



# Ecosystem Services of Russia

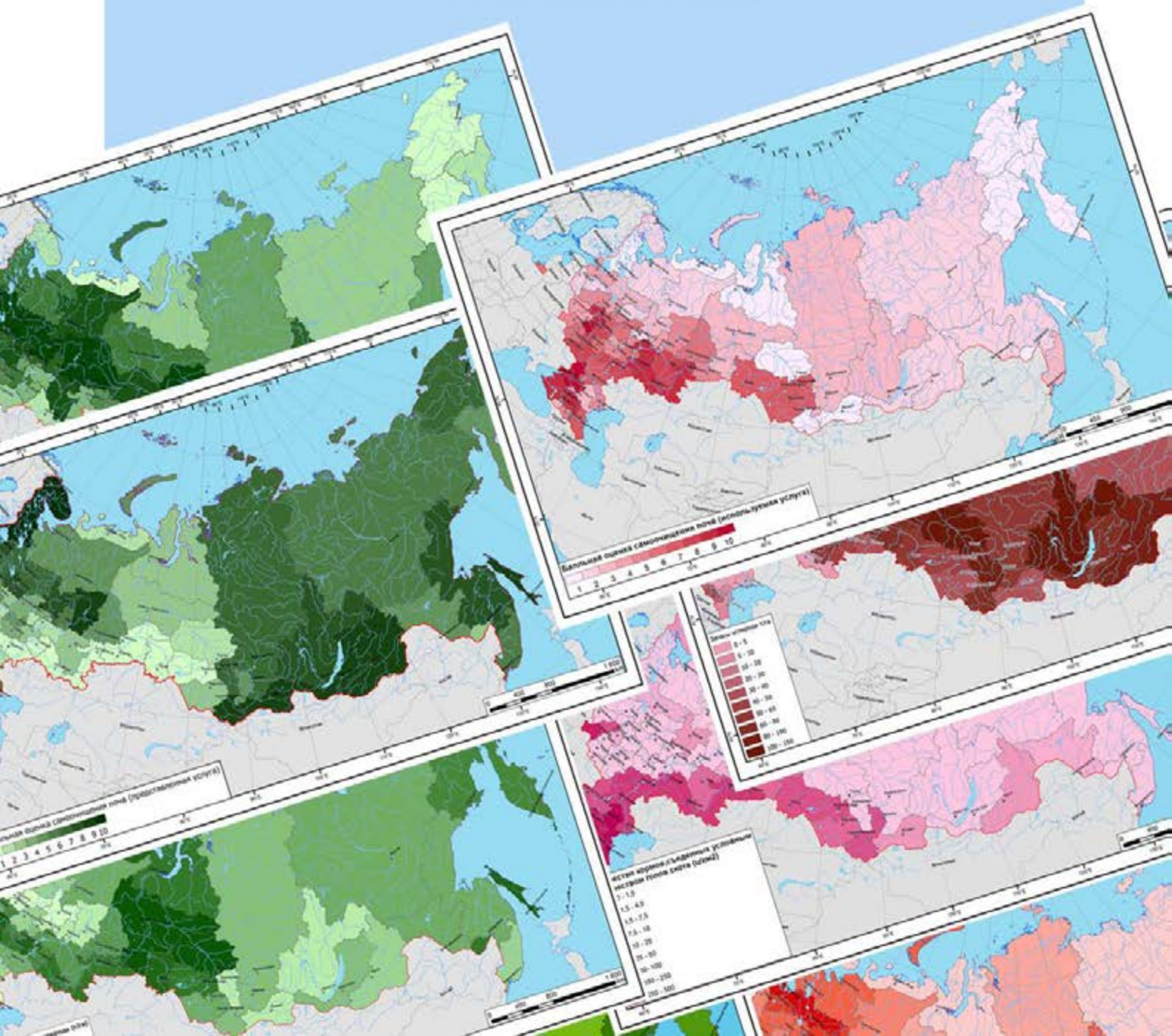
Prototype of National Report

Volume 1

## Services of Terrestrial Ecosystems

### Summary

for decision makers



The Russian-German project "TEEB-Russia. Ecosystem Services Evaluation in Russia: First Steps" was initiated in 2013 by the Biodiversity Conservation Center (Moscow) in cooperation with the Leibniz Institute of Ecological Urban and Regional Development (Dresden) in accordance with the decision (of 23 May 2012) of the

Russian-German standing working group "Protection of nature and biodiversity". The financial support is provided by the German Federal Agency for Nature Conservation (BfN). The project is also supported by the Ministry of Natural Resources and Ecology of the Russian Federation.

