

What is globalisation?

Are we globalised yet?

Where is the end of the process?

Globalisation and food chain safety: drivers, analysis tools and implications on official control

Ákos JÓZWIAK, NÉBIH



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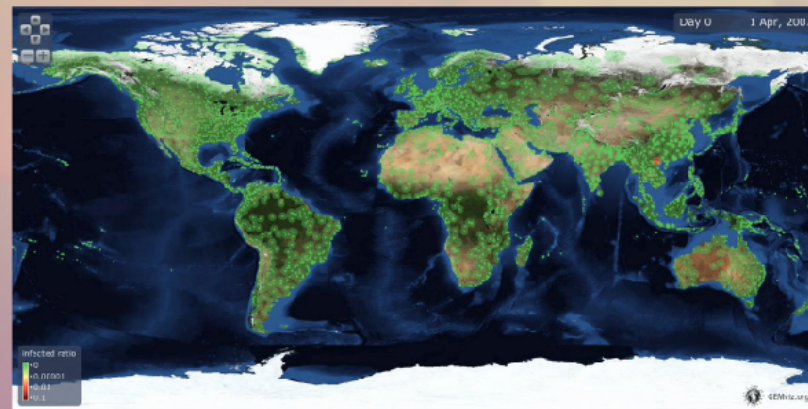
Where is the end of the process?

Globalisation

drivers analysis

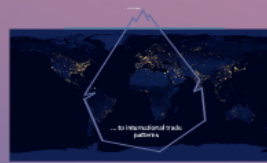


Food chain is actually a complex network

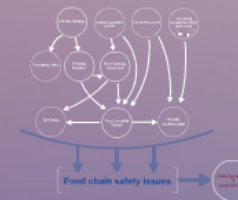


gleanviz.org

Many orders of magnitude

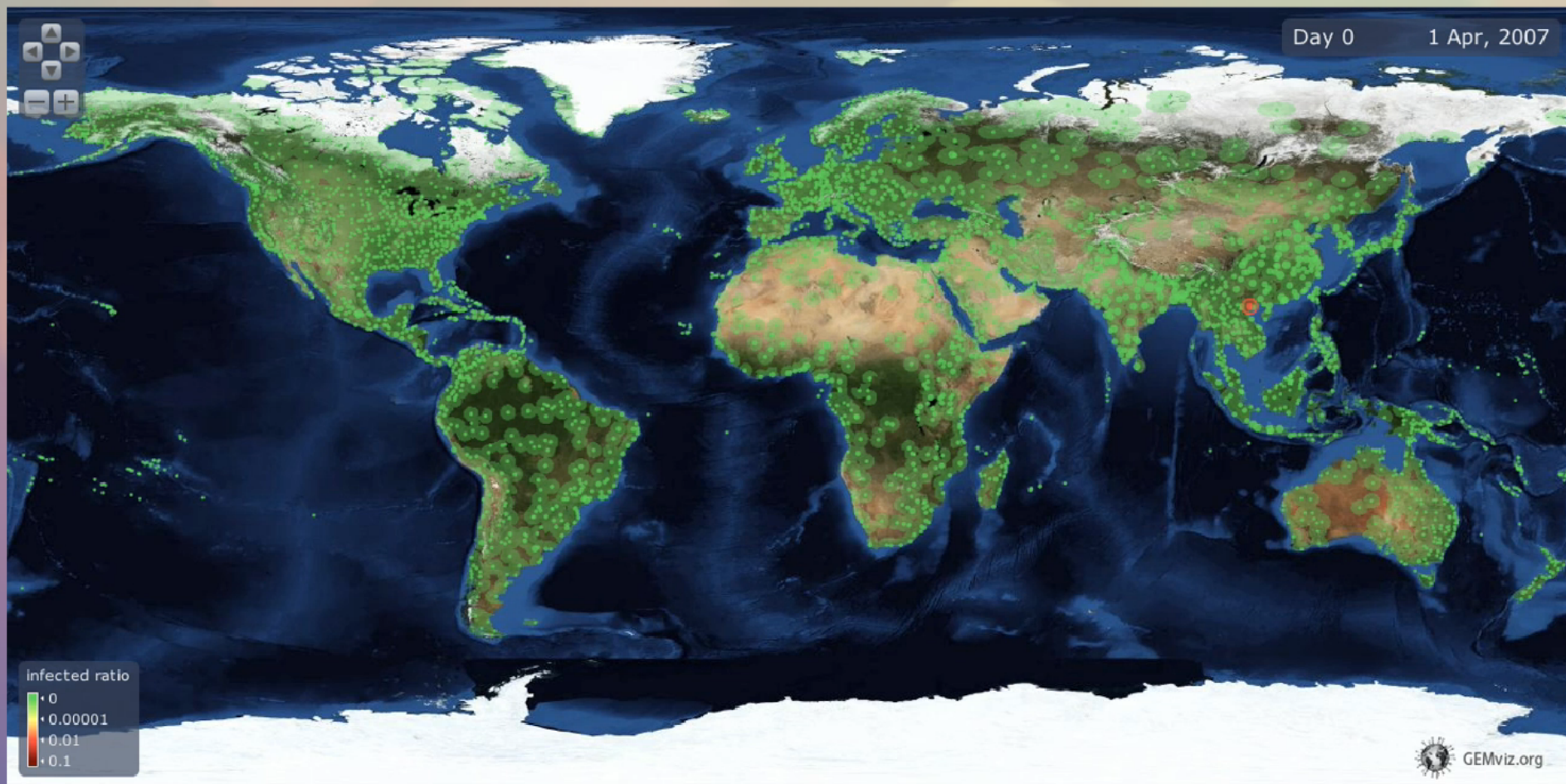


Complex drivers



Global and local data analysis

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S. Keola, M. Andersson and O. Hall: "Monitoring development from space: Using night-time light and land cover data as proxies of economic growth"
(via <http://www.economist.com/blogs/banyan/2013/09/measuring-local-economies>)

From nano particles...



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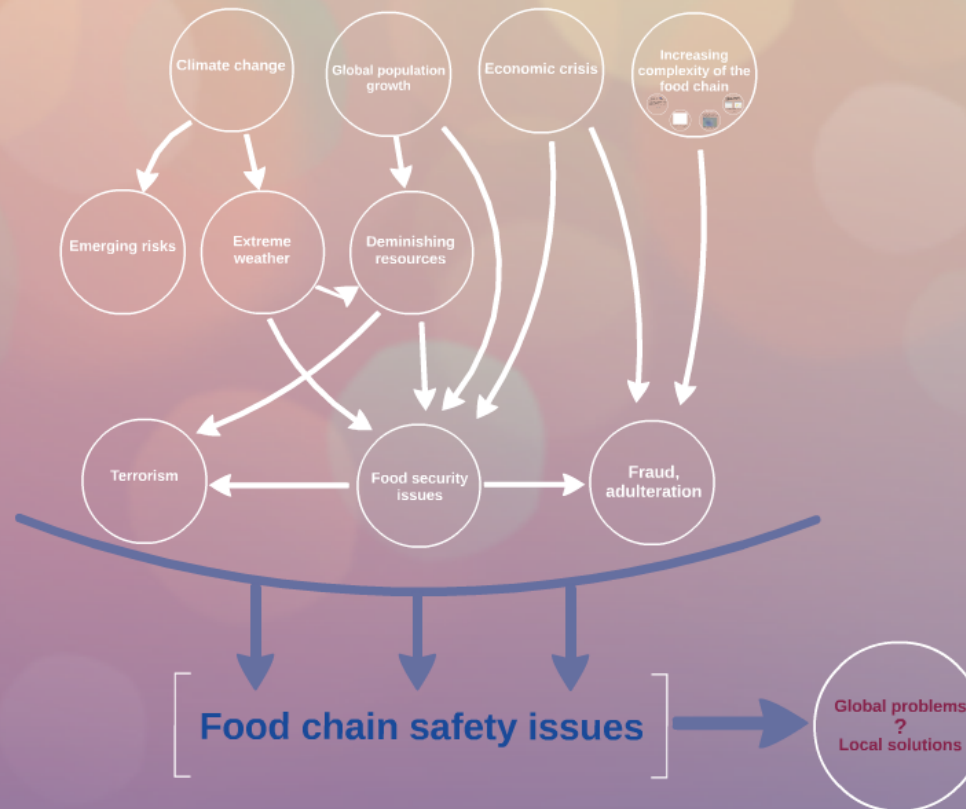
**... to international trade
patterns**

