

Food-Water-Energy Nexus: Addressing Information Needs through Cross-Domain Collaboration

Presented by
Hans-Peter Plag
Tiwah UG, Germany

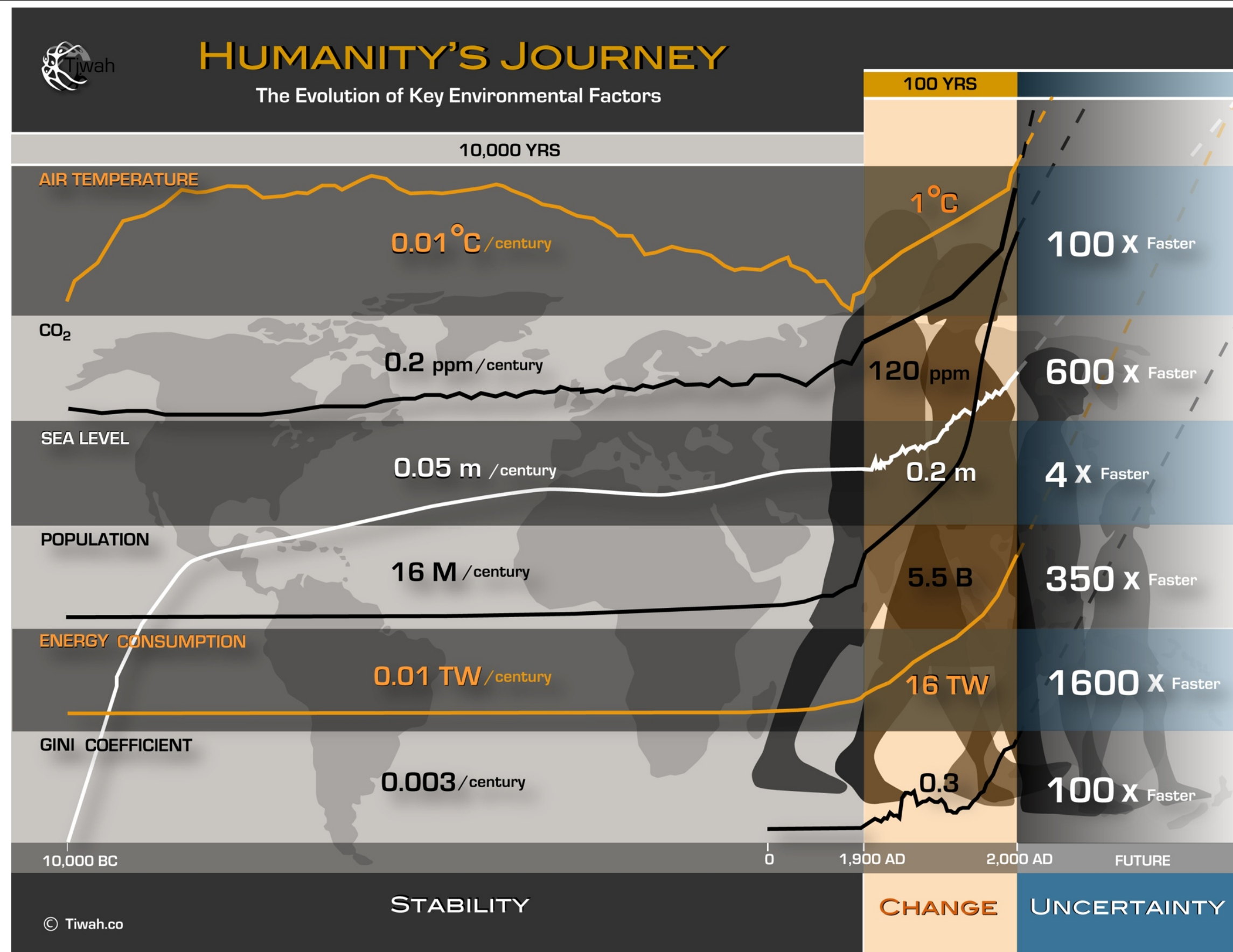


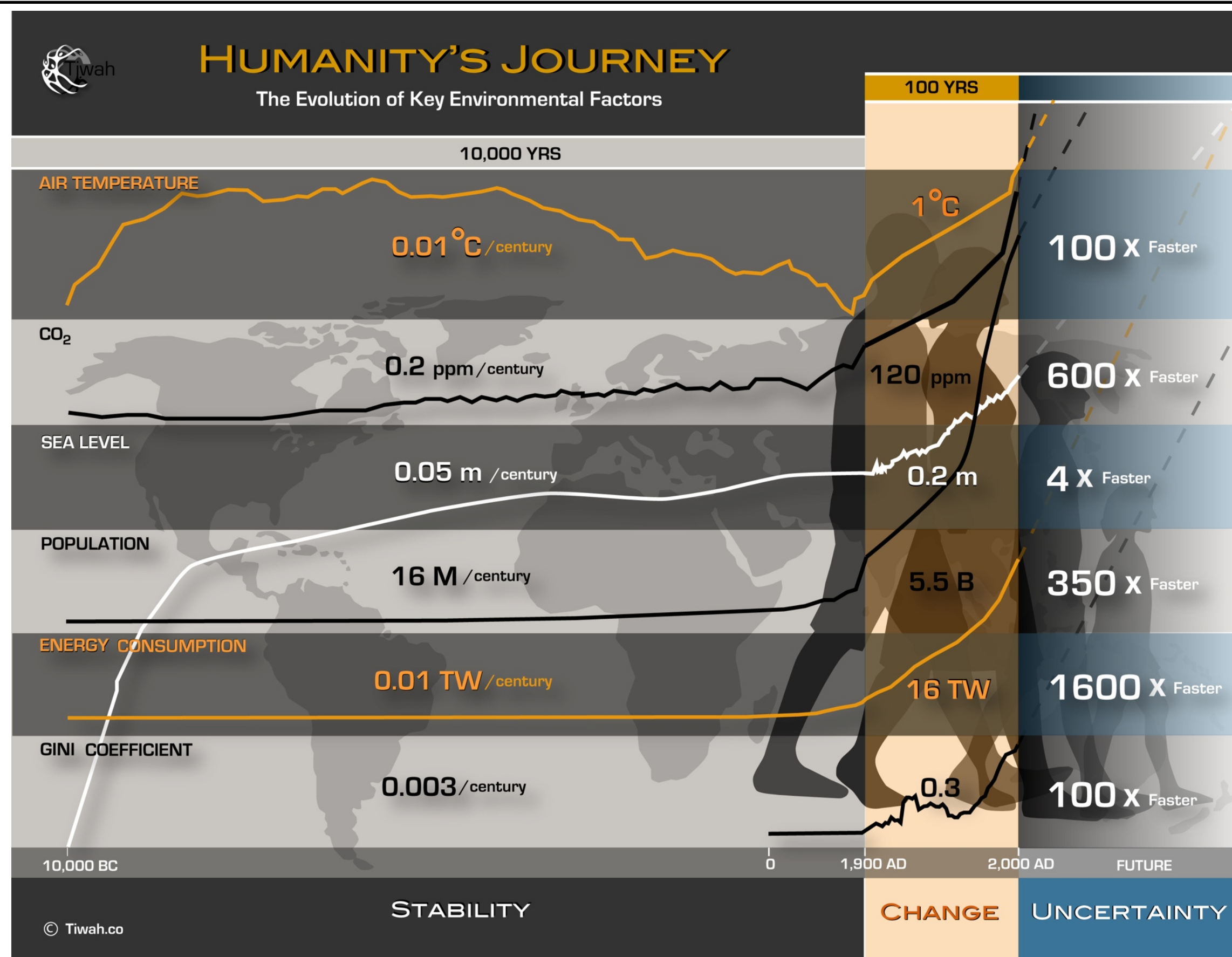
The ConnectinGEO project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 641538.

