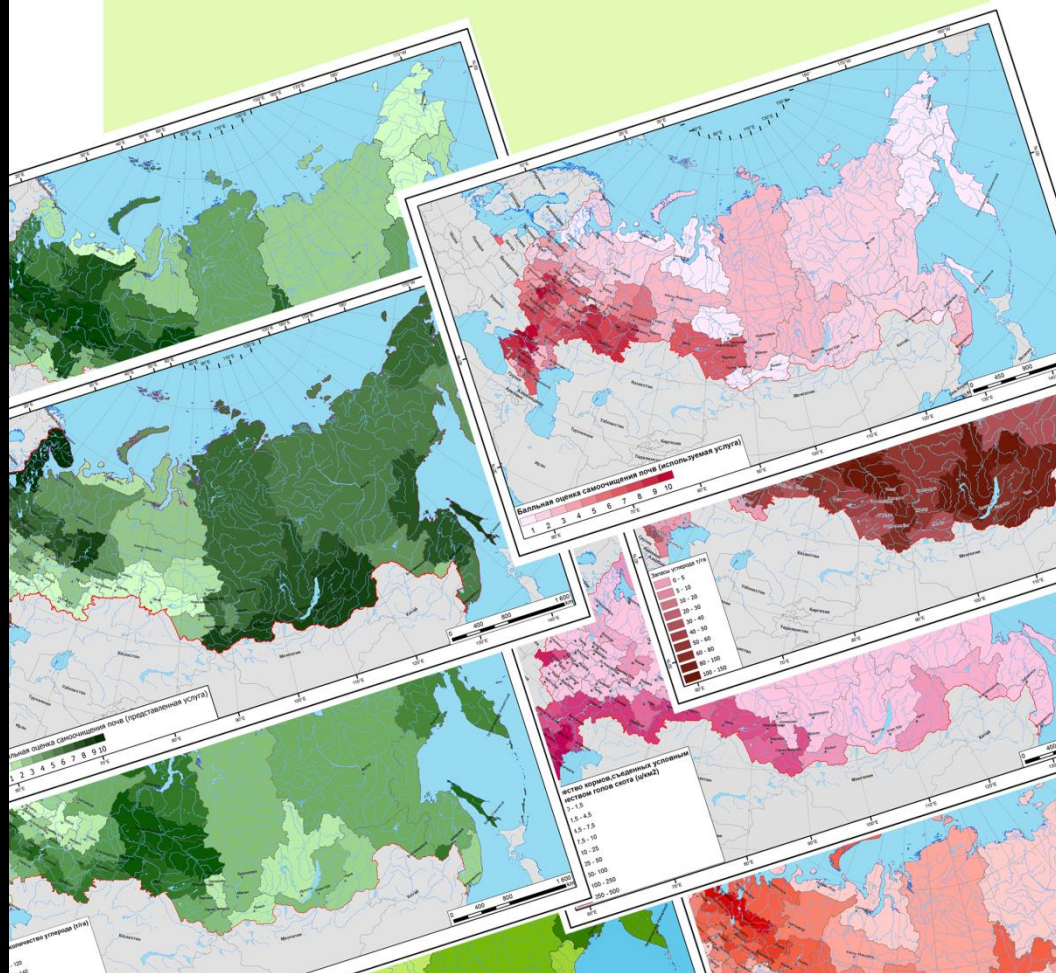


Ecosystem Services of Russia

Volume 1

Services of Terrestrial Ecosystems

Prototype of the National Report



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Project “TEEB-Russia”

Biodiversity Conservation Center (Moscow)
**Leibniz Institute of Ecological Urban and
Regional Development (IÖR Dresden)**

Participating organizations

Russian Academy of Sciences: A.N. Severtsov Institute of Ecology and Evolution; Institute of Geography; Center of Forest Ecology and Productivity; Institute for System Analysis

Lomonosov Moscow State University: Faculty of Biology; Faculty of Geography; Faculty of Economics

**Financial support: German Federal Agency for
Nature Conservation**

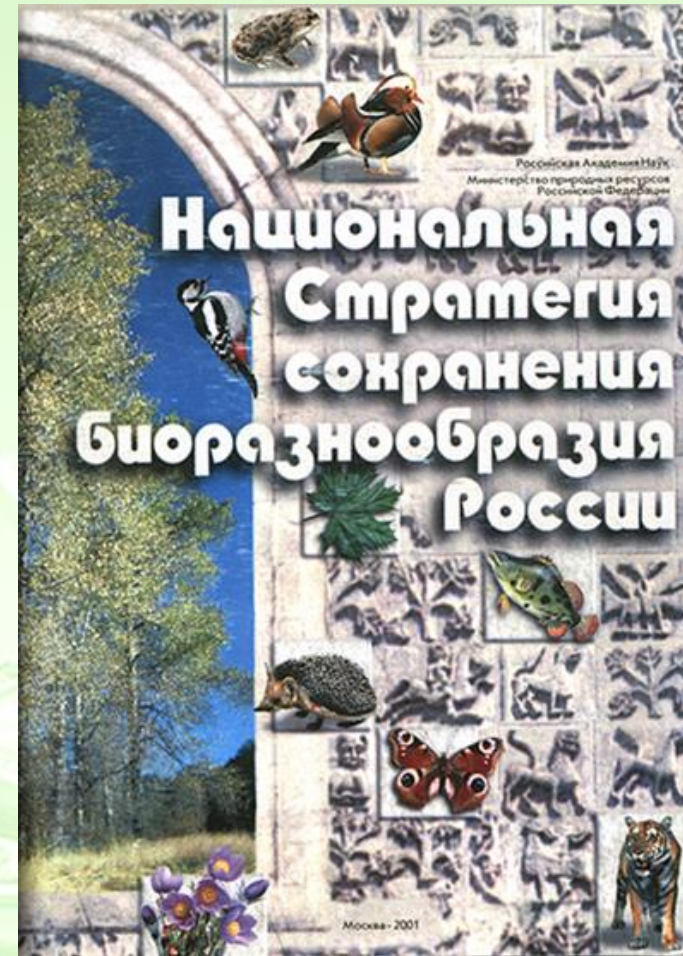
Life-supporting functions of biodiversity

Environment-forming (regulating, supporting) - maintenance of biospheric processes and creation of favourable living conditions for man, such as clean air and water, suitable climate, and fertile soils.

Productive - biological production - foods and raw materials for various sectors of economy.

Informational-- storage of information on the structure and function of biological and ecological systems (including genetic information) accumulated in the course of a long evolution of biosphere.

