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MOND'Alim 2030: the transformation of public risks and issues

One chapter in the publication *MOND'Alim 2030* produced by the Centre for Studies and Strategic Foresight (Centre d'Etudes et de Prospective - CEP) is devoted to public risks and issues and the globalization of their management. The present note describes the main components of this, focusing in particular on the health, economic, environmental and geopolitical domains. It shows how globalization is changing risk regimes (emergence of new risks, systemic effects, mitigation, and so on) and how food systems are adjusting. It also underscores the fact that global governance of those risks contains tensions between unilateral strategies and collective management.

By making food systems part of a global configuration characterized by flows of people, information, capital and goods, globalization is changing risk regimes and the definition of public issues. The reciprocal assertion is also true: public risks and issues are shaping food system globalization. Some were identified long ago and are intrinsic to food systems, such as sanitary problems or those relating to price fluctuations. Others are broader, relating for example to geopolitics, environment or climate change. The fourth chapter of *MOND'Alim 2030*[1] is devoted to those risks, which are increasingly being considered, expressed and addressed across the planet as a whole. It also explores the way in which certain issues have come to be seen as "global public issues".

We adopt here a deliberately broad meaning for "risks" and "public issues". This means that a risk may be a hazard to which individuals are exposed and against which they wish to protect themselves. It can also be defined as the prospect of a gain or opportunities associated with a situation which is uncertain. As for public issues, these are actually or potentially hazardous situations acknowledged by a social group as possibly undermining the social order and requiring intervention from a political authority. These two concepts will be addressed jointly because risks are increasingly being defined as public issues and, reciprocally, public issues are perceived as risks for society (the problem of hunger becoming food insecurity, for example). Lastly, a "risk regime" is defined here as the complete set of factors, both quantifiable and non-quantifiable, that characterize the risks for an actor or system of actors, and which may change under the influence of globalization: probabilities of occurrence or uncertainties, possible correlations, localized or widespread effects, immediate or long-term impacts, and so on. Such regimes also include the determinants of the perception of risk (known or unknown, voluntary or imposed, etc.).

The present note starts by showing how globalization goes hand in hand with changes in risk regimes due to the dissemination, displacement and appearance of new, especially systemic challenges. We go on to see that globalization also offers opportunities to mitigate or to adjust to those challenges. Finally, a description is provided of the trends in the global governance of risks and public issues, and in particular the growing tensions between collective management and unilateral strategies.

1. Food system globalization is accompanied by new risks

We observe two major changes in risk regimes: i) the emergence of new risks and global issues accompanying improvements in knowledge and increasing complexity in flows (of raw materials, people, technology, etc.), ii) the dissemination and displacement of the risks intrinsic to food systems.

1.1. A "risk society"

Public risks and issues relate to objectifiable realities (foodborne infections, rocketing prices, and so on), but they are also social constructs, issues of perception and representation. While eating has never been as safe and certain, individuals have never felt so much fear about food as levels of development in society rise. The progress achieved (improved hygiene, etc.) is invariably judged to be unsatisfactory and increased knowledge brings increased worry with it, individuals being focused less on which has

1. This publication is available *via* the following link: http://agriculture.gouv.fr/mondalim-2030-panorama-prospectif-de-la-mondialisation-des-systemes-alimentaires.

been accomplished than on what still needs to be improved[2]. This critical view of society on itself constantly leads to the identification of new risks. On this point, Ulrich Beck[3] refers, with reference to developed countries, to a "risk society". Where Giddens[4] is concerned, he writes that: "paradoxically, these risks are engendered by the process of modernization that seeks to control them".

The advancement of technology and research is a factor for the growing number of hazards of which we are made aware, such as "emerging risks". These are hazards that have been recently identified (e.g. endocrine disruptors, nanotechnology, etc.), although the molecules concerned have long existed. As sources of uncertainty with regard to their effects on health and the environment, as well as in terms of exposure, they become objects both of scientific controversy and societal concern. Such emerging risks could become a major topic for global scientific collaboration by 2030 insofar as they call into question present methods for detection, assessment and management. They are also perceived as genuine public issues to be addressed by the management bodies and calling for intervention by the highest political authorities. Lastly, these new risks are a challenge for commerce and a source of friction between the sanitary protection of the general public in an uncertain context (cf. the precautionary principle) and international trade disciplines.

1.2. Risk dissemination and displacement

Globalization leads to an increase in the numbers of interactions between issues and between distant locations. Increased flows, standardization of certain technical solutions and the partial homogenization of food systems are transforming risk regimes in the direction of dissemination and exacerbation.

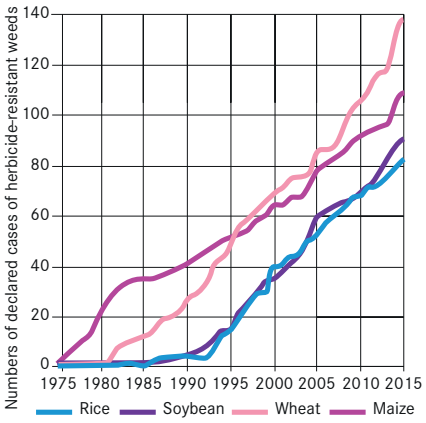
For example, food systems involve a variety of sanitary risks affecting the safety of the public in terms of quantity (insufficient food intake) and quality (infections and causation of medical conditions). They may also impact agricultural workers (the Ebola virus is a recent example). Globalization has impacts on their (re)emergence and their spread, although it is not easy to define how this translates into impacts by 2030. Increasing flows of people, animals and goods and faster transport over longer distances are all conducive to the development of diseases[5]. Other factors are also in play: e.g. cold chain interruptions and land use changes resulting in ecosystem disruption.

