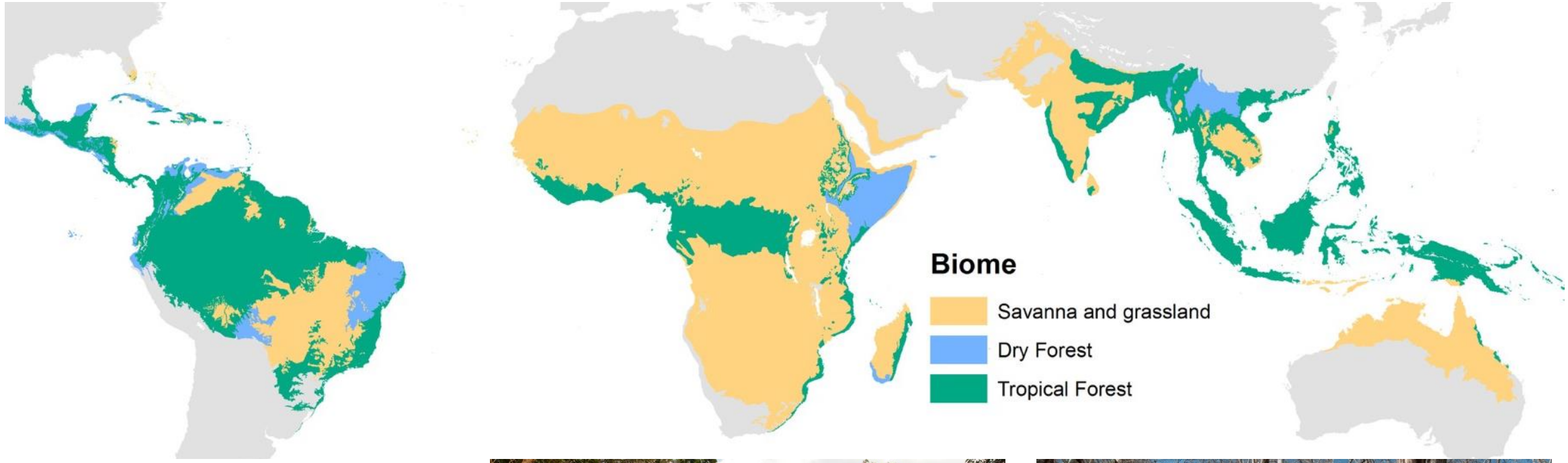
UN Decade of Ecosystem Restoration

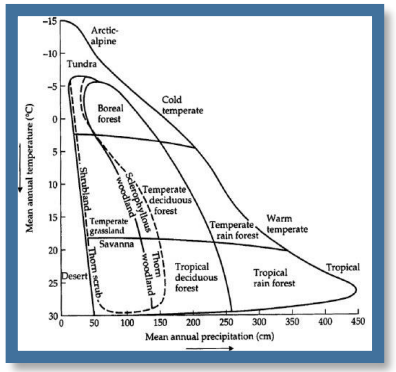
- Bonn Challenge: 3.5 million km2 of forest landscape restoration
- AFR100: 1 million km2 of forest landscape restoration targeting Africa
- Trillion trees campaign (e.g., Bastin et al 2019 Science)

BONN CHALLENGE

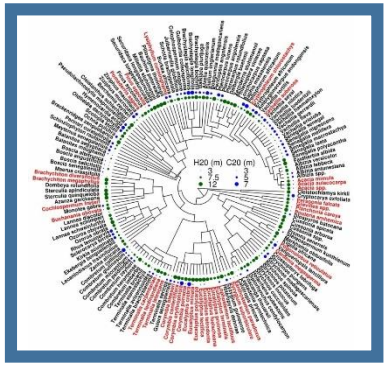
afr100

Major ecosystems of the tropics



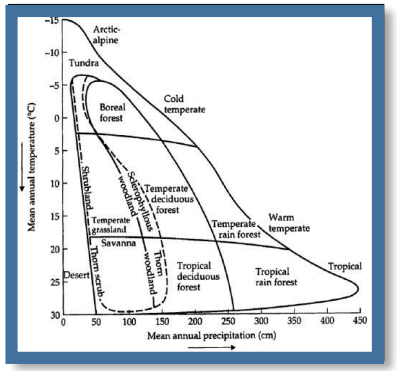


Vegetation structure and climate - old school.
Used in remote sensing and global protocols…



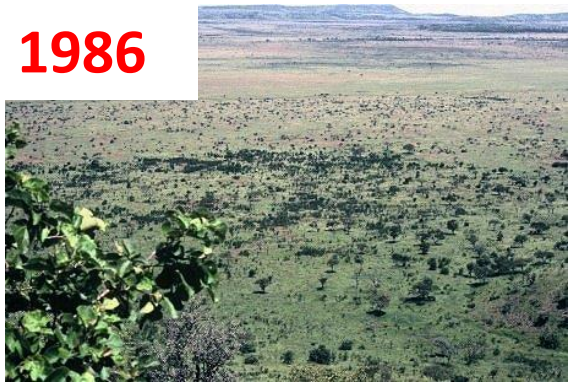
Biogeography - evolutionary history, diversity patterns..

