Sustainable Development in Tertiary Education

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A plethora of programs

- There are now thousands of university programs that mention ‘sustainable development’; environmental science, energy engineering, conservation, social justice, business management, environmental economics, law, urban planning, policy and others.

- But still several under-served but critically important areas:

- The science/policy interface.
- High-level applied multidisciplinary problem-solving.
- Developing policy in an age of change and uncertainty.

CHALLENGES FOR EFFECTIVE DECISION-MAKING

Politicians

- Short-term time horizon.
- Have to include political feasibility, perceived costs/benefits.

Scientists

- Believe that people will act on clear, factually-based argument.
- Don’t address limited role of scientific evidence in decision-making.
- Don’t fully engage with social and political trade-offs involved.

SOLUTION-ORIENTED APPROACH

Politicians

- Show viable transition path to better future.
- Identify pathways with investment opportunities, not just costs.

Scientists

- Translate uncertainties into probabilities.
- Engage with social and political trade-offs, identify transition strategies.

EXAMPLE: key SD issues:

Parameters

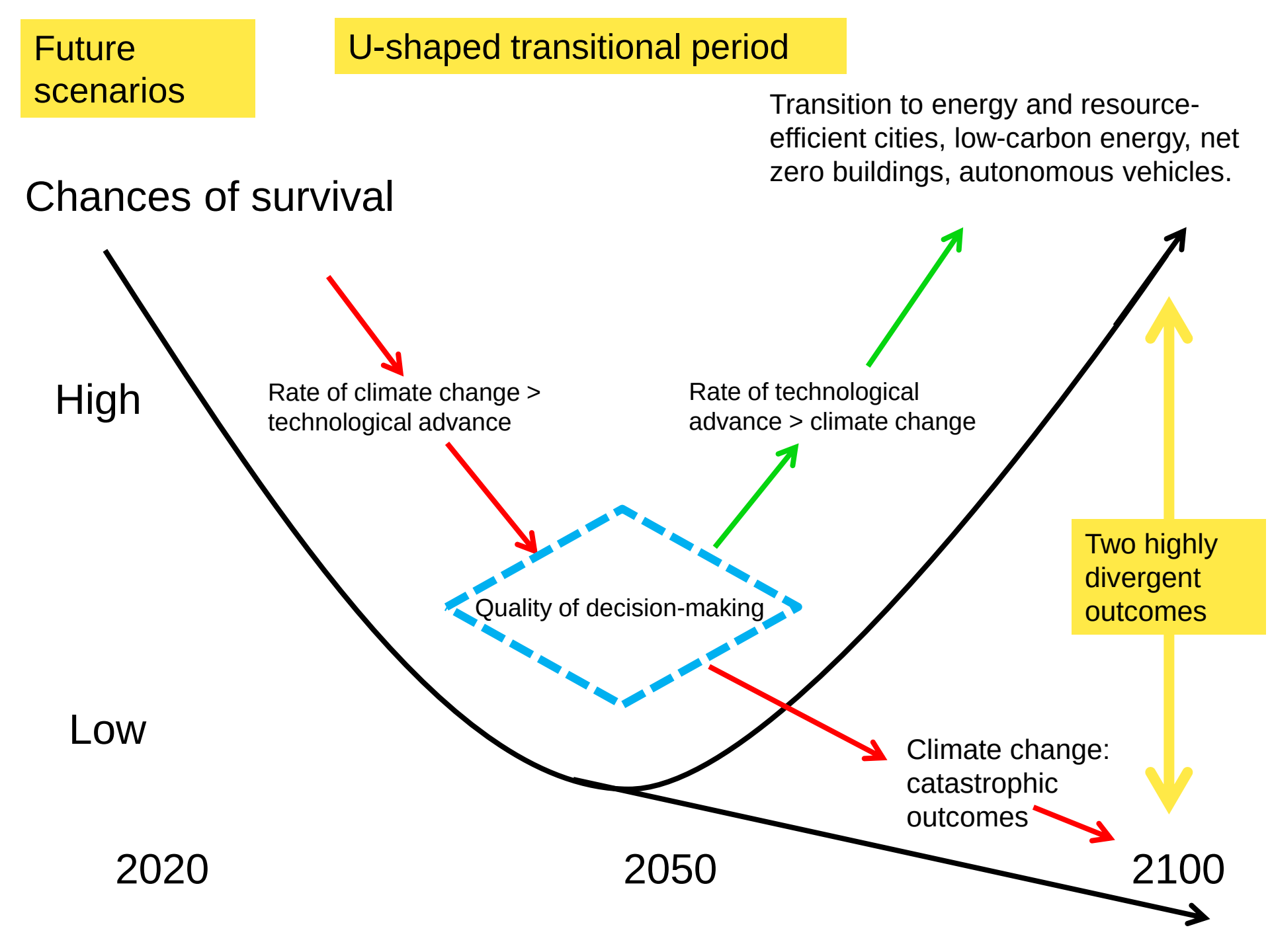
1. **More people:** by 2100 will be 2.5–5.3bn more people (up from 8.2bn), transition into ageing/population decline.
2. **Older:** median age now 29; by 2050 will be 41, ~3bn will be > 60yo.
3. **More urban:** demographic growth, internal migration, relocation from flood areas could add 3.9bn to urban populations, need ~200 more cities with >20m people.
4. **Climate change:** By 2050 2C hotter than pre-industrial level, over 50% population in water-stressed areas. By 2100 2-4C hotter; large-scale climate-driven migration.