Numerous studies underscore an acceleration firstly in the resistance of pathogens to antibiotics (antimicrobial resistance), and secondly in the resistance of pests to crop protection strategies (cf. figure 1). Globalization accentuates these phenomena through the homogenization of food production, large-scale dissemination of antibiotics and plant protection chemicals and regional specialization. Other than in the event of radical change, this is likely to lead by 2030 to increasing numbers of technological impasses and consequently to the construction of a global public issue. It is already the case that the management of such sanitary risks is shifting the agendas of international organizations, governments and research programmes towards building solutions shared at the global level (e.g. "rational" utilization, efforts to find alternative methods).

Globalization is also a contributor to risk displacement. In recent years, international agricultural commodities markets have experienced a series of crises, particularly in 2007-2009 and 2010-2012. This led to higher international prices and greater volatility compared with the earlier period. Despite the fact that agricultural prices have been on a downward trend since 2014, the question arises of how long this change in price regime may last. Such episodes have revived the debate on the link between price volatility and globalization (cf. box 1). Although the opening up of markets is seen as a source of stability (cf. section 2.2), these international markets are also perceived as a source of instability in that they "import" external factors for volatility, which explains measures aimed at protecting domestic markets.

2. Theys J., 1991, postface to Dourlens C., Galland J-.P., Theys J., Vidal-Naquet P., *Conquête de la sécurité, gestion des risques*, Paris, L'Harmattan.
3. Beck U., 1986, trad 2001, *La société du risque. Sur la voie d'une autre modernité*, Paris, Flammarion.
4. Giddens A., 1999, *Frequently Asked Questions.*
5. Lesage M., 2014, "Zoonoses émergentes et réémergentes: enjeux et perspectives", Centre for Studies and Strategic Foresight, *Analysis* No. 66.
6. High Level Panel of Experts, 2011, *Price volatility and food security*, A report by the High-Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security, Rome.
7. Claquin P., 2017, *La mondialisation par le commerce des produits alimentaires : tendances structurelles et exploration prospective*, Centre for Studies and Strategic Foresight, *Analysis* No. 102.

Figure 1: **Evolution of the numbers of declared cases of herbicide-resistant weeds**



NB: In the case of each species, only the initial appearances of resistance are counted. Consequently, for a given weed, all cases of resistance relating to an action site not previously recorded are included.

Source: CEP, after www.weedscience.org

Box 1: **Volatility and globalization**

Volatility is a characterization of the amplitude of upward or downward price fluctuations relative to a trend over a defined period. The literature identifies numerous explanations (both structural and cyclical) and combinations of them: the fixed nature of short-term market supply, sanitary hazards, low levels of stock leading to fears of inability to tolerate possible poor harvests, inflows of financial actors and the strategy of governments, among others.

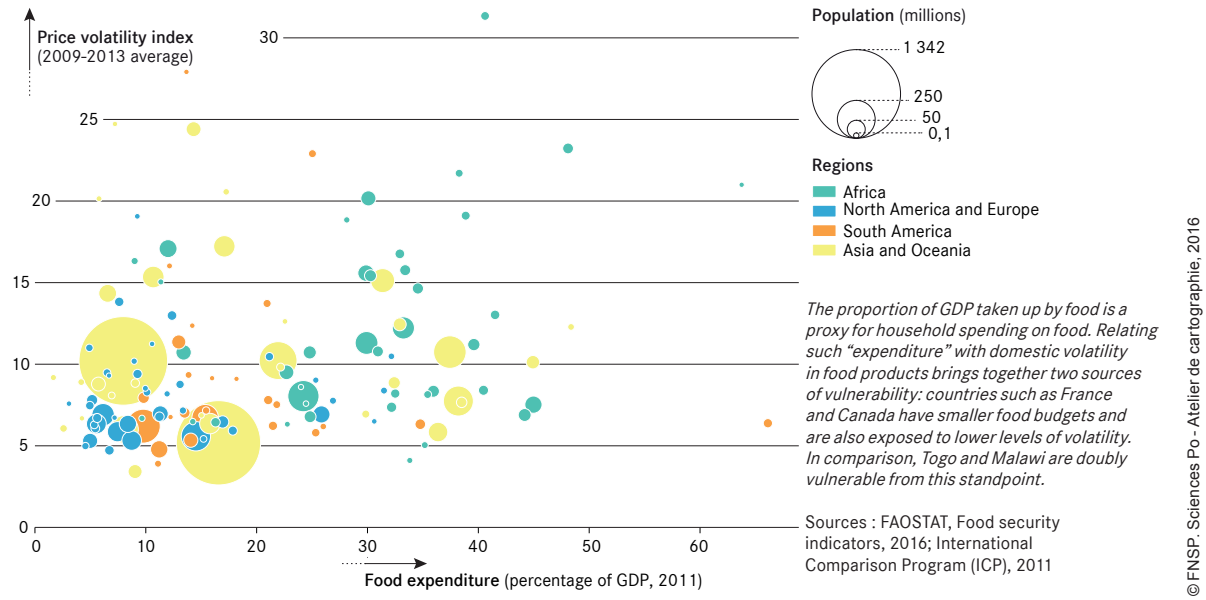
Volatility originates locally[6]: low trading volume, net selling farmers becoming net purchasing farmers following poor harvests, lack of infrastructure and information, and so on.

Globalization also affects these price variations. Transmission of international price volatility to domestic markets still differs between countries[7], largely due to public intervention. In addition, the rising importance of biofuels in some of the main production areas (Europe, United States, Brazil) adds a rigid source of demand to demand for food that itself is relatively insensitive to price variations, although their impact on food prices is in fact difficult to quantify.

In addition to factors related to the results of growing seasons, poor forecasting and the spread of unfounded rumours can generate erratic effects on markets, especially those for co-products. On the other hand, worldwide networking provides better access to information and can therefore have a mitigating effect.

