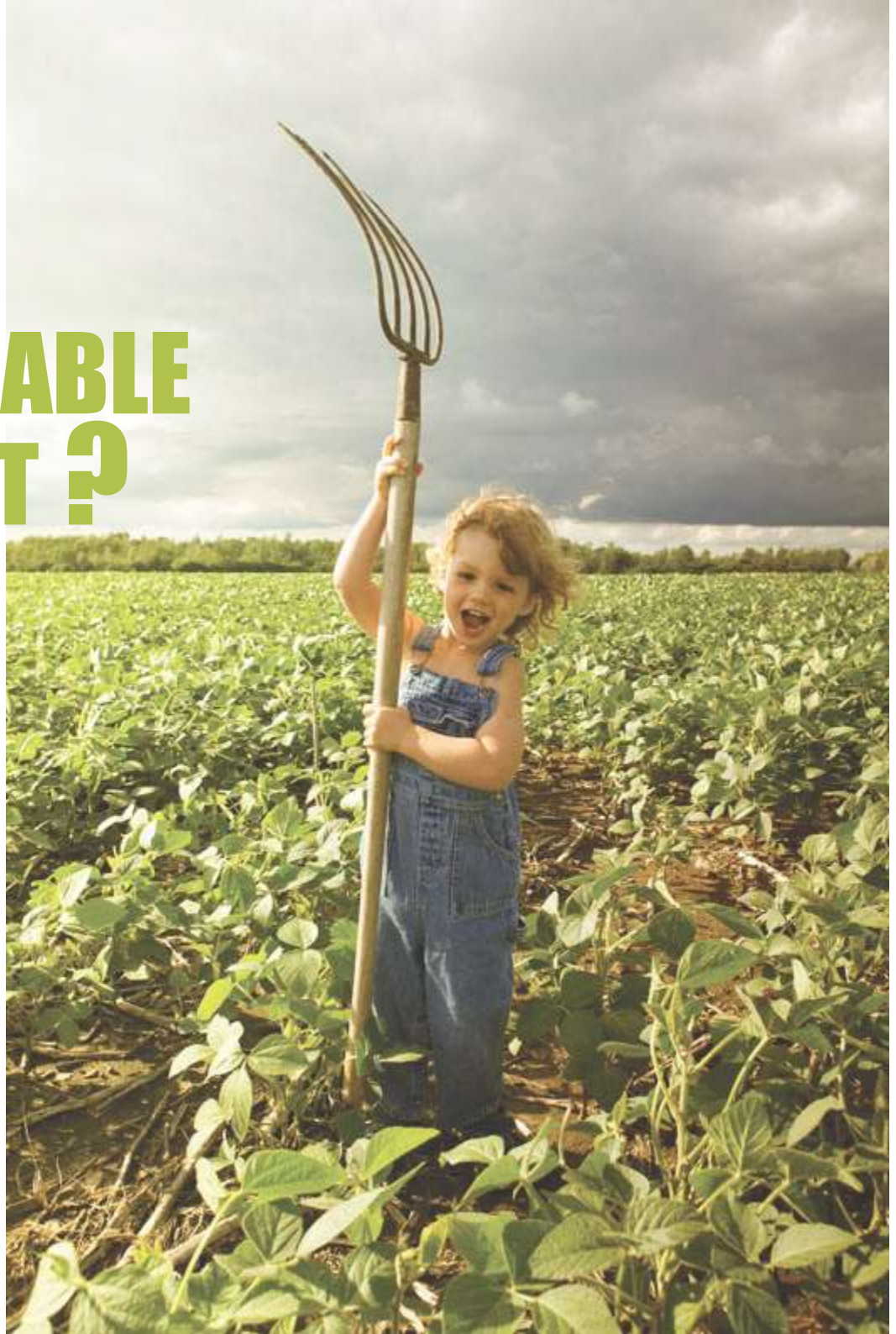


17 octobre 2018

GEMBLoux

DÉVELOPPEMENT DURABLE ET/OU EFFONDREMENT ?

PABLO SERVIGNE

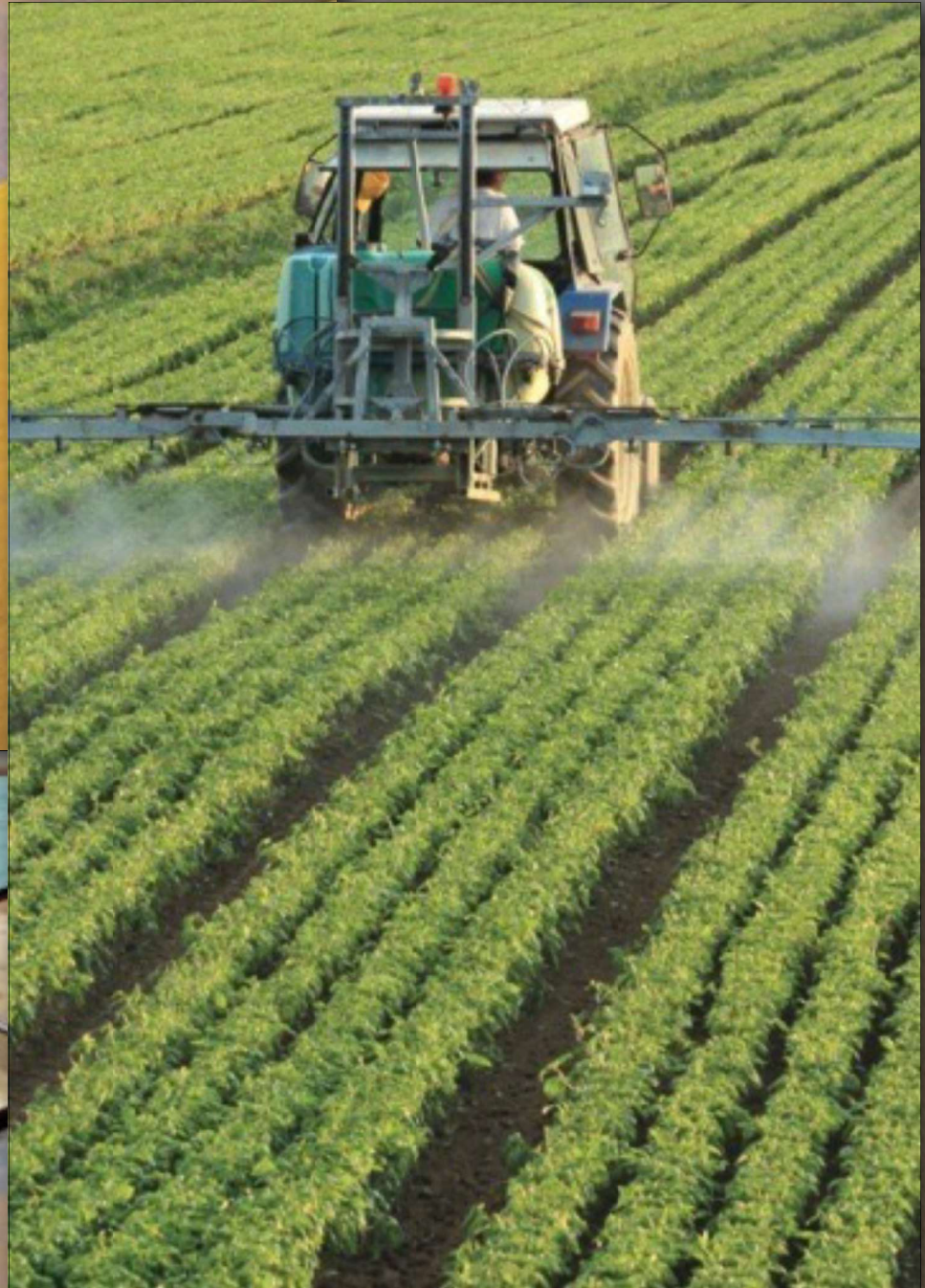




Peter Menzel « Hungry Planet »

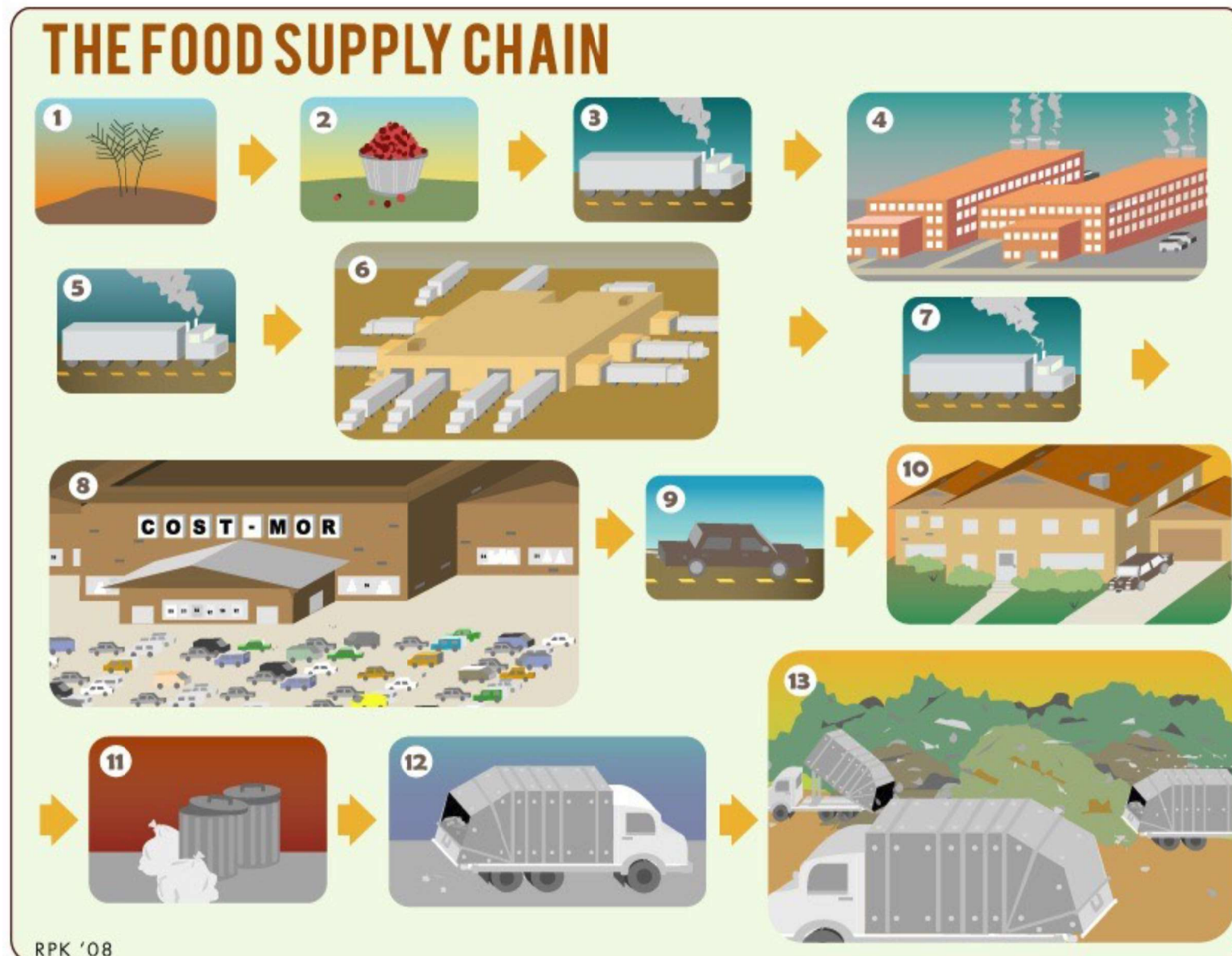


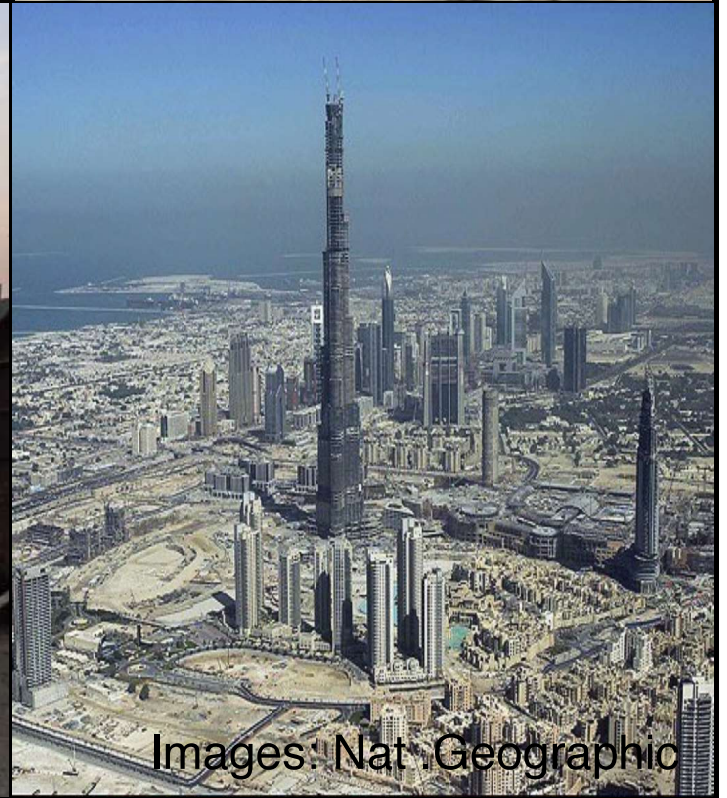
Peter Menzel « Hungry Planet »



