

# Global Land Programme Update:

Ariane de Bremond  
Executive Director, GLP  
Geographical Sciences, UMD

LCLUC Science Team Meeting  
April 2-4, 2024

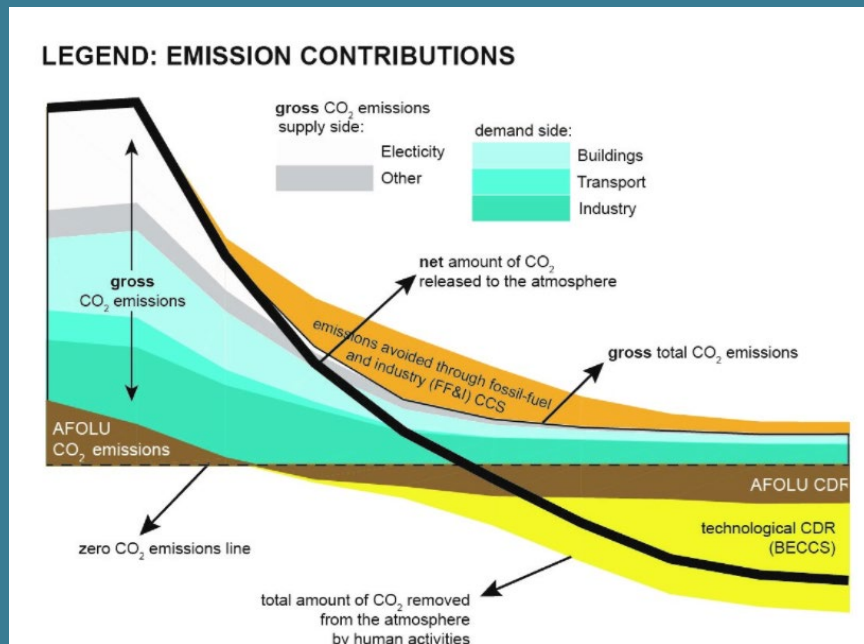


# Roadmap

- Global Land Programme (overview, status update, our network)
- Recent activities – new home, new people, new science plan/emerging themes
- OSM!
- Up and coming challenges for land system science | what role for science?

