

Good morning!



Experience in assessing Tyumen ecosystem services

Опыт оценки экосистемных услуг города Тюмени

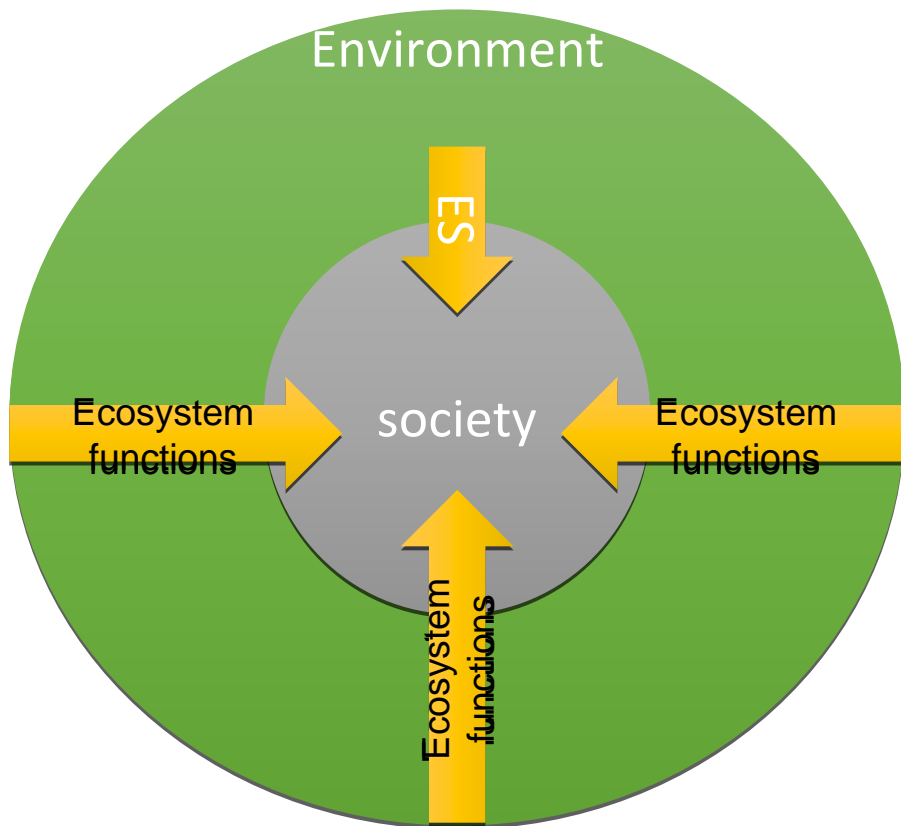
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University of Tyumen, 20.11.2019

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What is ecosystem services?

Ecosystem services - are all the benefits humankind gets from the ecosystem (fresh water and air, aesthetic view, etc.)



Ecosystem services demand a recipient

What are Urban ecosystem services?

Everything which is produced for the city demands

All the ecosystem services, produced within urban area

High concentration of people and detached green and blue infrastructure in city make ES with high local significance the more important

Urban planning needs not only information about production of ES, distribution, but about demand for ES and its distribution too

What are Urban ecosystem services?