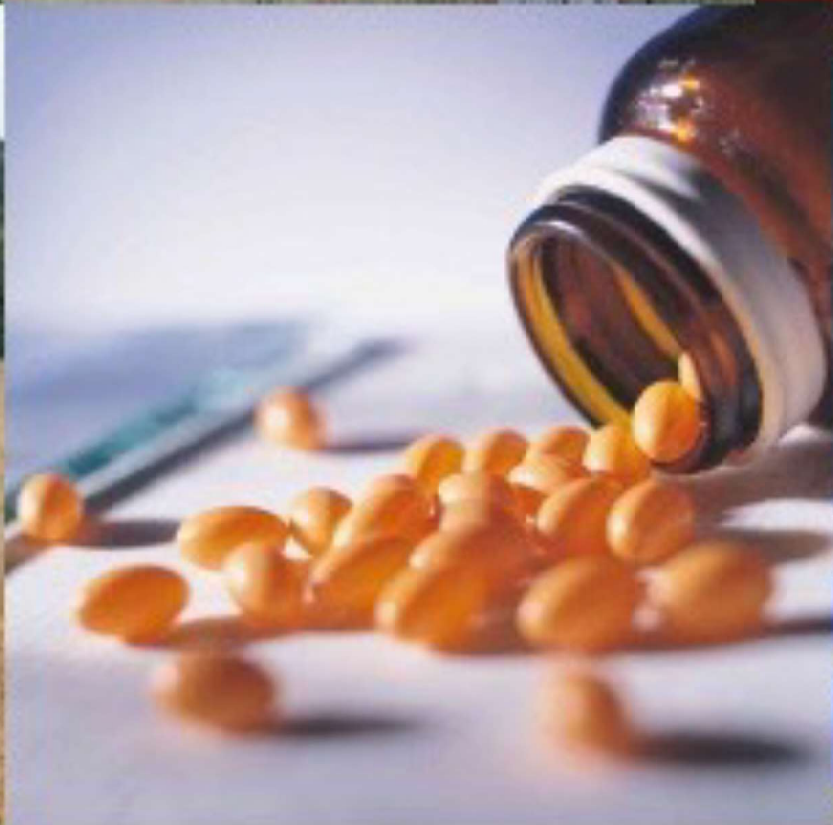


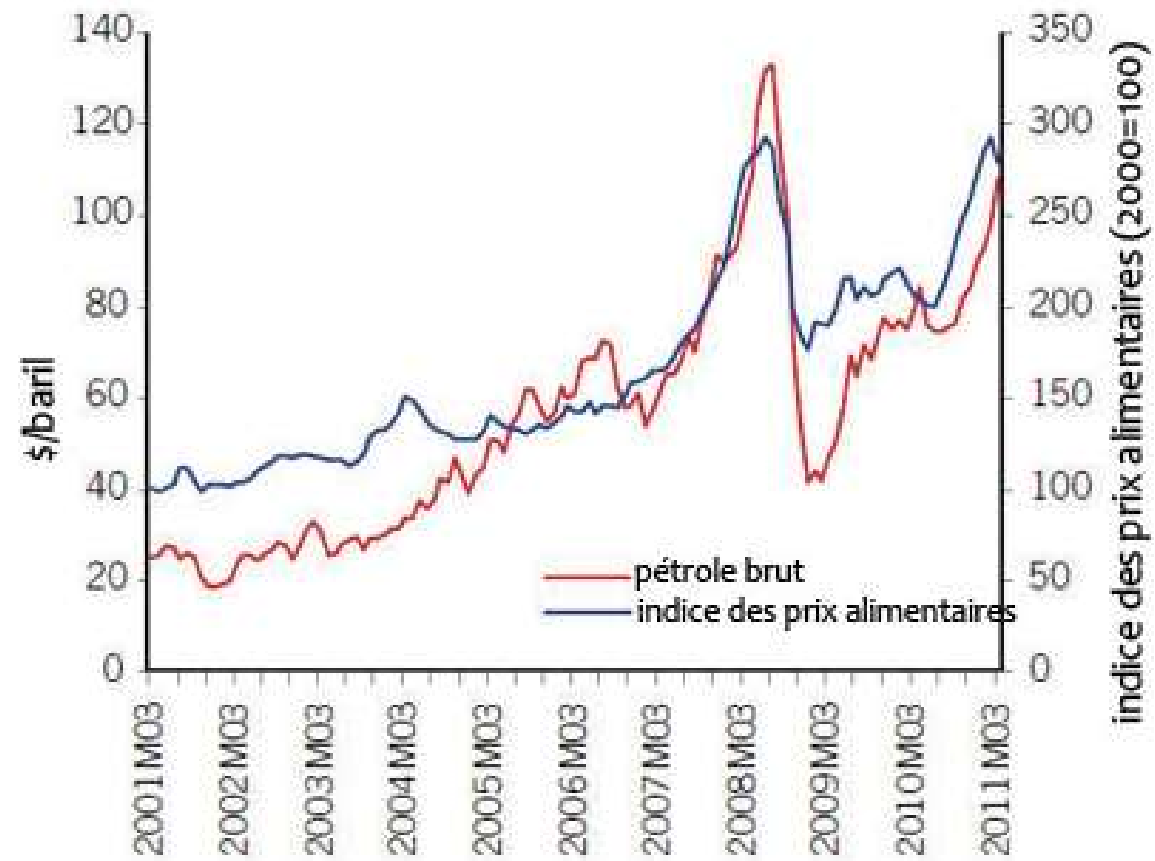
Le système alimentaire industriel



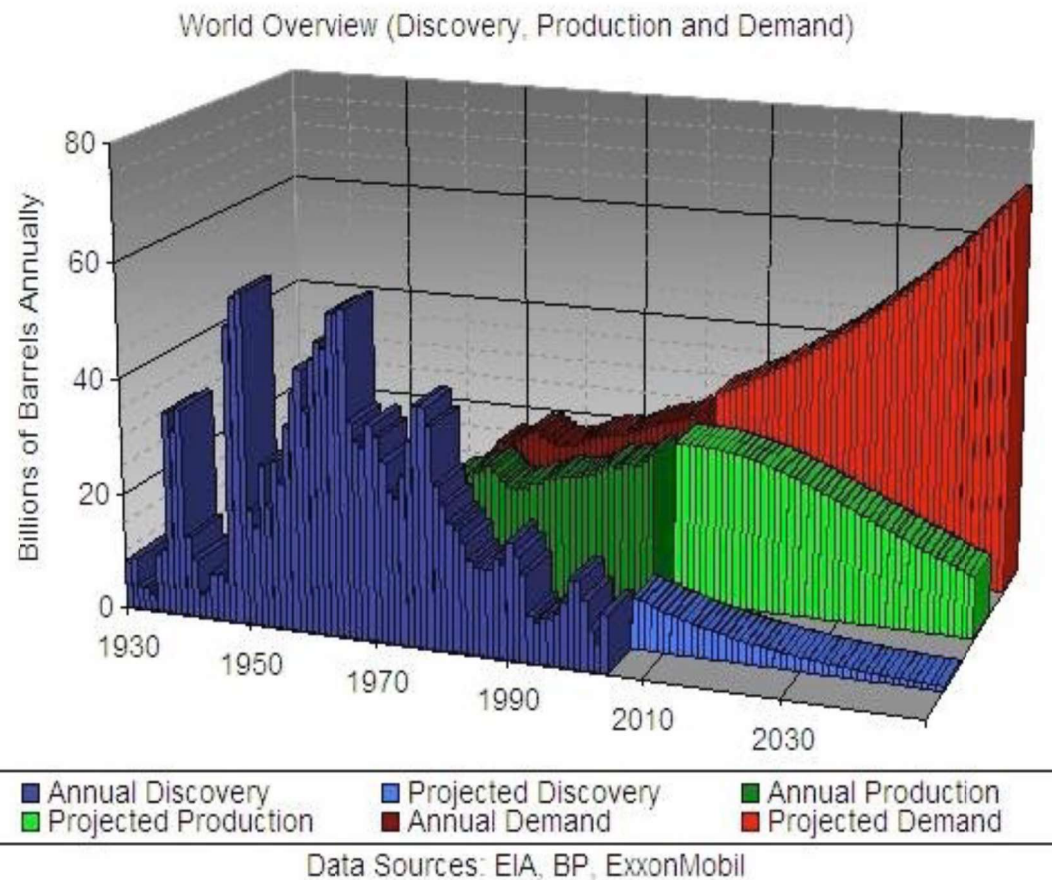


Images: Nat Geographic





Peak oil



EROEI

Taux de retour énergétique

1900 : un baril permet d'extraire 100 barils

1990 : un baril permet d'extraire 35 barils

2007 : un baril permet d'extraire 12 barils

L'extinction du moteur : la question des limites

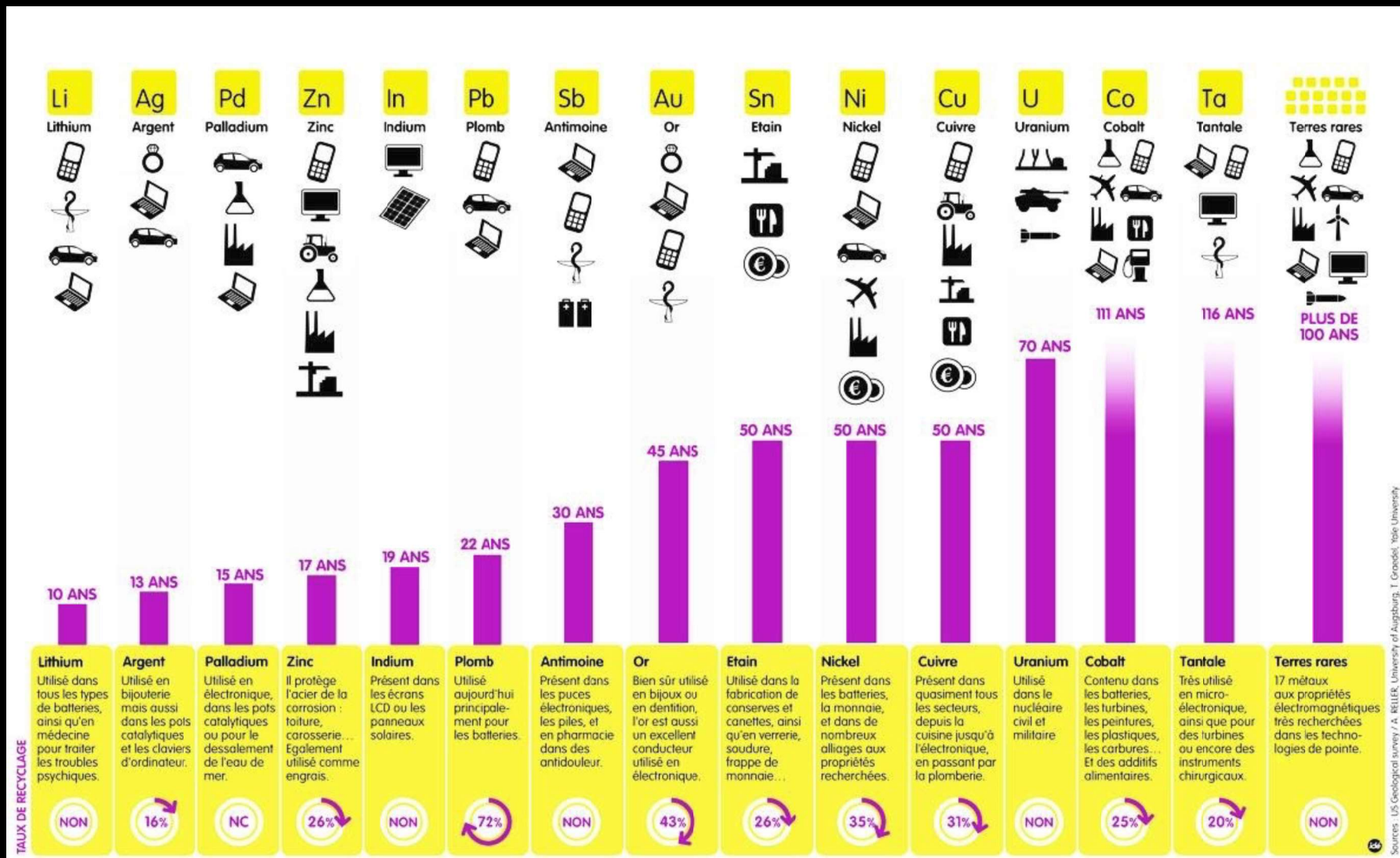
Approvisionnement
en énergie



Systeme
financier

Autres “limites”

sable, phosphore, métaux, minerais...



Data: USGS - Yale University

Pour atteindre la puissance des énergies fossiles, **la construction de fermes solaires et d'éoliennes pour la remplacer nécessitera la production de**

- 15x plus de béton
- 90x plus d'aluminium et
- 50x plus de fer, de cuivre et de verre.

