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**METHODOLOGY
OF REGIONAL ECONOMICS**

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Introduction

Regional economics is the science of the economies of specific regions. The economy of a region is an integral part of two macro-objects: the region as a combination of nature, population, economy and administration, and the economy as a combination of municipal, regional and national economies, as well as the global economy as a whole. Therefore, regional economics has one object of study – the regional economy – but two subjects of study: 1) the economic subsystem of the region and 2) the economic subsystem of the national and global economies. If the regional economy is considered as part of the region, then regional economics conducts research as a regional science. If the regional economy is considered as part of the national and global economies, then regional economics conducts research as an economic science. This situation requires the combination of two approaches in regional economic theory: the comprehensive approach of regional sciences and the specialised approach of economic sciences.

So far, no one has succeeded in combining the two approaches. There was always a bias either towards regional and geographical sciences or towards economic sciences. The mechanical combination of research tasks and theories also did not produce results. A "mishmash" of research methods and results arose, which the consumer of knowledge had to "untangle," making scientific information unsuitable for use in public administration and business. In 2000, Academician A.G. Granberg noted the existence of this problem and proposed some possible solutions (Fundamentals of Regional Economics, Moscow, Higher School of Economics Press), but to date, the problem has not been resolved. The author managed to solve this problem by creating the sectoral-factor theory of regional economics (SeFaTRE). However, the presentation of this theory must be preceded by a presentation of the methodology of regional economics. This is because the sectoral-factor theory is based not only on the methodological and methodical achievements of regional economics and economic geography over the past centuries, but also on basic general scientific approaches (system approach, non-equilibrium thermodynamics, theory of existence). Therefore, the publication of two interrelated monographs is planned: 1. "Methodology of Regional Economics" in 2016 and 2. "Sectoral-Factor Theory of Regional Economics" in 2017.

The first monograph examines the basic definitions of science, the main approaches to research (comprehensive, systemic, information-problem), ideas about the structure and dynamics of the regional economy, and considers the position

of regional economics in the system of regional sciences and in the system of economic sciences. It analyses the dynamics of the regional economy research programme over the last 60 years (1955-2015) and presents the author's version of a modern research programme. The paradigms and main specific theories of regional economics over the last 220 years (1794-2014) are considered, from the works of the Marquis de Condorcet to the present day.

The first chapter provides a clear definition of a country, a state, and a region as part of a country (micro-, meso- and macro-regions) and as a group of countries (megaregions). A clear distinction is made between the terms "region" (as a territory under study) and "district" (as a territory under administration).

The second chapter uses a systemic-structural approach to consider the region as a system. It shows that the fundamental structure of a country and most regions will include four vertical subsystems – Nature, Society, Economy and Management – as well as four horizontal subsystems – Centre, Sub-centres, Semi-periphery and Periphery.

The third chapter examines the "normal" dynamics of a country and region based on the Theory of the Earth's Existence, developed by the author in the 2000s and outlined in the work *General Geography: A Global Synthesis* (Pearson Education, 2005, co-authored with P. Haggett). It is shown that for any region and economic subsystem of a region, absolutely normal stages of existence are not only growth and development, but also degradation, decline, death, and disappearance. However, if the region's management subsystem understands the essence of the changes taking place and has the means to influence the subsystems, then the region's stay in the stages of growth and development can be quite long.

The fourth chapter examines the economic subsystem of the region in more detail. It shows the main function of the region's economy, which is to create an artificial world, a world of technology, that compensates for the natural, social and administrative discomfort of the region's population.

The fifth chapter defines the subject of regional economics as part of regional sciences (the economic subsystem of the region as part of the regional system, its structure and dynamics).

The sixth chapter defines the subject of regional economics as part of economic science (the economic subsystem of the region as part of the national and global economy).

The seventh chapter characterises the dynamics of the regional economy research programme over the past 60 years. It shows the periods of convergence and divergence of regional economy research programmes in the American-European tradition and the Soviet-Russian tradition. The author's version of the modern regional economy research programme is presented.

Chapter 8 shows the paradigmatic dynamics of regional economics over the past 220 years, naming the main specific theories of regional economics and more than 30 research models. The paradigms, theories and models are brought together into a single system, which has made it possible to identify "blank spots" in regional economic theory and create a basis for presenting the author's sectoral-factor theory of regional economics in the second monograph.

Work on the monographs began after the death of Academician A.G. Granberg, as the author had expected that it would be the academician who would create a general theory of regional economics. This did not happen, so I considered it my main task to continue the academician's research, and I would like to dedicate the results to his memory.

Let us move on to the content of the research.

Chapter 1. Country and region, state and district

1.1. Definition of a country

1.2. Definition of a state

1.3. Definition of a region

1.4. Definition of district

1.5. Spatial levels in regional sciences (micro-, meso-, macro- and megaregions).

The main objective of this chapter is to provide clear definitions of the terms "country," "state," "region," and "district," as well as to define the spatial levels of regions, from the mega-level (group of countries) to the micro-level (group of municipalities).

1.1. Definition of a country

Brief definition: a country is the property of a people (group of peoples) on a part of the Earth's surface.

Extended definition: A country is a part of the Earth's surface where a historically inhabiting people (group of peoples) uses natural resources and carries out its activities through the economy and administration.

Let us agree that all objects existing on the Earth's surface can be divided into four main groups: Nature, Society, Economy, and Management. The most active group is Society, which transforms the Earth's surface (Nature) with the help of Economy and Management. The increased activity of Society is ensured by high competition between nations for natural resources and the Earth's surface itself (as a place of settlement).

The main feature of the existence of nations on the Earth's surface is the constant competitive struggle for the use of natural resources that ensure the life and self-reproduction of nations. The main instruments of competitive struggle are Economy and Management. If a people exists for a long time within a certain territory, it means that the methods of Economy and Management used by this people are effective in competitive struggle. If a people disappears, it means that these methods have proved ineffective for life and self-reproduction. Historically, long-term interaction between peoples (millennia or hundreds of years) has led to the division of the entire surface of the Earth into countries – territories with the stable existence of a people or group of peoples. In the national consciousness, the territory of a country is associated with the property of a people (a group of friendly peoples), and the protection of this territory from encroachment by other peoples is considered one of the priority tasks for the government and economy of that country. The administration creates a system for organising life in the country, relying on the economy. Thus, **a country is formed as a territory owned and protected by a particular people (group of peoples), serving as a source of natural resources extracted and used by the economy and under the control of the administration system.**

1.2. Definition of a state

Brief definition: A state is the international legal form of a country's existence.

Extended definition: A state is a country capable of independent existence and recognised internationally as a state by other states for a certain period of time, within certain spatial boundaries, in accordance with international treaties and its own constitution (basic law).

A state is a form of compromise between peoples competing for territory. In cases where it is more advantageous for peoples to agree on the spatial boundaries of countries than to engage in mutually destructive struggle, the idea of a state as an internationally recognised form of existence for a particular country arises. Mutual recognition of countries as states with mutually recognised borders means finding a compromise in the competitive struggle between peoples for territory for a certain period of time. Over time, the terms of the compromise may cease to suit one of the parties to the agreement, and then states may resort to various forms of competition for space and natural resources, seeking to change existing borders. In this case, the struggle will continue until the next compromise is found, which will again fix the states for a new period of time and within new borders. Thus, the state is an international legal form of a country's existence, as a way for all other nations or part of nations to recognise the right of a given nation or group of nations to a certain part of the Earth's surface.

For example, dozens of forms of state existed on the territory of Germany (the Weimar Republic, the Prussian Empire, feudal city-states, etc.), but Germany always remained a country inhabited predominantly by Germans (Germans). Unlike a state, the borders of a country are not internationally recognised and basically coincide with the territory inhabited by a particular ethnic group. The ideal case is when the borders of the state and the borders of the country coincide exactly. However, in the modern world, such cases (except for island states) are practically non-existent. This often leads to inter-state conflicts and attempts to change state borders to ensure that they more closely correspond to country borders.

An important ability of a state is its capacity for independent existence. If all neighbouring states are hostile towards a given state and it is deprived of external ties, the state must possess the necessary natural and labour resources, as well as production and management capabilities, to enable it to exist independently of the outside world for a long period of time. One of the reasons for Russia's independent foreign policy is its self-sufficiency.

Thus, a country as a place of settlement for a nation (people) creates the basis for the formation of states with internationally recognised state borders. All other methods of dividing territories on the Earth's surface for socio-economic research must be based on this primary fundamental division of space.

1.3. Definition of a region

Brief definition: a region is a part of a country or a group of countries

Extended definition: a region is a part of a country distinguished by characteristics of homogeneity or mutual complementarity of nature, society, economy and governance. A region can be viewed as a quasi-country capable of relatively autonomous existence within a "larger" country. A region can also be viewed as a group of homogeneous or complementary countries.

If a country includes several friendly peoples, each of these peoples may have its own territory of predominant residence. By analogy with the country as a whole, it can be said that a region is a territory that one of the friendly peoples considers its own. In addition to national characteristics, regional territories can also be distinguished by other significant characteristics. For example, if the territory of a country includes several natural zones, each natural zone can be considered a separate region. The same applies to territories with different economic sectors. For example, territories where agriculture is predominantly developed can be classified as an agrarian region, while territories with an industrial economy can be classified as an industrial region, etc. Regions can be distinguished on the basis of religious, linguistic, institutional and other differences (e.g. border regions or transit regions, etc.).

In addition to regions identified on the basis of existing differences, it is also possible to identify problem regions (linked by common problems to be solved), as well as project and research regions, with future joint projects (spaceports, infrastructure projects, raw materials projects, etc.) or joint research tasks.

The large number of grounds for distinguishing regions within a country makes this term very flexible to use. This same flexibility also creates enormous problems in clearly defining regions. Here are a few examples:

1. Academician A.G. Granberg characterised a region as "a specific territory that differs from other territories in a number of ways and possesses a certain integrity and interconnection between its constituent elements " (*Fundamentals of Regional Economics*, p. 16). As we can see, this is too general a definition, since a continent, country or municipality also fall under this formulation.

2. In the basic provisions of regional policy in the Russian Federation (approved in 1996), a region is defined as "...a part of the territory of the Russian Federation that has common natural, socio-economic, national-cultural and other conditions. A region may coincide with the boundaries of a constituent entity of the Russian Federation or combine the territories of several constituent entities. In cases where a region acts as a legal entity, it is understood to mean only a constituent entity of the Russian Federation." (Quoted from "*Fundamentals of Regional Economics*" by A.G. Granberg, p. 16).

3. In Latin, the term "regio" means country, region, area, district, city quarter, border, direction, line, frontier.

4. In the textbook edited by V.I. Vidyapin and M.V. Stepanov, *Regional Economics: Basic Course* (Moscow, INFRA-M, 2008), "a region is understood to be a large territory of a country with more or less homogeneous natural conditions and a characteristic orientation of productive forces" (p. 7), with the authors including such fundamentally different associations as groups of countries, territories of a country covering several economic regions, and individual economic regions (p. 7) in the composition of macro-regions.

Many other definitions could be given, but if the reader is interested in this issue, it makes sense to consult specialised studies. In economic geography and regional economics, dozens of monographs have been written on the subject of the division of regions and districts (N.N. Kolosovsky, *Fundamentals of Economic Regionalisation*, Moscow, 1958; P.M. Alampiev, *Economic Regionalisation of the USSR*, vols. 1-2. Moscow, 1959, 1963; N.N. Baransky, *Economic Geography. Economic Cartography*. Moscow, 1960; A.M. Kolotievsky, *Issues of Theory and Methodology of Economic Zoning*. Riga, 1967; V.M. Chetirkin, *Problematic Issues of Economic Zoning*. Tashkent, 1967, and many others). In the 1970s and 1980s, the issue of identifying large economic regions and territorial-production complexes was very relevant in the union republics of the USSR, and after the collapse of the USSR, the topic transformed into a search for the optimal spatial structure of Russia (merging of federal subjects, the problem of separatism, creation of federal districts, etc.).

1.4. Definition of a district

Brief definition: a district is a part of a state, and a region is a part of a country.

Extended definition of a district: a district is a part of a state with legally defined boundaries, distinguished by economic or administrative criteria.

Unlike the flexible term region, which can be applied to any part of a country and on virtually any basis, the term district has a more rigid application. It comes from the French term *raion*, meaning radius or ray, which is used to define the territory under the influence of a particular centre. The size of a district is determined by the power of the central city where authority is concentrated (the system of territorial administration). By analogy with countries and states, it can be said that districts are formed within states, depending on the internal competition between central cities for the use of resources. For example, representatives of one of the central cities gain power in the state. In this case, they will begin to redistribute the resources of the entire state in favour of their district and their central city. In order to prevent excessive competition within the country and within the state between representatives of different territories, the boundaries of the districts are sought to be legally (normatively) fixed by laws, the Constitution or decrees. This creates internal stability, which reduces internal competition. In some cases, the boundaries of regions and districts may coincide, but it should be noted that district boundaries must be confirmed by legal documents and are a compromise between the decisions of the national and regional elites.

Due to the fact that some derivatives of the term "district" in Russian sound more euphonious than derivatives of the term "region" (for example, районирование sounds better than региони́рование, районный sounds better than регионный or региональный), and vice versa (for example, региональные исследования sounds better than районные исследования), it is permissible to deviate from the strict definition of these terms and use them interchangeably when there is no detriment to the accurate expression of meaning.

Now, let us consider the example of the division of districts and regions in Russia.

The country of "Rus" or "Russia" has existed for over a thousand years. The very name of the country defines the people who own this territory – Russians or Russians. During this time, Russia has existed in many forms of government – as "Kievan Rus", as the Principality of Moscow, as the Russian Empire, as the Soviet

Union, etc. Moreover, Russia's borders have changed enormously over the years as a result of international treaties. From shrinking to the size of the Grand Duchy of Moscow to expanding to the maximum extent of the Soviet Union.

Dozens of regions can be identified within Russia. Many regions can be identified on the basis of nationality, i.e. as places of residence of certain peoples of Russia (national republics, autonomous regions, etc.). Many regions are distinguished by their geographical location (regions of the European part, the Urals, Siberia, coastal regions, etc.), and many by natural, economic and administrative characteristics.

As for the regions of Russia, the most well-known are the large economic regions, on the basis of which planned economic development was carried out during the Soviet period (economic criterion), as well as the modern federal districts, on the basis of which federal authorities control the development of the constituent entities of the Russian Federation (administrative criterion). The creation of federal districts began in May 2000 (one of the first decrees of President V.V. Putin No. 849) and by mid-2015 there were already nine federal districts (Central, North-Western, Volga, Southern, North Caucasus, Crimean, Ural, Siberian, and Far Eastern).

1.5. Spatial levels in regional sciences (micro-, meso-, macro- and megaregions).

The main idea of the paragraph: geography distinguishes five spatial levels of research (local, regional, national, continental and global), while regional studies and regional sciences consider four spatial levels of research – megaregional, macroregional, mesoregional and microregional.

The main science that studies the Earth's surface is geography. In geography, it is customary to distinguish five levels of spatial scale: local level (settlement and municipality level), regional level (part of a country), national level (country, state), continental level (continent level) and global level (the entire surface of the Earth) - Skopin A.Y. Introduction to Economic Geography, Vlado, 2001, p.15. Each level is characterised by a specific set of statistical data, a method of visual observation, the availability of theoretical generalising concepts, etc. It is easiest to collect complete information at the local level, where the researcher can cover the entire territory, measure and evaluate everything. Collecting data at the global level became possible only with the advent of satellite studies of the Earth's surface and the emergence of global UN programmes for monitoring the Earth's surface, as well as with the development of international statistics systems (OECD, IMF, World Bank and other international organisations). Since statistical surveys are funded at

the state level and used in public administration, the national level of research is characterised by the most complete statistical information.

Economic science, using data for different spatial levels of research, develops such branches as municipal economics and urban economics (local level), regional economics (regional level), national economics (national level), international economics (continental level) and world economics (global level). Each of these branches of economic science studies the specifics of economic processes in the territories of the corresponding spatial levels.

For regional studies, I will further distinguish four levels. Three levels (micro-, meso- and macro-regions) are located between the national and local levels. I will refer to a group of municipalities as a micro-region, an administrative entity as a meso-region, and a group of administrative entities as a macro-region. Another level of regions (mega-regions) will be located between the national and continental levels and will include a group of countries. I will briefly describe the specifics of regions at different levels.

A group of countries as a megaregion. There are four reasons for grouping countries into megaregions: 1) ensuring security (political and military-political alliances); 2) economic development (economic alliances); 3) solving socio-cultural problems (socio-cultural associations), and 4) solving environmental and resource problems (environmental and resource associations). It is also possible to identify complex megaregions that are integrated according to all four criteria (e.g., the EU, ASEAN, CIS, etc.).

The basis for the creation of real megaregions are international treaties and agreements between states on the creation of international organisations. In essence, each international organisation is a real megaregion if the states participating in this organisation constitute a single territory. The most well-known international organisations that are megaregions are the European Union, ASEAN, the Shanghai Cooperation Organisation, NATO, etc. There are also megaregions with "gaps" in their territory, for example, OPEC countries, the Organisation of Islamic Cooperation, MERCOSUR, and others.

When studying **real megaregions, they serve as objects** of research in regional studies. The second group of megaregions can be called research or project-based, where countries are grouped together by a researcher or project developer. For example, all oil- and gas-producing countries in Eurasia, all French-speaking countries in Europe, all Spanish-speaking countries in Latin America, or all Islamic countries, etc., can be combined into a single megaregion. It is permissible to create

artificial megaregions from a wide variety of countries that share a single characteristic. For example, the BRICS countries do not share any borders (moreover, they are quite distant from each other, especially Brazil and South Africa from the three Eurasian countries – Russia, China and India), but they were similar in terms of rapid economic growth in the 2000s. In this case, a megaregion can be described as an artificially constructed subject of research, which in the future may become a functioning megaregion.

Thus, research and project megaregions are the subject of regional studies, while international regional organisations are the object of regional studies. In relation to the regional economy, we will discuss the existence of a sub-section of it known as the megaregional economy, which studies economic processes within megaregions. To a large extent, the function of the megaregional economy is now performed by the corresponding sections of the international and global economies.

An administrative entity as a mesoregion and a group of administrative entities as a macroregion. Any state has an administrative-territorial division that reflects internal differences (ethnic, historical, natural-geographical, etc.). Such a division is usually enshrined in the constitution of the state, which allows administrative entities to be considered internationally recognised parts of the state. I will refer to the administrative entities named in the state's constitution and additional laws (in the event of changes to the administrative-territorial structure) as mesoregions, and groups of such entities as macroregions. The usual number of mesoregions within a state is between 30 and 100. The usual number of macroregions is between 3 and 30. Macroregions are mainly distinguished by natural, economic or historical characteristics, while mesoregions are distinguished by ethnic, administrative and social characteristics. Examples of macro-regions in Russia include large economic regions (Western Siberia, the Far East, the North Caucasus, etc.), federal districts (the Central Federal District, the Ural Federal District, etc.), and macro-geographical zones (the European part, the Urals, the Asian part). Examples of mesoregions in Russia include the constituent entities of the Russian Federation (85 entities in 2015).

In the United States, macro-regions include the Northeast, Midwest, South, and West (4), which are further divided into 9 macro-regions. Meso-regions include 50 US states, the Federal District of Columbia, and dependent territories. In France, examples of macro-regions include 27 regions distinguished by social and cultural identity (Île-de-France, Brittany, Provence-Alpes-Côte d'Azur, etc.). Examples of meso-regions include 96 departments.

Virtually every large country has macro- and meso-regional levels of territorial division, reflecting the diverse specifics of the formation of the state's territory and the needs of the functioning of the state administration system. In relation to these levels of regional division, we can talk about the possibility of the existence of a macro-regional economy and a meso-regional economy. **In Russian practice, the regional economy is identified primarily with the mesoregional economy or the economy of the constituent entities of the Russian Federation.**

A group of municipalities as a micro-region. The smallest unit of territorial division of the state is the municipality. Municipal authorities are sometimes considered to be independent local authorities, sometimes part of the state administration system, and sometimes a mixed system of state and local authorities.

Since municipalities have extremely limited financial resources, it is often necessary to pool the resources of individual municipalities to solve social and economic problems, for example, to build hospitals, roads, vocational training institutions, etc. In this case, it makes sense to create micro-regions comprising several municipalities. In France, the municipal level includes communes, which can be combined into micro-regions called syndicates, districts and urban associations. In the United States, the municipal level includes 3,140 counties, as well as about 20,000 municipalities (in 30 states) and 16,504 townships in 20 states. To address a number of issues (education, fire protection, water supply, housing construction, etc.), they are grouped into micro-regions called school districts and special-purpose districts.