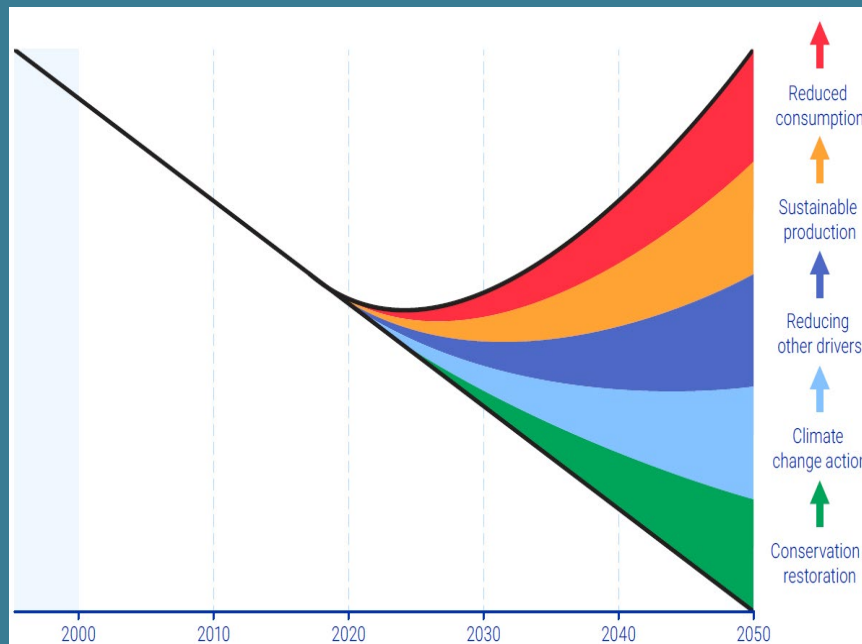
# LAND MATTERS

## Mitigation pathways compatible with 1.5°C



IPCC, 2021: Sixth assessment report

## Aligned actions for protecting and restoring life on Earth



UNEP, 2021: Making peace with nature

# Solutions for global challenges in concrete local contexts



*Beyond human impacts*

# Land Systems

Social-Ecological Systems

**Why does land change?**

**What are the consequences?**

**Study of dynamics, cause and implications of land use, land management and land cover change**

**Observing | Understanding | Modelling | Collaborating**

**Land Use & Land Cover**

**Management | Decisions**

**Structure | Function**

**Stakeholders | Governance**

***Multifunctional Landscapes***

**Institutions | Markets | Telecoupling**

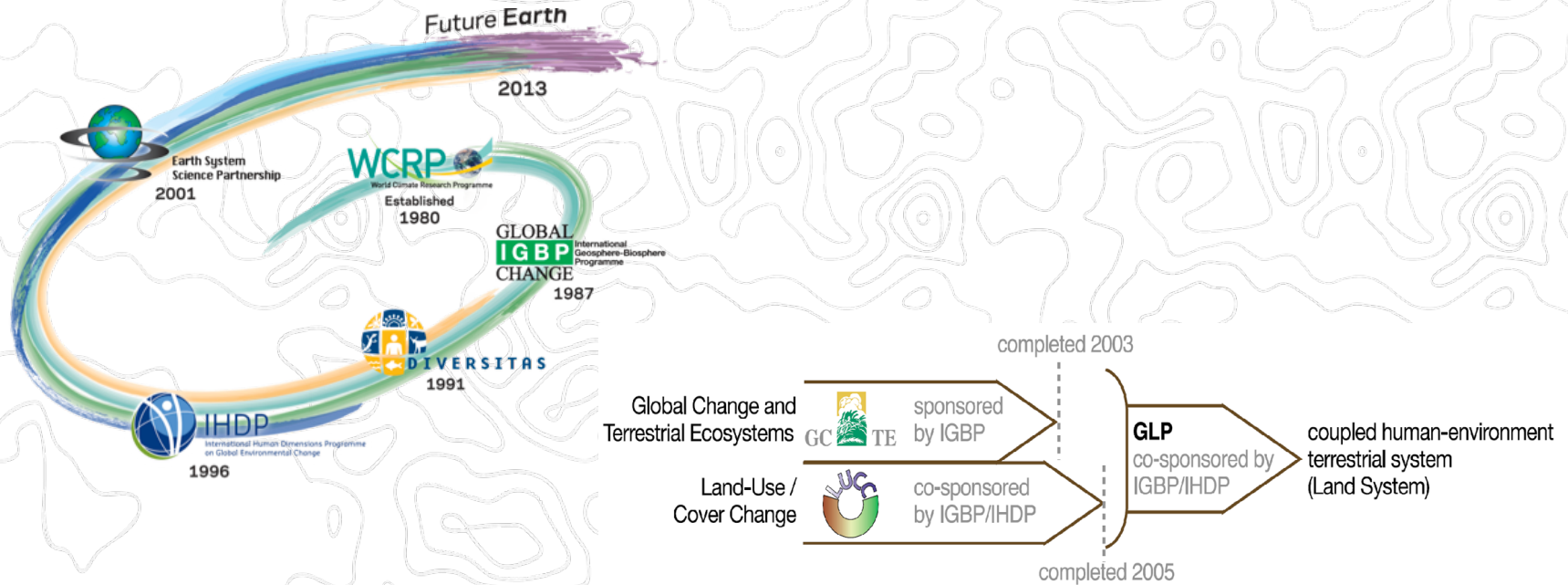
**Oriented towards solutions to sustainability and justice challenges**

## **General references:**

Lambin and Geist (Eds) (Book) (2006)



# Where did the Global Land Programme come from ?



... and who are we today?



# Connecting People, Land & Solutions

## Global research on land systems and land change

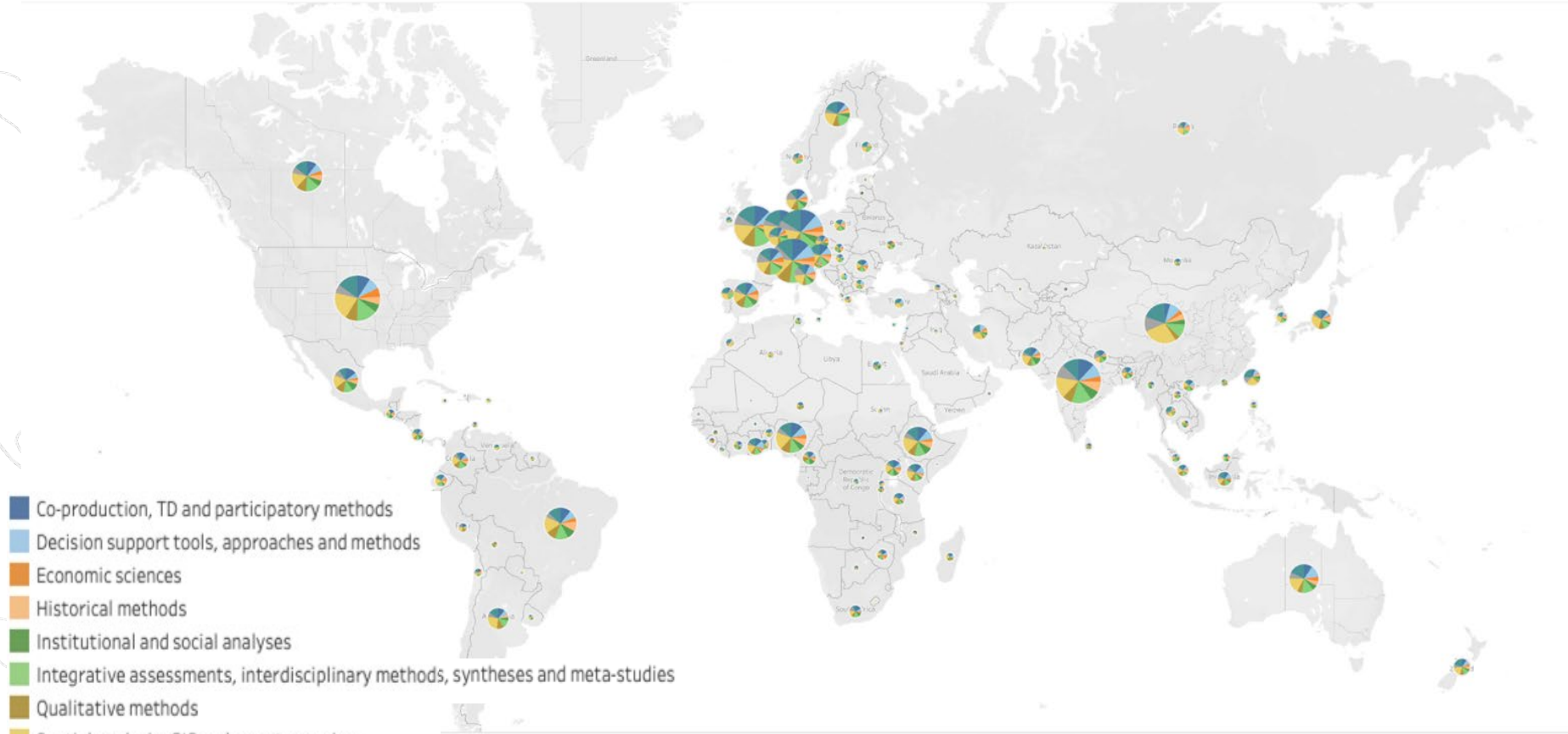
*Coordinating, inspiring, networking, enabling, summarizing & supporting*

