Global Footprint Network
Advancing the Science of Sustainability

UNDP

Resource Constraints and Economic Performance
in Eastern Europe and Central Asia

December 2011

Note about this report: One of the most significant new data trends presented in this report is the calculation of the market costs of biocapacity deficits over the last few decades (as introduced in Section 2). The results presented in this report are still crude and simplified. The Global Footprint Network is engaged in research to refine this analysis.

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Global Footprint Network

Global Footprint Network, based in Oakland (California), Brussels and Geneva, is an international think tank working to make ecological limits central to decision-making by advancing the use of the Ecological Footprint, a resource accounting tool that measures how much nature we have, how much we use and who uses what. By developing transparent, scientifically robust measures to help leaders monitor and protect ecological assets, the Global Footprint Network provides decision makers with the tools they need to succeed in an ecologically-constrained world.

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Table of Contents

** Hereafter referred to in the context of the UN Security Council Resolution 1244.*

Executive Summary

This report explores the link between resource constraints and economic performance for countries in Eastern Europe and Central Asia.

Evidence suggests that humanity is entering a new era where development globally will be more constrained by resource availability than ever before. Since the Second World War, resource limits have seldom been considered to be a significant economic factor (with the exception of the oil crises of the 1970s). They could therefore be left out of economic equations. This is no longer the case. Ever more countries have become biocapacity debtors. Their residents use more, in net terms, than what ecosystems within their countries can regenerate. Because of this global trend, biocapacity could become the limiting factor for economic performance in the twenty-first century.

This report documents the biocapacity situation of every country in the region, linking it to economic performance and other indicators of financial health. It suggests that resource issues are growing more prominent and are having more impact economically for many countries in the Central Asia and Eastern Europe region. If global and regional trends continue, resource constraints will shortly become the dominant determinant of economic success in this region.

These resource trends are slow-shifting, and hard to reverse. But reversal is possible. First of all, reversal requires adequate management and resource accounting tools like the Ecological Footprint. Once drivers are understood, policies can be devised and monitored that address these trends in cost-effective ways. Without any reversing trends, the impact of this growing pressure on natural capital might rise substantially, and might even become increasingly non-linear.

Recognizing these constraints also offers a number of opportunities. First, it helps to reveal that proactively addressing the constraints is in the direct self-interest of nations, since benefits generated by adjusting to this new reality will accrue to the nations that act. Those who fail to act will be outcompeted. While resource constraints are global, the risks and opportunities created by these constraints are largely local. Hence, early action pays off.

The report concludes by briefly outlining the opportunity for action. It emphasizes the importance of focusing on wealth generation (natural and human wealth), rather than on throughput (e.g., gross domestic product (GDP)). If prosperity (that is,, per capita wealth) is taken as the goal post, countries substantially increase their chances of succeeding in the coming rapids of resource constraints if they take action.

Section 1 : Entering a New Era

Summary of Section 1: Why Biocapacity Matters

This section makes the case that humanity is entering into a new era of biocapacity constraints, with constricting supplies of natural resources. While many of the trends are global, each country is in a unique situation, as demonstrated by the biocapacity and Footprint trends of countries in Eastern Europe and Central Asia.

Considering the economic relevance of these trends, addressing one's resource exposure risks is in the competitive interest of each country. It allows each country to position itself favourably in the new era of resource constraints.

Over the last half century, people's well-being has, on average, made stunning advancements. While no one disputes that challenges still exist – including the continuance of extreme poverty, vulnerability to food and energy price volatility and economic inequities in many parts of the world – reports by the United Nations Development Programme (UNDP) and others show that, in the last few decades, human development has increased in nearly every country (UNDP, 2010).

As more people have achieved greater gains in health, education and purchasing power, they have increased demand on the world's natural resources – more water, food, energy and associated carbon dioxide (CO_2) emissions. In parallel, the human population has increased from 3 billion in 1960 to 7 billion today. Even though consumption is very unevenly distributed, this expansion of the human population has further increased the impact on global water, food, and energy supplies, and has accelerated the amount of CO_2 pollution into the world's atmosphere and oceans.

While resource constraints have not been a significant global limitation on development in the first decades after the Second World War, the situation is changing. Overall demand is now outstripping the Earth's regenerative capacity (Global Footprint Network, 2010). The excess demand is now supplied by liquidation, rather than sustainable use, of natural capital. Freshwater, fossil fuels, cropland or biodiversity – the raw materials people want most to improve their well-being are increasingly in short supply. Similarly, the by-products of this hunger for goods – waste, erosion, carbon pollution, desertification – grow larger every year, as chronicled by the United Nations and other global reports (for example, the Millenium Ecosystem Assessment (MEA), the International Energy Agency (IEA), the Food and Agriculture Organization (FAO) and the Intergovernmental Panel on Climate Change (IPCC)).

This supply crunch is already a contributing factor to strife across the globe. It may have fuelled the tension behind the Arab Spring, where rapidly growing human demand, including significant population growth, was met by local resource constraints and increases in global food and energy prizes, shaving off opportunities and employment, particularly for the younger generation. The crunch certainly is painfully felt in regions from the Horn of Africa all the way to Haiti. Human misery and societal breakdowns are driven by much more than a lack of resources, of course. Yet, even low corruption, balanced budgets, and the absence of ethnic conflict, for example, cannot easily replenish resources that are either vanishing or already gone.

In fact, countries' fiscal debt dynamics, where national debt is rising precipitously compared to the size of a country's GDP, might simply be a sign of trying to overcome the supply crunch. But widening globalization and interdependence mean that everyone is more exposed to shortages and price volatility at the same time, and there are no new, untapped markets or continents to save us from this modern resource curse – a curse defined not by exploitation of abundance, but by scarcity hidden within the presumption of plenty.

Fortunately, as we are entering this new era, new tools are also becoming available to nations that will help them understand the resource limits they face, and make smarter choices in an increasingly connected and competitive world. Humanity has breached global limits, as succinctly summarized by researchers from the International Geosphere-Biosphere Programme (IGBP), the Resilience Institute and the Stockholm Environment Institute (Rockström et al., 2009).

Global examples of dwindling resources and increasing pollution:

- Greenhouse gas (GHG) emissions are accumulating in the atmosphere, causing climatic changes and potential negative feedback on the health of ecosystems (Haberl, 2006; Holdren, 2008; UNEP, 2007; Butchart et al., 2010). Worldwide atmospheric concentrations of carbon dioxide (CO2), methane (CH4), and nitrous oxide (N2O), for example, have noticeably increased in recent decades, and they now considerably exceed the natural range over the last 650,000 years. With high confidence, scientists have concluded that these global average concentrations are due to human activities (IPCC, 2007).

- Many forests, particularly in tropical zones, are cut down faster than they can re-grow: 130,000 km2 of forest have been destroyed each year for the last 15 years.

- 15% of ocean fish stocks were depleted over the same period and fish are caught faster than they can restock (UNEP, 2007). More than 50% of fish stocks are overexploited commercially (FAO SOFIA 2008).

- Global extraction of natural resources (e.g., biomass, fossil fuels, metal ores and other minerals) has increased by approximately 50% in the last 25 years (Behrens et al., 2007; Giljum et al., 2009a; Krausmann et al., 2009) in part due to the world's population quadrupling over the last 100 years.

- Availability of freshwater in countries in arid and semi-arid regions of the world, especially Central and Western Asia and North Africa, has decreased to or gone below below 1,000 m3/capita/year, which is the threshold for water scarcity (Falkenmark et al., 1989).

- Three of seven planetary boundaries have been exceeded. They are: climate change (CO2 concentration in the atmosphere <350 ppm and/or a maximum change of +1 W/m2 in radiative forcing); biogeochemical nitrogen (N) cycle (limit industrial and agricultural fixation of N2 to 35 Tg N/yr) and the rate at which biological diversity is lost (annual rate of <10 extinctions per million species) (Rockström et al., 2009).

Consistent with this recognition, Ecological Footprint[1] accounts provide an approach to track human demand on the biosphere. By offering an accounting approach that can be applied at any scale – product, person, city, country or humanity – it helps to make such boundaries relevant to decisions at the individual, organizational, regional or national level. These accounts track human demand on the biosphere: they summarize the biological assets a country has, as well as the demand its residents put on their own assets and those in the rest of the world. With these accounts, governments can better measure their exposure to the risks of using more biological capacity than ecosystems can give.

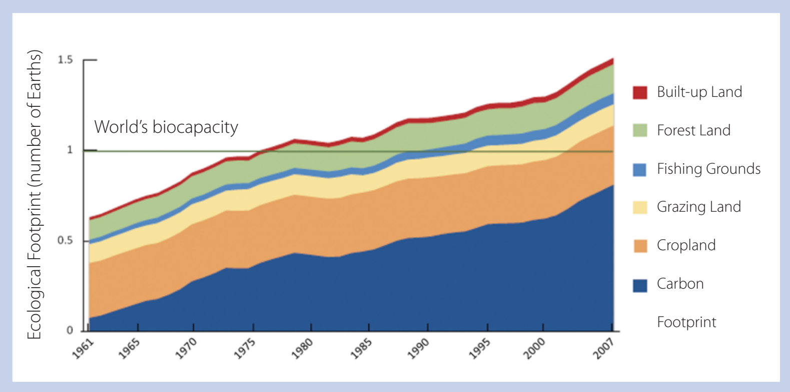


Figure 1-1 – World Trend of Ecological Footprint (in number of planets) shown through its component land types. ***Source: Global Footprint Network,*** *'National Footprint Accounts',2010 edition.*

The Ecological Footprint can also help nations better understand the interconnectedness of economic threats, allowing them to address root causes. Climate change, for example, is not an issue in isolation, but rather a symptom of a broader challenge: humanity's systematic overuse of the planet's finite resources. Our natural systems can only generate a limited amount of raw materials (fish, trees, crops, etc.) and absorb a limited amount of waste (such as carbon dioxide pollution). Global Footprint Network quantifies this rate of output by measuring biocapacity – nature's ability to renew resources and provide ecological services. Biocapacity is as measurable as GDP – and, ultimately, far more significant, as access to basic living resources is essential for people's ability to rise above poverty. Up until now, we have treated biocapacity as an essentially limitless flow, to the point that our demand for nature's services now outstrips biocapacity regeneration by 50 per cent.

If the last era was about rapid gains and fast-paced development, alongside drawdowns in limited assets, the new era must be about securing long-term wealth. If the last half century was about expansion in the context of seemingly unlimited resources, the new era will need to focus on meeting human needs within the means of what ecosystems can provide. But this is only possible if societies have the right information to visualize the scale of challenges they are facing.

As Figures 1-1 and 1-2 illustrate, these challenges are substantial. The fraction of world biocapacity that most nations use has increased drastically in only a few decades. Global biocapacity has increased slowly due to increased inputs, but not fast enough to counteract overall growth in population and consumption.[2] Per capita, biocapacity is declining as it becomes spread among more people, and it is possible (but not addressed in this report) that the systemic overuse of natural

[1] *For a full explanation of terms such as Ecological Footprint, biocapacity, and biocapacity deficit, and the methodology behind their calculation, please see Section 2, Appendix 2 (methodology) and the Glossary.*

[2] *Appendix 1 presents other views of these trends, as total biocapacity deficit, per capita, and per $ of GDP, viewed alongside the rise in carbon emissions, which have occupied a growing portion of the globe's Ecological Footprint.*

capital, including soil loss, climate change, water scarcity, and persistent pollutants, will further compound this negative trend.

Even if the regenerative ability of the biocapacity remained unaffected by overuse, demand is growing so much more rapidly than ecological supply that the mismatch will be limiting to the global economy. It is already limiting some people's ability to access basic resources, including portions of poor populations even in wealthy nations.

Today, most nations, including nearly all of Europe and Central Asia, are running a 'biocapacity deficit': using more biocapacity than they have within their territories and producing waste emissions, particularly carbon dioxide, that exceed the capacity of the globe's biology to sequester them. Truly, the world today is not what it was only a few years ago.

In summary, demand for ecological assets is growing unabated as global population grows, consumption rises, and the size of the global economy increases. These trends are likely to continue in the future if measures are not taken to reduce this demand, with growing impacts on economic performance and human development from resource limitations.

Many hold the misconception that it is humanity as a whole that is on a collective slippery slope of resource depletion. Since it is considered to be a global trend, leaders believe that they can do little about this worldwide challenge. The reality looks different. In spite of some common global trends, the situation for each country is unique, as illustrated by Figure 1-3, which summarize biocapacity and Footprint trends for Eastern Europe and Central Asia. Not only are all countries in a different position, but also it is their domestic decisions that largely determine how well a country is able to weather emerging resource constraints.

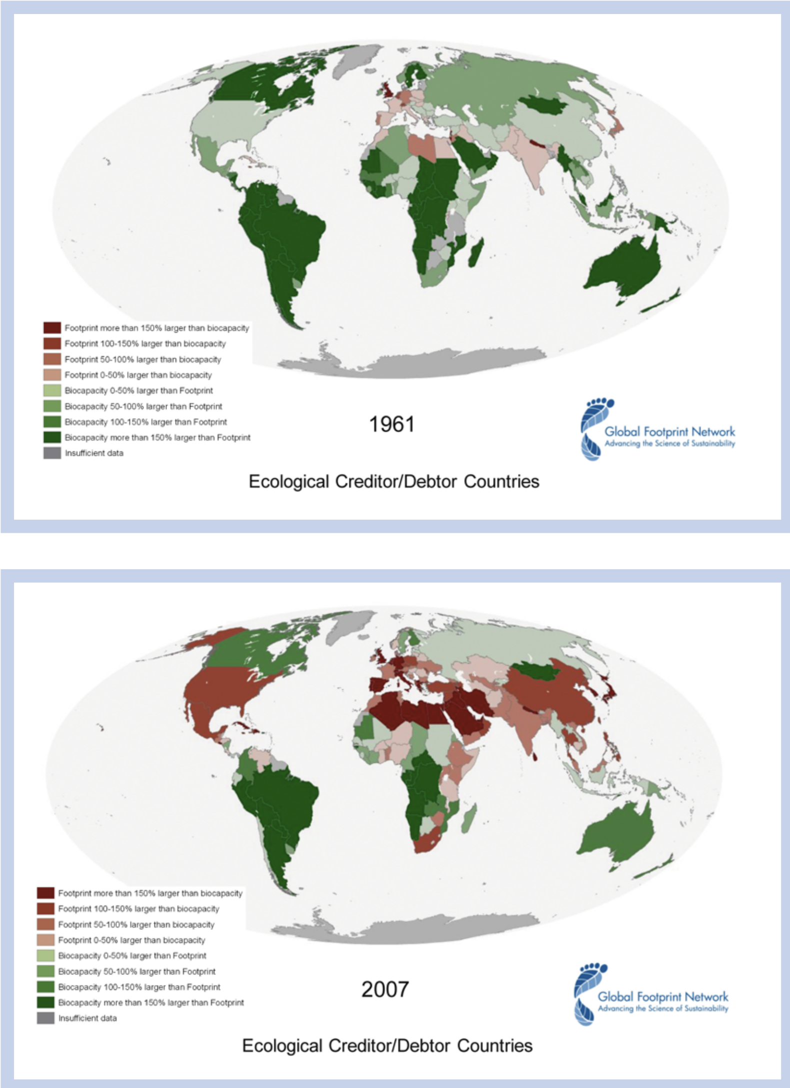
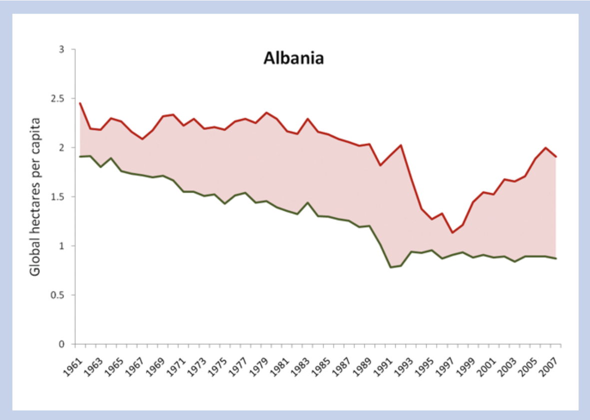
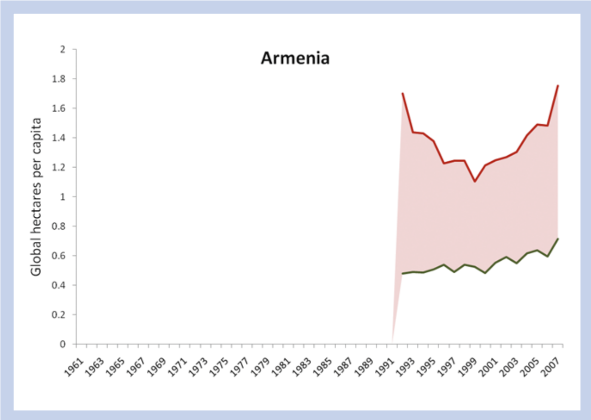


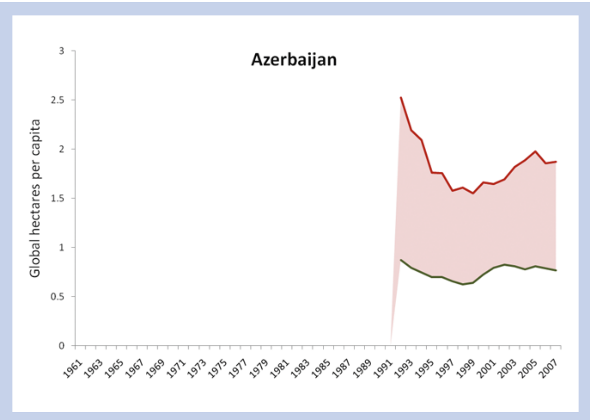
Figure 1-2 – Ecological Creditor and Debtor Maps of the world for 1961 and 2007: Within less than 50 years, the world has moved to a situation where more than 80 per cent of the population lives in countries where residents consume more, in net terms, than the ecosystems of their territory can regenerate. ***Source:*** *Global Footprint Network, 'National Footprint Accounts',2010 edition.*

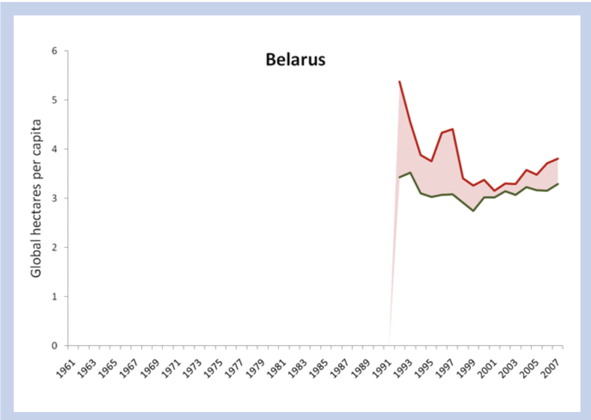
These constraints are particularly pertinent for Eastern Europe and Central Asia. Many of the countries in the region are already running significant biocapacity deficits. At the same time, their ability to purchase ecological services and resources from abroad, as measured by their GDP, is limited, and the high portion of income many households in the region spend on food and energy makes those countries particularly vulnerable to price shocks.

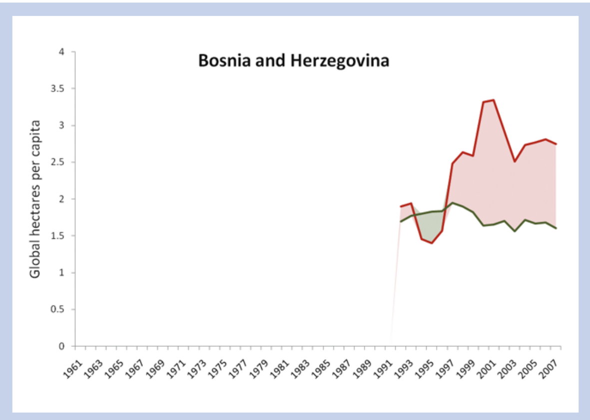
Ecological Footprint and Biocapacity of the Region – 1961-2007 (per capita)

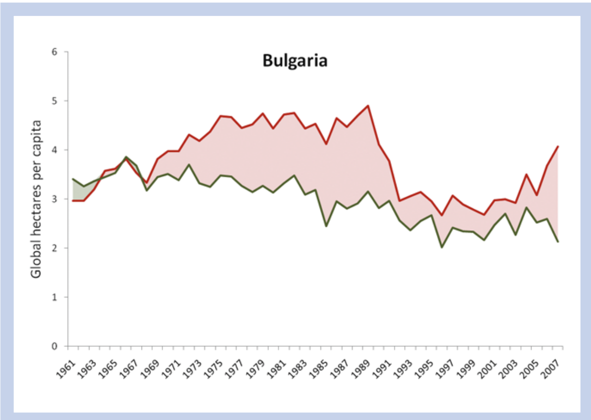


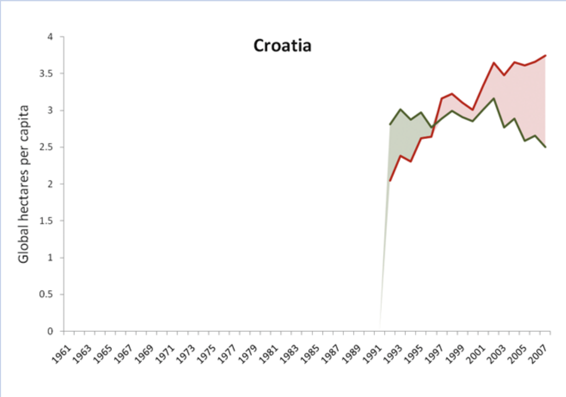











Croatia
Global hectares per capita
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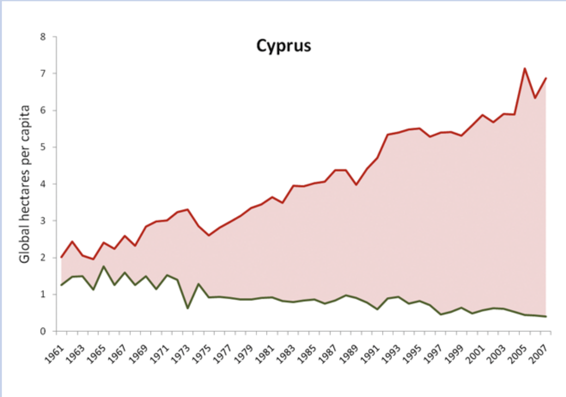
1961 1963 1965 1967 1969 1971 1973 1975 1977 1979 1981 1983 1985 1987 1989 1991 1993 1995 1997 1999 2001 2003 2005 2007


Cyprus
Global hectares per capita
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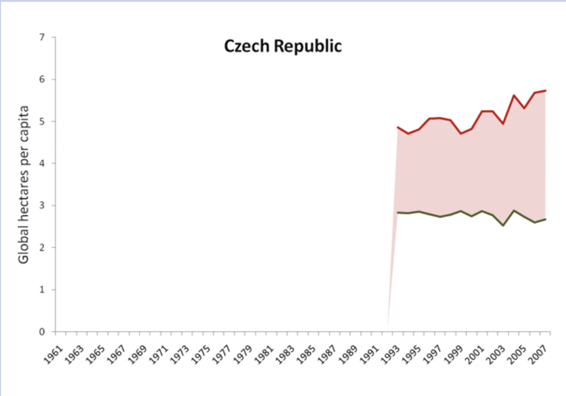
Czech Republic
Global hectares per capita
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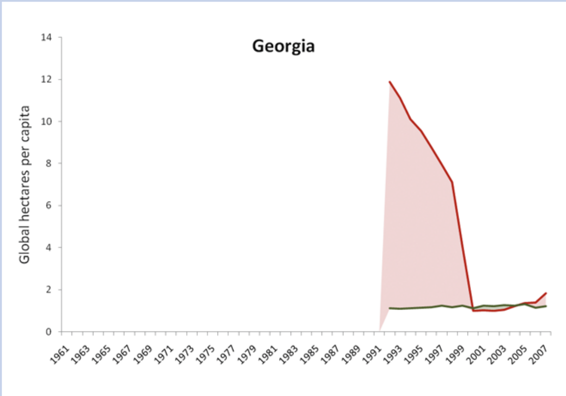
Georgia
Global hectares per capita
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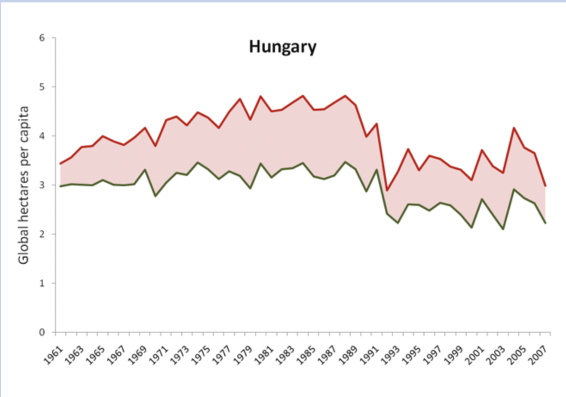
1961 1963 1965 1967 1969 1971 1973 1975 1977 1979 1981 1983 1985 1987 1989 1991 1993 1995 1997 1999 2001 2003 2005 2007


Hungary
Global hectares per capita
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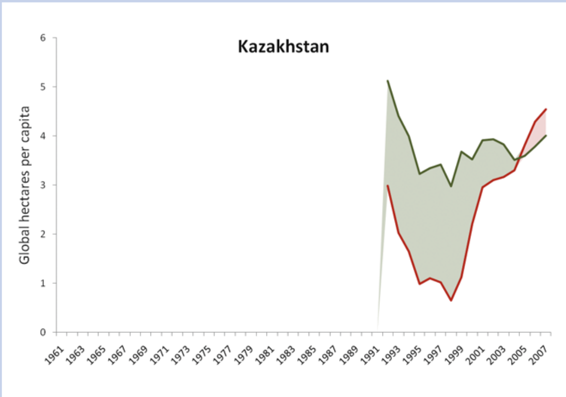
1961 1963 1965 1967 1969 1971 1973 1975 1977 1979 1981 1983 1985 1987 1989 1991 1993 1995 1997 1999 2001 2003 2005 2007


Kazakhstan
Global hectares per capita
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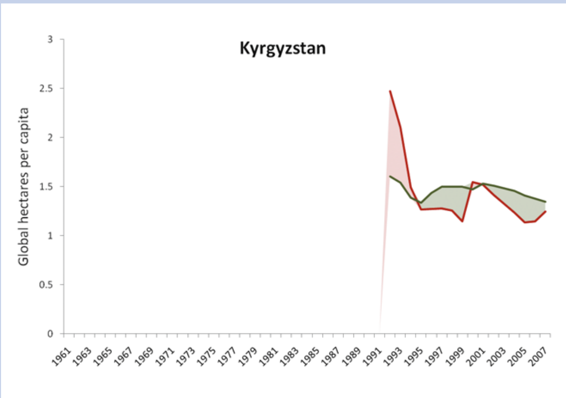
Kyrgyzstan
Global hectares per capita
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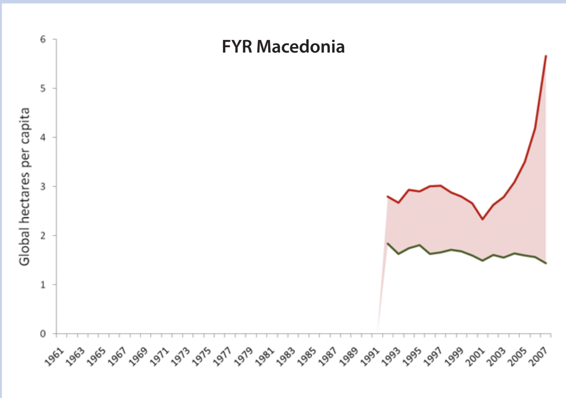
FYR Macedonia
Global hectares per capita
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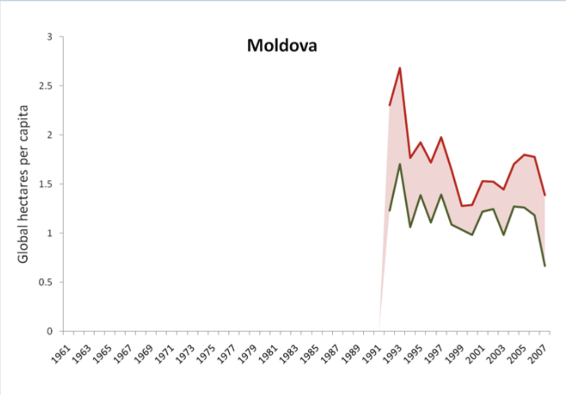
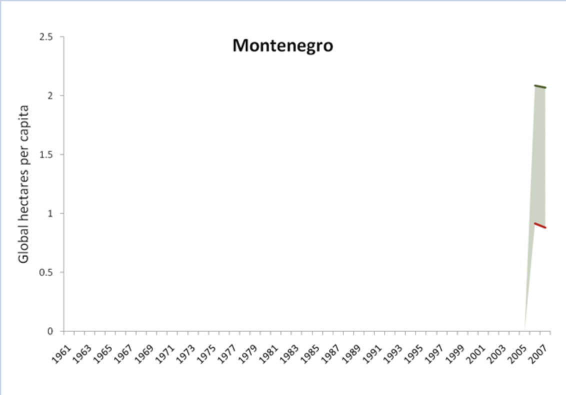
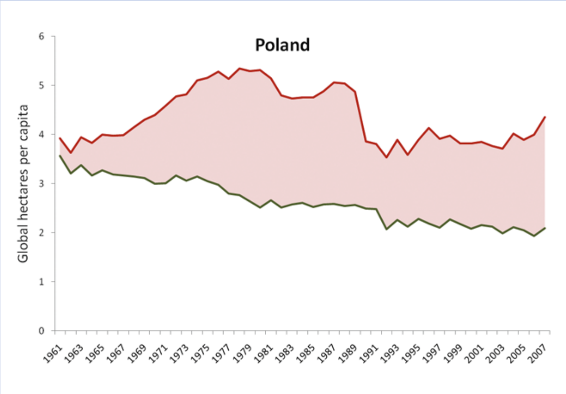
1961 1963 1965 1967 1969 1971 1973 1975 1977 1979 1981 1983 1985 1987 1989 1991 1993 1995 1997 1999 2001 2003 2005 2007