VIDAL, Olivier, GOFFÉ, Bruno et ARNDT, Nicholas. Metals for a low-carbon society. *Nature Geoscience*. 2013. Vol. 6, n° 11, pp. 894-896. (Univ. Grenoble et Aix-Marseille)

Pour 50% de probabilité de réussir à contenir le réchauffement en dessous de 2°C, il nous faudrait avoir construit pour 2028 (soit en 10 ans)

- 40x plus d'éoliennes de 5 MW
- 26x plus de km² de PV
- 15x plus de km² de serres à algues

JONES, Glenn A. et WARNER, Kevin J. The 21st century population-energy-climate nexus. *Energy Policy*. 2016. Vol. 93, pp. 206-212.

1

**SYSTÈMES
ALIMENTAIRES**
DÉPENDANTS
DU PÉTROLE

+

2

FIN DU PÉTROLE

=

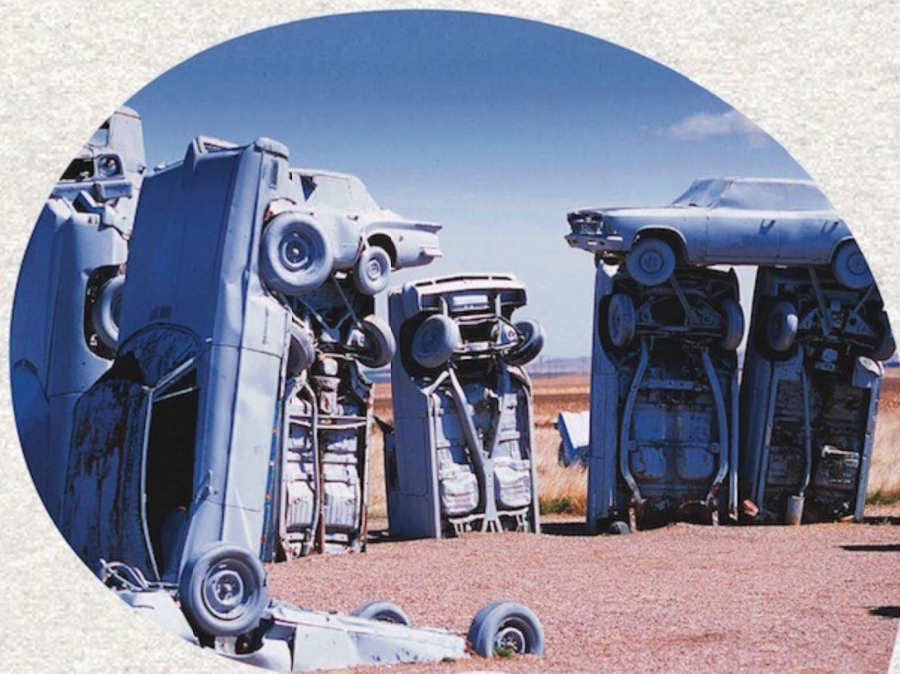
**FIN DE NOS
SYSTÈMES
ALIMENTAIRES**

PABLO SERVIGNE

NOURRIR L'EUROPE EN TEMPS DE CRISE

VERS DES SYSTÈMES
ALIMENTAIRES RÉSILIENTS





COMMENT TOUT PEUT S'EFFONDRE

Pablo Servigne
Raphaël Stevens

Petit manuel de collapsologie à l'usage des générations présentes





La grande accélération



SOURCE: igbp.net | Steffen et al., 2005, Global Change and the Earth System, Springer, pp. 132-133
 DESIGN: Globaia.org

ANTHROPOCENE



Photo: globaia.org

La biodiversité disparaît...

99% of Rhinos gone since 1914.
97% of Tigers gone since 1914.
90% of Lions gone since 1993.
90% of Sea Turtles gone since 1980.
90% of Monarch Butterflies gone since 1995.
90% of Big Ocean Fish gone since 1950.
80% of Antarctic Krill gone since 1975.
80% of Western Gorillas gone since 1955.
60% of Forest Elephants gone since 1970.
50% of Great Barrier Reef gone since 1985.
40% of Giraffes gone since 2000.
30% of Marine Birds gone since 1995.
70% of Marine Birds gone since 1950.
28% of Land Animals gone since 1970.
28% of All Marine Animals gone since 1970.
97% – Humans & Livestock are 97% of land-air vertebrate biomass. 10,000 years ago we were 0.01% of land-air vertebrate biomass

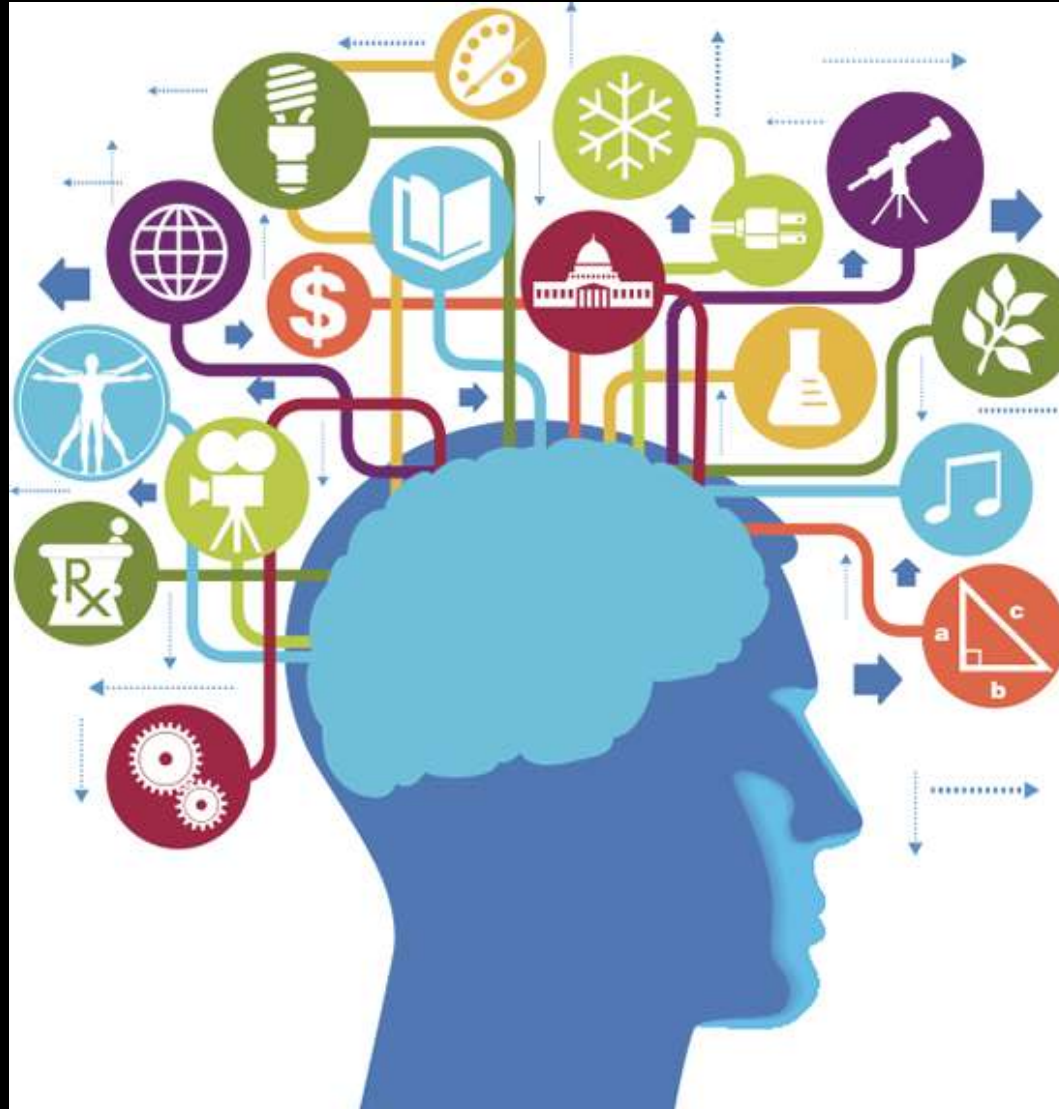


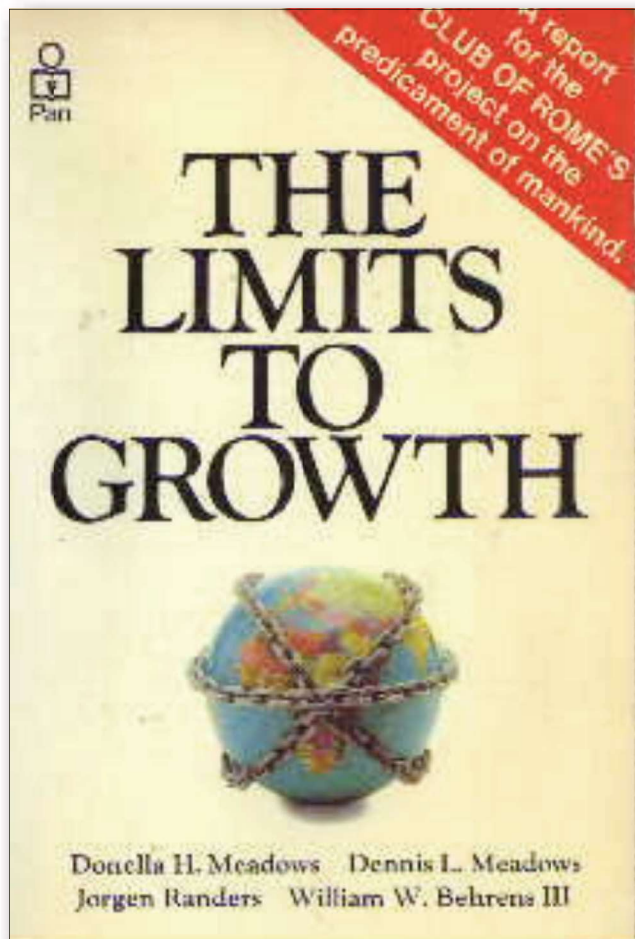


Verrouillages

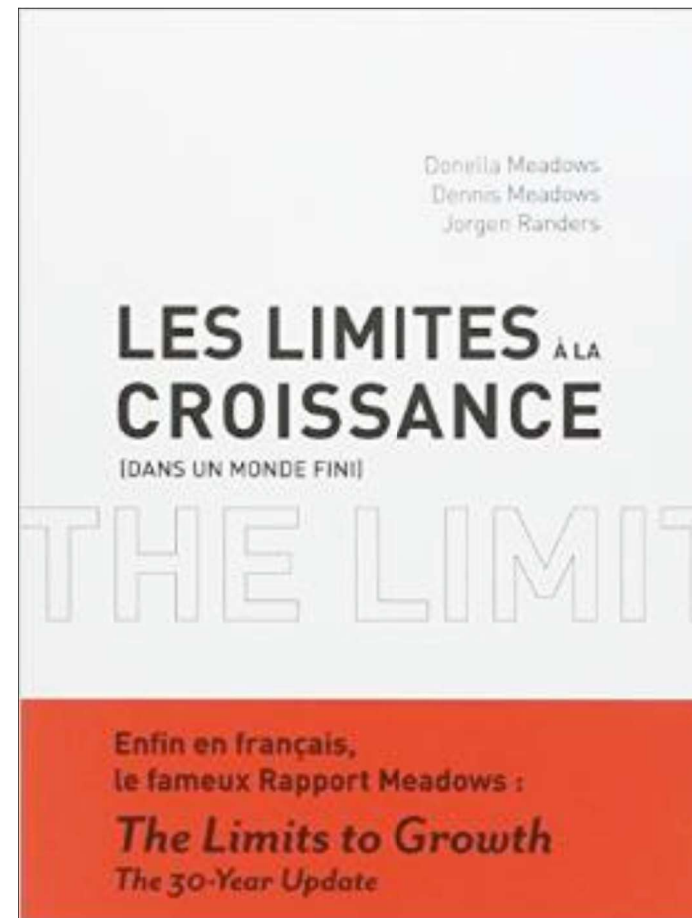
- Systemique
 - **Sociotechnique** (Infrastructures, énergie fossile, agriculture...)
 - **Institutionnel/politique** (affectation des fonds publics pour les alternatives, clivage gauche vs droite, ...)
 - **Monétaire** (argent-dette et impératif de croissance)
- Individuel et collectif
 - **Cognitif** (habitation, perception du danger, ...)
 - **Comportemental** (habitudes de consommation)
 - **Déni**
 - **Valeurs, imaginaire, vision du monde**
 - **Marchands de doute**