Functional - how process shapes ecosystem biodiversity.
Ecology aims to <u>predict</u> ecosystems responses to environmental change

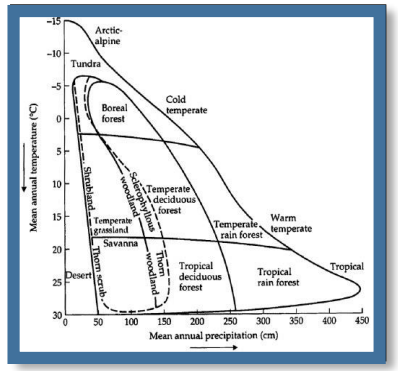


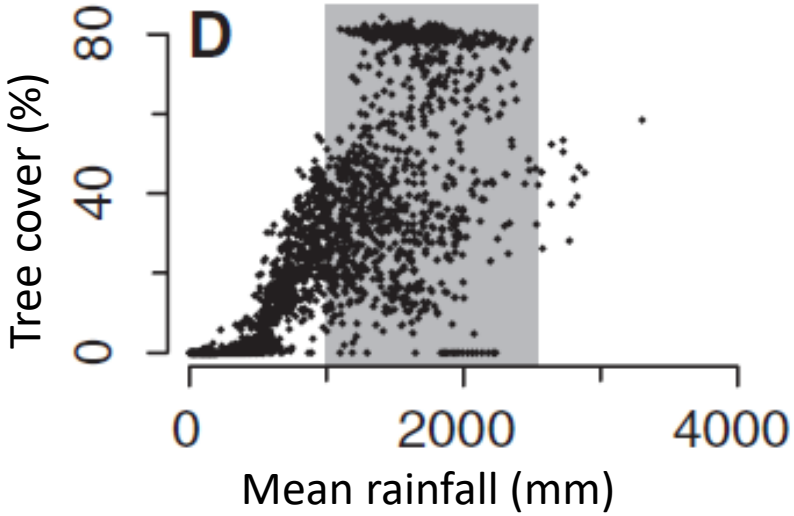
Map aboveground carbon

Defining ecosystem limits
Recognising degradation
Understanding processes
Predicting ecosystem change
Functional meaning to past ecosystems

