Role of Forest in Mitigating Climate Change and Challenge to Measure Progress in Limiting Land Use Change Emissions

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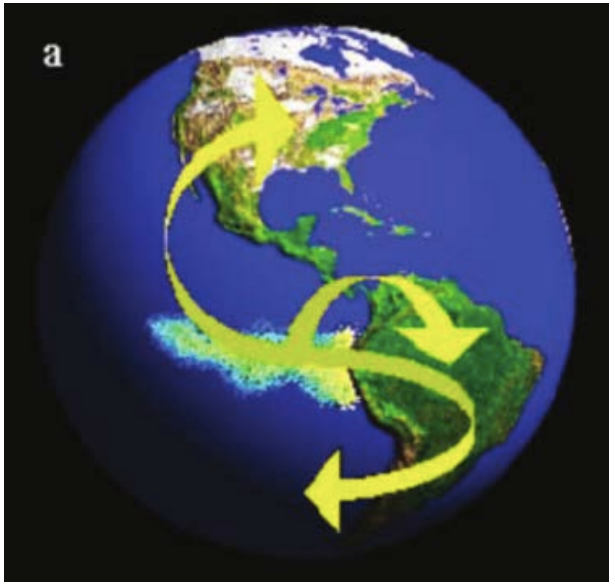
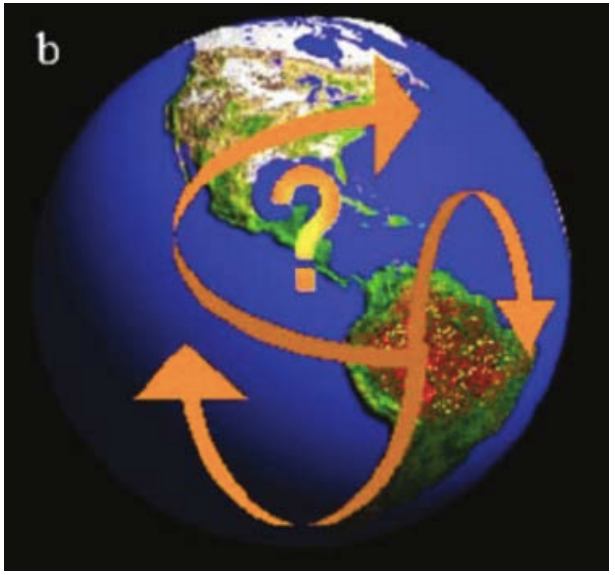
Role of Forest in Mitigation

- Land use change and forest often considered as secondary mitigation option with high complexity
  - High Uncertainties of emission/removal estimates
  - Methodological issues such as additionality, separation of non-anthropogenic effects, leakage (displacement of land-use activities to other areas), and permanence
  - Variation on forest definition

Role of Forest in Mitigation

- However, forest plays a significant role in regulating our climate → Regional climates were sensitive to change of types and density of vegetation
- From climate modeling, loss of forest in tropical regions significantly affects precipitation at mid and high latitudes through hydro-meteorological teleconnections (Avissar and Werth, 2005)
- Paris Agreement calls explicitly for all countries to make use of a full range of land-based mitigation options, and to take action on REDD+

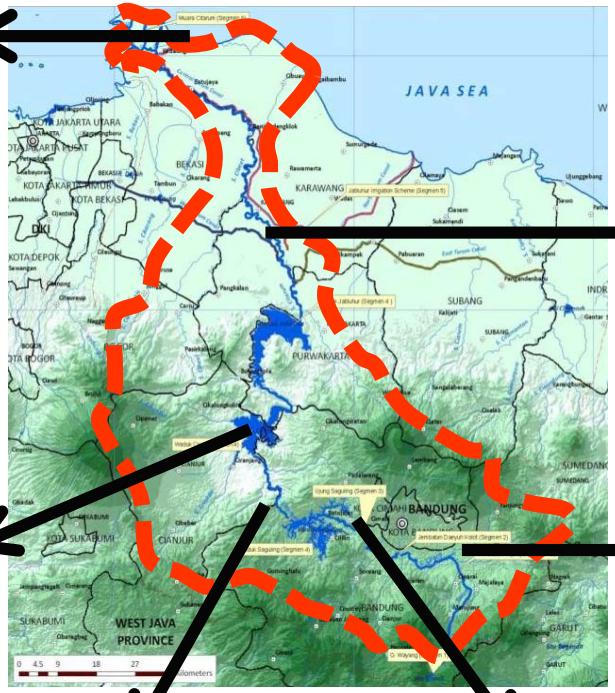




LOCAL LEVEL: FOREST LOSS IN WATERSHEED OF CITARUM

MANGROVE

DROUGHT



FLOOD

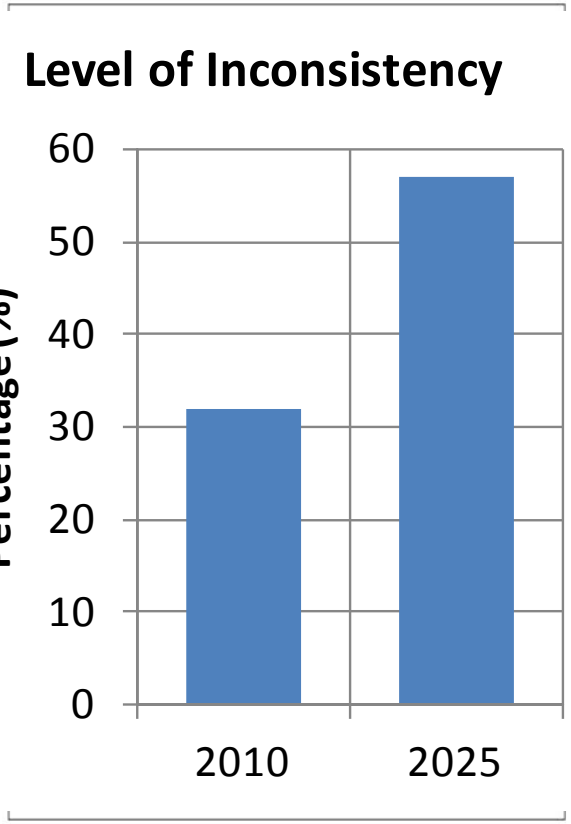
AQUA CULTURE

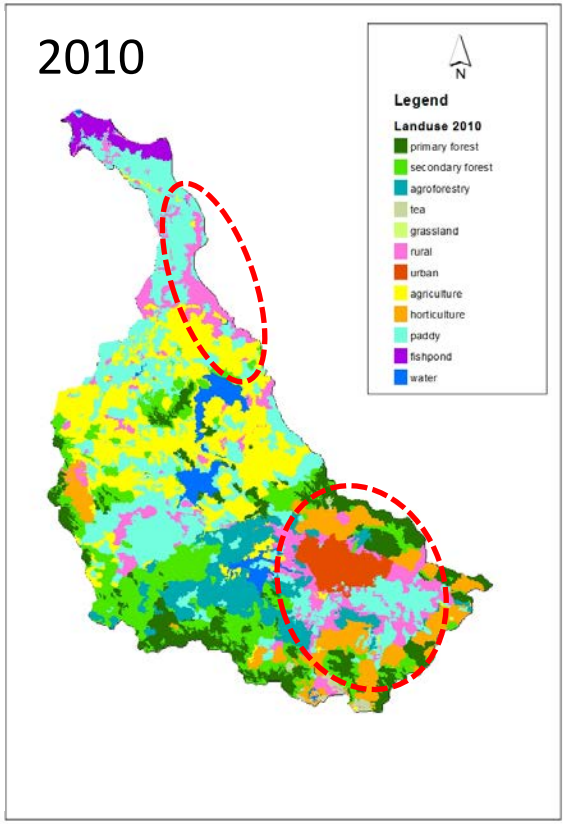
SEDIMENTATION

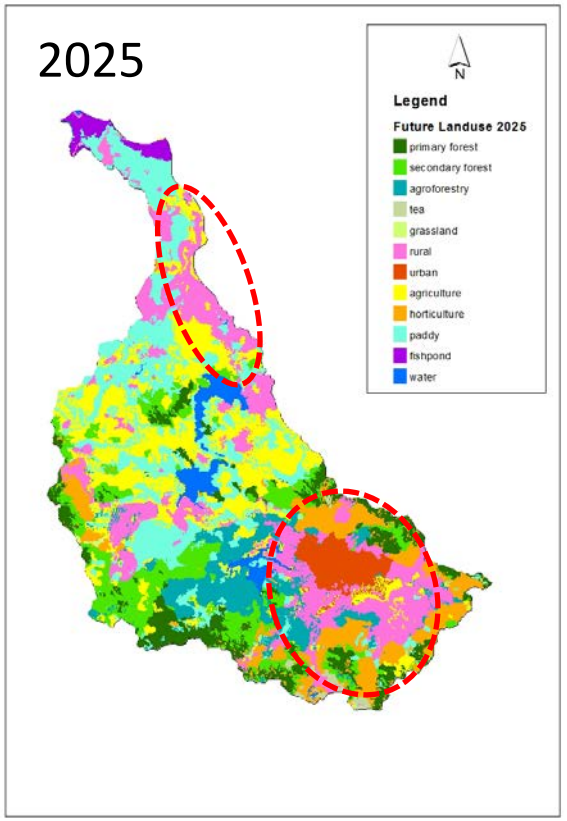
POLLUTION

Photo Source: various

Land Use 2000 & 2010 and Projected Land Use 2025







secondary forest
rural
paddy
agroforestry
urban
fishpond
tea
agriculture
water
grassland
horticulture