**The goal of the project** is the creation of the Prototype of the National Report on Ecosystem Services of Russia, which demonstrates approaches to country-scale ecosystem services (ES) evaluation as well as the urgency to start forming a national system of ES monitoring and evaluation and the integration of ES value into economy and decision-making process.

In the first phase of the project (2013-2015) the Volume 1 of the Prototype Report considering terrestrial ecosystem services was created. It addressed the following main objectives:

- the ES classification adapted to Russian conditions was elaborated;
- the possible approaches to the ES estimation on the federal and interregional levels were demonstrated;
- the most important ES of the Russian regions were evaluated quantitatively in natural sciences indicators or estimated in points;
- the existing publicly available data on ecosystems, their components and their use were analysed, the list of necessary additional data to ES assessing on the national and interregional levels was compiled.

Economic ES valuation, the analysis of the importance of biodiversity for ES maintenance, as well as the development of specific recommendations on monitoring and management of ES of Russia are scheduled for the following stages of the project.

Given the limited resources of the project, the national report prototype can not claim a final comprehensive ES assessment. The document pursues methodological goals and shows possible approaches to the ES estimation on the national level and their importance for the socio-economic development and population welfare of Russia.

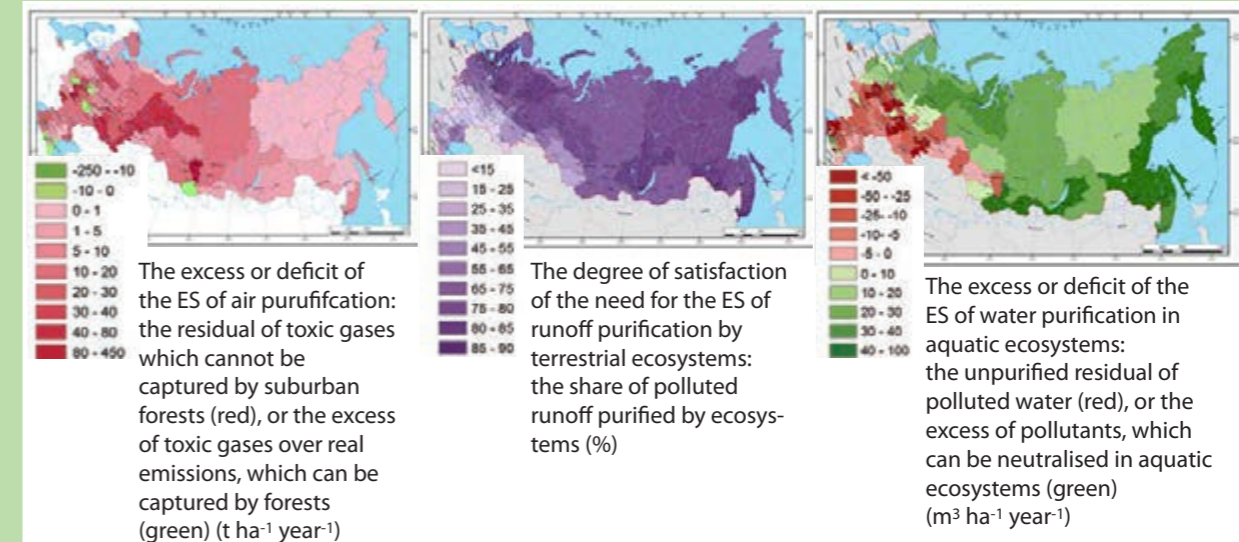
**All the ES estimates presented in the Prototype of the National Report are only illustrations of the possible assessment approaches and should be significantly refined for use in decision making.**

## THE MAIN FINDINGS

### • Terrestrial ecosystem services are critical for the well-being of population and economy of Russia.

The provided by ecosystems amount of the most important ES is comparable to the amount of basic needs of population and economy of the Russian regions in regulation of the environment, natural bioproduction, conditions for recreation.

