

Project Tellus

Achieving Human-Earth Sustainability A New Way Forward

Presented by ETH Zurich

Supported by Prof. Dr. Didier Sornette – Chair of Entrepreneurial Risks, ETH Zurich

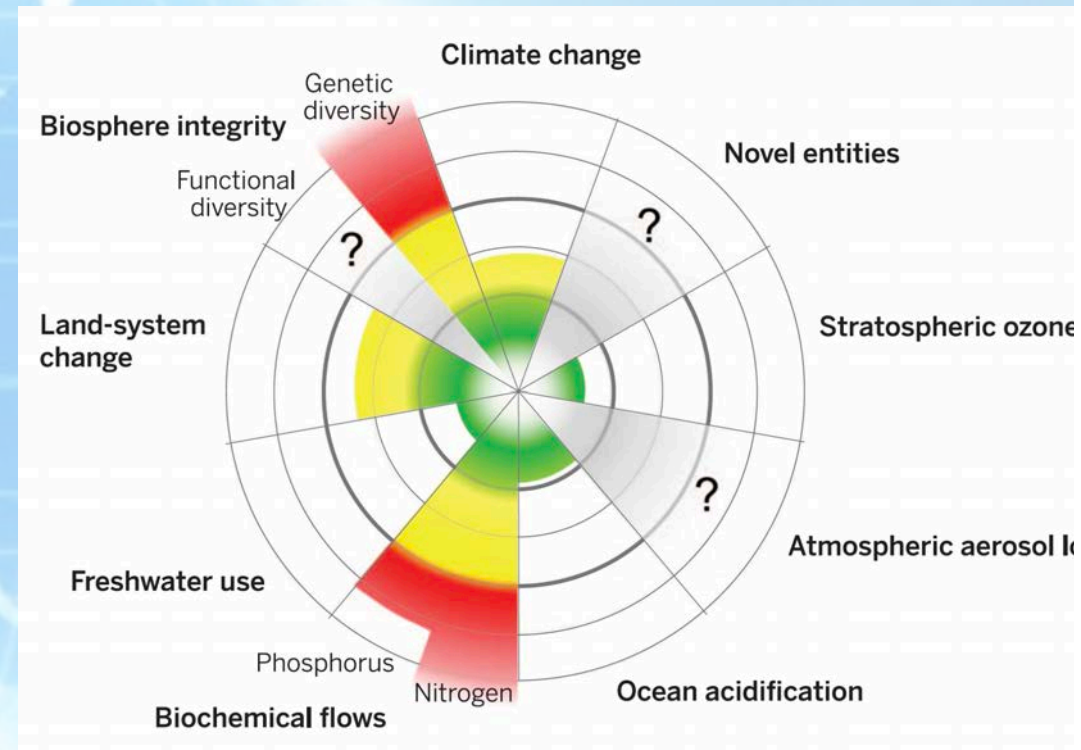
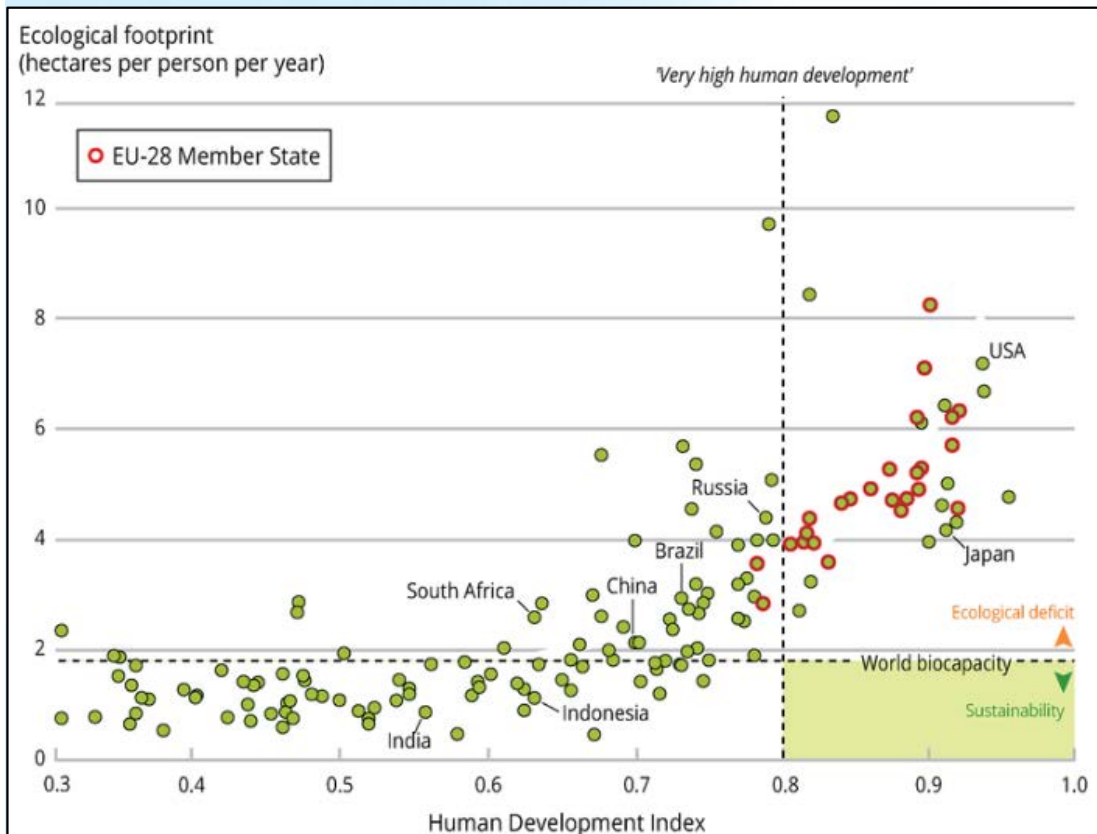
Dr. Peter Cauwels - Chair of Entrepreneurial Risks, ETH Zurich