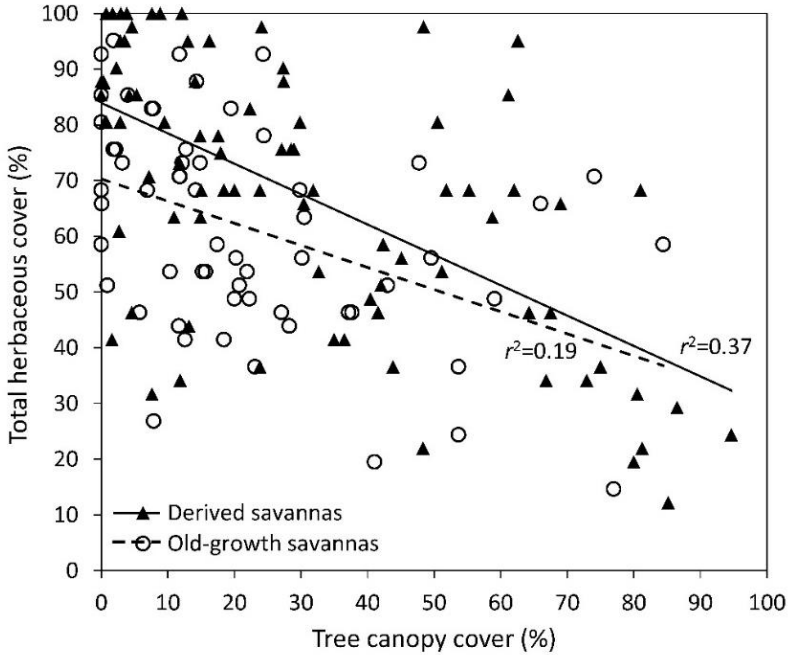


Photos: Tony Sinclair - Serengeti





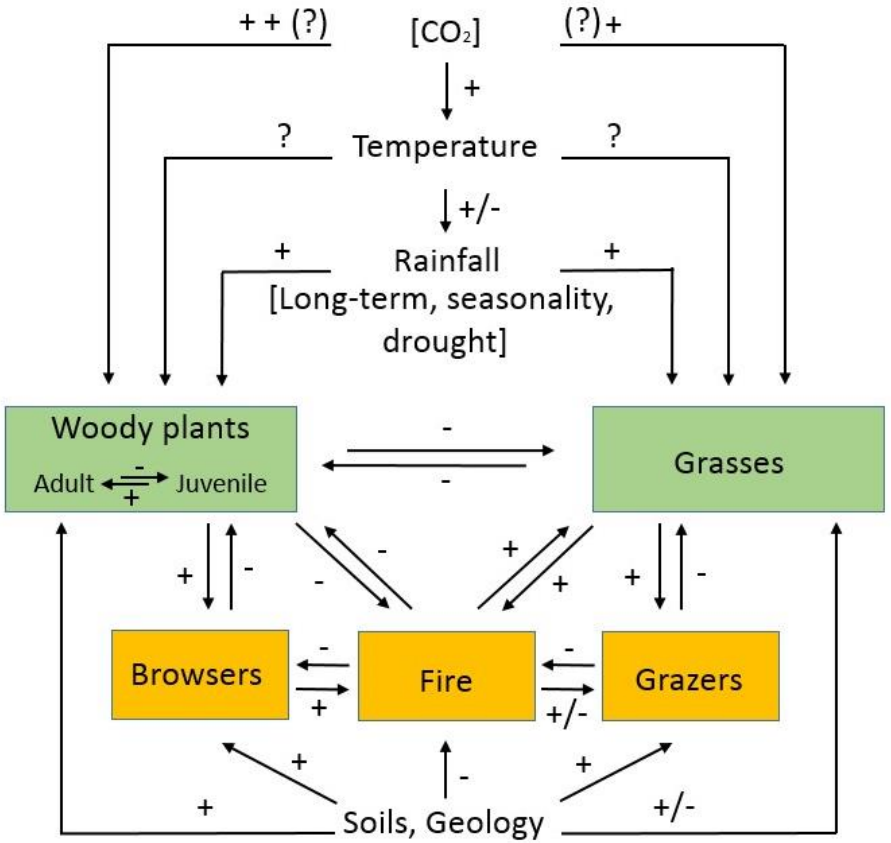
- Climate ≠ biome
- Tree cover does not distinguish savanna and forest