### • A number of the most important life-supporting services are fully used or they already are not sufficient to meet the needs of people and economy. This is true for ecosystem regulation of runoff, ensuring water quality by terrestrial ecosystems, purification of water in aquatic ecosystems, absorption of air pollutants by suburban forests.



**A number of the most important regulating services already are not sufficient to meet the needs of people and economy**

### • Uneven distribution of supplied, demanded and consumed ES makes some regions ES donors, and others – ES beneficiaries. These relations must be considered when national and interregional planning and development of ES markets.

• **ES monitoring is absent in Russia.** Monitoring of natural ecosystems (except for forests) and the components of biodiversity which are the physical and functional basis of ES is incomplete and does not correspond to the modern level of technology. Bio-resources accounting systems are permanently reformed and do not provide comprehensive information. The degree of official data reliability is low, especially on IUU harvesting and forest fires. Many of the data are not available in the public domain.

• **Immediate start forming of a national system of ES monitoring and evaluation is necessary, as well as mechanisms of integrating ES values in decision making.** If this is not done the environmental safety and sustainable development of Russia will be threatened, global advantages of ecological donor country will be lost.

### • Currently ES are missing in the field of state regulation. ES are not adequately assessed and does not take into account when making decisions.

**Provisioning ES** partially (the main biological resources) is subject to government regulation, but in the post-Soviet time, it was significantly weakened and the share of illegal unreported and unregulated (IUU) harvesting of all types of bioresources has grown substantially.

**Regulating ES** are practically not taken into account and are not regulated by the government, except for some forest ES (partly water and soil protection and "carbon" services). The lack of regulating ES accounting in decision making leads to damage that may exceed several times supposed profit.

**Information ES** are completely absent in the governmental and legal regulation.

**Recreational ES** are understood very limited - just as the possibility of get profit from recreation in nature. Particularly, this has a negative impact on the strategy of development of Russian nature reserves (zapovedniks). The traditional priority task of preservation and study of nature was replaced by the task of the tourism development which inevitably leads to violations of natural systems and the loss of information about their structure and functions.

## ES CLASSIFICATION

**ES classification.** The Prototype Report employed a classification of ES combining the approaches of the Millennium Ecosystem Assessment, CICES and National Strategy of Biodiversity Conservation in Russia (2001). It includes four major ES groups:

- 1) **productive (provisioning)** – production of biomass which is removed from ecosystems by people (in contrast to CICES, "production" of water is not included);
- 2) **environment-forming (regulating)** – establishment and maintenance of the environmental conditions conducive to human life and economic development;
- 3) **information (cultural)** – all kinds of information which is contained in natural ecosystems and can be used by people.
- 4) **recreational** – establishment and maintenance of natural conditions for different types of recreation; recreational ES are integrative, as they are coupled to all of the groups above to various extents.

This ES classification is proposed to use in the national system of ES monitoring and assessment.

## DATA SOURCES

**Data sources.** ES were assessed by open public data bases of the Russian Federal State Statistics Service (FSSSR), published cartographical materials and statistical compilations. The Prototype Report has primarily a methodological orientation. Analysis of the accuracy of used data and their adjustment is not a task of the Prototype Report. The accuracy of the ES estimates corresponds to the accuracy of the source data. In the future ES valuation should be clarified on the basis of more detailed and adjusted original data.

## METHODS OF ES ASSESSMENT

**Units of assessment.** The subjects of the Russian Federation – Oblasts, Krai, Republics etc. (the top-level administrative units; hereinafter the regions) were used as assessment units. The entire socio-economic data as well as some environmental indicators were obtained from the public FSSSR databases and the databases of other federal agencies, which produce data for the subjects of the Russian Federation. There were multiple sources of physical, geographical and biological data used for ES evaluation, which was available at various scales from the level of medium-resolution satellite imagery to the level of natural domains. To make our assessment uniform, we assumed the values scaled down or up to the level of the administrative units using GIS methods.

