Introduction. From Past to Future. Some Demographic Forecasts in Geopolitical Lens

Anton L. Grinin
HSE University, Moscow;
Lomonosov Moscow State University, Moscow

Leonid E. Grinin
HSE University, Moscow;
Institute of Oriental Studies, RAS, Moscow

Andrey V. Korotayev
HSE University, Moscow;
Institute of Oriental Studies, RAS, Moscow;
Lomonosov Moscow State University, Moscow

This issue is devoted to long-term trends in human history and forecasts of how these trends may develop in the future. In the Introduction, we would like to focus specifically on the demographic aspect of the future. Although the second article of the first section focuses on future demographic trends, the topic is so broad and relevant that it is appropriate to consider another aspect of possible demographic forecasts, for example, the geopolitical one.

The Role of Population as a Geopolitical Factor

The role of population as a factor in politics and geopolitics, including in relations with neighbors, has always been important. This factor could, of course, be partially replaced by technological and/or military power, but nevertheless it has never completely lost its significance (see Grinin and Grinin 2025). In the modern, closely interconnected world, population also plays a significant role. As for today, the mass of an illiterate or semi-literate poor rural population alone is clearly insufficient to claim a high position in the global balance of power and a strong foreign policy. Nevertheless, even in this state, China under Mao Zedong claimed a leading role in the socialist movement and played a significant role in global geopolitics. And rural India played an important role in the global Non-Aligned Movement.

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In other words, in a strong state, even large, poor, and not very literate population becomes a significant force. If education, technology, and a productive economy are added to population size, the role of population in geopolitics increases dramatically. Imagine if the USSR had continued to exist with a population significantly larger than that of the United States. The geopolitical situation would be different today. Or, for example, imagine if Russia had a population of 250 million instead of 146 million. Russia's influence might not be as great as that of the hypothetical USSR, but it would certainly be greater than it is today. Great Britain and France remain highly influential countries today, but their limited populations diminish their influence. Although both countries attempt to compensate for this through activity, leveraging their influence in former colonies, and so on, their power is limited by their population. However, Germany (even though it is losing its position due to the incompetent policies of O. Scholz and F. Merz and the skillful weakening of its economy by the United States [Schmeller 2024]) was and remains the leading country in the EU due to its larger population. German reunification in 1991, even taking into account the fact that East Germany's industry was practically destroyed, distinguished the country from other European powers. To a significant extent, it was precisely due to its population (and to a lesser extent, its territory, since Germany is still smaller than France) that Germany's rise in the 1990s and 2000s occurred.

The United States' leading role in the Western world is ensured not only by its military, economic, and technological superiority, but also by the fact that its population is significantly larger than that of any other Western country. On the whole, the United States ranks third in the world according to this indicator.

Thus, population plays a very significant role as part of the overall strength of states, as a factor determining their place in the balance of power and their claims to a role in the global order. The population's age structure, ethnoreligious unity, and other demographic characteristics are also crucial. An elderly population with a small number of children and young people clearly reduces the strength of a state and increases its concerns and costs. The fact that the US population is younger than Europe's is one factor explaining America's superiority over Europe. In this context, let us consider how world population is distributed and how it will be distributed.

Thus, in any case population size is significant for the global balance of power. Therefore, the most populous countries, India and China, as well as the very large Indonesia, Pakistan, and some other countries, have very significant or large influence in this regard which increases significantly if the countries' GDP, technological, and military strength grow along with their population. China demonstrated this until recently, but with its enormous population, even recent depopulation is insignificant taking into account its impact on the global balance. Today, India, Indonesia, and, to a lesser extent, Pakistan and other countries are demonstrating strong combined population and GDP growth.

But even if a country with a large population has a low GDP per capita, the size of the population, especially the young population, still plays a role. This increases GDP, provides opportunities for growth, affects the country's role in the global division of labor and global trade, and also creates a large consumer market. In other words, population size is one of the most important factors in a country's role in the global economic and political order (along with its military, technological, economic, and other potential). Therefore, if the dynamics of population growth and a country's share of the global population change, this affects the balance of power. And if such a change occurs within an entire continent, which is in some respects interconnected and sometimes functions as a single entity, like Africa, then this becomes much more important.

One should note that African countries are not only demonstrating high GDP growth rates, but are also experiencing rapid modernization (although, of course, the level of modernization varies greatly within this continent). They also have relatively rapid GDP growth rates. Together, demographic and economic growth in Africa (plus the rapid growth of investment in the African economy which is already underway) lead to the growing importance of African countries and Africa as a whole in the global situation, the balance of power, and the global order.

The Impact of Aging on Society

Global aging is a critically important process that influences many other processes and phenomena in society today and will have a big impact in the future[1]. However, it is little discussed, especially in terms of its broad impact on all spheres of society, even in scientific journals and publications[2]. Global aging in various forms impacts the technological, economic, political, and social spheres (see Grinin, Grinin, and Korotayev 2023a). But this impact has been insufficiently and superficially studied. Its impact on the struggle for a new world order is even less discussed. But it is more than significant.

We believe that in the final phase of the Cybernetic Revolution (*Ibid.*) and, in many ways, beyond it, the most important task will be the adaptation of global society to the process of global aging [*Ibid.*]. At the same time, each society, at every level, must actively begin to integrate this problem into everyday life in order to accelerate the processes of adaptation to aging and the institutionalization of changed age proportions in society.