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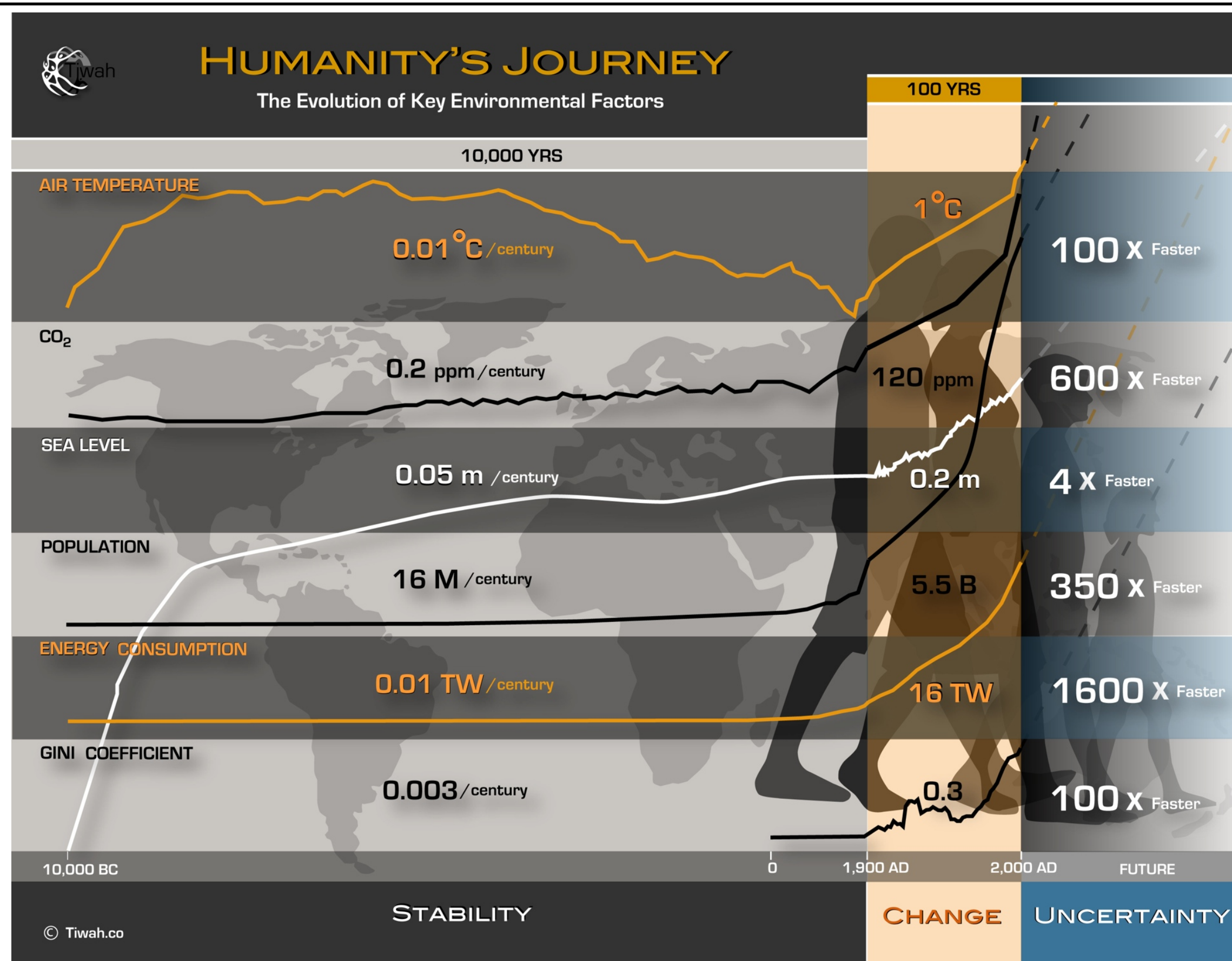
The Challenge
The Task
Implementation

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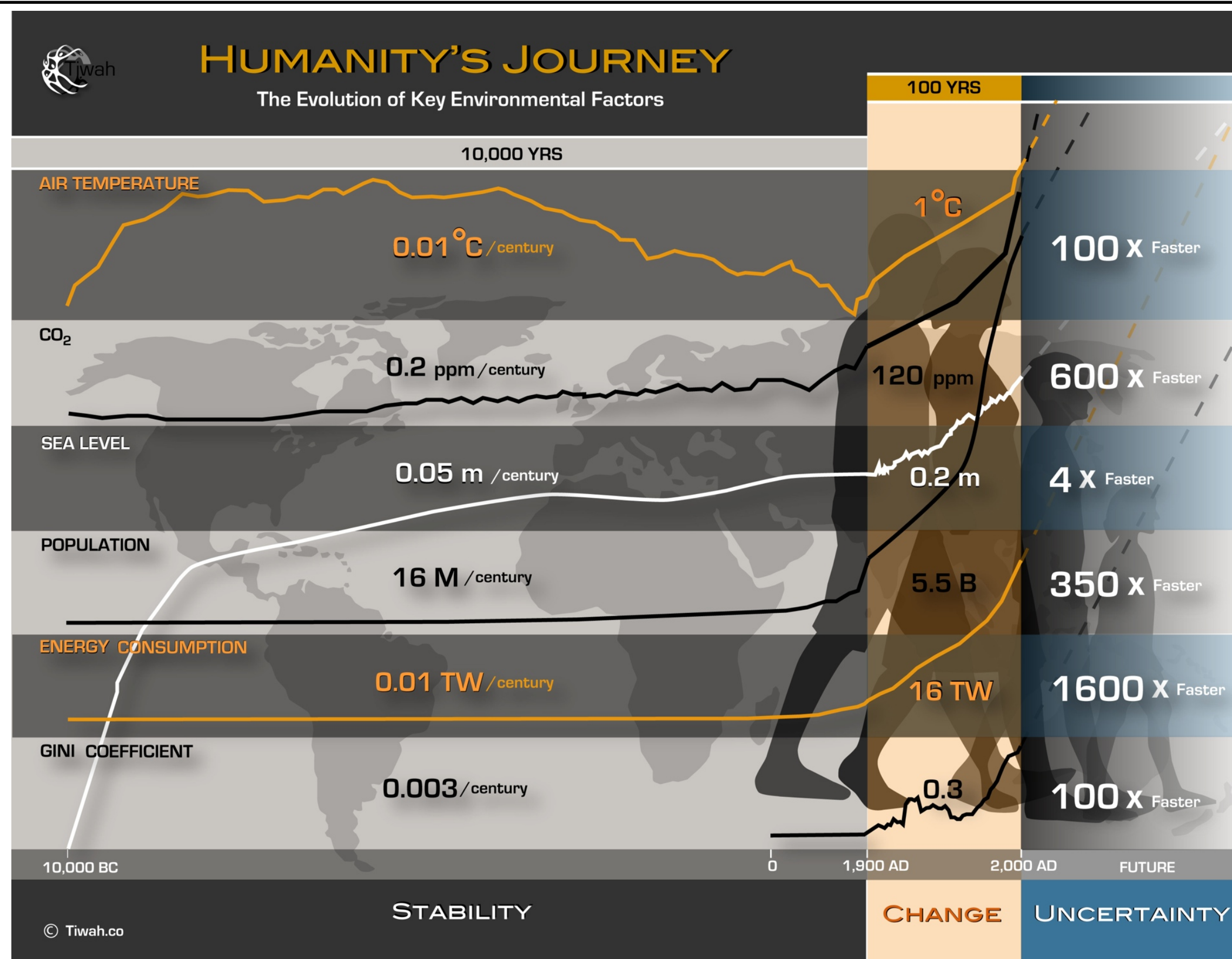