Spiritual and aesthetic -- the enormous influence of living nature on the cultural development of mankind, formation of aesthetic and ethical views, and creation of comfortable environment



ECOSYSTEM SERVICES OF RUSSIA

Category	Definition	Services
Productive	Production of biomass which is removed from ecosystems by people	<ol style="list-style-type: none"> 1. Продукция древесины 2. Недревесная продукция леса и других наземных экосистем (грибы, ягоды, орехи, кора, лыко, лекарственные, косметические, декоративные растения и т.п.) 3. Производство корма для скота на природных пастбищах и сенокосах 4. Продукции пресноводных экосистем, прежде всего, рыбы 5. Охотничья продукция
Environment-forming (supporting regulating)	Formation and maintenance of the environmental conditions conducive to human life and economic development	<ol style="list-style-type: none"> 1. Услуги по регулированию климата и атмосферы <ol style="list-style-type: none"> 1.1. Биогеохимическая регуляция климата (регуляция цикла углерода и потоков парниковых газов). 1.2. Биогеофизическая регуляция климата: <ul style="list-style-type: none"> - регуляция потоков энергии между поверхностью Земли и атмосферой (альbedo, тепловые потоки, скорость ветра); снижение силы ветра и ущерба от ураганов и штормов растительностью; - регуляция потоков влаги между поверхностью и атмосферой (формирование облаков, влияние на количество осадков). 1.3. Очистка воздуха растительностью 2. Услуги по регулированию гидросферы <ol style="list-style-type: none"> 2.1. Водоохранные и водорегулирующие услуги: <ul style="list-style-type: none"> - обеспечение объема стока воды; - регуляция (стабилизация) стока воды; - снижение интенсивности и ущерба от наводнений. 2.2. Обеспечение качества воды наземными экосистемами 2.3. Очищение вод в природных водоемах. 3. Услуги по формированию и защите почв <ol style="list-style-type: none"> 3.1. Защита почв от ветровой и водной эрозии; предотвращение пыльных бурь и оползней 3.2. Формирование биопродуктивности почв 3.3. Биологическая очистка почв от загрязнений 3.4. Регулирование криогенных процессов. 4. Услуги по регулированию биологических процессов, важных для экономики и безопасности <ol style="list-style-type: none"> 4.1. Контроль численности отдельных видов, имеющих важное хозяйственное значение: <ul style="list-style-type: none"> - вредителей сельского хозяйства; - вредителей леса; - опылителей 4.2. Контроль численности отдельных видов, имеющих важное медицинское значение (компоненты природных очагов заболеваний, переносчики заболеваний). <p>Услуги по уменьшению интенсивности экстремальных природных явлений и сокращению ущерба от них распределены между группами 2.1-2.3</p> <p>Услуги по биологической очистке (ассимиляционные услуги) распределены между группами 2.1-2.3</p>
Informaiton	Information which can be useful for humans and other non-material benefits	<ol style="list-style-type: none"> 1. Генетические ресурсы природных видов и популяций 2. Информация о структуре и функционировании природных систем, которая может быть использована для создания их аналогов. 3. Эстетическое и познавательное значение природных систем. 4. Этическое, духовное, религиозное значение природных систем.
Recreational	Services that combine the components of the first 2 or 3 groups	<p>Формирование природных условий для следующих видов отдыха:</p> <ol style="list-style-type: none"> 1. для ежедневного отдыха рядом с домом (чистый воздух, растительность, водоем); 2. для воскресного отдыха и пикников, дачной рекреации, любительской рыбалки, сбора грибов и ягод (не включая профессиональные заготовки недревесной продукции); 3. для познавательного туризма на природе (красивые пейзажи, наблюдение за птицами и другими животными); 4. для активного туризма на природе, спортивной рыбалки по схеме «поймал-отпусти», любительской охоты; 5. для оздоровительного отдыха на курортах (кроме морского побережья).

ECOSYSTEM SERVICES OF RUSSIA

Category	Services
Productive	<ul style="list-style-type: none">1.1. Production of timber and firewoods1.2. Production of non-wood plant resources (mushrooms, berries, nuts, bark, medicine plants etc.,)1.3. Production of fodder by natural pastures and hayfields1.4. Production of fresh-water seafood1.5. Production of game resources1.6. Production of honey from natural meadows

