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REPORT

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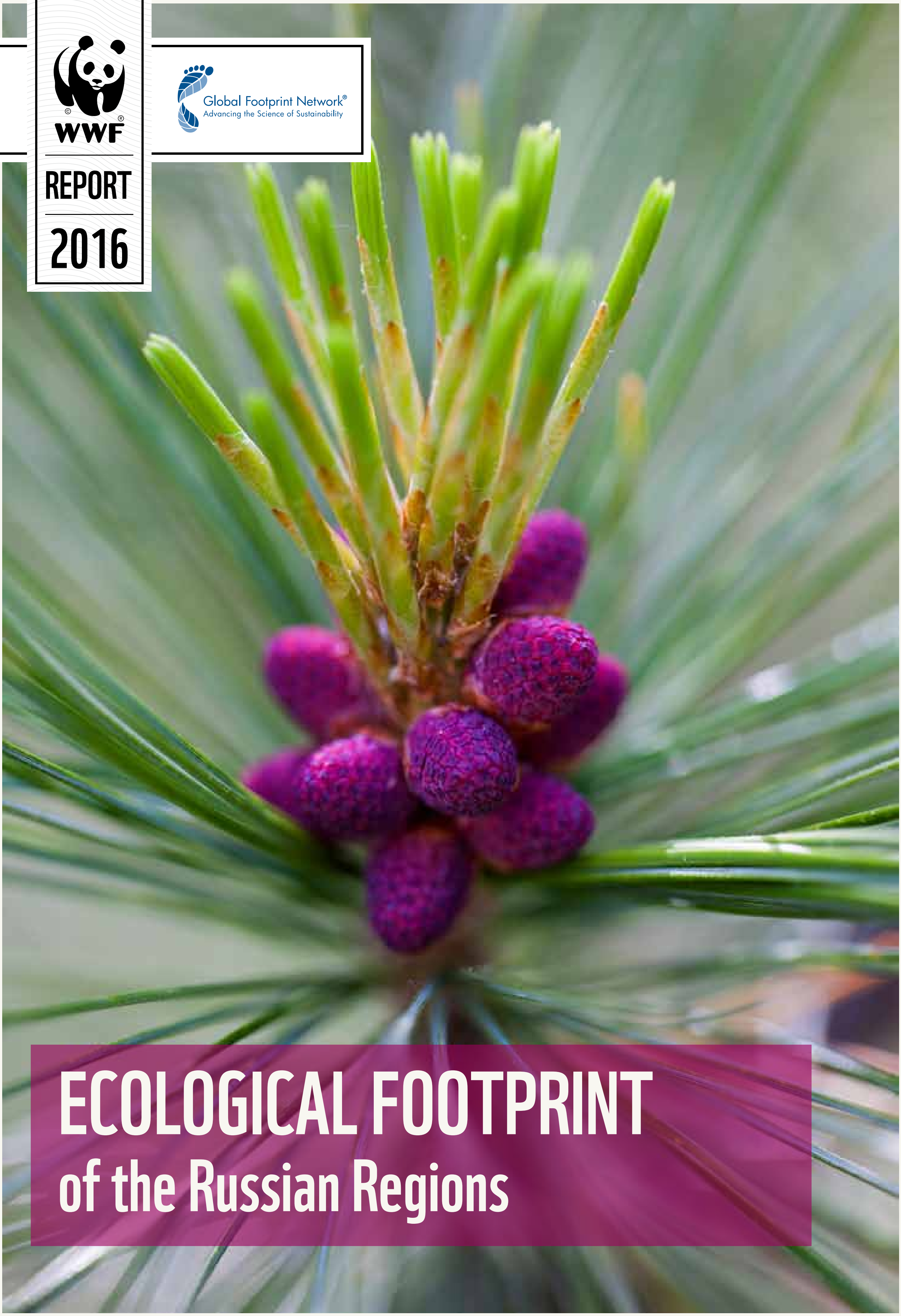

ECOLOGICAL FOOTPRINT
of the Russian Regions

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Moscow
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УДК 504(470-3)(042.3)
ББК 20.1
Э40

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Э40 **Ecological Footprint of the Russian Regions – 2016** / edited Pavel A. Boev and Dmitry L. Burenko — WWF-Russia. — Moscow, 2016. 112 pages

ISBN 978-5-906599-28-5

The report jointly designed by WWF-Russia and the Global Footprint Network contains data on the Ecological Footprint and Biocapacity of the Russian Federation. The report makes it possible to assess the sustainability of regional development and provides authorities and business leader with a toolkit to evaluate the effectiveness of sustainable development. This study also examines the possibilities of using biocapacity and Ecological Footprint indicators to assess the investment attractiveness of regions and sectors of the Russian economy. The project is the first attempt to apply Footprint methodology at the regional level in Russia.

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FOREWORD

One of WWF's goals in Russia and globally is reducing the negative impacts of human activity – our Ecological Footprint. A crucial first step towards this goal is regular measuring demand on and supply of our country's natural capital.

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This Report explicitly shows that Russia has vast biocapacity reserves. Not only does Russia satisfy its population's demand for resources, but it also serves as a global resource donor. Russia is among the world's top 4 biocapacity–rich countries – along with Brazil, China and the USA. A substantial part of Russian ecological reserves (60%) is made up of forests, including unique forest ecosystems of the Russian Far East.

It does not mean, however, that we can squander our natural capital. Russia's Ecological Footprint exceeds the world average. Greater effort is required to preserve our country's unique ecosystems: we need to introduce more effective methods of preserving endangered species, to expand and improve our national protected areas system, and to reduce human demand on our renewable biological resources – Russia's forests and seas.

Effective management of ecological reserves poses difficult questions. When does increased use of renewable resources result in a boost for a region's economic growth and its population's prosperity? At which point does production become economically inviable and environmentally unsustainable? Which regions employ sustainable resource management techniques and where economy is far from being resource-efficient? It is hardly possible to answer these questions without evaluating current resource management practices.

In an effort to address the task, WWF is releasing the second Russia Footprint Report. It assesses Russian Federal Subjects' demand on ecological reserves (their Ecological Footprint) and compares it with available ecological assets (the regions' biocapacity). For the first time biocapacity and Ecological Footprint for Russia's Federal Subjects were calculated in 2014. The present Report will make it possible to track the key changes and trends over time. Biocapacity and Ecological Footprint data will help each Federal Subject better understand their resource situation and devise effective strategies to enhance economic prosperity without degrading local ecosystems and to ensure sustainable development for this and future generations.

Today Russia is well positioned to preserve its vast ecological capital and at the same time retain welfare and high human development. However, this can only become possible if a long-term strategy is developed balancing economic growth and social welfare with environmental protection.

Igor Chestin

CEO, WWF-Russia

DEFINITIONS

BIOCAPACITY

Biological capacity represents a region's biologically productive land and sea area available to provide ecosystem services for human use. These services include providing food and timber, hosting human infrastructure, and absorbing waste such as carbon dioxide emissions from fossil fuel.

ECOLOGICAL FOOTPRINT

A measure of the area of biologically productive land and water an individual, population, or activity requires to produce all the resources it consumes and to sequester its waste. Because of data limitations, the main form of waste included in the National Footprint Accounts is carbon dioxide from burning fossil fuels. Both Ecological Footprint and biocapacity results are expressed in a globally comparable, standardized unit called a **global hectare** (gha) — a hectare of biologically productive land or sea area with world average bioproductivity in a given year.

ECOLOGICAL DEFICIT AND RESERVE

The difference between the Ecological Footprint and the biocapacity of a region or country. An **ecological deficit** occurs when the Footprint of a population exceeds the biocapacity of the area available to that population. An **ecological reserve** occurs when the available biocapacity of an area exceeds the Footprint of that area's population.

ECOLOGICAL OVERSHOOT

When a population's demands on an ecosystem exceed the capacity of that ecosystem to regenerate the resources demanded. Overshoot results in ecological assets being diminished and carbon waste accumulating in the atmosphere.

INTRODUCTION

The past decades have brought tremendous improvements to the way we live our lives. Technological advances have made food more plentiful, infrastructure more durable and efficient, and travel speedier and more affordable. Pollution management has steadily improved, resulting in better air and water quality in many places around the world.

These improvements have come as seemingly unlimited resources fueled our economies. But every day our planet must support more and more people. At the same time, their expectations for comfort and better lives are rising. Both trends lead to a growing global demand for resources and services from nature.

Today, human demand on our planet's resources already exceeds what Earth can renew. Humanity currently uses renewable resources equivalent to 1.6 planets. If everyone lived like the lifestyle of the average Russian, humanity would need 3.3 Earths to sustain its material demands. We can continue depleting natural capital as long as the stocks last. But that's a path that undermines our current and future economic possibilities.

Many nations are running ecological deficits. To compensate, they turn to trade, overuse their own resources, or emit more carbon into the atmosphere than their national forests can absorb. As ecological constraints tighten, a nation's ability to succeed will become more dependent on its ability to access ecological services.

Humanity currently uses renewable resources equivalent to 1.6 planets

Russia is among a handful of nations that holds a major advantage: Russia's population demands less resources than its own ecosystems can regenerate. If Russia can maintain this advantage, it will be better positioned in an increasingly resource-constrained world.

However, this advantage has shown signs of weakening in recent years. A rising Ecological Footprint has resulted in a decline in Russia's ecological reserve from 2009 to 2012, the latest year data is available. In addition, Russia's fossil fuel exports, which have brought the country great financial income, face an uncertain future because of climate change, price volatility, and the emergence of new energy technologies.

A resource-efficient economy is the only path to future resilience, as population growth and higher standards of living around the world continue intensifying human demand on natural resources. Such an economy will become any country's most valuable asset. As one of the largest and most resource-rich countries in the world, Russia is well positioned to build such a resource-efficient economy that provides for a thriving society and works within the budget of one planet. This requires new tools and new ways of living.

Measuring demands on and supply of renewable resources is a crucial first step. This measurement, in turn, provides information critical for developing and monitoring the success of policies and making investments that ultimately will determine the economic strength and well-being of our citizens and our country. It's time we measure what we treasure.

If everyone lived like the lifestyle of the average Russian, humanity would need 3.3 Earths to sustain its material demands

KEY FINDINGS

- In 2012, the year for which the most recent data is available, Russia's Ecological Footprint was 5.7 gha per person, whereas its biocapacity was 6.8 gha per person. This means Russia's per person demand for nature's services was 84 per cent of what its ecosystems provided.
- Russia's Ecological Footprint per person increased 9.1 per cent from 2009 to 2012. (The first Russia Footprint Report, released in 2014, featured data from 2009. Due to changes in Footprint calculation methodology, older results are not comparable to those featured in this report. For 2009 results calculated with the latest methodology, please consult Table 2 in the Appendix 2.)
- Russia's biocapacity per person decreased 3.2 per cent from 2009 to 2012.
- Russia's ecological reserve increased from 1992 to 2009, with biocapacity averaging 133 per cent of Russia's Ecological Footprint during that time. However, since 2009, Russia's ecological reserve has declined 16 per cent, to 119 per cent of its Ecological Footprint. This indicates the start of a troubling trend.
- While there are other nations with ecological reserves, only a few are not experiencing a decline in those reserves. Trends in Russia are significant for two reasons. Russia is the world's largest country, occupying 11.5 per cent of the world's landmass. Its total biocapacity wealth is fourth largest in the world, behind Brazil, China, and the United States.
- Of the world's ten most populous countries, only Russia and Brazil had ecological reserves in 2012, but between 1992 and 2012 Brazil's reserves declined over 30 times faster than Russia's reserves.
- This means that most of the world's economies, and most of the world's population, are becoming ever more dependent on humanity's common resources and the ecosystems of other nations.
- Russia is among the few nations that, with careful management of its resource demands, can securely maintain its ecological reserve for decades to come.

WHAT'S NEW IN 2016 REPORT

Higher resolution results

To provide more detail than the 2014 Russia Footprint Report, this report shows 12 household consumption categories plus government and gross fixed capital formation for the Federal Subjects. The household consumption categories are based on the United Nations Statistics Division's Classification of Individual Consumption by Purpose (COICOP). For maximum utility, this detail is also included in a table in Appendix 2.

Biocapacity results are also more detailed in this report compared with the 2014 report. In the previous report, only total biocapacity numbers were calculated, excluding fishing grounds biocapacity. In this report, a new method was used to provide biocapacity results according to six main land types: cropland, grazing land, marine and inland water biocapacity (fishing grounds), forest land, and built-up land.

Methodological differences in National Footprint Accounts

Every year, Global Footprint Network improves the accuracy of the National Footprint Accounts (NFA). A number of improvements to the NFA methodology were made since the publication of Ecological Footprint of the Russian Regions (2014). The most influential is the new calculation of Average Forest Carbon Sequestration (AFCS) value — which is the long-term capacity for one hectare of world-average forest ecosystem to sequester carbon dioxide (Mancini et al. 2015). By including new data sources and accounting for multiple forest categories, global wildfires, and forest ecosystem emissions from soil and harvested wood products, forests were found to provide less net-sequestration of carbon than previously calculated.

The Ecological Footprints of countries are impacted by the new methodology. The higher a country's carbon Footprint as a percentage of its overall Ecological Footprint, the bigger the increase in its Footprint compared to previous editions. As 68 per cent of Russia's Ecological Footprint is from carbon, this methodological update causes some notable differences from the previous report.

The robust carbon Footprint calculations are especially timely in light of the historic Paris Agreement adopted in December 2015 by 195 nations and the European Union. The goal of restricting average temperature increases to 2 degrees Celsius above pre-Industrial Revolution levels translates into a specific upper carbon budget for all future emissions of 800 gigatonnes CO_2. The Paris Agreement also shifts the focus to net emissions of countries, recognizing the importance of land-use choices for carbon sequestration. In this context, Ecological Footprint accounts — which measure both emissions on the demand side and the supply of sequestration on the biocapacity side — provide a natural framework to evaluate net emissions by countries and the interaction between competing demands on a country's land.

I. THE STATE OF THE PLANET

In the early 1970s, humanity crossed a major ecological threshold: Our aggregate demand on nature exceeded what our biosphere could renew. Forty years later, as populations continue to grow and resources become scarcer, our ecological assets are facing mounting pressures from increasing human demand and climate change.

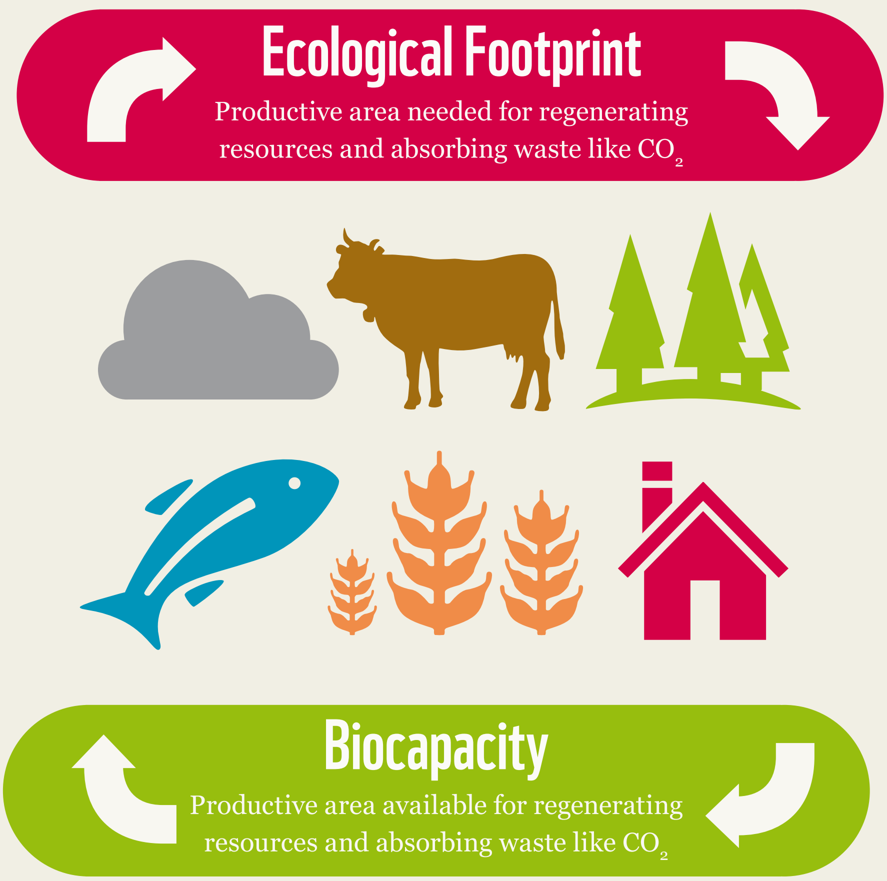
1.1 THE ECOLOGICAL FOOTPRINT AND BIOCAPACITY: MEASURING HUMANITY'S IMPACT ON NATURE

Today humanity is using the resources of 1.6 Earths. How is this possible? We use more ecological resources and services than nature can regenerate through such activities as overfishing, overharvesting forests, and emitting more carbon dioxide into the atmosphere than forests can sequester. The consequences of this "overshoot" include shrinking biodiversity, collapsed fisheries, eroded topsoil, and climate change. Global ecological overshoot translates into the liquidation of natural assets and ever-tightening resource constraints, ultimately resulting in greater economic risk. Measuring how much we demand from these ecological resources and the value of the services they provide is an essential step in creating a one-planet future where people, the planet and economies thrive.

Just as a bank statement tracks expenditures against income, Ecological Footprint Accounting measures a population's demand for and ecosystems' supply of ecological assets.

HUMAN CONSUMPTION IS COMPARED TO NATURE'S PRODUCTION

The Ecological Footprint measures people's use of cropland, forests, grazing land and fishing grounds for providing resources and absorbing waste (carbon dioxide from fossil fuel burning). Biocapacity measures how much biologically productive area is available to regenerate these resources and services.



On the supply side, a city, region, or nation's biocapacity represents the productivity of its ecological assets (including forest lands, grazing lands, cropland, fishing grounds and built-up land).

On the demand side, the Ecological Footprint measures the ecological assets that a given population requires to produce the natural resources and services it consumes (including plant-based food and fiber products, livestock and fish products, timber and other forest products, space for urban infrastructure, and forest to absorb its carbon dioxide emissions from fossil fuels).

Both measures are expressed in global hectares — globally comparable, standardized hectares with world average productivity.

Each city, region, or nation's Ecological Footprint can be compared to its biocapacity. If a population's Ecological Footprint exceeds the region's biocapacity, that region runs an ecological deficit. A region in ecological deficit meets demand by importing, liquidating its own ecological assets (such as overfishing), and/or emitting carbon dioxide into the atmosphere.

CARBON

CO_2 emissions associated with use of fossil fuels, electricity and energy intensive commodities, converted into biologically productive areas (such as forest land) necessary for their sequestration.

FISHING GROUNDS

The area of marine and inland waters required to support annual catches of aquatic species (fish and seafood).

GRAZING LAND

The area of grasslands used to raise livestock for meat, diary, hide and wool products. It includes all grasslands used to provide feed for animals, including cultivated pastures, wild grasslands and prairies.

CROPLAND

The area required to grow all crop products required for human consumption (food and fiber) and for livestock feeds, fish meals, oil crops and rubber.

FOREST PRODUCTS

The area of forests required to support the annual harvest of fuel wood, pulp and timber products.

BUILT-UP LAND

The area of land covered by human infrastructure such as roads, housing, industrial structures and reservoirs for hydroelectric power generation.

$$EF_C = EF_P + (EF_I - EF_E)$$

Ecological Footprint of Consumption

The Ecological Footprint of consumption indicates the consumption of biocapacity by a country's inhabitants.

In order to assess the total domestic demand for resources and ecological services of a population, we use the Ecological Footprint of consumption (EF_C). EF_C accounts for both the export of national resources and ecological services for use in other countries, and the import of resources and ecological services for domestic consumption.

EFc is most amenable to change by individuals through changes in their consumption behavior.

Ecological Footprint of Production

The Ecological Footprint of production indicates the consumption of biocapacity resulting from production processes within a given geographic area, such as a country or region.

It is the sum of all the bioproductive areas within a country necessary for supporting the actual harvest of primary products (cropland, grazing land, forestland and fishing grounds), the country's built-up area (roads, factories, cities), and the area needed to absorb all fossil fuel carbon emissions generated within the country.

This measure mirrors the gross domestic product (GDP), which represents the sum of the values of all goods and services produced within a country's borders.

Net Ecological Footprint of Trade

The Ecological Footprint of imports and exports indicate the use of biocapacity within international trade.

Embedded in trade between countries is a use of biocapacity, the net Ecological Footprint of trade (the Ecological Footprint of imports minus the Ecological Footprint of exports). If the Ecological Footprint embodied in exports is higher than that of imports, then a country is a net exporter of renewable resources and ecological services.

Conversely, a country whose Footprint of imports is higher than that embodied in exports depends on the renewable resources and ecological services generated by ecological assets from outside its geographical boundaries.

Figure 1. Tracking production, consumption and net trade with the Ecological Footprint: *The Ecological Footprint associated with each country's total consumption is calculated by summing the Footprint of its imports and its production, and subtracting the Footprint of its exports. This means that the resource use and emissions associated with producing a car that is manufactured in Russia, but sold and used in China, will contribute to China's rather than Russia's Ecological Footprint of consumption.*

A country's Ecological Footprint of consumption is derived by tracking how much biologically productive area it takes to absorb a population's waste[1] and to generate all the resources it consumes. Consumption is estimated by adding imports to domestic production, while subtracting exports (see box above).

All commodities carry with them an embedded amount of bioproductive land and sea area necessary to produce them and sequester the associated waste; international trade flows can thus be seen as flows of embedded Ecological Footprint.

[1] The only "waste stream" included in the national and regional assessments is carbon dioxide waste from fossil fuel burning. In theory, the Ecological Footprint measures all human-generated waste materials that exert pressure on the Earth's regenerative capacity. But in practice the inclusion of more waste streams is limited by data constraints.

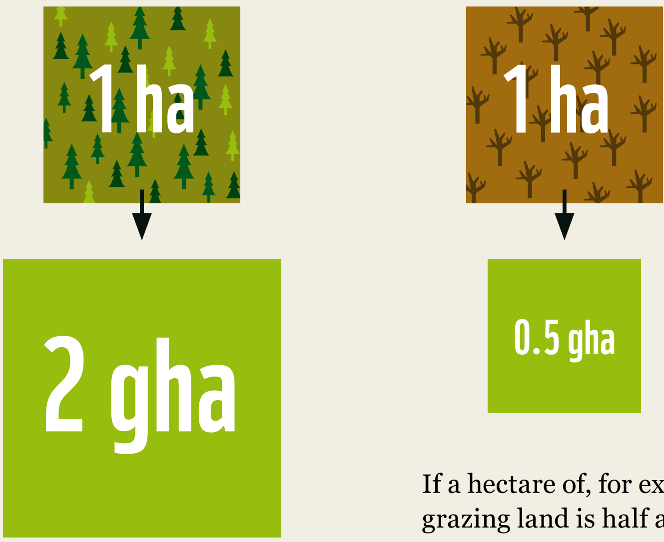
GLOBAL HECTARES

Both the Ecological Footprint and biocapacity figures are expressed in global hectares (gha) — hectares of productive area with world average biological productivity in a given year. This expression standardizes the hectares and makes them globally comparable. Actual areas of different land use types (in hectares) are converted into their global hectare equivalents by using yield and equivalence factors. Yield factors are used to account for differences between countries in productivity of a given land type. Equivalence factors allow us to compare between land types by weighting their respective productiveness. (Please refer to Appendix 1 for information on the methodology.)

Global hectares therefore adjust physical hectares to account for their productivity. For example, a hectare of fertile cropland would convert to more global hectares than a hectare of grazing land, because cropland is able to generate and renew more biological activity than typical grazing land. Another way to look at it is that a larger physical area of grazing land would be needed to provide the same biocapacity as a particular physical area of cropland.

Using global hectares allows us to understand consumption from a comparable global perspective. It means that 1 ton of wheat consumed in Russia has the same Footprint as 1 ton of wheat consumed in the United States. However, the value of a global hectare can vary from year to year due to changes in productivity of the world's surfaces.

Using global hectares as a unit to measure biocapacity may seem complex, but it is similar to using a standardized monetary unit in the course of financial accounting, such as the ruble or euro.



If a hectare of, for example, cropland is twice as productive as a world average biologically productive hectare, then it is classified as 2 gha.

If a hectare of, for example, grazing land is half as productive as a world average biologically productive hectare, then it is classified as 0.5 gha.

GLOBAL SUPPLY AND DEMAND

For centuries, the human race has occupied such a small portion of our planet that biocapacity appeared to be limitless. Because resources were abundant when our modern economic systems developed, decisions were made without considering the explicit contribution of nature to economic activity. As populations and consumption have grown, these resources have become increasingly scarce worldwide. Today humanity's overall demand for biocapacity outstrips global supply by 64 per cent.

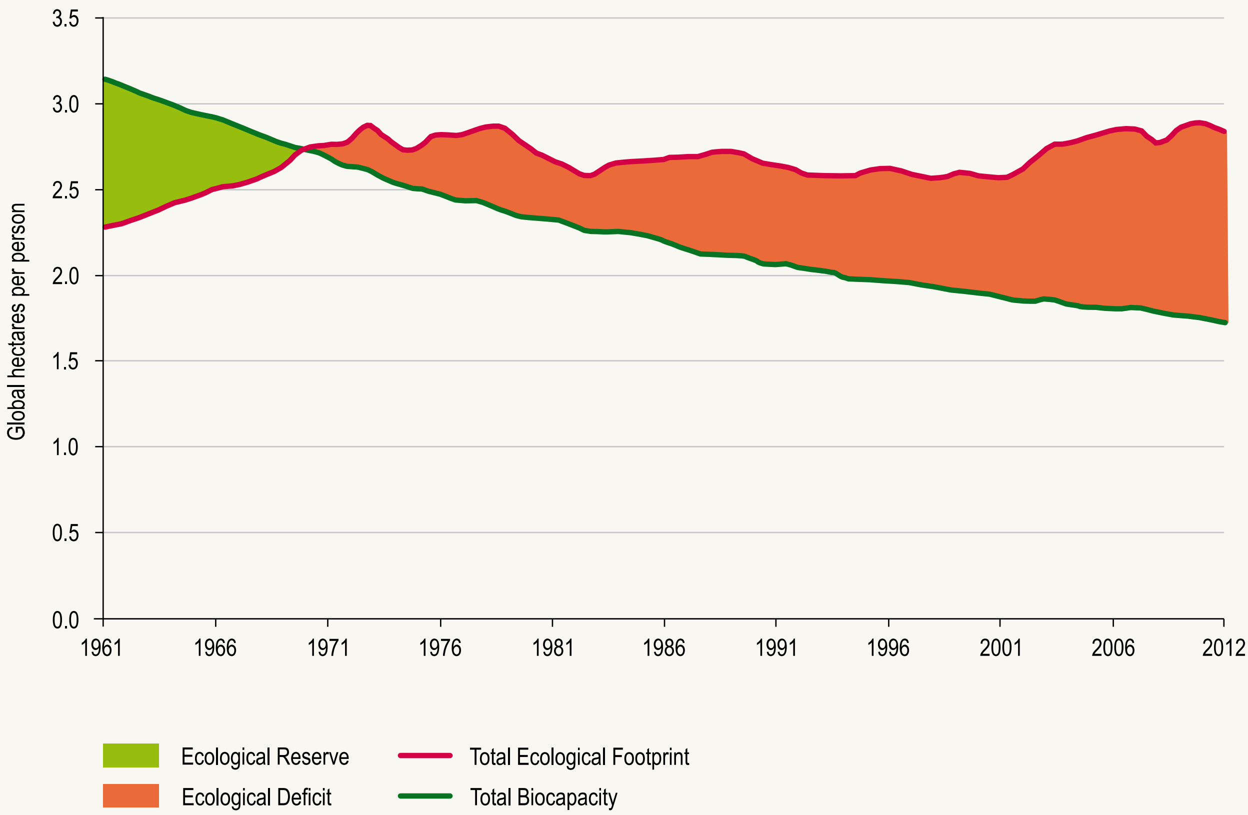


Figure 2: World Ecological Footprint and Biocapacity, 1961-2012

In 2012, humanity's per person Footprint and biocapacity were 2.8 gha and 1.7 gha respectively. Since the early 1970s, humanity's demand on Earth has exceeded what the planet can renewably provide. This ecological overshoot has steadily grown during the past 40 years, to the point that it now takes 1.6 Earths to regenerate the resources we use every year (Global Footprint Network, 2016).

1.2 EARTH OVERSHOOT DAY

Earth Overshoot Day marks the date in a given year when humanity's demand on nature exceeds what Earth can regenerate in that entire year. On this date, the global population's demand for the goods and services that our lands and seas can provide — fruits and vegetables, grazing land for cattle, fish, wood, cotton for clothing, and carbon dioxide absorption — exceeds what our world's ecosystems can renew in a year. We maintain this deficit by liquidating stocks of ecological resources and accumulating waste, primarily carbon dioxide in the atmosphere. Earth Overshoot Day has moved from late September in 2000 to August 8 in 2016.

Overshoot is possible for a limited time, but at the cost of depletion and degradation of resources. This poses great risks for economies. Weaker natural capital stocks erode economic opportunities and increase social pressures. We can already recognize many of the signs of global ecological overshoot: drought and climate change, depleted fisheries, deforestation, and soil degradation. Given global trends the past four decades, these and other signs will become more frequent in the near future.

Global overshoot exposes every country to risk. Those with a secure resource base will be best positioned to safeguard their economies and their citizens' quality of life.

1.3 CARBON FOOTPRINT AND PARIS CLIMATE AGREEMENT

For more than a half century, the largest and fastest growing component of our Ecological Footprint has been carbon. Today the carbon Footprint is nearly three times larger than it was in 1961, currently making up 60 per cent of the global Ecological Footprint. The increase in fossil fuel consumption (and carbon emissions) has had a direct impact on biocapacity and Footprint components. Much of today's improved agricultural productivity, for instance, depends on fertilizers, pumps, tractors, and other machinery that are heavily dependent on fossil fuel input.

But for all the world's technological gains, developments in energy efficiency have not kept pace with the growth in populations and per person demands on biocapacity. We may have more fuel-efficient automobiles on our roads, but we are still operating more automobiles on our roads than ever before. And if burning more fossil fuels gives us higher agricultural yields (and greater food production), it also increases the risks associated with anthropogenic climate change.

The historic UN climate agreement reached in Paris in December 2015 sets the stage for embarking on a new low-carbon path. Nearly 200 countries pledged to limit global warming to 2°C, and drive efforts to limit temperature increases even further to 1.5 degrees above pre-Industrial Revolution levels. Successfully meeting the Paris targets will require a transformation in how we live on our one planet. The good news is that this transformation is possible with current technology, and financially advantageous with overall benefits exceeding costs. It will stimulate emerging sectors like renewable energy, while reducing risks and costs associated with the impact of climate change on inadequate infrastructure.

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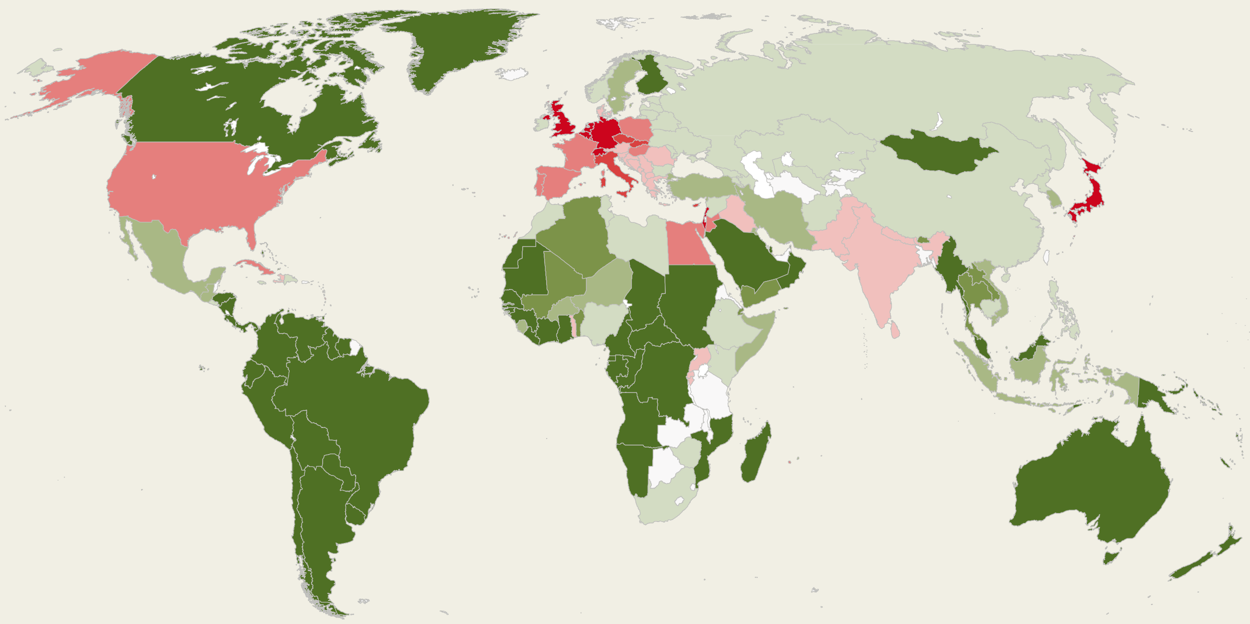
1.4 NATIONAL ECOLOGICAL DEFICITS AND RESERVES

If a country's Ecological Footprint exceeds the biocapacity within its borders over a given time period, that country runs an ecological deficit. A country in ecological deficit meets this excess demand by importing additional biocapacity, overharvesting its natural resources (such as overfishing), or emitting carbon dioxide into the atmosphere. Each of these strategies carries economic and social risks.

Dependence on imported resources exposes a country to both supply disruption and price volatility. Overharvesting causes a direct loss of ecological assets, which affects supply and makes a country more dependent



1961

Figure 3: Ecological reserves and deficits, 1961 and 2012

An ecological reserve (green) means the country's Ecological Footprint is less than the national biocapacity; an ecological deficit (red) means the country's Ecological Footprint is greater than the national biocapacity. Fifty years ago, 1.3 billion people lived in countries that had more biocapacity than their residents demanded. Today, roughly 6.1 billion out of 7.1 billion people (or 86 per cent) live in countries where residents demand more than what their ecosystems can renew (Global Footprint Network, 2016).

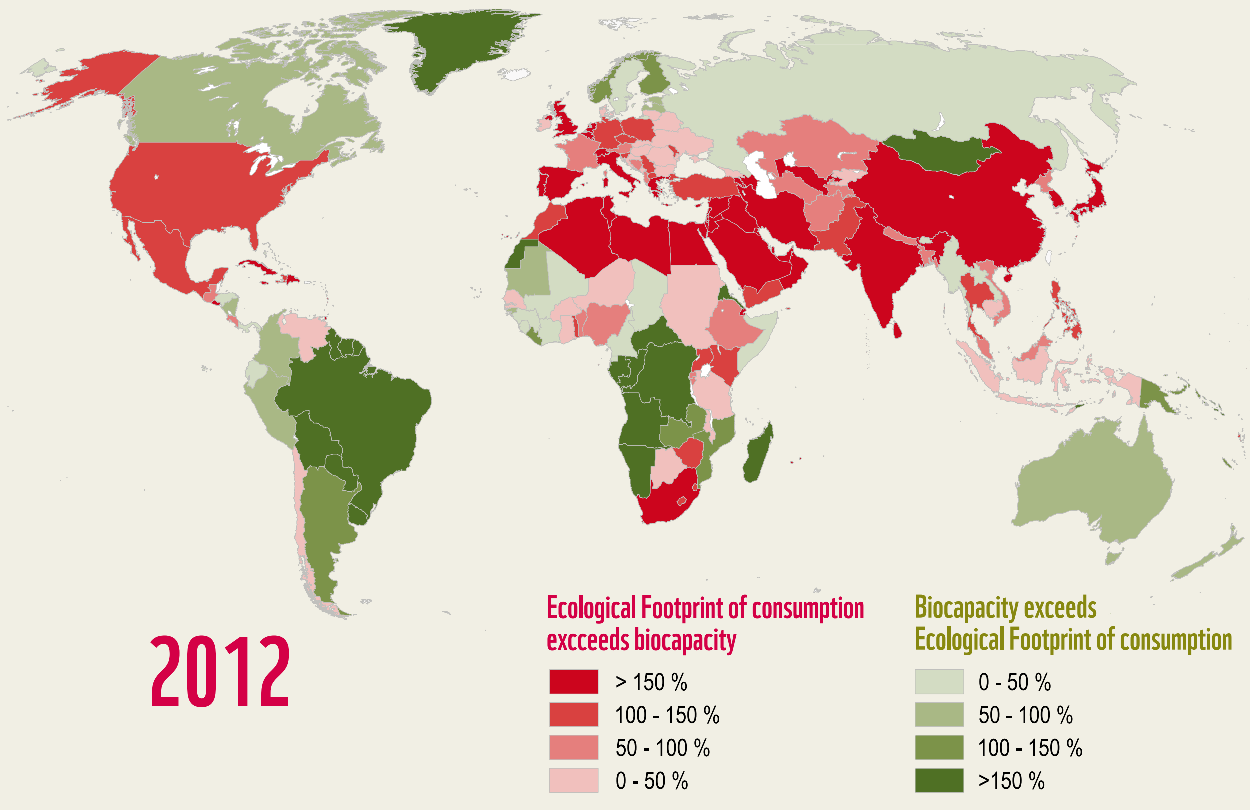
86%

of the global population lives in countries where residents demand more than what their ecosystems can renew

on imports. Burning fossil fuels and emitting carbon dioxide into the global commons come at a cost, even in the absence of significant CO_2 taxes. And climate change, independent of one's own emissions, imposes costs on us all.

The most vulnerable countries are those in ecological deficit without the financial strength, political clout, or national power to compete for the biocapacity they lack. But even high-income nations share these risks.

One key trend is clear: More and more countries are running ecological deficits. In 1961, 1.3 billion out of 3.1 billion people (or 43 per cent) lived in countries where residents demanded more than their ecosystems could provide. By comparison, in 2012, 6.1 billion out of 7.1 billion people (or 86 per cent) lived in countries where residents demanded more than their ecosystems can provide.