Energy usage increased in the last 100 years 1,600 faster than *on average throughout the Holocene (OATH)*



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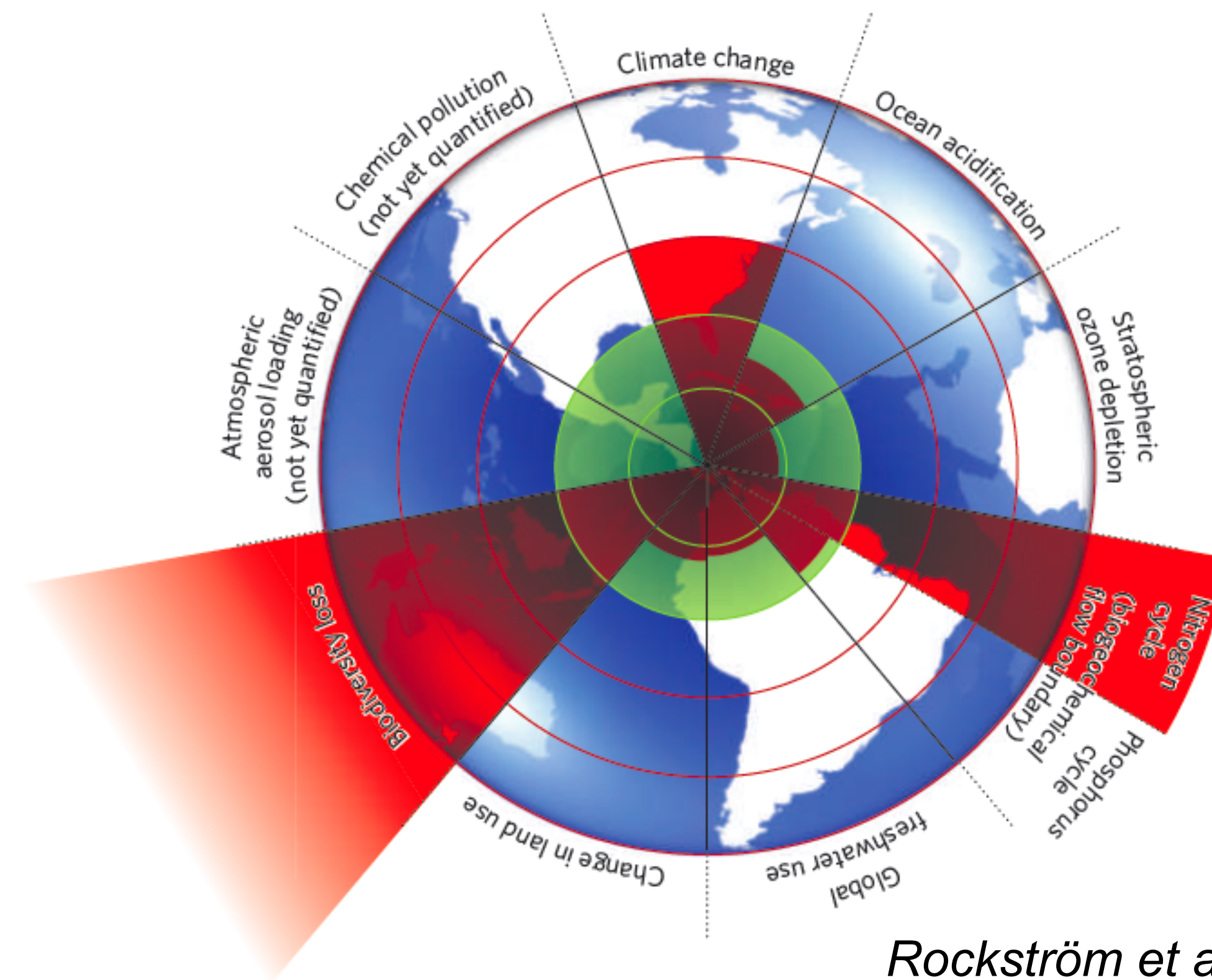
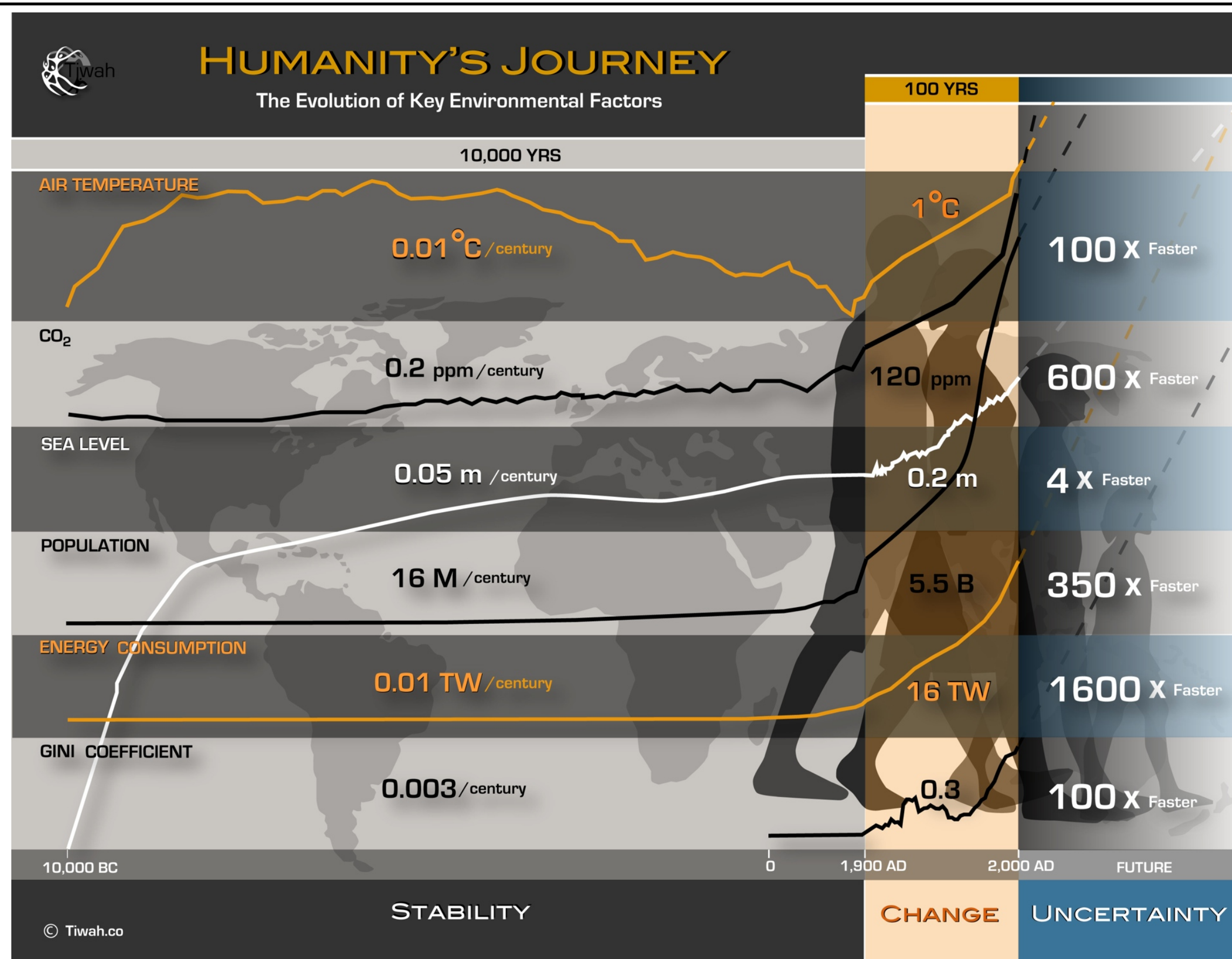