Many orders of magnitude

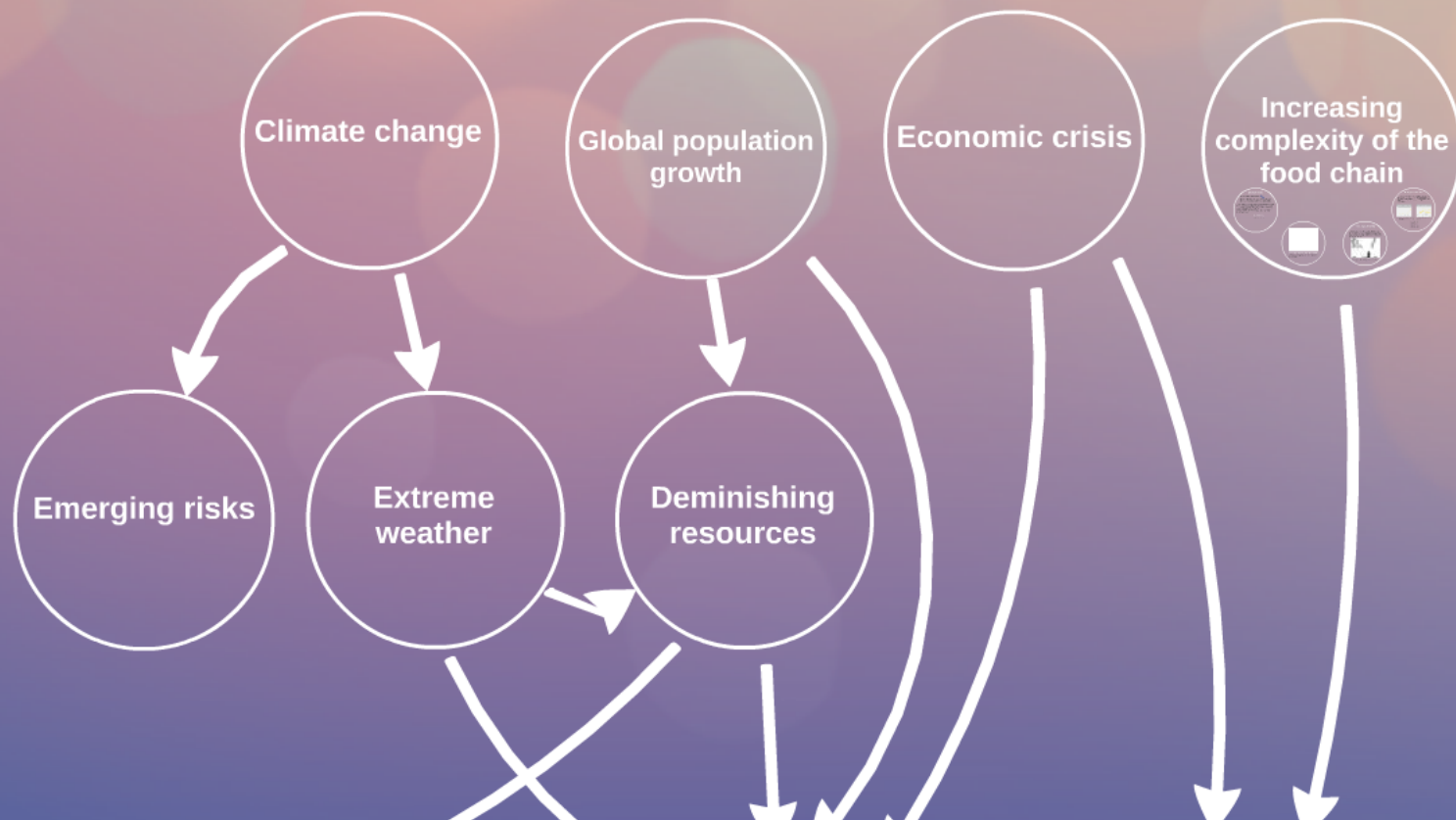


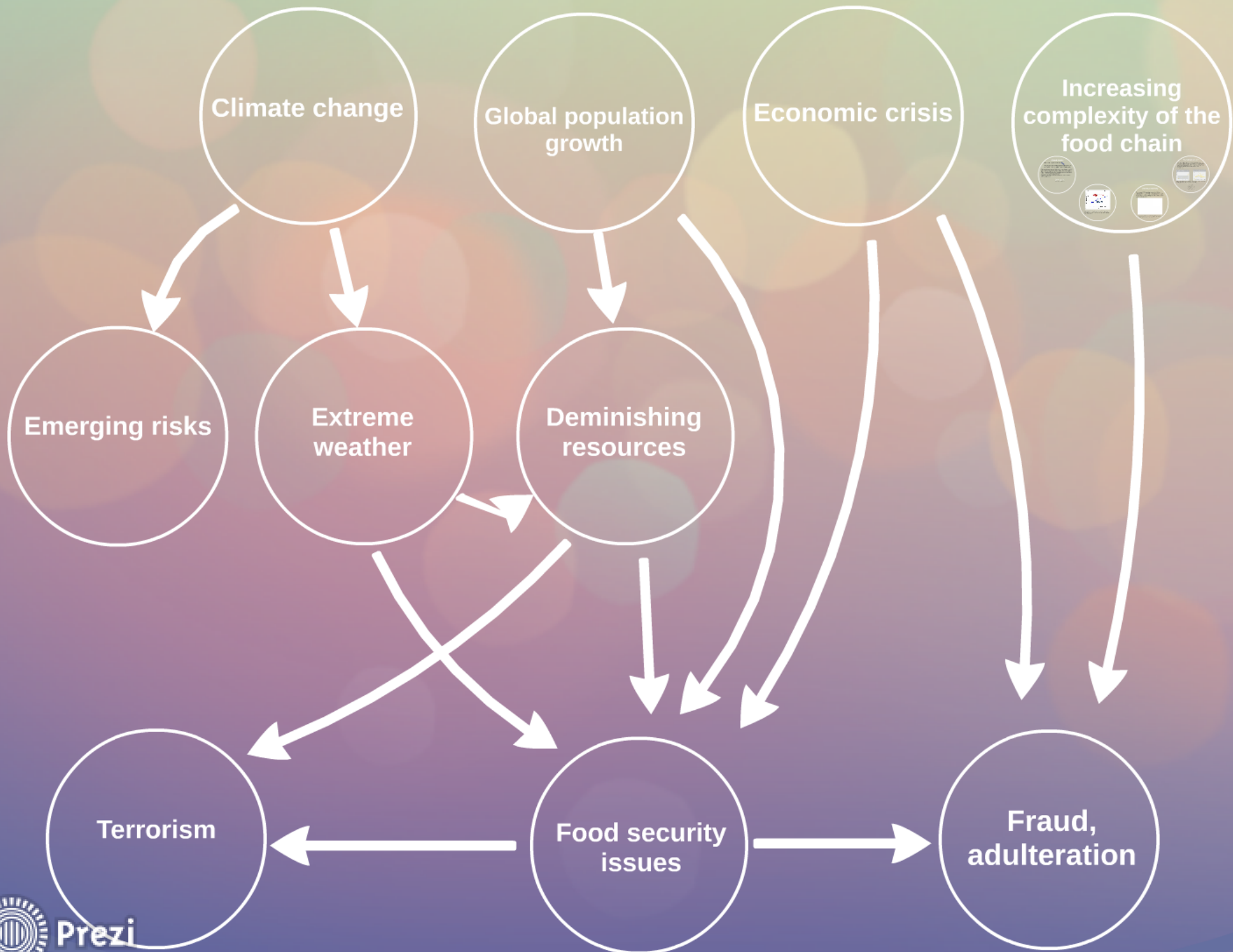
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Complex drivers



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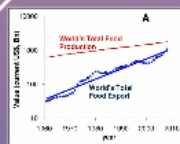
Increasing complexity of the food chain

Global trends

2050: 9.2 billion people expected
International trade in food and feed is expected to rise significantly in order to nourish the global population

- The global economy up to 2010 was constantly growing (2.2% per year on average during the period between 2000-2010).
- This trend changed due to the economic crisis and it is very difficult to make any predictions now.
- However, it is clear that developing countries are facing a hunger explosion.

Provisional share of the global economy's total

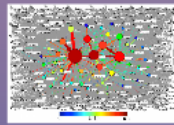


The world's food trade grows faster than the food production

International trade in food and feed is expected to rise significantly in order to nourish the global population

Growing complexity

7 countries (6 EU member states, the USA and Canada) form the core of the international agri-food trade network, each trading with over 77% of all the countries on the world.



How global we are?

The network global pattern is far from trivial, actually the network is only the beginning and the world we know is more local than global, but our personal relations and business connections are rooted in our direct environment.



Personal relations and business connections are only the beginning and the world we know is more local than global, but our personal relations and business connections are rooted in our direct environment.