Penser la transdisciplinarité et la complexité



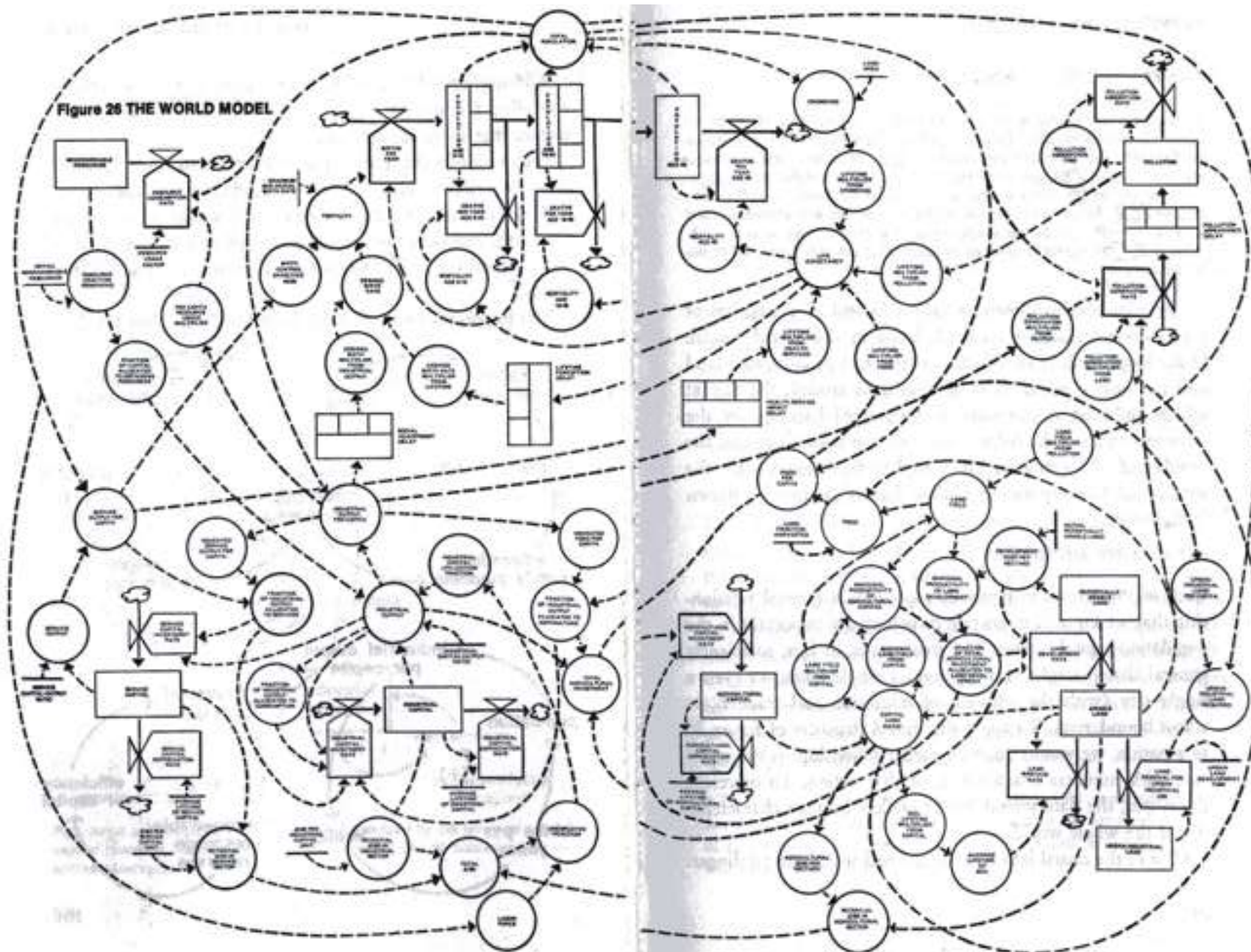


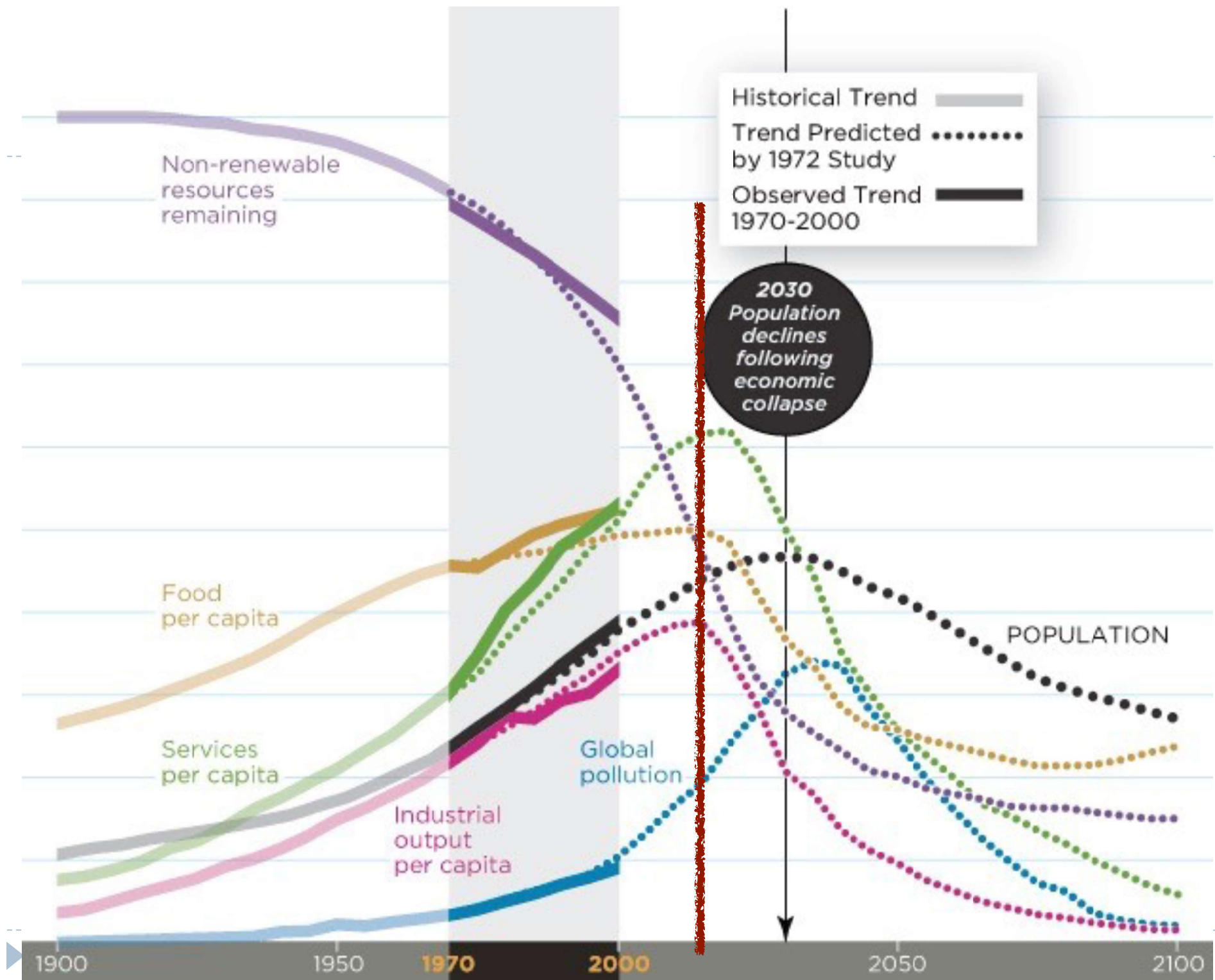
1972



2004

Figure 26 THE WORLD MODEL





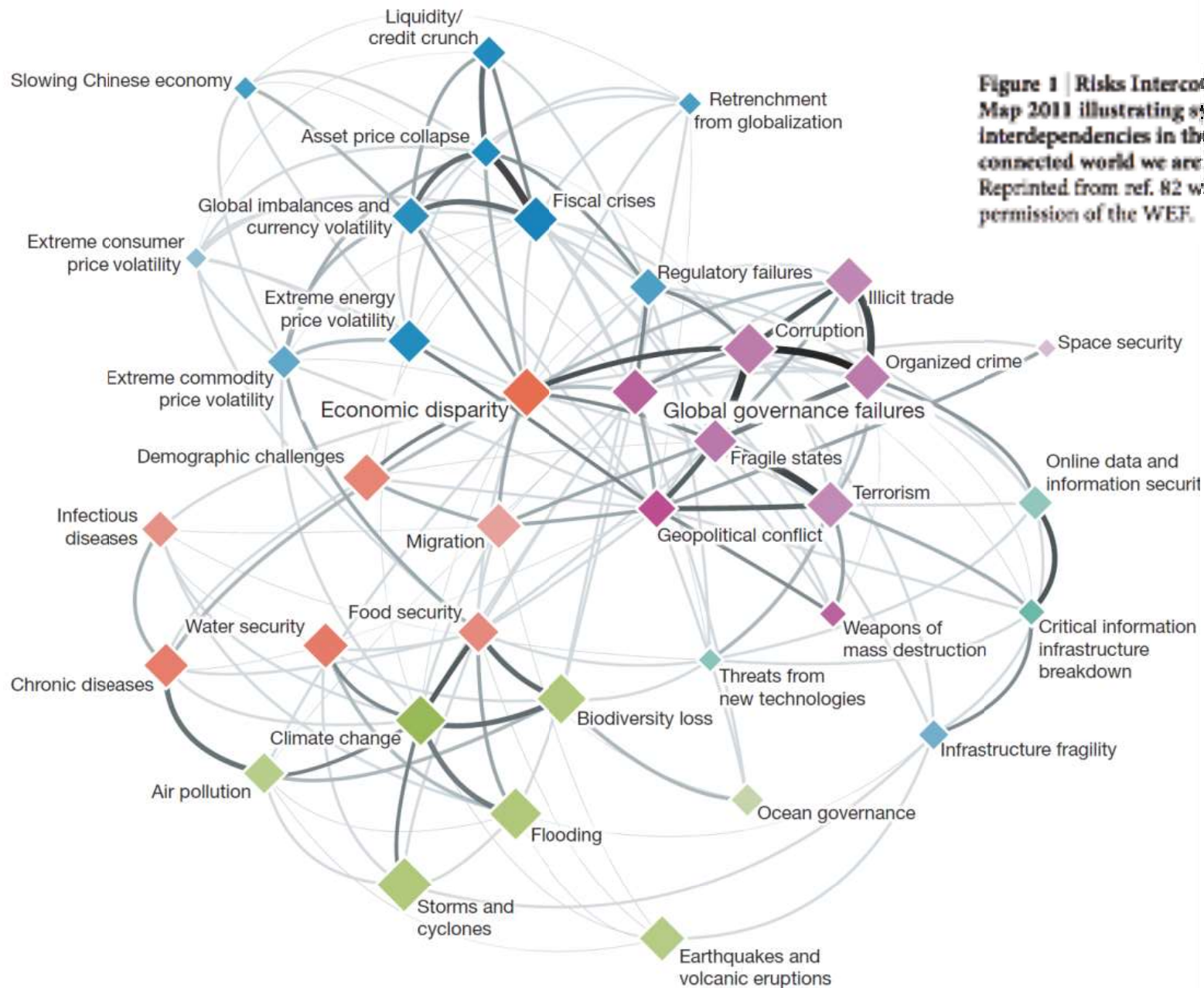
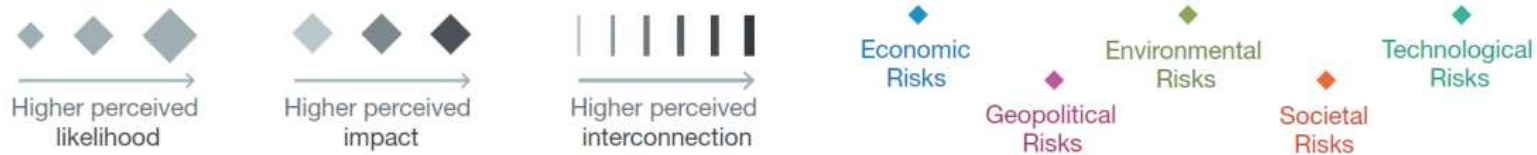
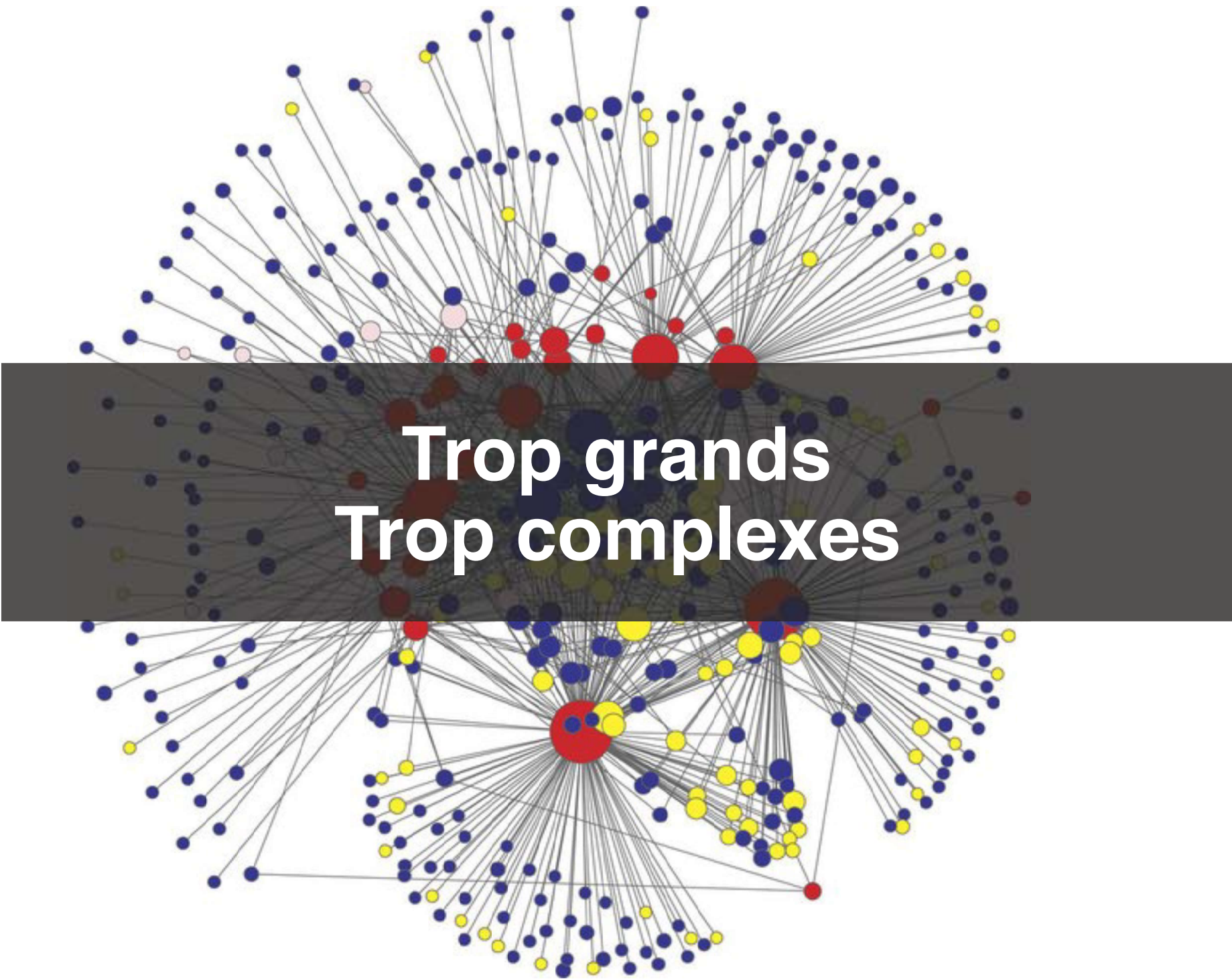


