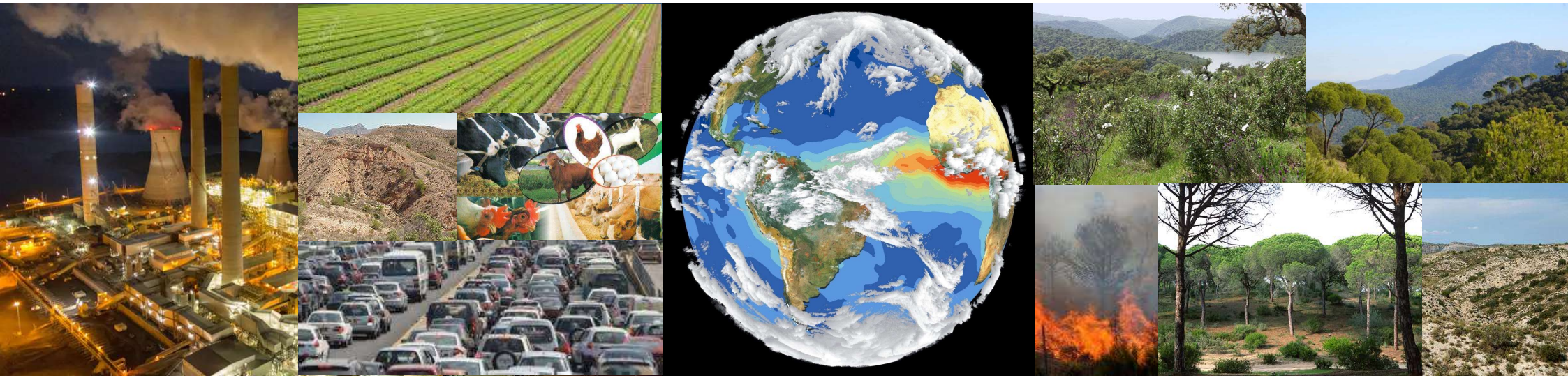
BASQUE CENTRE
FOR CLIMATE CHANGE
Klima Aldaketa Ikergai

VI MFW

Land Use and Paris Agreement

Mediterranean Forest

M.J. Sanz



Science advice Paris Agreement Land Use (Forest)

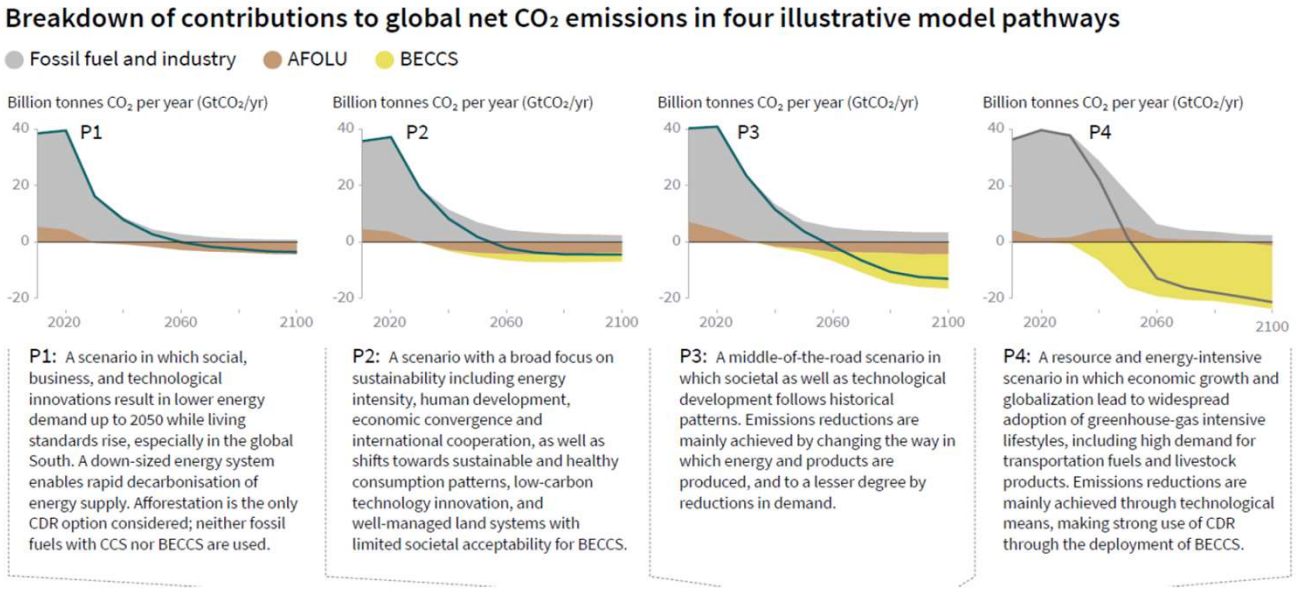
Paris Agreement 1/COP.21

Katowice Rulebook 1/CMP.1

United Nations
Framework Convention on
Climate Change

1.5 IPCC SR: Characteristics of four illustrative model pathways

50–800 pasture and 0–500 of non-pasture agricultural land (food and feed crops) million Ha into 100–700 million Ha for energy crops

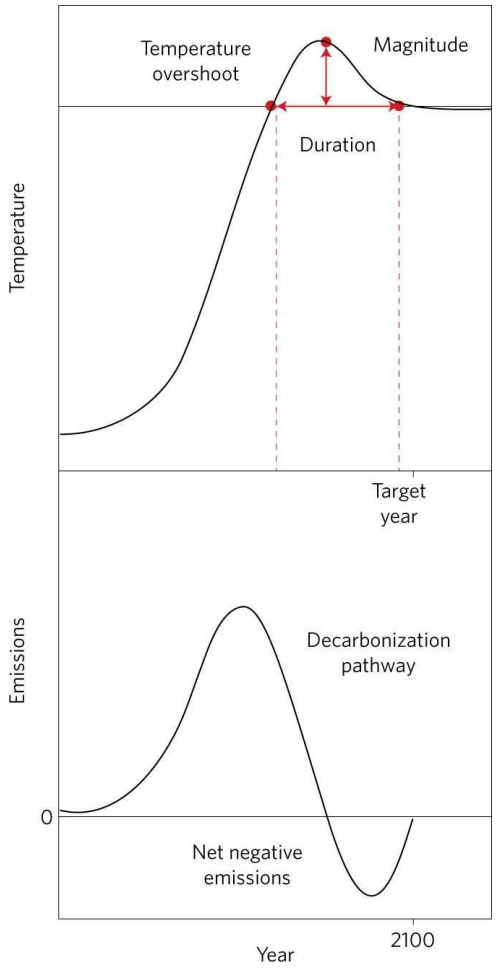


Cumulative CCS until 2100 ($GtCO_2$)	0	348	687	1218
↳ of which BECCS ($GtCO_2$)	0	151	414	1191
Land area of bioenergy crops in 2050 (million hectare)	22	93	283	724
Agricultural CH_4 emissions in 2030 (% rel to 2010)	-24	-48	1	14
in 2050 (% rel to 2010)	-33	-69	-23	2
Agricultural N_2O emissions in 2030 (% rel to 2010)	5	-26	15	3
in 2050 (% rel to 2010)	6	-26	0	39

Model pathways that limit global warming to 1.5°C with no or limited overshoot

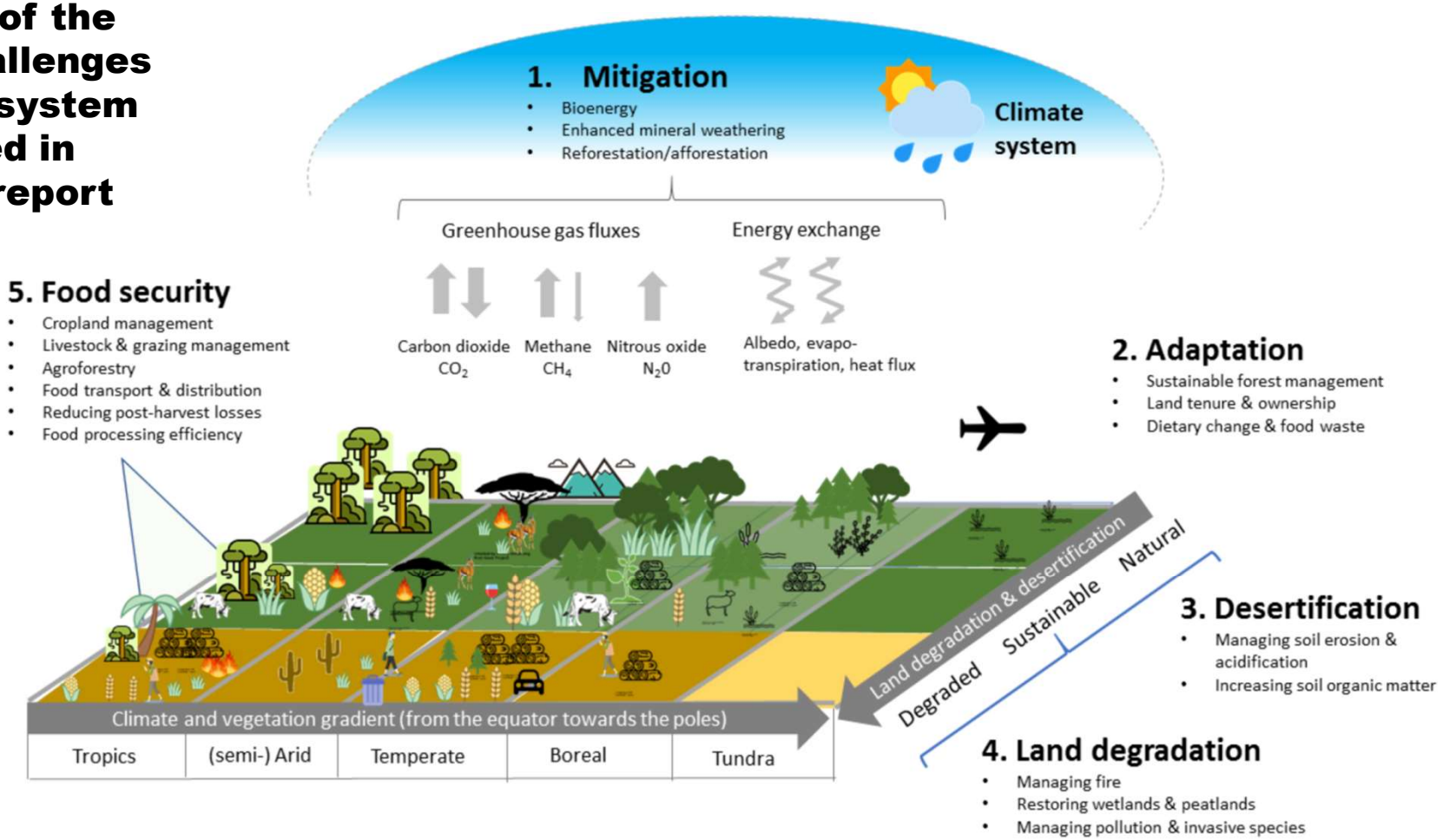
- Mitigation options **limiting the demand for land** include sustainable intensification of land use practices, ecosystem restoration and changes towards less resource-intensive diets (*high confidence*).
- The implementation of land-based mitigation options would **require overcoming socio-economic, institutional, technological, financing and environmental barriers that differ across regions** (*high confidence*).