Where climate-related hazards are concerned, the pooling of risk enables their effects to be reduced, although globalization leads to new forms of vulnerability to those hazards due to regional specialization. In fact, the main sources of risk differ according to the degree to which the domestic market is integrated into the global market.

Figure 2: Price volatility and spending on food



The proportion of GDP taken up by food is a proxy for household spending on food. Relating such "expenditure" with domestic volatility in food products brings together two sources of vulnerability: countries such as France and Canada have smaller food budgets and are also exposed to lower levels of volatility. In comparison, Togo and Malawi are doubly vulnerable from this standpoint.

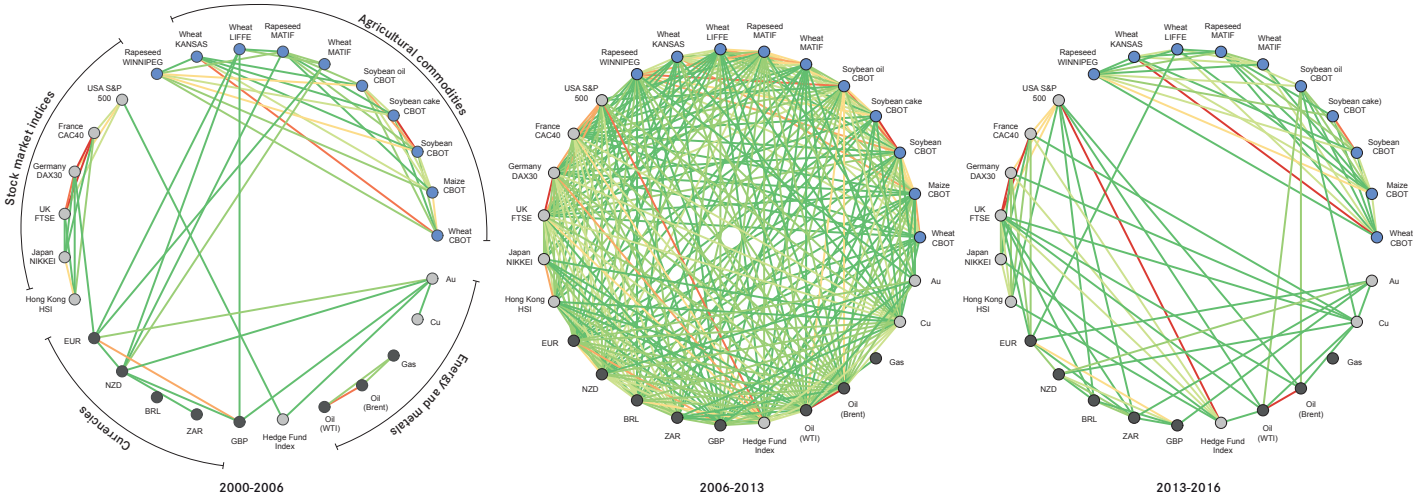
Sources : FAOSTAT, Food security indicators, 2016; International Comparison Program (ICP), 2011

We can also observe that consumers are more or less sensitive to variations in the prices for foodstuffs depending on their income level and the proportion of their income taken up by food (cf. figure 2). Unlike high-income households, poor consumers adjust their purchasing when prices rise and this can lead them to consume less of the products concerned or to turn towards others, potentially involving inadequate calorie intake and dietary deficiencies. Decapitalization of households due to sales of their assets (e.g. cattle in the case of rural populations in the Sahel) or the use of savings can make producers and consumers less resilient to later shocks and prolong the situation of food insecurity. While it is difficult to offer any price projection out to 2030, it is generally assumed that high levels of volatility will continue. The most vulnerable populations are even more likely to bear the brunt of the effects in a context typified by global demand that is less sensitive to price variation, thereby accentuating inequality over the period to 2030.

This displacement also applies to the resources utilized by food systems. Although trade allows countries with very restricted water resources to import the commodities they need (e.g. Middle East, North Africa), this is not without increased internal tensions in the exporting countries, some of which have less than abundant water resources (e.g. certain regions in the USA, Australia)[8].

8. Hoekstra A. Y., 2010, *The relation between international trade and freshwater scarcity*, Working Paper ERSD-2010-05, WTO.

Figure 3: Evolution of the network of correlations between different assets



Legend: The above representation does not show correlations under 20%. The weakest correlations are shown in green and the strongest in red. The data used relates to the period between 1 January 2000 and 1 January 2016.
Source: CEP, after Guilleminot *et al.*, 2012.

1.3. Growing interconnection and systemic effects

The increasing numbers of actors, flows and issues, a remarkable feature of globalization, makes more problematic any forward vision of the potential effects of risks. The emergence of a complex global food system goes hand in hand with so-called "global systemic" risks: i.e. large-scale effects flowing from the spread of an initially circumscribed disruption, concomitant localized events, concentration of risks on certain key actors, and so on. Such planet-wide systemic effects mean that risk approaches that are excessively sectoral or focused on a particular actor are obsolete.

Global networks for trade in wheat and rice contain sources of vulnerability linked to the fact that the actors are relatively homogeneous[9]. This characteristic is conducive to the propagation of disruption via trade restrictions based on incremental decisions taken by governments to protect their domestic markets. Interlocking in the global food system also ensures that it is more exposed to the rapid spread of a chemical or microbiological contaminant, since traceability becomes more problematic[10]. It is worth noting that increased vulnerability in the past does not mean that the risk will be greater in the future, due to the implementation of diversification strategies or enhanced capacity for cooperation.

