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The system of criteria for assessing the effectiveness of the Russian Federation climate adaptation as a basis for the country's competitiveness in the Eurasian and global space

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ORIGINAL ARTICLE

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Abstract. Nowadays, the intensification of the negative dynamics of climate change on the planet continues. This trend indicates a clear lag in adaptation measures to global climate change. However, many international efforts in this regard (for example, the Paris Climate Agreement) are primarily declarative in nature. In this regard, the adoption of the Climate Doctrine of the Russian Federation in 2023 was a very important in terms of the problems of adaptation to climate change on 1/7th of the Earth. Nevertheless, the macroeconomic and microeconomic advantages of climate adaptation determine the long-term national competitiveness. The purpose of this study is to develop a system of criteria for assessing the effectiveness of climate adaptation in the Russian Federation as a basis for the country's competitiveness in the Eurasian and global space. The novelty of the obtained results based on the requirements of the Climate Doctrine of the Russian Federation, a new approach to assessing the effectiveness of adaptation of the national economy to climate change, designed to ensure as a basis for country competitiveness in the Eurasian and global space. The practical significance of the results obtained concern with the possibility of their use in the development of approaches to assessing the effectiveness of national economy adaptation to climate change in accordance with the requirements of the Climate Doctrine of the Russian Federation to ensure country competitiveness.

Keywords: criteria system; efficiency assessment; climate adaptation; Russian Federation; country competitiveness; Eurasian space

JEL codes: F01, L13, Q54

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Introduction

Climate change is one of the most serious challenges of the XXI century. According to the Climate Doctrine of the Russian Federation, they 'go beyond scientific discussions and represent a complex interdisciplinary problem, covering environmental, economic, and social aspects of sustainable development of the Russian Federation'[1].

Today the negative dynamics in climate change on the planet remain (Fig. 1)[2], indicating a clear lag in climate adaptation measures to the ongoing changes [3] both for national and global economy.

However, people concerned about the increasing number of scientifically substantiated 'evidence of human economic activity, primarily associated with greenhouse gas emissions and increasingly affects the

[1] *Decree of the President of the Russian Federation on Oct. 26, 2023 No. 812 "On Approval of the Climate Doctrine of the Russian Federation". Source: http://publication.pravo.gov.ru/document/0001202310260009 (accessed on 01.01.2025)*
[2] *GISS Surface Temperature Analysis. Source: https://data.giss.nasa.gov/gistemp/graphs_v4/ (accessed on 01.01.2025)*

climate'[3].

Moreover, many international documents aimed at prevent the global warming. However, they are mainly declarative in nature. This is particularly evidenced by the criticism[4] of the Paris Climate Agreement (Fig. 2).

In this regard, the adoption of the Climate Doctrine of the Russian Federation in 2023 was a very important in terms of the problems of adaptation to climate change on 1/7th of the Earth.

Nevertheless, the macroeconomic and microeconomic advantages of climate adaptation determine the long-term national competitiveness.

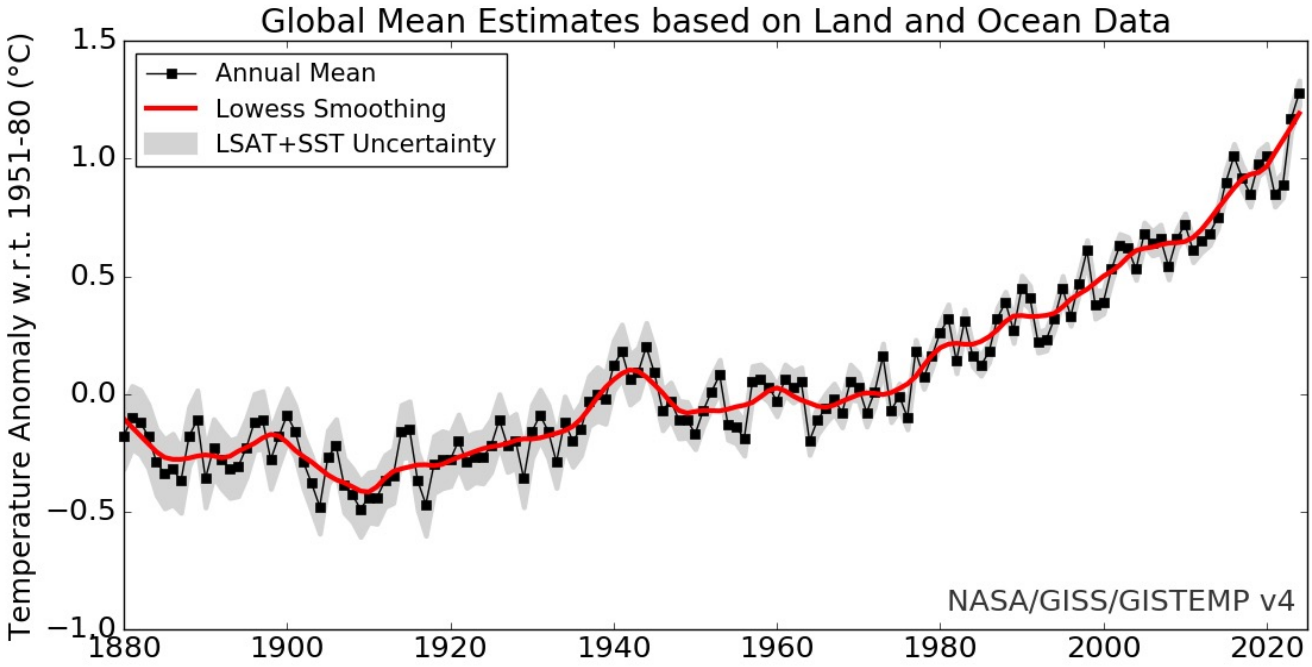

Figure 1. Increase in the Earth's surface temperature, 1880s-2020s

Source: NASA[5]

Therefore, to implement the Climate Doctrine of the Russian Federation effectively, ones need to develop approaches to assessing the effectiveness of the goals and objectives formulated in the doctrine. These goals aimed at addressing the problems of adaptation to climate change predetermined the relevance of the research topic.

