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Adaptation to climate change as a key factor in ensuring international competitiveness

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ORIGINAL ARTICLE

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Abstract. Nowadays, there is negative dynamics in climate change on the planet. It indicates a deficit in measures of climate adaptation changes both at the national and global economic levels. The purpose of the research is to form the requirements for assessing the effectiveness of addressing climate adaptation challenges in terms of the new Climate Doctrine of the Russian Federation as a key factor in ensuring international competitiveness in modern conditions. Those based on theoretical and methodological analysis, as well as the challenges and prospects of adaptation to climate change at the national economy level. The novelty of the results concerns with the substantiations based on the requirements of the Climate Doctrine of the Russian Federation, an approach to assessing the effectiveness of national economy adaptation to climate change as a key factor in ensuring international competitiveness. The practical significance of the results obtained considers the possibility of their use in assessing the effectiveness of national economy adaptation to climate change in accordance with the requirements of the Climate Doctrine of the Russian Federation.

Keywords: adaptation; climate change; key factor; ensuring international competitiveness

JEL codes: F01, L13, Q54

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Introduction

Climate change is one of the most serious challenges of the 21st century. According to the Climate Doctrine of the Russian Federation, "it is out of scientific discussions and represents a complex interdisciplinary problem covering environmental, economic, and social aspects of sustainable development of the Russian Federation"[1].

Nowadays, there is global negative dynamics in climate change. It indicates a deficit in measures of climate adaptation to these changes [3, 5] both at the national and global economic levels.

Moreover, there is an increasing scientific publications on "human economic activity, primarily related to greenhouse gas emissions, increasingly affects the climate against the background of its natural variability"[2].

The development of the global economy clearly demonstrates the following:

– firstly, different countries differently deal the problem of climate adaptation;

– secondly, the success of addressing climate change adaptation is one of the decisive factors of the international competitiveness.

In this regard, there is a need for further improvement of approaches to assessing the effectiveness of addressing climate change adaptation.

[1] *Vedomosti. (2022). Adaptation to climate change is a process, not a one-time event. Retrieved from: https://www.vedomosti.ru/ecology/climate/articles/2022/11/11/949904-adaptatsiya-k-izmeneniyam-klimata-eto-protsess-a-ne-razovoe-meropriyatie (accessed 30.04.2024) (in Russian).*

[2] *Decree of the President of the Russian Federation N 812 on 26/10/2023 "On Approval of the Climate Doctrine of the Russian Federation". Retrieved from: http://publication.pravo.gov.ru/document/0001202310260009 (accessed 30.04.2024) (in Russian)*

These factors determined the choice of the research topic and objectives.

The purpose of the research is to form the requirements for assessing the effectiveness of addressing climate change adaptation in terms of the new Climate Doctrine of the Russian Federation. Nowadays, it is a key factor in ensuring international competitiveness. Those based on theoretical and methodological analysis, as well as the challenges and prospects of adaptation to climate change at the national economy level.

Methods

The research methodological base consists in scientific works on addressing climate change adaptation by Nikolaev N.P. [4], Tarasova O.S. [6], Shelomentsev A.G., Goncharova K.S. [11], Serebritsky I.A.[3], Gasha E.[4], Porfiriev B.N., Terentyev N.E. & Zinchenko Yu.V. [5], Klaptsov V.M.[5], as well as [7-10], etc.

The research methodological basis is formed by relevant analytical materials on addressing climate change adaptation[6], etc.

We considered the Climate Doctrine of the Russian Federation as a main normative act.

Results

The structure of the Climate Doctrine of the Russian Federation [30] is shown in Fig. 1. Firstly, we focus on the analysis of its general provisions, climate adaptation goals, and basic principles.

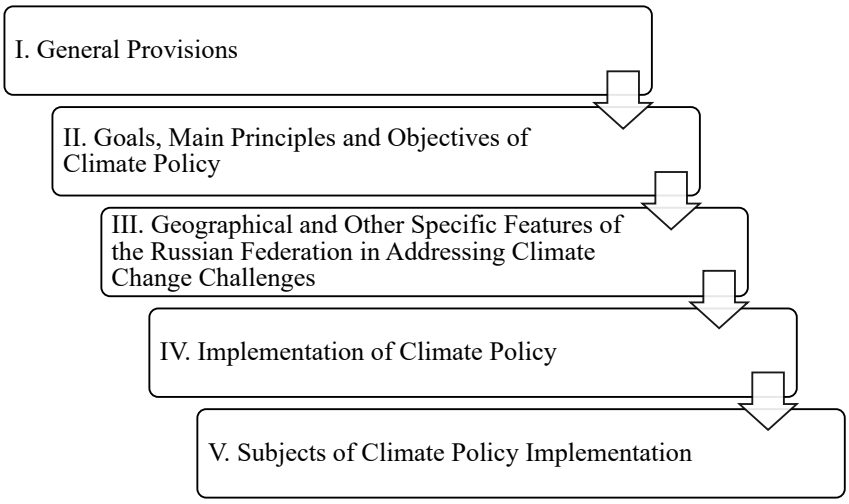

Figure 1. The structure of the Climate Doctrine of the Russian Federation

Source: Decree of the President of the Russian Federation N 812 on 26/10/2023 "On Approval of the Climate Doctrine of the Russian Federation"[7]

Analysing the Climate Doctrine of the Russian Federation adopted in October, 2023, we consider the allocation of fundamental and applied scientific knowledge in climate and related fields (Fig. 2). It determines the personnel training on adaptation to climatic conditions changes.