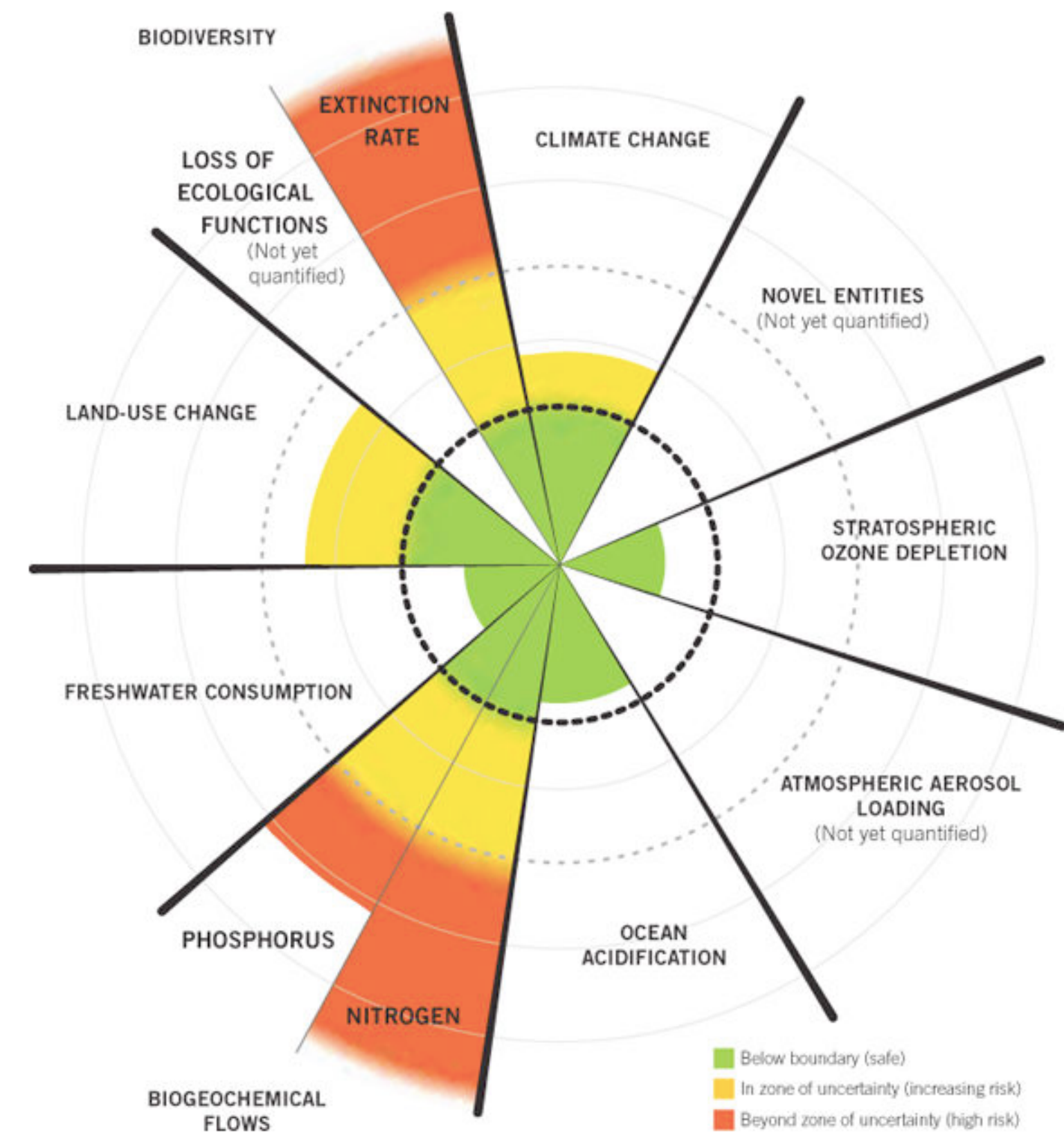
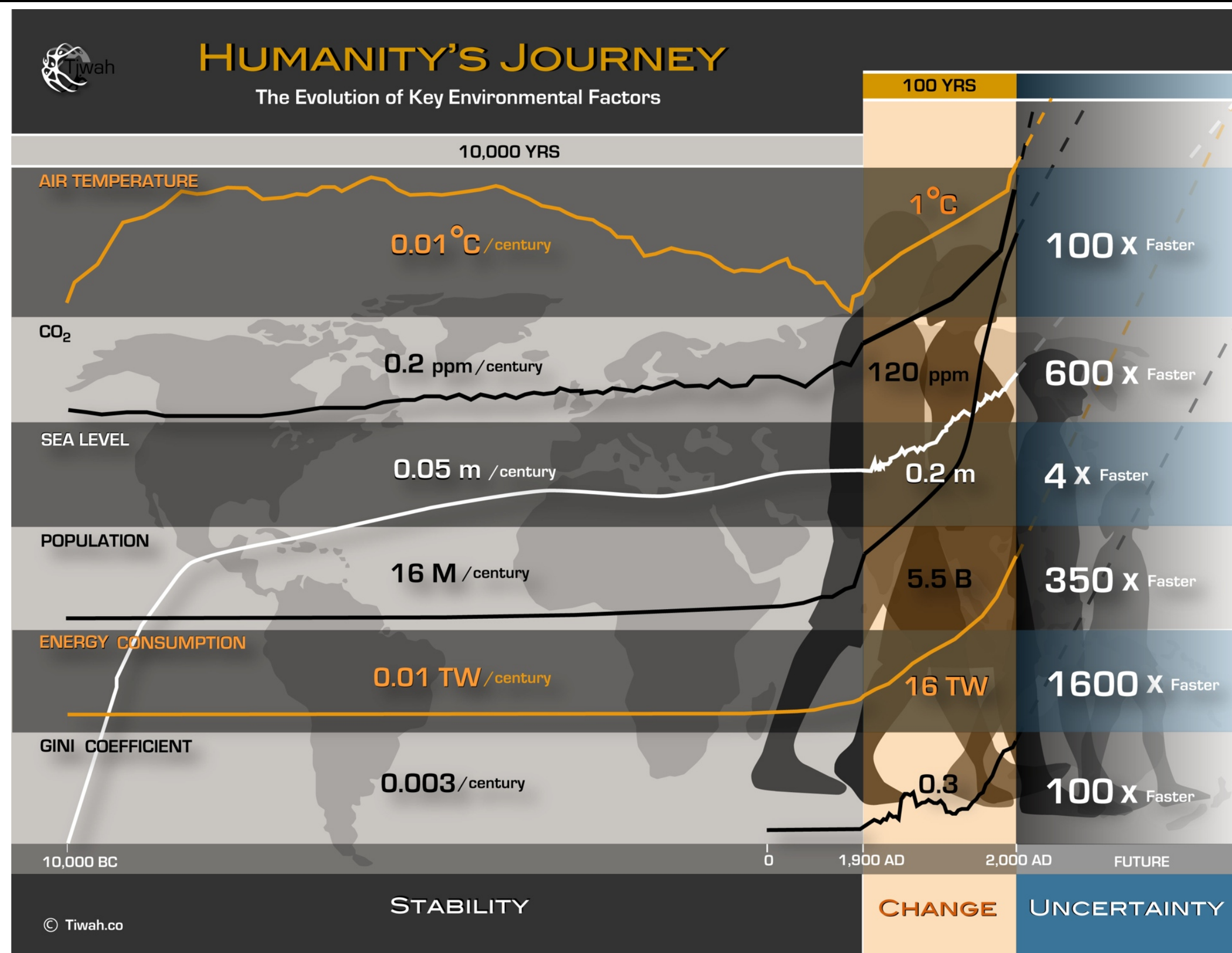
Figure 1 | Beyond the boundary. The inner green shading represents the proposed safe operating space for nine planetary systems. The red wedges represent an estimate of the current position for each variable. The boundaries in three systems (rate of biodiversity loss, climate change and human interference with the nitrogen cycle), have already been exceeded.

