GROUP ON EARTH OBSERVATIONS

INSIGHT FOR A CHANGING WORLD
GEO WEEK 2017
23-27 OCTOBER 2017
WASHINGTON, D.C., USA

GROUP ON EARTH OBSERVATIONS

CARBON AND GHG INITIATIVE

GEO-C: Need for (land-based) carbon observations in support to the Paris Agreement

A. Bombelli *et al.*

cmcc Euro-Mediterranean Center on Climate Change, Italy

Vision for WIGOS in 2040, GEO Week 2017, Washington D.C., 24/10/2017

PPT outline:

1- short intro on the Paris Agreement*

2- Emerging needs from the PA

3- GEO-C

* Not exhaustive overview, focus on the land sector

GEO-C: the Policy context

The Paris Agreement:

Article 4 and Article 13 – National Reporting

- Reported five-yearly by parties, successive reductions in emissions
- Using existing methods and guidance

Article 5 Mitigation

- Knowledge of evolution of sinks and sources

Article 7 Adaptation

- Best available science, research, systematic observation
- Strengthening cooperation

PARIS2015
UN CLIMATE CHANGE CONFERENCE
COP21·CMP11

Article 10 Technology Transfer

Article 11 Capacity Development

Article 14 Global stocktaking

- in the light of equity and the best available science: 2023, 2028…

Article 15 Compliance

GEO-C: the Policy context

The Paris Agreement:

- recognizes the importance of scientific knowledge, including research and systematic observations, to support the commitment of reducing GHG emissions to keep global warming below 1.5-2.0°C

Systematic "carbon" observations, data and information can support:

- National reporting
- Mitigation (adaptation)
- Global stocktake
- Transparency process
- Technical experts review
- Public access to information
- Etc.

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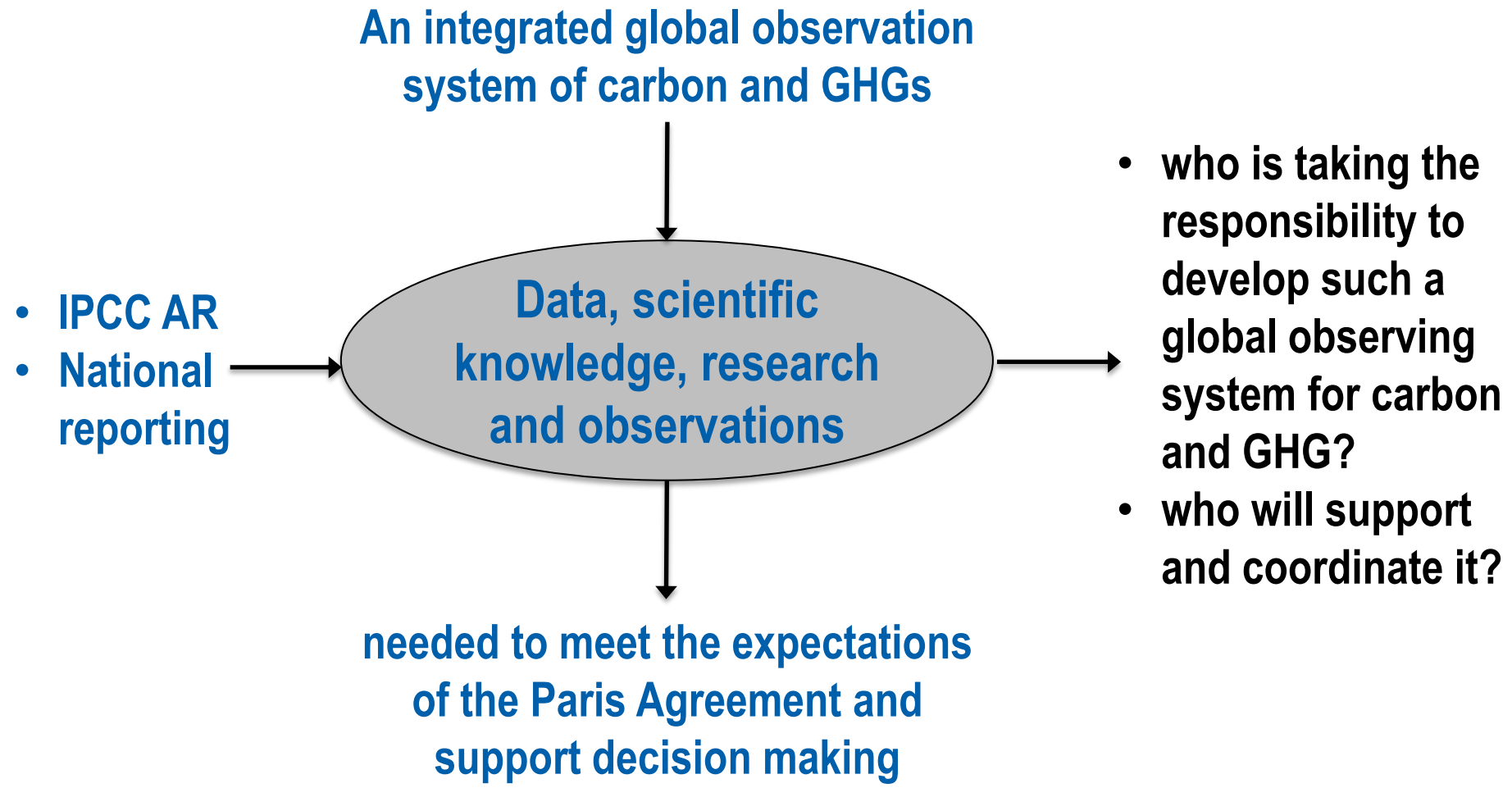
Policy makers and inventory agencies strongly need reliable GHG-related observations and knowledge