Moldova
Global hectares per capita


Montenegro
Global hectares per capita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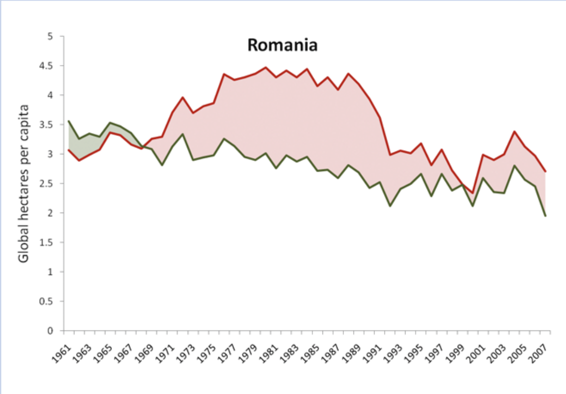
Global hectares per capita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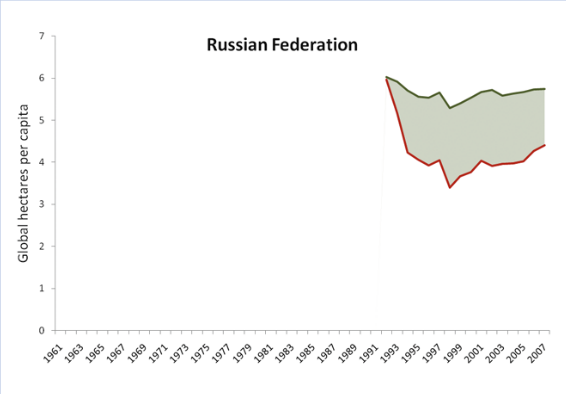
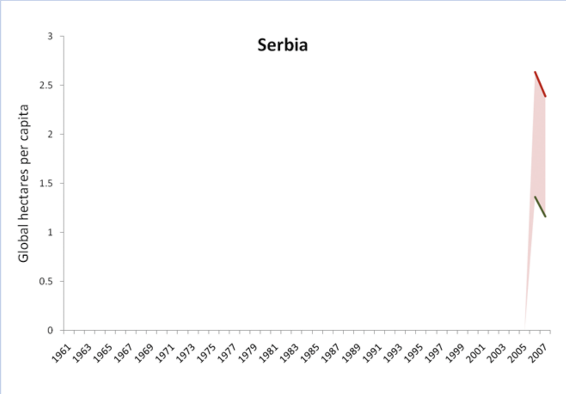
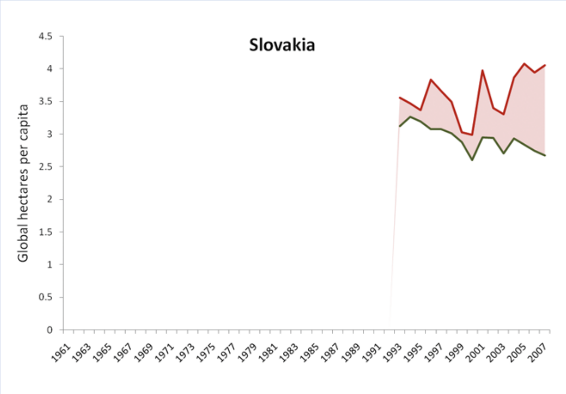
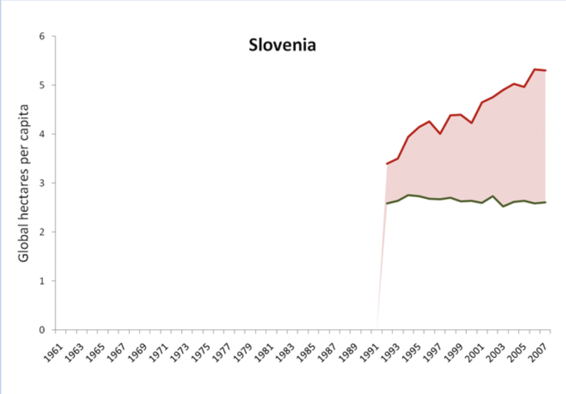
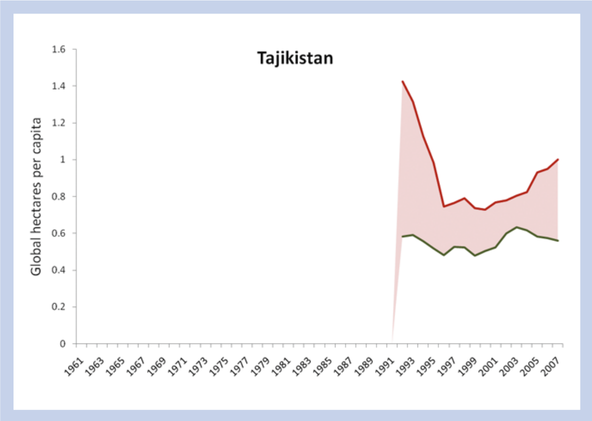
Global hectares per capita

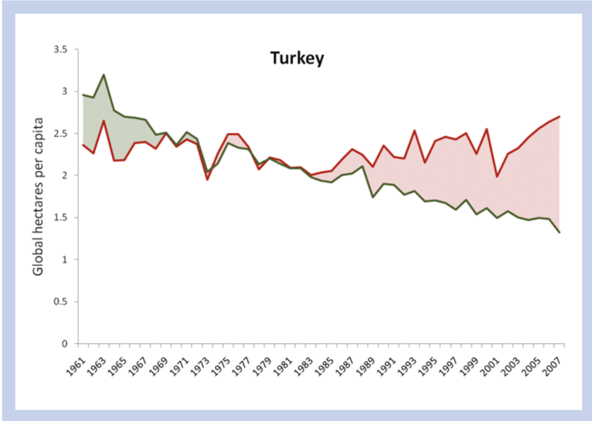

Russian Federation
Global hectares per capita

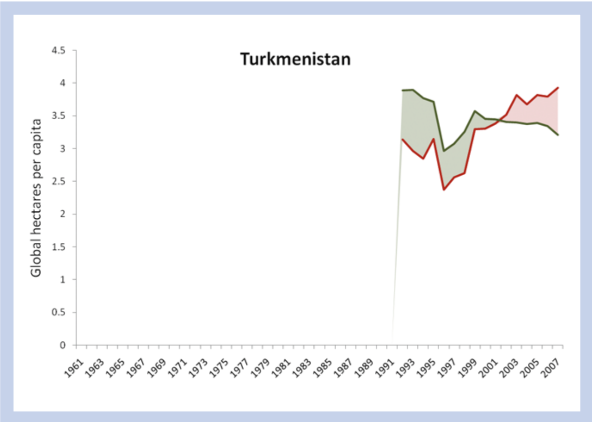

Serbia
Global hectares per capita

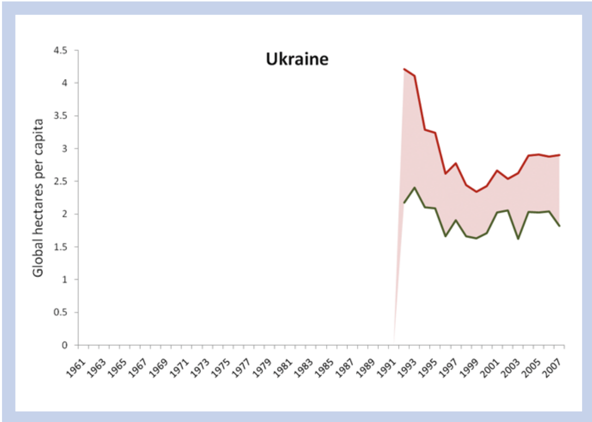

Slovakia
Global hectares per capita


Slovenia
Global hectares per capita









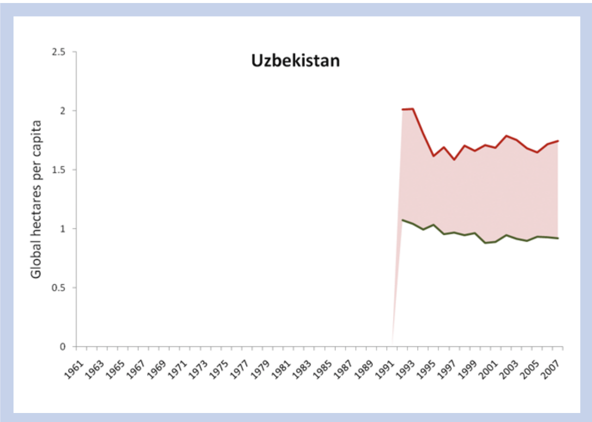


Figure 1-3 – Summary of the region's demand on nature: 27 nations' per-person Footprint and biocapacity since 1961 (in global hectares (gha) per person) in Eastern Europe and Central Asia (vertical scales differ for each country to better depict dynamics). All but three are running biocapacity deficits. These deficits are made possible by liquidating their own ecological assets, net importing biocapacity, or using the global commons. Some have noticeably declining biocapacity per person in addition to overall deficits (Albania, Cyprus, Poland, Romania, and Turkey). Most countries reached ecological limits some time ago, with Kyrgyzstan being close to reaching them. *Source: Global Footprint Network, 'National Footprint Accounts', 2010 edition.*

Section 2 : Key Measures for Economic and Environmental Performance

Summary of Section 2: Overview of Country Diagnosis

This section introduces the key trends for characterising countries' economic risk exposure to ecological constraints. The overarching trend – the starting point of the analysis – is the Ecological Footprint versus biocapacity comparison. This first comparison reveals, among other things, to what extent a country is demanding more ecological services, in net terms, than the country's ecosystems can regenerate:

1. Biocapacity deficit: the difference between Footprint and biocapacity (in gha per person)

The additional four trends interpret the economic implications of such a potential biocapacity deficit:

2. Cost of basic commodities embodied in biocapacity deficit (compared to GDP or GNI). What were the costs of the resource demand that could not be renewed within the country? How has this changed in the more immediate past?
3. Relative ability to buy from world markets (indicated by country's GDP per capita compared to total GDP of the world). How is the country's residents' share of global income evolving?
4. Public debt (as percentage of GDP). What has been the trend in public debt, and to what extent is public debt within manageable dimensions?
5. Human Development Index (HDI)-Footprint path (HDI and Footprint values since 1970). To what extent has the country been able to advance human development, without increasing its resource dependence?

These measures are illustrated through examples for Poland, Switzerland, and Kazakhstan. Results for all the Eastern European and Central Asian countries are covered in Appendix 4.

This section argues that in the new era of global resource constraints, running a biocapacity deficit is becoming an increasing risk to national economies. The reasons are simple: overshoot is only possible temporarily – as long as there are stocks to deplete and sinks to fill up with waste. Therefore, for nations to run increasing biocapacity deficits or lose biocapacity reserves makes them increasingly vulnerable to the dangers of global overshoot. For nations, trade opens ports to new stocks and sinks. However, these stocks and sinks become less available as trading partners also start running biocapacity deficits. As more and more countries bank on being able to maintain biocapacity deficits, they will see themselves under increasing competitive pressure for dwindling piles of resources. If prices rise quickly or supplies are disrupted, their economies will be strained.[3]

Countries benefit from being able to keep track of their biocapacity since they can make decisions that will allow them to operate safely in this riskier age. While all capital stocks need to be monitored carefully, natural capital, both from the perspective of availability and demands on it, is particularly critical and has traditionally been overlooked. By determining how much natural capital they have, how much they use, and the types of resources being depleted, they can determine whether their ecological demand is exceeding, in net terms, what ecosystems of the country can provide.

To illustrate these kinds of trends, two complementary measures can reveal resource performance and limits: per capita biocapacity and per capita Ecological Footprint.

Biocapacity describes the ability of natural assets to regenerate ecological services. Ecological Footprints measure the human demand on biocapacity. Both are usually measured over the course of one year. Current 'National Footprint Accounts' include provision of biological resources, use of productive area for housing and other infrastructure, and sequestration of carbon dioxide from fossil fuel use. Both values can be expressed as totals for a given population, or on a per capita basis.

These metrics work as a pair: if the Ecological Footprint exceeds biocapacity, the country runs a biocapacity deficit. This is marked with a red surface. (Figure 2-1 shows Footprint and biocapacity; Figure 2-2 shows the composition of the Footprint according to land-use categories). If the world's Ecological Footprint exceeds the biocapacity that ecosystems provide each year, overshoot occurs – the supplies generated by natural capital diminish and often become even costlier to access.

In order to provide a simple, but comprehensive, overview of a country's resource performance, this report describes key time trends that will help nations understand their biocapacity.

Biocapacity deficit: Human and non-human life compete for area on this planet and are ultimately limited by the biosphere's regenerative capacity. It is upon this premise that the Ecological Footprint tool is built. In addition to crop land, fishing grounds, forests, and the like, this limitation also includes access to non-renewable resources from the lithosphere. For instance, the primary lithosphere resource, fossil fuel, is most restricted by the planet's biocapacity, due to the biosphere's limited capacity to absorb waste (CO_2, in the case of burning fossil fuels). If humanity burned all the fossil fuel already discovered, the carbon concentration would grow to at least 1,700 parts per million as, for example, emphasized by the UK's Institution of Mechanical Engineers (2009). Ores are another resource from the lithosphere. Ores and their products are not 'used up' so much as dispersed. Hence, the limiting factor is the energy – from fossil fuels – required to concentrate these materials. This puts the limitation back on energy, which in return is limited by biocapacity – particularly in the case of fossil fuel, which is ultimately limited by the biosphere's ability to sequester the associated CO_2 emissions.

[3] Two common criticisms need to be addressed here. Many critics claim: a) Changes in prices will provide a signal for people to switch to supplementary goods that are cheaper or more available, and b) Technology will solve our problems – whether it is through efficiency gains, invention of new supplements, or increased ability to clean up our waste. a) Price changes may indeed induce change. But, as argued later, may emerge too late or too rapidly for effective responses. They have not been sufficient in the past to alert us to the resource risk, and in some cases supplements are not readily available. Additional physical indicators are needed for nations to better anticipate potential risks. b) The role of technology can be significant and is emphasized in the solutions list in Section 4 of this report. Our assessment covers past performance and shows that technology improvements have been too slow to turn around resource trends (technological advances are taken into account in historical biocapacity and Footprint trends). This does not mean that they could not be more effective in the future. In fact, similar to research on the impact of environmental regulations, policies that spring from knowledge of resource limits may actually incentivise net positive technological progress earlier and in greater volume than would otherwise be undertaken (this is part of what is known as the Porter hypothesis).

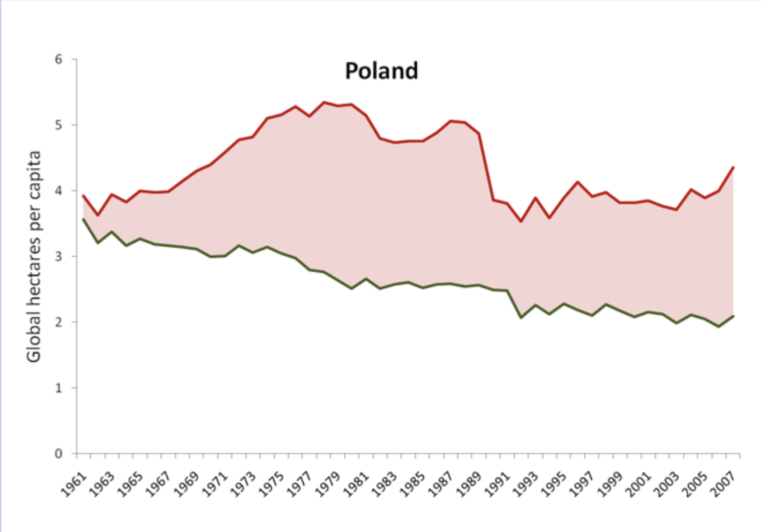


Figure 2-1: Poland's Ecological Footprint and biocapacity in gha per person since 1961: The national Ecological Footprint represents the biocapacity needed to provide for the average consumption of a resident (upper line). The biocapacity is the productive area available within the country (lower line). The red surface between the lines shows a biocapacity deficit. If the green biocapacity line is above the red Ecological Footprint line, the country has a biocapacity reserve. Biocapacity deficits can be compensated for by overusing local biocapacity (that is, using domestic resources at a rate faster than they regenerate) for a time, or by using biocapacity from abroad, for instance through import. At the global level, if consumption is greater than biocapacity, only overuse is possible. This net overuse is called global overshoot. *Source: Global Footprint Network's 'National Footprint Accounts', 2010 edition.*

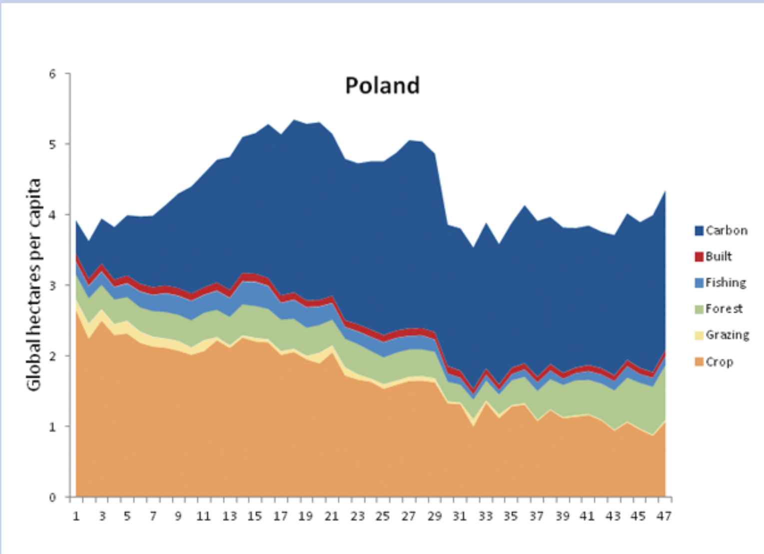


Figure 2-2: Poland's per person Footprint (and its components) in gha per person since 1961. *Source: Global Footprint Network's 'National Footprint Accounts', 2010 edition.*

Many countries, from high income to low, are running biocapacity deficits. Already, 24 of 28 Central Asian and Eastern European nations currently carry biocapacity deficits. What is the economic implication of such a deficit? This is what the next three analyses explore.

Fiscal cost of biocapacity deficits: An economist's most obvious **first** consideration for assessing the significance of such a biocapacity deficit would be to estimate the deficit's fiscal costs for a country. The economist would want to know: what are the current costs of the commodities that make up this biocapacity deficit, even if each citizen is not directly paying them?

This biocapacity deficit includes material inputs, such as wood, fibre or livestock from abroad. These deficits also contain ecological services the country depends on that come from other countries or from the future. An example is carbon sequestration. What do these inputs currently cost the country?

Assessing the market value of biocapacity deficits is relevant for two primary reasons. First, it helps to illuminate to what extent these costs have been a substantive factor for an economy in the past. Secondly, it illustrates to what extent these costs have become more significant in recent times, and whether indeed these trends are becoming a material and significant factor for economic performance.

Such costs can be estimated from a number of perspectives, each one illuminating different aspects of the issue. For instance, costs can be calculated for all net imported resources or only for the net biocapacity deficit. The latter assumes that unused domestic biocapacity could be employed and hence could mitigate against the biocapacity risk. Also, carbon emission costs could be calculated as the climate change damage costs, following suggestions of the 2006 Stern Report, or at zero cost, reflecting the current reality of costs outside a limited number of carbon markets. Prices could also be calculated at local costs or at world market costs.

To keep this initial assessment simple and transparent, this report only includes the cost of basic food and energy commodities (raw and embodied) not being provided in net terms by the country's regenerative sources.[4] In other words, the calculation adds up the market value of resources that the country cannot provide regeneratively through its own biocapacity, in net terms.[5]

While current CO2 emission costs are assumed to be zero, there is still a cost for obtaining fossil fuel. We calculate the costs for fossil fuel use at world-market prices and national consumption levels of each fuel (crude oil, coal, and natural gas), and account for the entire amount used, whether imported or from domestic stocks. When imported, the country obviously faces world-market prices. When using one's own stock, the cost represents a depletion of the country's assets, that is, a loss of domestic wealth. If the fuel is sold on domestic markets below world-market prices, the difference represents an opportunity cost, that is, lost revenues. This too, is a cost to the economy.

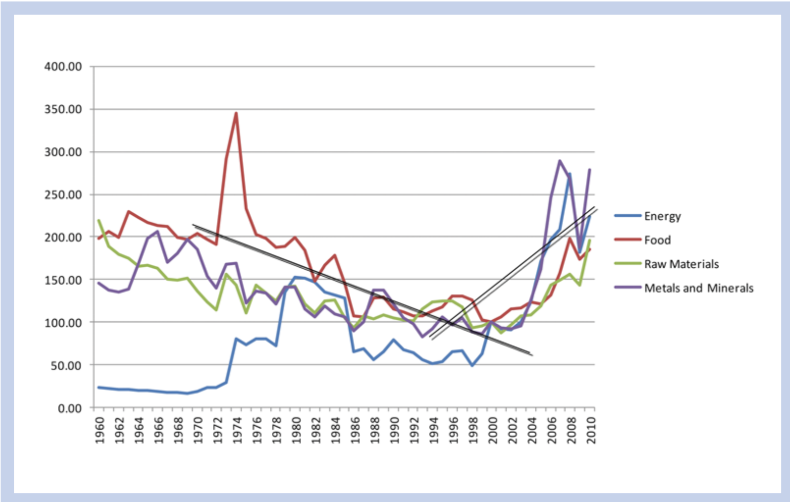


Figure 2-3: World commodity cost index (real year US$ 2,000) and overall trends. *Source: World Bank Commodity Price Data (Pink Sheet).*

In essence, this cost calculation represents a multiplication of biocapacity deficits with commodity prices. The global trends in commodity prices are shown in Figure 2-3, with a downward trend in per unit price from the 1960s to the year 2000, and upward sloping prices since then. The ex-

[4] *More elaborate assessments are still being developed by Global Footprint Network.*

[5] *This assessment deliberately does not capture the full value of these services, as per the example provided in the important the Economics of Ecosystems and Biodiversity (TEEB) analysis (2010). Rather, it estimates the economic costs based on actual market transactions. It thereby excludes values that ecosystem services provide, but markets are not compensating for. There is great value in estimating non-market values of ecosystem services, as provided by the TEEB study. Studies like TEEB illustrate to what extent the value generation of natural capital is being ignored in current economic deliberations. Here we deliberately limit the analysis to actual market transactions, excluding the externalities TEEB focuses on. This analysis here allows us to estimate current cost pressures on economies. Non-market costs of lost ecosystem services and resource depletion are also true burdens on an economy, with real future consequences, but they are typically ignored or discounted and do not enter the economic calculations of current economic decision making in a significant way.*

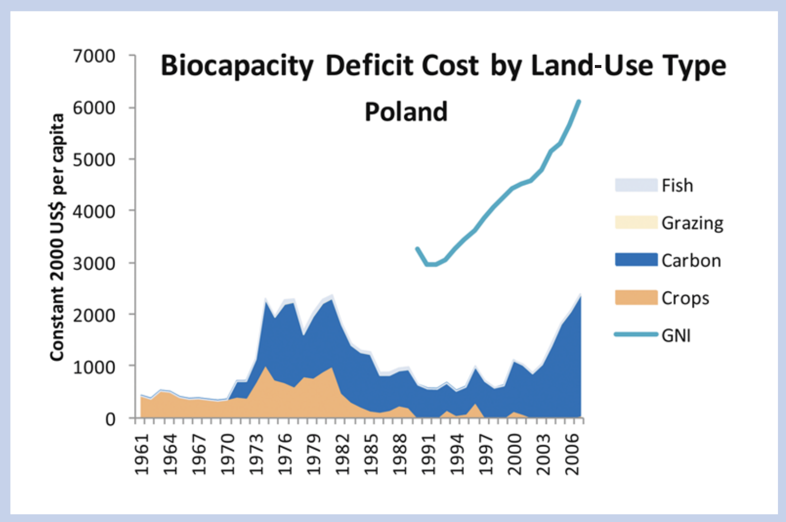


Figure 2-4: Cost of commodities embodied in Poland's biocapacity deficit. The costs of Poland's biocapacity deficit were high in the 1970s, and have grown significantly over the last 10 years, as resource prices (especially fossil fuels) have been increasing. While the preliminary estimates do not allow an exact comparison with Poland's national income, this analysis suggest that resource costs represent a large portion of the country's income, making the economy particularly vulnerable to resource shocks. ***Source: Calculated by Global Footprint Network based on biocapacity deficit and World Bank world-market prices of representative commodities.***

ception to these trends were the 1970s price shocks associated with the oil crisis.

Figure 2-4 shows the trends of these costs for Poland. These costs are contrasted with the country's Gross National Income (GNI).[6]

What can one learn from these trends? Material inputs to a national economy, beyond what could be available from the natural capital within the country, represent a cost exposure for that economy. Most of these financial flows (with the exception of opportunity costs) are a portion of the balance of trade attributed to resource costs[7] – resources for which in net terms there is not sufficient local supply, or which are depleted, thereby losing wealth.

These costs can be viewed, in first approximation, as the financial flows that will leave the country's economy. They pay for the biocapacity services the country is receiving from liquidation or from elsewhere – and they are typically commodities.[8]

For countries with biocapacity reserves, it is the opposite. For them, higher commodity prices translate into higher financial inflows, since they service other countries' biocapacity deficits; or they are a savings and a buffer against external resource shocks, and thus have a value to nations even if not consumed. Pragmatic economists may also argue that it may only make sense to deplete lithosphere assets if the earned money is invested in assets that appreciate more rapidly than the deposits. Otherwise, the country would be better off delaying exploitation. In other words, countries with lithosphere assets that are committed to increase their net wealth would in-

6 Gross national income (or GNI) is gross domestic product (GDP) plus primary incomes receivable from non-resident units minus primary incomes payable to non-resident units. For example, the profits of a United States (US)-owned company operating in Switzerland will count towards US GNI and Swiss GDP, but will not count towards Swiss GNI or US GDP. If a country becomes increasingly in debt, and spends large amounts of income servicing this debt, this will be reflected in a decreased GNI but not a decreased GDP. If a country sells off its resources to entities outside their country this will also be reflected over time in decreased GNI, but not decreased GDP. GNI is a more meaningful competitiveness measure than GDP, since it is sensitive to losses due to increasing national debt or decreasing assets.

7 Note, this is a simplification, as the cost of local overuse is calculated as if these commodities would need to be purchased from the world market. Also, commodities that in reality are imported, but for which, in net terms, there is sufficient biocapacity within the countries, are excluded from this assessment.

8 They also could be ecosystem services. But currently only very few international ecosystem services are being paid for – in spite of recent efforts to establish carbon sequestration markets or offer markets for other ecosystem services, such as biodiversity and ecological integrity, as for instance through the United Nations Collaborative Programme on Reducing Emissions from Deforestation and Forest Degradation (REDD+).

vest their mineral and oil wealth into other assets that may appreciate more rapidly than the mineral assets themselves, generating net value through those investments.

Both graphs 2-3 and 2-4 show that the declining trend of resource costs in the final four decades of the last century are on an upward swing again. These compounding factors lead to growing costs and risks, which put increasing strains on the performance of the country's economy.

Countries with large portions of their income devoted to food and fuel are particularly vulnerable. Figure 2-5 shows world statistics for how much GDP countries spend on food, utilities, and housing. Poland is near the medians, with expenditures of 13% and 15%, respectively, spending in total about 28% of its GDP on these basic resources.

World Average Expenditures as % of GDP (2005)					
	Maximum	Highest 10%	Median	Lowest 10%	Minimum
Food and non-alcoholic beverages	64%	>41%	17%	<6%	3%
Housing, water, electricity, gas and other fuels	24%	>15%	10%	<5%	1%

Figure 2-5: World Average Expenditures on food and housing and utilities in 2005 as a percentage of GDP. Countries with high expenditure, possibly due in part to large biocapacity deficits, will be more vulnerable to increases in global prices for these basic commodities. ***Source: World Bank.***

This cost escalation of resource prices is accentuated by the size of the country's biocapacity deficit.

Even though availability of and access to biocapacity is a real physical constraint, prices in the last century have indicated to economic decision-makers that this physical constraint is a minor matter. Resource exposure represented only a small, and possibly declining, factor of the overall economic cost structure. More recently, though, these costs have been climbing as global resource supplies have tightened and more countries and people are competing for them.

The economic risk to countries with biocapacity deficits is therefore two-fold: The first consideration is that biocapacity deficits can only slowly be reversed, or might even continue to grow, since they are largely determined by population size and how long-lasting built infrastructure shapes consumption patterns of that population. Secondly, they are multiplied by rising and potentially volatile commodity prices.