The role of the financialization of commodity markets is frequently discussed in the debate surrounding the reasons for increased agricultural price volatility. In the 2000s, a striking feature of futures markets was the arrival of new global actors with strictly financial motivations. In commodities, including agricultural commodities, they were seeking a way to diversify their asset portfolios or generate profit. New forms of investment (high-frequency algorithmic trading, index tracking) established connections between agricultural commodities and other assets at global level. These global investors and speculators exposed agricultural markets to the dynamics of other markets by bringing them into the major financial cycles and under the growing influence of the global macroeconomic context. While the role of these actors remains difficult to measure and is hotly debated in the international literature, their modes of intervention do contribute to increased volatility, especially over short periods. Figure 3 illustrates a cyclical aspect in the correlations/decorrelations, which may be maintained to the 2030 horizon, between agricultural markets and the major indices and other classes of macroeconomic assets.

1.4. The globalization of environmental issues

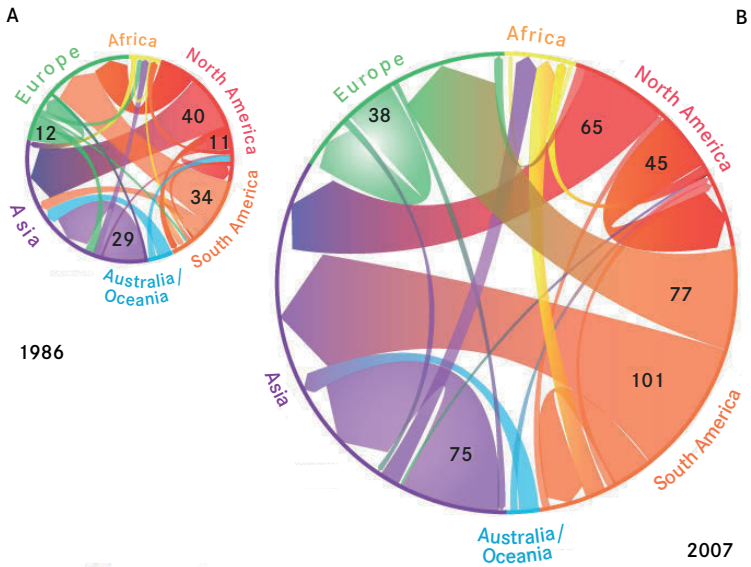
More and more "public issues" initially identified at local level are now considered at global level and declared to be challenges for globalized food systems. For example, the state of soils, the substrate for agricultural production, is the subject of close attention in the work done by the Intergovernmental Technical Panel on Soils[11]. The same is true of biodiversity: genetic erosion in grown or farmed plants and species, irreversible loss of ecosystem services (such as pollination), are threats to food security. Worse still, most projections or forward studies at global level since the early 2000 agree in pointing to the limits of the underlying trends in food systems[12]. The main environmental challenges highlighted are the availability of suitable farmland, greenhouse gas emissions and the impacts of land use changes, balances in geochemical cycles (principally nitrogen and phosphorus), dependence on fossil energies (limited deposits), erosion of biodiversity and the availability of water (quantity and quality).

All-encompassing issues such as climate change may well reconfigure food system globalization by throwing into question our capacity to adapt and certain practices which have proven their worth in recent decades (e.g. food conservation processes). As the quintessential global risk, and one constructed as a global public issue, climate change affects all the various aspects of food security: food availability, access and use. It also raises the question of the future of certain types of high value-added production conducted under a quality-focused approach associated with local production areas (wine, for example), although adaptive strategies will probably appear for the mitigation of the effects of these changes.

2. Risk sharing, common diagnoses and adaptive strategies

Although globalization worsens certain hazards, it also helps mitigate risks and raises awareness of the environmental status of the Earth system. In modifying the risk landscape, it also raises questions as to the adaptive capacity of food systems.

Figure 4: **Flows of virtual water between world regions**



(A) Virtual water trade network in 1986

(B) Virtual water trade network in 2007

NB: The figures indicate the largest volumes of virtual water in cubic kilometres. Circle size is proportional to the total volume of virtual water involved in trade flows. It is worth noting the major difference between 1986 (A; 259 cu. km.) and 2007 (B; 567 cu. km.). This illustration was created using Martin Krzywinski's software program and adapted from the PNAS USA publication. Source: Dalin *et al.*, 2012 – The PNAS is not responsible for translation accuracy - website: http://www.princeton.edu/engineering/news/archive/?id-7905.

9. Puma M., Bose S., Chon S. Y., Cook B., 2015, "Assessing the evolving fragility of the global food system", *Environmental Research Letters*, 10(2).
10. Ercsey-Ravasz M., Toroczkai Z., Lakner Z., Baranyi J., 2012, "Complexity of the International Agro-Food Trade Network and Its Impact on Food Safety", *PloS ONE*, 7(5).
11. FAO, ITPS, 2015, *Status of the World's Soil Resources (SWSR) – Main Report*, Food and Agriculture Organization of the United Nations and Intergovernmental Technical Panel on Soils, Rome.
12. Even M-. A., Vert J., 2011, "La production agricole mondiale à l'horizon 2050. Comparaison de quatre prospectives", Centre for Studies and Strategic Foresight, *Analysis* No. 28.

2.1. Mitigation and global pooling of risks

Globalization can mitigate the effects of climate-related and sanitary hazards, which are often localized. The pooling of risk, through trade for example, can ensure security of supply, especially for urban populations, thus limiting agricultural price volatility at local level.

We can take here a brief look at another significant example: water. Many authors describe international trade as a channel for the transfer of water resources from countries with abundant supplies to those less well endowed. Such approaches, inspired by the "virtual water" concept, represent another way of thinking about such trade flows. They are based on estimates of the quantity of water required for the production of the goods traded. This enables a country to measure its vulnerability by estimating the proportion of its national food supply that is dependent on imports of food produced in areas exposed to water stress. Historical evaluation of exchanges of water via trade in foodstuffs shows that such transfers doubled between 1986 and 2007[13] (cf. figure 4). Asia increased its imports of virtual water by 170% over the same period, with a significant change in the region of origin, with South America replacing North America (soybean effect). Overall, the development of trade in food is moving in the direction of greater global efficiency in the use of water resources[14].