GEO-C: the Policy context



PPT outline:

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Comprehensive approach (not only T and atmospheric CO_2)

Paris target is about temperature, however monitoring and meeting this target requires a broader range of climate indicators (Briggs et al., 2015)

Measuring CO_2 emissions in the atmosphere is not enough: decreasing anthropogenic emissions does not imply a direct slowdown in [CO_2]

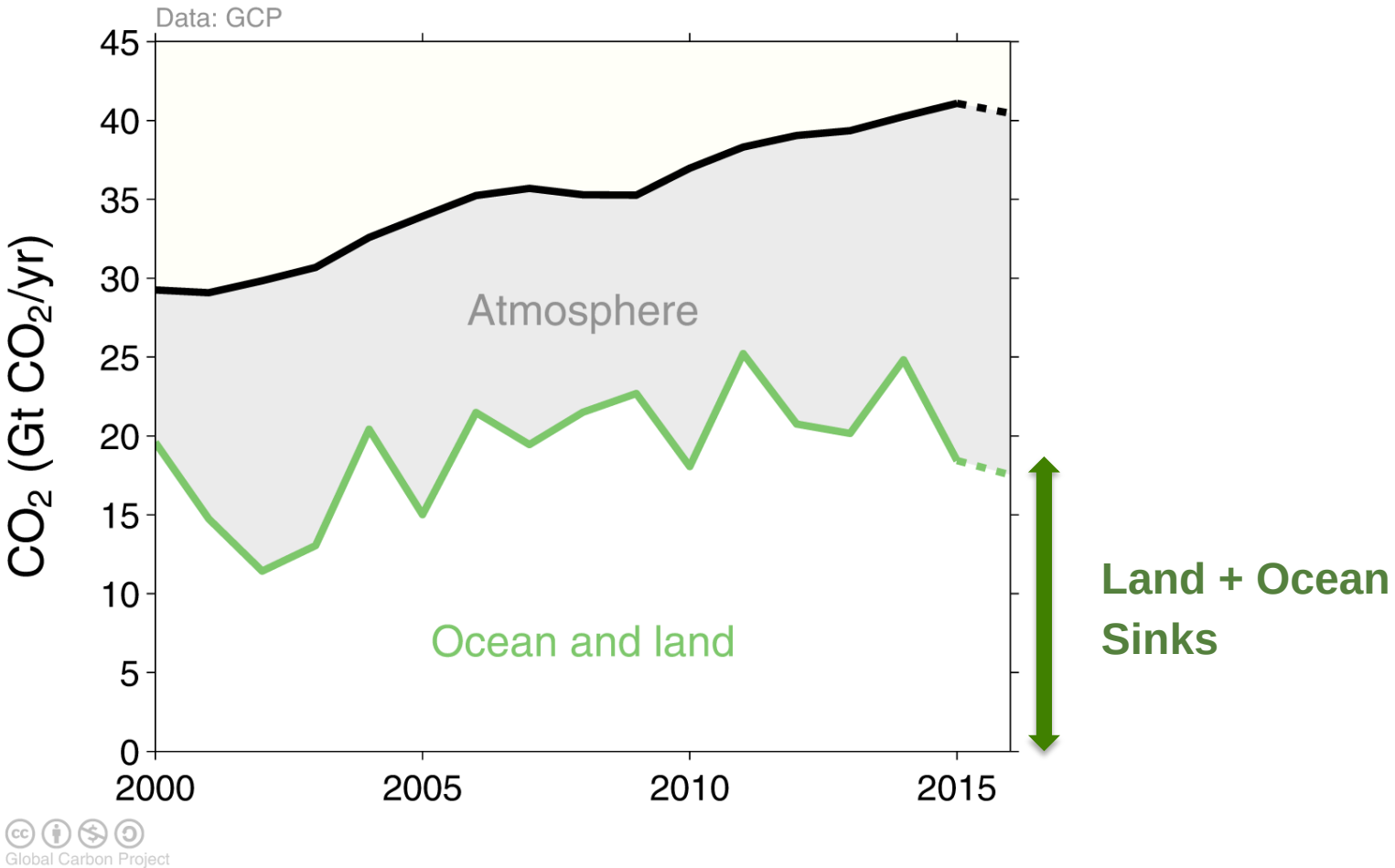
Climate impacts on land → land surface could become a net C-source: e.g. permafrost melting, peatlands fires, forest drought/mortality, etc.