Key directions of change

1. **Increase efficiency** (food, energy, water, waste, transport etc.)
2. **Adjust to ageing** society (e.g. biomedical science, robotics)
3. **Find new solutions for urban living** (construction, work, transport etc.)
4. **Transition to low-carbon** energy supplies.

Future scenarios

U-shaped transitional period

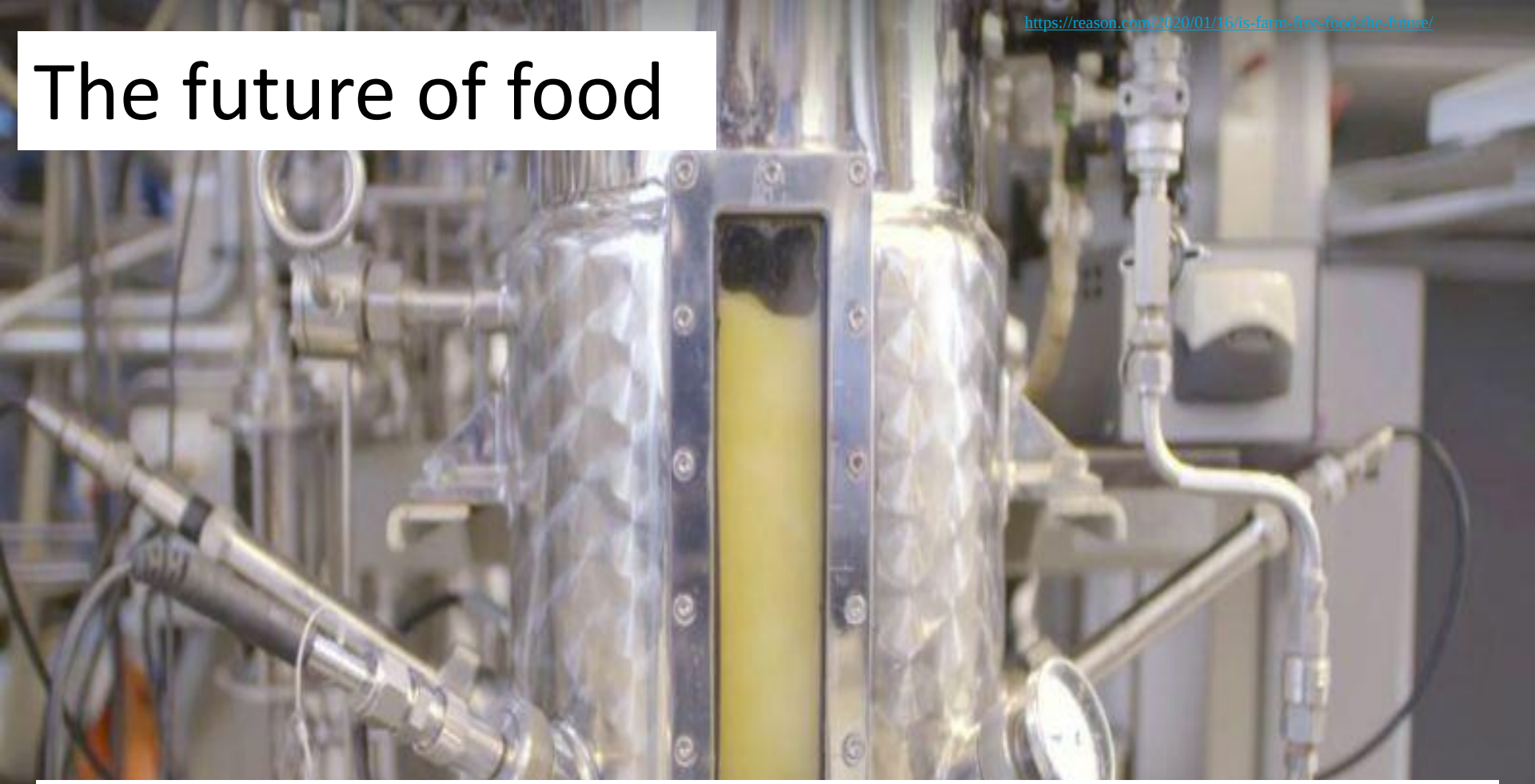


How can we meet challenges on this scale?

By changing how we think about the problem

Integrating water management, food production and air quality control into building structures

The future of food



https://reason.com/2020/01/16/is-farm-free-food-the-future/

Microbes producing proteins in fermentation bioreactors.

- Inputs: CO2, hydrogen, sodium, potassium etc.
- Outputs: Protein powder, amino acid composition similar to soy. Can be used in any processed food product.

1 kg fermed protein requires 1.5% of land, 1% of water required for 1kg plant protein; 0.2% of water and 0.1% of land required for 1kg beef.

Mercedes Benz F015 autonomous car

- Average car in USA in use 5% of time.
- In NYC, own car costs $3/mile. Uber taxi $1.50/mile. Autonomous taxi: $0.30/mile.
- Automated trucks double capacity of roads, reduce cost per load by 75%: eight-fold gain in price performance.
- USA just needs 20% of vehicle fleet.
- Prevent 90% of road deaths.

THE FOURTH INDUSTRIAL REVOLUTION

- By 2050, there will be 6 billion people in the world workforce.
- About 5 billion will be doing jobs that don't exist today.

- The Millennium Project, 2020

The challenge for educators

- How do you prepare people for jobs that don't yet exist?
- Where they will use technologies that may have not yet been invented?
- To solve problems that we may not yet know about?

The challenge for universities

- Universities have been protected by government regulation and rising demand for HE qualifications, driven by demographics, defensive expenditure and public financing. Now post-peak for all three. Populating ageing; 20% UK graduates would have been better-off without university, governments now seek value for money
- "In the past, people came to the information, which was stored at the university. In the future, the information will come to the people, wherever they are. What then is the role of the university?" - Eli Noam
- Most popular MOOC in 2021: Machine Learning, Andrew Ng, Stanford University. Total enrollment: 3,739,475. (Total for entire Caribbean c.95,000, 1/40th)
- About half of universities and colleges in the USA now marginal

Degree structures

- Can no longer acquire all necessary skills in a few years at university. Model will be life-long learning. People will take short course when need to upgrade skills.
- Courses constantly updated to reflect technological changes, more emphasis on applying knowledge in work environment.
- Emphasize development of understanding, context, pattern – many technical components will be automated.
- Some universities have moved away from degrees organized by disciplinary subject, now focusing on hybrid degrees in high demand. In future, fewer graduates in biology or business studies, and more in combinations such as ‘biomimetics and business’.

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