Tuesday, 21st January 2020

WEF 2020, Davos

**Tellus in Latin means 'Earth', in ancient Rome it was the name of the original Earth Goddess.*

Why Tellus?



Technological and economic progress have significantly improved human well-being, at the cost of a larger ecological footprint

We are crossing major planetary boundaries, while 85% of the global population is still catching up.

What is Tellus?

Tellus is a bottom-up partnership between industry, academics and foundations with the purpose to lay out pathways to achieve Human-Earth Sustainability.

Core deliverables:

Phase 1

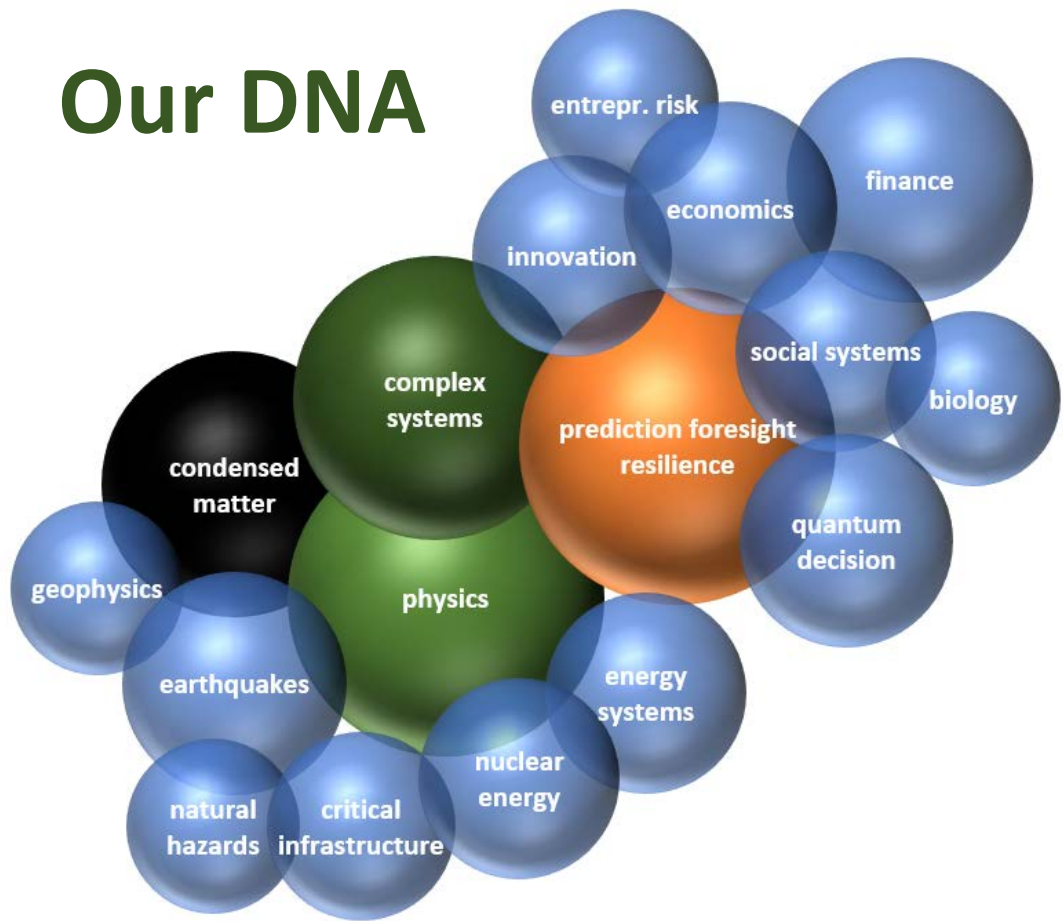
- Assemble existing models in a global Human-Earth simulator that can serve as decision making tool and 'management tool' (what ... if ... scenario's)
- Identify and rank the problems
- Identify and develop solutions

Phase 2

- Draft plans that are technically, socially and economically feasible

ETHZ - Chair of Entrepreneurial Risks

Our DNA



Silo's in science are a human construct. The universe is not confined by any such cultural boundaries.

To get to a deep understanding of the complexity of our world and human systems, **we must break down the walls between the different disciplines.**

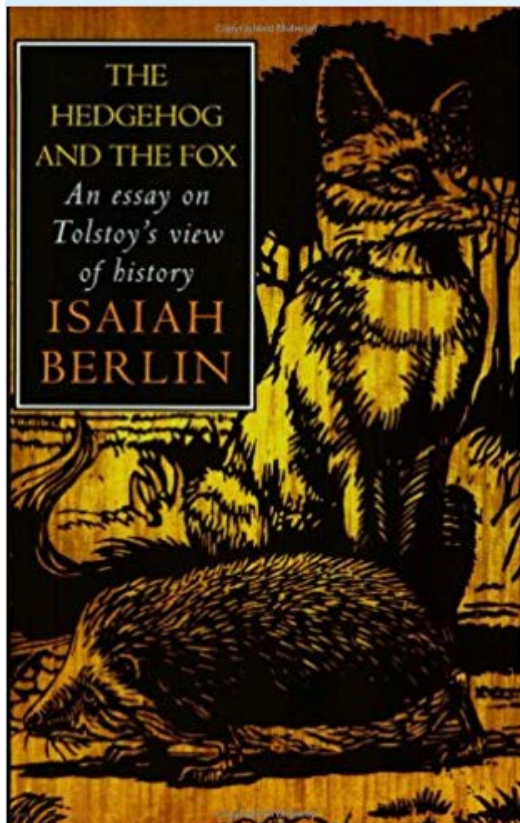
We are mavericks, like to go off the beaten academic track, not shying away of big problems, but with the modesty to ask experts for advice and work with them.

