

One aspect of water security: the
relationship between water, energy and
food.

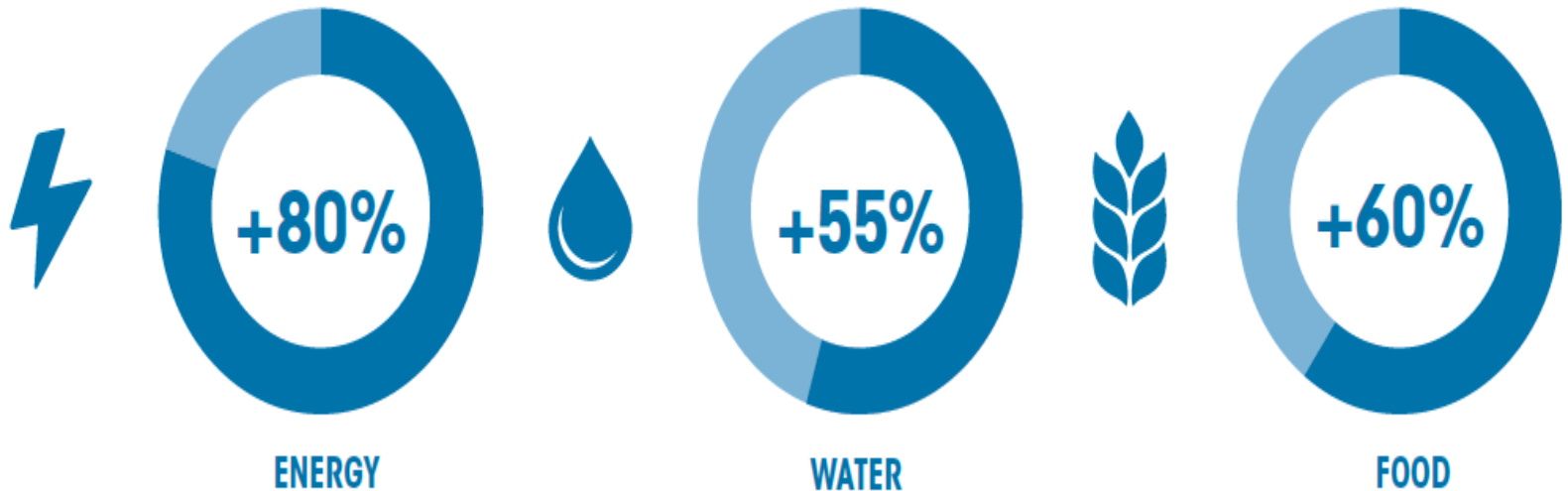
ANTONIO EMBID IRUJO
CATEDRÁTICO DE DERECHO ADMINISTRATIVO
UNIVERSIDAD DE ZARAGOZA. ESPAÑA.