The purpose of the research is to form a system of criteria for assessing the effectiveness of climate adaptation in the Russian Federation as the basis for the country's competitiveness in the Eurasian and global space.

Methods

The methodological basis of the research was formed by well-known scientific works devoted to the problems of climatic adaptation. The following papers were considered: Klaptsov V.M. [1], Nikolaev N.P. [2], Porfiryev B.N., Terentyev N.E., Zinchenko Yu.V. [3], Gasho E.G.[6], Serebritsky I.A. [4], Tarasova O.S. [6], Shelomentsev A.G., Goncharova K.S. [5], etc.

The methodological basis of the research was also formed by actual information and analytical materials

[3] *GISS Surface Temperature Analysis. Source: https://data.giss.nasa.gov/gistemp/graphs_v4/ (accessed on 01.01.2025)*

[4] *Decree of the President of the Russian Federation on Oct. 26, 2023 No. 812 "On Approval of the Climate Doctrine of the Russian Federation". Source: http://publication.pravo.gov.ru/document/0001202310260009 (accessed on 01.01.2025)*

[5] *At COP21, the world agreed to increase emissions. Source: https://climateandcapitalism.com/2015/12/13/cop21-world-agrees-to-increase-emissions (accessed on 01.01.2025)*

[6] *Gasho, E.G. (2019). Priorities for climate adaptation in megacities: people, nature, technology. Source: https://clck.ru/3LSHBb (accessed on 01.01.2025)*

devoted to the problems of adaptation to climate change[7,8,9,10] etc.

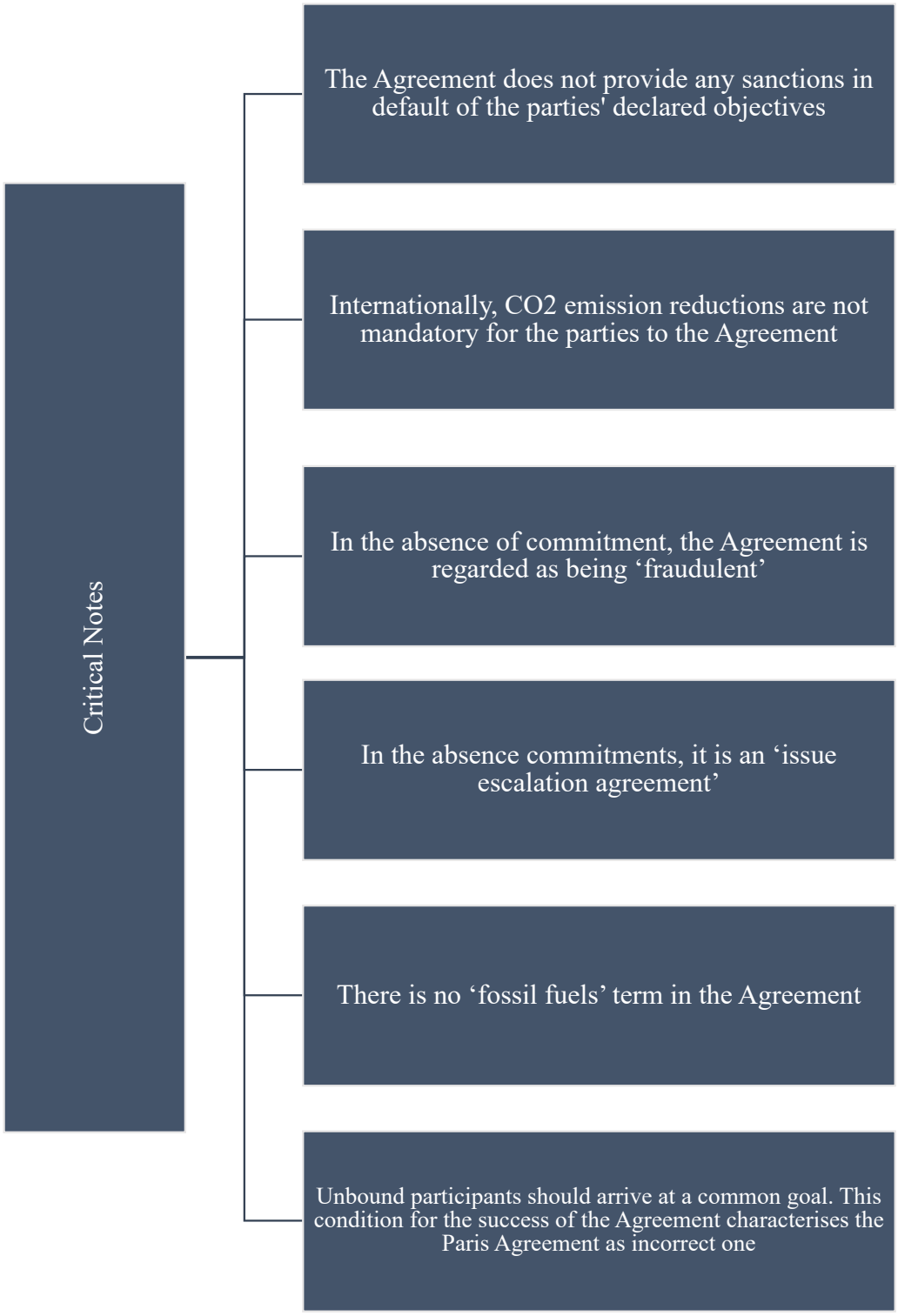

Figure 2. The criticism of the Paris Climate Agreement

Source: Authors

[7] *Adaptation to climate change is a process, not a timely event. Source: https://www.vedomosti.ru/ecology/climate/articles/2022/11/11/949904-adaptatsiya-k-izmeneniyam-klimata-eto-protsess-a-ne-razovoe-meropriyatie (accessed on 01.01.2025)*

