

Global and Regional Challenges Benefiting from Systems Analysis

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**Systems Analysis
and the Americas**



Complex Global Challenges



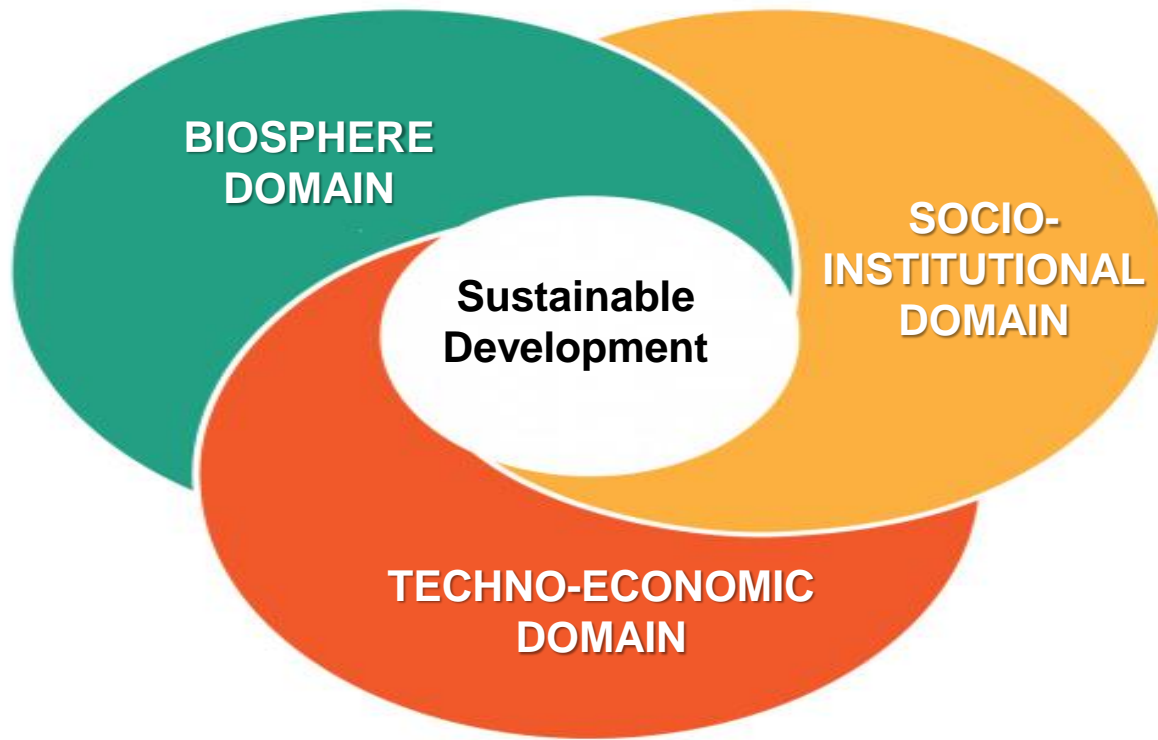
The urgent **Global Challenges** of our times include several that already existed decades ago, as well as new and emerging ones...



Discuss how **Systems Analysis** can bridge sectors and actors, as well as temporal, social, and spatial scales to facilitate the task of policy and decision makers to address them.



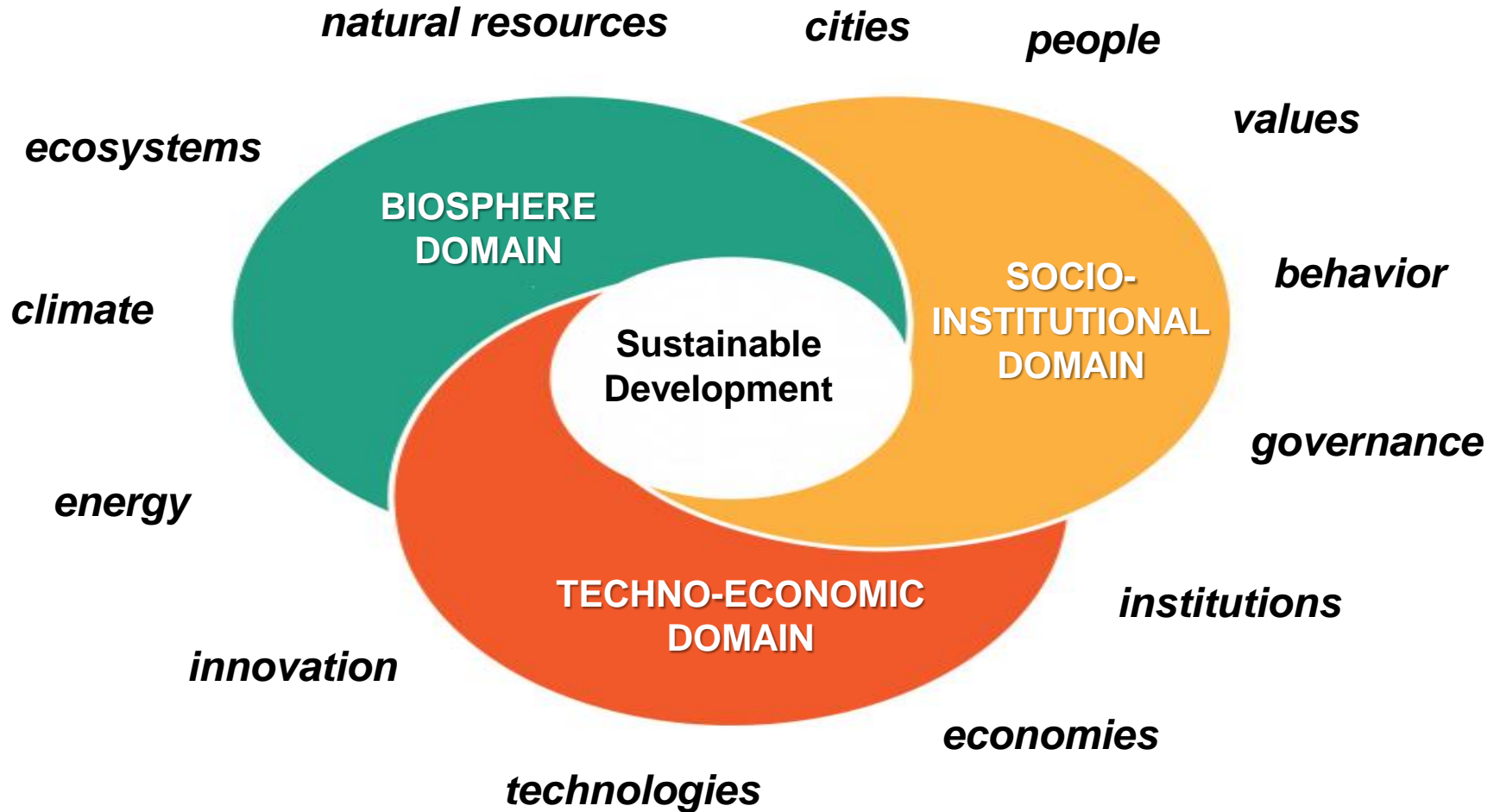
Complex Global Challenges



Relevant challenges to sustainable development in three interlinked domains



Complex Global Challenges



Many are persistently around for decades...