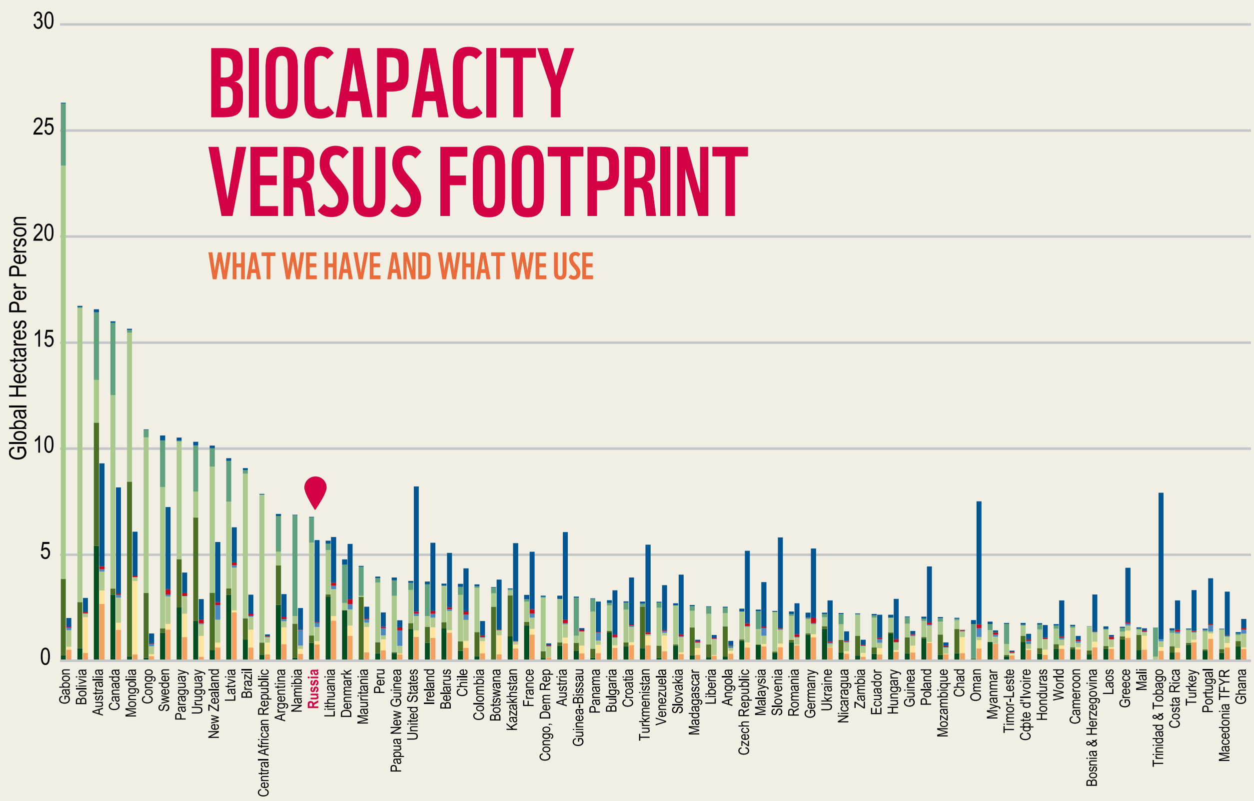
1.5 ECOLOGICAL FOOTPRINT AND BIOCAPACITY OF NATIONS

Every day, the planet must support more and more people. At the same time, their expectations for comfort and better lives are rising. Both trends lead to a growing global demand for resources and services from nature, including food, carbon sequestration, fiber (for clothing and paper), and wood (for construction, furniture, and biofuels).

The planet's biocapacity is now about 27 percent higher than in 1961, largely due to agricultural practices. Biocapacity can change from year to year due to climate, ecosystem management, changing soil conditions, and agricultural inputs. The expansion in biocapacity, however, may not last, given climate change, water scarcity, energy availability, topsoil erosion, and loss of biodiversity.

BIOCAPACITY VERSUS FOOTPRINT

WHAT WE HAVE AND WHAT WE USE



Meanwhile, the world's total demand for resources — the product of rising populations and growing individual consumption — has jumped 186 per cent since 1961. In other words, during this period, global demand has increased at least 6.9 times faster than world biocapacity has increased.

From 1961 to 2012, the global population more than doubled from 3 billion to 7 billion, while the world's per person Ecological Footprint grew from 2.3 to 2.8 gha per person. This growing Ecological Footprint was met by a shrinking per person biocapacity, from 3.1 to 1.7 gha per person. This means that more people are now competing for fewer resources.

These global trends mask the huge variability that exists between regions and countries, and within countries themselves. In Asia, for instance, both China and India's populations grew by over 730 million people from 1961 to 2012. However, China has a much larger impact on the region's total Footprint as its per person Footprint increase is almost five times that of India.

Figure 4: Per capita Ecological Footprint and biocapacity ranked by countries' per capita biocapacity.

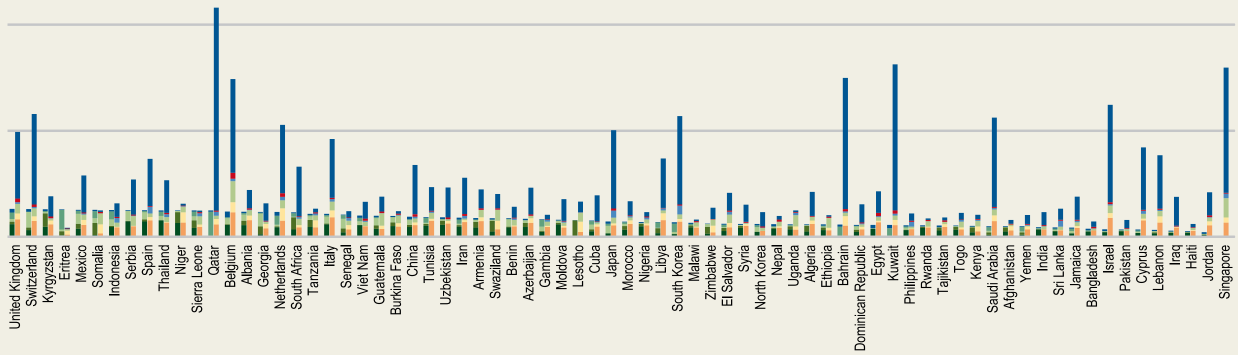
(Graph includes countries with populations of one million or more only.) (Global Footprint Network, 2013).

Ecological Footprint

- Crop Land
- Grazing Land
- Forest Products
- Fishing grounds
- Built-up Land
- Carbon Footprint

Biocapacity

- Crop Land
- Grazing Land
- Forest Products
- Fishing grounds
- Built-up Land

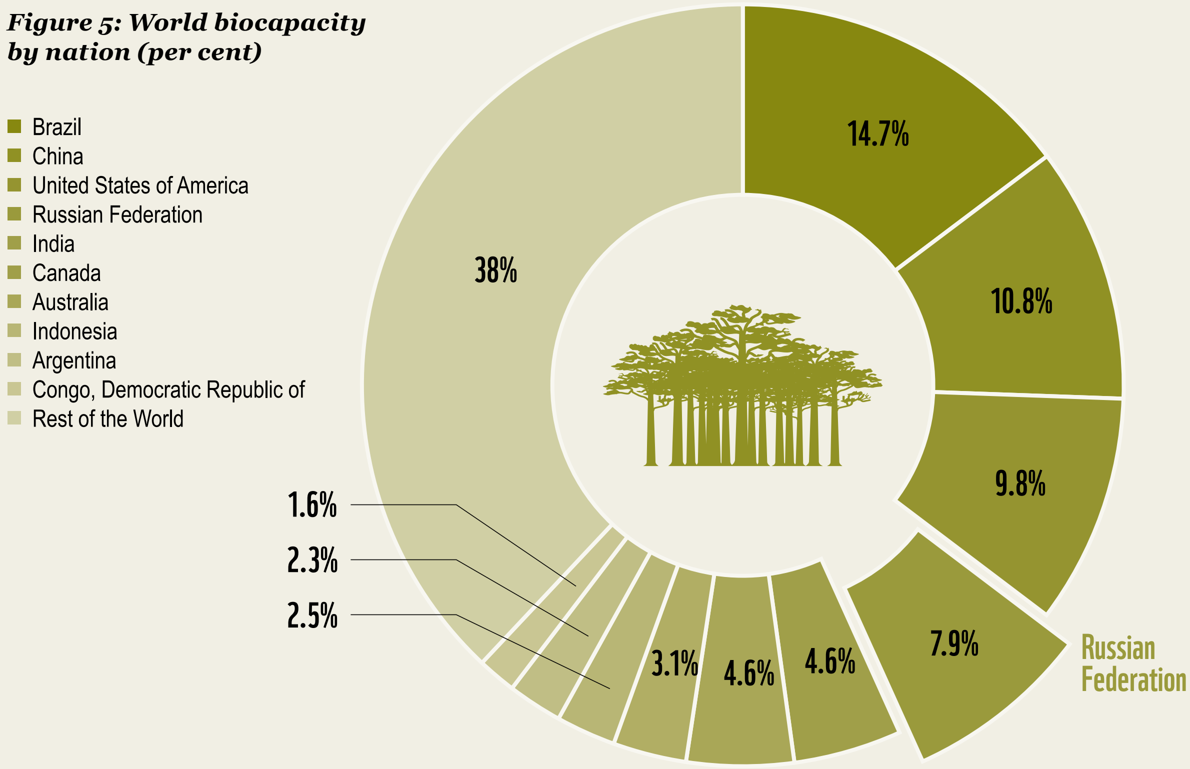


Russia has 972 million gha of biocapacity and an Ecological Footprint of 814 million gha, giving it a reserve of about 158 million gha (as of 2012). On a per-person basis, Russia has 6.8 gha of biocapacity and an Ecological Footprint of 5.7 gha. However, Russia's per-person biocapacity decreased 3 per cent from 2009 to 2012. Only Brazil has a total ecological reserve larger than Russia's, at 1.2 billion, or 6.0 gha per person.

Brazilians' consumption corresponds to 34 per cent of their country's biocapacity. Even with this bounty of nature, Brazil is overharvesting or degrading some of its local ecosystems. As Brazil's population and domestic demand has increased over the past 50 years, its per-person ecological reserve has declined 71 per cent. In addition to local consumption, Brazil uses 11 per cent of its biocapacity to meet export demands. If it fails to stop this per person decline in ecological reserves, Brazil could cross into deficit within the next 50 years.

TOP 10 COUNTRIES BY TOTAL BIOCAPACITY

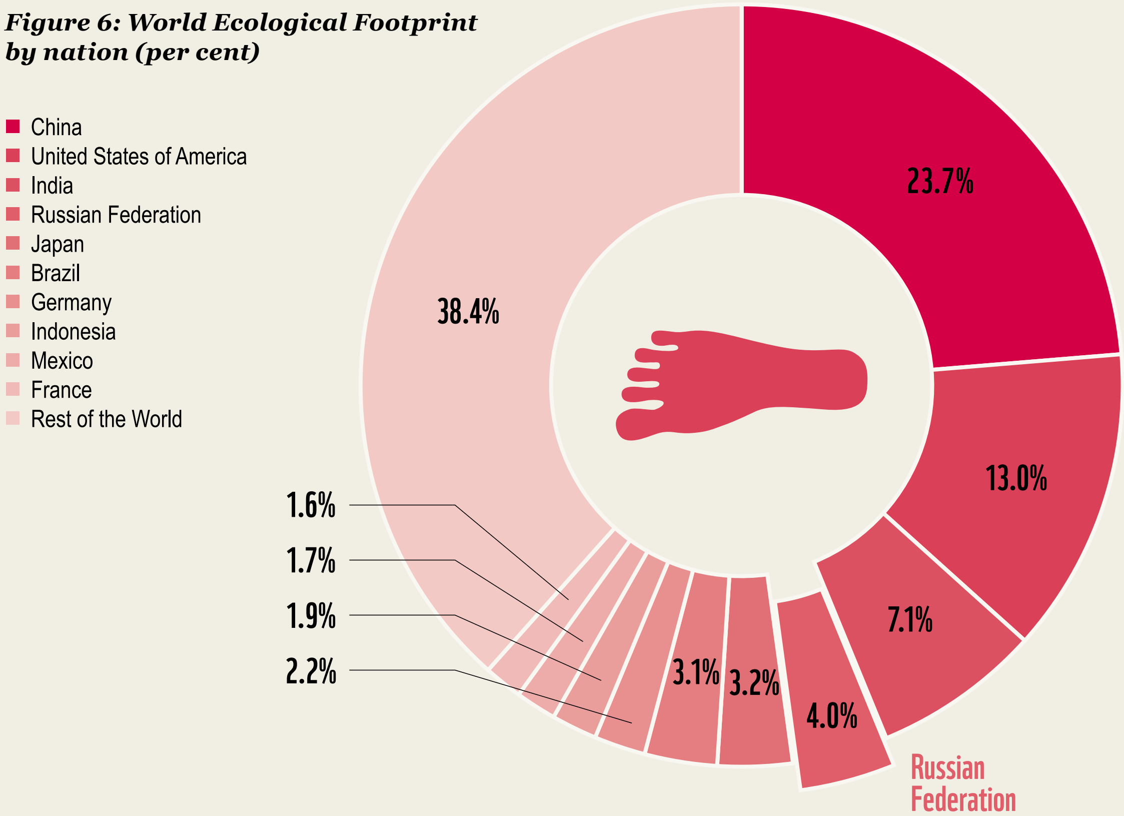
Figure 5: World biocapacity by nation (per cent)



Russia's ecological reserve grew from 1992 to 2009, but experienced a drastic decrease from 2009 to 2012. Still, with a far larger ecological reserve than the vast majority of countries, Russia is less dependent on the resources of other nations than most of the world's other economies. On the supply side, 62 per cent of the world's total biocapacity is located in just 10 countries. For most countries with a high biocapacity, forest land comprises the largest proportion of the total biocapacity. This is true for Russia, where forest land accounts for 64 per cent of Russia's total biocapacity. Forests are significant ecosystems because they provide services not only to local users, but also the world more broadly by storing and sequestering carbon and consequently playing a significant role in climate stability.

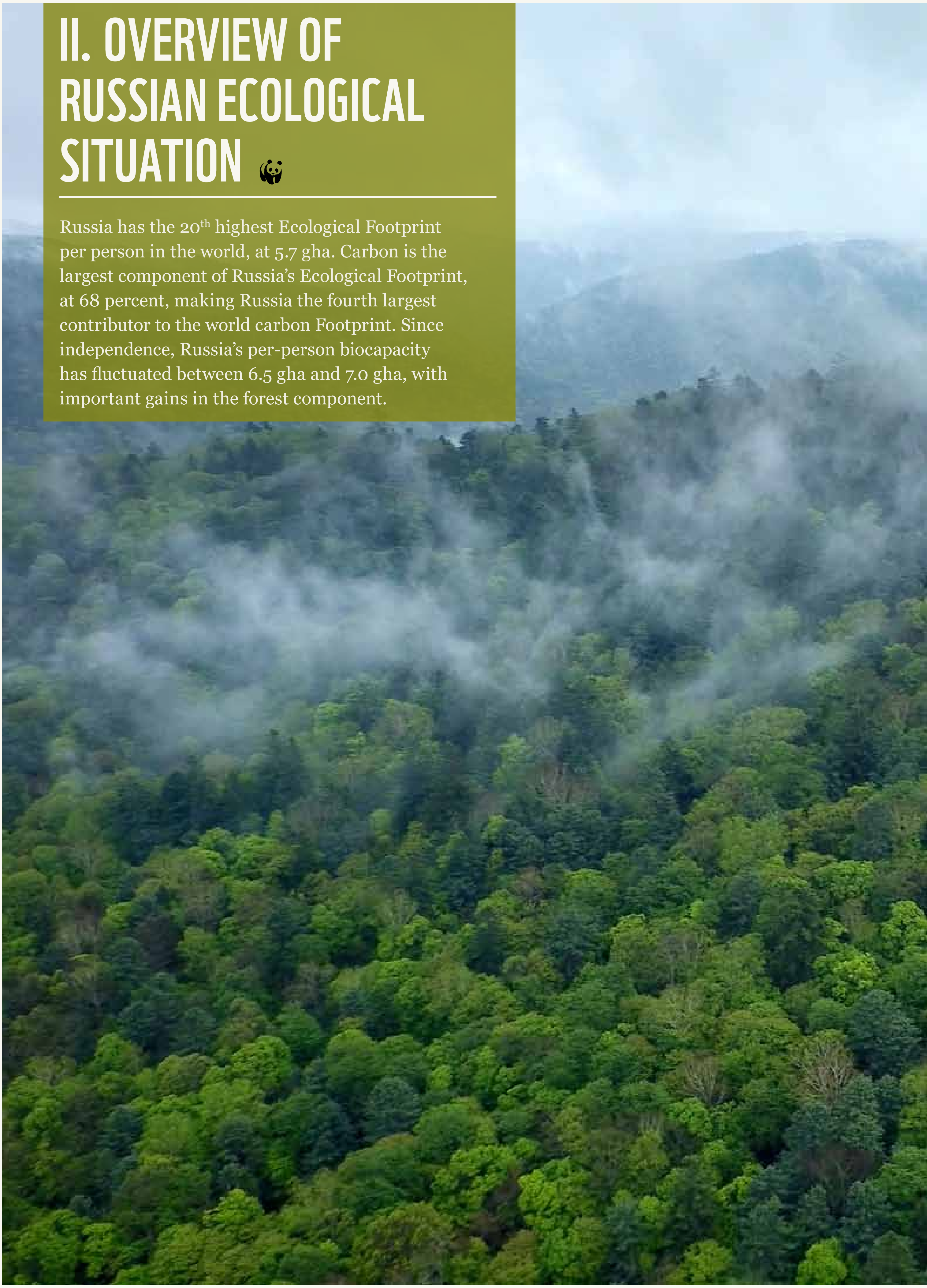
TOP 10 COUNTRIES BY TOTAL ECOLOGICAL FOOTPRINT

Figure 6: World Ecological Footprint by nation (per cent)



II. OVERVIEW OF RUSSIAN ECOLOGICAL SITUATION

Russia has the 20th highest Ecological Footprint per person in the world, at 5.7 gha. Carbon is the largest component of Russia's Ecological Footprint, at 68 percent, making Russia the fourth largest contributor to the world carbon Footprint. Since independence, Russia's per-person biocapacity has fluctuated between 6.5 gha and 7.0 gha, with important gains in the forest component.



From 1961 to 1991, the Soviet Union's Ecological Footprint per person increased 53 per cent as its biocapacity per person declined by 21 per cent. By the time it dissolved, the Soviet Union — which held an ecological reserve over 50 years ago — was running a significant ecological deficit (see Figure 8).

The causes of the Soviet Union's ecological decline are easily identified. Its population between 1961 and 1991 increased 33 per cent, while per-person demand on biocapacity (Ecological Footprint) grew 53 per cent during the same period. The impacts from inefficient energy usage and residents' growing demands for fossil fuels were especially significant during this continuous 30-year Footprint increase (see Figure 9).

Russia's emergence as a biocapacity-wealthy nation is attributed to a number of factors. Upon independence, the Russian Federation had a smaller population and a larger per-person share of biocapacity than did the USSR. The economic shock that followed Russia's first years of independence decreased economic activities and with it resource demand (see Figure 8). Per-person consumption immediately decreased in almost all Footprint categories.

In short, while per-person biocapacity jumped, a much smaller population and a rapid drop in per-person demand caused a swift reduction in Russia's total Footprint. The result was a boon to the nation's biocapacity situation (see Figure 10).

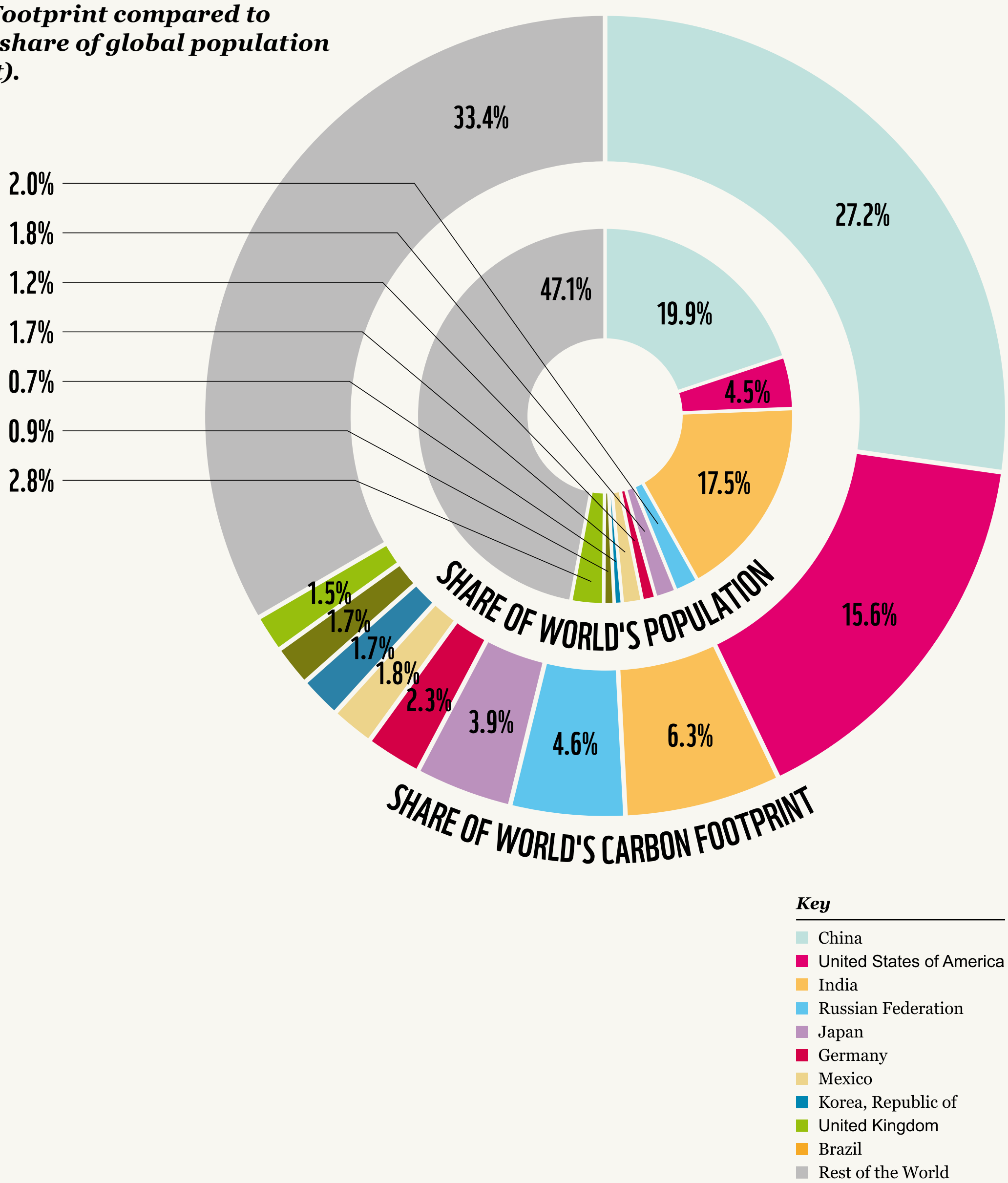
Since independence, Russia's per-person biocapacity has fluctuated between 6.5 gha and 7.0 gha, with important gains in the forest component. Russia's Ecological Footprint has been more turbulent: A steep decline from a high of 7.1 gha per person in 1992 to a low of 4.3 gha in 1998, then climbing to 6.0 gha in 2011 and back down to 5.7 gha in 2012.

After a drop in the per-person carbon Footprint by 33 per cent between 1992 and 1998, the carbon Footprint of Russia has grown by 34 per cent from 1999 to 2012. It comprises 68 per cent of the country's Ecological Footprint, larger than the world average of 60 per cent. When we look at the world's total carbon Footprint, Russia is the fourth largest contributor, accounting for 4.6 per cent of the global carbon Footprint. By comparison, Russia's population makes up only 2.0 per cent of the global human population.

The global economic recession of the late 2000s is visible in a drop of the Ecological Footprint. In 2009, Russia's GDP hit a ten-year low as the country, and most of the world, experienced an economic downturn. While the Footprint decreased during this time, it is our hope that countries experience further reductions in the Ecological Footprint by design and not disaster.

Forests constitute 80%
of Russia's total demand on nature

Figure 7: Country share of world carbon Footprint compared to country share of global population (per cent).



In 2012, Russia's per-person Ecological Footprint was 5.7 gha. Russia ranked 20th highest at the global level, with its per-person Footprint about two times the world average of 2.8 gha. In comparison, the average per-person Ecological Footprint in the BRIICS countries (Brazil, Russia, India, Indonesia, China, and South Africa) was 3.0 gha, and the average in the European Union was 4.8 gha. Those averages were 53 per cent and 84 per cent of Russia's Ecological Footprint, respectively. The largest component (see Figure 10) of Russia's overall Ecological Footprint was carbon (68 per cent), followed by cropland (14 per cent), and forest products (12 per cent). Combined, the carbon Footprint and forest products – both of which require forest biocapacity – constitute 80 per cent of Russia's demand on nature.

Figure 8: Ecological Footprint and Biocapacity of Russia, 1961-2012.

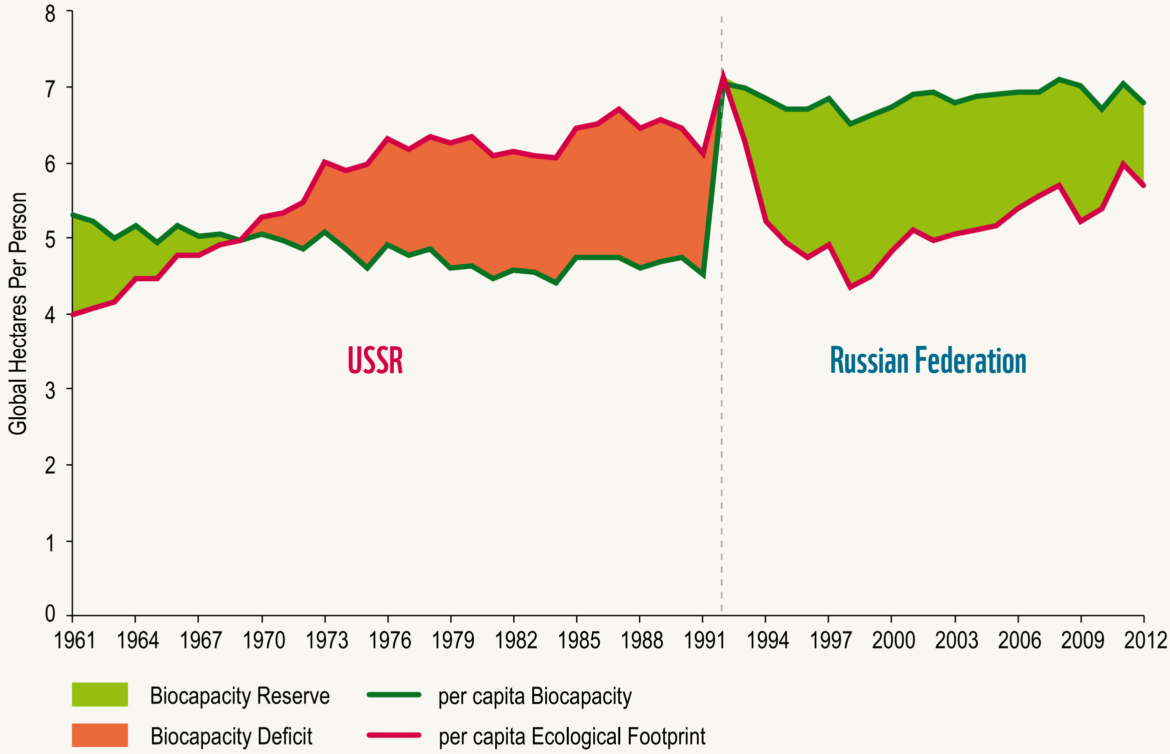


Figure 9: Ecological Footprint of Russia by Land Types, 1961-2012.

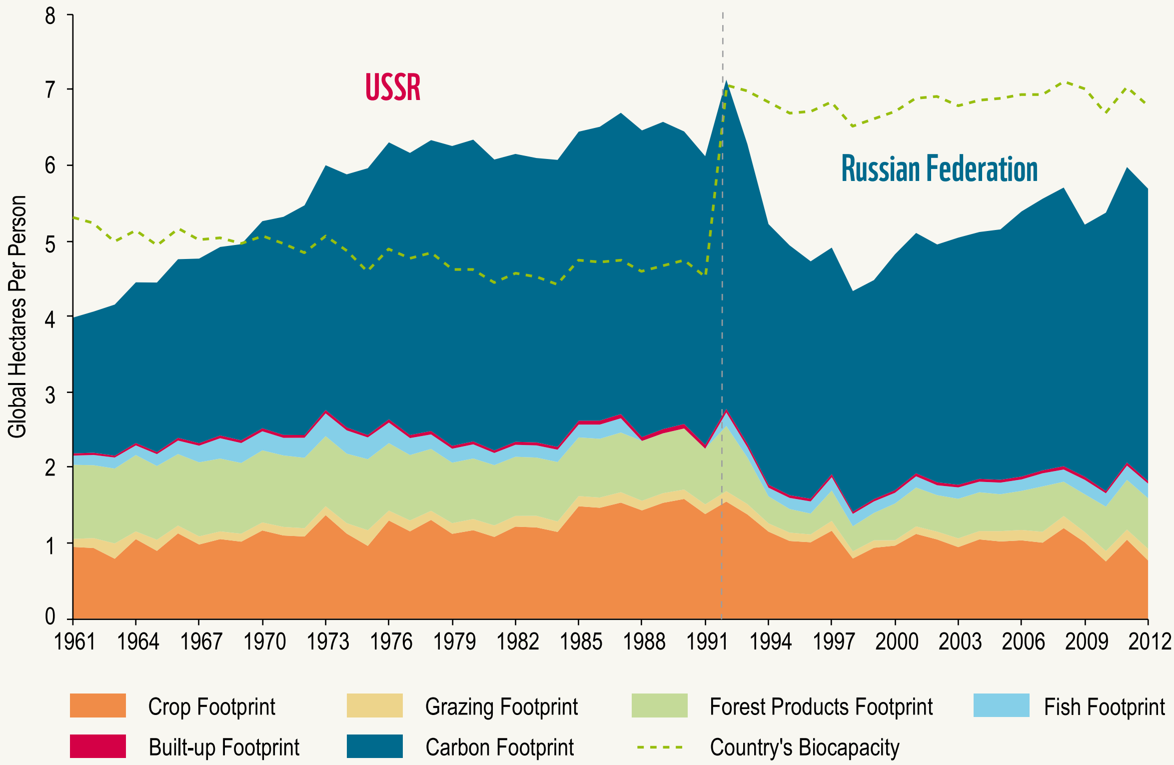
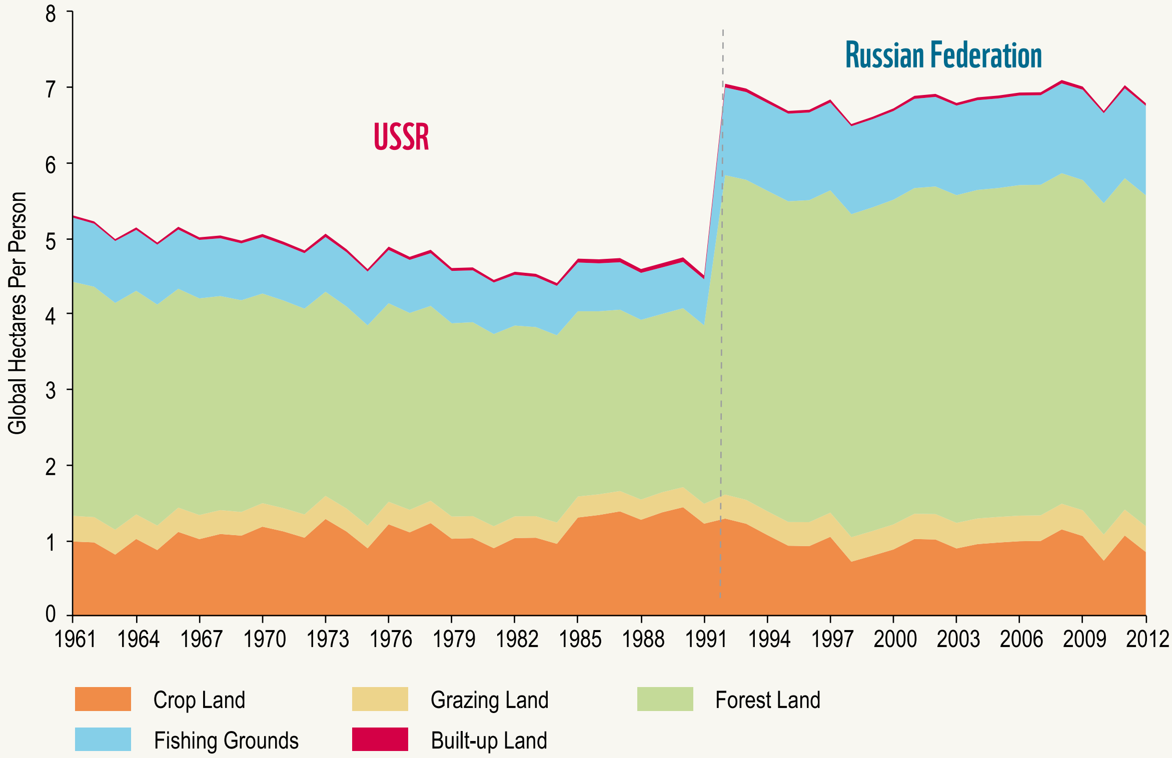
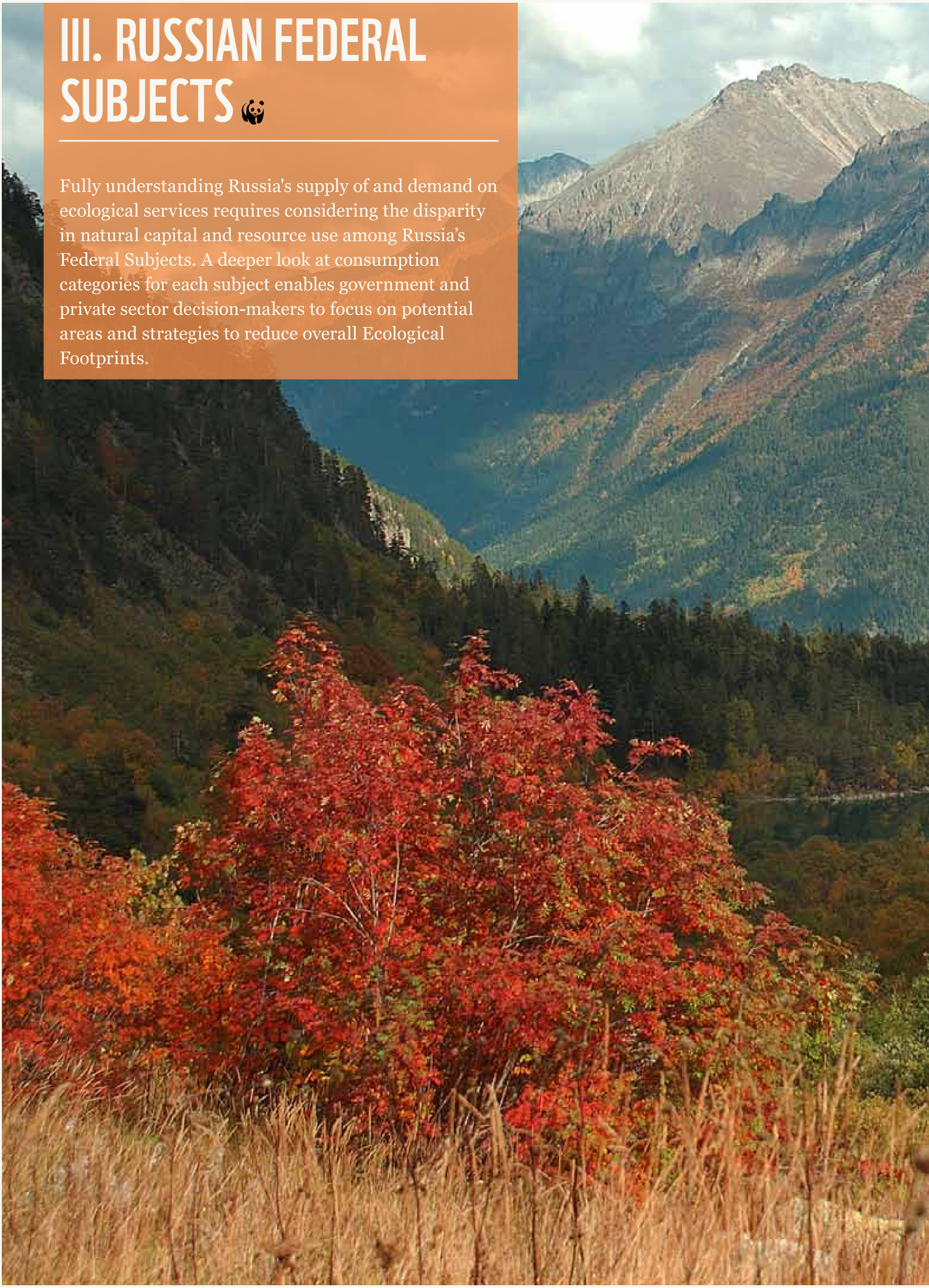


Figure 10: Biocapacity of Russia by Land Type, 1961-2012.



III. RUSSIAN FEDERAL SUBJECTS

Fully understanding Russia's supply of and demand on ecological services requires considering the disparity in natural capital and resource use among Russia's Federal Subjects. A deeper look at consumption categories for each subject enables government and private sector decision-makers to focus on potential areas and strategies to reduce overall Ecological Footprints.



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Fully understanding Russia's supply of and demand on ecological services requires considering the disparity in natural capital and resource use among Russia's Federal Subjects: In 2012, seven Federal Subjects alone contributed 52 per cent of Russia's biocapacity (Figure 11); 16 Federal Subjects contributed 51 per cent of Russia's Ecological Footprint.

The per-person biocapacity of each Federal Subject is a function of both population and land productivity. A total of 31 Russian Federal Subjects were found to have a greater per-person biocapacity value than the national average biocapacity of 6.8 gha per person; six of those are categorized as "extremely high biocapacity states," with seven to almost 44 times the national average of terrestrial biocapacity. Out of these 31 top biocapacity-wealthy Federal Subjects, Tyumen Oblast (which includes Yamalo-Nenets Autonomous Okrug and Khanti-Mansi Autonomous Okrug) had an Ecological Footprint of 6.7 gha per person (larger than the national average of 5.7 gha per person), and Komi Republic had an Ecological Footprint of 4.7 gha per person (less than the national average).

A total of 52 Russian Federal Subjects reported smaller biocapacity values than the national average. Only two of the middle-ranked Federal Subjects had a Footprint larger than the national average (Sverdlovsk Oblast, 5.8 gha, and Omsk Oblast, 6.1 gha) as did seven of the low-ranked biocapacity Federal Subjects (Saint Petersburg reporting the highest Footprint in this category, at 7.3 gha).