[8] *Various factors can influence: the Russian climatologist - on humanity's adaptation to climate change. Source: https://russian.rt.com/science/article/710184-klimat-intervyu-izmeneniya (accessed on 01.01.2025)*

[9] *Adaptation to climate change. Source: https://www.un.org/ru/climatechange/climate-adaptatio (accessed: 01.01.2025)*

[10] *Adaptation to warming: what's wrong with the current climate agenda. Source: https://www.forbes.ru/society/487300-adaptacia-k-potepleniu-cto-ne-tak-s-sovremennoj-klimaticeskoj-povestkoj (accessed on 01.01.2025)*

The Climate Doctrine of the Russian Federation approved by Decree of the President of the Russian Federation No. 812 on October 26, 2023 was considered.

Results

Analysing the Climate Doctrine of the Russian Federation, we identify the areas of fundamental and applied scientific knowledge in terms of the climate and related fields (Fig. 3). They determine personnel training (including advanced training and professional retraining) as one of the issues to climate change adaptation.

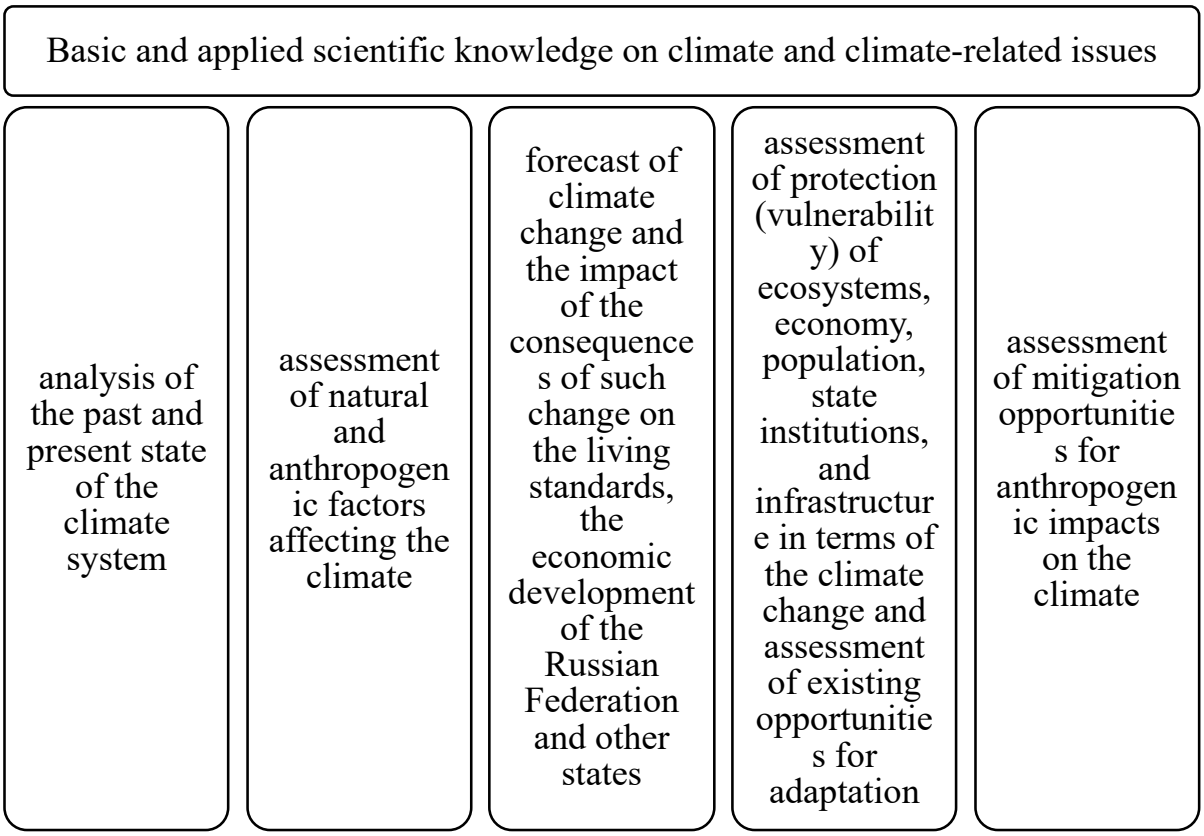

Figure 3. The areas of fundamental and applied scientific knowledge in terms of the climate and related areas based on the Climate Doctrine of the Russian Federation

Source: Authors

Therefore, the areas of scientific knowledge highlighted in Fig. 3 are the basis for both further scientific research in terms of the climate adaptation and for training in various activities.

The algorithm for analysing climate change based on the use of fundamental and applied scientific knowledge in terms of the climate (Fig. 3) to address the problems of climate adaptation provided for by the Climate Doctrine of the Russian Federation is presented in Fig. 4.

The main issues of global climate change and the main approaches to their solution, provided by the Climate Doctrine of the Russian Federation, are presented in Fig. 5.

Indeed, the National Goals of the Russian Federation for the period up to 2030 and for the perspective up to 2036, defined by the Decree of the President of the Russian Federation on 07.05.204 No. 309[11], the goal of achieving environmental well-being as one of the two new national goals in comparison with the previously adopted National Development Goals of the Russian Federation for the period up to 2030, defined by the Decree of the President of the Russian Federation on 21.07.2020 No. 474[12] (Fig. 6) are the key long-term factors of the Russian Federation security. In combination with the problem of global climate change as one of the priorities of the country's domestic and foreign policy, they show their urgency and relevance.