SESION ESPECIAL: “WATER SECURITY IN THE AMERICAS”
CANCUN MEXICO XVI WORLD WATER CONGRESS 1-6-2017

THE NEXUS. IRENA (2015), p. 23

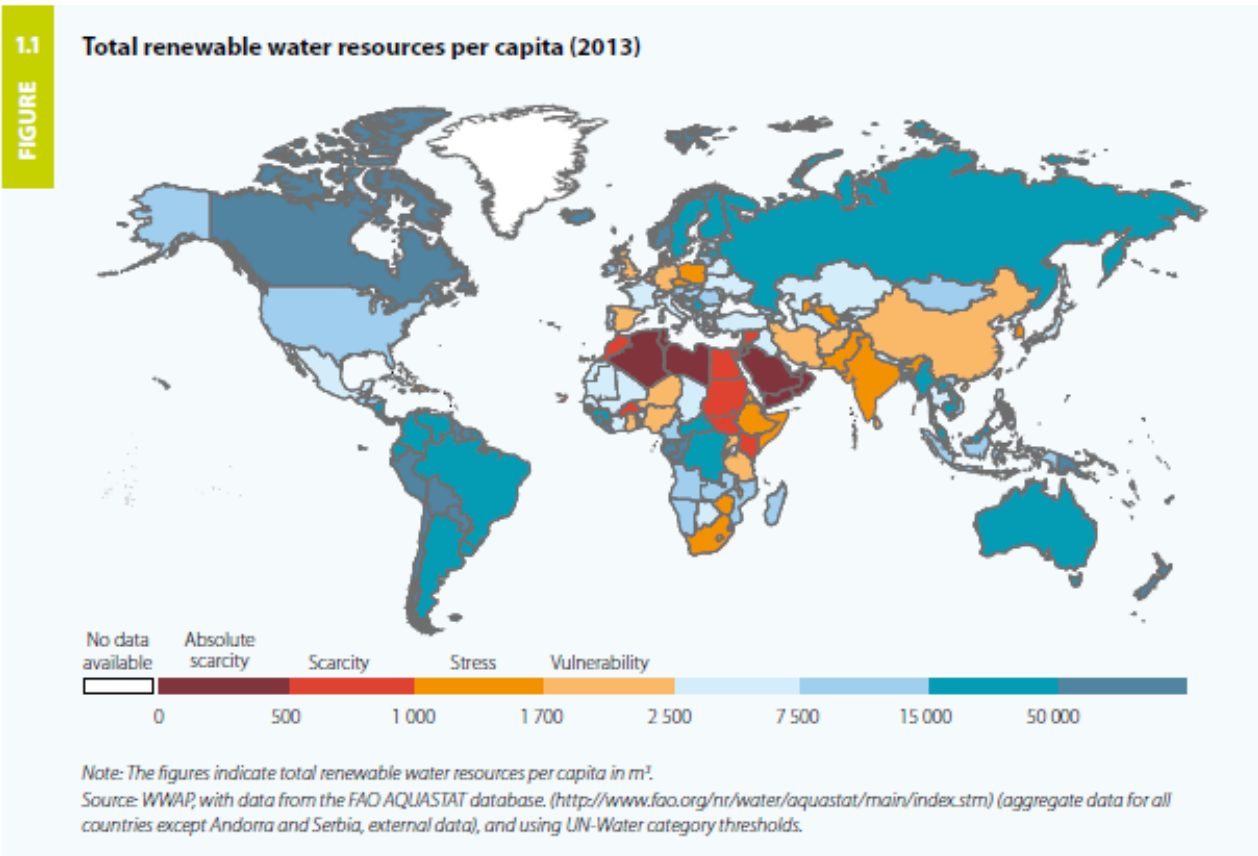
Estimated increase in water, energy and food demand by 2050