Similarly, exchanges of products *via* international trade helped improve the use of the land factor by approximately 90Mha in 2008[15] (a three-year average), while at the same time increasing the distances between the locations of production and consumption. The use of land for export production increased in this way between 1986 and 2009 by approximately 100Mha, or 8% of global farmed land in 2008.

2.2. Towards global questions

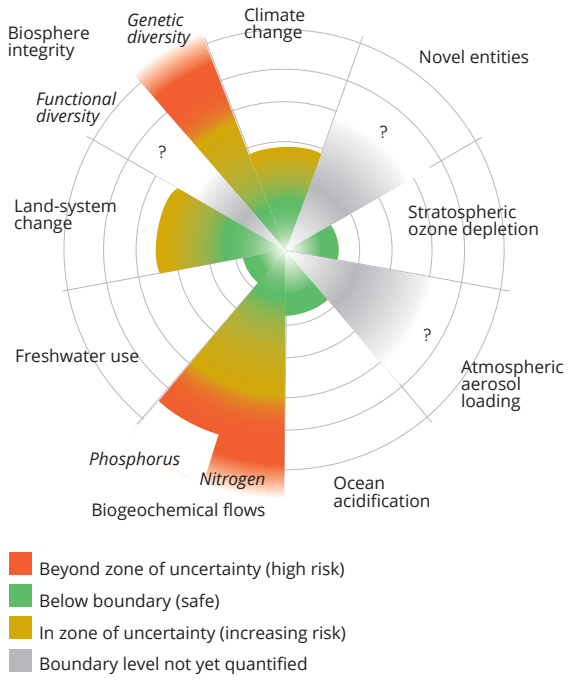
Perceived as shared risks, the "challenges for the world" mentioned earlier are the subject of mental representations at global level, often backed by research. Maps and infographics provide illustrations both of the singular nature of the issue and the diversity of its local manifestations. Such representations also highlight existing areas of interdependence and the "glocalization" of risks: i.e. local actions, global effects.

"Planetary Boundaries"[16] are examples of these representations. This concept, which derives from academic research, describes nine domains of biophysical regulation (cf. figure 5) for which the breach of a defined disruption threshold would compromise the stability of the Earth system and thereby the development of human activities. The greater the breach, the greater the risks of violent change in the environment – and erosion of its capacity for resilience. According to this, four of the nine boundaries have been crossed at the present time (compared with three out of seven in their first publication in 2009): changes in land use, geochemical cycles (nitrogen and phosphorus), biodiversity integrity and climate change. The latter two planetary boundaries could tip the terrestrial system into a critical state due to their interactions with the others.

The Global Footprint Network is a further illustration of such representations. This compares a composite indicator – the "Ecological Footprint" – with the biosphere's capacity to regenerate the resources consumed and assimilate the waste produced. Every year, it calculates the date from which the biosphere's capacity has been exceeded by requirements linked to human activities (cf. figure 6).

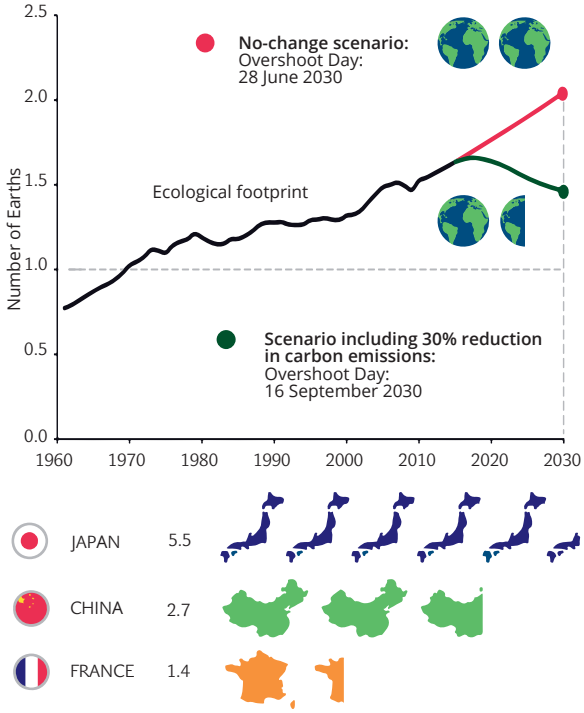
13. Dalin C., Konar M., Hanasaki N., Rinaldo A., Rodriguez-Iturbe I., 2012, "Evolution of the global virtual water trade network", *PNAS*, 109(16): 5989-5994.
14. Dalin *et al.*, 2012, *op. cit.*
15. Kastner T., Erb K. H., Haberl H., 2014, "Rapid growth in agricultural trade: effects on global area efficiency and the role of management", *Environmental Research Letters*, 9.
16. Steffen W. *et al.*, 2015, "Planetary boundaries: Guiding human development on a changing planet", *Science*, 347(6223).

Figure 5: **Planetary Boundaries**



NB: The planetary boundaries are located between the safe space in green and the zone of uncertainty in yellow. A quantitative variable has been defined for each item (e.g. climate change and atmospheric concentration of CO_2 in ppm) along with two figures marking the limits of the zone of uncertainty. The current level of the control variable is compared with these two figures in order to determine the zone in which each item is positioned.
Source: After Steffen *et al.*, reproduced with the permission of the AAAS.

Figure 6: **How many Earths are needed to meet humanity's needs?**



NB: The second graph relates to an estimate of the number of countries that would be required to meet the needs of its inhabitants (consumption of goods and services).
Source: © 2016 Global Footprint Network, www.footprintnetwork.org.

These holistic representations underscore the degraded state of the planet and the need to correct it. Although this shared new awareness is accompanied by a range of discourses relating both to the overall assessment and the solutions to be applied, criticisms are levelled at global coordination efforts, these being judged to be insufficient given the scale, speed and nature of the global changes concerned. The increase in the numbers of such environmental issues is leading to competition to attract attention and resources and to influence international agendas. Such planet-wide questions will be increasingly numerous over the period to 2030, contributing simultaneously to a strengthening of the feeling that the "planetary system" has a single destiny and to the definition of "global public issues".