Many others emerging in recent years...

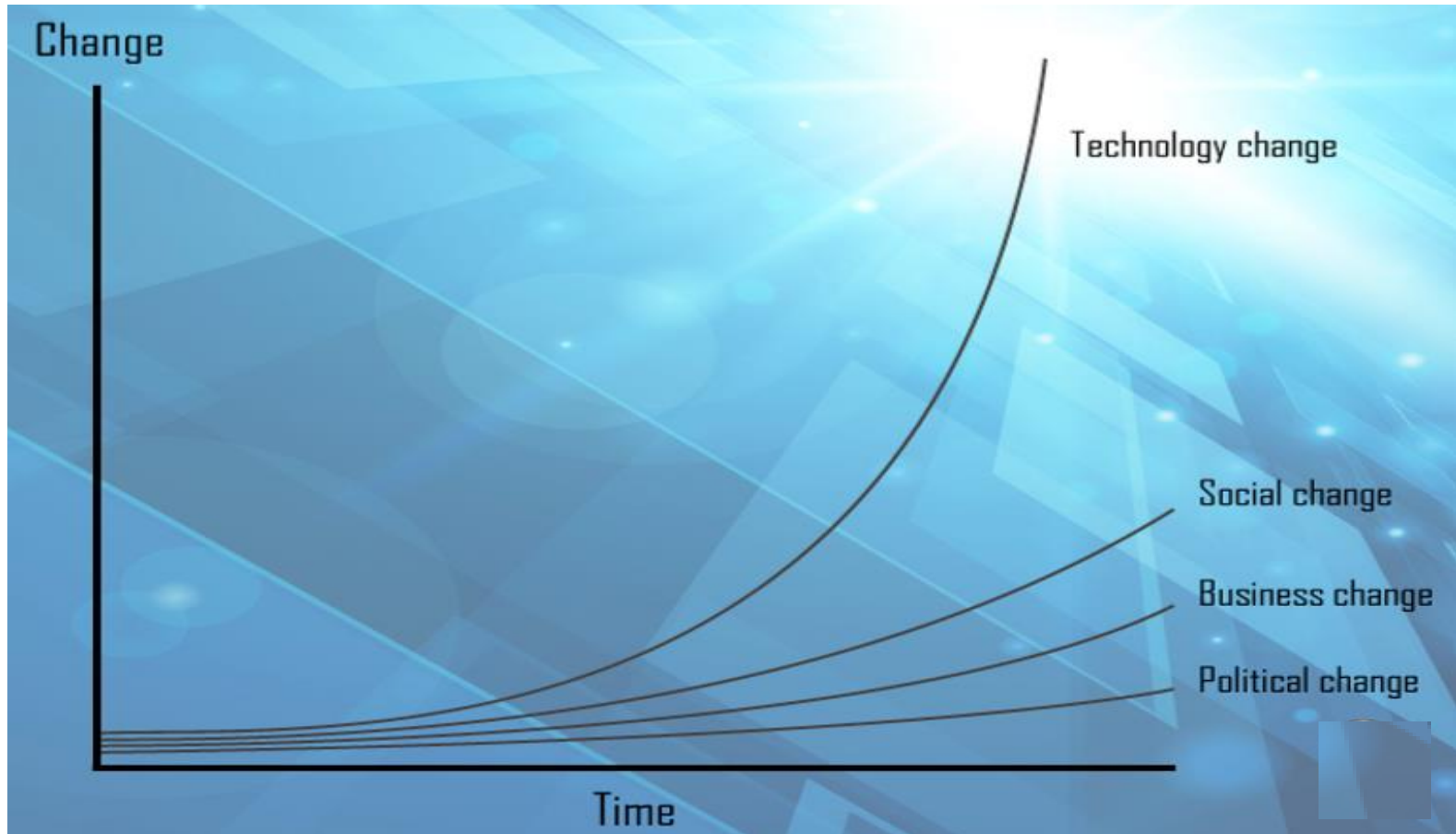


Complex Global Challenges

Technology has been a major source of progress to humanity...

...but also a major source of challenges and risks!

A disconnect between the pace of change - exponential x slow



Source: Pieter Haasnoot - upnext.nl

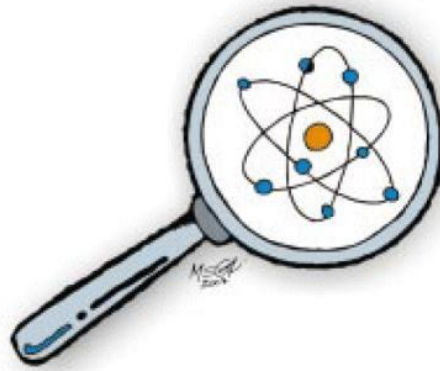


Complex Global Challenges

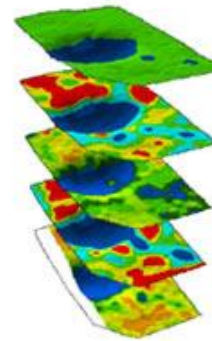
Bio



Nano



Geo



Data



Complex Global Challenges



DATA EXPLOSION



Complex Global Challenges



INTERNET SOCIAL MEDIA

Wonderful opportunities...

...not without problems.

