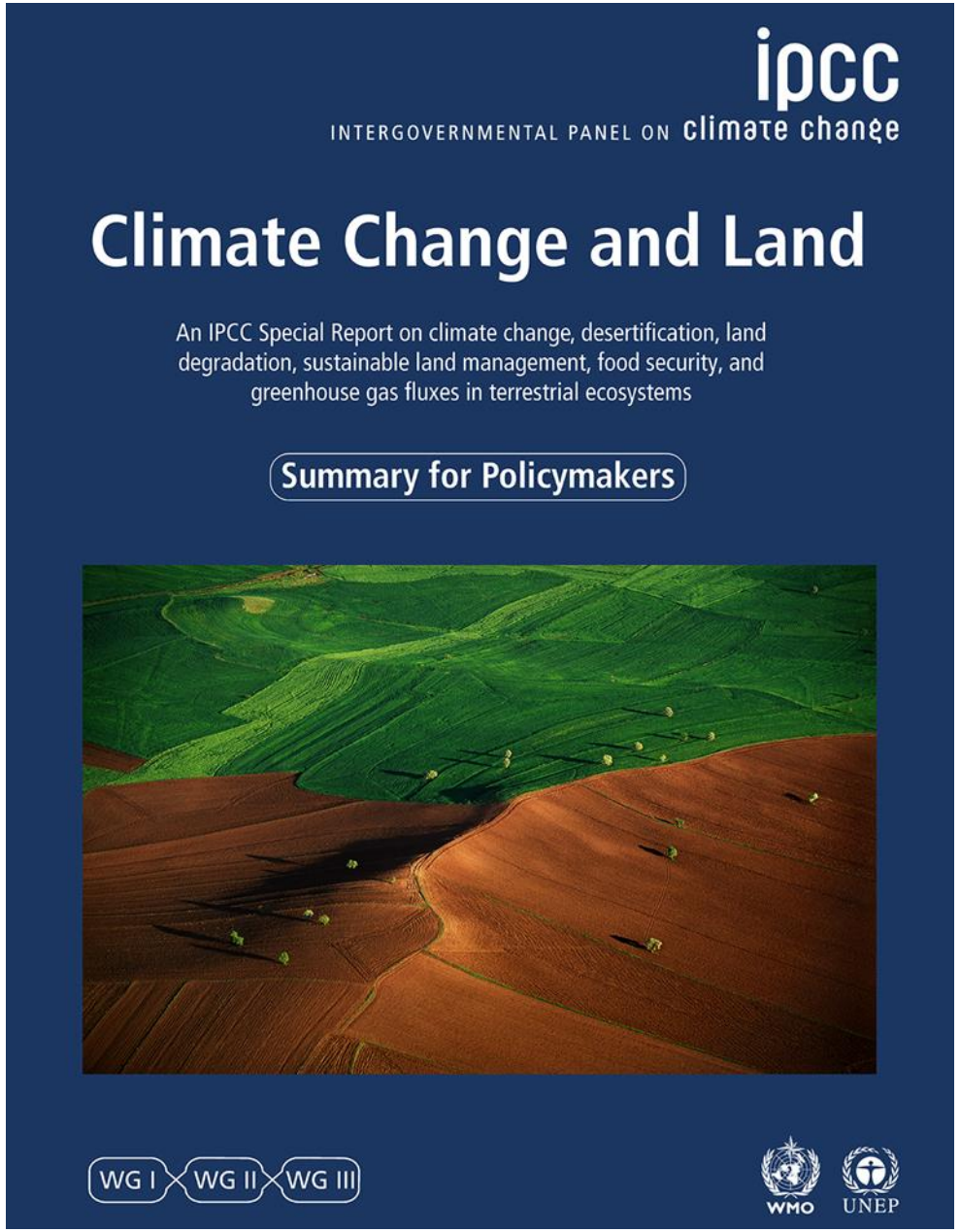
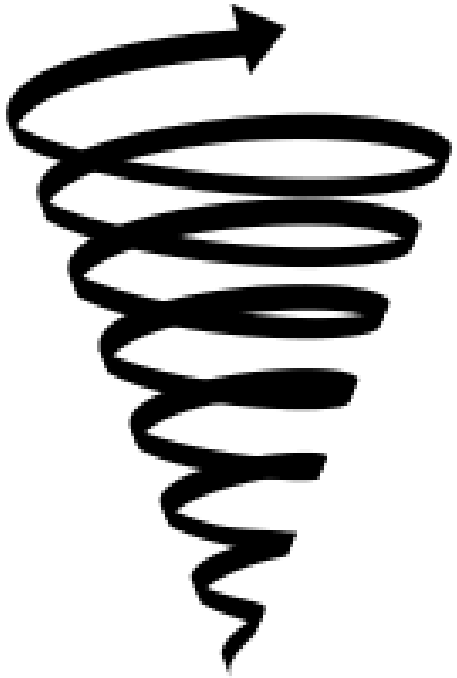