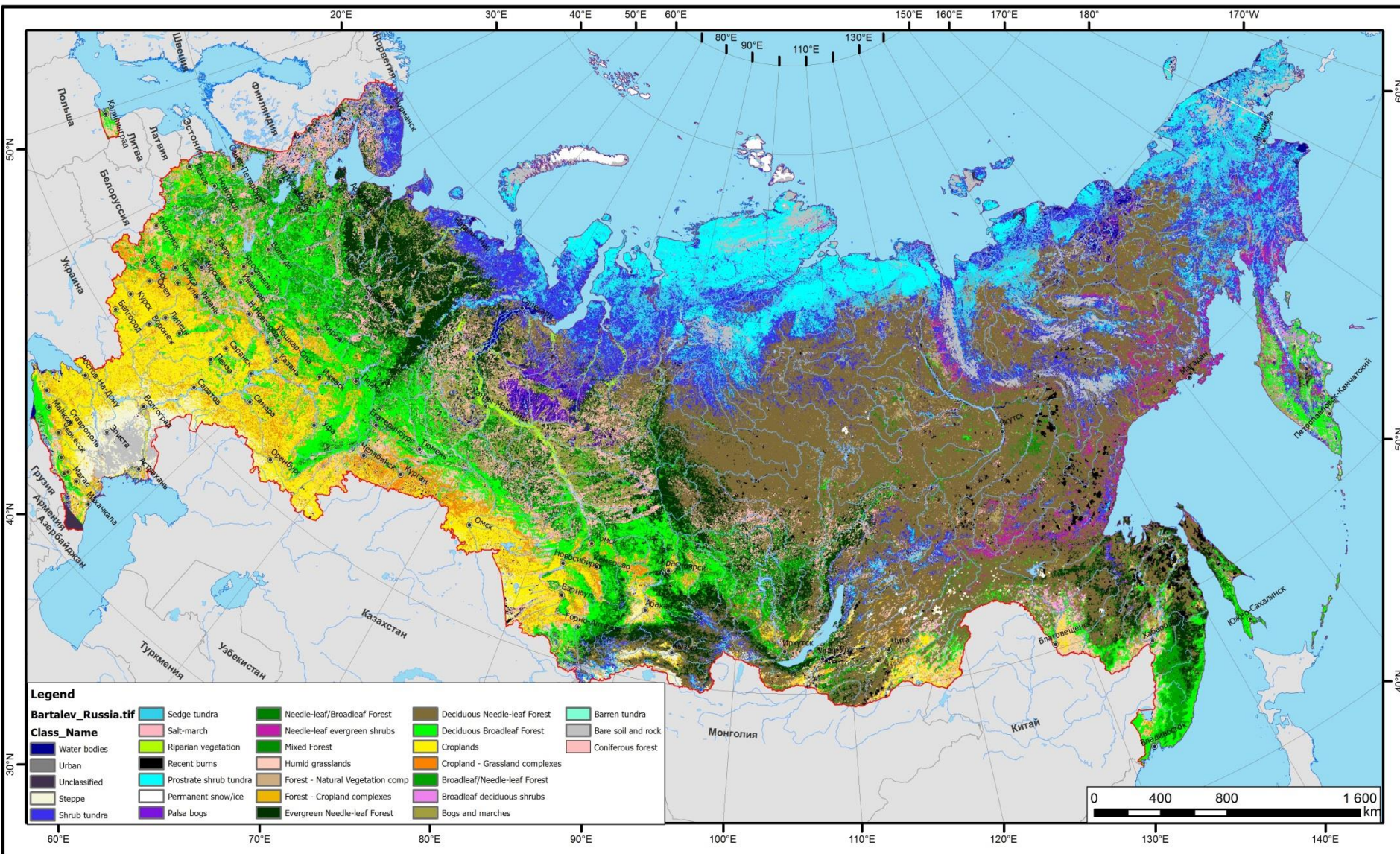
ECOSYSTEM SERVICES OF RUSSIA

Category	Services
<p>Environment-forming</p> <p>Services to reduce the intensity of extreme weather events and reduce the damage caused by them are distributed among the groups 2.1-2.3</p> <p>Services of bioremediation (assimilation services) are distributed between the groups 2.1-2.3</p>	<ol style="list-style-type: none"> 1. <u>Regulation of climate and atmosphere</u> <ol style="list-style-type: none"> 1.1. Biogeochemical regulation of climate (carbon cycle, flows greenhouse gases) 1.2. Biogeophysical regulation of climate 1.3. Cleaning of air by vegetation 2. <u>Regulation of hydrosphere</u> <ol style="list-style-type: none"> 2.1. Regulation of hydrological regime of territories (regulation of water run-off, cleaning of water by terrestrial ecosystems, reduction of damage from floods) 2.2. Self-cleaning of water in reservoirs and streams. 2.3. Providing of water quality by terrestrial ecosystems 3. <u>Forming and protection of soils</u> <ol style="list-style-type: none"> 3.1. Forming of bioproductivity of soils 3.2. Biological cleaning of soils, removal of pollutants 3.3. Protection from water and wind erosion, prevention of landslides and dust storms 3.4. Regulation of cryogenic processes 4. <u>Regulation of biological processes which are important for economics and safety</u> <ol style="list-style-type: none"> 4.1. Regulation of economically important species (agriculture pests; forest pests; pollinators) 4.2. Regulation of species which have medical importance (components of natural focuses of disease, carriers of disease)

ECOSYSTEM SERVICES OF RUSSIA

Группа услуг	Услуги
Information	<ol style="list-style-type: none">1. Genetic resources of native species and populations2. Information about the structure and functioning of the natural systems that can be used to create artificial and technological analogs.3. Aesthetic and cognitive value of natural systems.4. Ethical, spiritual and religious significance of natural systems.
Recreational	<p>Formation of natural conditions for the following types of recreation:</p> <ol style="list-style-type: none">1. daily recreation next to the house (clean air, vegetation, water);2. weekend recreation, the country house recreation, fishing, hiking, mushrooms and berries (not including commercial non-timber products);3. excursions and educational tourism in nature (beautiful scenery, bird watching etc.);4. active tourism in nature, sport fishing and hunting;5. wellness recreation at resorts.

Evaluation of ES by the two indicators: provided and consumed volumes

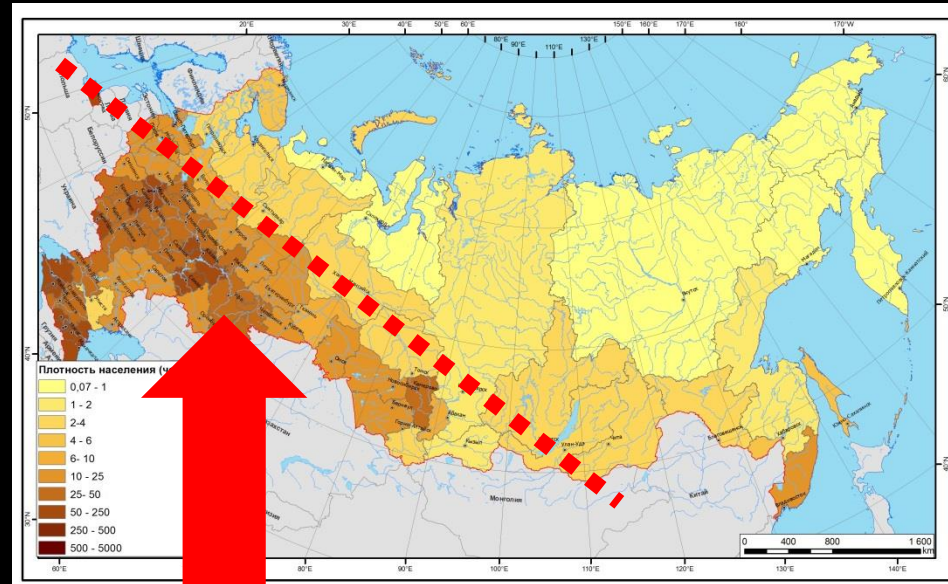
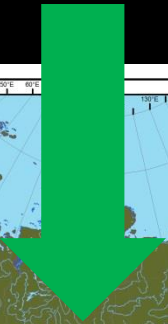


Evaluation of ES by the two indicators: provided and consumed volumes



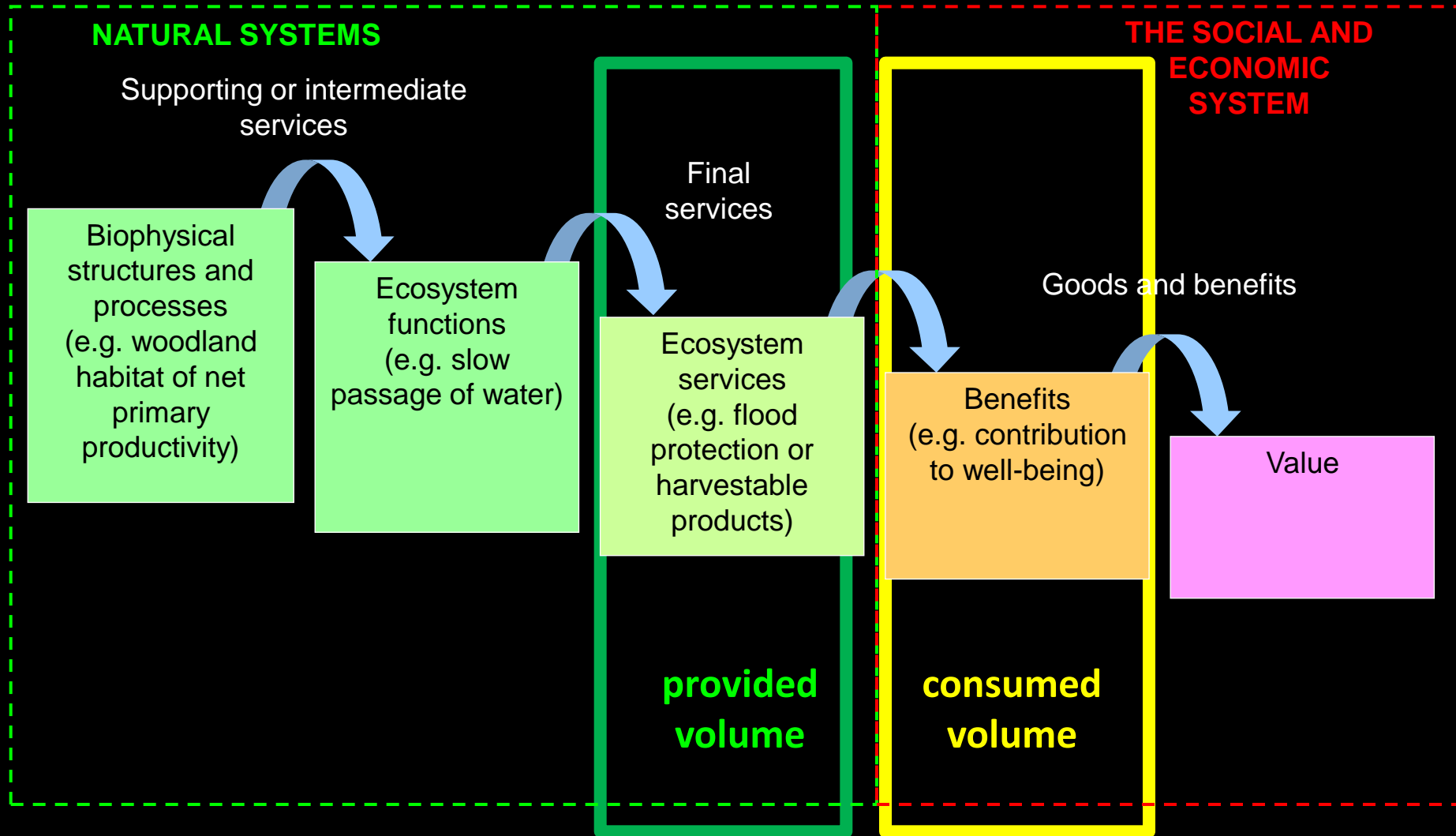
Evaluation of ES by the two indicators: provided and consumed volumes