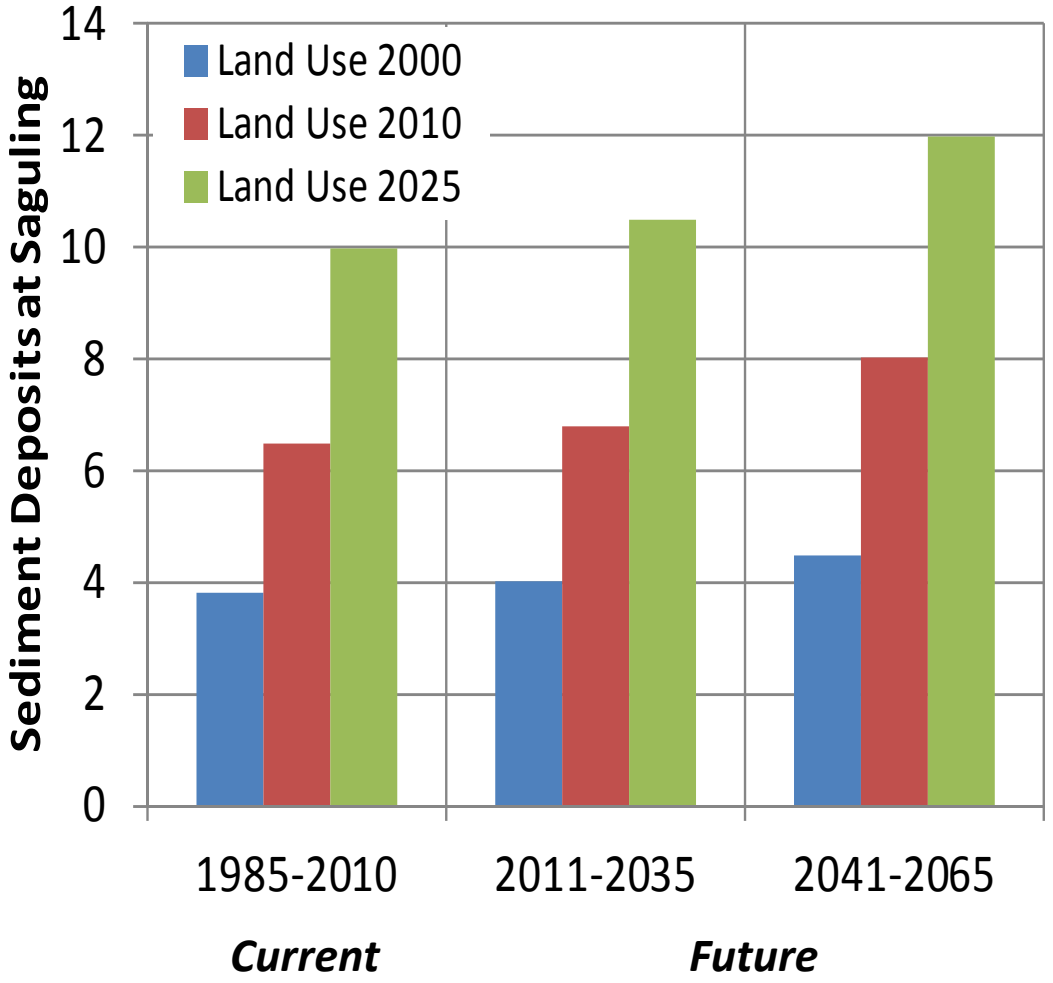
Changes between 2000 and 2025:

- Settlement: increase 4000 ha/year.
- The forest cover lost: ~2500 ha/year
- Conversion of rice paddy area: ~2600 ha/year (Note: agriculture area (non-rice) increased

Ardiansyah et al., 2013

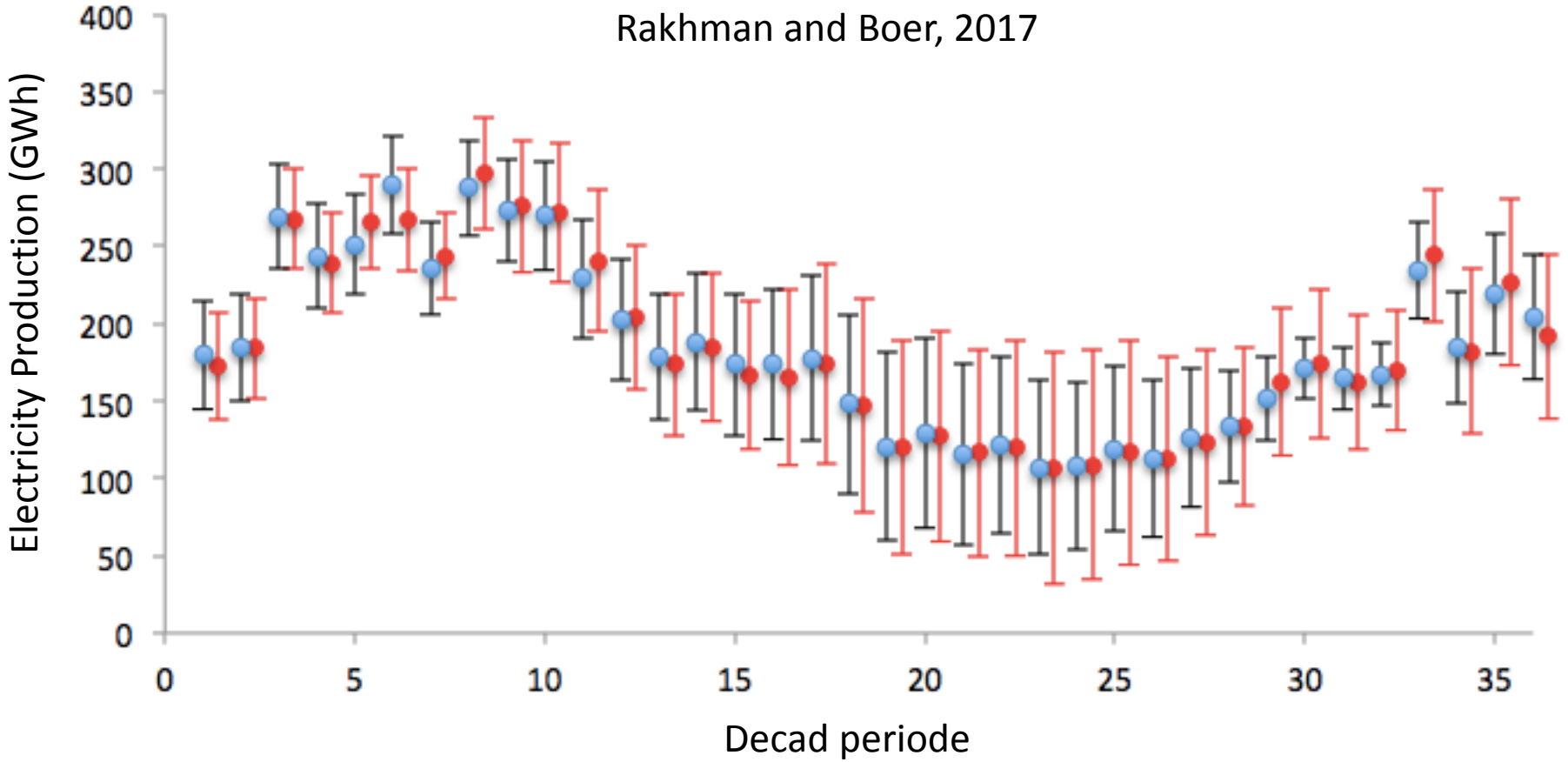
Sedimentation at Saguling

- Impact of cover changes are higher than impact of climate changes
- How much money we have to spent for river normalization?