[11] *GISS Surface Temperature Analysis. Source: https://data.giss.nasa.gov/gistemp/graphs_v4/ (accessed on 01.01.2025)*
[12] *GISS Surface Temperature Analysis. Source: https://data.giss.nasa.gov/gistemp/graphs_v4/ (accessed on 01.01.2025)*

Based on the analysis of the goals (Fig. 7), objectives (Fig. 8), and principles (Fig. 9) of the country's climate policy defined by the Climate Doctrine of the Russian Federation we substantiated the system of criteria for assessing the effectiveness of addressing climate adaptation problems to ensure the country's competitiveness in the Eurasian and global space (Table 1).

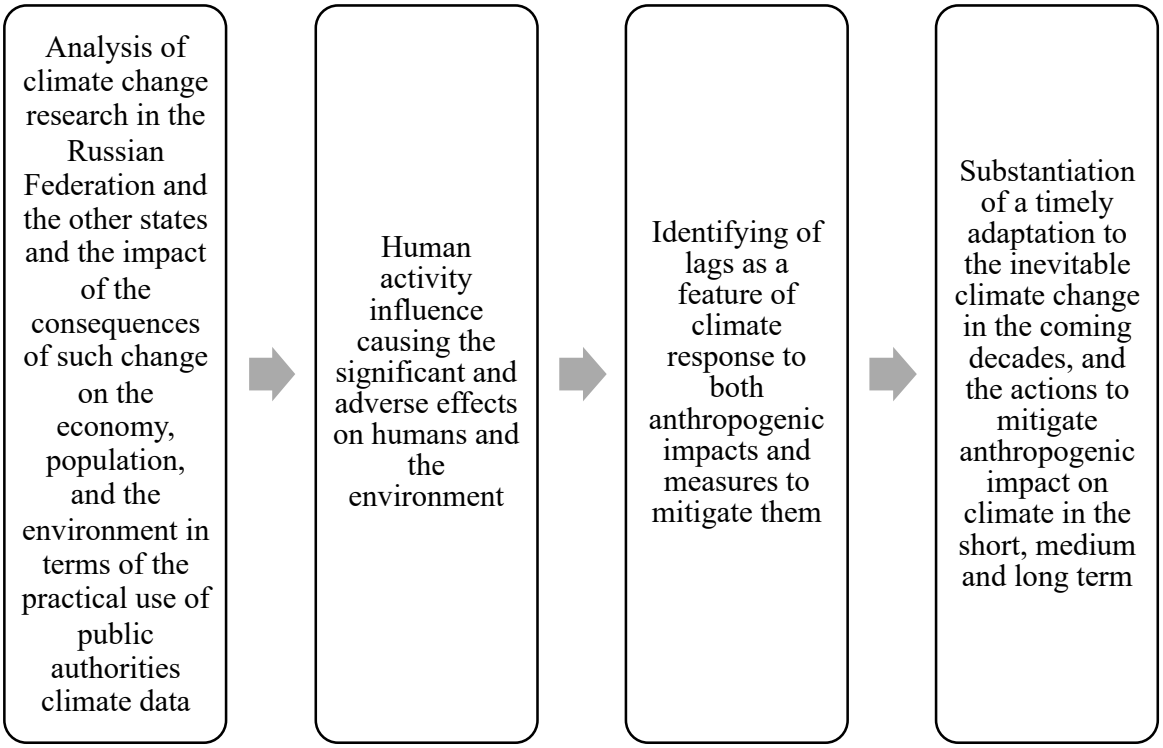

Figure 4. The algorithm for analysing climate change based on the use of fundamental and applied scientific knowledge in terms of the climate to address climate adaptation problems in accordance with the Climate Doctrine of the Russian Federation