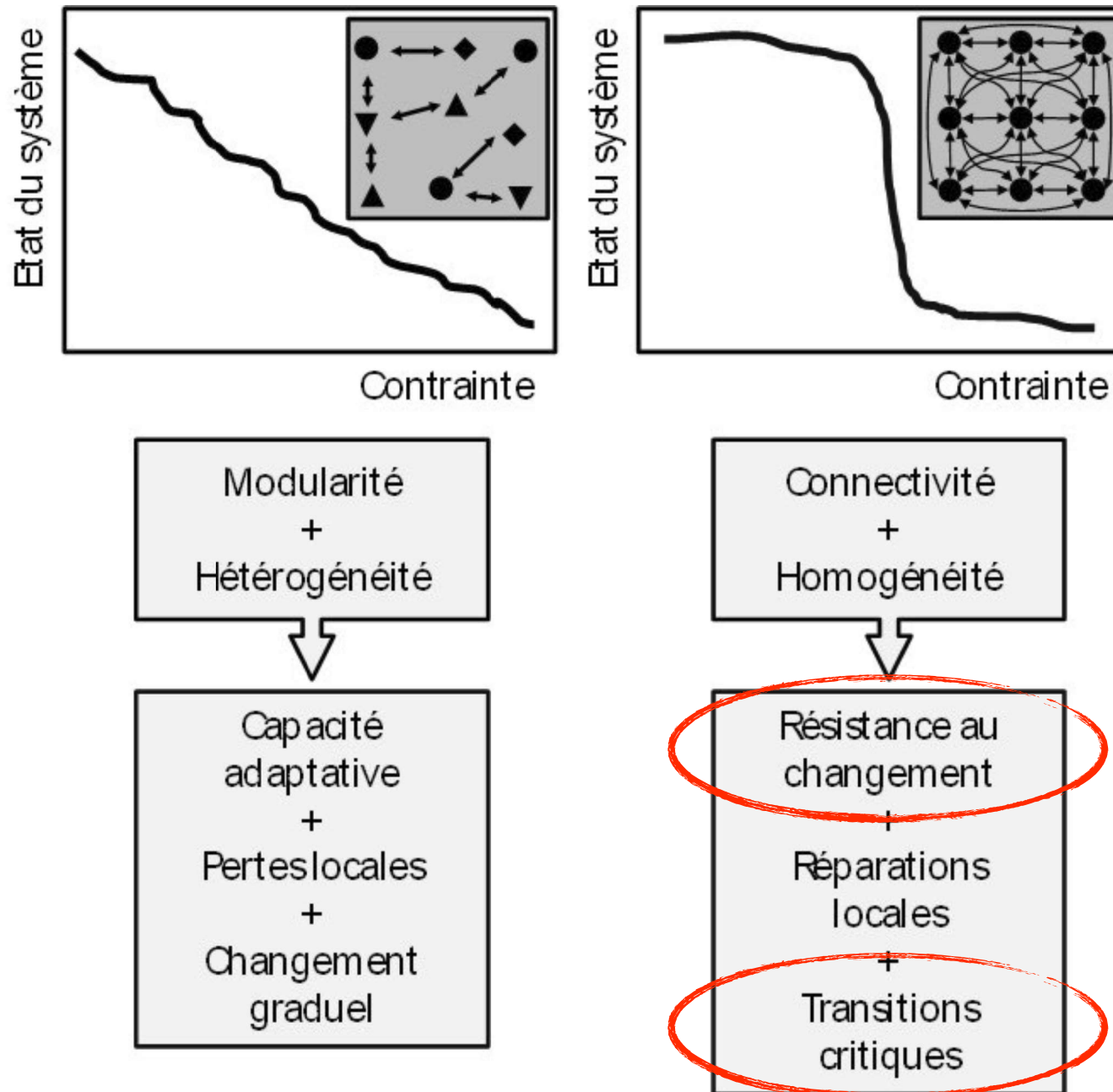
Figure 1 | Risks Interconnection Map 2011 illustrating systemic interdependencies in the hyper-connected world we are living in. Reprinted from ref. 82 with permission of the WEF.





Trop grands Trop complexes

Réponses types des réseaux complexes aux perturbations





Systemes complexes

Boucles de rétroaction & réseaux

Risques systémiques

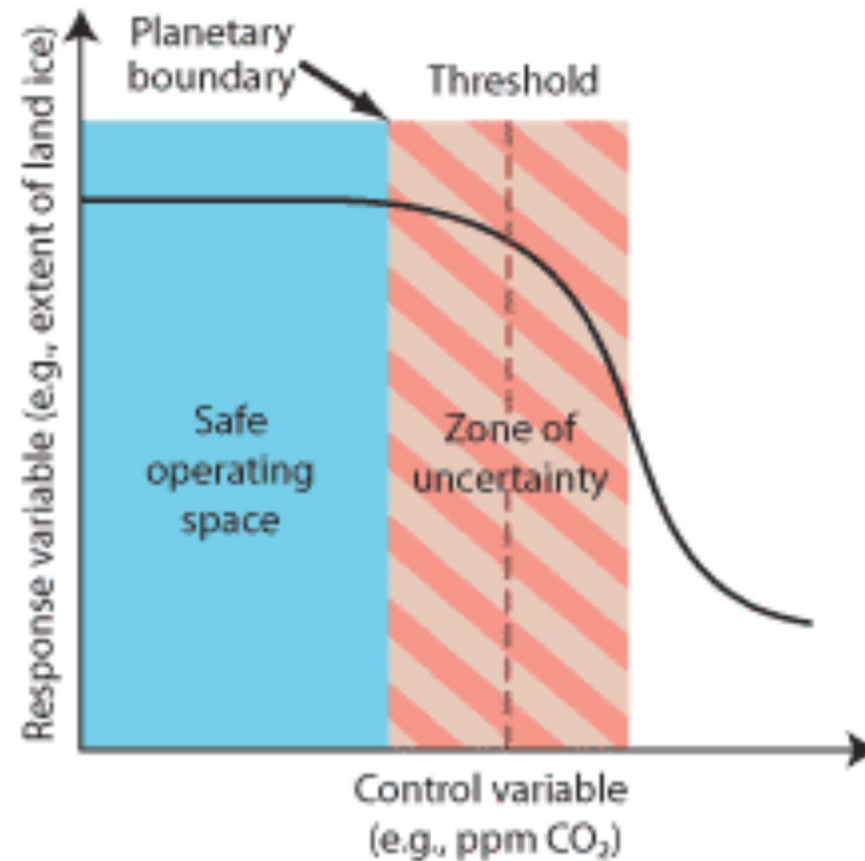
Seuils (tipping points)

Contagion

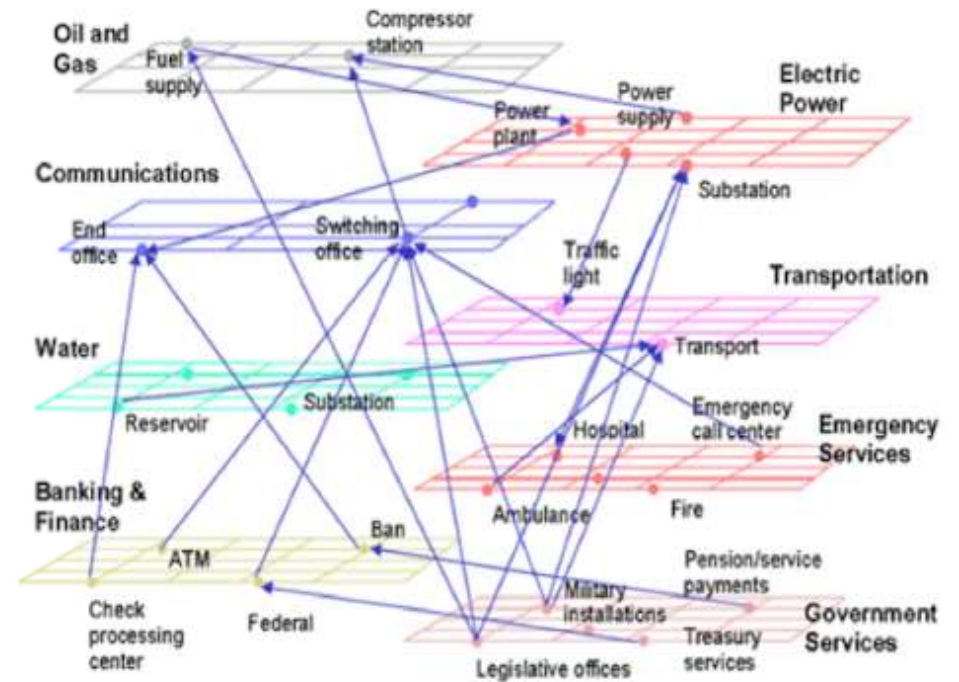
Hysteresis

Signaux avant-coureurs (EWS)

Effets de seuils et zones d'incertitude



Vers des ruptures irréversibles ?



MARC ELSBERG

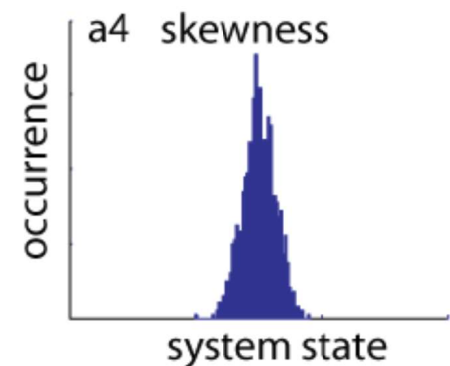
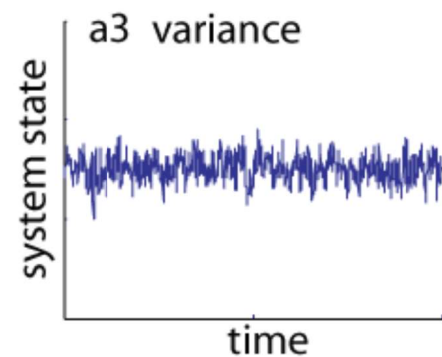
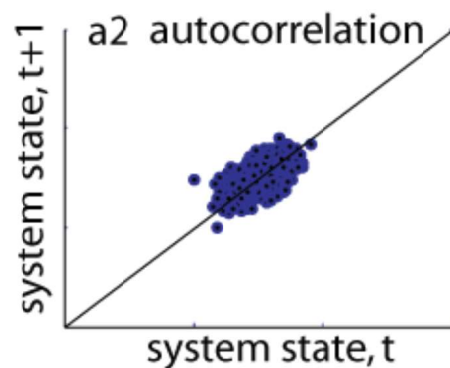
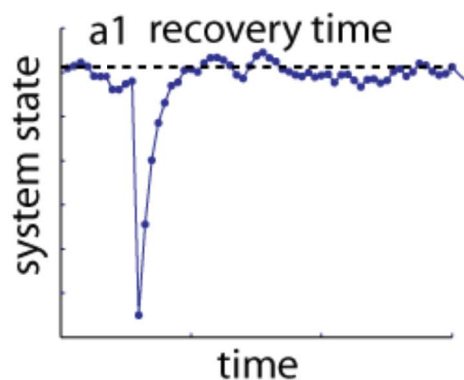
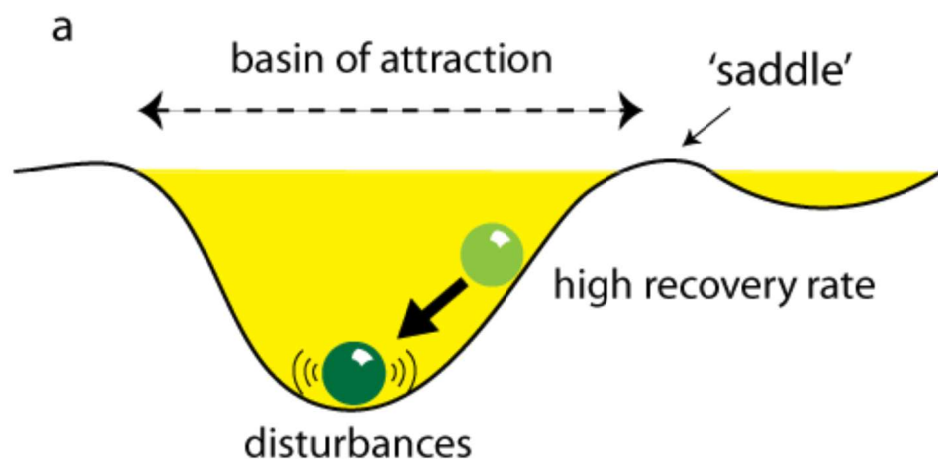
BLACK OUT