Geden and Löschel, 2017



IPCC SR Climate Change and Land (FD under preparation)

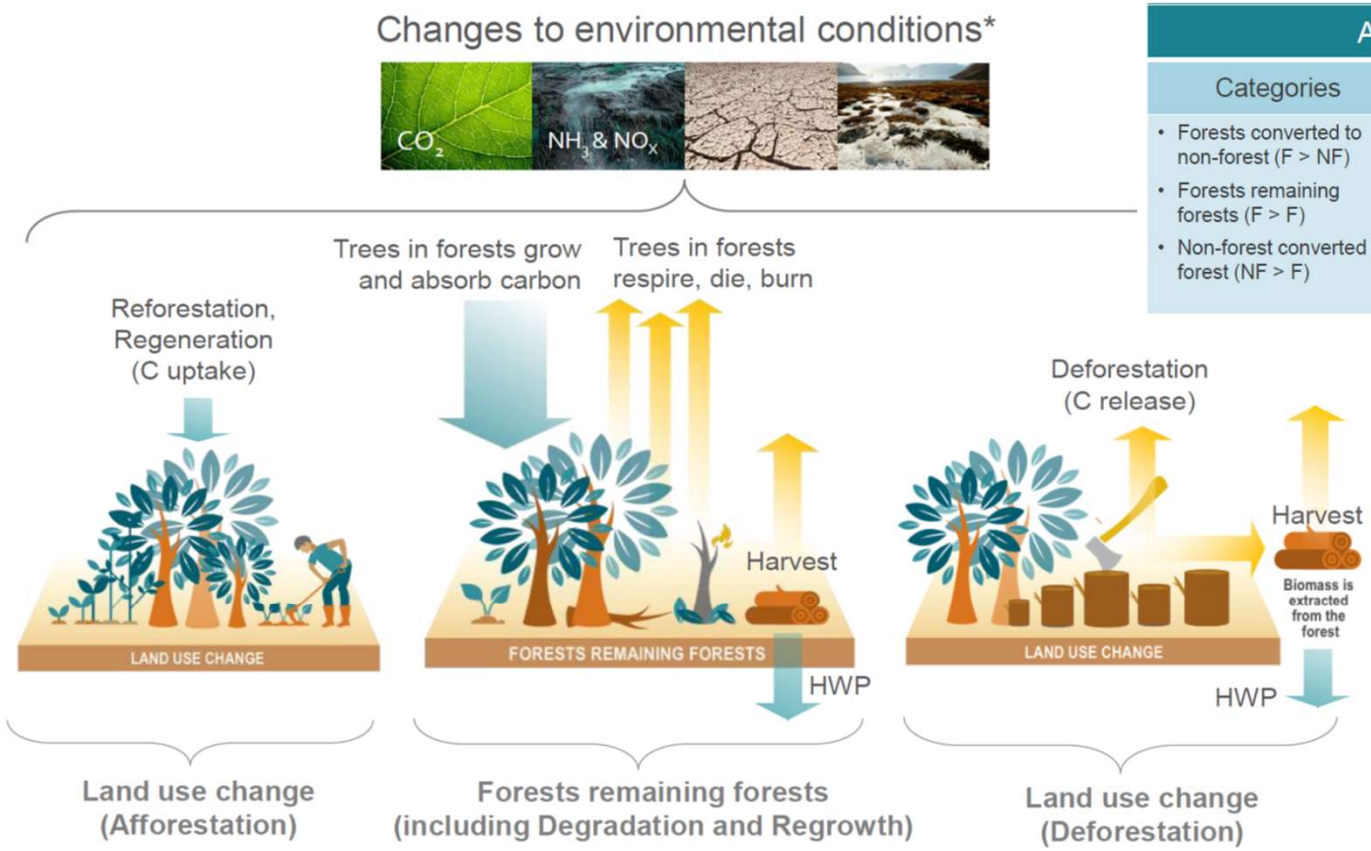
A representation of the principal land challenges and land-climate system processes covered in this assessment report



Mitigation

Recent literature / IPCC SR1.5, IPCC SRCCL, IPCC 2019 Refinement

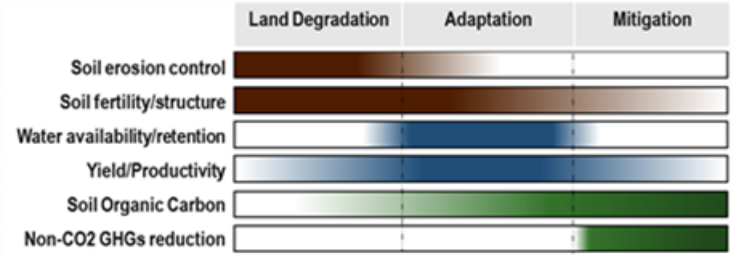
Forest fluxes are the result of….



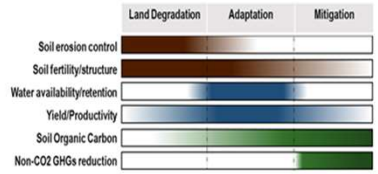
A complete GHG inventory contains…		
Categories	Pools	Gases
• Forests converted to non-forest (F > NF) • Forests remaining forests (F > F) • Non-forest converted to forest (NF > F)	• Aboveground biomass (AGB) • Belowground biomass (BGB) • Dead organic matter (DOM), including Deadwood (DW) and Litter (L) • Soil organic matter (SOM) • Harvested Wood Products (HWP)	• Carbon dioxide (CO_2) from biomass loss • Nitrous Oxide (N_2O) and Methane (CH_4) mostly from fire

*Environmental conditions mostly impact "forests remaining forests" since this accounts for most of the forest area (95-99%) in the world.

Assesement of practices (SLM) can be done balancing different objetives such Mitigation, Adaptation and Land Degradation, biodiversity….



SLM practices in forests/woodlands considered clustered in seven groups of technologies reflected in Section 2.2. Addressing land degradation (LD), climate change adaptation and mitigation, co-benefits (biodiversity), and cost (investments): Low (□), moderate (□□), high (□□□).



	Soil fertility/structure	Soil erosion control	Soil Organic Carbon	Non-CO2 GHGs reduction	Water availability/retention	Yield/Productivity	Biodiversity	Cost
	LD		Mitigation		Adaptation			
FOREST / WOODLAND								
Afforestation/Reforestation								
Afforestation with species mix at different scales	□	□□	□□□	□□	□□	□□	□□	□□
Forest establishment in semi-arid land	□□	□□□	□□	□	□	□□	□	□□□
Land reclamation with forest native species	□	□□	□□□	□□	□	□□	□□□	□
Reforestation in former forest lands	□	□□	□□□	□□	□□	□□	□□	□□□
Reintroduction of forest cover after wildfires	□	□□	□□□	□□	□	□□	□□	□□□
Drainage								
Trees for bio-drainage	□□	□	□□	□	□	□□	□	□
Fire control, pest and diseases control								
Control of wildfires in peatlands	□□	□□	□□	□□□	□	□	□□	□
Controlling anthropogenic disturbances	□	□	□□	□	□□□	□□	□□	□□□
Management for forest fire prevention	□	□□	□□	□□□	□□□	□□	□□	□□□
Forest restoration								
Assisted regeneration	□□	□□	□□□	□□	□	□□	□□	□□
Reducing deforestation								
Establishment of protected forest areas	□□□	□□□	□□□	□□□	□□	□□	□□□	□□
Reducing slash and burn agriculture	□□	□□	□□	□□□	□□	□□	□□□	□
Soil erosion control								

(Sanz et al 2017)

IPCC SR Climate Change and Land (FD under preparation)

SR CCL proposal for Integrated response options available to address the land challenges of **climate change mitigation, climate change adaptation, desertification, land degradation and food security**

Main indicative use of the integrated response options

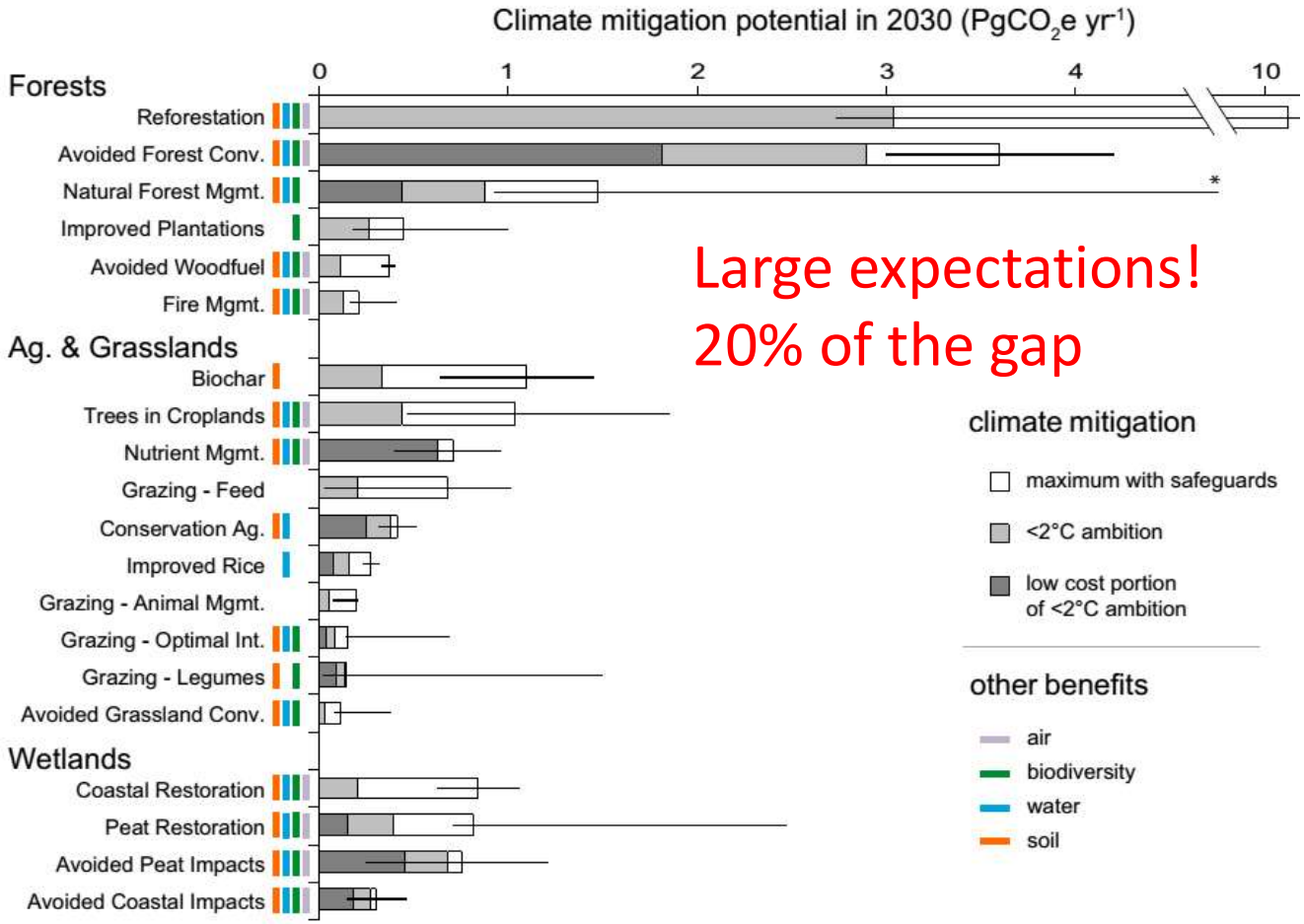
Category	Integrative response option
Response options based on land management	Increased soil organic matter content (and reduced losses)
	Improved cropland management
	Improved livestock management
	Improved grazing land management
	Increased food productivity
	Agro-forestry
	Sustainable forest management
	Agricultural diversification
	Management of erosion
	Prevent / reverse soil salinization
	Prevention of compaction
	Fire management
	Management of landslides and natural hazards
	Ecosystem-based adaptation
	Reduced deforestation and degradation
	Management of pollution including acidification
	Management of invasive species / encroachment
	Reforestation
	Restoration and avoided conversion of coastal wetlands
	Biochar
	Restoration and avoided conversion of peatlands
	Afforestation
	Avoidance of conversion of grassland to cropland
	Enhanced weathering of minerals
	Bioenergy and BECCS
Response options based on value chain management	Dietary change
	Reduce post-harvest losses
	Reduce food waste (consumer or retailer)
	Promotion of value-added products
	Stability of food supply
	Improved food transport and distribution
	Urban food systems
	Improved efficiency and sustainability of food processing, retai
	and agri-food industries
	Increased energy efficiency in agriculture
	Material substitution
Response options based on governance and risk management	Land tenure / ownership
	Prevention of land grabbing
	Management of urban sprawl
	Livelihood diversification
	Promotion of seed sovereignty
	Early warning systems for disaster risk reduction
	Commercial crop insurance