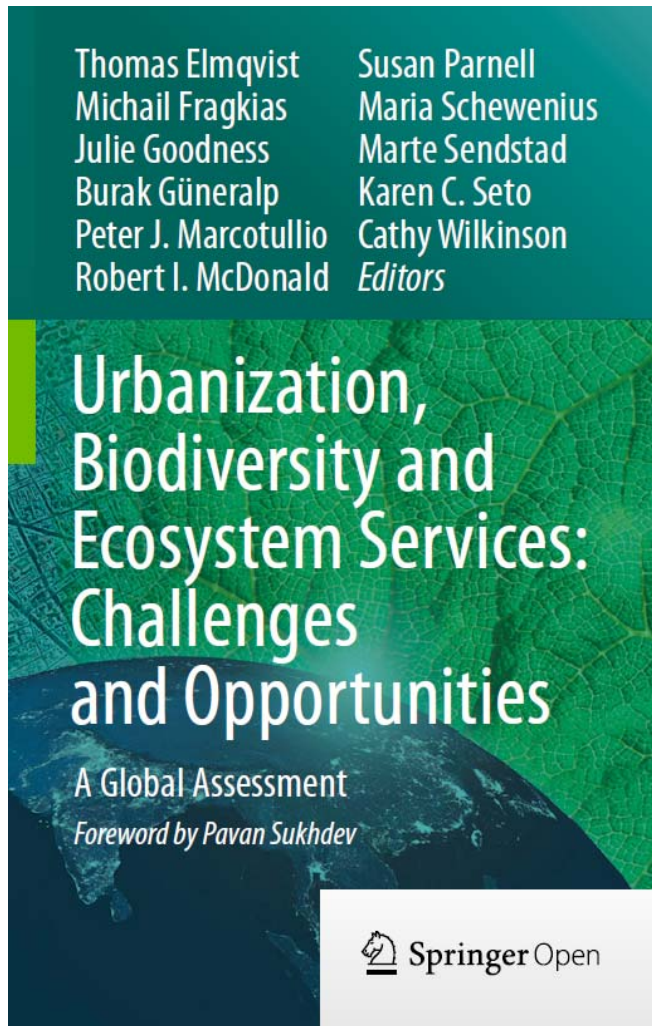


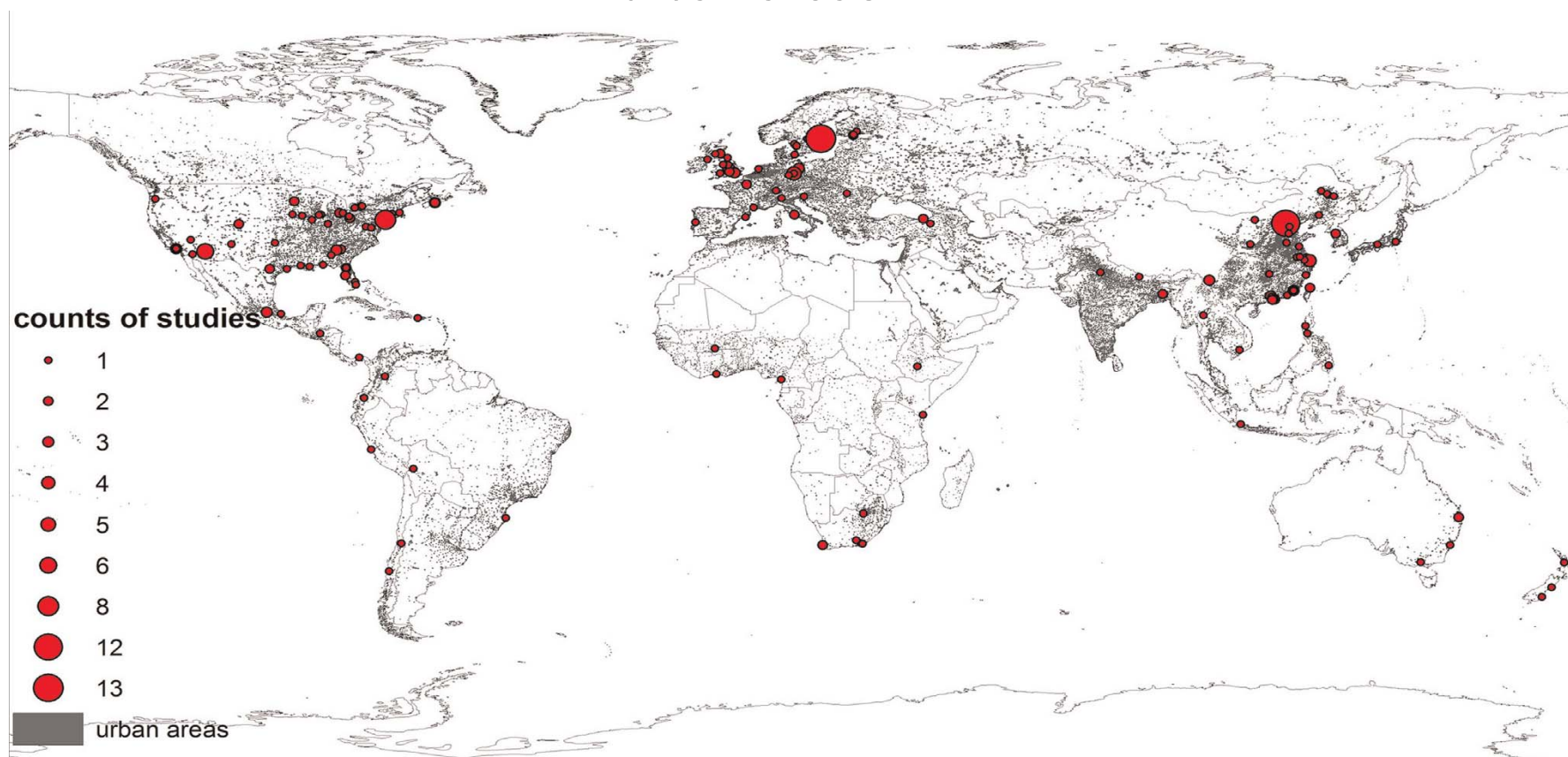
Table 11.1 Classification of important ecosystem services in urban areas and underlying ecosystem functions and components

Ecosystem functions	Ecosystem service type	Examples	Key references
Energy conversion into edible plants through photosynthesis	Food supply	Vegetables produced by urban allotments and peri-urban areas	Altieri et al. (1999)
Percolation and regulation of runoff and river discharge	Runoff mitigation	Soil and vegetation percolate water during heavy and/or prolonged precipitation events	Villarreal and Bengtsson (2005)
Photosynthesis, shading, and evapotranspiration	Urban temperature regulation	Trees and other urban vegetation provide shade, create humidity and block wind	Bolund and Hunhammar (1999)
Absorption of sound waves by vegetation and water	Noise reduction	Absorption of sound waves by vegetation barriers, specially thick vegetation	Aylor (1972); Ishii (1994); Kragh (1981)
Dry deposition of gases and particulate matter	Air purification	Absorption of pollutants by urban vegetation in leaves, stems and roots	Escobedo and Nowak (2009); Jim and Chen (2009); Chaparro and Terradas (2009); Escobedo et al. (2011)
Physical barrier and absorption of kinetic energy	Moderation of environmental extremes	Storm, flood, and wave buffering by vegetation barriers; heat absorption during severe heat waves; intact wetland areas buffer river flooding	Danielsen et al. (2005); Costanza et al. (2006b)
Removal or breakdown of xenic nutrients	Waste treatment	Effluent filtering and nutrient fixation by urban wetlands	Vauramo and Setälä (2010)
Carbon sequestration and storage by fixation in photosynthesis	Global climate regulation	Carbon sequestration and storage by the biomass of urban shrubs and trees	Nowak (1994b); McPherson (1998)
Movement of floral gametes by biota	Pollination and seed dispersal	Urban ecosystem provides habitat for birds, insects, and pollinators	Hougnier et al. (2006); Andersson et al. (2007)
Ecosystems with recreational values	Recreation	Urban green areas provide opportunities for recreation, meditation, and relaxation	Chiesura (2004); Maas et al. (2006)
Human experience of ecosystems	Cognitive development	Allotment gardening as preservation of socio-ecological knowledge	Barthel et al. (2010); Groening (1995); Tyrväinen et al. (2005)
Ecosystems with aesthetic values	Aesthetic benefits	Urban parks in sight from houses	Tyrväinen (1997); Cho et al. (2008); Troy and Grove (2008)
Habitat provision	Habitat for biodiversity	Urban green spaces provide habitat for birds and other animals that people like watching	Blair (1996); Blair and Launer (1997)

The current state of knowledge about urban ecosystem services in Russia:

State of art about urban ecosystem services as a scientific term

Global distribution of studies on ecosystem services conducted in urban areas



The current state of knowledge about urban ecosystem services in Russia:

State of art about urban ecosystem services as a scientific term



Key words: «urban ecosystem services» («экосистемные услуги городов») – 3 articles
 («урбоэкосистемные услуги») - same 3 articles
 «ecosystem services»+ «city» («экосистемные услуги» + «город») – 445 articles

Search in: **Title**

Abstract

Main body (text of article)

References

The current state of knowledge about urban ecosystem services in Russia:

State of art about urban ecosystem services as a scientific term

№	Публикации	Цит.
1	ЭКОСИСТЕМНЫЕ УСЛУГИ ЗЕЛЕННЫХ НАСАЖДЕНИЙ УРБАНОЦЕНТРАЛЬНЫХ ГОРОДА МОЛОДЕЖНО Маришвили Г.И., Трофимук Д.А. В сборнике: Современная экология: образование, наука, практика материалы международной научно-практической конференции. 2017. С. 65-69.	0
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1. Only 20 articles are dedicated to Urban ecosystem services assessment
2. 16 articles are reviews, 3 articles are case-studies, 1 article is a comparative analysis
3. Only 4 articles dedicated to a real Russian cities, 14 to reality in Russian cities
4. 3 articles are about economic assessment, 3- about methodological issues, 7 -about natural assessment and 5- about ESA as an instrument for decision makers

