



Future Earth Research for Global Sustainability

The Research Framework

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Some of the challenges we face

- Feeding 9 billion people within sustainable planetary boundaries
- Valuing and protecting nature's services and biodiversity
- Adapting to a warmer and more urban world
- Transitioning to low carbon societies
- Providing income and innovation opportunities through transformations to global sustainability
- Reducing disaster risks and build resilience
- Aligning governance with stewardship
- Global scientific capacity building

The challenges of global environmental change and sustainable development require some new approaches which are:

- *More international*
- *More integrated*
- *More collaborative*
- *Co-designed with users, funders...*
- *More responsive to society and grand challenges of sustainability*
- *Builds on the success of current international research programmes*



photos: www.dawide.com

Future Earth

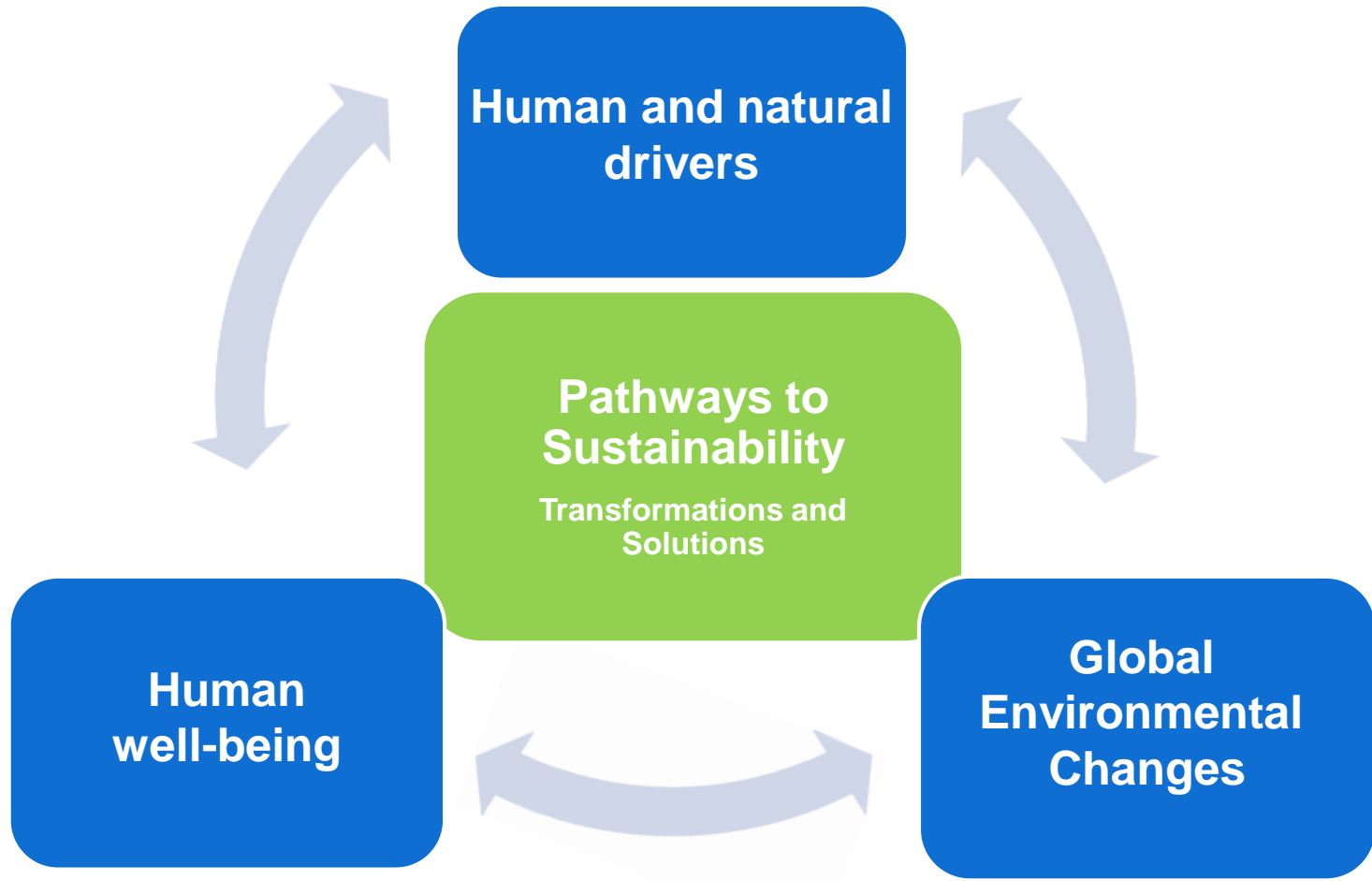
To provide the knowledge required for societies in the world to face risks posed by global environmental change and to seize opportunities in a transition to global sustainability

Future Earth: can we answer ...