The directions of scientific knowledge highlighted in figure 2 are the basis for further scientific research on climate adaptation, personnel training in terms of adaptation to climate changes.

The algorithm for using knowledge on climate (Fig.2) in addressing the challenges of climate adaptation provided for by the Climate Doctrine of the Russian Federation is presented in figure 3.

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[3] *Serebrickij, I. A. (2020). International experience in managing adaptation to cli-mate change. Retrieved from: https://climatescience.ru/articles/5e9ef5ddc810400019470e50 (accessed 30.04.2024) (in Russian)..*

[4] *Gasho, E. (Ed.). (2019). Priorities of megalopolis climate adaptation: people, nature, technology. Algorithm, strategy and plan. Scientific and methodological publication. Moscow. Retrieved from: https://mpei.ru/persohal/Lists/CadrePapers/Attachments/2893/ADAPTATION%20 full%20 layout.pdf (accessed 30.04.2024) (in Russian)*

[5] *Klaptsov, V. M. (2011). Measures for adaptation to climate change. Retrieved from: https://riss.ru/analitica/mery-po-adaptatsii-k-izmeneniyam-klimata/ (accessed 30.04.2024) (in Russian).*

[6] *Shmeleva, I. F. (2020). Recommendations for adaptation to climate change – urban infrastructure, green spaces. Retrieved from: https://climatescience.ru/articles/5fdb75eabc9c150019d9b623 (accessed 30.04.2024) (in Russian).*

[7] *Decree of the President of the Russian Federation N 812 on 26/10/2023 "On Approval of the Climate Doctrine of the Russian Federation". Retrieved from: http://publication.pravo.gov.ru/document/0001202310260009 (accessed 30.04.2024) (in Russian).*

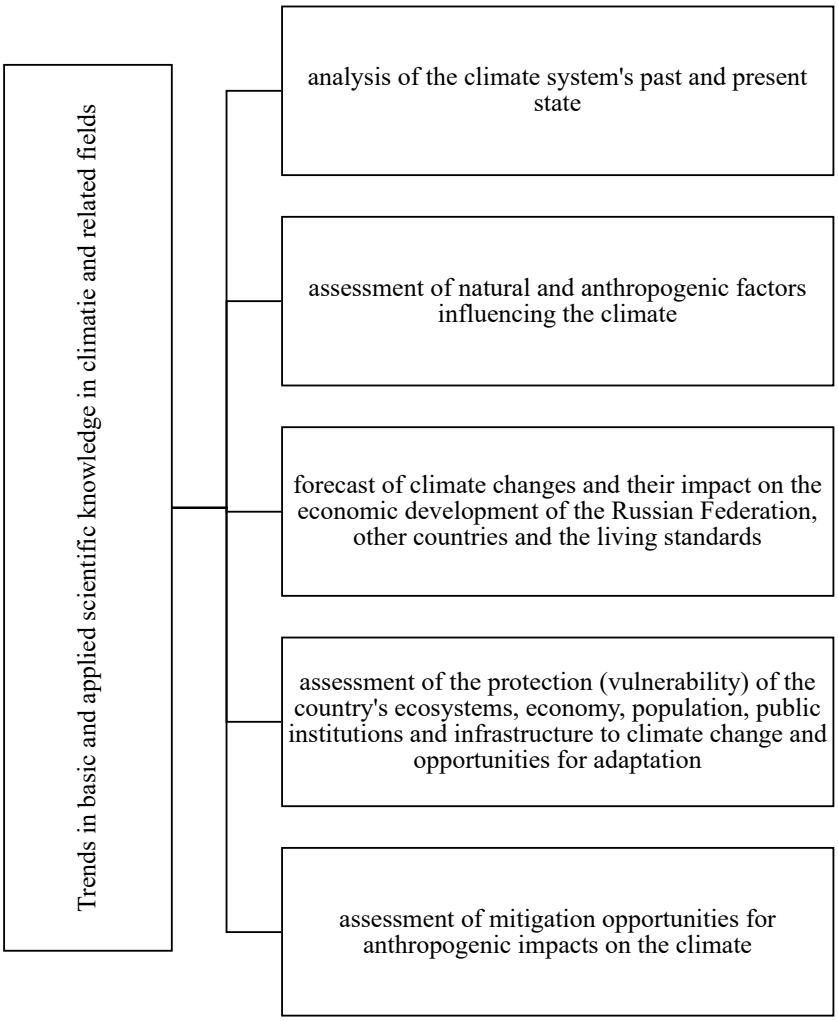

Figure 2. Fundamental and applied scientific knowledge on climate and related fields, according to the Climate Doctrine of the Russian Federation

Source: Decree of the President of the Russian Federation N 812 on 26/10/2023 "On Approval of the Climate Doctrine of the Russian Federation" [8]

The main challenges on climate change and the general approach to their addressing provided by the Climate Doctrine of the Russian Federation [30] are presented in figure 4.