Suharnoto et al., 2013

Electricity Production of Saguling Power Plant in CRB



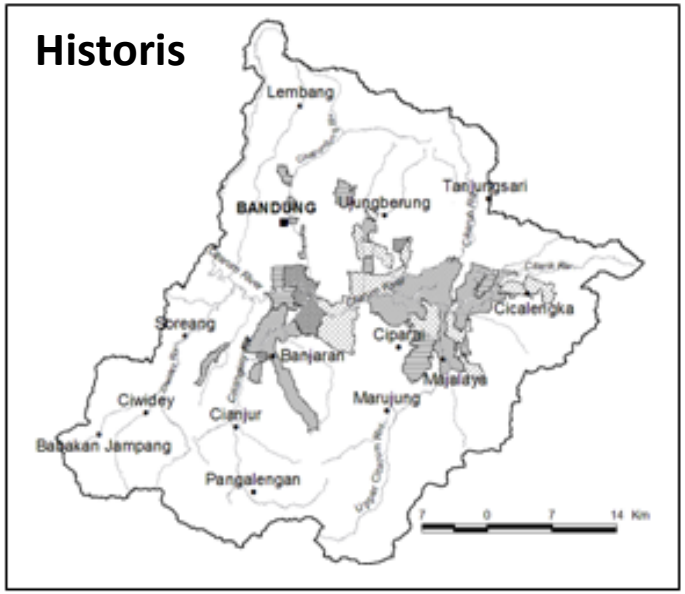
LU-2000 (Forest cover 34%)

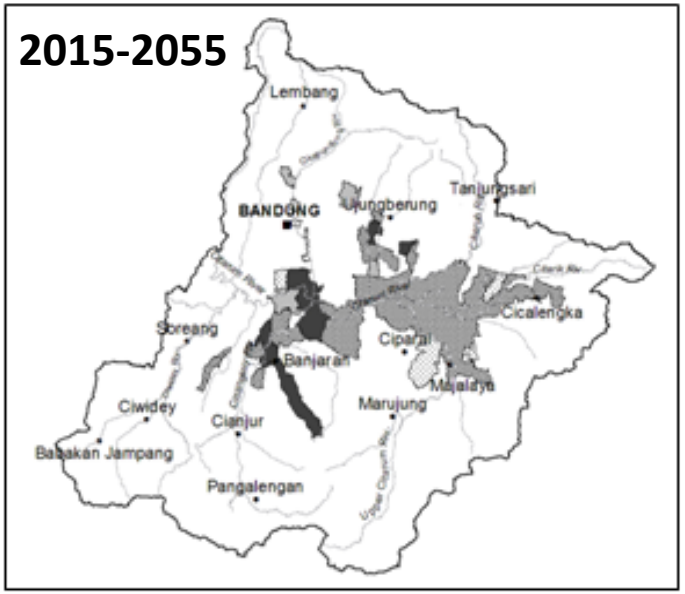
LU-2010 (Forest Cover 26%)

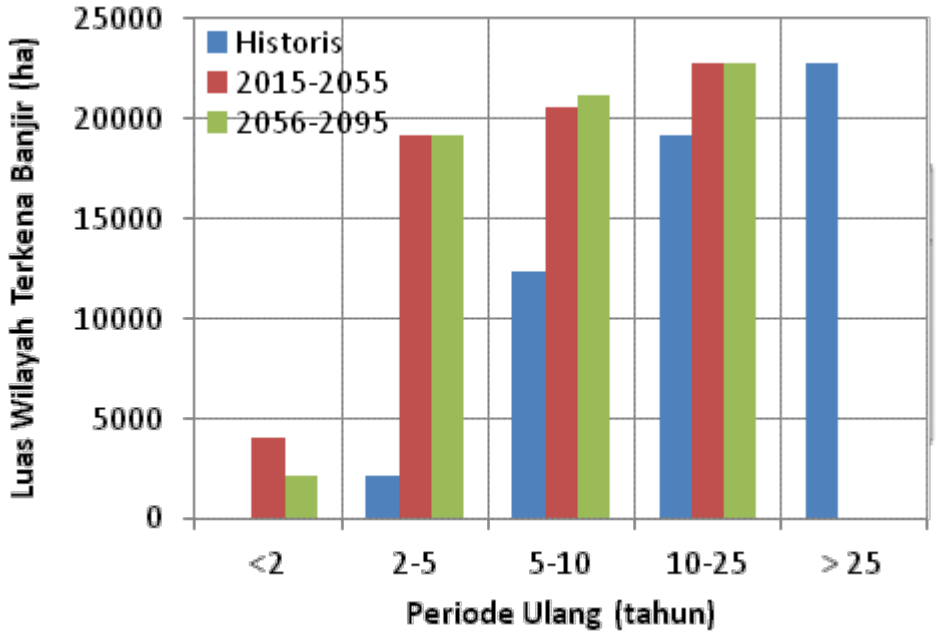
With loss of forest cover in the watershed from 34% t0 26% increase the change of having electriticity production of less than 100 MWh

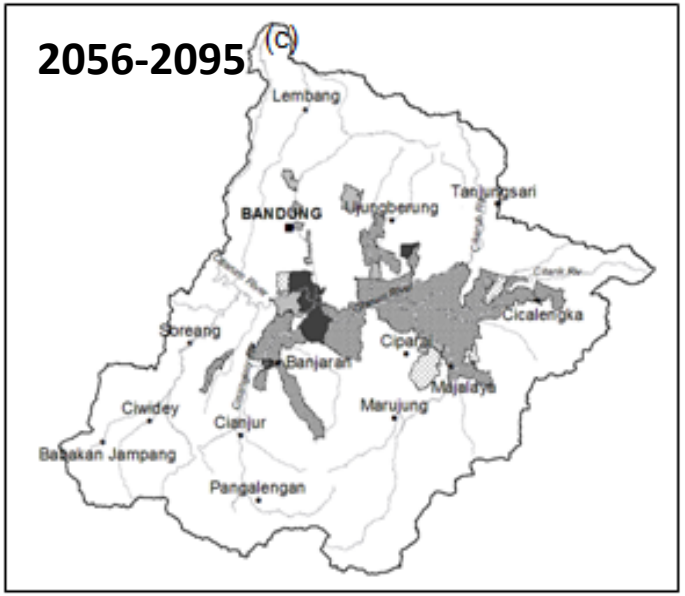
Climate change will increase frequency of climate hazards: Bandung City Case (LU 2010)

Return period of flood hazards with total affected area of 22,725 ha covering 79 villages will shorten (from 25 years to 10-25 years)