Services provided by ecosystems



Services consumed by people

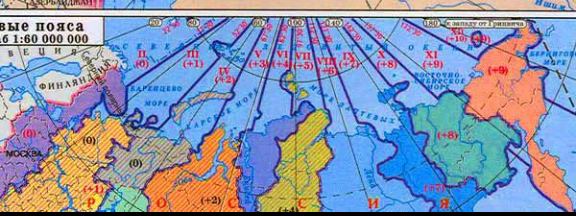
Evaluation of ES by the two indicators: provided and consumed volumes



Evaluation units – subjects of Russian Federation (regions)



Российская Федерация состоит из республик, краев, областей, городов федерального значения, автономной области, автономных округов – равноправных субъектов Российской Федерации. (Конституция Российской Федерации, статья 5)



Evaluation methods

- 1 - **the direct quantitative estimation** of the provided and consumed volumes when data on stocks and use of resources are available;
- 2 - **indirect quantitative estimation** of the provided and consumed volumes on the basis of transformation and combination of existing data;
- 3 - **score in points** if we can estimate only factors affecting services;
- 4 - **formulation of the assessment task** if the assessment methodology is poorly elaborated.

Evaluation methods

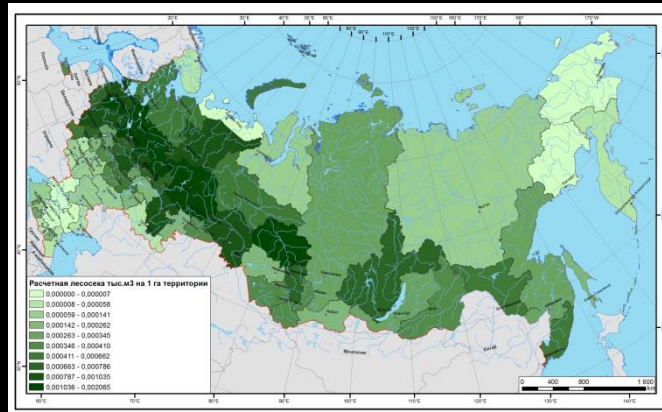
Услуги	Direct	Indirect	In points	Formulation
1	2	3	4	
PRODUCTIVE				
1. Wood production	X			
2. Production of non-wood plant resources	X			
3. Production of fodder by natural pastures		X		
4. Production of fresh-water seafood				X
5. Game production	X			
6. Production of honey from natural meadows				X
ENVIRONMENT-FORMING				
1. Regulation of climate and atmosphere				
1.1. Biogeochemical regulation of climate (carbon cycle, flows greenhouse gases)	X			
1.2. Biogeophysical regulation of climate				X
1.3. Cleaning of air by vegetation		X		
2. Regulation of hydrosphere				
2.1. Regulation of hydrological regime of territories		X	X	
2.2. Providing of water quality by terrestrial ecosystems			X	
2.3. Self-cleaning of water in reservoirs and streams		X		
3. Forming and protection of soils				
3.1. Protection from water and wind erosion, prevention of landslides and dust storms			X	
3.2. Forming of bioproductivity of soils				X
3.3. Biological cleaning of soils, removal of pollutants			X	
3.4. Regulation of cryogenic processes			X	
4. Regulation of biological processes important for economics and safety				X
INFORMATION				
RECREATIONAL				
			X	

DIRECT QUANTITATIVE ESTIMATION

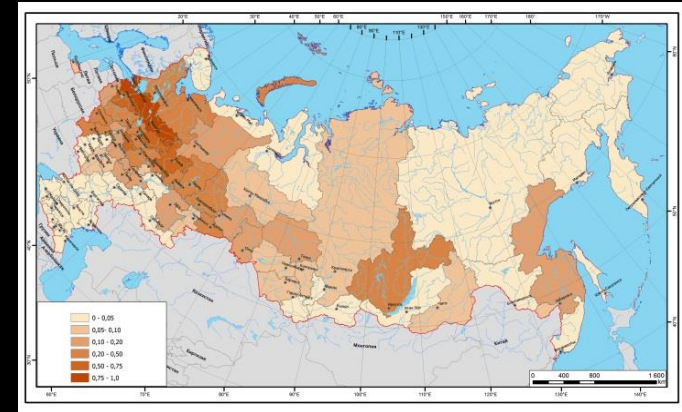
PROVIDED VOLUME

CONSUMED VOLUME

WOOD PRODUCTION



Allowable annual cut (m³/ha/year)

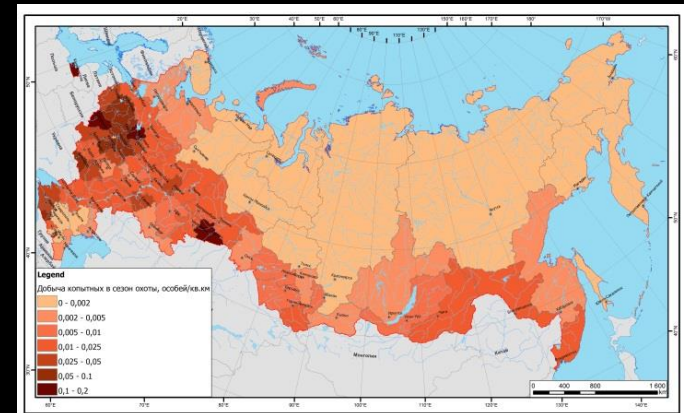


Logging (m³/ha/year)