City of Tyumen as a case-study of urban ecosystem services assessment

City of Tyumen



Categorization of UES

Regulatory	Production	Information	Recreational
Climate Regulation - Storage of carbon stocks	Harvest	Information on the structure and functioning of ecosystems that can be used	Territories for daily recreation
Air cleaning	Production of feed for livestock	Genetic Resources	Territories for weekend recreation
Air temperature Regulation	A fish	Aesthetic value	Recreation in country house
Wind speed Regulation	Non-timber forest resources	Cognitive development of man	Territories for active tourism and sports
Decreasing the level of Noise	Mineral resources	Spiritual significance	Territories for educational tourism
Regulation of wind speed	Sources of alternative energy		Territories for health tourism
Mitigation of fluctuations in runoff volumes	Pure water		
Cleaning of drains	Raw materials for medical industry		
Waste assimilation			
Prevention of erosion			
Sustaining Soil Fertility			
Control over Pest			
Control over epidemics			

Algorithm for Urban ecosystem services assessment

Step 1. Calculation and mapping of initial data

Step 2. Valuation of the production and the demand for UES

Valuation of Production

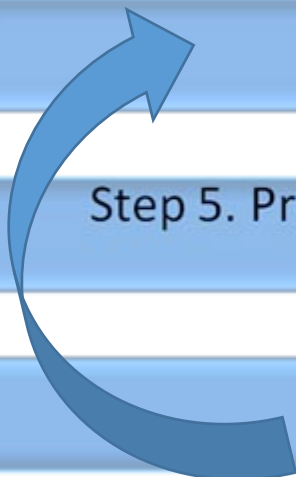
Valuation of demand

Step 3. Comparison analyses of the demand and production

Step 4. Recommendation (Measures) for urban planning

Step 5. Prognostic assessment of production and demand for UES considering planning measures

Step 6. Decision making



Algorithm for Urban ecosystem services assessment

Step 1. Calculation and mapping of initial data

1.1. Demand

1.2. Production

1.1.a.
Population
distribution

1.1.b.
Natural
hazards
zones

1.1.c.
Negative
impact
zones

1.2.a. Map
of Function
zones

1.2.b. Map
of green
spaces

Algorithm for Urban ecosystem services assessment

OPEN STREET MAP
(buildings) as a
vector basis + Q GIS



Calculation of lodger
number (ArcGIS):
1. information about
number of floors (2GIS)
2. Type of building
3. unit area for one
person according to
legislation



Population
distribution map
(ArcGIS)