According to the national development goals of the Russian Federation until 2030 and for the perspective until 2036, defined by the Decree the President of the Russian Federation on 07.05.2024 No. 309[9], there is a need to take climate change into account as one of the key long-term security factors of the Russian Federation. It combined with the recognition of global climate change problem as one of the priorities of the country's domestic and foreign policy. It is also evidenced by achieving environmental well-being as one of two fundamentally new goals compared to the previously adopted national development goals. It also was defined by Decree of the President of the Russian Federation on 21.07.2020 No. 474[10]. Moreover, it was expanded by the new document compared to the previously adopted presidential decree (Fig. 5).

[8] *Decree of the President of the Russian Federation N 812 on 26/10/2023 "On Approval of the Climate Doctrine of the Russian Federation". Retrieved from: http://publication.pravo.gov.ru/document/0001202310260009 (accessed 30.04.2024) (in Russian).*

[9] *Decree of the President of the Russian Federation on 07.05.2024 N 309 "On the National Development Goals of the Russian Federation Until 2030 and For the Future Until 2036". Retrieved from: http://publication.pravo.gov.ru/document/0001202405070015?index=1 (accessed 30.04.2024) (in Russian).*

[10] *Decree of the President of the Russian Federation on 27.07.2020 N 474 "On the National Development Goals of the Russian Federation Until 2030". Retrieved from: http://publication.pravo.gov.ru/Document/View/0001202007210012 (accessed 30.04.2024) (in Russian).*

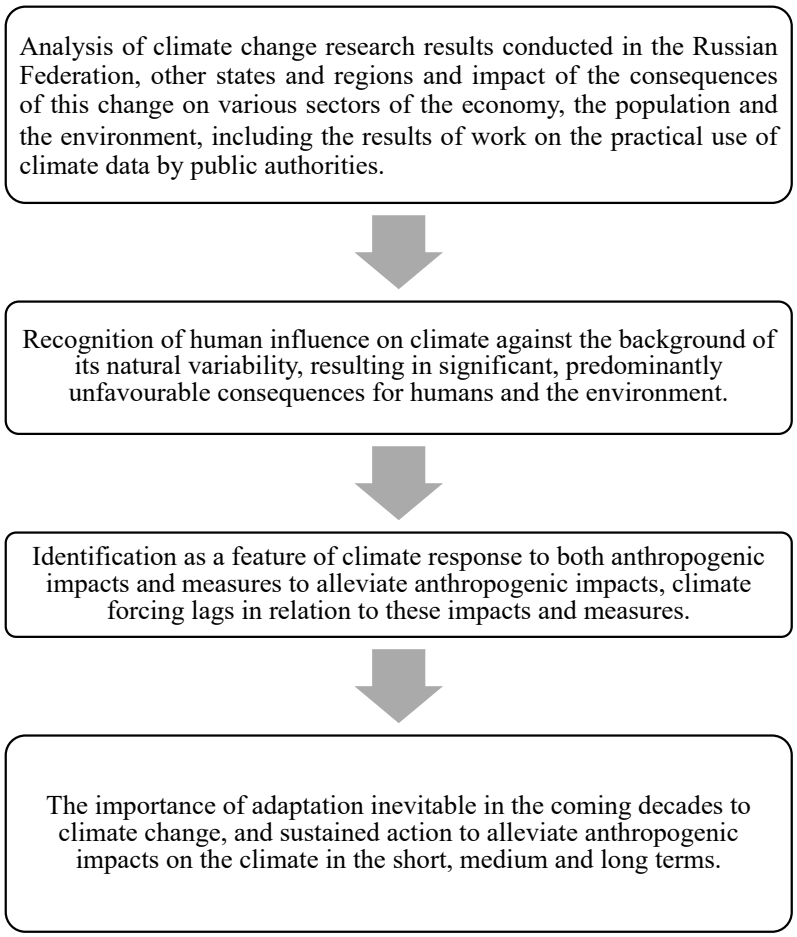

Figure 3. An algorithm for using knowledge on climate in addressing the challenges of climate adaptation provided for by the Climate Doctrine of the Russian Federation

Source: Decree of the President of the Russian Federation N 812 on 26/10/2023 "On Approval of the Climate Doctrine of the Russian Federation"[11]

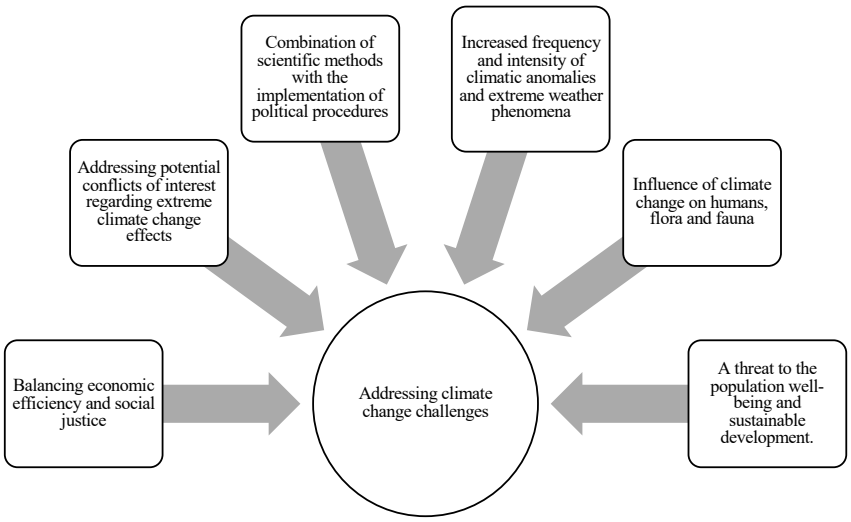

Figure 4. The main challenges of climate change and the general approach to their addressing provided by the Climate Doctrine of the Russian Federation