GAME PRODUCTION

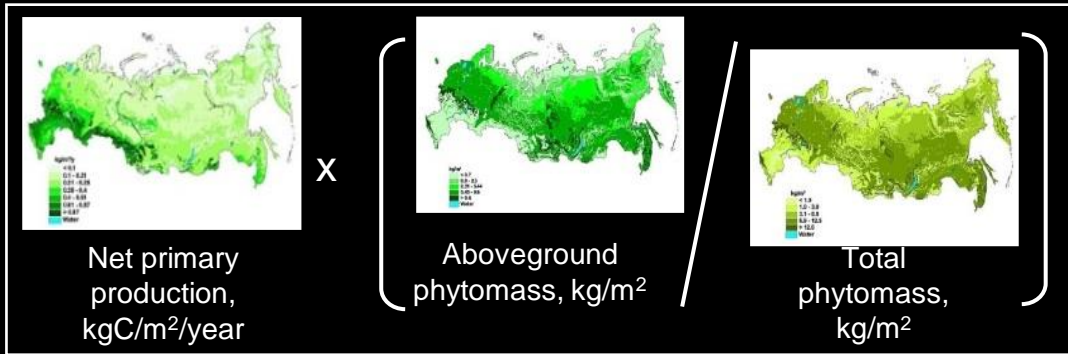


Density of ungulates per km²

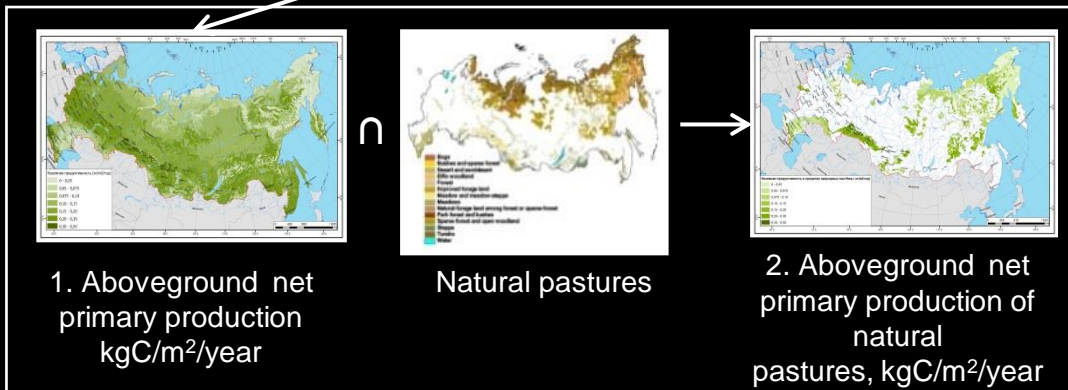


Production of ungulates per km²

INDIRECT QUANTITATIVE ESTIMATION



Fodder production on natural pastures

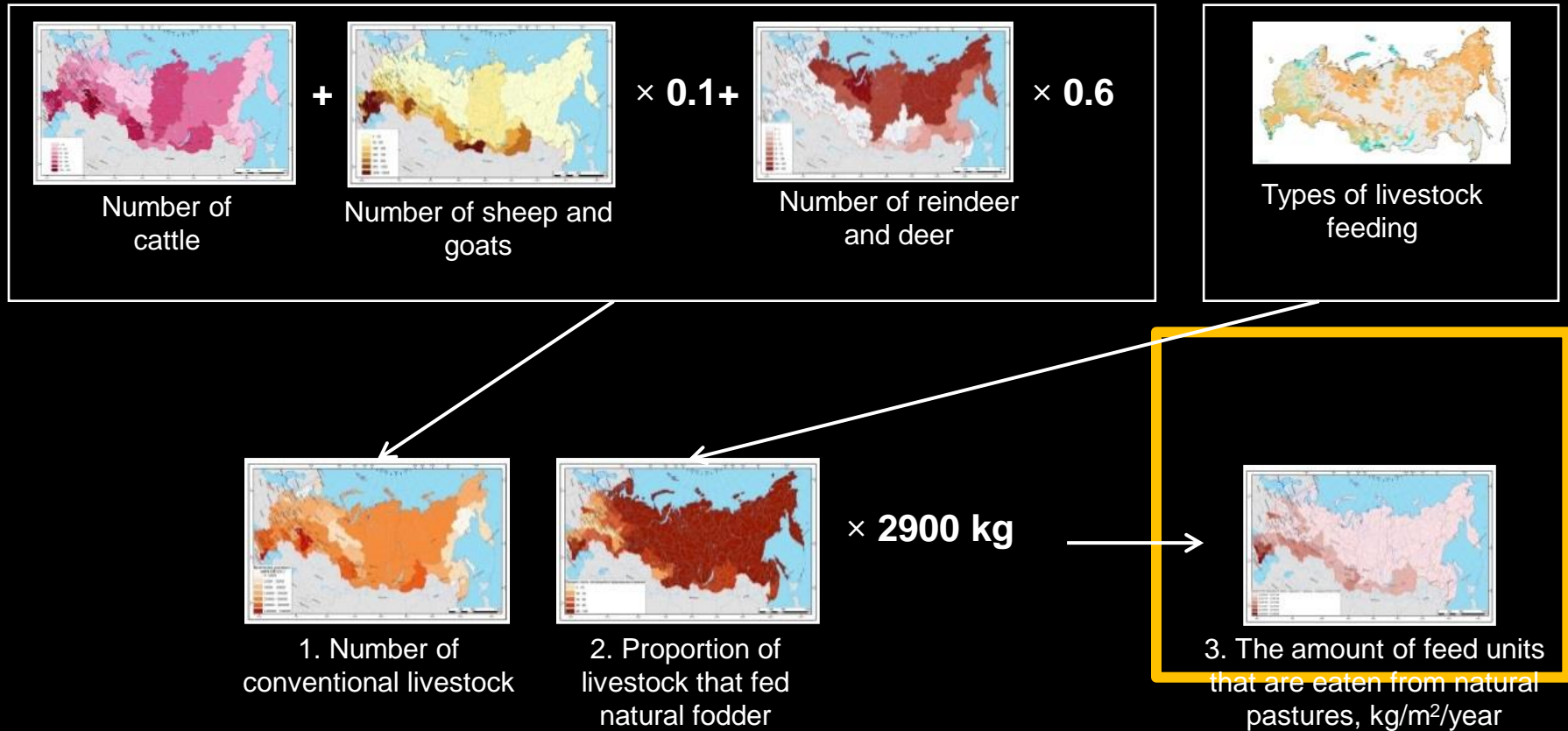


Provided volume
(number of feed units of fodder that are provided by natural pastures in regions, $\text{kg}/\text{m}^2/\text{year}$)



INDIRECT QUANTITATIVE ESTIMATION

Fodder production on natural pastures



Consumed volume (amount of “feed units” of natural fodder eaten by livestock (kg/m²/year))

INDIRECT QUANTITATIVE ESTIMATION

Fodder production on natural pastures

PROVIDED VOLUME



The amount of “feed units” of fodder that are provided by natural pastures in regions, $\text{kg}/\text{m}^2/\text{year}$