Based on land management

Based on the value chain management

Based on governance and risk management

Land Use role: Are potentials realistically calculated?

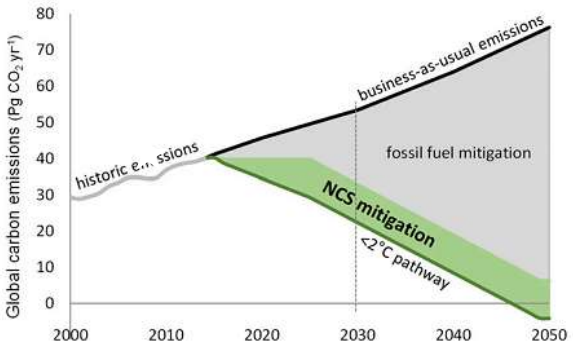


Large expectations!
20% of the gap

But huge uncertainty

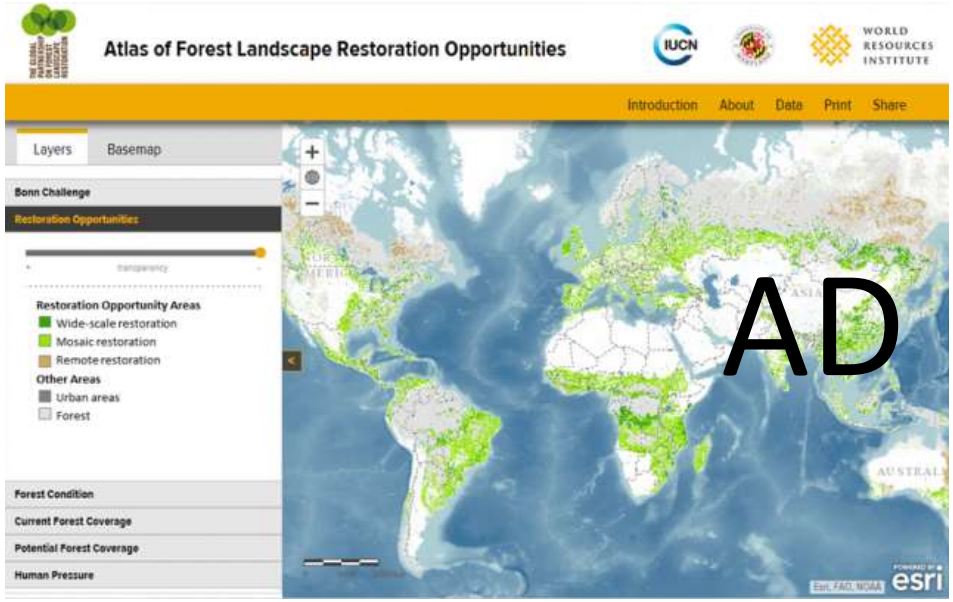
Are top down numbers right?

co-benefits?



Griscom et al 2017 (PNAS)

Land Use role: Are potentials realistically calculated? For example Reforestation



AD x EF

Griscom et al 2017 (PNAS)

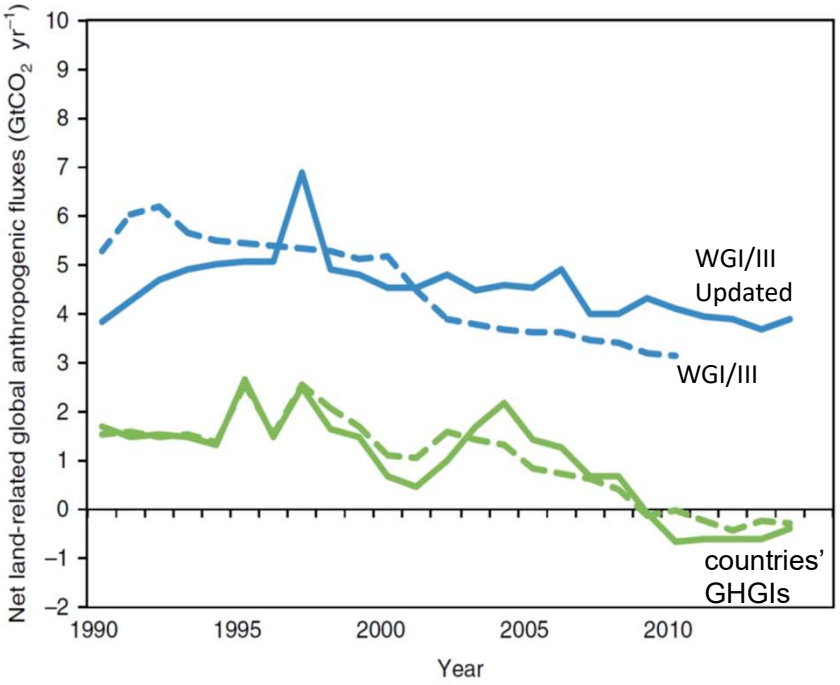
Country level maximum mitigation potential with safeguards for 8 NCS pathways. Units are $TgCO_2e\ yr^{-1}$ unless otherwise specified. "Ukn" refers to Unknown.

Country	Reforestation	Natural Forest Mgmt.	Grazing - Optimal Intensity	Grazing - Legumes	Improved Rice Cult.	Avoided Coastal Impacts - Mangroves	Avoided Peatland Impacts	Peatland Restoration
Spain	188.73	12.13	1.05	3.72	0.20	0.03	0.03	0.06

Forest definition: Crown cover trehshold 25% / EF single one – corresponding to a semitropical forest for all Spain

Land Use role: large discrepancies among and between models and with GHGinv?

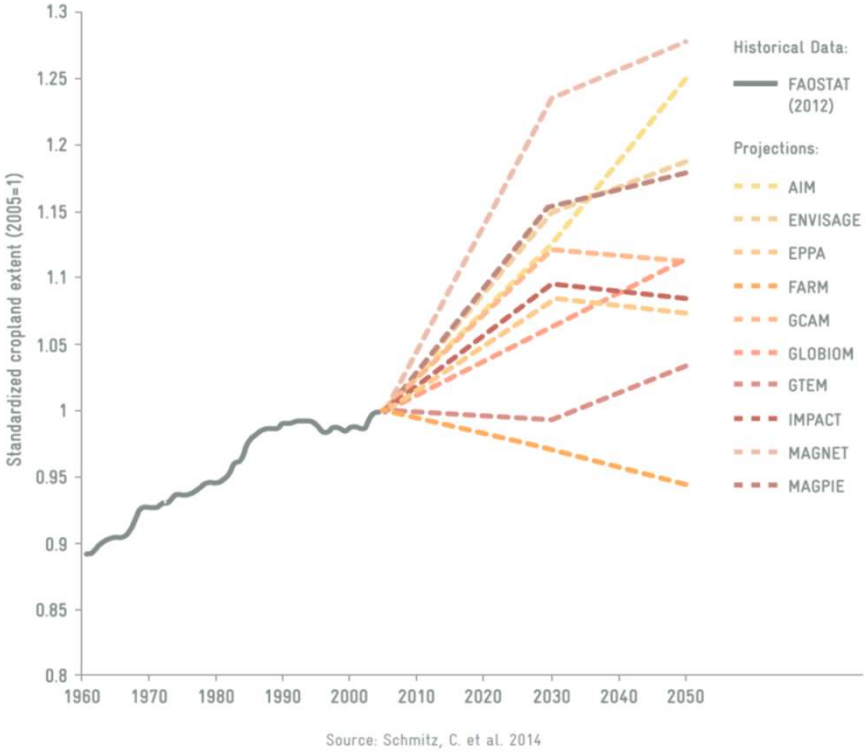
Comparison of the global net anthropogenic land-related CO2 fluxes estimated by AR5 / countries' GHGIs



Source: Grassi et al 2018

The gap between the updated estimates is about 4 $GtCO_2\,yr^{-1}$ for the period 2005–2014.

Comparison of different models on their proyections for the increase of croplands 2012-2050



Source: Schmitz, C. et al. 2014

The range goes from -5% to +30% .