By
2050



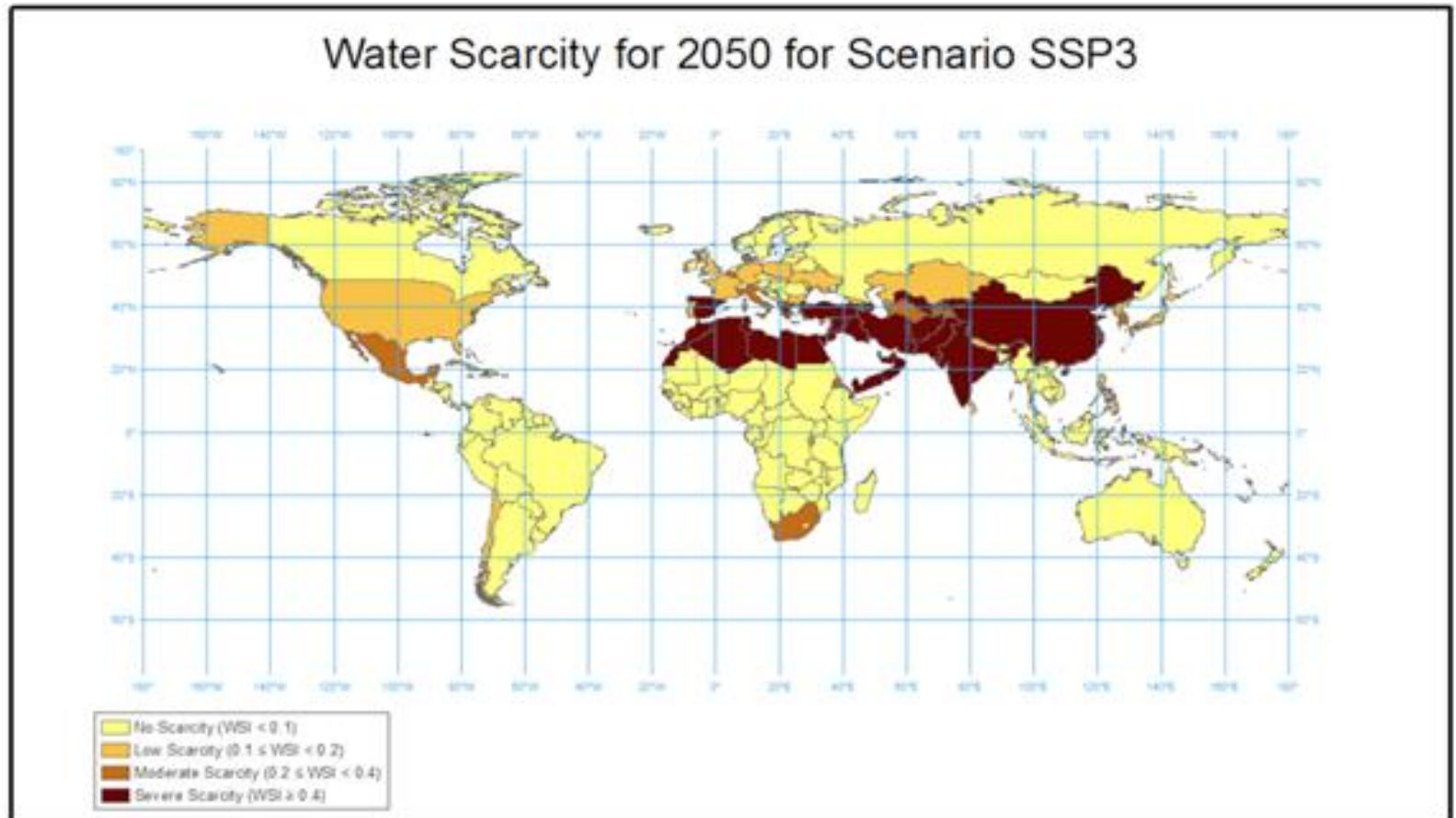
Source: OECD-FAO, 2012

LATINOAMÉRICA Y EL CARIBE (1).



LATINOAMÉRICA Y EL CARIBE (2).

(Universidad de Maryland)



LATINOAMÉRICA Y EL CARIBE. (3) (WILLAARTS y otros 2014, p. 271).