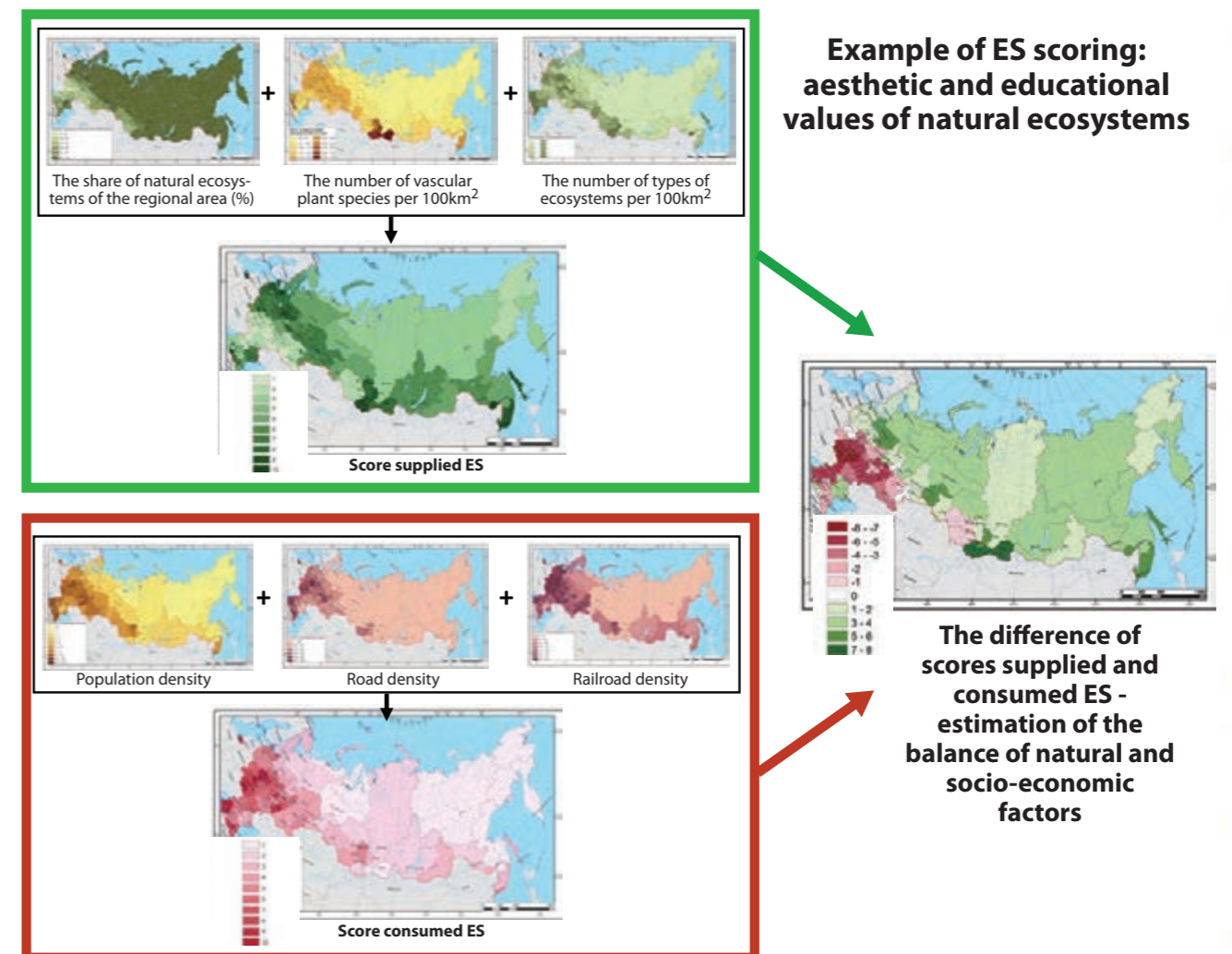
**Methods of ES assessment.** Depending on the data availability and methodological clarity the following methods were used.

1. **Direct quantitative evaluation** when statistical data are available on supplied, demanded and consumed ES.
2. **Indirect quantitative evaluation** based on combination of other quantitative data on regional ecosystems and economy.
3. **Score in points** if there is no data to evaluate ES itself and if it is possible to estimate only factors affecting it. Scores of supplied ES show the relative intensity of natural factors that determine the performance of ES (eg, the share of natural ecosystems of the area of the region). Scores of demanded and consumed ES show the relative intensity of social and economic factors that determine the need for ES and their use (eg, population density and transport accessibility of the territory).
4. **Formulation of the task** of ES assessment, if methodological approaches aren't ready for the above methods or failed to get data.