How forest emissions are estimated by different communities

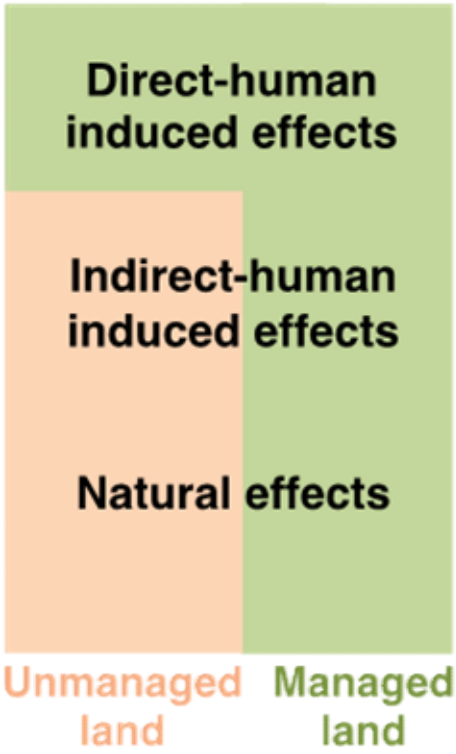
a) Effects of various factors on the forest CO_2 fluxes

Direct-human induced effects
- Land use change
- Harvest and other management

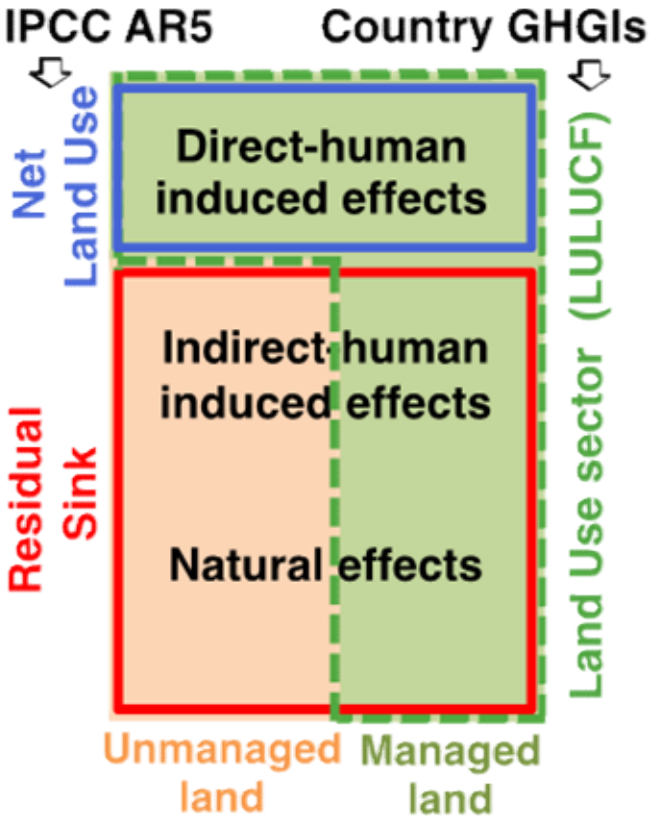
Indirect-human induced effects
- Climate change induced change in T°, precipitation, length of growing season
- Human-induced CO_2 and N fertilisation
- Impact of air pollution
- Changes in natural disturbances regime

Natural effects
- Natural interannual variability
- Natural disturbances

b) Where these effects occur



c) How these effects are captured in:



Transparency matters …Relevant for the Global Stock Take!

Source: Grassi et al 2018, and Lee & Sanz 2017

Vulnerability / Adaptation

Recent literature / IPCC SRCCL

Localities with increased forest mortality related to climatic stress from drought and high temperatures

Drought and High Temperatures

Severe mortality of overstorey aspen (*Populus tremuloides*) following the 2001–2002 drought in the parkland zone of Saskatchewan, Canada (August 2004)

Drought-induced mortality of *Pinus sylvestris*, Andalucia, Spain (April 2006)

Climate-induced mortality of *Pinus sylvestris*, Valais, Switzerland (1999)

Pinus yunnanensis stand, Yunnan Province, China, showing mortality induced by a drought that resulted in outbreaks of *Tomicus yunnanensis* and *Tomicus minor* shoot beetles from 2003 to 2005 (July 2005)

Drought-induced death of *Acacia aneura*, eastern Australia (2007)

Mortality after warm drought in the early 2000s, Jemez Mountains, New Mexico, United States: left, *Pinus ponderosa* mortality (July 2006); right, mass mortality of *Pinus edulis* and scattered *Juniperus monosperma* survivors (May 2004)

Mortality of *Nothofagus dombeyi* in mixed *N. dombeyi–Austrocedrus chilensis* stand, induced by a warm drought in 1998–1999, northern Patagonia, Argentina (September 2004)

A dust storm blows through a stand of *Acacia albida* in the Senegalese Sahel where dieback was documented in the last half of the twentieth century (1993)

Cedrus atlantica mortality triggered by drought, Belezma National Park, Algeria, with surviving understorey including *Quercus ilex* (2007)

Dieback and decline of *Juniperus procera*, Saudi Arabia (March 2006)

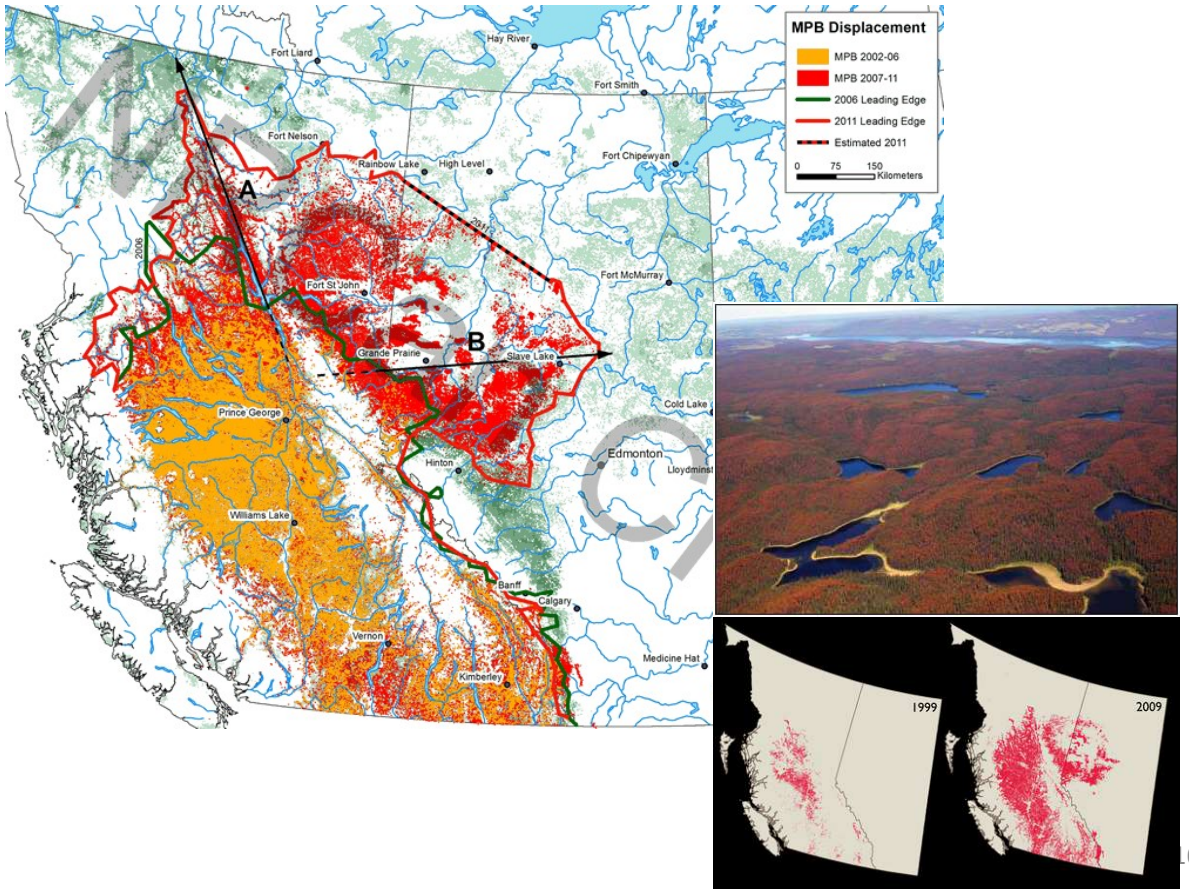
Forest are vulnerable!

Note: Only localities from the Table are shown; many additional localities are mapped in Allen *et al.*, 2009.

Allen et al 2009

Mountain pine beetle and forest carbon feedback to climate change - CANADA

- Cumulative impact of the beetle out-break in the affected region during 2000–2020 will be 270 Mt C over 374,000 km2 (Kurtz el al 2008)
- In the worst year, the impacts resulting from the beetle outbreak in British Columbia were equivalent to 75% of the average annual direct forest fire emissions from all of Canada during 1959–1999



Recent case of a disease (*Dothistroma pini*) in north Spain

Recent tree mortality… Basque Country

Pinus radiata
Monoculture (50% forest área)

Guipúzcoa (Spain)- January 2018 about 1.100 ha affected, six months later 16.000 of the 65.000 ha of pine forest in the province affected (mainly monocultures of *P. radiata*

During summer 2018 also detected in Vizcaya and Alava provinces. It will require extraction of the wood in the coming months

Importance of EO in the context of a changing climate

- The impacts of disturbances are increasing (i.e. diseases and pests, fires, windrows, unexplained decays, etc), and its effects on carbon dynamics, are generally poorly monitored and therefore ignored in modelling analyses and mitigation scenarios.
- EO therefore becomes critical:
  - Monitoring ecosystems natural variability and response to climate change and human management, understanding the processes behind
  - Establishing early warning systems for disturbance and damage early detection and assessment
  - Establishing relations between the above and the land planning and practices to address climate change (Adaptation and Mitigation) and the provision of other services

PA TFW - Adaptation information is becoming important, for both the definitions of NDCs and the provision of information

Paris Agreement: Land Use (Forest)

Paris Agreement 1/COP.21

Katowice Rulebook 1/CMP.1

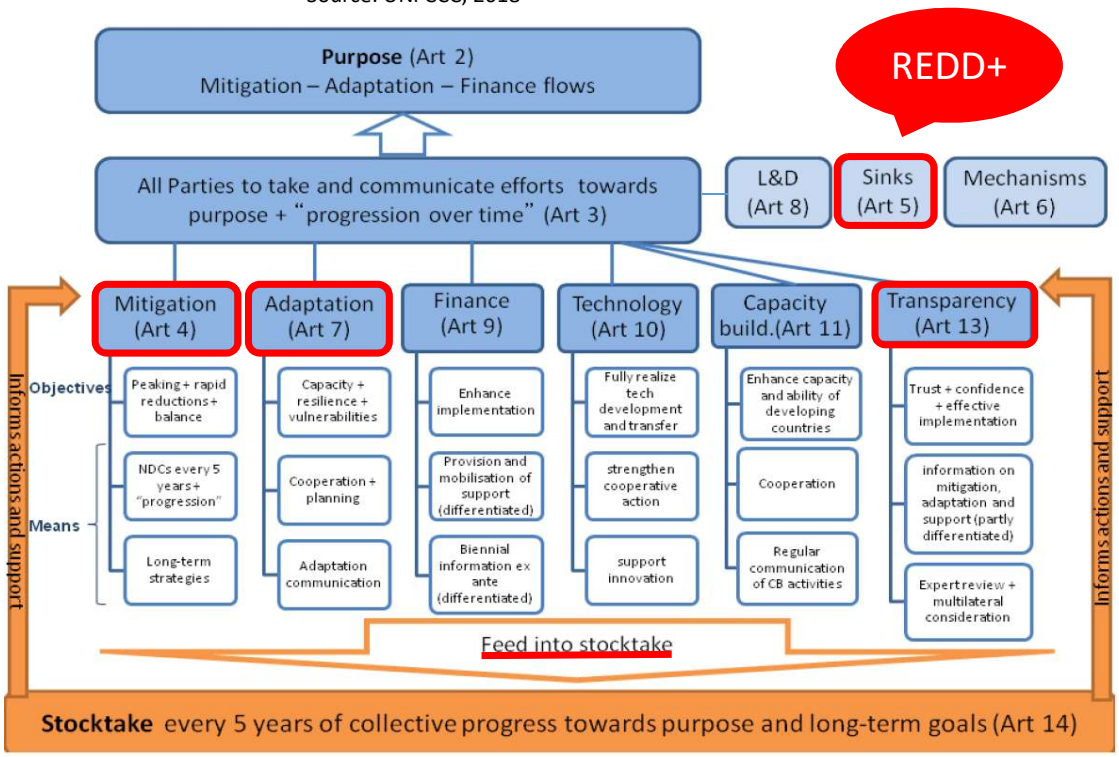
PARIS2015
UN CLIMATE CHANGE CONFERENCE
COP21·CMP11