We need to study C-cycle on the whole and better understand (among others) climate-land feedbacks: we do not know if the current trends – e.g. land and ocean sinks – will remain the same in the future

Need for enhanced observations from an integrated approach: in situ / satellite / inventory, across scales (time & spatial), domains (atmosphere, land, ocean) systems and processes (ecophysiology, ecology, earth system).

Partitioning of total CO_2 emissions

Atmospheric CO_2 growth rate was a record high in 2015 in spite of no growth in fossil fuel and industry emissions because of a weaker CO_2 sink on land from hot & dry El Niño conditions



The emissions (shown in black) include fossil fuels and industry and land-use change

Source: CDIAC; NOAA-ESRL; Houghton et al 2012; Giglio et al 2013; Joos et al 2013; Khatiwala et al 2013; Le Quéré et al 2016; Global Carbon Budget 2016

Real data: observations driven estimates

Move from the “residual” land sink to more observation-driven approaches

Global Observations (not only Annex 1)

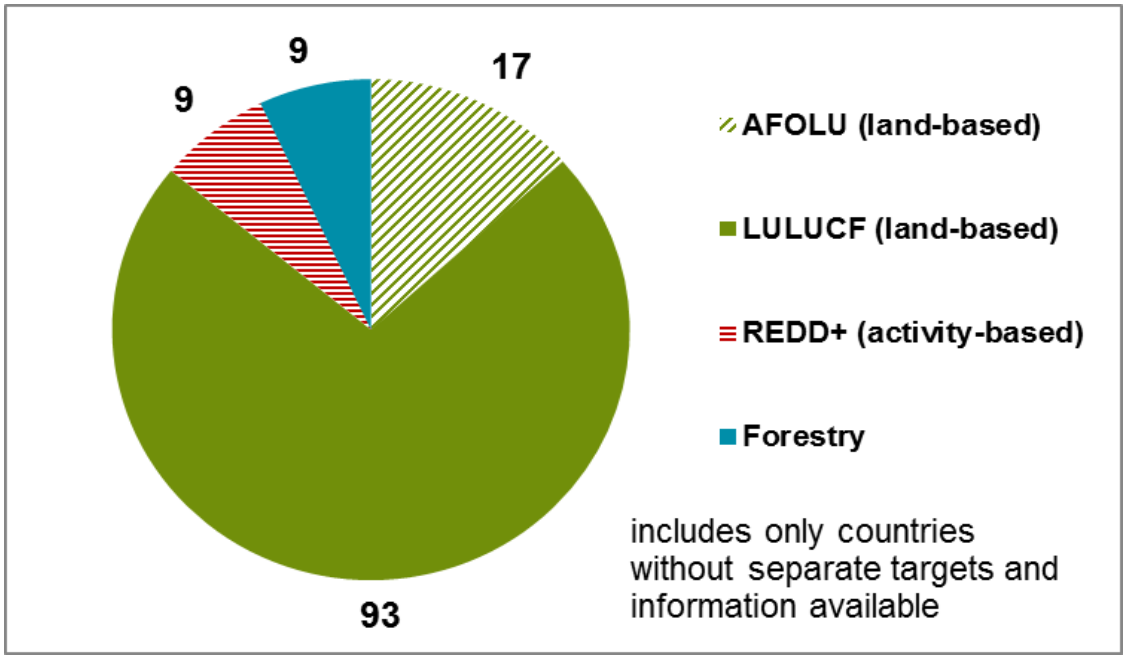
All countries → NDCs

Need for a global integrated picture

However some regions (e.g. Africa) almost not covered by systematic in situ observations

Support needed by developing countries: large areas, inadequate observing systems, difficult to identify all the different land uses and related emissions vs removals estimates; high uncertainties.

Importance of the land sector (in NDCs)



Land sector (both emissions and sinks) represents 20% of the total global budget

High uncertainty!

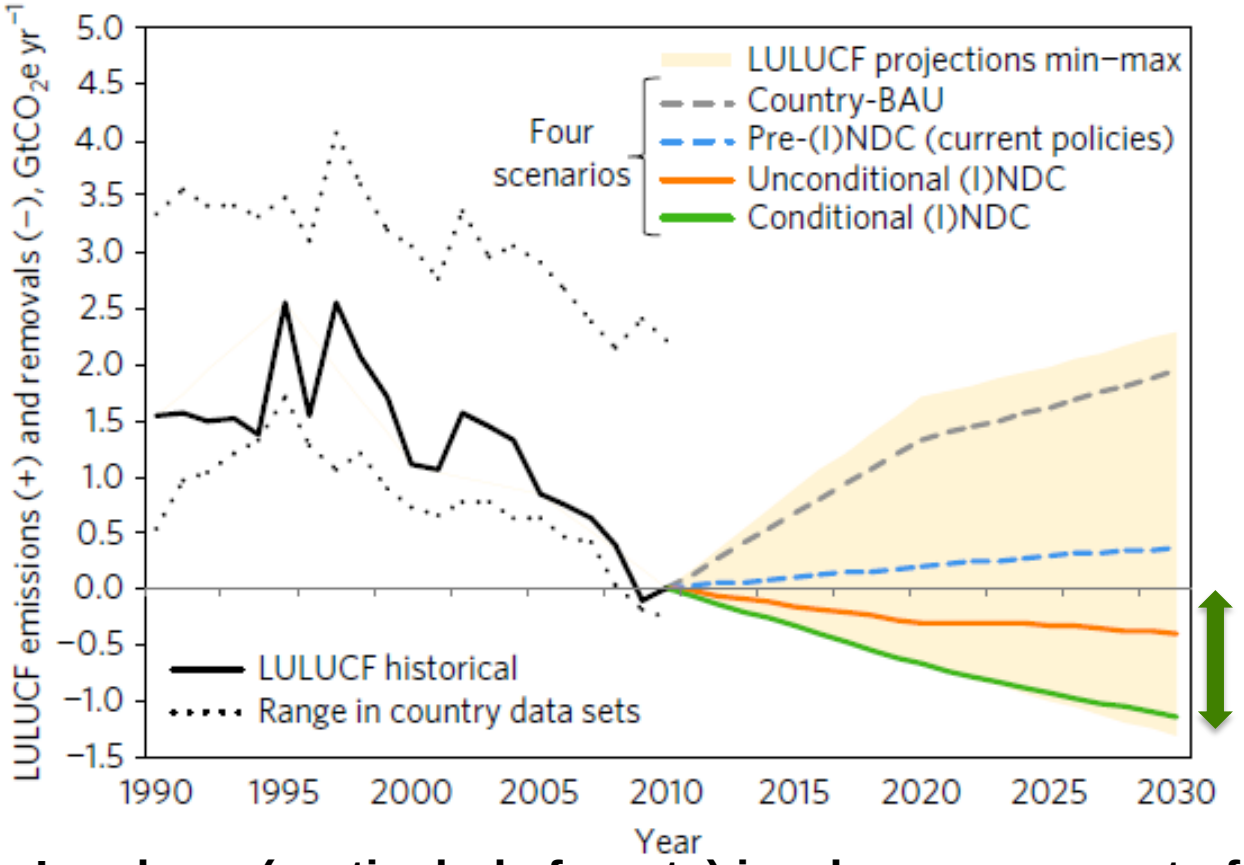
Land sector mentioned in 73% of NDCs

Land use sector, mentioned for:

- mitigation (e.g. Ghana, India, China, Uganda)
- adaptation (e.g. Mexico with deforestation, Ghana with SFM)
- markets (e.g. Ghana, Chad with REDD+)
- means of implementation (e.g. Brazil and Uganda with REDD+).