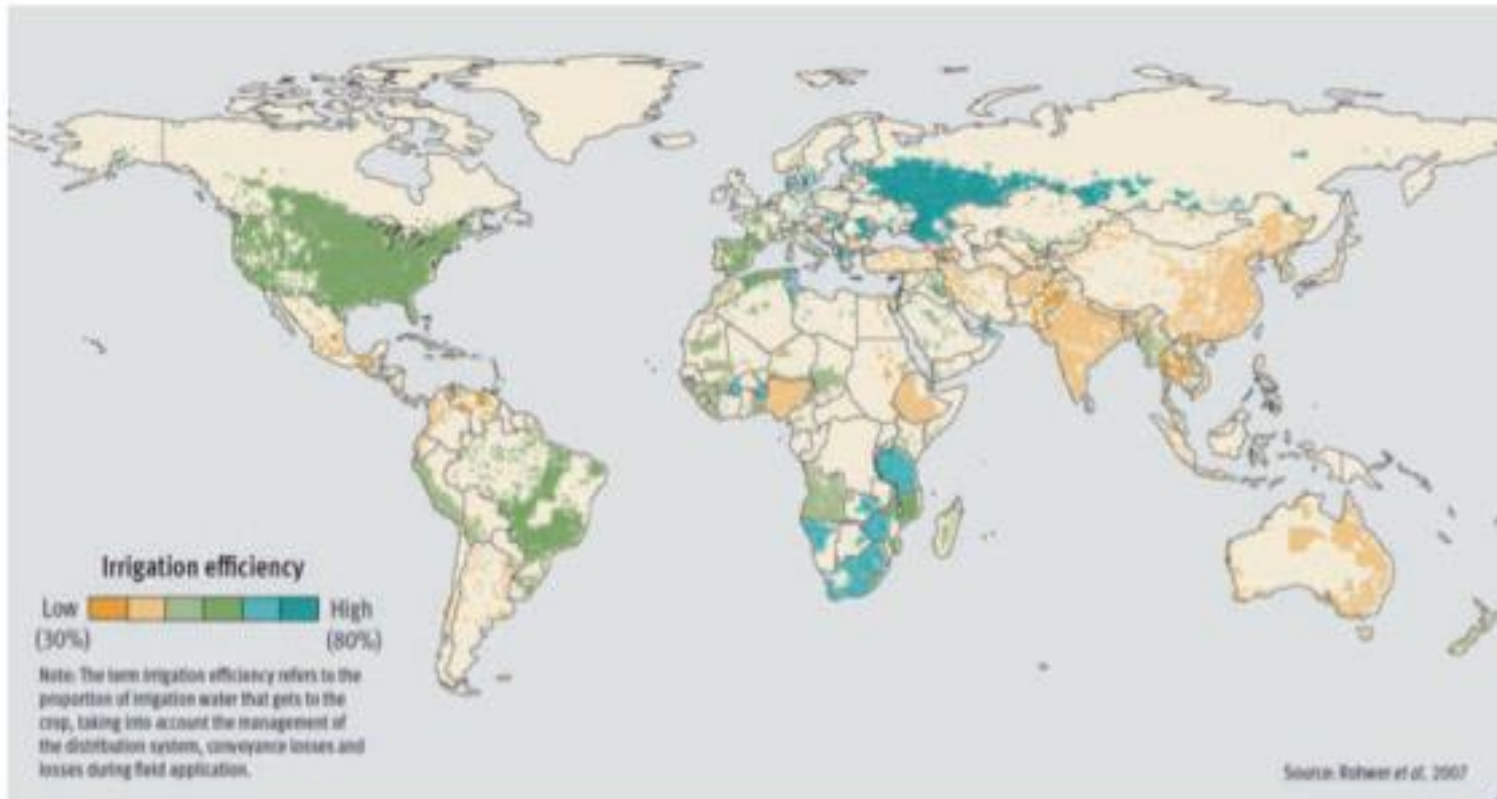


Figure 10.2 Global irrigation efficiencies, year 2000. *Source: UNEP (2012).*

LA SOCIEDAD DEL RIESGO.

Global Risks Report 11ª ed., 2016.

Figure 1.1.1: The Evolving Risks Landscape, 2007–2016

Top 5 Global Risks in Terms of Likelihood

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
1st	Breakdown of critical information infrastructure	Asset price collapse	Asset price collapse	Asset price collapse	Storms and cyclones	Severe income disparity	Severe income disparity	Income disparity	Interstate conflict with regional consequences	Large-scale involuntary migration
2nd	Chronic disease in developed countries	Middle East instability	Slowing Chinese economy (<6%)	Slowing Chinese economy (<6%)	Flooding	Chronic fiscal imbalances	Chronic fiscal imbalances	Extreme weather events	Extreme weather events	Extreme weather events
3rd	Oil price shock	Failed and falling states	Chronic disease	Chronic disease	Corruption	Rising greenhouse gas emissions	Rising greenhouse gas emissions	Unemployment and underemployment	Failure of national governance	Failure of climate-change mitigation and adaptation
4th	China economic hard landing	Oil and gas price spike	Global governance gaps	Fiscal crises	Biodiversity loss	Cyber attacks	Water supply crises	Climate change	State collapse or crisis	Interstate conflict with regional consequences
5th	Asset price collapse	Chronic disease, developed world	Retrenchment from globalization (emerging)	Global governance gaps	Climate change	Water supply crises	Mismanagement of population aging	Cyber attacks	High structural unemployment or underemployment	Major natural catastrophes