Source: Decree of the President of the Russian Federation N 812 on 26/10/2023 "On Approval of the Climate Doctrine of the Russian Federation"[12]

[11] *Decree of the President of the Russian Federation N 812 on 26/10/2023 "On Approval of the Climate Doctrine of the Russian Federation". Retrieved from: http://publication.pravo.gov.ru/document/0001202310260009 (accessed 30.04.2024) (in Russian).*

[12] *Decree of the President of the Russian Federation N 812 on 26/10/2023 "On Approval of the Climate Doctrine of the Russian Federation". Retrieved from: http://publication.pravo.gov.ru/document/0001202310260009 (accessed 30.04.2024) (in Russian).*

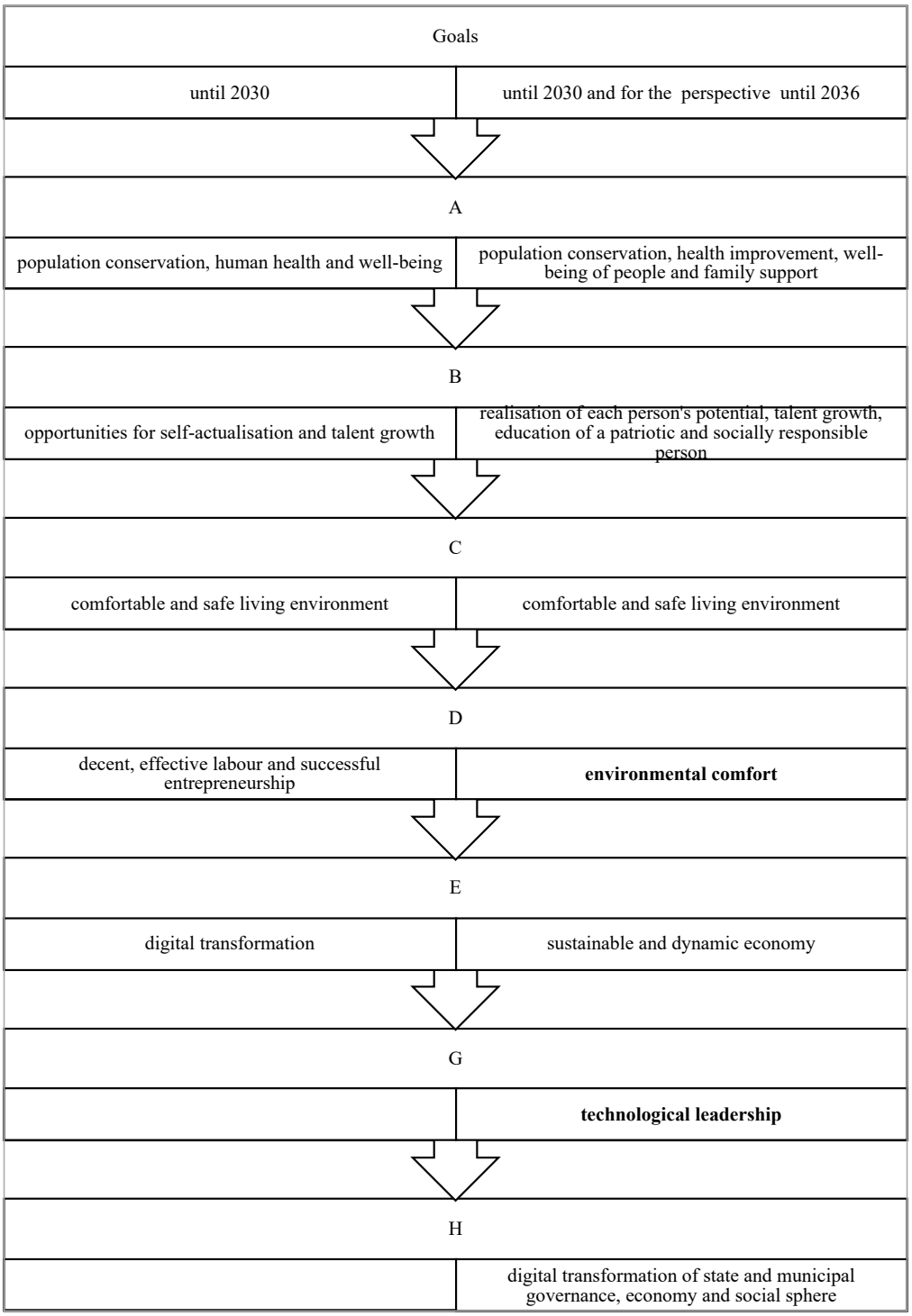

Figure 5. Correlation of national development goals of the Russian Federation until 2030 and national development goals of the Russian Federation until 2030 for the perspective until 2036

Source: Decree of the President of the Russian Federation on 07.05.2024 N 309[13] *& Decree of the President of the Russian Federation on 27.07.2020 N 474*[14]

The basis for further reducing the negative consequences of climate change, as defined in the Climate

[13] *Decree of the President of the Russian Federation on 07.05.2024 N 309 "On the National Development Goals of the Russian Federation Until 2030 and For the Future Until 2036". Retrieved from: http://publication.pravo.gov.ru/document/0001202405070015?index=1 (accessed 30.04.2024) (in Russian).*

[14] *Decree of the President of the Russian Federation on 27.07.2020 N 474 "On the National Development Goals of the Russian Federation Until 2030". Retrieved from: http://publication.pravo.gov.ru/Document/View/0001202007210012 (accessed 30.04.2024) (in Russian).*

Doctrine, was the implementation of decisions by the Russian Federation, adopted in the documents presented in figure 6. However, these climate change adaptation solutions have also contributed to the development of international competitiveness.