- **2672 members across 110 countries** (60/40 global north/south)
- **Scientific Steering Committee (SSC)**
- **International Programme Office (IPO)**
- **12 Working groups** (Global dryland SES, BeModelS, Shifting Cultivation, Telecoupling...more)
- **Nodal Offices** (Japan, Beijing, Taipei, Europe, MENA, West Africa, North America, Latin America)
- **Open Science Meetings**
  - **\*NEW\* Early-Career Network**



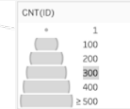


# Diversity of methods used by GLP community

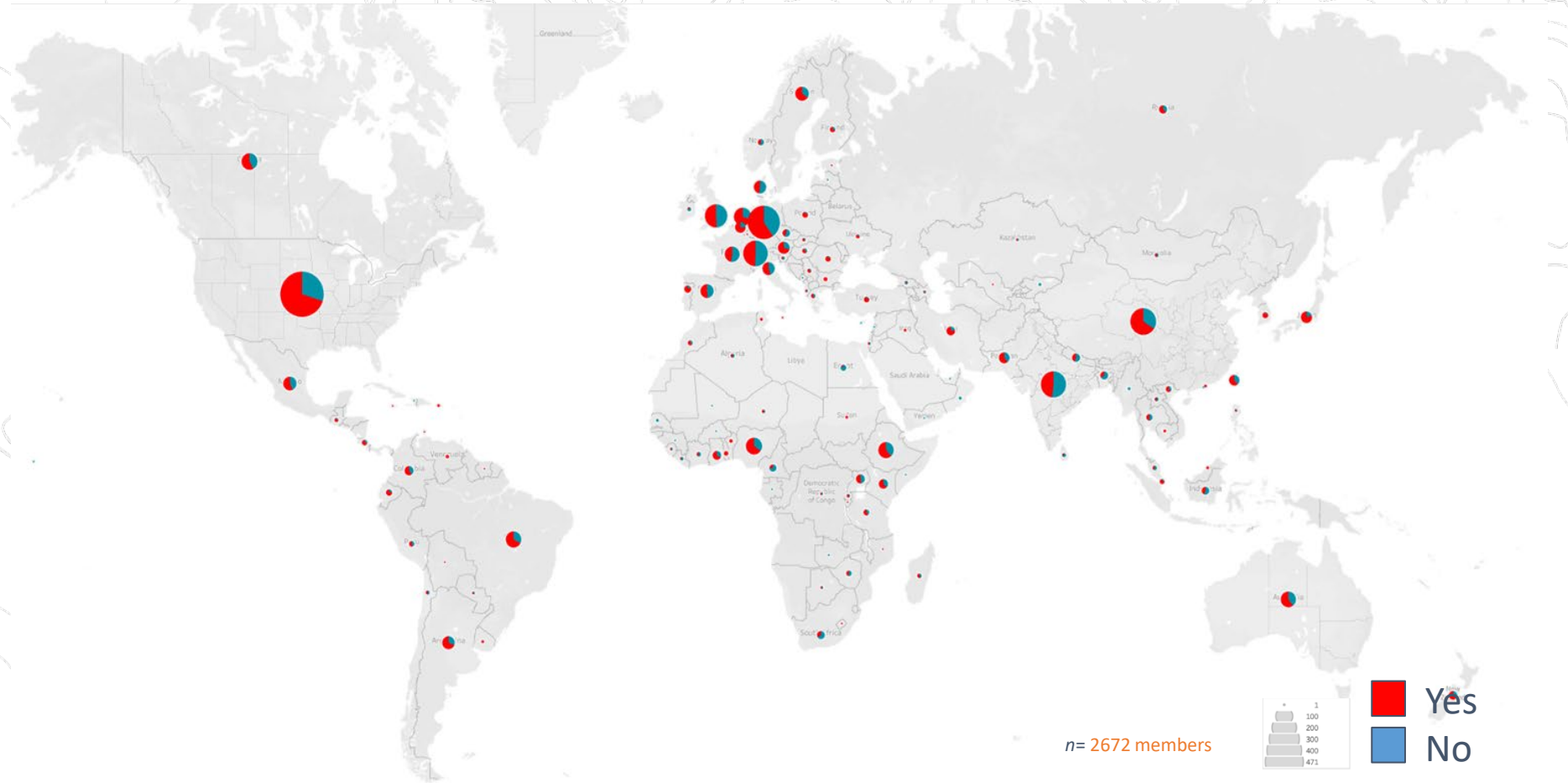


- Co-production, TD and participatory methods
- Decision support tools, approaches and methods
- Economic sciences
- Historical methods
- Institutional and social analyses
- Integrative assessments, interdisciplinary methods, syntheses and meta-studies
- Qualitative methods
- Spatial analysis, GIS and remote sensing
- Visualisations, scenarios and modelling
- Unknown

*n* = 2672 members



# Proportion of GLP members using “Spatial analysis, GIS and remote sensing”



## Global Land Programme's Headquarters Is UMD-Bound



DEPARTMENT OF  
GEOGRAPHICAL  
SCIENCES



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U.S. Global Change  
Research Program

IAIWG



An international research program that brings together more than 2,300 land scientists to advance studies of rapid changes to Earth's environment is moving its home to the University of Maryland on Feb. 1.

The Global Land Programme (GLP)'s shift from the University of Bern in Switzerland to UMD's Department of Geographical Sciences is made possible by a \$2.3 million National Science Foundation [grant](#) awarded to Associate Research Professor and

# International Programme Office

The International Programme Office (IPO) is hosted by the by the Department of Geographical Sciences at the University of Maryland in the United States of America.

Executive committee (EXCO)

SSC

U. Maryland (HOST)

C. Justice/ T. Loboda



**Rieley Auger (she/her)**

GLP  
United States



**Ariane de Bremond**

GLP  
United States



**Lauren Hertel**

GLP  
United States



**Ariani Wartenberg**  
LSS Lead



**Christopher Justice**

University of Maryland  
United States

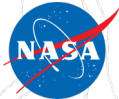


**Tatiana Loboda**

University of Maryland  
United States



U.S. Global Change  
Research Program



UNIVERSITY OF  
MARYLAND

DEPARTMENT OF  
GEOGRAPHICAL  
SCIENCES

SCIENTIFIC SPECIALIZATION

GENERALIZATION

TRANSFORMATION

CONTEXTUALIZATION

No. 1

Set agendas and facilitate synthesis in LSS



No. 3

Inform and support science-based policy on land



No. 2

Enable production of cutting-edge LSS worldwide



No. 4

Build capacity of LSS community to deliver inclusive solutions-oriented science



A global network enabling research for sustainable development of coupled human-environmental land systems

# Roadmap

- Global Land Programme (brief history, status update)
- Recent activities/science plan/emerging themes
- OSM!
- Up and coming challenges for land system science | what role for science?



Science Plan and  
Implementation Strategy  
2024-2028

## Structure of the Science Plan



# Our research agenda

## 1. Descriptive and Explanatory [What is, has been, and will be]

- **Characterizing** land systems and their dynamics (the temporal dynamics and spatial patterns of land cover and land use, land management, their changes)
- **Identifying** causes and moderating factors of land system dynamics and human-environmental outcomes; developing scenarios for the future of land systems
- **Estimating** the impact of land system change on ecological and Earth system functioning
- **Evaluating** land systems as complex systems with non-linearities, feedbacks, and path dependencies.

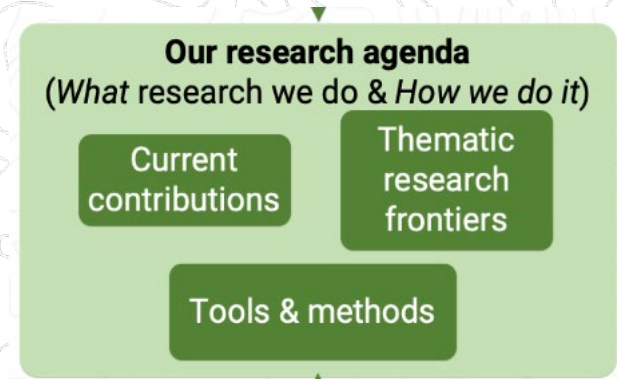




# Our research agenda

## 2. Normative [What should be]

- **Understanding normative agendas:** what do people want or claim about, in, for or from land systems, what do different people or groups value, what are the conflicts or potential convergences between different benefits, beneficiaries, values, and aims
- **Conducting normative research:** how can we support identifying and deciding on goals and priorities? What approaches and tools can LSS propose to create scenarios, envision, forecast, and negotiate land futures?