Top 5 Global Risks in Terms of Impact

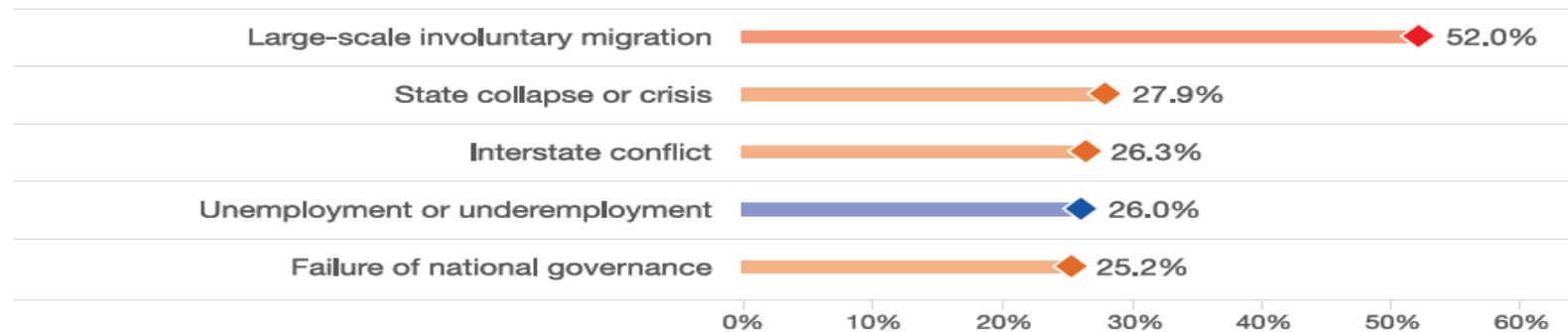
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
1st	Asset price collapse	Asset price collapse	Asset price collapse	Asset price collapse	Fiscal crises	Major systemic financial failure	Major systemic financial failure	Fiscal crises	Water crises	Failure of climate-change mitigation and adaptation
2nd	Retrenchment from globalization	Retrenchment from globalization (developed)	Retrenchment from globalization (developed)	Retrenchment from globalization (developed)	Climate change	Water supply crises	Water supply crises	Climate change	Rapid and massive spread of infectious diseases	Weapons of mass destruction
3rd	Interstate and civil wars	Slowing Chinese economy (<6%)	Oil and gas price spike	Oil price spikes	Geopolitical conflict	Food shortage crises	Chronic fiscal imbalances	Water crises	Weapons of mass destruction	Water crises
4th	Pandemics	Oil and gas price spike	Chronic disease	Chronic disease	Asset price collapse	Chronic fiscal imbalances	Diffusion of weapons of mass destruction	Unemployment and underemployment	Interstate conflict with regional consequences	Large-scale involuntary migration
5th	Oil price shock	Pandemics	Fiscal crises	Fiscal crises	Extreme energy price volatility	Extreme volatility in energy and agriculture prices	Failure of climate-change mitigation and adaptation	Critical information infrastructure breakdown	Failure of climate-change mitigation and adaptation	Severe energy price shock