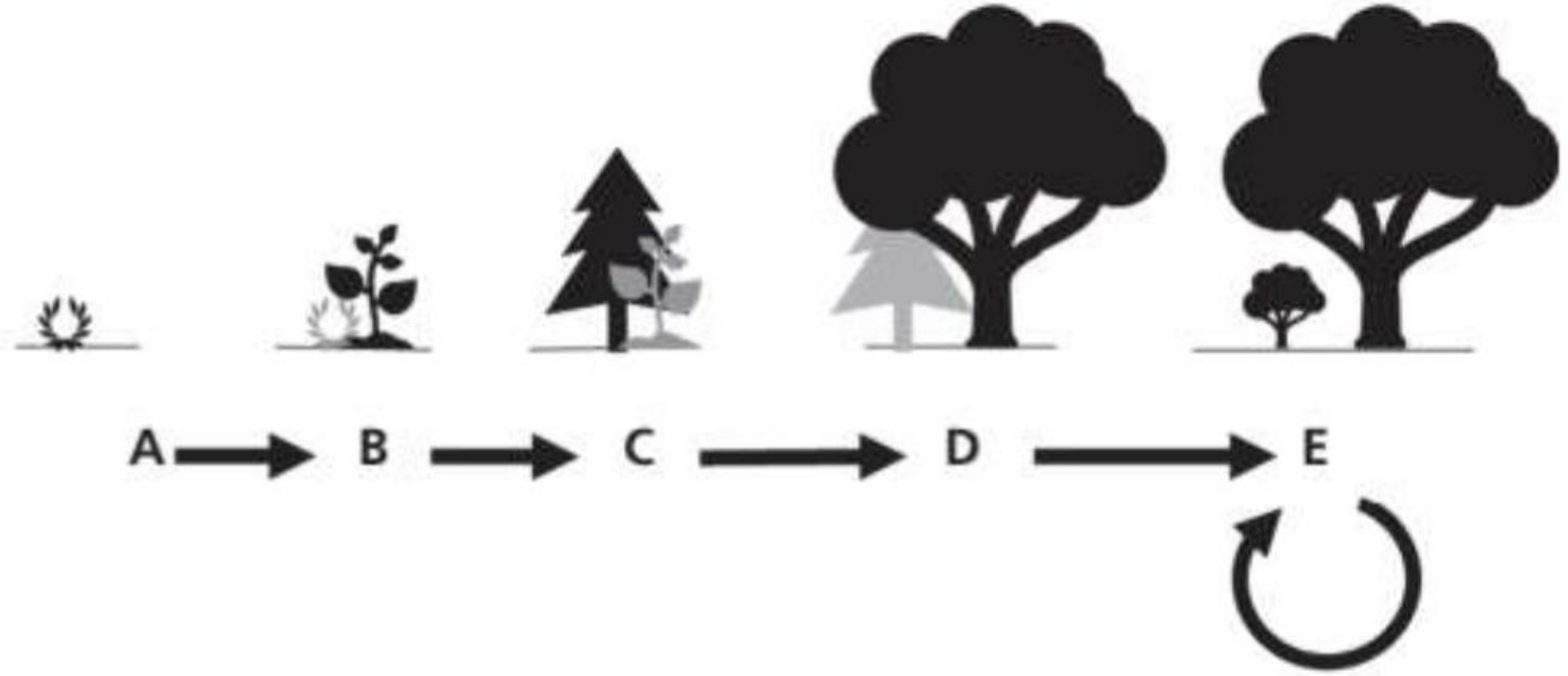
- Structure masks degradation

Staver et al. 2011; Veldman 2016

Define global limits of ecosystems
Recognises degradation – avoids confusion around structure
Predict ecosystem change
Understand community assembly



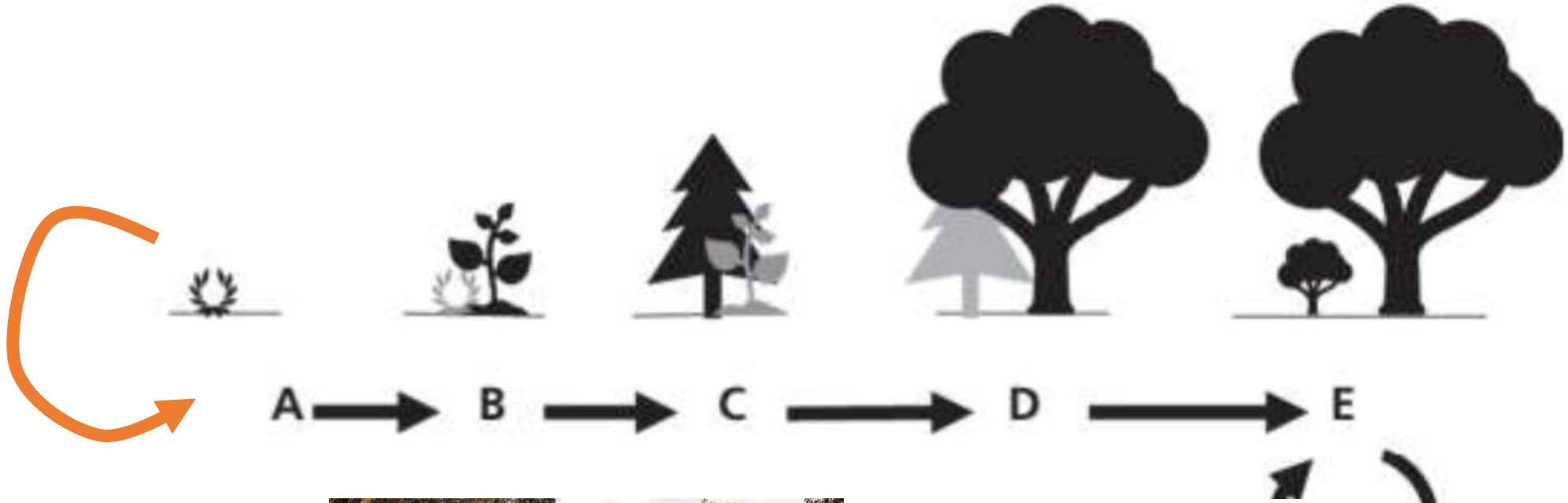
19-20th Century theory of vegetation: succession and climax



Succession is driven by taller plants - competition for light asymmetric

Really?! Plants have evolved to reduce offspring chances of survival?

What if smaller plants prevented recruitment of larger ones?