# Our research agenda

## 3. Transformative [How do we get there]

- Building pathways for transformation: how to identify and foster pathways through which land systems can maintain or regain (social-)ecological integrity and contribute to broader sustainability transformations





Science Plan and  
Implementation Strategy  
2024-2028

# Thematic research frontiers

## 4.2.1 Measuring and characterizing subtle changes in land cover and specific land use practices

New remote sensing data and methods to monitor land system change

Characterizing land management

## 4.2.2 Evaluating causality in LSS and the coverage and effectiveness of land system interventions

## 4.2.3 Evaluating the impacts of land system changes on ecological and Earth system functioning



Science Plan and  
Implementation Strategy  
2024-2028

# Thematic research frontiers

**4.2.4 Land systems as wicked (complex and messy) problems**

**4.2.6 Pathways for transformation and stewardship of land systems for sustainability**

**4.2.5 Power, politics, and justice**



Science Plan and  
Implementation Strategy  
2024-2028

# Transversal challenges to improve LSS

- Generalizability and knowledge synthesis
- Interactions across places, scales and sectors
- Overcoming geographic biases
- Diversity and plurality of meanings and values

# Ten facts about land systems for sustainability

## FACTS about land systems:

## CHALLENGES for sustainability:

## IMPLICATIONS for governance and practice:

- |           |   |   |   |
|-----------|---|---|---|
| <b>1</b>  | <b>Multiple values and meanings</b>                 | ▶ | Notions of land degradation and restoration are socially constructed and contested                  |
| <b>2</b>  | <b>Land as complex system</b>                       | ▶ | Consequences are difficult to foresee and trace   |
| <b>3</b>  | Irreversibility & path-dependence                   | ▶ | Loss of option value, shifting baselines, no return to original state                               |
| <b>4</b>  | Large impacts of small footprints                   | ▶ | Spillovers may be more important than direct impacts  |
| <b>5</b>  | Distant connections                                 | ▶ | Solving local problems can displace issues elsewhere  |
| <b>6</b>  | <b>Used planet</b>                                  | ▶ | No "free" land that does not already provide benefits   |
| <b>7</b>  | Prevalence of trade-offs                            | ▶ | Prioritizing a single goal such as carbon nearly always reduces other benefits for some             |
| <b>8</b>  | Multiple, overlapping, contested land tenure claims | ▶ | Identifying decision-makers and policy recipients is complicated                                    |
| <b>9</b>  | Unequal distribution of control and benefit         | ▶ | Interventions always have distributional consequences   |
| <b>10</b> | <b>Multiple dimensions of justice</b>               | ▶ | Governance processes that do not acknowledge distinct forms of justice will be considered as unjust |

### More sustainable and just solutions require:

- ▶ **Acknowledging multiple perceptions, beliefs and values, multiple visions of justice, and power differentials**
- ▶ **Developing contextual and adaptive solutions, avoiding silver bullets and "one-size-fits-all" panaceas**
- ▶ **Considering spatial and temporal spillovers**
- ▶ **Preventing undesired irreversible impacts**
- ▶ **Fostering synergies but also acknowledging and mitigating unavoidable tradeoffs**
- ▶ **Explicitly addressing inequalities and acknowledging unclear land tenure**



## '10 Facts' Explored in Meeting Hosted by UK's Royal Society

Rebecca

PNAS

PERSPECTIVE | SUSTAINABILITY SCIENCE

## Ten facts about land systems for sustainability

Patrick Meyfroidt, Ariane de Bremond, Casey M. Ryan, and Erasmus K. H. J. zu Ermgassen

Edited by Gretchen Daily, Department of Biology, Stanford University, Stanford, CA; received June 7, 2021; accepted November 13, 2021

February 7, 2022 | 119 (7) e2109217118 | <https://doi.org/10.1073/pnas.2109217118>



What do the "10 Facts" about land systems mean for land system policy design and implementation?

How do they influence policy goals, policy processes and the governance scale?



January 2024

# Roadmap

- Global Land Programme (brief history, status update)
- Recent activities/science plan/emerging themes
- **OSM!**
- Up and coming challenges for land system science | what role for science?



A stylized landscape illustration. In the foreground, there are green mountains with a white snow-capped peak. Behind the mountains is a blue sky with a sun rising over the horizon. The sun is orange and yellow, with rays extending upwards. The sun is partially obscured by the mountains. The text "OAXACA, MEXICO" is written in white on the sun. The background consists of blue and green wavy lines representing water and land. The entire scene is framed by a green border with decorative patterns.

OAXACA, MEXICO

# GLOBAL LAND PROGRAMME

## 5<sup>TH</sup> OPEN SCIENCE MEETING | NOV 5-7 2024

Pathways to Sustainable and Just Land Systems

# Oaxaca de Juárez, México



Nestled in the Oaxaca Valley, Oaxaca de Juárez is a culturally vibrant city that offers a unique setting to cultivate discussions on sustainable and just land systems. This historic city boasts a blend of indigenous traditions, colonial architecture, and local gastronomy that provides a rich and diverse cultural experience.