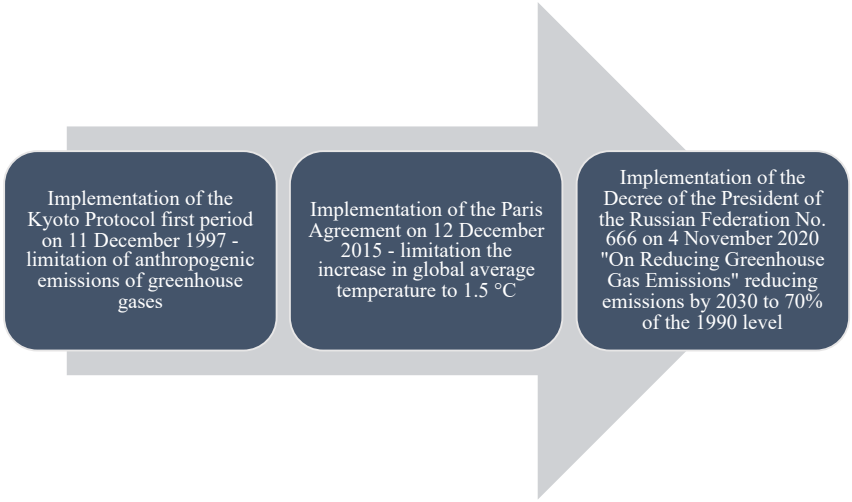

Figure 6. The basis for further reducing the negative consequences of climate change, as defined in the Climate Doctrine

Source: Decree of the President of the Russian Federation N 812 on 26/10/2023 "On Approval of the Climate Doctrine of the Russian Federation"[15]

The content of the Climate Doctrine of the Russian Federation [30] and the objectives of the country's climate policy are presented in figure 7 and 8, respectively.

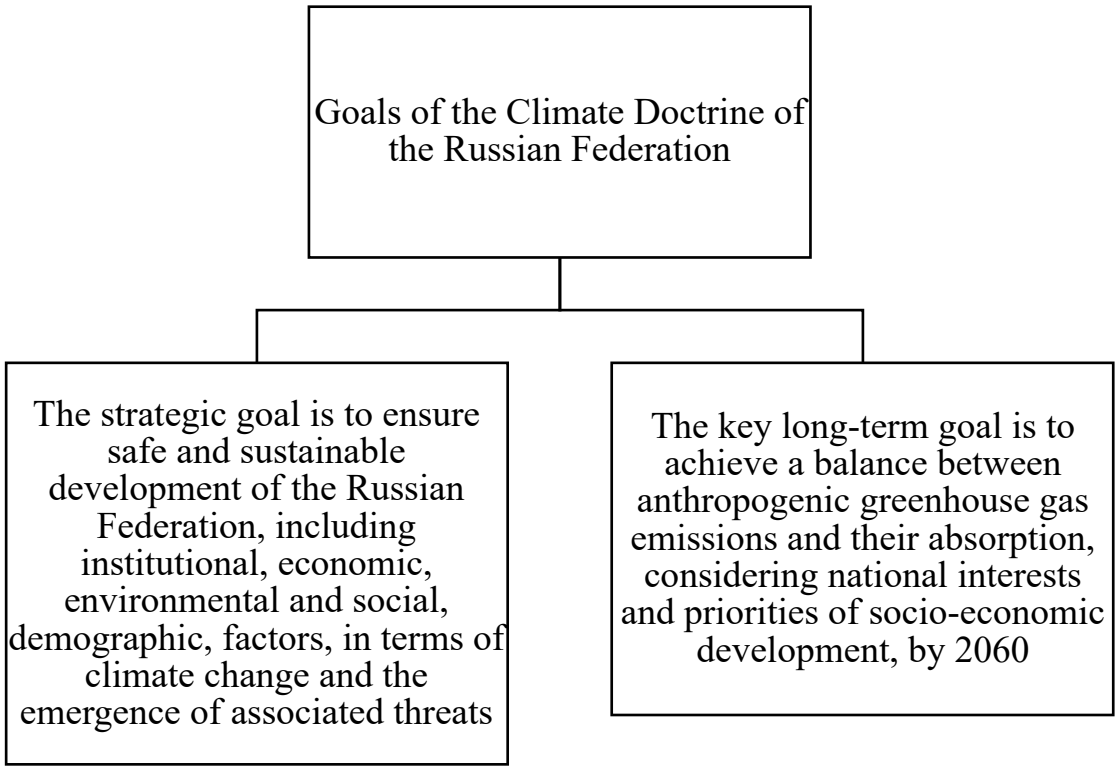

Figure 7. The content of the Climate Doctrine of the Russian Federation

Source: Decree of the President of the Russian Federation N 812 on 26/10/2023 "On Approval of the Climate Doctrine of the Russian Federation"[16]