Data from Anke Herold

Contribution of the land sector in the NDC



Considering all sectors, the estimated mitigation contribution from LULUCF at global level is about 25% of emission reductions planned by countries

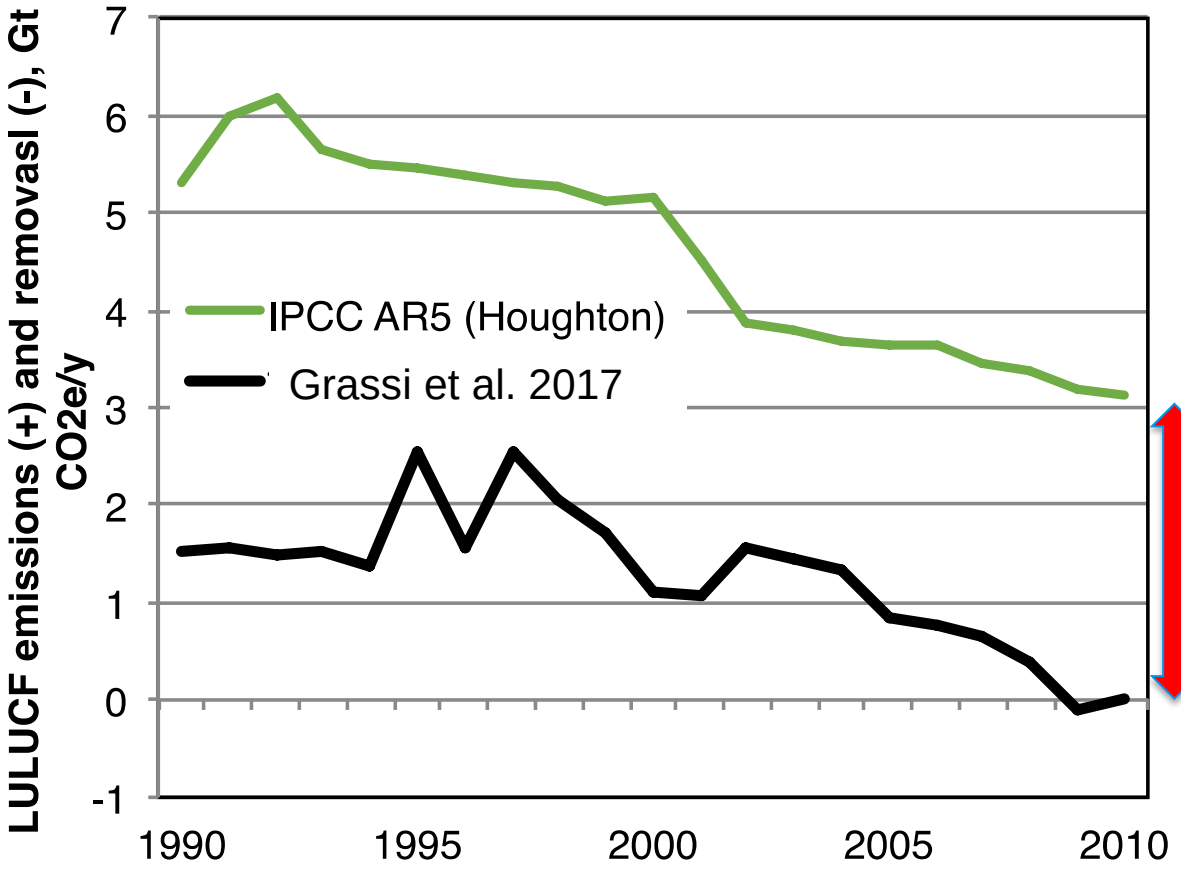
≈ 1.1 $GtCO_2eyr^{-1}$

Land use (particularly forests) is a key component of the Paris Agreement*, turning globally from a net anthropogenic source during 1990–2010 (1.3±1.1 GtCO2e yr^{-1}) to a net sink of carbon by 2030 (up to -1.1±0.5 GtCO2e yr^{-1}).