#FakeNews

#Relations

#Trust

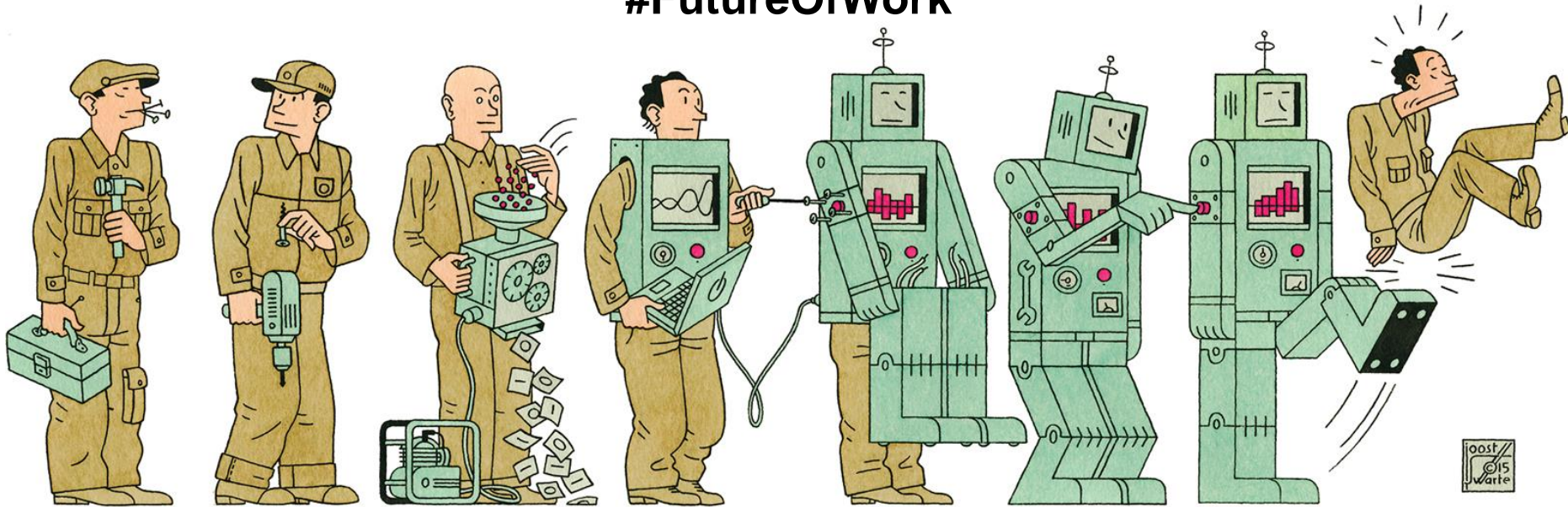
EMPOWERMENT



Complex Global Challenges

Wonderful opportunities...
not without problems...

#FutureOfWork



Source: Technology Review

ROBOTICS

Complex Global Challenges

Synthetic Biology, Epigenetics and Microbiome...



GENOME EDITION

Source: Pieter Haasnoot - upnext.nl



Complex Global Challenges



AGING POPULATION



Complex Global Challenges



CITIES AND COMMUNITIES



Complex Global Challenges

Global Order?

Less predictable world...

Weakening multilateral dialogue...

Too many forces at play...

#governance #institutions



Complex Global Challenges

We lack good metrics to capture the complexity and the breadth of the changes occurring...



The world may be improving better than most pessimists know...

Future dangers may become worse than most optimists are willing to accept...



Complex Global Challenges

Science is our best source of credible metrics...

Sectoral and fragmented approach to research and innovation...

Disciplines - Departments - Programs



1 – Energy

2 – Water

3 – Food

4 – Environment

5 – Poverty

6 – Health

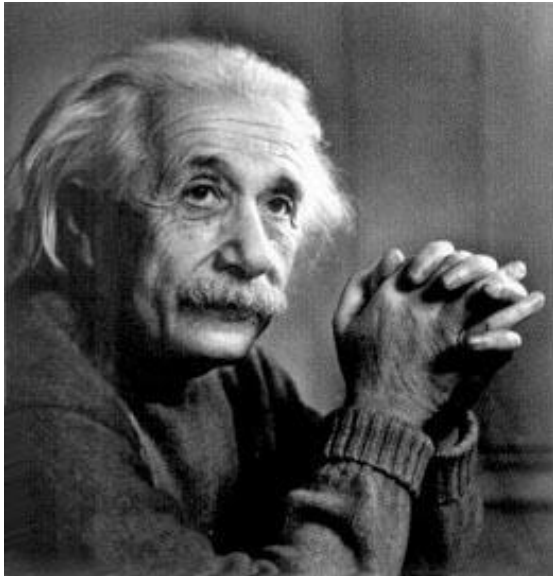
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Complex Global Challenges

Our capacity to address the complexity and breadth of the changes occurring has been limited by several factors...