Twenty of the 28 middle- and all 28 of the low-ranked Federal Subjects reported ecological deficits, with their Footprints exceeding their biocapacity. As expected, the largest per cent deficits were found in Moscow (26,005 per cent), St. Petersburg (7,077 per cent) and Moscow Oblast (809 per cent), all densely populated urban areas that are dependent on the hinterlands to fulfill their resource needs. However, larger Federal Subjects also reported significant deficits: Republic of Dagestan runs a 284 per cent deficit, for example, and Chelyabinsk Oblast a 421 per cent deficit.

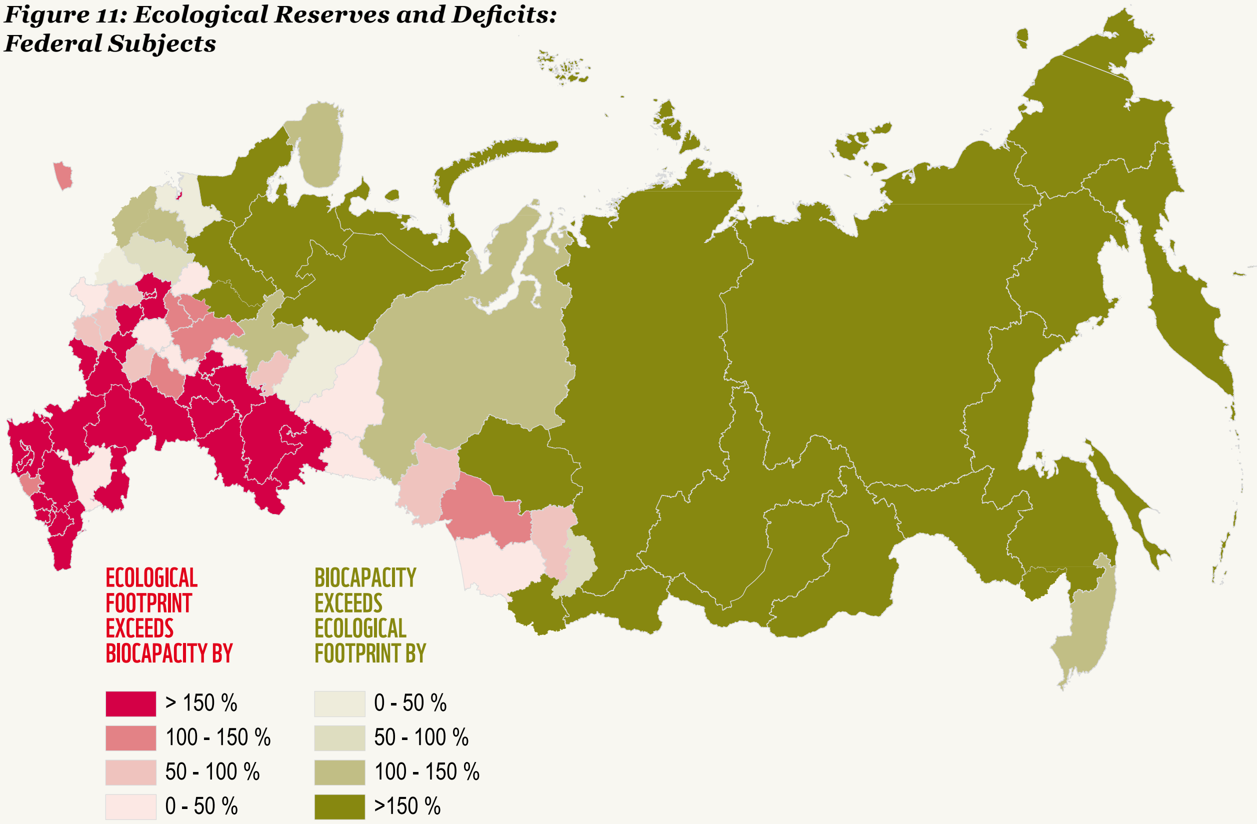
Individuals' daily activities are primary Footprint drivers. Socio-economic factors, income level, food, goods and services consumed, and CO_2 emitted all contribute to a country's per-person Ecological Footprint.

Even though citizens have little direct control over how a country produces its electricity or how companies produce goods and services, citizens do have a substantial influence on decisions made by governments and businesses in the long-term. It is therefore important to understand how much individuals' daily activities contribute to a country's Footprint size and composition.

The overall Ecological Footprint contains three types of consumption: 1) short-term consumption paid for by households (HH); 2) short-term consumption paid for by government (GOV), such as police equipment, school supplies for public schools, paper for public administration; and 3) lasting goods and services, or "gross fixed capital formation" (GFCF), such as construction of housing, bridges, roads, and factories.

The first, household, component is further broken down into five categories: food, housing, transport, goods, and services. This breakdown enables

Figure 11: Ecological Reserves and Deficits: Federal Subjects



government and private sector decision-makers to focus on potential areas and strategies to reduce overall Ecological Footprints.

These five household consumption categories can be further broken down into 12 detailed categories, from the United Nations' Classification of Individual Consumption According to Purpose (COICOP), including:

1. Food and non-alcoholic beverages
2. Alcoholic beverages, tobacco, and narcotics
3. Clothing and footwear
4. Housing, water, electricity, gas, and other fuels
5. Household furnishings, equipment, and maintenance.
6. Health
7. Transportation
8. Communication
9. Recreation and culture
10. Education
11. Restaurants and hotels
12. Miscellaneous goods and services

To provide more detail than the 2014 Russia Footprint Report, this report features graphics showing 12 household consumption categories plus government and gross fixed capital formation for the Federal Subjects. The household consumption categories are based on the United Nations Statistics

Division's Classification of Individual Consumption by Purpose (COICOP). For maximum utility, this detail is also included in Appendix 2.

Direct household spending for short-term consumption accounts for 71 per cent of Russia's Footprint

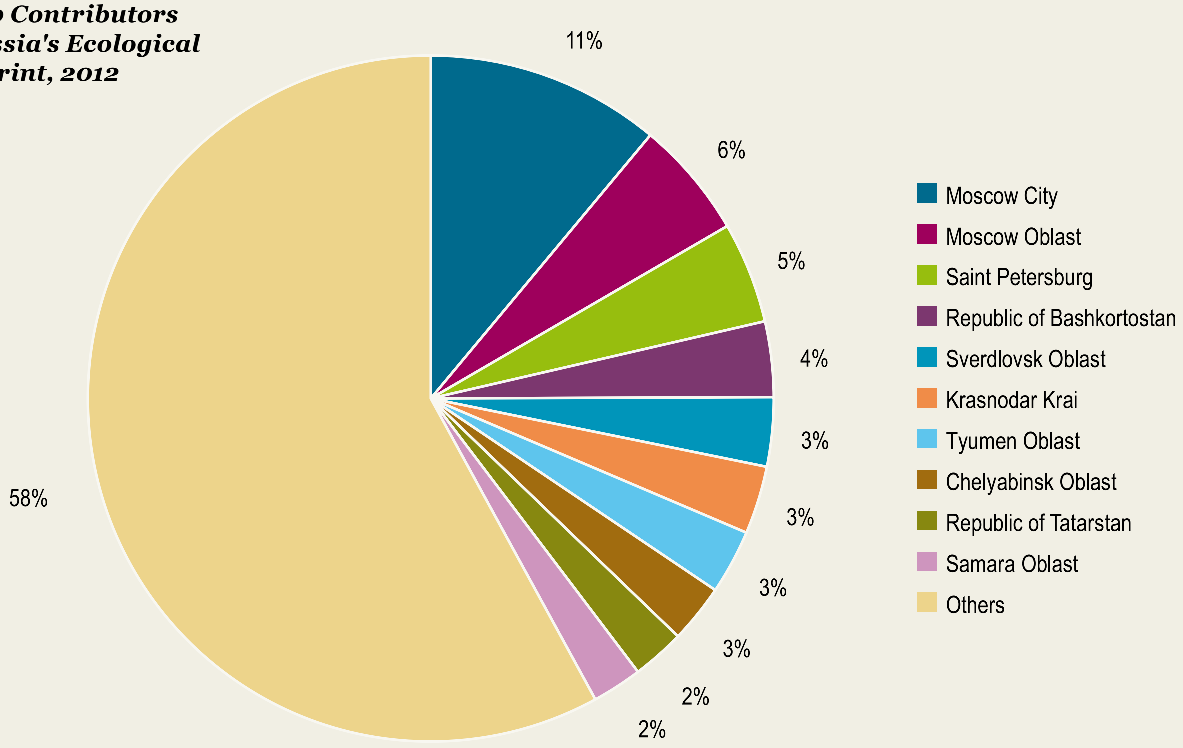
The Ecological Footprint can be analyzed for any population. For this report, we analyzed the Footprint of Federal Subjects and found considerable variation. Differences in lifestyle, economic structure, and the carbon Footprint required to generate each unit of electricity, as well as geographical and cultural differences, affect the Ecological Footprint.

Looking at the final demand category level, the main contributor of Russia's Ecological Footprint comes from direct household spending for short-term consumption, accounting for 71 per cent of total demand. This means that daily decisions made at the household level have the power to change the course of Russia's Ecological Footprint trends.

Among the daily consumption and service categories shaping the "direct household expenditure" component, those that contributed the most to the Ecological Footprint were "housing, water, electricity, gas, and other fuels" (with a low of 10 per cent of the overall Ecological Footprint in Chechen to

TOP 10 CONTRIBUTORS TO RUSSIA'S ECOLOGICAL FOOTPRINT AND BIOCAPACITY

Figure 12: Top 10 Contributors to Russia's Ecological Footprint, 2012



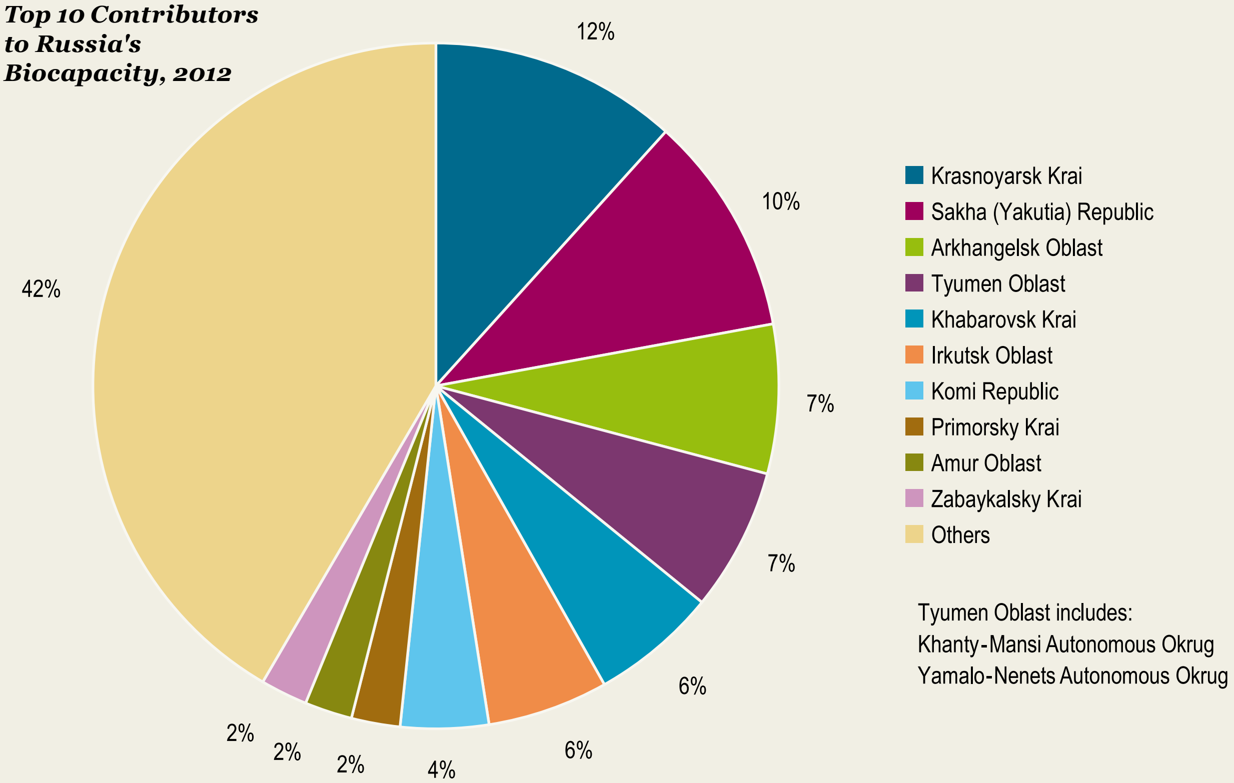
a high of 50 per cent in Amur), and "food and non-alcoholic beverages" (a low of 20 per cent in Khanty-Mansi Autonomous Okrug and a high of 73 per cent in Chechen). Transportation was also a large contributor, especially in Volgograd (32 per cent), Republic of Bashkortostan (31 per cent), and Yamalo-Nenets Autonomous Okrug (29 per cent).

Each of these categories impacted the Federal Subjects' Footprint differently. The "food" category put more demand on cropland and grazing land than it did on other land-use types. Housing and transportation put more demand on the carbon sequestration capacity of the planet.

To reduce subnational Footprints, it is important to understand the complex connections between international and inter-provincial supply chains and consumption patterns. Unique provincial features, such as geographic conditions and culture, also play an important role. These variations demonstrate the need for the adoption of state and regionalized Ecological Footprint assessments to wisely manage ecological assets. Maintaining and enhancing biocapacity — especially at a sub-national scale — is critical for achieving sustainable standards of living.

Every Federal Subject has an Ecological Footprint exceeding the global average biocapacity of 1.7 gha per person (based on 2012 data). And every Federal Subject has an Ecological Footprint larger than the world average Footprint of 2.8 gha per person. The Republic of Mordovia has the smallest Ecological Footprint per person, at 3.5 gha.

Figure 13: Top 10 Contributors to Russia's Biocapacity, 2012



3.1 RUSSIA CONSUMPTION HOTSPOTS

The Ecological Footprint consumption categories can be divided into 42 sub-categories to more specifically identify "hotspots" within Russia's Ecological Footprint to serve as targets for reduction. This figure displays the top 24 of 42 sub-categories (the remaining 18 categories are added into the "Other" category), ranked by Footprint size. This breakdown illustrates the connection between Russians' daily activities and the Ecological Footprint.

The largest consumption sub-category of Russia's Footprint is electricity, gas, and other fuels (33 per cent), followed by food (27 per cent), operation of personal transport equipment (11 per cent), and transport services (5 per cent). These top four sub-categories account for 76 per cent of Russia's Ecological Footprint.

Russia's demand for electricity, gas, and other fuels can be partially attributed to its climate and geography, where long, dark, and cold winters require substantial lighting and heating. Inefficient appliances and wasteful energy use practices also contribute to large energy demands. Fossil fuels dominate Russia's primary energy consumption at 88 per cent.[2] As long as the country continues to be a heavy user of oil, natural gas, and coal for power, it will continue to be a heavy carbon emitter. While Russia is the third-largest consumer of nuclear power in the world, only 12 per cent of its primary energy consumption is supplied by non-fossil-based energy sources, including nuclear and renewables (primarily hydropower).[3] As the Footprint sub-categories suggest, increasing energy efficiency where technically possible and transitioning to renewable energy where economically viable will help to reduce Russia's Ecological Footprint and achieve one planet living.

Russia's second largest Footprint sub-category is the food Footprint, with nearly one third of this demand coming from meat and another third coming from food products, beverages, and tobacco products, etc. Because food is one of the most essential components of human demand on nature, it would seem the most challenging to reduce. However, 30 per cent of food is wasted worldwide.[4] The easiest step to reducing the food Footprint — eliminating food waste — has been strongly promoted by Jose Graziano da Silva, the Director-General of the UN Food & Agriculture Organization. Minimizing food losses and food waste along the entire supply chain is just one way to reduce Russia's food Footprint. A lasting shift towards a diet increasingly based on locally produced seasonal food whenever possible can further decrease the food Footprint. (See Section IV Russian Food Footprint for more details.)

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[2] BP, 2016. Statistical Review of World Energy. http://www.bp.com/content/dam/bp/pdf/energy-economics/statistical-review-2016/bp-statistical-review-of-world-energy-2016-full-report.pdf.

[3] Ibid.

[4] FAO, 2013. Food wastage footprint impacts on natural resources. http://www.fao.org/docrep/018/i3347e/i3347e.pdf.

The high proportion of the Footprint related to personal transportation and transport services (16 per cent combined) suggests more public transit and housing located in close proximity to workplaces as policy actions that could lead to Footprint reductions. Businesses also can invest in walkable cities with green infrastructure and low carbon transportation.

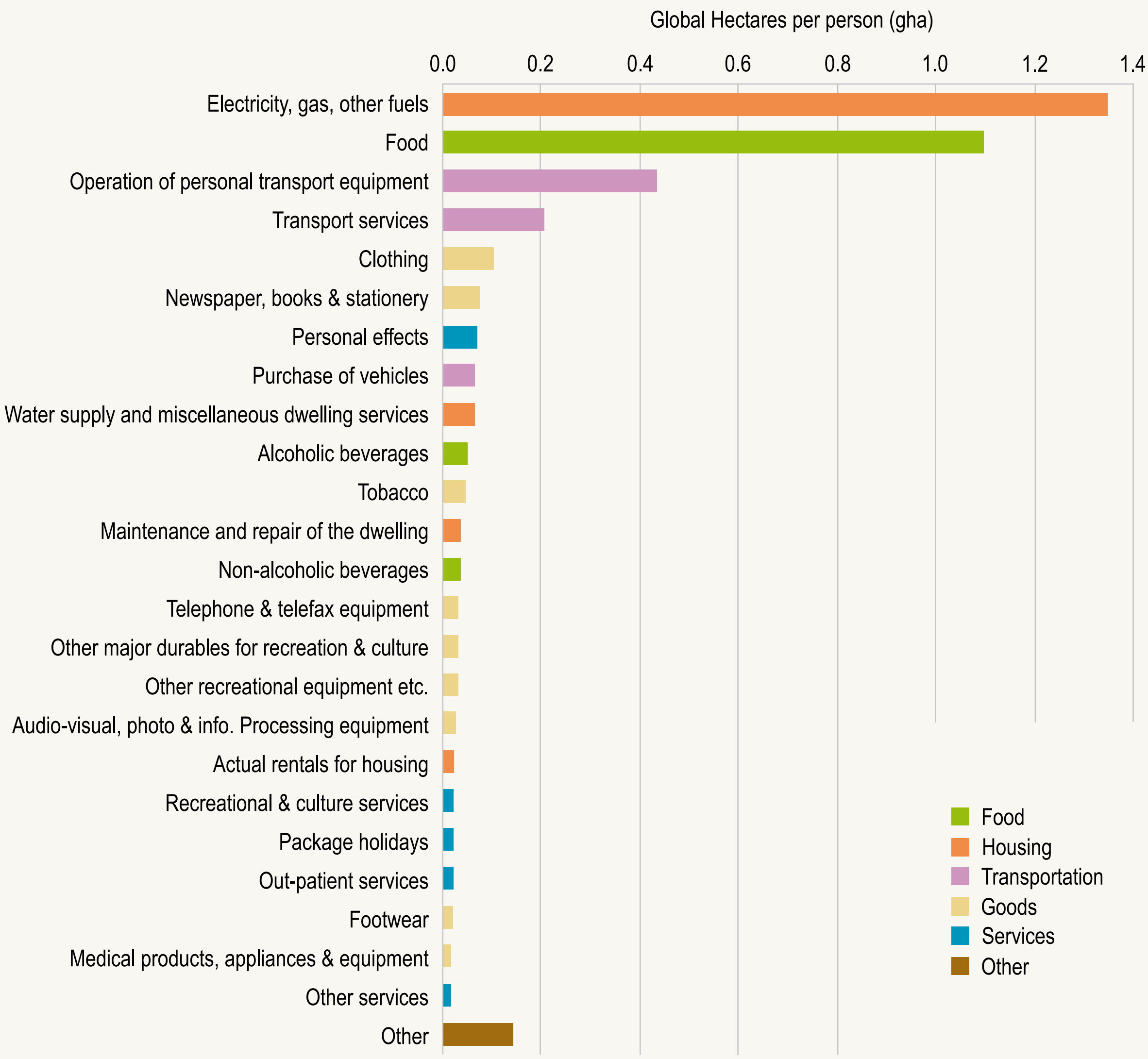
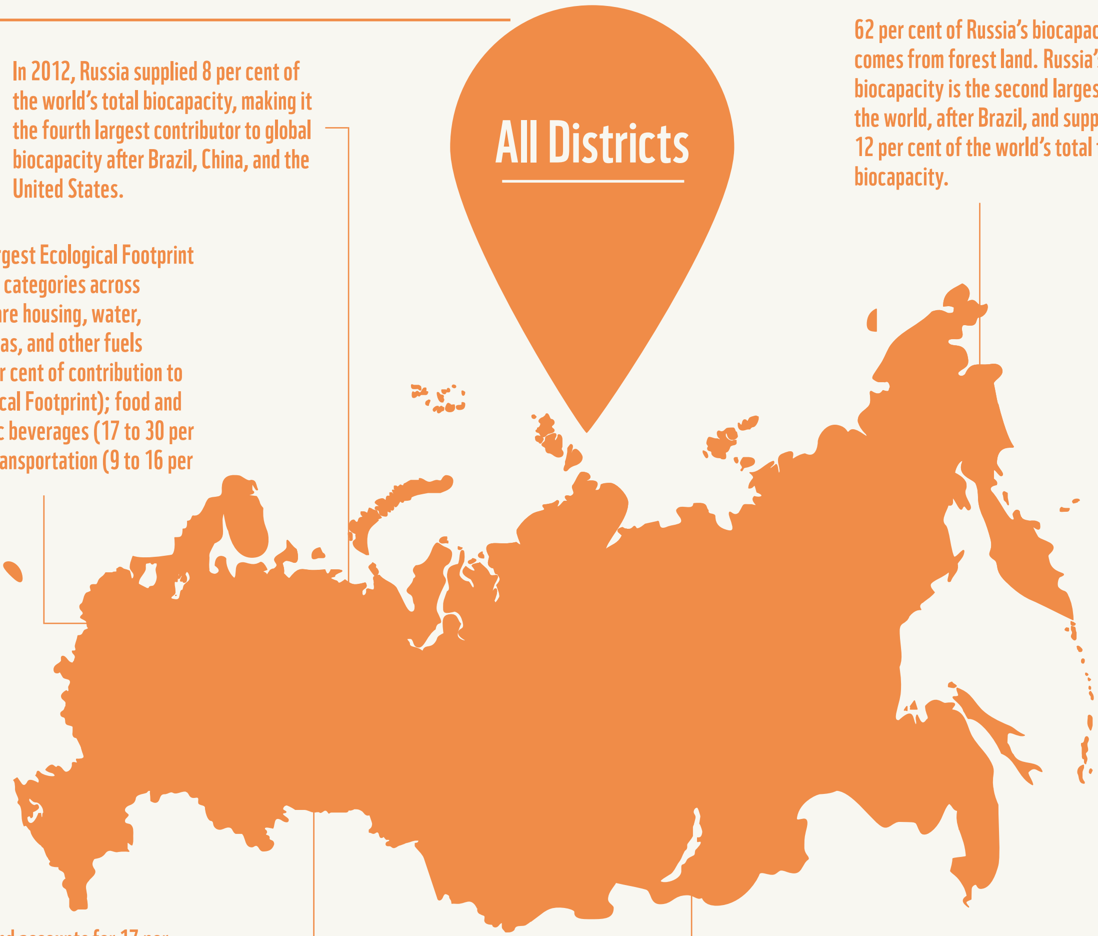


Figure 14: Top Ecological Footprint Sub-categories

This figure displays the top 24 of 42 Ecological Footprint sub-categories (the remaining 18 categories are aggregated into the "Other" category), ranked by Footprint size. This breakdown reveals the connection between daily activities and the Ecological Footprint.

3.2 ECOLOGICAL FOOTPRINT AND BIOCAPACITY BY FEDERAL DISTRICT

This section includes detailed Ecological Footprint per-person information, broken down by consumption category, for each Federal District. This section also breaks down Ecological Footprint and biocapacity by land type to provide a simple comparison. See Appendix 2 for a table of consumption categories.



In 2012, Russia supplied 8 per cent of the world's total biocapacity, making it the fourth largest contributor to global biocapacity after Brazil, China, and the United States.

62 per cent of Russia's biocapacity comes from forest land. Russia's forest biocapacity is the second largest in the world, after Brazil, and supplies 12 per cent of the world's total forest biocapacity.

The three largest Ecological Footprint consumption categories across all districts are housing, water, electricity, gas, and other fuels (21 to 30 per cent of contribution to total Ecological Footprint); food and non-alcoholic beverages (17 to 30 per cent); and transportation (9 to 16 per cent).

Fishing ground accounts for 17 per cent of Russia's biocapacity. Russia has the world's largest fishing ground biocapacity, accounting for 16 per cent of the world's total fishing ground biocapacity. This reflects the fact that Russia has the world's largest area of continental shelf (more than 4 million km^2), where the majority of ocean productivity comes from.

Cropland biocapacity makes up 12.5 per cent of Russia's total biocapacity.

Ecological Footprint methodology scales the Footprint associated with government activities and gross fixed capital formation by the ratio of regional to national household consumption footprint. For example, if a region's household consumption is 10 per cent higher than the national average, the per capita Footprint of government activities and gross fixed capital will also be 10 per cent higher for that region compared with the national average.

Figure 15: Ecological Footprint of Federal Districts by Consumption Category

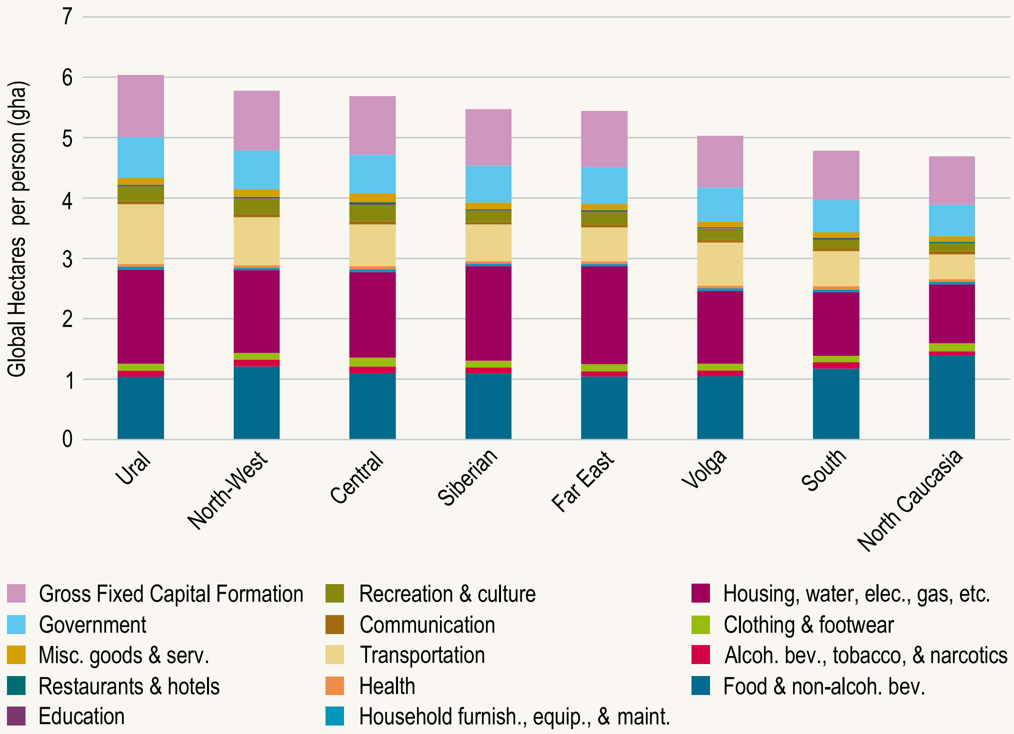
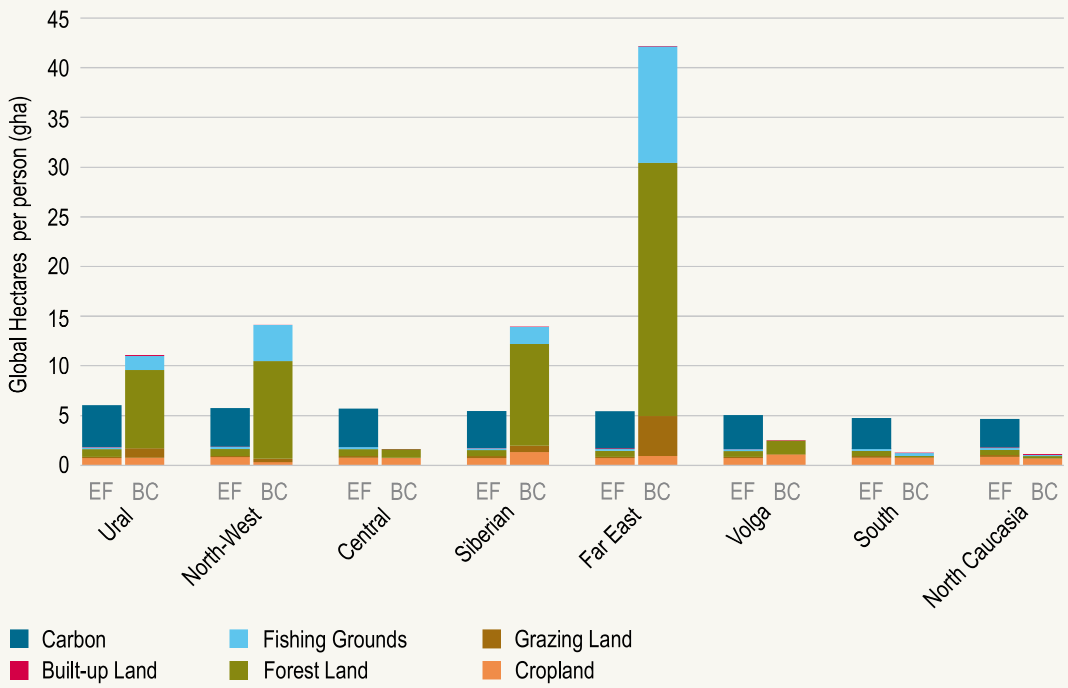
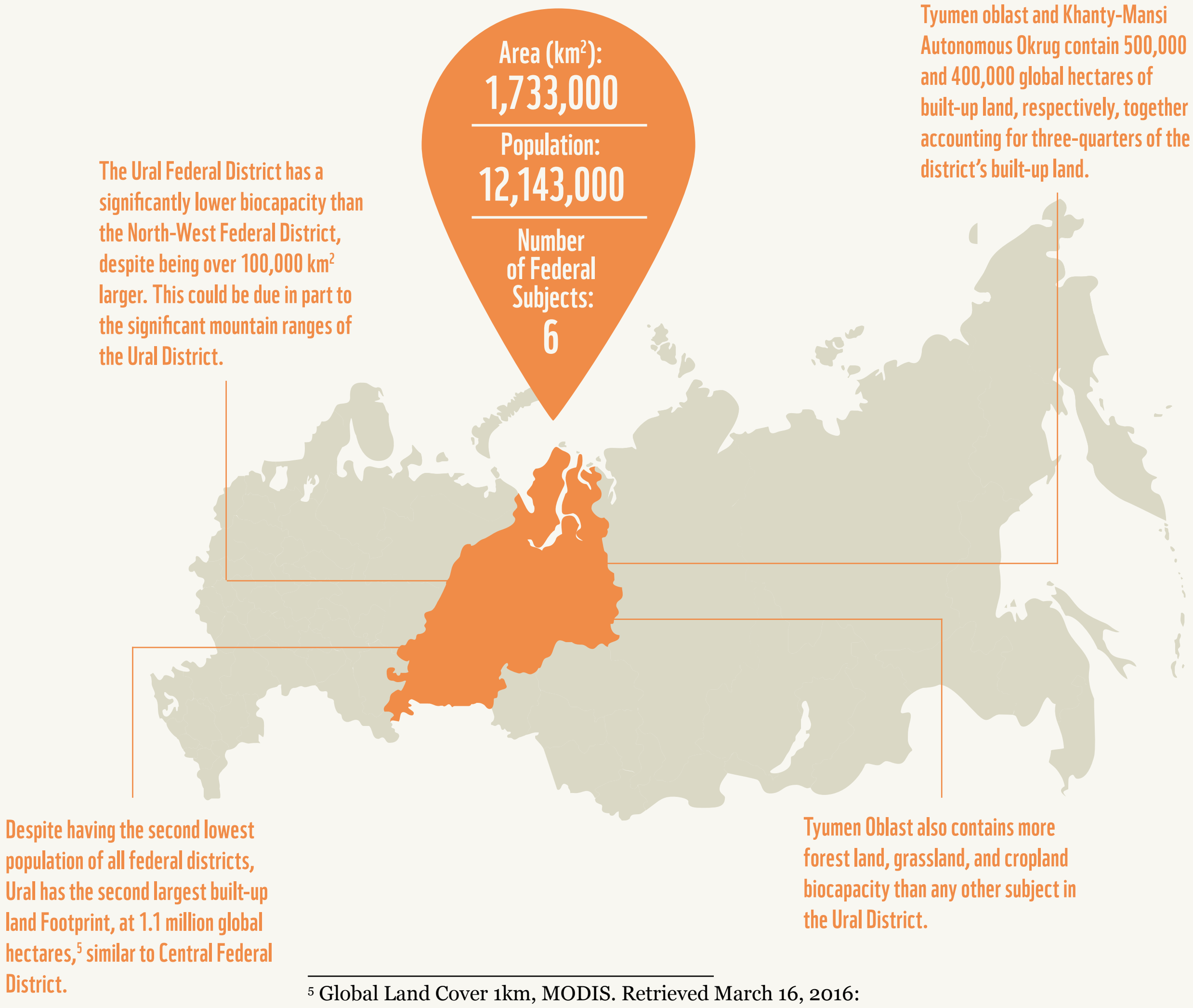


Figure 16: Ecological Footprint and Biocapacity by Land Type for Federal Districts



URAL FEDERAL DISTRICT

The Ural Federal District has the highest Ecological Footprint per person of all Russian districts. This is driven largely by housing, electricity, gas/other fuels, and food and non-alcoholic beverages. The transportation component of the Ural District's Footprint (which includes both private vehicles and transport services) is 39 per cent higher than the Russian Federation average. Ural Federal District has third largest energy intensity of electricity production, which is 22 per cent greater than Russian average. This high Ecological Footprint is also driven by the district's use of coal as a higher proportion of its energy source. These high rates of consumption in transportation and housing are driven largely by three subjects that make up about 40 per cent of the district's population: Tyumen Oblast, Khanty–Mansi Autonomous Okrug – Yugra, and Yamalo-Nenets Autonomous Okrug. Yamalo-Nenets Autonomous Okrug has the highest Footprint of all Russian Federal subjects at 8.9 gha per person compared to the Russian Federation average of 5.7 gha per person.