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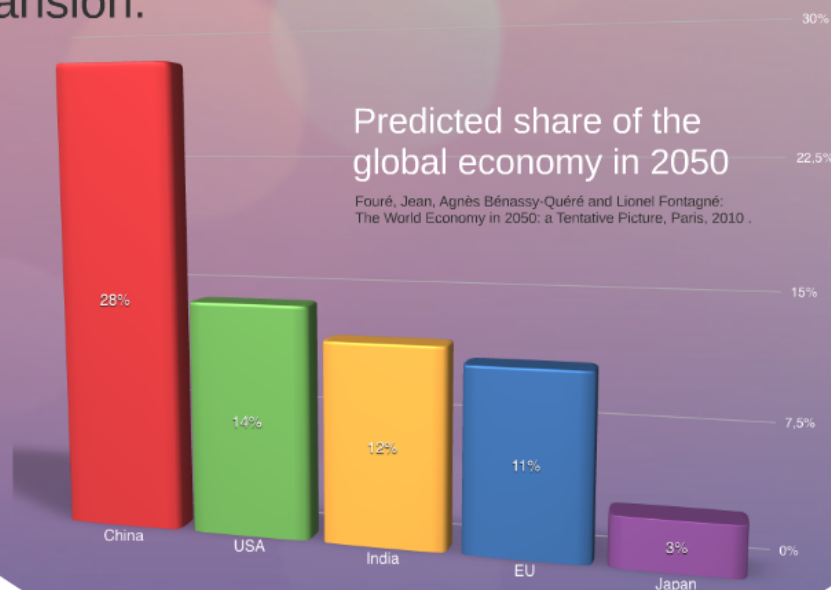
Global trends

2050: 9.3 billion people expected



international trade in food and feed is expected to rise significantly in order to nourish the global population

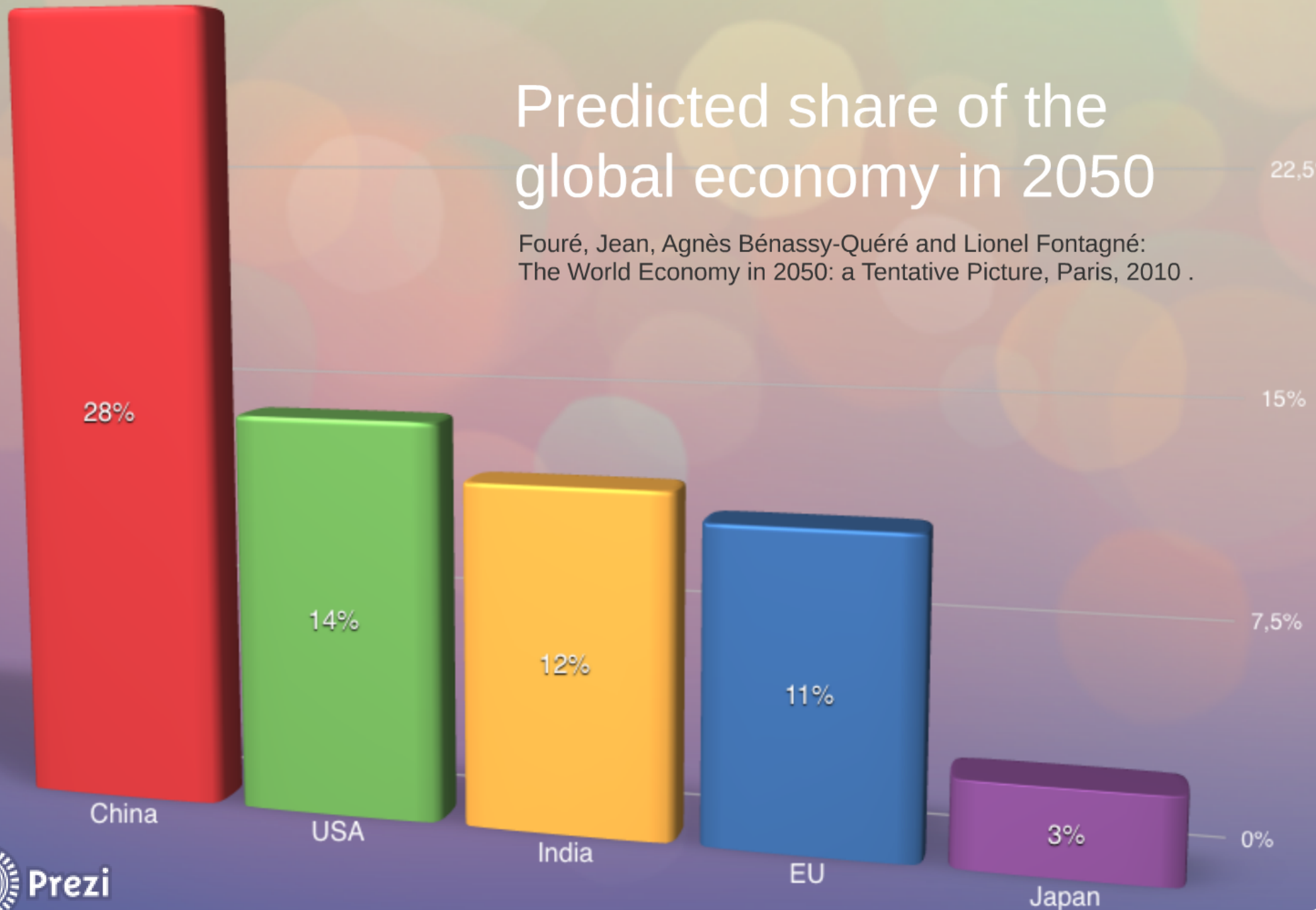
- The global economy up to 2010 was constantly growing (3.2% per year on average during the period between 1980-2010).
- This trend changed due to the economic crisis and it is very difficult to make any predictions now.
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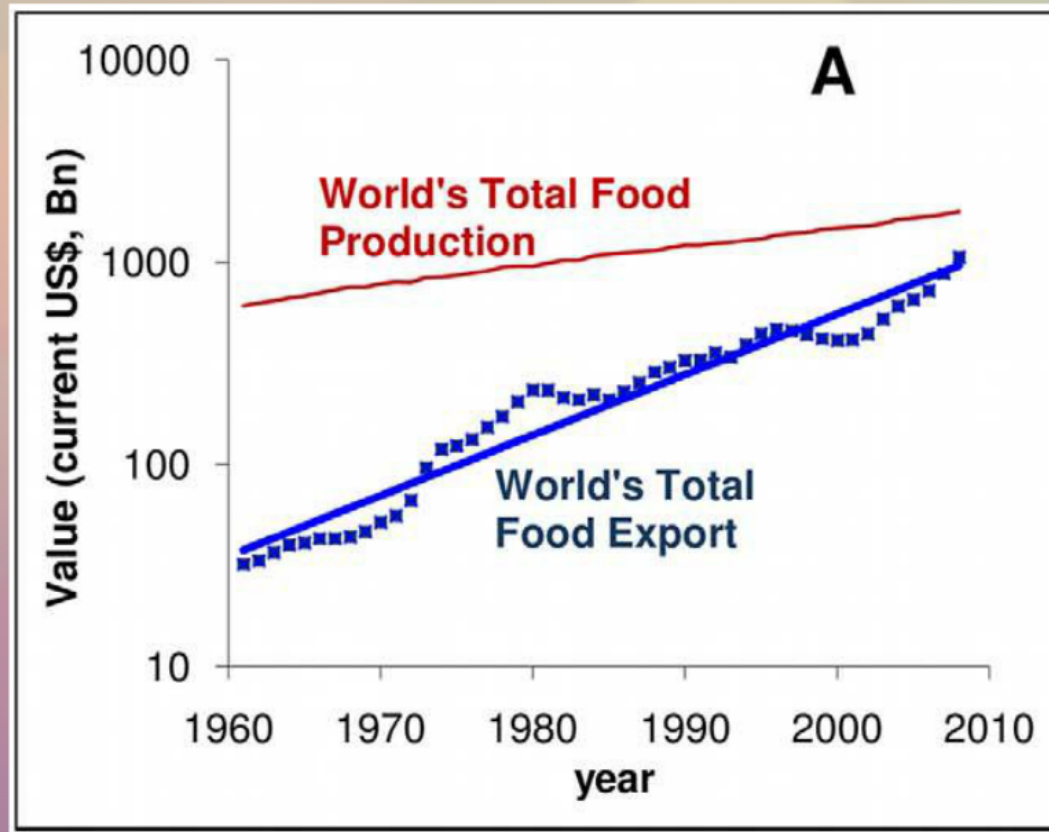


ansion.

Predicted share of the global economy in 2050

Fouré, Jean, Agnès Bénassy-Quéré and Lionel Fontagné:
The World Economy in 2050: a Tentative Picture, Paris, 2010 .