Demain il sera trop tard

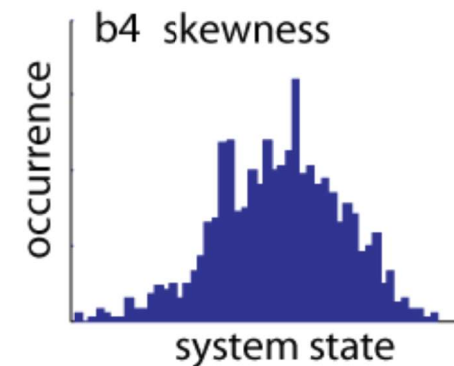
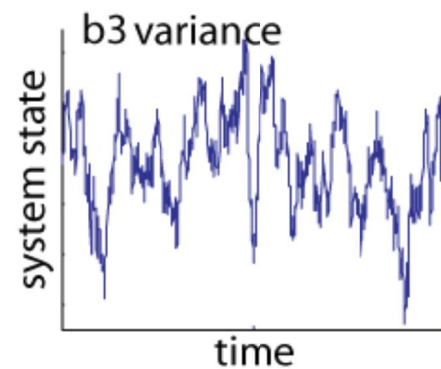
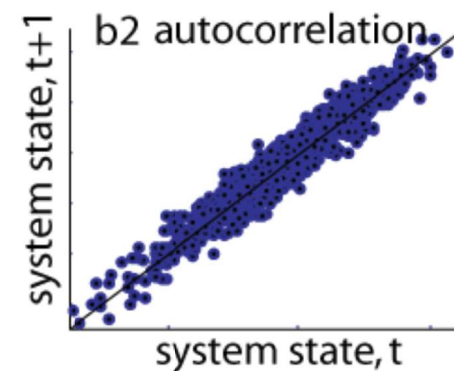
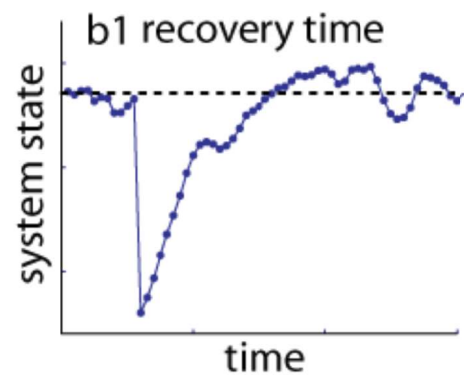
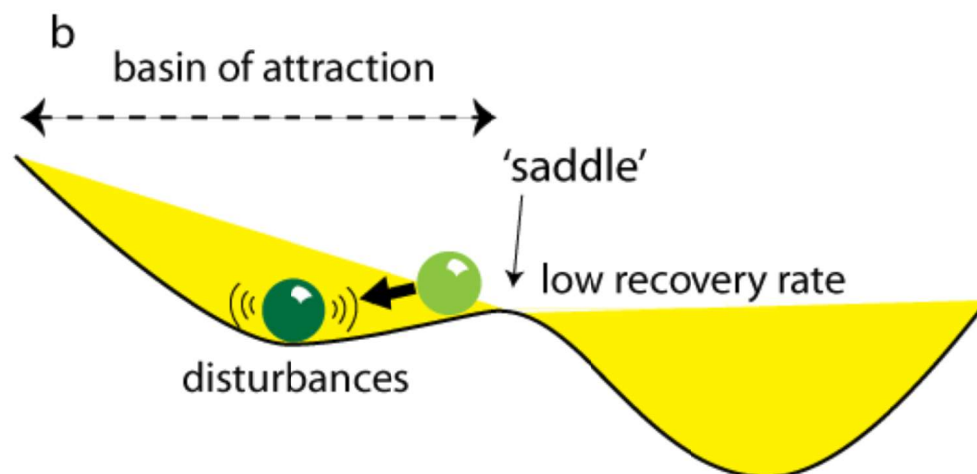
thriller



far from the transition

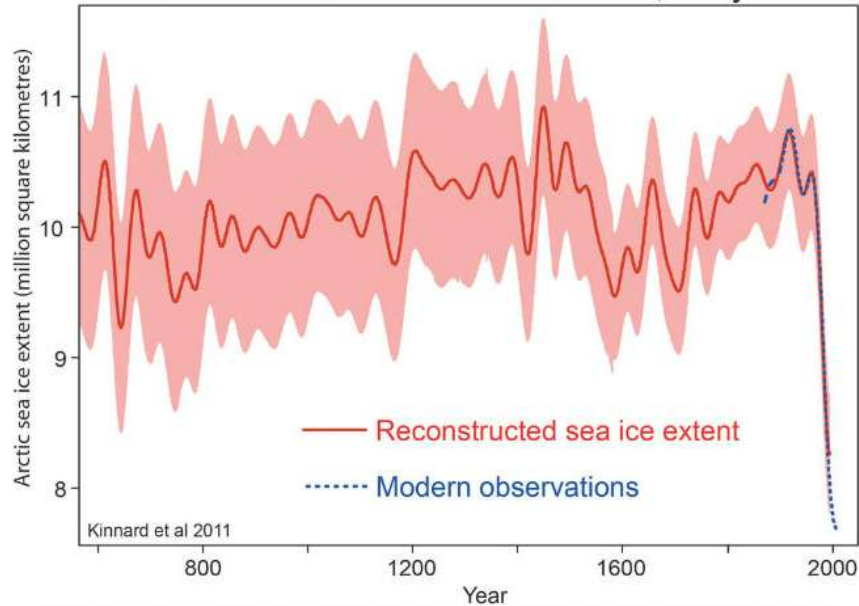


close to the transition

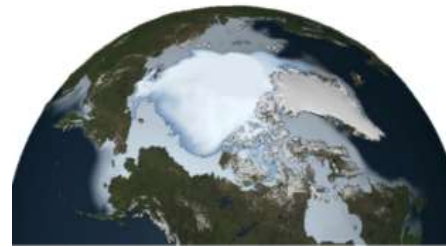


Signaux avant-coureurs

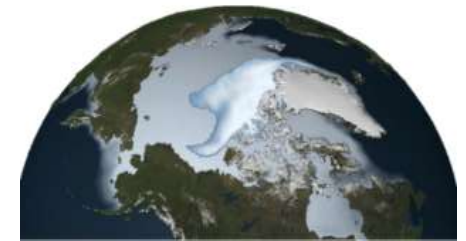
Arctic sea ice extent over the last 1,450 years