City of Tyumen as a case-study of urban ecosystem services assessment



POPULATION DISTRIBUTION

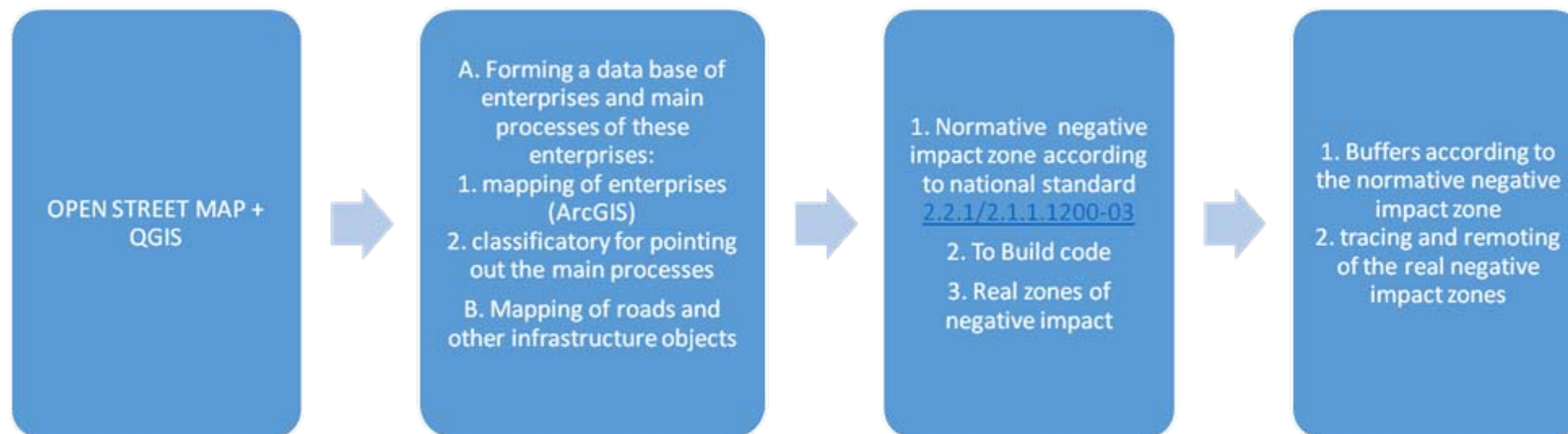


City of Tyumen as a case-study of urban ecosystem services assessment

Step 1.1.b. Natural hazard zones

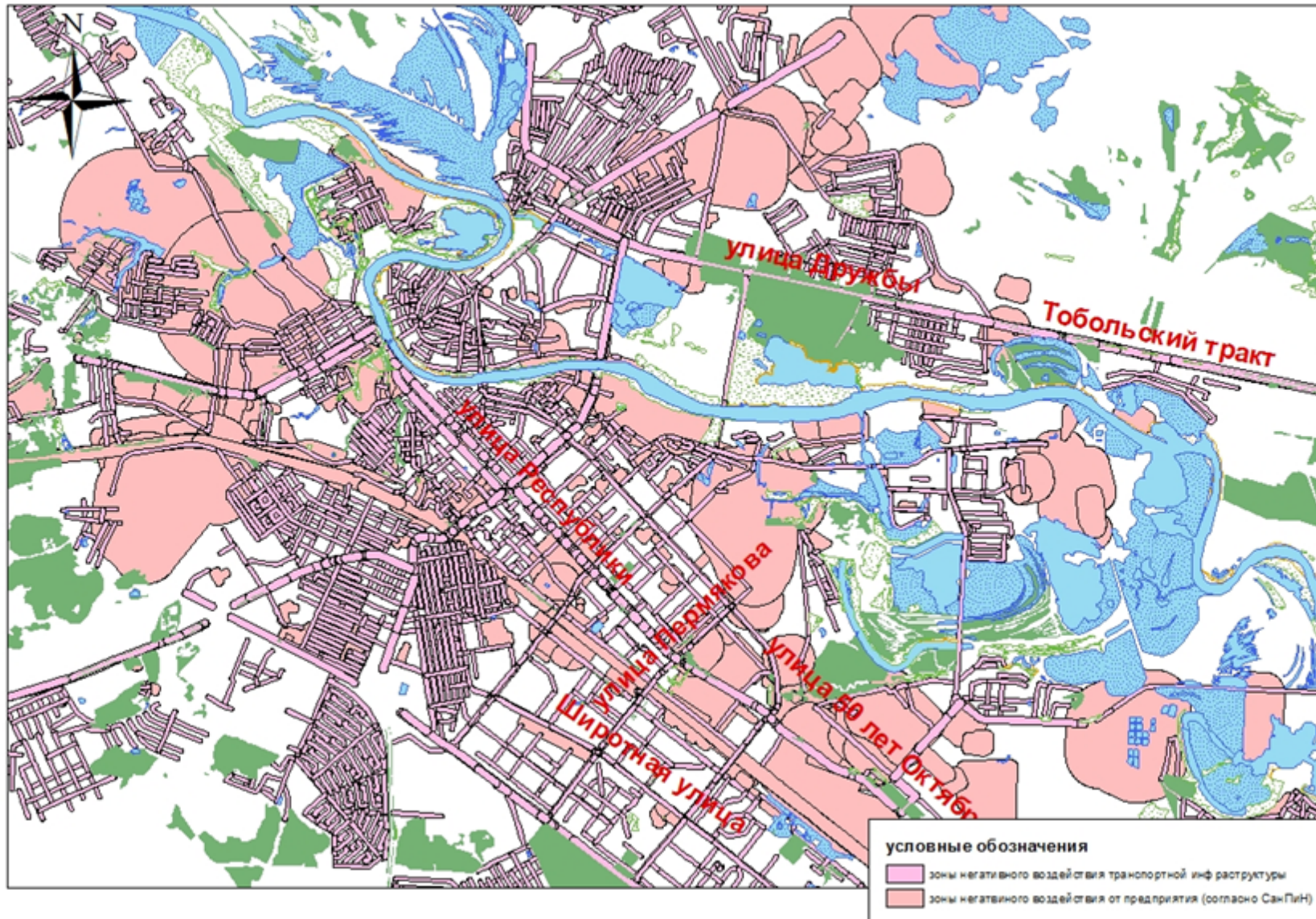


Step 1.1.c. Negative impact zones



City of Tyumen as a case-study of urban ecosystem services assessment

Negative impact zones



City of Tyumen as a case-study of urban ecosystem services assessment

Step 1.2.a. Function zones

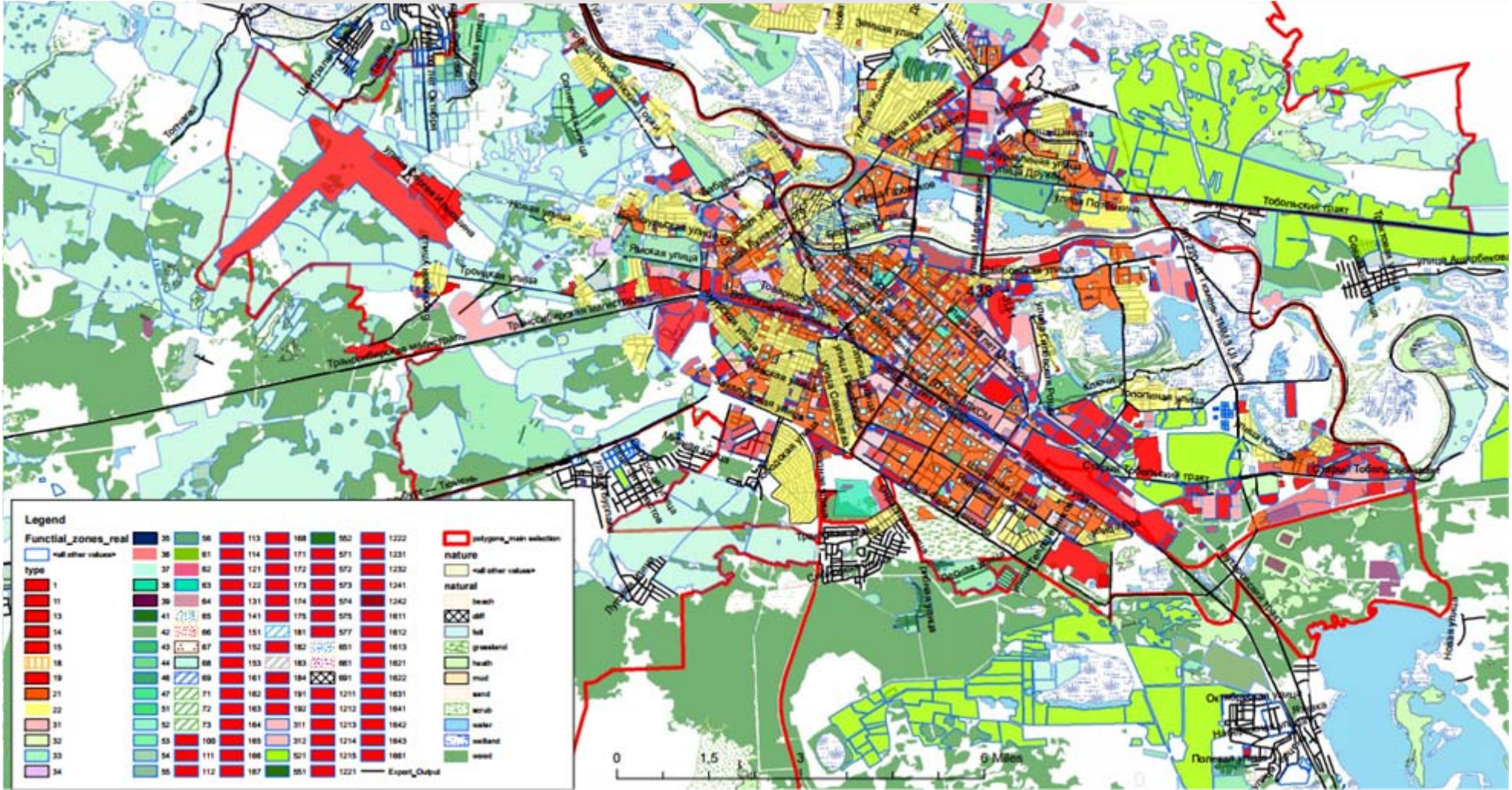
OPEN STREET MAP +
QGIS

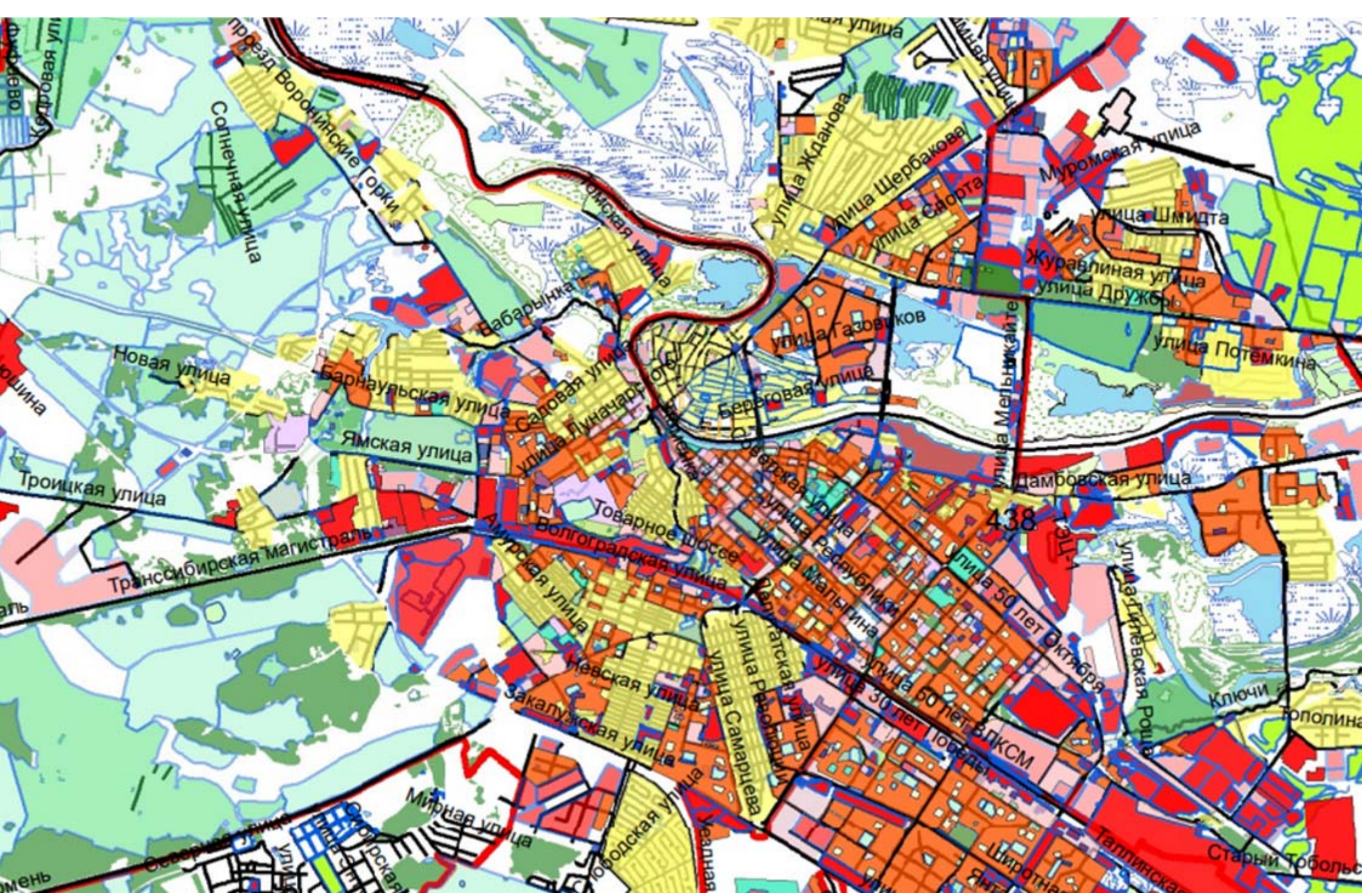


Mapping of existing
FZ

City of Tyumen as a case-study of urban ecosystem services assessment

Function zones





Журавлиная улица
Котловая ул
Дорожное

презд Воронинские Горки
Солнечная улица

улица Жданова
улица Щербакова
улица Саорты
Муромская улица
улица Шмидта

Новая улица
Троицкая улица

Бабарынка
Барнаульская улица
Ямская улица
Садовая улица
улица Пунчагар

улица Газовиков
Береговая улица
улица Потемкина

Транссибирская магистраль

Товарное шоссе
Волгоградская улица
Амурская улица