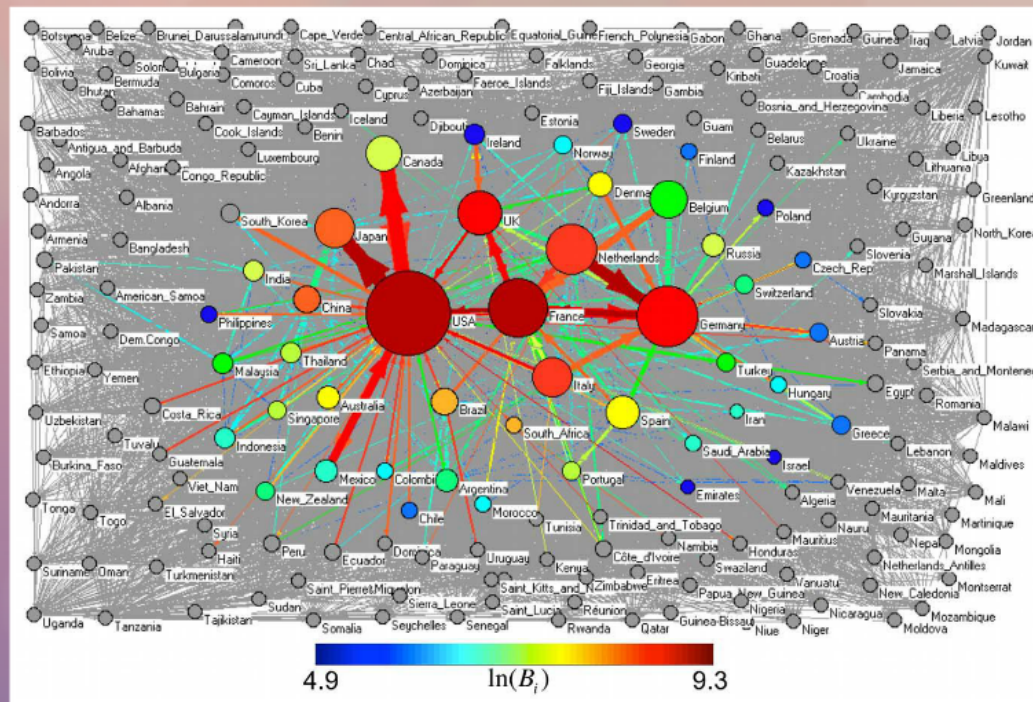


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Ercsey-Ravasz, M., Toroczkai, Z., Lakner, Z. & Baranyi, J. Complexity of the International Agro-Food Trade Network and Its Impact on Food Safety. PLoS ONE 7, e37810 (2012)

Growing complexity

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How global we are?

The sensed globalization is far from finished, actually this process is only the beginning and **the world we know is more local than global**: both our personal relations and business connections are realised in our direct environment.

Figure 1.2 Total Exports of Goods and Services As a Percentage of World GDP, 1810–2011

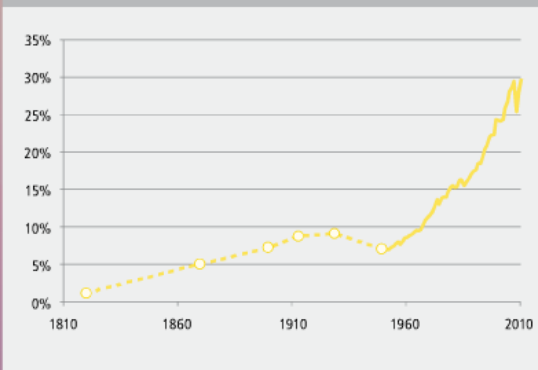
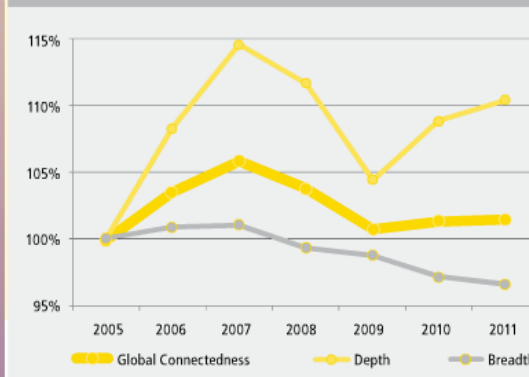


Figure 1.1 Global Connectedness Trends, 2005–2011 Overall Connectedness Depth and Breadth



Pankaj Ghemawat and Steven A. Altman: DHL GLOBAL CONNECTEDNESS INDEX 2012. Analyzing global flows and their power to increase prosperity

- Global connectedness is weaker than is commonly perceived
- Europe is the world's most globally connected region: a reminder of what EU integration has managed to achieve – and what its fragmentation might put at risk
- Potential gains from boosting global connectedness can reach trillions of dollars
- Every country has untapped possibilities to benefit from more connectedness
- Countries' domestic and international policies can help them connect more