[15] *Decree of the President of the Russian Federation N 812 on 26/10/2023 "On Approval of the Climate Doctrine of the Russian Federation". Retrieved from: http://publication.pravo.gov.ru/document/0001202310260009 (accessed 30.04.2024) (in Russian).*
[16] *Decree of the President of the Russian Federation N 812 on 26/10/2023 "On Approval of the Climate Doctrine of the Russian Federation". Retrieved from: http://publication.pravo.gov.ru/document/0001202310260009 (accessed 30.04.2024) (in Russian).*

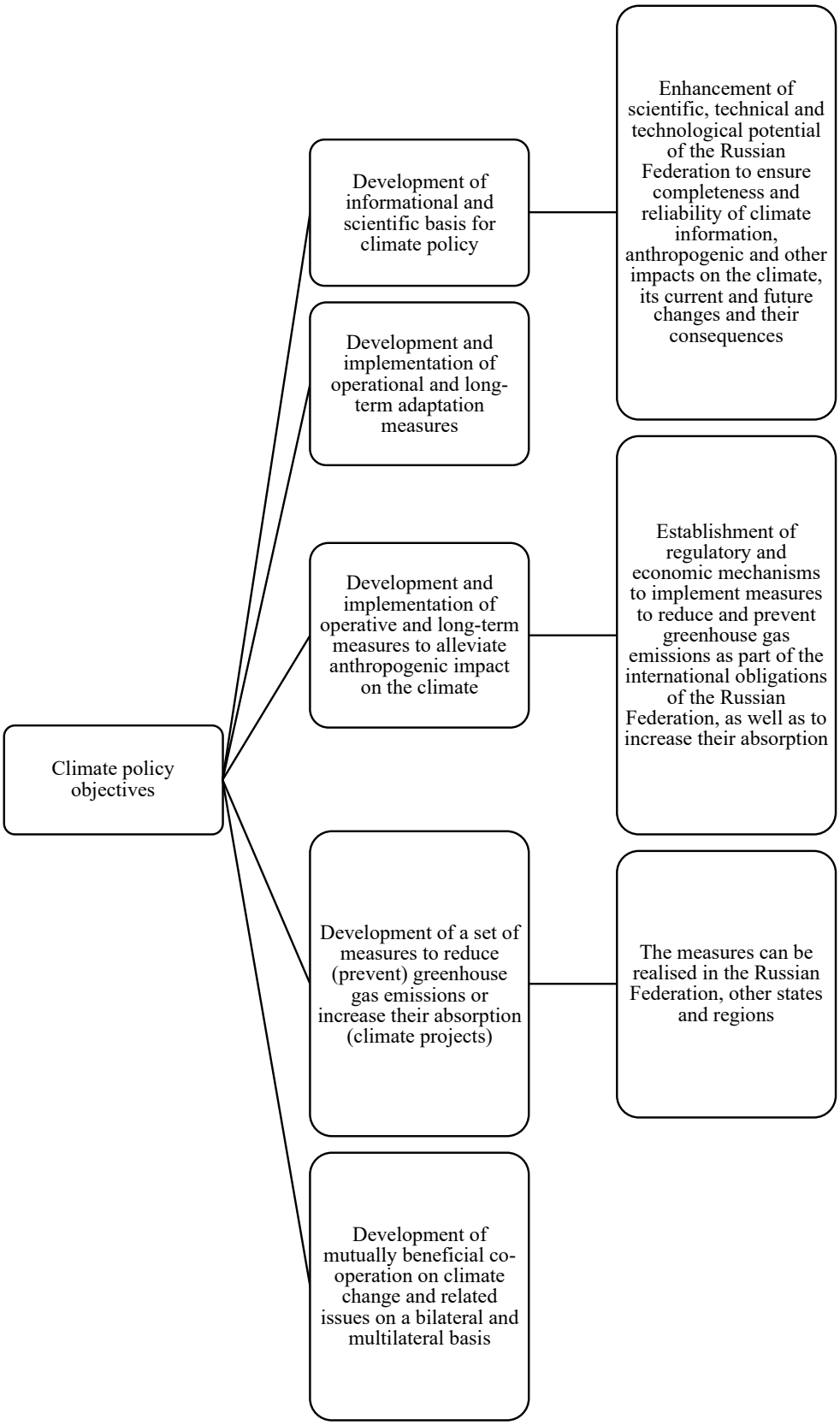

Figure 8. The composition of the country's climate policy objectives defined by the Climate Doctrine of the Russian Federation

Source: Decree of the President of the Russian Federation N 812 on 26/10/2023 "On Approval of the Climate Doctrine of the Russian Federation"[17]

[17] *Decree of the President of the Russian Federation N 812 on 26/10/2023 "On Approval of the Climate Doctrine of the Russian Federation". Retrieved from: http://publication.pravo.gov.ru/document/0001202310260009 (accessed 30.04.2024) (in Russian).*

In terms of forming the requirements to the measures for assessing the climate adaptation efficiency as a factor of international competitiveness, it is important to consider the main principles of climate policy, defined in the Climate Doctrine of the Russian Federation (Fig. 9).