* assuming full implementation of NDCs

Grassi et al. 2017, Nature Climate Change

Issues in the land sector



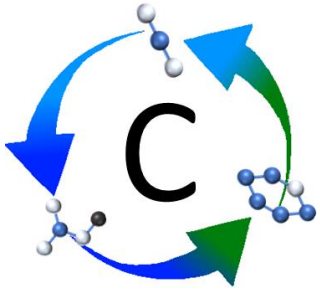
≈ 3 $GtCO_2eyr^{-1}$

Difference due to different methods and languages (e.g. definition of forest, anthropogenic vs natural effects)

Comparison of historical LULUCF net GHG flux: country reports to UNFCCC vs scientific studies (IPCC AR5).

C Global stocktake to be based on both country reporting and IPCC reports → need for reconciliation → need to use more real observations than statistics and models.

Need for Coordination of research and observations



Carbon Cycle

Climate Change

Ecosystems **Oceans** **Atmosphere** **Gases** **Aerosols** **Human activities** **Natural**

Very diverse scientific domains that need specialized approaches

NEON

eLTER

GOOS

SOCAt

Blue Planet

ARGO

IG^{3}IS

GAW

IAGOS

TCCON

FLUXNET

ICOS

ACTRiS

CEOS

AnaEE

(this is not an exhaustive list, it is just for example)

Need for Coordination of research and observations

Some Emerging needs from the PA

(focus on land)

summary

- **Comprehensive approach (not only T and atmospheric CO_2)**
- **Global observation (not only annex 1)**
- **Real data (observations driven estimates – not only statistics, models, etc.)**
- **Issues in the land sector (methods, definitions, attribution, etc.)**
- **Coordination of research and observations**
- others…

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GEO Engagement Priorities 2017-2019

2030 Agenda for Sustainable Development

PARIS2015
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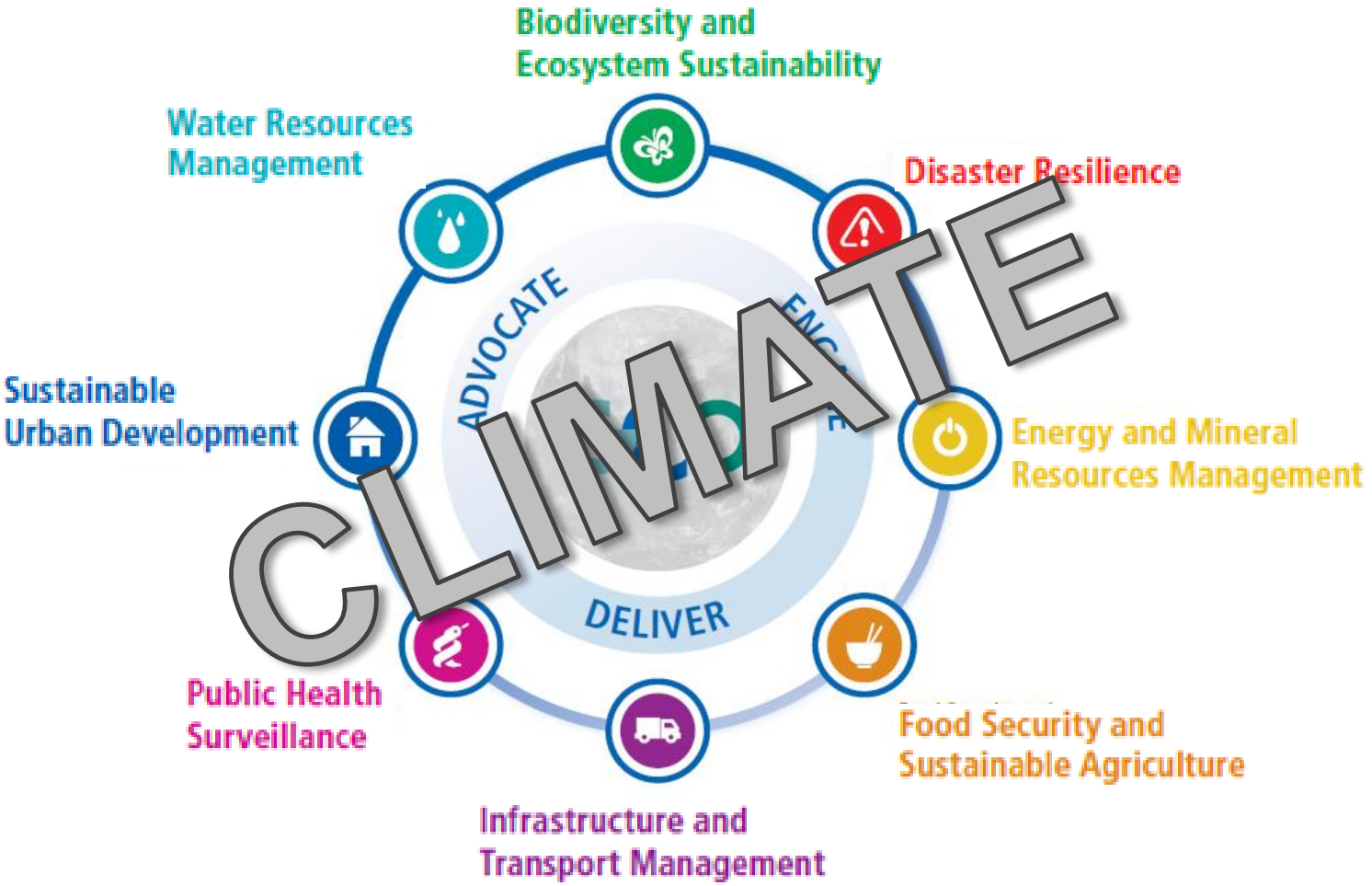
Climate Change and Greenhouse Gas Monitoring