Even countries with biocapacity reserves, like Montenegro, may need to factor Ecological Footprint and biocapacity into their decision-making. Having a biocapacity remainder overall does not mean a country is not in deficit in some types of resources – resources that may be more susceptible to price and supply shocks than other types. Still, the larger a biocapacity remainder a country maintains, the more it insulates itself against shocks. Perhaps even more importantly, in a world with biocapacity limitations, countries with well managed biocapacity reserves will have a significant advantage and new opportunities that might help set them apart.

As both biocapacity debtors and creditors start to manage their biocapacity more carefully, the global economy will benefit as well. For instance, reducing biocapacity deficits means less resource volatility for all players.

Global competition – from factory world to global auction: The second consideration is whether a country is getting stronger or weaker over time in bidding for resources against everyone else in the world.

In a world of unlimited resources, additional demand should stimulate additional supply. If more books, shirts or potatoes are purchased, more books, shirts, and potatoes will be produced. In such a world, all that matters is your absolute income – more income will give you more goods. While this is an idealized world (one where we assume there will be no imminent resource constraints), many economies have effectively operated as if they live in such a world.

However, in a world of resource limitations, with more and more countries running biocapacity deficits and depending on global resources, the increasing demand for global resources turns into an auction for a finite good. In such an auction what matters is not absolute ability to pay, but the relative ability compared to all the other bidding power in the auction room.

The world is a large, interconnected global economy, with all participants with (growing) biocapacity deficits bidding for the same, limited biocapacity resources (that is, the services the biosphere can provide). It is not unlike an auction for the limited supply of original Picasso paintings. Or, more precisely, every year countries need more or less the same bundle of bio-resources again. However, since the world has a limited regenerative capacity, there is only a limited amount available every year, similar to a finite number of Picasso paintings. But unlike Picassos, countries cannot do without food and other bio-resources.

Still, some may question the comparison to an auction, since biocapacity can be increased as well. Hence, the limits are not absolute or static. Indeed, while the surface of the planet has not increased, the biocapacity on it may have gone up 20 per cent on average between 1961 and 2007, according to our preliminary estimates (Global Footprint Network 2011). Yet human demand for biocapacity has grown nearly three-fold. Hence, in a first approximation, this represents a relatively static biocapacity supply, which supports the 'auction argument'.

Accepting the reality of the 'auction world', the question countries need to consider is whether they are getting stronger or weaker over time in bidding for resources against everyone else. How can this be measured?

One first approximation for measuring change in people's 'bidding power' for the world's resources is tracking the trend in a person's relative share in world income, as shown in Figure 2-5 for Poland and Switzerland. This figure simply depicts each country's per capita GNI divided by the total income of the rest of the world. This ratio shows the portion of an average resident of a country in global income. The trend line of this ratio (**in blue**) indicates whether the average person in that country is facing lighter or stiffer competition for accessing the world's limited biological resources.

Today, the average worldwide ratio for a person's share in world income would be 1/7 billionth, since about 7 billion people inhabit the world (or about 1.4 E-10 or 0.14 billionth, as shown by the **dotted yellow line** in Figure 2-5). This curve has been declining, since there are more and more people sharing the overall total. If a person's income is higher than world average, the likelihood of being able to purchase from others, rather than others purchasing one's biocapacity, increases.

In a world of global overshoot, this trend is significant. For a country with a decreasing ratio, indicating a relative decrease in bidding power for the globe's ecological services vis-à-vis the rest of the world, it will become increasingly more difficult for the country to purchase limited biocapacity from abroad. This reality is accentuated in a world where global overshoot is increasing. (Losing relative income at the same time as biocapacity becomes less available globally creates a compounding burden on national economies).

Debt dynamics: The third consideration is the debt dynamics of countries. Debt dynamics is becoming particularly prominent in the current euro crisis, where many nations have rapidly increased the national government's debt ratio compared to GNI. As debts increase compared to GNI, budgets become less flexible. Less discretionary spending is available to react to price and supply shocks; more is going towards debt financing. In fact, at one point, debt becomes so high compared to GNI that debt payments start to grow more rapidly than the economy, which can easily turn the situation into an unmanageable debt spiral. Debt dynamics on its own is a significant issue. Elevated levels of debt in the context of resource constraints represent an even more significant problem. The reason is that resource constraints may significantly reduce growth rates – or may even produce negative growth (that is, shrinkage). Under these conditions, large debt burdens become ever more difficult to manage and further reduce a country's room to manoeuvre.

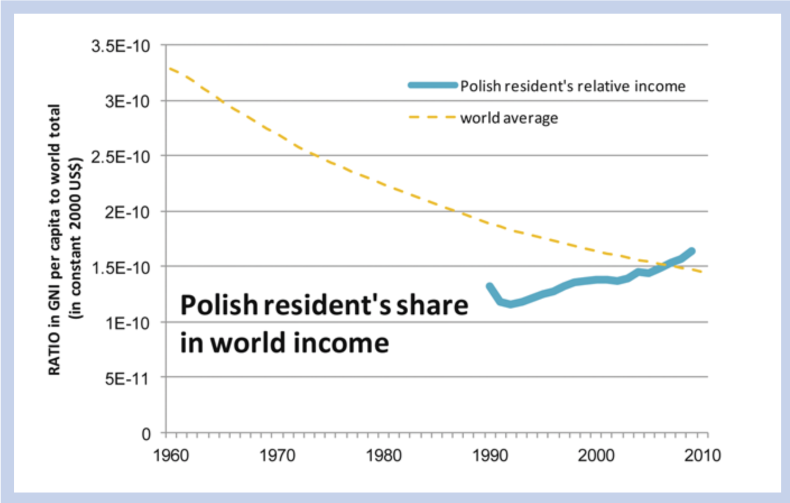


Figure 2-5a: The Polish resident's share in global income. Trends in relative per person income approximate the trend in a country's ability to buy sufficient resources from the world market. The Polish resident's share has been increasing slightly since its independence, and has grown just above world average (**blue line**). As a reference, the world average is shown with the **dotted yellow line**. This curve has been declining since there are more and more people sharing the overall total. With 7 billion people, the average per person is 1/7 billionth or about 1.4 E-10, since about 7 billion people inhabit the world. If the income is higher than world average, the likelihood of being able to purchase from others, rather than others purchasing one's biocapacity, increases. *Source: Raw data by World Bank on-line statistics, ratio calculated by Global Footprint Network.*

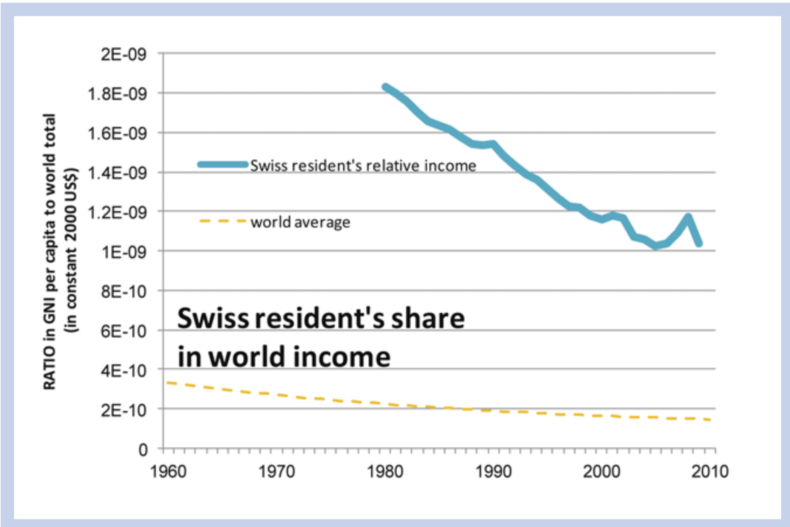


Figure 2-5b: Switzerland's per person ability to buy on the world market, compared to rest of the world. In contrast to countries in Western Europe like Switzerland, where the relative ability to purchase is declining, Poland's is increasing. However, the Swiss resident's advantage is that her or his income is significantly higher than world average, even though this advantage is shrinking. This trend illuminates the economic challenge for a country to sufficiently increase its income generation in order to afford an ever-larger biocapacity deficit. *Source: Raw data by World Bank on-line statistics, ratio calculated by Global Footprint Network.*

This loss of choice becomes additionally significant since it limits an economy's ability to retool and adapt. Repositioning economies for a resource-constrained world by making them less resource dependent also requires large investments of capital. A high debt ratio on top of a biocapacity deficit ***and*** weakening bidding power further amplifies the challenge.

One key measure for debt exposure is a country's national government debt compared to GNI or GDP.[9] It suggests to what extent the national government will lose discretionary spending power as debt service eats up larger portions of its budgets. This is particularly true in low growth situations, where debt burden might be growing more rapidly than the economy, leading to potential economic instabilities (such as runaway debts). An additional metric to capture this risk is to track annual debt repayment obligations as a portion of the government's overall budget.[10]

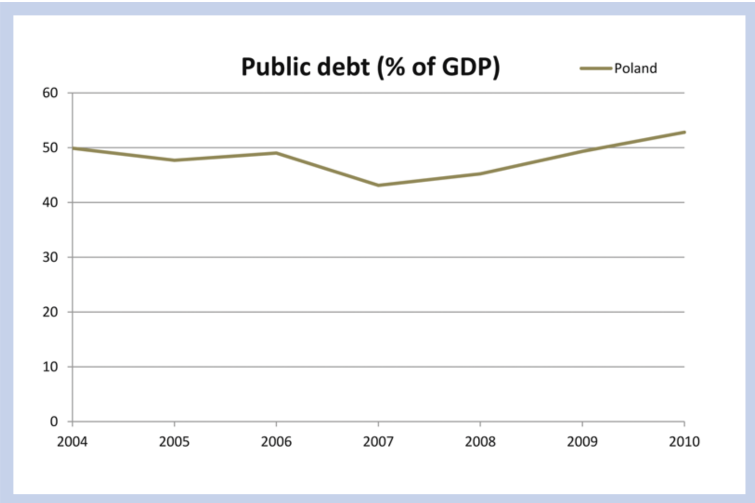


Figure 2.5: Poland's national debt has been about half of the country's GDP in recent years. *Source: CIA World Factbook – Public Debt.*

While knowledge of biocapacity deficits helps countries reveal hidden economic risk, it also highlights tremendous opportunity. Figure 2-6 puts country performance into another context: progress towards sustainable development, or the extent to which the country is building a green economy. The green economy is an attempt to operationalize sustainable development. It is about getting the fundamentals right: how can we structure the economy so all live well within the resource constraints of planet Earth?

This vision of sustainable development extends the 1972 Stockholm Conference slogan 'Only One Earth', and complements it with the United Nations' original focus on economic and social development as expressed in the United Nations Development Programme's (UNDP) Human Development Report, the Millennium Development Goals, and the Universal Declaration of Human Rights. It is the essence of the 1987 definition promoted by the Brundtland Report.

Figures 2-6 and 2-7 show how to make the goals of sustainable development (or the green economy) more specific by integrating biocapacity accounting. Do all live well (with regard to social and economic development), within the limits of available biocapacity (sustainability)?

More specifically, ***economic and social development,*** or human well-being, can be approximated with UNDP's widely used Human Development Index (HDI). Despite recognized criticisms, the HDI

[9] *For countries where public debt as a percentage of GNI was not available, public debt as a percentage of GDP was used instead. GNI figures are shown in red in Section 3. Public debt as a percentage of GDP was not available for all countries. The two trends were also available for differing numbers of years. Thus, public debt comparisons cannot be made between all pairs of nations in this report.*

[10] *Tracking debt service would also offer useful information. But it was not possible for the authors to find consistent data sets across all countries. Having high debt but a very long repayment window, or extremely low interest rates, would reduce the debt risks. The immediate risk stems from high repayment burdens compared to GDP.*

represents basic universal outcomes like longevity, health and education. Particularly in an interconnected world, where people compete throughout the economy, it is difficult for people to thrive without basic education and good health. UNDP considers an HDI of more than 0.67 to be 'high human development'. ***Environmental sustainability***, or living within the means of nature, can be evaluated by comparing human demand (or Ecological Footprint) to available biocapacity. Note that some biocapacity should be left for other species – otherwise biodiversity and other critical ecosystem services cannot be maintained.

The resulting global graph provides a high-level snapshot of countries' or populations' current development position. It can also be used to show progress over time, compare the situation of one community with another one or illustrate patterns. The graph below depicts countries, and exemplifies the challenge of creating a globally reproducible high level of human well-being without overtaxing the planet's ecological resource base.

The above graph shows the global development situation in 2007 in relation to the goals of sustainable development (lower right quadrant).[11] Figure 2-7 shows the movement of Poland since 1970 (**red line**).

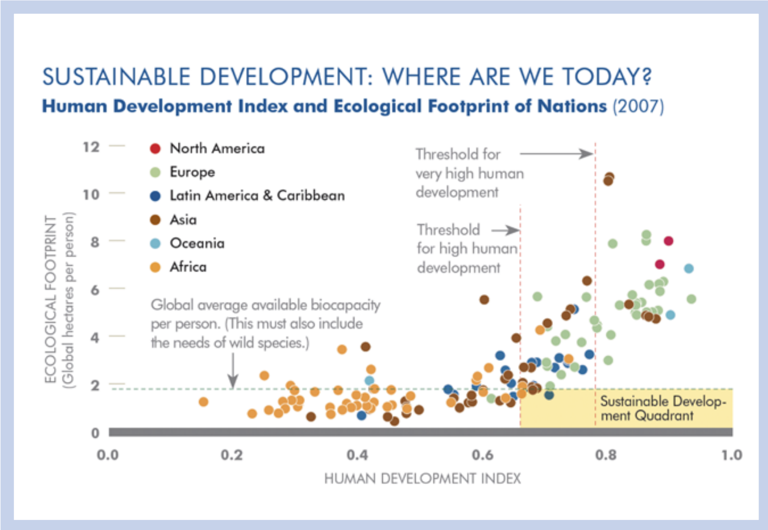


Figure 2-6: Global development assessed using UNDP's Human Development Index (HDI) as an indicator of human development, and the Ecological Footprint as a measure of human demand on the biosphere. An Ecological Footprint less than two gha per person is within global biocapacity constraints. Despite the growing adoption of sustainable development as an explicit policy goal, most countries do not meet both minimum requirements. Since every country contains different amounts of biocapacity, this analysis can also be adapted to each country. Also note that the world as a whole is outside the Sustainable Development quadrant.

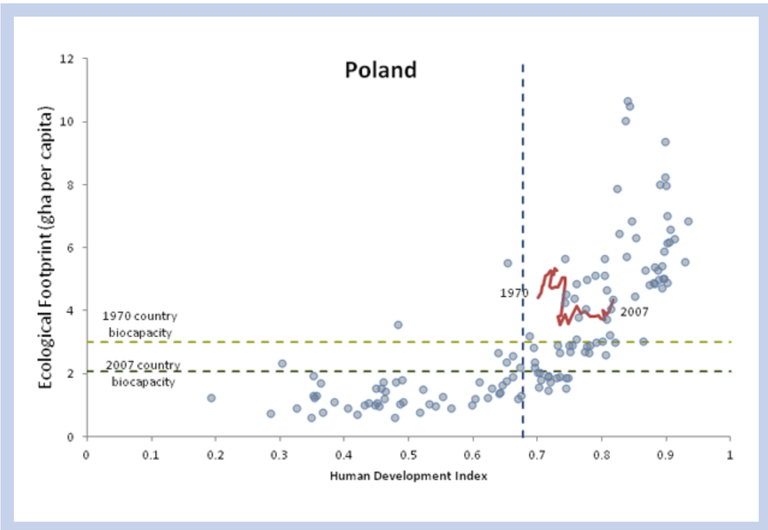


Figure 2-7: Poland's development path since 1970 assessed using UNDP's Human Development Index (HDI) as an indicator of human development, and the Ecological Footprint as a measure of human demand on biocapacity. Poland's biocapacity was 3.00 gha per capita in 1970 but only 2.09 by 2007.

[11] *One could also show how things have changed over the last 40 years: for 1972 (Stockholm conference), 1987 (Brundtland report), 1992 (Rio), 2002 (Johannesburg conference), and a projection for 2012 (Rio+20). In the last 40 years, countries have moved significantly, but per capita biocapacity has dropped by nearly half.*

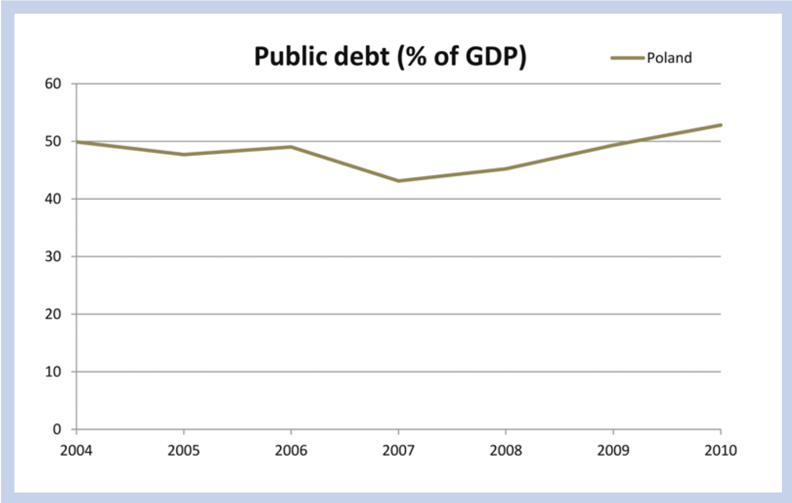


Figure 2.5: Poland's national debt has been about half of the country's GDP in recent years. *Source: CIA World Factbook – Public Debt.*

These trends demonstrate that while the HDI has generally increased, the resource situation has grown ever tighter, putting into question whether development progress witnessed over the last four decades can be maintained without a shift to sustainable development. Appendix 4 shows how each country in this report has moved on the HDI/Ecological Footprint diagram since 1970 (or since the inception of the country).

Comparing these trends across countries can help nations to understand how they are faring against their competitors, allies, trading partners, and neighbours. Figures 2-8 and 2-9 provide somewhat representative comparisons for Western Europe and Central Asia, through, respectively, Switzerland and Kazakhstan.

For example, Switzerland's data look relatively strong among Western European countries. Even though it shows a large biocapacity deficit, this deficit has not been increasing rapidly. Also, its income level is high compared to the rest of the world, which allows Switzerland to shield itself from resource competition. Declining public debt make Switzerland financially less vulnerable. Hence, it is not surprising that Switzerland shows continued progress in achieving even higher human development. However, its significant biocapacity deficit, particularly in carbon, along with rising fossil fuel prices, may start to reduce its competitiveness at a time when its per capita bidding power against the world is declining (but is still higher than average).

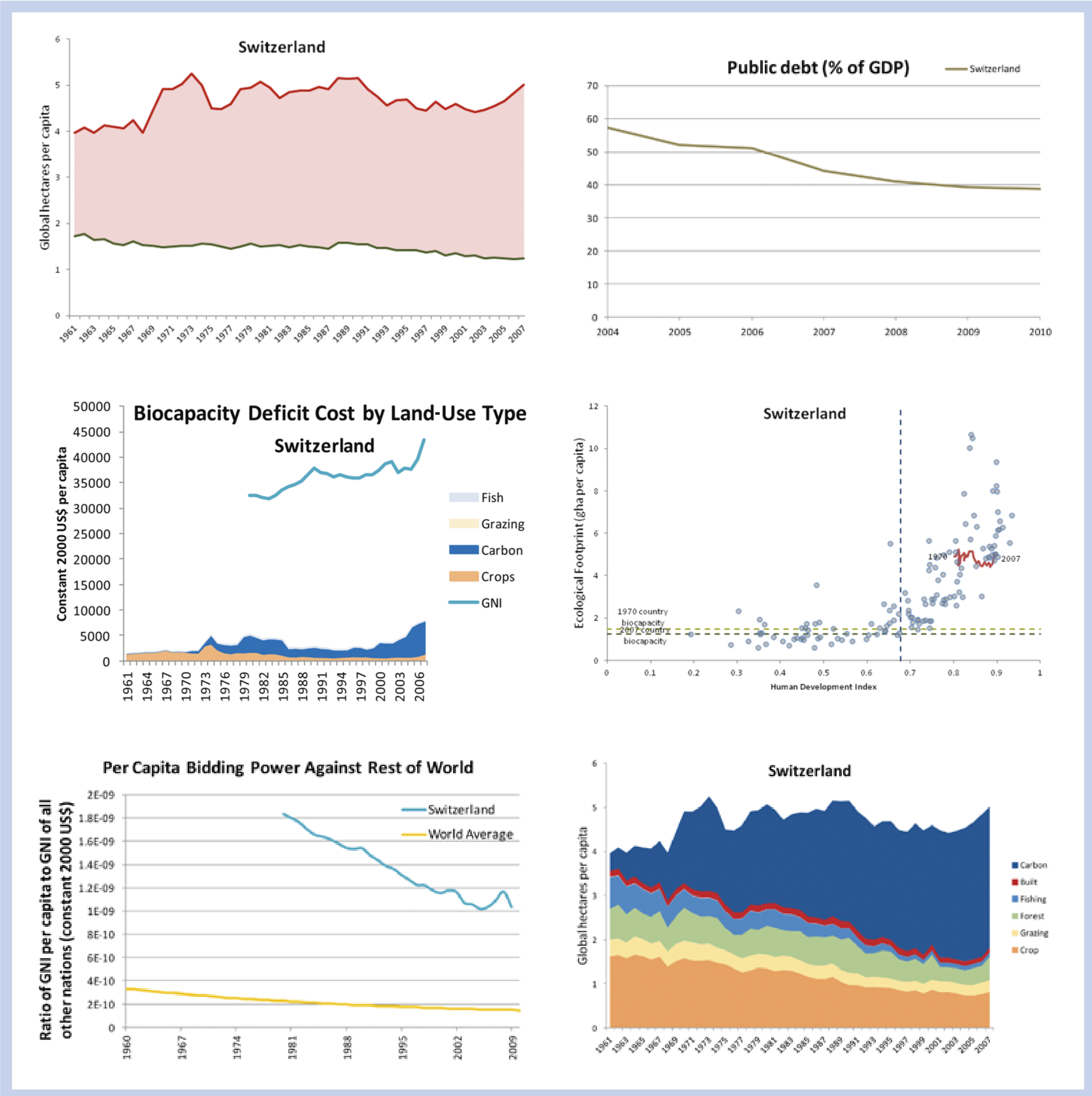
Kazakhstan's performance measure is a typical representation of Central Asian countries. While starting as an ecological creditor just after the Soviet era, it is now in biocapacity deficit, a deficit that is slightly growing. Kazakhstan has made some progress in its HDI, but at a high cost to biocapacity. Its relatively low public debt may give it more financial resources to manage future natural capital constraints. Yet, its per capita bidding power against the rest of the world has not improved much and remains below the world average. With its rising carbon footprint and simultaneously sharply rising fossil fuel prices, future progress may well be threatened. It is striking that the value of the fossil fuel used by Kazakhstan residents within a year now exceeds their annual GDP. In other words, just one resource category alone is bigger than the entire value generation of the country. It is similar to a factory that produces US$100 worth of products, but at a cost of US$200, figuratively speaking.

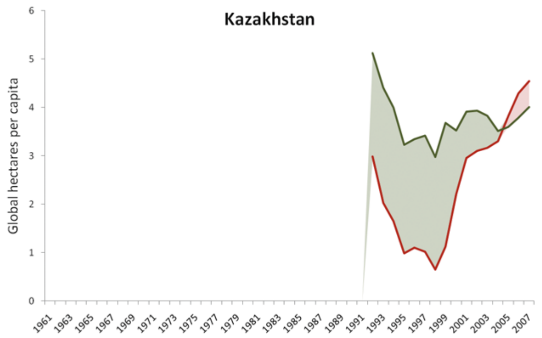
Poland's situation falls somewhere in between these two examples, with similar challenges from declining biocapacity and increasing biocapacity deficit (and cost of biocapacity deficit – particularly rising fossil fuel prices and an increasing carbon-based Ecological Footprint). Its bidding power has grown, but its high public debt may be limiting.

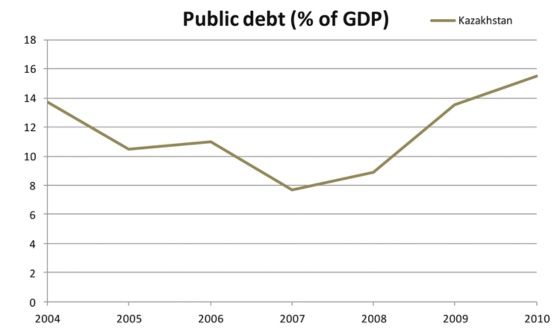
As these country examples help illustrate, growing global consumption has rewritten the rules of economic competitiveness. These indicators are essential strategic tools for every country that wants to succeed in a resource-constrained world. Recognizing the danger of these resource limitations provides countries with a direct incentive to innovate and value sustainable development locally, not just as a global challenge.

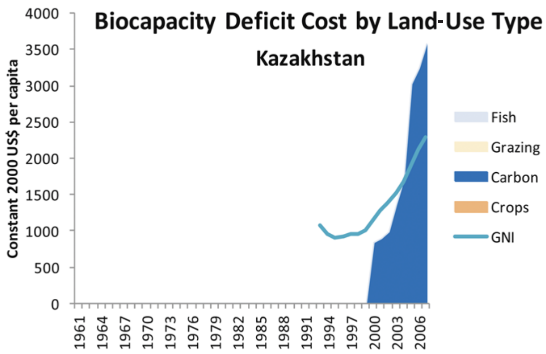
The diagnostic approach as presented in this Section 2 is provided in Appendix 4 for all 28 countries in Eastern Europe and Central Asia.

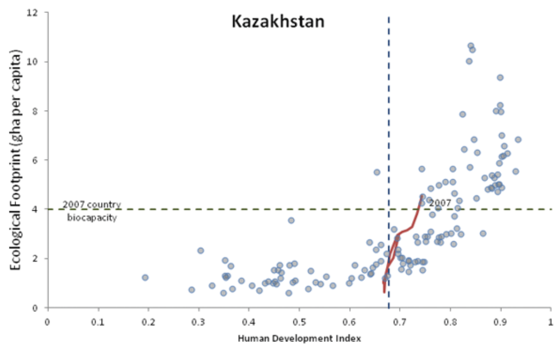
Figures 2-8 and **2-9: Competitiveness indicators for Switzerland (above) and Kazakhstan (below).** Note that Kazakhstan's energy consumption translated into world market costs far exceeds the country's national income. This indicates how dramatic and central resource questions have become for economic performance and human development questions.

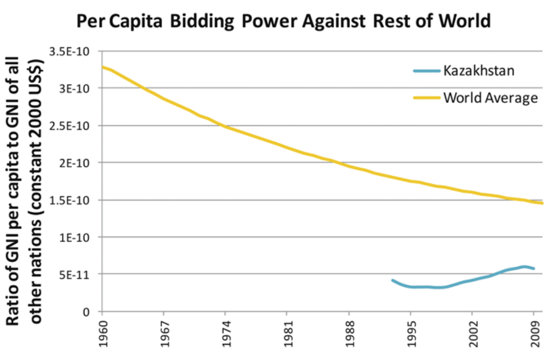


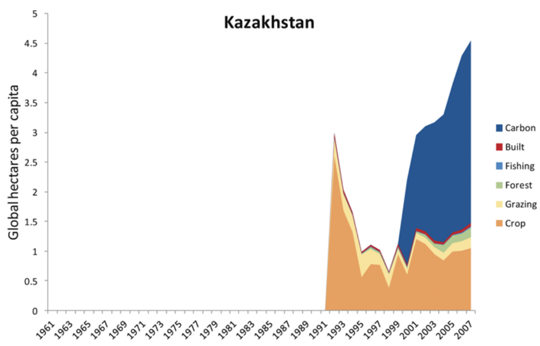

Kazakhstan
Global hectares per capita


Public debt (% of GDP)
Kazakhstan


Biocapacity Deficit Cost by Land-Use Type
Kazakhstan
Constant 2000 US$ per capita
Fish
Grazing
Carbon
Crops
GNI


Kazakhstan
Ecological Footprint (gha per capita)
2007 country biocapacity
2007
Human Development Index


Per Capita Bidding Power Against Rest of World
Ratio of GNI per capita to GNI of all other nations (constant 2000 US$)
Kazakhstan
World Average


Kazakhstan
Global hectares per capita
Carbon
Built
Fishing
Forest
Grazing
Crop

Section 3 : Ecological Constraints and National Competitiveness

Summary of Section 3: Overview of Country Diagnosis

- In a world of global biocapacity constraints, the self-interest of nations (and cities) is aligned with reducing biocapacity deficits.
- National competitiveness is therefore interlinked with resource performance.
- There are many options for action.
- Each nation needs to ask itself: What do we need to track in order to operate safely in this new era?

A country's procrastination in preparing its economy for a resource-constrained future will become an increasing risk. Conversely, a country's ability to address this emerging trend will provide them with a significant advantage.

The facts of overshoot are sobering, and it is common for people to assume humanity is on an unstoppable decline towards resource depletion. Because of this, leaders mistakenly believing they cannot do anything about the resource crunch. They may be limiting their focus to using increasingly powerful modes of technology and to implementing more aggressive trade tactics to compete for resources. These strategies do not address the underlying dynamics and therefore merely make sure their people 'lose last', rather than actually win. Without reshaping and significantly decreasing an economy's resource dependence, this limited intervention only serves to increase the speed at which we are drawing down the world's remaining natural capital.