Source: Authors

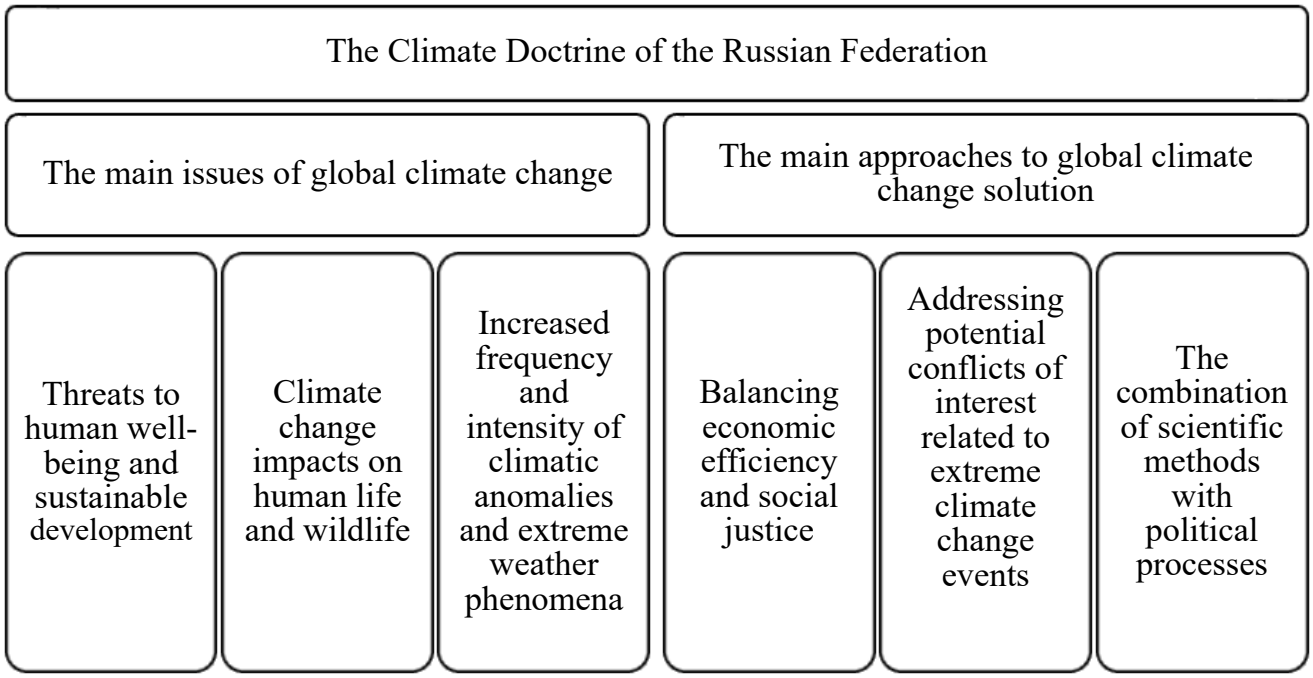

Figure 5. The main issues of global climate change and the main approaches to their solution, provided by the Climate Doctrine of the Russian Federation

Source: Authors

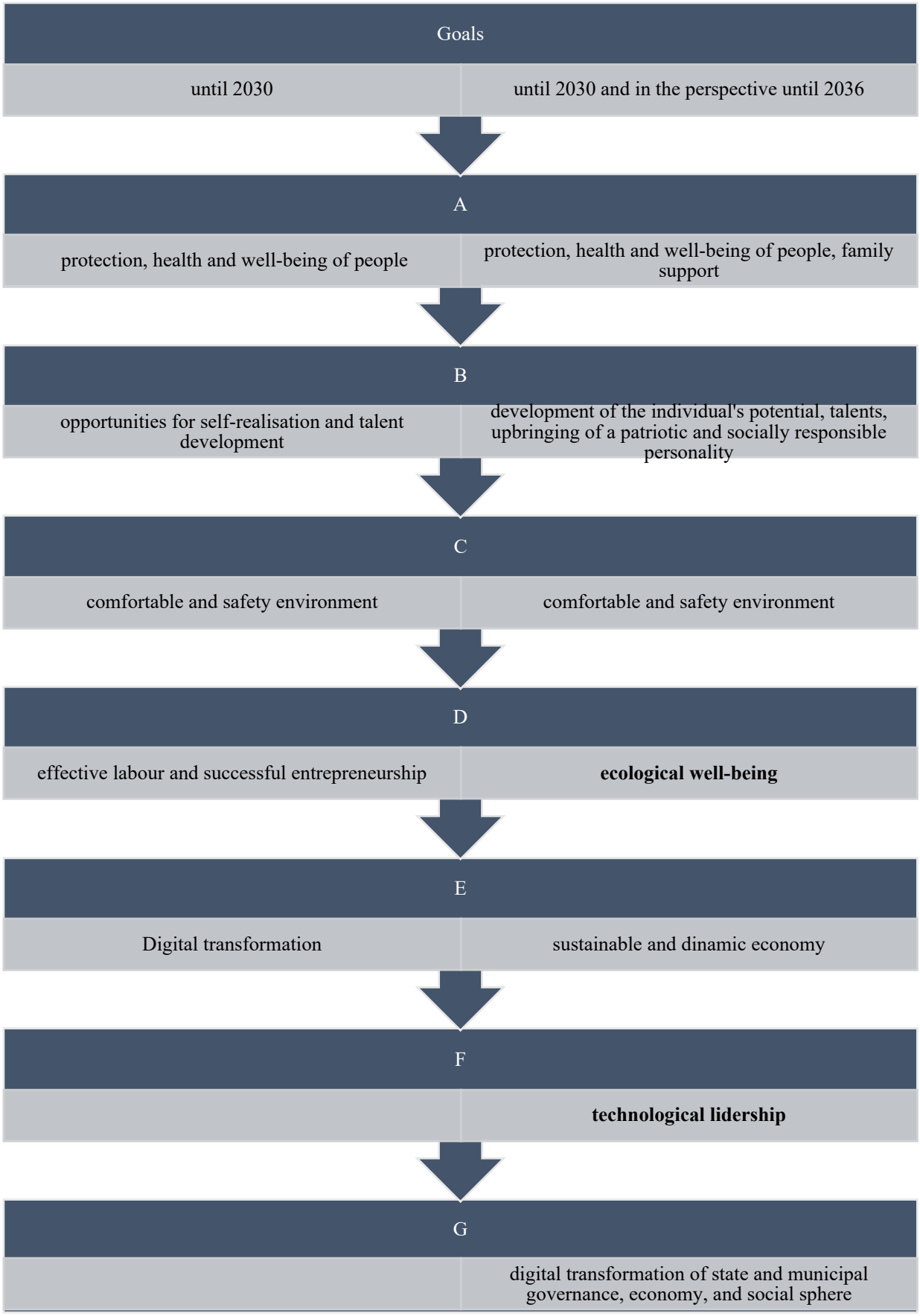

Figure 6. The composition of the National Development Goals of the Russian Federation for the period until 2030 and for the perspective until 2036