[5] Global Land Cover 1km, MODIS. Retrieved March 16, 2016: ftp://ftp.ntsg.umt.edu/pub/NPP_Science_2010/GeoTIFF/MOD12Q1/

Figure 17: Ural Federal District Ecological Footprint by Consumption Category

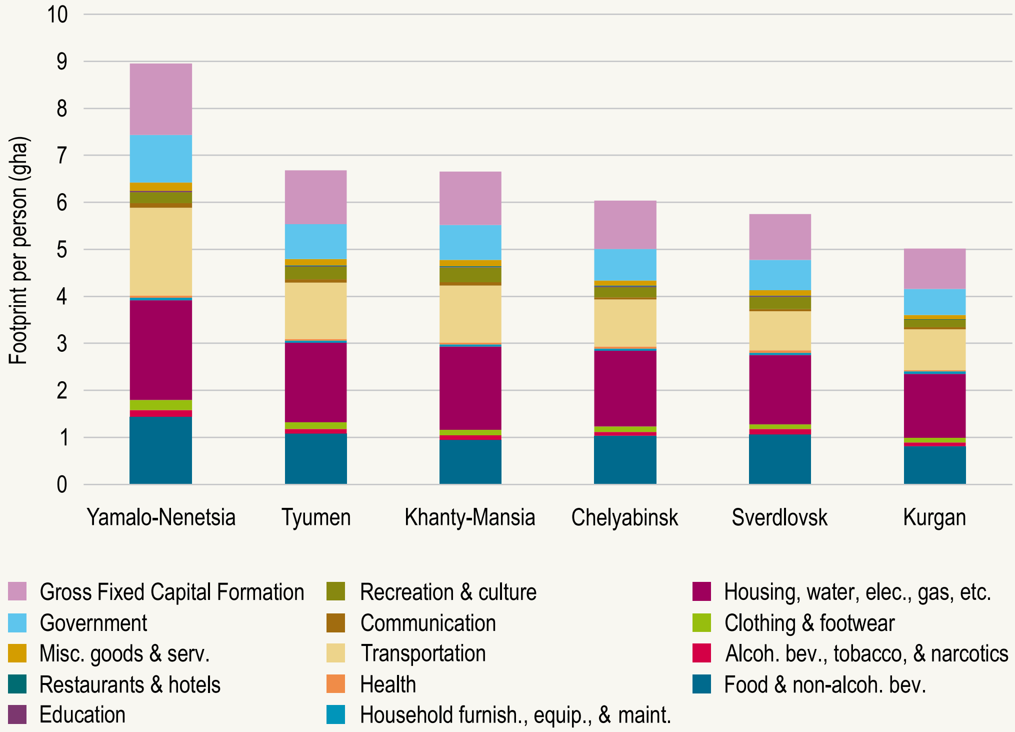
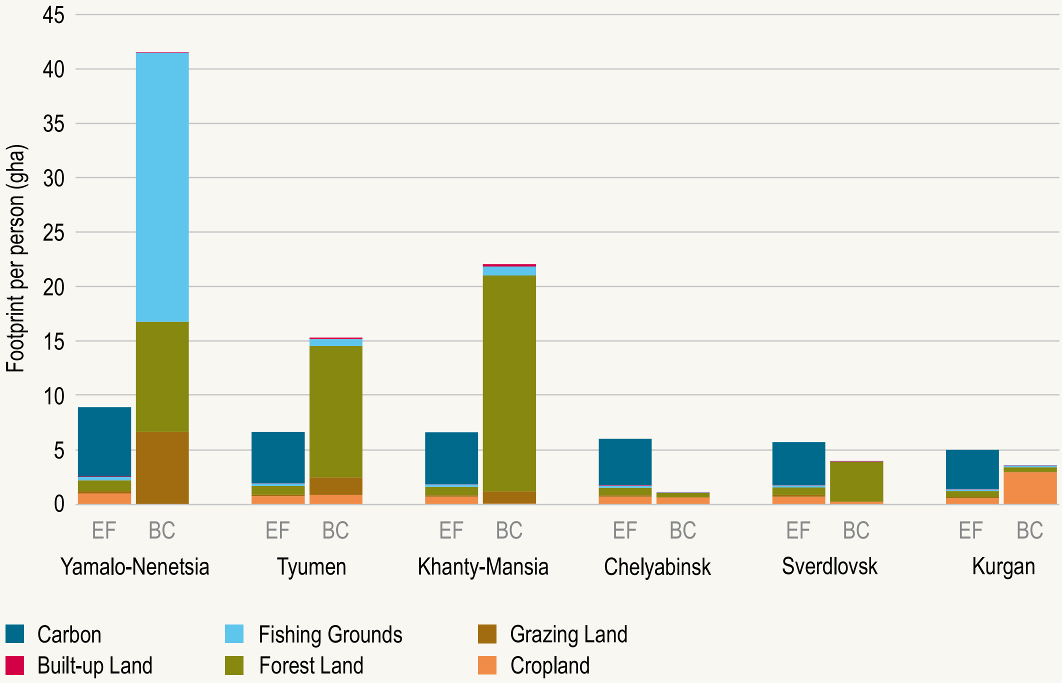


Figure 18: Ural Federal District Ecological Footprint and Biocapacity



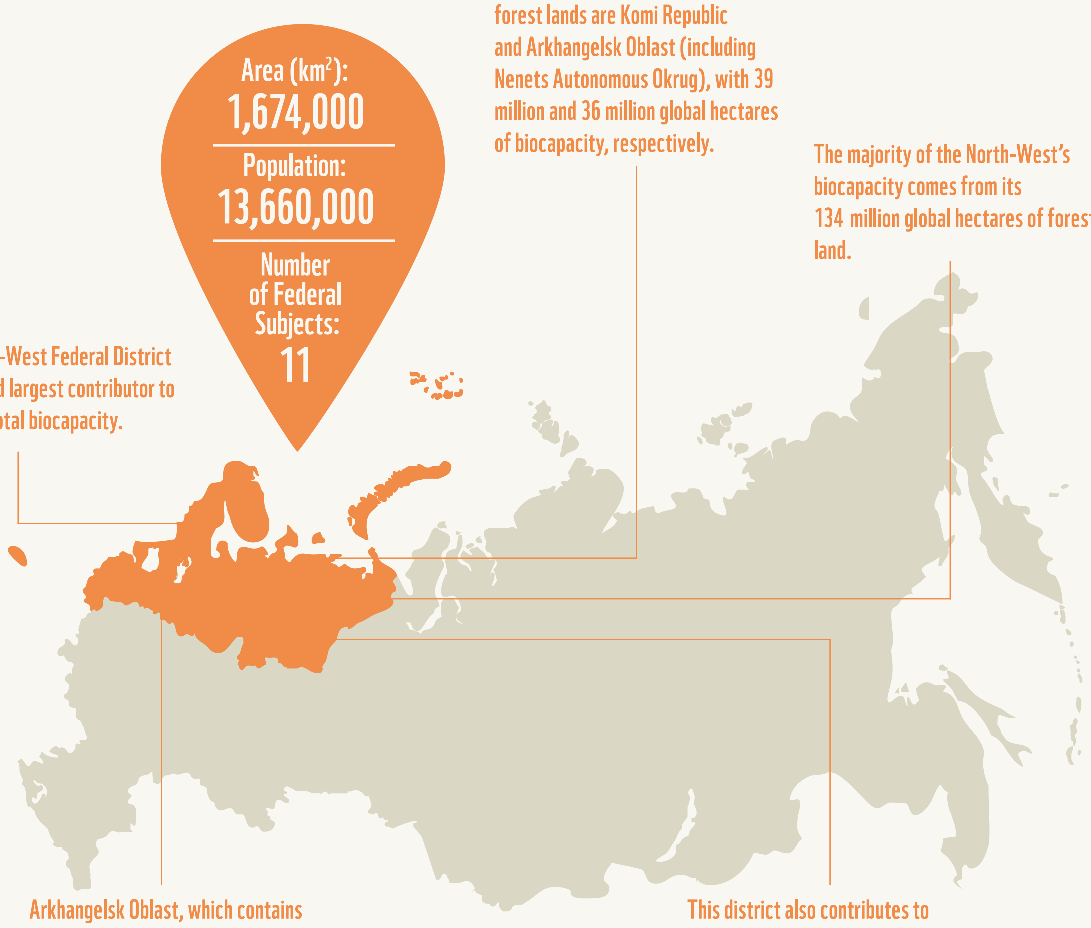
NORTH-WEST FEDERAL DISTRICT

The North-West Federal District has the second highest Ecological Footprint per person of all Russian districts. This is driven largely by St. Petersburg, which makes up over a third of the district's population. With an Ecological Footprint averaging 7.3 global hectares per person, St. Petersburg has one of the highest Footprints among all subjects. The North-West District has particularly high Footprints in transportation and food categories compared to the rest of the nation, largely due to St. Petersburg consumption patterns.

The two subjects that contain the majority of the North-West's forest lands are Komi Republic and Arkhangelsk Oblast (including Nenets Autonomous Okrug), with 39 million and 36 million global hectares of biocapacity, respectively.

The majority of the North-West's biocapacity comes from its 134 million global hectares of forest land.

The North-West Federal District is the third largest contributor to Russia's total biocapacity.



Arkhangelsk Oblast, which contains 30 million global hectares of marine and inland waters, contains 59 per cent of the district's fishing ground biocapacity.

This district also contributes to 28 per cent of Russia's fishing ground biocapacity with 49 million global hectares.

Figure 19: North-West Federal District Ecological Footprint by Consumption Category

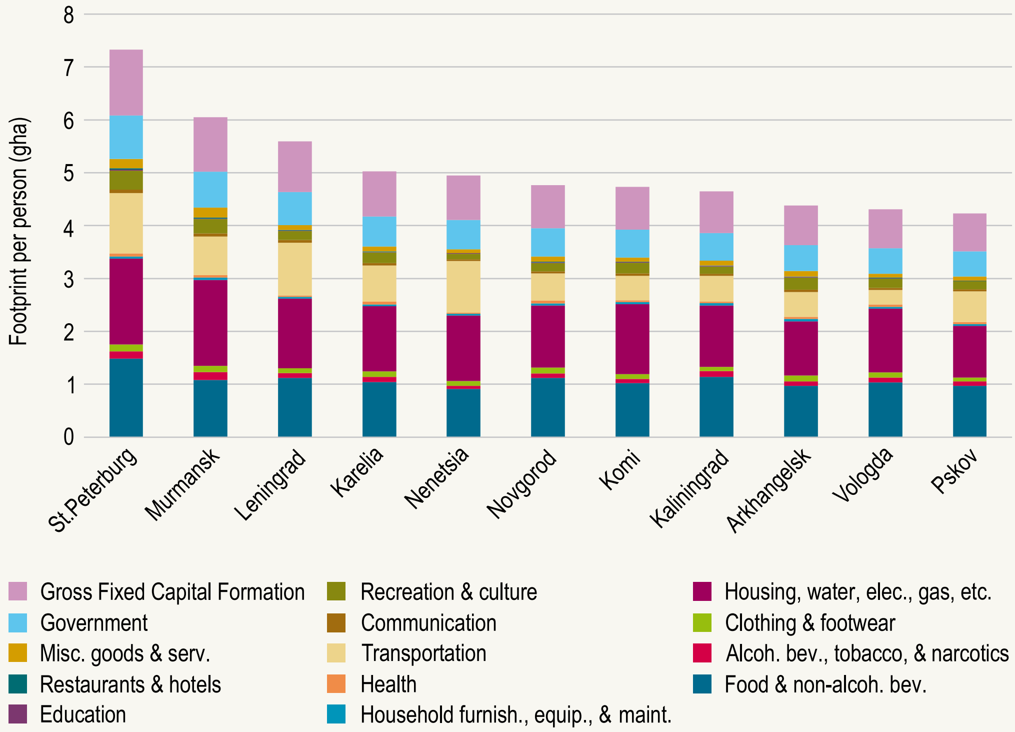
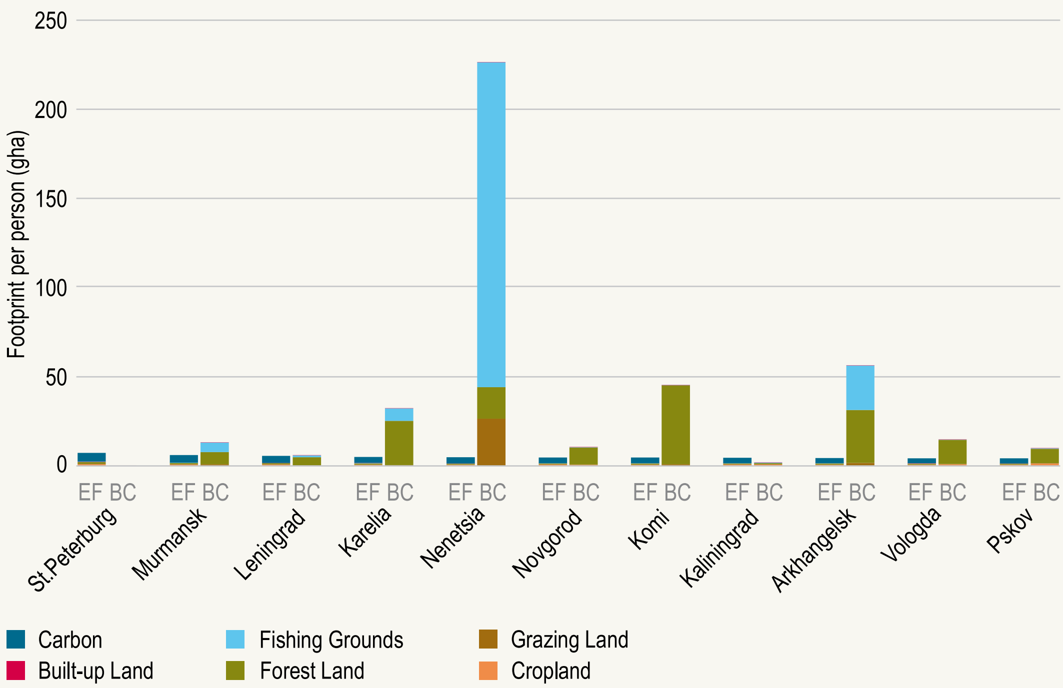


Figure 20: North-West Federal District Ecological Footprint and Biocapacity



CENTRAL FEDERAL DISTRICT

The Central Federal District has the third largest Footprint per person in Russia. People living in the Central District consume 24 per cent more goods and services than the average Russian citizen. This is largely driven by the high per-person Footprint in Moscow City and, to a lesser extent, Moscow Oblast. Moscow City, with a population of over 10 million people, has the third highest per-person Footprint of all federal subjects (behind Yamalo Nenets Autonomous Okrug and St. Petersburg), but the highest Footprint for consumption of goods and services. Moscow City contrasts sharply with Tambov, Smolensk, Voronezh, and Ryazan, which are all in the bottom 10 subjects in terms of per-person Footprint, particularly in consumption of goods and services.

Figure 21: Central Federal District Ecological Footprint by Consumption Category

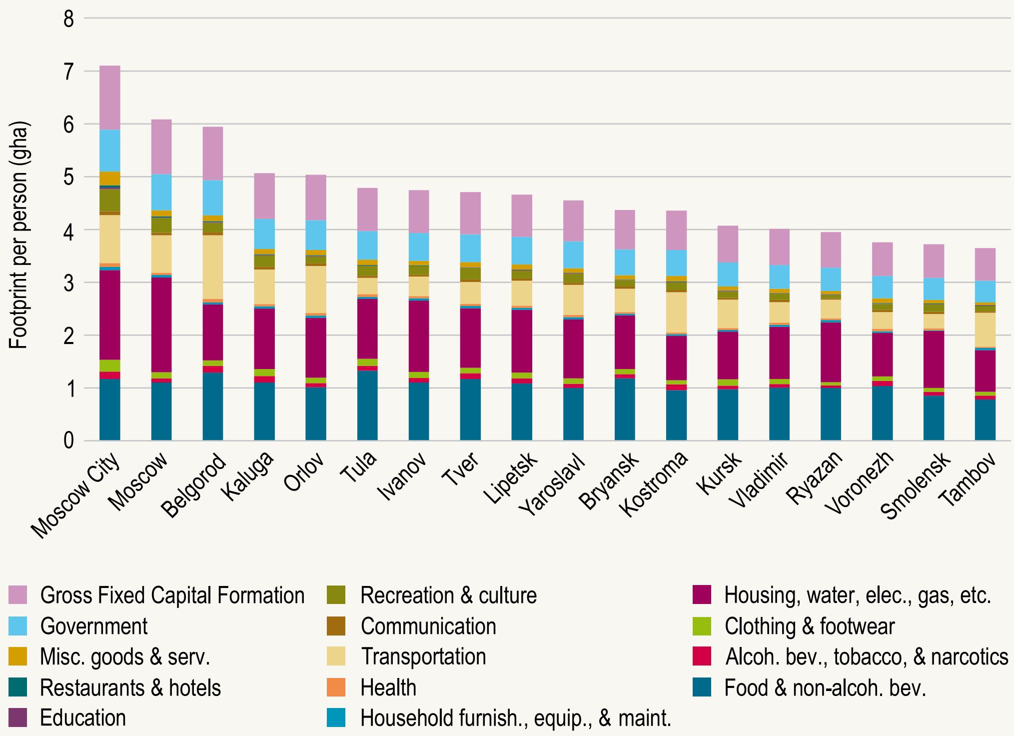
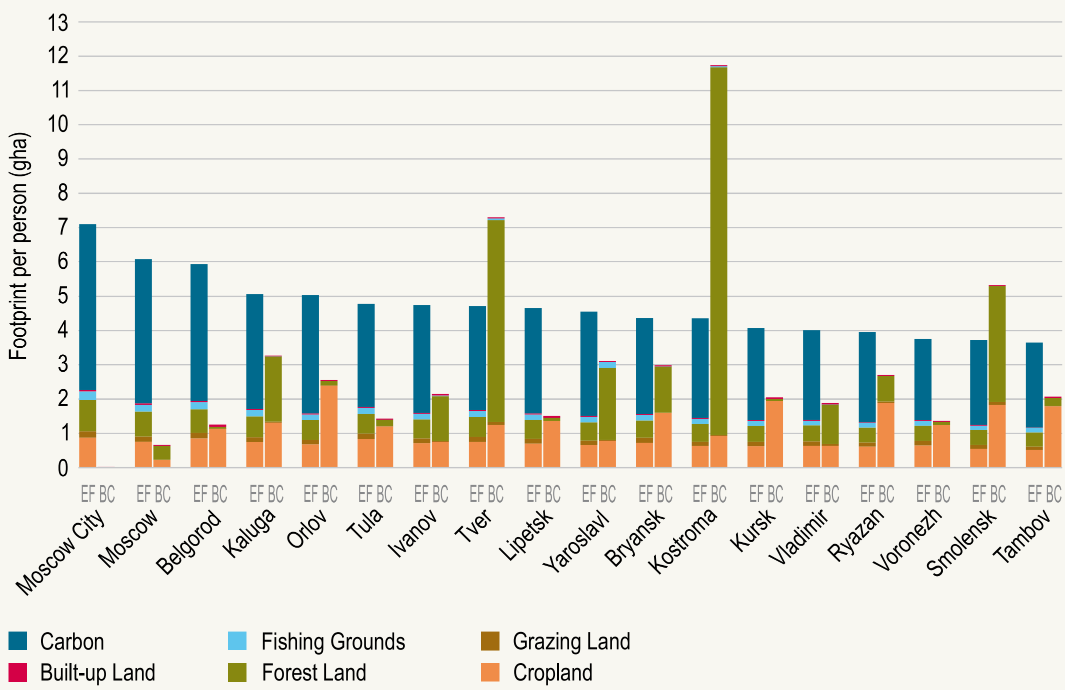


Figure 22: Central Federal District Ecological Footprint and Biocapacity

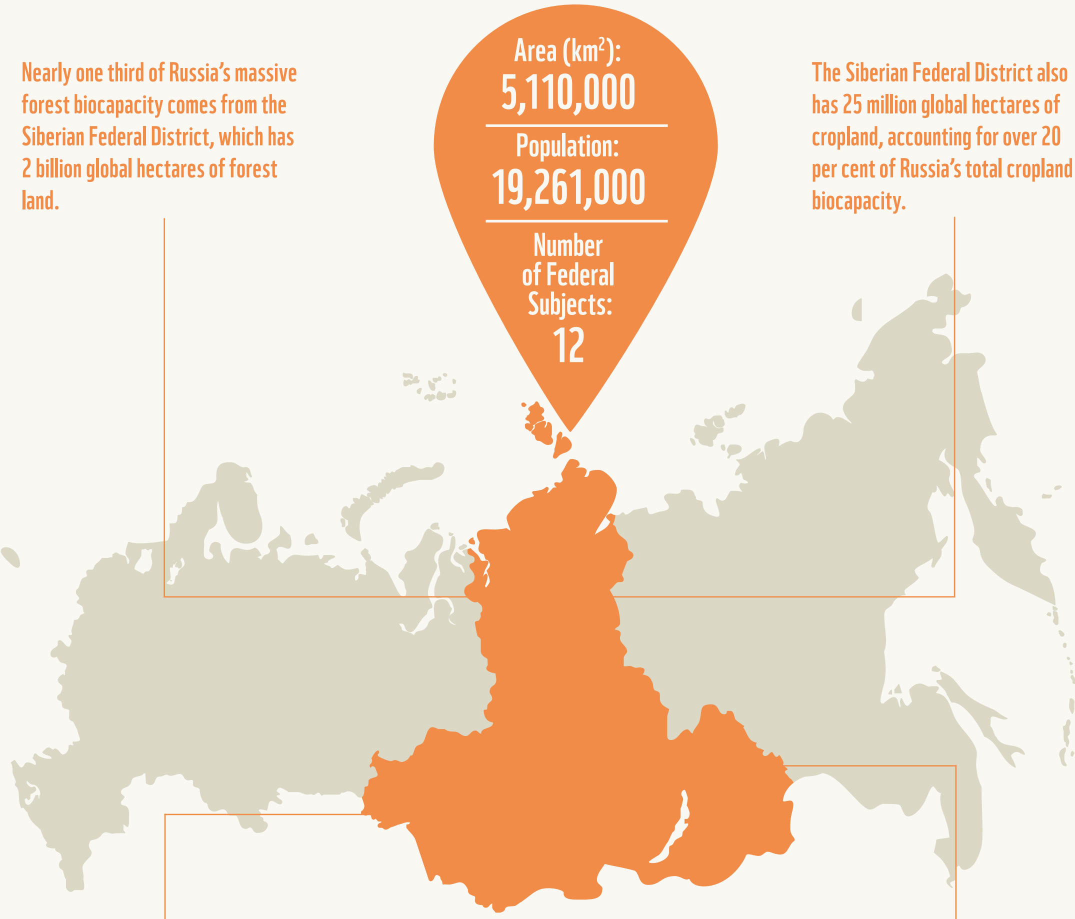


SIBERIAN FEDERAL DISTRICT

The Siberian Federal District has the fourth largest Footprint per person in Russia. The district has the highest biocapacity of all districts, though it is the second largest by land area. Krasnoyarsk Krai, which contains 46 per cent of all land area in the Siberian Federal District, contributes to 42 per cent of the district's total biocapacity, including 89 per cent of the district's fishing ground biocapacity and 37 per cent of its forest land biocapacity. Altai Krai, despite containing only 3 per cent of the district's land area, is the largest contributor to cropland biocapacity, with 5.4 million global hectares. The largest Ecological Footprint consumption category is housing, water, electricity, gas, and other fuels, which contributes 29 per cent of the district's Footprint, followed by food and non-alcoholic beverages, at 20 per cent. Zabaykalsky Krai is the subject with the largest per person Footprint in the district, at 6.2 gha, while Altai Republic has the smallest Footprint, at 3.8 gha per person.

Nearly one third of Russia's massive forest biocapacity comes from the Siberian Federal District, which has 2 billion global hectares of forest land.

The Siberian Federal District also has 25 million global hectares of cropland, accounting for over 20 per cent of Russia's total cropland biocapacity.



The Siberian District contributes to about a quarter of Russia's total grassland biocapacity, with 12 million global hectares.

Irkutsk Oblast has the second largest biocapacity in the Siberian Federal District, 93 per cent of which comes from forest land.

Figure 23: Siberian Federal District Ecological Footprint by Consumption Category

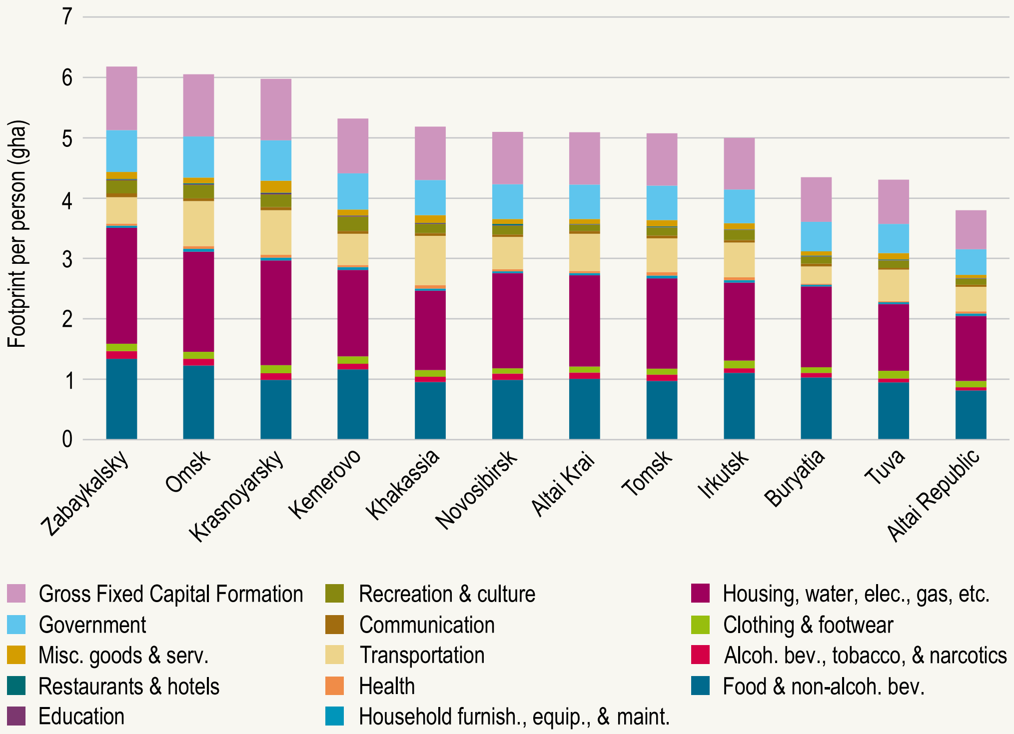
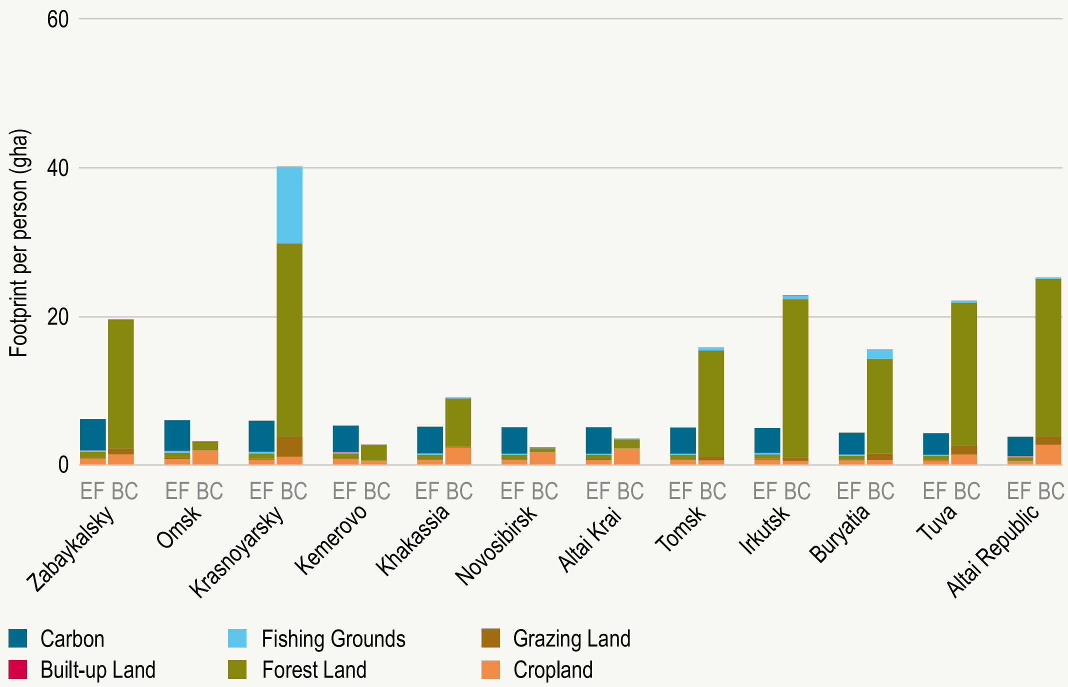


Figure 24: Siberian Federal District Ecological Footprint and Biocapacity

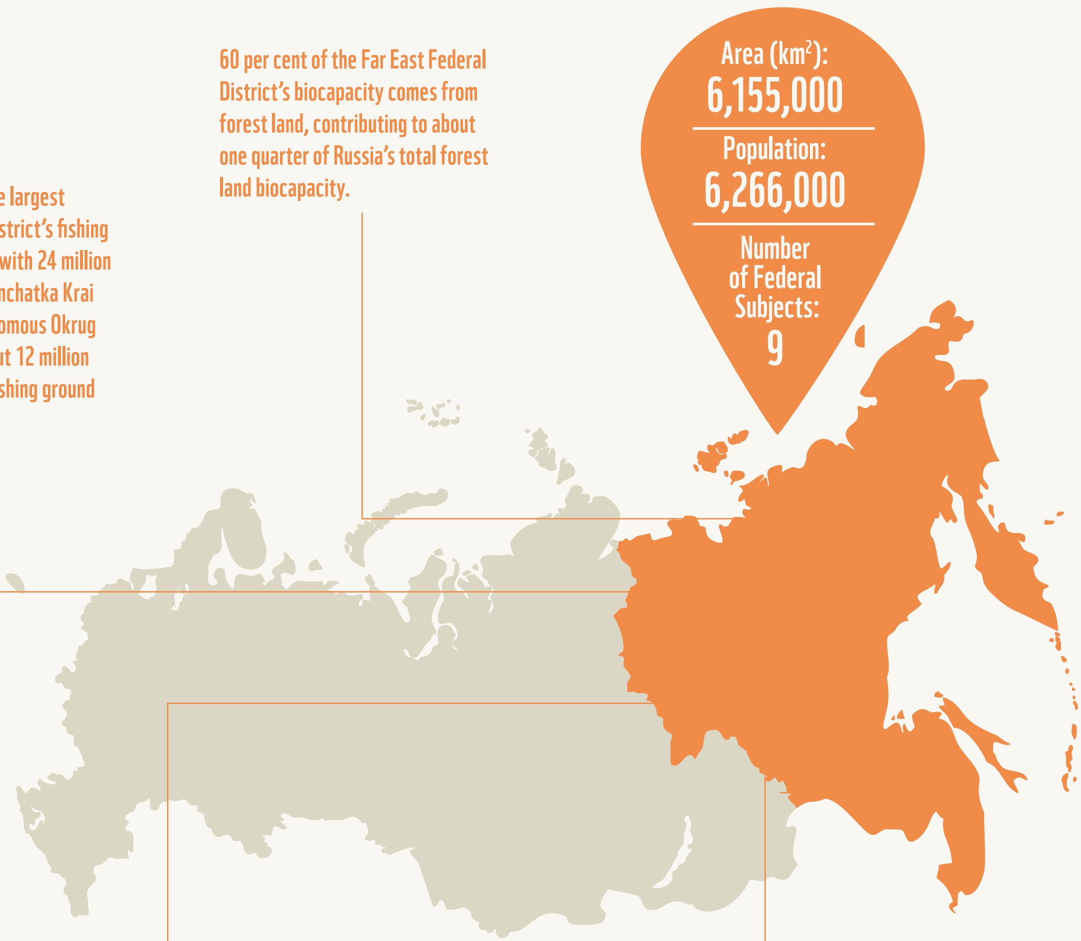


FAR EAST FEDERAL DISTRICT

The Far East Federal District contains the second highest total biocapacity of all districts. It contains 73 million global hectares of fishing grounds, which is a combination of marine and inland water, accounting for 41 per cent of Russia's total fishing ground biocapacity. Although the district contains 36 per cent of Russia's total land area, only 4 per cent of Russia's population live here (2012 Census). Sakhalin Oblast has the largest transportation Footprint in the district, which accounts for 14 per cent of the subject's total Footprint; however, its overall Footprint ranks fourth largest in the district. Chukotka Autonomous Okrug has the smallest Footprint in the district and a remarkably small transportation Footprint, accounting for only 4 per cent of the subject's Footprint, compared to the district average of 10 per cent.

60 per cent of the Far East Federal District's biocapacity comes from forest land, contributing to about one quarter of Russia's total forest land biocapacity.

Sakha Republic is the largest contributor to the district's fishing ground biocapacity, with 24 million global hectares. Kamchatka Krai and Chukotka Autonomous Okrug both contribute about 12 million global hectares of fishing ground biocapacity.



The Far East District also contains 25 million global hectares of grassland, which makes up nearly half of Russia's total grassland biocapacity.

53 per cent of the district's grassland biocapacity comes from Sakha Republic.

Figure 25: Far East Federal District Ecological Footprint by Consumption Category

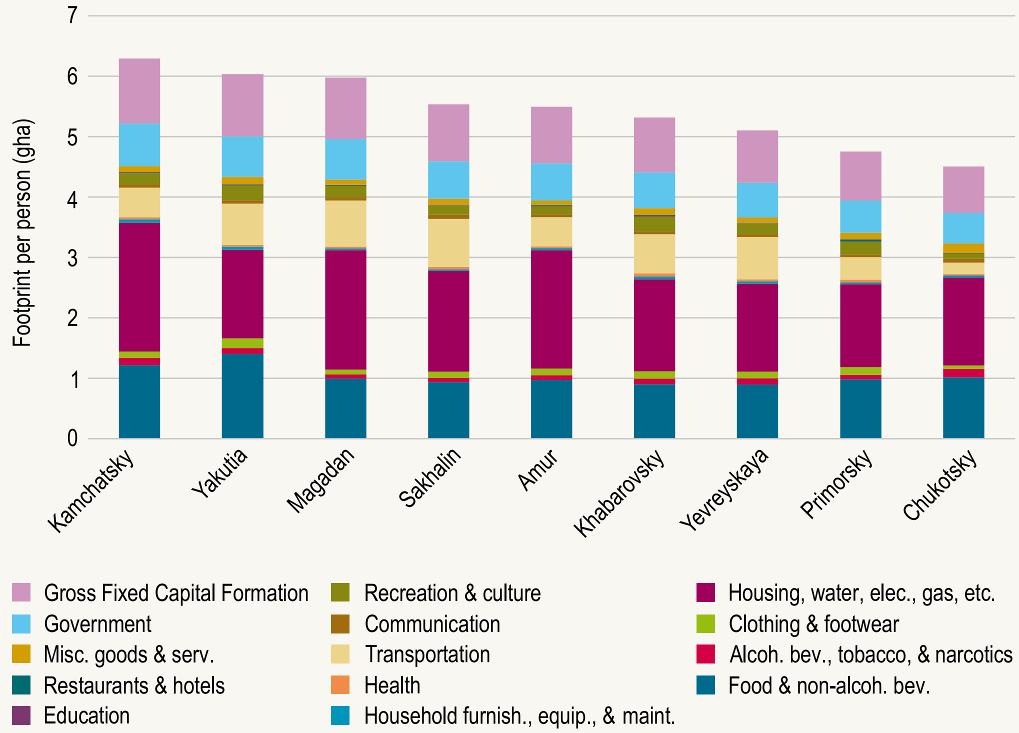
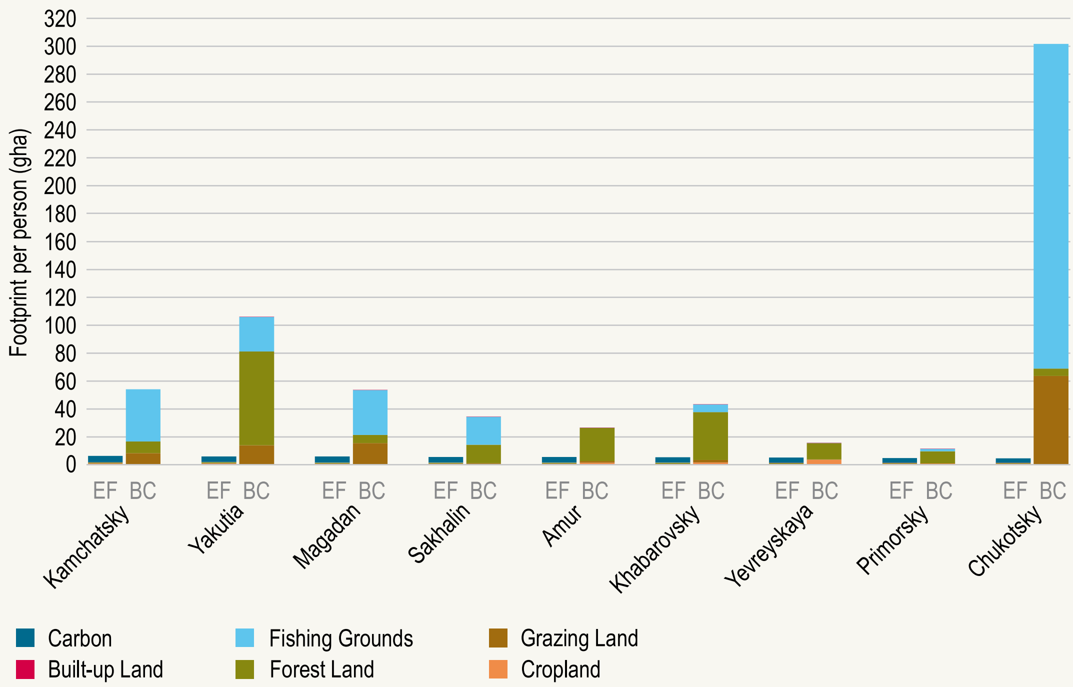


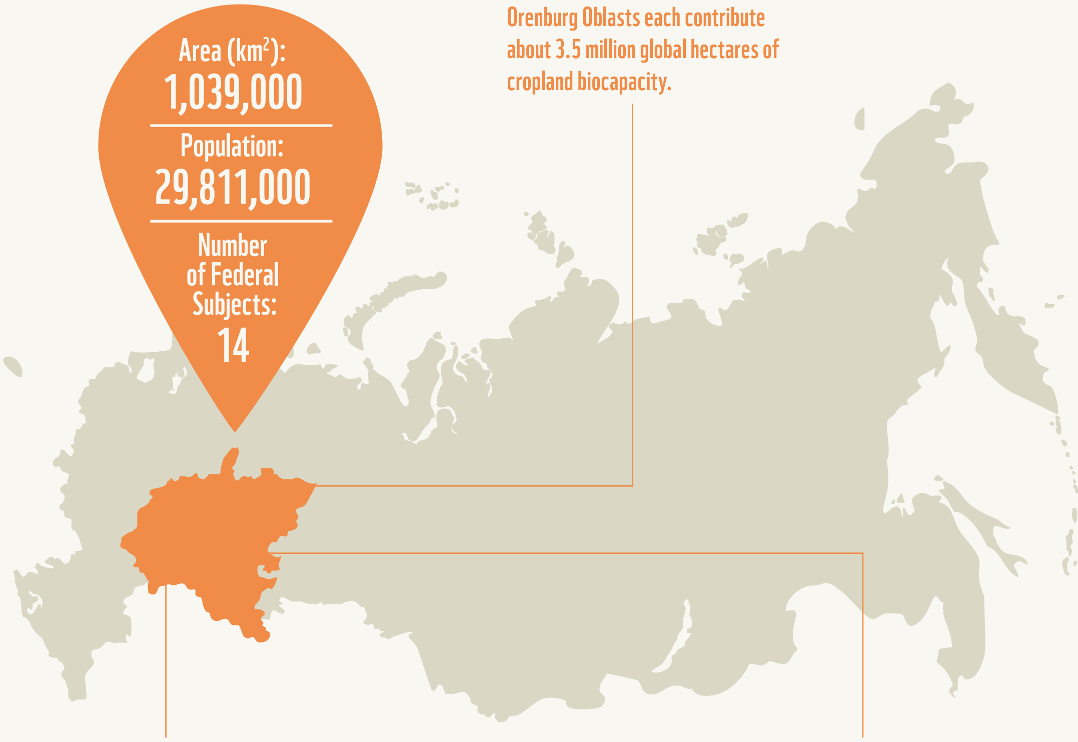
Figure 26: Far East Federal District Ecological Footprint and Biocapacity



VOLGA FEDERAL DISTRICT

The Volga Federal District has the third lowest Footprint per person in Russia. The Republic of Bashkortostan has the largest Footprint in the district, 32 per cent larger than the district average. This is driven in part by the Republic of Bashkortostan's large transportation Footprint, which accounts for 22 per cent of the subject's total Footprint, compared to an average 14 per cent for the Volga Federal District. The Republic of Mordovia has the district's smallest total Footprint, but the largest component of the housing, water, electricity, gas, and other fuels at 29 per cent, compared to a district average of 24 per cent. The Volga Federal District, which contains just 6 per cent of the nation's land area and 21 per cent of its total population, contains almost exclusively cropland and forest land biocapacity. Built-up land accounts for only 1.3 per cent of the district's biocapacity.

The Republic of Bashkortostan contains 4.7 million global hectares of cropland biocapacity, accounting for 21 per cent of the district's total. Nizhny Novgorod, Saratov, and Orenburg Oblasts each contribute about 3.5 million global hectares of cropland biocapacity.



With 32 million global hectares of cropland, Volga contains over a quarter of Russia's cropland biocapacity.

Permskij kraj has the highest biocapacity of all subjects in the Volga District, but the lowest cropland biocapacity of any subject. Forest land comprises 90 per cent of its biocapacity.