Since May 2014, seven types of municipal entities have been allowed to be created in Russia: rural settlements, urban settlements, municipal districts, urban districts, intra-city territories of federal significance, urban districts with intra-city divisions, and intra-city districts. As of 1 January 2014, there were 22,777 municipal entities in Russia (including 18,525 rural settlements and 1,660 urban settlements). There is little experience of combining municipalities into micro-regions in Russia, but in some constituent entities of the Russian Federation, school districts have been created as a combination of several municipalities (for example, in the Samara Region).

In order to study economic processes in such territorial entities, it is necessary to develop a micro-regional economy that neighbours the city economy and the municipal economy. Research in the field of micro-regional economics in modern Russia is practically non-existent, while research in the field of municipal economics and city economics is only beginning to develop.

Conclusions to Chapter 1.

1. A country is the property of a people (a group of friendly peoples) on a part of the Earth's surface.

2. A state is the international legal form of a country's existence in a specific historical period, determined by the recognition of that country by other countries (states), including the recognition of state borders.

3. A region is a part of a country (micro-, meso- and macro-regions) or a group of countries (megaregions). Regions can be distinguished both by individual characteristics of homogeneity (natural, social, economic, administrative) and by a set of complementary characteristics.

4. A district is a legally established part of a state. As a rule, districts are created by normative acts (laws, presidential decrees, government resolutions) for the purposes of state administration, are taken into account by state statistics and may have special administrative bodies. In some cases, the boundaries of administrative districts and regions may coincide, especially for macro- and meso-levels.

5. The division of regions into four spatial levels allows us to distinguish four branches of knowledge in the regional economy: megaregional economics (studying the economy of a group of countries), macroregional economics (studying the economy of a group of administrative entities), mesoregional economics (studying the economy of individual administrative entities), and microregional economics (studying the economy of a group of municipalities). Megaregional economics intersects with international and global economics, macroregional economics intersects with national economics and macroeconomics, and microregional economics intersects with municipal, urban economics and microeconomics. Mesoregional economics coincides with regional economics in the traditional narrow sense.

Let us consider the structure and dynamics of countries and regions in order to clearly understand the place of the economy in the life of regions.

Chapter 2. The country and region as systems. A systematic approach to regional economics.

2.1. The country as a system

2.2. The fundamental structure of a country

2.3. Structure of a region

The main idea of this chapter is that a country is a rather complex object, the analysis of which requires the use of an appropriate methodology. The systemic-structural approach is best suited for this purpose. According to this approach, it is necessary to represent the country as a system, divide it into basic subsystems (including regional subsystems), identify its fundamental structure and substrate, and establish quantitative and semi-quantitative parameters to describe the system. The difference between a country and a region in a systemic description is that a country must have a complete structure that allows the territory to function as independent and self-sufficient. A region may have an incomplete structure, determined by its position as part of a country. If a country becomes part of a megaregion, it begins to acquire features of incompleteness within that megaregion, redistributing some of its functions to other countries in the megaregion and receiving some functions from other countries. Therefore, a systematic description of any region must begin with a systematic description of the country to which it belongs.

2.1. The country as a system

The main idea of the paragraph: the systemic (system-structural) approach is currently the ideal methodology for structuring any object under study. The main concepts of the systemic approach include the concepts of system, structure, substrate, element, property, connection, boundaries, subsystem, and supersystem.

Since there are several hundred definitions of the basic concepts of the systemic approach, I will give my own definitions, which have been tested over 20 years in regional studies and have proven their effectiveness.

So, the first three concepts are: **system, structure, and substrate**. I define **SYSTEM** as **the combination of STRUCTURE and SUBSTRATE**. **Structure is the known part of the system, consisting of elements and connections. Substrate is the unknown part of the system only insofar as its elements and connections have not been identified.** When a person looks at a car, they see it as a whole. They see the system as a whole. Then they begin to identify elements in this system – mirrors, windows, wheels, engine, etc. The part of the car in which elements are identified and connections are established becomes the structure. The part of the car that exists but whose elements and connections have not yet been identified is the substrate for the observer. In its most unknown state, the system is almost entirely a

substrate; in its most known state, the system becomes almost entirely a structure. For the average car enthusiast, 95% of the car will forever remain a substrate; for a car designer, 100% of the car must be a structure. When a researcher first begins to study a country or region, the only things known to him are the borders of the territory and the central city. Subsequently, he learns about the resources of the territory, the population, cities, and production, and gradually moves from an initial substratum representation of the region to a structural representation.

The second set of three basic concepts **are elements, properties, and connections**. An **ELEMENT** is **the smallest indivisible part of a system**. The level of indivisibility is determined by the researcher, and in this sense, any system is subjective. It is only a model of reality (the subject of research). The definition of a system element sets the lower limit of the study, since the study of an element does not involve the study of its internal state. However, the identification of an element involves the study of its external properties, thanks to which the element occupies a certain position in the system and enters into connections. I will define **the PROPERTIES** of an element as the main systemic (system-forming) characteristics of the element. They may relate to the spatial, functional, hierarchical, and other positions of the element. I will refer to any relationships between elements of the system as **CONNECTIONS**. Elements, properties, and connections in the system can be **constant or variable**. **Constant elements, properties, and connections exist throughout the entire period of observation of the system, while variable elements, properties, and connections appear in the system from time to time**. In the case of studying a region as a system, municipalities can be considered as elements, and other groups of elements can also be identified.

The third set of three basic concepts is **system boundaries, supersystems and subsystems**. Defining the **external boundaries of the system** is extremely important for all applied systems research, including regional and country studies. If "negative" territories are included in the composition of the country or region under study, the study becomes "problematic". If "positive" territories are included, the study will be too "optimistic." Manipulation of administrative boundaries during the Soviet period led to statistically positive results in the economic and social development of territories or to the concealment of problems (transferring problems to a latent state). Manipulation of electoral district boundaries in American practice led to the advantage of one of the candidates for elected office, etc. The concept of **a SUPERSYSTEM** includes everything that lies beyond the external boundaries of the system. The concept **of a SUBSYSTEM** includes the division of a system into several parts, i.e. the establishment of internal boundaries within the system. In the case of a country, the identification of regions can be considered as the identification

of subsystems. Subsystems, like individual elements, can have properties that determine their position in the system.

Thus, the systemic-structural approach involves a qualitative and semi-quantitative (depending on the indicators and parameters used) analysis of a country, including: 1. defining the external boundaries of the country; 2. defining the internal boundaries of the country and identifying subsystems; 3. defining the elements of the country, their properties and connections; 4. defining the structure and substrate of the country; 5. defining the country's position in the supersystem. Let us move on to defining the fundamental structure of the country and the position of regions within this structure.

2.2. Fundamental structure of the country

The main idea of this paragraph: the fundamental structure of a country, ensuring its independence and self-sufficiency, includes four vertical (Nature, Population, Economy, Management) and four horizontal (regional) subsystems (Periphery, Semi-periphery, Sub-centres and Centre).

The author's experience in studying countries as systems (Kazakhstan, Russia, Spain) allows us to identify four main vertical and four main horizontal subsystems within any country. The presence of these subsystems makes a country independent and self-sufficient. The four vertical subsystems, which are hierarchically and genetically dependent on each other, are Nature, Population, Economy, and Management. The lowest level is occupied by the natural subsystem (Nature) as a source of resources for all other subsystems. The second level is occupied by Population as the most active component in the system, transforming nature. The third level is occupied by Economy as the Artificial World (Technology), created by Population to transform Nature and for its own needs, but acquiring independent significance, since in many respects Technology surpasses the capabilities of Population. The fourth level is occupied by Management as a subsystem that regulates the interaction between Nature, Population and Economy.

The group of horizontal (regional) subsystems includes the country's periphery, semi-periphery, sub-centres and centre. The centre of the country mainly houses the administrative subsystem, the sub-centres mainly house the economic subsystem, the semi-periphery mainly houses the population, and the periphery mainly houses untouched nature. Figure 1 illustrates the fundamental structure of any country, including the eight subsystems listed above.

	Centre	Sub-centres	Semi-periphery	Periphery
Administration	x			
Economy		x		
Population			x	
Nature				x

Figure 1. Fundamental structure of a country.

The regions of any country can be considered as specialised and complex. Specialised regions will be monofunctional and will correspond fairly accurately to the specifics of one of the country's four horizontal subsystems: periphery (natural regions), semi-periphery (social regions), sub-centres (economic regions) and centre (administrative regions). Complex regions will develop as quasi-countries, with the formation of all the subsystems necessary for independent functioning. For example, many republics within Russia are developing as complex regions (especially Tatarstan), while the territory of the Central Federal District is developing as a collection of specialised regions, where Moscow functions as the centre, the Moscow Region, Ryazan, Tula, Kaluga, Smolensk, Tver, and Vladimir perform the functions of sub-centres, and the remaining territories perform the functions of semi-periphery and periphery. If, for some reason, a centre region leaves the country, its function will have to be transferred to one of the sub-centre regions that is most capable of performing this function effectively. The desire to make all regions central regions is meaningless in itself, just as is the desire for all regions to become natural peripheries. The art of structural analysis of a country boils down to understanding the harmonious structure of the country, including the structure and specialisation of regions as parts. Consequently, **structural analysis of a region involves: 1. Determining the region's position within the country (in vertical and horizontal subsystems); 2. Determining the type of region (specialised or comprehensive); 3. Determining the internal structure of the region.**

It is extremely important to understand that the problems of a region are often related to its substrate. The regional substrate includes unknown phenomena in nature, society, the economy and the management of the region. For example, the region's budget has large revenues, but the standard of living of the population is constantly deteriorating, and the governor is buying a castle in France. This clearly indicates the existence of criminal, corrupt schemes for transferring budget funds to companies controlled by the governor, followed by embezzlement and transfer abroad. Or 70% of the region's population is unemployed, but every family has a

foreign car. This indicates a high level of development of the shadow economy in the region, which brings in large incomes at the household level. The powerful effect of the substrate can manifest itself in the administrative, economic, social and natural subsystems of the region. For example, the recruitment of people into terrorist organisations, or the emergence and rapid spread of new diseases, or fashionable youth movements, etc. Therefore, studying the substrate and its impact on the structure of the regional system is a crucial task for any regional study.

2.3. Structure of the region.

The main idea of the paragraph: the structure of a complex region should fully reproduce the fundamental structure of the country. A complex region is a future country (quasi-country). The structure of a specialised region may be limited to an incomplete set of vertical and horizontal subsystems. Let us consider the examples of Moscow, Tatarstan and the Chukotka Autonomous Okrug.

Moscow. Within Russia, Moscow functions as a specialised administrative centre. Of the 250,000 hectares of total area of this mesoregion (Moscow is a subject of the Federation), approximately 20% is occupied by federal lands. Almost all federal government bodies (legislative, executive, and partly judicial authorities, foreign embassies, etc.) are located in Moscow. The expansion of Moscow's territory in 2012 was primarily carried out in the interests of creating a new federal centre in New Moscow. If we look at the state of the subsystems in this region, the natural subsystem of Old Moscow is in an extremely depressed state and is unable to meet even 10% of the region's natural resource needs, the population subsystem (over 12 million people) is overpopulated, with a high level of competition between people for limited space, the Economy subsystem is under stress due to competition with the population and the administration for limited territory (increase in rent and property taxes), the Management subsystem is doing very well, spending budget funds on projects that do not always contribute to solving Moscow's main problems – transport, environmental, overpopulation, etc.

Moscow's oppressed natural subsystem must bear the burden of an excessive population, economy, and overbearing administration. The territory of New Moscow would seem to alleviate these problems, but in fact exacerbates them, because instead of decentralising the population and economic activity from Old Moscow, it attracts new residents from other regions of Russia and other countries (migrant workers, etc.) to the territory of New Moscow, creating a super-populated region. Currently, Moscow accounts for less than 9% of Russia's population. If 2

million new residents move to New Moscow in the near future, Moscow's share will increase to 10%, and if we take into account the population of the Moscow suburbs working in Moscow, it will increase to 19-20 million, which will already account for 14-15% of Russia's population. When France faced the problem of overpopulation in Paris in the 1970s, a policy of decentralisation was initiated, creating new regions of development on the periphery of the country and halting the process of excessive population concentration in the capital region. Similar decentralisation was carried out in the United Kingdom, Germany and other Western countries. In this regard, Russia's management system has chosen the trend of developing countries with huge capital agglomerations.

Tatarstan. Tatarstan is developing as a comprehensive self-sufficient region that reproduces the fundamental structure of the country. It has peripheral natural subsystems, a social subsystem, a comprehensive economic subsystem with agriculture, extractive and manufacturing industries, and a service sector, as well as a management subsystem concentrated in Kazan. Kazan acts as the administrative centre of the region. Naberezhnye Chelny, Nizhnekamsk, Almetyevsk, Zelenodolsk, Bugulma, Elabuga, Leninogorsk, and Chistopol. The semi-periphery consists of the rural areas of the republic, and the periphery consists of the outlying territories, including the Volga-Kama Reserve and the Lower Kama National Park. The republic experiences significant pressure on its natural subsystem, including oil production, oil refining, and environmental pollution, but this problem remains under control for now. There is no problem of overpopulation in the republic (the total population is 3.9 million people). Overall, the growth of the subsystems is balanced.

Chukotka Autonomous Okrug. The region occupies the extreme north-eastern tip of Russia. It has extreme natural and climatic conditions, vast underdeveloped territories (more than 0.7 million square kilometres), and a population of only 50,500. The region is part of Russia's natural periphery, distinguished by gold production (more than 20 tonnes per year) and reindeer husbandry (about 200,000 reindeer). The region is clearly specialised and cannot exist independently outside Russia.

Thus, Moscow specialises in administration, the Chukotka Autonomous Okrug in the use of natural resources, and Tatarstan is a comprehensive self-sufficient region. The internal structure of the regions will primarily correspond to the performance of external functions. In Moscow, the main feature of the internal structure will be the priority given to the use of the city's territories by the federal centre and other governing bodies (large state corporations, banks, political parties,

etc.). In Chukotka, priority will be given to mining companies and reindeer herding farms, while in Tatarstan, a comprehensive internal structure will be formed, necessary for the region's self-sufficiency in all functions. Moreover, Kazan is increasingly referred to as Russia's "third" capital, highlighting the republic's successes not only in Russia's development, but also in the republic's growing international significance. Thus, the structure of the region is determined by the performance of national functions and reinforces the region's specialisation over time. The transition to comprehensive development is associated either with the future separation of the region from the country or with the need to create a group of regions within the country that duplicate the main functions in order to increase resilience to external influences or internal disasters. For example, in Kazakhstan, the creation of a second capital, Astana, was prompted, on the one hand, by the high probability of natural disasters (earthquakes and mudslides) and the high level of air pollution in the "old" capital, Almaty, and, on the other hand, by the need to "centre" the capital in relation to the country's territory. In Russia, discussions about moving the capital to the east also reflect the idea of centring the capital in relation to the entire territory of the country and shifting the capital towards the rapidly developing countries of Asia. The rapid development of Shanghai in China reflects the creation of a "commercial" capital of the country in relation to the "state" capital in Beijing.

The specialisation of regions or their comprehensive development is largely determined by the dynamics of countries' development, so it is necessary to understand the basic patterns of the dynamics of countries and regions.

Conclusions to Chapter 2.

- 1. A systemic-structural approach is best suited for a comprehensive analysis of countries and regions. Initially, the object under study appears as a system-substrate (black box), in which much is unknown, and then gradually transforms into a system-structure (white box), in which virtually everything is known and measured.**
- 2. The fundamental structure of a country includes four vertical subsystems (Nature, Population, Economy, Management) and four horizontal subsystems (Periphery, Semi-periphery, Sub-centres and Centre).**
- 3. The structure of regions within a country depends on the policy of specialisation or comprehensive development of regions. When implementing a**

specialisation policy, each region of the country can receive at least one of four functions: natural (extraction of natural resources, reproduction, conservation), social (population reproduction, recreation, treatment, education, etc.), economic (production of goods and services), administrative (regulation, monitoring, control, security, etc.). All other functions will be implemented through interregional ties. Under a comprehensive development policy, the country is divided into macro-regions, each of which develops as a self-sufficient quasi-country. In this case, a fundamental structure of the country consisting of eight subsystems is created within each macro-region. Interregional ties within macro-regions become significantly stronger than those between macro-regions.

4. The structure of a country and a region is largely inert, formed over decades and centuries. Nevertheless, it is possible to change the established dynamics in various directions. It is advisable to analyse the dynamics of countries and regions on the basis of the author's Theory of Existence.

Chapter 3. Dynamics of countries and regions. Non-equilibrium thermodynamics and the Theory of Existence in regional economics.

3.1. Non-equilibrium thermodynamics and the theory of existence. Rules of human existence

3.2. The life cycle of a human being, a company, a country and a region. Stages of existence.

3.3. Deviations from the normal life cycle trajectory

3.4. Diagnosis and forecasting of the existence of a country and region

The main idea of the chapter: structural analysis of countries and regions must be supplemented by dynamic analysis. Dynamic analysis is carried out on the basis of the author's Theory of Existence, based on the ideas of non-equilibrium thermodynamics and the second law of thermodynamics. This theory allows us

to substantiate the basic rules (laws) of existence and explain the life cycle of any object, including a person, company, country or region. The subordination of society's activities to physical laws creates a fundamental basis for the theory of economic activity, which cannot be created within the framework of classical economic theory, based on subjectivism, mathematical simplification and logical anarchism (L. von Mises and others). The application of the Rules of Existence in countries and regions makes it possible to diagnose the current stage of existence and predict the future state of a country or region.

3.1. Non-equilibrium thermodynamics and the theory of existence. The rules of human existence

The main idea of the paragraph: every person is subject to four rules of existence: - 1. The rule of water-temperature balance; 2. The rule of maximum spatial expansion; 3. The rule of complication; and 4. The rule of simplification. The rules (laws) of existence were developed by as part of the Theory of Existence, the main components of which are outlined below.

For economists, the laws of physics are distant and not very understandable, but if we want to create **an OBJECTIVE THEORY OF ECONOMIC DEVELOPMENT** that is applicable to all countries and regions, across the entire surface of the Earth, for all historical stages of society's development, then it is impossible to do without the most important physical laws. After all, if society and the Earth are only parts of the universe, then they must obey the laws governing the functioning of the universe, and these laws are studied by physics.

The first law of physics that is mandatory for use in economics is the second law of thermodynamics, which states that heat is always transferred in one direction — from a hotter body to a colder one. This means that a person with a constant body temperature of 36.6 degrees will always give off heat to the environment when the air temperature is below 36.6 degrees Celsius and will always receive heat from outside when the ambient temperature is above 36.6 degrees. This fundamental physical fact determines the first rule of existence for an individual and for humanity as a whole: the rule of the need to maintain the body's temperature balance. Since humans are physically a water-salt substance, and the fastest way to regulate body temperature is through water cooling or heating, the Rule of Temperature Balance must be extended to the Rule of Water-Temperature Balance of the Body. The vast majority of basic economic goods – clothing, food, drink, housing, etc. – are produced and consumed in accordance with this rule of existence!

The second rule of existence – the rule of maximum spatial expansion or the rule of establishing control over the maximum possible spatial resource – is based on the theory of an expanding universe. The second rule is closely related to the first rule, the need to provide the organism with two essential life resources: energy and water. Since these resources are scattered throughout space, control over a large space means an increased probability of finding these resources and prolonging one's existence. Control over space is established in two main ways: by the speed of movement in space and finding resources, as well as by protecting space and resources from competitors. This is related to the third rule of existence: the Rule of Complexity.

The Rule of Complexity is based on the ideas of non-equilibrium thermodynamics (I. Prigogine and others) about the self-organisation of an object in the event of external influence. For example, when a substance is heated or subjected to other influences, spontaneous self-organisation of molecules into a specific spatial structure of motion may begin, which is less predictable for an external observer than the previous state. Competitive struggle between individuals, peoples and countries is won by those who have a greater capacity for complexity, such as unpredictable self-organised behaviour and self-structuring. To prepare for and implement such behaviour, an individual possesses physical and intellectual resources. Physical resources include strength and coordination of movement, while intellectual resources include knowledge and deception (misleading the enemy). In the case of countries and peoples, complexity manifests itself in population growth, physical and intellectual training of the population, arms production, training of diplomats, and other activities. In the modern world, India and China have the greatest human resources, while the United States and Russia have the greatest weapons resources. In addition, the United States has the greatest ability to mislead its competitors, as it controls up to 80% of the world's media. When faced with an external threat, Russians are distinguished by their ability to suddenly self-organise (guerrilla warfare), the scale and manifestations of which, as a rule, stump the external aggressor. That is why Russia has the largest territory among the countries of the world, despite repeated attempts to seize this space, recurring at least once every hundred years.