2.3. Globalization as a source of innovation

Some actors are developing responses to the risks generated by globalization. Companies, for example, are addressing the increasing complexity of their Global Value Chains (GVC). Although these still cover only a limited part of global food systems[17] they have led to an increase in the numbers of contributors and their interactions, as well as geographically dispersed operations, among other effects. This increased complexity ensures that GVCs are channels for the global transmission of systemic risks. The rising number of companies involved in value chains is a source of dysfunction and diminished transparency along GVCs can impede both detection of failures and application of solutions[18]. In the past, a number of events have in fact put these long chains to the test: foot-and-mouth disease in the United Kingdom in 2001, the 2008-2009 financial crisis, the melamine-contaminated milk scandal in China in 2008 and "Horsegate" in 2013. The globalization of value chains obliges companies to refrain from considering risk only at the level of their own business. The strategies for making GVCs more resistant to shocks includes a change towards greater diversity of suppliers, which can mitigate procurement risks: this increases geographical dispersion, allocates orders to substitute (smaller) suppliers and breaks long chains down into shorter chains[19]. Another strategy is based on the blockchain concept, an upcoming technology for ensuring product traceability along the food supply chain. It also offers a promising solution for combating the internationalization of food-related fraud[20].

Globalization helps mitigate certain risks by disseminating solutions. The Intergovernmental Panel on Climate Change (IPCC) points for example to the potential of agricultural methods for the mitigation of greenhouse gas emissions at the 2030 horizon[21]: efficiency in existing modes of production, development of new practices, lower levels of production, use of substitutes and carbon storage in soils and biomass. Other levers for action relate to demand: e.g. reduced consumption of meat products and combating waste. Such channelling of the international agenda is also to be found in initiatives such as the international "4 per 1,000" programme on carbon storage in soils.

With regard to adaptive measures in global food systems, current knowledge mainly relates to the production stage[22]. These strategies are based on[23]:

- escheduling crop calendars and grazing periods to benefit from longer periods favourable to crops as well as resistance to water stress;
- the use of more suitable breeds or varieties more tolerant of the new climatic conditions;
- enhancing the resilience of production systems with diversification as the core component.

Where livestock farming is concerned, rising temperatures could lead to changes in the composition of herds in Africa, cattle being replaced by small, more heat-tolerant ruminants. A number of measures are possible in aquaculture: use of species better suited to the new conditions (acidification, higher water temperatures), the fine-tuning of feed and better use of water resources. Adaptation is not simply a technical agricultural matter but also relates to the support system in order to reduce the fragility of the actors in food systems (e.g. access to credit and markets, public policies).

3. Global risk governance: tensions between unilateral strategies and collective management

Looking beyond new risk regimes, the dynamics of the period to 2030 for these various challenges (economic, sanitary, etc.), and the actors' ability to propose solutions will depend on the effectiveness of global governance.

3.1. Consolidating forms of governance

Global management and governance of risks are becoming stronger, especially in the sanitary domain. Due to the multiplicity of flows of plant and animal products, the (re)appearance of infectious diseases, the cross-border spread of pests and increasing numbers of cases of antimicrobial resistance are leading to international action by actors. While good national sanitary governance continues to be essential, globalization is making global coordination of effort ever more necessary. This dynamic is significant in the case of the risks linked to food and the animal sector, with some successes, such as the eradication of rinderpest in 2011. Conversely, it is less marked in the plant sector: given the lesser importance of the issues of direct concern for human health, the risks are perceived above all in economic terms.

The objective of global risk governance is to deal with issues "at source", i.e. in the country of origin[24]. It is founded on enhanced transparency for member countries' epidemiological status and on the participation of a larger number of stakeholders in surveillance networks[25]. The episode of the H1N1 virus pandemic in 2009-2010 is cited as the first genuinely planetary response to an emerging pathogen, ranging as it did from surveillance through to vaccination[26].

In addition to the World Health Organization (WHO), three institutions which experienced a positive membership dynamic in the 20th century are playing this role internationally: the *Codex Alimentarius* joint FAO/WHO Commission on food product safety, the World Organization for Animal Health (OIE) and the FAO's International Plant Protection Convention (IPPC). They have a mandate under the Sanitary and Phytosanitary Measures Agreement[27] and build normative

17. Claquin P., 2017, *op. cit.*
18. Park A., Nayyar G., Low P., 2013, *Supply chain perspectives and issues. A literature review*, FGI and WTO.
19. OECD, 2014, "Chaînes de valeur mondiales : maîtriser les risques", in *Économies interconnectées. Comment tirer parti des chaînes de valeur mondiales*, Paris.
20. Hug M., 2017, "Un nouvel outil numérique pour la fiabilisation des supply chains: la blockchain », *Annales des Mines – Réalités industrielles*.
21. IPCC, 2014, *Climate Change 2014: Impacts, Adaptation and Vulnerability. Summary for Policymakers*, Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, World Meteorological Organisation, Geneva.
22. Porter J. R. *et al.*, 2014, "Food security and food production systems", *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects*, Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge University Press, pp. 485-533.
23. Vert J., Schaller N., Villien C., Portet F., Mahé T., Sergent A., 2013, *Agriculture, Forêt, Climat. Vers des stratégies d'adaptation*, Centre for Studies and Strategic Foresight.
24. Buffard M, 2013, *La globalisation de la politique de lutte contre la fièvre aphteuse*, Institut d'études politiques de Lyon.
25. Figuié M., 2014, "Towards a global governance of risks: international health organisations and the surveillance of emerging infectious diseases", *Journal of Risk Research*, 17 (4): 469-483.
26. Lefrançois T., Pineau T., 2014, "Public Health and livestock: Emerging diseases in food animals", *Animal Frontiers*, 4(1): 4-6.
27. WTO, 1998, Understanding the WTO Agreement on Sanitary and Phytosanitary Measures, https://www.wto.org/english/tratop_e/sps_e/spsund_e.htm.

standards, guidelines and recommendations. They develop and translate global sanitary doctrines, some of which are shared, such as the *One Health* initiative in 2010 between the WHO, the FAO and the OIE, the purpose of which is to strength the links between human health, animal health and environmental management. These organizations are addressing potential divergences between the development of international trade and sanitary management.