COP24·KATOWICE 2018
UNITED NATIONS CLIMATE CHANGE CONFERENCE

Land use sector in the Paris Agreement context

- Land can contribute to mitigation, many future pathways largely relay on the sinks
- Sinks are very vulnerable to CC impacts (adaptation is key)
- Are specifically mentioned in Art. 5 (PA), including REDD+
- Difficult history under the UNFCCC GHG inv. Reporting (refined GHG IPCC GL) and KP Accounting (Second CP Modalities)
- Some specificity on Sinks included in the Transparency FW Modalities Procedures and Guidelines (MPGs)

Source: UNFCCC, 2018



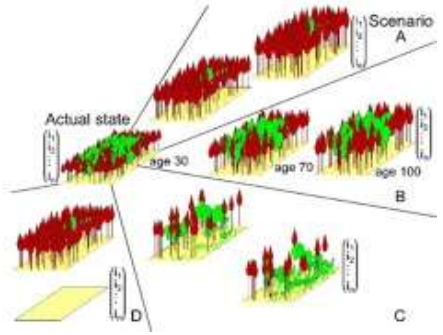
IMPORTAN TO NOTICE

Large discrepancies between top-down and bottom-up estimates !!!

Land use sector in the Paris Agreement context: LU additional specificities TFW (COP24)

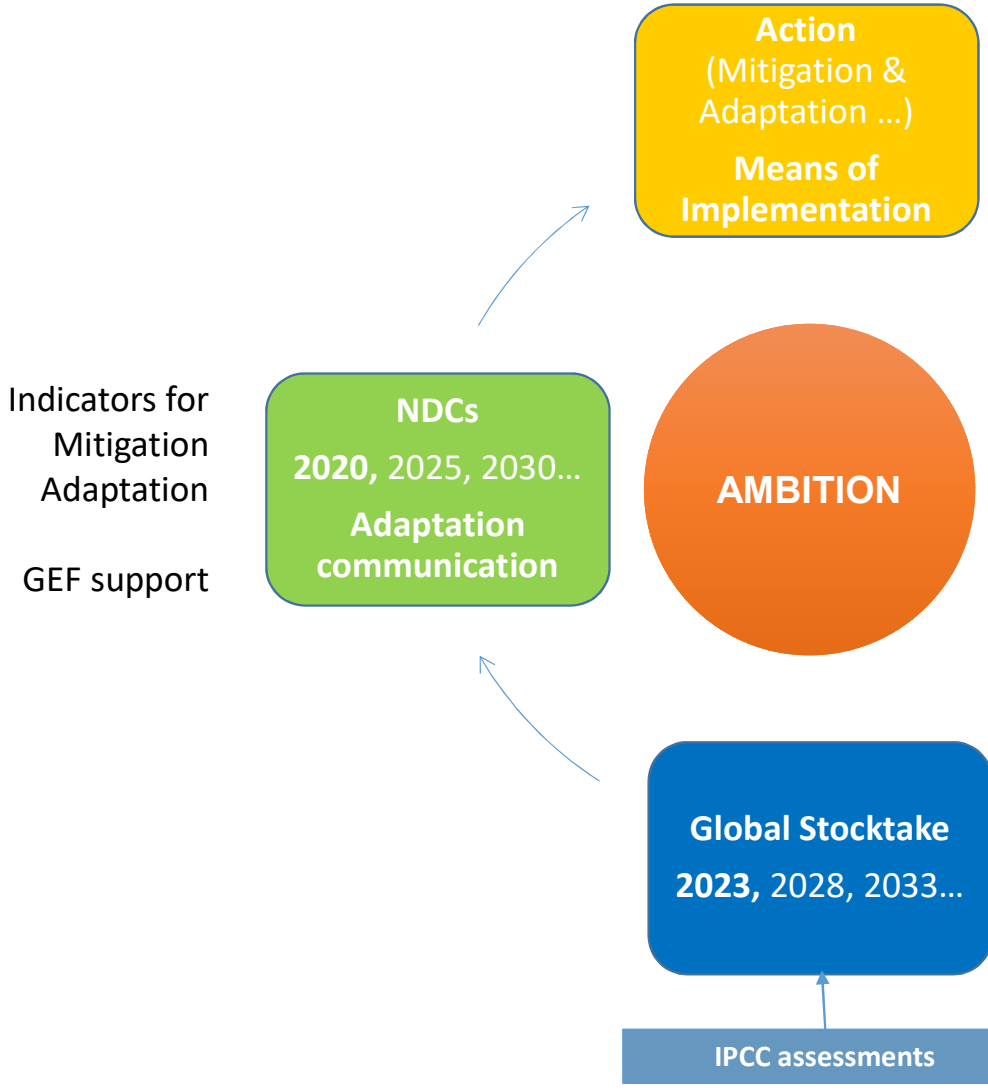
Assumptions and methodological approaches for estimating and accounting for anthropogenic greenhouse gas emissions and removals:

- Approach to addressing emissions and subsequent removals from natural disturbances on managed lands
- Approach used to account for emissions and removals from harvested wood products
- Approach used to address the effects of age-class structure in forests

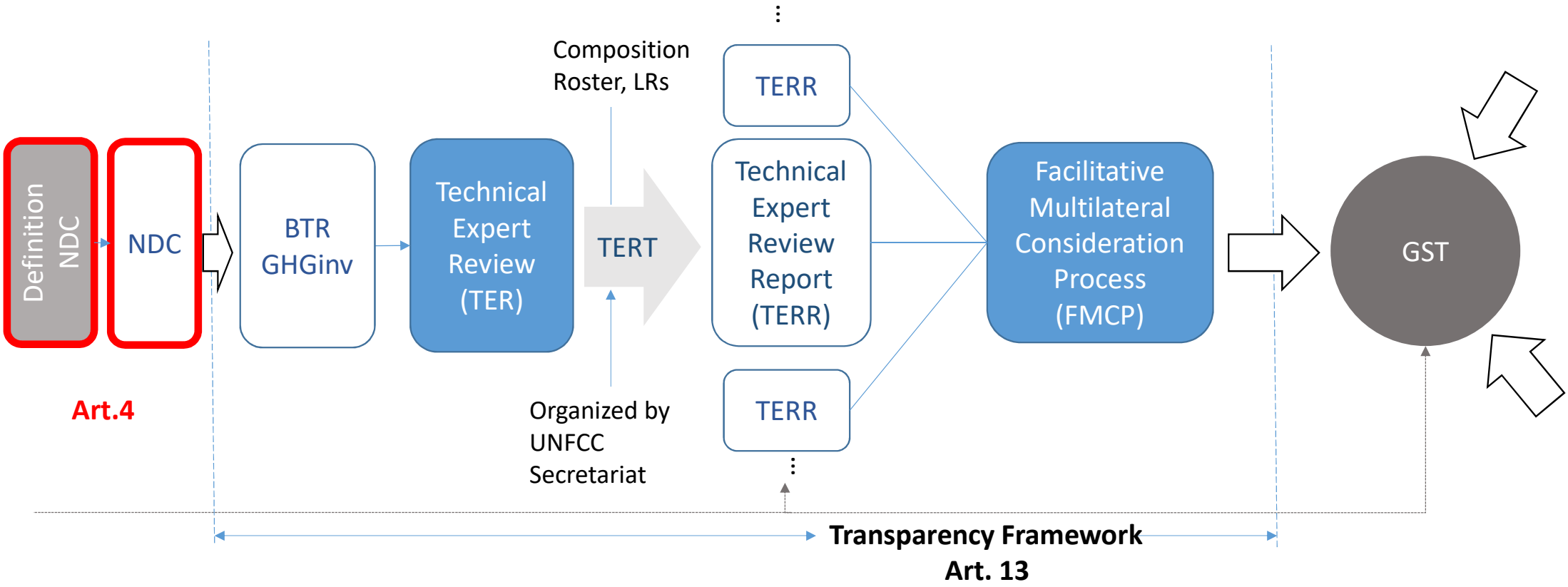


Information to facilitate clarity, transparency and understanding of nationally determined contributions, referred to in decision 1/CP.21, paragraph 28

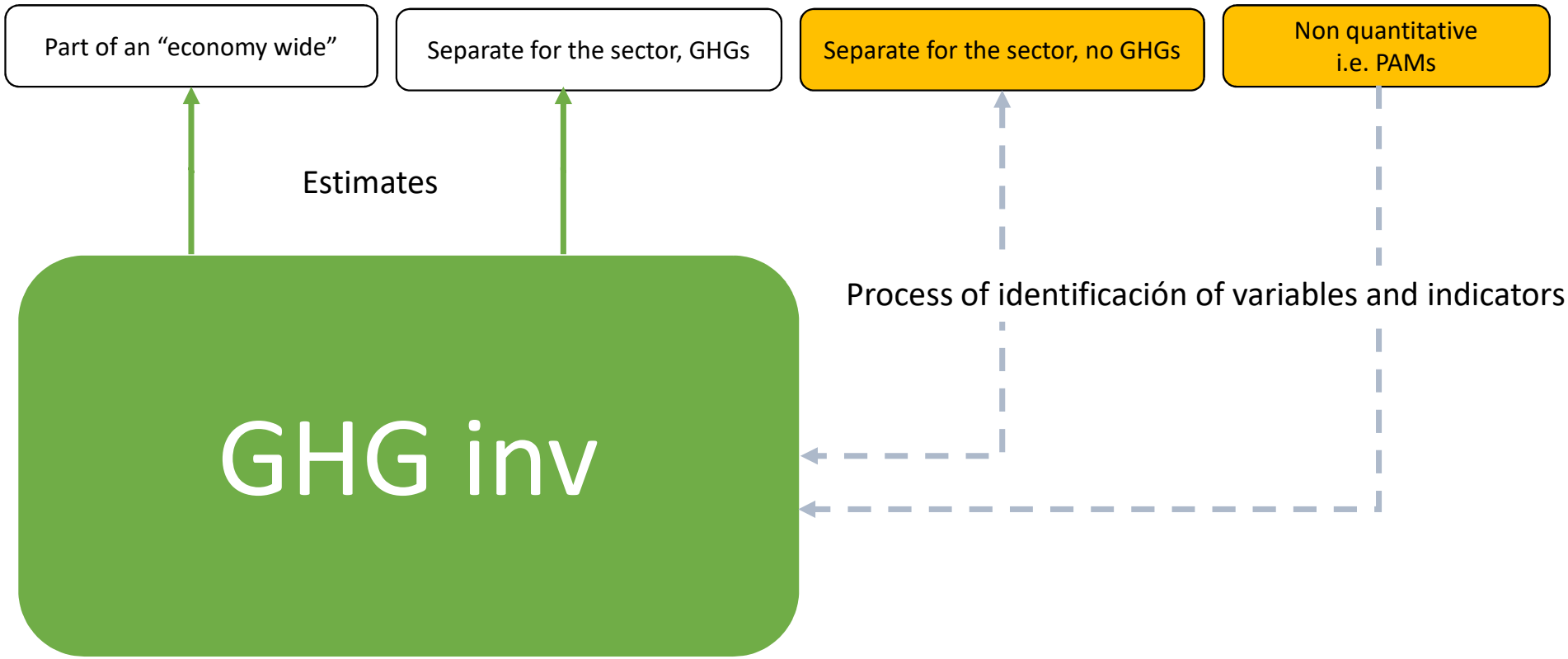
The ambition cycle: Together but flexible