The core argument of this report rests on the premise that we are entering into an era of resource constraints. The report substantiates the premise by documenting demand on and availability of biocapacity. Then, it highlights trends that suggest that economies' ability to thrive is already being weakened by this new reality, and evidence is put forward for 28 countries in Eastern Europe and Central Asia. Therefore, in this new era, national governments need information that assists them in defining a new framework and set of tools to manage the challenges facing their countries. With this clearer understanding of their context, and their particular situation, they then can chart more successfully a pathway that will strengthen their current position and will allow them to adapt to resource constraints more readily than countries that are not prepared.

The ability to compete effectively ***will*** continue to be key in determining a country's success in this new era. But now, governments must expand the classical understanding of 'competitiveness' in ways that let go of an outdated focus that is singularly on achieving growth. Leaders will need to recognize that resource factors are becoming increasingly significant drivers of, or detractors from, economic performance and social stability. Economic stability and wealth creation will no longer be secured by focusing on Gross National Product (GDP) alone. In fact, in the new era wealth creation may be increasingly at cross-purposes with GDP growth.

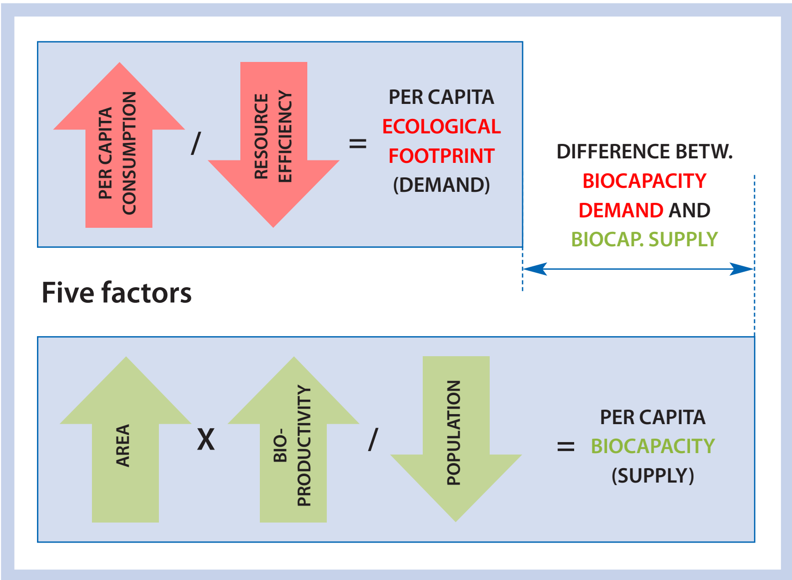


Figure 3-1: Five factors. Five factors determine the biocapacity deficit, or the size of the gap, if any, between available biocapacity and demand on biocapacity. Two factors determine people's Ecological Footprint and three determine the amount of available biocapacity. **Two Ecological Footprint Factors:** Ecological Footprints – or total demand on biocapacity – are a function of consumption per person and resource efficiency. **Three Biocapacity Factors:** The available biocapacity per resident in a country is determined by the amount of biologically productive area in the country, the productivity or yield of that area, and the number of people among whom this area is shared. ***Source: Global Footprint Network***

Leaders will only be truly competitive when they find a way to reduce their dependence on finite resources and natural capital while at the same time producing real added value for their citizens, including social improvements such as health, full employment, and education. To accomplish this, they must shift from a passive approach, where the objective is merely to lose last, to an approach that focuses on **wealth creation**.

The ecological dimension of wealth creation is becoming increasingly influential, as access to ecological resources is turning into a limiting factor. Ecological wealth can be strengthened by reducing demand, preserving biocapacity, and implementing innovative strategies for more efficient use of resources. By using these strategies when developing long-term plans for everything from energy to agriculture, leaders can make good infrastructure investments that will promote sustainable human development for their nations. Therefore, resource constraints issues need to be at the core of any government's economic decision-making and policy planning.

Reversing biocapacity deficit means closing the gap between Footprint and available biocapacity. Five factors determine the size of this gap (Figure 3-1).[12]

On the ***demand side***, the average Footprint in a country is a function of the goods and services each person consumes, and the resource and waste intensity of these goods and services. Reductions in individual consumption and the resources used or waste emitted in producing goods and services all result in a smaller Footprint.

On the ***supply side***, biocapacity per person is determined by the amount of biologically produc-

[12] *For simplicity's sake, the discussion here covers only the consumption deficit, not the production deficit. For a further discussion, see Global Footprint Network's Africa's Ecological Footprint: Human Well-Being and Biological Capital, 2006 version.*

tive area available, the productivity of that area and the number of people among whom this capacity is shared. Note that increases in productivity may come at the expense of greater resource use or waste production. If this is the case, the degree to which biocapacity gains are offset by an increased Footprint must be taken into account in determining the net impact on overshoot. Some practices for increasing biocapacity may also weaken the biocapacity's longer-term ability, particularly if they include overuse of groundwater, soil depletion or erosion.

Many different strategies could reduce the gap between human demand on nature and the availability of biological capacity. Each of these strategies can be seen as a wedge that bridges human demand and nature's regeneration. Succeeding depends on finding wedges that effectively help to close the gap while also increasing human well-being. Unless there is an extraordinarily strong craving in the population and the government for reducing biocapacity deficits, it is unlikely that biocapacity deficit measures will succeed if they do not simultaneously increase the well-being of the population.

Strategies can be organized along the five factors described. For instance, reductions in per person consumption and in the technology factor can be achieved by encouraging highly energy-efficient buildings and compact cities where non-car transport options outcompete car use. This transport shift is achieved by giving easier access to other means (for instance, by making walking easier than driving) and pricing. Other options include cradle-to-cradle industrial approaches, renewable energy production and smart grids. Technological innovations can increase the efficiency of resource use, such as video conferencing instead of travel, meeting communication needs with cellular phones rather than landlines, and replacing paper with energy-efficient electronic devices. The Footprint of food might be reduced by optimizing distribution and cutting supply chains that are resource-intensive. Typically, eating in season can significantly reduce the resource intensity of food production and distribution.

However, efficiency strategies need to be carefully designed to make sure that rebound effects are not eating up the gain from efficiency increases, or that demands are not just displaced to other resource-consumptive areas. Ecological tax reforms are likely to be an essential part of avoiding negative rebound effects.

Other strategies, such as those that would reduce and eventually reverse population growth, may generate fewer resource gains in the very short term, but lead to large cumulative declines in biocapacity deficits in the longer term. Population growth can be discouraged most effectively through voluntary measures, and can, if well planned, lead to significant economic boons, particularly per capita. Also, there is large potential to build synergies of such efforts with strengthening the populations' health and educational potentials, as well as reducing violence. While shrinking populations are portrayed by some as a dangerous spectre, such trends open cost-cutting opportunities that may well significantly outweigh potential costs, particularly in a resource-constrained world.

On the biocapacity side, rehabilitation of degraded lands can increase agricultural, livestock, and forestry yields while minimizing increases in Footprint associated with agricultural area expansion.

The choice of actions should also take into account the longevity and cost of replacement of infrastructure. As Figure 3-2 shows, some resources, including human capital, last longer than others. Strategies should focus on the longest-lived assets first, since these will affect resource use longer, and are often more costly to replace or improve. It can take decades to get an economy and city infrastructure retooled and ready for more severe resource constraints. This also implies that waiting comes at a high cost. Those who retool first and focus on the right assets will outcompete others trapped with an inefficient infrastructure. Examples of such investments might include improved human well-being and demographic composition, since people are a relatively long-lived asset.

The idea is simple: our physical assets are long-lived. They lock us in to gains – or traps.

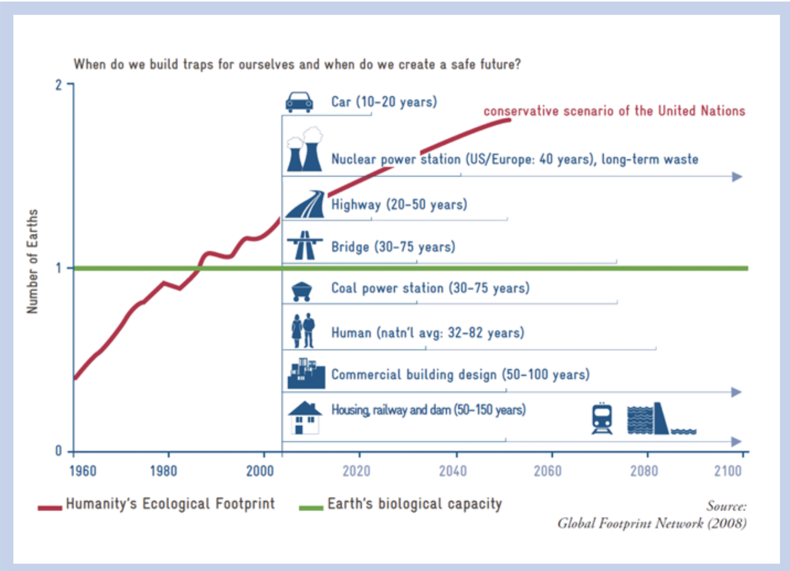


Figure 3-2: Focusing first on changes to long-lived assets can help to avoid 'trapping' a country with infrastructure that may be resource-intensive and thus financially costly to operate in a resource-constrained world. Assets that produce services without depending on cheap resources will gain in value. The opposite is also true. ***Source: Global Footprint Network.***

While these changes will occur in the context of a global economy, nations have the power to change their own trajectory and take their fate into their own hands. They do not need to wait for global agreement in order to act – rather, inaction could endanger their competitive position. Countries ***can*** find the right balance between solving challenges locally and building on the opportunities of a globalized world. An accumulation of independent actions by nations working to reduce their own biocapacity deficits may ultimately lead to increased sustainability across the globe.

In addition, these changes can be accomplished through the same spirit of innovation and entrepreneurship that countries have employed to compete in the past, as long as they are undertaken within the context, and with the new tools, of this new era.

Government leaders need to ask themselves a simple question: 'What is the best direction we can take to secure our own long-term stability and security in a time of increasing resource constraints?'

Supporting national government agencies in addressing this question for their economies could be an effective way for the UNDP to help nations adjust to these new realities. This could include region- or country-based programmes or in-depth analyses of local resource constraints.

The simple question above also opens new options and opportunities. And it is not a particularly complex task compared to how nations already manage themselves. Addressing one's biocapacity deficit is structurally not different from attacking financial deficit spending. When a company spends more than it earns, it will look at the financial accounts and identify the big drivers and opportunities for redressing the imbalance. If the cost of the imbalance is unbearable, bold action is often taken.

The same is true for a nation's biocapacity deficits. Good accounting is required to understand the drivers and thereby the options for action. There is no magic to it.

While many have outlined how resource dependence can be reduced, ultimately it will only happen if national governments recognize the significance of such action to secure their economic performance and social stability. Therefore, a simple action framework could follow this six-step sequence of what policy advisors can do:

1. Commit to the country's economic success through a framework that recognizes that new strategies may be needed in the context of resource constraints.

2. Clarify the goal. Focus on wealth generation (increasing people's per capita wealth, including natural, social, and human-made capital). Generating wealth should take centre stage among policy concerns, not GDP.

3. Measure what nations need to know to operate safely in this new era. How significant is it to know finite resource levels and debt balance?

4. Focus on 'slow things first'. Recognise the significance of long-lasting stocks or assets in determining future success. It may help to approach any large investment or infrastructure project from the perspective of net present value (or costs). Note that stocks not only include physical and social infrastructure, but, critically, also demographics. Use the five factors approach to identify key drivers and intervention opportunities.

5. Make it financially feasible. If managed well, a different path may not cost more, but simply require current budgets to be allocated differently.

6. Generate easy, early wins. Without them, no political momentum can be built. For instance, introduce life-cycle costing in decision-making.

Section 4 : Navigating the New Era

Summary of Section 4: Conclusion

This report attempts to demonstrate that resource constraints have started to affect economic performance.

Understanding the state of their country's demand on and supply of biocapacity will allow nations to make wiser decisions to avoid risk and capitalize on opportunities. This is at the core of what the 'green economy' is trying to achieve.

Today, the world is a very different place than it was a generation ago. In the past four decades, large numbers of people across the globe have made great advances in human development. Improvements in technology, agriculture, manufacturing, and trade have distributed more resources to more people, thus raising standards of living. Increased access to goods and services – coupled with improvements in medicine – has caused dramatic increases in longevity and in the size of the world's population.

A consequence of this prosperity is that the world is now in ecological overshoot. Overall demand is outstripping the Earth's regenerative capacity. Expanding, or even maintaining, this level of resource demand is causing a rapid liquidation of natural resources. While it is an unintended consequence, the consequence is becoming ever more notable.

As demonstrated in this report, these resource constraints are likely to be starting to affect economic performance. This will increasingly contribute to financial insecurity, including debt crises. Economic strain may be accelerated by increased competition within and between nations for access to the world's dwindling supplies, even as many people in these countries will still require basic resources in order to rise out of the poverty they remain in.

In this new era of resource constraints, leaders need not only new ways of framing and prioritising the challenges, but also new tools for helping them to weigh their options. They need fresh strategies for creating a competitive advantage in present circumstances, which will empower them to provide for their people in a sustainable way. Understanding the state of their country's demand on and availability of biocapacity will allow them to make wise decisions to avoid risk and capitalize on opportunities. This will generate a competitive advantage that also stabilizes the global resource situation.

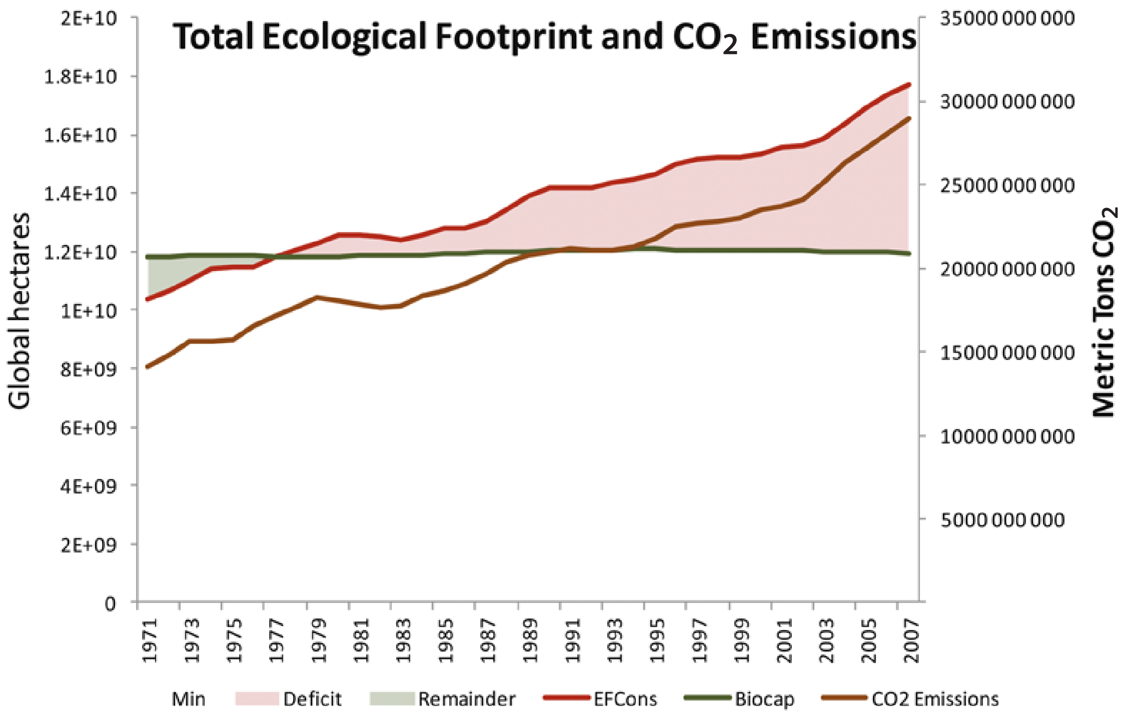
This is the essence of the 'green economy'.

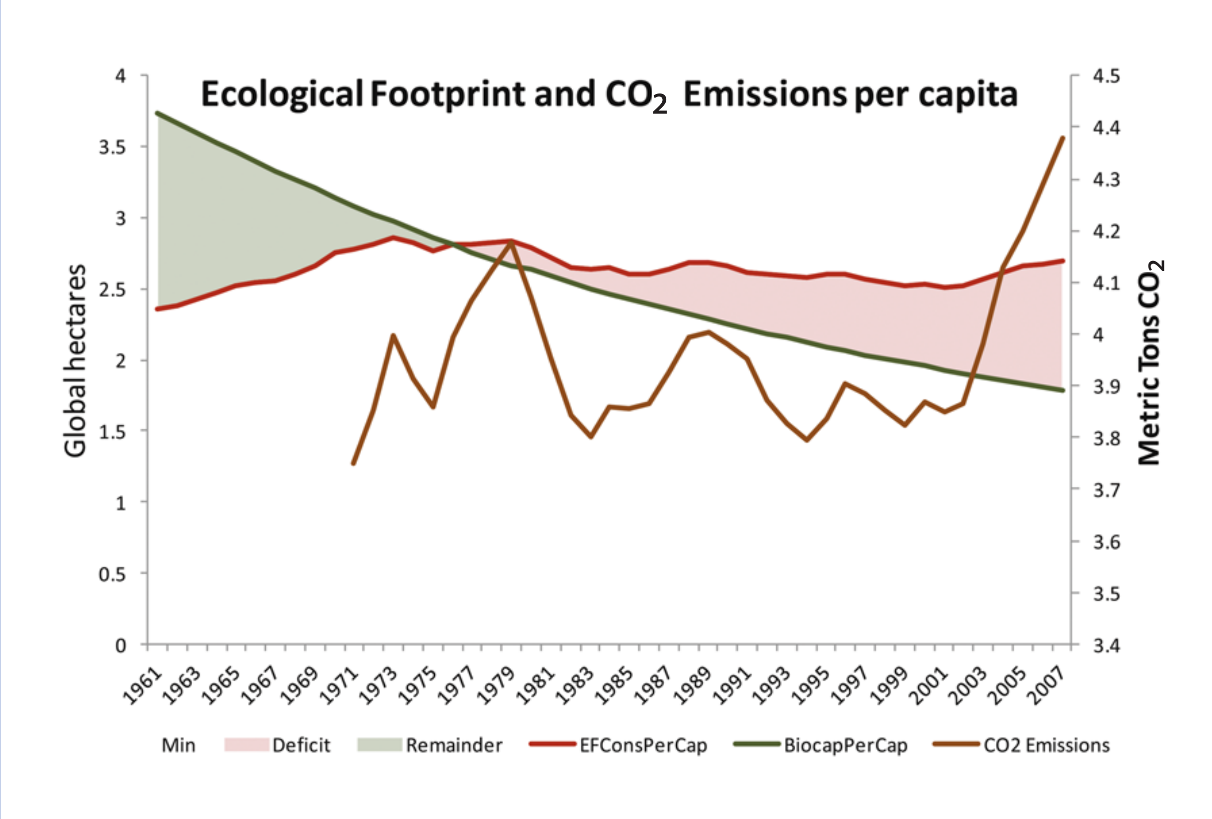
To navigate this new situation, nations need to keep track of the state of natural capital over time. Tracking what they have and what they use will allow leaders to uncover hidden economic risk. For instance, using the Ecological Footprint, leaders can assess their biocapacity deficits, compute the fiscal cost of such a deficit to their economies, measure how the loss of their countries' resources negatively impacts their ability to trade, and infer what kind of financial debt levels they can afford. In addition, information about biocapacity allows people to understand what wealth will be if trends continue or changes are made, empowering leaders to create long-term infrastructure plans that operationalize sustainable development and generate wealth.

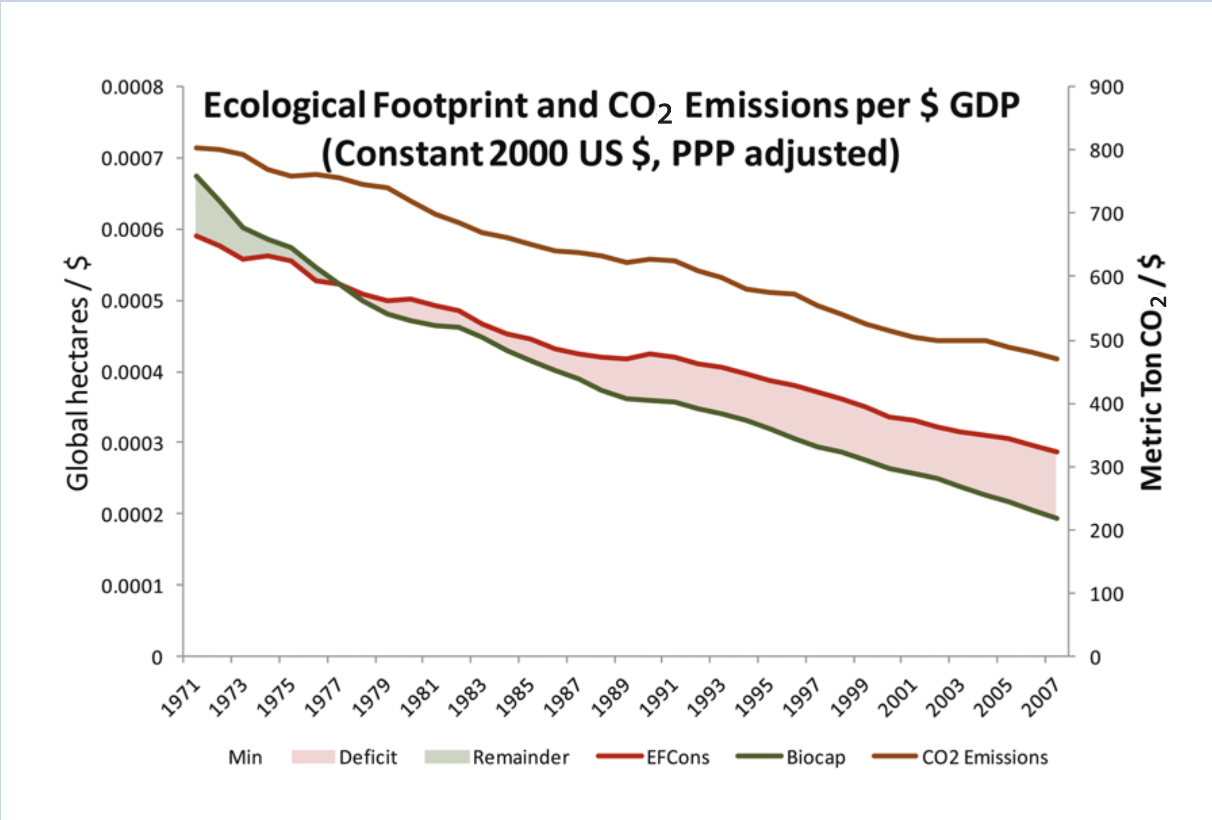
Trends show that nearly all the countries in the Eastern Europe and Central Asia region are running biocapacity deficits. Many are in an economically challenging position, as measured by their buying power vis-à-vis the rest of the world. This trend is making it more difficult for them to afford these biocapacity deficits in the future, particularly for those countries who are already applying a large percentage of their GDP towards providing food, energy, and other basic goods. By shifting to a competitive strategy that harnesses information about biocapacity, leaders in the region could move quickly, and independently, towards an economic strategy that focuses on sustainable prosperity.

There is much potential for countries in Eastern Europe and Central Asia to succeed. Given the rapid political and economic changes many of these countries have experienced over the last two decades, they may also be more nimble than many established industrial nations in adapting to new realities and embracing innovative approaches for succeeding in a resource-constrained world.

Appendix 1 : Ecological Footprint and CO2 Trends




Ecological Footprint and CO_2 Emissions per capita
Global hectares
Metric Tons CO_2
4
3.5
3
2.5
2
1.5
1
0.5
0
4.5
4.4
4.3
4.2
4.1
4
3.9
3.8
3.7
3.6
3.5
3.4
1961 1963 1965 1967 1969 1971 1973 1975 1977 1979 1981 1983 1985 1987 1989 1991 1993 1995 1997 1999 2001 2003 2005 2007
Min
Deficit
Remainder
EFConsPerCap
BiocapPerCap
CO2 Emissions


Ecological Footprint and CO_2 Emissions per $ GDP (Constant 2000 US $, PPP adjusted)
Global hectares / $
Metric Ton CO_2 / $
0.0008
0.0007
0.0006
0.0005
0.0004
0.0003
0.0002
0.0001
0
900
800
700
600
500
400
300
200
100
0
1971 1973 1975 1977 1979 1981 1983 1985 1987 1989 1991 1993 1995 1997 1999 2001 2003 2005 2007
Min
Deficit
Remainder
EFCons
Biocap
CO2 Emissions

Appendix 2 : Ecological Footprint Methodology

Based on

- Mathis Wackernagel and Gemma Cranston, answering questions raised at the European Commission Workshop on the Ecological Footprint, in response to Directorate General on the Environment Workshop: 'Coming to grips with key indicators: Applying the Ecological Footprint', 1 March 2011.
- Alessandro Galli, David Moore, Gemma Cranston, Nina Brooks and Mathis Wackernagel, 'Assessing the biosphere's natural endowment and human resource consumption through the Ecological Footprint: The Mediterranean situation and its implication for the region's competitiveness', Global Footprint Network, Geneva, Switzerland contribution to the World Resources Forum, Davos, 2011.

What the Ecological Footprint measures

How much of the biosphere's regenerative capacity does humanity (or any human activity) demand? The Ecological Footprint accounts are developed to answer this one particular research question, nothing else.

For a population, this question becomes: How much of the planet's (or a region's) regenerative capacity is demanded to provide all the ecological services (that are competing for mutually exclusive space) a specified population demands, including all the resources that the population consumes and to absorb all its waste, using prevailing technology?

Accounts have typically two sides. For example, financial balance sheets include both 'expenditure' and 'income'. Similarly, Footprint accounts compare demand on biocapacity (Footprint) against availability of biocapacity.

The Ecological Footprint emerged as a response to the challenge of sustainable development, which aims at securing human well-being within planetary constraints. By staying within planetary constraints, one makes sure that biocapacity is available now and for future generations. The ambition lying behind Footprint accounts is to provide motivational, managerial and monitoring capacity for assessing and dealing with these biophysical constraints.

Methodology

The Ecological Footprint (Wackernagel 1994, Rees and Wackernagel 1994, Wackernagel et al., 1999) is a resource and emission accounting tool designed to track competing human demand on the biosphere's regenerative capacity. It includes the capacity of the biosphere to renew resources, to absorb waste and to provide space for infrastructure. In the current national Footprint calculations, the only waste stream included is CO2 from fossil fuel burning. Other waste streams could be included as well, if consistent data sets become available.

Human demand (Footprint) can then be compared with the Earth's capacity to renew such resources and absorb CO2 (biocapacity) (Wackernagel et al., 2002).

The two components of the accounts – the Ecological Footprint and biocapacity – are thus resource flow measures. Rather than being expressed in metric tonnes per year, each flow is expressed in terms of bioproductive land areas annually necessary to provide (or absorb) the respective resource flows (Monfreda et al., 2004). The areas are measured in a common unit: global hectares (gha), or biologically productive hectare with world average productivity.

Six main types of bioproductive areas are considered: 1) cropland for the provision of plant-based food and fibre products; 2) grazing land and cropland for the provision of animal-based food and other animal products; 3) marine and inland fishing grounds for the provision of fish-based food products; 4) forest areas for the provision of timber and other forest products; 5) carbon uptake land for the absorption of anthropogenic CO2 emissions; and 6) built-up area representing productivity lost due to the occupation of physical space for shelter and other infrastructure (Kitzes et al., 2008).

In calculating Ecological Footprints, a consumer approach is used, in which the amount of regenerative capacity embedded in production activities as well as imports and exports is considered. The Ecological Footprint of consumption (EFC) is calculated by adding to the final Footprint value the Footprint embedded in locally produced products (EFP) and in the imported products (EFI) and subtracting the Footprint of exported products (EFE), as in equation 1:

$$EF_C = EF_P + EF_I - EF_E$$

Equation 1

Each individual flow can be translated into the correspondent appropriation of bioproductive land area through a multi-step process, described in equation 2:

$$EF = \frac{P}{Y_N} \, x \, YF \, x \, EQF$$

Equation 2

where P is the amount of a product harvested or CO2 emitted, YN is the national average yield for the product P (or its carbon uptake capacity in cases where P is CO2), and YF and EQF are the yield and equivalence factors, respectively, for the land-use type in question (Monfreda et al., 2004; Galli et al., 2007). The yield factor indicates the relative productivity of a specific hectare within a particular land-use category with the world average productivity of that land-use category. The equivalence factor represents the relative productivity of one land-use category against the world average of all land-use categories.

Conversely, the overall biocapacity available in each nation is calculated as the sum of the biocapacity supplied by each land type. For any land-use type, biocapacity (BC) is calculated as in equation 3:

$$BC = A \, x \, YF \, x \, EQF$$

Equation 3

where A is the area available for a given land-use type and YF and EQF are the yield and equivalence factors for that land-use type, respectively. The Ecological Footprint can thus be used to inform governments about the ecological consequences of the demands humans place upon the biosphere and its natural ecosystems. A 'biocapacity deficit' situation can be identified when the Ecological Footprint value is higher than the biocapacity value; conversely a 'reserve' occurs when biocapacity ishigher than the Ecological Footprint.

Appendix 3 : Methodology Improvements and Ecological Footprint Acceptance Worldwide

Based on Mathis Wackernagel and Gemma Cranston, answering questions raised at the European Commission Workshop on the Ecological Footprint, in response to Directorate General on the Environment Workshop: 'Coming to grips with key indicators: Applying the Ecological Footprint', 1 March 2011.