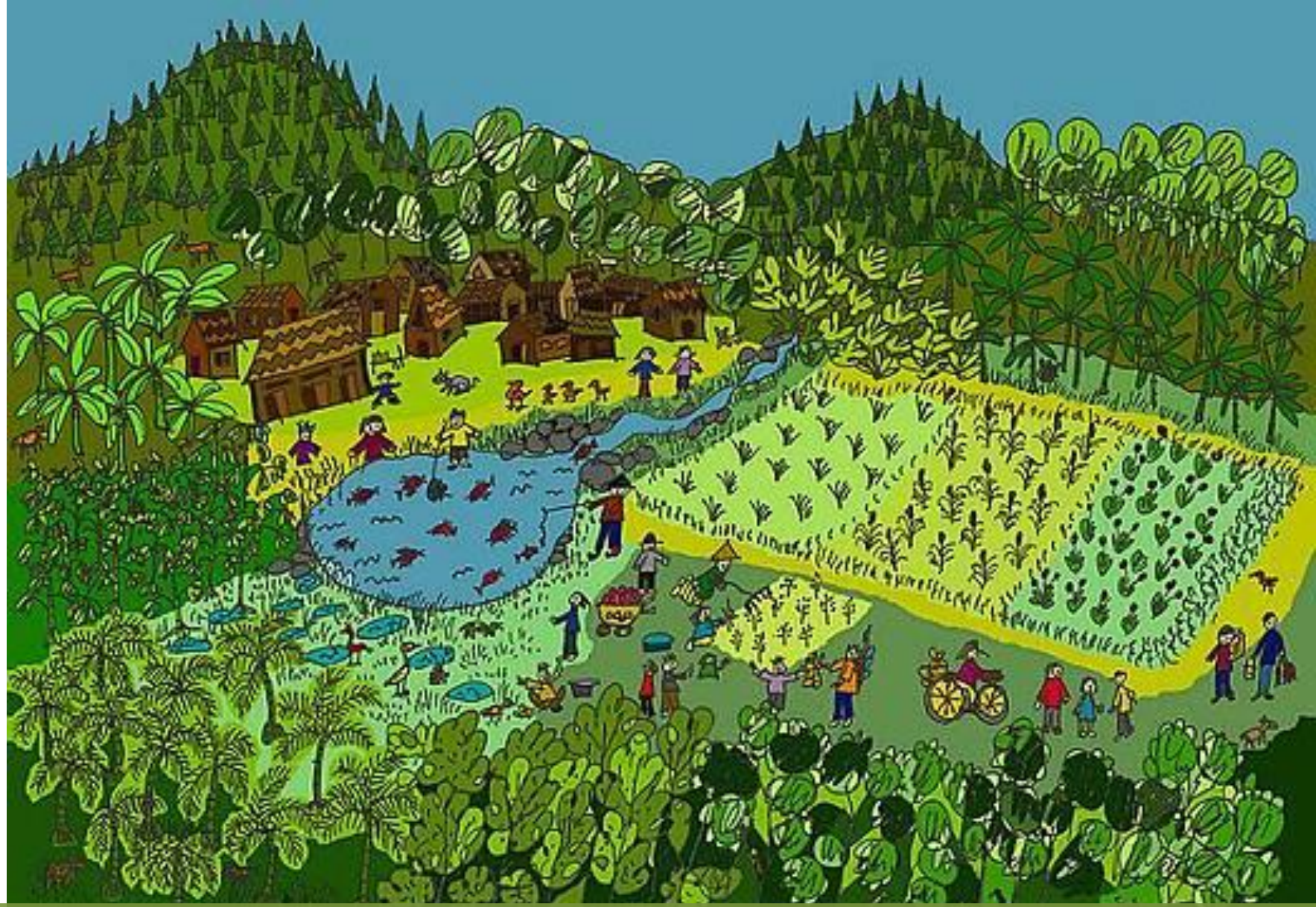

# Climate Change and Land Degradation: Impacts and Responses

Annette Cowie

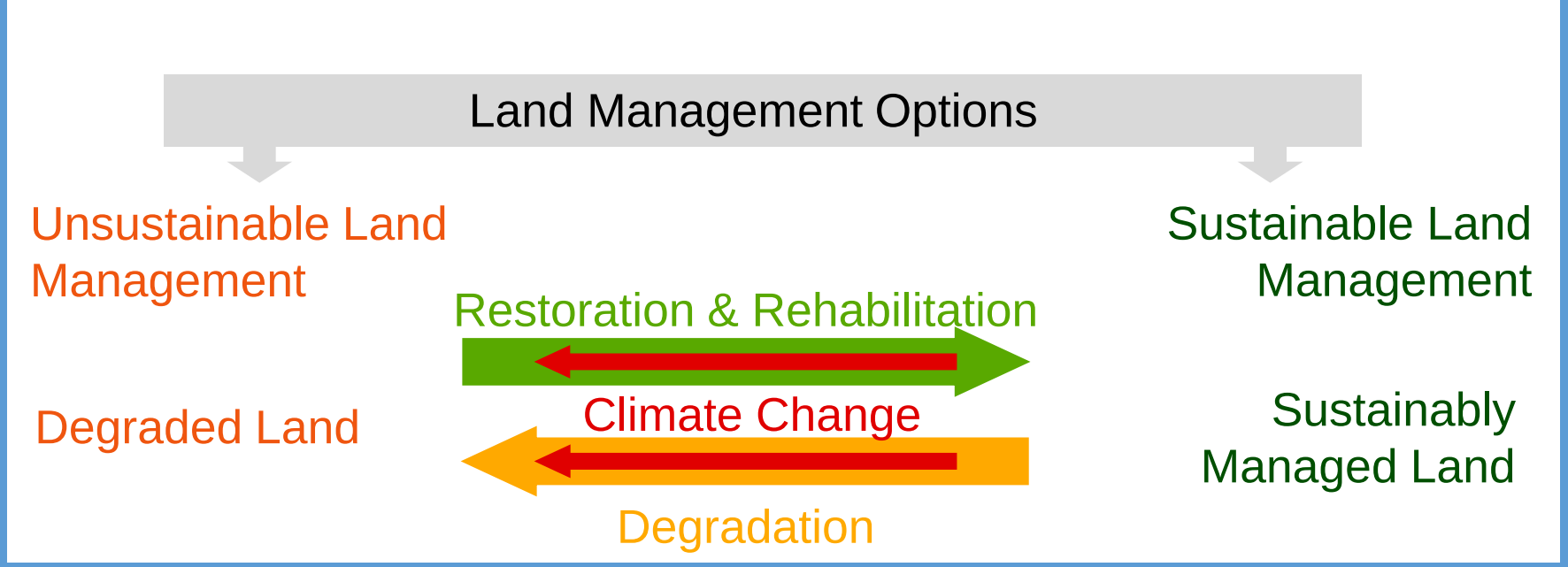
# Climate change + Land degradation

# Sustainable Land Management





The stewardship and use of land resources, including soils, water, animals and plants, to meet changing human needs, while simultaneously enhancing resilience, to ensure the long-term productive potential of these resources and the maintenance of their environmental functions

