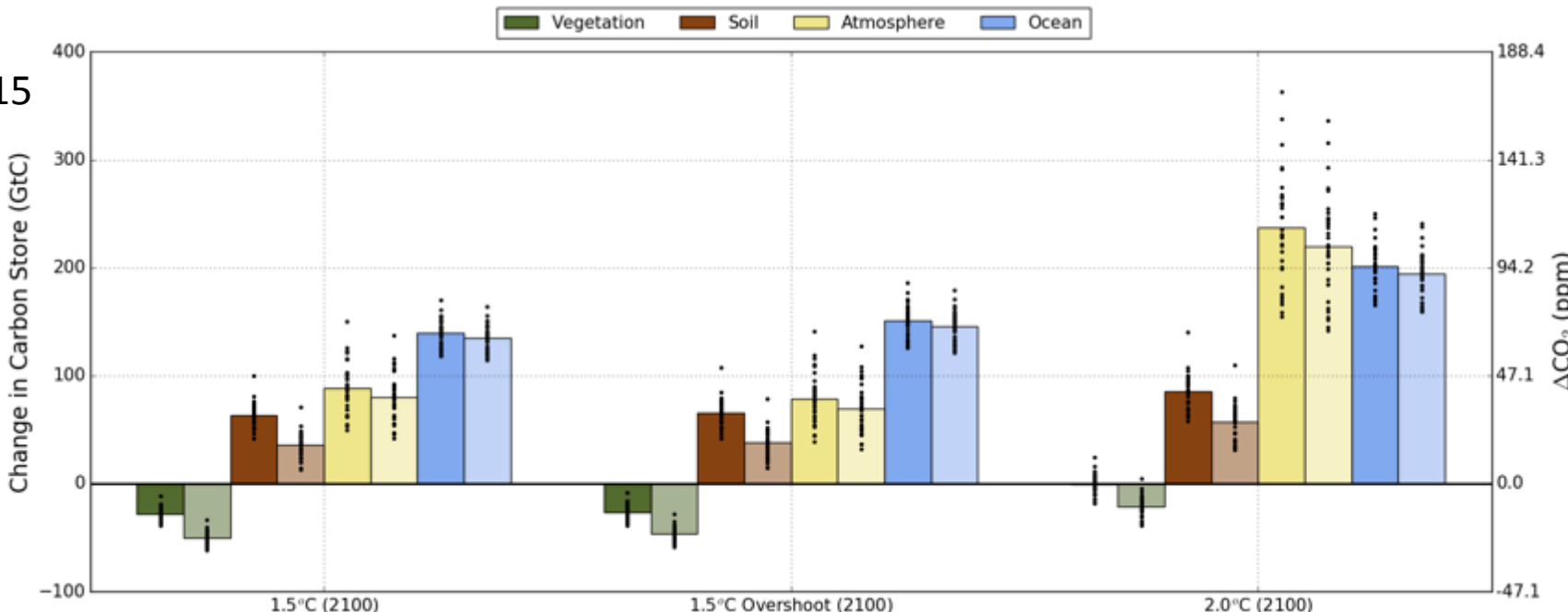
- Improved representation of respiration and input litter flux
- Improved estimates of Soil Carbon stocks (Burke et al., 2017a)
- Better representation of permafrost area
- Better representation of methanogenesis
- Wetland Methane Feedback included



(1) Burke, E. et al., 2017: Biogeosciences Discussions; (2) Burke, E. et al., 2017: Geo. Mod. Devel.; (3) Gedney et al., 2017: Nature, in review; (4) Chadburn et al., in preparation