Mental Models – Patterns of Thought

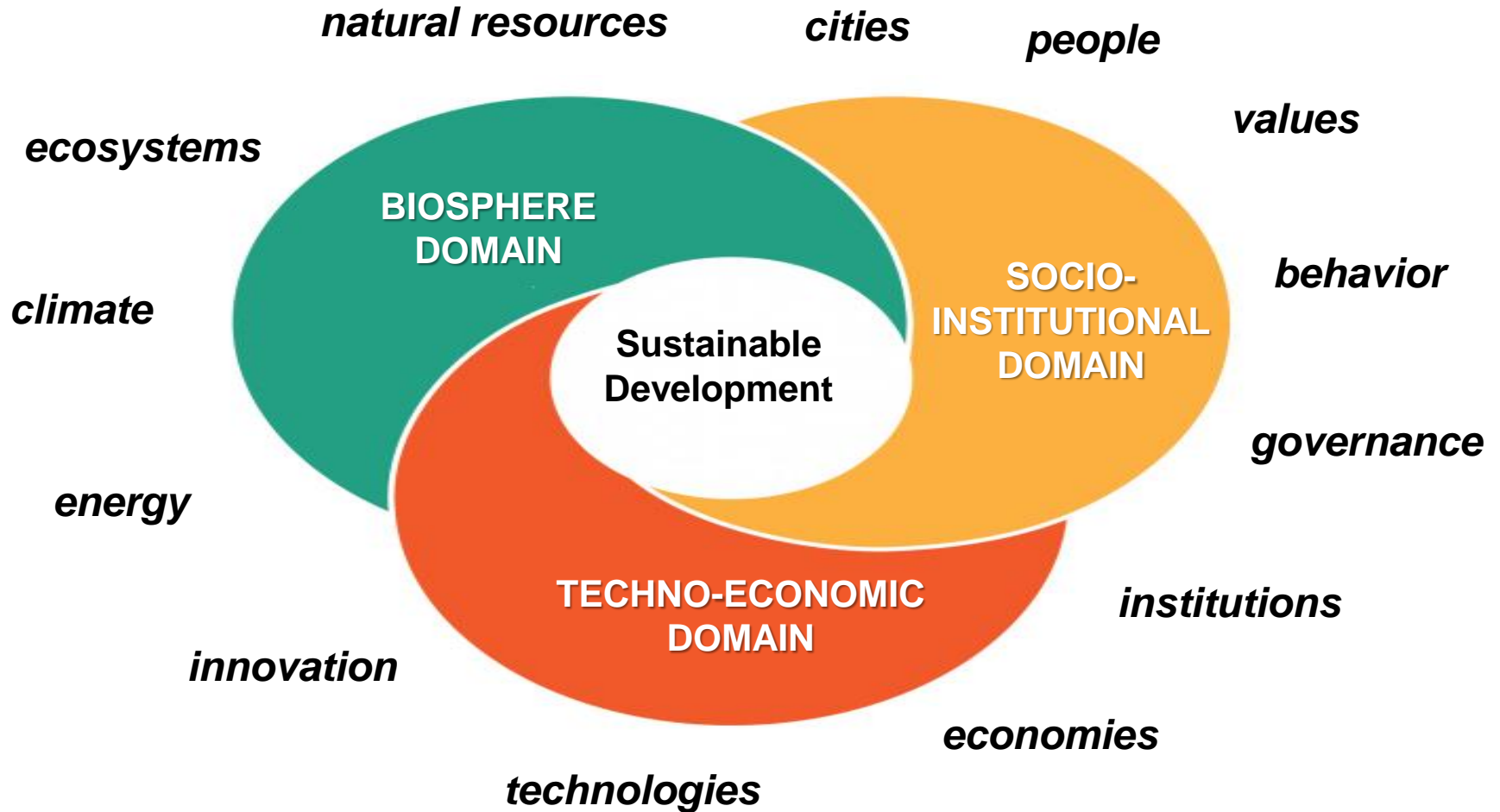


"Without changing our patterns of thought, we will not be able to solve the problems we created with our patterns of thought"

Albert Einstein



Complex Global Challenges



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Many others emerging in recent years...



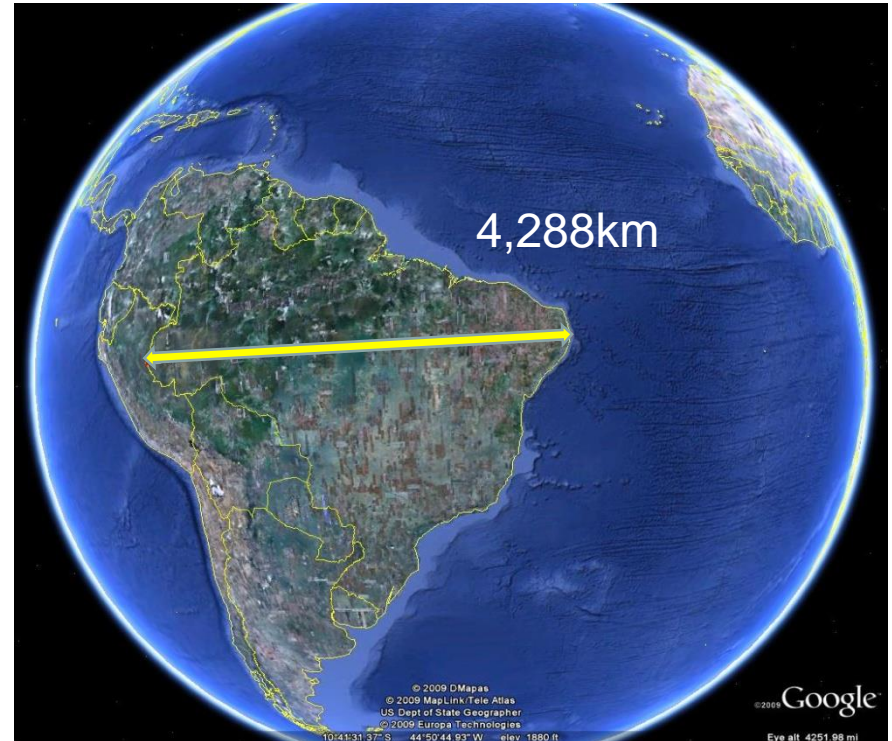
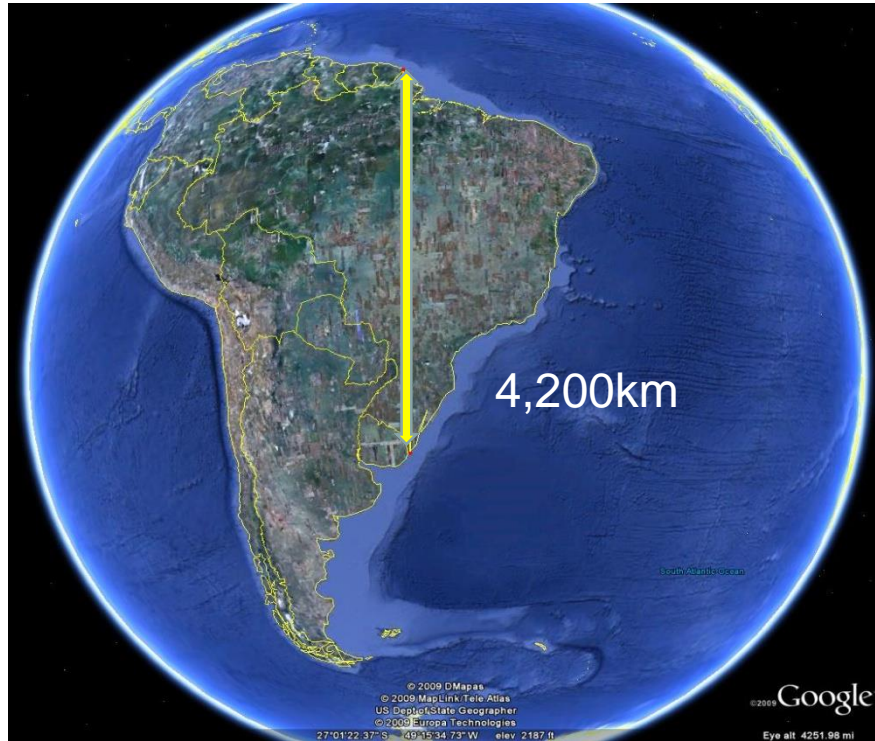
Systems Analysis and Nexus Thinking

*Help us understand a cohesive
conglomeration of interrelated and
interdependent parts that are either
natural or man-made.*