- Savanna
- Grassland
- Shrubland
- Heathland

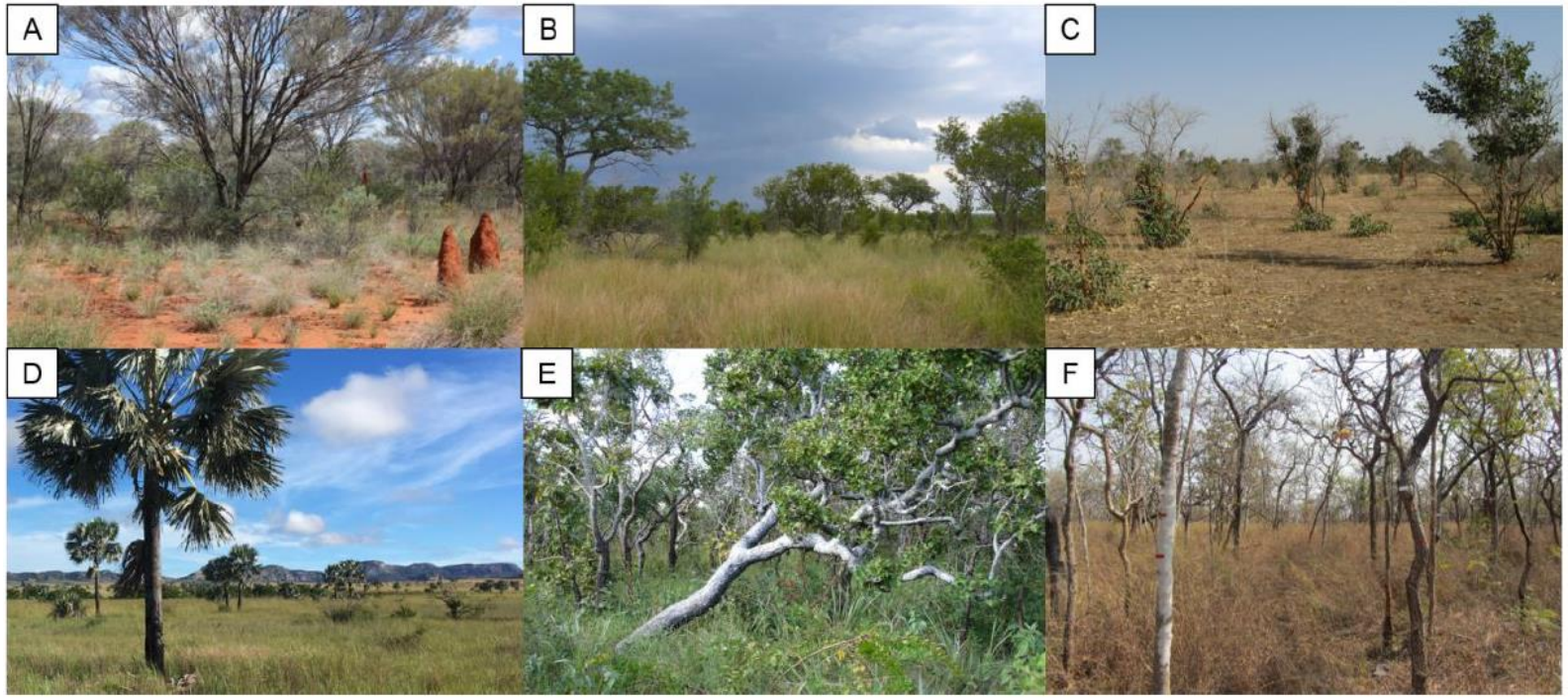
Open Ecosystems

Closed Ecosystems

- Forest
- Dry forest
- Rainforest

How is forest defined by global organisations?

- Forest = Minimum 10% tree cover over half a hectare
- Forest = Areas temporarily under 10% but expected to recover
- Expects that any low tree cover ecosystem is degraded
- An economic NOT ecological definition