The fourth rule of existence is the rule of simplification. The rule of simplification also corresponds to non-equilibrium thermodynamics, which states that as external influences decrease, self-organisation decreases and the capacity for unpredictable behaviour declines. The simplification of a country begins with a reduction in population, a decline in the quality of its physical and intellectual training, a reduction in arms production, and the deprofessionalisation of civil

servants, including diplomats, etc. This leads to a decline in the ability to compete for space and water and energy resources and a loss of opportunities for future existence. In the modern European Union, primarily in the Baltic states, the rule of simplification is clearly at work. Politicians are becoming more cynical and corrupt, the media is spreading lies more actively, and the most intelligent part of the population is trying to leave the country. In Russia in the 1990s, the rule of simplification was also at work.

A certain sequence of rules of existence determines the dynamics of any object, including people, companies, countries and regions. In general, such a dynamic sequence can be called a life cycle.

3.2. The life cycle of a person, company, country, and region. Stages of existence.

The main idea of the paragraph: The life cycle of any self-organising object, including a person, company, country, and region, consists of 12 normal stages: 1. Conception; 2. Gestation; 3. Birth; 4. Growth; 5. Development; 6. Macro-coordination; 7. Stabilisation; 8. Micro-coordination; 9. Degradation; 10. Decline; 11. Death; 12. Decomposition. At each stage, the rules of existence operate in a specific combination. At stages 1-7, the rules of complexity and maximum spatial expansion apply. At stages 8-12, the rule of simplification applies. At all stages, the rule of water-temperature balance applies.

Any object capable of self-organisation goes through 12 normal stages of its existence. This is obvious to anyone who observes their own life and the lives of their relatives and acquaintances. However, these same stages are characteristic of all other types of objects capable of self-organisation.

As applied to a company, we can easily identify all of the listed stages of the life cycle: 1. Inception (company idea and legal registration); 2. Development (obtaining credit, purchasing equipment, hiring staff, etc.); 3. Birth (brand presentation, release of the first batch of goods); 4. Growth (increase in staff, machinery and equipment, increase in output, increase in market share); 5. Development (increased internal coordination, advertising campaigns, bonuses for regular customers, increase in market share, etc.); 6. Macro-coordination (absorption of competitors, lobbying for one's interests in governing bodies, market capture, price wars, etc.); 7. Stabilisation (constant market share, "ageing" management, resistance to innovation, etc.); 8. Micro-coordination (loss of external influence, reduction of branches, sale of non-core assets); 9. Degradation (disruption of internal ties, division in company management, withdrawal of financial resources by top managers, decline in product quality, loss of market share); 10. Decline (reduction in output, loss of credit rating, mass layoffs, sale of assets); 11. Death (cessation of

production, declaration of bankruptcy); 12. Decomposition (bankruptcy proceedings, lawsuits, prosecution of top managers, criminal showdowns, etc.).

The rules of existence apply at all of the above stages. A firm will always strive for maximum spatial expansion in search of cheap resources and rich markets. To achieve this goal, a firm must constantly become more complex (growth, development, staff training, production innovations, advertising campaigns, etc.). Upon reaching the maximum permissible market share (under antitrust legislation), the firm strives for a balanced state. If complexity, spatial expansion, and balance are unattainable, the rule of simplification comes into effect, leading to the gradual liquidation of the firm.

The same rules of existence apply to the life of any country or region.

At the stage of a country's inception, a social group must emerge that will consider a certain territory as its property (place of permanent residence and development). At the gestation stage, this social group recognises itself as a single entity (a nation), acquires a common language (a means of coordination), ideology, intellectual leaders and military leaders. At the birth stage, this nation, through its leaders, announces to neighbouring nations the creation of a country (state). During the growth stage, the population of the country increases and extensive development of the territory takes place. During the development stage, the internal cohesion of the country (transport, communications, administration, education) is strengthened. During the macro-coordination stage, the country strengthens its external influence by subjugating other countries or strengthening the coordination of its interaction with other countries. At the stabilisation stage, the population stabilises, the country reaches the limits of its spatial influence, and becomes conservative in terms of culture, economy, and governance. At the micro-coordination stage, the country's external spatial influence begins to decline (). At the degradation stage, internal connections begin to break down. At the stage of reduction, the country's own space shrinks, the population declines, and economic activity decreases. At the stage of death, the country's ideology, culture, and system of governance disappear. At the stage of decay, neighbouring countries divide the territory of the country among themselves, and civil war, rampant crime, etc. are possible. The situation in modern Ukraine indicates that the country is transitioning to the stages of death and decay of the old statehood. Modern Russia is in the stage of macro-coordination, when external influence is increasing. The modern United States and the European Union are in the stage of stabilisation and are transitioning to the stage of micro-coordination, etc.

The 12 stages of normal existence for a country and region are linked to the Rules of Existence as follows. The rule of water-temperature balance (for a country – water-fuel-energy balance) applies to all stages of the life cycle without exception. The rule of maximum spatial expansion shows the limits of a country's territorial growth, which begin at the inception stage and reach their maximum at the stabilisation stage. The rule of complexity applies to the ascending part of the life cycle curve (stages of growth, development, macro-coordination, stabilisation). The rule of simplification applies to the descending part of the life cycle curve (micro-coordination, degradation, decline, death and decay stages). Figure 2 shows the stages of the life cycle.

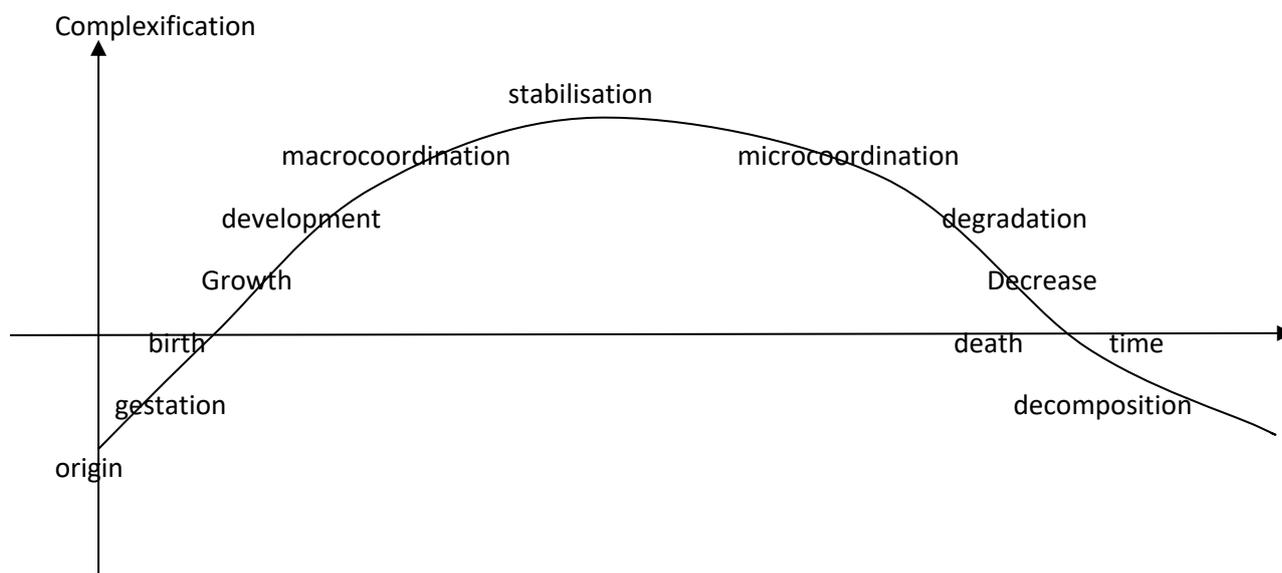


Fig. 2. Stages of existence (life cycle) of an object

An object can hardly influence the sequence of stages, although there is a great temptation to return from the stage of degradation or decrease to the stage of growth. The interest of older people in finding young partners, the replacement of conservative top managers of a firm by the company's shareholders or the acquisition of creative companies, the change of the country's managerial elite – these are attempts to return to the stages of complication. If this does not happen, the object has the opportunity to influence the duration of the stages. Of all the stages of existence, the stage of stabilisation brings the greatest comfort, so any object strives to prolong this stage as much as possible. Some people and companies manage to remain in the stabilisation stage for decades. Such people and companies seem to be unaffected by age-related changes. If it is not possible to return to the ascending part of the life cycle curve, then the simplification stages can be prolonged, especially the micro-coordination and degradation stages. Some people, companies and states

tend to adopt this strategy of existence, but it can only be successful when there is a low level of competition.

3.3. Deviations from the normal life cycle trajectory

The works of I. Prigogine and the development of catastrophe theory (V.I. Arnold et al.) have shown three possible types of deviation of an object from the normal trajectory of existence, i.e., from the sequential passage through all 12 stages.

The first type of deviation is called fluctuation. This is the "easiest" of the possible deviations. During fluctuation, the object remains within the next stage of the life cycle, but increases the amplitude of movement and moves in such a way that it approaches the permissible limits of "normal" movement. For example, in the case of a car's trajectory, normal movement would be straight, and fluctuation would be curved movement, but not going beyond the boundaries of the lane.

The second type of deviation is called bifurcation. In bifurcation, an object reaches the limits of normal behaviour and either a return to the normal trajectory or crossing the boundary, leading to unforeseen consequences, including disaster, become equally possible. In the case of a moving car, a bifurcation situation arises every time the car crosses the boundaries of its lane.

The third type of deviation is the most serious – catastrophe. In a catastrophe, the object irrevocably goes beyond the boundaries of normal behaviour. In the case of a car, a catastrophe occurs when it crosses into the oncoming lane, drives into a ditch, overtakes dangerously, etc. In a catastrophe, the object "jumps" over the normal stages of existence and, after the growth stage, may immediately find itself in the stage of degradation or death. Can a country enter the stage of death? Of course it can! Throughout human history, there have been numerous cases of countries and even civilisations disappearing. The death of a region can be diagnosed in the event of a natural disaster – a tectonic collapse, a supervolcano eruption, a meteorite fall; a man-made disaster (radioactive contamination, chemical contamination); military action, etc.

To predict the existence of a country or region, it is necessary to diagnose its current stage of existence as accurately as possible, which is quite achievable using statistical data and expert assessments.

3.4. Diagnosis and forecasting of the existence of a country and region

Methodologically, it is quite simple to determine whether a situation is becoming more complex or simpler. From a systems perspective, complexity manifests itself in an increase in the number of elements in the system, an increase in the number of internal connections, greater coordination within the system, and an increase in the controlled territory. Simplification is characterised by the opposite features.

All four fundamental subsystems of the country – Nature, Population, Economy and Management – must be diagnosed.

The growth of Nature is manifested in the growth of biomass and the growth of elements of the natural subsystem, interpreted as sources of natural resources (the number of mineral deposits, the area of developed land, the number of rivers and reservoirs, etc.).

Population growth is characterised by numerical population growth as a result of natural increase or migration.

Economic growth is characterised by an increase in output (GDP), the number of people employed and the number of firms.

The growth of management is characterised by an increase in management entities (administrations), an increase in the number of people employed in the management subsystem, and the number of management decisions.

The development of the subsystem is interpreted as an increase in internal connectivity and the ability to behave in a coordinated manner.

For nature, development means the formation of sustainable ecosystems with complete food chains. From a resource perspective, the development of nature is interpreted as the comprehensive use of a region's raw material potential (complementary types of raw materials).

For the population, development means an increase in internal communications provided by a unified education system, language standards, mass media, transport and communications systems.

For the economy, development means the formation of production clusters, territorial-production complexes, industrial areas, special economic zones and other forms of convergence of firms, creating conditions for their cooperation and collaboration.

For management, development means an increase in the internal connectivity of the management system, uninterrupted communications, clear subordination and optimal division of powers, and the quality and soundness of management decisions.

Macro-coordination is interpreted as an increase in the external influence of the subsystem and is diagnosed by the spread of subsystems beyond the borders of the country or region.

Macro-coordination of the natural subsystem at the ecological level can be diagnosed as the migration of animal and plant species beyond the region and the formation of new, expanded habitats. At the resource level, macro-coordination of nature can be diagnosed as the formation of resource-dependent territories – for example, regions of lower river basins from regions of upper and middle basins, or forest-deficient territories from forest-excessive ones, etc.

Macro-coordination of the population is diagnosed as the expansion of the regional population beyond the region or the establishment of ties with dependent population groups, with the formation of stable positive ties between this population and the population of the region (Huaqiao for China, the Armenian diaspora for Armenia, the Jewish diaspora for Israel, etc.).

Macro-coordination in the economy manifests itself in the creation of transnational corporations doing business in neighbouring countries and regions on preferential terms, the acquisition of foreign assets, etc.

Macro-coordination in governance is diagnosed as an increase in dependent territories, the formation of political and military megaregions with a leading position for a given region or country, and the spread of governance decisions to dependent countries and regions.

Stabilisation is diagnosed by the achievement of maximum indicators in natural resources, population, economy, and management. All quantitative indicators stabilise, and growth is zero.

Micro-coordination is determined by a reduction in the external influence of the country (region). Degradation is determined by the destruction of internal ties and communications. Decline is determined by a reduction in all quantitative indicators. Death is determined by the cessation of the country's functioning as a single entity.

Let us diagnose the current stage of existence of Moscow, Tatarstan and the Chukotka Autonomous Okrug (2010-2015).

In Moscow, the natural subsystem has expanded following the annexation of New Moscow, the social subsystem is growing, the economy is stable, and governance is stable. This means that Moscow as a region is currently in a stage of growth and stabilisation, i.e. on the upward part of the life cycle curve.

Tatarstan is in a slightly worse condition. The natural subsystem is degrading, the social subsystem is growing, the economy is growing, and governance is stable. The growth in natural resource consumption is worsening the state of the natural subsystem, so environmental problems in the republic will increase in the near future. The difference in the state of the subsystems is greater than in Moscow – from economic growth to environmental degradation – so it is time for regional management to take effective decisions, otherwise deviations from the normal life cycle are likely.

In the Chukotka Autonomous Okrug, the natural subsystem is stable, the social subsystem is declining, the economy is stable, and governance is stable. Overall, this indicates a possible negative trend for the entire region if the population does not begin to grow.

Thus, in the dynamics of countries and regions, it is necessary to assess the state of all four subsystems in order to make a reasonable conclusion about the stage of the region's existence and a forecast of its future state. The most general assessment is the positive (stages 1-5), stable (stages 6-8) or negative (stages 9-12) state of the region. From the point of view of the overall state of the region, the state of all four subsystems are of equal importance. However, for the regional economy, the state of the region's economy is of paramount importance. Therefore, we will focus on assessments of the region's economy as the accumulated result of economic activity and on the current economic process.

Conclusions for Chapter 3:

- 1. The regional economy is only part of the regional system. Therefore, understanding the structure and dynamics of the regional economy is only possible within the framework of understanding the specifics of the entire regional system.**
- 2. The life cycle of a region includes 12 stages: Emergence, Growth, Development, Macro-coordination, Stabilisation, Micro-coordination, Degradation, Decline, Death, and Decomposition. Emergence begins with the**

process of pioneering development of the region's territory, and death occurs as a result of the population's inability to remain in the region.

3. The subsystems of a region may be at different stages of existence, so it is methodologically difficult to determine a single stage of existence for a regional system. It is easier to determine one of three macro-stages: complication, stabilisation or simplification.

4. The art of regional management consists in maintaining the regional system at the macro-stage of complexity for as long as possible and making timely decisions to move individual subsystems of the region from the macro-stage of simplification to the macro-stage of complexity. However, this often requires extraordinary efforts and revolutionary reforms.

5. The "regional economy" subsystem is of paramount importance for research in the field of regional economics, but the state of the regional economy must be understood in the context of the state of the entire regional system. Therefore, regional economic analysis must be preceded by a nationwide and regional analysis that provides a clear picture of the state of the environment, population, economy and governance of the country and region.

6. It is also impossible to understand the regional economy outside the vertical structure: region-country-world. Therefore, the state and dynamics of the national economy, the international economy and the global economy are also extremely important for making informed conclusions and proposals for the development of the regional economy. We will discuss this in the next chapter.

Chapter 4. The regional economy: one object and two subjects of study

4.1. Understanding the "regional economy"

4.2. The well-being of the region's population

4.3. Production capabilities of the region's economy

4.4. Dynamics of the region's economy. Regional economic process.

4.5. The regional economy – two subjects of study

Main idea of the chapter: The economy (economic activity) of a region is the accumulated result of the economic activity of the region's population (regional economic process) on a specific date. The economy of a particular region in January 2015 will differ from the economy of the same region in January 2016 by the amount of the results of the regional economic process in 2015. The economy of the region in 2016 will differ from the economy of the same region in 1913 by the amount of the result of the regional economic process for 1913-2015. The economy of the region includes two components: the well-being of the population and production capabilities (capital). The main goal of the regional economic process is to increase the welfare of the region's population, which is only possible with capital growth. The main means of achieving this dual goal (welfare growth and capital growth) is the creation of an artificial world (Technology) that compensates individuals, groups of people and the entire population of the region for natural and social discomfort. I see the fundamental difference between economic and non-economic activity in the fact that economic activity increases the physical comfort of human existence and life expectancy, i.e. it corresponds exactly to the theory of existence and the laws of non-equilibrium thermodynamics. Non-economic activity may have other priorities, up to and including human self-destruction.

The analysis of a region's economy in the context of its interaction with other subsystems of the region is the subject of regional economics as a regional science. The analysis of a region's economy as part of the national and global economy is the subject of regional economics as an economic science.

4.1. Understanding the "regional economy"

The main idea of the paragraph: the regional economy should be viewed as the consolidated result of a long-term regional economic process aimed at increasing the well-being of the population and production capabilities by creating an artificial world in the region.

The main long-term product of human economic activity is the artificial world, or artificial environment. If nature and society provide humans with everything necessary for their existence, then there is no need for an artificial world. If the natural and social conditions of human existence constantly create a problem of survival, then the need for an artificial world as a substitute (supplement) for Nature and Society increases dramatically. Consequently, the significance of economic activity increases in those regions of the Earth where Nature and Society, as the natural world, pose a threat to human existence. Since the natural world

provides optimal conditions for human existence at the equator and the most extreme conditions at the poles, the need for an artificial world will increase as we move from the equator to the poles of the Earth.

The main component of the artificial world is Technology. I will refer to Technology as everything material that humans create through their labour (material culture). Clothing, footwear, packaging, containers, machines, equipment, buildings, structures, tools, computers, robots – all of these are Technology. Modern food products, beverages and other consumer goods that have undergone technological processing can also be classified as Technology. The fundamental feature of Technology is that its production capabilities or consumer characteristics must ultimately exceed those of its natural or social counterparts, otherwise there would be no point in creating Technology.

The effectiveness of technology is determined primarily by its ability to eliminate natural or social discomfort, in accordance with the rules of existence outlined in the previous chapter. This ability includes: 1) maintaining the water-temperature balance of the human body; 2) ensuring maximum spatial expansion (speed of movement and control over territory); and 3) ensuring human complexity, including increasing the unpredictability of behaviour for competitors.

In addition to technology, **the second component** of the artificial world is technically modified natural objects and people. For example, a dam is a technical structure, and the reservoir created by this dam is a natural-technical object (eco-technology). A person who uses technical products in their activities, up to and including the implantation of technology in the human brain and body, is also already a socio-technical object (socio-technology).

The third component of the artificial world is intellectual objects, such as analogues of real objects (models), as well as knowledge, information, rules of behaviour in the artificial world, means of exchange (money, cryptocurrencies, etc.), computer programs, etc.

So, **the artificial world consists of: 1) Technology; 2) Eco-technology and Socio-technology; and 3) Intellectual objects (technical information).** The global trend is that as humanity spreads and the Earth's population grows, the artificial world (technosphere) occupies more and more space on the Earth's surface, displacing the natural world. Nature and society, included in the artificial world, are transformed into eco-technology and socio-technology. Technical (economic) man creates a technical barrier between himself and the natural world and expands the space of his existence by moving this barrier to new territories. From this point of

view, the degree of development of a region's economy will show the degree of transformation of the region's natural world into an artificial world.

The creation of an artificial world in a region can be caused by three main reasons: the internal needs of the region's population, the needs of the external population, and the need for expanded reproduction of the artificial world itself (technology for technology's sake). Meeting the internal needs of the region's population requires the comprehensive, balanced development of the region's economy, providing a full range of goods and services specifically needed by the region's population. Meeting the needs of the external population leads to the specialisation of the region's economy in the production of products that have an absolute, comparative or competitive advantage in the country's or world economy. At the same time, the region's economy can develop as a single-profile economy, disrupting the balance between the natural and artificial worlds of the region. The reproduction of the artificial world also leads to narrow specialisation of the region's economy, since the artificial world develops as a global system in which the artificial world of each region performs a specific function.