Global Footprint Network (www.footprintnetwork.org) is the steward of the national Footprint method and calculations. It is also advocating continuous improvements of the method. Improvements address shortcomings identified by criticisms as well as by limitations discovered in Footprint applications. As a scientific organization aiming to implement policy relevant tools and analyses, Global Footprint Network depends on input and suggestions from others regarding calculation methods and potential improvements.

There are numerous valid critiques of the Ecological Footprint method, many of which form the basis for an active research agenda as described below. A good summary of the research agenda is provided by Kitzes et al., 2007-2009, www.footprintnetwork.org/download.php?id=32, http://dx.doi.org/10.1016/j.ecolecon.2008.06.022)

What principles underlie Ecological Footprint accounting?

Sustainable development implies a commitment to giving all people the opportunity to lead fulfilling lives within the means of planet Earth. This kind of development continues to be identified as the primary overarching policy goal, as for instance in the merging 'green economy' debate in the context of Rio2012 or the OECD's Green Growth strategy. Yet, when it comes to actual environmental strategies and policies, are decision makers asking the right questions to lead us towards this goal?

When people catch more fish than fishing grounds can regenerate, fisheries eventually collapse; when people harvest more timber than forests can re-grow, they advance deforestation; when people emit more CO_2 than the biosphere can absorb, CO_2 accumulates in the atmosphere and contributes to global warming. This overuse of renewable resources is called 'biocapacity overshoot'. To achieve sustainable development, it is crucial to have information regarding humanity's demand, both global and local, on the material flows of the biosphere as well as what the biosphere is actually able to provide, for any given year.

Hence Ecological Footprint accounting compares the actual amount of biological resources produced and the waste absorbed by the planet in a given year with the number of resources humans extract and how much waste is subsequently generated in that year. This accounting can be done at any scale, from the resource demand of a single activity or a single individual, to that of a city, country or the entire world.

These accounts use about 6,000 data points per country and year. The overwhelming majority of these data points are taken from official United Nations statistics, mainly FAO, COMTRADE, and IEA.

Often accounts are confused with composite indicators, but they are systematically distinct approaches.

Accounts start from a clear research question. They use as their measurement element a unit that is relatively substitutable. Examples include financial accounting, which includes GDP, where dollars are the unit, or greenhouse gas accounts, where the unit is CO2 equivalents. In the case of Footprint accounting, the unit is gha.[13] In none of the accounts are the units universally interchangeable. They are just a reasonably good approximation of a more or less interchangeable unit. For example, US$1 to a low-income person may be worth much more than to a billionaire; yet, the dollar is a good approximation of a comparable unit of purchasing power.

In contrast, composite indicators, such as a Mercer quality of life indicator, which compares the liveability of cities, or the World Economic Forum competitiveness indicator comparing national economies, or Transparency International's corruption perceptions index measuring the perceived levels of public sector corruption, are a somehow arbitrary aggregation of diverse indicators that are then averaged out according to a particular weighing framework. The upside of indices is that they can be as broad as they wish and cover entire topic areas. The downside is that the results depend on the arbitrary architecture of the index, with assumed or implied trade-offs. In other words, they lack a clear, method independent research question and are therefore at the periphery of truly scientific inquiries. In spite of their limited scientific robustness, indices may still serve useful functions. For instance, they can be used as alarm bells, but cannot be used as management tools or for determining trade-offs.

The underlying premise of the Footprint accounts is based on the recognition that the ecological services demanded for human activities are competing for space, which allows biological processes to harvest rain and sunlight. All the mutually exclusive areas needed for all the demanded services then can be added up to the Footprint.

The area that is demanded is calculated by turning the formula for yield on its head. Since yield is defined as:

$$Yield = \frac{Amount\ per\ year}{Area\ occupted}$$

It follows that

$$Area\ occupted = \frac{Amount\ per\ year}{Yield}$$

Rather than expressing the area results in hectares, each hectare is adjusted for its respective biocapacity. These adjusted hectares are called gha and,

[13] *A global hectare (gha) is a common unit that encompasses the average productivity of all the biologically productive land and sea area in the world in a given year. Biologically productive areas include cropland, forest and fishing grounds, and do not include deserts, glaciers and the open ocean.*

essentially, these gha are biologically productive hectares with world average bioproductivity. They are the standard measurement units for both Footprint and biocapacity. One gha of any area is (in the idealized theory) able to produce a similar amount of ecological services. It is a 'similar' amount, because different hectares across the world do not provide identical services – even so, hectares across biomes and vastly different plant communities, from tropical to boreal, from wet to dry, can be compared for their productivity of meat, cereals, timber or carbon sequestration capacity.

More on this calculation methodology is available through Global Footprint Network, including the 'Ecological Footprint Atlas' with the complete 2007 data and results (based on the 2010 edition), a method paper, and a guidebook to the 'National Footprint Accounts' (all available at www.footprintnetwork.org/atlas). In addition to these scientific publications, a summary of the results for the general public is presented in 'Living Planet Reports', published by the Worldwide Fund for Nature (WWF), with support from Global Footprint Network, and the Zoological Society of London (see LPR 2008 and LPR 2010, www.panda.org/livingplanet). The 2010 edition of the 'National Footprint Accounts' was launched in September 2010. As with any edition, the 2011 edition launched in fall 2011 will feature a number of minor improvements. Larger improvements are planned for the 2012 edition.

How are Ecological Footprint accounts improved?

One significant input for methodological Footprint improvements emerges from collaborations with national governments. The following reviews are examples of such collaborations or independent assessments by government agencies:

- Switzerland - http://www.bfs.admin.ch/bfs/portal/en/index/themen/21/03/01.html (both the technical and the descriptive report).
- Germany - http://www.umweltdaten.de/publikationen/fpdf-l/3489.pdf
- France - Stiglitz commission (http://www.stiglitz-sen-fitoussi.fr/documents/Issues_paper.pdf);
- France - SOeS of the French Ministry of Sustainable Development. The study 'Une expertise de l'empreinte écologique (May 2009, No. 4)' examined the transparency and reproducibility of the 'National Footprint Accounts' and found reproducibility of time trends within 1-3 per cent. The initial report is available at http://www.ifen.fr/uploads/media/etudes_documentsN4.pdf,or see http://www.ifen.fr/publications/nos-publications/etudes-documents/2009/une-expertise-de-l-empreinte-ecologique-version-provisoire.html
- At the European Union's 'Beyond GDP' conference (www.beyond-gdp.eu) a strong endorsement arose from the European Economic and Social Committee.
- Ireland – http://erc.epa.ie/safer/iso19115/displayISO19115.jsp?isoID=56#files
- Belgium - www.wwf.be/_media/04-lies-janssen-ecologische-voetafdrukrekeningen_236536.pdf
- Directorate-General for the Environment – June 2008: 'Potential of the Ecological Footprint for monitoring environmental impact from natural resource use' available at http://ec.europa.eu/environment/natres/studies.htm
- United Arab Emirates – Al Basama Al Beeiya Initiative http://www.agedi.ae/ecofootprintuae/default.aspx
- Directorate General for Research, Division Industry, Research, Energy, Environment, and Scientific and Technological Options Assessment (STOA), 2001, Ecological Footprinting http://www.europarl.europa.eu/stoa/publications/studies/20000903_en.pdf
- As a result, the following methodological aspects are being worked on currently:

Trade

The current method utilizes estimated world average Footprint intensities for all traded goods and omits trade in services. By utilizing a global multi-regional input-output model, the 'National Footprint Accounts' will more comprehensively and consistently track energy and resource flows embodied in traded goods and services.

Equivalence Factors

Equivalence Factors are central to Ecological Footprint analysis, as they provide the basis for consistent aggregation. They are key to translating a hectare into its respective global hectare value. The current Equivalence Factors are based on global-average agricultural suitability of various biomes. Alternative approaches are being researched

Fisheries

The fishing grounds Footprint is currently under revision, with the aim of more explicitly incorporating estimates of sustainable yield with regard to the species group and possibly even at the species level. More geographically explicit catch and species range data will also be incorporated. However, global data availability is still limiting the analysis.

Carbon

Refinements are needed for specifying the biosphere's assimilative capacity for CO2 emissions. Possible improvements include:

1. Defining an explicit measure of the biocapacity available for carbon uptake, such that exceeding this capacity (measured in gha) results in an increase in atmospheric concentrations of CO2.
2. Accounting for carbon uptake by multiple biomes, including narrowing our measure of marine carbon sequestration to encompass only biological fixation.
3. More explicitly reflecting analysis of the global carbon budgets as reported by the IPCC.

SEEA Compatibility

The alignment of the 'National Footprint Accounts' with the United Nations' integrated System of Environmental-Economic Accounts (SEEA) will improve the policy relevance of the 'National Footprint Accounts' and more easily allow for the incorporation of Ecological Footprint analysis in coordination with economic decision-making. This is particularly relevant for assessments that allocate overall demand to particular consumption categories.

Appendix 4 : Resource Trends in Eastern Europe and Central Asia

Summary of Appendix 4: Resource trends

This appendix applies the diagnostic approach presented in Section 2 to the 28 countries in Eastern Europe and Central Asia.

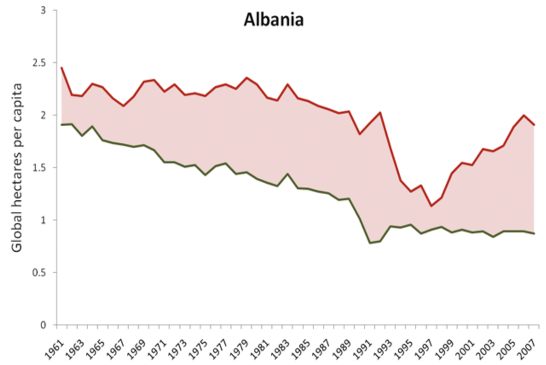
The main trends this report highlights span from 1961 to today and are:

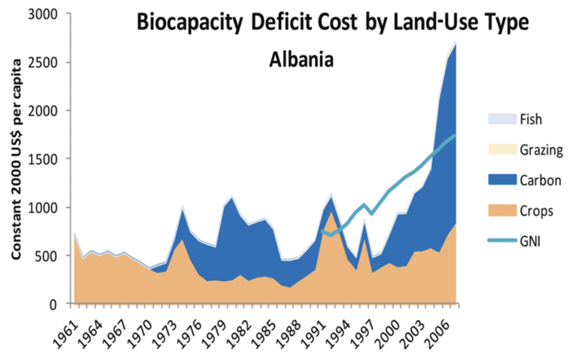
1. Biocapacity deficit (or reserve), the difference between Footprint and biocapacity (in gha per person).

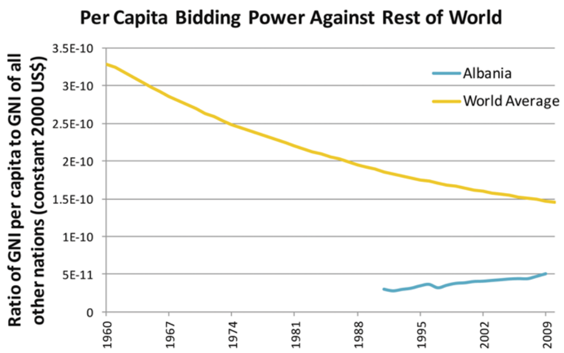
Plus the following four trends for interpreting the economic implications of such a potential biocapacity deficit:

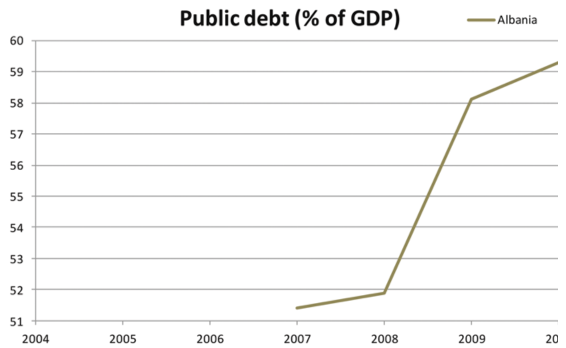
2. Cost of basic commodities embodied in biocapacity deficit (compared to GNI).
3. Trend in relative per capita income compared to world total as an indication of trends in a country's ability to buy resources from world markets (country's GDP per capita compared to total GDP of the world).
4. Public debt (as a percentage of GDP).
5. HDI-Footprint path (HDI and Footprint values since 1970).

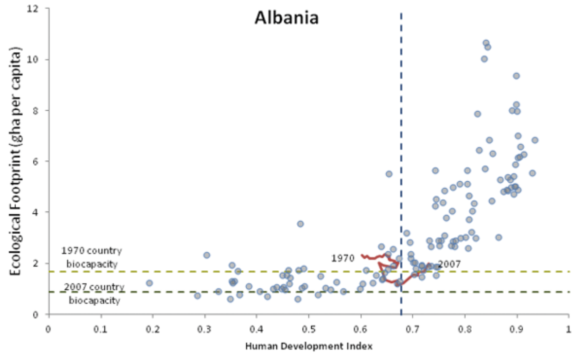
Albania

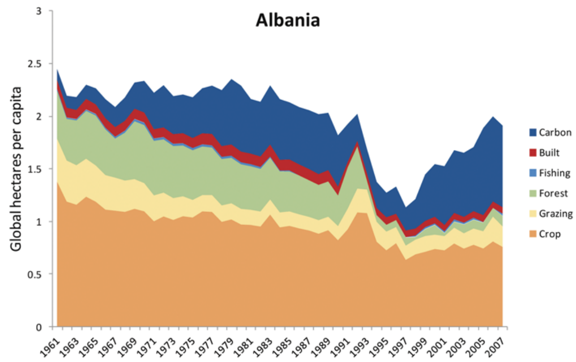






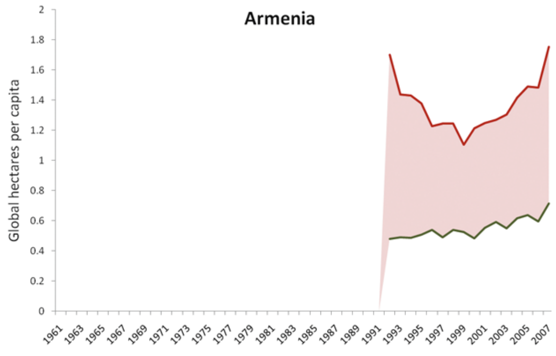


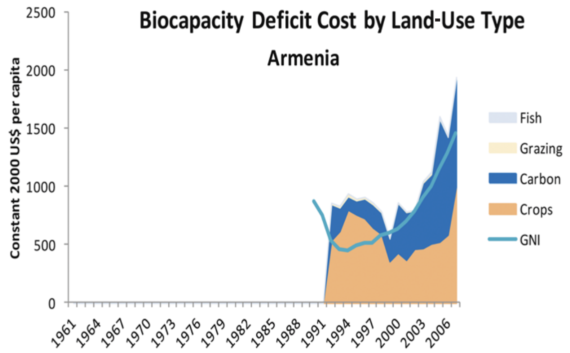


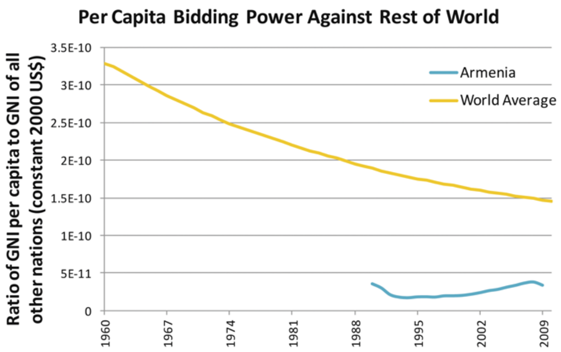


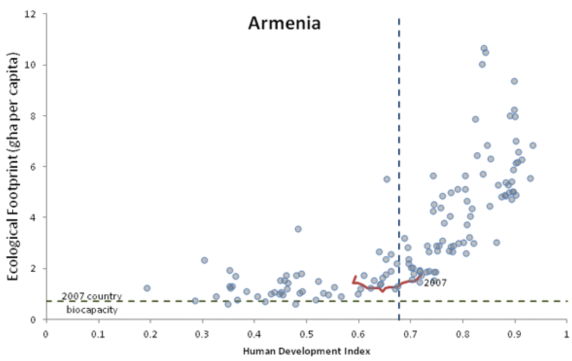
Expenditures as % of GDP (2005)	
Food and non-alcoholic beverages	20.6
Housing, water, electricity, gas and other fuels	16.0
Total	**36.6**

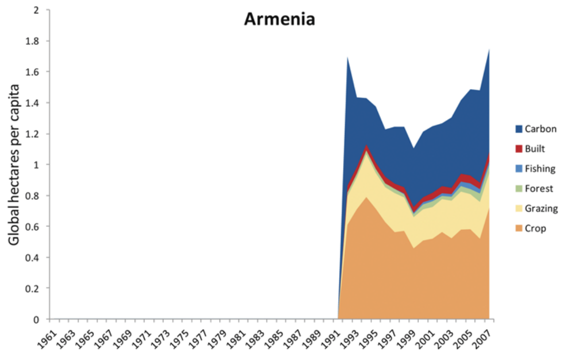
Armenia





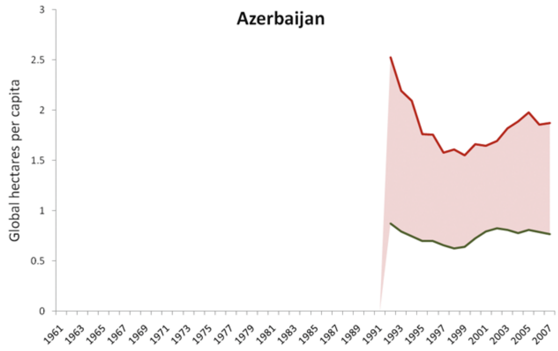


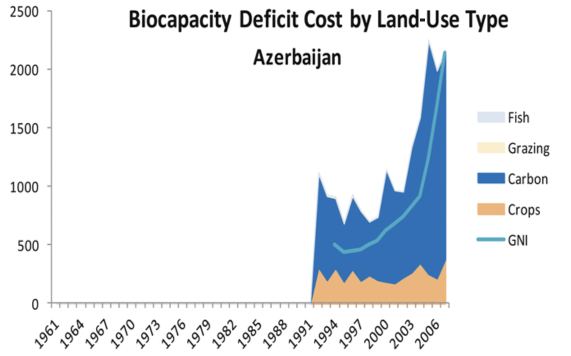


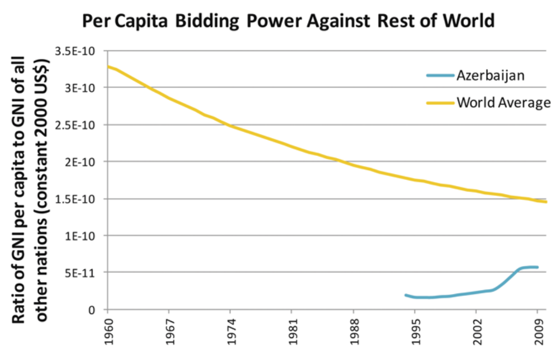


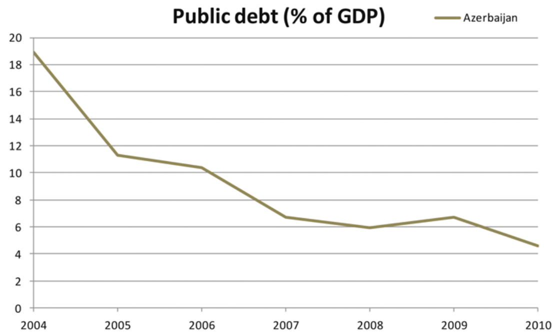
Expenditures as % of GDP (2005)	
Food and non-alcoholic beverages	51.5
Housing, water, electricity, gas and other fuels	5.6
Total	**57.1**

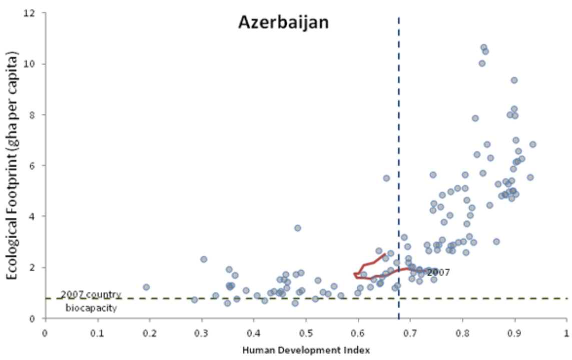
Azerbaijan

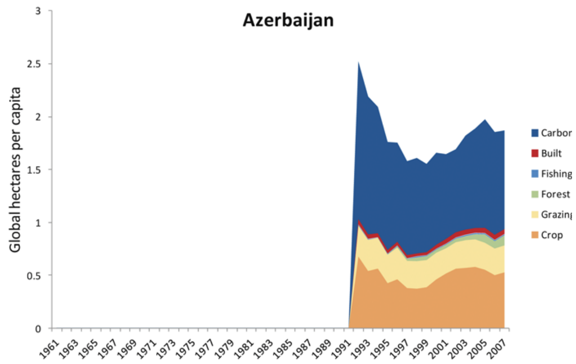






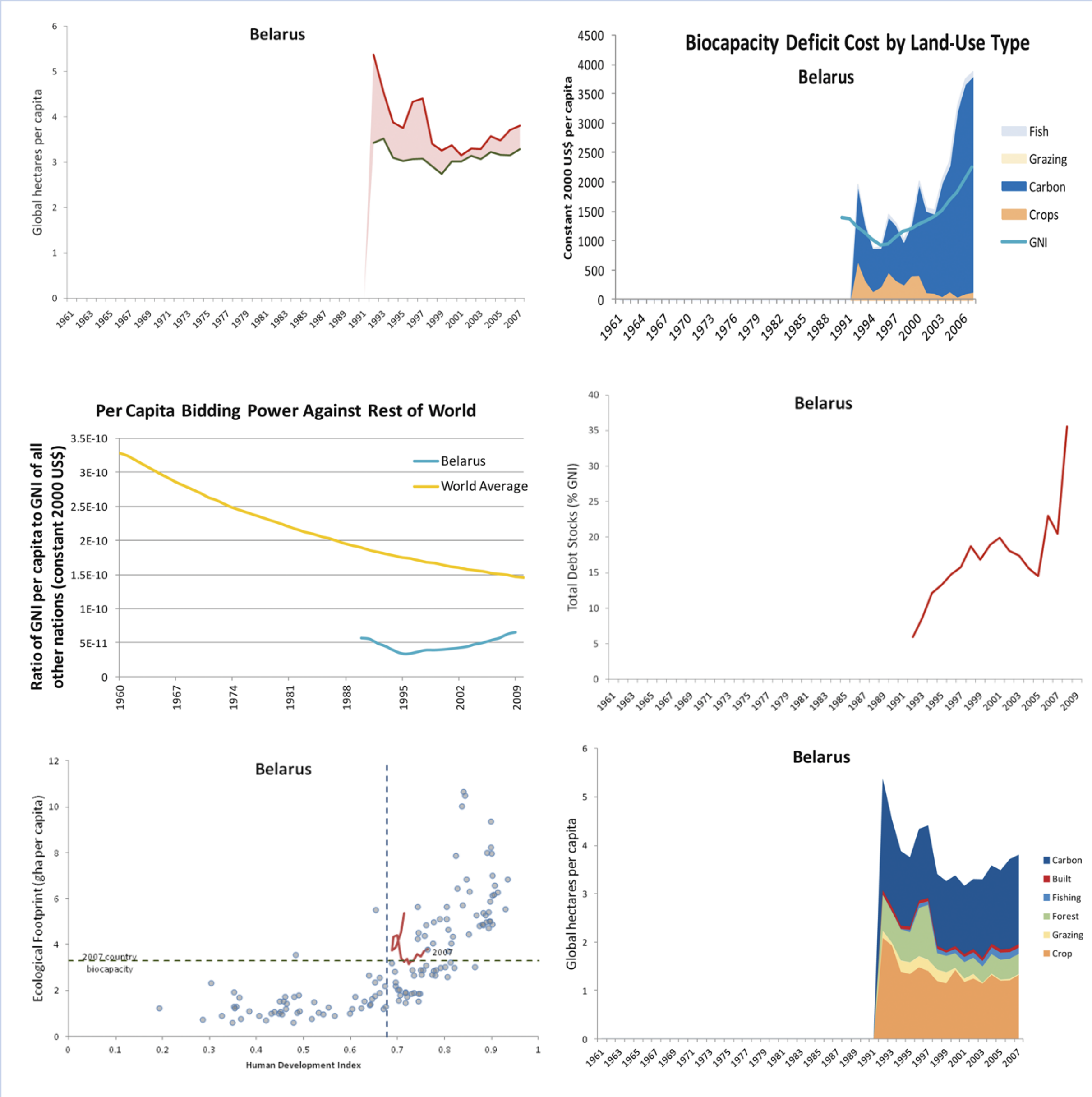






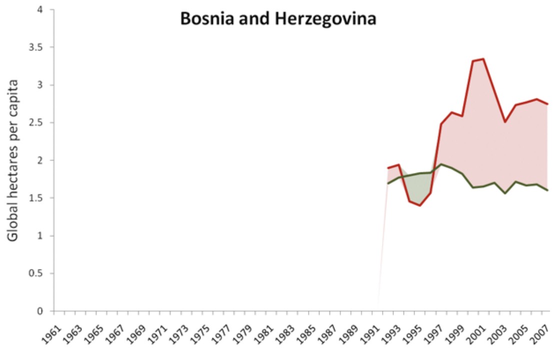
Expenditures as % of GDP (2005)	
Food and non-alcoholic beverages	29.4
Housing, water, electricity, gas and other fuels	2.9
Total	**32.3**

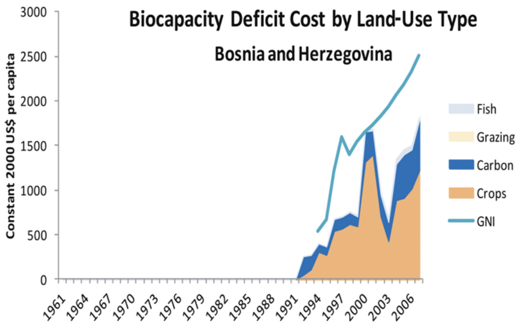
Belarus

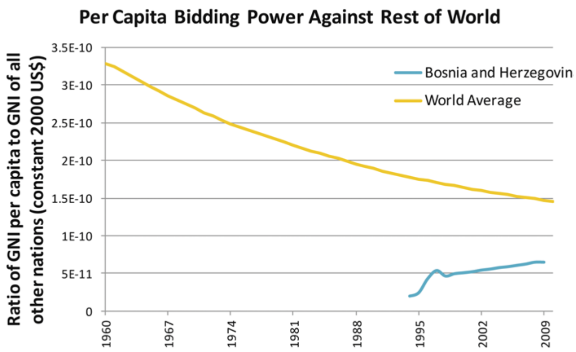


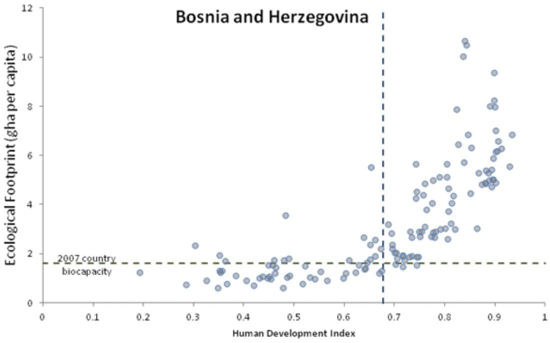
Expenditures as % of GDP (2005)	
Food and non-alcoholic beverages	21.9
Housing, water, electricity, gas and other fuels	7.2
Total	**29.1**