438

улица Редублики
улица Малыгина
улица 50 лет Октября
улица 60 лет ВЛКСМ
улица 30 лет Победы

Мирная улица
Сибирская

улица Равноправия
улица С.С. Маршалева
улица Гигиевская Рош
Ключи
Таллинская
Старый Тобольск

City of Tyumen as a case-study of urban ecosystem services assessment

Step 1.2.6. Map of Green spaces



Step 1. Calculation and mapping of initial data

1.1. Demand

1.2. Production

1.1.a. Population distribution

1.1.b. Natural hazards zones

1.1.c. Negative impact zones

1.2.a. Map of Function zones

1.2.b. Map of green spaces

Calculation of lodger number (ArcGIS):
 1. information about number of floors (2GIS)
 2. Type of building
 3. unit area for one person according to legislation

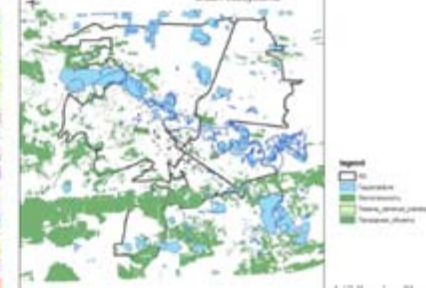
City general plan
 + literature
 + interview

A. Forming a data base of enterprises and main processes of these enterprises:
 B. Mapping of roads and other infrastructure objects

1. Buffers according to the normative negative impact zone
 2. tracing and remoting of the real negative impact zones

Population distribution map (ArcGIS)

Natural hazard zones map (ArcGIS)