Thus, the economy of a region as an artificial world of the region is created by the population to compensate for all kinds of discomfort and includes technology, a technically modified population and nature, and technical information. The level of economic development of a region can be assessed by the degree of spread of the technosphere (the share of land of all types of economic use in the total area of the region, including land in populated areas), the level of well-being of the region's population (the degree of artificial comfort), the productive capacity of the region's economy (the capacity to create an artificial world), and the dynamics of the region's economy (the speed of creation and spread of the artificial world). Let us discuss the level of well-being, production capabilities and dynamics of the region's economy in more detail.

4.2. Well-being of the region's population

The main idea of this paragraph: the main goal of economic activity is to ensure the existence of the population and the growth of its economic well-being

Human existence involves three basic negative and three basic positive levels of existence. The negative levels include: - 1.Existence as survival (constant threat of death); 2.Existence as suffering (constant pain); 3.Existence as discomfort (constant feeling of discomfort). The positive levels include: 4. Neutral (balanced) existence (without positive or negative sensations); 5. Comfortable existence (constant feeling of comfort, pleasure); 6. Happy existence (constant feeling of happiness).

The primary sources of discomfort (suffering) are Nature and Society. Secondary sources of discomfort are the Economy and Management themselves.

The main types of natural discomfort are: 1) unfavourable natural and climatic conditions; 2) lack of natural resources; 3) pollution and negative changes in the environment; 4) lack of space.

The main types of social discomfort are: 1) crime, including war; 2) the spread of disease; 3) dangerous behaviour; 4) restrictions on social functions (love, marriage, childbirth and upbringing, friendship, etc.).

The main types of economic discomfort include: 1) a shortage of consumer goods and services; 2) high prices for goods and services; 3) economic inequality; 4) technological imperfection and resistance to innovation.

The main types of managerial discomfort include: 1) insufficient production of public goods; 2) inaccessibility of public goods; 3) poor quality of regulation of the interaction between nature, society and the economy (institutional problems); 4) instability of the management system.

It can be assumed that economic activity will be primarily aimed at eliminating the above types of discomfort, and even more so, suffering and the threat of death. This can be called a mandatory task of the economy. An additional task is to achieve a neutral state, as well as a state of constant comfort and happiness.

The level of well-being and economic development of a territory can be judged by the level of existence of the region's population (from 1 to 6). Since each region of the country and the world will have a unique combination of types of natural and social discomfort, the economy of each region will be a unique combination of artificial world objects that solve specific problems.

It should be added that objects of the artificial world can also be a source of discomfort, suffering, and even death. This occurs when economic development is given a different meaning, such as the pursuit of profit. In this case, the artificial world is not a means of comfortable existence, but a means of generating income and profit at any cost, including the cost of lost human lives. The transition to a profit-driven economy in Russia in the 1990s led to the loss of 20 million lives. Therefore, the search for an economic system that effectively addresses the task of improving the quality of life of the population in all four possible sources of discomfort – natural, social, economic and managerial – is still ahead. Germany, Switzerland, Austria and a number of other Western European countries have come closest to creating such a system. The economic successes of the European Union as

a megaregion of the world were primarily linked to the spread of the German economic model to countries joining the EU.

Methods for specific assessments of regional prosperity require special consideration in the second monograph (Theory of Regional Economics).

4.3. Production capabilities of the region's economy.

The main idea of this paragraph is that in order to understand the extent to which the region's economy solves not only intra-regional but also extra-regional tasks of providing for the population and the expanded reproduction of the artificial world, it is necessary to analyse the productive capabilities of the region's economy.

Thus, the regional economy has three objectives: 1) the welfare of the region's population; 2) the partial welfare of the extra-regional population; 3) the expanded reproduction of the artificial world.

To understand the possibility of achieving these goals, it is necessary to understand the productive capabilities of the region's economy. These include economic sectors as production systems and factors of production as resources for these production systems.

In my opinion, there are five sectors of the economy and eight main factors of production. I will discuss the author's sectoral-factor theory of regional economic development in detail in my second monograph. Here, I will only mention the sectors and factors themselves.

So, humanity has invented five main types of production systems: 1) primitive economy; 2) agrarian economy; 3) industrial economy; 4) service economy; and 5) information economy. Primitive and agrarian economies provide the population with products of biological origin. Industrial economy provides the population with technological products and creates Technology. Service economy produces changes in Man, Nature and Technology. Information economy produces technical and economic information and other types of information (social, environmental, managerial). Returning to paragraph 4.1, the industrial economy produces technology itself, the service economy mainly produces socio-technology and eco-technology, and the information economy mainly produces technical information. The key sector producing the basic objects of the artificial world is the industrial sector of the economy. Therefore, the production capabilities of a region's economy

will primarily be determined by the level of development of the region's industrial sector.

Each sector of the economy requires factors of production as resource components of the production process.

A primitive economy requires natural ecosystems that produce ready-to-use products such as fish, berries, etc.

Agricultural economies require natural conditions and resources (agro-climatic resources, domesticated plant and animal species, soil, pastures, etc.), labour resources (with appropriate professional training), and technology (in the form of agricultural machinery and tools).

For industrial farming, the main factors of production are natural resources (mineral reserves, hydropower resources, etc.), trained labour resources, equipment, and financial capital.

The service economy also requires natural conditions and resources, labour resources, technology, financial capital, as well as infrastructure and institutions.

The information economy requires natural resources (electromagnetic fields and radiation), labour resources, technology, financial capital, infrastructure, institutions, as well as information and innovation.

A detailed explanation of the composition of production factors for each sector of the economy will be given in the second monograph. For now, I will only note that the number of factors required for more advanced sectors will constantly grow, so the production capabilities of a region's economy will depend not only on the presence of sectors as existing production systems, but also on the presence of factors such as production resources.

Changes in the production capabilities and welfare of the region's population are the result of the regional economic process. The monetary equivalent of the result of the annual regional economic process is the gross regional product (GRP) indicator. In Russian statistics, GRP is calculated not by sector, but by type of economic activity. The relationship between economic sectors and types of economic activity will be explained in the second monograph.

4.4. Dynamics of the regional economy. Regional economic process.

The main idea of this paragraph is that the dynamics of the regional economy are assessed based on trends in the level of well-being of the region's population and trends in production capacity. The possibility of revolutionary changes in the regional economy must also be taken into account.

A strategic assessment of changes in the level of well-being is achieved by studying the trends in the transition between levels 1 and 6 of the well-being of the region's population.

Methodological issues related to such assessments will be addressed in the second monograph. Here, I will only note that, first, it is necessary to identify all types of natural, social, economic, and even administrative discomfort in the region, determine the level of discomfort for each type on average for the region and for the main social groups (by income level) with a difference of five and ten years. Based on these assessments, it is possible to make a forecast for the next five and ten years and identify the main problems for the future well-being of the region's population in terms of specific types of discomfort.

As for assessments of the region's economic production capacity, it is necessary, first of all, to study changes in the region's factor potential (all factors of production) over ten-year, thirty-year, sixty-year and hundred-year periods, since the impact of factors on the development of economic sectors has long-term and ultra-long-term effects. Based on trends in changes in factor potential, it is possible to forecast changes in factors in the coming decades and, on this basis, to forecast the development potential of economic sectors and types of economic activity in the region.

For strategic forecasting of the production capabilities of the region's economy, the life cycle concept can also be used, as applied to the regional system as a whole and to the economic subsystem of this system. In particular, this concept can be applied to the diagnosis of the state of economic sectors, determining the stage of existence for each of them and drawing conclusions about the sector's transition to the next stage of the normal life cycle.

It is extremely important to determine the possibility of deviations from the normal life cycle of each sector, the entire economic subsystem and the entire regional system.

Finally, all calculations of the dynamics of the region's economy should be based on demographic forecasts and calculations showing changes in household demand and human capital.

In addition to normal trend forecasting, it is necessary to take into account possible revolutionary changes in the economic subsystem and the entire regional system in the event of revolutionary changes in nature, society, the economy itself, and in the management of a given region, country, or even megaregion.

There is a great deal of contradictory writing about possible revolutionary changes. In nature, these range from a new ice age to a new Jurassic period and the return of the dinosaurs; in society – from a return to cavemanism to the total cyborgisation of humanity, in the economy – from a new phase of global growth to continuous depression, in governance – from continuous democratisation to the creation of a totalitarian global government. In this regard, I will mention only one factor of revolutionary change, which I will take into account in the future when presenting the theory of regional economics. This is the factor of experimental (fantasy) labour.

Human labour is an essential part of the economic process. It can be divided into normal (objective) labour and experimental (subjective) labour.

Normal labour is associated with the fulfilment of the rules of existence, as explained in Chapter 3. In normal labour, a person clearly understands their desires or obligations, calculates the algorithm of labour activity, and applies their will and strength to achieve the goal.

Experimental (subjective) labour is associated with fantasies. Every person, social group, and even a nation may have their own fantasies, which can also be a motivation for labour, but few people are interested in why a person does this, what the end result will be, how justified it will be, or whether it will lead to the loss of life. The behaviour of a person who solves subjective tasks can be called "experimental" behaviour.

Normal labour has **a goal** – to ensure the existence of humans and society, **tasks** – to maintain water and temperature balance, maintain complexity, ensure spatial expansion and control over territories, and **means** – tools of labour and organisation of labour. Normal labour is rational, calculable, understandable.

Experimental (fantasy) labour is aimed at realising fantasies. The search for an earthly paradise, the land of El Dorado, the construction of pyramids and other religious buildings, flights to Mars, the creation of Neuschwanstein Castle, the

Sagrada Familia in Barcelona, and other examples of fantasy labour are numerous. Some of these examples bring about civilisational revolutions, some are forgotten forever, but the need for this type of labour is obvious, despite its irrationality (in the sense that the results of such labour are extremely distant for the creators of fantasies).

Thus, the economy of a region is created by normal (objective) and experimental (subjective) labour. Dangerous rationalism lies in the idea of supporting only normal labour, since it solves the immediate problems of society's existence. Dangerous idealism lies in the idea of supporting only fantasy labour aimed at creating a distant bright future (communism). Support for experimental labour is extremely important for accelerating economic development, since in the course of experimental economic processes (venture, creative business), the economy finds completely new solutions to old problems and opens up unprecedented prospects. The very emergence of economic sectors and factors of production is also the result of experimental labour, when new opportunities arise in place of old problems. The art of governing a country and a region also requires the use of experimental labour, when a third world country is replaced by a first world country (Singapore) in 35 years.

Historical trends in economic development show that the share of experimental labour in the total volume of labour is constantly increasing, and the share of virtual production in the total volume of experimental labour is constantly increasing. Therefore, research into the dynamics of regional economic development must necessarily include research into experimental labour in the region (invention, science, art, venture business, etc.). The share of such labour will be higher in societies with a high population concentration, since in such conditions, the demand for the products of experimental labour will be higher.

For some regions, experimental labour will yield greater economic results than normal labour. This applies to capital cities and centres of the "creative" economy. However, in the overall result of economic activity, the results of experimental labour cannot exceed 20-40%, otherwise humanity would be on the brink of survival. The historical trend is that as survival issues are resolved, people's inclination towards experimental labour will increase, reaching 100% in areas of the world such as Hollywood (the fairy tale factory).

Now let us consider the regional economic process as a whole. It includes eight main stages: a) awareness of economic needs by the population of the region; b) creation of the potential to meet these needs (factors of production); c) organisation of production; d) production (sectors of the economy and types of

economic activity); e) distribution; f) exchange; g) consumption; h) accumulation and investment. Three stages of this process have already been considered: b) factors of production, d) production (economic sectors) and g) consumption (level of well-being). It should be borne in mind that all other stages of the regional economic process must also be studied, since difficulties may arise at each stage that hinder its full implementation and reduce the effectiveness of the process for solving the region's economic problems. The REP will also be examined in more detail in the second monograph.

A full analysis of the dynamics is impossible without taking into account the substrate – the shadow economy. In some countries, the share of the shadow economy can reach 50-70%, and in some regions of the world – 70-90% (regions with drug production). Therefore, expert assessment of the level of development of the shadow economy must be included in the dynamic analysis in order to obtain objective conclusions about the state, problems and prospects of the region's economic development and the well-being of the population.

Based on general ideas about the region's economy, let us consider the subjects of study of regional economics as a regional science and as an economic science.

4.5. Regional economy – two subjects of study

So, the regional economy is the sum of the accumulated welfare of the population and the productive capabilities of the regional system (capital). Let us consider the research questions that arise when analysing the regional economy as part of the regional system and when analysing the regional economy as part of the national and global economy.

a) When studying the regional economy as a subsystem of the regional system (region), research questions come to the fore that can be grouped into five main themes corresponding to the concept of the fundamental structure of the region: 1) the role of the regional economy in the existence of the regional system as a whole; 2) the interaction of the economic subsystem with the natural subsystem; 3) the interaction of the economic subsystem with the social subsystem (the region's population); 4) the interaction of the economic subsystem with the region's management subsystem; 5) the development of the region's economy as a self-sufficient intraregional complex. These issues will be discussed in detail in the next chapter.

b) When studying the regional economy as a subsystem of the national and global economies, the following research questions come to the fore, also grouped into five main themes: 1) the regional economy as a group of municipal economies; 2) the role of the regional economy in interregional economic interactions; 3) the role of the regional economy in the national economy; 4) the place of the regional economy in the megaregional and continental economy; 5) the position of the regional economy in the global economy. These issues will be examined in detail in Chapter 6.

Conclusions to Chapter 4.

1. The regional economy is the subject of regional economic research. The regional economy should be understood as the result of a long-term regional economic process that creates the well-being of the region's population and production opportunities (capital). The economy is created by human labour (economic activity). The main motives for labour are: a) compensation for natural and social discomfort (normal, objectively necessary labour); b) imagination (experimental, subjective labour).

2. The level of economic compensation for natural and social discomfort can be called the level of economic well-being. It can be defined semi-quantitatively – from level 1 (life on the brink of death) to level 6 (happy life).

3. Economic activity in the region (regional economic process) can solve welfare problems not only in this region, but also in other regions. This depends on the productive capacity of the region's economy. Productive capacity is determined by the presence of economic sectors and factors of production, as well as the degree of their annual utilisation – from 0 to 100%. Meeting the internal needs of the region's population requires comprehensive development of the region's economy. Satisfying external needs leads to the specialised development of the region's economy within the framework of the national, megaregional and global economies and requires an increase in the competitiveness of regional production from the intraregional and interregional levels to the national, megaregional and global levels.

4. In addition to meeting the needs of the region's population and the external population, the production capabilities of the region's economy are focused on the expanded reproduction of the global artificial world as a given that has its own interests, apart from the interests of society. Technology is created not only

for humans, but also for technology itself. This aspect of the functioning of the region's economy must also be taken into account in research.

5. The central question of research into the region's economy is to determine its dynamics. Dynamics can be determined by changes in the level of well-being of the region's population, changes in factor potential, changes in the sectoral structure of the economy, total production (GRP), stages in the life cycle of the economic subsystem and individual sectors of the economy, and changes in the positioning of the region's economy in the national, megaregional and global economies. A detailed picture of the dynamics of the region's economy can be obtained by studying the regional economic process as a set of stages of awareness of the economic needs of the region's population, creation of factor potential, organisation of production, production, distribution, exchange, consumption, accumulation and investment. Problems that slow down this process at any of the stages listed above lead to a slowdown in the entire process and a lag in the region's economic development.

6. The regional economy, considered as part of the regional system, is the subject of study of regional economics as a regional science. The regional economy, considered as part of the national and global economy, is the subject of study of regional economics as an economic science. Each of these subjects requires its own research programme, although three key research questions: 1) the welfare of the region's population; 2) the region's production capabilities; and 3) the region's economic dynamics will be present in both programmes.

Chapter 5. Regional economics as part of regional sciences.

5.1. The role of the regional economy in the existence of the regional system as a whole

5.2. Interaction between the economic subsystem and the natural subsystem

5.3. Interaction between the economic subsystem and the social subsystem

5.4. Interaction between the economic subsystem and the management subsystem.

5.5. The role of the economic subsystem in the formation of a self-sufficient regional complex

The main idea of the chapter: studying the economy of a region as part of a regional system requires the exchange of information with other regional sciences, regional studies, country studies and geography. This is necessary to understand the interaction between the subsystems of the region, especially to understand the role of the economic subsystem in the life of the region and the influence of all other subsystems on the functioning of the region's economy.

5.1. The role of the regional economy in the existence of the regional system as a whole

The study of **the mutual influence of the economic subsystem of the region and the regional system is a central research question** of regional economics as **a regional science**.

It is economic growth that makes a region attractive to the population, tourists, the media, investors, researchers, etc. While the Kaluga Region was a depressed region, few people were interested in it, and its residents tried to move to the Moscow Region or Moscow. As soon as the implementation of extremely interesting projects for the development of the automotive and pharmaceutical industries began under the leadership of Governor A. Artamonov, the population stabilised, migrants began to arrive, and housing projects, agricultural projects, etc. began to be implemented.

The revival of Chukotka began with R. Abramovich's economic projects.

The Krasnodar Territory experienced the strongest impact of economic projects under Governor A. Tkachev.

The Belgorod Region has been a consistent leader in economic growth under Governor Savchenko.

Tatarstan has consistently strengthened its economic subsystem under Presidents M. Shaimiev and R. Minnikhanov.

All these regions have focused on the growth of the economic subsystem even in the most unfavourable macroeconomic conditions and are developing successfully. Therefore, it can be said that it is the economic subsystem and the regional management subsystem that currently play a decisive role in the positive state of the regional system as a whole (at stages of complexity).

If a region is moving towards stages of simplification, then most likely something is wrong with the management subsystem and the economic subsystem.

We can even say that the state of the region's economy is one of the most important indicators of the state of the entire regional system as a whole.

Statistically, the growth of economic subsystem indicators (output growth) should correlate with the growth of indicators of the state of other subsystems in the region and some generalised indicators for the regional system as a whole. These indicators include: a) the migration and tourist attractiveness of the region; b) life expectancy in the region; c) the investment attractiveness of the region; and d) the information attractiveness of the region. I will now move on to the question: What are the characteristics of the interaction between the economic subsystem and other subsystems in the region?

5.2. Interaction between the economic subsystem and the natural subsystem

Natural discomfort is the main motivator for economic activity in the region. At present, there are no attempts to conduct a systematic assessment of all types of natural discomfort in the regions of Russia. Such assessments can be provided in part by medical geography and in part by economic geography, but the resources allocated to scientific research do not identify this topic as a priority, which deprives us of scientific facts and, consequently, opportunities for quantitative analysis.

Four main types of natural discomfort were previously identified: 1) unfavourable natural and climatic conditions; 2) lack of natural resources; 3) pollution and negative changes in the environment; 4) lack of space. Consequently, the development of the region's economic subsystem should be aimed at eliminating these types of discomfort. Unfavourable natural and climatic conditions are dealt with by the housing and utilities sector, the production of household appliances, clothing, footwear, food and beverages. The problem of natural resource scarcity is being solved by the development of geological exploration and the extractive industry, energy, water management, forestry and other resource-extracting economic activities. Pollution and negative changes to the environment as a result of natural processes are compensated for by the activities of the Ministry of Emergency Situations, the Ministry of Natural Resources, and other ministries and departments. The key problem is the growing shortage of spatial resources. This problem is particularly acute in small countries, where every piece of land is extremely valuable. In Russia, vast undeveloped territories make this problem insignificant, and only in the capital region do land prices already prevent its extensive use.

Thus, natural discomfort motivates the development of all key types of economic activity in the region.

In short, the interaction between the economic subsystem and the natural subsystem can be described as compensation for natural discomfort through the extraction of resources from the natural subsystem and the creation of local points of artificial comfort (cities and settlements).

I will now move on to describing the interaction between the region's economy and the social subsystem.

5.3. Interaction between the economic subsystem and the social subsystem

The region's population (social subsystem) plays three roles in its interaction with the economic subsystem. The first role is as a source of demand for artificial comfort, and therefore for the products of the economic subsystem. The second role is as a creator of discomfort for its own existence, for a variety of reasons, but primarily due to abnormal behaviour and an inability to think in terms of compromise. The third role is as a creator of artificial comfort (as a labour resource or human capital).

As a source of demand, the social subsystem stimulates the development of the economic subsystem in two cases: a) in the case of physical population growth, and b) in the case of the pursuit of a higher level of well-being. In the first case, the demand for the quantity of goods and services increases, and in the second case, the demand for the quality of goods and services increases. A decline in population and living standards leads to the degradation of the economic subsystem.

