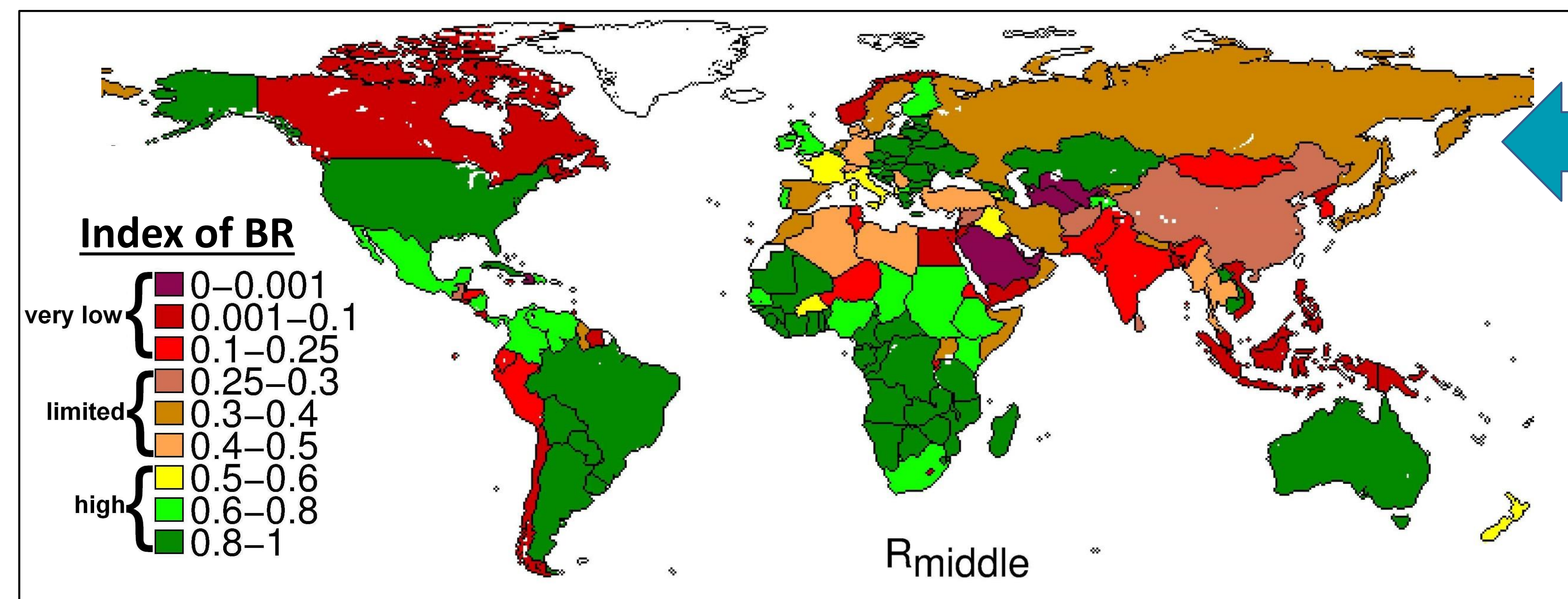


# Introducing “biophysical redundancy”: The global status and past evolution of unused water, land and productivity resources for food production