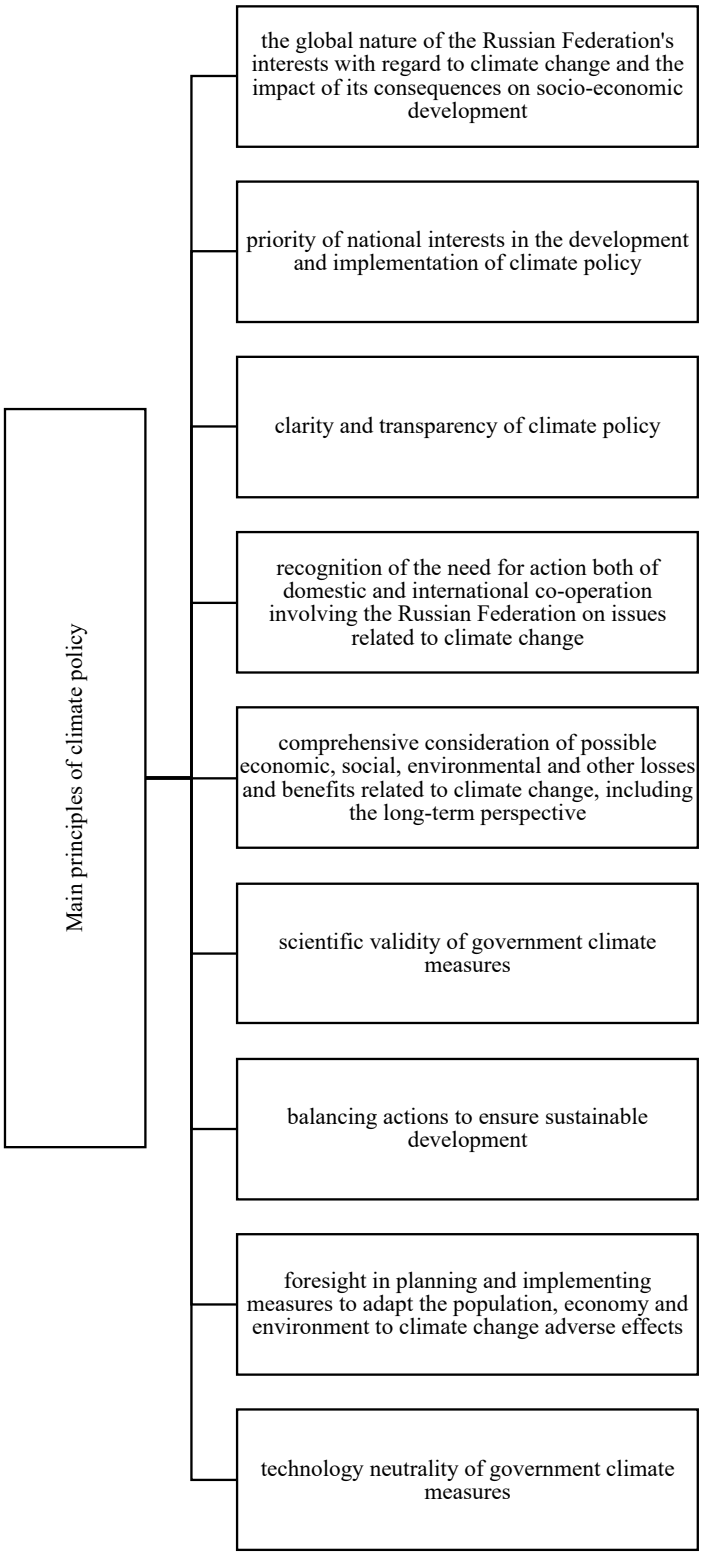

Figure 9. The basic principles of climate policy defined in the Climate Doctrine of the Russian Federation
Source: Decree of the President of the Russian Federation N 812 on 26/10/2023 "On Approval of the Climate Doctrine of the Russian Federation"[18]

[18] *Decree of the President of the Russian Federation N 812 on 26/10/2023 "On Approval of the Climate Doctrine of the Russian Federation". Retrieved from: http://publication.pravo.gov.ru/document/0001202310260009 (accessed 30.04.2024) (in Russian).*

In terms of the goals of the Climate Doctrine of the Russian Federation (Fig.7), the degree of achievement of a key long-term goal can be considered as a generalised criterion for assessment the effectiveness addressing climate adaptation challenges:

$$E_{KLTG}=Q_{GG}/Q_{GGE}, \quad (1)$$

where:

E_{KLTG} is the effectiveness of achieving the key long-term goal of the Climate Doctrine of the Russian Federation,

Q_{GG} is the absorbed volume of anthropogenic greenhouse gas emissions,

Q_{GGE} volume of anthropogenic greenhouse gas emissions.

The value of criterion (1), according to the Climate Doctrine of the Russian Federation, should satisfy equality by 2060: $E_{KLTG} = 1$.

Therefore, on the basis of the strategic goal components of the Climate Doctrine of the Russian Federation (Fig. 7), which are closely related to the objectives of the Climate Doctrine of the Russian Federation (Fig. 8), we would like to draw attention to general approach to assessing the dynamics of achieving climate change adaptation goals of any planning horizon (from short-term to long-term) can be formed on the basis of the main principles of the Climate Change Adaptation Strategy of the Russian Federation (Fig. 7).