■ Economic
 ■ Environmental
 ■ Geopolitical
 ■ Societal
 ■ Technological

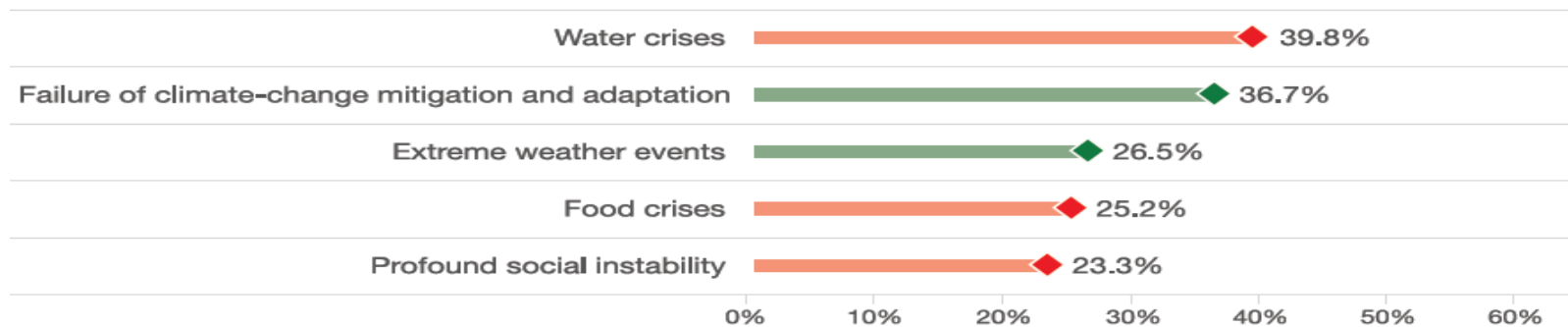
LA SOCIEDAD DEL RIESGO Y LAC (1). (Global Risks Report 11ª ed., 2016).

Figure 1.2: The Top Five Global Risks of Highest Concern for the Next 18 Months and 10 Years