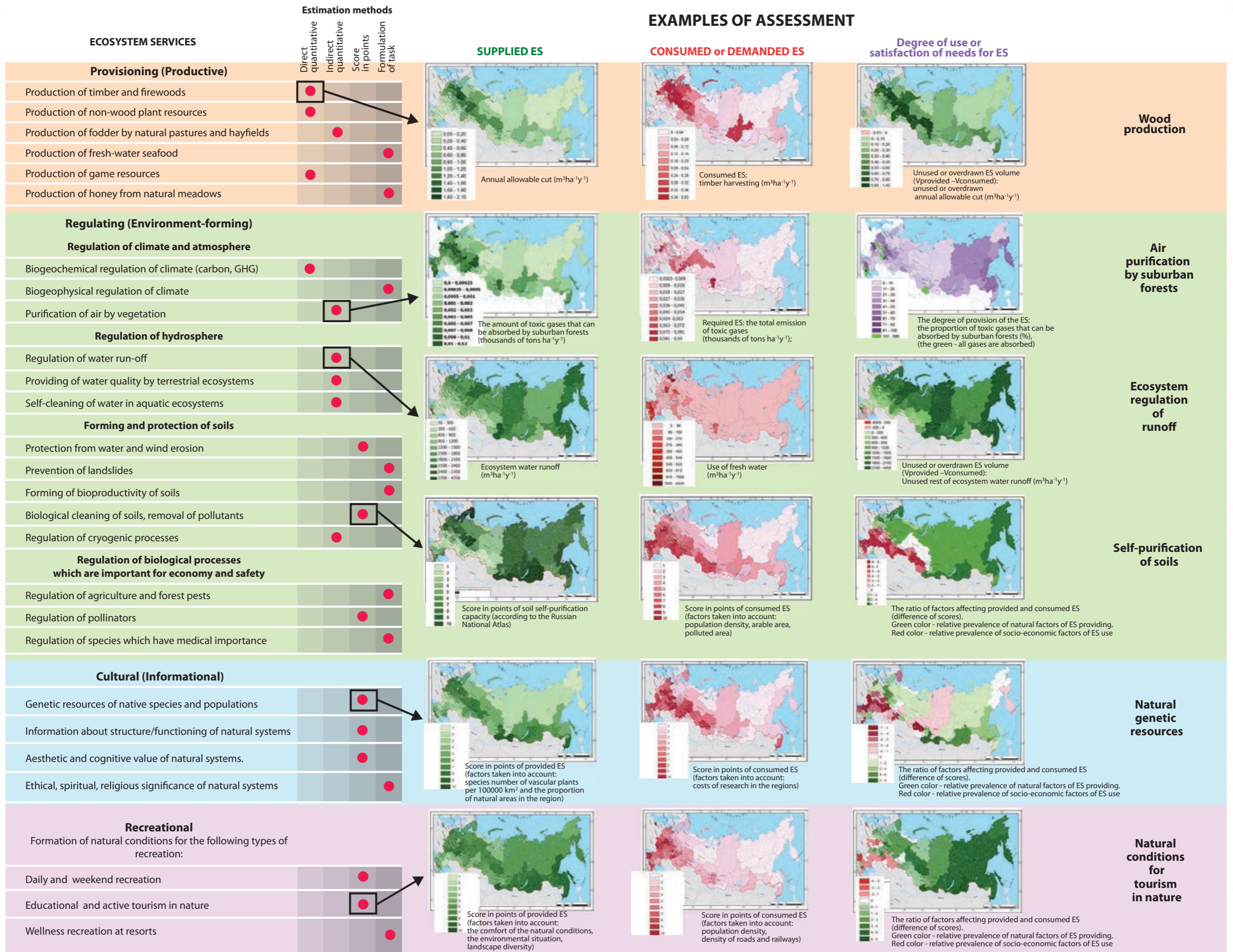
### PRELIMINARY REQUIREMENTS FOR THE NATIONAL SYSTEM OF MONITORING, EVALUATION AND MANAGEMENT OF ECOSYSTEM SERVICES

The system of monitoring, evaluation and management of ES should take into account the state of natural ecosystems and biodiversity, as they are structural and functional basis of ES. These issues will be considered in the Volume 2 of the Prototype Report and the full requirements for the system of monitoring, evaluation and management of ES will be set after that. In the Volume 1 of the Prototype Report only the general preliminary requirements were formulated.