As a source of discomfort for its own existence, the population of the region also affects the functioning of the economy. Let me remind you that the main types of social discomfort are: 1) crime, including wars; 2) the spread of disease; 3) dangerous behaviour; 4) restriction of social functions (love, marriage, childbirth and upbringing, friendship, etc.). The overwhelming majority of criminal acts are aimed at redistributing economic benefits between social groups or individuals. To suppress crime, a system of public security and defence is necessary as protection against external encroachments. To prevent the growth of disease, healthcare is necessary; to prevent dangerous behaviour, the development of culture and education is necessary; to combat the restriction of social functions, state and public protection of human rights, the fight against discrimination and cults is necessary. Virtually all of the activities listed above are clearly related to economic activity, if only because they involve the use of technology. Video surveillance, special

equipment, information technology and other components of the economic subsystem are used particularly actively.

The third role of the population – as a labour resource – is extremely important for the economic subsystem. A shortage of labour resources in terms of quantity or quality limits the growth of the economic subsystem, while a surplus stimulates growth. The quality and quantity of labour resources are reproduced by the population with the active participation of education and healthcare, so the economic subsystem can directly influence this role of the region's population.

Thus, demographic dynamics, mentality and behaviour of the population have a strong influence on the economic subsystem and are themselves strongly influenced by the region's economy. Russian regions differ significantly in terms of economic development, not only for natural reasons, but also for social reasons.

5.4. Interaction between the economic subsystem and the management subsystem.

The main task of the management subsystem in the region is to support the longest possible existence of the entire regional system at the stages of complexity (growth, development, macro-coordination and stabilisation), for which it is necessary to regulate the balanced existence of all four subsystems. For example, when the social subsystem grows (population increase), the economic subsystem must grow at least at the same rate just to maintain the existing average level of well-being. If the social subsystem moves to the development stage (increase in internal connections), the economic subsystem must receive a clear signal about new priorities in the form of preferences for types of economic activity that serve social connections (transport, communications, media, culture, etc.). If the social subsystem enters a stage of decline (population decline), the economic subsystem can be used to stimulate birth rates, reduce mortality, encourage migration, provide assistance to large families, etc.

The positive impact of the management subsystem can be replaced by a negative impact if the management subsystem aims to destroy the regional system through deregulation, making false management decisions, deceiving the population, and in other cases.

The main types of management discomfort created for the population include: 1) insufficient production of public goods (including security, education, information, etc.); 2) inaccessibility of public goods for certain social groups or for the majority of the population; 3) poor quality of regulation of the interaction

between nature, society and the economy (institutional and professional problems); 4) instability of the management system; 5) violation of human rights, including the right to participate in the work of the management subsystem.

The management subsystem can also create discomfort for economic activity. For example, it can act as a "robber," withdrawing resources from the economic subsystem and directing them to personal consumption, including the transfer of resources to other regions and countries. However, it can also act as a "creator," attracting external resources to the economy of its region and stimulating internal economic activity. Thus, the impact of the management subsystem on the economic subsystem can have completely different results.

Highly professional managers who are patriots of their region tend to have a positive impact on the regional system and the region's economic subsystem. Cynical "outsiders" tend to "plunder" the region. There may also be the opposite scenario, where a "quasi-patriot" hinders innovation, while an "outsider" promotes innovation and breathes new life into the region. Therefore, the socially responsible formation of the management subsystem and public control over its functioning are the key to the long-term and successful existence of the regional system, especially in the context of its comprehensive development.

5.5. The role of the economic subsystem in the formation of a self-sufficient regional complex

One of the most difficult issues in regional management is choosing between two economic strategies: a strategy of specialisation or a strategy of comprehensive development.

The specialisation strategy makes the economic subsystem single-industry and highly productive, which allows it to compete successfully in national and global markets. However, if an even more specialised region appears on the market, or if demand declines, such an economy sharply loses income and the level of well-being of the population. The development of the Russian economy as an oil and gas economy in the 2000s has led to a situation where only one indicator – the price of crude oil on the global market – allows for an accurate diagnosis of the state of the entire economy and the welfare of the population. At a price of around \$100 per barrel of oil, the Russian economy flourishes; at \$50 per barrel, it stagnates; and at lower prices, it falls into depression.

It is for this reason that Saudi Arabia, which in the 1970s was completely dependent on crude oil sales, began to develop a diversified economy, which now

includes all vital sectors – from energy and water management to agriculture, manufacturing, transport, banking, etc.

If Moscow were to lose its capital functions now, it could be abandoned by the financial and banking sector, luxury real estate developers, high-end retailers, sports clubs, around a million people associated with federal government agencies (officials and their families), the media, etc. This would lead to economic collapse in Moscow.

The vulnerability of specialised regions to external shocks requires the creation of an economic complex with reserve self-sufficiency capabilities in the region. Therefore, the choice between specialisation and complexity of the economic subsystem, between risk and stability, is extremely important for the functioning of the entire regional system, and each region must decide for itself. In essence, each region must choose between its own harmonious development and national specialisation. It is this choice that distinguishes regional economics as a regional science (harmonious development of the regional economy) from regional economics as an economic science (national or international specialisation and high risks).

Conclusions to Chapter 5.

- 1. The key research questions of regional economics as a regional science are the welfare of the region's population and the productive capabilities of the region's economy in the context of the interaction of the economic subsystem with the natural, social and administrative subsystems, as well as in the context of the dynamics of the entire regional system as a complex object of development.**
- 2. The economic subsystem currently plays a crucial role in the development of the entire region. It can accelerate both the growth of the regional system and its degradation and is the most important instrument of the management subsystem in ensuring the long-term existence of the region during periods of complexity.**
- 3. The development of the economic subsystem is largely determined by the need to compensate for the natural discomfort in the region by extracting and using natural resources.**

4. The development of the economic subsystem must be sensitive to the demographic dynamics of the social subsystem, increasing output when the population grows and reducing it when the population declines.

5. The development of the economic subsystem is strongly influenced by the administrative subsystem, which is capable of "plundering" the region, "slowing down" economic development, or creating additional opportunities for the growth of the economic subsystem.

6. Specialised development of the regional economy can lead to growth in prosperity and labour productivity, but there are high risks of fluctuations in external demand. Therefore, comprehensive development with a certain degree of specialisation creates stability in the regional economy and the regional system as a whole. Regional economics as a regional science has been advocating this idea for 40 years (1975-2015).

Chapter 6. Regional economics as part of economic sciences

6.1. Regional economics and national economics (the problem of specialisation)

6.2. Interregional economic ties

6.3. The influence of national macroeconomic regulators

6.4. The influence of continental and global regulators

6.5. The influence of big business

6.6. Economic differentiation of regions

The main idea of the chapter: regional economics, as part of economic science, studies the economic subsystem of a region exclusively as part of the national and global economy, as well as a collection of municipal economies. The most important issues are the economic specialisation of regions (at the national, continental and global levels), interregional interactions, the influence of national (Ministry of Finance, Central Bank, Ministry of Economy, ministries and departments) and global regulators (International Monetary Fund, World Bank, World Trade Organisation, global markets) on the development of regional economies, the influence of regional economies on the development of national and global economies, economic and socio-economic differentiation of

regions, and tools for solving economic development problems. Another important topic is the interaction between regional economies and municipal economies (especially cities).

6.1. Regional economy and national economy (the problem of specialisation)

The main idea of the paragraph: the main goal of the national economy is to create a self-sufficient, independent economic system that provides the country's population with all the basic types of artificial comfort at a certain level (from 1 to 6) and constantly increases its production capabilities. Self-sufficiency implies a division of labour between regions with subsequent exchange, and therefore clear specialisation of regions.

The larger the territory of the country and the more diverse its resources and conditions, the more diverse the population and its requirements for comfort, the greater the predisposition for specialised regional development. Each region has some kind of competitive advantage that is beneficial to exploit on a national scale. In addition, some functions do not allow for duplication (e.g., capital functions).

The country should have a brain region, a heart region, a stomach region, a kidney region, a liver region, an arm region, a leg region, and so on, right down to a reproductive system region and a rectum region. All regions must be connected by the circulatory system (transport), the nervous system (communications), and the lymphatic system (security). If the heart region is also given the function of the stomach, then the country as a whole will begin to malfunction. The same disruptions would occur if there were two brain regions or two heart regions. This is, of course, a simplified understanding of the country as an organism, but nevertheless, there is a certain logic to this understanding. If all regions start producing oil, who will grow bread, catch fish and teach children?

State authorities create the national economy as a self-sufficient complex in which each region has its own role. This role can be called the "**national (state) function of the region.**" In the use of regional resources, the fulfilment of national functions has absolute priority. In periods of national survival, all resources of all regions can be directed exclusively towards the fulfilment of national functions. Survival requires greater political centralisation and dependence of regions on a single centre, which leads to a higher level of specialisation of regional economic systems. The USSR had a rigid centralised management system that determined the so-called "all-Union" specialisation for each republic and region. The products of large specialised enterprises had an all-Union sales market; for some types of

products, it was even a "socialist sales market" (weapons) or a global market (fuel and energy resources). When the USSR collapsed, the huge drop in the country's economic production capacity was mainly due to the collapse of markets and production and technological links between specialised enterprises. No one can rule out the collapse of any country at any time. Therefore, the risk of a contraction in a region's economic subsystem is directly proportional to the level of specialisation of the region's economy.

What can be considered the optimal solution for the distribution of resources between national and intraregional goals? If national goals are interpreted as a percentage (share) of the irrevocable withdrawal of regional resources, then it can vary from 100% in the case of ultra-strict centralisation of resources to 0% in the case of absolute freedom of the region to use its own resources. The 70-100% range is typical for the survival of the national economy (strict centralisation), the 40-70% range is typical for the implementation of super-large national projects (strong federalism), the 20-40% range is characteristic of a "greenhouse" existence of the national economy (weak federalism), and the 0-20% range shows almost complete freedom of regions from national functions (strong confederalism).

Interestingly, regional authorities also strive for specialisation at the municipal and municipal group levels to ensure the comprehensive development of the region. The distribution of resources between the regional and municipal levels also requires optimal solutions in specific situations.

Thus, specialisation and comprehensiveness are two sides of the same coin. Without regional specialisation, comprehensive national development is impossible. This is the most serious contradiction between regional economics as part of regional sciences (aimed at comprehensive regional development) and regional economics as part of economic sciences (aimed at regional specialisation within the country). The art of regional economics as a coherent science consists in finding the optimal combination of complexity (sustainability) and specialisation (efficiency) of the regional economy.

This art requires a particularly high level of professionalism when taking into account the factor of interregional economic interactions, as well as the position of the region in the supranational economic system.

6.2. Interregional economic ties.

The main idea of the paragraph: the comprehensive development of regions does not require the development of interregional ties; on the contrary, the economy of a region is created as self-sufficient. This means that the

development of interregional ties is closely linked to the specialisation of the economy of a region within a group of regions. The higher the level of specialisation, the greater the need for the development of interregional economic ties. The greatest need for interregional ties arises at the macro-regional level (federal districts, large economic regions, macro-zones).

The specialised development of regional economies requires absolute permeability of interregional borders, absolute freedom of movement of factors of production, goods and services, and free entry into regional and national markets. Regional subsystems extend beyond regional boundaries (natural resources, population, business, management), intermingling with the subsystems of neighbouring regions to create a new spatial "fabric". Regional borders are becoming blurred, manageability, regulation and monitoring at the regional level are declining, and spontaneous self-organisation is increasing.

In a planned economy, such a development was considered unacceptable, so interregional interactions were restrained, and all connections between regions had to be carried out through the Centre (to the extent that all transport flows actually passed through Moscow or macro-regional centres such as St. Petersburg, Rostov, Nizhny Novgorod, etc.) or receive the Centre's "approval." In order to keep the factors of production in the regions, it was necessary to "tie" them to the territory of registration (population), poor border roads (transport links), administrative decisions restricting interregional business activity, etc.

In a market economy, the degree of interregional ties is determined solely by administrative regulation, which is necessary to restrict or stimulate such ties in the case of certain special national or regional tasks. For example, the task of preserving small indigenous peoples or languages and cultures in certain territories requires a reduction in the flow of migrants between regions. The task of protecting a unique ecosystem or species of animals or plants may lead to restrictions on the use of certain natural resources, etc. In modern Russian practice, environmental regulation of interregional economic ties is practically non-existent, while social and bureaucratic regulation, especially in regions with a rigid management system and pronounced clan priorities, is of significant importance.

A mixed economic system should provide an optimal combination of economic freedom and self-organisation with the protection of intra-regional priorities and values. The art of achieving such an optimal combination is the art of regional management.

The optimisation of interregional ties must correspond to at least the Pareto optimum. If at least one region benefits from interregional ties and all the others do not lose out, then the development of interregional ties makes sense. If a certain group of regions constantly benefits from interregional ties, while another group constantly loses out, then we will face increasing differentiation in the levels of economic development of regions and, ultimately, a situation of a "stretched" fleet, where the speed of the lagging regions (ships) will decrease, while the speed of the leading regions (ships) will constantly increase, leading to a breakup of the fleet (national economy) and the emergence of a multitude of negative effects (growth of interregional crime, growth of the shadow economy in weak regions, social conflicts, separatism, etc.).

The most striking example of economic differentiation occurred in Italy, where the agrarian south constantly lagged behind the service-industrial north in its development. The significant financial support provided to the southern regions by the national government in the 1960s-1980s only led to a strengthening of the shadow economy in the south and a reduction in opportunities for the northern regions of Italy, which ultimately made the idea of dividing Italy into two states quite popular among northerners. The situation in the European Union as a megaregion is similar to that in Italy. Northern European countries demonstrated steady economic growth and high-tech development in the 1970s and 1980s, then the EU's strong regional policy supporting southern countries led to income equalisation but reduced economic opportunities for northern countries. When the resources for such a policy were exhausted (2010-2015) and economic stagnation began in the northern European countries, a series of financial crises began in the weak economies of the southern EU countries, which could lead to the collapse of the entire EU.

Two specific scenarios of interregional cooperation should be noted. The first scenario concerns cooperation between regions of different countries separated by a state border. The existence of a border is a serious obstacle to economic contacts, so both border regions are at a disadvantage compared to the central regions of their countries. Many countries try to stimulate economic growth in border regions by granting them special status (removing visa restrictions, customs duties, etc.), but this often leads to the development of smuggling and the transformation of the region into a hotbed of the shadow economy. The second scenario relates to cross-border cooperation, where any region of one country can interact with any region of another country regardless of their border location. The basis for such cooperation may be common problems faced by capital regions, major cities, national-cultural autonomies, recreational regions, old industrial regions, etc. The diversity of reasons for cross-border cooperation and the difficulty of predicting its consequences force

national governments to seriously limit opportunities for cross-border cooperation between regions.

6.3. Influence of national macroeconomic regulators

Main idea of the paragraph: macroeconomic regulation (fiscal policy, monetary policy, employment policy, investment policy), as well as agricultural policy, social policy, regional policy itself and other types of public policy, even defence and security policy at the national and supranational levels, have a huge impact on the development of the region's economy.

As part of the state, the region is strongly influenced by all types of state policy, but above all by macroeconomic policy. Export-oriented or import substitution policies, policies to reduce unemployment or combat inflation, the Central Bank's monetary policy, the Ministry of Economy's public investment policy, and other types of macroeconomic policy have a powerful impact on the economic situation in the regions. Each type of policy pursued in the national interest as a whole provokes a wide variety of, and often unpredictable, reactions at the regional level. For example, a policy of restricting the money supply at the national level may force some regions to resort to external borrowing on global financial capital markets, while others may be forced to curtail economic activity and reduce budget expenditures. Policies to stimulate import substitution may reduce economic activity in coastal regions that serve foreign economic relations and increase activity in the manufacturing and agricultural regions of the central part of the country. Policies to stimulate the birth rate may lead to a sharp increase in the birth rate in underdeveloped regions of the country, as parents will be interested in additional income, and this will subsequently increase the problem of unemployment, while for highly developed regions this measure will prove insufficiently stimulating, etc.

In other words, any action taken by macro-regulators has a multidirectional effect on regional economies, the cumulative effect of which may have consequences that are directly opposite to those expected.

When it comes to the impact of other types of policy (apart from macroeconomic policy) on the state of regional economies, completely unexpected effects may arise. For example, defence and security policy, in general, can limit the economic development of border regions and stimulate the economic development of inland regions. However, with large distances between such regions, it may be extremely advantageous to establish repair bases and production facilities for all types of weapons at a short distance from possible conflict areas.

Education policy, health policy and other types of policy must necessarily have a "regional dimension", since in some regions the reduction of the network of rural schools is acceptable if there are good transport links and the creation of large "quasi-urban" schools, while in other regions, reducing the network of rural schools will lead to the "social desertification" of the territory, when parents without access to educational institutions for their children due to poor road quality will be forced to move to other regions. From the point of view of proper public administration, all political decisions must be "regionally" differentiated, which requires ministries and agencies to have regional development departments (specifications) that accurately calculate the regional effects of a particular political decision. For Russia, with its vast territory and extremely diverse regional characteristics, regional differentiation of national policies is extremely necessary. This regionalisation must be reflected in laws and other regulatory acts.

For open economies, the situation in the continental and global economies, as well as the actions of global regulators (the IMF, the World Bank, the WTO and others) and transnational businesses, have a major impact on the economic development of regions.

6.4. Influence of continental and global regulators.

The main idea of the paragraph: decisions made by continental and global regulators can have a greater impact on the state of the regional economy than the actions of national regulators. And these decisions should be taken into account in studies on the regional economy.

Let me start with a simple example. The decision by OPEC countries in November 2014 to maintain oil production at 30 million barrels per day caused crude oil prices to plummet by \$7, leading to a reduction in Russia's federal budget revenues and a reduction in the revenues of Russia's oil-producing regions by billions of dollars. Russia's decision to impose counter-sanctions against EU countries in response to EU sanctions caused damage to the economies of EU countries amounting to \$40-50 billion in 2014-2015, with EU farms and agricultural regions being the first to suffer these losses. In Spain's tourist regions, revenues from Russian tourism fell by 40% in 2014, and in Greece's tourist regions by 30% as a result of the sharp change in the exchange rate of the rouble against the dollar and the euro. As we can see, any decisions made by continental regulators have a serious

impact on the economies of highly specialised regions that are open to the continental and global economy.

The impact of global regulators is even more powerful. Cheap loans from the IMF and the World Bank initially give a sharp boost to the economic development of a country and a group of regions within that country, but then become a heavy debt burden, as up to 30% of these loans are stolen, used inefficiently and do not bring the expected results. Compliance with WTO rules should theoretically be beneficial to all members of the organisation, but in fact leads to unbalanced trade, which benefits countries and regions with developed manufacturing and service sectors, as well as those that impose higher quality standards or other non-market restrictions on goods from developing countries.

When Russia joined the WTO, there wasn't enough work done to figure out how this would affect the economies of Russia's regions. As a result, the economies of metallurgical, agricultural, and machine-building regions got hit hard, and the national government had to make decisions to balance things out.

Fluctuations in prices on global commodity markets, changes in exchange rates, sanctions, rules and decisions of international organisations have a direct impact on the economies of "open" regions, and therefore often deserve more attention from researchers than the actions of intra-regional and national regulators.

In addition to state and supranational regulators, large national and transnational businesses are having an increasing impact on regional economies.

6.5. The influence of big business.

The main idea of this paragraph: in today's world, large national and transnational businesses have a huge impact on the economic development of regions. Transnational corporations, relying on state support from their home countries, seek to exploit the competitive advantages of regions in a wide variety of countries, minimising costs and maximising profits. Therefore, regional economic studies must take into account the influence of big business on regional economic development.

Any successful business project uses four types of economic innovation: 1) a new product or service; 2) a new market, allowing it to occupy a monopoly position in the market; 3) new resources; and 4) a new organisation of labour, allowing it to reduce costs. While the first and fourth types of innovation are directly related to the economy of the firm, the second and third types of innovation are directly related to

the economy of the regions, as they involve new sales markets and new sources of resources. Apple Corporation creates a new product every six months and a new technology or work organisation every three to four years. At the same time, assembly plants are located in East Asia, and the largest sales markets are in the United States and Europe. Thus, by distributing economic activity across different countries and regions of the world, the corporation maximises profits at minimum cost.

The largest oil corporations seek to extract oil in countries and regions with minimal costs and sell oil and petroleum products in the most expensive markets (the United States and Europe). If we consider the regional economic process, which includes the stages of identifying needs, organising production, production, distribution, exchange, consumption, accumulation and investment, then for each stage, large businesses can find the most suitable region and achieve maximum efficiency in the company's operations through **a regionally distributed business process**. This leads to the inevitable interaction of the regional economy with large companies and corporations.