NDC description (Art. 4) – COP24

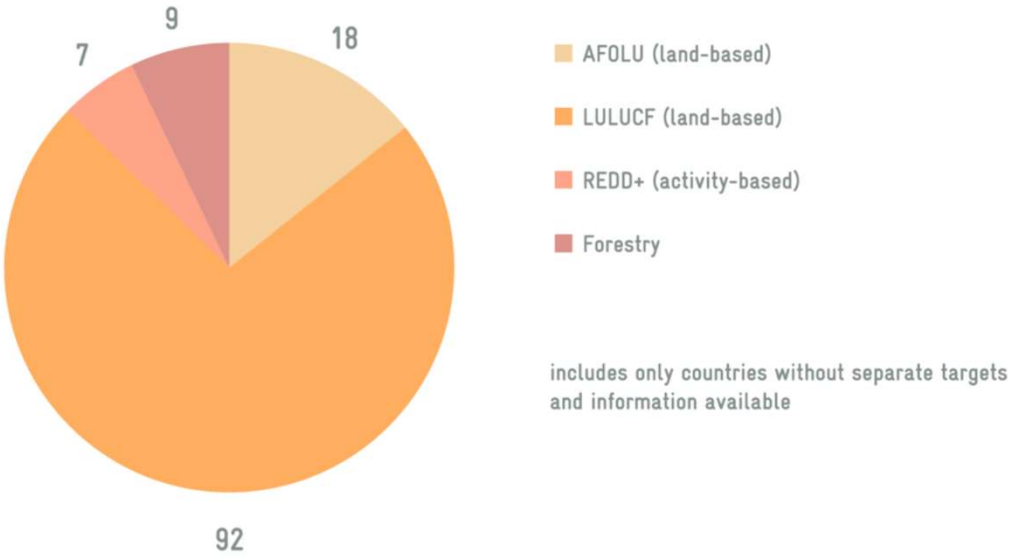


Type of commitments under the NDCs



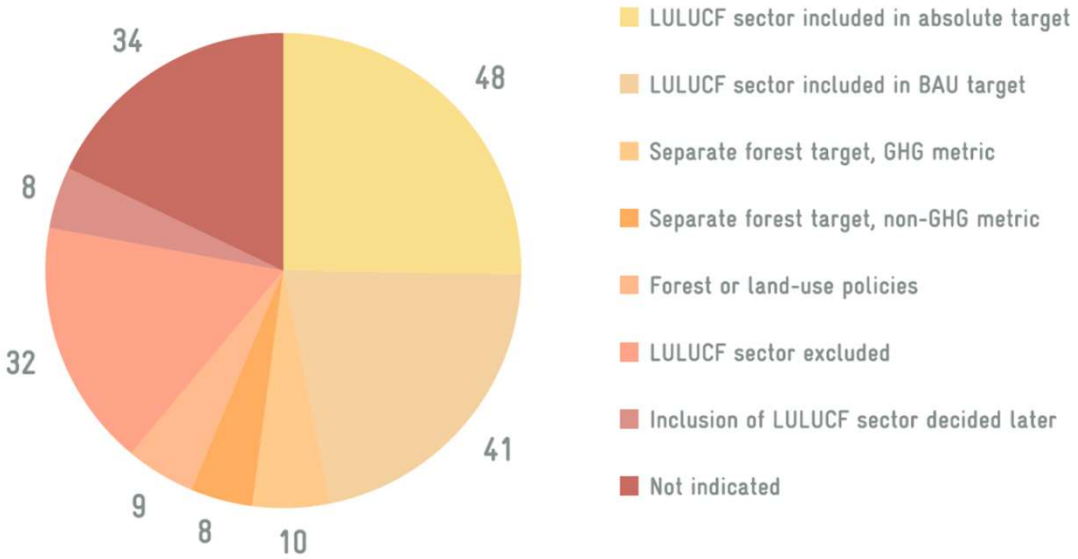
Land Use sector under the first NDCs global

Figure 3-5: References to the land-use sector in NDCs



Source: Based on the analysis of 163 NDC submissions under the UNFCCC, analysis by Öko-Institut (EU counted as EU plus 28 Member States)

Figure 3-3: Inclusion of the LULUCF sector in first NDCs submitted under the Paris Agreement

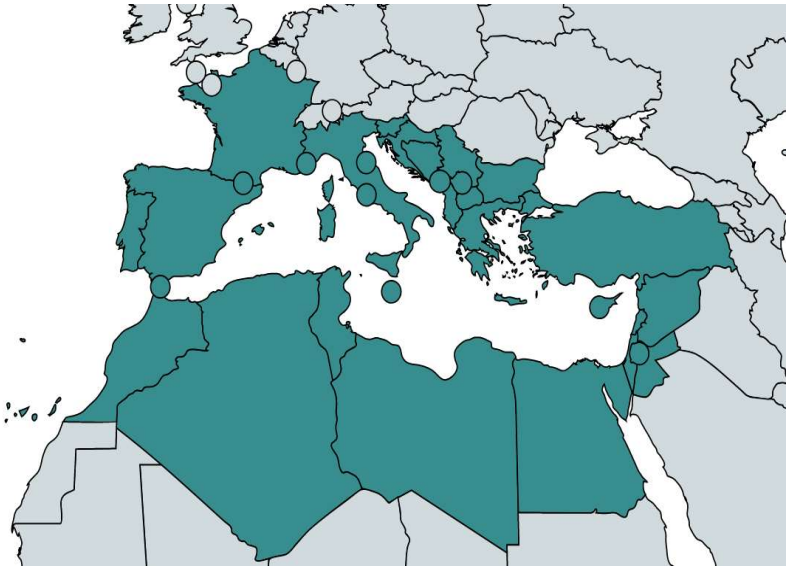


Source: Based on the analysis of 163 NDC submissions under the UNFCCC, analysis by Öko-Institut (EU counted as EU plus 28 Member States)

Land Use first NDCs Mediterranean Countries

Of the 24 countries in the Mediterranean Basin:

- 1 did not submitted NDC
- 12 include all AFOLU sector, under the assumption of comprehensive accounting (Land Base) - only Mitigation
- 1 only cropland soils
- 6 include LULUCF (including forest) by specific activities
- 4 do no include LULUCF (no forest)



50 % mentioned or included adaptation related to the LULUCF sector

Next NDCs information to include

Large information requirements

Quantifiable information

- Year, period, baseline
- In the case of policies and measures, information relevant to their evaluation
- Identification of information sources
- Quantification forms, relevant information in case of changes in the forms of quantification

Period of application / implementation (beginning and end, nº years)

Scope and coverage (sectors, categories, activities, pools)

- Once included it can not be excluded
- Include all anthropogenic emissions and removals

Next NDCs information to include

Description of how the NDC was defined

- Information used, institutional arrangements, consultations
- National circumstances
- As the GST has informed the NDC (art.4.9)
- Co-benefits in adaptation mitigation

Large information requirements

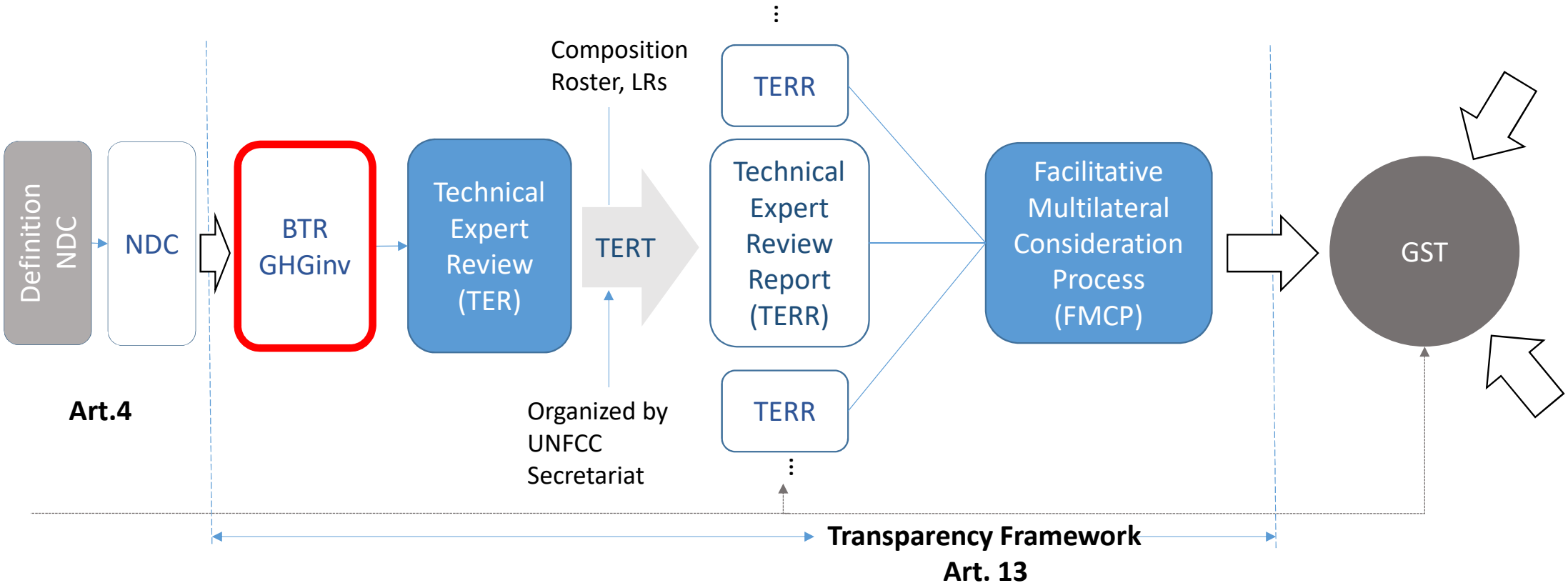
Assumptions and methodologies used for the accounting of emissions and removals

- How existing guidelines in the UNFCCC have been taken into account
- Assumptions and methodology used in the case of policy objectives and measures
- IPCC guidelines and metrics used
- Assumptions and methodologies in the inclusion of sectors, categories, etc., including approaches to treat natural disturbances and timber products, how the effects of age classes have been considered

Any other information relevant to the understanding of the NDC

How it contributes to art.2 of the UNFCCC and how it responds to national circumstances and ambitions