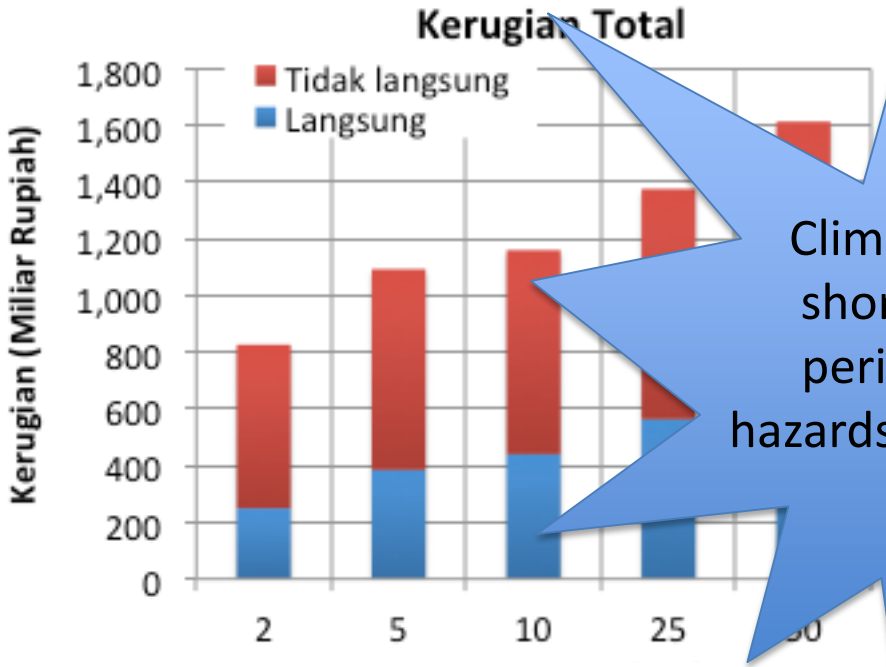




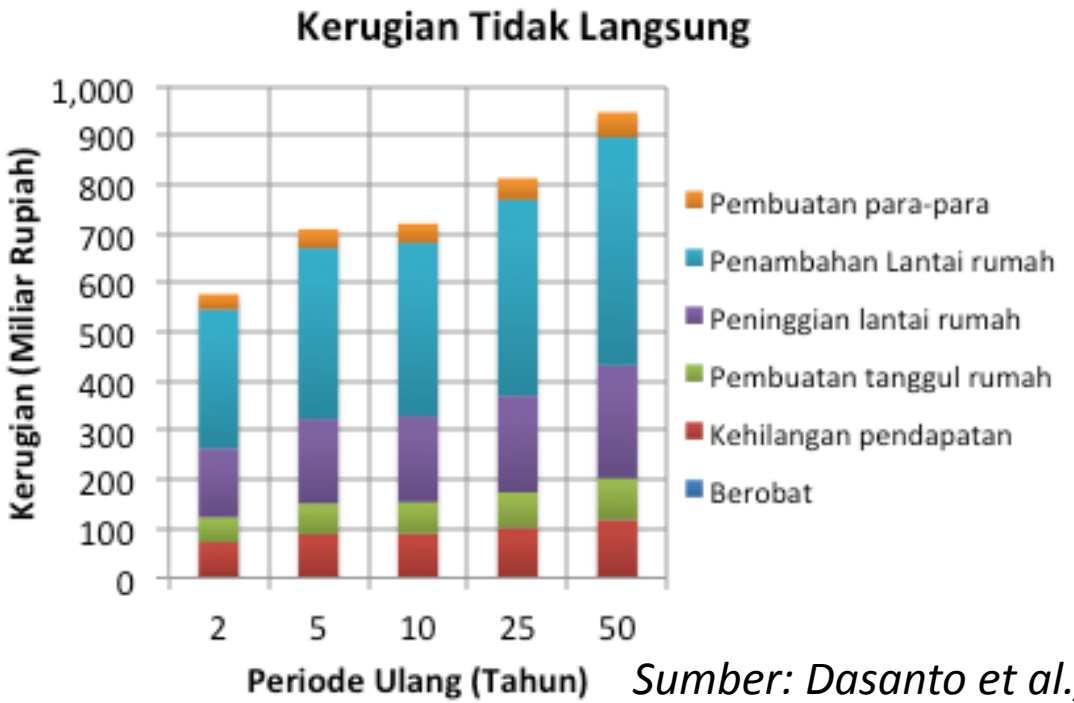


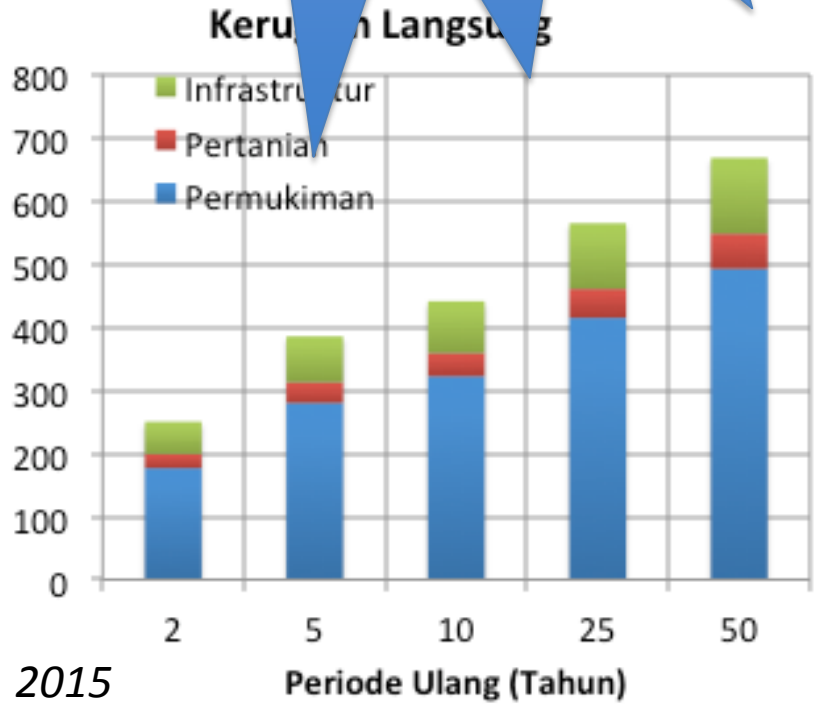
Dasanto *et al.* 2014

Economic loss due to Flood of low laying area of Bandung District



Climate Change will shorten the return period of big flood hazards leading to higher loss

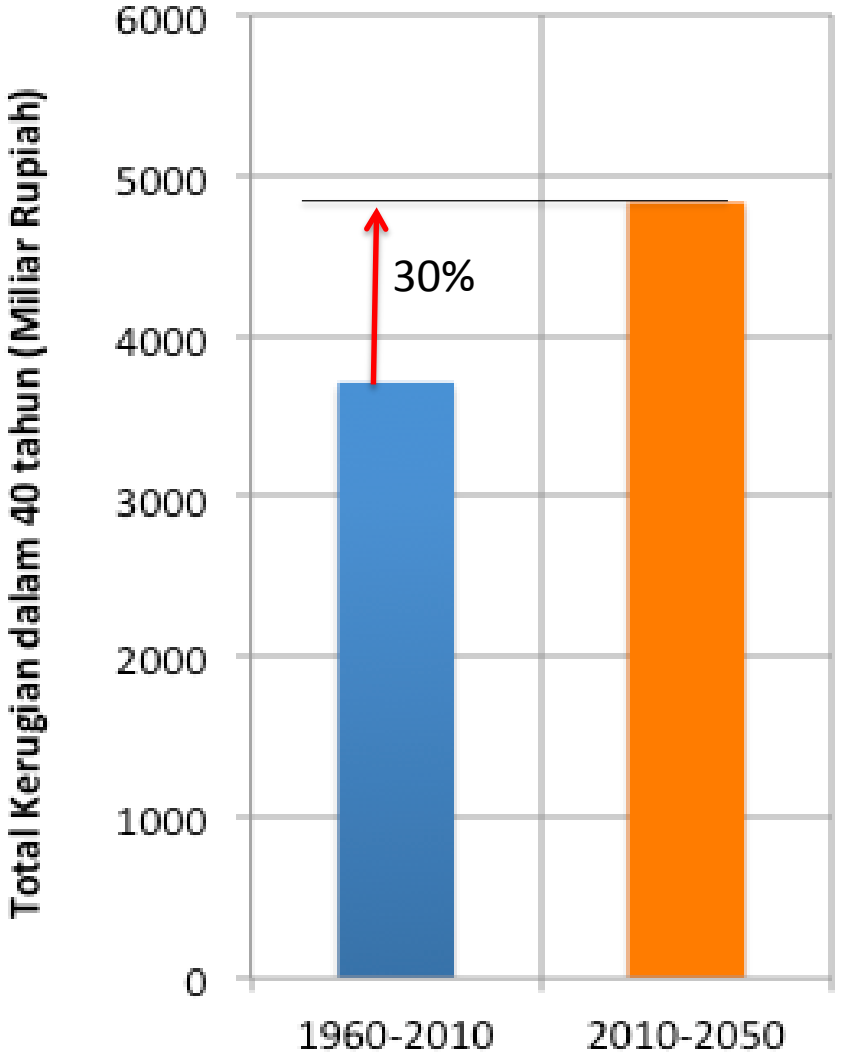




Sumber: Dasanto et al., 2015

Average Economic loss due to Flood with return period of 40 years (without considering discount factor)

- At present: Average loss per year reached 92 billion IDR per year
- In the Future without adaptation: loss increase to 120 billin IDR per year (no change in land use from the 2010 condition)