Systems Analysis and Nexus Thinking

Brazil: Continental Size and Environmental Diversity



Systems Analysis and Nexus Thinking

Important Food Producer

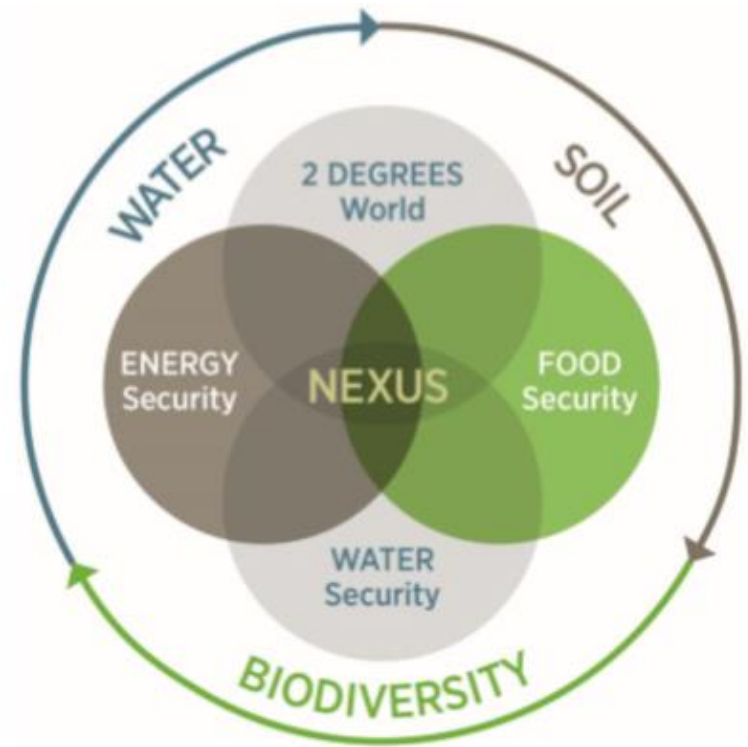
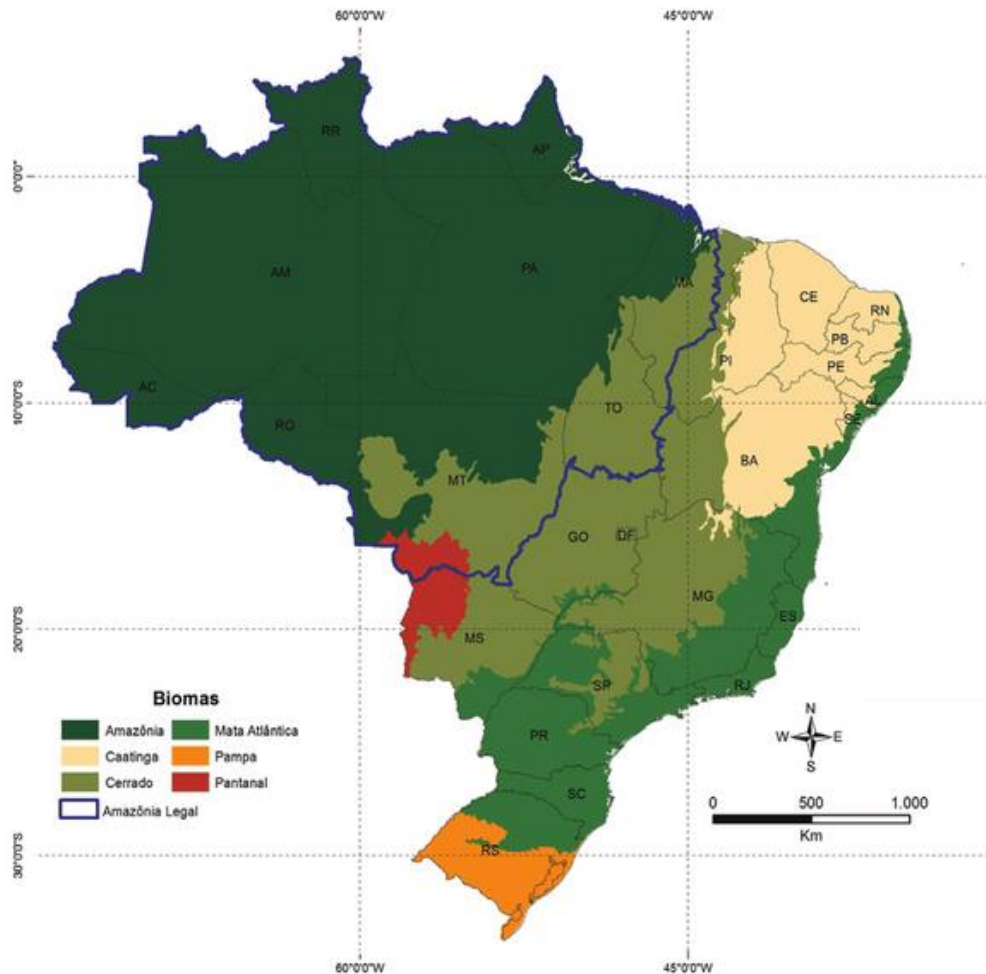
...

A Mega-diverse Country

It is estimated that Brazil contains greater biodiversity than any other country on Earth.