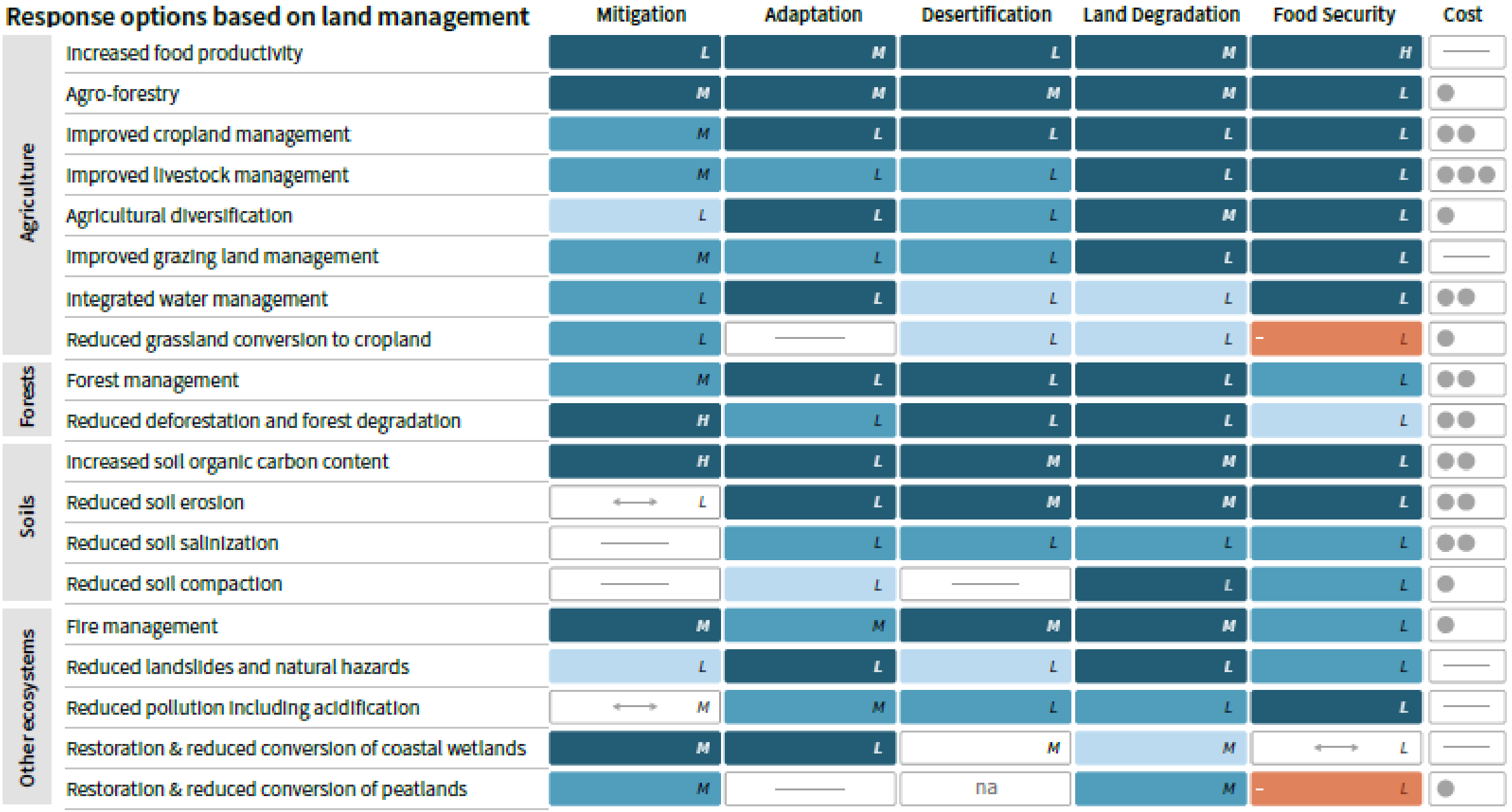



*SRCCL Ch4 Fig 1*

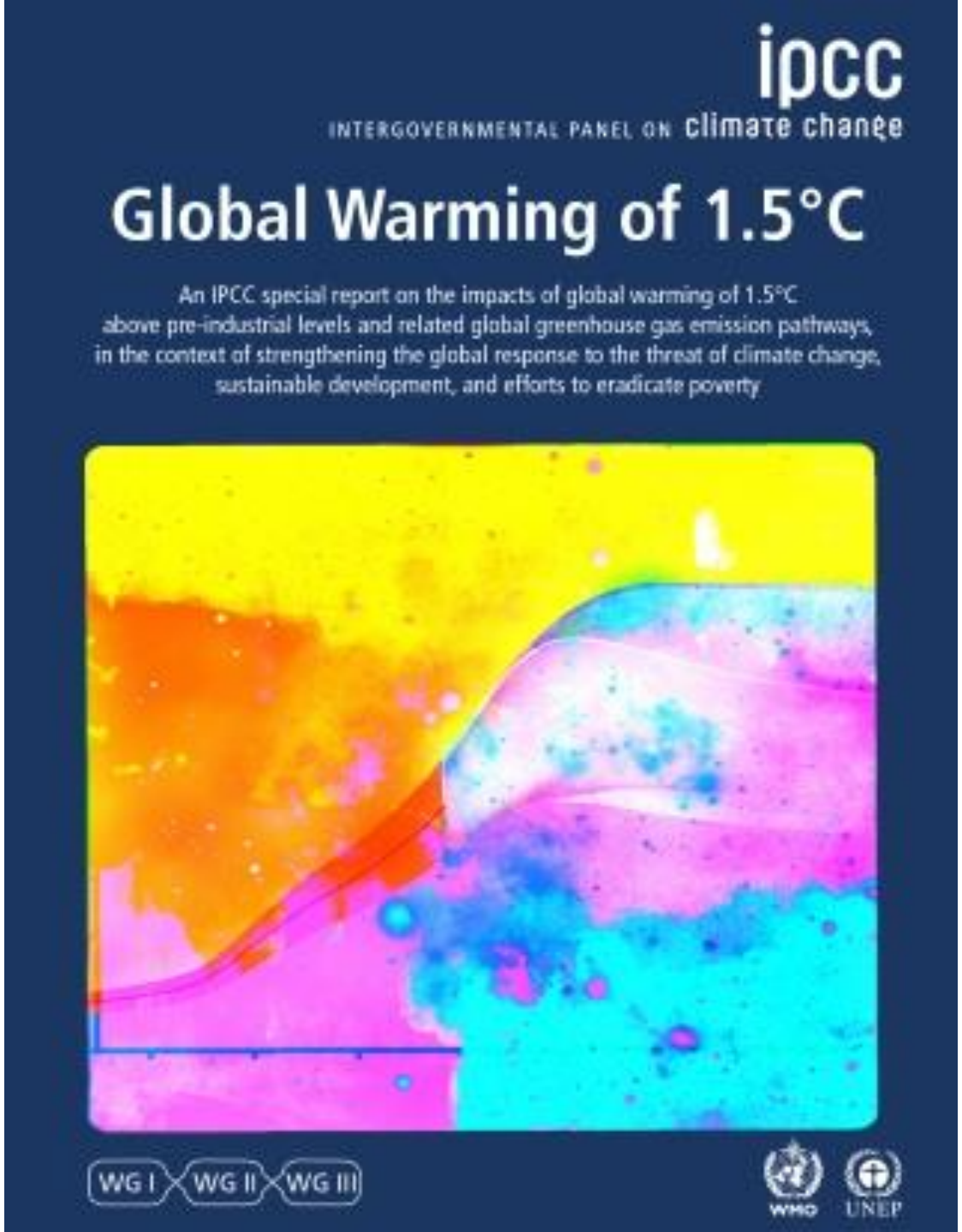





# Win-win options in land management




SRCCL SPM3A




# IPCC Special Report 1.5°C

- Human activities have already caused about 1.0°C of global warming above pre-industrial levels
- Climate-related risks for natural and human systems are substantially lower for global warming of 1.5°C than 2°C