In addition to recommendations and standards, numerous management instruments have been introduced internationally, benefiting from the fluidity provided by communication technologies: shared databases (e.g. WAHIS interface, ProMED) and the organization of surveillance and alert networks (e.g. INFOSAN, influenza surveillance network). Some projects such as EDENext and STAR-I-DAZ are aimed at creating a global research dynamic on sanitary risks. But the roll-out of such initiatives also reveals geographical disparities in access to the information needed, especially in areas lacking in veterinary and sanitary services. Such regions then become weak links in the global effort to prevent, detect and respond to sanitary issues[28]. The globalization of sanitary management and the dissemination of the associated tools also involve the private sphere. For example, the Hazard Analysis Critical Control Point (HACCP) approach is now applied generally in large companies.

Another illustration of these new forms of governance concerns price risk management. Fluctuations in the prices for agricultural commodities and the aggravating effect of unilateral trade policies in upward trending periods (i.e. export bans) have favoured global reflection on long-term strategies and on issues of structural dependency. This desire for stronger governance was given practical expression, among other things, at the G20 meeting in Paris in June 2011 with the creation of the Agricultural Market Information System (AMIS). This trade platform is dedicated to the transparency of markets and the public policies likely to impact them, as well as to international coordination in times of crisis, based around the "rapid reaction forum" attached to AMIS. Its members are the G20 governments, plus Spain and the main wheat, rice, maize and soybean importing and exporting countries (i.e. Egypt, Kazakhstan, Nigeria, Philippines, Thailand, Ukraine and Vietnam). In the context of market pressures in 2011 (rocketing maize prices), a fear of sending the wrong signal (confirmation of the crisis) convinced policymakers that they should refrain from meeting; coordination then took the form of informal contacts in order to build a coherent response across national institutions.

3.2. Possible regression due to an accumulation of sources of tension

Although the steps forward outnumber the steps backward, the hypothesis of a possible regression in international cooperation cannot be ruled out in the event of a loss of trust or an accumulation of sources of tension, notably geopolitical (cf. box 2). Initiatives for management of volatility in agricultural commodity prices are recent (e.g. the collective scheme for rice in Asia[29]). It is therefore difficult to foresee their impacts to the 2030 horizon and their capacity to overcome the protectionist temptations that will come to fore in future crises. Indeed, it is difficult to imagine a collective strategy that would be adhered to irrespective of events, even if the prospect of sanctions is included. While stabilization of domestic prices is an important objective that can be achieved at the cost of commercial interests[30], a return to isolationist strategies can still be considered a possibility. This would involve a reduction in trade dependencies (self-sufficiency) and

28. Lefrançois T., Pineau T., *op cit.*
29. Cadilhon J., Millemann A., 2011, "Les politiques publiques de stabilisation du marché du riz en Asie", Centre for Studies and Strategic Foresight, *Analysis* No. 30.
30. Gouel C., 2014, *Trade policy coordination and food price volatility*, CEPII Working Paper 2014-23.
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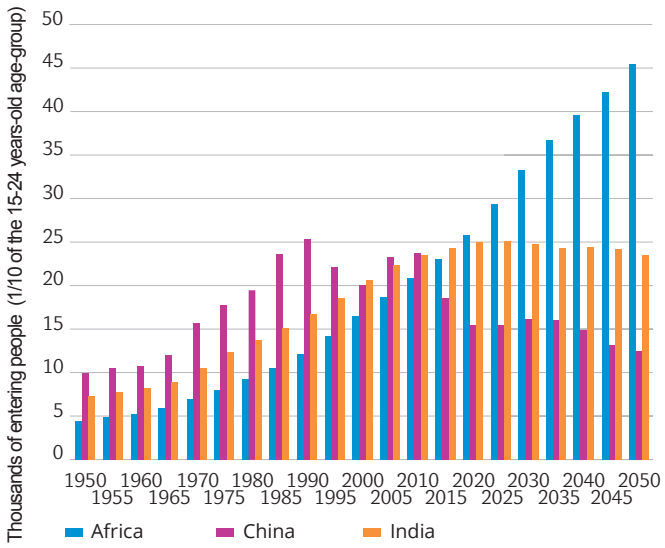
Box 2: Geopolitics and food systems

Food systems act through many channels to shape the development of geopolitical issues, the reverse also being true. For example, while food insecurity is a consequence of conflict, it is also among its causes[31]. Food and nutritional insecurity are frequently concentrated in countries affected by conflict or emerging from a period of conflict (high mortality, migrations of agricultural workers, destruction of crops, equipment and infrastructure, market disruption, isolation and capture of food aid, disorganization of health services, etc.). Conversely, food insecurity can contribute to the destabilization of a country, although this will often have multiple causes. For example, hunger riots impacting supplies to vulnerable urban populations contributed to the government's fall in Haiti. As for the protests during the "Arab Spring" in 2011, these coincided with rising food prices, exacerbating the climate of rebellion.

The demographic outlook indicates that rural employment will be a major challenge over the period to 2030 (cf. figure 7), particularly in Africa, with rising tension between the necessity of improving agricultural productivity (the world's lowest) and the necessity of maintaining rural populations in order to avoid excessively massive migrations (both internal and international). In order to meet this challenge, there are a number of possible avenues: defence of family farming, improvement of the operation of local markets and regional policies linking town and countryside[32].