ETHZ - Chair of Entrepreneurial Risks

<p>CENTRE DE PHYSIQUE LES HOUCHES</p> <p>EDITORS: B. DUMFRIELLE F. GRANER D. SORNETTE</p> <p>SCALE INVARIANCE AND BEYOND</p> <p>1997</p> <p>EDP-SCIENCES • SPRINGER</p>	<p>BRINCELOW AGENCY LIBRARY</p> <p>WHY STOCK MARKETS CRASH</p> <p>CRITICAL EVENTS IN COMPLEX FINANCIAL SYSTEMS</p> <p>DIDIER SORNETTE</p> <p>WITH A NEW PREFACE BY THE AUTHOR</p> <p>2003 2017</p>	<p>D. Sornette</p> <p>Critical Phenomena in Natural Sciences</p> <p>Chaos, Fractals, Selforganization and Disorder: Concepts and Tools</p> <p>First edition 2000</p> <p>Second enlarged edition 2004 and 2006</p> <p>Springer</p>	<p>Malevergne - Sornette</p> <p>Extreme Financial Risks</p> <p>Y. Malevergne D. Sornette</p> <p>Extreme Financial Risks</p> <p>From Dependence to Risk Management</p> <p>Nov 2005</p> <p>Springer</p>	<p>632 LECTURE NOTES IN ECONOMICS AND MATHEMATICAL SYSTEMS</p> <p>Alexander Saichev Yannick Malevergne Didier Sornette</p> <p>Theory of Zipf's Law and Beyond</p> <p>Nov 2009</p> <p>Springer</p>	<p>Didier Sornette Sergey Ivliev Hilary Woodard Editors</p> <p>Market Risk and Financial Markets Modeling</p> <p>Feb 2012</p> <p>Springer</p>
<p>Extreme Risks: Dragon-Kings versus Black Swans</p> <p>The European Physical Journal EPJ ST Special Issue EPJ ST: SPRINGER D. Sornette and G. Ouillon Guest Editors (May 2012)</p> <p>From Beak Length to Dragon-King to There Life Beyond Power Laws</p> <ol style="list-style-type: none"> Geosciences of the solid envelop <ol style="list-style-type: none"> Earthquake magnitude. Volcanic eruptions. Landslides. Floods. Meteorological and Climate sciences <ol style="list-style-type: none"> Rains, hurricanes, storms. Snow avalanches. Material Sciences and Mechanical Engineering <ol style="list-style-type: none"> Acoustic emissions. Hydrodynamic turbulence. Economics : financial drawdowns, distribution of wealth Social sciences: distribution of firm sizes, of city sizes, of social groups... Social sciences : wars, strikes, revolutions, city sizes Medicine: epileptic seizures, epidemics Environmental sciences : extinctions of species, forest fires <ol style="list-style-type: none"> Evolution and extinction of species. Forest fires. 	<p>Didier Sornette Wolfgang Kröger Spencer Wheatley</p> <p>New Ways and Needs for Exploiting Nuclear Energy</p> <p>2018</p> <p>Springer</p>	<p>Dmitry Chernov & Didier Sornette</p> <p>Man-made Catastrophes and Risk Information Concealment</p> <p>Case Studies of Major Disasters and Human Fallibility</p> <p>Nov. 2015</p> <p>Springer</p>	<p>Chernov - Sornette</p> <p>Critical Risks of Different Economic Sectors</p> <p>Based on the Analysis of more than 500 Incidents, Accidents and Disasters</p> <p>Dmitry Chernov · Didier Sornette</p> <p>2019</p> <p>Springer</p>		

Consolidate the hedgehog views

Many professionals and specialists look for solutions from the vantage point of their specific expertise. Most of these solutions are valid and useful, but often, **unintended consequences** are overlooked. **We need foxes as well as multi-lingual hedgehogs** to be aware of the many interconnections in the system and **avoid becoming sorcerer's apprentices**.