- Drastic cuts to current rate of emissions required to meet Paris Agreement target
- Carbon dioxide removal will be needed: key role for bioenergy with CCS - BECCS

# Land use change under different scenarios consistent with 1.5°C target

## SSP1 Sustainability-focused

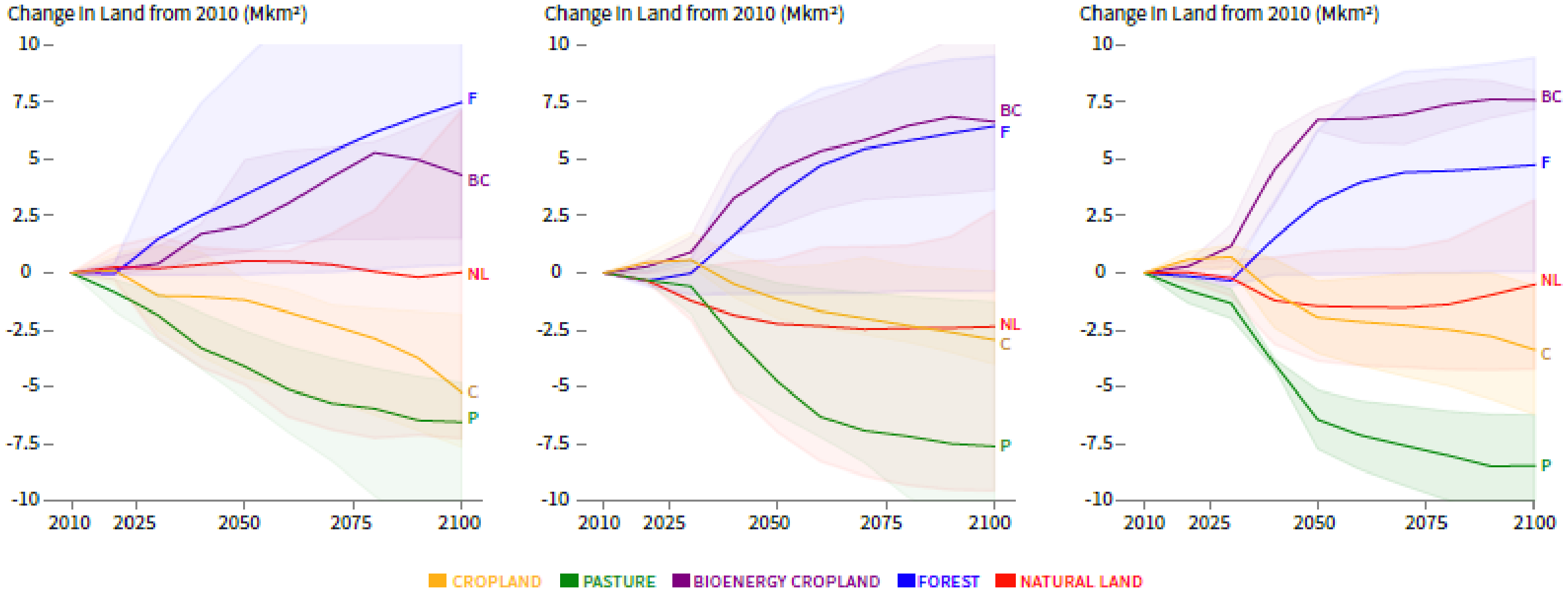
- Sustainable land management
- Sustainable production and consumption
- Ag intensification
- Spares land for afforestation, bioenergy