How and why the global environment is changing, what are likely future changes, what the implications are for human wellbeing and other species, what choices can be made to reduce harmful risks and vulnerabilities and enhance resilience, and how this knowledge can support decisions and sustainable development?



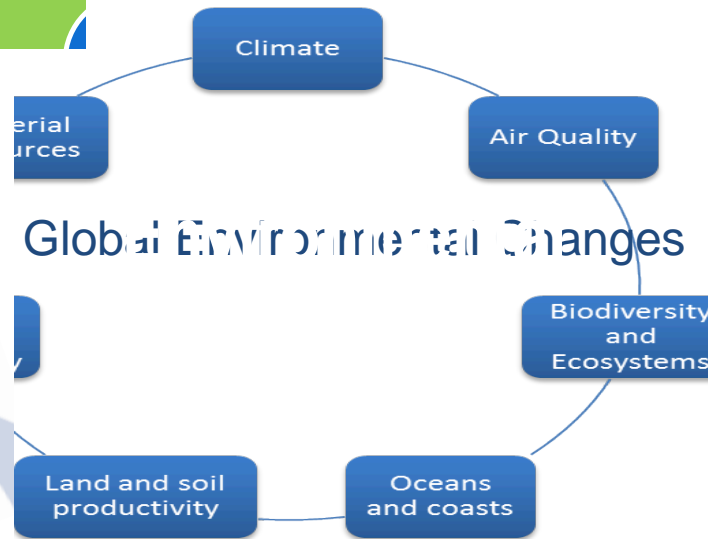
Future Earth conceptual framework



**Human and natural
drivers**

**Pathways to
Sustainability**
Transformations and
Solutions

**Human
well-being**



Criteria for Future Earth Research

- From fundamental to actionable Earth system research for global sustainability
- Answer complex questions that require international collaboration
- Co-design and co-production of knowledge
- Integrates natural, economic, engineering, arts, humanities and social sciences
- Regional to global scale



Drivers

Economic, demographic, Socio-Political, technical and cultural



Land use, resource management, ecosystems diversity and energy



Natural forcing factors
(sun, volcanoes etc.)