Monday Nov 4,  
Nov 4, 2024  
2024

Tuesday Nov 5, 2024

Wednesday Nov 6, 2024

Thursday Nov 7, 2024

Friday Nov 8,  
Nov 8, 2024  
2024

Morning

Pre-Program Meetings

Opening Plenary Keynotes  
8:30 AM - 10:30 AM

Keynotes & Panel Discussion  
Discussion  
8:30 AM - 10:00 AM

Thematic Keynotes  
9:00 AM - 10:15 AM

Field Trips  
Workshops/  
Training  
Sessions

**Early Career  
Network  
Meeting**

Presentation Sessions 1R  
11:15 AM - 12:45 PM

Presentation Sessions 3R  
10:45 AM - 12:15 PM

Presentation Sessions 6R  
10:45 AM - 12:15 PM

Working Group Meetings

Lunch

Afternoon

Nodal Office Meetings

Presentation Sessions 2R  
2:00 PM - 3:30 PM

Presentations Sessions 4R  
1:30 PM - 3:00 PM

Interactive Sessions 3N  
1:30 PM - 3:00 PM

**NASA LCLUC  
Meeting  
(invite-only)**

Interactive Sessions 1N  
4:15 PM - 5:45 PM

Presentation Sessions 5R  
3:15 PM - 4:45 PM

Presentation Sessions 7R  
3:30 PM - 5:00 PM

FABLE network meeting (invite-only)

Posters  
5:45 PM - 7:30 PM

Interactive Sessions 2N  
5:15 PM - 6:45 PM

Closing Session  
5:30 PM - 7:00 PM

\*\*other meetings as arranged

Evening

Welcome

Free Time

GLP Fiesta /Dinner

Free Time

## Themes

Paralleling [GLP's 2024-2028 Science Plan](#) three themes inspire these conversations:

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The State of the World

1. **Descriptive and Explanatory [What is, has been, and will be]**
- 

Imagining the Future(s)

2. **Normative [What should be]**
- 

Enabling Transformative Changes

3. **Transformative [How do we get there]**
- 



- 90 Sessions (Research & Innovative) + posters
- Over 700 abstracts under review
- WB High/Middle/Low income distribution of submissions:

HI	532
MI	216
LI	26

- Registration opens April 20 (*on or around*)



[www.glp.earth](http://www.glp.earth)



Wyss Academy for Nature,  
UBC, UMD, NSF...others..

<https://event.fourwaves.com/osm2024>

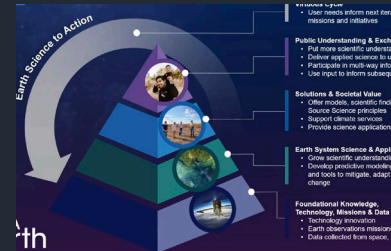


# Wrap up

- Words I heard yesterday – global challenges, international collaboration, interdisciplinary, societal benefit, human impacts and feedbacks and interconnectedness, thriving world, translational, actionable science, evidence base, knowledge to decisions, open data  
→ open science
- New directions and approaches at NASA: Earth Action ROSES A .1

*“we want to encourage people to ‘cross the layers of the pyramid’ wherever they can”*

- = Land system science!



- Tom Wagner

**Relationship between GLP and LCLUC is more important than ever**







# Five dimensions that guide current and future Land System Science:



# Land system science and land policy: Side by side or engaged together?

March 2019



**GLOBAL LAND PROGRAMME**  
**5<sup>TH</sup> OPEN SCIENCE MEETING | NOV 5-7 2024**  
Pathways to Sustainable and Just Land Systems

OAXACA, MEXICO

What are the knowledge needs of societal partners concerned with land issues?

Knowledge gaps,  
untapped research  
and mutual blank  
spots

How can land science provide knowledge that can help to understand way to navigate trade-offs & maximize synergies between competing claims on land resources?

# Wrap up

Land use is a major force in biological systems >> importance of studying land systems as social-ecological systems (with humans; Anthropocene)

Land systems are increasingly linked across places and scales (telecouplings etc), interactions between local and regional and global dynamics

Middle-range theories is a tool for generalizing and can integrate processes at different scales

Meyfroidt et al. 2018 *Global Environmental Change*  
<https://doi.org/10.1016/j.gloenvcha.2018.08.006>

Meyfroidt, de Bremond, Ryan et al. (2022) *PNAS*  
<https://doi.org/10.1073/pnas.2109217118>  
<http://10facts.glp.earth/>

Community of land system scientists: Global Land Programme

# Why systems change?

## Events

Above the waterline are the events that we can see or experience.

## Example

A species of bee going extinct. The area of habitat lost in one year.

## Patterns

Just below the waterline we can detect patterns - of similar events in different places and at different times.

Declining indices of biodiversity, accelerating rates of deforestation across the world.