Figure 27: Volga Federal District Ecological Footprint by Consumption Category

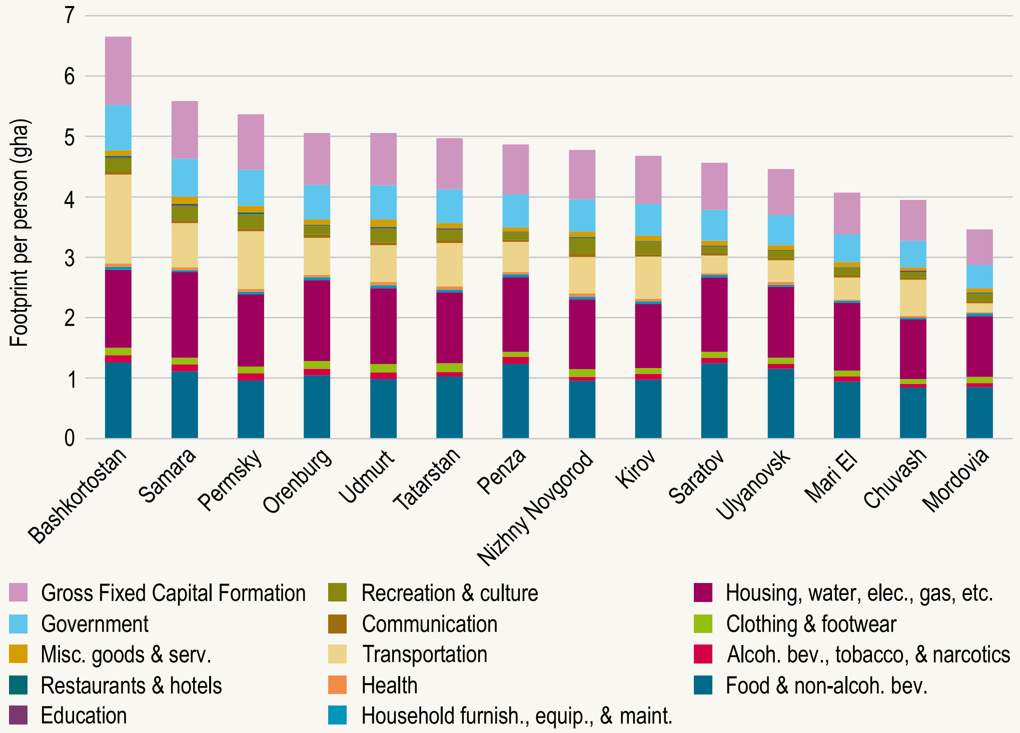
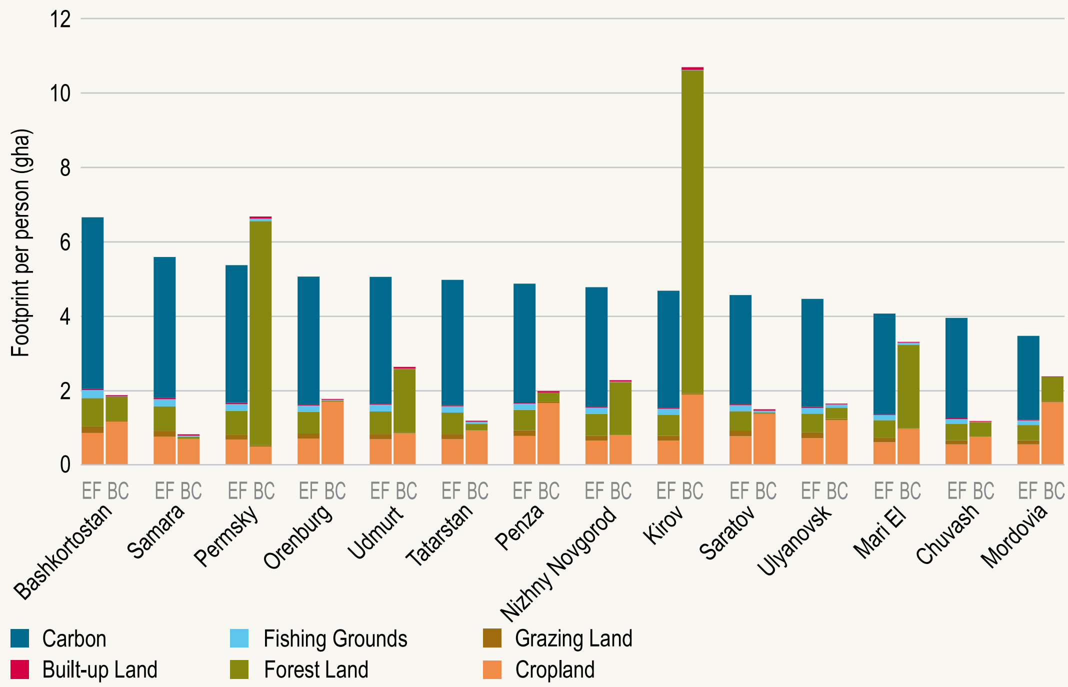


Figure 28: Volga Federal District Ecological Footprint and Biocapacity



SOUTH FEDERAL DISTRICT

The South Federal District has the second lowest per-person Footprint in Russia at 4.75 gha. While its food Footprint is slightly above average, households in the South Federal District have a far lower Footprint in all other consumption categories than Russia's average. Consumption trends are driven largely by Krasnodar Krai and Rostov Oblast, which contain the majority of the district's population. Krasnodar Krai also contains a great deal of the district's biocapacity, including 80 per cent of its forest land, half of its fishing ground, and a third of its cropland.

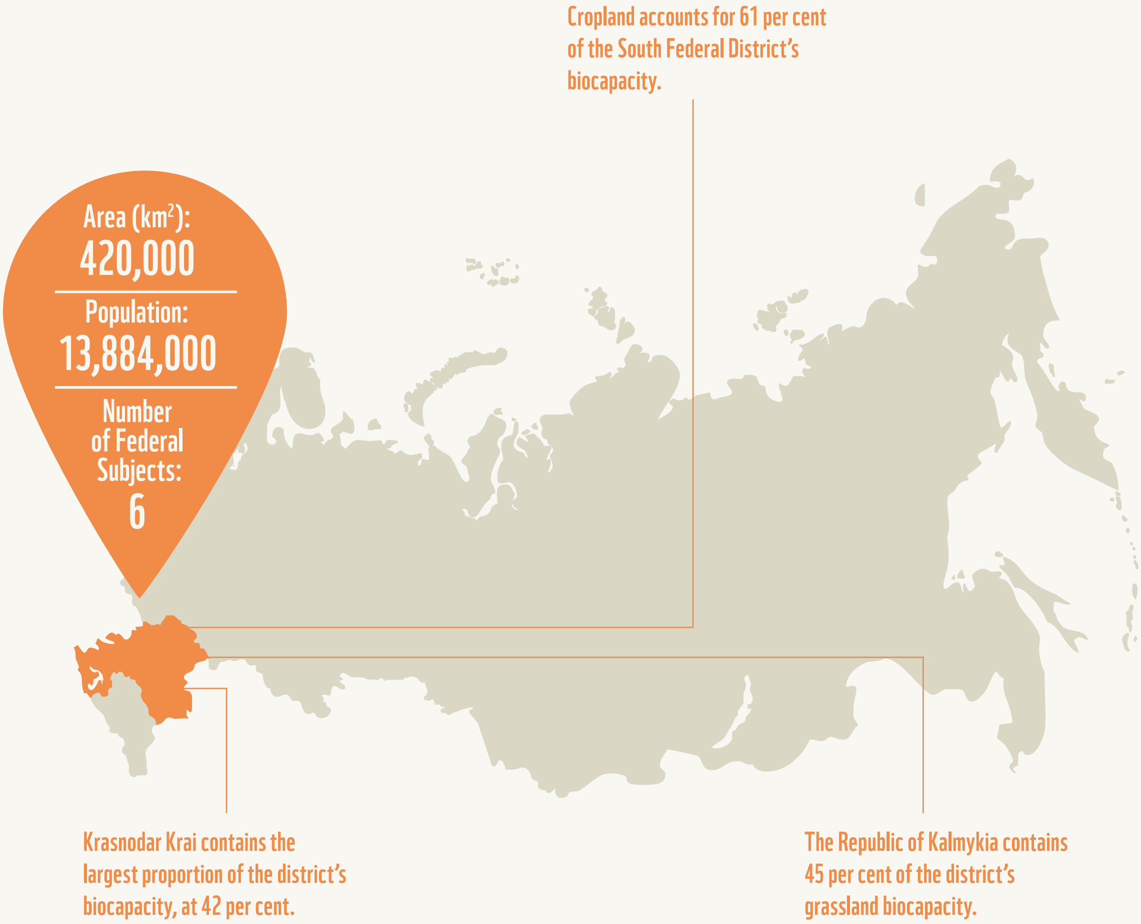


Figure 29: South Federal District Ecological Footprint by Consumption Category

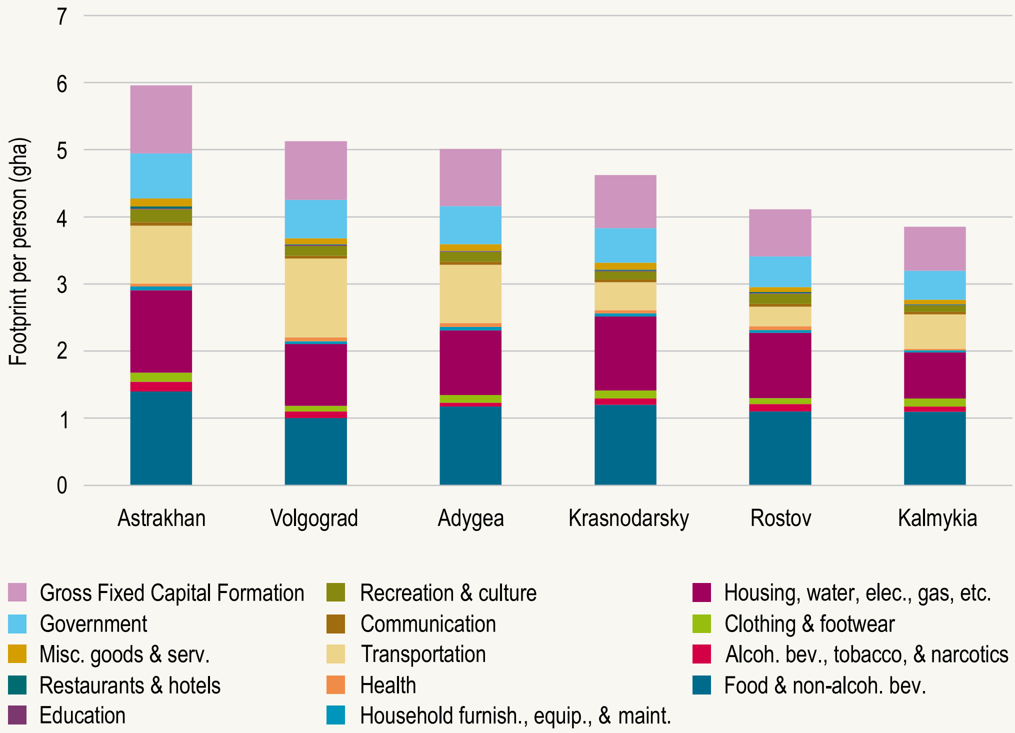
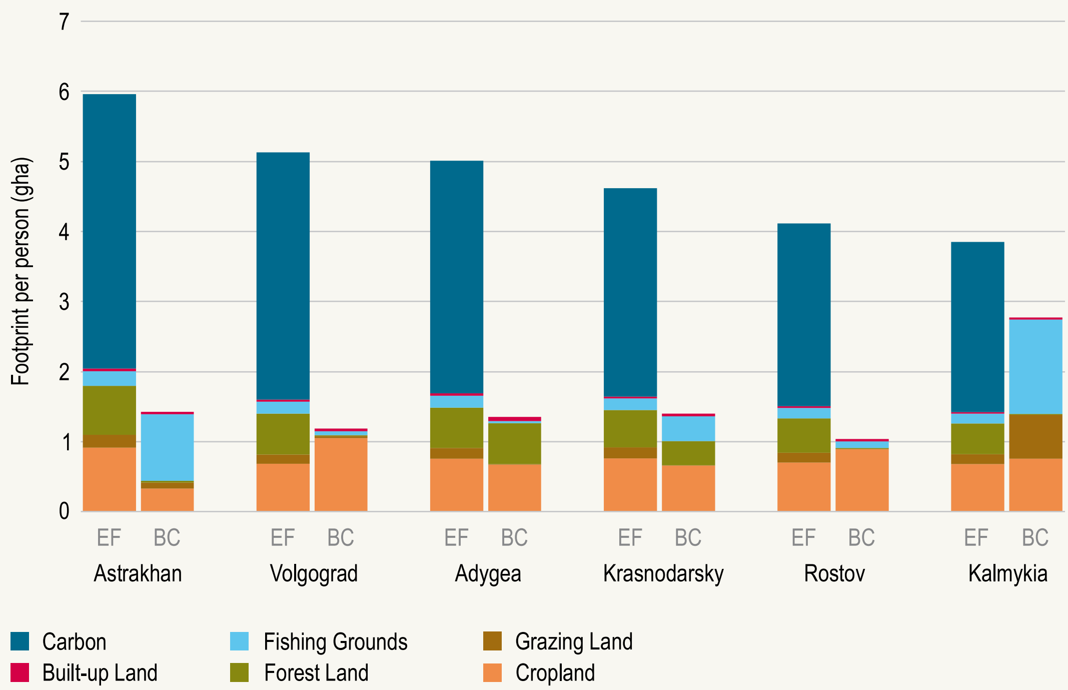


Figure 30: South Federal District Ecological Footprint and Biocapacity

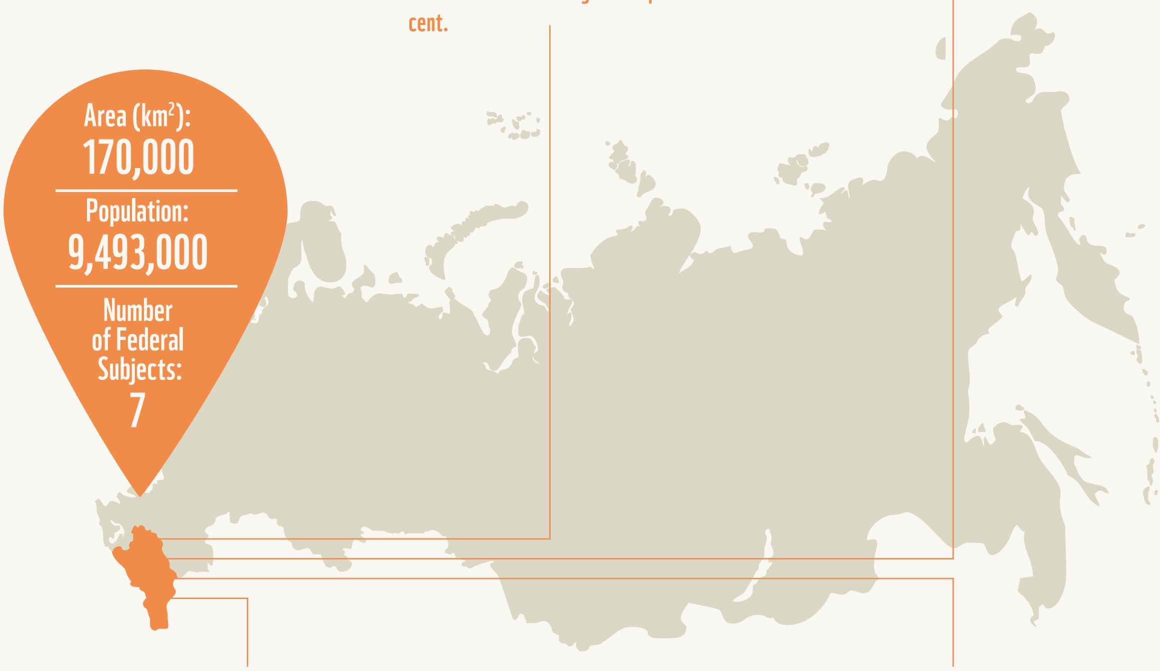


NORTH CAUCASIAN FEDERAL DISTRICT

The North Caucasian Federal District is the smallest federal district in Russia by area, with the lowest biocapacity. It also has the lowest per-person Footprint in Russia. While the food Footprint in the North Caucasian District is about 20 per cent higher than the national average, the following consumption categories are lower than average: alcoholic beverages, tobacco, and narcotics; housing, water, electricity, gas, and other fuels; transportation; and recreation and culture.

Food and non-alcoholic beverages makes up 52 per cent of Chechen Republic's Footprint and 44 per cent of the Republic of Ingushetia's Footprint, both significantly higher than the district average of 30 per cent.

Cropland makes up 60 per cent of the North Caucasian Federal District's biocapacity, while forest land makes up 20 percent.



Cropland makes up 94 per cent of Stavropol Krai biocapacity and accounts for 44 per cent of the district's total biocapacity.

Dagestan has 40 per cent of the district's inland water biocapacity and 100 per cent of its marine biocapacity, which reflects its location bordering the Caspian Sea.

Figure 31: North Caucasian Federal District Ecological Footprint by Consumption Category

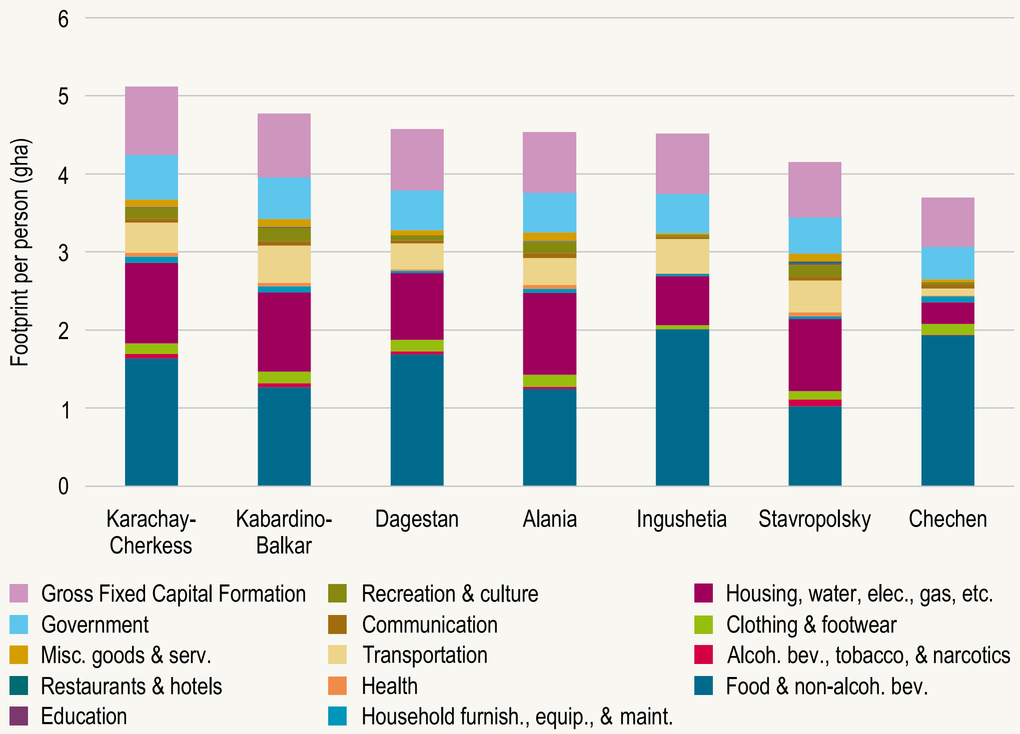
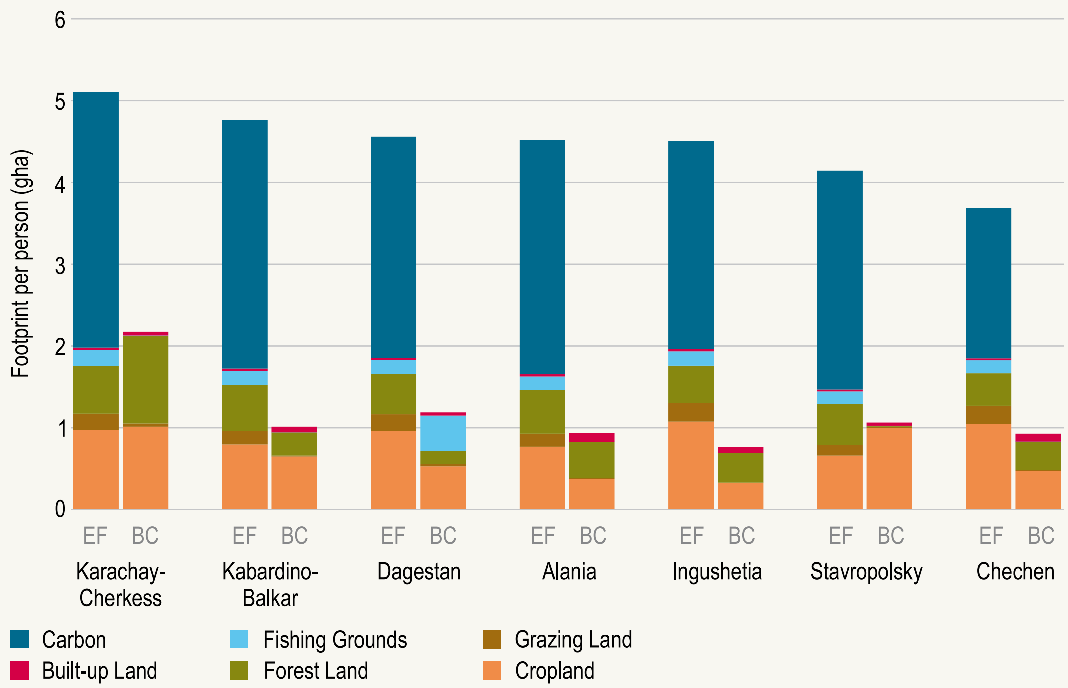
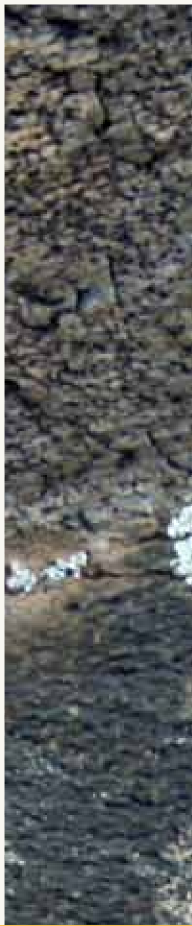


Figure 32: North Caucasian Federal District Ecological Footprint and Biocapacity





3.3 WORLD HDI-FOOTPRINT COMPARISON

MEASURING HUMAN PROGRESS

In the early 1990s, Indian economist and Nobel laureate Amartya Sen and former Finance Minister of Pakistan Mahbub ul Haq created a measure for human development that was simple, outcome based, and not solely focused on income. The result, published by the United Nations Development Programme, was the Human Development Index (HDI) – now the most prominent alternative progress measure to GDP.

HDI is composed of three domains: longevity, basic education, and income. For the last component, the logarithm of income is measured, since an extra dollar to a high-income person is worth less than the extra dollar to a low-income person.

Federal Subjects' HDI rankings were calculated using regional GDP, from which extractive income was excluded. This makes the calculation more consistent with the intention behind the HDI, which focuses on the ability to generate income.

Hence the number should not include income from liquidation of assets. This slight modification (i.e., "adjusted HDI") helps rectify the bias toward low-population density regions with large extractive sectors. In those regions, the reported GDP does not necessarily translate into local income since the assets may be held by people and entities outside the Federal Subject.

A country's development progress can be assessed by using the United Nations' Human Development Index (HDI), which aggregates education, longevity, and income into a single number.

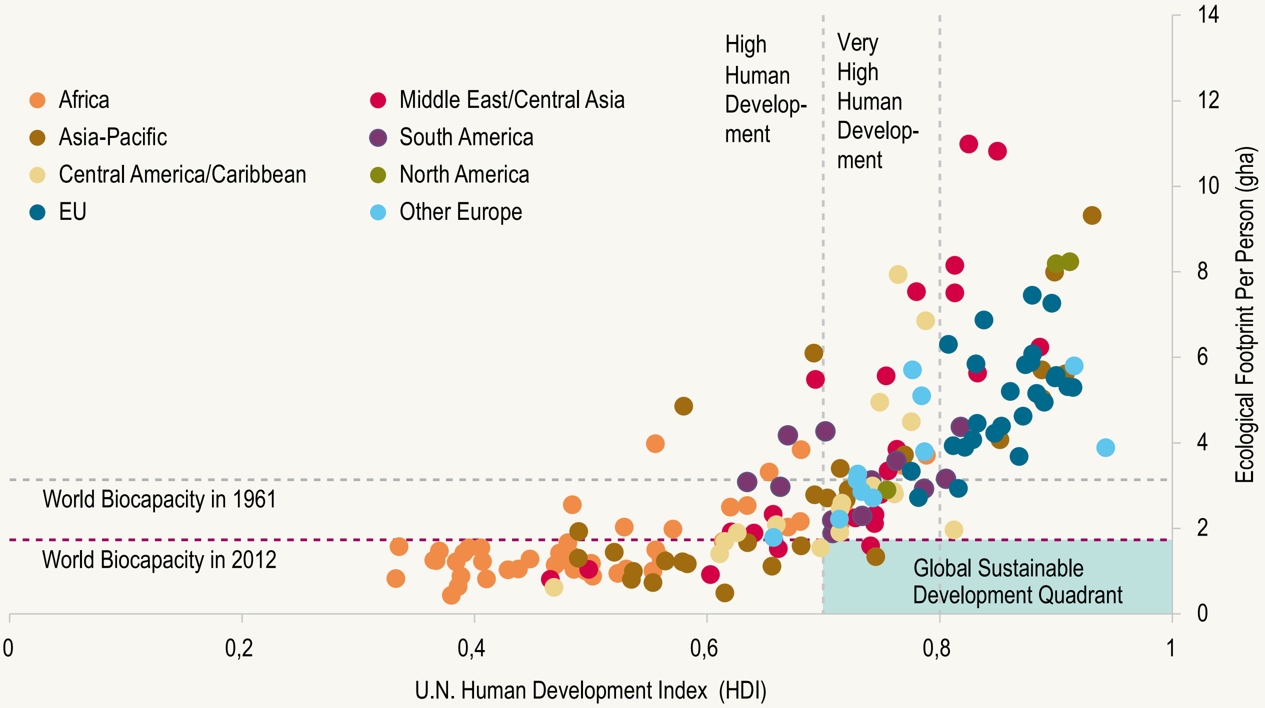
United Nations Development Programme defines an HDI score of 0.7 as the threshold for high development.

The biocapacity available on the planet is calculated as 1.7 gha per person. Combining available biocapacity and HDI provides clear minimum conditions for globally sustainable human development (Figure 33). Countries in the light-blue section of the lower right-hand box exhibit high levels of development within globally replicable resource demand. As of 2012, no countries occupy the right-most section, which represents very high levels of sustainable development.

Despite the recent focus on sustainable development on the world stage, a resource-intensive, traditional path to development remains the norm. Higher development achievements are highly correlated with increased resource use (see Figure 33). However, access to growing levels of ecological resources is no longer guaranteed in today's world, and this reality may threaten long-term improvements in human welfare if the conventional path is taken. Countries that pursue the path of sustainable development will be best positioned to meet their future needs.

Russia has shown great success in the area of human development and is securely positioned as a country with a high HDI, with relatively high standards of health and education. However, Russia is now demanding more biocapacity per person than is globally available, and the world's growing population is increasing that discrepancy.

Figure 33: Ecological Footprint Per Person and HDI of Nations by World Regions (2012)



ADJUSTED HUMAN DEVELOPMENT AND ECOLOGICAL FOOTPRINT

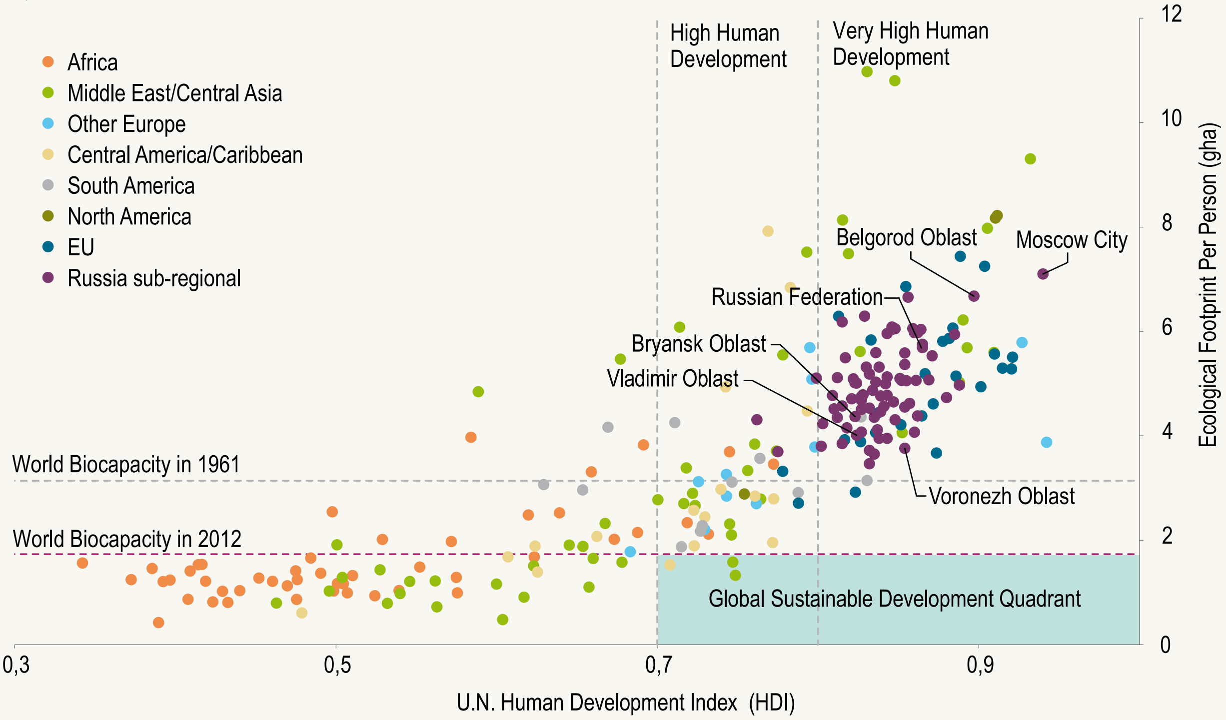
Russia has made notable progress during the 20th century in implementing policies that enable residents to improve the quality of their life. Every Federal Subject can be categorized as having a high-, or very high adjusted HDI value, and compares favorably with much of the world (see Figure 34).

In 2012, 79 Federal Subjects had a very high adjusted HDI score (above 0.8 or 98th per centile). An additional two subjects were classified as having high Human Development, with an HDI value above 0.7.

During the same period, however, the Ecological Footprint of every Federal Subject exceeded the global average available per person biocapacity of 1.7 global hectares.

More study is required to determine which Federal Subjects have most improved well-being at the expense of resource security, and which Subjects remain most exposed (Footprint and biocapacity long-term time trends are not presently available at the subnational level). With all subjects achieving at least a high level of human development, it is now important to monitor the Footprint and biocapacity at the subnational level in Russia and focus on shifting the subjects' Ecological Footprints toward the global sustainable development quadrant.

Figure 34: Ecological Footprint Per Person and HDI of Nations by World Regions (2012)



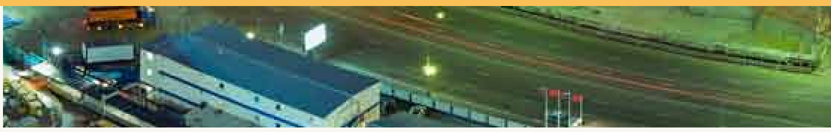
“The two major sources of air pollution in Moscow are vehicle emissions and industrial emissions, accounting for 90% and 10% of air pollutants respectively. Over the last few years Moscow Government has implemented an ambitious program which allowed cutting motor vehicle emissions by over 100,000 tonnes. This was due in part to the introduction of the Euro 5 standard, major public transportation system improvements, including construction of new metro stations, expansion of paid on-street parking zones, as well as efforts to restrict access of heavy goods vehicles to the city. Compared to a year before, average annual concentration of nitrogen dioxide in 2015 was down 9%, nitrogen oxide down 25%, particulate matter down 15%, sulfur dioxide down 20% and carbon monoxide down 7%.

To mitigate their impact on urban ecosystems, Moscow’s industrial enterprises are carrying out modernization projects with potentially hazardous facilities being relocated away from the city. One such large-scale reconstruction and modernization program adopted in late 2010 is currently being implemented at one of Moscow Refineries. Modernization of the refinery is scheduled for completion in 2020, but it has already led to a 36% reduction in emitted air pollutants and a 50% decrease in overall damage to the environment. At the final stage of modernization, the refinery’s negative effect on the environment is expected to go down by another 50%. The facilities of two major wastewater treatment plants - in suburban areas of Kurianovo and Lubertsy - are also being upgraded, as a result of which a high content of hydrogen sulfide in the city air is being registered much less frequently.

Even more importantly, there is a clear trend towards greater environmental transparency of enterprises in terms of their compliance with environmental laws and regulations. This has been achieved largely through the introduction of industrial emission control systems. A total of 57 industrial enterprises have had emission control systems installed so far and the progress is still ongoing.

In recent years many efforts have been made to retain Moscow’s top ranking as the city with the largest area of green spaces. Urban greenery takes up almost half the city’s land area (49,4%), which is almost twice as much as in London (26%), 2,5 times more than in Paris (21%), and 13 times more than in Beijing (3,8%). Extensive projects to plant trees, shrubs, flowers, etc., are annually carried into effect. In 2013, a “One million trees” community-wide environmental initiative was launched in Moscow to help enhance the city’s green spaces. As part of the campaign, 1,6 million trees and shrubs have been planted across Moscow, and the city plans to move forward with it.”

Anton Kulbachevskiy
Director of the Moscow Department
for Environmental Management and Protection



3.4 CASE STUDY: MOSCOW CITY

Moscow's Ecological Footprint is 84.2 million global hectares, while the city itself has just 324,000 global hectares of biocapacity. In other words, Moscow demands 260 times as much from nature as nature within its borders can regenerate. Moscow is 2,600 km² in size with over 12 million people, which helps explain why its Ecological Footprint far exceeds its biocapacity.

Moscow is surrounded by the Moscow Oblast, which has an additional 44,300 km². The biocapacity of Moscow Oblast plus Moscow City is about 5 million global hectares, which is almost 80 million global hectares less than what Moscow City demands in a year.

Moscow and Moscow Oblast are within the Central Federal District, with a total area of 651,000 km². The biocapacity of the entire Central Federal District is 62.5 million global hectares – still more than 20 million global hectares less than Moscow's total demand for renewable resources.

In fact, meeting Moscow's annual demand would require the biocapacity of a 450 kilometer radius around the city – an area of 636,000 km². This is greater than the combined areas of Germany, the Netherlands, Belgium, Slovakia, the Czech Republic, and Switzerland.

However, in reality, the biocapacity from the surrounding regions is also used by the people living in those regions and beyond.

The carbon Footprint is the main driver of Moscow's high Ecological Footprint. Moscow City's cropland Footprint is over one third of the Central Federal District's cropland biocapacity. Moscow consumes almost four times as much grazing land Footprint as the Central Federal District contains, and almost nine times as much fishing grounds. Yet Moscow city makes up roughly one third of the district's population.

This situation is hardly surprising, given that cities are epicenters of population and economic prosperity. By 2050, cities are expected to host 80 per cent of the global population (which is forecast to reach 10 billion by this time). Even today some cities consume more resources than their entire countries could provide. For instance, Athens alone demands 122% of the biocapacity of all of Greece.

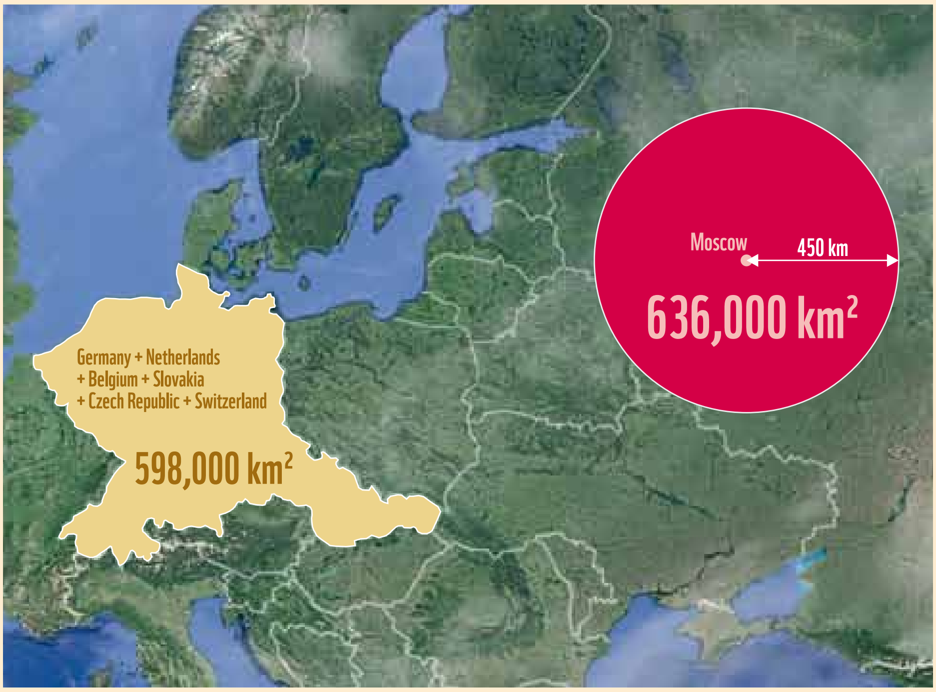


Figure 35: Moscow City Ecological Footprint. *Meeting Moscow's annual demand would require the biocapacity of a 450 kilometer radius around the city – an area of 636,000 km². This is greater than the combined areas of Germany, the Netherlands, Belgium, Slovakia, the Czech Republic, and Switzerland.*

And yet cities hold the key to making lifestyles more sustainable. The first step towards a more sustainable future is to take stock of the amount of resources available to cities and to use these metrics for long-term development planning. Some cities, such as Calgary, the largest city in Alberta, Canada, have developed specific Footprint reduction targets.[6] Others, including Moscow, are catching up. In its 2014 Report on the State of Environment in Moscow, the Moscow City Government acknowledged the need to regularly measure the city's Ecological Footprint and to develop a set of measures aimed at its reductions.[7]

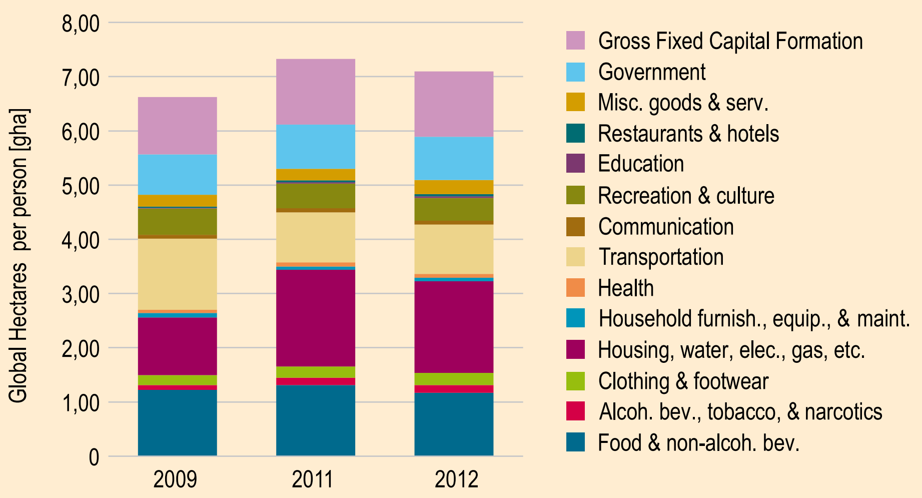
Moscow is a member of C40 Cities Climate Leadership Group, a network of the world's megacities committed to addressing climate change, and the Compact of Mayors, a platform to capture the impact of cities' collective actions through standardized measurement of emissions and climate risk and consistent, public reporting.