## SSP2 Middle of the road

- Continues historical social, economic, and technological trends
- Slow progress in sustainable development

## SSP5 Resource intensive

- Resource-intensive production, consumption and lifestyles
- Innovation, free trade
- Large challenge for mitigation




SRCCL SPM4

Compared with: 15 Mkm$^2$ total global cropland; 35 Mkm$^2$ pasture; 40 Mkm$^2$ forest

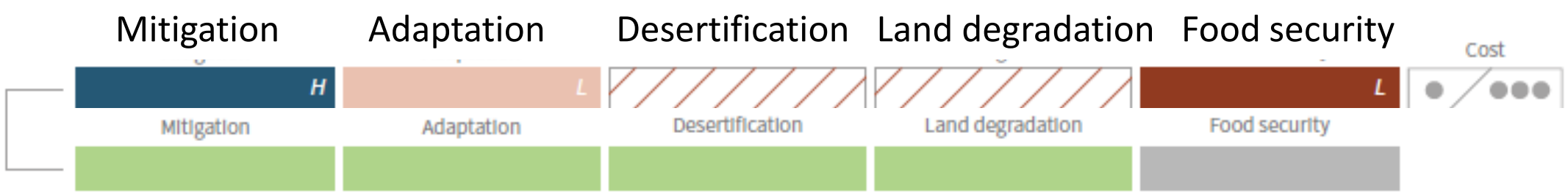
# Biochar

# Biochars can:

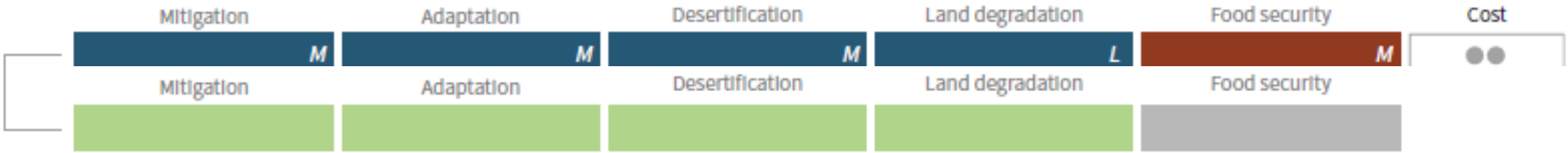
- Improve soil properties – relieve soil constraints:
  - chemical
  - physical
  - biological
- Have liming effect
- Increase water holding capacity
- Increase nutrient use efficiency
- Increase plant growth, plant health
- Reduce leaching and N volatilisation
- Immobilise contaminants
- Climate benefits: Carbon stabilisation, reduced non-CO2 emissions
- Benefits vary between biochars