CLIFFTOP Results: Change in permitted emissions

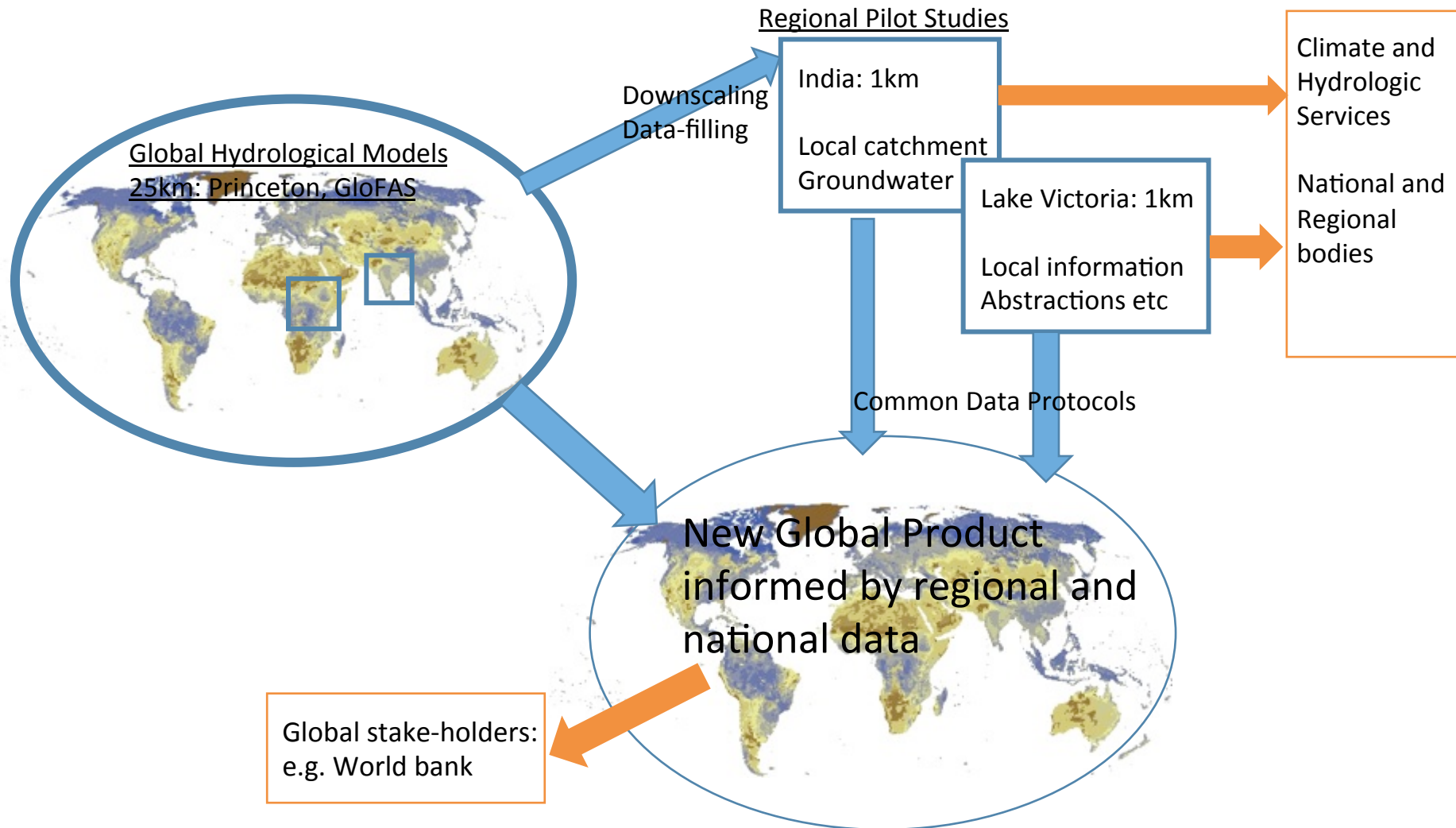
Change from 2015

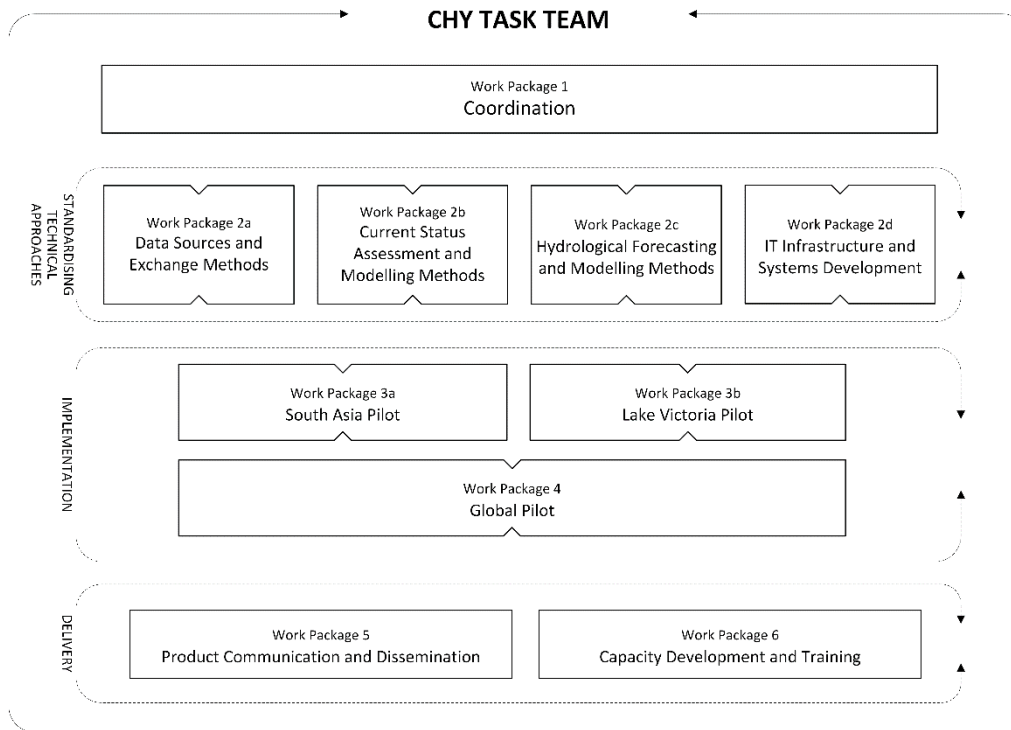


Baseline Scenario	268 GtC	273 GtC	529 GtC
Permafrost/Methane Feedback	213 GtC	217 GtC	465 GtC
% Change	21%	21%	12.4%



HydroSOS – Global Hydrological Status and Outlook System Adopted by Commission for Hydrology in WMO





Alan Jenkins	CEH	UK	1
Harry Dixon	CEH	UK	1
Tanya Warnaaars	CEH	UK	1
Wang	Nanjing Hydraulic Research Institute	China	2 a
Jian	USGS	USA	2 b
Narendra Tuteja	Bureau of Meteorology	Australia	2 c
Andersson	SMHI / Swedish Meteorological and Hydrological	Sweeden	2 d
Arheimer	SMHI / Swedish Meteorological and Hydrological	Sweeden	2 d
Paudyal	Independent Consultant	Nepal	3 a
Tom Kanyike	Ministry of Water and Environment	Uganda	3 b
Eleanor Blyth	CEH	UK	4
Andy Wood	National Center for Atmospheric Research	USA	5
Aris Georgakakos	Georgia Institute of Technology	USA	6

Kickoff meeting in Uganda – October 2017
Task-team meeting April 3-5 2018, CEH

4 –year pilot project. Can it be done?

The Global Pilot Project

Task team leader: Eleanor Blyth

Need to recruit my team – all offers welcome!

A globally consistent, regionally-informed analysis of:

- a) Current global hydrological status
- b) Current anomaly (wetter, dryer)
- c) Anomaly forecast (week/month)

Approach:

1. Use an ensemble of globally-consistent models
2. Use Reanalysis products to quantify what is 'normal' and spin up of the hydrological states (root-zone soil moisture, groundwater, reservoirs etc)
3. Use satellite products to provide globally- consistent current status (rainfall, surface soil moisture)
4. Use Regional Information to update hydrological states
5. Use meteorological forecasts to provide drivers for land surface/hydrological models for the Anomaly Forecast (c)

How can iLEAPS link to GEWEX?



1. Land Surface Modelling Summit – 2020 in Oxford?
2. Impact of CO₂ fertilisation on the water cycle
3. Impact of the water cycle and extremes on the global carbon cycle

Need to identify other Global Research Networks/
Programmes/Projects e.g. Global Carbon Project?