Although food is an integral component of geopolitical issues, it cannot be isolated from other sources of intergovernmental tension or rapprochement. As an example of this, fisheries in the China Sea are among many strategic issues (military, energy-related due to hydrocarbons, trade-related due to the maritime route, etc.) generating tension in this geographical space[33].

Figure 7: **Annual cohorts entering the working-age population (1950-2050)**



NB: The annual cohort of new members of the working population highlights the importance of young people and helps avoid uncertainty as to actual departures from the working population after age 64. Worldwide, the percentage of rural entrants falls from 64% to 54% over the period 2010-2030.
Source: Losch B., 2014, updated by the author (World Population Prospects, revised 2015)

the securing of external supplies, including by non-commercial means (e.g. diplomatic threats, more or less official annexations).

Standing as they do at the interface between issues of mitigation and adaptation, agriculture and food systems are increasingly present on international agendas, given that reductions in emissions and adaptation must notably involve shared solutions (transfers of knowledge, technology and capital). While a deepening of global governance on climate appears to be the most likely scenario for the period to 2030, as shown by the signing of the Paris Agreement in 2015, the next few decades will be crucial for the implementation of actions on the ground and observation of their results. The fragmentation of climate governance cannot however be ruled out due to excessive disparity in degrees of exposure to the hazards and actors' real commitment, as well as criticisms levelled at certain actions (e.g. inadequate consideration for specific local characteristics, technologies in the possession of a limited number of organizations).

Climate change is also revelatory of the interactions between "risks" and "public issues" relating to food systems. It will have impacts on food and sanitary security, biodiversity, geopolitics, and more. Such interdependencies (cf. figure 8) are a challenge for any form of global governance and require integrated management. The necessity of this will be all the greater during transition periods when there will be an accumulation in any given area of risks that are already known and new risks that do not affect that area.

*

This *Analysis* throws light on the links between risks, public issues and globalization, without aiming to be exhaustive and with a focus on public authorities. Despite these limitations, it highlights a small number of trends likely to be sustained to the 2030 horizon.

Globalization will continue to modify the prisms through which we view risks and the definition of the associated public issues. While it may mitigate some of these by pooling them, it will worsen others due to the effect of dissemination or through displacement. It will lead to the emergence of global issues and increased awareness of a rising number of issues will go hand in hand with questions raised at planetary level. This globalization will itself be shaped by worldwide challenges, climate change first and foremost.

Although risks will grow tomorrow, how they translate into actual impacts over the period to 2030 is not easy to determine given that certain responses may counterbalance ongoing trends. With regard to (re)emerging diseases, the future of humanity and pathogens somewhat resembles a thriller in which the plasticity of their genes battles with our ability to cope with the successive challenges they pose for us[34]. Likewise, the degree to which global trade networks are vulnerable will depend on the adoption of diversification strategies or greater capacity to cooperate. The question of who will pay for and bear risks also arises, particularly in a context in which the private sector and foundations are increasingly influential, alongside national governments, as major actors in risk management. While good governance at national level will continue to be essential, globalization will make worldwide coordination of effort and strategy increasingly necessary. Nevertheless, in 2030 we shall still be a long way from genuinely global government of risk.

Élise Delgoulet
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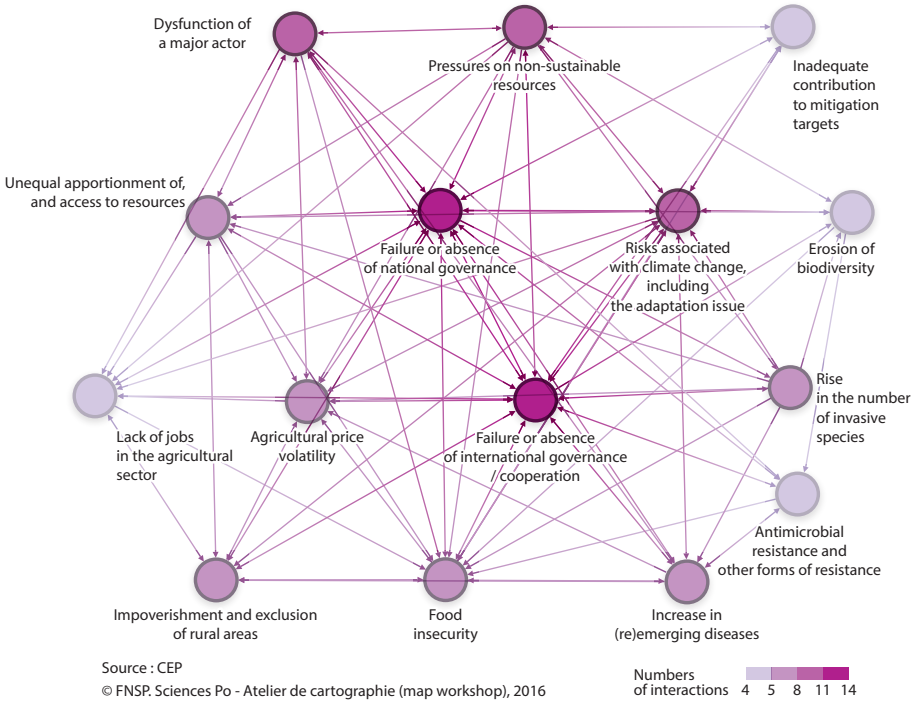
34. Lederberg J., 2000, "Infectious history", *Science*, 288: 287-293.

Figure 8: **Interactions between risks and public issues**

The figure below contains a qualitative illustration of the interactions between the main risks referred to in the chapter but does not claim to be exhaustive. The purpose of this graphic is simply to highlight the interdependencies that must lead to an integrated approach to consideration of the risks.



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