The Economist: *We must correct for market anomalies by pricing externalities. Substitution effects and creative destruction will shift the economic system towards sustainability*

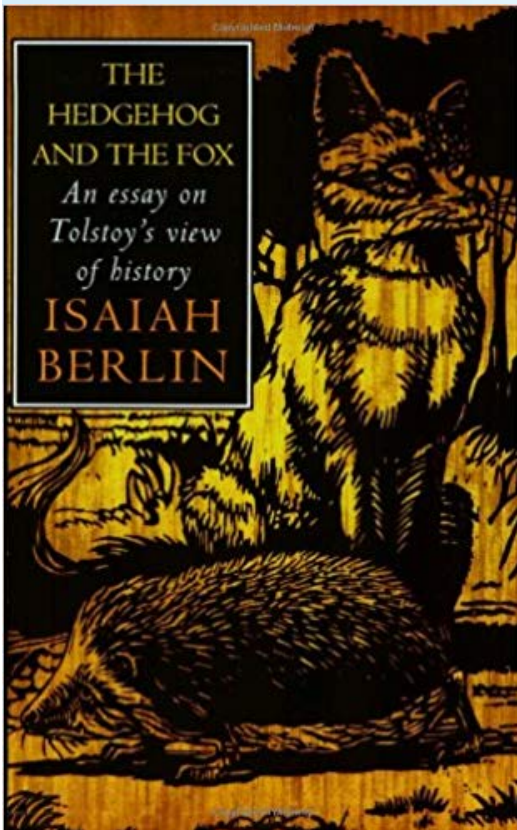
The Environmentalist: *To keep the planet from warming more than 2°C we need to go to zero emissions now and degrow the economy*

The Politician: *We must change the behavior of people and companies with subsidies and taxes and by introducing new legislation*

Consolidate the hedgehog views

Isaiah Berlin divides thinkers in two categories:

- Hedgehogs view the world through the lens of a single defining idea
- Foxes draw from a wide variety of experiences

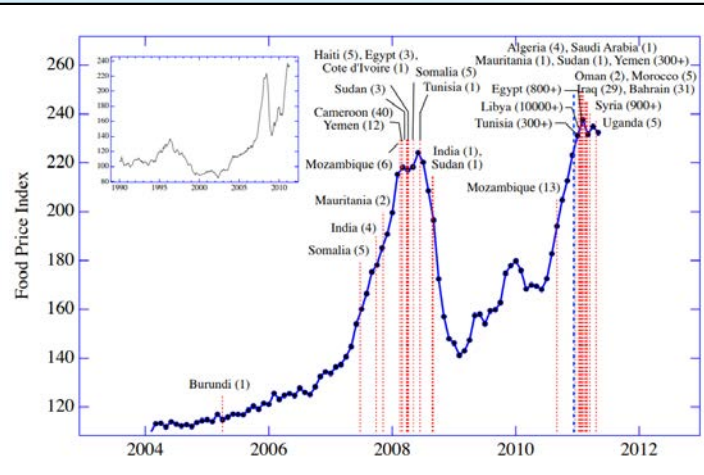


The Engineer/Technologist: *We must invest in new technology and R&D to decarbonize production of energy, steel, cement, change the transportation system, make cities smart, put carbon back in the ground, and find new energy storage systems*

The Investor: *Disclosures in financial statements will change investors' behavior, lead to a repricing of risk, and a better allocation of capital*

The Central Banker: *We must prepare for new forms of quantitative easing. By aligning fiscal and monetary policy, we can supply new funds during the next downturn. With one stone, we can catch two birds: economic recovery and energy transition*

Unintended consequences - what history teaches



Protests rage around the world. This is often caused or strongly exacerbated by rising food and energy prices and inequality