Pathways to Sustainability

Transformations and Solutions

Policy, Market, Behavioural, Technological, and Informational choices

Human well-being

Opportunities

Security

Empowerment

Livelihoods

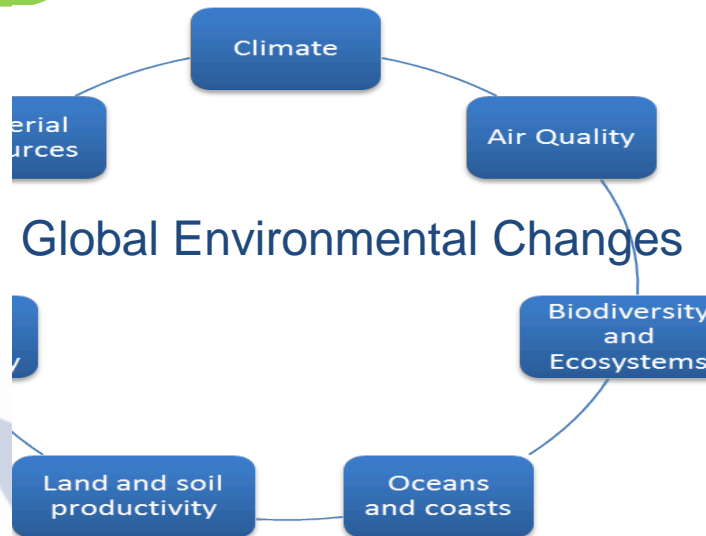
Health

Values

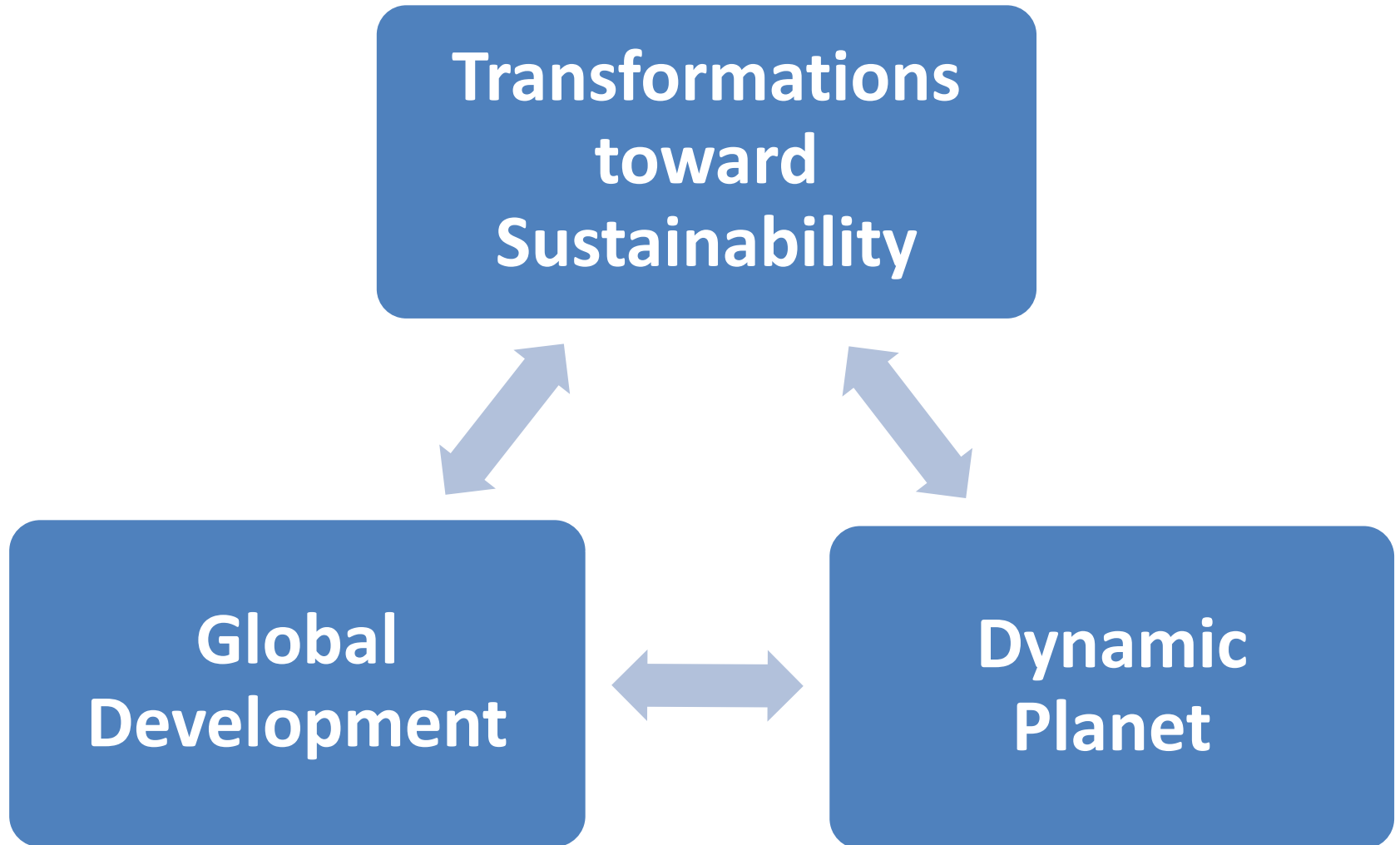
Wealth

food, water and energy

air, materials and human security



Future Earth Research Themes



Dynamic Planet



projecting environment

- **Approaches and Models**

drivers

societal system

observing

- **States and Trends**

explaining

thresholds

understanding

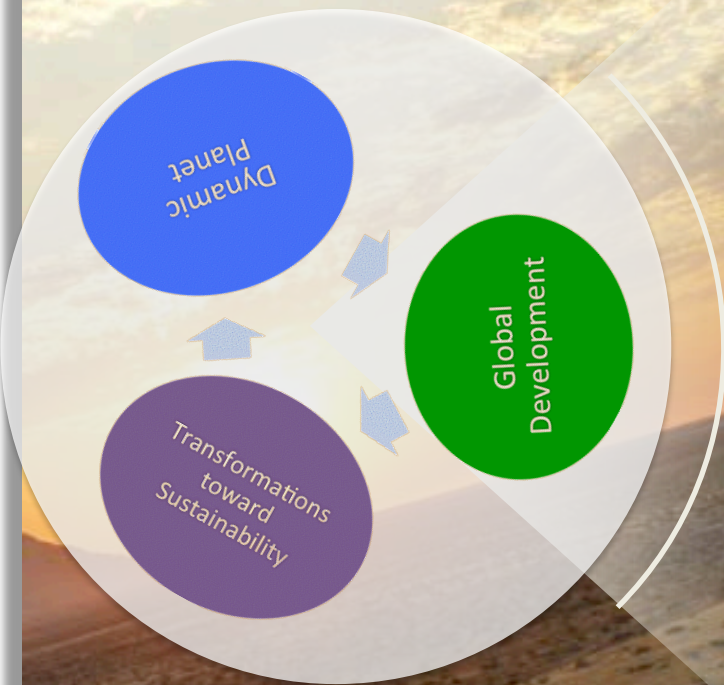
- **Critical Zones**

coasts

tropical forests

Polar regions

Global Development



- **stewardship of resources**
 - clean air
 - mining
 - materials
 - biodiversity
- **ecosystem services**
 - Trade-offs
 - climate change
 - fisheries
- **equitable access**
 - food security
 - water availability
 - healthy environment

Transformations toward Sustainability



- **transformation process**

decision making

economy

mega-cities

development options

- **Innovation and ideas**

trade-offs

emerging technology

assessment of policies

- **global and regional governance**

International law

incentives

regional enforcement

Dynamic Planet – observing, explaining, understanding, projecting Earth, environmental and societal system trends, drivers and processes and their interactions; anticipating global thresholds and risks.

Example research questions include:

What are the states and trends of key environmental components such as biodiversity, climate, soils, cryosphere, biogeochemistry, air quality, hydrology, and oceans, and in the social foundations of sustainable development such as wellbeing, equality, health, education, human security?

How and why do these vary across time, space, and social context?

What approaches, theories, and models allow us to explain the functioning of Earth and socio-ecological systems, understand the interactions between them, make projections for the future, and anticipate critical thresholds?

What can be understood and anticipated about the condition and future for critical zones and biomes such as coasts, tropical forests, or polar regions?