## Structures

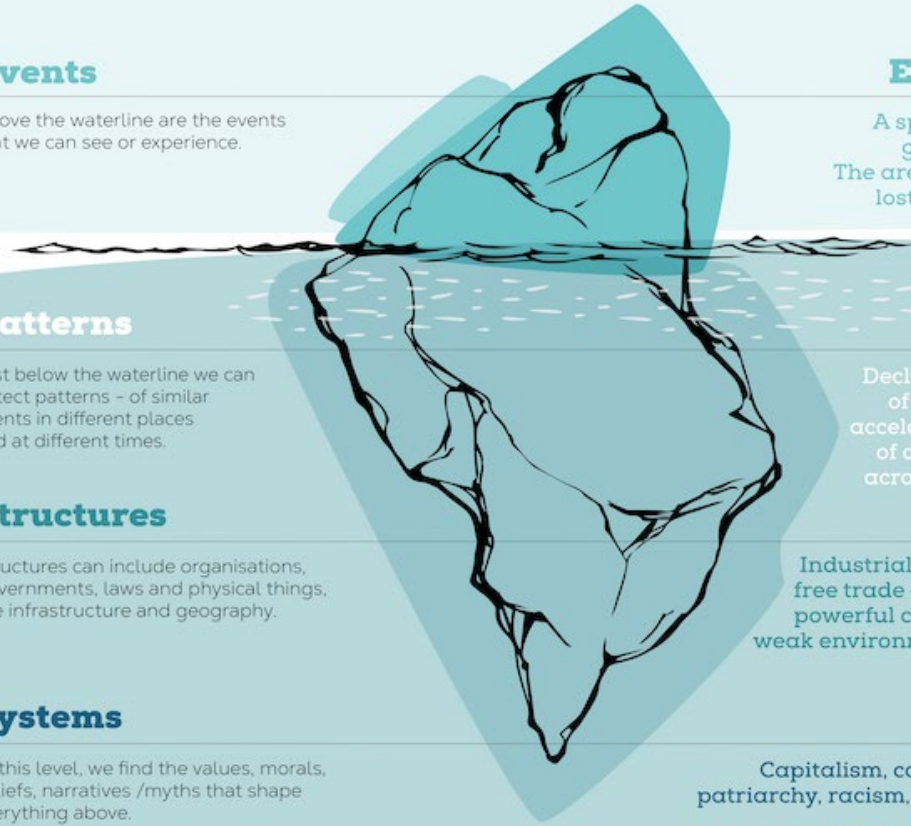
Structures can include organisations, governments, laws and physical things, like infrastructure and geography.

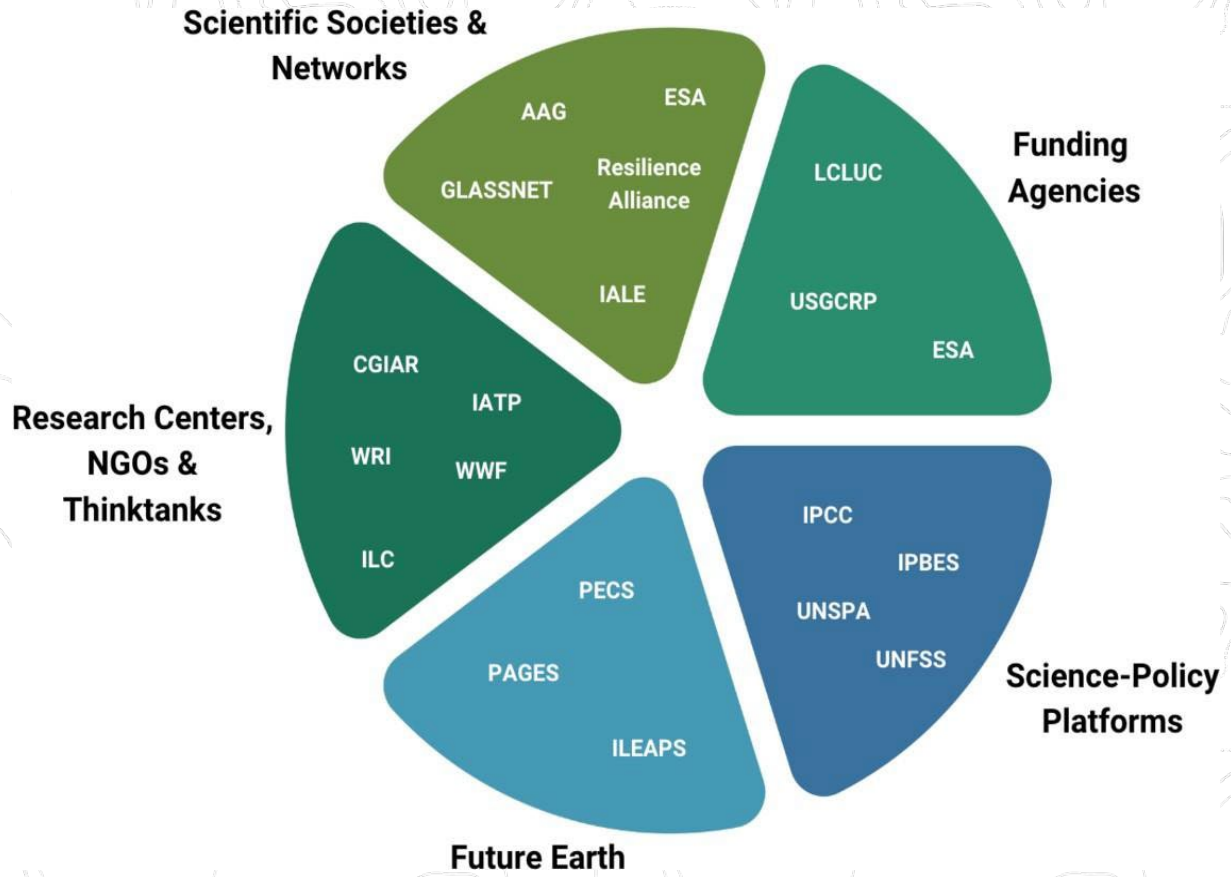
Industrial agriculture, free trade agreements, powerful corporations, weak environmental laws.