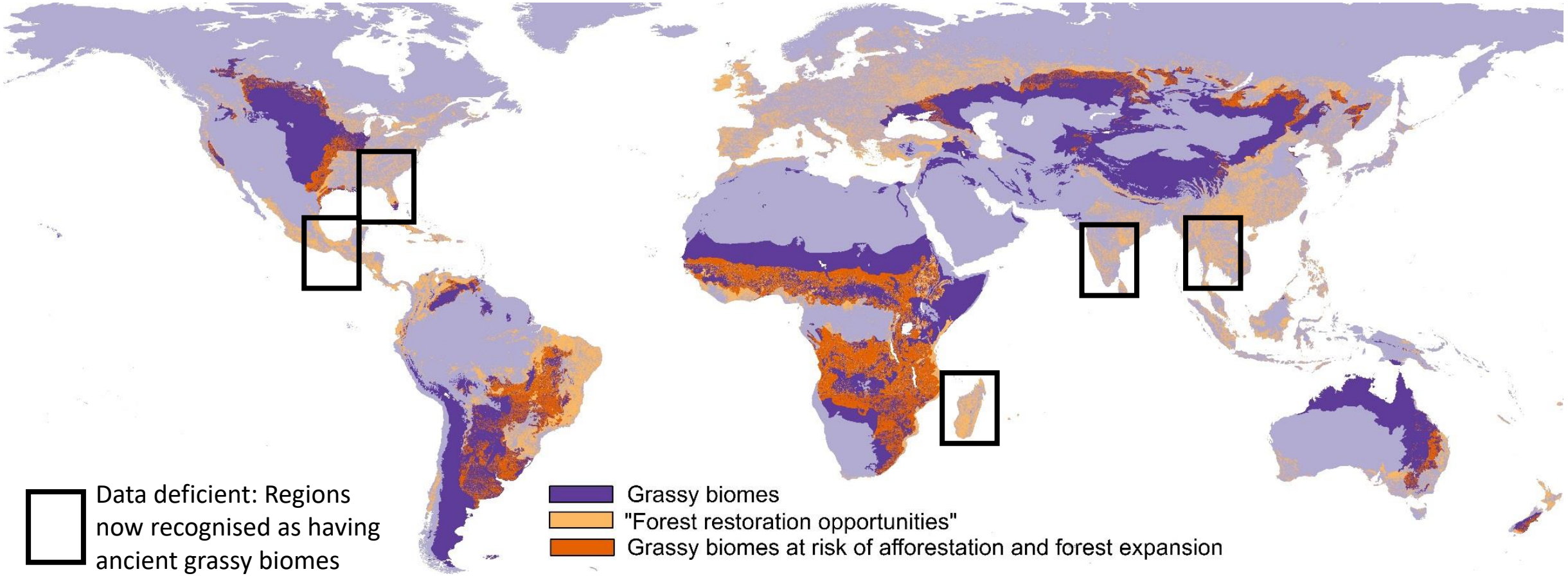


UNFCCC

Food and Agriculture Organization of the United Nations

Parr et al. 2014; Griffith et al., 2017

Overlap between the *Atlas of Forest Landscape Restoration Opportunities* and the distribution of grassy biomes



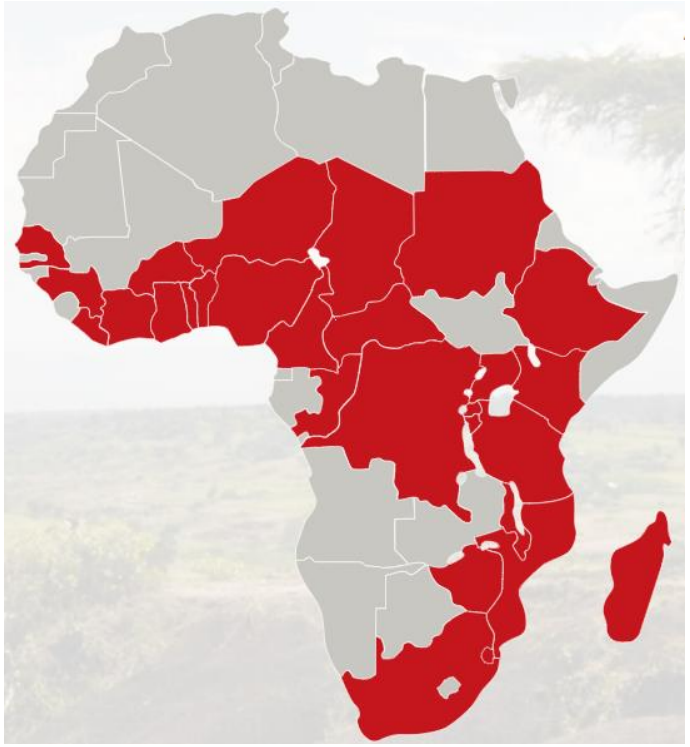
9 million km^2 (40%) of the "opportunities" correspond to grassy biomes

Veldman et al. *Science* 2015; Veldman et al. *Bioscience* 2015

Forest restoration vs deforestation

- Bonn Challenge (global) signs countries up to reforest 350 Mha by 2030
- Current commitments about 270 Mha.
- Current rate of *actual* forest restoration ~2-3 Mha/year – even with mass acceleration target will be missed.
- Current global deforestation rate ~18-20 Mha/year
- Current rates in Africa ~5 Mha/year (50% Congo basin)

>>>>> Shouldn't the priority be to stop land clearing?