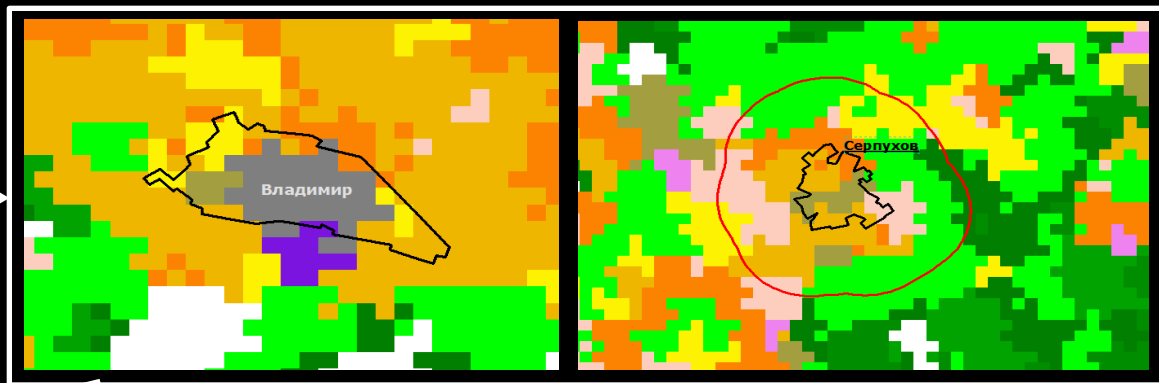
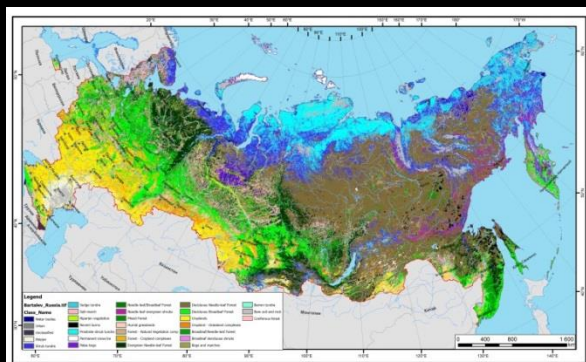
CONSUMED VOLUME



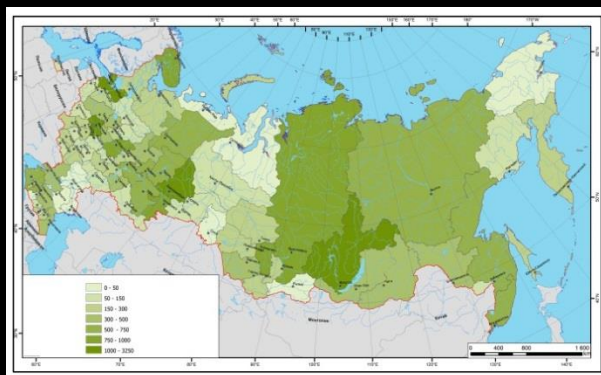
The amount of “feed units” of natural fodder eaten by livestock, $\text{kg}/\text{m}^2/\text{year}$

INDIRECT QUANTITATIVE ESTIMATION

Purification of air by forests

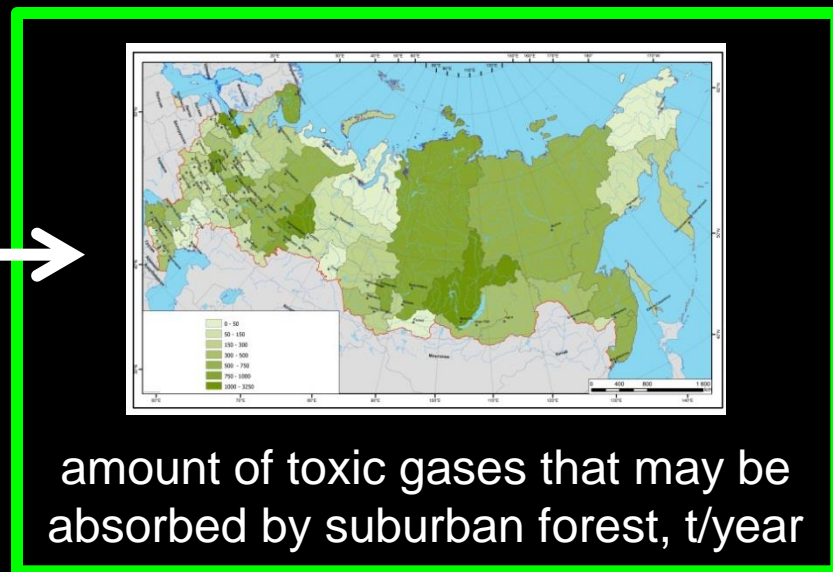


Forests within 5-km zones around cities



Area of suburban forests, ha

X 1 T →



amount of toxic gases that may be absorbed by suburban forest, t/year

Provided volume (amount of toxic gases that may be absorbed by suburban forest, t/year)

INDIRECT QUANTITATIVE ESTIMATION

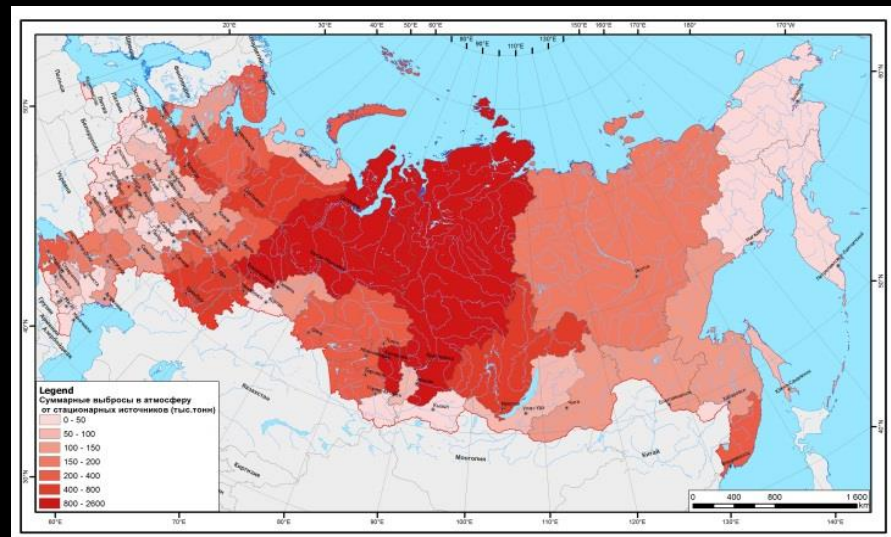
Purification of air by forests

PROVIDED VOLUME



The amount of toxic gases that may be absorbed by suburban forest, tons/year

CONSUMED VOLUME



The amount of emissions of pollutants from stationary sources, tons/year

SCORE IN POINTS

Storage of natural genetic resources



The number of vascular plant species per 100000 km² (National Atlas of Russia)



The map of terrestrial ecosystems (Bartalev at al., 2004)



The number of vascular plant species in regions per 100000 km²

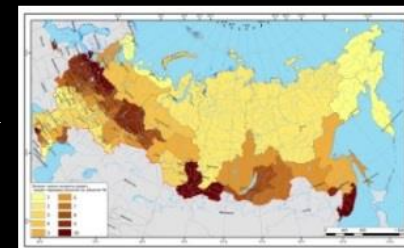


% of natural areas in regions.