Biannual Transparency Reports (Art. 13) – COP24



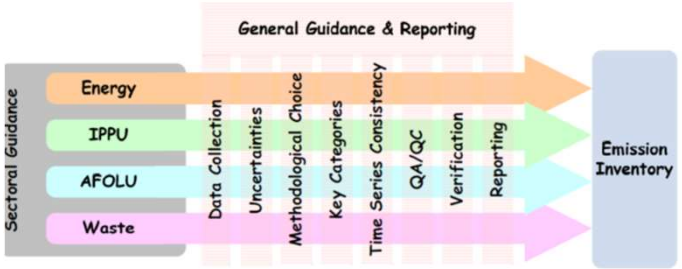
Biannual Transparency Reports (Art. 13) – COP24

- Account for anthropogenic emissions and removals according to IPCC methodologies as adopted by the CMA (in the case of NDC not quantifiable in terms of E / R describe the methodology)
  - Specifically for forests: age classes; natural disturbances; timber products
- Ensure methodological coherence, including baselines, between communication and implementation of NDCs
  - Consistencies in the scope, coverage, methodologies, definitions, metrics, data and assumptions between the description and the rendering of accounts
  - Consistent with the GHG inventory
  - Avoid overestimating or underestimating projected emissions and removals
  - If corrections are applied, they should be related to: changes in the inventory, methodological improvements that improve accuracy
- Try to include all anthropogenic emissions or removals related to the sectors included in the NDC at the national level, once a source, sink or activity is included, continue to included
- Provide an explanation of why anthropogenic emissions or removals are excluded

GHGi Methodological GL

To prepare GHG inventories that are **complete, consistent, comparable, transparent** and **accurate** taken into account the available resources

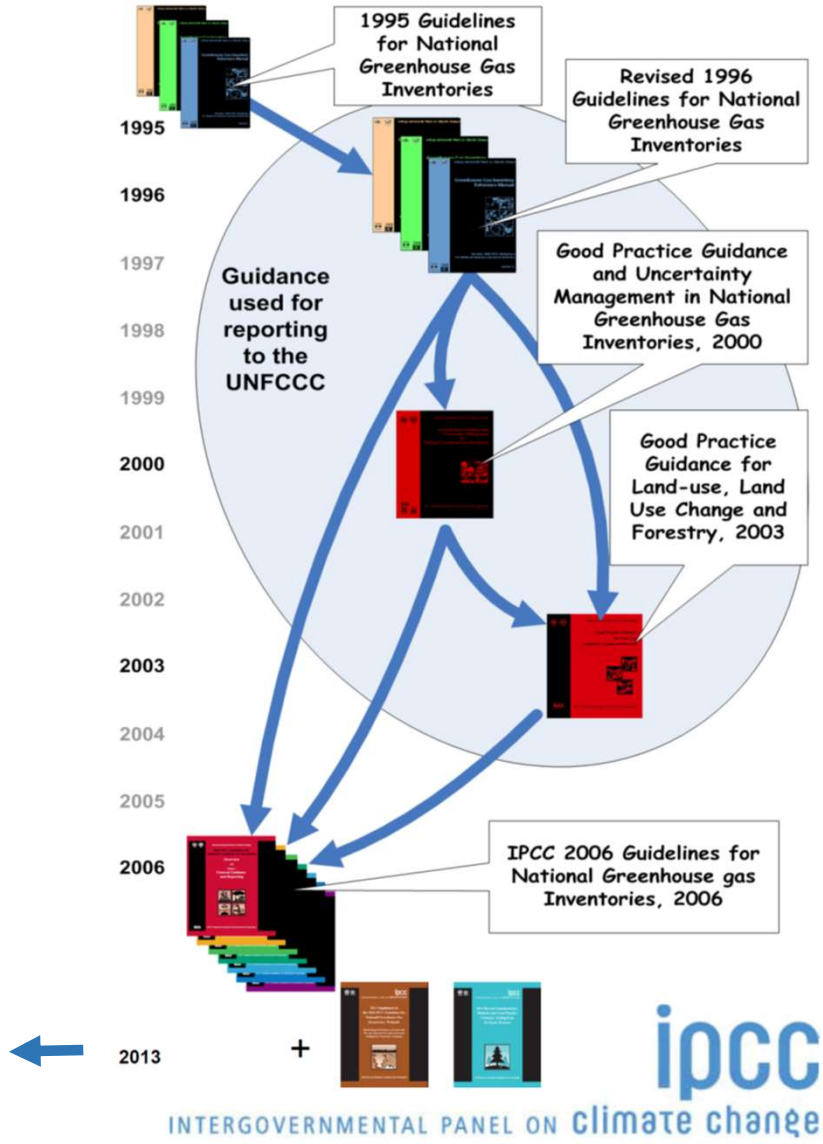
IPCC 2006 GL



- Four Sectors (Energy, IPPU, **AFOLU**, Waste)
- Methods (Tier 1 to 3) and default factors improved
- More GHGs and methods than previous
- Replace and integrate previous GLs
- No prejudging the accounting
- Best available operative methodologies at the stage of its publication

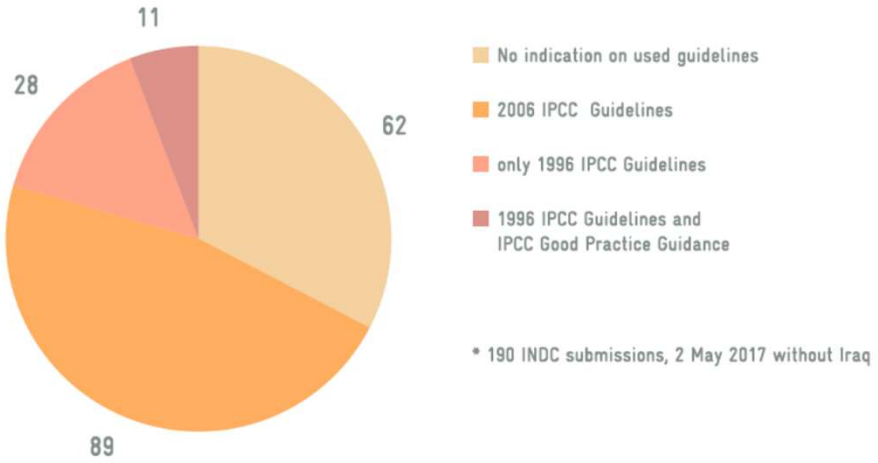
2019 Refinement of IPCC 2006 GLs

(better default emission factors, improve guidance for some categories and pools, Tier 2, natural disturbances, age class structure, inter-anual variability, HWPs)



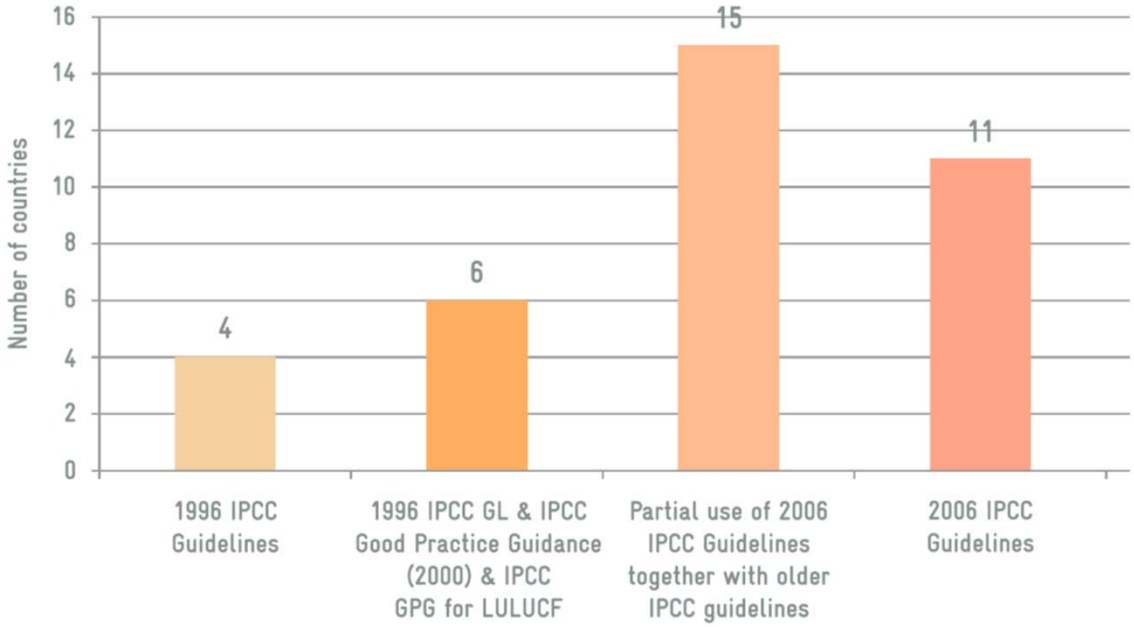
Use of IPCC Guidelines for GHG inv (NDCs, BURs)

Figure 3-7: Use of IPCC methodological guidance as indicated in NDCs



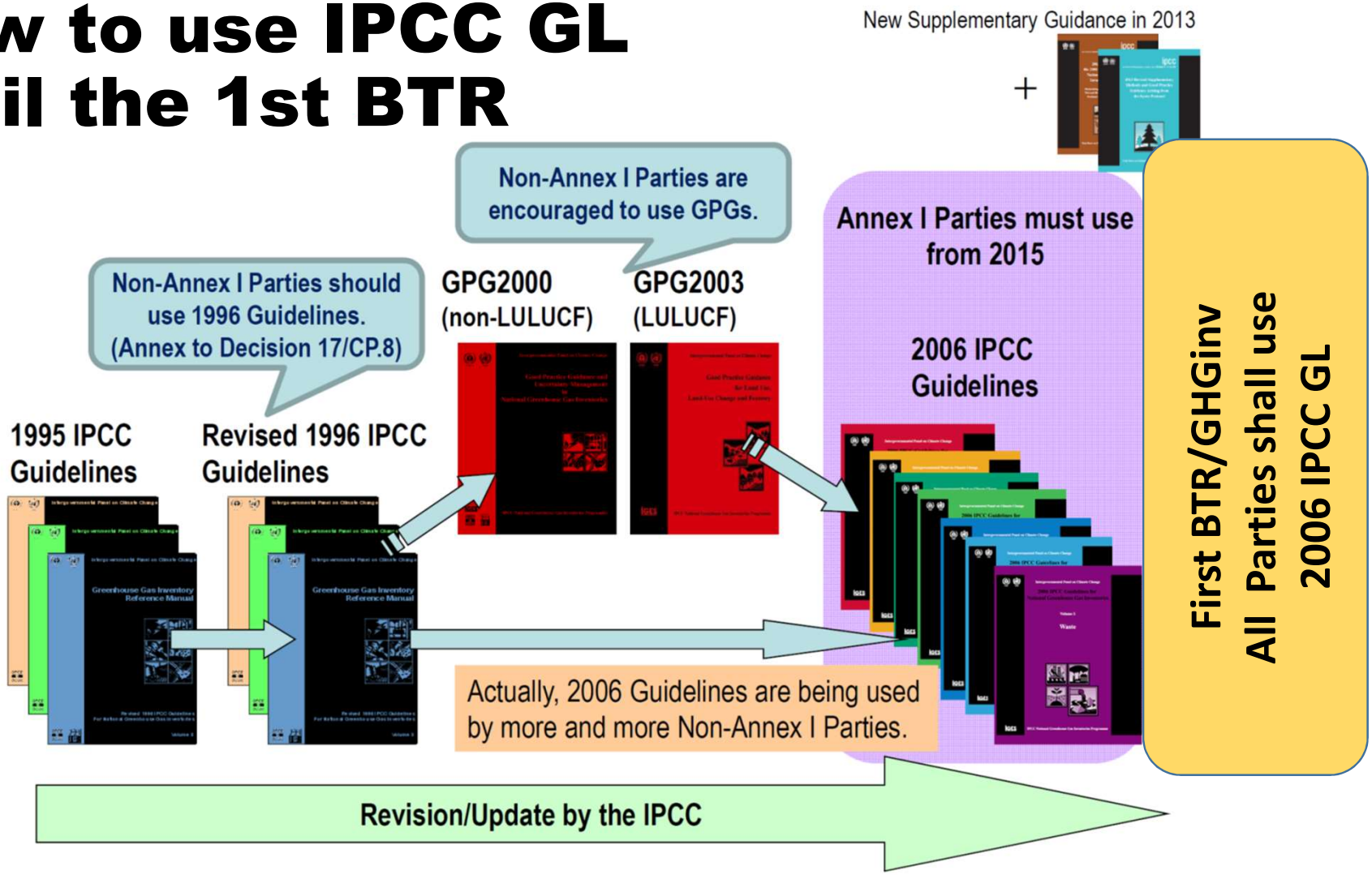
Source: Based on the analysis of 163 NDC submissions under the UNFCCC, analysis by Öko-Institut (EU counted as EU plus 28 Member States)