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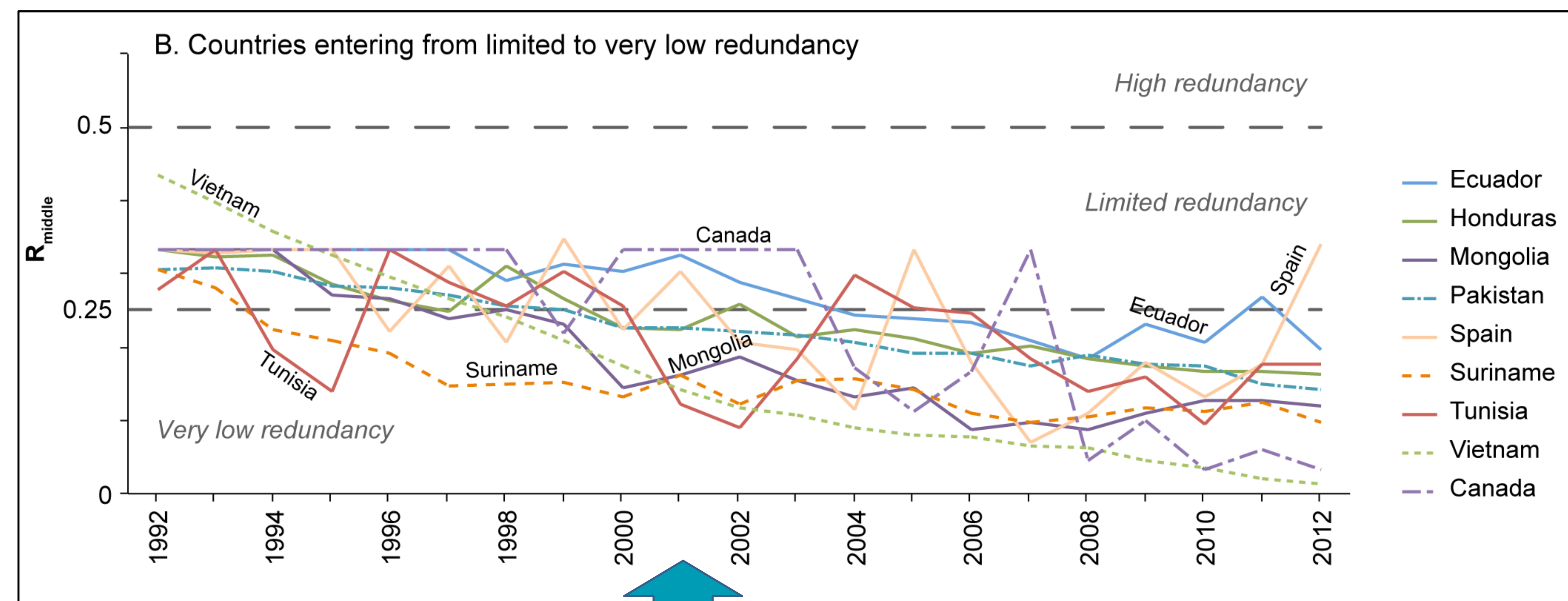
**Relevance and definitions:** Countries have different resilience to sudden and long-term changes in food demand and supply. An important part of this resilience is the degree of **biophysical redundancy (BR)**. BR is the potential food production of 'spare land', available water resources, as well as production increases through yield gap closure on cultivated areas and potential agricultural areas. **Different scenarios** according to available resources and their productivity:  $R_{middle}$ ,  $R_{low}$ ,  $R_{high}$ .