UN World Conference on
Disaster Risk Reduction
2015 Sendai Japan

Disaster Risk Reduction

GEO SBAs - Societal Benefit Areas



GEO-C: Global observation system via cooperation

facilitate cooperation to develop a coordinated system of observations across domains

The approach: a global joint effort / a common platform

build on existing initiatives and networks, support their continuity and coherence, promote the interoperability of their data and systems

plan joint strategies and implement joint activities

fill in the missing pieces to obtain a comprehensive, globally coordinated C & GHG observation and analysis system

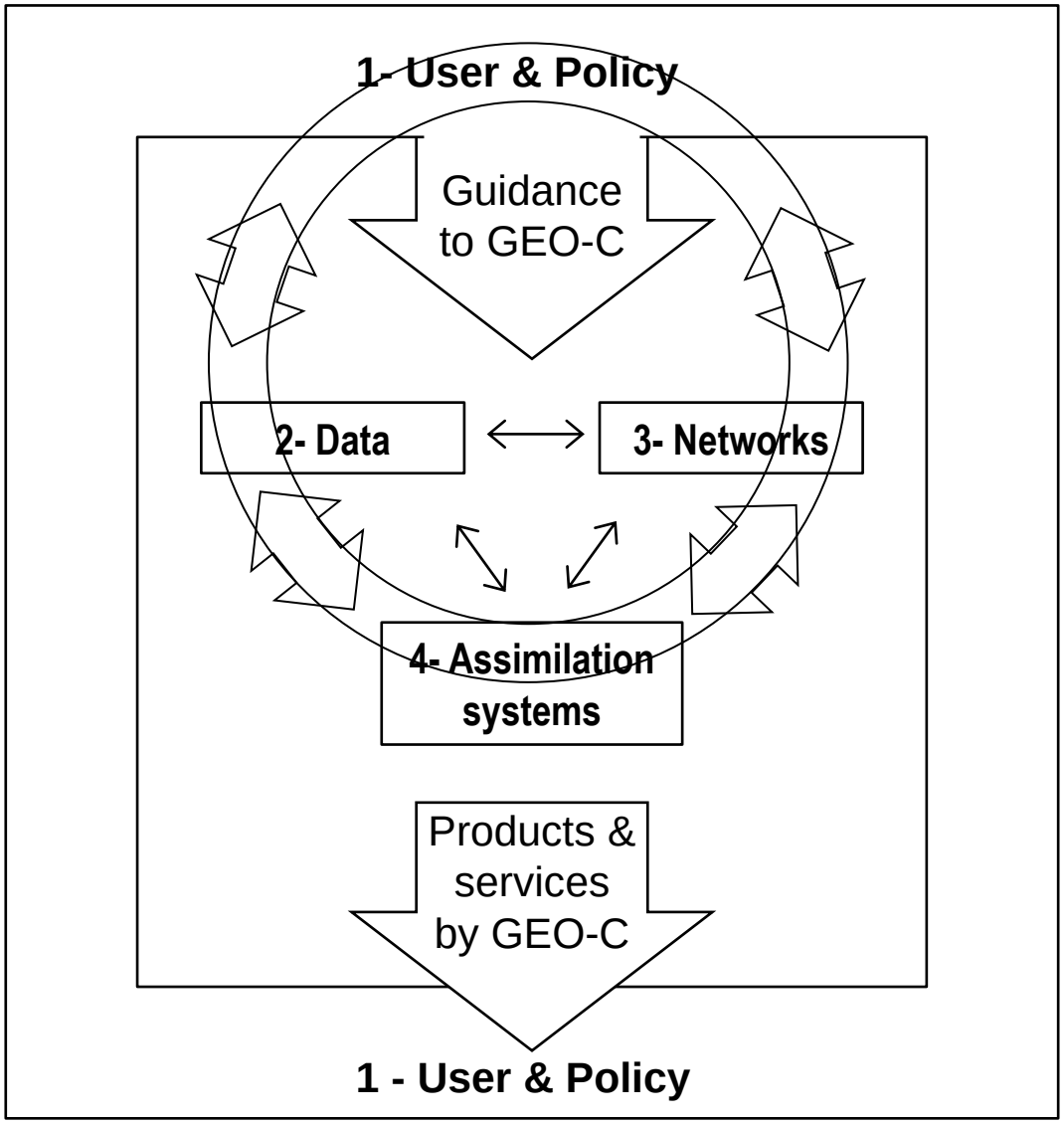
Monitor changes in the carbon and GHG cycles, and GHG emissions as they relate to human activities and global change