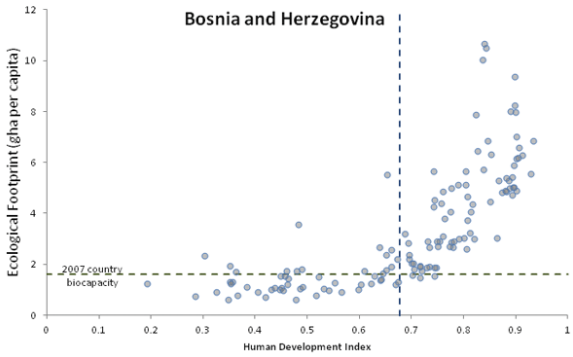
Bosnia and Herzegovina

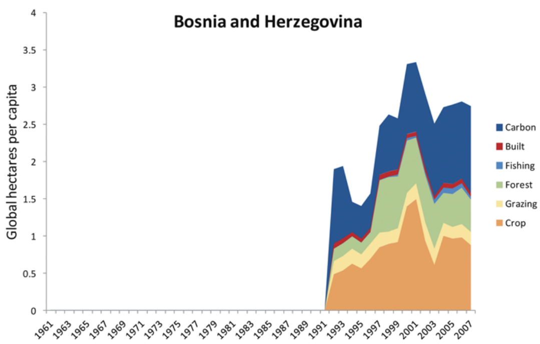






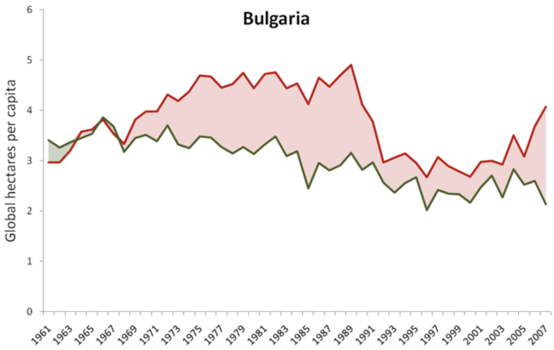


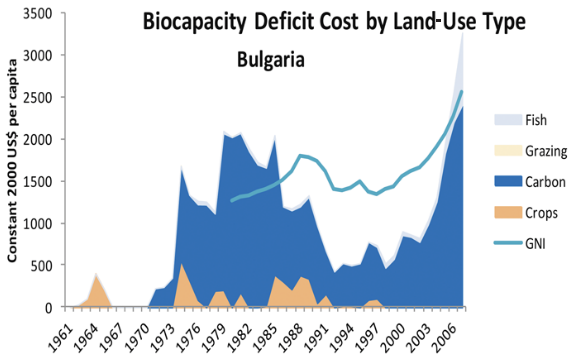


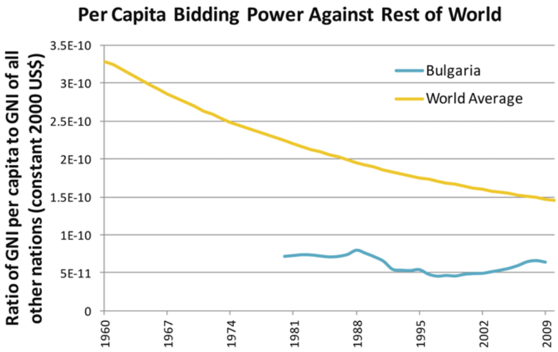


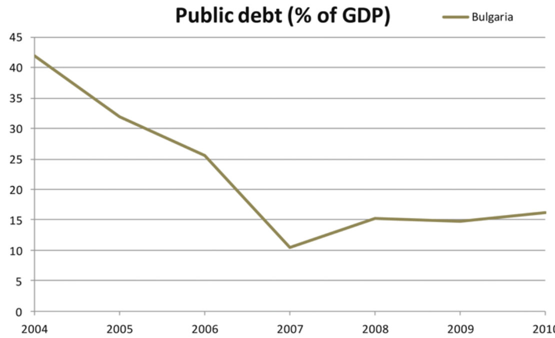
Expenditures as % of GDP (2005)	
Food and non-alcoholic beverages	30.0
Housing, water, electricity, gas and other fuels	14.0
Total	**44.0**

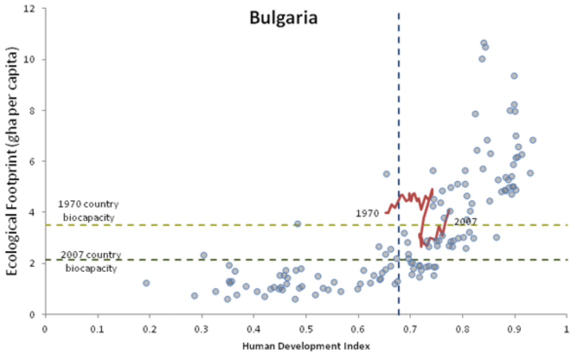
Bulgaria

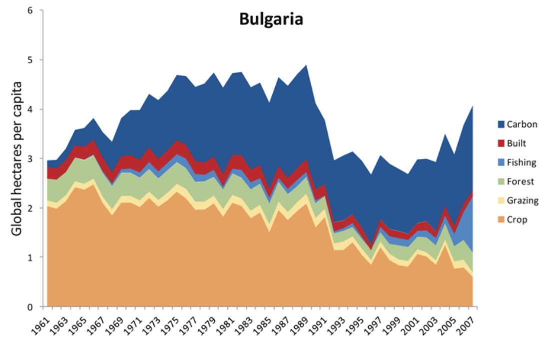






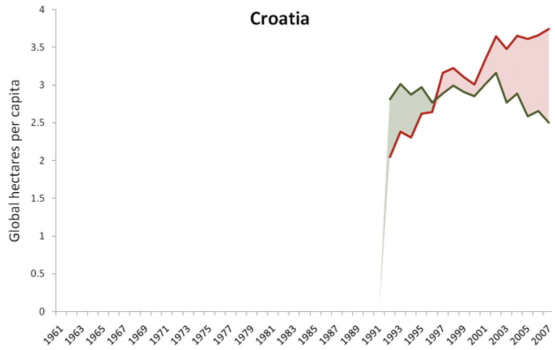


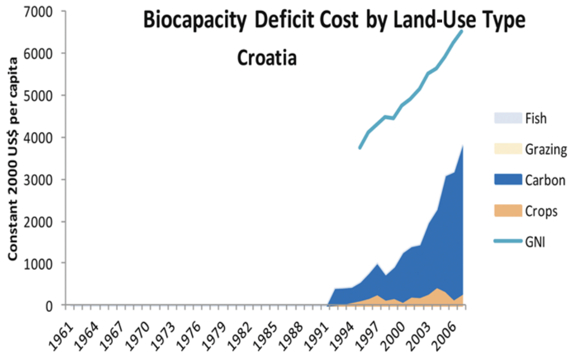


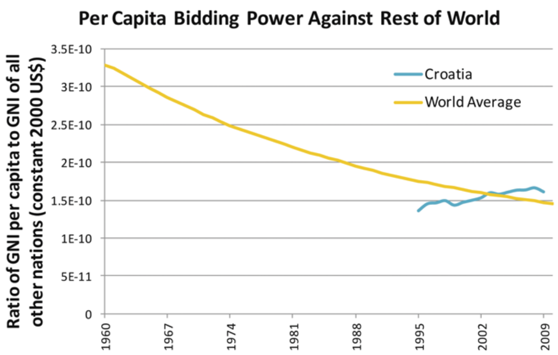


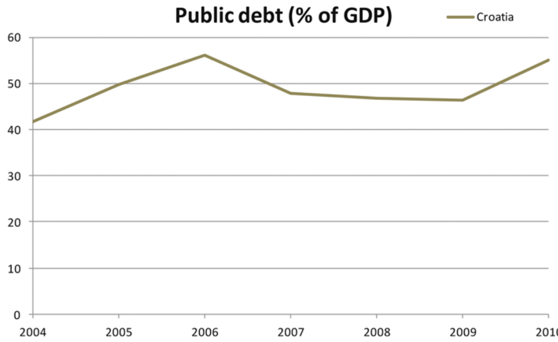
Expenditures as % of GDP (2005)	
Food and non-alcoholic beverages	16.1
Housing, water, electricity, gas and other fuels	14.9
Total	**31.0**

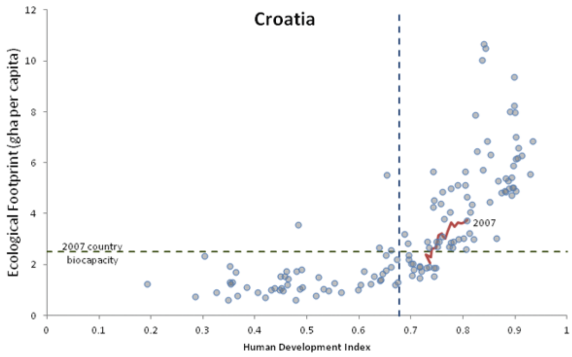
Croatia

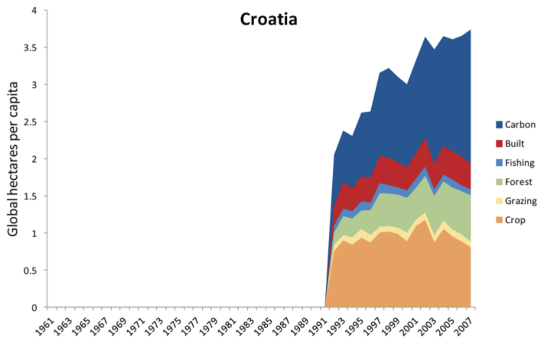






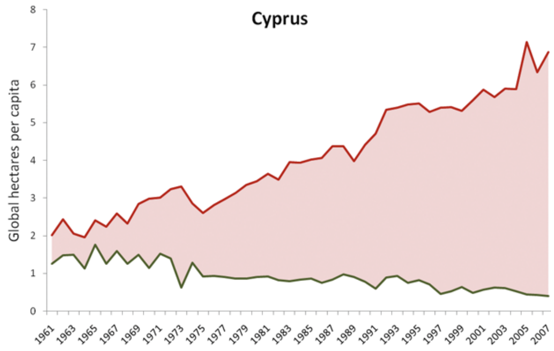


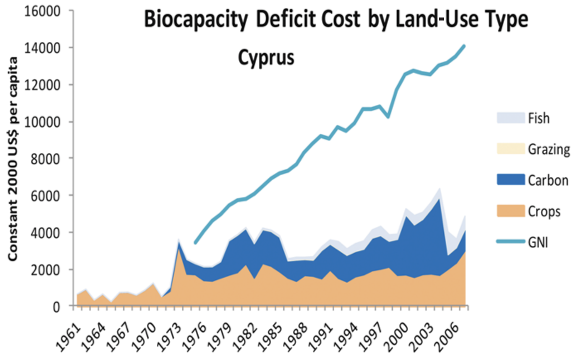


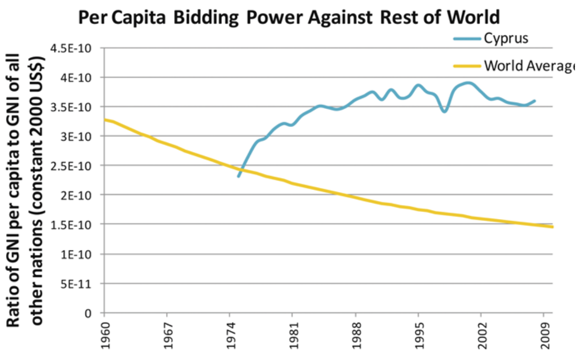


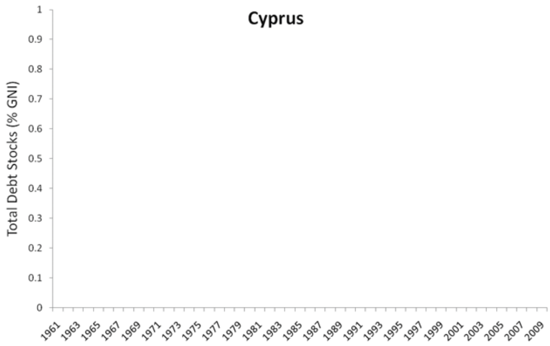
Expenditures as % of GDP (2005)	
Food and non-alcoholic beverages	15.9
Housing, water, electricity, gas and other fuels	12.2
Total	**28.1**

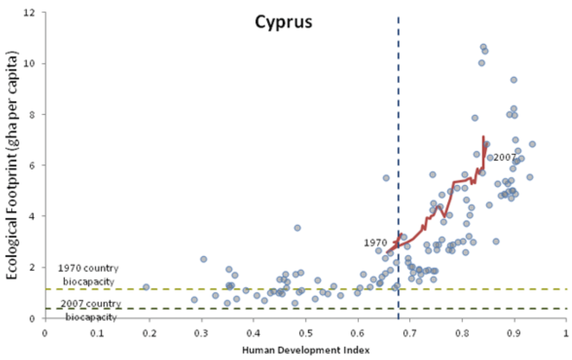
Cyprus

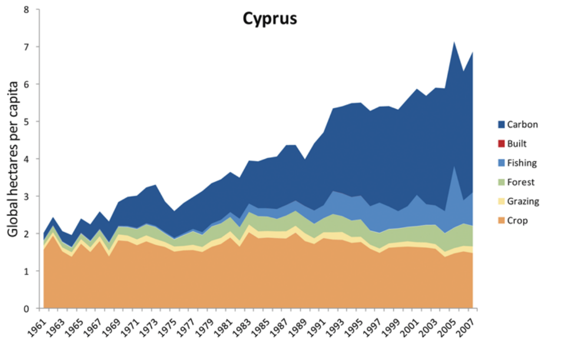






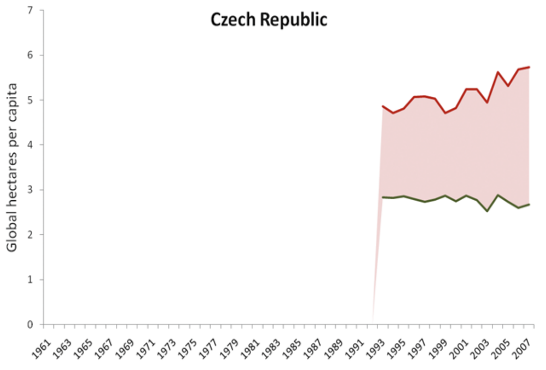


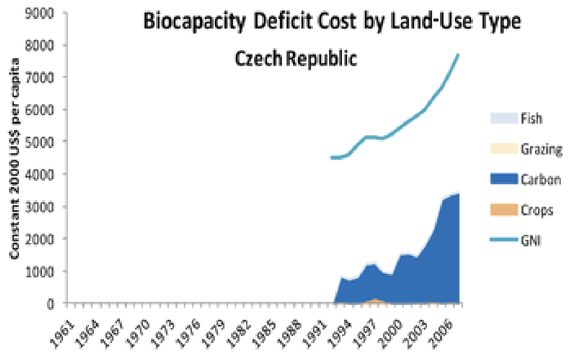


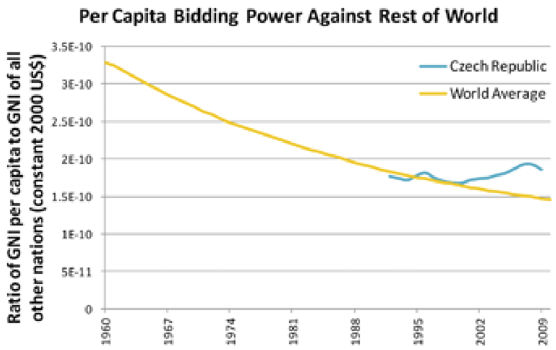


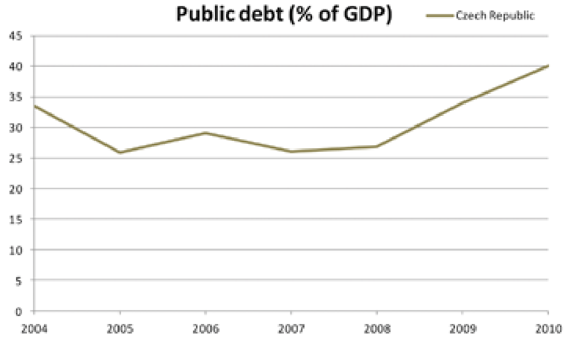
Expenditures as % of GDP (2005)	
Food and non-alcoholic beverages	11.7
Housing, water, electricity, gas and other fuels	11.0
Total	**22.7**

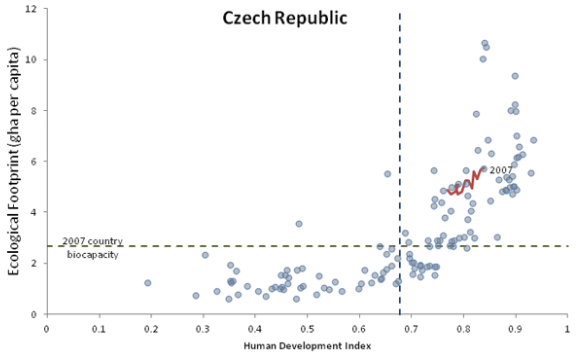
Czech Republic

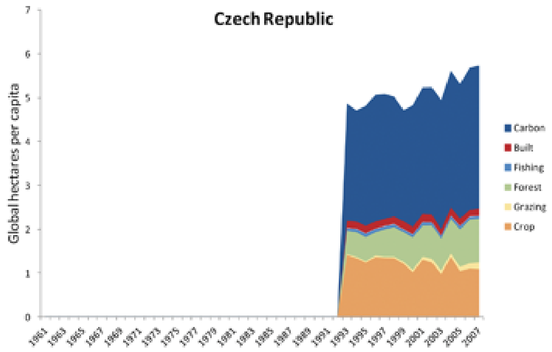






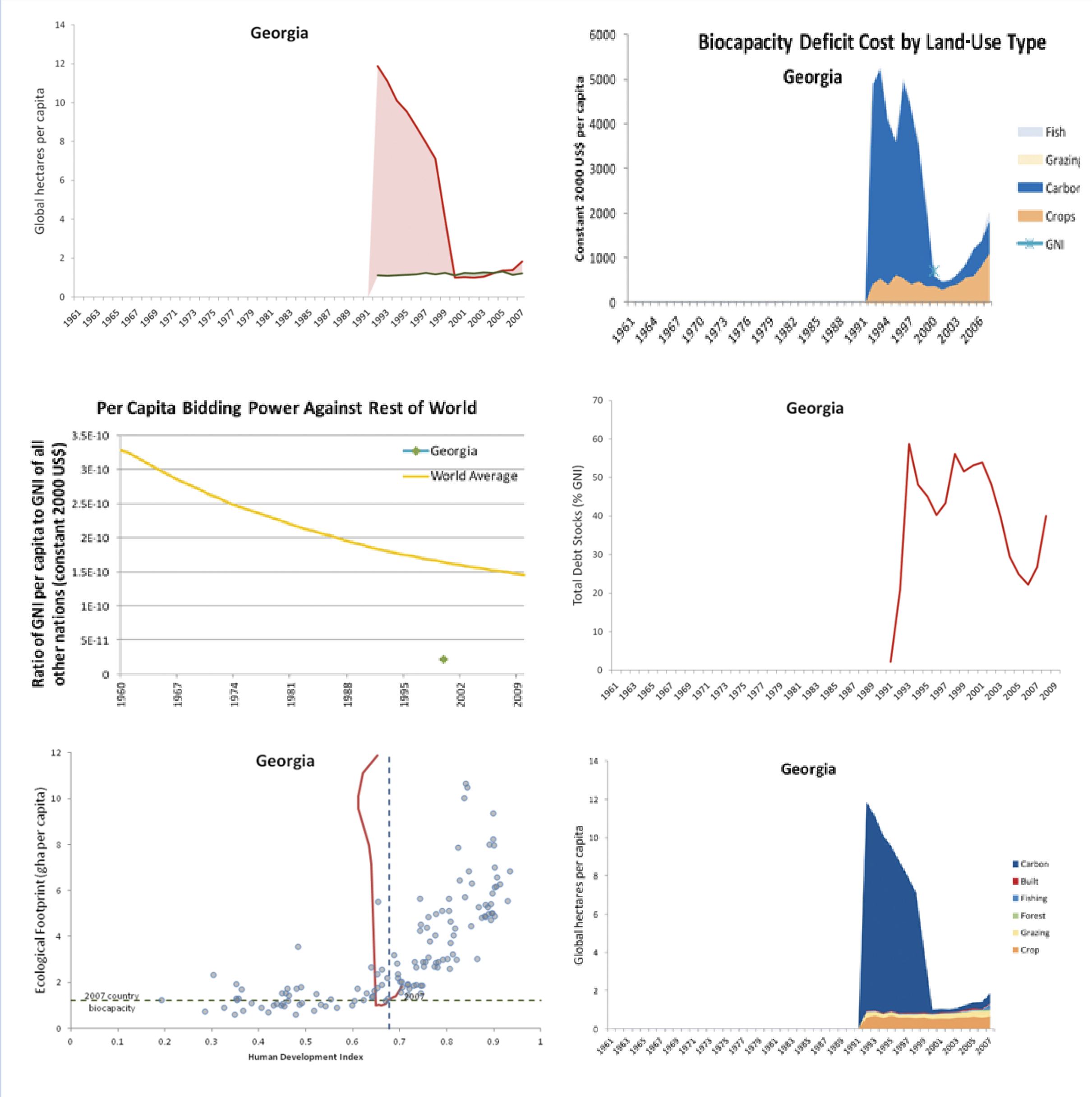






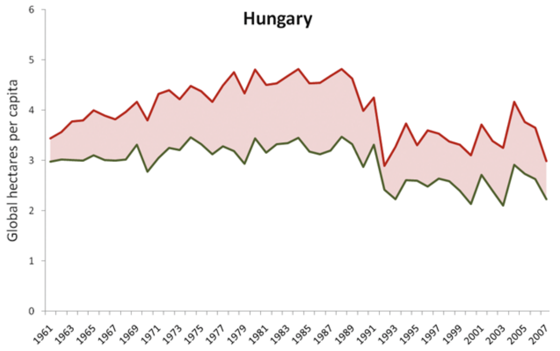
Expenditures as % of GDP (2005)	
Food and non-alcoholic beverages	8.2
Housing, water, electricity, gas and other fuels	11.3
Total	**19.5**

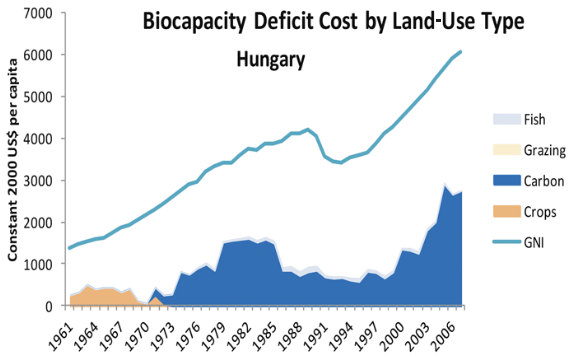
Georgia

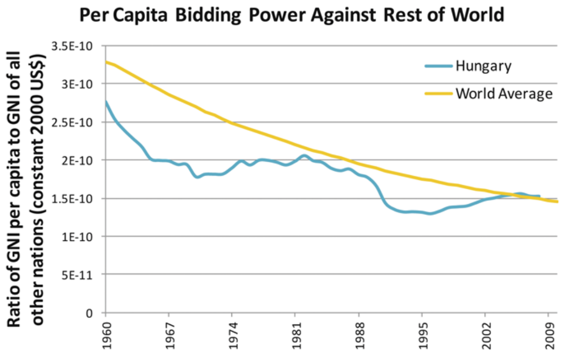


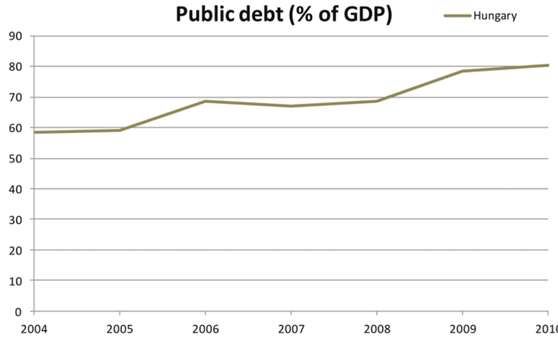
Expenditures as % of GDP (2005)	
Food and non-alcoholic beverages	23.1
Housing, water, electricity, gas and other fuels	8.9
Total	**32.0**

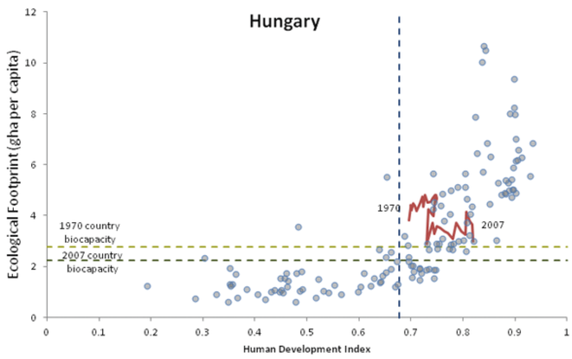
Hungary

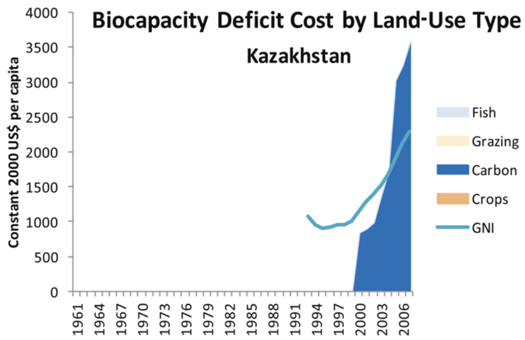






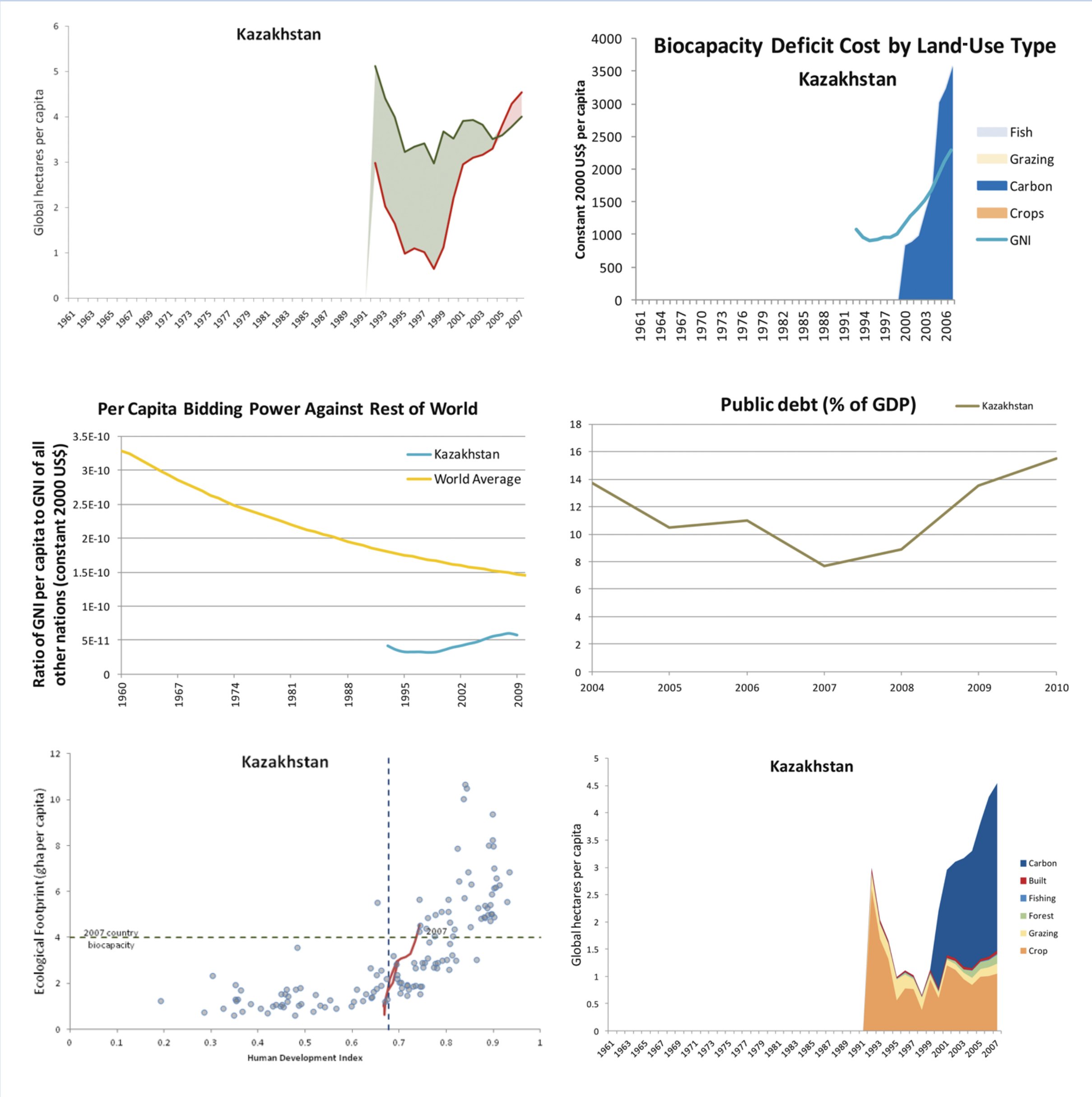






Expenditures as % of GDP (2005)	
Food and non-alcoholic beverages	9.2
Housing, water, electricity, gas and other fuels	10.1
Total	**19.3**

Kazakhstan

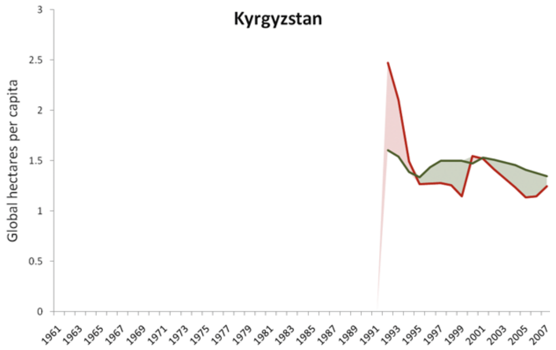


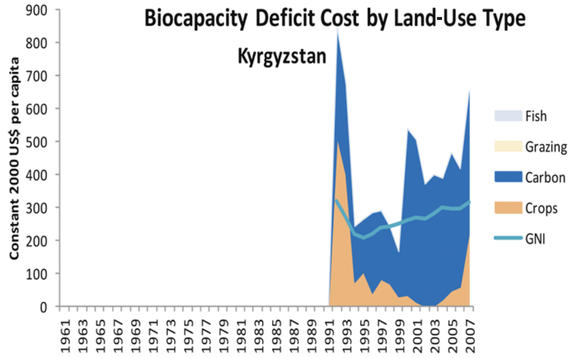
Expenditures as % of GDP (2005)	
Food and non-alcoholic beverages	10.5
Housing, water, electricity, gas and other fuels	14.4
Total	**24.9**