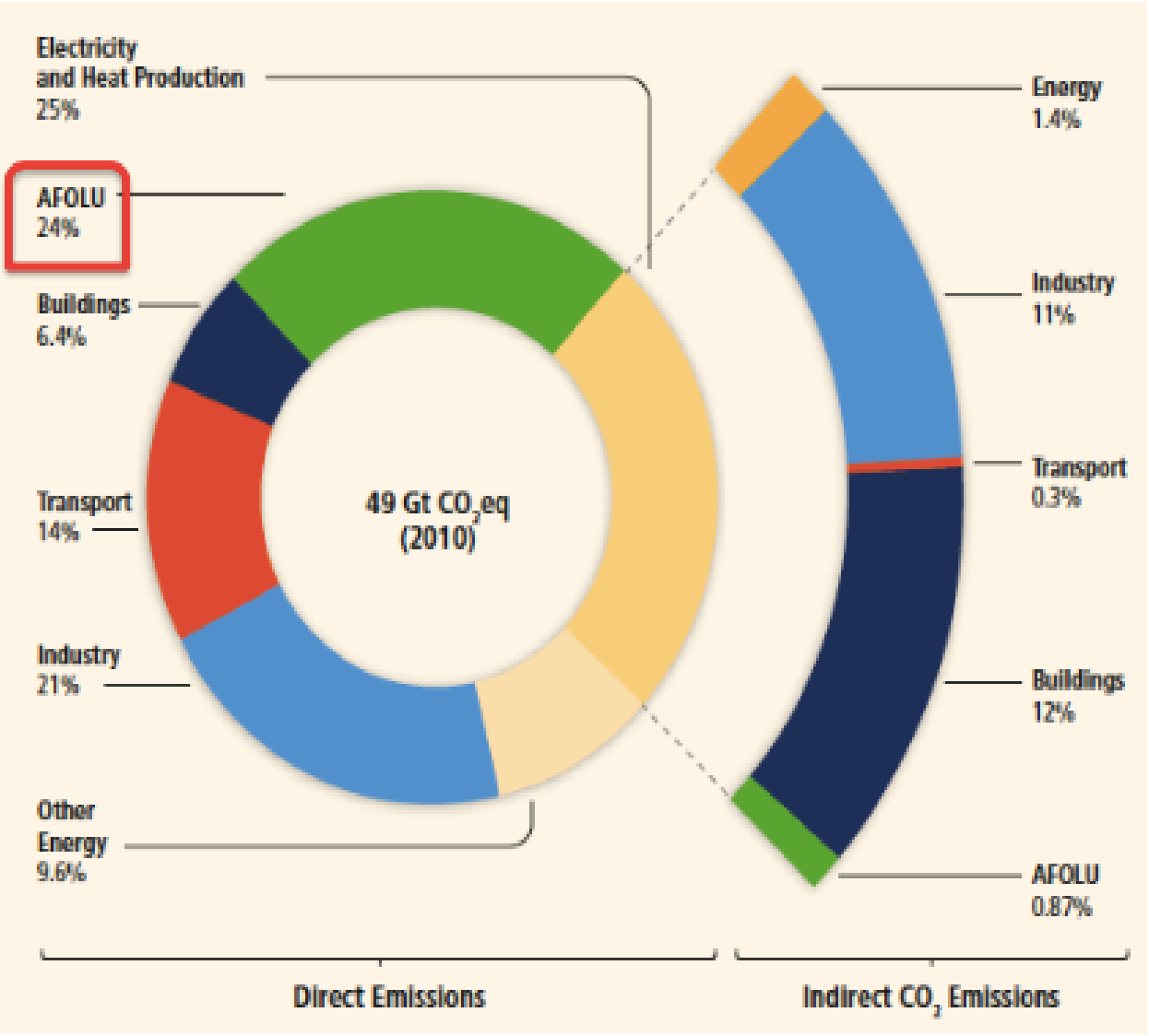


Source: Boer et al., 2014

ROLE OF FOREST IN MITIGATION

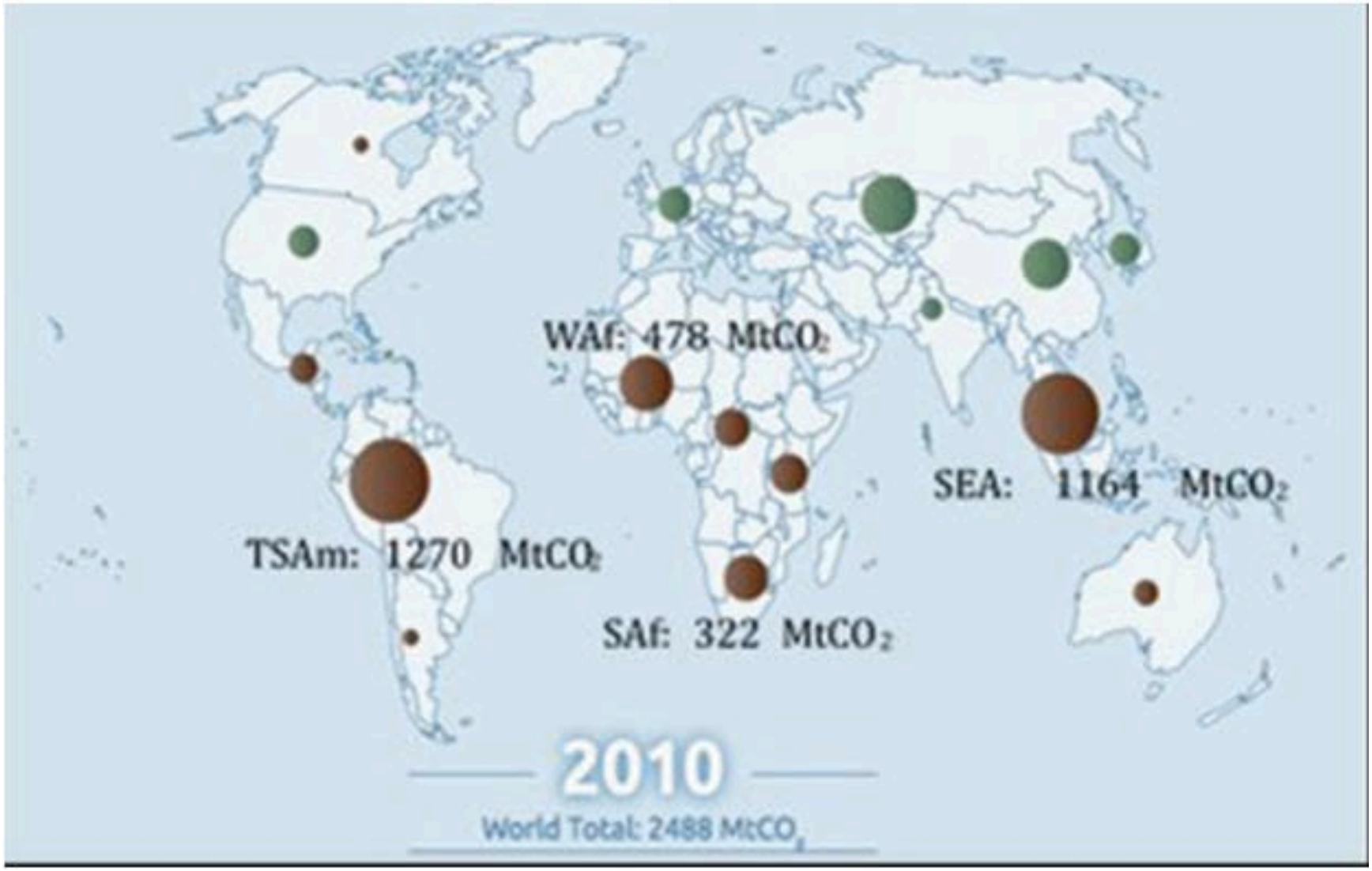
- Article 4: In order to achieve the long-term temperature goal (<<2oC), Parties aim to reach global peaking of GHG emissions as soon as possible (...), and to undertake rapid reductions thereafter in accordance with *best available science*, so as *to achieve a balance between anthropogenic emissions by sources and removals by sinks of GHG* in the second half of this century
- PA Calls explicitly for all countries *to make use of a full range of land-based mitigation options, and to take action on REDD+*

Emission from AFOLU (IPCC-AR5)



- AFOLU accounts for about **10% of global CO2** emission, and nearly a **quarter with inclusion of CH4 and N2O**
- Contribution **Agriculture 14% and FOLU 10%**
- In **most of tropical countries**, emission from **deforestation is still dominating**
- In **temperate and boreal** countries, **forests are net sink**