Systems Analysis and Nexus Thinking



The soil-water-energy-food
biodiversity-climate nexus

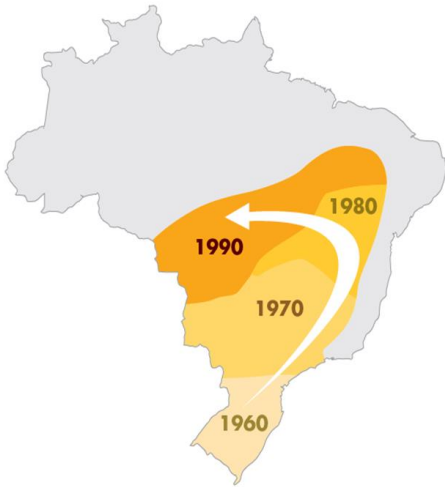
Müller et al. 2015



Systems Analysis and Nexus Thinking

1

EXPANSION



2

COMPETITIVITY



3

SUSTAINABILITY



4

MULTIFUNCTIONALITY

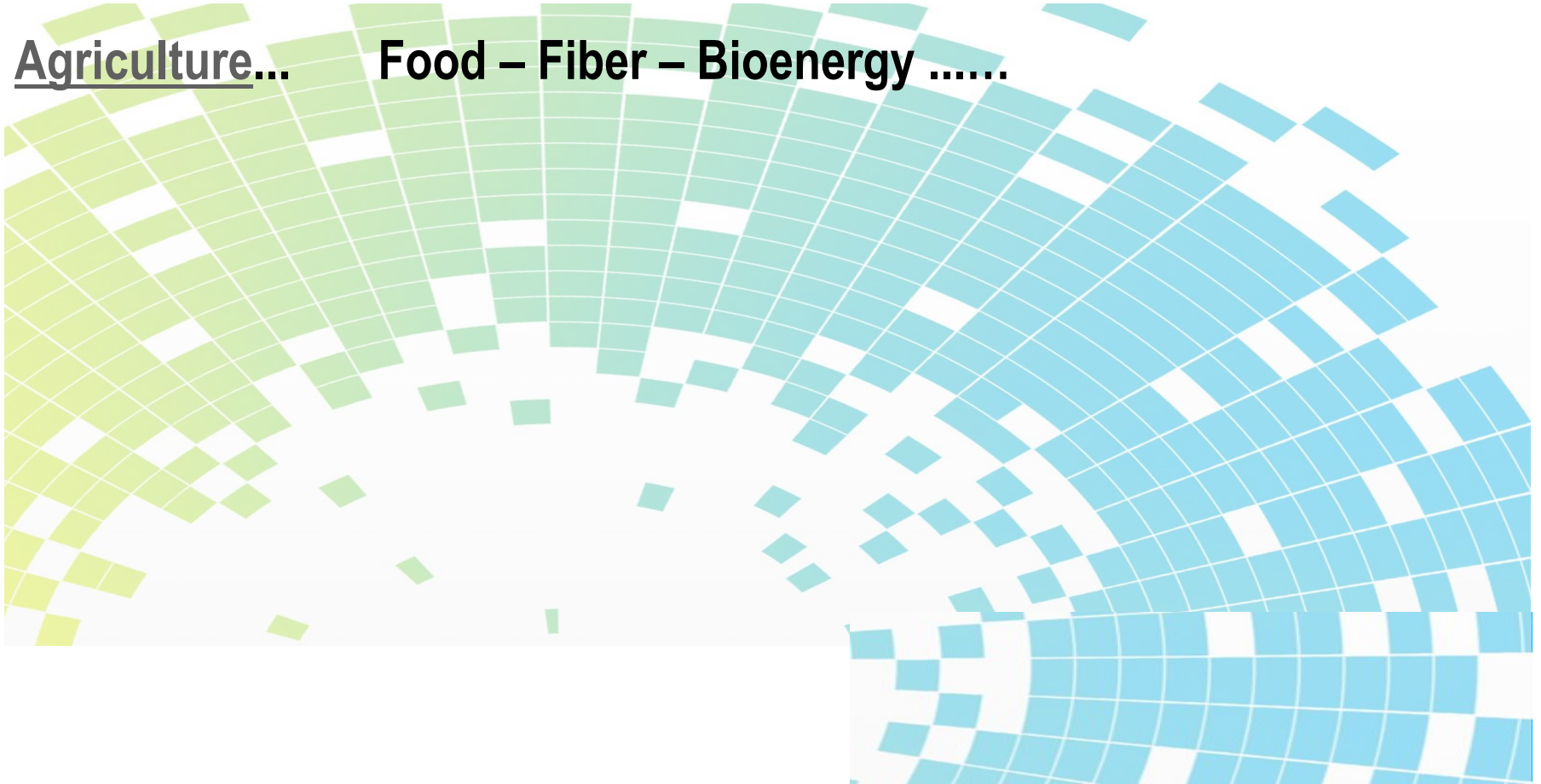
 SUSTAINABLE DEVELOPMENT GOALS



Systems Analysis and Nexus Thinking

Functionalities from Agriculture

Agriculture... Food – Fiber – Bioenergy



Systems Analysis and Nexus Thinking

Multiple Functionalities from Agriculture

Agriculture... Food – Fiber – Bioenergy ...

Agriculture... Food – Nutrition – Health ...

Agriculture... Environmental and Ecosystemic Services

Agriculture... Biomass – Biomaterials – Green Chemistry...

Agriculture... Organic – Agroecology – Agroforestry ...

Agriculture... Food – Culture – Tradition – Gastronomy – Tourism



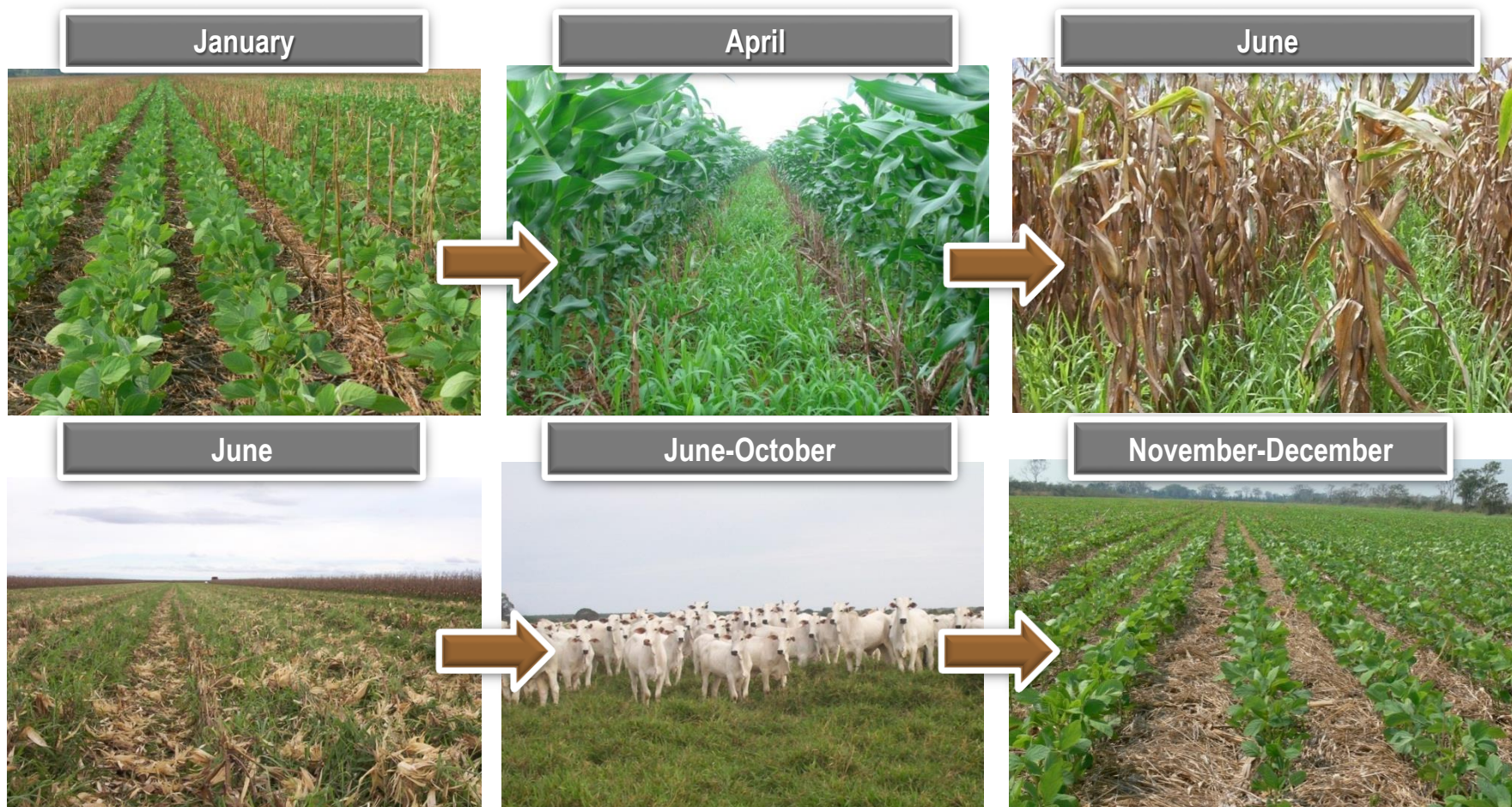
Reconcile Production and Conservation

Sustainable Intensification – Crop/Livestock/Forest



Systems and Nexus Thinking

Sustainable Intensification – Crop/Livestock/Forest



INTEGRATED SYSTEMS ARE BECOMING A NORM FOR RECOVERY OF DEGRADED LAND

14 MILLION HA OF INTEGRATED SYSTEMS, AND GROWING...

Photos: J.C.M. Sá



Sustainable Intensification of Land Use

Cycling crops and livestock – and adding trees...