Source: Authors

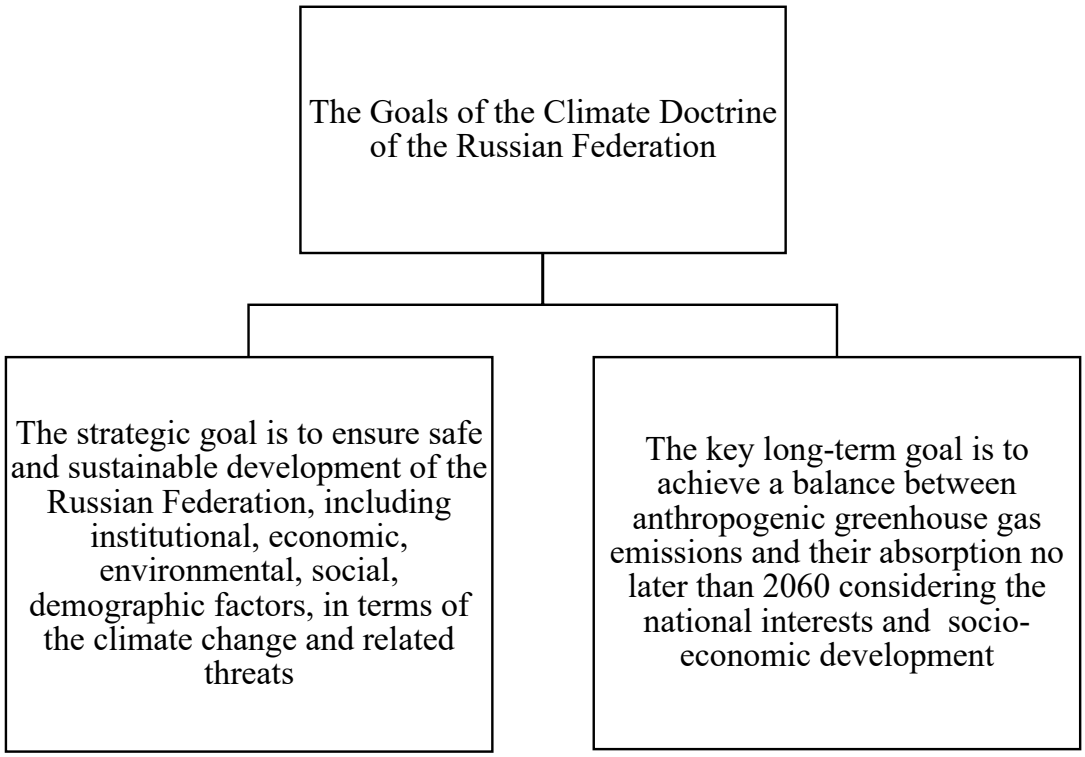

Figure 7. The Russian Federation climate policy objectives defined by the Climate Doctrine of the Russian Federation

Source: Authors

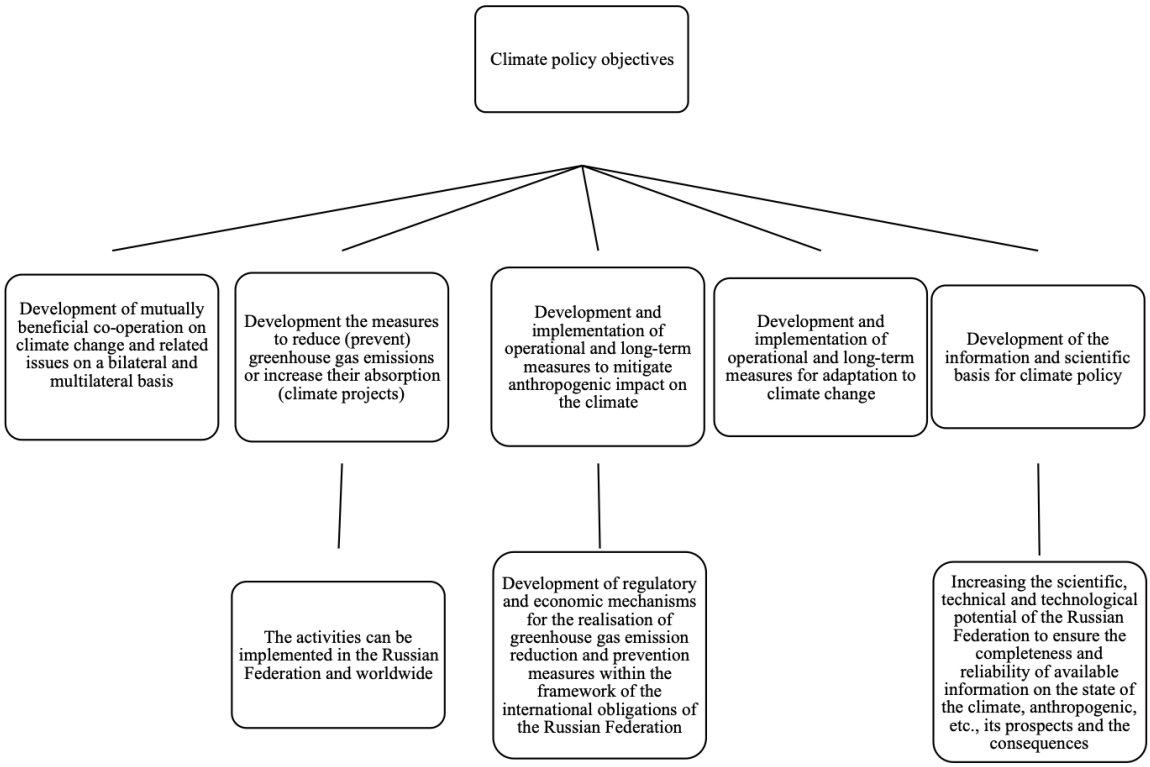

Figure 8. The composition of the country's climate policy objectives defined by the Climate Doctrine of the Russian Federation