The criterion for assessment the effectiveness in addressing climate adaptation challenges, formed in terms of the basic principles of the Russian Federation climate policy (Fig. 9). It reflects a general approach to assessing the dynamics of climate change adaptation goals as follows:

$$E_{DA}(t)=a\times IC_{SEV}(t) + b\times PNI_{CPI}(t) + c\times CN_{CP}(t) + d\times AD_{CCR}(t) + e\times TC_{PB}(t)+f\times SV_{GM}(t) + g\times VA_{ESD}(t) + h\times DM_{AECC}(t) + j\times TM_{GMC}(t), \quad (2)$$

where:

$E_{DA}(t)$ is a generalized criterion for assessment the effectiveness in addressing climate adaptation challenges, reflecting a general approach to assessing the dynamics of achieving the goals of climate change adaptation,

$IC_{SEV}(t)$ is a particular criterion for assessing the dynamics of the impact of the effects of climate change on the socio-economic development of the Russian Federation;

$PNI_{CPI}(t)$ is a particular criterion for assessing the dynamics of compliance with the priority of national interests in the development and implementation of climate policy;

$CN_{CP}(t)$ is a particular criterion for assessing the dynamics of clarity and transparency of the Russian Federation climate policy;

$AD_{CCR}(t)$ is a particular criterion for assessing the dynamics of activity both at the domestic level and within the framework of international cooperation on issues related to climate change;

$TC_{PB}(t)$ is a particular criterion for assessing the dynamics of comprehensive consideration of possible economic, social, environmental, and other losses and benefits associated with climate change;

$SV_{GM}(t)$ is a particular criterion for assessing the dynamics of the scientific validity of government measures in terms of climate;

$VA_{ESD}(t)$ is a particular criterion for assessing the dynamics of balanced actions to ensure national economy sustainable development;

$DM_{AECC}(t)$ is a particular criterion for assessing the dynamics of foresight in planning and implementing measures to adapt the population, economy, and environment to the adverse effects of climate change;

TM_{GMC} is a particular criterion for assessing the dynamics of technological neutrality of governmental measures implementation in terms of climate.

a is the weighting coefficient of a particular criterion for assessing the dynamics of the impact of climate change on the socio-economic development of the Russian Federation;

b is the weighting coefficient of a particular criterion for assessing the dynamics of compliance with the priority of national interests in climate policy development and implementation;

c is the weighting coefficient of a particular criterion for assessing the dynamics of clarity and transparency of the Russian Federation climate policy;

d is the weighting coefficient for assessing the dynamics of activity both at the domestic level and within the framework of international cooperation on issues related to climate change;

e is the weighting coefficient of a particular criterion for assessing the dynamics of comprehensive consideration of possible economic, social, environmental and other losses and benefits associated with climate change;

f is the weighting coefficient of a particular criterion for assessing the dynamics of government measures scientific validity in terms of climate;

g is the weighting coefficient of a particular criterion for assessing the dynamics of balanced actions to ensure national economy sustainable development;

h is the weighting coefficient of a particular criterion for assessing the dynamics of foresight in planning and implementing measures to adapt the population, economy and environment to the adverse of climate change effects;

j is the weighting coefficient of a particular criterion for assessing the dynamics of technological neutrality of governmental measures implementation in terms of climate.

Conclusions

Nowadays, negative dynamics in climate change on the planet remains. It indicates a deficit in measures of climate adaptation to changes both at the national and global economic levels. The presented study forms the requirements for assessing the effectiveness of addressing climate adaptation challenges in terms of the new climate doctrine of the Russian Federation as a key factor in ensuring international competitiveness in modern conditions.

As a generalised criterion for assessing the effectiveness of addressing climate adaptation challenges, we propose to consider the degree of achievement of the key long-term goal of the Climate Doctrine of the Russian Federation as ratio of the absorbed volume of anthropogenic greenhouse gas emissions to the volume of anthropogenic greenhouse gas emissions.

The criterion for assessing the effectiveness of addressing climate adaptation challenges, formed on the basic principles of the Russian Federation climate policy, reflecting a general approach to assessing the dynamics of achieving the goals of adaptation to climate change. It includes specific criteria for assessing its dynamics: the impact of climate change consequences on the socio-economic development of the Russian Federation; compliance with the priority of national interests in climate policy development and implementation; clarity and transparency of the Russian Federation climate policy; active actions both at the domestic level and within the framework of international cooperation on issues related to climate change; comprehensive consideration of possible economic, social, environmental and other losses and benefits associated with climate change; scientific validity of state measures in terms of climate; balanced actions to ensure national economy sustainable development; the foresight in planning and implementing measures to adapt the population, economy, and environment to climate change adverse effects; the implementation of technology-neutral state climate measures.

We plan to substantiate approaches to assessing the effectiveness of addressing climate adaptation challenges as a key factor of international competitiveness. It is envisaged to form efficiency criteria in terms of the objectives of the Russian Federation climate policy, geographical and other features of addressing climate adaptation challenges, requirements for implementing climate policy provided for by the Climate Doctrine of the Russian Federation.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHORS' CONTRIBUTION

Alexey V. Tebekin – conceptualization, project administration, writing – original draft.
Oleg E. Lomakin – formal analysis; writing – review & editing.

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