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Sustainable Intensification of Land Use

Cycling crops and livestock – and adding trees...

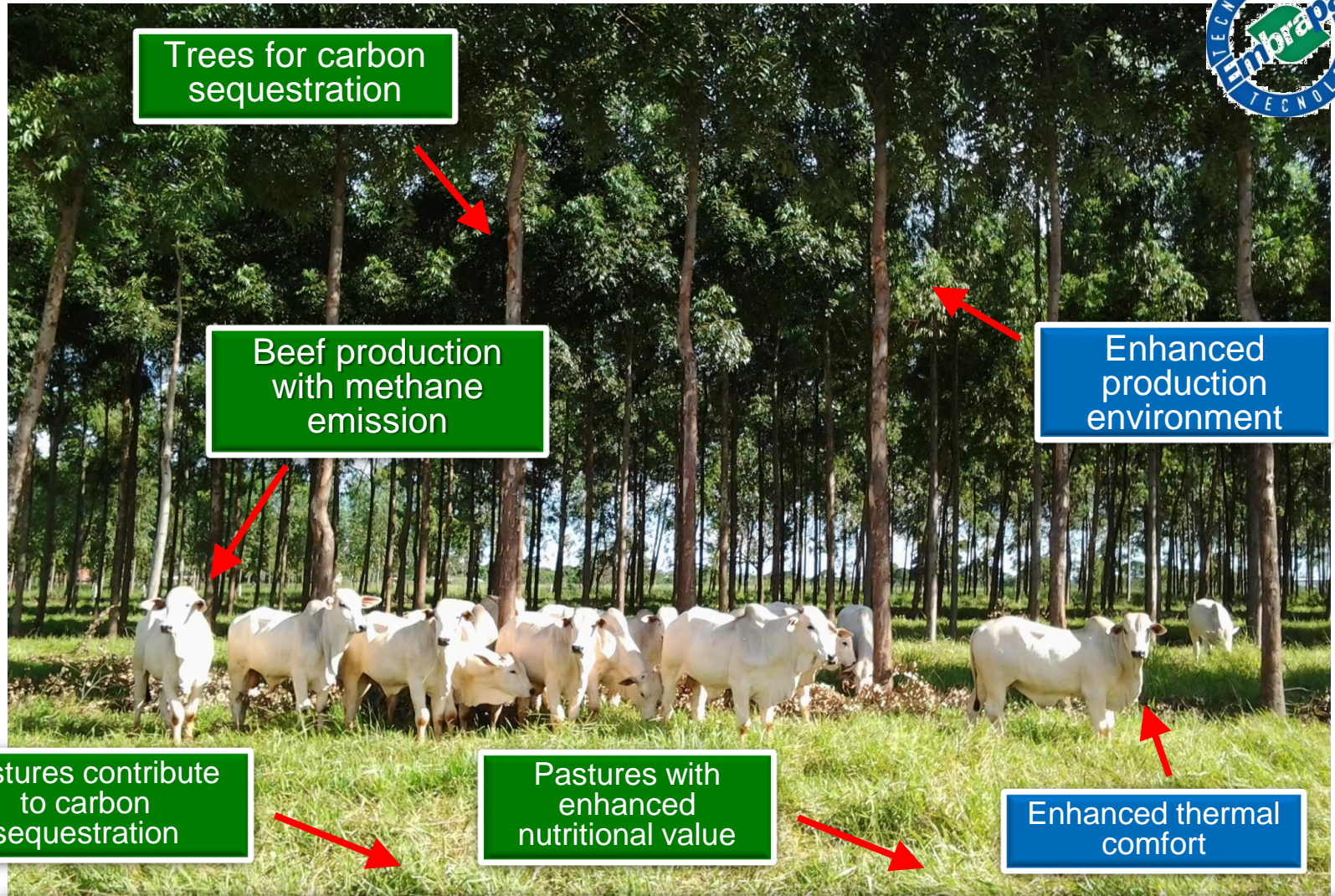


Sustainable Intensification of Land Use

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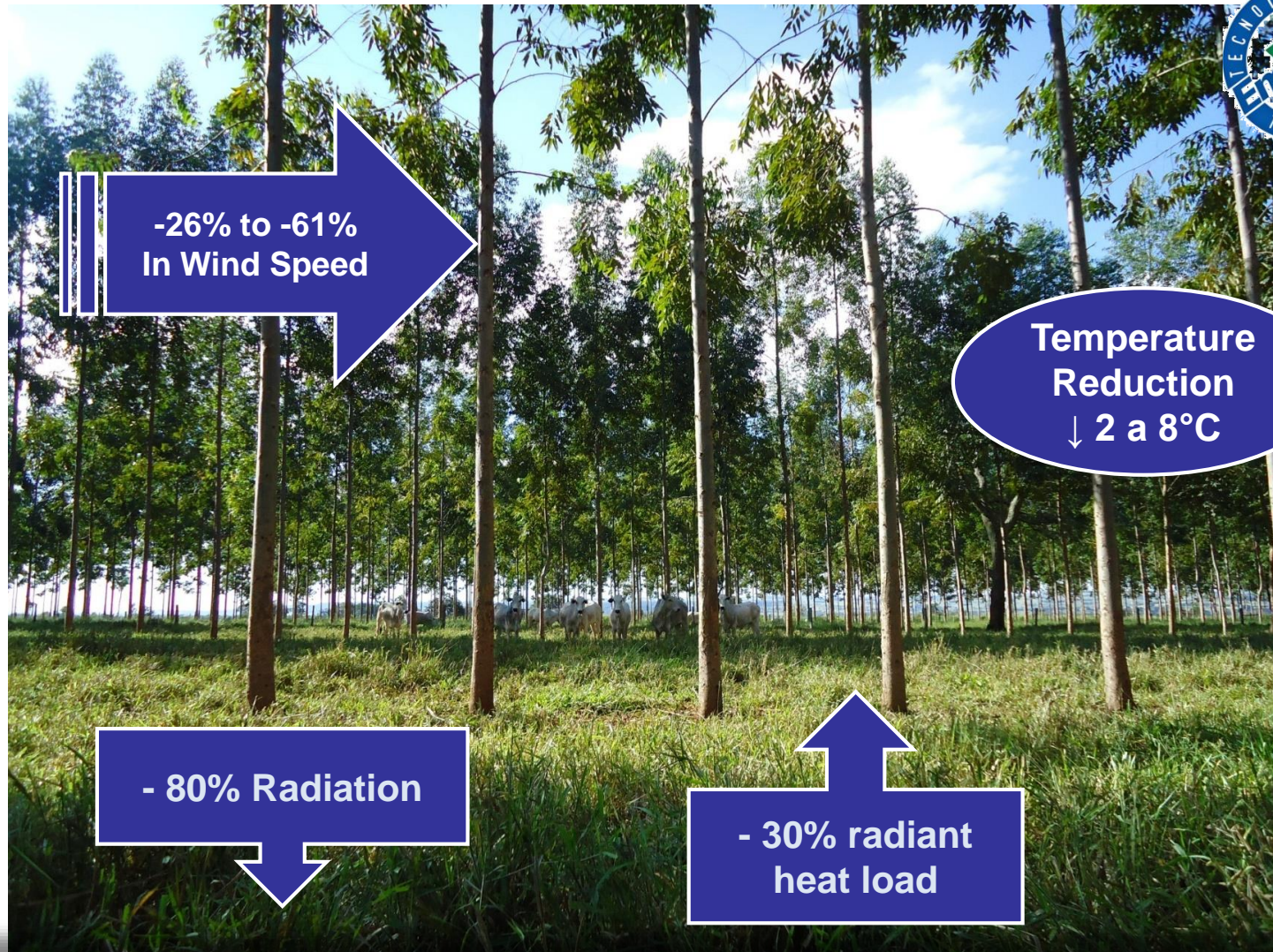
Improved Environment and Animal Welfare