In some countries and regions, such interaction will be viewed positively, and every effort will be made to attract large businesses. In some countries and regions, negative expectations prevail, since in the event of a conflict of interest, large businesses are capable of the most destructive actions to achieve their goals. There are many known cases of coups d'état, assassinations of national and regional leaders, blackmail, bribery and other criminal activities by large businesses. The creation of private armies, terrorist structures and the widespread use of mercenaries to do any "dirty" work puts the interaction between regional government and big business in a "knife-edge" situation. For big business, there are also risks of losing assets in a country or region under certain circumstances.

6.6. Economic differentiation of regions

The main idea of the paragraph: economic differentiation of regions is the result of intra-regional development and the interaction of the regional economy with the national and supranational economies.

In order to understand why the region's economy has reached a certain level of development, it is necessary to consider three key topics: 1) intraregional development of the region's economic subsystem; 2) development of the region's economy as part of the national economy; and 3) development of the region's economy as part of the supranational (continental and global) economy.

To analyse intraregional development, it is necessary to understand the position of the region's economy in the regional system (in interaction with the region's natural, social and administrative subsystems).

To analyse the development of the region's economy as part of the national economy, it is necessary to understand the "national functions" of the region's economy, its specialisation in the national economy, the influence of national macro-regulators on the functioning of the region's economy, and the influence of large national businesses, including state-owned companies.

To analyse the development of the region's economy as part of the supranational economy, it is necessary to understand the 'supranational' specialisation of the region's economy, the influence of continental and global mega-regulators, and the influence of transnational companies and corporations.

An analysis of all three components will reveal the reasons for the current state of the region's economy in the national, continental, and global rankings of regional economies.

Conclusions to Chapter 6.

- 1. Regional economics, as part of economic science, studies the economic subsystem of a region exclusively as part of the national and global economy, as well as a collection of municipal economies.**
- 2. The most important issues are the economic specialisation of regions (at the national, continental and global levels), interregional interactions, the influence of national and global regulators, large businesses, and the economic and socio-economic differentiation of regions.**
- 3. Regional specialisation arises from the need to create a self-sufficient, independent economic system at the national level that provides the country's population with all the basic types of artificial comfort and constantly increases its production capacity. Self-sufficiency implies a division of labour between regions with subsequent exchange, and therefore clear regional specialisation.**
- 4. The development of interregional ties is closely linked to the specialisation of the region's economy within the macro-region. The higher the level of specialisation, the greater the need to develop interregional economic ties.**
- 5. National regulators have a strong impact on the development of the regional economy. Therefore, all types of public policy should have a "regional**

dimension" by identifying groups of regions with similar effects on the actions of national regulators. In times of national survival, all regional development resources may be subordinated to national goals.

6. The economies of open regions will be seriously affected by continental and global regulators. The high level of export orientation of a region's economy makes it extremely dependent on events in world markets and vulnerable in the event of chaotic changes in the situation. For such regions, the actions of mega-regulators may be more important than the actions of national regulators.

7. The influence of large national and transnational businesses on the economic development of regions is constantly growing. Therefore, regional economic studies must take into account the influence of large businesses on the development of the region's economy.

8. Economic differentiation between regions is the result of intra-regional development, as well as the interaction of the regional economy with the national and supranational economies. The creation of national, continental and global rankings of regions is an extremely relevant research task.

Chapter 7. Research programme on regional economics

7.1. Dynamics of the development of the regional economy research programme in the West and in Russia.

7.2. Contemporary research programme for regional economics (author's proposal)

7.3. Differences between research programmes on regional economics, economic geography and spatial economics.

The main idea of the chapter: the research programme of any science includes core tasks, which are divided into three groups: a) fundamental tasks (tasks of the past) related to the dynamics of knowledge accumulation and self-development of science, b) applied tasks (tasks of the present) aimed at specific consumers of knowledge (society, the state, business), and c) tasks of the future (tasks of imagining, forecasting, programming and designing the future). The development of science in the 20th century (especially mathematics and physics) has shown that the theoretical self-development of science must

precede applied research and the solution of future problems, since theoretical models allow us to identify typical situations and typical solutions that can be applied to countless specific situations in the present and future. In this chapter, I will examine not only the dynamics of development and the current state of the regional economics research programme, but also compare it with research programmes in economic geography and spatial economics.

7.1. The dynamics of the development of the regional economics research programme in the West and in Russia.

The main idea of the paragraph: the formation of regional economics in the second half of the 20th century shows similarities in the methods and goals of science in the early 1960s in the USSR and the USA, followed by a sharp divergence in Western and Soviet regional economics research programmes in the 1970s and 1980s and a gradual convergence of programmes in the 2000s. Throughout the second half of the 20th century, regional economics was concerned with solving applied problems. The fundamental tasks of creating a theory of regional economics were set, but not solved.

I will examine the dynamics of change in the core tasks of regional economics in the 20th century based on the fundamental works of W. Izard (1956, 1960), the multi-volume *Modern Classics in Regional Science* (1996) and the classic textbook by M. Armstrong and J. Taylor, *Regional Economics and Regional Policy*, which represent the American-European tradition, as well as the fundamental works of N.N. Kolosovsky (1958), N.N. Nekrasov (1975) and the textbook by A.G. Granberg (2000), which represent the Soviet-Russian tradition.

I will begin with representatives of the Western tradition.

Walter Izard, in his work *Methods of Regional Analysis: an Introduction to Regional Science* (New York, 1960), sets out 11 core tasks of regional research:

1. Forecasting the size and composition of the region's population;
2. Assessing population migration;
3. Assessing regional income and social accounts;
4. Analysing interregional flows and the balance of payments;
5. Analysing the regional economic cycle and multiplier;
6. Analysing the location of industries;
7. Studying interregional and intraregional links using the input-output model;
8. Analysing the region's industrial complex;
9. Linear programming of interregional links;
10. Study of spatial interaction between cities based on a gravitational model and a potential model;
11. Comprehensive regional studies based on synthetic analysis.

Of the tasks listed, only seven (from the third to the ninth) should be

considered tasks of regional economic research. The first and second tasks relate to demographic research, the tenth task mainly concerns the interaction of cities (urban geography and the economics of cities and agglomerations), and the eleventh relates to regional analysis as a whole. Thus, W. Izard speaks of seven core tasks of regional economics. Considering that in 1956 another work by W. Isard was published – *Location and Space-Economy* (NY, 1956), in which "an attempt was made to synthesise separate theories of location into a single general doctrine and to link this doctrine, where possible, with the theory of production, pricing and trade" (p. 2 of the author's preface to *Methods of Regional Analysis*), we can confidently speak of eight core tasks of regional economics in the early 1960s as understood by W. Izard.

In the series "Modern Classics in Regional Science" (1996, An Elgar Reference Collection), all major works in the field of regional science are grouped into six main areas:

1. Location theory; 2. Transport and land use; 3. Analytical urban economics; 4. Regional dynamics; 5. Regional housing and labour markets; 6. Regional policy and regional integration. The second and third areas are devoted to urban economics and transport economics, and the sixth to regional policy, so only the first, fourth and fifth areas should be considered as relating to regional economics proper. If we look at these areas in more detail, location theory is presented as: a) the location of enterprises and industries; b) spatial economics. Regional dynamics are presented as: a) the theory of regional change; b) economic restructuring and industrial reorganisation; c) population dynamics; d) technology and regional growth; e) constraints on regional growth; and f) models of regional dynamics. Regional residential real estate and labour markets are represented as: a) housing market models and b) spatial labour market models. If we exclude the study of population dynamics and spatial economics from this list, we are left with eight new core tasks of regional economics. These are:

1. Location of enterprises and industries; 2. Theory of regional change; 3. Economic restructuring and industrial reorganisation; 4. Technology and regional growth; 5. Constraints on regional growth; 6. Models of regional dynamics; 7. Housing market models; and 8. Spatial labour market models.

If we compare these tasks with those of W. Izard, only the location tasks are completely identical. All other tasks differ significantly, since in the 1990s, all Western countries entered the era of the post-industrial economy, and economists were interested in industry only as a problematic sector of the economy, rather than as a sector of growth, as it had been in Izzard's time. Non-linear models became a more popular research tool than linear models, the question of constraints on

economic growth, including infrastructural, institutional and environmental constraints, was raised, and more attention was paid to the economies of megacities.

This trend was partly cemented in the textbook by M. Armstrong and J. Taylor, *Regional Economics and Regional Policy* (Wiley-Blackwell, 2000, 448 p.). The textbook covers seven (7) topics on regional economics and six topics on regional policy. The seven topics on regional economics are: 1. Regional income and the definition of employment; 2. The input-output approach to modelling the regional economy; 3. Regional growth inequality: neoclassical perspectives; 4. Export-oriented models, agglomeration processes and cumulative growth; 5. Interregional trade; 6. Interregional migration; 7. Regional unemployment disparities. As we can see, issues of location and spatial organisation of the regional economy are not considered at all, and the primary applied issues considered are those of justifying regional policy at the level of countries (the United Kingdom) and megaregions (the European Union).

All of the above changes indicate that the Western regional economy is sensitive to the demands of society and business for the formulation and resolution of new research tasks corresponding to new development needs, and has almost completely changed its research programme over the past 40 years (1956-2000).

What happened to the regional economy in the USSR and Russia during the same period?

In 1958, N.N. Kolosovsky published his monograph "Fundamentals of Economic Regionalisation," in which he identified the following as the main research objectives of regional sciences (economic geography and regional economics): 1. The study of economic regions as integral territories striving for development as parts of a single economic complex of the country; 2. The study of the all-Union specialisation of economic regions; 3. The study of production-territorial combinations of enterprises in different industries, the joint development and location of which produces a certain economic effect (complex effect); 4. Analysis of groups of enterprises that form sustainable energy-production cycles based on a particular combination of energy and raw materials; 5. Research into the interdependence of economic development in the country's regions and the development of transport schemes that ensure smooth interaction between regions; 6. Expeditionary studies of the natural productive forces of regions (natural resources and their combinations); 7. Regional energy studies ensuring the advanced development of energy in the regions; 8. Calculation of the effects of production combining and complexing, the effect of regionalisation of sales and transportation of products. This set of tasks clearly corresponded to the requirement for accelerated

industrialisation of the eastern and southern regions of the USSR, based on the creation of territorial-production complexes (TPCs) around unique deposits of natural resources and energy sources. The removal of new industrial areas from traditional sales markets in the European part of the USSR required a sustainable solution to the transport problem, which made the industrial and transport development of the regions key tasks of economic development as such.

The successful application of N.N. Kolosovsky's approach in the eastern, southern and northern regions of the USSR led not only to the growth of applied regional economic research, but also to the regional economy taking a leading position in the economic science of the USSR. This situation was recorded in the monograph by Academician N.N. Nekrasov, *Regional Economics* (1975), in which the main tasks of science were divided into three groups: 1. Methodological and practical research into the territorial proportions of the development of the national economy; 2. Development of a general theory and scientific justification of objective factors for the rational allocation of socialist productive forces; 3. Research into the processes of planned formation of the country's regional economies (p. 28).

The academician understood the first group of tasks as: a) the combination of production centres with consumption areas; b) spatial shifts in the allocation of productive forces (development of a strategy for the planned economic development of new territories); c) the formation of the territorial structure of individual sectors of the economy; d) macro-regional, inter-regional and intra-regional proportions. Following N.N. Kolosovsky, N.N. Nekrasov emphasised the special importance of transport in ensuring the proportional development of the entire country. The task of determining the territorial organisation of the economy of the regions on the basis of prospective territorial proportions was also set.

As for the second group of tasks, it was completely borrowed from economic geography and set a precedent for one science taking over the research field of another science. Thus, the academician understood the scientific basis for the distribution of productive forces to be: a) the study of the regional aspect of scientific and technological progress; b) research into social problems in the country's regions; c) study of the availability of natural resources in the regions; d) analysis and study of the forms of territorial organisation of production (p. 30). At the same time, economic geography was left with only the narrow task of assessing natural complexes and natural conditions of territories: "From our point of view, an in-depth and comprehensive study of natural complexes and, in particular, an assessment of the natural conditions of territories should become the scientific basis of economic geography. This opens up a wide field of activity for theoretical developments that

will be of practical importance in solving regional economic problems and territorial planning of the national economy" (p. 31). This statement by N.N. Nekrasov can only be described as a mockery of economic geography, since only one task was left out of all the research tasks of economic geography!

The academician revealed the third group of tasks as: a) researching the specifics of regional economic development; b) determining their production specialisation; c) improving the production infrastructure as a complex that supports the region's economic activity, including all types of freight transport, energy supply, and construction; d) developing social infrastructure as a complex that supports the life of the population, including all types of passenger transport and public utilities; e) studying the positive and negative factors of regional development; f) taking into account regional development based on the factors and trends characteristic of the macro-region to which it belongs; g) studying optimal options for the economic structure of both individual regions and the entire system of regions; h) analysing factors affecting labour productivity growth, national income distribution, use of fixed assets, and territorial differentiation of prices and tariffs; i) limiting the location of enterprises in large and major cities and organising the environment.

The academician further points to the regional economic rationale for regional policy as the policy of the union authorities towards the union republics, macro-regions and regions of the country. Among the main components of regional policy, he names: a) a strategy for the planned economic development of new territories, especially areas with a high concentration of natural resources; b) a long-term programme for the development of the northern regions and the desert regions of Central Asia and Kazakhstan; c) the application of the principle of equalising the levels of economic development of the regions; d) the justification of new directions in the location of material production; e) the development of general plans for the location of the productive forces of the USSR, plans for the location of economic sectors, plans for the comprehensive development of the economies of the union republics and economic regions; f) the development of projects for regional economic complexes (pp. 38-39).

Summing up the description of the tasks of the regional economy, N.N. Nekrasov concludes that: "Thus, a system of regional studies has been created that allows complex regional problems to be solved on a sound scientific basis at all stages of planning and territorial organisation of the economy, from the initial stage and scientific concept to state territorial planning, from a constructive model of the territory's economy (regional planning) to the design and construction of specialised enterprises... and... infrastructure" (p. 39).

The work of N.N. Nekrasov shows that during the period from 1958 to 1975, N.N. Kolosovsky's theory of industrial development became widely accepted in the USSR, and on its basis, a fairly coherent system of territorial planning was created, which became an integral part of the overall planned economy of the USSR. The 1973 crisis in Western countries, associated with a sharp rise in oil prices, which led to the transfer of industry to developing countries, brought additional income to the USSR economy and convinced it that it had chosen the right resource development strategy. Therefore, no abandonment of the resource strategy was expected in the coming decades. This led to the catastrophic events of the late 1980s, a sharp drop in oil prices, the collapse of the USSR, and the search for a new model of economic development for Russia in the 1990s, which inevitably affected the regional economy. Let us look at the formulation of regional economic tasks in the early 2000s by Academician A.G. Granberg, taking into account that by this time the system of territorial planning had been completely eliminated and the world raw materials markets had entered a stage of saturation. by Academician A.G. Granberg, bearing in mind that by this time the territorial planning system had been completely eliminated, global commodity markets had reached saturation point and the need to develop new sources of resources had begun to decline, the state had abandoned its regional policy and, in general, demand for regional economic information had fallen sharply.

Thus, A.G. Granberg, in his textbook *Fundamentals of Regional Economics* (Moscow, Higher School of Economics, 2000), identifies five main research tasks in regional economics:

1. Studying the economy of a particular region;
2. Studying economic ties between regions (interregional interactions);
3. Studying regional systems (the national economy as a system of interacting regions);
4. The distribution of productive forces;
5. Regional aspects of economic life (*Fundamentals of Regional Economics*, 2000, p. 14).

As we can see, in comparison with N.N. Nekrasov's research programme, A.G. Granberg completely excluded the tasks of the first group (justification of territorial proportions in the planned development of the country's economy), but left the tasks of the second group (location) and the third group (development of regional economies), allowing for both state regulation and the action of spontaneous market forces in the development of regional economies. A breakthrough idea would have been to include issues related to the study of the economies of megaregions, but the academician ceded this subject to the global economy and international relations (p. 14). He also completely rejected the

inclusion of regional planning (territorial organisation) in the regional economy and argued for a clear distinction between the tasks of regional economics and economic geography: "Our position is that, firstly, regional economics does not necessarily have to replace economic geography and, secondly, economic geography should not be camouflaged in the guise of regional economics... The whole point is their reasonable complementarity..." (p. 10). However, in his interpretation of the subject of regional economics, Alexander Grigorievich completely reproduces the economic-geographical approach: "...regional economics studies the economy of a region, or more precisely, the economies of individual regions: the objective prerequisites for the economic development of a region (geographical location, natural resources, demographic and production potential), the production structure, the social sphere and living conditions, the system of settlement and economic distribution, the mechanism of functioning and management of the economy, etc." (p. 13).

Thus, the research objectives (subject of study) of regional economics in A.G. Granberg's work, compared to N.N. Nekrasov's, were, firstly, drastically reduced; secondly, an attempt was made to distinguish between the subjects of economic geography and regional economics (which are presented as a single whole by both N.N. Kolosovsky and N.N. Nekrasov); thirdly, regional economics was presented as the primary research task (instead of the territorial proportions of the all-Union economy), and fourthly, industrialisation and planned development were not indicated anywhere as priorities for economic development. Thus, we can speak of a fundamental change in the research programme of the regional economy of Russia compared to the regional economy of the USSR, which took place in the period 1975-2000. Moreover, A.G. Granberg pointed to four new concepts of regional economics: the region as a quasi-state, the region as a quasi-corporation, the region as a market, and the region as a society (pp. 83-84), which could not have arisen at all in the planned economy of the USSR. References and comments on numerous Western models and theories, the works of W. Izard (Aizard) and other Western specialists determined the trend of convergence of the regional economy of Russia, as understood by A.G. Granberg, with the Western regional economy. Nevertheless, a new theory of regional economics was not developed. The academician only managed to point out the main theoretical tasks and possible points of growth, but did not manage to create a new theory. This task is being addressed in this and subsequent monographs.

Let us consider the new research programme for regional economics as of 2015, taking into account the new economic and political realities in the country and in the world.

7.2. Contemporary research programme for regional economics (author's proposal).

The main idea of this paragraph is that science must first and foremost follow its own logic of self-development, which generates fundamental knowledge, and then it must meet the demand for knowledge from society, the state and business (applied knowledge). Finally, it must have the courage to put forward hypotheses that anticipate the emergence of future knowledge (new ideas for development). Therefore, a modern research programme for regional economics should contain three groups of tasks: 1) tasks for creating fundamental knowledge; 2) tasks for creating applied knowledge; 3) tasks for imagining, forecasting, programming and designing (tasks for the future).

I will begin with fundamental tasks. These are determined by the logic of scientific self-development. The main task of self-development is to achieve a holistic, self-sufficient existence, i.e. to create a comprehensive theory that explains the essence and dynamics of the object under study. The object of study is the regional economy, so the main fundamental task of regional economics is to create **a general theory of the development (transformation) of the regional economy (OTRE)**. This theory should become part of **the theory of the development of the country's and the world's economy** as a fundamental theory of economics (regional economics as part of economic sciences), as well as part of **the theory of regional development** as a fundamental theory of regional sciences (regional economics as part of regional sciences).

The general theory of regional economic development (OTRED) should:

- 1) explain the essence and properties of the regional economy;
- 2) explain the structure of the regional economy;
- 3) explain the dynamics of the regional economy;
- 4) identify the substrate of the regional economy;
- 5) explain the relationships between the regional economy and the economies of municipal formations;
- 6) explain the relationships between the regional economy and the economies of other regions, countries, continents and the world;
- 7) explain the relationships between the region's economy, nature, population, and administration;
- 8) possess the necessary terminology and conceptual apparatus for verbally describing the stages of existence of the object under study;
- 9) possess the necessary methodological apparatus for semi-quantitative and quantitative analysis and synthesis of the object under study;
- 10) be based on existing general scientific approaches (systemic approach, thermodynamics, etc.) and theories of economics and regional studies (country studies);
- 11) be open to new facts and observations;
- 12) be receptive to scientific discoveries, additions and changes.

Thus, the main fundamental task of regional economics is to create a General Theory of Regional Economic Development (GTERD).

The content of the GTDER is related to the creation of approaches, paradigms, specific theories, hypotheses, concepts, models and methods, which we will discuss in the next chapter.

I will now move on to defining the main applied tasks of regional economics. These are determined by demand from society, the state and business.

Society will be primarily interested in the differences between regions in terms of quality of life, the current economic problems of the population in the regions, and the economic prospects of the regions. Consequently, the most important applied task of regional economics is to prepare comparative analytical reviews of the socio-economic situation of the regions, the main economic problems and prospects. This information is necessary for making decisions about where to work, various types of travel and migration (educational, labour, retirement, recreational, tourist, etc.), decisions about where to purchase real estate, etc. In English, this task can be briefly formulated as Social and Economic Situation in Regions, Housing and Labour Markets in Regions. As we can see, it practically coincides with one of the tasks set in the work *Modern Classics in Regional Science*, which was discussed above. In the Russian version, this task can be formulated simply as Comparative Analysis of the Socio-Economic Situation in Regions for the Population.