It is important, however, that cities go beyond reporting and information exchange and engage in real-life projects aimed at reducing their Footprint. In Moscow, the most significant progress so far can be observed in transportation, where the Footprint fell from 1.32 gha in 2009 to 0.91 gha in 2012 — a decline of more than 30 per cent. If the large-scale public transport improvements continue, the per capita Footprint of transportation, which largely consists of emissions from fossil fuel combustion, will likely further decrease in the coming years.

On the other hand, the Footprint of housing, which accounts for water, electricity, and heating consumed by citizens, continues to grow (1.69 in 2012 from just 1.06 gha in 2009), which indicates that more efforts are needed to reduce resource consumption. These could include more sustainable building standards, as well as measures to reduce water, energy, and heating losses in resources transmission and distribution.

Living sustainable lifestyles, including eating sustainably, also is important. Recommendations and tools to save water and energy and reduce wastes should be widely communicated to citizens. Moscow's food Footprint (1.17 gha) accounts for 16.5 per cent of the city's overall resource requirements, and is much higher than is globally sustainable. Eating more local and seasonal products when available, as well as cutting down on animal proteins (like beef imported from South America) and highly processed foods, will all contribute to making Moscow's food Footprint more sustainable.

Figure 36: Moscow City Ecological Footprint by Consumption Category

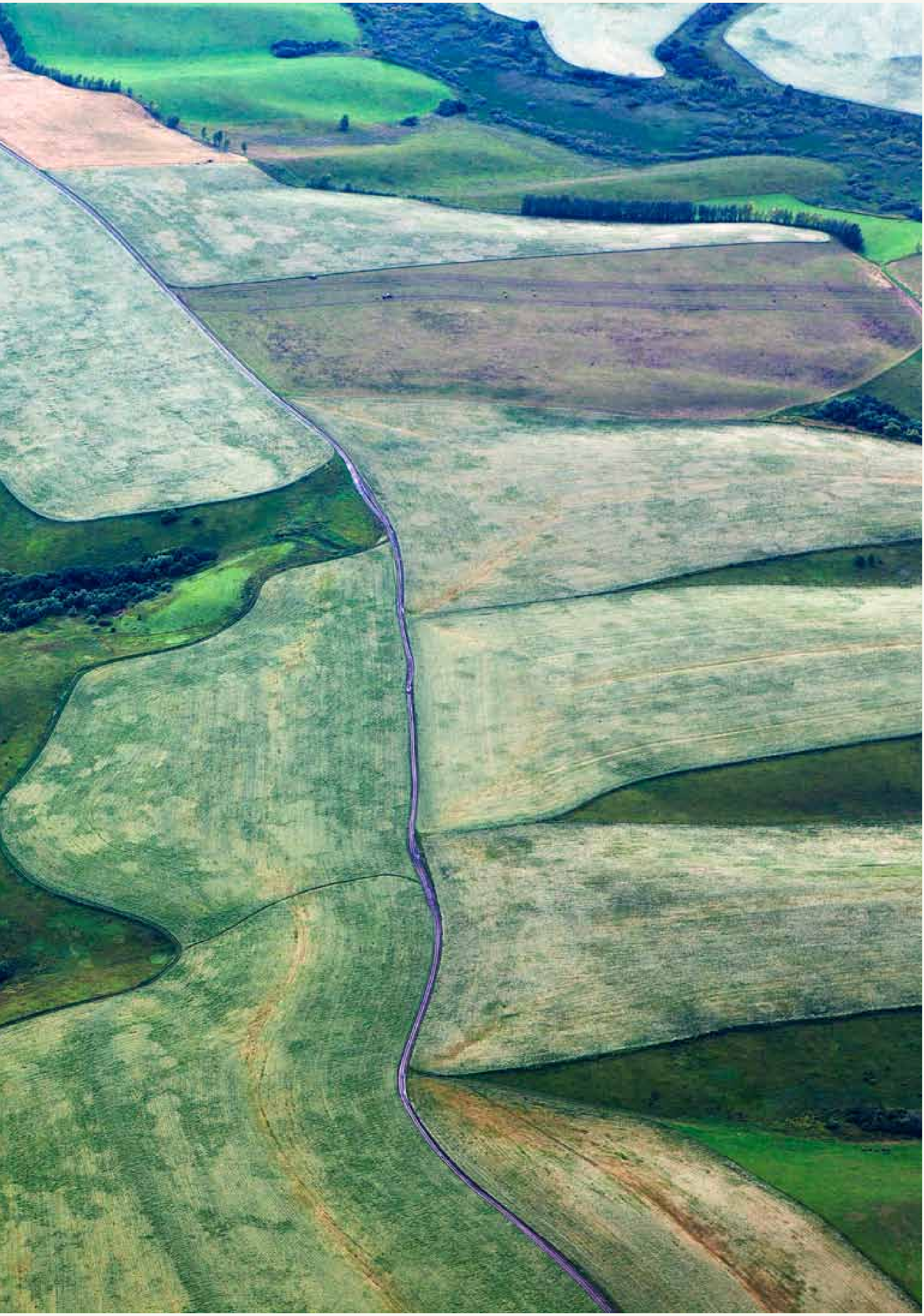


[6] Global Footprint Network. n.d. "Calgary." Accessed October 26, 2016. http://www.footprintnetwork.org/en/index.php/GFN/page/calgary_case_study.

[7] "Доклад о состоянии окружающей среды в Москве в 2014 году." Accessed November 4, 2016. http://www.dpioos.ru/eco/ru/report_result/o_442335

IV. RUSSIAN FOOD FOOTPRINT

The food Footprint is a major driver of the total Ecological Footprint and accounts for over a quarter of the household consumption Footprint. Food is also a key factor in biodiversity and habitat degradation and losses at an unprecedented scale. Creating a sustainable food system is thus crucial to meeting the needs of a growing human population and preventing further declines in the populations of other species.



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As human impacts on the natural world increase there are increasing calls to understand the driving forces behind these impacts and ways to reduce them. The Consumption Land Use Matrix (CLUM) approach can translate land-based Ecological Footprint results into three specific final demands: household consumption (HH), government consumption (GOV), and gross fixed capital formation (GFCF). The household component is further broken down into five categories: food, housing, transport, goods, and services.

The CLUM approach provides the basic data to identify Ecological Footprint hotspots, which enables government and private sector decision-makers to focus on potential areas and strategies to reduce overall Footprints.

Russia's Ecological Footprint is 5.7 global hectares per person, which is twice as high as the world average Footprint. Russia's per-person Footprint is also the highest among BRIICS[8] countries; it is 65 per cent higher than China's, 72 per cent higher than South Africa's, 83 per cent higher than Brazil's, and 391 per cent higher than India's. Russia's per-person Footprint is about 8 per cent higher than those of Germany and the Netherlands, but over 30 per cent lower than the per-person Footprints of the United States and Canada.

By looking at the final demand category level, the main contributor of the Ecological Footprint among all regions comes from household consumption, accounting for 42 to 94 per cent of countries' total Ecological Footprints. In Russia, household consumption accounts for 71 per cent of the country's total Ecological Footprint. This means that daily decisions made at the household level have the power to change the course of national Ecological Footprint trends.

The food Footprint is a major driver of the total Ecological Footprint and accounts for over a quarter of the household consumption Footprint. To contrast, food only contributes to 17 per cent of the United States household Footprint, while it makes up half of the household Footprint in Brazil and India. In absolute values, Russian citizens consume about 1.1 global hectares per year in food, which is very similar to Germany and the Netherlands, but more than twice what citizens of China and India consume.

[8] BRIICS is an association of six major emerging national economies: Brazil, Russia, India, Indonesia, China and South Africa.

4.1 HOW FIT IS OUR DIET?

As mentioned previously, humanity today needs 1.6 planets to sustain its demands on renewable resources. Under the most cautious scenarios, the global population is likely to reach 9.7 billion by 2050.[9] If current trends continue, humanity will be using the ecological resources and services of about three Earths by 2050. Given that food is a basic human requirement, creating a sustainable food system will be crucial to meeting the demands of a larger population. However, resource needs for food consumption can be shifted by only small amounts. In addition, food consumption heavily relates to entrenched dietary habits and production efficiency.

According to a recent study commissioned by WWF-Netherlands, agriculture alone occupies roughly half of the plant-habitable surface of the planet, uses 70 per cent to 85 per cent of extracted freshwater, and, together with the rest of the food chain, is responsible for almost 50 per cent of global greenhouse gas emissions.[10] And yet 30 per cent of all food is currently lost along the supply chains, including the field and transportation losses and retailer and consumer food waste.[11]

This combination of forces makes food a major Ecological Footprint driver and one of the key impact factors resulting in biodiversity and habitat degradation and losses at an unprecedented scale.

30 per cent

of all food is currently lost along the supply chains

[9] United Nations. 2015. "World population projected to reach 9.7 billion by 2050." July 29. http://www.un.org/en/development/desa/news/population/2015-report.html

[10] "The Global Food System: An Analysis." 2016. Metabolic, January, 26. http://www.metabolic.nl/publications/global-food-system-analysis/.

[11] Food and Agriculture Organization of the United Nations. 2011. "Global food losses and food waste – Extent, causes and prevention." Accessed October 26, 2016. http://www.fao.org/docrep/014/mb060e/mb060e00.pdf.

4.2 FOOD IN RUSSIA

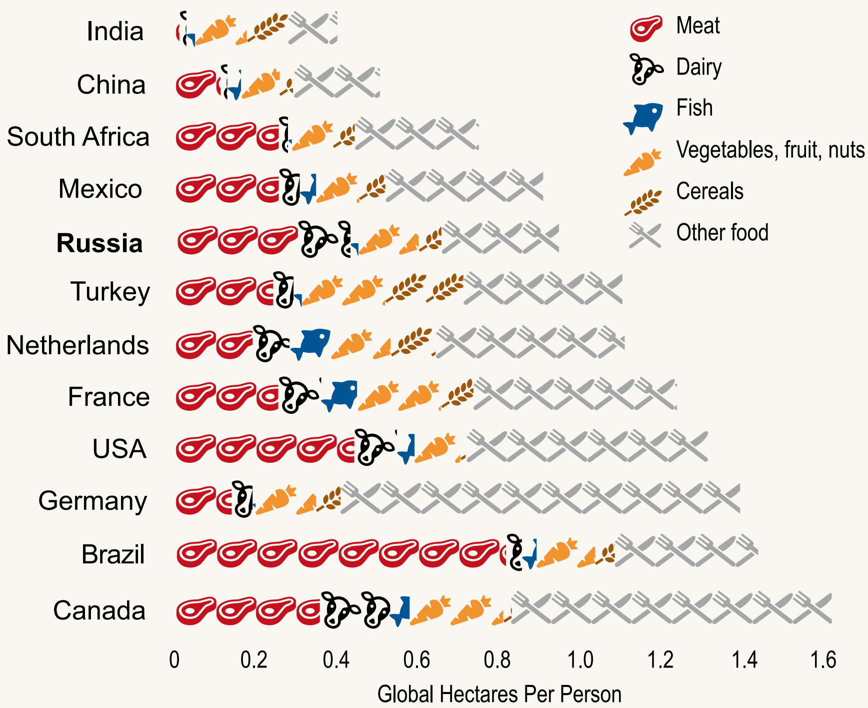
Russia is both a major producer and a key consumer of most WWF priority food commodities. Russia is among the world's top five producers of food;[12] a significant producer of whitefish and wild-caught salmon; the second largest beef importer in the world (following the United States);[13] and a significant consumer of soy and palm oil, which is the second largest vegetable oil consumed in Russia.

Food makes up a substantial share of Russia's overall resource requirements, comprising 27 per cent of Russia's per person Ecological Footprint of household consumption. However, the food Footprint ranges widely across the country as a proportion of the Ecological Footprint of household consumption, from as low as 22 per cent for Moscow City to as high as 71 per cent for the Chechen Republic.

When compared to other nations, Russia's food Footprint stands somewhere between the BRICS countries on the one side and high-income EU and North American countries on the other. Among the BRICS countries, only Brazil, with its sizable meat consumption, surpasses Russia in terms of per person resource requirements for food. With its considerable consumption of meat and dairy and increasingly processed foods, Russia's dietary patterns are closer to those in the EU and North America than other BRICS countries.

Figure 37: Ecological Footprint of Food Consumption for Select Countries.

This graphic shows the "Foodprints" of several countries, based on the National Footprint Accounts 2016 (2012 data).



[12] "The Global Food System: An Analysis." 2016. Metabolic, January, 26. http://www.metabolic.nl/publications/global-food-system-analysis/.

[13] USDA GAIN (United States Department of Agriculture Global Agricultural Information Network), Russia Livestock and Products Annual 2012.

4.3 ENDANGERING PARAGUAY FORESTS AND WILDLIFE

Although it is among the world's top five food producers based on crop production, Russia still relies on imported agricultural and farming products, in particular fruits, vegetables, and meat.

Despite extensive private and public investment in domestic livestock production, Russia remains one of the largest importers of beef globally. Russian beef imports rose by 3.3 per cent in 2012 compared to 2011, with Brazil accounting for 39.6 per cent of imports, followed by Paraguay at 19 per cent and Belarus at 16.6 per cent.

Russia is the largest buyer of Paraguay's beef. By mid-2012, Russia accounted for 80 per cent of the total export volume of Paraguayan beef and will continue to be its main export market.[14]

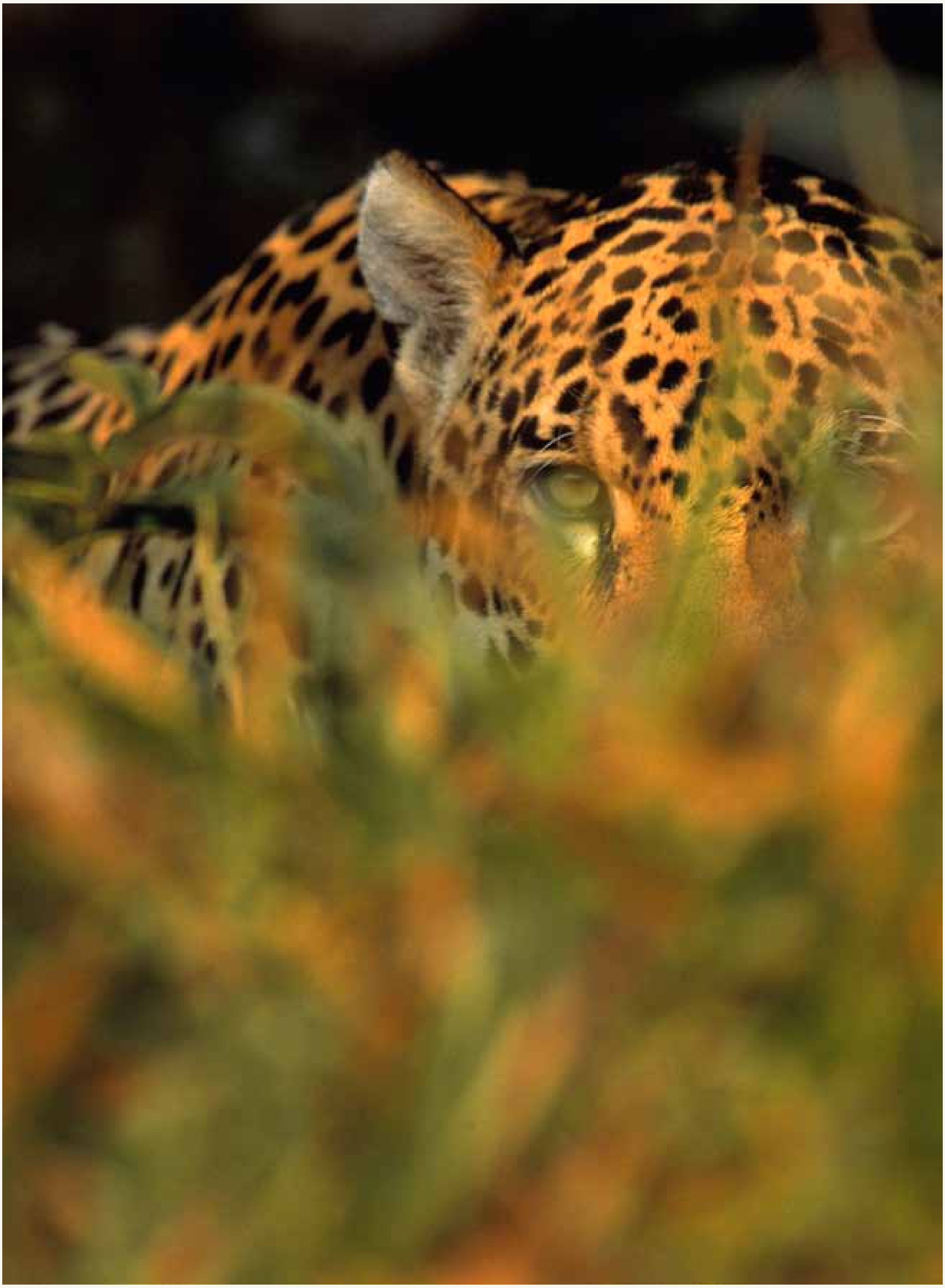
Consequently, the cropland and grazing land used in Paraguay for food exported to and consumed in Russia is accounted for in Russia's Ecological Footprint. This means Russia's sourcing policies and consumption patterns have significant implications for the key ecosystems in the Paraguayan Chaco.

A hot, dry plain of around 100 million hectares, the Gran Chaco comprises a range of habitats from dry thorn forests and cactus stands to palm savannahs that are flooded in the wet season. The Gran Chaco has high levels of biodiversity, containing around 3,400 plant species, 500 bird species, 150 mammals, and 220 reptiles and amphibians. Its central location in South America makes it an important refuge for many migrating birds.[15] Gran Chaco is also a key habitat of the largest and most iconic felids in the Americas, the jaguar (*panthera onca*). Agricultural expansion is the biggest threat to the natural ecosystems of the Gran Chaco, where most of deforestation is related to cattle expansion or real estate business (buy forest, convert it to productive land, and then sell at higher price) that ultimately leads to cattle ranching.

This case clearly demonstrates how the Ecological Footprint, particularly the food Footprint, in one country can affect concrete areas of land on the other side of the world and pose major environmental threats to local ecosystems. It also highlights how truly global the world has become, and how our everyday habits and behavioral patterns can relate to important environmental and social issues more than 10,000 kilometers away.

[14] LEI Wageningen UR and SOMO. 2016. Financial Value-Change Analysis: Tuna, shrimp, soy and beef. http://library.wur.nl/WebQuery/wurpubs/498814

[15] WWF Global. n.d. "The Gran Chaco." http://wwf.panda.org/what_we_do/footprint/agriculture/soy/soyreport/soy_and_deforestation/the_gran_chaco/index.cfm.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4.4 INGREDIENTS OF SUCCESS

It is clear that Russia's food Footprint is much larger than what is globally sustainable. Though by no means an easy task, decreasing Russia's demand for biological capital imbedded in its food consumption is possible.

In order to reconcile the quantities of food that can sustainably be produced with what Russia's population demands, we must minimize food losses and food waste along the entire supply chain and adjust the consumption of resource-intensive foods. A lasting shift towards a diet increasingly based on locally produced seasonal food whenever possible can help decrease Russia's food Footprint.

Another important step would be to persuade major buyers, processors, retailers, and brands operating in the Russian market to commit to higher sustainability requirements for procurement and stricter eco-certification and labeling standards. Technically, the Ecological Footprint associated with consuming MSC-certified fish and uncertified fish is identical, given the two fisheries have the same yields. However, these two practices will have very different consequences for the available future capacity of the fisheries to replenish. Supporting sustainable fisheries is crucial if we are to succeed in our efforts to feed the growing global population and to preserve our biological wealth for generations to come.

The Ecological Footprint provides an opportunity to measure the impact of our food consumption on the planet. Taking stock of what we have is the first step towards managing our natural capital responsibly. However, it is hardly possible to create lasting global change unless there is a critical mass of people and organizations understand how human consumption depletes biological resources and act to limit it to what is globally sustainable. Under these circumstances our goal must be tackle the key actors along the supply chain and inform, educate, and enable wider audiences to shift towards a more sustainable lifestyle. It is high time we brought the human story into our conservation efforts.

V. HISTORY OF FOOTPRINT ANALYSIS

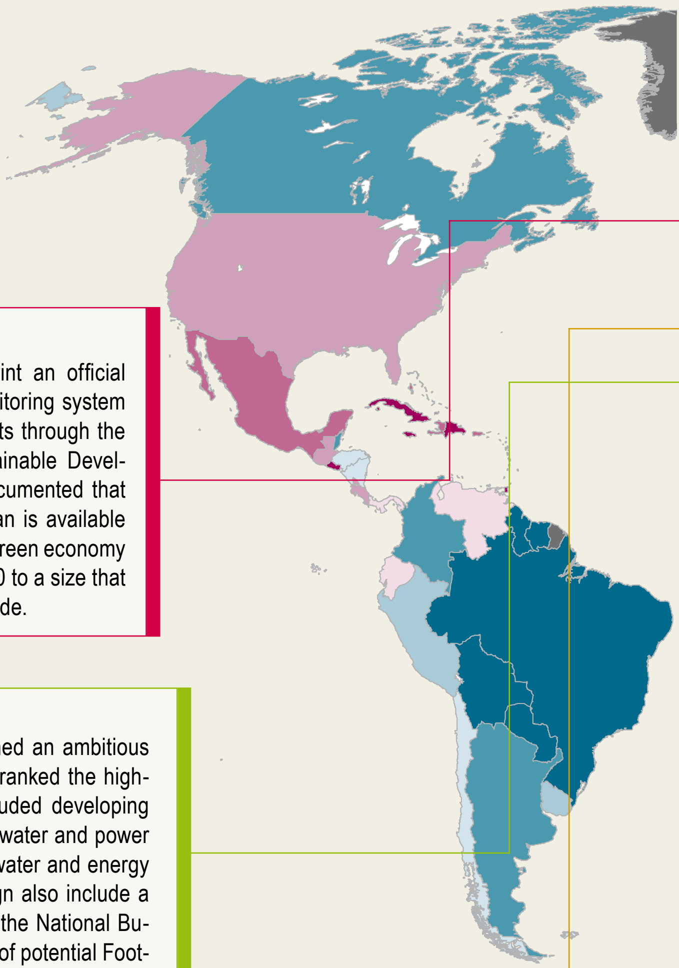
In a world of climate change and resource constraints, a resource-efficient economy will become any nation's strongest asset. Recognizing the need to manage and measure their natural resources, 20 countries have completed reviews of their national Ecological Footprint and nearly a dozen have formally adopted the Ecological Footprint as a national planning or accountability mechanism.


ЛОТТЕ ПЛАЗА
ТОРГОВЫЙ ЦЕНТР

5.1 HISTORY OF FOOTPRINT ANALYSIS IN THE WORLD AND RUSSIA

Ecological assets are becoming arguably the most decisive competitive factor in global affairs. Nations that effectively manage their ecological assets will increase their chances of economic success. Since 2003, more than 50 nations have engaged with Global Footprint Network directly, and 20 have completed reviews of their national Ecological Footprint. Japan, Switzerland, UAE, Ecuador, Finland, Latvia, Luxembourg, Scotland, Wales, and Montenegro have formally adopted the Ecological Footprint as a national

Nations that effectively manage their ecological assets will increase their chances of economic success.



Switzerland has made the Ecological Footprint an official national indicator, used in its sustainable development monitoring system ("Monet") and annually publishes Ecological Footprint results through the Swiss Federal Statistical Office. The government's "Sustainable Development Report 2012," launched at the Rio+20 Summit, documented that Swiss residents consume three times more biocapacity than is available per person worldwide. In 2016, a ballot initiative proposed a green economy for Switzerland that would adjust the Swiss Footprint by 2050 to a size that would fall within the means of the planet if replicated worldwide.

The United Arab Emirates launched an ambitious Ecological Footprint Initiative after its per person Footprint ranked the highest of all nations. Led by local partners, the initiative included developing decision-making tools such as a scenario calculator for the water and power sector, a public awareness campaign, and efforts to lower water and energy consumption in government offices. Results of the campaign also include a new energy efficiency lighting standard and the creation of the National Bureau of Statistics. Most recently, the UAE completed a study of potential Footprint reductions in the context of the world's transition to a low-carbon future.

Guizhou, China, a mountainous province of China with rich biodiversity, is at a crossroads, seeking to balance economic growth and citizen well-being with environmental protection. It is a pilot region in China pioneering the concepts of ecological civilization. The aim is to guide Guizhou's development into a model ecological civilization that lives in harmony with nature. Through support from and collaboration with Switzerland, the Guizhou government worked with Global Footprint Network to analyze its Ecological Footprint and biocapacity as part of an initiative that aims to create a data-driven evaluation framework. The Guizhou Footprint Initiative also may include workshops with government officials to interpret results and develop scenarios and an exploration of development and investment options. The work will expand to other provinces, with Guizhou representatives initially exploring the possibility of bringing in colleagues from Sichuan province.

planning, sustainability framework, or accounting mechanism.

Human demands on nature are usually measured separately in terms of climate change, land use, and food consumption. The Ecological Footprint translates these individual demands into a single aggregated number. This unique factor of the Ecological Footprint helps policy makers to understand their overall and sometimes competing resource needs, limits, and dependencies.

Learning from this global experience, it is time for Russia to implement a realistic national action plan and stipulate concrete numerical goals that take into account natural capital accounting and the nation's Ecological Footprint. A policy mechanism with a quantitative target will give Russia a clear indication of the state of the nation, highlighting where the nation is going, as well as how individual choices, institutional investments, and governmental policies will lead toward those goals.

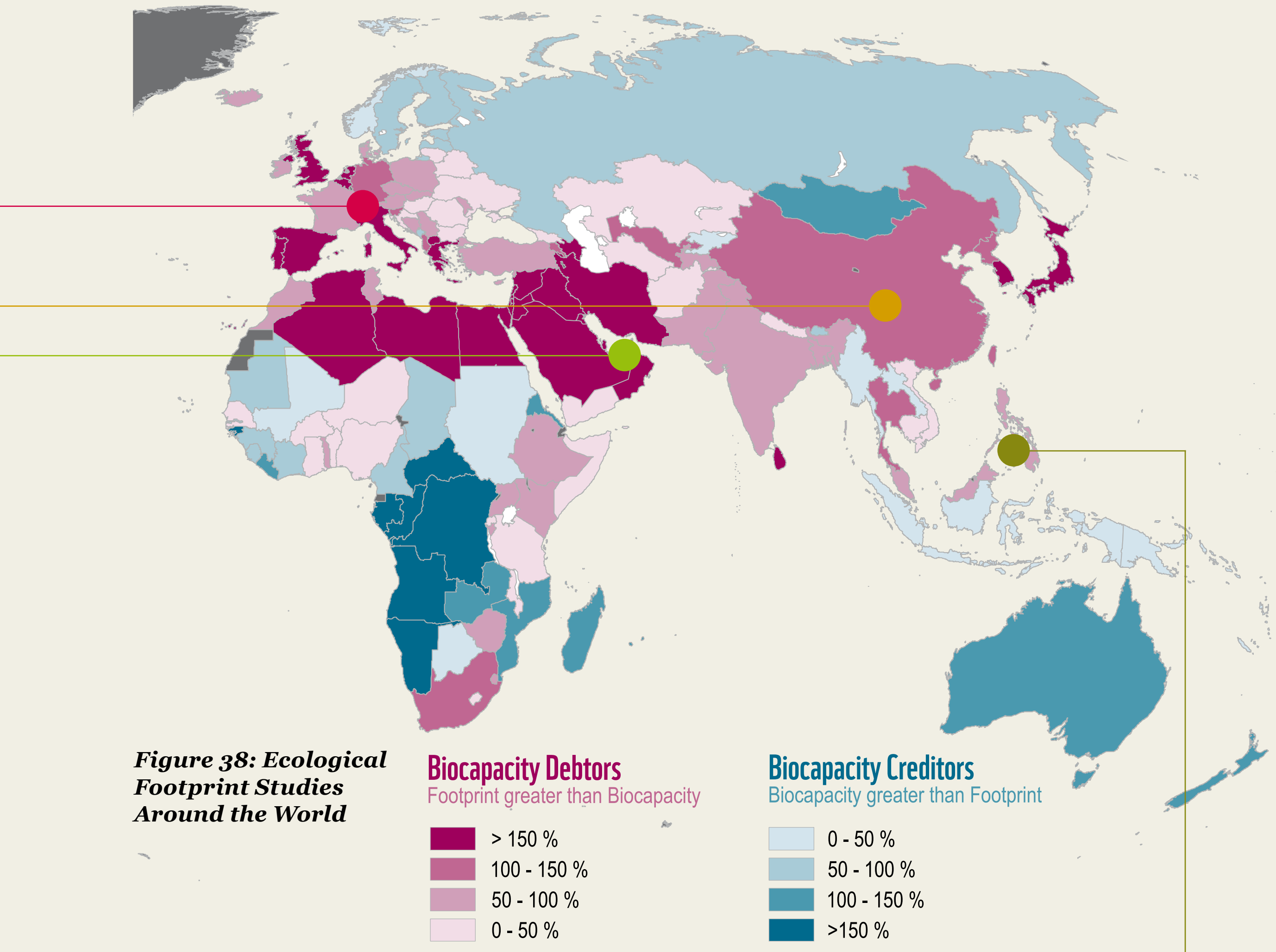


Figure 38: Ecological Footprint Studies Around the World

The Philippines incorporated the Ecological Footprint into its 2012 National Land Use Act, a comprehensive national land-use policy that protects areas from haphazard development and plans for the country's use and management of its physical resources. The 2012 Philippines Ecological Footprint study also launched a public discourse on the ecological state of the country, with President Benigno Aquino III declaring: "Indeed, the time is right for ecological accounting." It was followed by two subnational Footprint assessments. One assessment focused on the Laguna Lake region, which encompasses Metro Manila, includes some of the country's most biologically productive land, and contributes more than 60 per cent of the Philippines' Gross Domestic Product. A second assessment, completed in 2016, focused on the Mindanao region, the "food basket" of the Philippines, which supplies more than 40 per cent of the country's food, despite being home to some of the nation's most vulnerable people.

5.2 WHAT WE DON'T MEASURE, WE DON'T TREASURE: TAKING STOCK OF RUSSIA'S BIOLOGICAL WEALTH

Russia is a vast country, blessed with an enormous biological wealth. In the past, however, measuring the country's natural capital has been largely overlooked. During the territorial expansions of the Imperial Russia and the rapid extraction and industry-driven economic growth of the Soviet period, resources – both mineral and biological – were taken for granted.

However, attitudes have been changing over the past several years. In a resource-constrained world, Russian government, businesses, and NGOs gradually have come to realize the importance of taking stock of the country's biological resources. In 2014, Global Footprint Network together with WWF-Russia for the first time calculated the biocapacity and Ecological Footprint for each of Russia's Federal Subjects. The results revealed a considerable disparity in natural capital and resource use among Russia's Federal Subjects: seven Federal Subjects alone contributed 49 per cent of Russia's biocapacity; 12 Federal Subjects contributed 50 per cent of Russia's Ecological Footprint.

The 2014 Footprint Report jointly developed by WWF and Global Footprint Network was presented to the Minister of Environment, and discussions are underway with several regional governments to include the Ecological Footprint in the list of environmental indicators for long-term planning. The report was designed so that policymakers and business leaders could use its data and accompanying analysis as a baseline in their efforts to build a safe, prosperous, and fulfilling future for all. The city of Moscow, which accounts for over 11 per cent of the country's overall Ecological Footprint, is committed to developing a set of measures to decrease the city's Footprint to the Russian average.[16]

The 2016 National Footprint Report tracks biocapacity and Footprint of Russia's Federal Subjects for a second time, with updated data and an improved methodology. This 2016 report makes it possible to see trends over time and to measure the positive (or negative) changes over the past two years. Thanks to the updated methodology (please see Appendix 1), the 2016 Report also provides more accurate data, which will help policymakers and businesses better understand resource constraints and develop policies and practices to tackle them.

Individuals' daily activities are primary Footprint drivers. Although citizens have little direct control over how a country produces its electricity or how companies produce goods and services, households do have a substantial influence on decisions made by governments and businesses in the long term.

[16] "Доклад о состоянии окружающей среды в Москве в 2014 году." Accessed November 4, 2016. http://www.dpioos.ru/eco/ru/report_result/o_442335

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This prompted WWF-Russia to explore how the Footprint concept could be employed to influence behaviours and change lifestyles. In 2015, WWF for the first time launched the Bill from the Earth campaign to mark Earth Overshoot Day in Russia. Overshoot Day marks the date when humanity's demand for ecological resources and services in a given year exceeds what Earth can regenerate in that year.[17] The Overshoot Day campaign attracted considerable media attention and resonated widely with the public.

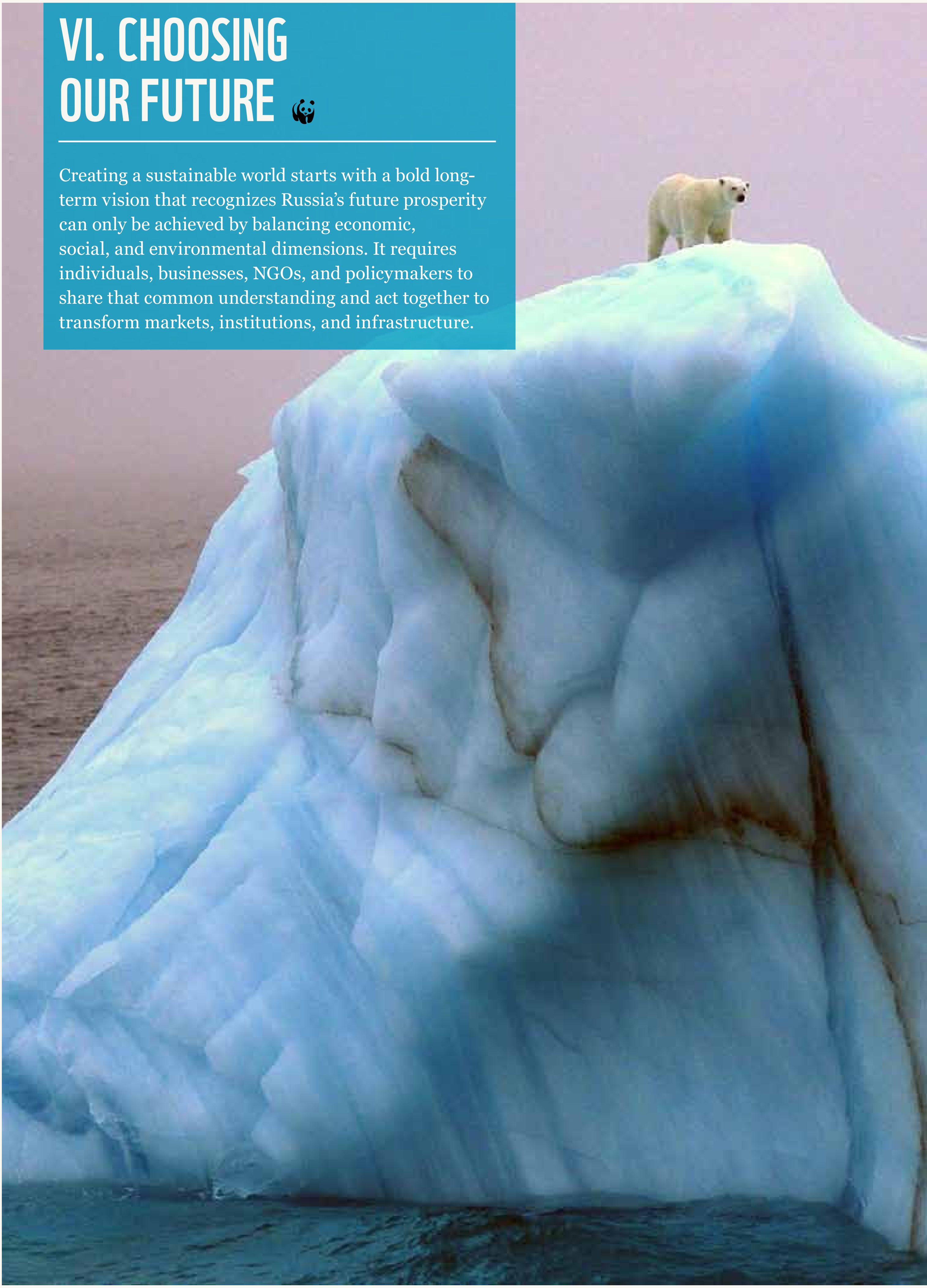
WWF-Russia's 2016 Earth Hour campaign also focused on the Ecological Footprint. As part of the campaign, WWF-Russia designed an accessible '7 steps' concept for its target audiences to help them adopt sustainable living practices. Through the campaign, 22 million people learned about sustainable lifestyles and responsible consumption habits, making Earth Hour 2016 one of the most successful consumer-oriented sustainability campaigns in Russia.

Our strategy is clear. With the growing interest in and demand for sustainable living practices, WWF is in the right place at the right time to achieve real and lasting change. Using the Footprint research and report as the underlying scientific foundation, we aim to develop an easy-to-use set of sustainable lifestyle solutions for individuals and households that will help Russia preserve its ecological capital and at the same time retain high human development and welfare.

[17] Global Footprint Network. "Earth Overshoot Day." http://www.overshootday.org/.

VI. CHOOSING OUR FUTURE

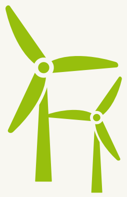
Creating a sustainable world starts with a bold long-term vision that recognizes Russia's future prosperity can only be achieved by balancing economic, social, and environmental dimensions. It requires individuals, businesses, NGOs, and policymakers to share that common understanding and act together to transform markets, institutions, and infrastructure.



Direct household consumption is the primary Footprint driver globally, and the situation is no different in Russia. This means that the everyday decisions and choices we make as individuals can have a direct and lasting impact on the amount of natural capital we consume.

However, consumers alone cannot transform markets and create a more sustainable world. To ensure that Russia retains its natural capital and prospers in an increasingly resource-constrained world, it is important that consumers, businesses, NGOs, and policymakers share a common understanding and act together to create a future where people prosper in harmony with nature. Success starts with having the right long-term vision. A vision that recognizes Russia's future prosperity can only be achieved by balancing economic, social, and environmental dimensions. And even with that bold vision, a great deal of investment and infrastructure and institutional change will be required if we are to achieve a sustainable future for our generation and generations to come.