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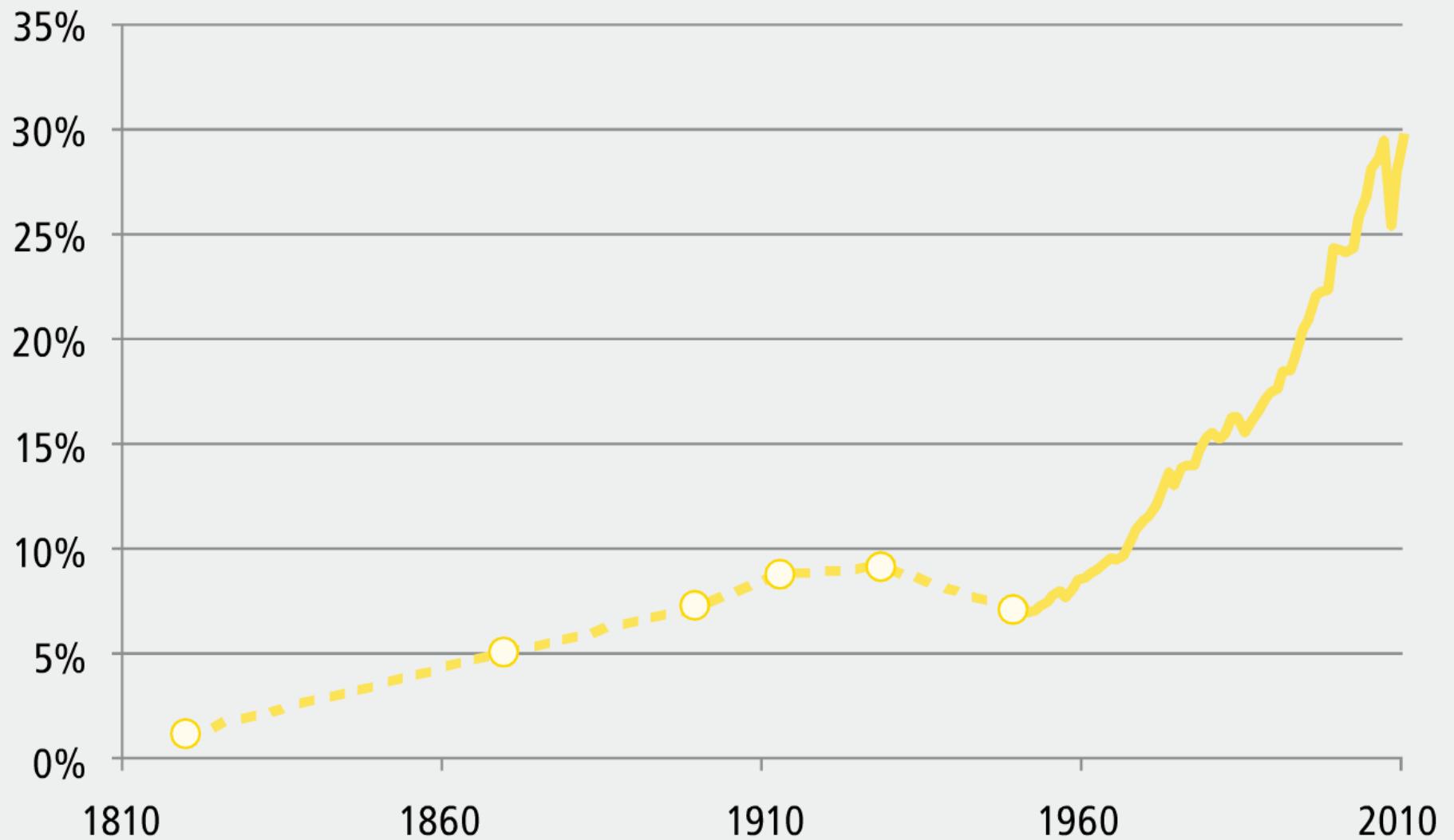
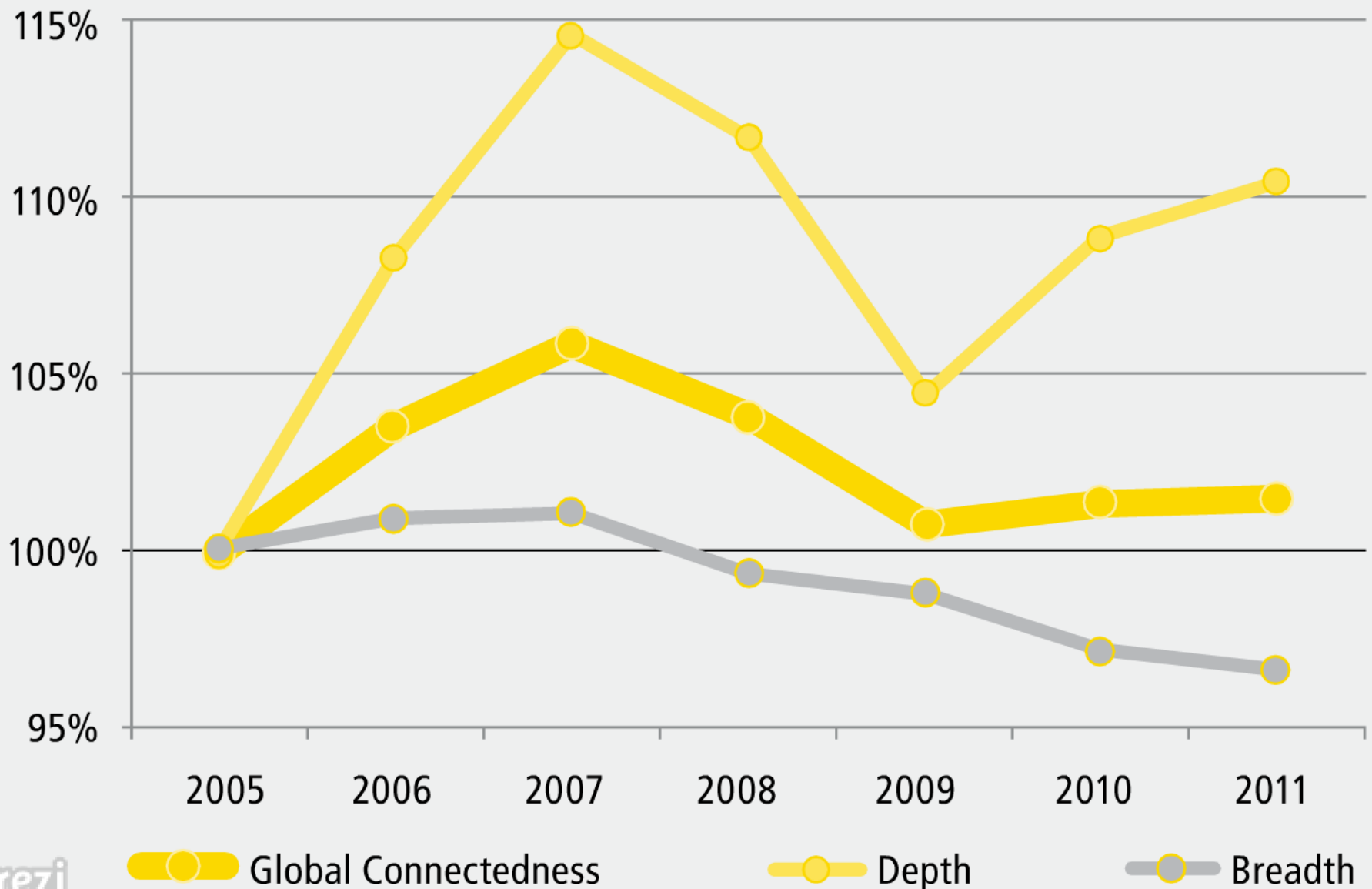


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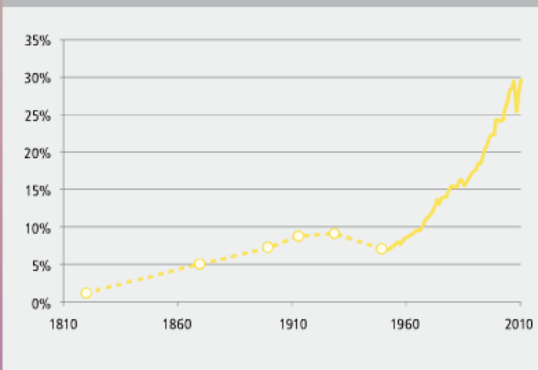
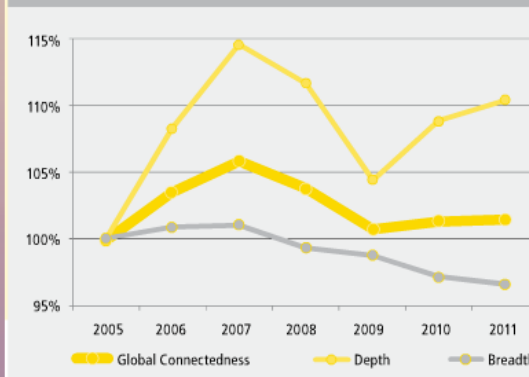


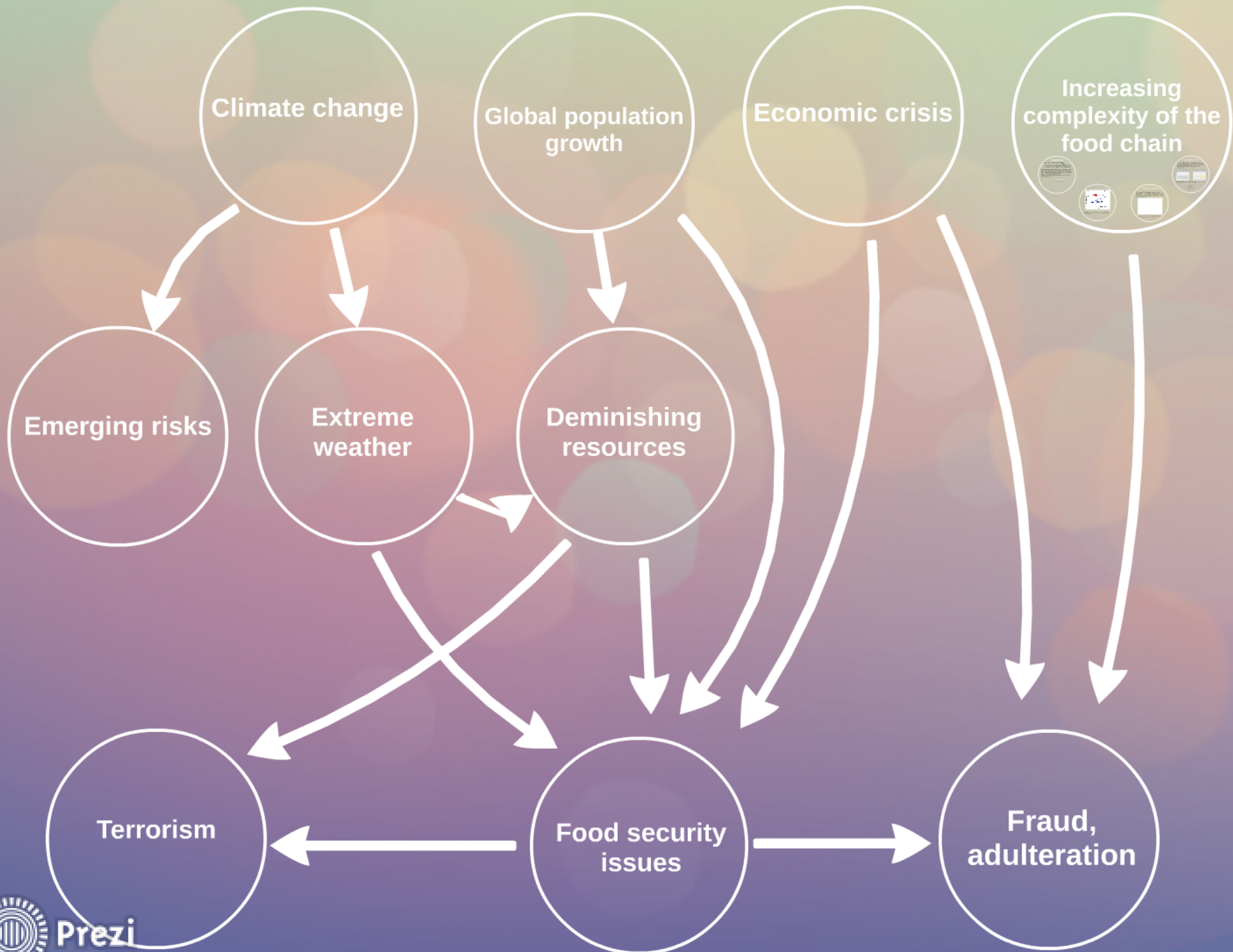
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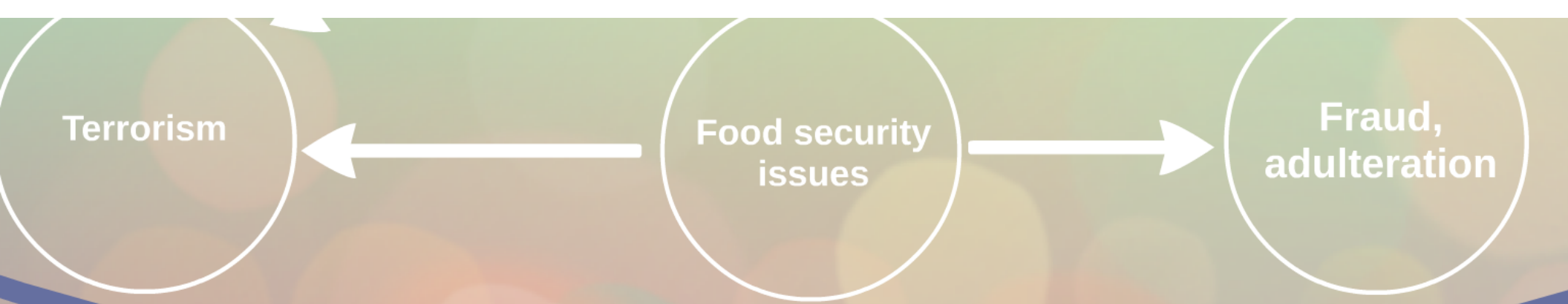