## Systems

At this level, we find the values, morals, beliefs, narratives /myths that shape everything above.

Capitalism, consumerism, patriarchy, racism, colonialism.





**Scientific Societies & Networks**

**Funding Agencies**

**Science-Policy Platforms**

**Future Earth**

**Research Centers, NGOs & Thinktanks**

AAG

ESA

GLASSNET

Resilience Alliance

IALE

LCLUC

USGCRP

ESA

CGIAR

IATP

WRI

WWF

ILC

PECS

PAGES

ILEAPS

IPCC

IPBES

UNSPA

UNFSS

# LAND AS COMPLEX SYSTEMS

NO. 2



Land systems are complex and behave in unexpected ways

Policy interventions, intended to solve a particular problem, can fail when they ignore this complexity

=> unintended harm to ecosystems, and their services and goods to people that ensure human well-being

NO. 1

# MULTIPLE VALUES AND MEANINGS

## LAND HAS MULTIPLE MEANINGS AND VALUES

Land provides food, energy, and raw materials to human societies

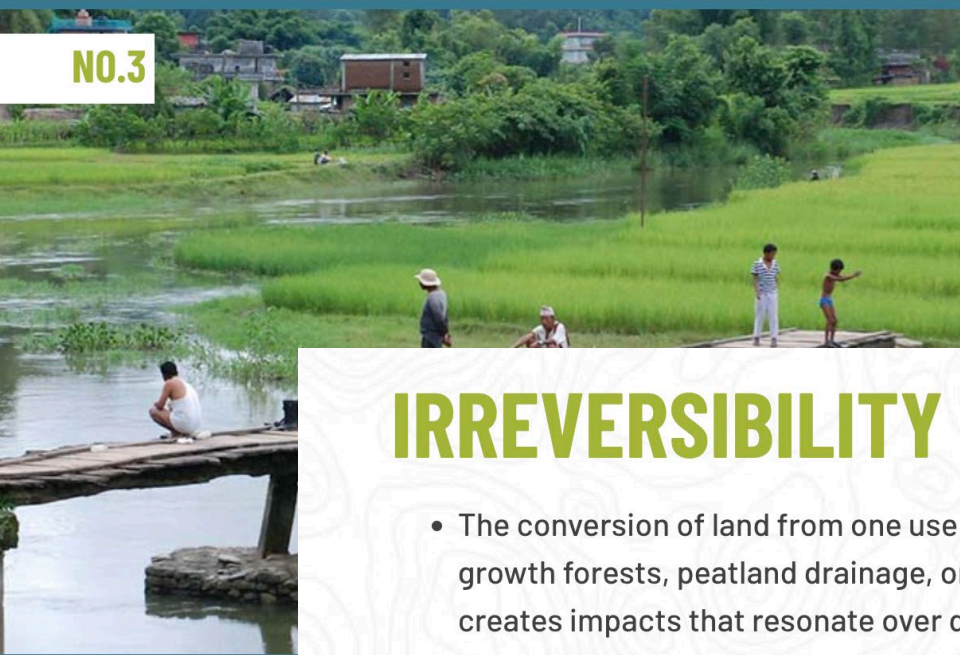
Understandings of land are also deeply cultural and symbolic

Even as we see land changes differently, some changes -- such as soil erosion have observable negative impacts



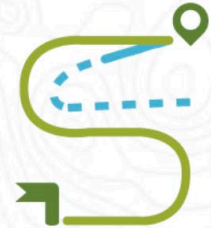


NO.3



## IRREVERSIBILITY & PATH DEPENDENCE

- The conversion of land from one use to another, such as clearing old-growth forests, peatland drainage, or converting farmland to urban area, creates impacts that resonate over decades or centuries.
- Though crucial, restoration efforts may not bring land back to a state that truly matches pre-conversion conditions. Once such “lock-in” situations develop, land systems become less resilient.
- Perceptions of land as an inherently-plentiful resource, as seen in the huge enthusiasm for land-based climate solutions, run counter to ecological reality.

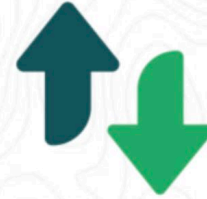


NO.7



## PREVALENCE OF TRADE-OFFS

- Land uses deliver a range of benefits, but any specific piece of land cannot deliver them all simultaneously.
- Trade-offs among uses are ubiquitous.



- Some trade-offs—such as a view prevalent in the Global North prioritizing tree planting, without acknowledging the impact on communities directly affected—demonstrate that different groups in different locations, or across generations, experience benefits or dis-benefits from land use differently.
- Land use decisions involve value judgments. Often land use that is economically beneficial in the short term, or the land use valued by those in power, takes precedence.