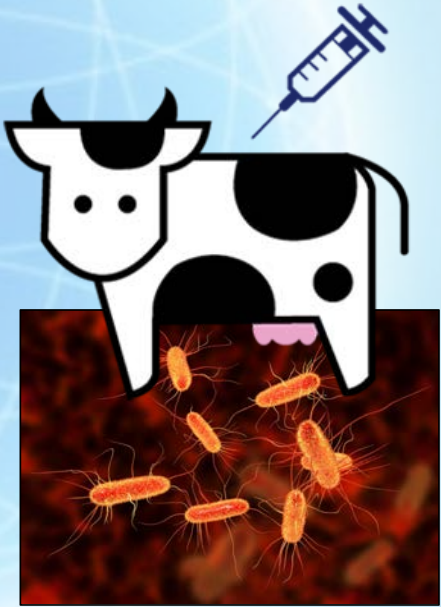
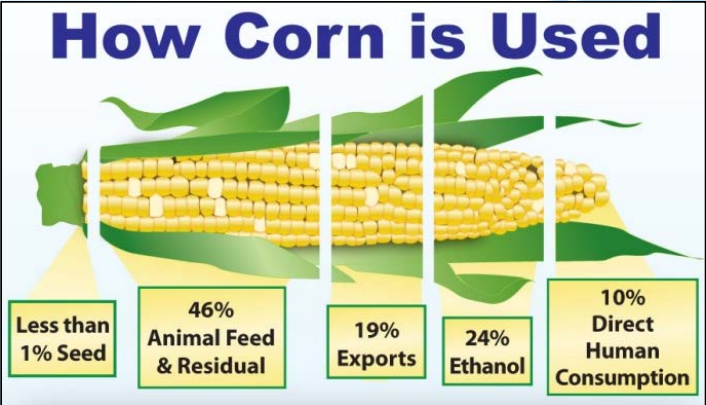
Unintended consequences - what history teaches



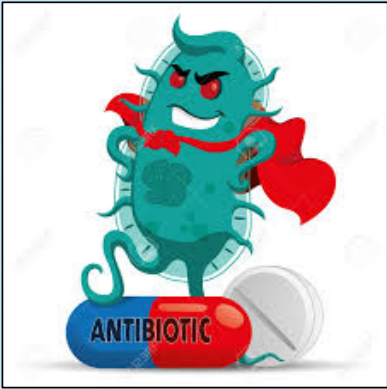
An energy supply shock may destabilize emerging markets and increase extreme poverty. Monetary policy may further impoverish the bottom 90% and increase inequality.

Unintended consequences - what history teaches

From food subsidy to global pandemics and world health risk



Antibiotic resistance




How Tellus is different

Entrepreneurial process with academic, industry, think-tanks, consultants, modelers to deliver a battle plan for decision makers

- Solutions must look at the worldwide socioeconomic system and take for real the fact that **85% of the world's inhabitants are trying to catch up**
- Different regions, with varying economies, political systems and cultures need **tailored solutions**
- **System and system-of-system approach**: Carbon emission is only one dimension of humanity's ecological footprint. Solving this in isolation is likely to lead to unintended consequences. The Human-Earth system faces many more problems like **biodiversity loss, pollution, health, inequality, stagnating economic growth, debt, water scarcity, erosion, waste ...**

We follow these general principles

- Focus on technical feasibility putting physics, thermodynamics, demographics, economics, and engineering back at the center
- Prioritize problems and (big impact) solutions
- Submit any plans and solutions to rigorous simulations for unintended consequence and what-if scenarios
- Take a worldwide perspective and follow the fox' creed: *'one size does not fit all'*



Bring together dream team of scientists, technologists and industrialists

Internationally diversified: Europe, China, North America, India ...

Multi-disciplinary: Climate, energy, ecology, economics, finance, food, health

Across industries: Food, energy, asset management, insurance ...

Institutions: ETH, Shenzhen, BIS, UN, IPCC, ...

In a multi-levelled partnership

- Academic Advisory Board
- Industrial Advisory Board
- Supervisory Board
- Executive management team
- Staff of modelers, data scientists, programmers and researchers
- Support by external consultant companies and freelancers
- Access to engineers, scientists and modelers – the wisdom, experience and knowledge from our partners

Where do we stand?

To tackle this enormous challenge, we need to bring together a diverse group of **doers** from different sectors in industry and finance to **sponsor** the project and/or to **participate** with their wisdom and experience.

Total project cost: \$ 5 million

Of which, phase 1 project cost: \$ 2.5 million

Commitment: \$ 1.2 million

‘doing well by doing good’

Hoping that you join this initiative, this positions yourself at the forefront to foresee, adapt, recognize risks, grab new opportunities and steer your company through the turbulent times ahead.

Rebalancing towards a green economy will impact all sectors:

- energy
- food
- heavy industry, steel, cement, chemical
- transportation and mobility
- infrastructure, building and construction
- insurance
- finance and investment management

This shock will create new winners and losers.