For the next 18 months



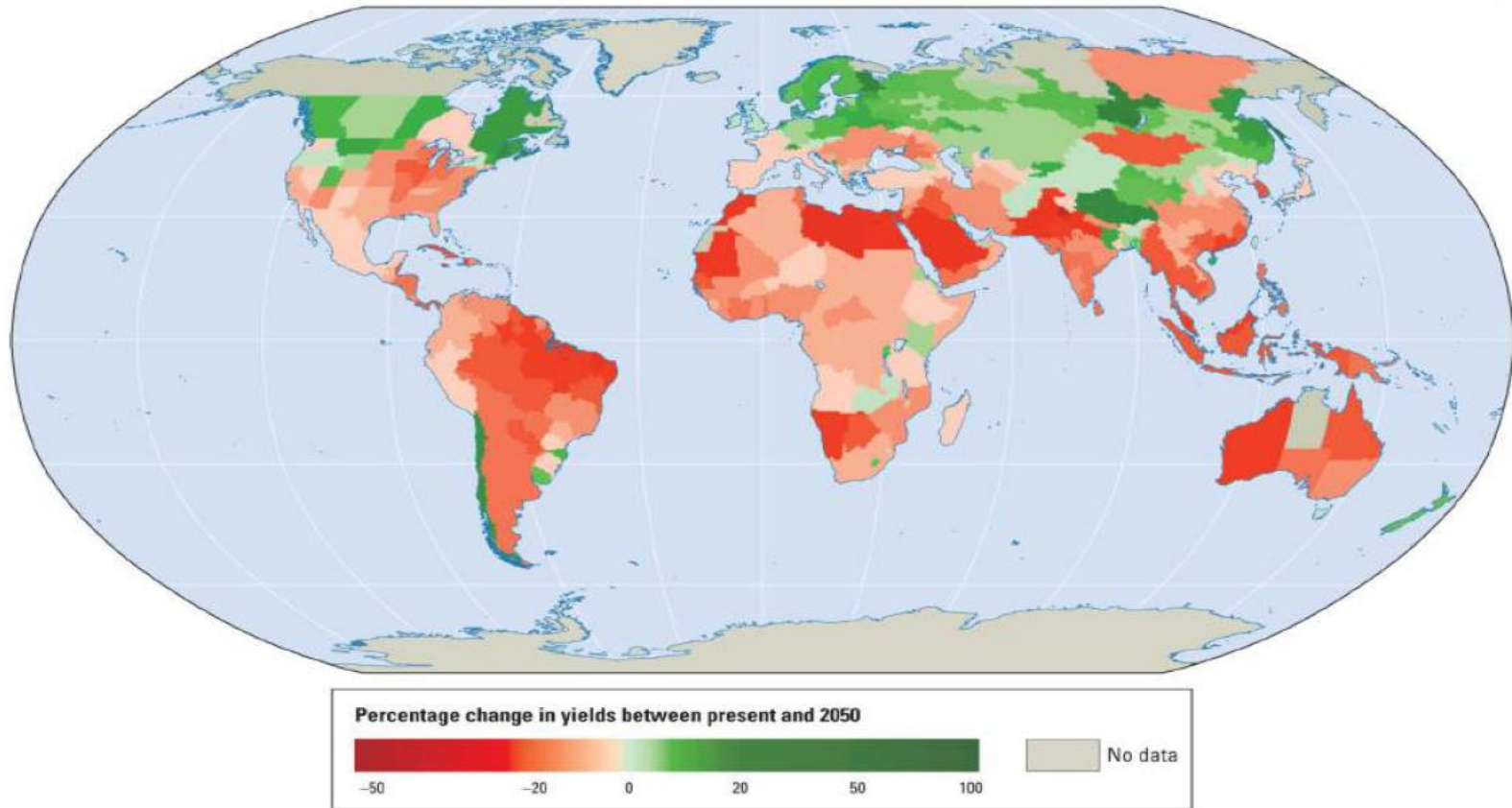
For the next 10 years



Source: Global Risks Perception Survey 2015, World Economic Forum.

LA SOCIEDAD DEL RIESGO Y LAC (2). (Global Risks Report 11^a ed., 2016).