Emission from LUCF



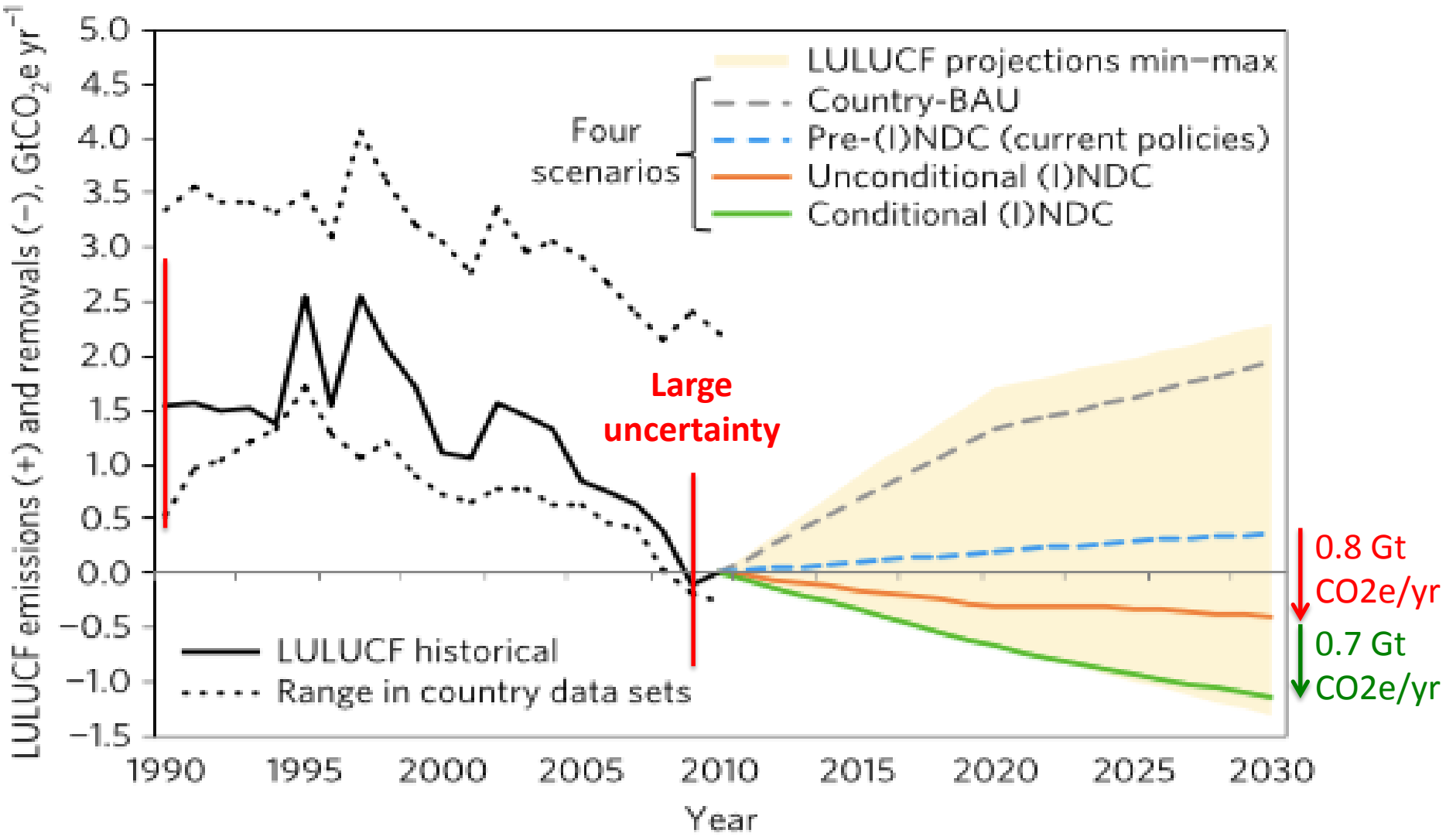
Source: (http://www.globalcarbonatlas.org)

Paris Agreement (PA)

- **Global Stocktake (GST)** should highlight the **state of the collective progress** towards the goals of the PA, including **the current "gap"** between **existing pledges** and the **emissions reduction required** to achieve the PA's goals it should drive **increasing ambition** with regular rounds of **new NDCs ~ Measuring progress (?)**

Global net historical emission from LULUCF and projection based on countries pledges ((I)NDC)

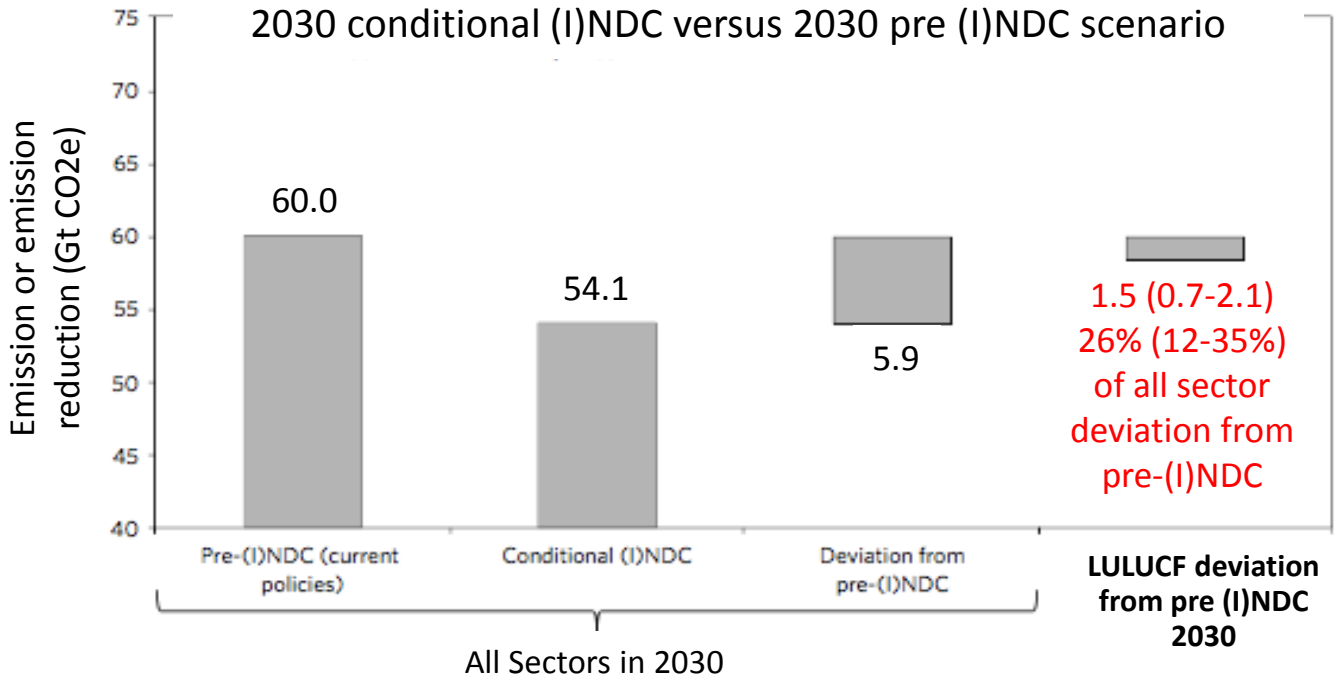
Source: Grassi et al. - Nature Climate Change 7 (2017):220-227