1. Diversity

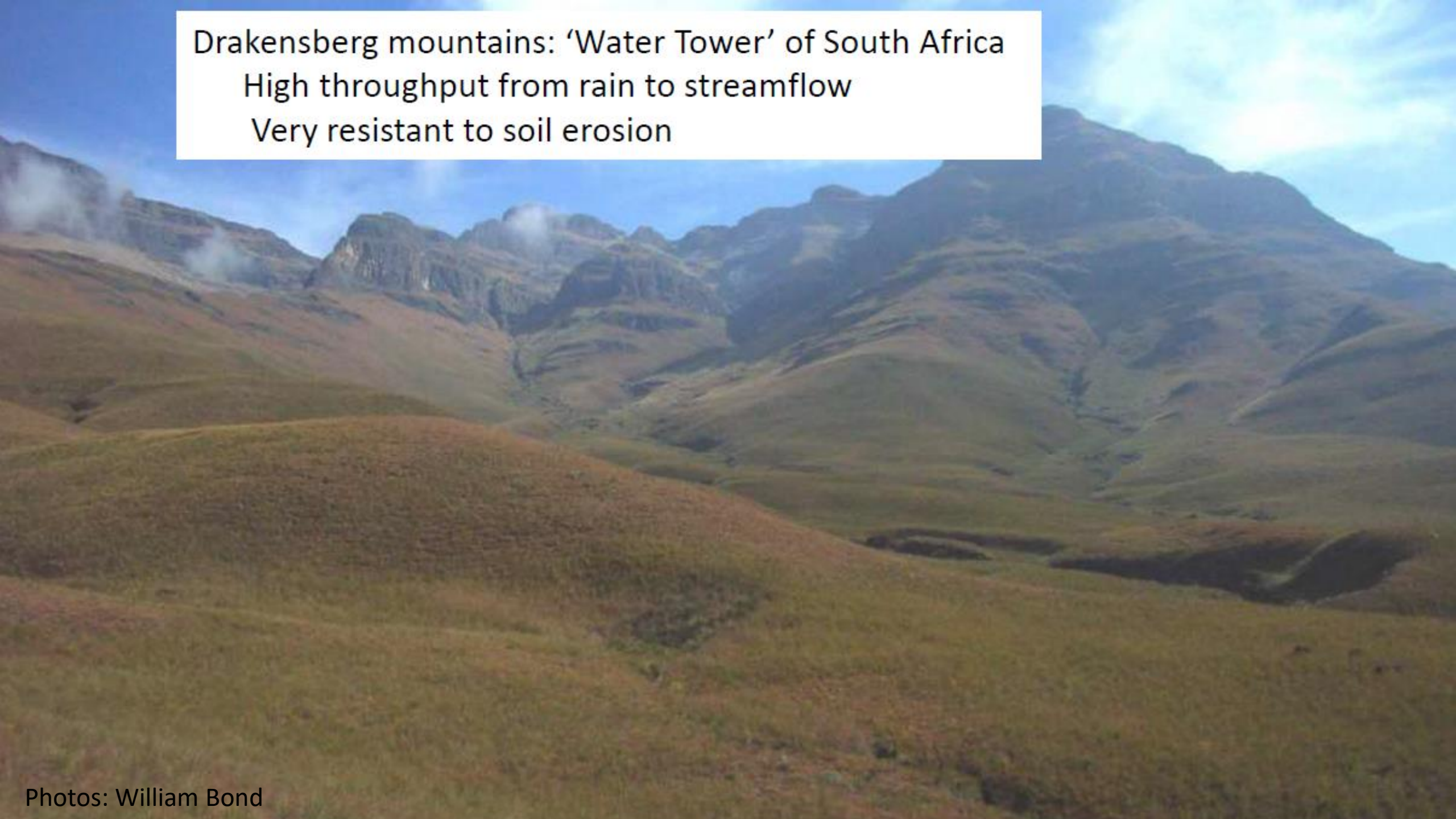
2. Changing albedo and net warming

- Trees planted in semi-arid and low latitude regions can produce net warming for decades through regional change in the energy balance
- At high latitudes and elevations, the warming effect of trees is greater than their cooling effect via carbon sequestration

Li et al., 2015; Rotenberg et al., 2010

3. Water – trees use water

- Many tropical countries pledging to plant extensively are water scarce.
- People depend on this water.