METRICS FOR ENHANCED ENVIRONMENT AND ANIMAL COMFORT



Improved Environment and Animal Welfare



METRICS FOR ENHANCED ENVIRONMENT AND ANIMAL COMFORT



Low Emission, Sustainable Production



Carbon Neutral Beef

Conheça o conceito de produção de carne em sistemas sustentáveis, com neutralização das emissões de carbono.



FB.COM/AGROSUSTENTAVEL



CERTIFIED LOW CARBON PRODUCTION SYSTEMS



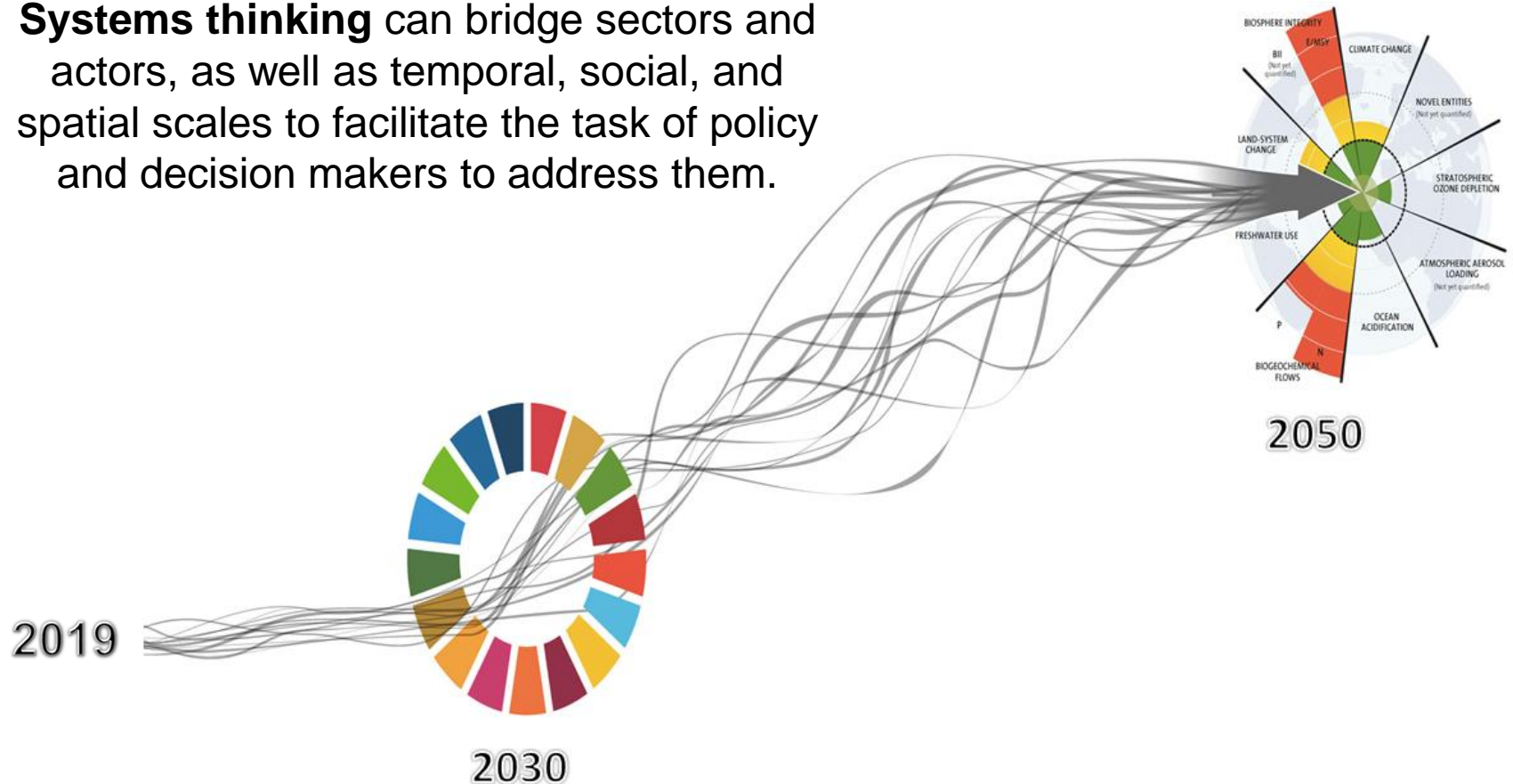


CONCLUSION



Systems Thinking and Sustainability

Systems thinking can bridge sectors and actors, as well as temporal, social, and spatial scales to facilitate the task of policy and decision makers to address them.



Source: Modified from J. Lokrantz/Azote



Systems Thinking and Sustainability

We need learners...



*“In a time of drastic change, it is the **learners** who will inherit the future.*

*The **learned** usually find themselves prepared for a world that no longer exists.”*

-- Eric Hoffer



Questions? *(and thanks!)*

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