Support UNFCCC and policy: support the UNFCCC process and provide decision makers with timely and reliable policy-relevant information

GEO-C: Tasks

GEO-C Tasks

- Task 1: User needs and policy interface
- Task 2: Data access and availability
- Task 3: Optimization of observational networks
- Task 4: Carbon and GHG budget calculations



GEO-C: from Observations to Decisions

Communication

SOCAT · SURFACE OCEAN CO_2 ATLAS · CEOS · WMO · ipcc · SBSTA · FLUXNET · GAW · GEO GROUP ON EARTH OBSERVATIONS · UNEP United Nations Environment Programme · GCOS · GEO CARBON AND GHG INITIATIVE 1 · Framework Convention on Climate Change

Observations → **Services** → **Knowledge** → **Decisions**

AMERIFLUX · neon · TERN · ICOS INTEGRATED CARBON OBSERVATION SYSTEM · NOAA · JapanFlux · GEO CARBON AND GHG INITIATIVE 3

Identifying observational gaps

GEO CARBON AND GHG INITIATIVE 2 · opernicus Europe's eyes on Earth

Data sharing

management (incl. metadata)

Improve data harmonization

Improve inter-operability

Improve data accessibility

Data Citation

From data to knowledge

Global Carbon Project · GEO CARBON AND GHG INITIATIVE 4

Model-Data

ts

Sustainability

Capacity building

GEO-VI Plenary, Washington D.C., Reagan Center, 17-18/11/2009

GEO-C was conceived right here in Washington, 8 years ago!

- Presentations during the Plenary (17 Nov 2009)
- Side Event (18 Nov 2009)
- Key note talk at the Smithsonian (19 Nov 2017)

18 November 2009

Side Event to establish the GEO CCoP, Carbon Community of Practice

17 November 2009

Integrated Global Carbon Observations

Beverly Law

Prof. Global Change Forest

Science Chair, AmeriFlux N

Oregon State Univers

19 November 2009

IGOS Integrated Global Observing Strategy

GEO GROUP ON EARTH OBSERVATIONS

The need for carbon observations: Yesterday, today and tomorrow

Philippe Ciais

Antonio Bombelli

Roger Dargaville

Han Dolman

and IGCO community of practice

GEO IGOS Symposium Washington DC, Nov 19, 2009

Baird Auditorium, Smithsonian National Museum of Natural History

Announcement

GEO Workshop to address the needs emerging from the Paris Agreement

Where: probably Geneva
When: 1st half of 2018

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THANKS

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