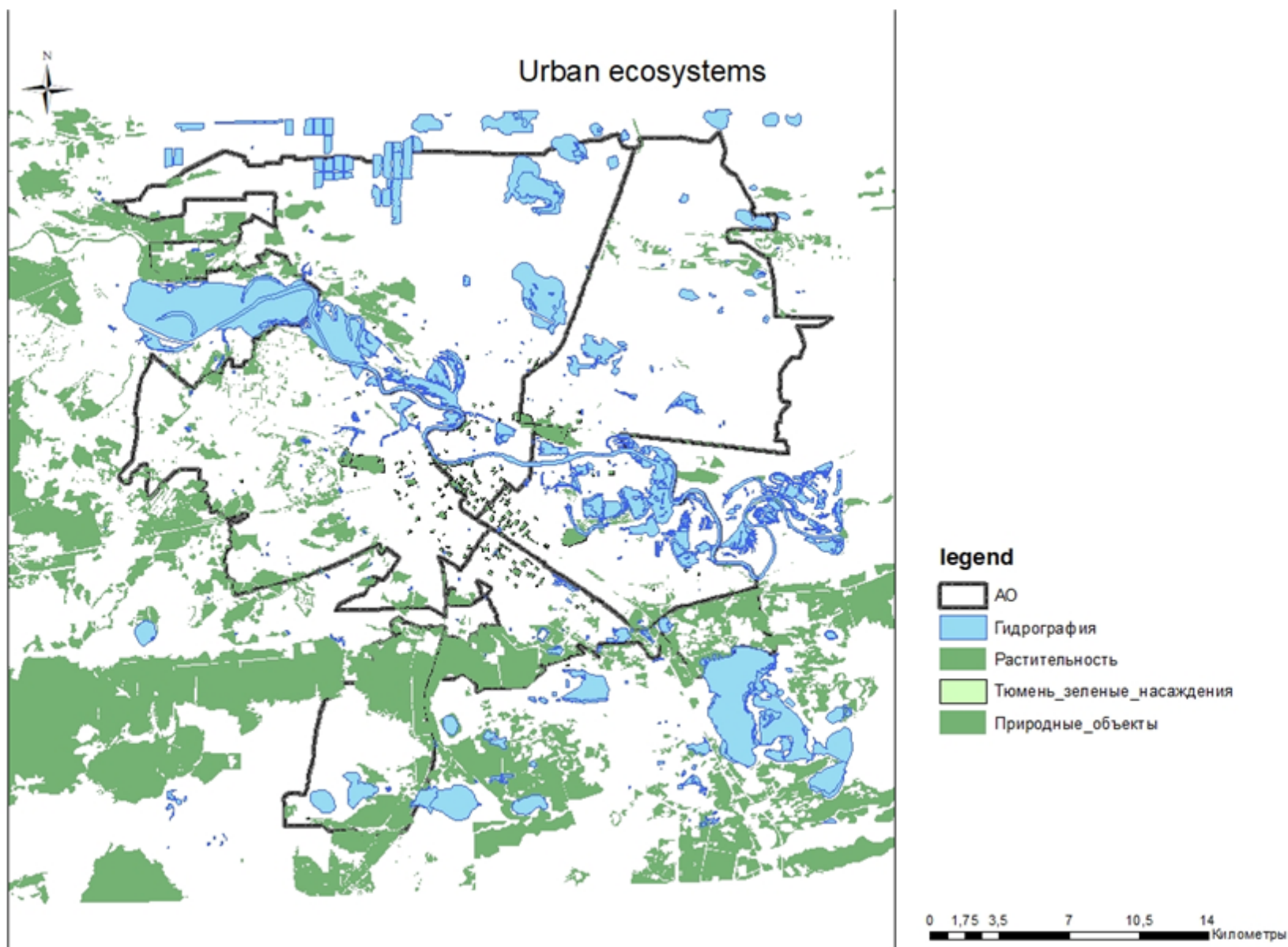


Step 2. Valuation of the production and the demand for UES

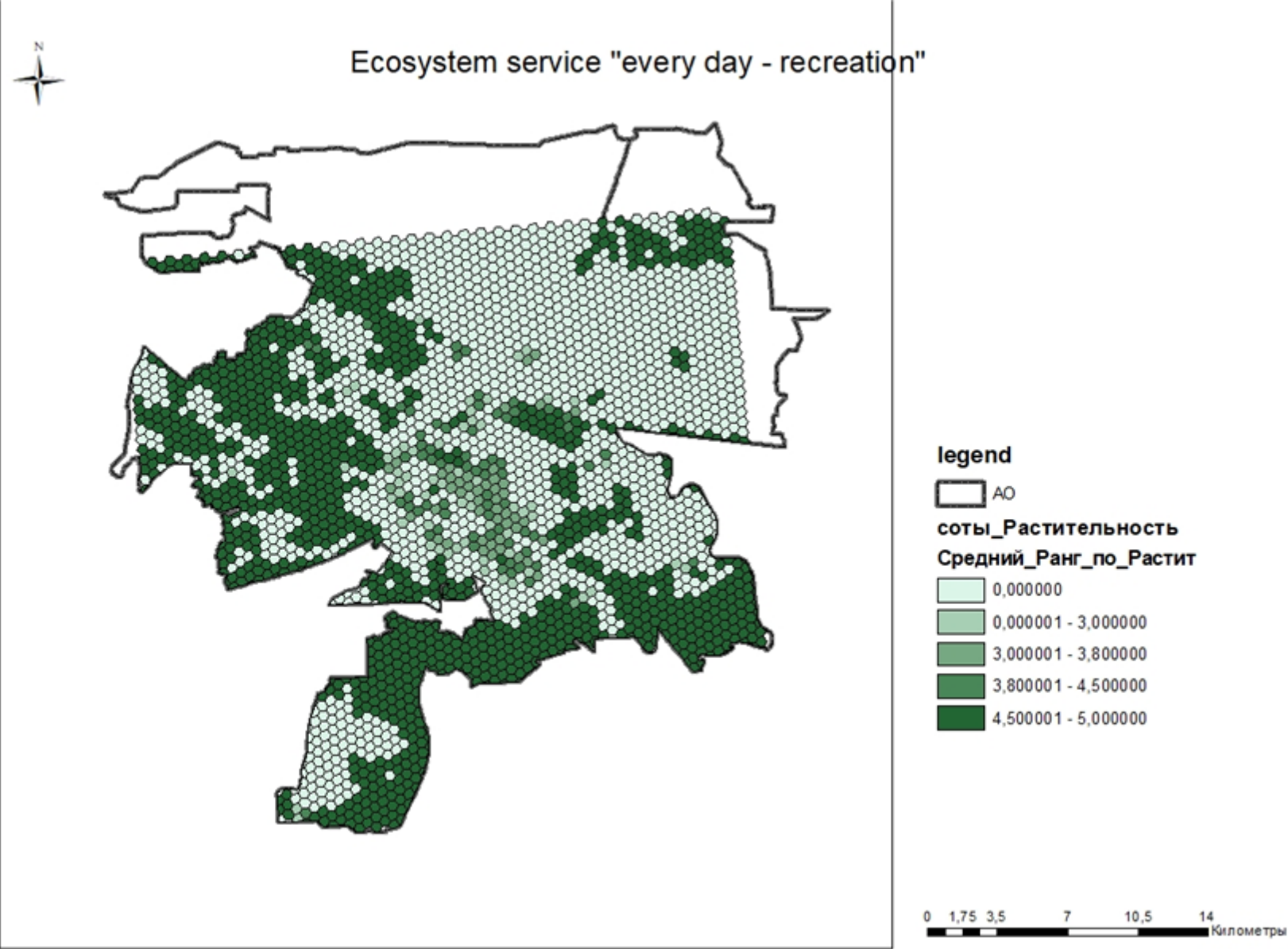
2.1. Demand

2.2. Production