Photos: William Bond

4. Environmental risk – fire and drought

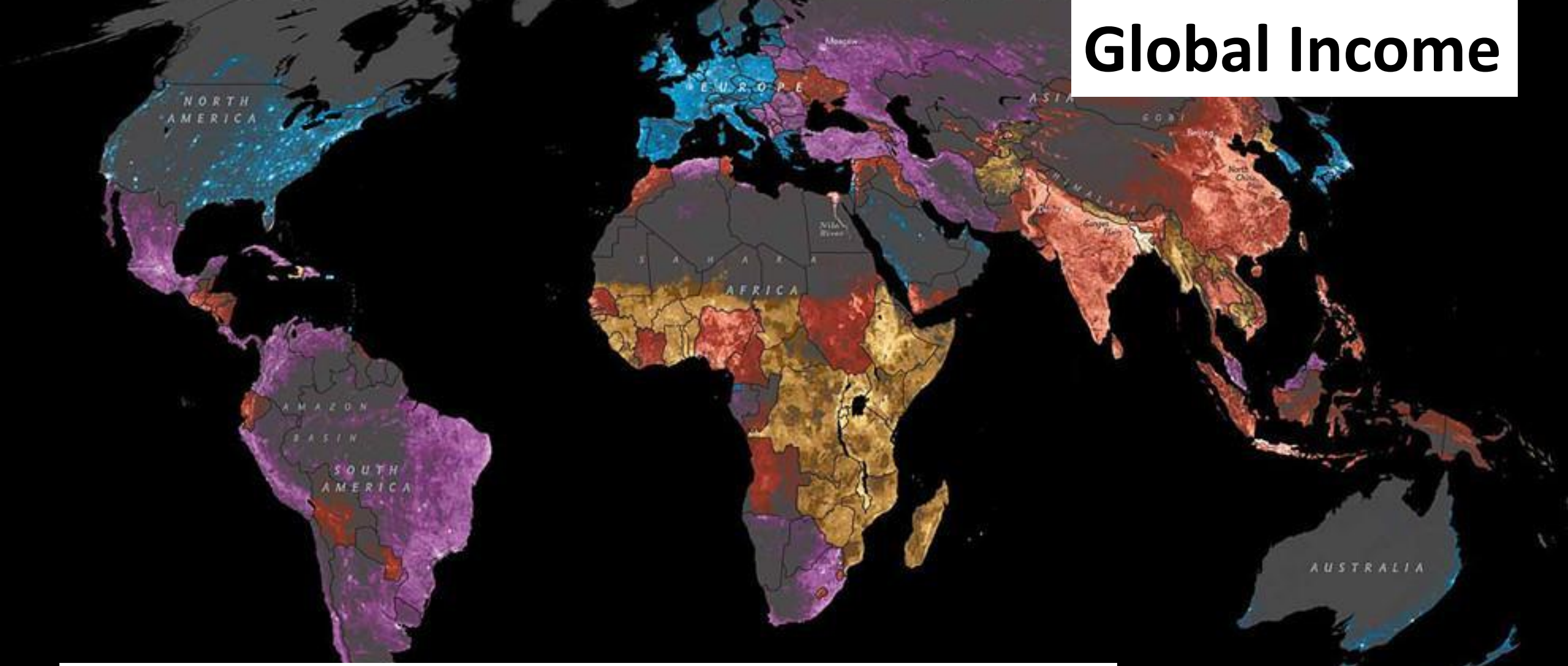
- Easy to control
- Quick and cool fires
- Manageable
- Minimal loss of carbon

- Difficult to control
- Persistent and hot fires
- Danger to life
- Large loss of carbon

Photos: Joe Veldman

5. Locking up land– what about people?

Global Income



Should the global South be receiving of the “solution” ?

Right trees in the right place

Ecosystem	Biodiversity	Water	Warming	Fire intensity	Forage
Savanna + grassland	-	-	+	+	-
Arid shrubland	-	-	+	+	-
Heathland	-	-	+	?	na
Montane grassland	-	-	+	+	-
Forests	**Depends on species planted**	+/-	-	+/-	na

What does this mean?

1. Respect the diversity of ecosystems on Earth + the processes that shape them
2. Tree planting is not THE solution - it can contribute
3. Right tree in the right place
    - Plantations have little value other than economic
    - Damaging to biodiversity of open ecosystems
    - Net warming could offset carbon sequestration for many decades
    - Reduces water flows, forage and human use of ecosystems
4. URGENT need to REDUCE and HALT deforestation and land use change
5. URGENT need to transform our energy and food systems
6. We can’t use tree planting to avoid dealing with the REAL PROBLEM