Global Development – provide the knowledge for sustainable, secure and fair stewardship of biodiversity, food, water, health, energy, materials and other ecosystem services.

Example research questions include:

What are the patterns, trade-offs and options for equitable and sustainable use of resources, and how can we ensure sustainable access to food, water, land, clean air, energy and materials for current and future populations?

What are the implications of climate change for food, water, health, human settlements, and ecosystems? How can climate services and disaster risk reduction reduce these impacts and facilitate adaptation?

What are the links between biodiversity, ecosystems, human wellbeing and sustainable development?

What options are available to provide energy for all with reduced environmental impacts, and what are the social implications of these energy choices?

Transformations toward Sustainability – understanding transformation processes and options, assessing how these relate to human values, emerging technologies and economic ideas, and evaluating strategies for governing and managing the global environment across sectors and scales.

Example research questions include:

How can governance and decision-making be aligned across different levels, issues, and places to manage global environmental change and promote sustainable development?

How can technology and infrastructure choices be combined with changes in institutions and behaviors to achieve low carbon transitions, food security and safe water?

How do values, beliefs and worldviews influence individual and collective behaviour to more sustainable lifestyles, patterns of trade, production and consumption?

What facilitates deliberate transformations at the individual, organizational, and systems levels; what socio-political and ecological risks does it entail?

Future Earth Cross Cutting Capabilities

- Science will be supported by a set of cross-cutting capabilities ... and will often be provided through **partnerships** with initiatives outside Future Earth.