- Considering the current state and possible changes of biodiversity at different hierarchical levels (intra-population, intraspecific, species and ecosystem diversity) as a basis of ecosystem functions and services, because biodiversity is a critical factor in efficiency and stability of ecosystem functioning.
- Valuation of species and populations, including traditionally considered as commercial resources, taking into account their importance for the sustainability of ecosystems and the ES performance.
- Accounting the total value of all major groups of ES, and first of all environment-forming (regulating) ES; priority of environment-forming (regulating) ES in possible conflicts between aims of use of different ES.
- Estimation of ES in three indicators: supplied, demanded and consumed ES.
- Considering spatial scales of ecosystem functions and services.
- Comparing spatial distribution of ES and indicators of socio-economic development of regions in the choice of the assessment methods and management goals.
- Use of best available techniques and technologies.



## EXAMPLES OF ASSESSMENT



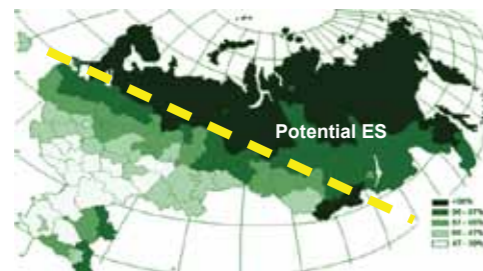
## Supplied, demanded and consumed ES

The extreme diversity of natural and socio-economic conditions in Russia required specific approaches to the assessment of ES which could potentially be supplied by ecosystems, ES necessary for people and ES actually used by people. The supplied ES are generally correlated with the area of ecosystems. The demanded and consumed ES and the value of the ES for human well-being are linked to population density, economic development and transport accessibility of the regions. The

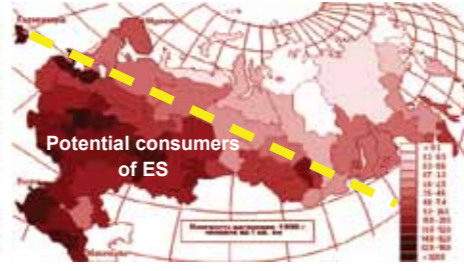
most common pattern is an inverse relationship between the area of natural ecosystems and the density of ES consumers, because human economic activity in most cases, is associated with the destruction or disruption of natural ecosystems.

The comparison of distribution of potential ES and potential consumers of ES can be made by estimating of ES in three indicators: supplied, demanded and consumed ES.

The share of natural ecosystems of the region area (%)



Population density



**Supplied ES** were defined as ES produced by ecosystems regardless of the presence or absence of people. Supplied ES correspond to the capacity of ecosystems to perform useful for people functions and meet their needs. Supplied ES are determined by natural factors: the state of ecosystems and biodiversity, the intensity and stability of ecosystem functioning, degree of ecosystem disturbance. This indicator should be evaluated taking into account the sustainable use of ecosystems and their components, ie. it is equal to the ES volume which may be used by people without disturbance of ecosystem structure and functioning (eg, volume of withdrawal of bioresources, which does not disturb the structure, reproduction and ecosystem functions of exploited populations).

**Demanded ES** were defined as ES which correspond to the ES yield necessary to fulfill the needs of the population and economy of a region.

**Consumed ES** were defined as the ES yield which is materially or immaterially being used by the population, or which people derive benefits from.

Ratios and differences of supplied, demanded and consumed ES show the degree of use of ES and satisfaction of needs for ES which is important information for the assessment of the environmental situation in the regions and interregional comparisons. These indicators are relative indices in the case of ratios and are measured in the same units as ES volumes in the case of differences.