Food production has dramatically changed the nitrogen and phosphorous cycles and reorganized land use.

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From Rockström and Klun (2015)

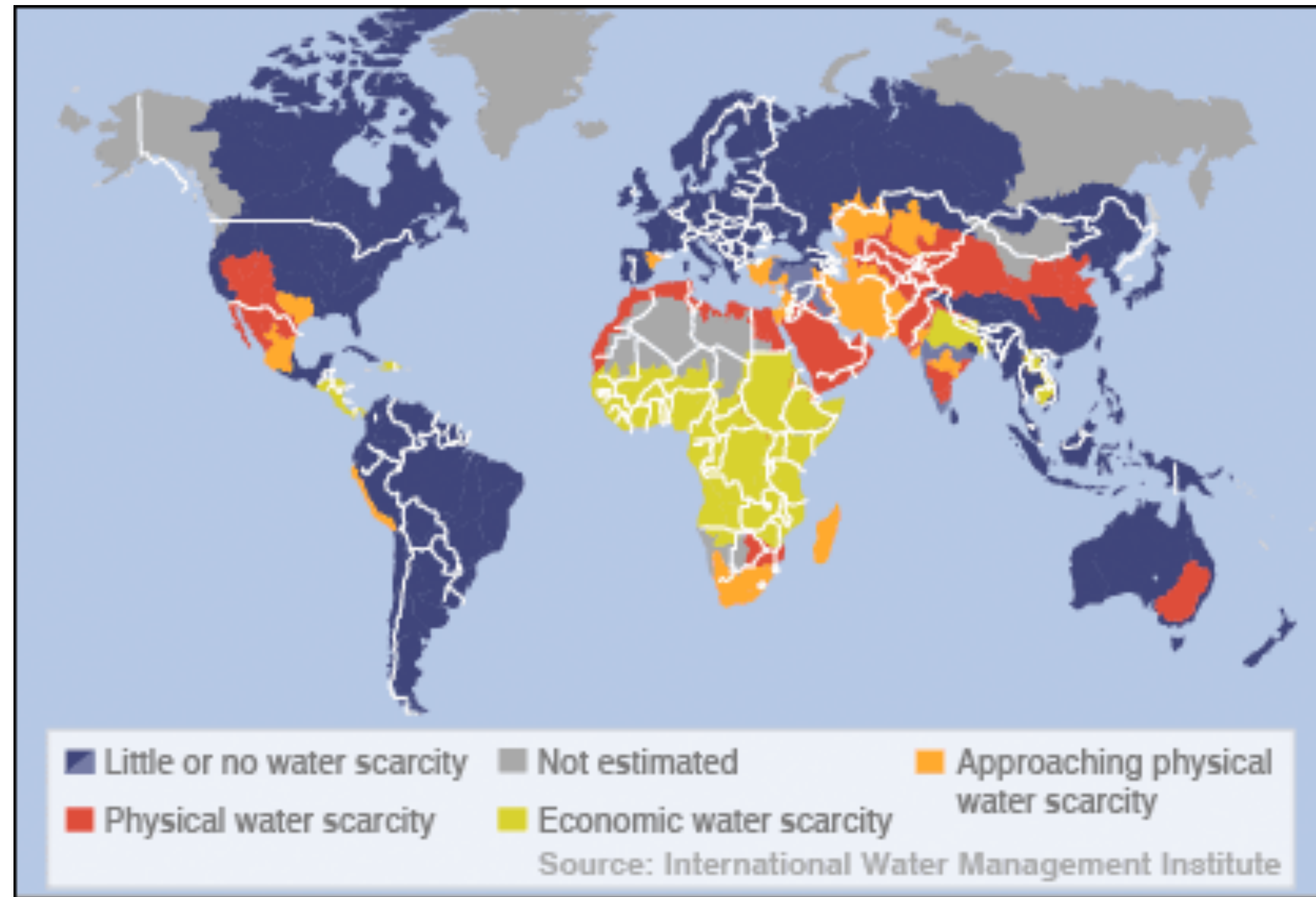
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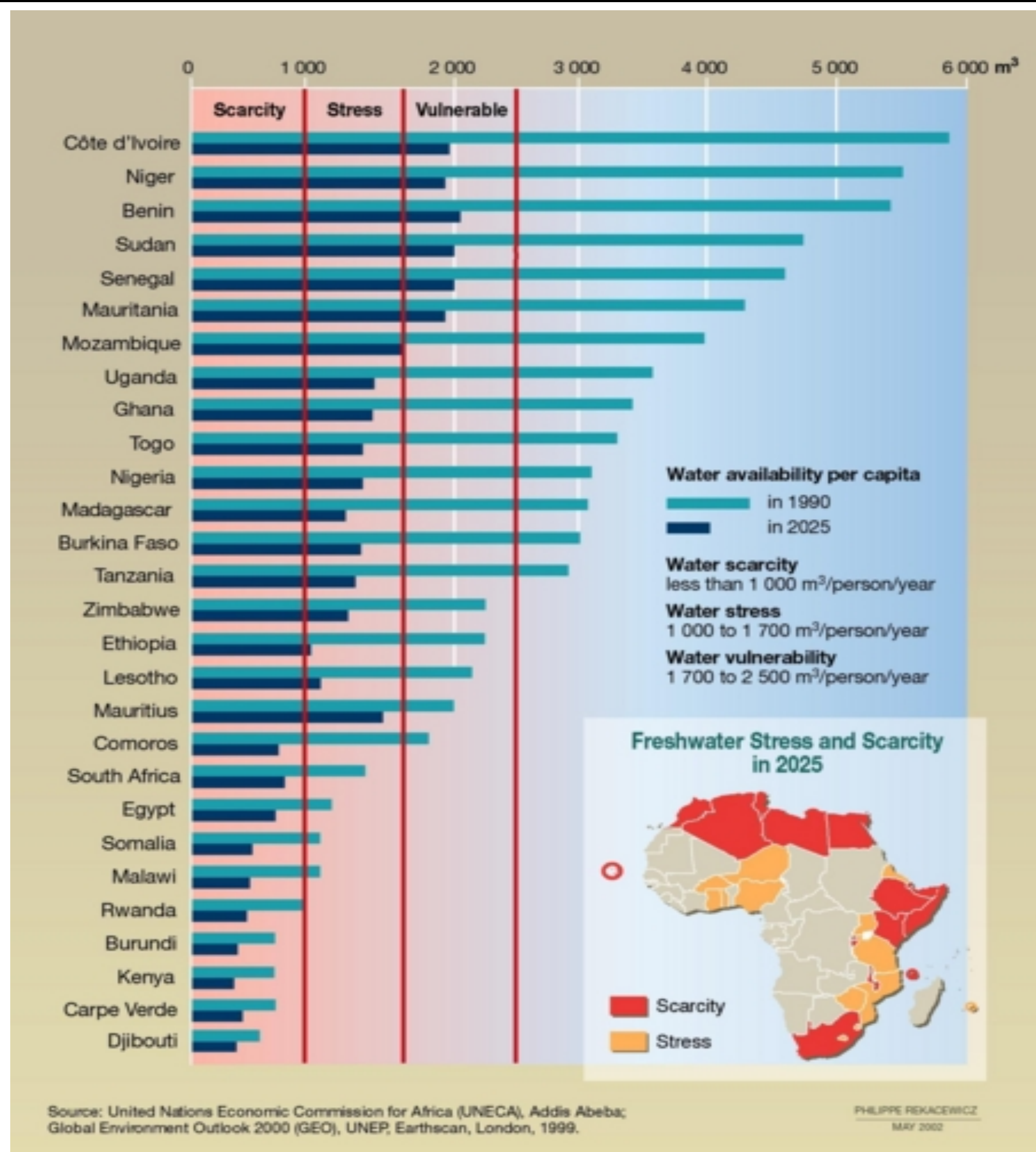