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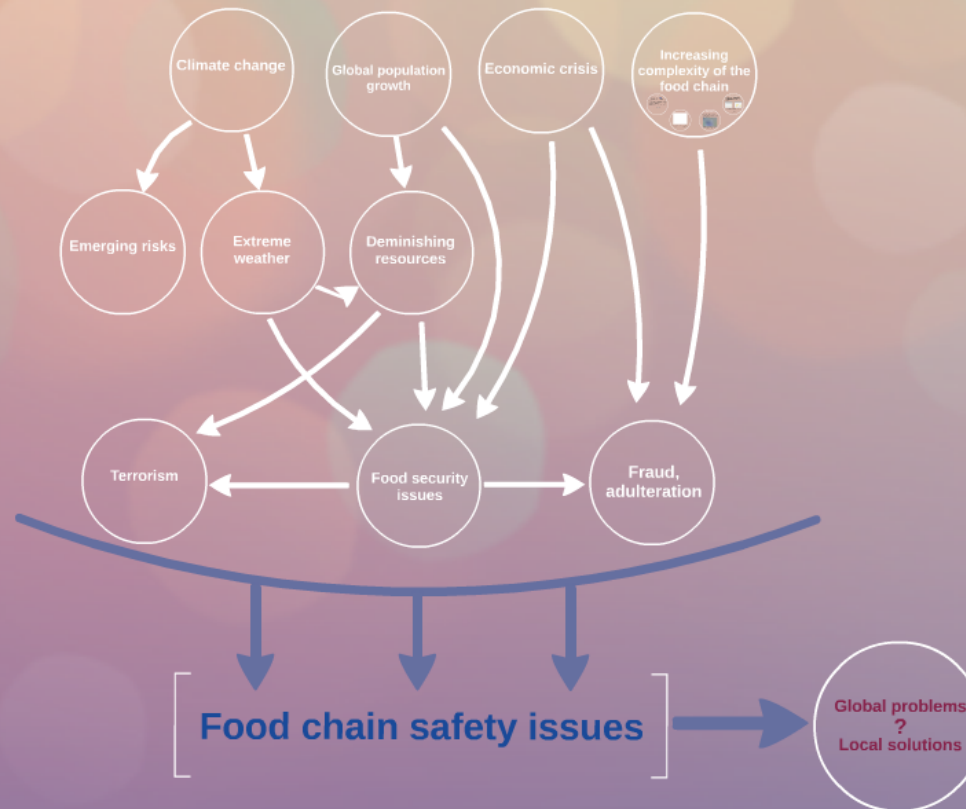


Food chain safety issues



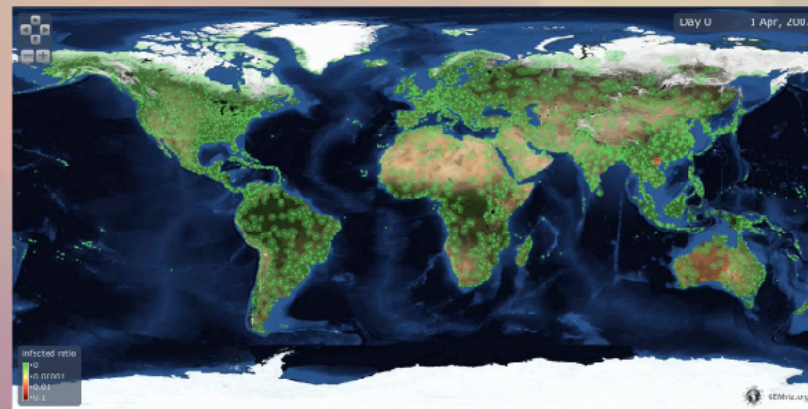
**Global problems
?
Local solutions**

Complex drivers

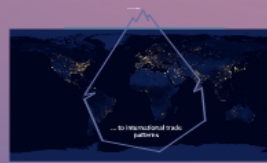


Global and local data analysis

Food chain is actually a complex network

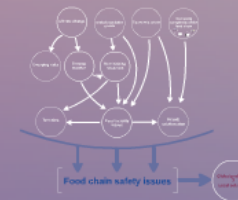


Many orders of magnitude



Global and local data analysis

Complex drivers



Information boom

From the dawn of the civilization to 2003
humans produced 5 exabytes of data.

Now we produce 5 exabytes every 2 days.

R&D&I

New methods are needed

Computational science

- able to detect patterns which can not be detected by a smaller set of data
- those **emerging patterns** can be surprising & counterintuitive
- 'more is different'

R&D&I

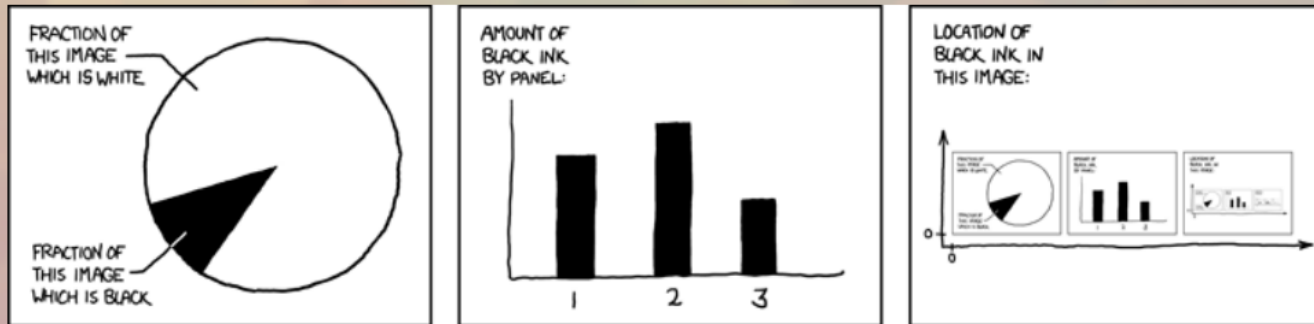
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Important is...

...the story behind the numbers!



Source: xkcd.com

Creation and development of (big) databases is not only an IT problem

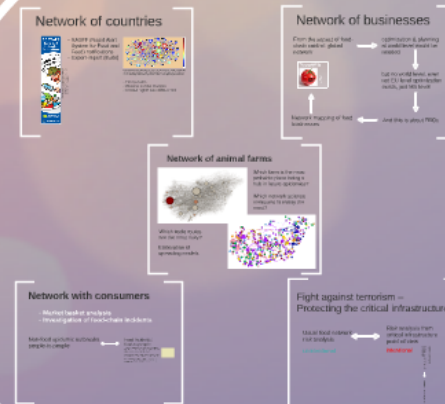
The ability of analysis and evaluation of input data and results: high-level knowledge of food chain science is needed enabling interpretation and validation.