Source: Authors

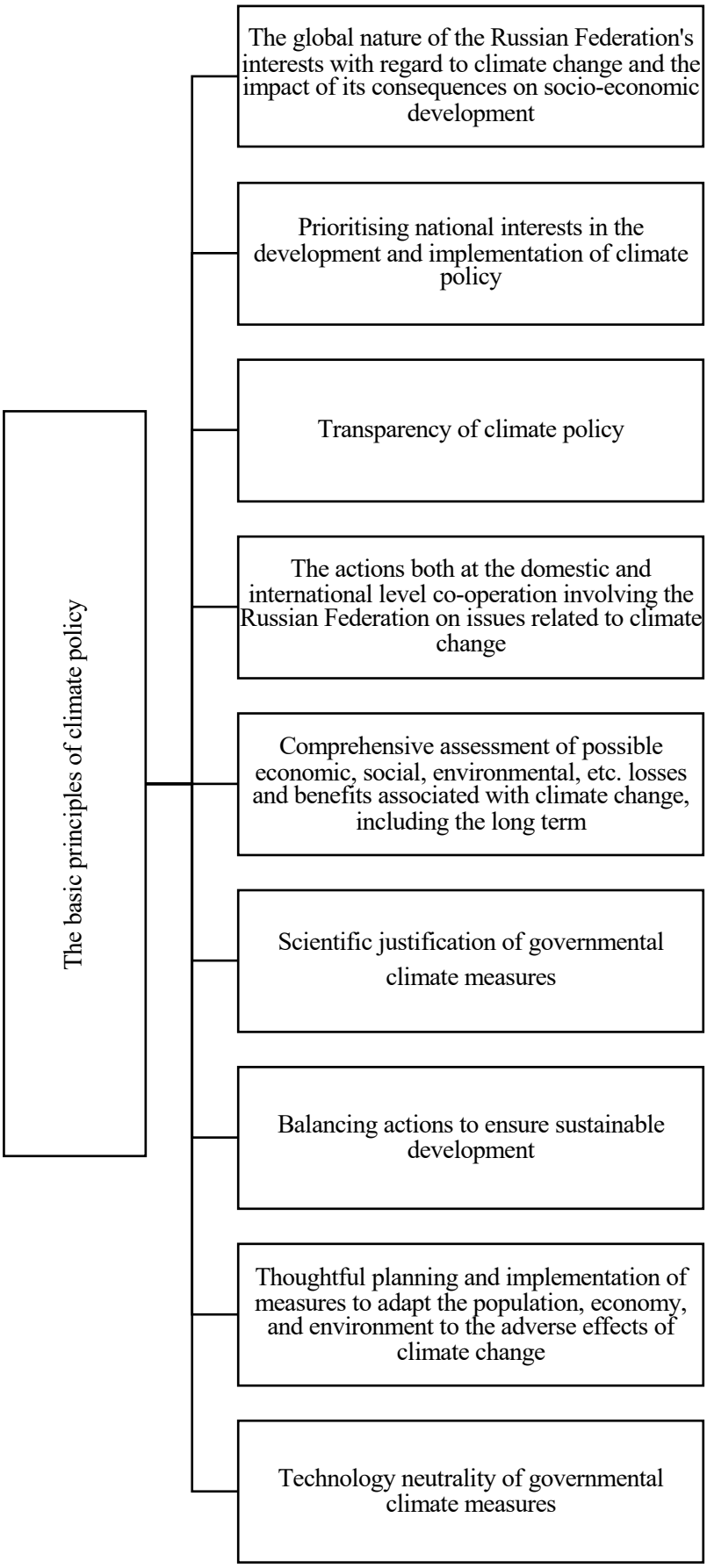

Figure 9. The basic principles of climate policy defined in the Climate Doctrine of the Russian Federation
Source: Authors

Table 1 – The results of substantiation of criteria system for assessing the effectiveness of addressing climate adaptation in terms of the Climate Doctrine of the Russian Federation to ensure the country's competitiveness in the Eurasian and global space

No.	Criterion	Model type	Model symbols	Note
1	Criterion for assessing the effectiveness of the key long-term goal of the Russian Federation climate policy	$AEG=Q_A/Q_{Em}$ (1)	where AEG is an assessment of the effectiveness of the key long-term goal of the Climate Policy of the Russian Federation, Q_A is the absorbed volume of anthropogenic greenhouse gas emissions, Q_{Em} is the total anthropogenic greenhouse gas emissions.	The criterion can be used as a generalised criterion for assessing the effectiveness of climate change adaptation issues
2	The criterion for assessment the effectiveness of addressing the issues of the Russian Federation climate policy	$AEAO=E_p \times E_{m1} \times E_{m2} \times E_{m3} \times E_c$, (2)	Where AEAO is an assessment of the effectiveness of addressing of the Russian Federation climate policy objectives E_p is an assessment of the effectiveness of scientific, technical, and technological potential of the Russian Federation to ensure the completeness and reliability of information on the state of the climate, anthropogenic and other impacts, its current and future changes and their consequences; E_{m1} is an assessment of the efficiency of the development and implementation of operational and long-term climate change adaptation measures; E_{m2} is an assessment of the efficiency of mechanisms for implementing measures to reduce and prevent greenhouse gas emissions and their absorption; E_{m3} is an assessment of the efficiency of measures to reduce (prevent) greenhouse gas emissions or increase their absorption;	The criterion allows us to assess the effectiveness of addressing the Russian Federation climate policy objectives in general and for each of the set objectives separately. Each of the considered performance assessment indicators (E_p, E_{m1}, E_{m2}, E_{m3}, E_c) is the ratio of the actually achieved level of the climate policy to the required level as it defined by the Climate Doctrine of the Russian Federation