Figure 3-6: Use of IPCC guidelines in BUR submissions of developing countries

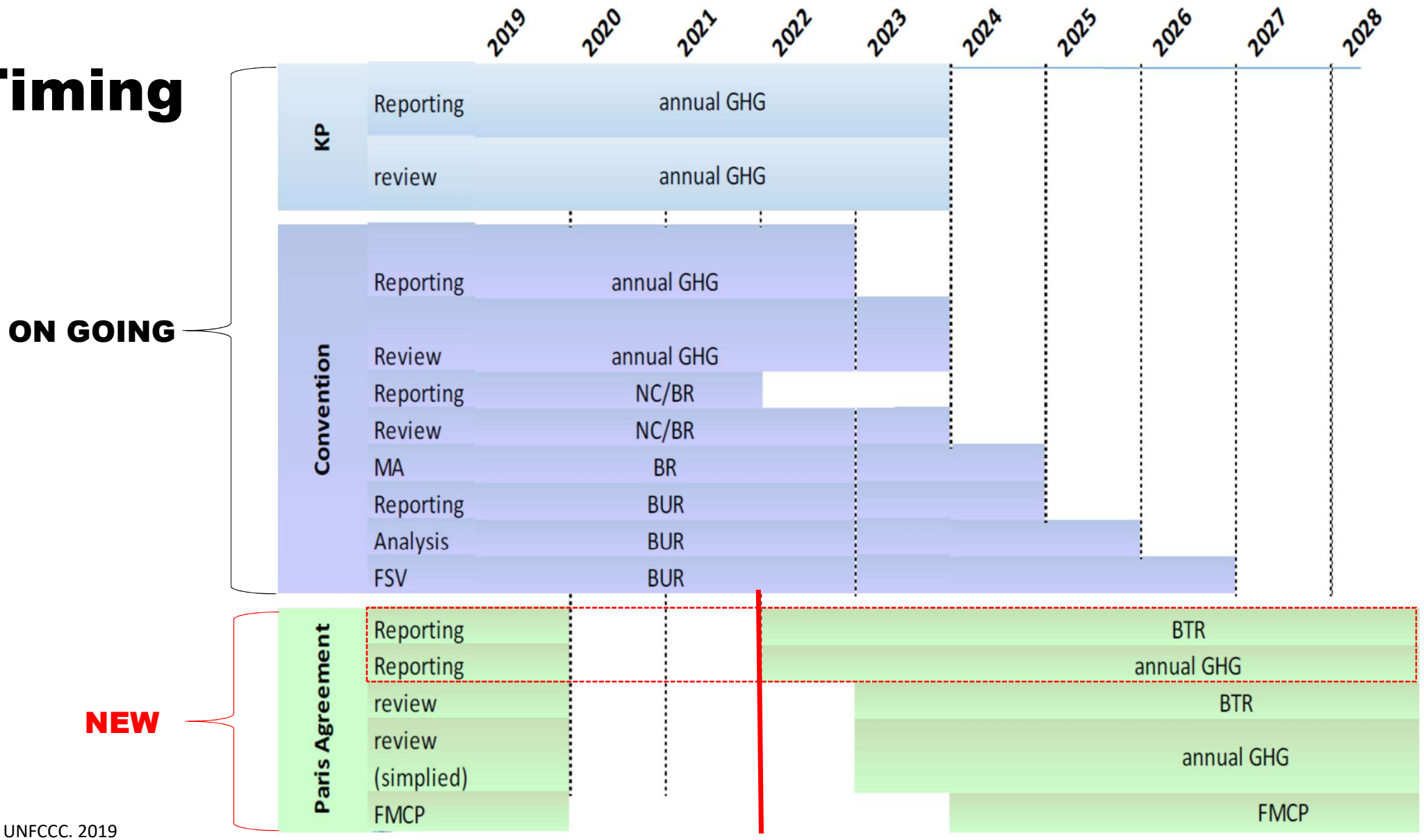


Source : Compilation by Öko-Institut, based on first BUR submissions as submitted per May 2017.

How to use IPCC GL until the 1st BTR



Timing



Source: UNFCCC. 2019

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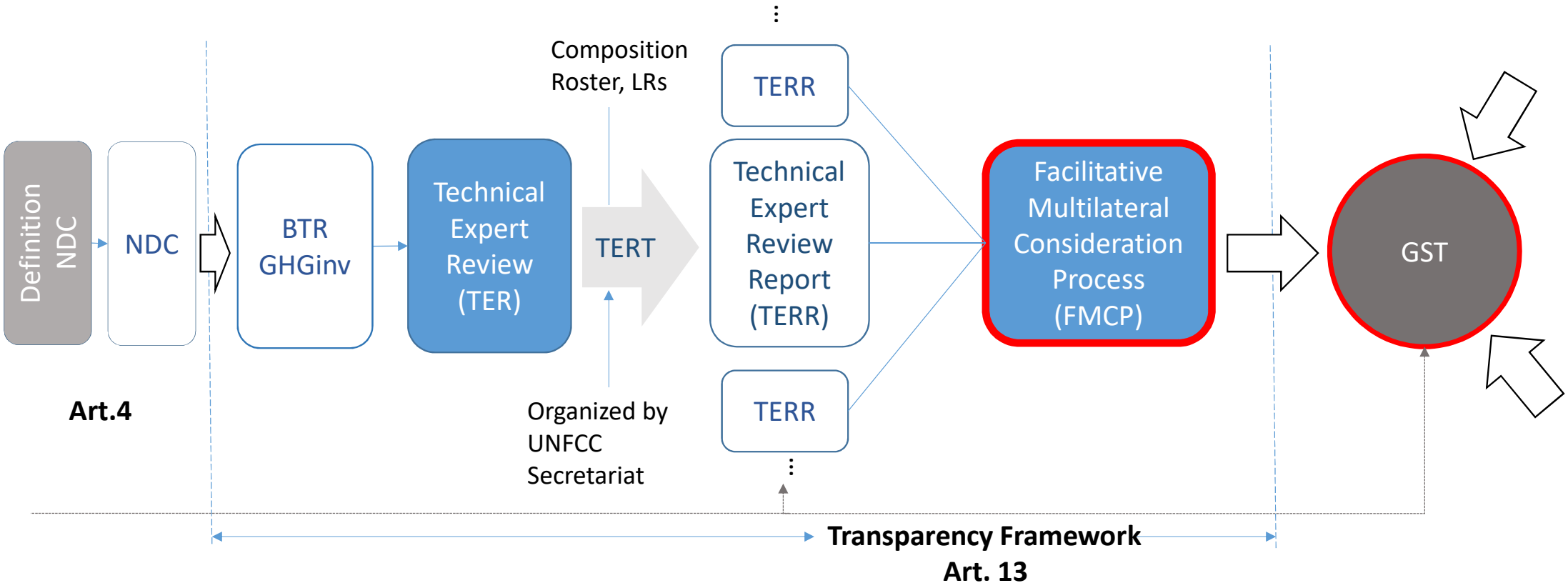
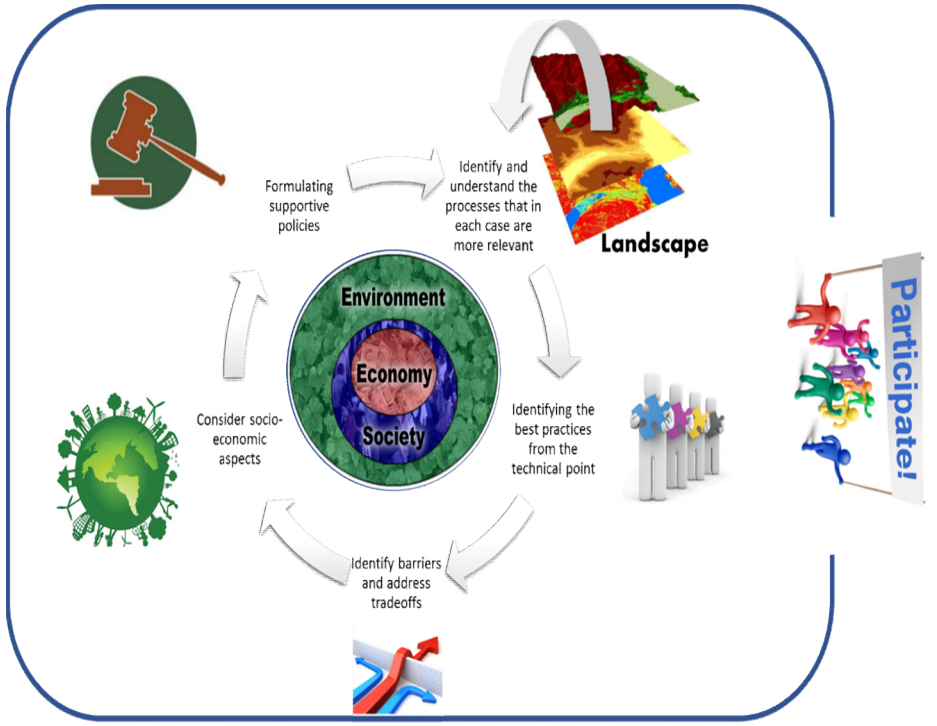


To take home… in the context of NDCs

- Priorities in Mediterranean countries are likely to differ from those in other regions (adaptation, water, mitigation, food security, land degradation, desertification)
- Perturbation regimes are changing and climate feedbacks could undermine projected potentials of mitigation and other key services, we need to monitor and better understand them to be included in the future projections
- Careful consideration of how management systems can address this priorities and challenges is necessary



Thank you for your attention