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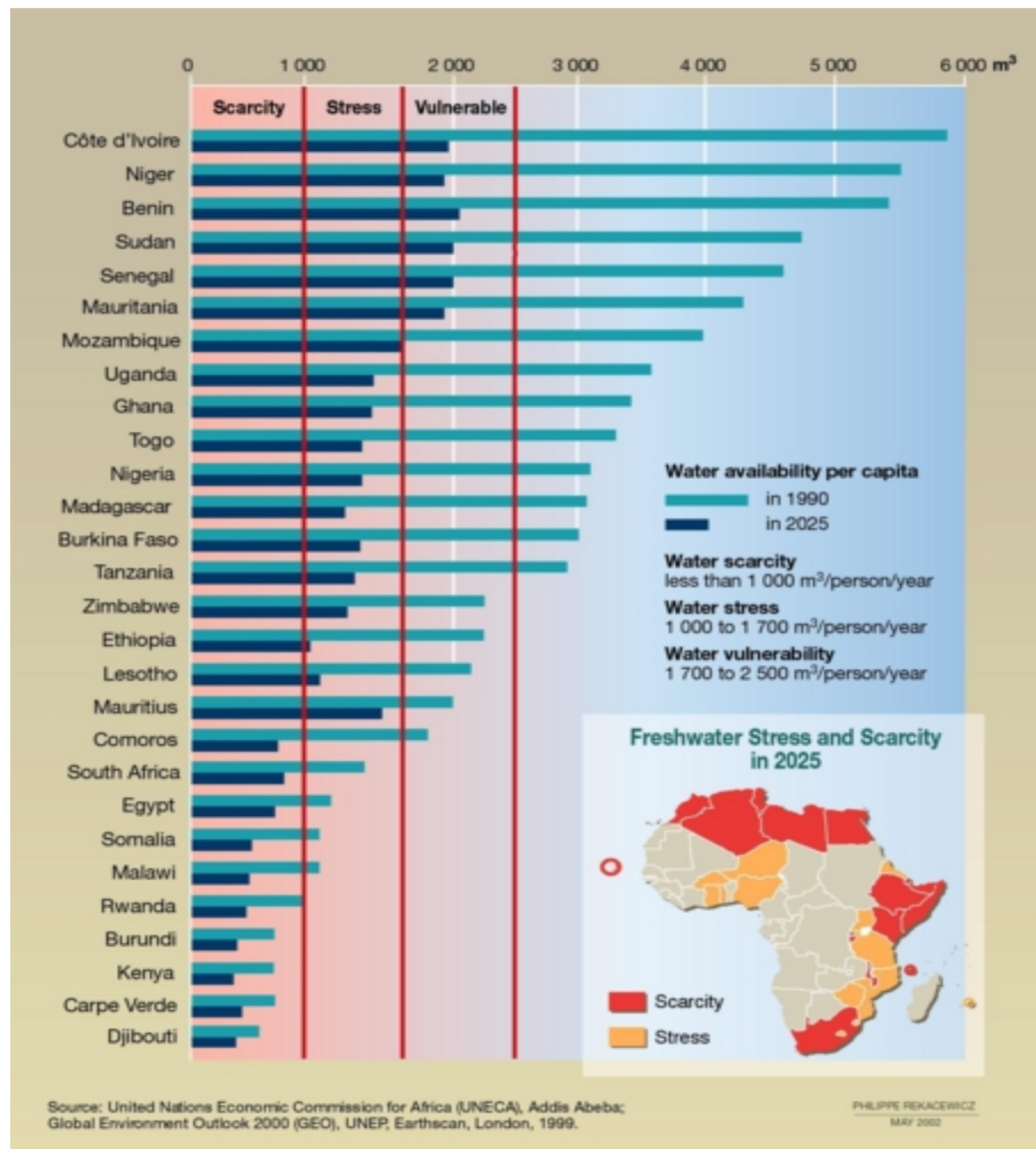
Extinction rate, nitrogen cycle, and phosphorus cycle have crossed the planetary boundaries of the Holocene, the “safe operating space for humanity.”