Divided into 10 classes



PROVIDED VOLUME



The provided volume of the ES. Score in points

SCORE IN POINTS

Storage of natural genetic resources

CONSUMED VOLUME



Cost of scientific research,
million rubles

Area of
regions

Divided
into
10 classes



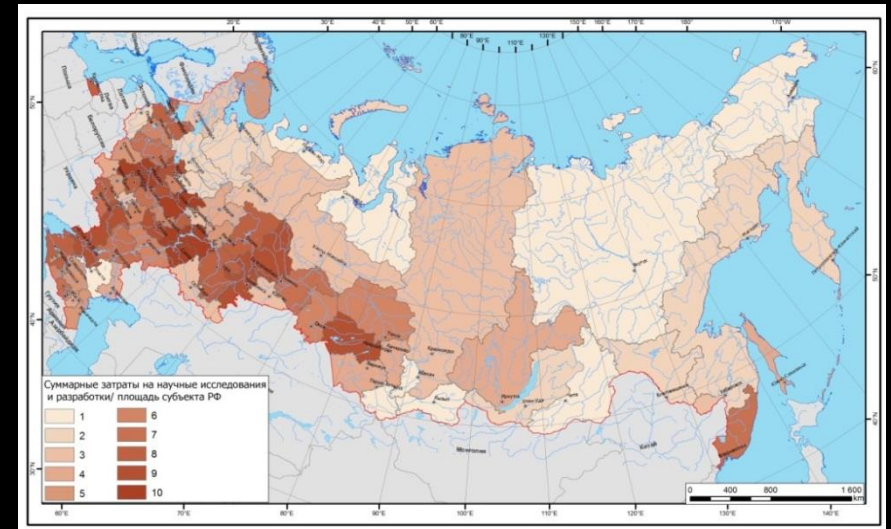
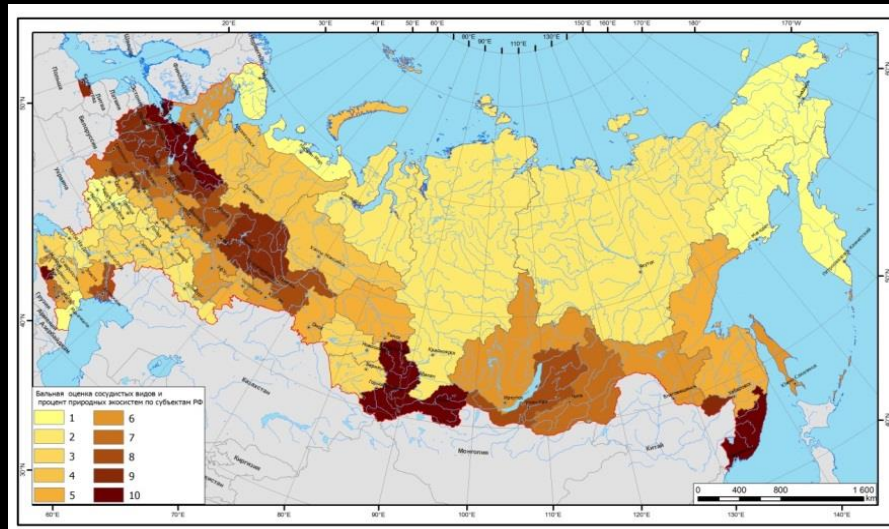
Score for the consumed
volume of the ES

SCORE IN POINTS

Storage of natural genetic resources

PROVIDED VOLUME

CONSUMED VOLUME

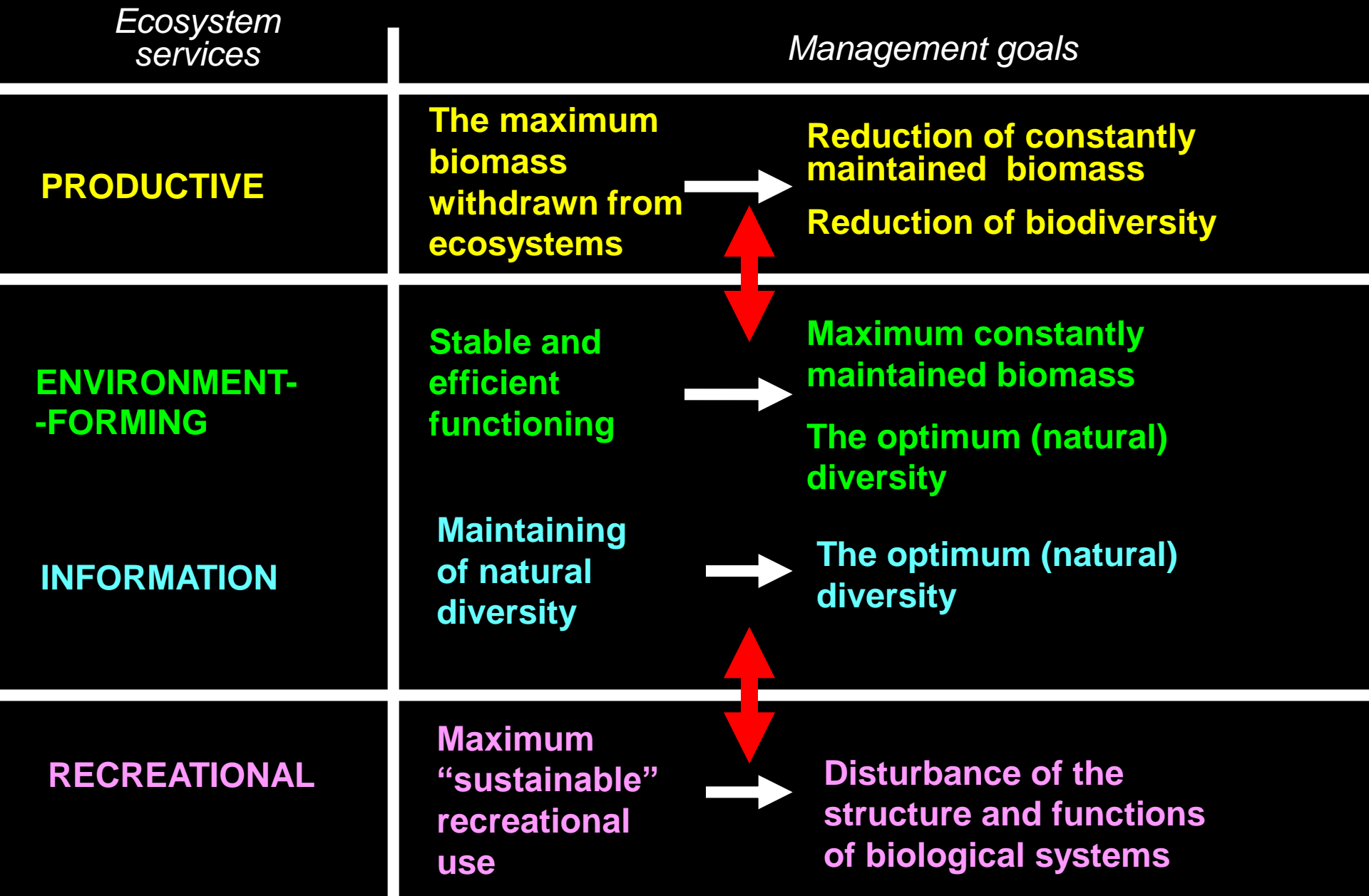


**Conflict of management goals
for different ecosystem
services**

and

**the problem of complete
evaluation of ecosystem
services**

Conflict of management goals for different ecosystem services



Evaluation methods

Услуги	Direct	Indirect	In points	Formulation
	1	2	3	4
PRODUCTIVE				
1. Wood production	X			
2. Production of non-wood plant resources	X			
3. Production of fodder by natural pastures		X		
4. Production of fresh-water seafood	X			X
5. Game production	X			
6. Production of honey from natural meadows				X
ENVIRONMENT-FORMING				
1. Regulation of climate and atmosphere				
1.1. Biogeochemical regulation of climate (carbon cycle, flows greenhouse gases)	X			
1.2. Biogeophysical regulation of climate				X
1.3. Cleaning of air by vegetation		X		
2. Regulation of hydrosphere				
2.1. Regulation of hydrological regime of territories		X	X	
2.2. Providing of water quality by terrestrial ecosystems			X	
2.3. Self-cleaning of water in reservoirs and streams		X		
3. Forming and protection of soils				
3.1. Protection from water and wind erosion, prevention of landslides and dust storms			X	
3.2. Forming of bioproductivity of soils				X
3.3. Biological cleaning of soils, removal of pollutants			X	
3.4. Regulation of cryogenic processes			X	
4. Regulation of biological processes important for economics and safety				X
INFORMATION				
RECREATIONAL				
	X		X	