### Ratios and differences of ES volumes and their application in ES assessment

Ratios and differences of ES volumes	Application in ES assessment	Examples from the Prototype Report
$\frac{V_{consumed}}{V_{supplied}}$ $\frac{V_{consumed}}{V_{supplied}} \times 100\%$	<b>The level of ES use</b>	The share of harvested game animals, mushrooms or berries in the total biomass or abundance The share of fodder eaten by livestock The share of actually purified water volume in purification abilities of terrestrial ecosystems* The share of regional carbon stock in managed forests
$V_{supplied} - V_{consumed}$	Unused (if positive) or overdrawn (if negative) ES volume	The unused residual of the annual allowable cut (the difference between annual allowable cut and logged timber) The supplied ecosystem runoff unused by people
$\frac{V_{supplied}}{V_{demanded}}$ $\frac{V_{supplied}}{V_{demanded}} \times 100\%$	<b>The potential satisfaction of the needs for ES</b>	The share of toxic gases which can be assimilated (or trapped) by suburban forests*
$V_{demanded} - V_{supplied}$	Excess (if positive) or deficit (if negative) of ES	The excess volume of toxic gases over the ecosystem's capacity to trap pollutants* The residual volume of polluted runoff which cannot be neutralized by water ecosystems or water ecosystems' untapped opportunities for wastewater treatment
$\frac{V_{consumed}}{V_{demanded}}$ $\frac{V_{consumed}}{V_{demanded}} \times 100\%$	<b>The actual satisfaction of the needs for ES</b>	The share of purified runoff in polluted runoff* The share of toxic gases absorbed by suburban forests*
$V_{demanded} - V_{consumed}$	Volume of unmet need for ES	The residual of polluted runoff unpurified by terrestrial ecosystems (the difference between polluted and purified runoff)*

### Indicators and measures for estimation of supplied, demanded and consumed ES

Category of ES	Supplied ES	Demanded ES	Consumed ES	Measure
<b>Provisioning ES</b>	- The total biomass, abundance or productivity of a bio-resource (e.g. abundance of hunting animals, total biomass of mushrooms and berries, productivity of natural pastures). - More accurately – the part of a bio-resource yield that could be extracted from the ecosystem without undermining the population (e.g. annual allowable cut)	Yield of a bio-resource necessary for sustainable socio-economic development of a region	Yield of a bio-resource extracted from natural ecosystems (e.g. logging volume, fish take, mushroom and berry harvest, the mass of fodder eaten by cattle in natural pastures)	Mass Number
<b>Regulation ES</b>	- Volume/area for which ecosystems control the considered parameters (e.g. the total area protected from erosion) - Volume of matter involved in the considered function (e.g. runoff provided by ecosystems, amount of pollutants which could potentially be neutralized by ecosystems, the amount of carbon stored in all ecosystems)	- Volume/area where it is necessary to regulate environmental parameters for sustainable socio-economic development of a region (e.g. volume of ecosystem runoff regulation needed for the population and the economy) - Volume of matter which needs to be involved in the considered function to maintain acceptable environmental conditions (e.g. amount of pollutants which must be neutralized by ecosystems)	- Volume/area directly important for people where ecosystems regulate environmental parameters (e.g. the area of agricultural land protected from erosion, the area of agricultural land with natural pollinators) - Amount of matter directly important for people which is involved in the ES (e.g. the amount of water used by people, the volume of runoff purified by ecosystems, the amount of pollutants neutralized by ecosystems, the amount of carbon stored in managed ecosystems)	Volume Area Mass  Score in points
<b>Cultural ES</b>	Overall factors affecting the environmental regulation (area and productivity of ecosystems, the capacity for self-cleaning, etc.)	The sum of factors that determine the necessary volume of environment regulation	The sum of factors that determine actual benefits (or prevented damage) from environment regulation (population, regional GDP, level of pollution, agricultural area, etc.)	Score in points
<b>Recreational ES</b>	The sum of natural factors that determine recreational potential (recreational capacity of ecosystems, pleasant climate, picturesque sights, capabilities of swimming, bird-watching, fishing, etc.)	The sum of socio-economic factors that determine the necessary recreational potential	Overall socio-economic factors affecting the actual recreational load (transport accessibility, tourist infrastructure, etc.)	Score in points



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The Prototype of the National Report (Vol. 1) includes on-line supplement with quantitative ES evaluation spreadsheets and high-resolution maps ([www.biodiversity.ru/teeb-russia.html](http://www.biodiversity.ru/teeb-russia.html)) (available from August 1, 2016).

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