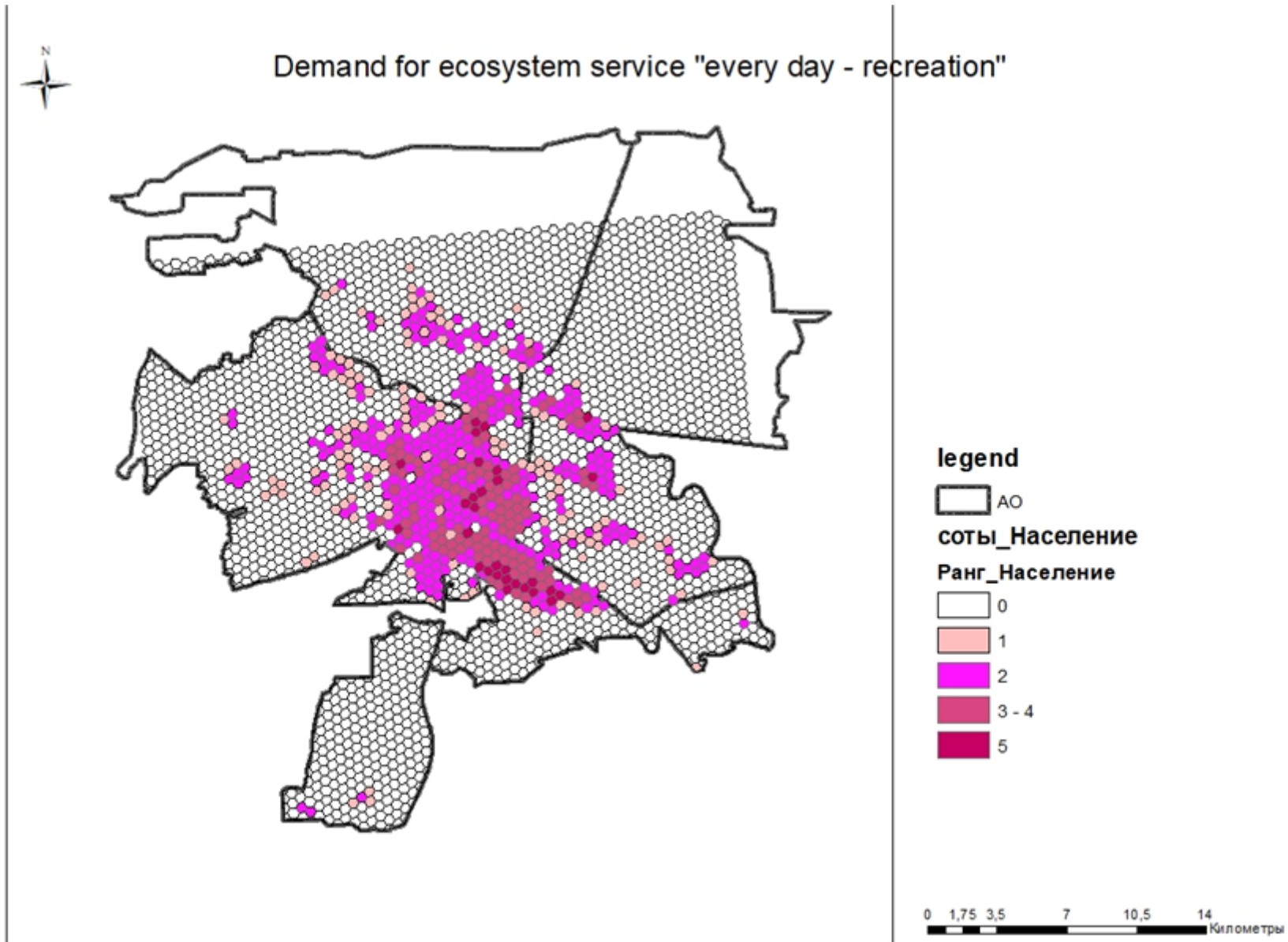
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City of Tyumen as a case-study of urban ecosystem services assessment