Figure 3.2.1: Projected Impacts on Crop Yields in a 3°C Warmer World

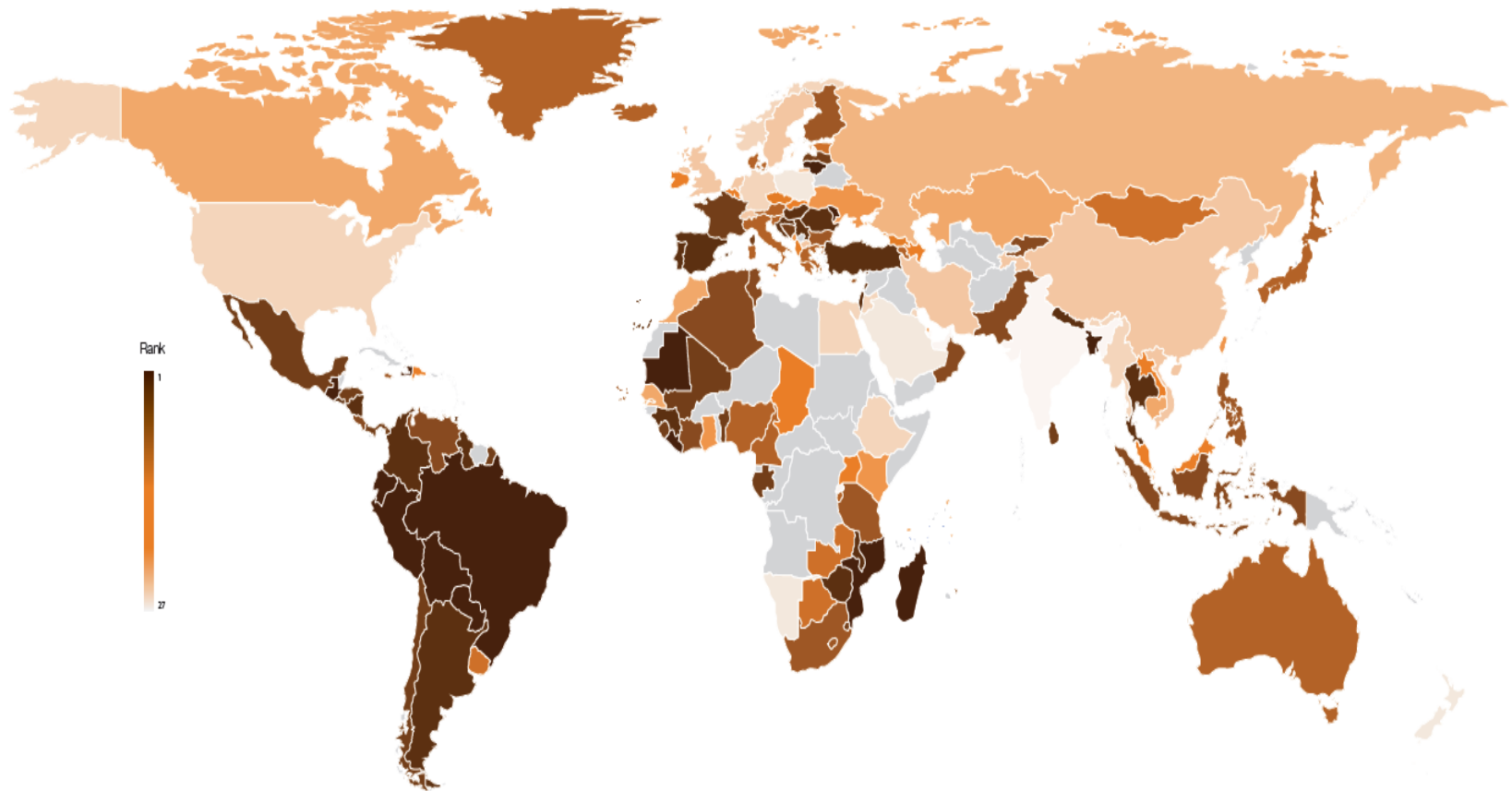


Source: WRI 2013.

Note: -50% change = half as productive in 2050 as in 2015; +100% change = twice as productive in 2050 as in 2015.

LA SOCIEDAD DEL RIESGO Y LAC (3). (Global Risks Report 11ª ed., 2016).

Figure 4.4: Failure of National Governance, rank



Source: Executive Opinion Survey 2015, World Economic Forum.
Note: The darker colour, the higher the concern.

INTERRELATIONS BETWEEN WATER AND ENERGY

-**Use of water to produce energy.** Traditional approach to hydropower and in cooling nuclear power plants and thermal plants.

-**15% of worldwide water abstraction is used in energy production.** (It's a very important amount).

-**Interrelations too:** by hydrocarbon extraction ("fracking" in non-conventional hydrocarbons). Great controversy (Precautionary principle).

-**Use of water and mining:** Water use in mining has major problems in arid countries.

INTERRELATIONS BETWEEN ENERGY AND WATER

-Essential role of energy in seawater desalination, pumping of groundwater and irrigation modernization.

In **desalination**, the main concern is environmental: the dumping of brines but also the energy consumption is very important.

In **pumping of water**, there is a serious problem when the price of energy is subsidized. This increases water consumption.

The **modernization of irrigation systems** greatly increases energy consumption, although it can reduce water consumption

-The agrifood chain is estimated to consume around 30% of worldwide energy.

INTERRELATIONS BETWEEN WATER AND FOOD

- Water is used to produce food: irrigation and aquaculture.
- Water uses percentages: it depends on the country. It can range from 70 to 90%.
- The returns the water to the cycle do not usually exceed 20-30%.

It is necessary to line channels to reduce water consumption.

-Usually water enjoys a privileged position in countries whose legislation is based on a hierarchy of uses. Only human consumption of water is ahead of irrigation.

INTERRELATIONS BETWEEN WATER, ENERGY AND FOOD

- The best example of these interrelation: biomass production.
- In recent years a growth of this phenomenon in some geographical areas can be appreciated: Argentina, Brasil.
- This production can involve a decrease in food production; if the biomass is forest waste, the ecological funcion of the forest can be affected.
- It's also possible an increase in food prices too. Although this is not proven.

The nexus approach can help avoid the drawbacks of these interrelationships

OTHER CONSIDERATIONS BY WAY OF CONCLUSION

- interrelations between water, energy and food should be taken into account in all public policies.
- The central element in the nexus is water. Water should be a relevant issue in the future.
- The environment must be the element underlying all interrelationships.
- Human rights can not be forgotten in the considerations on the nexus.