Seek for new approaches, new analysis and control methods

Computational science as a solution

- Big data
- Network science
- Data mining
- (Business) intelligence
- Quantified self
- STEAM (science, technology, engineering, arts, mathematics)
- ...

Network science



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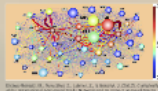
- Meta-analysis
- Psychology
- Game-theory
- Decision theory
- Risk-benefit analysis
- Predictive modeling
- ...

Network science

Network of countries



- RASFF (Rapid Alert System for Food and Feed) notifications
- Export-import (trade)



- Find patterns
- Observe sudden changes
- Choose higher risk nodes or link

Network of businesses

From the aspect of food-chain control: global network

optimization & planning at world level would be needed

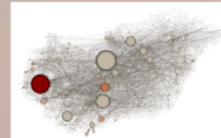


but no world level, even not EU level optimization exists, just MS level

Network mapping of food businesses

And this is about FBOs

Network of animal farms



Which farm is the most probable place being a hub in future epidemics?

Which network science measures fit reality the most?

Which trade routes are the most risky?
Elaboration of spreading models

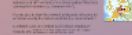


Network with consumers

- Market basket analysis
- Investigation of food-chain incidents

Non-food epidemic outbreaks people-to-people

Food incidences: food-to-people



Fight against terrorism – Protecting the critical infrastructures

Usual food network risk analysis

Risk analysis from critical infrastructure point of view

unintentional

intentional



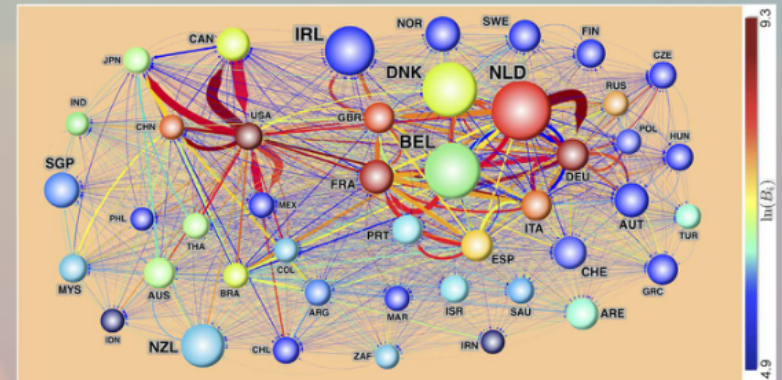
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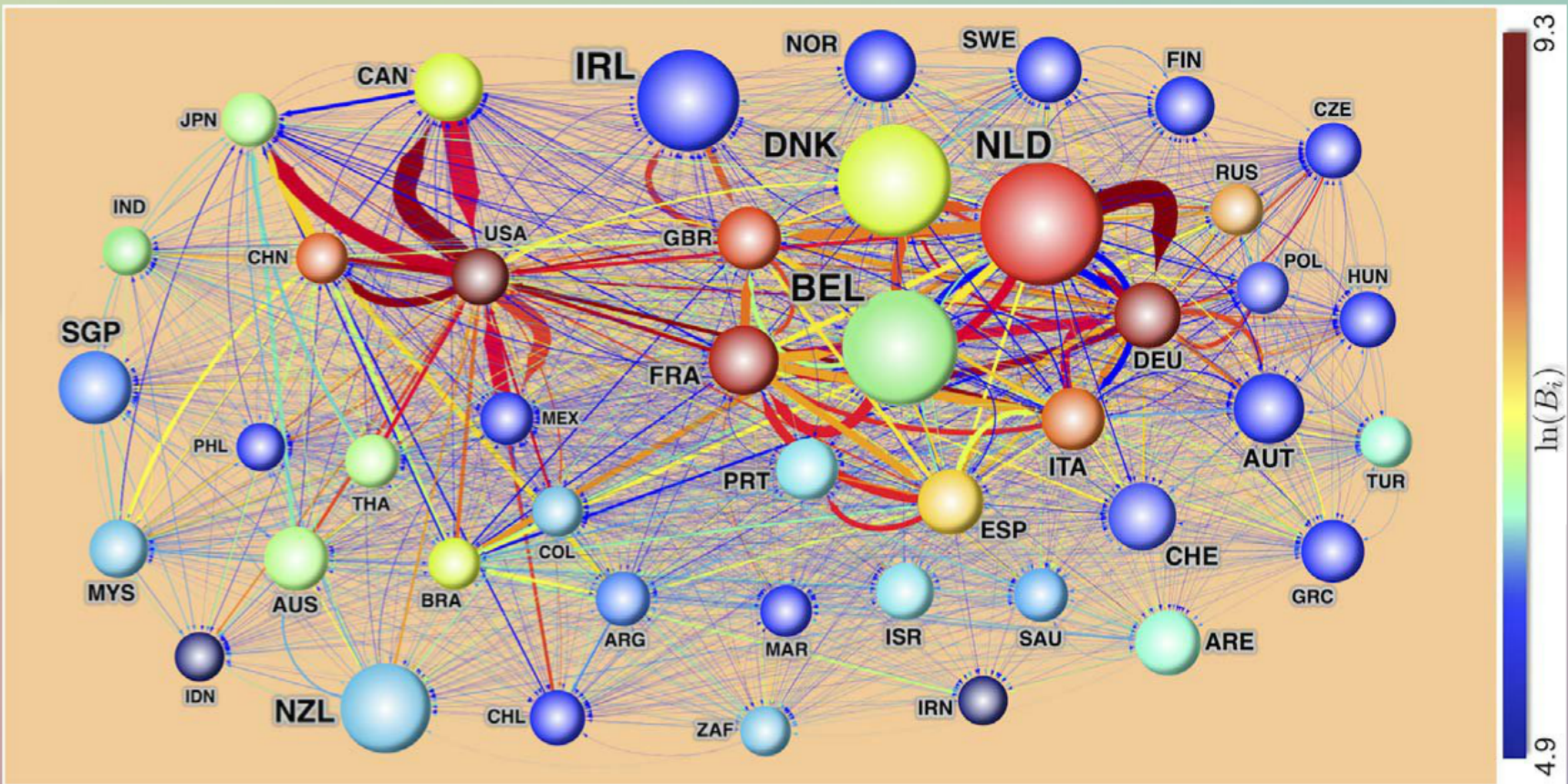
Our aim is to protect this network

Scale free networks: allows for a fault tolerant behaviour
but also allows for a few major hubs and
take them out of the network, it simply falls apart and is
turned into a set of rather isolated graphs.



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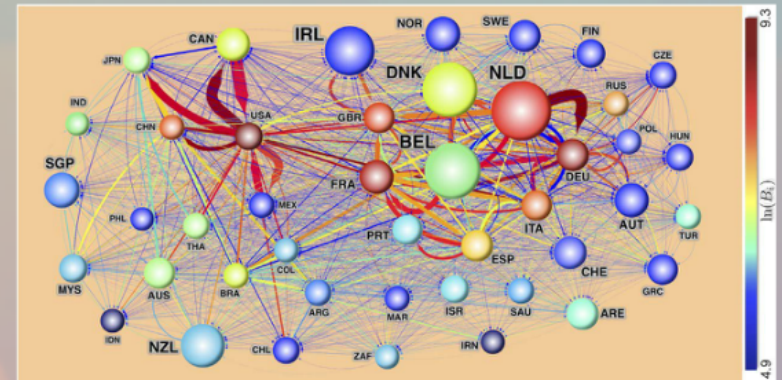
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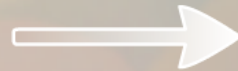


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Network of businesses

From the aspect of food-chain control: global network



optimization & planning at world level would be needed



but no world level, even not EU level optimization exists, just MS level



And this is about FBOs



Network mapping of food businesses



Traceability



'one step back –
one step forward'

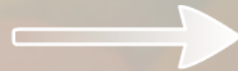


No obligation for internal traceability nor for electronic databases, however there is potentially enormous amount of data to explore