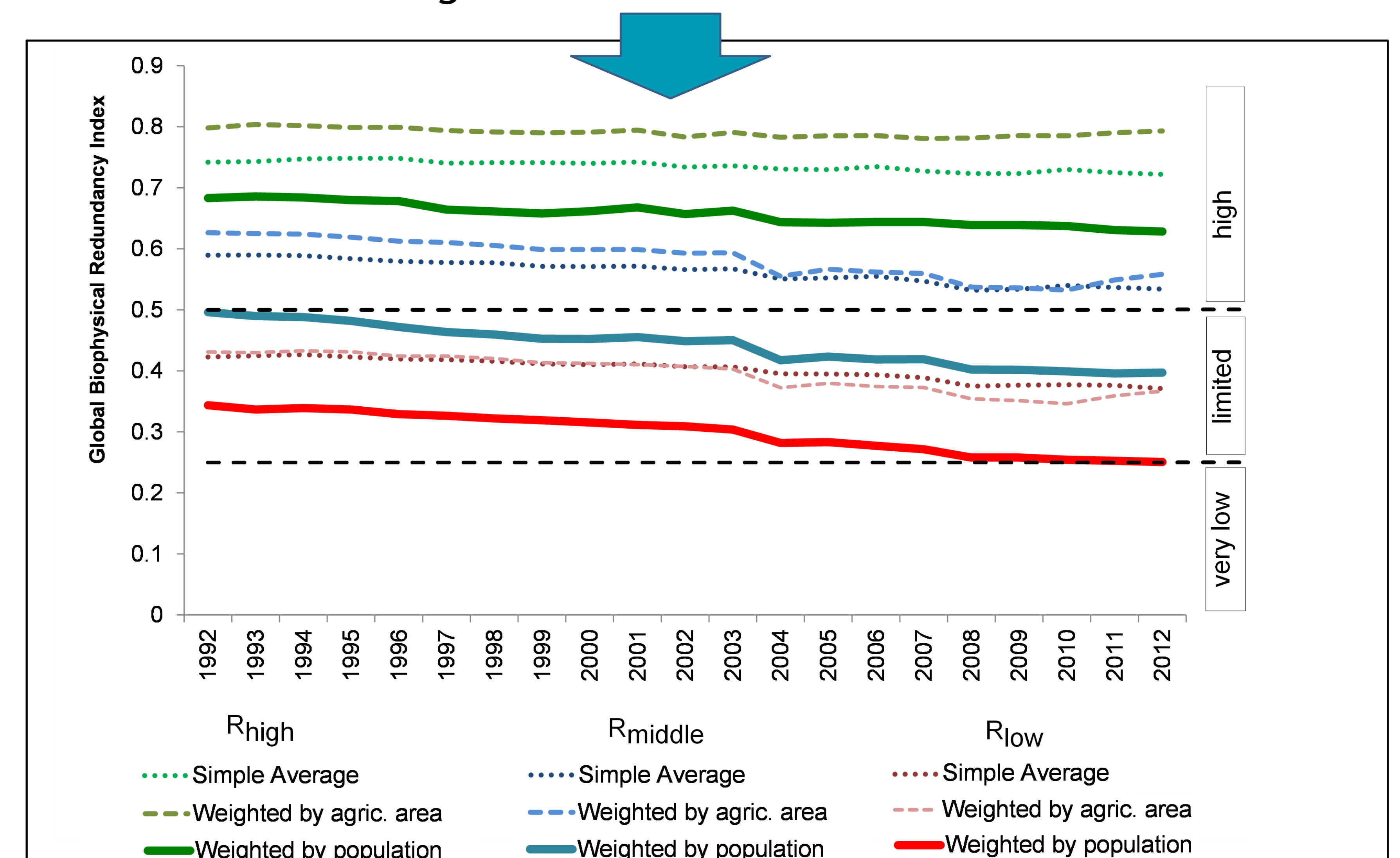
In 2012, the **BR of 75 countries was limited or very low** (mainly in North Africa, Western Europe, the Middle East and Asia). The resources and potential productivity increase of these countries were insufficient to produce the caloric nutritional needs for at least 50% of their population during a year.

Currently, **9 Low Income Economies have limited or very low BR**. Many of these showed a decrease in BR over the last two decades, which is not always linked with improvements in per capita food availability (not shown).

The **world as a whole shows a decreasing trend in BR** in the last two decades, with considerable differences among the different scenarios.



**BR has decreased in 102 out of 155 countries**, 11 of these went from high to limited redundancy, and 9 from limited to very low redundancy. The reasons for the BR decrease are heterogeneous, but improvements in yield and population growth certainly played a role in numerous countries that went towards the very low redundancy category.



**Source:** Fader, M.; Rulli, MC.; Carr, J.; Dell'Angelo, J.; D'Odorico, P.; Gephart, J.; Kummu, M.; Magliocca, N.; Porkka, M.; Prell, C.; Puma, M.; Ratajczak, Z.; Seekell, D.A.; Suweis, S.; Tavoni, A. (2016): Past and present biophysical redundancy of countries as a buffer to changes in food supply. Environ. Res. Lett. 11 (2016) 055008.