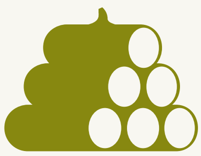
WE CALL ON CONSUMERS TO:



- Set your heating/cooling thermostat 1 degree warmer in summer and 1 degree cooler in winter.
- Support renewable energy.
- Choose certified appliances with high energy efficiency.

- Cut down processed food. Heavily processed food tends to be more resource-intensive to produce. Try cooking more often from scratch with fresh seasonal ingredients.
- Choose and support local and seasonal food.
- Avoid overly packaged items.
- Eat more vegetables and fruit instead of animal-based products.
- Look for the MSC label on fish and seafood products; fish and seafood with the blue MSC label has been responsibly caught by a certified sustainable fishery.

- Turn off the tap. Don't let the water run while shaving, brushing teeth or washing vegetables.
- Take short showers instead of a bath.
- Install water-saving, low-flow shower heads.
- Install a flush saver on your toilet.



- Look for the FSC label on wood and timber products, for everything from furniture to paper and even toilet tissue. Save forests and wildlife by choosing good wood.
- Save paper and recycle: Think twice before you print, use both sides of the sheet or paper, avoid printing out single line e-mails or unnecessary copies of documents, and try to stay paperless.

- Walk, cycle or take public transit if possible.
- Think twice when you book airplane tickets, consider train options, and when possible compensate your flights through carbon offset schemes.
- Choose an electric car or car with higher fuel efficiency when you buy or rent

WE CALL ON BUSINESSES TO:

a car.

Reduce their Ecological Footprint by conducting materiality and risk assessments and by recording and reducing the wastes they generate along the entire supply chain.

Implement ambitious sustainability standards for their key raw materials and production practices, with a focus on credible third-party verified certification systems, including FSC, MSC, RSPO, GRSB, RTRS, and beyond.

Employ best available practices and technologies, including renewable energy, to reduce greenhouse gas emissions and toxic wastes.

Redirect financial flows: value nature; account for environmental and social costs; support and reward conservation, sustainable resource management, and innovation.

WE CALL ON DECISION MAKERS TO:

Develop a concept of green (sustainable) development for the Russian Federation for the period up to 2030 with a longer vision up to 2050 aimed at ensuring that the country's economic and social development complies with the internationally recognized environmental standards and resource and energy efficiency indicators.

Design a system of green (sustainable) growth indicators that will be used to assess the performance of the Federal and regional governments and their compliance with national standards and Footprint reduction targets.

Build a national environmental accounting system aimed at providing a quantitative assessment of the natural capital and ecosystems services at the federal and regional levels in Russia.

Develop and adopt environmental criteria, standards, and requirements for the public procurement of goods and services, and to ensure that such standards and requirements are properly reflected in the national legislation.

Develop and adopt a national environmental education program. Such a program should popularize environmental and sustainability science and build widespread awareness around critical environmental issues, concepts, and processes, as well as Russia's international commitments under the UN Sustainable Development Goals (2030 Agenda for Sustainable Development) and Paris Climate Agreement.

APPENDIX 1: METHODOLOGY

Ecological Footprint

Ecological Footprint and biocapacity accounting answers a simple research question: How much do people demand from biologically productive surfaces (Ecological Footprint) compared to how much can the planet (or a country's productive surfaces) regenerate (biocapacity)?

Economic activities fundamentally depend on ecological assets and their capacity for provisioning primary resources and life-supporting ecological services. Managing an economy's resource dependence is becoming a central issue for decision-makers, particularly planners and economists. Adequate access to ecological assets is a necessary condition for economic success and lasting development gains.

Global Footprint Network uses United Nations (U.N.) data sets to calculate the Ecological Footprint and biocapacity of nations. The calculations are based on over 15,000 data points per country and year. Data points are individual numbers that describe resource production and use within a country, such as tonnes of apples harvested, or hectares of forest land. Further, the Footprint can be disaggregated into components. Because of limited data availability, National Footprint Accounts probably underestimate biocapacity deficits.

Table 1: Major categories in Ecological Footprint and biocapacity accounting.

The forest biocapacity serves two competing uses: absorbing CO_2 for the carbon Footprint and providing forest products such as timbre and firewood.

Ecological Footprint demand types	Biocapacity areas
Crop	Cropland
Grazing Products	Grazing Land
Fish Footprint	Fishing Grounds
Carbon Footprint	Forest
Forest Products	
Built-up Land	Built-up Land

The Ecological Footprint, in its most basic form, is calculated using the following equation:

$$EF = D/Y \qquad \textbf{Equation 1}$$

Where D is the annual demand of a product and Y is the annual yield of the same product (Borucke et al, 2013). Yield is expressed in global hectares. In practice, global hectares are estimated with the help of two factors: the yield factors, which compare national average yield per hectare to world average yield in the same land category; and the equivalence factors, which capture the relative productivity among the various land and sea area types.

Taking into account these factors, the formula of the Ecological Footprint becomes:

EF = (P/YN)*YF*EQF **Equation 2**

Where P is the amount of a product harvested or waste emitted (equal to D above), YN is the national average yield for P, and YF and EQF are the respective yield factors and equivalence factors for the country and land use type in question. The yield factor is the ratio of national-to-world-average yields, which is calculated as the annual availability of usable products and varies by country and year. Equivalence factors translate the supply of or demand for an area of a specific land use type (e.g., world-average cropland or grazing land) into units of world-average biologically productive area expressed in global hectares. These factors can vary by land use type and year.

Biocapacity

The calculation of a country's biocapacity begins with the total amount of bioproductive land and sea available in that country. "Bioproductive" refers to areas of land and water that support significant photosynthetic activity and accumulation of biomass. Barren areas of low or dispersed productivity are not included. This is not to say that places such as the Sahara Desert, Antarctica, or the alpine environments of various countries do not support life; simply that their production is too widespread to be directly harvestable and is negligible in quantity.

Biocapacity is an aggregate measure of the amount of area available, weighted by the productivity of that area. It represents the ability of a biosphere to produce crops, livestock (grazing land), timber products (forest) and seafood (fishing grounds); as well as the biosphere's ability to sequester CO_2 in forests. It also measures how much of this regenerative capacity is occupied by infrastructure (built-up land). In short, it measures the ability of the available terrestrial and aquatic areas to provide ecological services. A country's biocapacity for any land use type is calculated as:

BC = A*YF *EQF **Equation 3**

Where BC is biocapacity, A is the available area of a given land use type, and YF and EQF are the yield factors and equivalence factors, respectively, for the land use type in question in that country.

Tracking the Ecological Footprint of Trade

$$EF_C = EF_P + (EF_I - EF_E)$$

Ecological Footprint of Consumption

The Ecological Footprint of consumption indicates the consumption of biocapacity by a country's inhabitants.

In order to assess the total domestic demand for resources and ecological services of a population, we use the Ecological Footprint of consumption (EF_C). EF_C accounts for both the export of national resources and ecological services for use in other countries, and the import of resources and ecological services for domestic consumption.

EFc is most amenable to change by individuals through changes in their consumption behavior.

Ecological Footprint of Production

The Ecological Footprint of production indicates the consumption of biocapacity resulting from production processes within a given geographic area, such as a country or region.

It is the sum of all the bioproductive areas within a country necessary for supporting the actual harvest of primary products (cropland, grazing land, forestland and fishing grounds), the country's built-up area (roads, factories, cities), and the area needed to absorb all fossil fuel carbon emissions generated within the country.

This measure mirrors the gross domestic product (GDP), which represents the sum of the values of all goods and services produced within a country's borders.

Net Ecological Footprint of Trade

The Ecological Footprint of imports and exports indicate the use of biocapacity within international trade.

Embedded in trade between countries is a use of biocapacity, the net Ecological Footprint of trade (the Ecological Footprint of imports minus the Ecological Footprint of exports). If the Ecological Footprint embodied in exports is higher than that of imports, then a country is a net exporter of renewable resources and ecological services.

Conversely, a country whose Footprint of imports is higher than that embodied in exports depends on the renewable resources and ecological services generated by ecological assets from outside its geographical boundaries.

The National Footprint Accounts

The Ecological Footprint is an environmental accounting tool introduced by Mathis Wackernagel and William Rees in the early 1990s (Rees, 1992; Wackernagel and Rees, 1996; Wackernagel et al., 2002). It calculates human demand on the Earth's renewable resources, and the capacity of the Earth to provide those resources (biocapacity). The biologically productive land and sea areas that generate the renewable resources and ecological services that humans demand include: cropland for the provision of plant-based food and fiber products; grazing land and cropland for animal products; fishing grounds (marine and inland) for fish products; forests for timber and other forest products; uptake land to sequester waste (CO_2, primarily from fossil fuel burning); and space for shelter and other urban infrastructure (Galli et al., 2014).

While the Ecological Footprint can be calculated at various levels, national calculations called the National Footprint Accounts (NFA) are done each year by Global Footprint Network for over 200 countries (including Russia) using data over a period of five decades, 1961 to 2012 (Bastianoni et al., 2013; Kitzes et al., 2009). The time coverage of NFA data is determined by the data availability of the primary data sources from which the NFA is built. For example, The Food and Agriculture Organization of the United Nations Statistics Division (FAOstat) reports agricultural production and trade data beginning in the year 1961.

Global Footprint Network not only updates its data on a regular basis, but also improves its methodology and incorporates better data where available. Global Footprint Network estimates that the absolute precision may be within 10 per cent to 20 per cent. However, the assessments of overall trends are more robust – this means the relative position of a country for one year compared to previous years within one edition is typically more robust. In this respect, the data shows unequivocally that humanity's demand on nature is at an unsustainable level — one year is no longer enough to regenerate humanity's annual demand on the planet, even using conservative data sets that underestimate the gap between how much humans use compared to what nature can renew.

The 2016 edition of the National Footprint Accounts includes 21 improvements over the 2015 edition, including some better data points. The most influential improvement is the new calculation of the world's Average Forest Carbon Sequestration (AFCS) — which is the long-term capacity for one hectare of world-average forest ecosystem to sequester carbon dioxide. Including new data sources and accounting for multiple forest categories, global wildfires, and forest ecosystem emissions from soil and harvested wood products, forests were found to provide less net-sequestration of carbon than previously calculated. As a result, the updated calculation has revealed that the global carbon Footprint is 16 per cent higher than previously calculated, with a consequent 8 per cent increase in the global Ecological Footprint.

Interpreting Ecological Footprint Results

The Ecological Footprint addresses one key question: *How much of the biosphere's regenerative capacity (or biocapacity) for natural resources and ecological services do human activities demand?* The Ecological Footprint framework is thus most useful to account for 1) the magnitude of humanity's biophysical metabolism and 2) the competing demand such metabolism places on the Earth's ecosystems.

As reported in Galli et al., (2015), a country's Ecological Footprint of consumption is determined by three main factors: the average consumption patterns of each resident, how resource intensive this consumption is, and the population of the country. Conversely, a country's biocapacity is determined by two factors: the areas of biologically productive land and water available, and their biological productivity levels (Galli et al., 2012a; Niccolucci et al., 2011). A country's Ecological Footprint and biocapacity represent two sides of an ecological balance sheet: if a country's consumption of natural resources and services is greater than the capacity of its ecosystems to supply them, it creates a situation of ecological deficit in the same way that a situation of financial budget deficit occurs when spending is greater than revenue (Monfreda et al., 2004).

During the last decade, the Ecological Footprint has helped reopen the sustainability debate (e.g., Wiedmann and Barrett, 2010) by communicating the scale of humanity's overuse of Earth's natural resources and ecosystem services in simple and powerful terms. However, as a biophysical measure, Footprint accounts cannot be used to evaluate the social and economic dimensions of sustainability. The Ecological Footprint should be complemented with other indicators and tools to arrive at comprehensive sustainability assessments. Moreover, even within the environmental pillar of sustainability, National Footprint Accounts are not able to quantify human environmental damage or pollution, nor indicate the intensity with which a biologically productive area is being used or whether current resource management practices can be sustained. Biocapacity and Ecological Footprint accounts document the supply and demand of natural resources and services based on historical datasets. Persistent or harmful environmental practices, which reduce the ability of our ecosystems to provide these natural resources and services, are reflected in biocapacity accounts only during the time period which reduction in productivity has occurred and is recorded – not before (Lin et al., 2015a).

Historically, human economies have increased the biocapacity of their existing environment by investing in practices such as fertilizer-use and technology improvements, some of which come at a high Footprint cost. The use of fossil fuels, for example, has enabled societies to improve their economic and resource situations. However, the resulting anthropogenic emission of CO_2 at rates faster than our ecosystems can sequester has led to damaging levels of CO_2 accumulation in our atmosphere. It is very difficult to determine the balance between additional biocapacity gained relative to the additional Ecological Footprint cost.

Nevertheless, current Footprint accounts tell us that humanity's annual demand has overshot the earth's ability to supply natural resources and services and can be interpreted as a proxy for the minimum magnitude of human demand on nature. These accounts also show that the impact of current policies to promote sustainable use of resources is insufficient to address resource limitations and trends highlighted by Ecological Footprint accounts (Goldfinger et al., 2014; Lin et al., 2015b).

Data Quality Scores

The National Footprint Accounts use internationally available data from multiple datasets for all countries for each year dating back to 1961. Data are reported by country statistical offices to the United Nations Food and Agriculture Organization (FAO) without margins of error. (Similarly, standard data in financial accounting are not given with margins of error in measurement.) In some cases, data may be limited, unavailable, or may contain apparent errors. Because of this, reported data can only be analyzed statistically and compared to an expected distribution.

At the most detailed level (raw data reported by countries), primary data aggregators such as FAO apply statistical methods to determine and clean potential outliers, or points that are considered statistically unlikely given a sample of similar values. The specific statistical methodology is not provided to the public. Global Footprint Network applies a conservative multi-pass statistical analysis to trade data to assess how far a specific data point may vary from a normal range of expected values in terms of monetary value per unit weight, taking into consideration specific commodities, specific country income groupings, and change over time.

At the aggregate level, our algorithm also considers high inter-annual variation or spikes/dips in resource consumption. These data are flagged and investigated, and when not accompanied by major known changes within a country (such as major recession, war, or redefinition of borders/population) these data are flagged as unlikely. The specific methodology for this analysis is confidential to Global Footprint Network.

As more detailed data becomes available from new/existing sources and country reporting improves, so do the statistical approaches. The research team at Global Footprint Network actively engages with a community of scientists from data providing organizations (Eg. FAO, GTAP, Sea Around Us) in order to analyze and integrate each dataset appropriately.

While the National Footprint Accounts include some data error improvement and estimation of missing data, results for countries and/or years are inevitably of variable reliability. As part of the completion of an Edition, researchers assess a level of confidence in the final results for each country, as follows:

Table 2: Data Quality Scores for National Footprint Accounts

Quality Score	Criterion for NFA qualification
6	• No component of biocapacity or Ecological Footprint has been determined to be unreliable or unlikely for any year.
5	• No component of biocapacity or Ecological Footprint has been determined to be unreliable or unlikely for the latest data year. • Some individual components of the Ecological Footprint or biocapacity have results that have been determined to be unreliable or unlikely, but not in the latest data year. • The total Ecological Footprint and biocapacity results are not impacted significantly by the unlikely or unreliable component values.
4	• No component of biocapacity or Ecological Footprint has been determined to be unreliable or unlikely for the year prior to the latest data year. • Some individual components of the Ecological Footprint or biocapacity have results that have been determined to be unreliable or unlikely, including the latest data year. • Total Ecological Footprint and biocapacity values may be impacted by the unlikely or unreliable component values in the most recent data year.
3 B	• No component of biocapacity or Ecological Footprint has been determined to be unreliable or unlikely for the latest data year. • Some individual components of the Ecological Footprint or biocapacity have many results that have been determined to be very unreliable or very unlikely, but not for the latest data year. • The total Ecological Footprint and biocapacity results may be impacted by the unlikely or unreliable values, but not so much that the totals are unusable.
3 T	• Some individual components of the Ecological Footprint or biocapacity have many results that have been determined to be very unreliable or very unlikely, including the latest year. • The total Ecological Footprint and biocapacity results may be impacted by the unlikely or unreliable values, but not so much that the totals are unusable.
3 L	• No component of biocapacity or Ecological Footprint has been determined to be unreliable or unlikely for the latest data year. • Some individual components of the Ecological Footprint or biocapacity have many results that have been determined to be very unreliable or very unlikely, but not for the latest data year. • The total Ecological Footprint and biocapacity results are significantly impacted by the unlikely or unreliable values, making them unusable.
2	• Some individual components of the Ecological Footprint or biocapacity have many results that have been determined to be very unreliable or very unlikely, including the latest year. • The latest year's total Ecological Footprint and biocapacity results may be impacted by the unlikely or unreliable values, but not so much that the totals are unusable. • Total Ecological Footprint and biocapacity results for years prior to the latest data year are significantly impacted by the unlikely or unreliable values, making them unusable.
1	• Some individual components of the Ecological Footprint or biocapacity have many results that have been determined to be very unreliable or very unlikely, including the latest year. • The total Ecological Footprint and biocapacity results - including those of the latest year - are significantly impacted by the unlikely or unreliable values, making them unusable. • The unlikely or unreliable values have most likely not impacted the creditor/debtor status, however.
0	• Some or all individual components of the Ecological Footprint or biocapacity have many results that have been determined to be very unreliable or very unlikely, including the latest year. • The total Ecological Footprint and biocapacity results - including those of the latest year - are significantly impacted by the unlikely or unreliable values, making them unusable. • The unlikely or unreliable values have most likely impacted the creditor/debtor status.

The data quality score for the National Footprint Accounts of Russia is 6.

Methodology:
Multi-Regional Input-Output Footprint Accounts (MRIO-FA)

In order to track the contribution of economic activity to demands on the biosphere, data and analytical methods are needed to identify demands and allocate them to the various economic activities.

For this report, we use Global Trade Analysis Project (GTAP)-based Environmentally-Extended Multi Regional Input Output analysis (EE-MRIO). The multi-regional feature is needed because modern economies are deeply embedded in import and export flows. It is environmentally extended, because standard Input-Output models track financial flows. By extending them, we overlay these financial flows with the associated resources.

GTAP is one of the most comprehensive global models available, and the strongest one for analysis that includes biological resources. Even though the model is limited to 57 sectors, many of them are within the agricultural or forestry domain, making it particularly suitable for Ecological Footprint related analyses. With 57 sector types and 140 regions, GTAP provides an input-output table of 7,980 unique sectors, all of which are inter-related through direct or indirect monetary flows.

For the environmental extension, we use Ecological Footprint. This information is derived from the Global Footprint Network's National Footprint Accounts, 2016 edition. We call this combination of GTAP's MRIO and Global Footprint Network's National Footprint Accounts MRIO-FA (standing for MRIO Footprint Accounts). We use our MRIO-FA model to generate the Footprint intensities associated with economic sectors and consumer spending. The MRIO-FA model uses financial data on purchases between sectors of the economy and purchases by final consumers as a proxy for flows of embodied resources.

EE-MRIO analysis allows for analyzing trade from two distinct perspectives, which are referred to in the MRIO-FA model as "direct trade" and "origin-destination." Direct trade captures the Footprint embodied in an actual transaction, where a sector sells goods or services to another sector or to a final consumer. Origin-destination trade captures the connection between where Footprint was originally generated and where that Footprint was finally consumed.

For example, if the cotton growing industry in Brazil sells raw cotton to the textile manufacturing industry in Vietnam, the embodied cropland Footprint in the cotton would be counted as a direct export to Vietnam. The Vietnam textile industry then uses that cotton to produce cotton fabric, which it could sell to the clothing manufacturing sector in Vietnam. Since the fabric stays within Vietnam, this sale is not counted as trade, though it does carry embodied cropland Footprint from the cotton as well as embodied carbon Footprint from emissions generated in the manufacturing process. The clothing sector in Vietnam then turns the cotton fabric into clothing, which it could export to retail clothing stores in Russia. This direct export to the retail sector in Russia would carry embodied cropland Footprint as well as carbon Footprint from the entire manufacturing process. When the final consumer, a shopper at the store in Russia, purchases the clothing, they are consuming the entire Footprint of this long chain, from the cropland in Brazil, to the emissions from the manufacturing sectors in Vietnam, the emissions from transporting the goods, and the energy use of the retail stores in Russia. All along the way, Footprint was imported and exported again, while more Footprint was being generated by the activities of each sector.

Direct trade occurs each time a product crosses borders, and the Footprint of that trade captures the entire embodied resource use of that product. Direct trade analysis would show Brazil exporting cropland Footprint to Vietnam, and Vietnam exporting both cropland and carbon Footprint to Russia.

Origin-destination analysis, however, would show the situation differently. Origin-destination would show Brazil 'exporting' cropland Footprint to the final consumer in Russia, and Vietnam 'exporting' carbon Footprint to the final consumer.

Methodology: Consumption Land Use Matrix (CLUM)

The CLUM indicates the Ecological Footprint associated with purchases in major consumption categories. A CLUM is unique to the economic system of a country, and can often highlight surprising findings that reveal important underlying features of a nation's consumption and its impact on ecological systems.

CLUMs are also used as reference points. The National CLUM describes consumption pattern at the national level. By using data that compares national average consumption in various categories with local consumption, an estimate of a local CLUM can be calculated. This approach is used for estimating the consumption Footprint of sub-national populations, for example cities or states. (See description below.)

The most common way to generate CLUMs is to use environmentally-extended input-output (IO) models – tying consumption also to expenditure categories. See the Methodology: Multi-Regional Input-Output Footprint Accounts (MRIO-FA) section for more discussion on environmentally extended input-output analysis.

Within the CLUM, there are two broad classifications:

1. Areas that are under direct short-term influence by households, such as direct consumption under the broad categories of food, shelter, personal transportation, goods, and services.

2. Areas that are under long-term or indirect influence by households, such as capital investment and infrastructure and government expenditure.

In the MRIO-FA model, capital investment and infrastructure comes from investment by firms (e.g., new factories and machinery). Government consumption relates to the ongoing consumption associated with the functions of the government, some of which might directly and materially benefit households.

Within the areas of direct short-term influence, the top level row categories are: food, housing, mobility (or personal transportation), goods, and services. Each top-level category is further broken down into sub-categories given by Classification of Individual Consumption According to Purpose (COICOP) classifications established by the United Nations.

Two categories of particular interest are “Electricity, gas and other fuels” under Housing, and “Operation of personal transport equipment” under Mobility. These categories include direct emissions from households due to fossil fuel combustion (e.g., gasoline for transportation and natural gas for heating) which are not passed through the input-output analysis.

The columns list each land use type and the total, therefore each cell refers to the Ecological Footprint on a certain land use type resulting from final purchases falling under each consumption category. For example, the grazing land Footprint associated with food purchases is 0.04 gha per person.

APPENDIX 2: UN CONSUMPTION CATEGORIES (COICOP) RESULTS BY DISTRICT

Table 1:
Ecological Footprint of Russia in UN Classification of Individual Consumption According to Purpose (COICOP) Categories (Contribution to Ecological Footprint per person), 2012.

Region	Food and non-alcoholic beverages	Alcoholic beverages, tobacco and narcotics	Clothing and footwear	Housing, water, electricity, gas and other fuels	Household furnishings, equipment and maint.	Health	Transportation	Communication	Recreation and culture	Education	Restaurants and hotels	Miscellaneous goods and services	Government	Gross Fixed Capital Formation	Total
Russian Federation	**1,13**	**0,10**	**0,13**	**1,49**	**0,04**	**0,05**	**0,71**	**0,05**	**0,22**	**0,01**	**0,02**	**0,12**	**0,64**	**0,97**	**5,69**
Central Federal District	**1,10**	**0,11**	**0,15**	**1,42**	**0,05**	**0,05**	**0,69**	**0,06**	**0,27**	**0,01**	**0,02**	**0,15**	**0,64**	**0,97**	**5,69**
Belgorod Oblast	1,29	0,12	0,11	1,06	0,04	0,06	1,21	0,06	0,18	0,01	0,02	0,10	0,67	1,01	5,94
Bryansk Oblast	1,19	0,08	0,09	1,02	0,03	0,03	0,44	0,04	0,12	0,01	0.0*	0,08	0,49	0,74	4,37
Vladimir Oblast	1,01	0,07	0,10	0,99	0,03	0,04	0,39	0,04	0,13	0.0*	0,01	0,08	0,45	0,68	4,01
Voronezh Oblast	1,04	0,10	0,08	0,82	0,03	0,05	0,31	0,04	0,11	0,01	0,01	0,09	0,42	0,64	3,76
Ivanovo Oblast	1,10	0,09	0,12	1,35	0,05	0,04	0,37	0,04	0,16	0.0*	0,01	0,08	0,53	0,81	4,74
Kaluga Oblast	1,10	0,12	0,13	1,15	0,04	0,04	0,66	0,05	0,21	0,01	0,01	0,10	0,57	0,86	5,06
Kostroma Oblast	0,96	0,11	0,08	0,84	0,03	0,03	0,76	0,04	0,15	0.0*	0,01	0,11	0,49	0,74	4,35
Kursk Oblast	0,98	0,06	0,12	0,90	0,03	0,03	0,54	0,04	0,12	0,02	0,01	0,07	0,46	0,69	4,07
Lipetsk Oblast	1,09	0,09	0,11	1,19	0,04	0,04	0,47	0,04	0,15	0,01	0,01	0,10	0,52	0,79	4,66
Moscow Oblast	1,11	0,08	0,11	1,79	0,05	0,04	0,71	0,05	0,28	0,01	0,03	0,11	0,68	1,04	6,08
Oryol Oblast	1,01	0,08	0,10	1,13	0,04	0,05	0,89	0,04	0,14	0,01	0,01	0,10	0,56	0,86	5,03
Ryazan Oblast	1,00	0,05	0,06	1,13	0,04	0,03	0,36	0,03	0,07	0,01	0.0*	0,06	0,44	0,67	3,95
Smolensk Oblast	0,86	0,07	0,07	1,08	0,01	0,03	0,28	0,04	0,14	0,01	0,01	0,07	0,42	0,63	3,72
Tambov Oblast	0,78	0,07	0,07	0,79	0,04	0,02	0,64	0,03	0,10	0,01	0,01	0,05	0,41	0,62	3,65
Tver Oblast	1,17	0,11	0,10	1,13	0,04	0,05	0,41	0,05	0,22	0,01	0,01	0,09	0,53	0,80	4,71
Tula Oblast	1,33	0,09	0,14	1,13	0,04	0,05	0,31	0,04	0,19	0.0*	0,01	0,11	0,54	0,82	4,78
Yaroslavl Oblast	1,00	0,08	0,10	1,11	0,05	0,04	0,57	0,04	0,17	0,01	0,01	0,08	0,51	0,78	4,55
Moscow City	1,17	0,14	0,22	1,69	0,06	0,07	0,91	0,07	0,42	0,03	0,04	0,26	0,80	1,21	7,10

Region	Food and non-alcoholic beverages	Alcoholic beverages, tobacco and narcotics	Clothing and footwear	Housing, water, electricity, gas and other fuels	Household furnishings, equipment and maint.	Health	Transportation	Communication	Recreation and culture	Education	Restaurants and hotels	Miscellaneous goods and services	Government	Gross Fixed Capital Formation	Total
North-West Federal District	**1,21**	**0,11**	**0,11**	**1,37**	**0,04**	**0,05**	**0,79**	**0,05**	**0,25**	**0,01**	**0,02**	**0,12**	**0,65**	**0,98**	**5,78**
Karelia Republic	1,04	0,10	0,11	1,23	0,03	0,05	0,69	0,05	0,20	0,01	0,01	0,10	0,56	0,86	5,03
Komi Republic	1,02	0,07	0,10	1,32	0,04	0,04	0,46	0,05	0,20	0,01	0,01	0,08	0,53	0,81	4,73
Arkhangelsk Oblast	0,97	0,08	0,11	1,02	0,05	0,04	0,48	0,04	0,23	0,01	0,01	0,10	0,49	0,75	4,38
Nenets Autonomus Okrug	0,91	0,06	0,09	1,24	0,03	0,02	0,97	0,04	0,10	0,01	0.0*	0,07	0,55	0,84	4,95
Vologda Oblast	1,04	0,09	0,10	1,21	0,03	0,05	0,27	0,04	0,18	0,01	0,01	0,07	0,48	0,73	4,31
Kaliningrad Oblast	1,14	0,11	0,08	1,16	0,04	0,03	0,48	0,04	0,14	0,01	0,01	0,09	0,52	0,79	4,65
Leningrad Oblast	1,12	0,10	0,09	1,32	0,03	0,03	1,00	0,05	0,17	0,01	0,01	0,09	0,63	0,95	5,59
Murmansk Oblast	1,08	0,15	0,12	1,62	0,05	0,05	0,73	0,05	0,27	0,01	0,02	0,19	0,68	1,03	6,05
Novgorod Oblast	1,12	0,08	0,11	1,17	0,04	0,05	0,52	0,04	0,16	0,01	0,01	0,10	0,53	0,81	4,76
Pskov Oblast	0,97	0,08	0,07	0,98	0,04	0,04	0,58	0,04	0,15	0.0*	0,01	0,08	0,47	0,72	4,23
Saint Petersburg	1,49	0,13	0,13	1,62	0,04	0,06	1,14	0,07	0,36	0,02	0,03	0,17	0,82	1,25	7,33
South Federal District	**1,18**	**0,10**	**0,11**	**1,05**	**0,04**	**0,06**	**0,58**	**0,05**	**0,14**	**0,01**	**0,01**	**0,09**	**0,54**	**0,82**	**4,78**
Republic of Adygea	1,17	0,06	0,12	0,96	0,05	0,06	0,87	0,05	0,15	0,01	0,01	0,10	0,56	0,85	5,01
Republic of Kalmykia	1,09	0,08	0,12	0,69	0,03	0,02	0,52	0,03	0,10	0,01	0,01	0,07	0,43	0,66	3,85
Krasnodar Krai	1,20	0,10	0,12	1,10	0,05	0,05	0,41	0,05	0,12	0,01	0,01	0,10	0,52	0,79	4,62
Astrakhan Oblast	1,40	0,15	0,14	1,23	0,06	0,05	0,86	0,05	0,19	0,01	0,03	0,12	0,67	1,02	5,96
Volgograd Oblast	1,00	0,10	0,08	0,92	0,04	0,06	1,17	0,04	0,15	0,02	0,01	0,09	0,57	0,87	5,13
Rostov Oblast	1,10	0,11	0,09	0,97	0,04	0,06	0,29	0,04	0,15	0,01	0,02	0,07	0,46	0,70	4,11
North Caucasian Federal District	**1,40**	**0,07**	**0,13**	**0,97**	**0,04**	**0,04**	**0,41**	**0,05**	**0,13**	**0,01**	**0,01**	**0,09**	**0,53**	**0,80**	**4,69**
Republic of Dagestan	1,68	0,04	0,15	0,86	0,03	0,01	0,34	0,04	0,06	0.0*	0,00	0,07	0,51	0,78	4,57
Republic of Ingushetia	2,01	0.0*	0,05	0,63	0,03	0,01	0,44	0,03	0,02	0,00	0.0*	0,02	0,51	0,77	4,51
Kabardino-Balkar Republic	1,27	0,05	0,15	1,01	0,08	0,05	0,48	0,06	0,17	0,01	0.0*	0,10	0,53	0,81	4,77
Karachay-Cherkess Republic	1,64	0,06	0,13	1,04	0,08	0,05	0,39	0,05	0,13	0,01	0.0*	0,10	0,57	0,87	5,11
Republic of North Ossetia-Alania	1,24	0,03	0,15	1,05	0,05	0,05	0,35	0,07	0,15	0.0*	0,01	0,11	0,51	0,77	4,53
Chechen Republic	1,93	0.0*	0,14	0,28	0,07	0,01	0,09	0,05	0,03	0,00	0.0*	0,04	0,41	0,63	3,69
Stavropol Krai	1,02	0,09	0,11	0,93	0,03	0,05	0,41	0,05	0,16	0,02	0,02	0,10	0,47	0,71	4,15

Region	Food and non-alcoholic beverages	Alcoholic beverages, tobacco and narcotics	Clothing and footwear	Housing, water, electricity, gas and other fuels	Household furnishings, equipment and maint.	Health	Transportation	Communication	Recreation and culture	Education	Restaurants and hotels	Miscellaneous goods and services	Government	Gross Fixed Capital Formation	Total
Volga Federal District	**1,05**	**0,10**	**0,11**	**1,20**	**0,04**	**0,05**	**0,71**	**0,04**	**0,19**	**0,01**	**0,02**	**0,09**	**0,56**	**0,86**	**5,03**
Republic of Bashkortostan	1,26	0,12	0,12	1,29	0,05	0,06	1,47	0,04	0,23	0,01	0,02	0,09	0,75	1,13	6,65
Mari El Republic	0,94	0,08	0,10	1,12	0,04	0,02	0,36	0,04	0,12	0,01	0,01	0,08	0,46	0,69	4,07
Republic of Mordovia	0,85	0,07	0,10	1,01	0,05	0,02	0,14	0,04	0,11	0,01	0,02	0,07	0,39	0,59	3,46
Republic of Tatarstan	1,03	0,07	0,14	1,18	0,04	0,05	0,72	0,05	0,17	0,01	0,02	0,08	0,56	0,85	4,97
Udmurt Republic	0,98	0,11	0,14	1,25	0,05	0,05	0,61	0,05	0,23	0,01	0,02	0,12	0,57	0,86	5,06
Chuvash Republic	0,85	0,06	0,08	0,99	0,03	0,03	0,59	0,04	0,10	0,01	0,01	0,06	0,44	0,67	3,95
Perm Krai	0,96	0,12	0,10	1,20	0,04	0,05	0,96	0,04	0,23	0,01	0,03	0,11	0,60	0,91	5,37
Kirov Oblast	0,97	0,09	0,10	1,06	0,04	0,04	0,70	0,04	0,20	0,01	0,01	0,09	0,52	0,80	4,68
Nizhny Novgorod Oblast	0,95	0,07	0,13	1,16	0,05	0,06	0,60	0,05	0,25	0.0*	0,02	0,09	0,54	0,81	4,78
Orenburg Oblast	1,05	0,11	0,13	1,34	0,04	0,04	0,62	0,05	0,15	0,01	0,02	0,09	0,57	0,86	5,06
Penza Oblast	1,23	0,11	0,09	1,24	0,05	0,03	0,50	0,04	0,12	0,01	0.0*	0,07	0,55	0,83	4,87
Samara Oblast	1,11	0,11	0,11	1,41	0,03	0,05	0,73	0,04	0,24	0,02	0,02	0,12	0,63	0,95	5,59
Saratov Oblast	1,25	0,09	0,10	1,23	0,04	0,03	0,29	0,04	0,11	0,01	0,01	0,08	0,51	0,78	4,57
Ulyanovsk Oblast	1,15	0,08	0,10	1,17	0,03	0,05	0,36	0,04	0,12	0,01	0.0*	0,08	0,50	0,76	4,46
Ural Federal District	**1,04**	**0,10**	**0,12**	**1,56**	**0,05**	**0,05**	**0,99**	**0,05**	**0,25**	**0,01**	**0,01**	**0,11**	**0,68**	**1,03**	**6,04**
Kurgan Oblast	0,81	0,08	0,10	1,36	0,05	0,03	0,87	0,04	0,16	0.0*	0,01	0,08	0,56	0,86	5,02
Sverdlovsk Oblast	1,06	0,11	0,10	1,47	0,05	0,05	0,83	0,05	0,26	0,01	0,01	0,11	0,65	0,98	5,75
Tyumen Oblast	1,08	0,10	0,14	1,69	0,04	0,04	1,20	0,07	0,27	0,01	0,01	0,13	0,75	1,14	6,68
Khanty–Mansi Autonomous Okrug – Yugra	0,95	0,09	0,12	1,77	0,04	0,04	1,22	0,07	0,31	0,01	0,02	0,13	0,75	1,13	6,65
Yamalo-Nenets Autonomous Okrug	1,43	0,14	0,22	2,12	0,06	0,04	1,87	0,10	0,23	0,03	0.0*	0,18	1,00	1,53	8,95
Chelyabinsk Oblast	1,04	0,08	0,11	1,61	0,04	0,04	1,00	0,05	0,22	0,01	0,02	0,11	0,68	1,03	6,04
Siberian Federal District	**1,09**	**0,10**	**0,11**	**1,56**	**0,04**	**0,04**	**0,61**	**0,05**	**0,18**	**0,01**	**0,01**	**0,11**	**0,61**	**0,93**	**5,47**
Altai Republic	0,82	0,05	0,10	1,08	0,04	0,04	0,41	0,04	0,10	0,01	0.0*	0,05	0,43	0,65	3,80
Republic of Buryatia	1,03	0,07	0,09	1,34	0,03	0,02	0,28	0,04	0,12	0,01	0,01	0,07	0,49	0,74	4,35
Tuva Republic	0,95	0,07	0,12	1,11	0,03	0,02	0,52	0,03	0,12	0,01	0,01	0,10	0,48	0,73	4,31
Republic of Khakassia	0,96	0,09	0,11	1,32	0,04	0,06	0,81	0,05	0,15	0,01	0,01	0,13	0,58	0,88	5,18

Region	Food and non-alcoholic beverages	Alcoholic beverages, tobacco and narcotics	Clothing and footwear	Housing, water, electricity, gas and other fuels	Household furnishings, equipment and maint.	Health	Transportation	Communication	Recreation and culture	Education	Restaurants and hotels	Miscellaneous goods and services	Government	Gross Fixed Capital Formation	Total
Altai Krai	1,01	0,11	0,09	1,52	0,03	0,03	0,62	0,05	0,10	0,01	0.0*	0,08	0,57	0,87	5,09
Zabaykalsky Krai	1,34	0,13	0,12	1,92	0,04	0,04	0,44	0,06	0,22	0,01	0,01	0,12	0,69	1,05	6,18
Krasnoyarsk Krai	0,99	0,11	0,14	1,74	0,05	0,05	0,74	0,05	0,21	0,01	0,01	0,20	0,67	1,02	5,98
Irkutsk Oblast	1,10	0,08	0,13	1,29	0,04	0,04	0,57	0,04	0,17	0,01	0,01	0,10	0,56	0,85	5,00
Kemerovo Oblast	1,16	0,10	0,12	1,43	0,05	0,04	0,52	0,05	0,24	0,01	0,01	0,10	0,60	0,91	5,32
Novosibirsk Oblast	0,99	0,11	0,08	1,58	0,03	0,03	0,53	0,04	0,15	0,01	0,02	0,08	0,57	0,87	5,10
Omsk Oblast	1,23	0,11	0,11	1,66	0,04	0,05	0,75	0,05	0,22	0,01	0,01	0,10	0,68	1,03	6,05
Tomsk Oblast	0,97	0,11	0,10	1,49	0,05	0,06	0,56	0,04	0,13	0,01	0,01	0,10	0,57	0,86	5,07
Far East Federal District	**1,04**	**0,09**	**0,12**	**1,62**	**0,04**	**0,04**	**0,56**	**0,05**	**0,20**	**0,01**	**0,02**	**0,11**	**0,61**	**0,93**	**5,44**
Sakha (Yakutia) Republic	1,40	0,10	0,16	1,47	0,05	0,03	0,69	0,06	0,23	0,01	0,01	0,12	0,68	1,03	6,04
Kamchatka Krai	1,21	0,12	0,10	2,14	0,06	0,04	0,48	0,06	0,19	0,01	0,01	0,10	0,71	1,07	6,29
Primorsky Krai	0,98	0,07	0,12	1,37	0,03	0,05	0,37	0,05	0,20	0,01	0,03	0,11	0,53	0,81	4,75
Khabarovsk Krai	0,90	0,09	0,12	1,52	0,05	0,05	0,65	0,05	0,25	0,01	0,01	0,11	0,60	0,91	5,32
Amur Oblast	0,97	0,08	0,11	1,96	0,03	0,03	0,48	0,05	0,13	0,01	0,01	0,08	0,62	0,94	5,49
Magadan Oblast	1,00	0,07	0,08	1,98	0,03	0,03	0,77	0,05	0,19	0,01	0,01	0,09	0,67	1,02	5,98
Sakhalin Oblast	0,94	0,07	0,10	1,67	0,03	0,03	0,79	0,07	0,15	0,01	0,01	0,10	0,62	0,94	5,53
Jewish Autonomous Oblast	0,89	0,11	0,10	1,46	0,04	0,03	0,70	0,04	0,18	0,01	0,01	0,09	0,57	0,87	5,10
Chukotka Autonomous Okrug	1,02	0,14	0,06	1,46	0,03	0,03	0,19	0,06	0,09	0.0*	0.0*	0,16	0,50	0,77	4,50

0.0* denotes values that are less than 0.005.