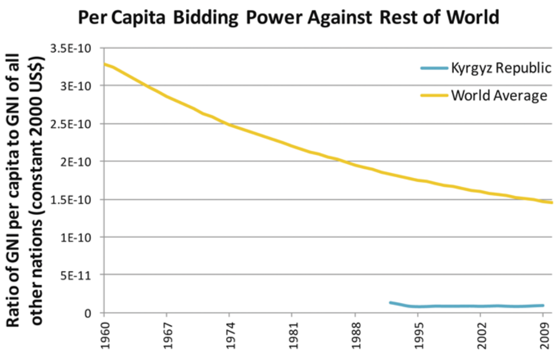
Kosovo*

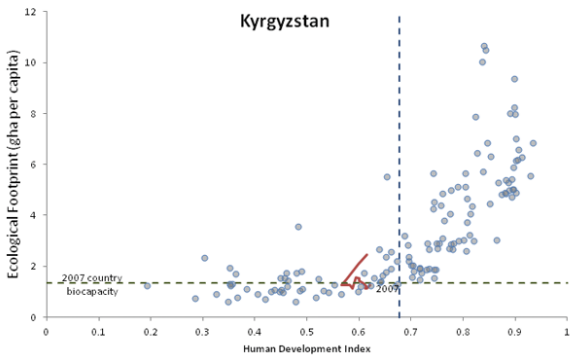
** Disaggregated data for Kosovo are not yet available from most of our data sources.*

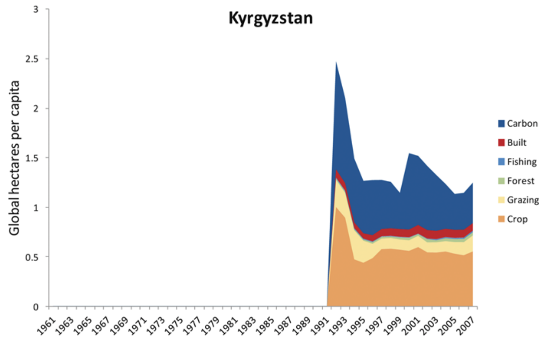
Kyrgyzstan





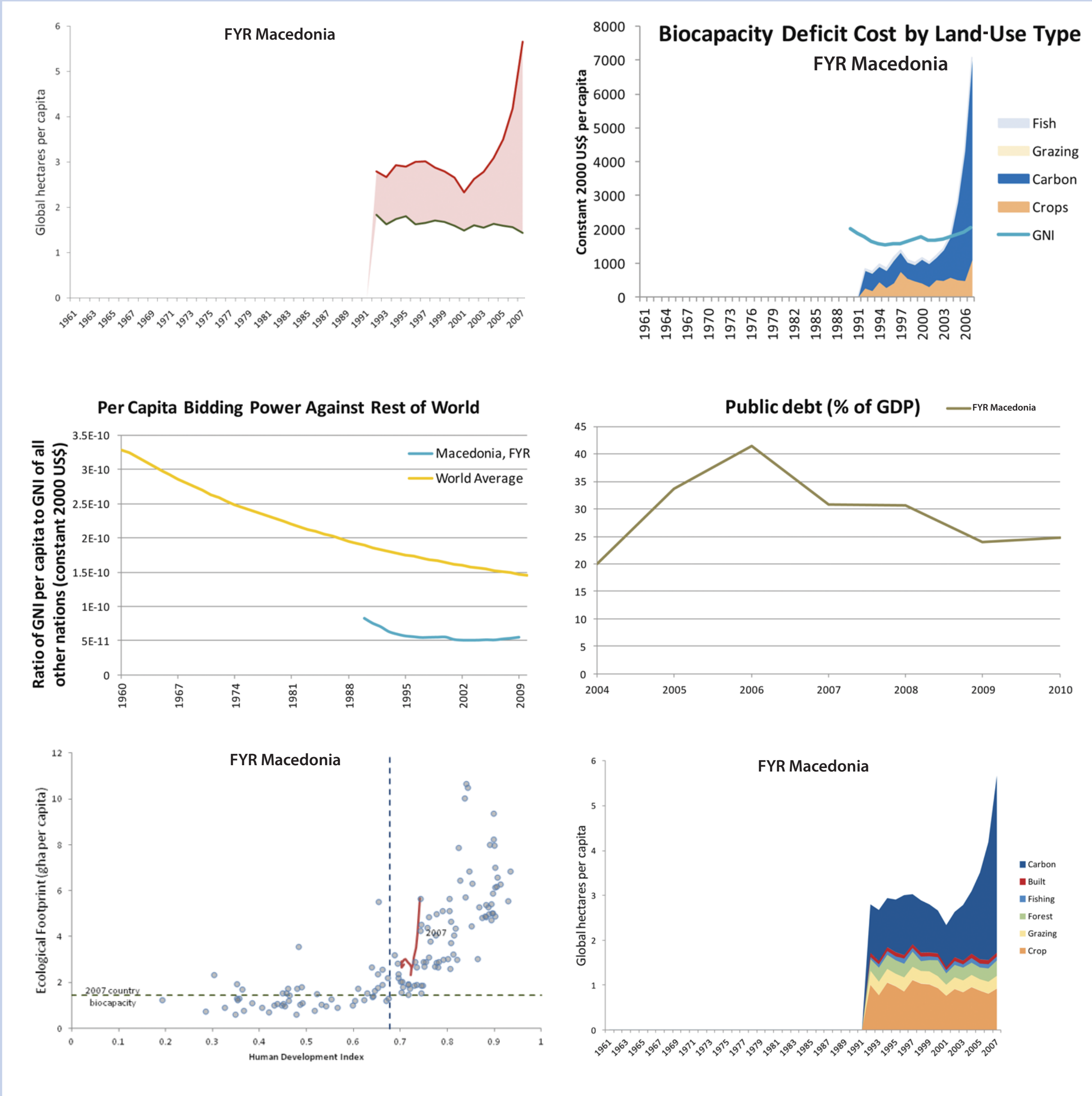






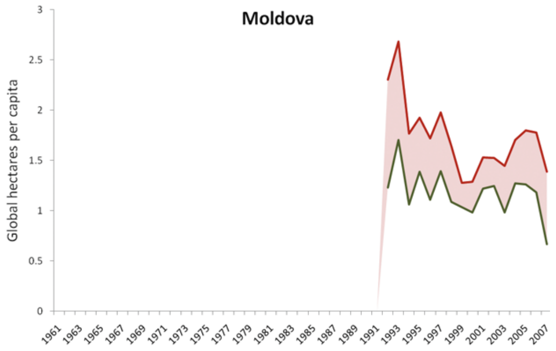
Expenditures as % of GDP (2005)	
Food and non-alcoholic beverages	38.4
Housing, water, electricity, gas and other fuels	6.6
Total	**45.0**

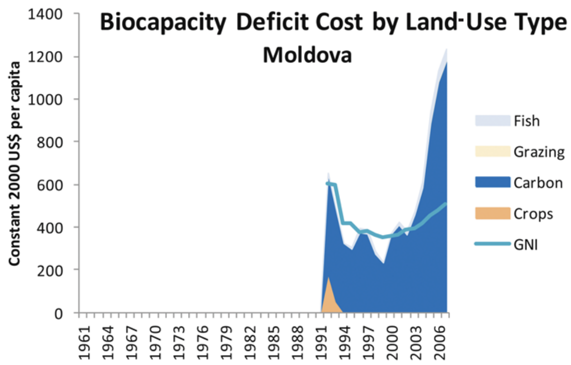
the former Yugoslav Republic of Macedonia

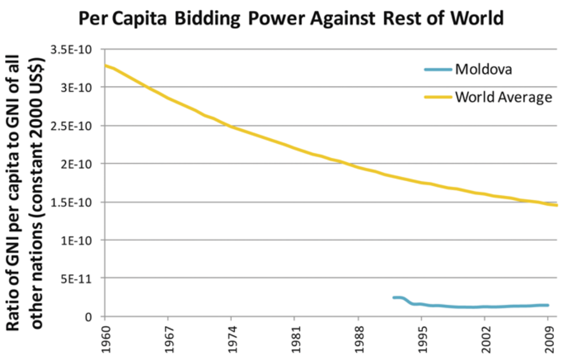


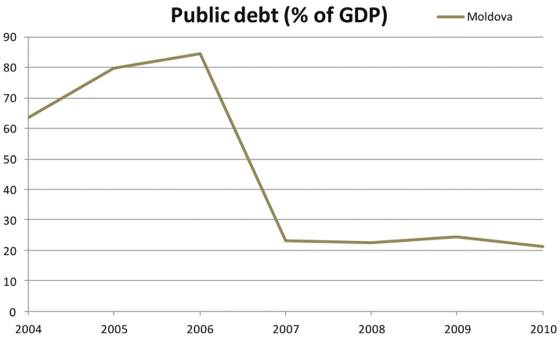
Expenditures as % of GDP (2005)	
Food and non-alcoholic beverages	26.2
Housing, water, electricity, gas and other fuels	15.2
Total	**41.4**

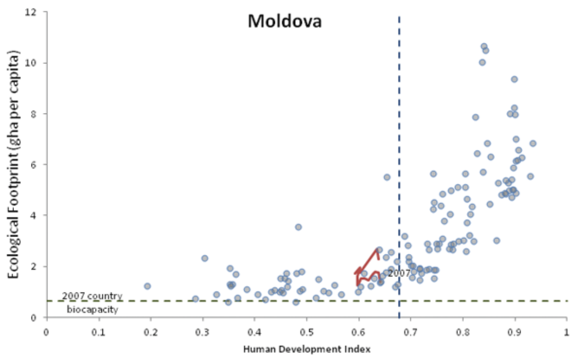
Moldova

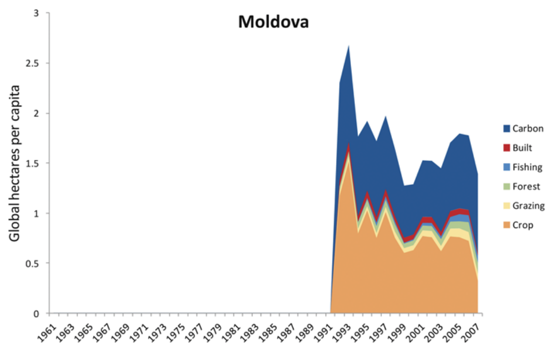






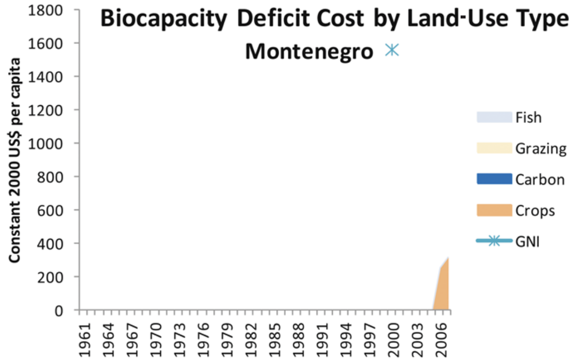


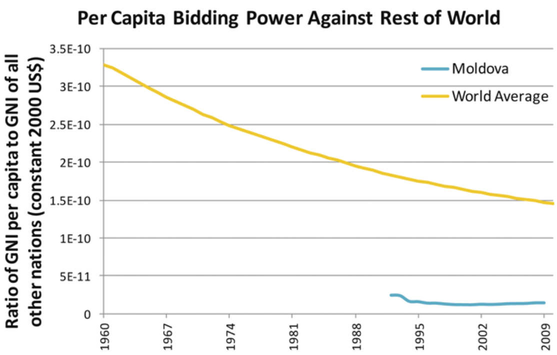


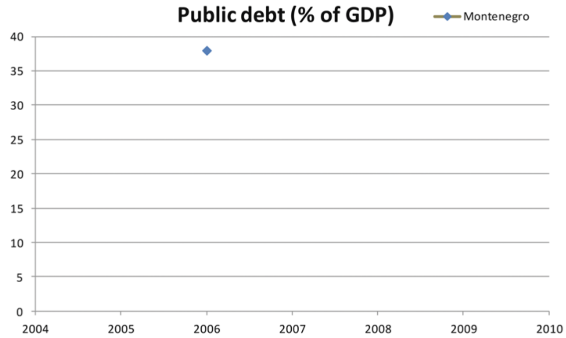


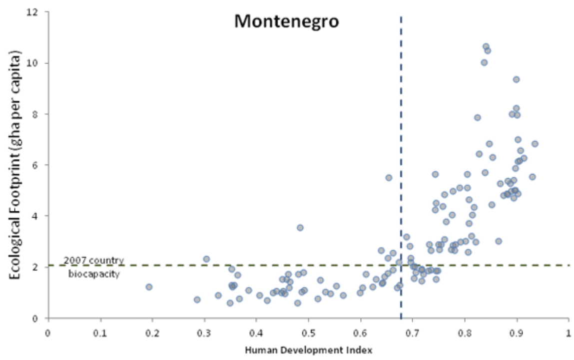
Expenditures as % of GDP (2005)	
Food and non-alcoholic beverages	24.5
Housing, water, electricity, gas and other fuels	15.5
Total	**40.0**

Montenegro



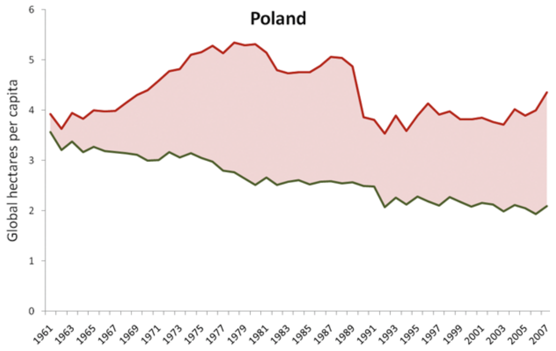


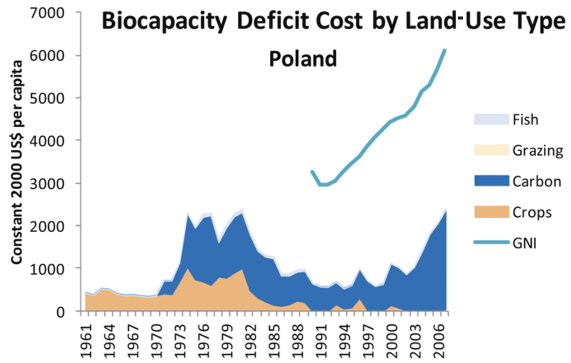


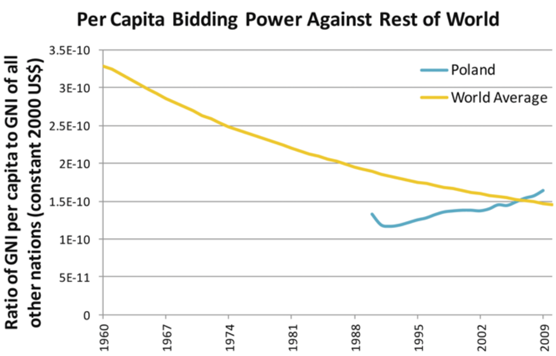


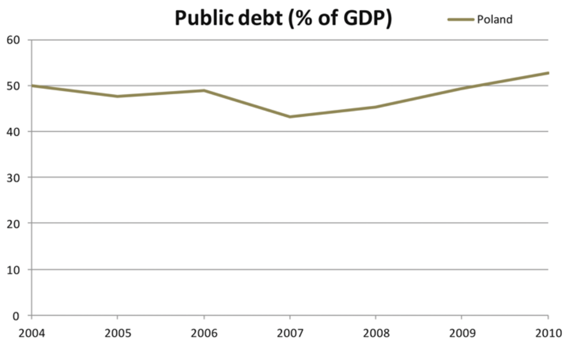
Expenditures as % of GDP (2005)	
Food and non-alcoholic beverages	25.1
Housing, water, electricity, gas and other fuels	18.0
Total	**43.1**

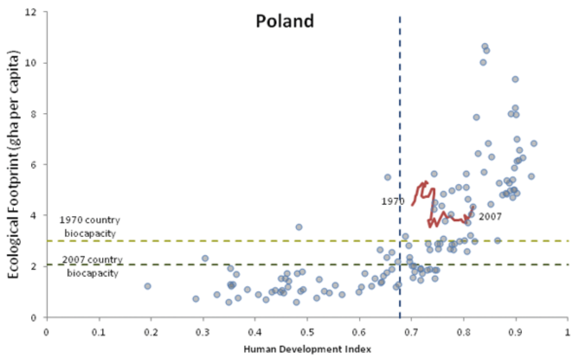
Poland

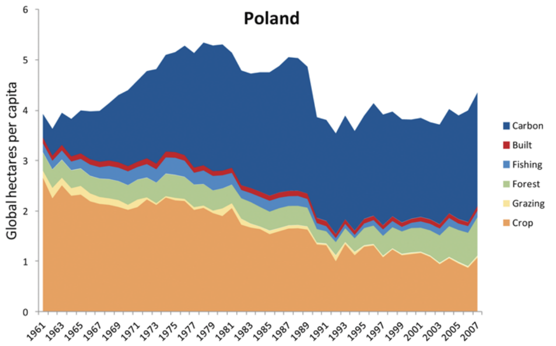






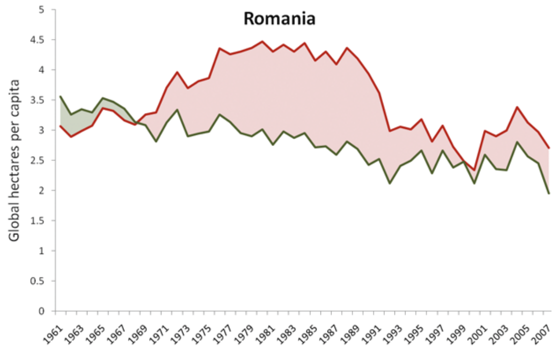


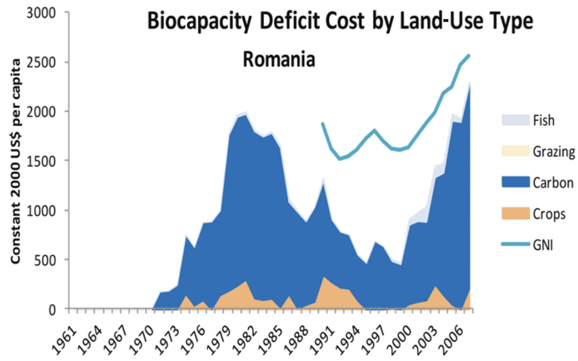


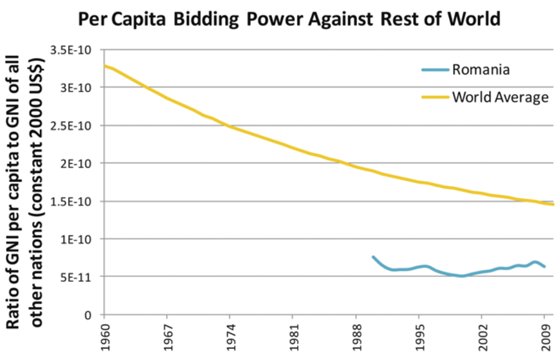


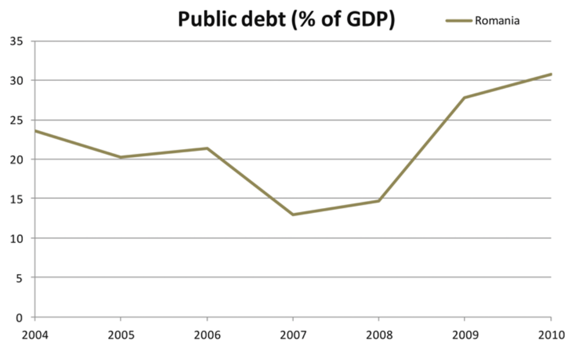
Expenditures as % of GDP (2005)	
Food and non-alcoholic beverages	13.1
Housing, water, electricity, gas and other fuels	14.8
Total	**27.9**

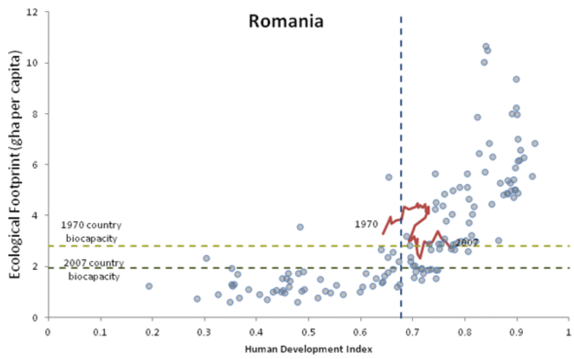
Romania

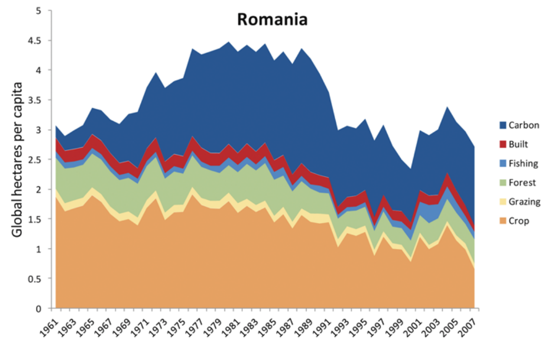






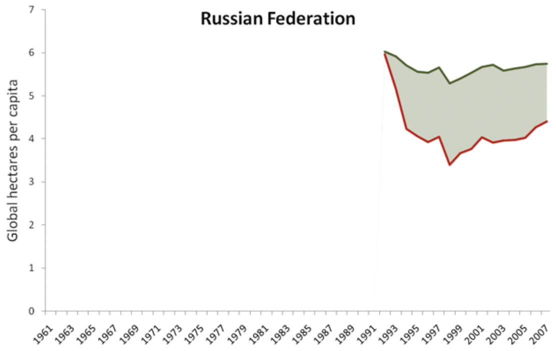


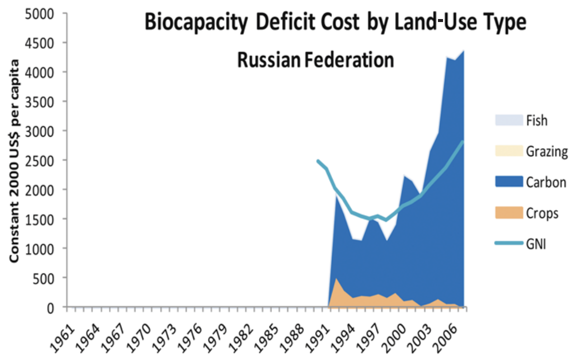


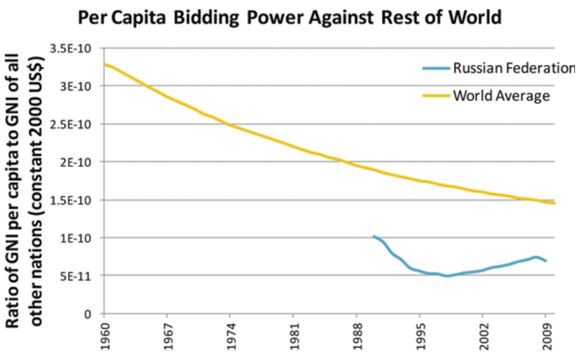


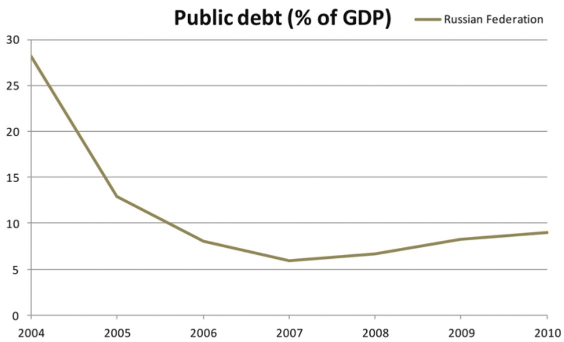
Expenditures as % of GDP (2005)	
Food and non-alcoholic beverages	19.7
Housing, water, electricity, gas and other fuels	15.6
Total	**35.3**

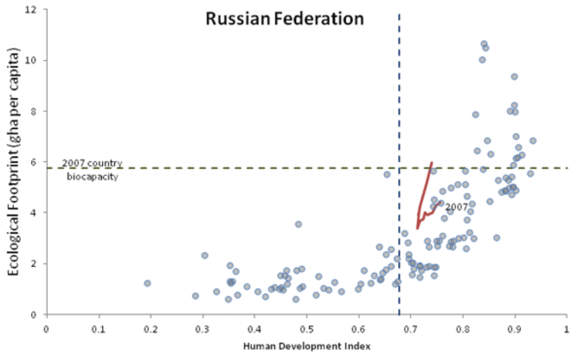
Russian Federation

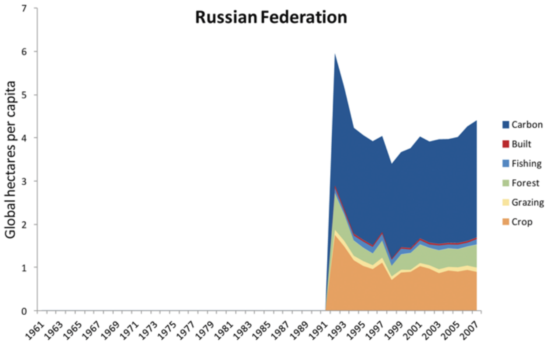






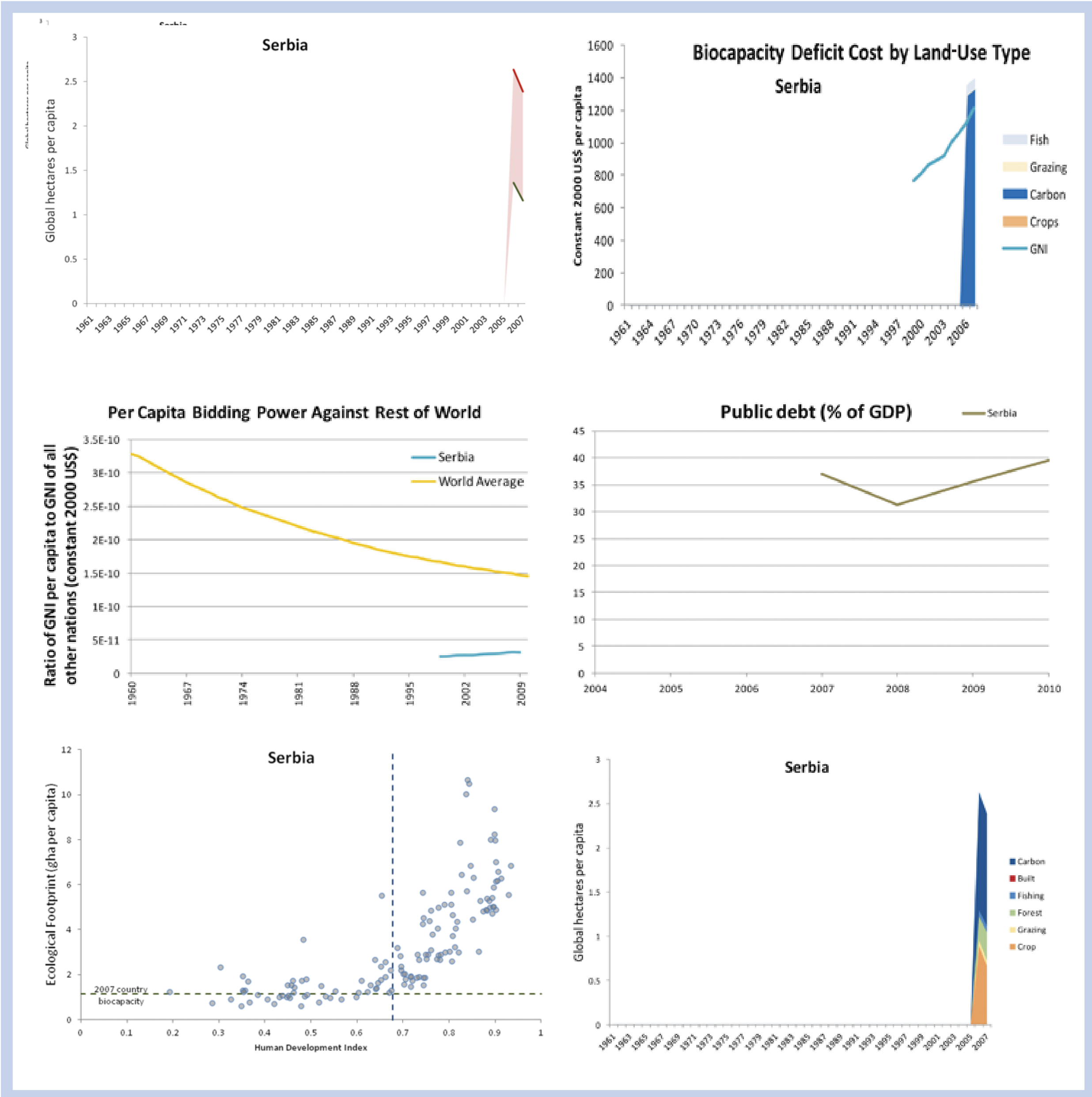






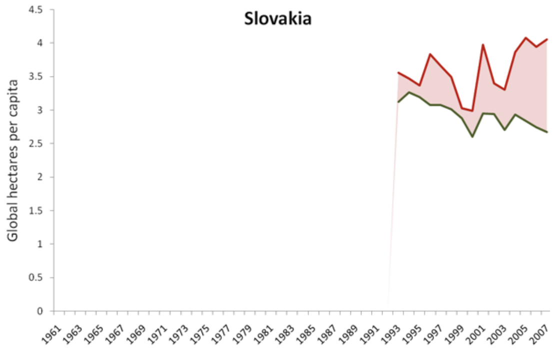
Expenditures as % of GDP (2005)	
Food and non-alcoholic beverages	14.3
Housing, water, electricity, gas and other fuels	5.4
Total	**19.7**