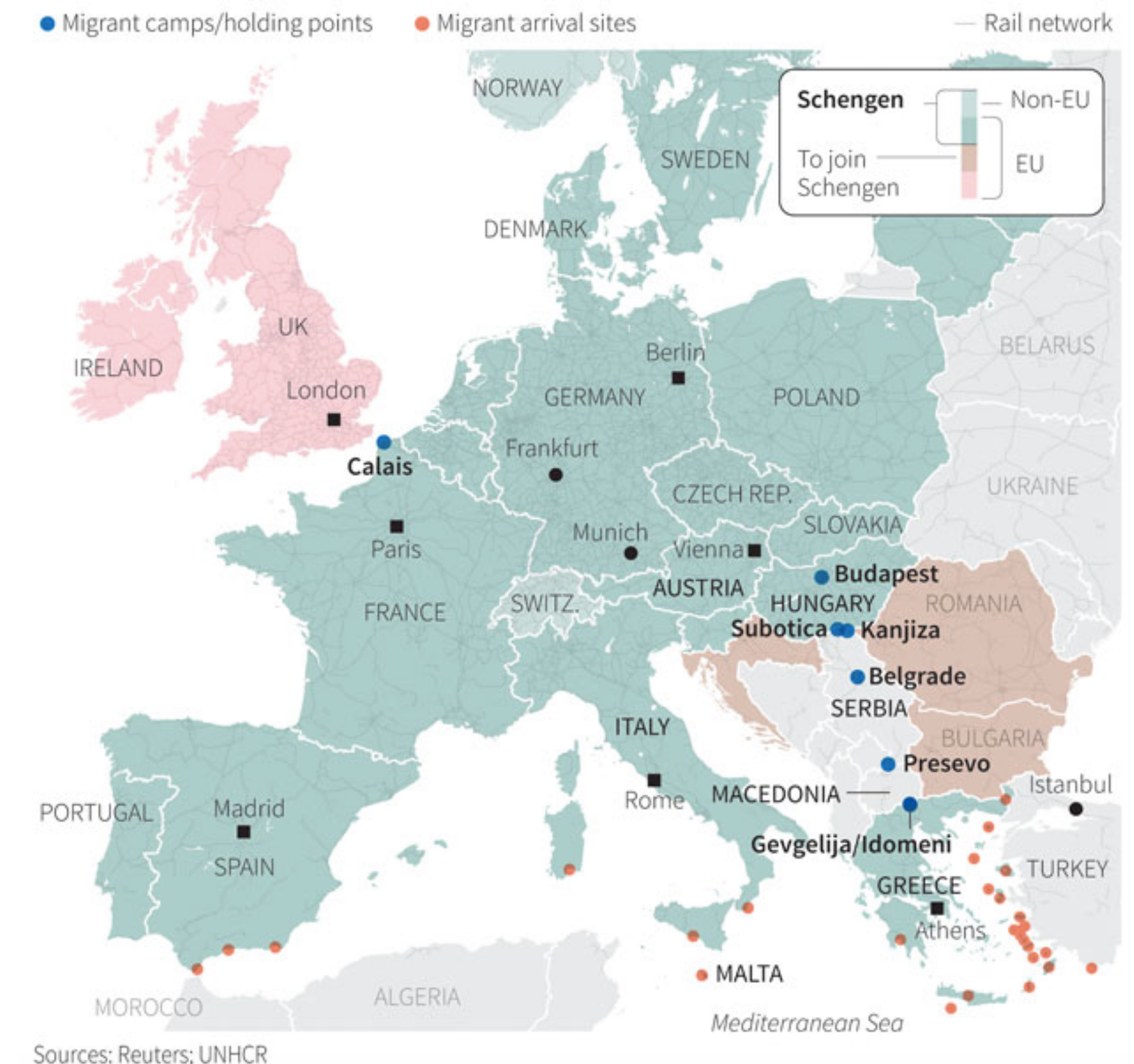
Access to water is a problem already today



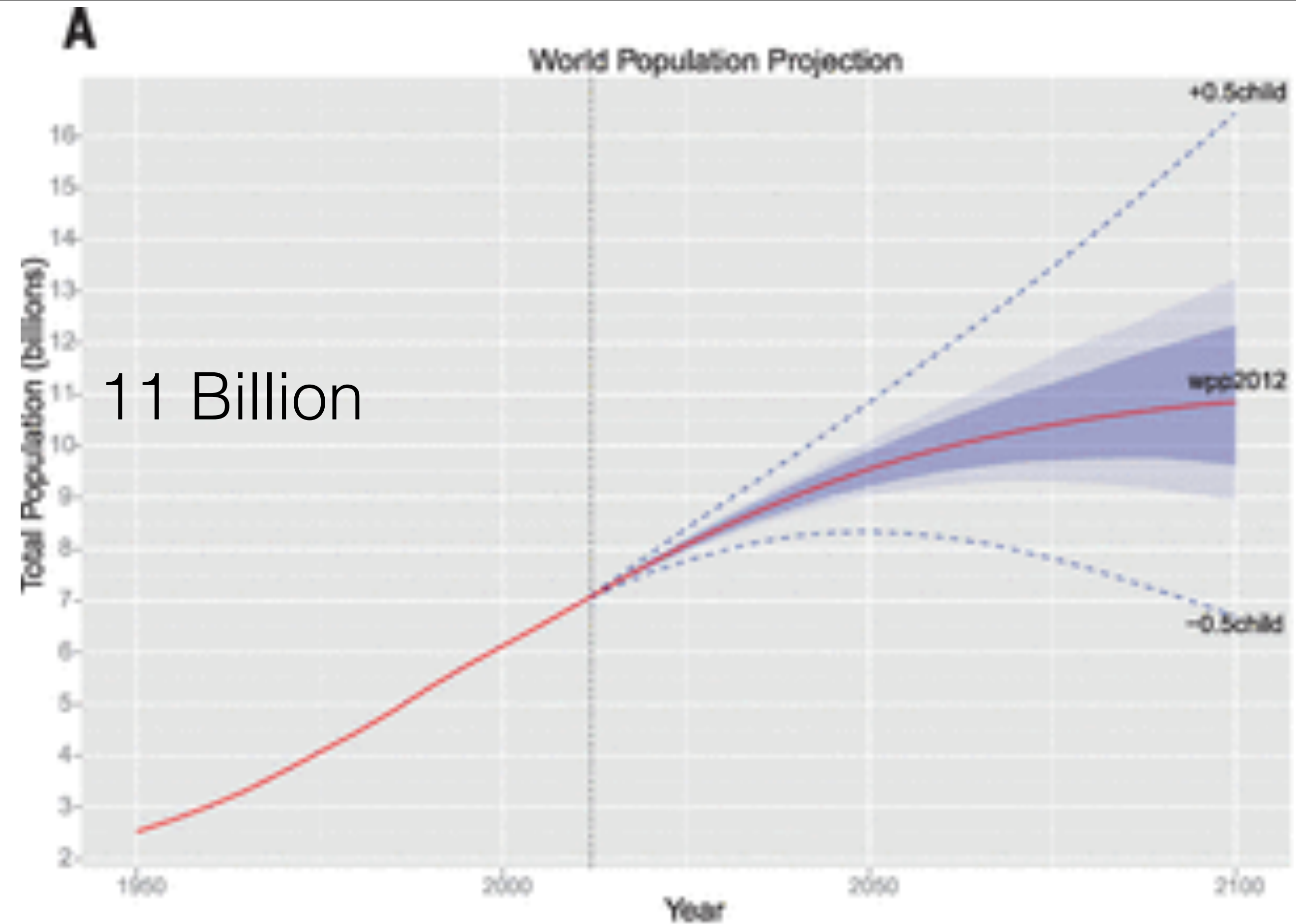
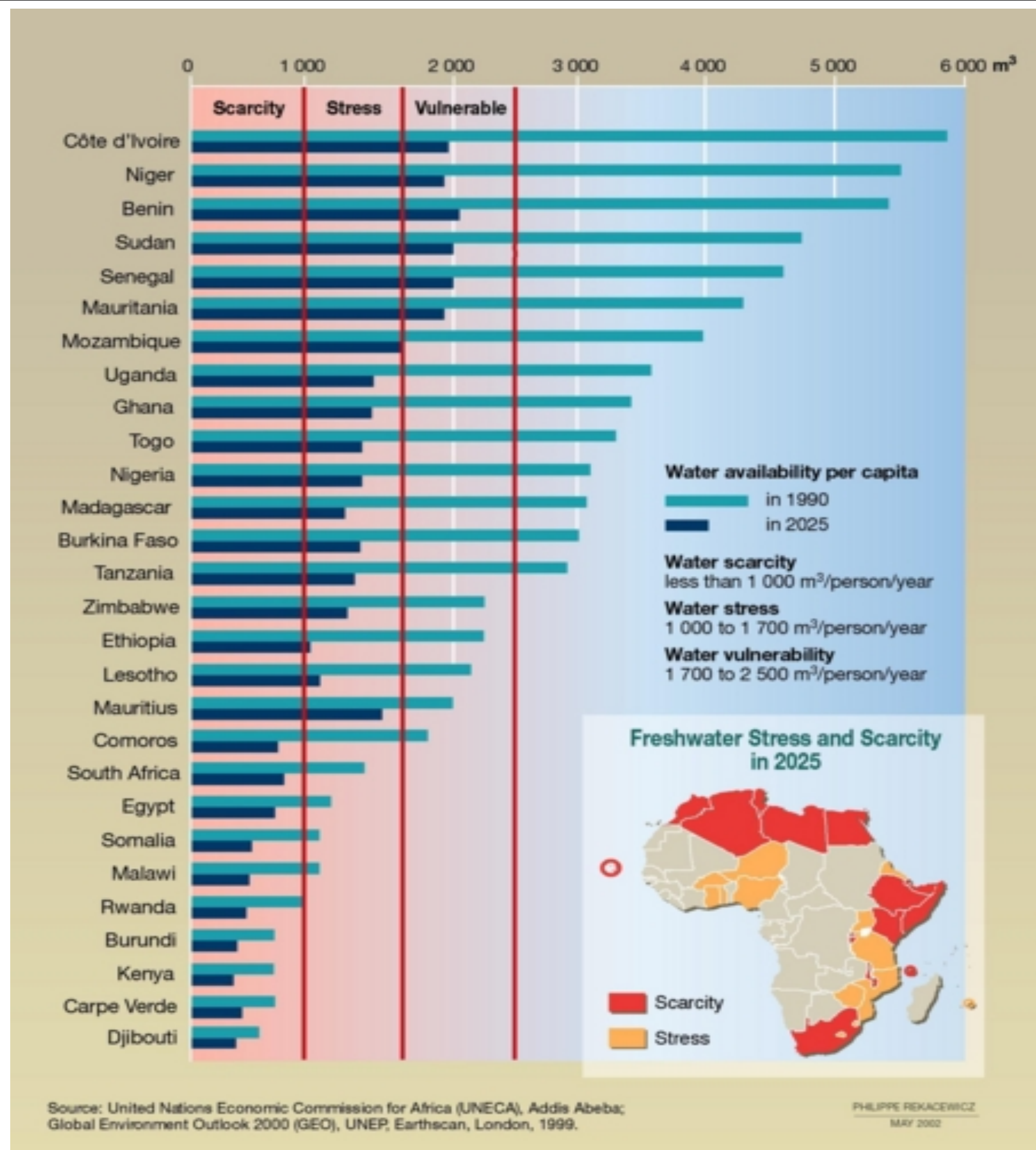
Access to water is a problem already today
 Access to water (and food) will be even more a problem in
 the future