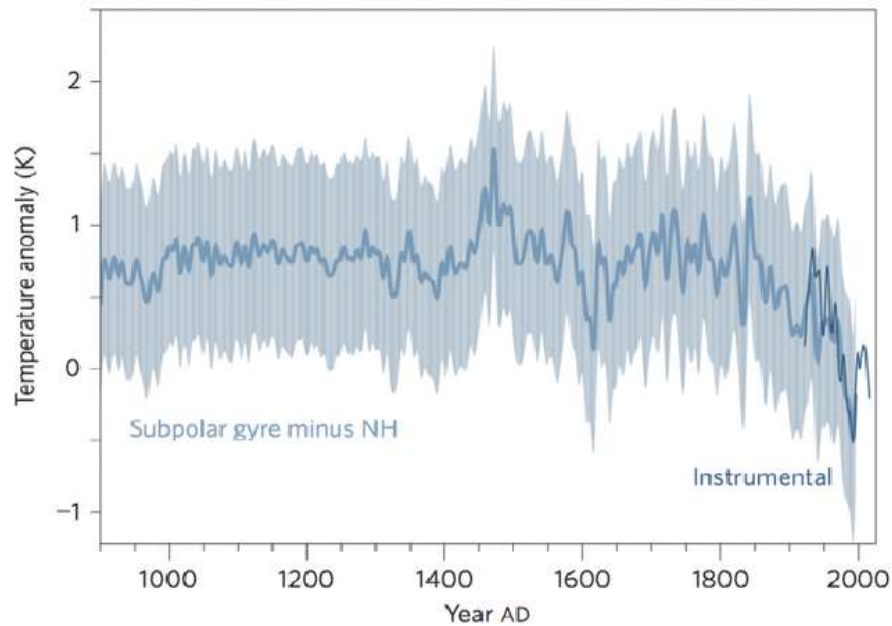
1980



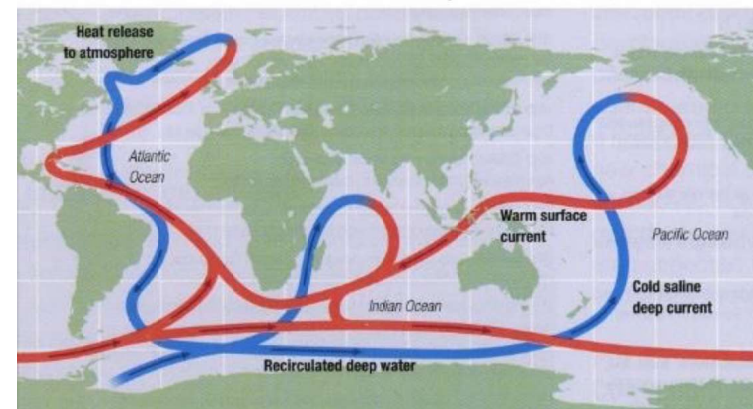
2012

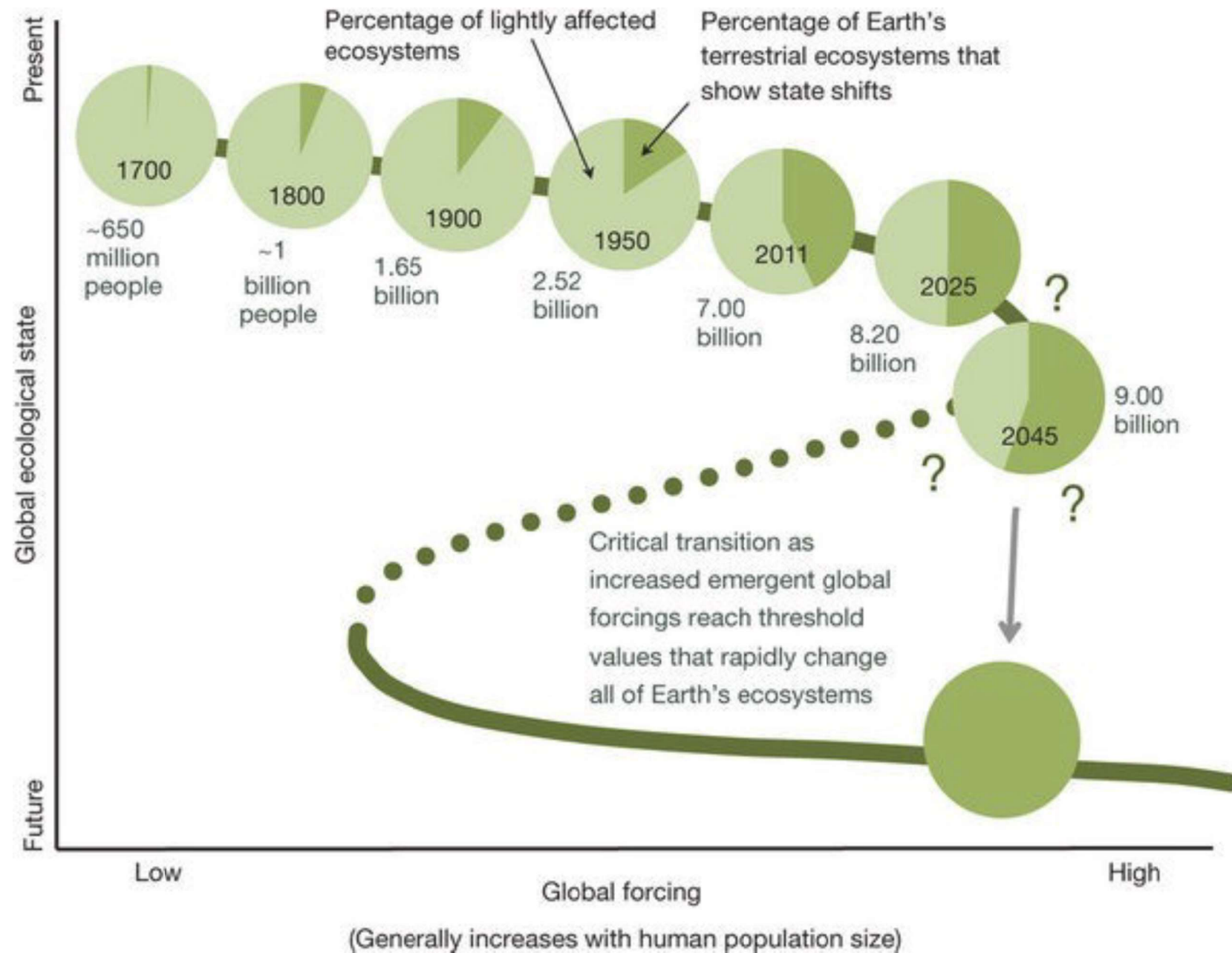


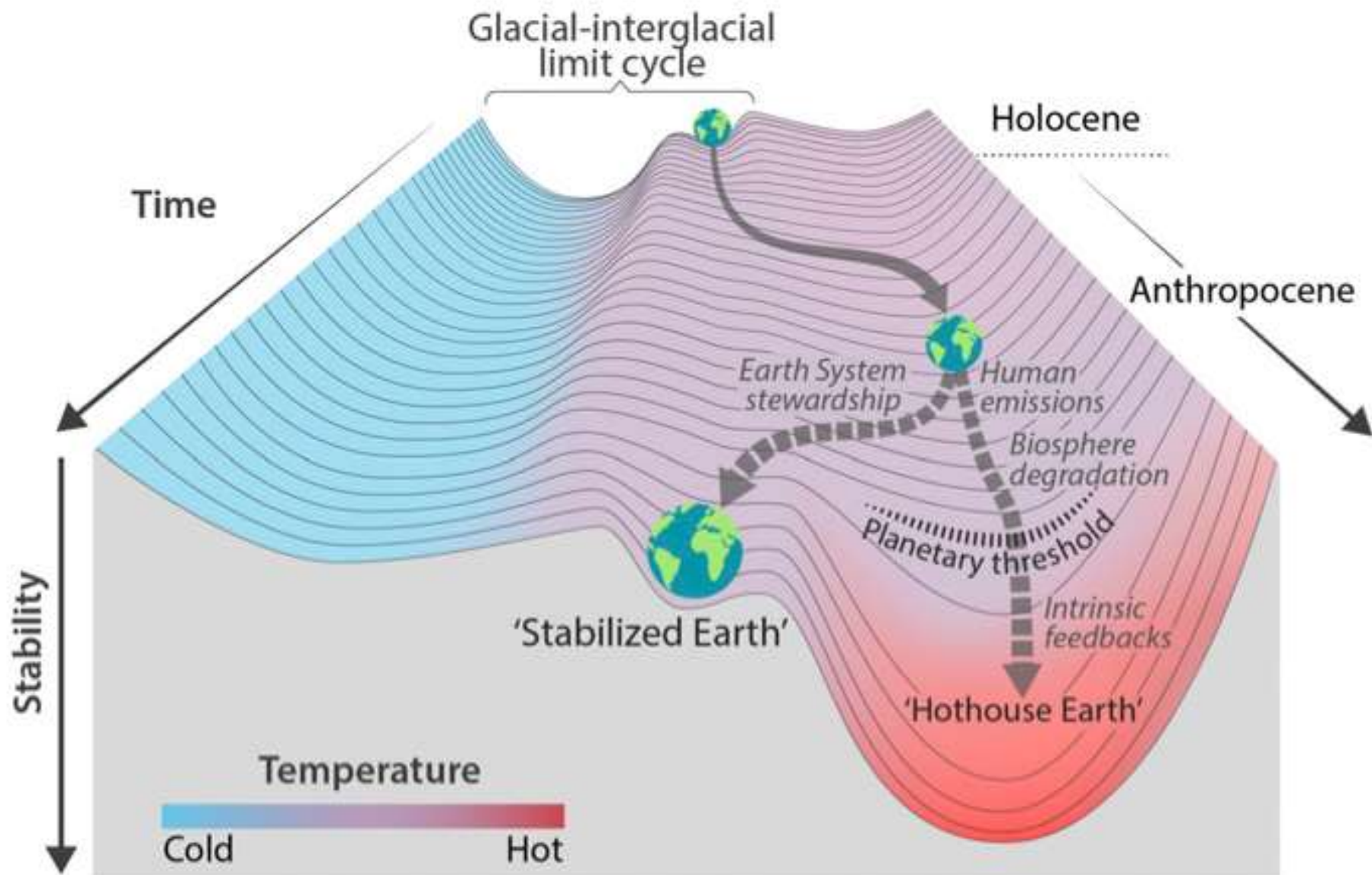
NASA (2012)

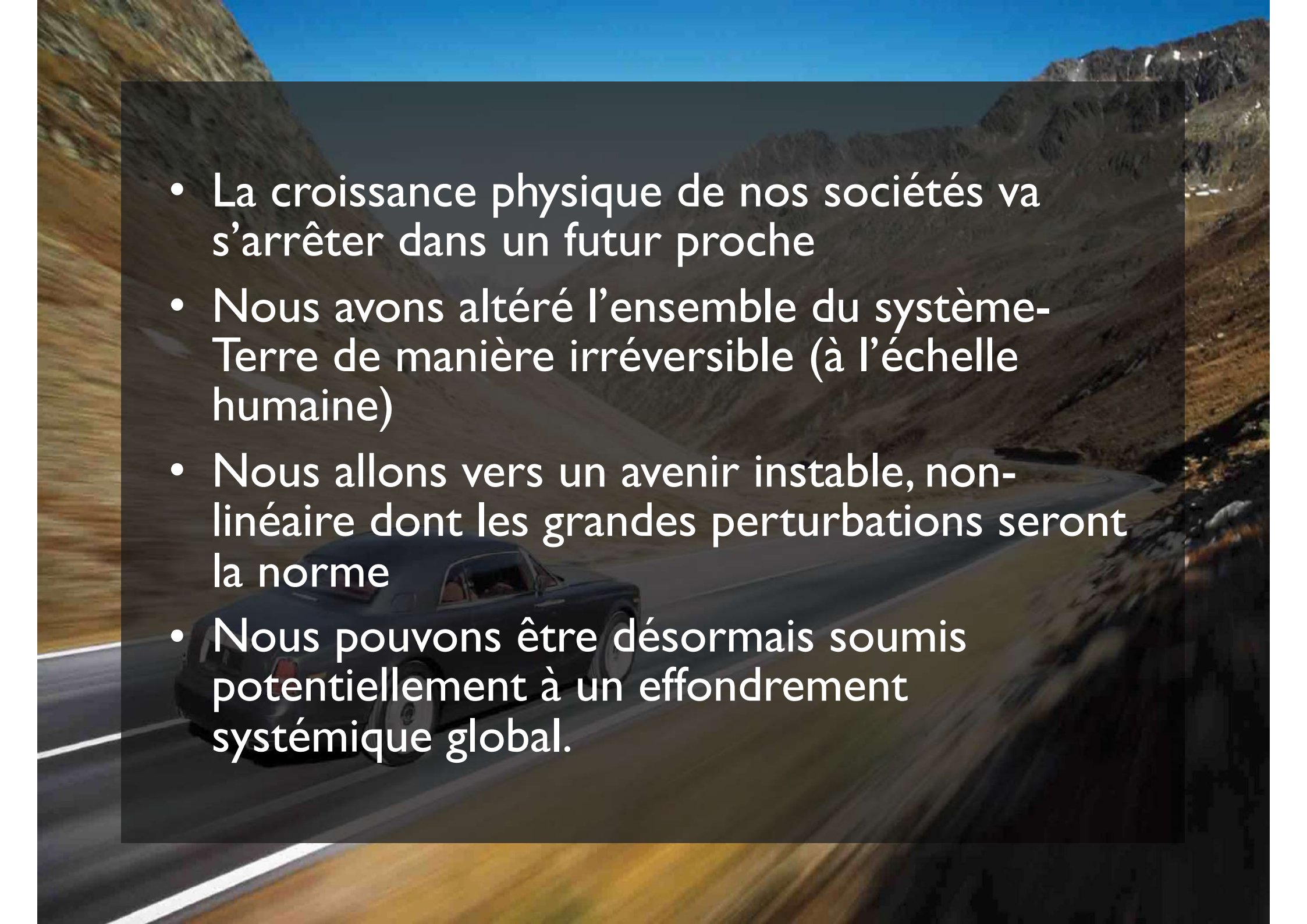


Global Ocean Conveyor Circulation

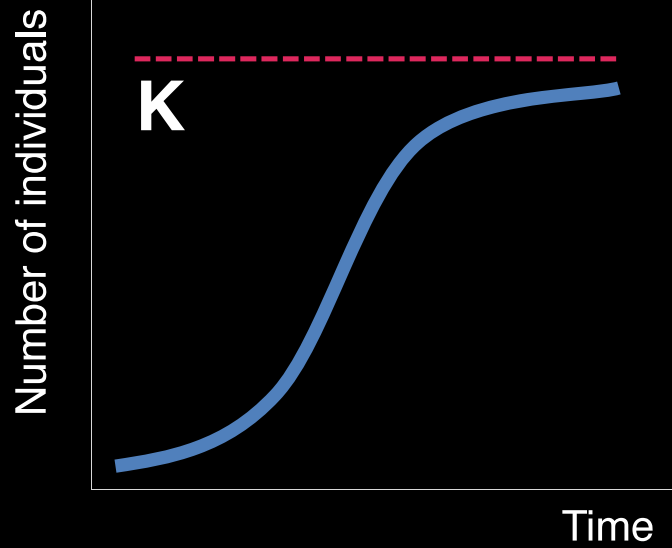




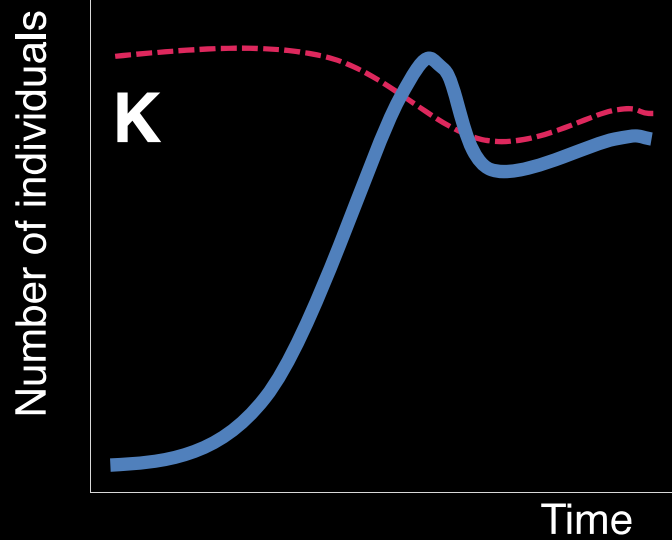


- 
- A dark-colored sports car is driving on a winding asphalt road that curves through a mountainous landscape. The road is flanked by steep, rocky slopes with sparse vegetation. In the background, more rugged mountain peaks are visible under a clear blue sky. The overall scene conveys a sense of speed and adventure in a natural setting.
- La croissance physique de nos sociétés va s'arrêter dans un futur proche
 - Nous avons altéré l'ensemble du système-Terre de manière irréversible (à l'échelle humaine)
 - Nous allons vers un avenir instable, non-linéaire dont les grandes perturbations seront la norme
 - Nous pouvons être désormais soumis potentiellement à un effondrement systémique global.