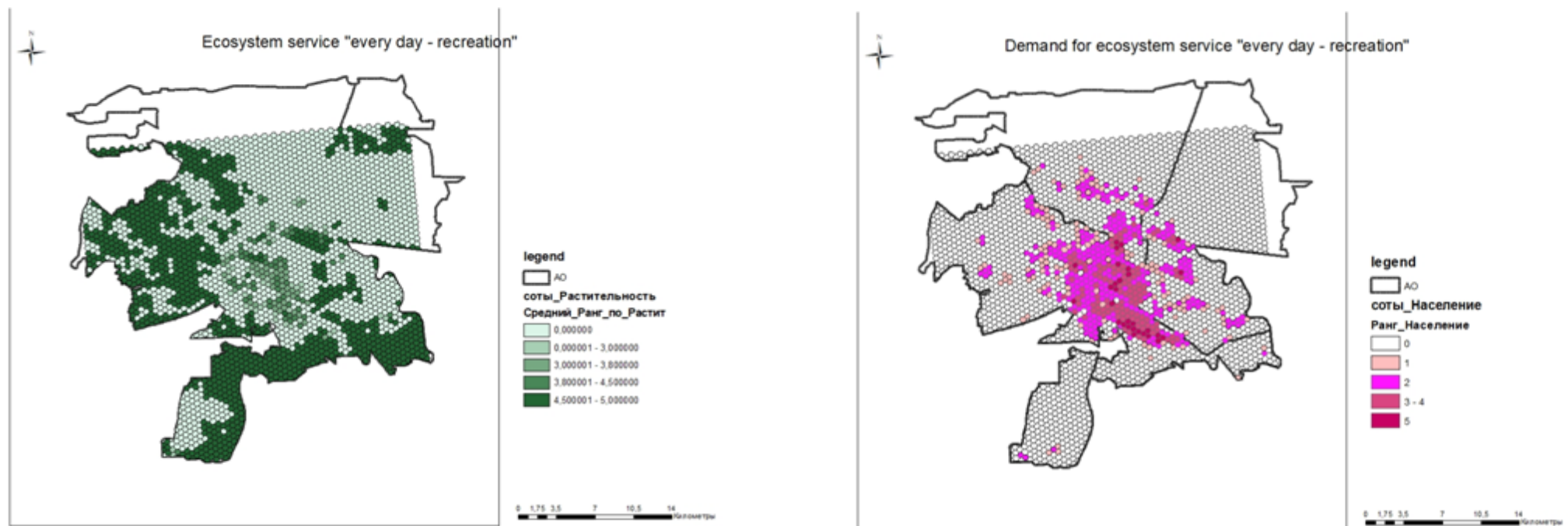


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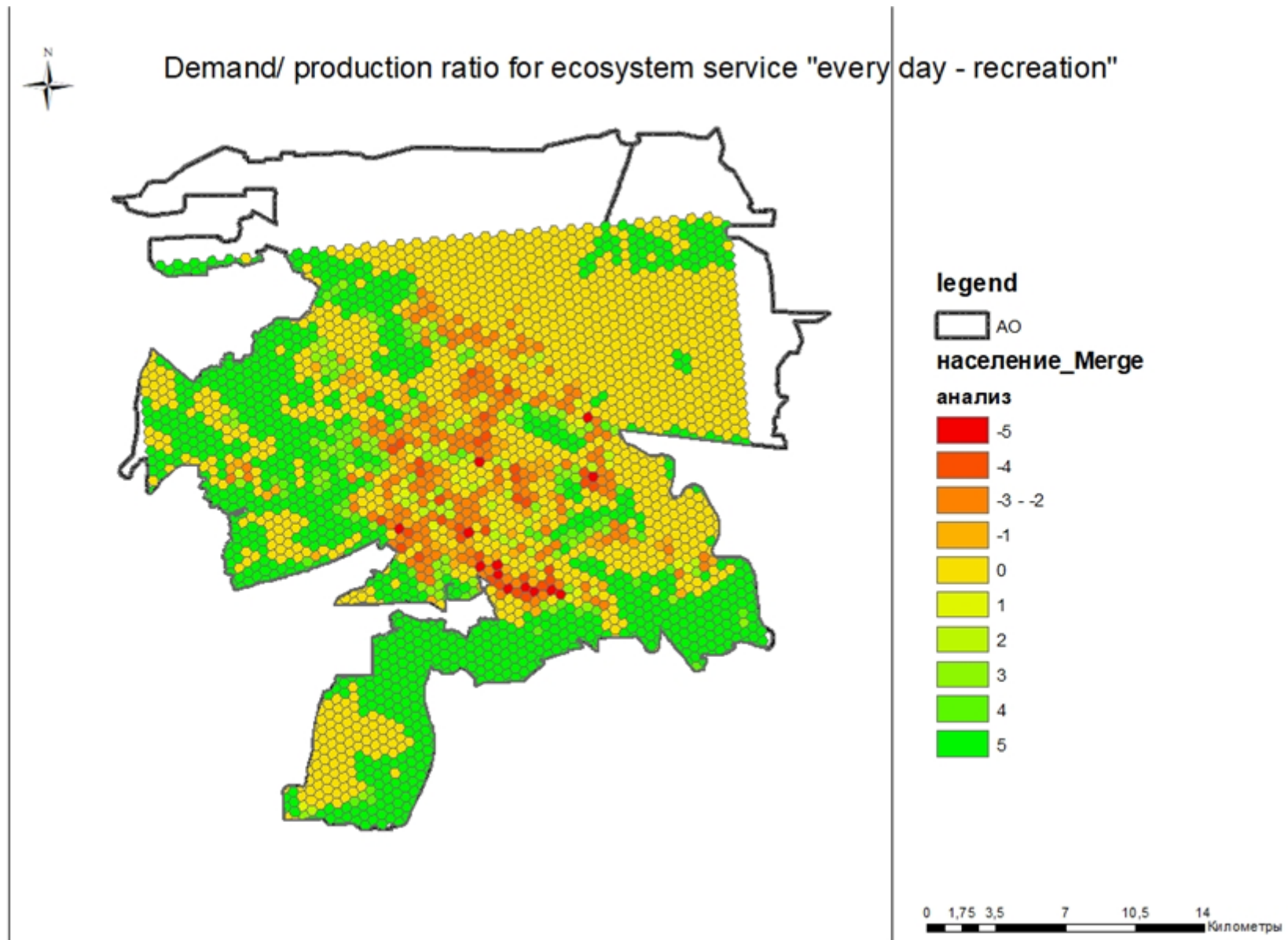
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Step 3. Comparison analyses of the demand and production



The maximum number of recreants for all ecosystems-producers of services is 248,756 people. The number of inhabitants of the city of Tyumen is 720 575 people.

City of Tyumen as a case-study of urban ecosystem services assessment



City of Tyumen as a case-study of urban ecosystem services assessment

Step 4. Recommendation (Measures) for urban planning

Three program goals of development:

- Preservation
- Improvement
- Development

For Tyumen:

Creation of new recreational zones instead of brownfields

New parts of the city must be designed considering recreational zones

Tyumen city general plan

There are such issues correlated to ecosystem services in Tyumen General city plan:

1. Preservation of cultural heritage and natural aesthetic dominants;
2. Creation and reconstruction of recreational zones;
3. Creation of green belt around city;
4. There is no idea about ecological framework.



Thank you for your attention!



ПРОЕКТ ПОВЫШЕНИЯ КОНКУРЕНТОСПОСОБНОСТИ
ВЕДУЩИХ РОССИЙСКИХ УНИВЕРСИТЕТОВ
СРЕДИ ВЕДУЩИХ МИРОВЫХ
НАУЧНО-ОБРАЗОВАТЕЛЬНЫХ ЦЕНТРОВ