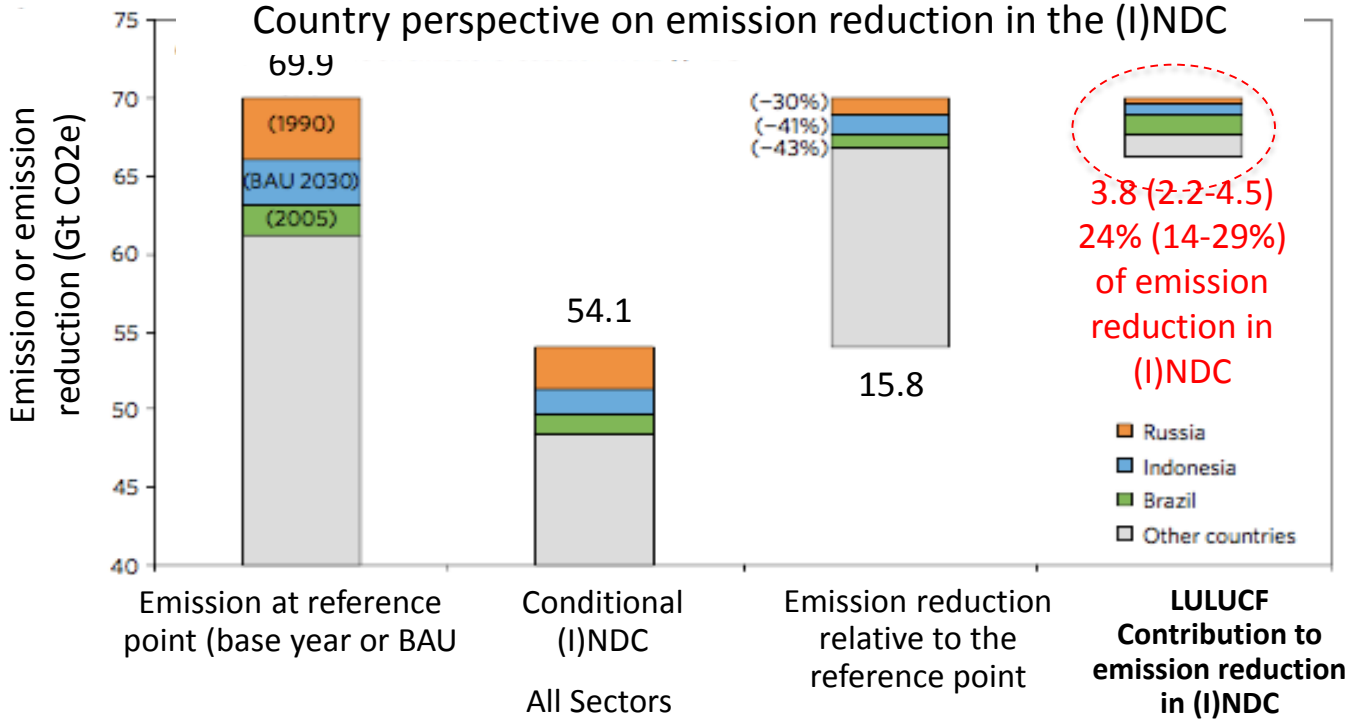


Contribution of LULUCF

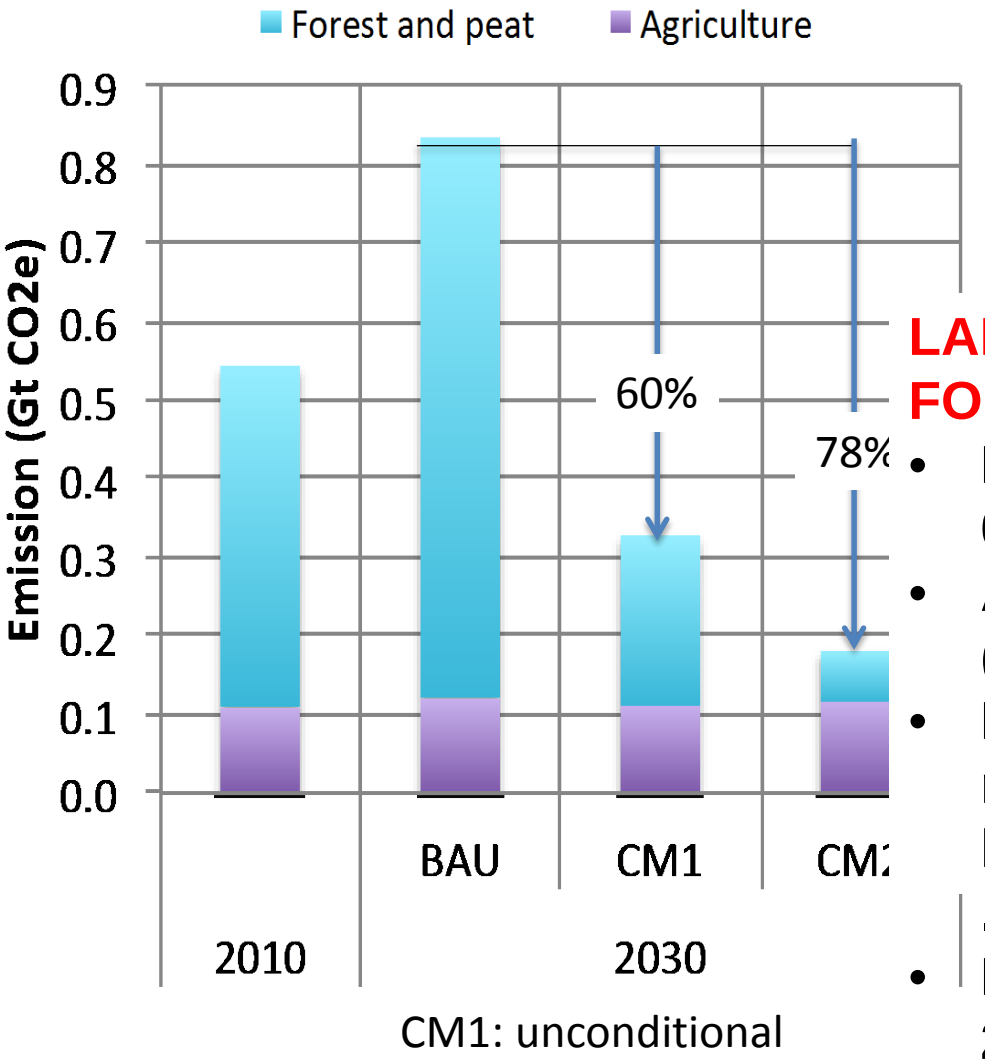
Source: Grassi et al. (2017)

- Different in defining emission reduction target across countries, including accounting rules
- From the pledge, it is expected that LULUCF will contribute to about quarter of global emission reduction target





Main action is to reduce emission from deforestation and peat land



Moving away from forest and peatland for agriculture development

2011-2030

LAND USE CHANGE AND FORESTRY

- **Reducing deforestation down to 0,41 ha- 0,24 Mha/year)**
- **Applying SFM principle (Mandatory for RIL)**
- **Land rehabilitation reached 12 million ha by 2030 about 800,000 ha/year with survival rate of 90%**
- **Peat restoration 2 million ha by 2030 with successful rate of 90%.**

BAU CM1 CM2

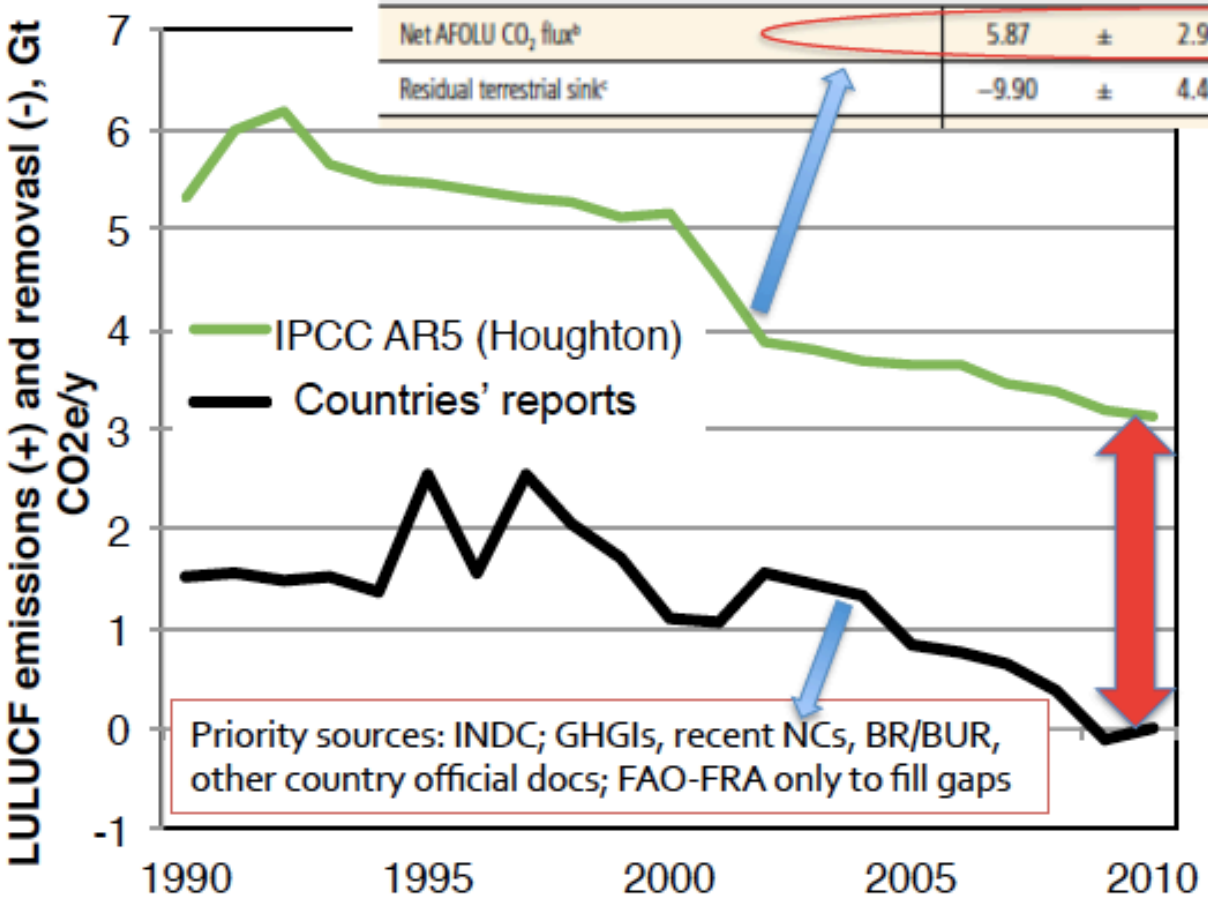
CM2: Conditional

Large discrepancy between net historical GHG emission from country's reports and that of the IPCC AR5