# Land options with risks and opportunities

## Bioenergy/BECCS



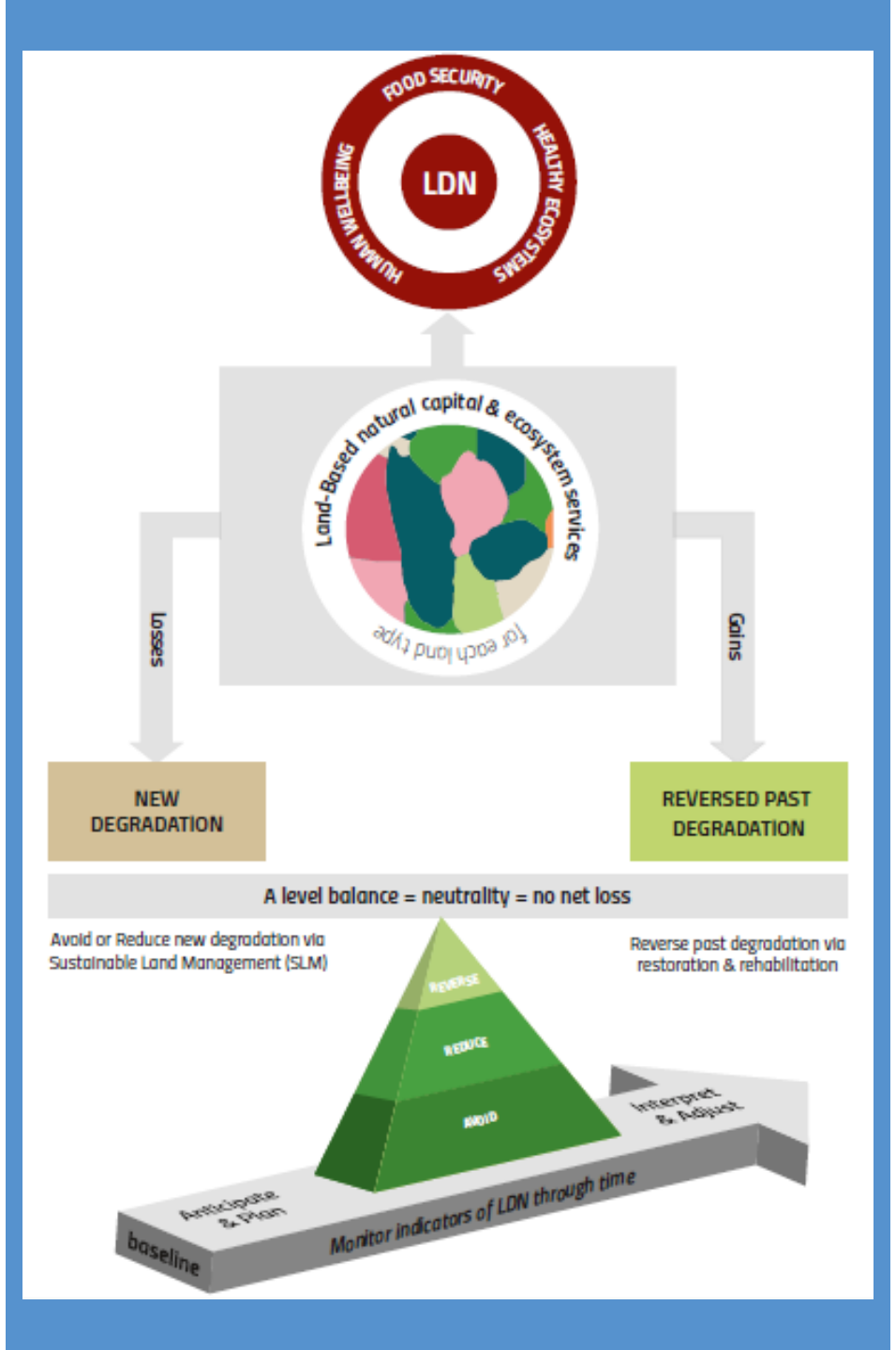

## Afforestation




## Biochar


SRCCL SPM3B

# Integrating biomass production with agriculture


United Nations
Convention to Combat Desertification

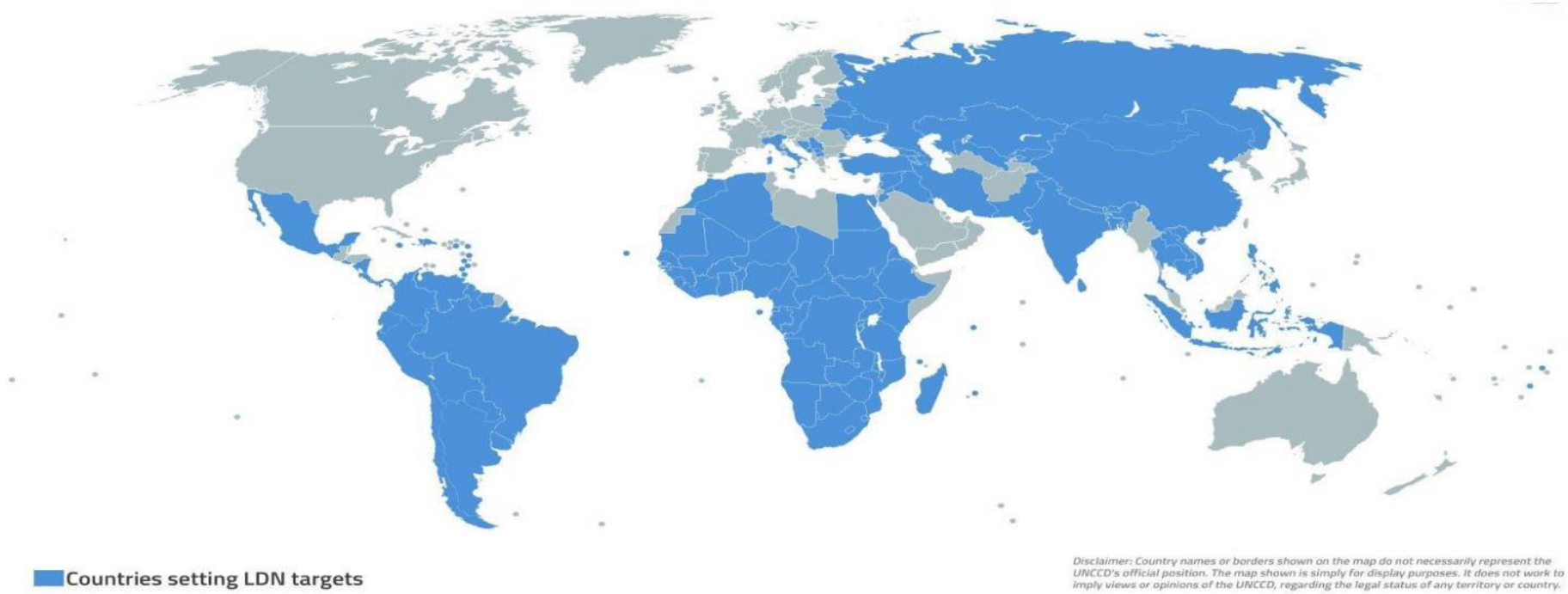
15 LIFE ON LAND

# Land degradation neutrality

No net loss of healthy, productive land

- Avoid degradation
- Reduce degradation - SLM
- Counterbalance anticipated degradation through restoration and rehabilitation within the same land type

# LDN commitments




- 122 countries have committed to set LDN targets
- 83 countries have validated targets
- 51 countries target adopted by Governments

# Deforestation, meat production driving climate crisis

CNN

## Change food production and stop abusing land, major climate report warns

Although recent meat substitutes mimic the properties of meat accurately, the sales of red meat have declined

nature
International journal of science

## Eat less meat: UN climate-change report calls for change to human diet

A balanced diet rich in plant-based foods is good for people and the planet

# What about red meat?

- Reducing or avoiding red meat offers technical potential mitigation of 3-8 Gt $CO_2$e/year
- Includes sparing land for carbon sequestration

*On the other hand:*

- Ruminants turn cellulosic biomass into nutrient-dense food - High quality protein, source of Fe
- Only 11% of land is arable - Ruminants graze land that can’t be used for crop production
- Most livestock feed is not suitable for human consumption
- Mixed crop-livestock systems reduce need for herbicides, ploughing, chemical fertiliser
- Pastures are important for restoring soil carbon, fertility of cropland
- Pastoralists manage grazing lands

# Key messages on Climate Change and Land Degradation

- Climate change and land health are inter-twined
  - exacerbating risk of land degradation
  - threatening land capacity for climate change mitigation
  - threatening global food security
- Controlling land degradation, sustainable land management, building soil organic matter are win-win-win options
- Urgent need to reduce emissions in all sectors – land cannot do it all
- Bioenergy, afforestation and biochar are important parts of the climate solution with potential benefits for land – we need to ensure they are done well, integrated with agriculture and forestry
- Eat a healthy diet, think about the source of your food – choose foods with low carbon footprint, reduce food waste