Conflict of management goals for different ecosystem services

<i>Ecosystem services</i>	<i>Management goals</i>	
PRODUCTIVE	<p>The maximum biomass withdrawn from ecosystems</p>	<p>Reduction of constantly maintained biomass</p> <p>Reduction of biodiversity</p>
<p>ENVIRONMENT-FORMING</p> <p>INFORMATION</p>	<p>Stable and efficient functioning</p> <p>Maintaining of natural diversity</p>	<p>Maximum constantly maintained biomass</p> <p>The optimum (natural) diversity</p> <p>The optimum (natural) diversity</p>
RECREATIONAL	<p>Maximum “sustainable” recreational use</p>	<p>Disturbance of the structure and functions of biological systems</p>

Evaluation methods

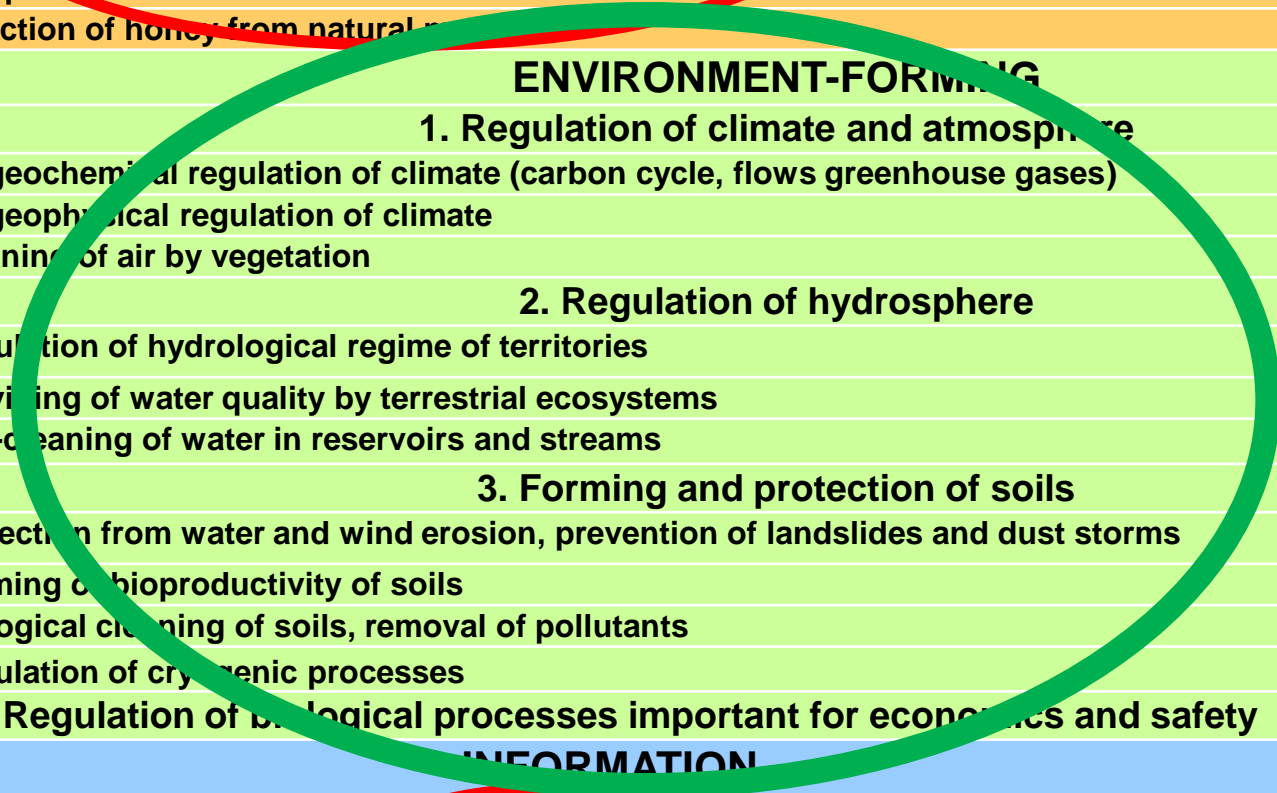
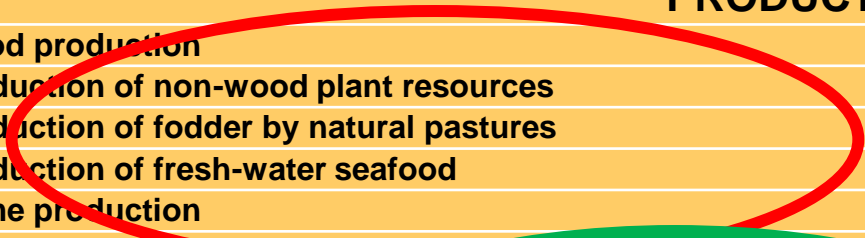
Услуги	1	2	3	4
PRODUCTIVE				
1. Wood production	X			
2. Production of non-wood plant resources	X			
3. Production of fodder by natural pastures		X		
4. Production of fresh-water seafood	X			X
5. Game production	X			
6. Production of honey from natural pastures				X
ENVIRONMENT-FORMING				
1. Regulation of climate and atmosphere				
1.1. Biogeochemical regulation of climate (carbon cycle, flows greenhouse gases)	X			
1.2. Biogeophysical regulation of climate				X
1.3. Cleaning of air by vegetation		X		
2. Regulation of hydrosphere				
2.1. Regulation of hydrological regime of territories		X	X	
2.2. Providing of water quality by terrestrial ecosystems			X	
2.3. Self-cleaning of water in reservoirs and streams		X		
3. Forming and protection of soils				
3.1. Protection from water and wind erosion, prevention of landslides and dust storms			X	
3.2. Forming of bioproductivity of soils				X
3.3. Biological cleaning of soils, removal of pollutants			X	
3.4. Regulation of cryogenic processes			X	
4. Regulation of biological processes important for economics and safety				
				X
INFORMATION				
			X	
RECREATIONAL				
	X		X	

Direct

Indirect

In points

Formulation



"Only after the last tree will be felled, the last fish – will be caught, the last river – will be poisoned, only then people will understand that money can not be eaten"

White Cloud (died in 1940)