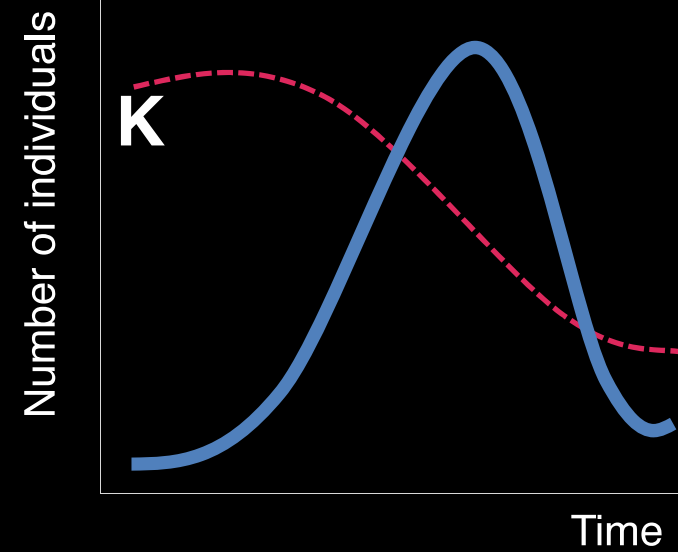
Sigmoid Approach to Equilibrium

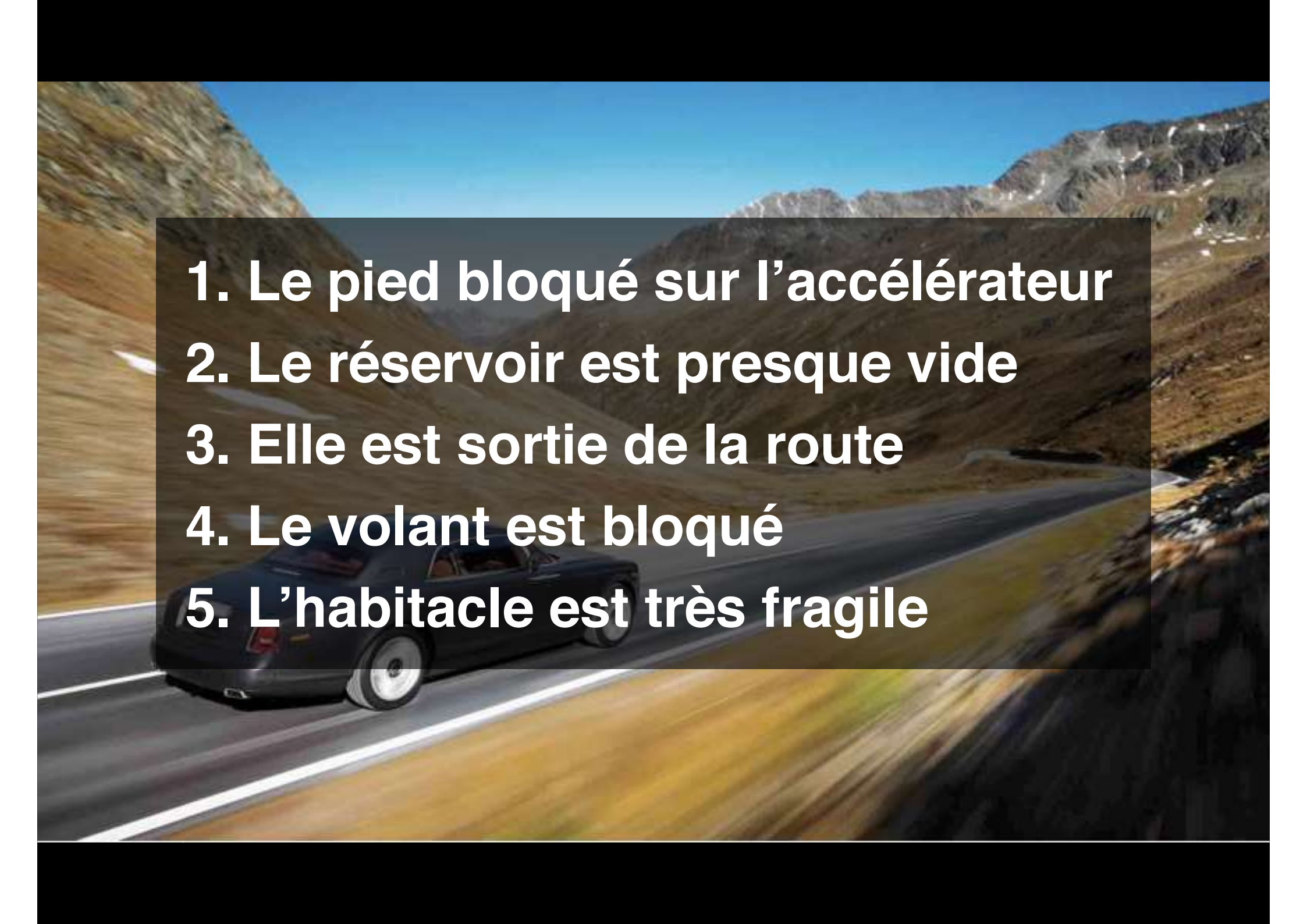


Overshoot and Oscillation



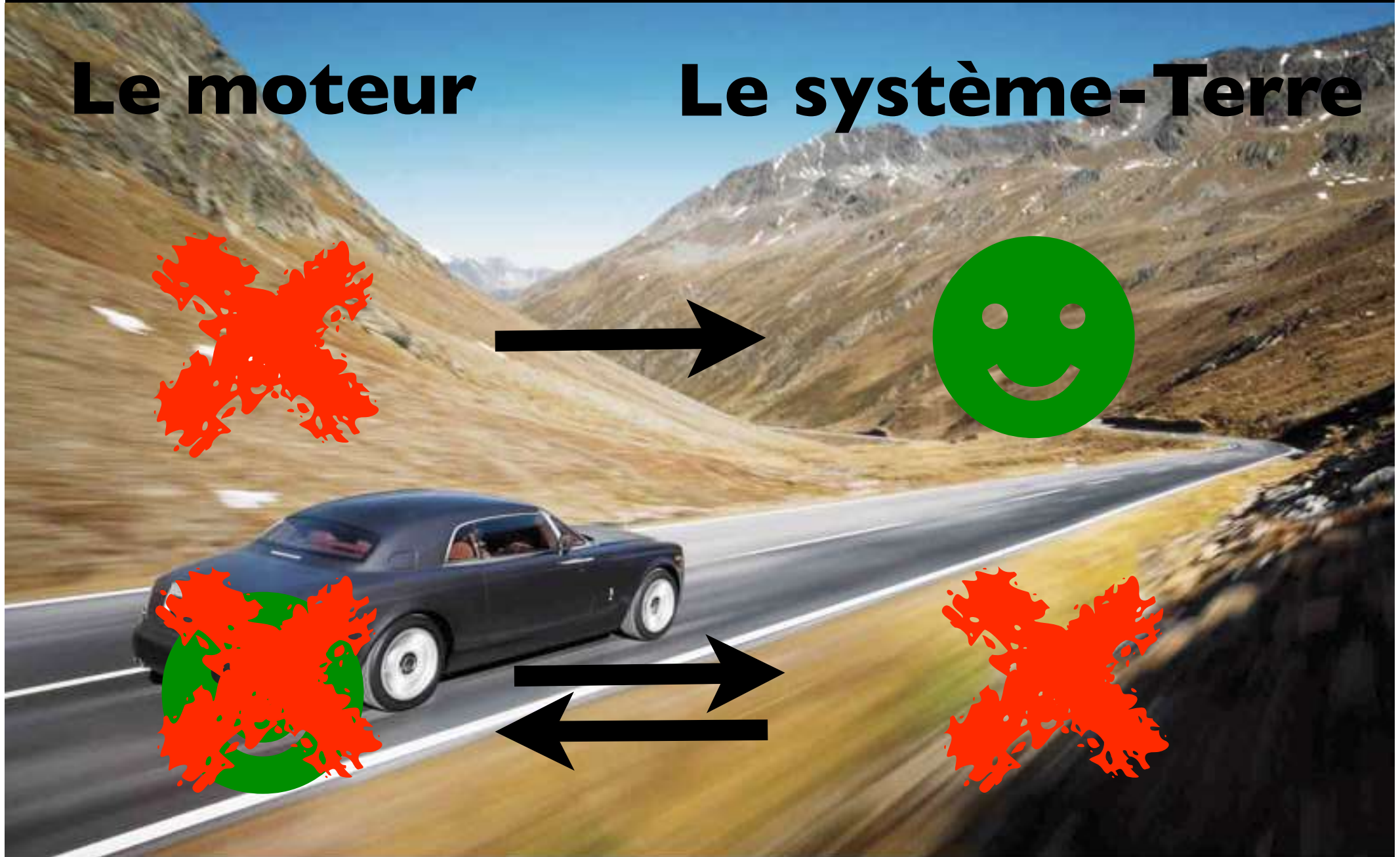
Overshoot and collapse



- 
- A dark-colored convertible car is driving on a winding asphalt road that curves through a mountainous landscape. The road has white lane markings. The surrounding terrain is dry and hilly, with some snow visible on the distant mountain peaks under a clear blue sky. The car is positioned in the lower-left portion of the frame, moving away from the viewer.
1. Le pied bloqué sur l'accélérateur
 2. Le réservoir est presque vide
 3. Elle est sortie de la route
 4. Le volant est bloqué
 5. L'habitacle est très fragile

Le moteur

Le système-Terre



**A quelles conditions
le concept de développement durable
peut-il éviter l'effondrement
de la civilisation moderne ?**

Quelques marges de manoeuvre

**1. On peut réduire la
production/prédation**



“ ”

**IN THE UK, SEVEN
MILLION TONNES OF
FOOD VALUED AT
ABOUT £10 BILLION IS
THROWN AWAY FROM
HOMES EVERY YEAR.**





1. On peut réduire la production/prédation

- = à condition de laisser les énergies fossiles
- = à condition de réduire massivement le commerce international
- = à condition de réduire le niveau de vie des riches
- = à condition de penser collectivement la natalité
- = risque d'effondrement financier/économique !

**2. On sait gérer les pénuries
(faire vite et à grande échelle)**

1973 : premier choc pétrolier









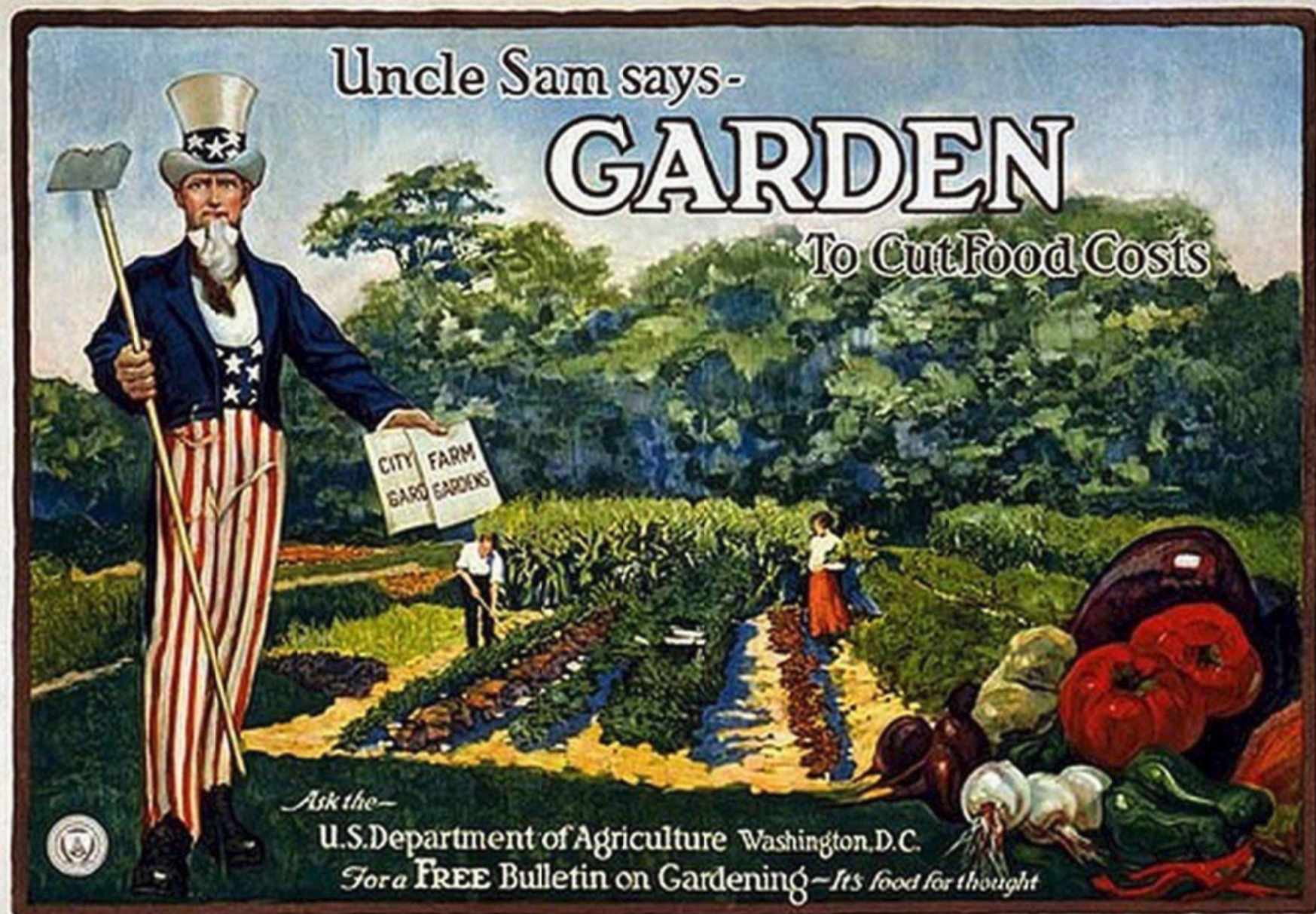
Cuba - Right Livelihood Award 1999

Grupo de Agricultura Orgánica, GAO (Cuba)













"OF COURSE I CAN!"



I'm patriotic as can be —
And ration points won't worry me!"

WAR FOOD ADMINISTRATION
Washington, D. C.

**DIG ON
FOR
VICTORY**



Peter Francis