Increased migration is one outcome of the water-food crisis leading to social unrest



Access to water is a problem already today
Access to water (and food) will be even more a problem in the future



The food-water-energy nexus is actually a food-water-population-energy nexus.

Access to water is a problem already today
 Access to water (and food) will be even more a problem in the future

Food-Water-Population-Energy Nexus

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Nexus: a relationship or connection between people or things

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Nexus perspective: understanding the interdependencies between energy usage and availability, population growth, global change, food security, water security, and the global boundaries

Food-Water-Population-Energy Nexus

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ConnectinGEO Task 5.6: “Interdisciplinary Challenge: Food-Water-Energy Nexus”

The task will specifically consider indicators related to food, water and energy security. The recent very **rapid changes in the phosphorus and nitrogen cycles** associated with food production will also be considered. Taking into account that the **rapidly increasing energy usage** during the last roughly 100 years **enabled the population growth** that is now threatening food and water security, the task will actually have to consider the Food-Water-Population-Energy Nexus (FWPEN).

The nexus approach will help to **understanding the interdependencies** between energy usage and availability, population growth, global change, food security, water security, and the global boundaries.

Specific questions to be consider are:

- How can collaboration through ENEON help to **inform about the FWEN and impacts in Europe?**
- Which **SDGs relate to the FWPEN** and which are the **relevant indicators?**
- Can ENEON help to **quantify the indicators** for these SDGs?
- What ENEON products could **support policy making** that takes a nexus perspective?
- What information derived from **data indicates urgency?**

Food-Water-Population-Energy Nexus

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The task will conduct the following activities:

- Use the observation inventory and the gap analysis to identify benefits of collaboration across disciplines and domains represented in ENEON and develop a compelling argument for the prioritization of FWPEN-related observations and products based on results from the work packages.
- Determine stakeholders, develop plans for further research and investigate regional, national and international funding opportunities to cover the gaps identified.
- Analyze the cost saving potential of collaborations across previously segregated disciplines and domains

Food-Water-Population-Energy Nexus

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Relevant SBAs: Agriculture, Water, Energy

EV used:

- EVs for the FWPEN will be determined using the ConnectinGEO methodology.
- based on related Sustainable Development Goals (SDGs) and targets, plus associated indicators
- To the extent possible, these EVs will be extracted from the SBA-specific EVs.

Addressed gap:

- lack of collaborations across disciplines and domains, and a gap in GEOSS related to
- gap in theme-based approaches to data and product discovery.
- missing links between industry and science communities.
- missing links between different observing networks

Food-Water-Population-Energy Nexus

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Types of Outcome:

A Report

- characterizing the gaps that hamper the use of GEOSS in addressing complex issues
- proposing actions to address these gaps
- identifying the stakeholders of the FWEN who are impacted by the identified gaps and who would benefit from actions addressing the gaps
- quantifying the societal benefits and to estimate the benefit-to-cost ration.
- discussing potential contributions of ENEON in closing the gaps.
- describing the EVs relevant for the FWEN and
- assessing to what spatial and temporal extent data for these EVs is available through ENEON.

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Data (and metadata) produced:

An attempt will be made to identify at least one product that directly relates to the FWEN and that could be produced based on data provided by ENEON members. Prime candidates are quantification of SDG-related indicators that are relevant to the FWEN. The EVs related datasets will be identified and an inventory of these datasets will be compiled.

Spatial and temporal extent:

It is planned to focus on Europe as the test region. Temporally, the project period is the main timeslot to be considered. However, for the quantification of indicators, it may also be consider to extend the time window into the past.

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Mean of Dissemination:

- presentations at the second ENEON plenary workshop in October 2016.
- report to the EC, and
- scientifically relevant parts will be published in scientific papers.

Connection to ENEON:

- ENEON key component bringing together the networks required to address metrics-related aspects of the FWPEN.
- goal is to identify related gaps in ENEON and to propose actions for a remedy of these gaps.

Connection with GEO – GEOSS:

- directly relates to the goal of GEOSS having a dedicated focus on supporting the SDGs.
- will provided important feedback to what extent GEOSS is prepared to inform complex societal issues associated with the SDGs.

Food-Water-Population-Energy Nexus

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Stakeholder Profile includes:

- those monitoring the indicators for SDGs related to the FWEN,
- those engaged in planning actions to make progress towards these SDGs.
- EO networks providing data for EVs required to quantify the indicators
- researchers studying the FWPEN
- funding agencies at national and international levels providing financial resources for EO networks, research, and monitoring relevant to the FWPEN
- funding agencies which will be interested in cost savings and increased efficiency.

Next Steps:

- identify key players in the EO world
- link to GEO activities (e.g., Water Cycle Community of Practice, GEOGLAM, volunteers are welcomed)
- populate the GEOSS Knowledge Base with relevant information
- carry out gap analysis

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