The state will be interested in information necessary to justify regional policy, regional and municipal administration, and regional sections of all types of state policy. This includes information on the socio-economic situation in the regions, on problems of economic development in the regions that have state causes (macroeconomic regulation, geopolitics, transport factors, national policy, etc.), the need for state support for regional economic projects and the creation of economic growth poles, excessive economic differentiation between regions and the need for equalisation policies, etc. In the English version, this is the task of Social and Economic Differentiation of Regions, Regional-Economic Policy, Regional-Municipal Economic Administration, Political Regionalisation. In the Russian version, this is the task of Comparative Socio-Economic Analysis of Regions for Policy and Management.

Businesses will be interested in the specifics of the regional economic process – cheap assets, production opportunities for sectors, industries and types of economic activity, regional production costs, income distribution conditions, the

exchange process, the state of regional markets, opportunities for monopoly positions in regional markets and profit maximisation, conditions for accumulation and investment in the region, environmental constraints, regional risks, etc. In the English version, this task is called Comparative Analysis of Doing Business in Regions. In the Russian version, it is called Comparative Analysis of Doing Business in Regions.

Thus, the regional economy should have three main applied tasks: - 1. Comparative analysis of the socio-economic situation in the regions for the population; 2. Comparative socio-economic analysis of the regions for policy and management; 3. Comparative analysis of doing business in the regions.

Let us move on to the third group of tasks - the tasks of imagination, forecasting, programming and design. If the first two groups of tasks correspond to normal work, then the third group of tasks corresponds to the concept of creative (imaginative) work, in the process of which ideas and projects are created that did not yet exist on planet Earth. This group of tasks can be divided into: 1) the creation of verbal ideas, hypotheses, concepts, and strategies for the development of the region's economy; 2) the development of semi-quantitative forecasts and programmes for the development of the region's economy; and 3) the development of quantitative projects for the development of the region's economy.

To summarise: in the author's opinion, a research programme on the modern regional economy should have eight core tasks: 1. the fundamental task of creating a general theory of regional economic development (OTRED); 2-4. applied tasks of comparative socio-economic analysis of regions for the population, the state and business; 5-8. tasks of imagining, forecasting, programming and designing the development of the regional economy.

Since the regional economics research programme is often confused with the economic geography research programme and other related sciences, it is necessary to raise the question of the fundamental differences between these programmes.

7.3. Differences between research programmes in regional economics, economic geography and spatial economics.

The main idea of the paragraph: throughout the 20th century, economic geography, regional economics and spatial economics developed as a single field of research. In the 1970s-1990s, regional economics took the lead, but now the leadership (fashion) is shifting to spatial economics. This leads to the absorption of research programmes in economic geography and regional economics by

spatial economics, which does not correspond to the needs of the self-development of science or the possibilities for solving applied problems. Therefore, the research programmes of all three sciences must be clearly separated.

First, I will describe the general situation with the development of all three sciences and then try to separate their research programmes.

Already in the works of W. Izard (1956-1960), there was a division of research into spatial economics and regional analysis (regional economics). Subsequently, these areas were either mixed (Modern Classics in Regional Science) or separated (P. Krugman, M. Fujita, etc.). In the Russian tradition, there is a tendency to mix these sciences or rename them depending on the political, educational or publishing situation.

So far, economic geography has suffered the most from these renamings. For 40 years, since the publication of Academician N.N. Nekrasov's work "Regional Economics" in 1975, economic geography has been fighting with regional economics for its field of research. This field of research includes the theory and models of enterprise location, territorial aspects of national economic development, population settlement issues, the creation of transport and infrastructure corridors, the assessment of the resource and demographic potential of a territory, problems of territorial development, and many other territorial and economic topics. Unfortunately, within the framework of Russian geographical science, economic geography has been severely limited in funding compared to physical geography, especially glaciology (the science of glaciers), and has been unable to fully realise its research potential. Economic geographers left to work in economic institutes, urban planning institutes, and industry-specific design institutes, taking their knowledge with them. This knowledge and these professionals were particularly in demand in the design of the development and location of productive forces in the republics of the USSR and the eastern regions of Russia, so the closest contacts between economists and economic geographers developed in the SOPs (Councils for the Study and Organisation of Productive Forces) of the union republics and in economic institutes in the Urals, Siberia, and the Far East. The mutual exchange of knowledge in the 1950s-1970s served as the basis for the creation of regional economics as a field of research, synthesising economic-geographical and planning-economic approaches to territorial development.

The sharp decline in spatial-economic work and urban planning in the 1990s and 2000s led to economic geographers moving to investment companies, universities, virtually all types of business, high politics and the further

dissemination of economic-geographical knowledge. However, academic economic geography received meagre funding and was brought to the brink of survival. Thus, a paradoxical situation arose in which the dissemination of economic-geographical knowledge increased sharply, while the importance of economic geography as an academic and applied science declined sharply. In the 1990s, this also affected the teaching of economic geography in economic universities. The discipline "Economic Geography" was replaced by the discipline "Regional Economics", with the content remaining entirely economic-geographical, but with a new name (textbook by T. Morozova). It was only in 2000, with the publication of A.G. Granberg's textbook *Fundamentals of Regional Economics*, that the content of textbooks began to change in favour of regional economic knowledge, and it became possible to talk about the separation of the fields of regional economics and economic geography. Nevertheless, to date, this division has not been finalised, as confirmed by numerous contemporary textbooks on regional economics and scientific works. In the 2010s, a similar story began to unfold between regional economics and spatial economics. In the textbook *Regional Economics and Spatial Development*, edited by L.E. Limonov (Yurait, 2014), the content of spatial economics, regional economics and new economic geography is mixed in one volume in such a way that it has become practically impossible to separate these research areas, and the "confusion" in the minds of students and young researchers must have reached a certain maximum. To prevent this approach of "borrowing and mixing knowledge" instead of creating new knowledge, it is necessary to clearly separate the research programmes of the three sciences.

I will attempt to make this distinction, especially since I have taught both Economic Geography and Regional Economics since 1994, and Spatial Economics since 2005 at the Higher School of Economics, and I have a fairly good understanding of the necessary differences.

So, economic geography as part of geography studies the Earth's surface, and economic geography itself studies the transformation of the Earth's surface under the influence of human economic activity. The object of study of economic geography is the entire surface of the Earth, while the object of study of regional economics is only the economies of regions. The object of spatial economics is the spatial characteristics of economic processes (production, exchange, consumption, etc.), while the subject of study is the properties of abstract economic space (curvature, concentration, dispersion, etc.). Thus, the objects of study of economic geography, regional economics and spatial economics differ significantly. However, the research tools (theories and models) may coincide significantly, which introduces ambiguity into the division of research programmes.

What tasks does economic geography set and solve, and what tasks does spatial economics set and solve?

At a fundamental level, the main task of economic geography is to create a General Theory of Economic Transformation of the Earth's Surface (GTEETS). This theory was mainly developed by the author and presented in the work "General Geography: A Global Synthesis" (in collaboration with P. Haggett, 2005).

The main applied tasks are to study the distribution across the Earth's surface of: - 1. Natural resources and conditions for economic activity; 2. Population and human qualities (working capacity, education, health, culture, mentality, etc.); 3. Economic activity (by economic sector and type of economic activity); as well as: - 4. Studying the dynamics of economic development of the Earth's surface, population dynamics and changes in the well-being of the population; 5. Comparative analysis of countries and regions in terms of economic development and welfare levels; 6. Research into the spatial organisation of economic activity, including the creation of production complexes, industrial parks, industrial areas, clusters and other spatial structures; 7. Creation of projects and strategies for the development of territories as complex entities; 8. Development of recommendations for state, regional, municipal and corporate management systems on solving complex development problems (including geo-ecological problems) and the location of economic activity.

Thanks to this set of tasks, economic and geographical education for economists provides for the geographical and ecological orientation of economic thinking and immersion in the real processes of economic development. This leads to the formation of a certain global (Earth) responsibility of future economists for the decisions they make and has little to do with financial speculation and making quick money. Perhaps this is why economic geography is being pushed to the periphery of modern economic education in Russia.

If we compare this group of tasks with the regional economy of the 1980s and 1990s, we find almost complete correspondence. Even in works from the 2000s, the tasks of regional economics included the study of natural resources, population settlement, territorial aspects of economic activity, regional characteristics of population welfare, spatial organisation of the economy, including the creation of industrial complexes, combines, industrial areas, clusters and other spatial structures, the creation of projects and strategies for the development of territories, and the development of recommendations for systems of state management (A.G. Granberg and authors of modern textbooks on regional economics).

My proposal for the division of research programmes leaves mutually beneficial joint work between regional economics and economic geography on tasks 3-6 of the economic geography research programme and tasks 2-4 and 5 of the regional economics research programme. The use of the General Theory of Economic Transformation of the Earth's Surface (GTEETS) to create its own general theory of regional economic development (GTERED) can also bring significant benefits to regional economics, as will be shown in the second monograph.

Thus, the research programmes of economic geography and regional economics can be considered half-divided at the level of core tasks, so joint research on overlapping topics will be mutually beneficial.

Let us move on to the research programme of spatial economics, which I would like to outline only in the most general terms.

First, classical economics ignores the spatial factor of rational decision-making as such, since if it were taken into account, all two-dimensional economic models (time-action) would have to be supplemented with a third dimension – space. This greatly complicates economic models and requires the development of spatial thinking among economists. But this could become a new vector for the development of economic science in a context where all economic actions are already interpreted by two-dimensional models. This means that spatial economics can be a way to improve all classical economic models. This is especially true for City-Suburb-Village models in regional economics or Centre-Semi-Periphery-Periphery models in the global economy.

Secondly, spatial economics can refute some of the basic tenets of classical economics in order to explain a number of phenomena that classical models and principles cannot explain – for example, the principle of constantly increasing (rather than decreasing) returns explains the trend towards concentration of economic activity, and the law of cumulative causality links market size and production volume in such a way that growth in production volume increases market size, which in turn stimulates growth in production volume.

Thirdly, spatial economics can reflect on the concept of "economic space" as a category capable of reflecting the state of markets, production, government regulation, and households in a single integrated indicator.

In fact, spatial economics is currently in the early stages of discovering many economic and geographical truths, and the interpretation of many phenomena of urban geography causes slight confusion with its "quasi-scientific" conclusions.

Nevertheless, the participation of economists in the study of these phenomena can only be welcomed.

Thus, the creation of a theory of economic space, the study of concentration, agglomeration, and decentralisation of economic activity, and the creation of three-dimensional Time-Space-Economic indicator models based on existing two-dimensional models can be called the pressing tasks of modern spatial economics.

Let us summarise:

1. Economic geography studies the real transformation of the Earth's surface as a result of human economic activity and has as its main applied task the justification of territorial development. The study of economic geography should be compulsory for economics, management and public administration, sociology, geography and ecology departments.

2. Regional economics, as part of regional sciences, intersects with economic geography at the regional level, but as part of economic science, it is designed to study the annually recurring regional economic process and the accumulated result of this process in the form of the region's economy and the well-being of its population. As an academic discipline, regional economics should be taught in the second year of all the above-mentioned faculties, including the faculties of geography and ecology.

3. Spatial economics in the Western understanding is at the stage of discovering "capitalised" economic and geographical truths, set out in trivial models. The real development of spatial economics will begin with the justification of the category of "economic space" as an integral characteristic of the state of the economies of municipalities, regions, countries, continents and the world, as well as with the understanding of "economic space" as a universal limited resource, in relation to which models of spatial economics should be created in the first place. However, at present, not even the first steps have been taken in this direction, so teaching spatial economics can only be considered possible as an elective course in master's programmes in economics departments.

The master's programme "Regional and Spatial Economics" could be a good stimulus for the development of this area in Russian science and education.

Conclusions to Chapter 7.

- 1. In the 20th century, regional economics was proclaimed an independent science, but it is still considered part of a single complex of regional sciences, economic sciences, and related sciences (economic geography, spatial economics, etc.), which makes it extremely difficult to identify a separate research programme for regional economics.**
- 2. Since the 1950s, the central task of regional economics has been considered to be the study of business location and the spatial organisation of the economy. This is a categorical mistake, since this task belongs to the main research tasks of economic geography, spatial economics and regional planning.**
- 3. The main fundamental task of regional economics should be to develop a general theory of the development (transformation) of the regional economy as the main object of study in regional economics.**
- 4. The main applied tasks of regional economics should be comparative assessments of the socio-economic situation in the regions for the population, state and municipal authorities, as well as a comparison of regions in terms of business conditions.**
- 5. The most important tasks of the modern research programme of regional economics are also the development of hypotheses, concepts, strategies, forecasts, programmes and projects for the development of regional economies.**
- 6. Research programmes in regional economics, economic geography and spatial economics differ significantly in terms of their fundamental objectives, but they have much in common in terms of their applied objectives and future planning objectives, which makes cooperation mutually beneficial.**

In Chapter 8, I will examine the existing basis for creating a general theory of regional economics.

Chapter 8. Paradigms, theories and models of regional economics

8.1. Paradigms of regional economics

8.2. Theories and models of regional economics.

8.3. Paradigmatic dynamics of regional economics

The main idea of the chapter: a paradigm is a model of behaviour of scientists, including the choice of research tasks (research programme) and research tools (theories, models, concepts, methods, etc.). Despite differences in research programmes, regional economics, economic geography and spatial economics often use the same theories and models in solving scientific problems. Let us consider the main paradigms, specific theories and models used in regional economics in a paradigmatic-chronological sequence.

8.1. Paradigms of regional economics

The main idea of this paragraph is that there are six (6) main paradigms of regional economics: the agrarian paradigm, the market-industrial paradigm, the planned-industrial paradigm, the new-industrial paradigm, and the service and information paradigms.

If we refer to the original source of the term "paradigm", then according to T. Kuhn's definition, it is "scientifically accepted achievements that, for a certain period of time, provide the scientific community with a model for posing problems and solving them" (The Structure of Scientific Revolutions. M, Progress, 1977, p. 11).

I define a paradigm as a set of research tasks and tools for solving them (theories, models, and methods) that create a scientific norm (a model of behaviour for scientists).

T. Kuhn's definition refers to the mega-achievements of scientists (Aristotelian logic, Newtonian mechanics, the theory of relativity, etc.) used by the global scientific community for centuries. In my understanding of paradigms, we are talking about models of behaviour of scientific communities at least at the national level, which does not require global recognition of the paradigm. Moreover, at any given moment in time, several paradigms can successfully coexist in the world, allowing different scientific communities to successfully engage in scientific, project and educational activities in their own countries or in groups of countries.

T. Kuhn's ideas are important in terms of describing the dynamics of scientific research. In particular, it becomes absolutely clear that the emergence of new paradigms and the replacement of old paradigms as a result of scientific revolutions is inevitable. According to T. Kuhn, a scientific field goes through four stages of

development: pre-paradigmatic, paradigmatic (normal science), crisis (turbulent), and scientific revolution (paradigm shift). At the pre-paradigmatic stage, science is created by a few individual scientists who are not connected to each other (the stage of loners). At the paradigmatic stage, one of the scientists combines all the main research results within the framework of a fundamental theory and/or textbook, i.e., creates a model of scientific research, which allows the scientific community to form. At the crisis stage, the textbook and theory are criticised by the scientific community as incapable of solving existing scientific problems. Scientists split into separate groups and individuals in search of solutions to problems. At the stage of scientific revolution, a new model of science emerges, which becomes the basis of a new paradigm.

I would interpret T. Kuhn's model as follows. The scientific community always includes four groups of scientists. The first group are scientific revolutionaries who question all existing knowledge. They are always focused on obtaining fundamentally new scientific knowledge. The second group are disseminators of new knowledge. They do not independently develop new knowledge, but are ready to actively discuss and apply it. The third group consists of neutral scientists who accumulate all kinds of knowledge and paradigms (encyclopaedists). The fourth group consists of conservative scientists who do not accept new knowledge and carefully preserve tradition. The dynamics of science are determined by the ratio (scientific power) of these four groups. It is clear that at the stage of normal science, scientific power belongs to encyclopaedists and conservatives, at the crisis and pre-paradigmatic stages – to scientific revolutionaries, and at the stage of scientific revolution – to disseminators of new knowledge. In regional economics, this model certainly applies, and we can speak of six (6) basic paradigms of this science: the agrarian paradigm, the market-industrial paradigm, the planned-industrial paradigm, the new-industrial paradigm, and the service and information paradigms.

As we can see, I have based the classification of paradigms on the leading sector of the economy (agricultural, industrial, service, information) and the leading method of organising economic activity (market, plan, mixed method).

Since the importance of economic sectors and the leading methods of organising economic activity changes in the world as a whole, as well as in individual countries and regions in a certain chronological sequence, it is possible to trace a kind of paradigmatic-chronological sequence in the development of regional economics as a global science and as part of national models of science. However,

before doing so, let us consider the main tools for solving scientific problems – theories and models of regional economics.

8.2. Theories and models of regional economics.

The main idea of this paragraph is that the creation of a fundamental theory of science and the solution of applied problems is based on specific theories, models, concepts and methods, some of which have already been developed, while others are yet to be created. A.G. Granberg spoke about four specific theories of regional economics: the theory of location, the theory of regional development, the theory of welfare, and the theory of interregional interactions. The author proposes to create one fundamental theory and eight specific theories, four of which are a) the theory of regional economic processes and economic dynamics; b) the theory of the national function of the regional economy; c) the theory of the global function of the regional economy; and d) the theory of the spatial organisation of the economy and optimal land use. These theories need to be created practically from scratch. The summary table will provide paradigms, existing theories and models of regional economics.

With regard to regional economics, we should mention one fundamental theory – the general theory of regional economic development (OTRER) – and eight specific theories of regional economics, which include: 1) the theory of economic well-being of the region's population; 2) the theory of the productive capabilities of the region's economy; 3) the theory of regional economic processes and economic dynamics; 4) the theory of interregional economic interactions; 5) the theory of the national function of the regional economy; 6) the theory of the global function of the regional economy. Based on the traditions of regional economics, the following can also be classified as specific theories: - 7) the theory of location and 8) the theory of spatial organisation of the economy and optimal land use, although in these theories, regional economics will have a strong overlap with economic geography and spatial economics.

I will briefly define the essence of the listed theories.

1. The theory of economic well-being of the region's population shows the relationship between economic growth, population dynamics and the level of economic well-being of the region's population. It is part of the general theory of quality of life, which, in addition to economic well-being, studies the natural

comfort, social well-being and information security of the region's population, including the quality of governance.

2. The theory of the productive capabilities of the region's economy shows the relationship between the factor potential of the region, the development of individual sectors of the economy, and the volume of output.

3. The theory of regional economic processes studies the specifics of the processes of business organisation, production, distribution, exchange, consumption, accumulation and investment in typical groups of regions.

4. The theory of interregional economic interactions studies the economy of a region in the context of interregional economic ties, including the exchange of factors of production and finished products.

5. The theory of the national function of the regional economy studies the specialisation of the regional economy in the national economy and the influence of national regulators on the state of the regional economy.

6. The theory of the global function of the regional economy studies the specialisation of the regional economy in the continental and global economy and the influence of relevant megaregulators on the development of the regional economy.

7. The theory of location studies the optimisation of the location of enterprises in various sectors of the economy in relation to factors of production, transport networks and sales markets.

8. The theory of spatial organisation of the economy and optimal land use studies the effective use of land resources in the region and the maximisation of output under various region-specific constraints (price, environmental, institutional and other constraints).

Currently, the most developed and comprehensive theories are the theory of location, the theory of welfare, and the theory of interregional interactions. The theory of regional development and the theory of spatial organisation of the economy have been significantly advanced by economic geographers. Theories of the national and global function of the regional economy, as well as the theory of the regional economic process, need to be created practically from scratch.

Each of the theories listed includes several models or concepts applicable to specific situations (groups of regions). I see the difference between models and concepts in that a concept is a descriptive logical assumption, while a model is a semi-quantitative or quantitative assumption about cause-and-effect relationships in the object under study. Models and concepts are usually named after their authors. The set of models forms a methodological basis for analysis, assessment, forecasting, programming, and design calculations.

Table 1 shows the paradigms of regional economics (rows), some theories of regional economics (columns), and the authors of the main models and concepts.