	Activity	Partners
C1	Observing Systems	GCOS, GEOSS, ...
C2	Data Systems	World Data Systems, ...
C3	Earth System Modeling	Modeling Centers
C4	Theory Development	
C5	Synthesis and Assessments	IPCC, IPBES, AoA, ...
C6	Capacity Development and Education	START, ...
C7	Communication	
C8	Science-Policy Interface and interactions	

Approaches to organizing Future Earth research



Co-design integrated research
Build on current strengths



Regional and National Engagement

Regional - building from existing regional networks

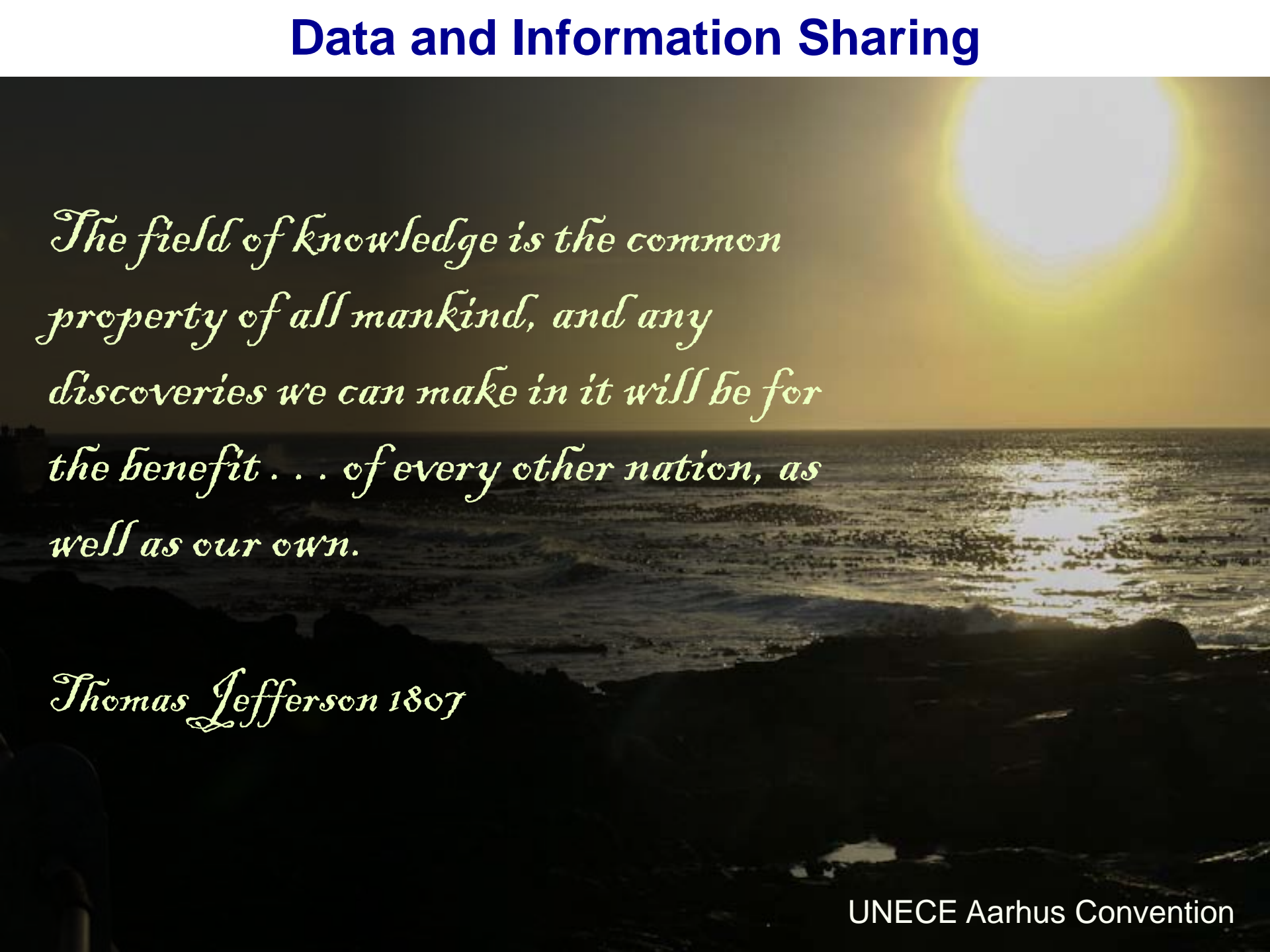
- to implement the vision of Future Earth and adapt it to regional specificities
- to shape global priorities
- to define how to carry out and fund Future Earth activities in the regions

National — benefiting from national committees

- to link to national communities and planning
- to support integration



Data and Information Sharing



The field of knowledge is the common property of all mankind, and any discoveries we can make in it will be for the benefit . . . of every other nation, as well as our own.

Thomas Jefferson 1807