Table 2: Ecological Footprint of Russia in UN Classification of Individual Consumption According to Purpose (COICOP) Categories (Contribution to Ecological Footprint per person), 2009.

Region	Food and non-alcoholic beverages	Alcoholic beverages, tobacco and narcotics	Clothing and footwear	Housing, water, electricity, gas and other fuels	Household furnishings, equipment and maint.	Health	Transportation	Communication	Recreation and culture	Education	Restaurants and hotels	Miscellaneous goods and services	Government	Gross Fixed Capital Formation	Total
Russian Federation	**1,22**	**0,10**	**0,12**	**1,28**	**0,04**	**0,04**	**0,61**	**0,05**	**0,19**	**0,01**	**0,02**	**0,11**	**0,59**	**0,83**	**5,21**
Central Federal District	**1,20**	**0,09**	**0,13**	**1,13**	**0,05**	**0,05**	**0,72**	**0,05**	**0,27**	**0,01**	**0,02**	**0,13**	**0,59**	**0,84**	**5,29**
Belgorod Oblast	1,32	0,10	0,13	1,12	0,03	0,05	0,45	0,05	0,11	0,02	0,02	0,08	0,54	0,76	4,80
Bryansk Oblast	1,29	0,07	0,09	0,91	0,04	0,05	0,29	0,04	0,12	0,01	0,01	0,07	0,46	0,65	4,11
Vladimir Oblast	1,06	0,07	0,08	0,91	0,03	0,04	0,30	0,04	0,11	0,01	0,01	0,07	0,42	0,60	3,74
Voronezh Oblast	0,93	0,10	0,11	0,78	0,04	0,05	0,29	0,04	0,20	0,01	0,03	0,12	0,41	0,59	3,68
Ivanovo Oblast	1,09	0,06	0,06	1,05	0,02	0,03	0,18	0,03	0,07	0.0*	0.0*	0,06	0,41	0,58	3,64
Kaluga Oblast	1,29	0,12	0,17	1,52	0,05	0,04	0,53	0,05	0,19	0,01	0,01	0,13	0,64	0,90	5,67
Kostroma Oblast	1,07	0,09	0,09	1,14	0,03	0,04	0,26	0,04	0,14	0.0*	0,01	0,09	0,46	0,66	4,13
Kursk Oblast	1,19	0,09	0,22	0,84	0,04	0,05	0,30	0,03	0,08	0,01	0.0*	0,10	0,46	0,65	4,07
Lipetsk Oblast	1,28	0,12	0,13	0,95	0,03	0,04	0,43	0,04	0,16	0,01	0,01	0,14	0,52	0,73	4,59
Moscow Oblast	1,27	0,07	0,09	1,68	0,04	0,03	0,52	0,04	0,21	0,01	0,02	0,09	0,63	0,89	5,60
Oryol Oblast	1,13	0,08	0,10	0,94	0,03	0,05	0,49	0,04	0,12	0,01	0,01	0,08	0,48	0,67	4,24
Ryazan Oblast	1,29	0,07	0,08	0,72	0,02	0,04	0,30	0,03	0,07	0,01	0.0*	0,06	0,42	0,59	3,69
Smolensk Oblast	0,92	0,08	0,05	0,75	0,01	0,02	0,21	0,03	0,09	0,01	0.0*	0,05	0,34	0,49	3,05
Tambov Oblast	0,91	0,06	0,08	0,97	0,03	0,04	0,25	0,04	0,06	0,02	0,01	0,05	0,39	0,55	3,45
Tver Oblast	1,22	0,11	0,09	1,04	0,03	0,04	0,49	0,04	0,15	0,01	0,01	0,09	0,51	0,73	4,57
Tula Oblast	1,59	0,08	0,15	1,09	0,04	0,03	0,38	0,04	0,19	0,01	0,01	0,10	0,57	0,81	5,08
Yaroslavl Oblast	1,14	0,10	0,10	1,09	0,03	0,04	0,27	0,03	0,16	0,01	0,01	0,08	0,47	0,67	4,19
Moscow City	1,22	0,09	0,19	1,06	0,08	0,06	1,32	0,07	0,49	0,01	0,03	0,22	0,74	1,05	6,62
North-West Federal District	**1,28**	**0,11**	**0,11**	**1,18**	**0,04**	**0,05**	**0,59**	**0,04**	**0,20**	**0,01**	**0,02**	**0,11**	**0,58**	**0,82**	**5,12**
Karelia Republic	1,28	0,09	0,09	1,08	0,04	0,04	0,56	0,04	0,16	0,01	0.0*	0,08	0,54	0,76	4,78
Komi Republic	1,04	0,08	0,12	1,21	0,03	0,05	0,52	0,04	0,17	0,01	0,01	0,09	0,52	0,74	4,64
Arkhangelsk Oblast	1,09	0,08	0,11	0,95	0,04	0,04	0,74	0,04	0,17	0,01	0,01	0,12	0,52	0,74	4,65
Nenets Autonomus Okrug	0,92	0,06	0,09	0,71	0,03	0,03	0,96	0,03	0,14	0,01	0.0*	0,05	0,47	0,66	4,16
Vologda Oblast	1,25	0,10	0,08	1,08	0,03	0,04	0,34	0,03	0,11	0,01	0,01	0,08	0,49	0,69	4,32

Region	Food and non-alcoholic beverages	Alcoholic beverages, tobacco and narcotics	Clothing and footwear	Housing, water, electricity, gas and other fuels	Household furnishings, equipment and maint.	Health	Transportation	Communication	Recreation and culture	Education	Restaurants and hotels	Miscellaneous goods and services	Government	Gross Fixed Capital Formation	Total
Kaliningrad Oblast	1,20	0,11	0,08	1,12	0,04	0,04	1,02	0,04	0,11	0,01	0,01	0,10	0,60	0,85	5,31
Leningrad Oblast	1,30	0,08	0,08	1,10	0,02	0,04	0,22	0,04	0,09	0,01	0,01	0,07	0,47	0,67	4,18
Murmansk Oblast	1,13	0,14	0,13	1,41	0,04	0,06	0,80	0,05	0,21	0,01	0,01	0,16	0,64	0,91	5,69
Novgorod Oblast	1,09	0,08	0,09	1,01	0,03	0,05	0,37	0,04	0,12	0.0*	0,01	0,08	0,46	0,65	4,06
Pskov Oblast	1,11	0,10	0,10	0,85	0,03	0,04	0,58	0,04	0,13	0,01	0.0*	0,07	0,47	0,67	4,21
Saint Petersburg	1,55	0,15	0,14	1,36	0,05	0,05	0,69	0,06	0,33	0,01	0,03	0,15	0,70	1,00	6,26
South Federal District	**1,24**	**0,09**	**0,11**	**0,83**	**0,03**	**0,04**	**0,45**	**0,04**	**0,12**	**0,01**	**0,01**	**0,08**	**0,47**	**0,67**	**4,20**
Republic of Adygea	1,21	0,07	0,11	0,88	0,04	0,05	0,40	0,04	0,10	0,01	0,01	0,09	0,46	0,66	4,12
Republic of Kalmykia	1,19	0,08	0,11	0,52	0,03	0,03	0,23	0,03	0,09	0,01	0.0*	0,05	0,37	0,52	3,25
Krasnodar Krai	1,28	0,11	0,11	0,98	0,04	0,05	0,57	0,04	0,15	0,01	0,01	0,10	0,53	0,75	4,74
Astrakhan Oblast	1,58	0,17	0,14	1,05	0,04	0,05	0,53	0,04	0,17	0,01	0,04	0,10	0,61	0,86	5,39
Volgograd Oblast	1,08	0,08	0,09	1,00	0,04	0,06	0,47	0,04	0,12	0,01	0,01	0,09	0,48	0,67	4,24
Rostov Oblast	1,23	0,11	0,08	0,86	0,02	0,04	0,46	0,03	0,15	0,01	0,02	0,07	0,48	0,67	4,23
North Caucasian Federal District	**1,72**	**0,07**	**0,14**	**0,74**	**0,04**	**0,04**	**0,48**	**0,05**	**0,15**	**0,01**	**0.0***	**0,09**	**0,55**	**0,77**	**4,86**
Republic of Dagestan	2,21	0,05	0,19	0,63	0,06	0,02	0,37	0,04	0,06	0,00	0.0*	0,08	0,57	0,81	5,08
Republic of Ingushetia	1,84	0,02	0,07	0,33	0,02	0,01	0,35	0,02	0,01	0,00	0.0*	0,02	0,41	0,58	3,66
Kabardino-Balkar Republic	1,53	0,05	0,17	0,94	0,04	0,05	0,38	0,06	0,13	0,01	0,01	0,13	0,54	0,76	4,79
Karachay-Cherkess Republic	1,81	0,11	0,16	0,81	0,04	0,05	0,35	0,05	0,11	0,01	0,06	0,14	0,57	0,81	5,07
Republic of North Ossetia-Alania	1,39	0,05	0,15	0,85	0,04	0,06	0,58	0,06	0,18	0,01	0,01	0,15	0,55	0,77	4,86
Chechen Republic	2,81	0,03	0,33	0,48	0,13	0,03	0,56	0,09	0,06	0.0*	0.0*	0,12	0,72	1,01	6,36
Stavropol Krai	1,18	0,09	0,13	0,96	0,03	0,05	0,51	0,04	0,14	0,02	0,01	0,08	0,50	0,71	4,46
Volga Federal District	**1,15**	**0,10**	**0,10**	**1,14**	**0,03**	**0,04**	**0,55**	**0,04**	**0,14**	**0,01**	**0,01**	**0,08**	**0,53**	**0,74**	**4,67**
Republic of Bashkortostan	1,43	0,14	0,12	1,32	0,04	0,05	0,76	0,05	0,14	0,02	0,02	0,09	0,64	0,91	5,73
Mari El Republic	1,03	0,10	0,11	1,07	0,03	0,02	0,34	0,03	0,14	0,01	0,01	0,07	0,46	0,65	4,08
Republic of Mordovia	1,01	0,07	0,13	1,28	0,03	0,03	0,19	0,04	0,11	0,01	0,01	0,08	0,46	0,66	4,13
Republic of Tatarstan	1,11	0,07	0,11	1,12	0,03	0,03	0,49	0,05	0,14	0,02	0,01	0,08	0,50	0,71	4,48
Udmurt Republic	1,19	0,13	0,15	1,16	0,04	0,06	0,47	0,05	0,18	0,01	0,02	0,13	0,55	0,78	4,91

Region	Food and non-alcoholic beverages	Alcoholic beverages, tobacco and narcotics	Clothing and footwear	Housing, water, electricity, gas and other fuels	Household furnishings, equipment and maint.	Health	Transportation	Communication	Recreation and culture	Education	Restaurants and hotels	Miscellaneous goods and services	Government	Gross Fixed Capital Formation	Total
Chuvash Republic	1,01	0,09	0,11	1,09	0,05	0,04	0,44	0,04	0,15	0,03	0,01	0,06	0,48	0,68	4,28
Perm Krai	1,10	0,12	0,09	0,90	0,03	0,04	0,62	0,04	0,17	0,01	0,02	0,08	0,50	0,70	4,41
Kirov Oblast	1,11	0,13	0,10	0,96	0,04	0,06	0,66	0,04	0,19	0,01	0,02	0,08	0,53	0,75	4,68
Nizhny Novgorod Oblast	1,12	0,08	0,10	1,33	0,03	0,04	0,33	0,04	0,14	0,01	0,02	0,09	0,52	0,73	4,60
Orenburg Oblast	1,15	0,12	0,11	1,23	0,04	0,04	0,67	0,04	0,12	0,01	0,01	0,09	0,56	0,79	4,99
Penza Oblast	1,18	0,12	0,07	1,19	0,03	0,04	0,38	0,04	0,11	0,01	0,01	0,06	0,50	0,71	4,46
Samara Oblast	1,08	0,09	0,10	1,24	0,03	0,04	0,91	0,04	0,13	0,03	0,01	0,10	0,59	0,83	5,21
Saratov Oblast	1,39	0,09	0,09	1,07	0,03	0,04	0,46	0,03	0,09	0,01	0,01	0,07	0,52	0,74	4,64
Ulyanovsk Oblast	1,15	0,06	0,09	1,12	0,03	0,02	0,36	0,04	0,11	0,01	0,01	0,06	0,47	0,67	4,18
Ural Federal District	**1,19**	**0,11**	**0,12**	**1,46**	**0,04**	**0,04**	**0,61**	**0,05**	**0,20**	**0,02**	**0,02**	**0,11**	**0,61**	**0,86**	**5,44**
Kurgan Oblast	1,00	0,06	0,09	1,22	0,02	0,04	0,31	0,03	0,09	0,01	0.0*	0,06	0,45	0,64	4,02
Sverdlovsk Oblast	1,20	0,12	0,10	1,35	0,03	0,05	0,57	0,04	0,19	0,01	0,02	0,10	0,58	0,82	5,18
Tyumen Oblast	1,26	0,14	0,17	1,71	0,05	0,03	0,68	0,06	0,21	0,02	0,02	0,13	0,69	0,98	6,13
Khanty–Mansi Autonomous Okrug – Yugra	1,32	0,16	0,21	1,92	0,06	0,03	0,79	0,07	0,29	0,01	0,03	0,18	0,78	1,10	6,94
Yamalo-Nenets Autonomous Okrug	1,48	0,16	0,12	2,01	0,06	0,03	1,09	0,07	0,23	0,03	0.0*	0,11	0,83	1,17	7,38
Chelyabinsk Oblast	1,19	0,10	0,11	1,42	0,04	0,04	0,69	0,04	0,22	0,02	0,02	0,10	0,62	0,87	5,47
Siberian Federal District	**1,17**	**0,11**	**0,12**	**1,42**	**0,04**	**0,04**	**0,63**	**0,05**	**0,14**	**0,01**	**0,01**	**0,09**	**0,59**	**0,84**	**5,25**
Altai Republic	0,91	0,06	0,11	1,28	0,03	0,03	0,44	0,04	0,08	0.0*	0.0*	0,05	0,47	0,66	4,17
Republic of Buryatia	0,90	0,08	0,10	1,42	0,02	0,02	0,37	0,04	0,13	0,01	0,01	0,06	0,49	0,69	4,33
Tuva Republic	1,09	0,10	0,13	1,08	0,03	0,03	0,58	0,04	0,11	0,02	0,01	0,12	0,51	0,73	4,57
Republic of Khakassia	1,02	0,08	0,12	1,14	0,03	0,04	0,68	0,04	0,13	0,01	0,01	0,10	0,52	0,74	4,65
Altai Krai	1,01	0,11	0,10	1,56	0,04	0,04	0,51	0,04	0,11	0,01	0,01	0,08	0,56	0,79	4,97
Zabaykalsky Krai	1,38	0,12	0,13	1,32	0,03	0,03	0,37	0,04	0,10	0,01	0,01	0,08	0,56	0,79	4,97
Krasnoyarsk Krai	1,14	0,10	0,13	1,62	0,04	0,05	0,61	0,05	0,16	0,01	0,01	0,11	0,62	0,88	5,53
Irkutsk Oblast	1,18	0,09	0,14	1,42	0,04	0,05	0,66	0,04	0,13	0,02	0,02	0,11	0,60	0,85	5,35
Kemerovo Oblast	1,33	0,13	0,14	1,17	0,05	0,05	0,67	0,05	0,17	0,01	0,01	0,11	0,60	0,85	5,34
Novosibirsk Oblast	1,13	0,11	0,08	1,32	0,03	0,04	0,94	0,05	0,15	0.0*	0,01	0,07	0,61	0,86	5,39

Region	Food and non-alcoholic beverages	Alcoholic beverages, tobacco and narcotics	Clothing and footwear	Housing, water, electricity, gas and other fuels	Household furnishings, equipment and maint.	Health	Transportation	Communication	Recreation and culture	Education	Restaurants and hotels	Miscellaneous goods and services	Government	Gross Fixed Capital Formation	Total
Omsk Oblast	1,42	0,11	0,11	1,44	0,04	0,05	0,53	0,04	0,12	0,02	0,02	0,08	0,61	0,87	5,46
Tomsk Oblast	1,06	0,10	0,13	1,45	0,03	0,05	0,50	0,05	0,14	0,02	0,01	0,09	0,56	0,79	4,98
Far East Federal District	**1,04**	**0,08**	**0,12**	**1,42**	**0,03**	**0,04**	**0,43**	**0,05**	**0,14**	**0,01**	**0,01**	**0,09**	**0,54**	**0,76**	**4,76**
Sakha (Yakutia) Republic	1,16	0,07	0,15	1,34	0,03	0,03	0,54	0,05	0,16	0,01	0,01	0,10	0,56	0,80	5,01
Kamchatka Krai	0,82	0,07	0,07	1,42	0,01	0,03	0,38	0,03	0,09	0,01	0.0*	0,07	0,46	0,65	4,10
Primorsky Krai	1,09	0,07	0,13	1,36	0,03	0,03	0,36	0,05	0,13	0,01	0,02	0,10	0,52	0,74	4,63
Khabarovsk Krai	0,94	0,09	0,12	1,44	0,04	0,06	0,49	0,05	0,19	0,01	0,01	0,11	0,55	0,77	4,86
Amur Oblast	0,98	0,06	0,09	1,39	0,03	0,04	0,33	0,04	0,09	0,01	0,01	0,07	0,48	0,68	4,29
Magadan Oblast	0,94	0,05	0,08	1,52	0,02	0,02	0,58	0,04	0,11	0,01	0,01	0,08	0,54	0,76	4,76
Sakhalin Oblast	1,05	0,08	0,12	1,48	0,03	0,03	0,47	0,05	0,18	0,01	0,01	0,09	0,55	0,78	4,92
Jewish Autonomous Oblast	1,03	0,09	0,11	1,44	0,04	0,03	0,39	0,04	0,13	0,01	0,01	0,07	0,52	0,74	4,65
Chukotka Autonomous Okrug	1,08	0,09	0,08	1,38	0,04	0,03	0,45	0,04	0,11	0,01	0.0*	0,06	0,52	0,74	4,62

0.0* denotes values that are less than 0.005.

APPENDIX 3: BIOCAPACITY AND ECOLOGICAL FOOTPRINT BY DISTRICT

Table 3:
Russian Population, GDP, adjusted HDI, Ecological Footprint, and biocapacity for 2009 and 2012 and land area (2012).

Region	Population (1000)		Land Area (1000 km²)	GDP		Adjusted HDI		Ecological Footprint (gha per person)		Biocapacity (gha per person)	
	2009	2012	2012	2009	2012	2009	2012	2009	2012	2009	2012
Russian Federation	**142 737**	**143 056**	**16 952**	**19 387**	**23 867**	**-**	**0.86**	**5.21**	**5.69**	**-**	**6.80**
Central Federal District	**38 263**	**38 538**	**651**					**5.29**	**5.69**		
Belgorod Oblast	1 526	1 536	27	19 569	28 259	0.85	0.88	4.80	5.94	1.18	1.26
Bryansk Oblast	1 294	1 264	35	9 345	12 847	0.79	0.82	4.11	4.37	2.76	2.99
Vladimir Oblast	1 458	1 432	29	11 666	14 106	0.79	0.82	3.74	4.01	1.87	1.89
Voronezh Oblast	2 339	2 332	52	11 036	17 599	0.82	0.85	3.68	3.76	1.29	1.37
Ivanovo Oblast	1 074	1 054	22	7 425	9 500	0.78	0.81	3.64	4.74	2.17	2.16
Kaluga Oblast	1 015	1 008	30	14 500	21 516	0.81	0.85	5.67	5.06	3.05	3.27
Kostroma Oblast	678	662	60	10 941	14 776	0.79	0.83	4.13	4.35	11.22	11.74
Kursk Oblast	1 143	1 122	30	12 860	17 400	0.82	0.85	4.07	4.07	1.98	2.05
Lipetsk Oblast	1 182	1 166	24	17 902	19 706	0.83	0.85	4.59	4.66	1.43	1.52
Moscow Oblast	6 958	6 949	44	17 255	20 923	0.82	0.85	5.60	6.08	0.67	0.67
Oryol Oblast	799	781	25	11 214	15 468	0.81	0.84	4.24	5.03	2.47	2.56
Ryazan Oblast	1 168	1 148	40	11 510	15 885	0.81	0.84	3.69	3.95	2.77	2.71
Smolensk Oblast	1 001	981	50	11 845	14 885	0.79	0.83	3.05	3.72	5.31	5.32
Tambov Oblast	1 108	1 082	34	11 469	14 169	0.80	0.83	3.45	3.65	1.91	2.07
Tver Oblast	1 376	1 342	84	12 228	13 675	0.79	0.82	4.57	4.71	7.03	7.30
Tula Oblast	1 576	1 545	26	12 671	15 159	0.80	0.83	5.08	4.78	1.40	1.44
Yaroslavl Oblast	1 286	1 271	36	14 760	18 611	0.82	0.85	4.19	4.55	3.13	3.11
Moscow City	11 282	11 863	3	40 805	43 082	0.96	0.94	6.62	7.10	0.01	0.03
North-West Federal District	**13 612**	**13 660**	**1 674**					**5.12**	**5.78**		
Karelia Republic	654	640	173	12 931	16 498	0.80	0.83	4.78	5.03	29.83	32.33
Komi Republic	922	890	417	22 335	32 201	0.81	0.86	4.64	4.73	37.39	45.35

Region	Population (1000)		Land Area (1000 km²)	GDP		Adjusted HDI		Ecological Footprint (gha per person)		Biocapacity (gha per person)	
	2009	2012	2012	2009	2012	2009	2012	2009	2012	2009	2012
Arkhangelsk Oblast	1 246	1 213	406	19 310	23 598	0.81	0.85	4.65	4.38	52.01	56.39
Nenets Autonomus Okrug	42	42	176		N/A	0.81	N/A	4.16	4.95	220.10	226.43
Vologda Oblast	1 214	1 198	146	14 327	19 550	0.81	0.85	4.32	4.31	14.38	14.91
Kaliningrad Oblast	937	947	15	14 136	18 555	0.81	0.84	5.31	4.65	2.18	1.88
Leningrad Oblast	1 699	1 734	85	21 549	25 612	0.80	0.84	4.18	5.59	5.81	6.04
Murmansk Oblast	806	788	144	15 555	19 988	0.80	0.84	5.69	6.05	11.88	13.06
Novgorod Oblast	645	630	55	16 397	20 360	0.80	0.84	4.06	4.76	10.26	10.60
Pskov Oblast	690	667	55	9 877	11 910	0.77	0.80	4.21	4.23	9.57	9.89
Saint Petersburg	4 799	4 953	1	25 277	29 392	0.90	0.91	6.26	7.33	0.11	0.10
South Federal District	**13 845**	**13 884**	**420**					**4.20**	**4.78**		
Republic of Adygea	440	443	8	8 583	11 180	0.79	0.82	4.12	5.01	1.71	1.35
Republic of Kalmykia	290	287	70	8 087	9 485	0.78	0.81	3.25	3.85	3.12	2.77
Krasnodar Krai	5 195	5 284	76	13 899	19 673	0.83	0.86	4.74	4.62	1.70	1.40
Astrakhan Oblast	1 010	1 015	53	12 610	16 249	0.81	0.83	5.39	5.96	1.59	1.43
Volgograd Oblast	2 618	2 595	113	13 200	16 351	0.82	0.84	4.24	5.13	1.25	1.19
Rostov Oblast	4 292	4 260	101	11 302	13 676	0.82	0.84	4.23	4.11	1.20	1.04
North Caucasian Federal District	**9 267**	**9 493**	**170**					**4.86**	**4.69**		
Republic of Dagestan	2 827	2 931	50	9 337	9 932	0.81	0.81	5.08	4.57	1.28	1.19
Republic of Ingushetia	409	430	3	3 494	7 343	0.76	0.81	3.66	4.51	0.81	0.77
Kabardino-Balkar Republic	858	859	12	7 666	9 773	0.79	0.81	4.79	4.77	1.11	1.02
Karachay-Cherkess Republic	470	475	14	8 669	9 352	0.80	0.81	5.07	5.11	2.35	2.18
Republic of North Ossetia-Alania	712	709	8	9 343	10 907	0.81	0.83	4.86	4.53	0.96	0.94
Chechen Republic	1 224	1 302	16	5 023	5 669	0.76	0.77	6.36	3.69	1.00	0.93
Stavropol Krai	2 767	2 787	66	8 725	10 553	0.80	0.82	4.46	4.15	1.34	1.07
Volga Federal District	**30 053**	**29 811**	**1 039**					**4.67**	**5.03**		
Republic of Bashkortostan	4 059	4 064	143	15 797	22 302	0.82	0.85	5.73	6.65	2.88	1.88
Mari El Republic	701	692	23	10 265	13 917	0.79	0.83	4.08	4.07	3.21	3.31
Republic of Mordovia	845	825	26	11 394	12 731	0.81	0.83	4.13	3.46	2.42	2.38
Republic of Tatarstan	3 774	3 803	68	23 290	29 844	0.85	0.87	4.48	4.97	1.33	1.19

Region	Population (1000)		Land Area (1000 km²)	GDP		Adjusted HDI		Ecological Footprint (gha per person)		Biocapacity (gha per person)	
	2009	2012	2012	2009	2012	2009	2012	2009	2012	2009	2012
Udmurt Republic	1 528	1 518	42	15 290	19 410	0.81	0.84	4.91	5.06	2.63	2.64
Chuvash Republic	1 258	1 247	18	10 971	14 071	0.81	0.84	4.28	3.95	1.20	1.18
Perm Krai	2 661	2 631	161	16 642	22 299	0.81	0.84	4.41	5.37	6.36	6.68
Kirov Oblast	1 365	1 328	121	9 634	11 499	0.79	0.83	4.68	4.68	9.93	10.69
Nizhny Novgorod Oblast	3 344	3 297	77	14 709	18 397	0.82	0.84	4.60	4.78	2.30	2.28
Orenburg Oblast	2 044	2 024	124	19 507	25 201	0.81	0.84	4.99	5.06	2.52	1.77
Penza Oblast	1 398	1 377	43	10 764	13 875	0.81	0.83	4.46	4.87	1.92	1.98
Samara Oblast	3 222	3 214	54	14 520	19 710	0.82	0.85	5.21	5.59	0.89	0.82
Saratov Oblast	2 545	2 509	101	12 812	15 933	0.82	0.84	4.64	4.57	1.49	1.49
Ulyanovsk Oblast	1 309	1 282	37	11 794	14 811	0.81	0.84	4.18	4.46	1.66	1.65
Ural Federal District	**12 076**	**12 143**	**1 733**					**5.44**	**6.04**		
Kurgan Oblast	925	896	72	10 833	12 249	0.79	0.82	4.02	5.02	5.17	3.62
Sverdlovsk Oblast	4 314	4 307	194	15 811	23 215	0.83	0.86	5.18	5.75	4.76	4.00
Tyumen Oblast	3 352	3 460	160	57 175	75 526	0.86	0.89	6.13	6.68	16.62	15.34
Khanty–Mansi Autonomous Okrug – Yugra	1 504	1 561	535		N/A	0.86	N/A	6.94	6.65	21.33	22.08
Yamalo-Nenets Autonomous Okrug	523	537	684		N/A	0.86	N/A	7.38	8.95	40.51	41.54
Chelyabinsk Oblast	3 485	3 480	89	15 098	18 087	0.83	0.85	5.47	6.04	1.83	1.16
Siberian Federal District	**19 282**	**19 261**	**5 110**					**5.25**	**5.47**		
Altai Republic	205	209	93	7 520	9 750	0.76	0.80	4.17	3.80	22.11	25.16
Republic of Buryatia	966	971	352	11 148	11 469	0.79	0.81	4.33	4.35	14.20	15.54
Tuva Republic	305	309	169	7 578	8 697	0.73	0.76	4.57	4.31	19.85	22.08
Republic of Khakassia	532	532	62	13 680	17 797	0.80	0.82	4.65	5.18	9.22	9.08
Altai Krai	2 439	2 407	168	10 295	12 399	0.80	0.82	4.97	5.09	5.24	3.54
Zabaykalsky Krai	1 109	1 100	432	12 671	15 182	0.78	0.81	4.97	6.18	18.07	19.63
Krasnoyarsk Krai	2 833	2 838	2 330	20 779	26 908	0.83	0.85	5.53	5.98	43.31	40.10
Irkutsk Oblast	2 448	2 424	775	15 987	21 693	0.81	0.83	5.35	5.00	24.47	22.86
Kemerovo Oblast	2 776	2 751	96	18 721	21 518	0.80	0.82	5.34	5.32	3.62	2.75
Novosibirsk Oblast	2 649	2 687	178	13 383	18 284	0.83	0.85	5.39	5.10	5.01	2.40
Omsk Oblast	1 988	1 975	141	16 213	20 199	0.83	0.86	5.46	6.05	5.26	3.22
Tomsk Oblast	1 032	1 058	315	19 064	23 868	0.84	0.85	4.98	5.07	26.33	15.82

Region	Population (1000)		Land Area (1000 km²)	GDP		Adjusted HDI		Ecological Footprint (gha per person)		Biocapacity (gha per person)	
	2009	2012	2012	2009	2012	2009	2012	2009	2012	2009	2012
Far East Federal District	**6 339**	**6 266**	**6 155**					**4.76**	**5.44**		
Sakha (Yakutia) Republic	958	956	3 073	21 159	29 604	0.82	0.83	5.01	6.04	110.13	105.91
Kamchatka Krai	325	320	464	12 931	15 893	0.80	0.83	4.10	6.29	53.61	54.02
Primorsky Krai	1 970	1 951	165	12 574	16 114	0.80	0.83	4.63	4.75	11.13	11.45
Khabarovsk Krai	1 351	1 342	785	12 320	16 554	0.80	0.83	4.86	5.32	39.31	43.18
Amur Oblast	839	821	363	13 115	16 637	0.78	0.81	4.29	5.49	27.40	26.53
Magadan Oblast	161	155	463	16 748	23 456	0.81	0.85	4.76	5.98	54.26	53.58
Sakhalin Oblast	505	495	86	43 462	61 712	0.81	0.84	4.92	5.53	32.21	34.35
Jewish Autonomous Oblast	178	175	36	9 849	14 013	0.76	0.80	4.65	5.10	15.56	15.58
Chukotka Autonomous Okrug	52	51	720	39 220	34 188	0.78	0.80	4.62	4.50	309.42	301.53

GLOSSARY

Biological capacity or Biocapacity

The capacity of ecosystems to regenerate what people demand from those surfaces. Life, including human life, competes for space. The biocapacity of a particular surface represents its ability to renew what people demand. Biocapacity is therefore the ecosystems' capacity to produce biological materials used by people and to absorb waste material generated by humans, under current management schemes and extraction technologies. Biocapacity can change from year to year due to climate, management, and also what portions are considered useful inputs to the human economy. In the National Footprint Accounts, the biocapacity of an area is calculated by multiplying the actual physical area by the yield factor and the appropriate equivalence factor. Biocapacity is expressed in global hectares.

Biological capacity available per person

There were about 12 billion hectares of biologically productive land and water on Earth in 2012. Dividing by the number of people alive in that year (7.1 billion) gives 1.73 global hectares per person. This area also needs to accommodate the wild species that compete for the same biological material and spaces as humans.

Biologically productive land and water

The land and water (both marine and inland water) area that supports significant photosynthetic activity and the accumulation of biomass used by humans. Non-productive areas as well as marginal areas with patchy vegetation are not included. Biomass that is not of use to humans is also not included. The total biologically productive area on land and water in 2011 was approximately 12 billion hectares.

Carbon Footprint

The carbon Footprint measures CO_2 emissions associated with fossil fuel use. In Ecological Footprint accounts, these amounts are converted into biologically productive areas necessary for absorbing this CO_2. The carbon Footprint is added to the Ecological Footprint because it is a competing use of bioproductive space, since increasing CO_2 concentrations in the atmosphere is considered to represent a build-up of ecological debt. Some carbon Footprint assessments express results in tonnes released per year, without translating this amount into area needed to sequester them.

Consumption

Use of goods or of services. The term consumption has two different meanings, depending on context. As commonly used in regard to the Footprint, it refers to the use of goods or services. A consumed good or service embodies all the resources, including energy, necessary to provide it to the consumer. In full life-cycle accounting, everything used along the production chain is taken into account, including any losses along the way. For example, consumed food includes not only the plant or animal matter people eat or waste in the household, but also that lost during processing or harvest, and all the energy used to grow, harvest, process and transport the food.

As used in input-output analysis, consumption has a strict technical meaning. Two types of consumption are distinguished: intermediate and final. According to (economic) System of National Accounts terminology, intermediate consumption refers to the use of goods and services by a business in providing goods and services to other businesses. Final consumption refers to non-productive use of goods and services by households, the government, the capital sector, and foreign entities.

Consumption components (also consumption categories)

Ecological Footprint analyses can allocate total Footprint among consumption components, typically Food, Housing, Mobility, Goods, and Services--often with further resolution into sub-components. Consistent categorization across studies allows for comparison of the Footprint of individual consumption components across regions, and the relative contribution of each category to the region's overall Footprint. To avoid double counting, it is important to make sure that consumables are allocated to only one component or sub-component. For example, a refrigerator might be included in either the food, goods, or shelter component, but only in one.

Consumption Land Use Matrix

Starting with data from the National Footprint Accounts, a Consumption Land Use Matrix allocates the six major Footprint land uses (shown in column headings) allocated to the five basic consumption components (row headings). For additional resolution, each consumption component can be disaggregated further. These matrices are often used as a starting point for sub-national (e.g. state, county, city) Footprint assessments. In this case, national data for each cell is scaled up or down depending on the unique consumption patterns in that sub-national region compared to the national average.

Ecological deficit / reserve (or biocapacity reserve / deficit): The difference between the biocapacity and Ecological Footprint of a region or country. An ecological deficit occurs when the Footprint of a population exceeds the biocapacity of the area available to that population. Conversely, an ecological reserve exists when the biocapacity of a region exceeds its population's Footprint. If there is a regional or national ecological deficit, it means that the region is importing biocapacity through trade or liquidating regional ecological assets, or emitting wastes into the global commons such as the atmosphere. In contrast to the national scale, the global ecological deficit cannot be compensated for through trade, and is therefore equal to overshoot by definition.

Ecological Footprint A measure of how much area of biologically productive land and water an individual, population or activity requires to produce all the resources it consumes and to absorb the waste it generates, using prevailing technology and resource management practices. The Ecological Footprint is usually measured in global hectares. Because trade is global, an individual or country's Footprint includes land or sea from all over the world. Without further specification, Ecological Footprint generally refers to the Ecological Footprint of consumption. Ecological Footprint is often referred to in short form as Footprint. «Ecological Footprint» and «Footprint» are proper nouns and thus should always be capitalized.

Equivalence factor A productivity-based scaling factor that converts a specific land type (such as cropland or forest) into a universal unit of biologically productive area, a global hectare. For land types (e.g., cropland) with productivity higher than the average productivity of all biologically productive land and water area on Earth, the equivalence factor is greater than 1. Thus, to convert an average hectare of cropland to global hectares, it is multiplied by the cropland equivalence factor of 2.53. Grazing lands, which have lower productivity than cropland, have an equivalence factor of 0.45 (see also yield factor). In a given year, equivalence factors are the same for all countries.

Global hectare (gha) Global hectares are the accounting unit for Ecological Footprint and biocapacity accounts. These productivity-weighted biologically productive hectares allow researchers to report both the biocapacity of the earth or a region, and the demand on biocapacity (the Ecological Footprint). A global hectare is a biologically productive hectare with world average biological productivity for a given year. Global hectares are needed because different land types have different productivity. A global hectare of, for example, cropland, would occupy a smaller physical area than the much less biologically productive pasture land, as more pasture would be needed to provide the same biocapacity as one hectare of cropland. Because world bioproductivity varies slightly from year to year, the value of a gha may change slightly from year to year.

National Footprint Accounts

The central dataset that calculates Footprint and biocapacity of the world and more than 200 nations from 1961 to the present (generally with a three year lag due to data availability). The ongoing development, maintenance and upgrades of the National Footprint Accounts are coordinated by Global Footprint Network and its partners.

Yield

The amount of regenerated primary product, usually reported in tons per year, that humans are able to extract per area unit of biologically productive land or water.

Yield factor

A factor that accounts for differences between countries in productivity of a given land type. Each country and each year has yield factors for cropland, grazing land, forest, and fisheries. For example, in 2012, Hungarian cropland was 0.95 times as productive as world average cropland. The Hungarian cropland yield factor of 0.95, multiplied by the cropland equivalence factor of 2.53 converts Hungarian cropland hectares into global hectares: one hectare of cropland is equal to 2.41 gha.

Ecological Footprint of the Russian Regions – 2016

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5.7 gha per person

average Russian's Ecological Footprint. This is 1.5 times more than the World average

6.8 gha per person

available biocapacity
in the Russian Federation in 2009

27%

of Russia's Footprint of household consumption results from food

3.3 Earths

would need the humanity to sustain our demand on nature if everyone on the planet lived the average lifestyle of Russian residents

68%

of Russia's overall Footprint is carbon

WWF's Mission Statement
To stop the degradation of the planet's natural environment
and to build a future in which humans live in harmony with nature

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