Table 1. Paradigms, theories and authors of the main models and concepts of regional economics

Theories Paradigms	Location theory	Theory of regional development	Theory of regional welfare	Theory of interregional interactions
Information	M. Castells, A. Saxenian R. Schuler	M. Castells, A. Y. Skopin, R. Florida	M. Castells, R. Florida	M. Castells, P. Krugman, M. Fujita
Service	V. Christaller	N. Hansen, M. Kinney, R. Florida	D. Meadows, G. H. Bruntland, J. Buchanan	T. Hegerstrand
New Industrial	E. Ullman, E. Hoover M. Porter, J. Friedman,	F. Perroux, M. Porter	A. Peccei, Lee Kuan Yew	J. Friedman, I. Wallerstein E. Ullmann V. Leontief
Planned industrialisation	V.I. Lenin N.N. Kolosovsky, N.N. Nekrasov	N.N. Kolosovsky I.G. Aleksandrov R.I. Shnip	K. Marx V.M. Chetyrkin, T.I. Zaslavskaya	A.G. Granberg, A.G. Aganbegyan
Market-industrial	V. Launhardt, A. Weber, A. Lesh, W. Izard	A. Lesh, W. Isard	D. Ricardo S. Kuznets, W. Isard	D. Ricardo W. Isard (Aizard E. Heckscher, B. Olin
Agricultural	J. Thünen	M. Condorcet	T. Malthus, M. Condorcet, A. Voeykov	M. Condorcet

As we can see, all fields of the table are filled in, which indicates that regional economic studies are sufficient in terms of creating basic models. However, a number of models are controversial or not universally accepted. In particular, this applies to models for the location of information economy enterprises, models of

regional development and models of the prosperity of information regions, models of the development of service regions and the growth of the prosperity of the population of service regions, as well as models of the development of agricultural regions and interregional interactions between agricultural regions. In other words, all paradigms, except for the group of industrial paradigms, have controversial models, so we can only talk about the "completeness" and consistency of regional economy paradigms in relation to the development of the industrial sector.

When it comes to the completeness of regional economic theories, the most comprehensive are location theories (which lack only universally recognised models for the location of information enterprises) and theories of interregional interactions, which lack models for the interaction of information regions. Theories of regional development and, especially, theories of regional welfare are the least complete. In addition, even existing theories are based on various assumptions that are often incompatible with each other. Therefore, until now, it has not been possible to speak of a comprehensive theory of regional economics.

In view of this problematic research situation, the author puts forward his own sectoral-factor theory of regional economics, on the basis of which all existing theories are then systematised, allowing us to speak of the creation of a unified methodological framework for modern regional economics. Based on the sectoral-factor theory, it is possible to obtain a complete description of all the above-mentioned theories of regional economics.

Now we can trace the paradigmatic dynamics of regional economics over the past nearly 220 years (since 1794).

8.3. Paradigmatic dynamics of regional economics

The main idea of the paragraph: regional economic paradigms correspond exactly to the sequential change of leading economic sectors and explore four main issues – the location and spatial organisation of the economy, the economic development of regions, regional prosperity and interregional interactions.

Agrarian paradigm (1794-1860s)

Within the agrarian paradigm, three models of regional economics emerge: the model of the Marquis de Condorcet (*Sketch of a Historical Picture of the Progress of the Human Mind*, 1794), which explores the links between economic development, intellectual development and cultural development; the model of T.

Malthus (1798 – *An Essay on the Principle of Population*), which examines the relationship between the growth of food production and population growth, and the model of J. Thünen (1826 – *The Isolated State in its Relation to Agriculture and National Economy*), for analysing the location of agricultural production.

According to Condorcet's model, all nations go through the same stages of economic development, some faster, some slower, which leads, on the one hand, to a single logic of economic progress and progress of reason, and on the other hand, to an increase in the diversity of cultures at the same moment in time, the diversity of countries and regions. Condorcet is optimistic about the future of humanity because reason always finds solutions to complex problems, develops itself and contributes to the progress of humanity.

According to Malthus' model, in the early stages of development of a region, the amount of food produced by agrarian and primitive (gathering, hunting, fishing) economies will be excessive in relation to the size of the population. Then, population growth will exceed food production growth, which will initially balance production and consumption, but will then lead to food shortages, famine and disease. Therefore, the well-being of the region's population can only be maintained through controlled birth rates. In general, following Malthus' model leads to pessimistic conclusions about the future of humanity, which is why the models of Malthus and Condorcet both contradict and complement each other.

According to J. Thünen's model, the optimal location of agricultural production around a single market is a circular arrangement, in which the production of less transportable (eggs, milk) and more labour-intensive agricultural products is closer to the market, while the production of more transportable (potatoes, grains, fodder crops) and less labour-intensive products will be removed from the sales market.

Thus, the use of these three models allows us to answer questions about the causes of regional prosperity (Condorcet and Malthus models), the causes of interregional trade (Condorcet's uneven development), and to optimise the use of land for agricultural production (Thünen model).

Market-industrial paradigm (1870s-1960s)

Within the market-industrial paradigm, models appeared by W. Launhardt (*Theory of Route Selection: Discussion of the Principles of Location*, 1872), Alfred Weber (1909 – *Pure Theory of Industrial Location*), August Lesche (*Spatial Organisation of the Economy*, 1940), and W. Izard (*Methods of Regional Analysis*, 1960).

W. Launhardt's model (location triangle) gave an example of the location of a metallurgical enterprise with two sources of raw materials (coal, ore) and one sales market. Alfred Weber added labour costs to the sources of raw materials, and August Lesch added taxes, customs duties, the size of market areas and other factors, and also proclaimed profit maximisation as the main criterion for choosing the location of an enterprise. The theory of economic landscape and the development of the foundations of the theory of spatial economic equilibrium by August Lesch are the pinnacle of the market-industrial paradigm in regional economics.

In the 1930s, the governments of many Western countries established state development corporations (Italy, Germany) or financed large-scale state programmes for regional development in response to the global financial crisis (United States). The development of the Tennessee River Valley in the United States between 1933 and 1964 demonstrated the significant success of the regional development programme, which was subsequently replicated in other areas of the United States (the Colorado River basin, California, the Appalachians, the southern United States, etc.). The obvious successes in regional development and the accumulated scientific potential allowed Walter Eizard (Eizard), whom I have already mentioned, to propose the creation of regional science (Methods of Regional Analysis: an Introduction to Regional Science, NY, 1960), which included methods of demography (forecasting population size and age-sex composition, assessing migration), methods of economic statistics (assessing regional income), methods of assessing interregional interactions (analysis of interregional flows and balance of payments, linear programming of interregional links, gravitational models), methods of industrial analysis (industrial location, analysis of the industrial complex) and methods of synthetic analysis (structure of metropolitan areas, accounting for intangible assets, interregional analysis and industrial complex, etc.). Thus, in 1960, the creation of the market-industrial paradigm was completed from the point of view of A. Lesh's theory of spatial equilibrium of the economy and from the point of view of W. Izard's methods of analysis, but it became clear that it was impossible to ensure regional development using market methods alone.

The planned-industrial paradigm (1920s-1980s)

From the 1920s onwards, in parallel with the development of the market-industrial paradigm in the West, a planned-industrial paradigm of regional economics began to take shape in the USSR. The basis for its development was the practical task of transforming the agrarian Russian Empire into the industrial Soviet Union through a plan to electrify the entire country (GOELRO) and create a large machine industry. As early as the beginning of 1918, V.I. Lenin, in his draft plan for

scientific and technical work, formulated two key ideas that subsequently became the basis of the planned industrial paradigm, namely: - 1. The rational location of industry in terms of proximity to raw materials and the possibility of minimising labour losses in the transition from raw material processing to all subsequent stages of semi-finished product processing, right up to the finished product. 2. Rational, from the point of view of the newest and largest industries, and especially trusts, merger and concentration of production in a few large enterprises. These ideas were put into practice in the GOELRO plan, which considered large regional power plants to be the centres of economic development in the territories. A group of electricity consumers connected to the power plants were linked by a cycle of processing raw materials into finished products.

In 1926, A. Weber's Theory of Industrial Location was translated and published in the USSR (L.-M.: Kniga, 1926) and became widely known among specialists. Discussions on this book (V.V. Pokshishevsky, N.A. Kovalevsky, I.G. Alexandrov and others) led to the development of specific location criteria, among which the requirements for the lowest production costs when locating, taking into account the defence factor, the requirement to combine production and the development of national peripheries became the main ones.

In the post-war period, the general shift in economic development towards the east and south was quite successful, linked both to the development of large resource sources and the development of large manufacturing centres. To a large extent, this was due to the concepts of energy production cycles and territorial-production complexes developed by N.N. Kolosovsky, which have already been mentioned. N.N. Kolosovsky believed that energy production cycles (chains of enterprises linked by common technological processes and electricity consumption) create industrial hubs. Territorial-production complexes are formed around industrial hubs, including not only the main production facilities with all-Union specialisation in the production of essential products (oil, non-ferrous metals, ferrous metals, etc.), but also auxiliary and service production facilities. Then, around the TPK, large economic regions are formed that are relatively "complete" in terms of the range of products manufactured, capable of self-sufficiency in consumer goods and having an all-Union specialisation in the production of several key industrial goods (Theory of Economic Regionalisation, M., Myśl, 1969).

In the 1970s, this approach continued to be successfully applied in Siberia, Kazakhstan and the republics of Central Asia. Academician N.N. Nekrasov included methods of systematic analysis in his research to develop a general plan for the distribution of the country's productive forces (The Economy of the USSR – An Interrelated National Economic Complex. Moscow, 1972 and Regional Economy, Moscow, 1975), while Academician A.G. Granberg worked on the development of

economic and mathematical methods for compiling inter-sectoral and inter-regional balances.

In the early 1980s, Academician A.G. Aganbegyan was one of the first to seriously criticise the planned paradigm of the Soviet economy. The rapid collapse of the planned economy management system under Gorbachev in 1985-1987 led to a sharp decline in research in the field of regional economics and stagnation in the 1990s and 2000s.

The new industrial paradigm (1960s-2010s)

Against the backdrop of the obvious successes of the USSR in developing the eastern and southern regions of the country in the 1940s-1960s, and the successes of the United States in developing the Tennessee Valley and the southwestern states in the 1930s-1960s, which led to the emergence of two superpowers, it became clear that there was a need to combine the market-industrial and planned-industrial paradigms into a new synthetic paradigm. This paradigm became the new industrial paradigm, which was used by second-tier countries (Europe and Asian countries led by Japan). The fundamental difference between these countries and the USSR and the USA was the lack of large reserves of natural resources, which forced them to focus on the development of high-tech manufacturing industries with deep processing of raw materials in seaports.

The basis of the new industrial paradigm was the principle of locating large processing plants in port cities and transferring full-cycle enterprises to these cities, from the production of semi-finished products to the manufacture of finished products. The construction of large railway junctions and airports near ports transformed these areas into zones of new industrial growth in Europe and Japan, and later in other countries around the world, especially China, Taiwan, South Korea, the Caribbean, the United Arab Emirates, etc. The ideology of the new industrial paradigm was formulated in the works of François Perroux (*The Economy of the 20th Century*, 1961), John Friedman (*Regional Development Policy in Venezuela*, 1966; *Urbanisation, Planning and Country Development*, 1973; *The Development of Cities: A Comparative Study of New Industrial Societies*, 1973), Michael Porter (*Competitive Strategy: Techniques for Analyzing Industries and Competitors*, 1980, Russian translation 2011, *Competitive Advantage: Creating and Sustaining Superior Performance*, 1985, etc.).

The most visible practical embodiments of the new industrial paradigm are Singapore, Hong Kong, China's special economic zones (Shanghai, Shenzhen, Qingdao, Guangzhou, Ningbo, Tianjin), Pusan (South Korea), Kaohsiung (Taiwan), Antwerp (Belgium), Rotterdam (Netherlands), Marseille (France), Barcelona

(Spain), the port cities of southern Italy, the United States (Los Angeles, New York, New Orleans, Houston), etc.

It turned out that even with a shortage of their own raw material resources, but with a well-developed transport infrastructure, regions are capable of ensuring their industrial development, and the pace of this development will significantly exceed the pace of development in the country's inland regions.

The new industrial paradigm turned the country's economic development outward, from the capital regions and internal raw material regions to seaports, and established the priority of mixed planned-programmatic-market development of territories. This approach was particularly successful in the Netherlands, thanks to the work of J. Tinbergen. The subsequent work of Jan Tinbergen's colleagues turned the Netherlands into one of the world's leading scientific and educational centres in the field of regional sciences. However, in the 1990s, it became clear that the new driving force behind regional development was not industry, but the service sector of the economy, leading to the formation of a new "service" paradigm in the regional economy.

The service paradigm (1930-1990)

The manufacturing industry, which began to concentrate in coastal industrial areas, led to an outflow of industry from metropolitan regions and inland raw material regions, reduced transport costs, but sharply increased wage costs, as skilled labour was required to work in such enterprises. In addition, manufacturing areas gave rise to areas of environmental pollution and faceless industrial landscapes, including pipes, industrial buildings, port facilities and cranes, warehouses, etc. These areas produced a lot of goods, but few people wanted to live there. As a result, service and recreational areas began to form next to industrial zones, where workers and employees could live and relax, fully recovering after working in industrial zones. In addition, metropolitan regions, freed from industry, also had to produce something, and instead of industrial goods, they began to produce services. Some of these services were related to industry (engineering, consulting, training, design, etc.), but most were aimed directly at consumers – hairdressers, cinemas, theatres, catering, sports, shops, transport, health, education, financial services and much, much more. The financial resources for the development of the service sector came from workers' incomes, as well as new market investments and state support for depressed industrial areas. For example, the phenomenon of English pop and rock music is linked to the high level of youth unemployment (70-80%) in the old industrial areas of Manchester and Liverpool and the development of music education and the music business in these areas. The same applies to the

development of football and other sports, which have made the UK one of the world's sporting powers. It turned out that the service sector was capable of generating high revenues and creating new markets, which for a number of regions became a lifeline out of a difficult economic situation. Moreover, high competition in the service sector stimulated the development of the "creative" economy, which created innovative services and the innovative goods necessary for their production (e.g., the high fashion industry, the "fragrance" industry, the production of films using innovative technologies, tourism, etc.).

The first works studying the location of the service sector and the spatial effects of the spread of new goods were published as early as the 1930s and 1950s. However, until the 1960s, they did not go beyond a narrow circle of specialists and were not in high demand by business and government. The most significant studies include those by Walter Christaller, Torsten Hegerstrand, and Edward Ullman.

In his 1933 work *Central Places in Southern Germany*, W. Christaller developed the theory of central places, in which each city becomes a central place for providing a set of optimal services to the surrounding area. The size of the city influenced the size of the market for the services provided in such a way that larger cities had larger markets and could provide increasingly rare services. The largest cities provided the entire range of services, which made them extremely attractive for all types of business and for the provision of the most complete range of services. Based on this theory, the post-war period saw a reorganisation of the system of local government in the Federal Republic of Germany, which led to the creation of one of the most effective systems of local government in the world.

Swedish researcher T. Hegerstrand studied population migration and the spread of innovation and created a theory of innovation diffusion. Using simulation models of innovation diffusion, it was possible to calculate the receptivity of markets to new goods and services, the sales volumes of innovative products, the speed of innovation diffusion, and other parameters of the innovation process. These models were of great importance for the development of the media and the innovation economy and became particularly widely used in the 1990s and 2000s.

American researcher E. Ullman created transport network models that were used for real-world territorial planning and the development of the economy and transport geography in the 1960s-1980s.

In the USSR, M. Abramov's monograph *Production and the Service Sector* was published in 1976, but it did not have a significant impact on regional economic research and attitudes towards the service sector as a possible driver of economic growth, as it did not correspond to the ideology of a planned industrial economy.

In the early 1990s, works appeared in the West that explored the impact of the service sector on regional development (W. Coffey, M. Polese, *Producer Services and Regional Development*; N. Hansen, *Do Producer Services Induce Regional Economic Development*), but their influence on regional economic theory proved insignificant, as researchers' attention shifted to the information economy, which grew at an incredible pace in the 1990s and 2000s.

An information paradigm began to take shape in regional economics.

The information paradigm (1990-2050?)

The phenomenal growth of the information economy sectors in the 1990s (production of telecommunications equipment, computers, development of the media and the Internet, a sharp increase in the importance of knowledge and management quality, and many other new phenomena in economic life) led to the formation of an information paradigm in the regional economy. Back in 1993, the author of this monograph put forward the idea of information technology geography as a branch of geography that studies the emerging information technology sphere on the Earth's surface and proposed an information-problem approach to the development of strategies for the development of countries and regions of the world (Abstract of doctoral dissertation "Justification of development strategies for arid countries and regions based on an information approach" M., 1993, *Information and technological geography: grounds for distinction and development programme*. Izv. RAN, ser. geogr., No. 2, 1994). Western journals feature articles by Eike Anderson and co-authors – "Knowledge and Communication Infrastructure and Regional Economic Change" (1990), Anna Lee Saxenian – "Regional Networks and the Resurgence of Silicon Valley" (1990), Richard Shuler – "Transportation and Telecommunications Networks: Planning Urban Infrastructure for the 21st Century" (1992), Richard Florida, Martin Kinney – "Institutions and Economic Transformation" (1994), M. Fisher and S. Gopal – *Artificial Neural Networks: A New Approach to Modelling Interregional Telecommunication Flows* (1994) and others. Manuel Castells succeeds in summarising the results of the impact of the information economy on regional development and society in a number of works – 1. *The Informational City: Information Technology, Economic Restructuring, and the Urban Regional Process*, 1989; 2. *The Internet Galaxy. Reflections on the Internet, Business and Society*, 2001; 3. *The Network Society: From Knowledge to Policy* (2006) and others. Thus, we can say that the foundations of the information paradigm in the regional economy have been laid, but so far no universally recognised models of spatial development of the information economy have been created, there are no models linking the development of the information economy

and the well-being of the population of the regions, there is no assessment of the impact of the information economy on interregional and supra-regional interactions, etc. Therefore, within the framework of the information paradigm, many interesting research tasks arise for the regional economy.

Another new area of research is the issue of sustainable development of regional economies, which includes not only social and economic sustainability, but also environmental sustainability. This is a completely new area of research in regional sciences, in which the key works include the reports of the Club of Rome, the models of D. Meadows and the ideas of A. Peccei, as well as the famous report "Our Common Future".

Thus, regional economics encompasses research carried out within the framework of six main paradigms: agrarian, market-industrial, planned-industrial, new-industrial, service and information. Each paradigm has been developing for 50-60 years, and it can be assumed that the latest paradigm, the information paradigm, will reach its peak in 2015-2020 in the West and, with some delay, in Russia.

In general, the paradigm shift corresponds to the change in the main sectors of the economy as the leading sectors of economic development in countries and regions. Researchers from developing countries are given the opportunity to transfer regional development models from highly developed countries to their own countries with appropriate adaptation, while researchers from highly developed countries face the difficult task of identifying innovative trends in economic activity that could lead to the creation of fundamentally new sectors of the economy. It is precisely on the study of economic sectors that the author's theory of regional economics is based, which I will discuss in my second monograph, *Theory of Regional Economics*.

Conclusions to Chapter 8:

- 1. A paradigm is a model of behaviour for scientists, including a research programme (research objectives) and research tools. Research tools include theories, models, concepts, methods, terminology and other patterns of action.**
- 2. Six (6) paradigms have developed in regional economics from 1794 to the present: agrarian, market-industrial, planned-industrial, new-industrial, service, and information.**
- 3. The main fundamental theory of regional economics should be the sectoral-factor theory of regional economics.**

4. Specific theories of regional economics include the theory of economic well-being of the region's population, the theory of production capabilities of the region's economy, the theory of regional economic processes and economic dynamics, the theory of interregional economic interactions, the theory of the national function of the region's economy, and the theory of the continental and global function of the region's economy. Based on the traditions of regional economics, specific theories also include the theory of location and the theory of spatial organisation of the economy and optimal land use, which are more actively studied in economic geography and spatial economics.

5. Most of the specific theories listed above have been developed on completely different methodological bases and are poorly aligned with each other in terms of ideology, approaches, calculation methods, etc. The task is to ensure such compatibility and the possibility of coordinated application for solving applied problems, especially those related to the strategic development of regions, within the framework of a single fundamental theory.

6. Within each of the theories listed, 3-5 models are used to explain quantitative relationships in the economic and social dynamics of the region. All models need to be modified within the framework of the new fundamental theory in order to create a comprehensive methodological research toolkit.

Conclusion.

Regional economics has undergone more than 200 years of accumulation and interpretation of knowledge that answers the questions of what a region is, what a regional economy is, and how economic development in a country and region affects regional development. It is now on the verge of creating a fundamental theory of regional economics.

The second monograph will present a sectoral-factor theory of regional economics, in which the sectoral-factor approach will be compared with existing proposals for solving relevant research problems. In addition, all eight specific theories of regional economics will be considered, together with the main models. I see my task not in imposing my point of view, but in providing a choice for students, young researchers and the most innovative mature researchers in the field of regional economics.

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