No.	Criterion	Model type	Model symbols	Note
			E_c is an assessment of the efficiency of developing mutually beneficial co-operation on climate change and related issues on a bilateral and multilateral basis.	
3	Criteria for assessing the effectiveness of the implementation of the Russian Federation climate policy	$EDA(t)= a \times ICS_{ED}(t)+ b \times PNI_{ICP}(t)+ c \times CT_{CP}(t)+ d \times DA_{CC}(t)+ e \times OC_{PNL}(t)+ f \times SV_{GM}(t)+ g \times BA_{SDNE}(t)+ h \times PM_{AECC}(t)+ j \times TN_{GMC}(t)$, (3)	where $E_{DA}(t)$ is a general criterion for assessing the effectiveness of climate adaptation in terms of a general approach to the dynamics of achieving climate change adaptation goals, $ICS_{ED}(t)$ is a private criterion for assessing the dynamics of the impact of climate change consequences on the socio-economic development of the Russian Federation; $PNI_{ICP}(t)$ is a private criterion for assessing the dynamics of compliance with the priority of national interests in the development and implementation of climate policy; $CT_{CP}(t)$ is a private criterion for assessing the dynamics of clarity and transparency of the Russian Federation climate policy; $DA_{CC}(t)$ is a private criterion for assessing the dynamics of action activity both at the domestic level and in the framework of international co-operation on climate change-related issues; $OC_{PNL}(t)$ is a private criterion for assessing the dynamics of overall control of possible economic, social, environmental, and other losses and benefits in terms of climate change; $SV_{GM}(t)$ is a private criterion for assessing the dynamics	The criterion for assessing the effectiveness of the implementation of the principles of the Russian Federation climate policy based on the principles of the Russian Federation climate policy allows us to assess the effectiveness of addressing the climate adaptation issues, develop a general approach to assessing the dynamics of achieving the goals of adaptation to climate change.

No.	Criterion	Model type	Model symbols	Note
			of the scientific validity of government climate action; BA_{SDNE} (t) is a private criterion for assessing the dynamics of balancing actions to ensure sustainable development of the national economy; PM_{AECC} (t) is a private criterion for assessing the dynamics of planning and implementing measures to adapt the population, economy, and environment to the adverse effects of climate change; TN_{GMC} (t) is a private criterion for assessing the dynamics of the implementation of technology-neutral state climate measures. a is a weight coefficient of the private criterion for assessing the dynamics of the impact of climate change consequences on the socio-economic development of the Russian Federation; b is a weight coefficient of the private criterion for assessing the dynamics of compliance with the priority of national interests in the development and implementation of climate policy; c is a weight coefficient of the private criterion for assessing the dynamics of transparency of the climate policy of the Russian Federation; d is a weight coefficient of the private criterion for assessing the dynamics of action both at the domestic level and within the framework of international co-operation on climate change-related issues	

No.	Criterion	Model type	Model symbols	Note
			e is a weight coefficient of the private criterion for assessing the dynamics of comprehensive consideration of possible economic, social, environmental, and other losses and benefits associated with climate change; f is a weight coefficient of the private criterion for assessing the dynamics of the scientific validity of the state's climate measures; g is a weight coefficient of the private criterion for assessing the dynamics of balancing actions to ensure sustainable development of the national economy; h is a weight coefficient of the private criterion for assessing the dynamics in planning and implementing measures to adapt the population, economy, and environment to the adverse effects of climate change; j is a weight coefficient of the private criterion for assessing the dynamics of implementation of technology neutrality of state climate measures.	

Source: Authors

Conclusions

Hence, the conducted research has allowed us to substantiate the system of criteria for assessing the effectiveness of addressing climate adaptation problems in terms of the Climate Doctrine of the Russian Federation. It designed to ensure the competitiveness of the country in the Eurasian and global space and includes the following:

- criterion for assessing the efficiency of achieving the key long-term goal of the Russian Federation climate policy as the ratio of the absorbed volume to the total volume of anthropogenic greenhouse gas emissions;

- a criterion for assessing the effectiveness of addressing the issues of the Russian Federation climate policy as a product of efficiency assessments: development of scientific, technical, and technological potential of the Russian Federation to ensure the completeness and reliability of information on the climate; anthropogenic and other impacts on the climate; its changes and the consequences; development and implementation of operational and long-term measures for adaptation to climate change; mechanisms for implementing

measures to reduce and prevent greenhouse gas emissions and increase their absorption; measures to reduce (prevent) greenhouse gas emissions or increase their absorption; development of beneficial cooperation on climate change and related issues on a bilateral and multilateral basis. Additionally, each of the efficiency assessment indicators included in the criterion for assessing the effectiveness of addressing the issues of the Russian Federation climate policy can be represented by the ratio of the actually achieved level of addressing the issue of climate policy to the required level of addressing the issues defined by the Climate Doctrine of the Russian Federation;

- a criterion for assessing the effectiveness of the implementation of the Russian Federation climate policy principles. It is a weighted additive model containing: a private criterion for assessing the dynamics of the impact of climate change consequences on the socio-economic development of the Russian Federation; a private criterion for assessing the dynamics of observing the priority of national interests in the development and implementation of climate policy; a private criterion for assessing the dynamics of clarity and transparency of the Russian Federation climate policy; a private criterion for assessing the dynamics of activity both at the domestic level and within the framework of international co-operation on issues related to climate change; a private criterion for assessing the dynamics of possible economic, social, environmental, and other losses and benefits in terms of the climate change; a private criterion for assessing the dynamics of the scientific validity of government climate action; a private criterion for assessing the dynamics of balancing actions to ensure sustainable development of the national economy; a private criterion for assessing the dynamics of planning and implementing measures to adapt the population, economy, and environment to the adverse effects of climate change; a private criterion for assessing the dynamics of the implementation of technology-neutral state climate measures.

The practical significance of the results obtained concern with the possibility of their use in the development of approaches to assessing the effectiveness of national economy adaptation to climate change in accordance with the requirements of the Climate Doctrine of the Russian Federation to ensure country competitiveness.

Further steps to develop a reasonable system of criteria for assessing the effectiveness of addressing climate adaptation problems in terms of the Climate Doctrine of the Russian Federation include substantiation of approaches to assessing the effectiveness of addressing climate adaptation issues, formation of effectiveness criteria considering the objectives of the Russian Federation climate policy, geographical and other specifics of addressing climate change problems, requirements for the processes of climate policy implementation and requirements for the activities of the Russian Federation.

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The work was done on a personal initiative.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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