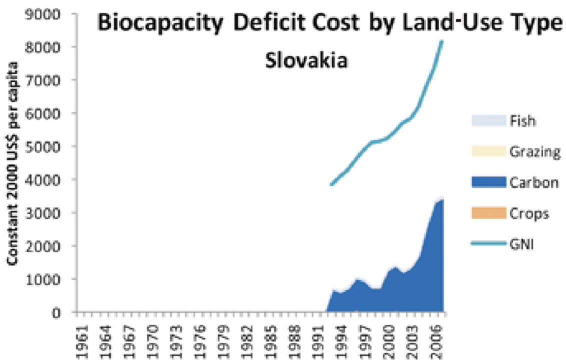
Serbia

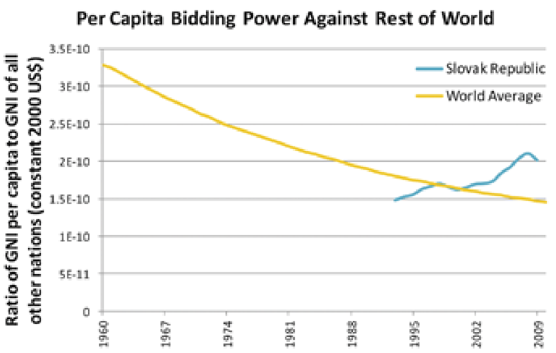


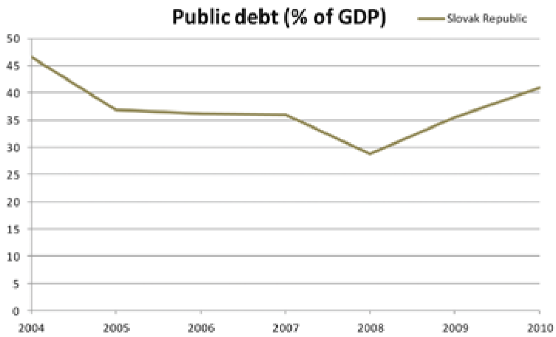
Expenditures as % of GDP (2005)	
Food and non-alcoholic beverages	20.8
Housing, water, electricity, gas and other fuels	17.4
Total	**38.2**

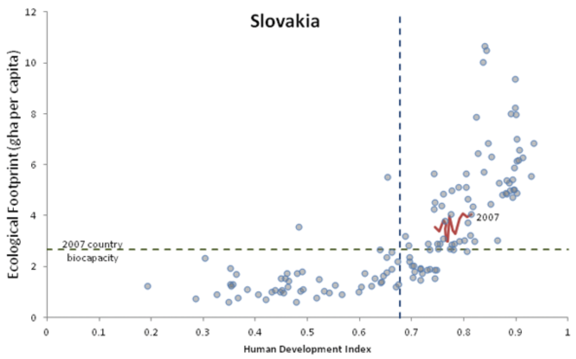
Slovak Republic

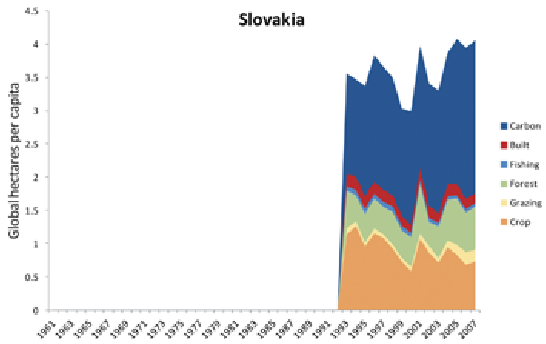






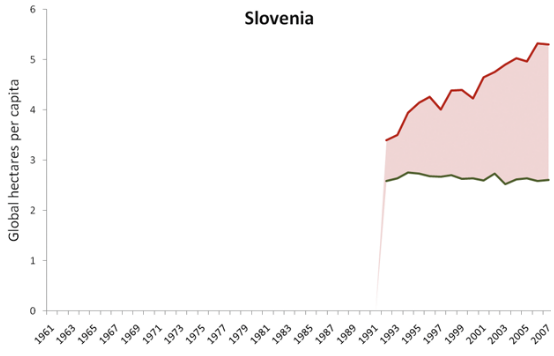


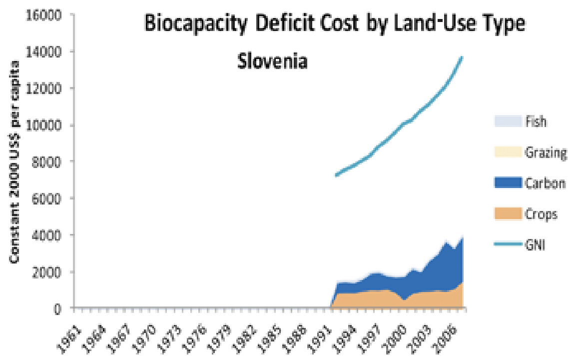


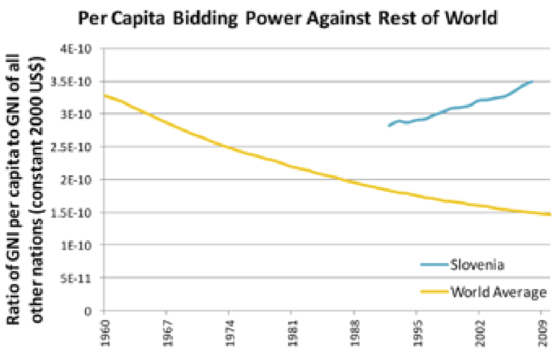


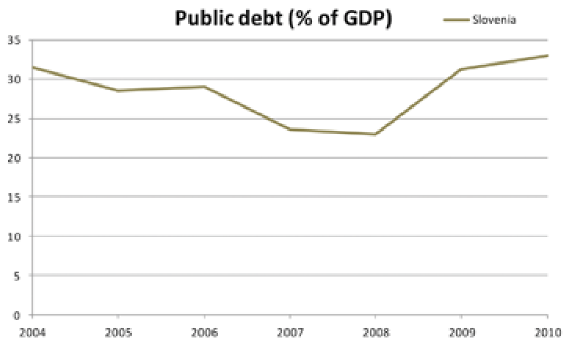
Expenditures as % of GDP (2005)	
Food and non-alcoholic beverages	10.2
Housing, water, electricity, gas and other fuels	14.5
Total	**24.7**

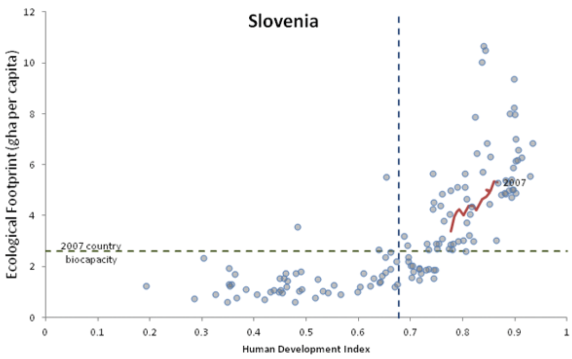
Slovenia

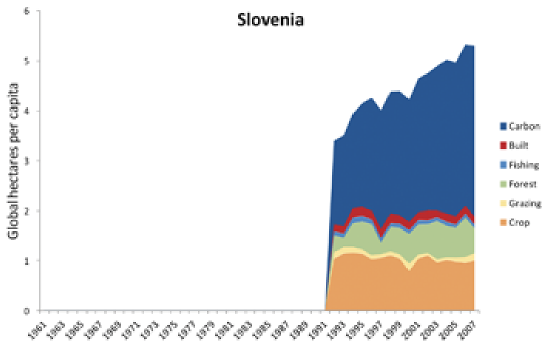






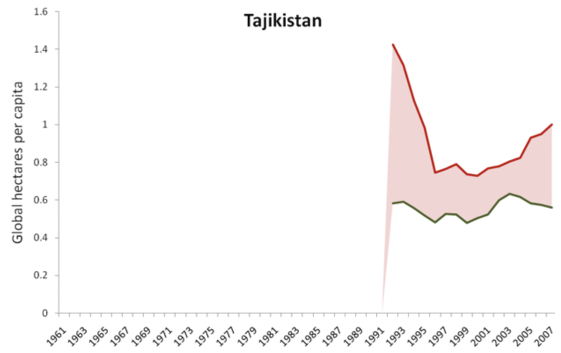


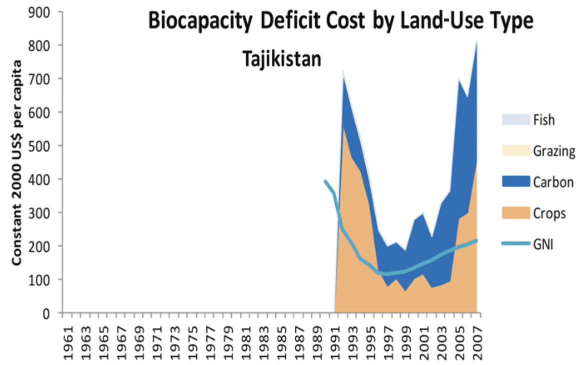


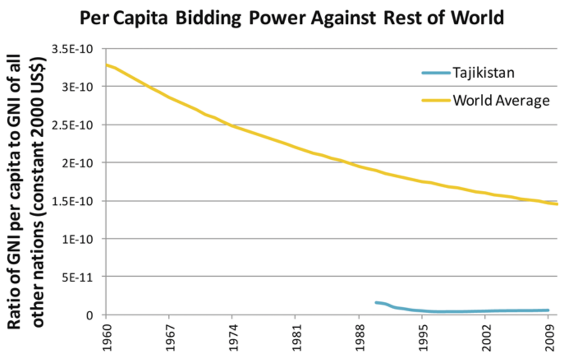


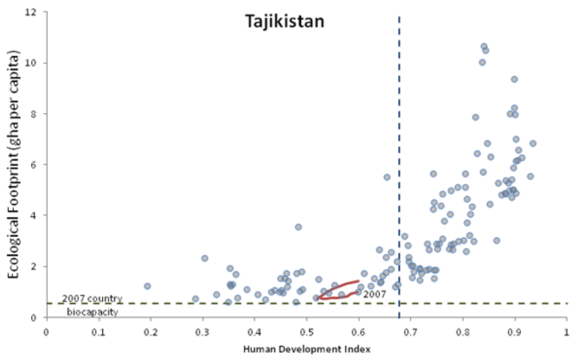
Expenditures as % of GDP (2005)	
Food and non-alcoholic beverages	8.2
Housing, water, electricity, gas and other fuels	10.7
Total	**18.9**

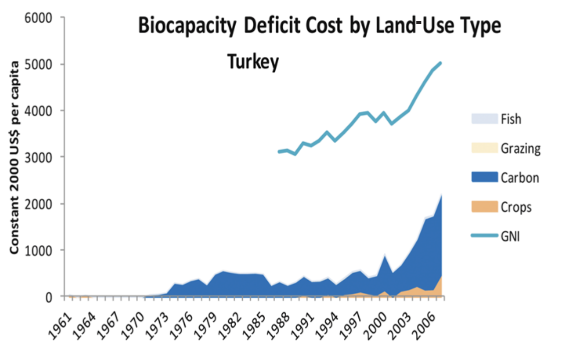
Tajikistan





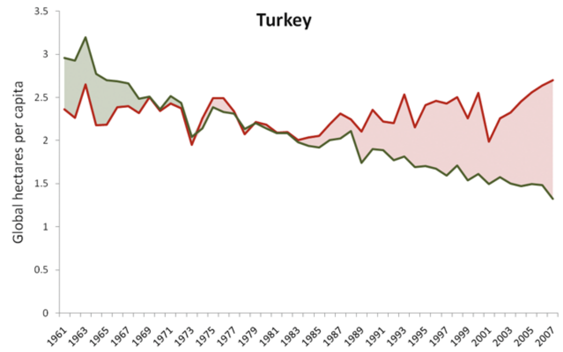


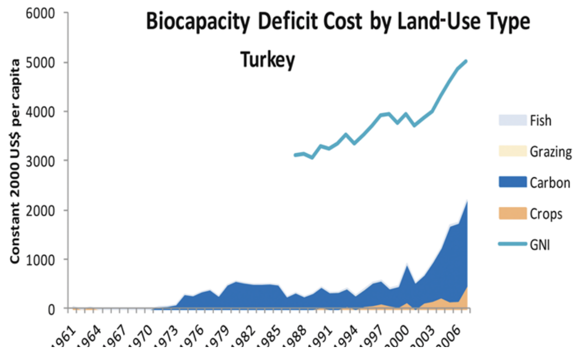


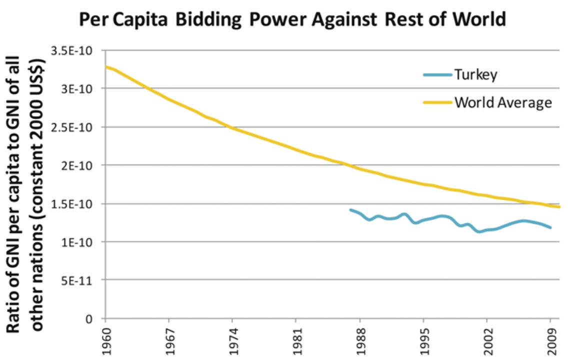


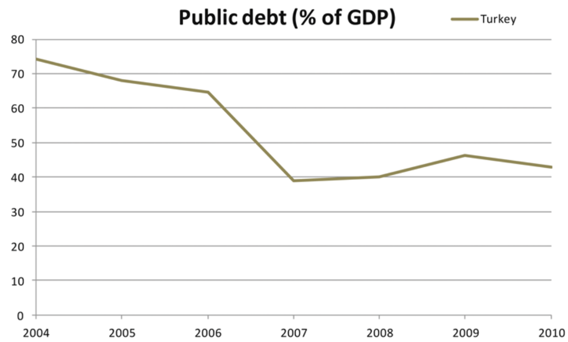
Expenditures as % of GDP (2005)	
Food and non-alcoholic beverages	45.8
Housing, water, electricity, gas and other fuels	8.5
Total	**54.3**

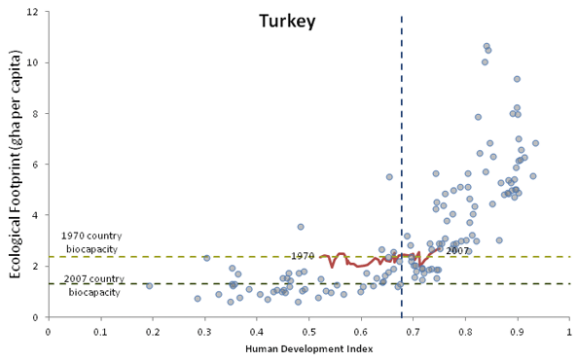
Turkey

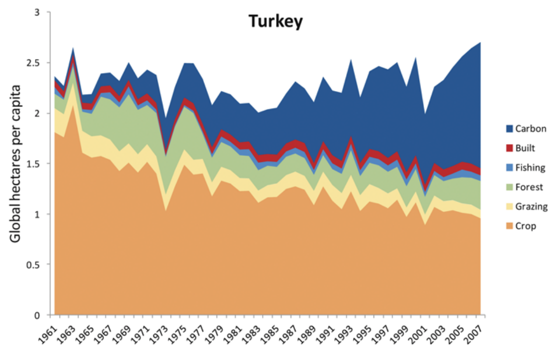






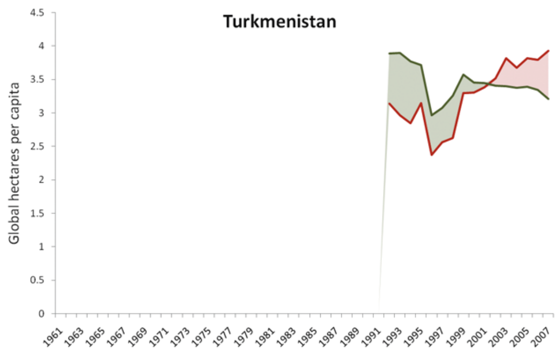


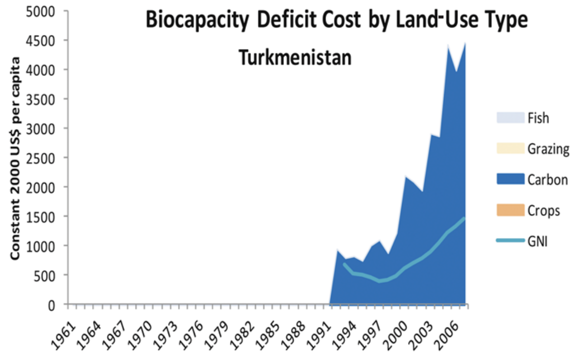


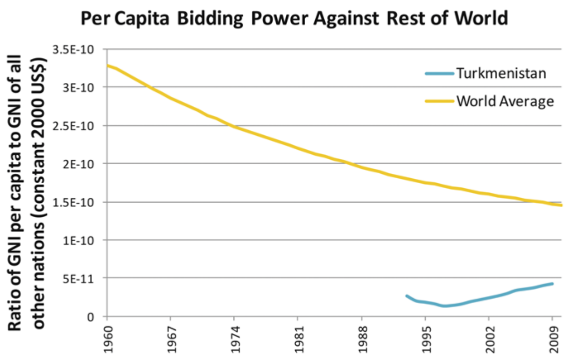


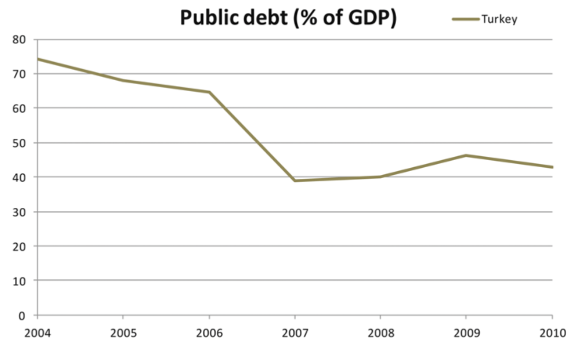
Expenditures as % of GDP (2005)	
Food and non-alcoholic beverages	17.0
Housing, water, electricity, gas and other fuels	17.7
Total	**34.7**

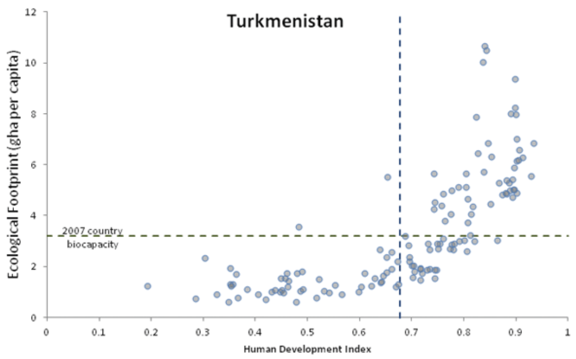
Turkmenistan

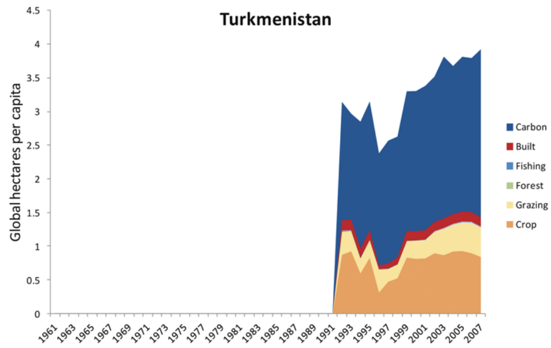








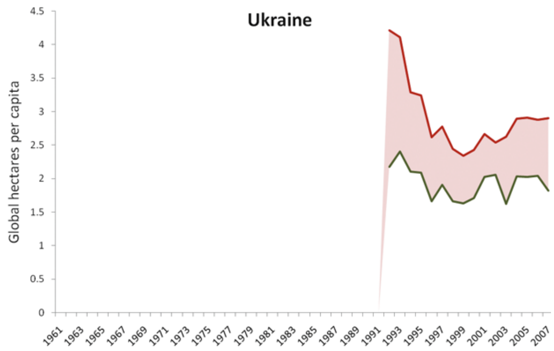


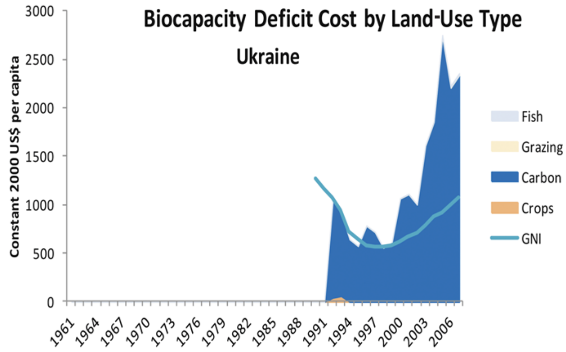


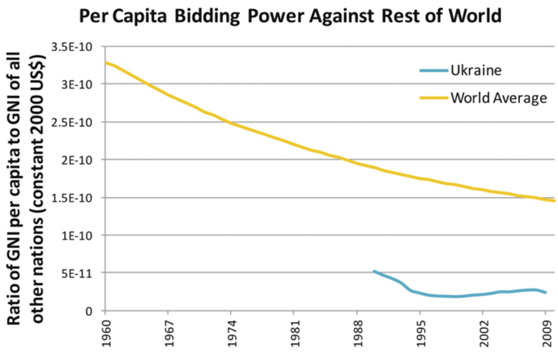
Expenditures as % of GDP (2005)	
Food and non-alcoholic beverages	---
Housing, water, electricity, gas and other fuels	---
Total	---

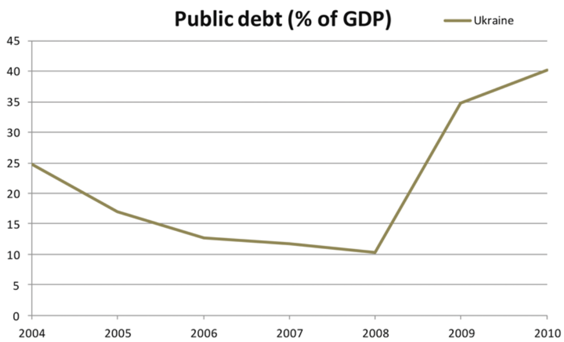
--- Not available

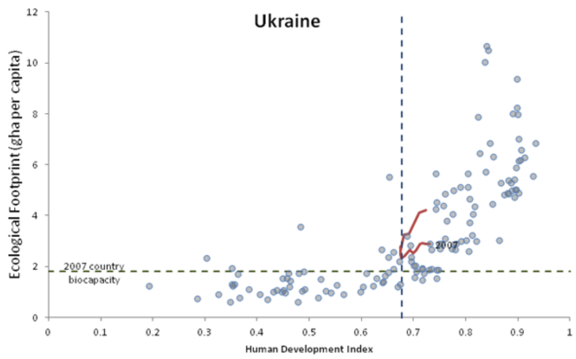
Ukraine

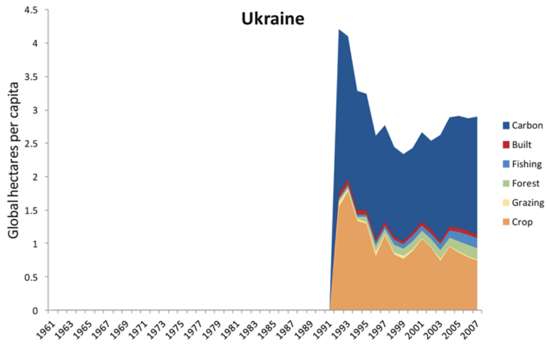






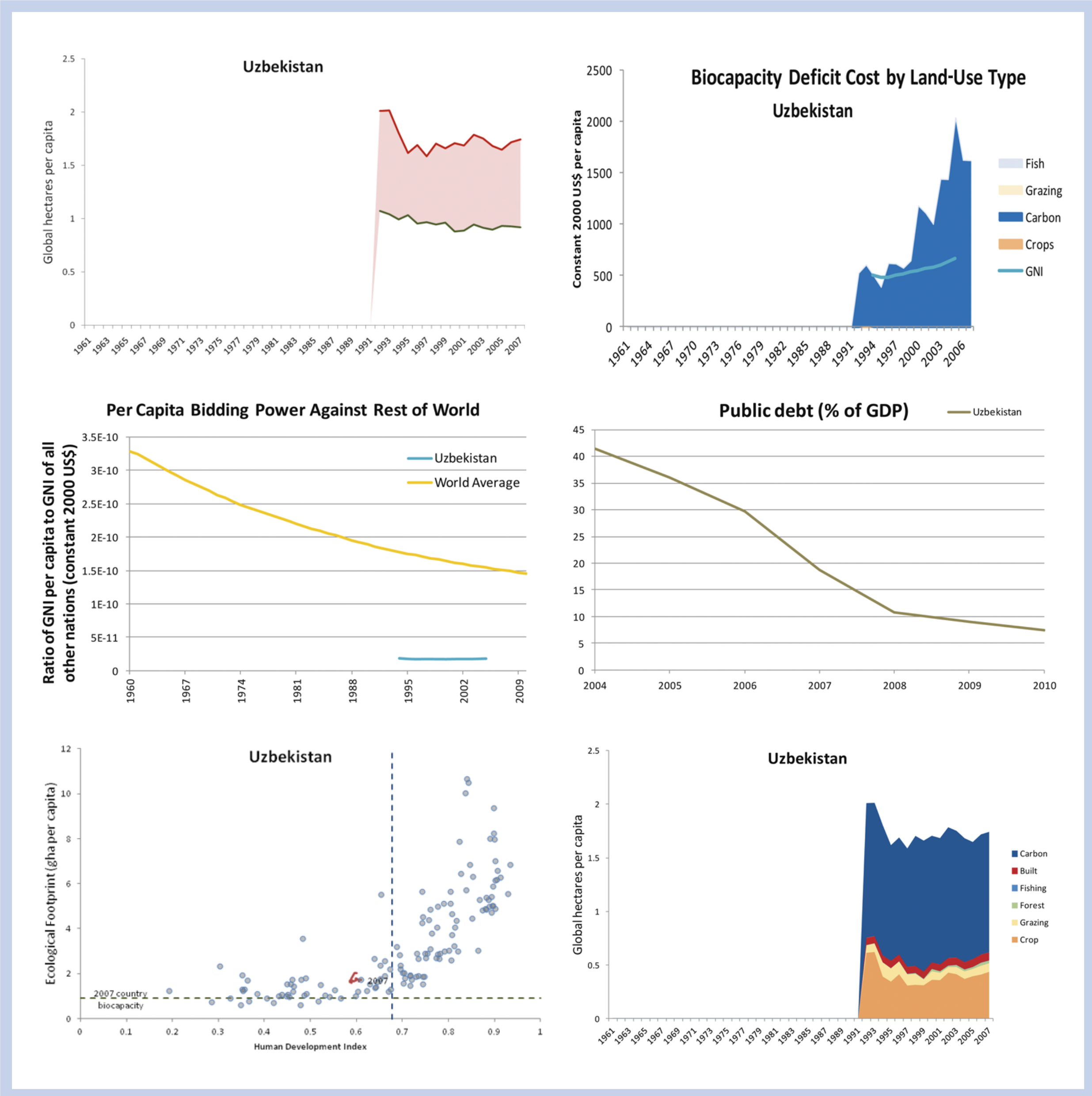






Expenditures as % of GDP (2005)	
Food and non-alcoholic beverages	22.4
Housing, water, electricity, gas and other fuels	6.2
Total	**28.6**

Uzbekistan



Expenditures as % of GDP (2005)	
Food and non-alcoholic beverages	---
Housing, water, electricity, gas and other fuels	---
Total	---

--- Not available

While data underlying these assessments may be of uneven quality, the trends show that for most countries in the region, resource issues are a significant economic factor. While many countries were able to generate modest human development advances, it has come at marked resource cost.

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Glossary

Assets: Capital that is either owned or able to be used in production, whether natural, manufactured, or human.

Biocapacity: The ability of natural assets to regenerate ecological services. In current Footprint accounts, this includes provision of resources, use of productive area for housing and other infrastructure, and sequestration of carbon dioxide from fossil fuel use.

Biocapacity deficit: The gap between demand on biocapacity and supply of biocapacity (the opposite is a biocapacity reserve). A nation's biocapacity deficit would be the gap between the demand of their residents (for final consumption) and the availability of biocapacity within that nation.

Competitiveness: The ability of a country to maintain its prosperity and secure prosperity.

Debt: The cumulative deficit over time.

Deficit: The gap between the demand of resources and the amount obtained.

Ecological Footprint: human demand on biocapacity.

Endowments: The initial assets available within a country, prior to exploitation. The underlying fertility of a region due to its intrinsic environmental setting can be considered an endowment, even if the region no longer supports production due to mismanagement.

Growth: An increase in the monetary output of a country's economic system over time (as measured by GDP).

National self-interest: Societal activities that will maximize citizens' utility.

Prosperity: The long-term achievement of, or uninterrupted progression towards, goals of national self-interest.

Risk, or Sovereign Risk: The probability for large decreases in the performance of national economies (including loss of prosperity).

Wealth: The absolute abundance of assets across all dimensions: including human capital (skills and time), manufactured capital (factories, houses, machines), cultural capital (knowledge, trust, democracy), natural capital, financial capital (rights to former forms of capital).