Network of businesses

From the aspect of food-chain control: global network



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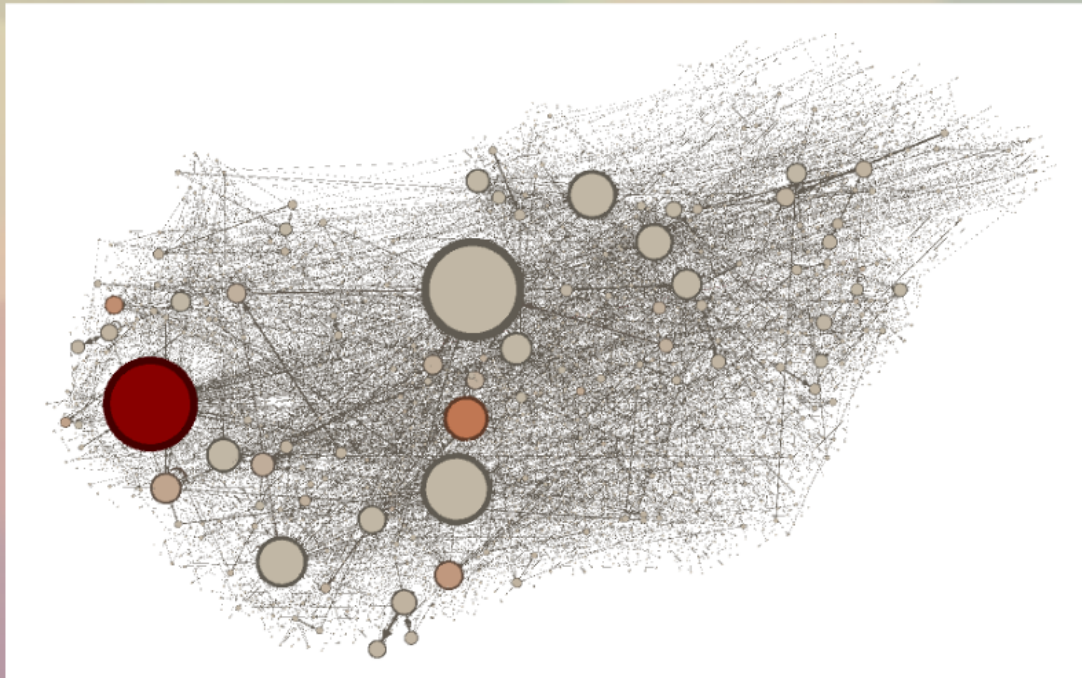
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Network mapping of food businesses



Network of animal farms

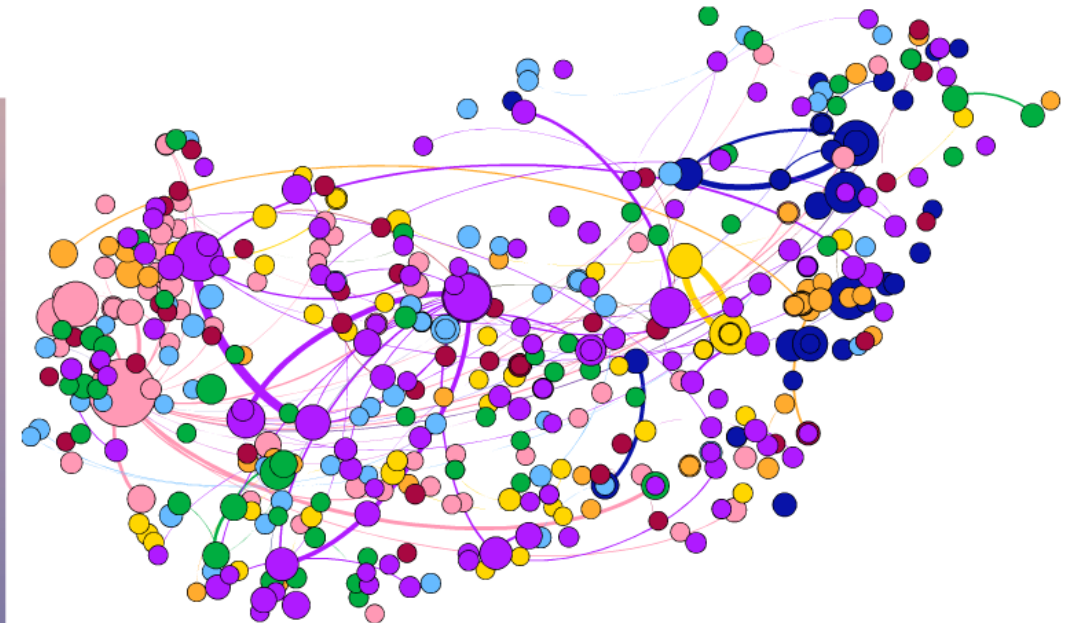


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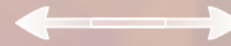
Elaboration of spreading models



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Non-food epidemic outbreaks
people-to-people



Food incidents:
food-to-people

The epidemiologic investigation has the most significant importance till the moment of the identification of the food causing the incident (e.g. German EHEC).

Are we able to draw the network at the point when we do not know exactly the nodes and links (i.e. source food)?

Is network science a helpful tool in those situations?

Actually, yes: Wilking H. et al.: Identifying Risk Factors for Shiga Toxin-producing Escherichia coli by Payment Information (2012)



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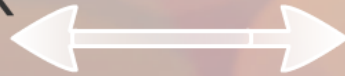
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Fight against terrorism – Protecting the critical infrastructures

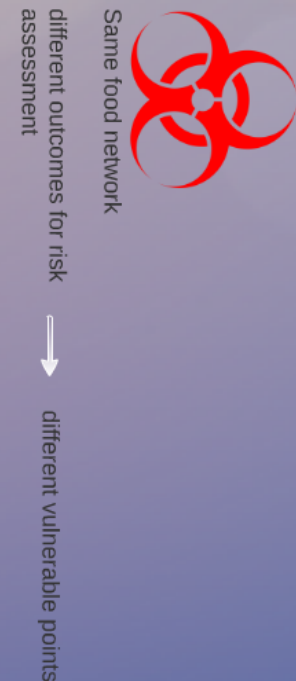
Usual food network
risk analysis

unintentional



Risk analysis from
critical infrastructure
point of view

intentional





Same food network

different outcomes for risk
assessment



different vulnerable points

WU



Prezi

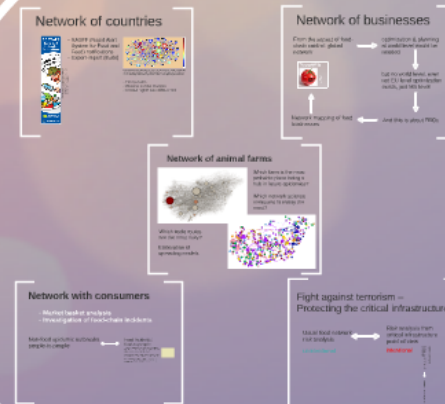


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Network science





Az sok csesztyapankát maizyva főznek, abból lesz a paprikaszoró.

Hé vaston nem főznek belébe, nem lesz belőle kosoró. Pólyá paprika
ágyasanyá, éppoly pörök, éppoly erők, de mégis kosoró.

Csak a maizdag lenne? Nem a maizdag lesz. Az a maizdag, mint tudják,
melekes, hármasfengu, vesem.

Hé akkor mi?

Aki ezon eszpendelkoni, s úgyis rá, hogy gondolják nékiválasztanak
opimáza, hanem bögyes anyósnak hallgatnak, nagy gúncigórnak, főbe a
opimáza.

Chikény Isidó: Az élel éthane

If we be a lot of chikény peppers on a string, they'll make a proper weath.

However, if we don't tie them on a string, they won't make a weath.
But only in the same amount of peppers, just as red and just as hot. But
not no weath.

Does it only lie in the string? No, it doesn't. That string, as we all know, is an
incidental, fufz-fufz thing.

Then what?

People capable of brooding over it and taking care not to let their mind
go to sleep, but keep their on the right track may get a bunch of eternal
weath.

Chikény Isidó: The meaning of life
Translated by M. Gillian Kishin



„Ha sok cseresznyepaprikát madzagra fűzünk, abból lesz a paprikakoszorú.

Ha viszont nem fűzzük fel őket, nem lesz belőlük koszorú. Pedig a paprika ugyanannyi, éppoly piros, éppoly erős. De mégse koszorú.

Csak a madzag tenné? Nem a madzag teszi. Az a madzag, mint tudjuk, mellékes, harmadrangú valami.

Hát akkor mi?

Aki ezen elgondolkozik, s ügyel rá, hogy gondolatai ne kalandozzanak összevissza, hanem helyes irányban haladjanak, nagy igazságoknak jöhet a nyomára.”

Örkény István: Az élet értelme

„If we tie a lot of cherry-peppers on a string, they'll make a pepper-wreath.

However, if we don't tie them on a string, they won't make a wreath. Although it's the same amount of peppers, just as red and just as hot. But still no wreath.

Does it only lie in the string? No, it doesn't. That string, as we all know, is an incidental, third-rate thing.

Then what?

People capable of brooding over it and taking care not to let their mind wander about, but keep them on the right track may get a scent of eternal verities.”

*Örkény István: The meaning of life
Translated by N. Ullrich Katalin*

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Are we globalised yet?

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Ákos JÓZWIAK, NÉBIH