Source: Grassi et al. - Nature Climate Change 7 (2017):220-227

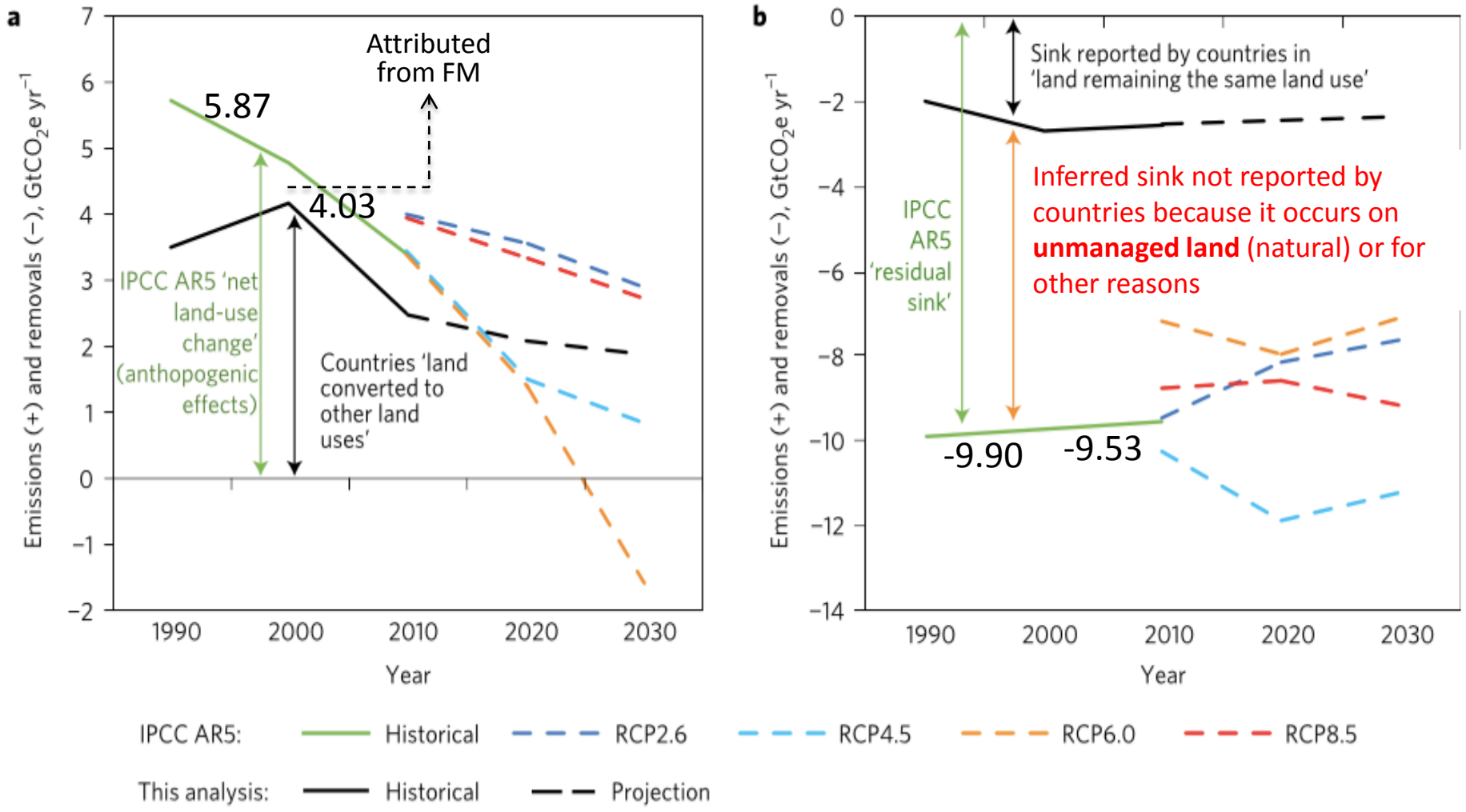
IPCC AR5, WG3, tab. 11.1

	1990–1999 GtCO$_2$/yr			2000–2009 GtCO$_2$/yr		
IPCC WGI Carbon Budget, Table 6.1[a]:						
Net AFOLU CO$_2$ flux[b]	5.87	±	2.93	4.03	±	2.93
Residual terrestrial sink[c]	−9.90	±	4.40	−9.53	±	4.40



≈ 3 GtCO2/y gap, mostly due due a greater sink in developed countries

FACTORS CONTRIBUTING TO THE DIFFERENCE BETWEEN COUNTRY"S REPORT AND OTHER SCIENTIFIC STUDIES (Grassi et al. - Nature Climate Change 7 (2017):220-227)

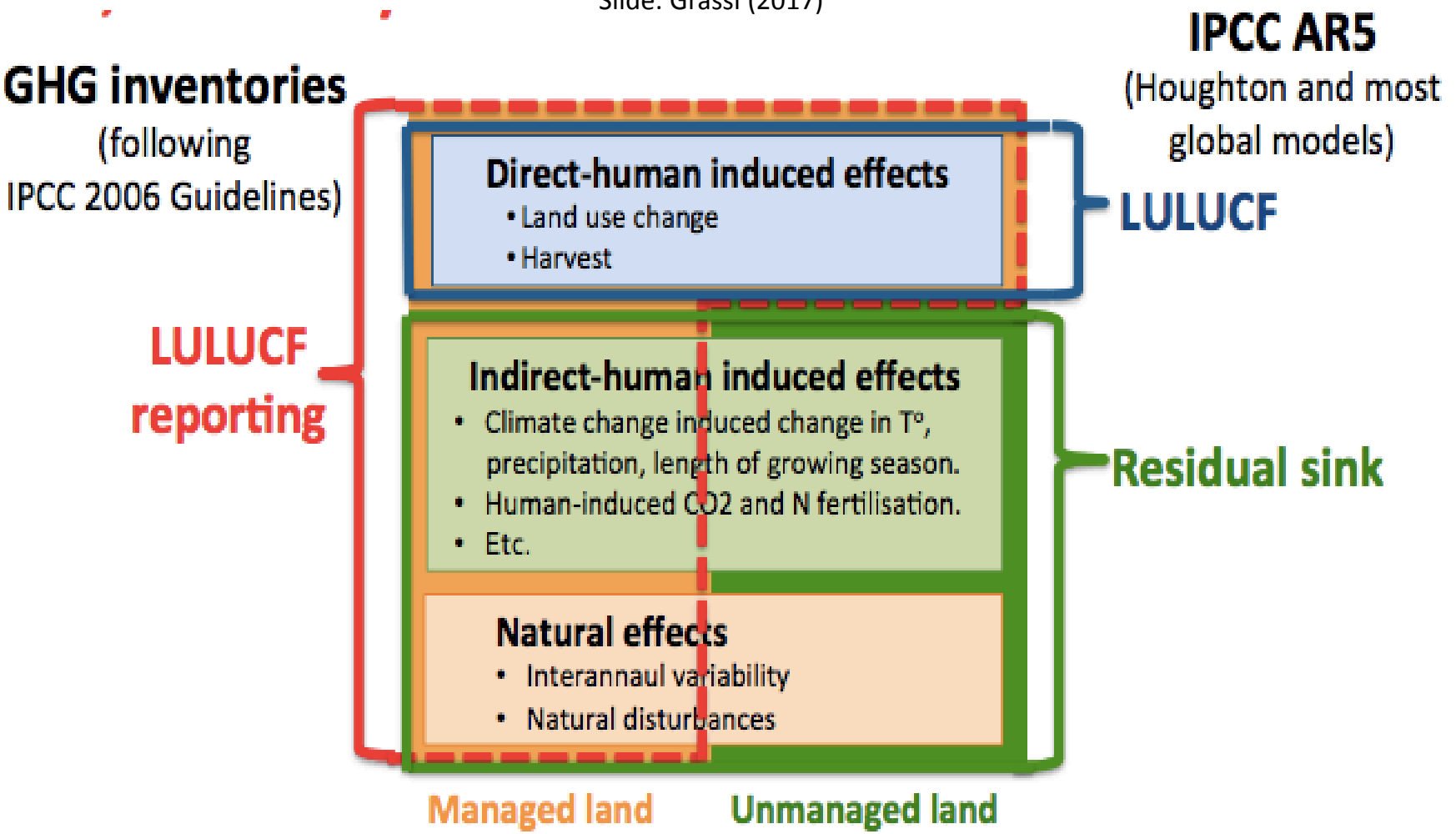


(a) Net anthropogenic CO2 emission from FOLU of the IPCC AR5 *versus* that of INDC reports which include only from lands converted to other land uses

(b) Sink from anthropogenic & natural of IPCC AR5 vs that of INDC reports from land remaining the same land use (only anthropogenic)

GHG Inventories vs IPCC AR5

Slide: Grassi (2017)



- Most countries reports include direct-human induced including some of indirect effects on managed lands.
- IPCC AR5 only include direct-human induced and residual sink from unmanaged (natural)

Discussion points?

- Different perspective among countries in defining emission reduction target including different accounting rules, different uncertainties
- Treatment of direct and indirect effects ~ which one should be included in the "**balanced**" ~ most countries include *indirect* effects on managed land (e.g. Indonesia peat fire emission natural disturbance in managed lands)
  - Need for reconciling the conceptual differences on "what is anthropogenic"
  - Clarification on managed land concepts
- GST requires comparability, without this progress towards PA's target cannot be properly assessed.
- Making forest mitigation promise into reality requires more transparency in commitment and more in confidence