The aging process actually strongly affects 1) economic vectors (employment, consumption, and its structure, growth rates, investment, *etc.*); 2) political vectors (*e.g.,* whether older people will be the leading electoral stratum;

[1] We have devoted a number of studies to this topic, see Grinin and Korotayev 2016; Grinin, Grinin, and Korotayev 2017, 2023b, 2023c, 2024; Grinin, Grinin, and Malkov 2023.

[2] Although the UN and related organizations, especially the WHO, pay considerable attention to the process of global aging, which occurs at different pace in different types of countries.

what part of the budget will be provided to them); 3) social vectors (to what extent social programs will be oriented toward them; how much the professional structure will be adapted for them); and of course, 4) the medical system; e) in any case, the social and political structures will have an increasing age criterion; 5) aging will have a great influence on the transformation of the structure of the state and its functionality, as well as on democracy[3]; finally, 6) global aging will have a huge impact on the development of technologies and the speed of technological, including military-technological progress (see Grinin A. L. 2025); 7) global aging will have a huge impact on the geopolitical structure of the World System, the balance of power and international relations.

It is now clear that modern society is *politically, financially, and economically prepared to adequately address the challenges associated with increasing life expectancy (LE), while medical and other technologies are moving in this direction.* And in the context of intensifying confrontation and rising military spending, the threat of possible permanent pandemics, *etc.*, it is entirely unclear what the situation will be for the elderly, and whether society will ensure a real increase in LE and an improvement in the quality of biological life. It is possible that we will face a serious socioeconomic or other crisis, a setback (a rehearsal of which we saw during the pandemic, where the elderly were the most disenfranchised). In this case, an increase in life expectancy and the quality of biological life will only be possible after a long break or a setback.

One can argue that the reconfiguration of the World System, with its reduction in economic and trade contacts, conflicts, increased military spending, and so on, may slow the growth of life expectancy or even reduce it temporarily, at least in some countries. At the same time, advances in medical technology will contribute to this upward trend in life expectancy. It may also happen that, due to a sharp intensification of conflict and a worsening economic situation, life expectancy in developed countries will decline, while in developing countries it will continue to rise. *Then, the gap in life expectancy between the Global North and the Global South will significantly narrow.*

Depopulation and Possible Division of the World System into an Aging North and a Young South

Thus, the situation where the population in the countries of the Global South, especially in Africa, is growing very rapidly (and therefore it is young), while in the countries of the Global North it is beginning to decline, is leading to irreversible and numerous changes. Specifically, while urbanization in the Global South will grow rapidly, in the Global North, due to depopulation, aging, changes in the economic structure, and technological advances, a process

[3] On the relationship between democracy and aging and potential problems, see Peterson 1999; Fukuyama 2002; Jackson *et al.* 2008, 2013; Grinin, Grinin, and Korotayev 2021b.

of deurbanization will begin (and it is already beginning in some places) (see Table 2, row 4; [Grinin L. *et al.* 2024; Nuwer 2024]). On the one hand, the widening demographic differences will contribute to the increased involvement of the population of the Global South in the economies and daily life of countries of the Global North. Today, some countries specialize in the 'supply' of female migrants to care for the elderly (and, of course, children). For example, in the Philippines, this process has gone so far that the government is even concerned that the exodus of 'caring daughters' abroad will leave their own parents without care in their old age [Serebryany 2023b]. But here, of course, there are obvious limitations. However, no limits are yet visible for remote work. The process is gaining momentum every year[4]. And as education levels and urbanization increase, the scope of such involvement will inevitably increase. But the more involved residents of the Global South become in the affairs of the Global North, the more noticeable their influence on the latter will be; the greater will be the North's dependence on the South and the competition for labor.

The demographic and other processes described above increase the risk of a new balance of power formation and its influence on the global order, often referred to as a potential global confrontation and struggle between the young South and the aging North. The demographic trends will undoubtedly: a) exacerbate existing tensions between developed and developing countries; b) require increased investment in the former by the latter; and c) intensify the Great Convergence process by, firstly, increasing the involvement of the educated population of the Global South in work in the countries of the Global North, earning relatively high wages, career growth opportunities, and so on. We have already discussed the significant role of migrants in business in the US and other countries, with many startups coming from them, and that they strive to promote their own people to the highest positions whenever possible. The same processes, only on a broader scale, will also occur with remote migration. However, another scenario, which we have termed agist neocolonialism (see below), is not excluded.

There are currently no noticeable trends toward this division of the World-System becoming a politically structured and even institutional. But it cannot be completely excluded. In any case, the stronger this demographic division becomes, the more it will be recognized as ideologically and politically important, and it may even begin to play a geopolitical role.

Socio-Demographic Scenarios

In our study, in relation to the potential demographic trends described we presented several scenarios for the development of the World-System [Grinin L. *et al.* 2024: Ch. 7]. Russia is also among the countries where depopulation has

[4] For example, business process outsourcing in the Philippines alone accounts for 1.7 million jobs. It is the country's largest source of employment and the largest contributor to its GDP. The Philippines is the world's second-largest outsourcing hub after India [Philippines… 2024].

begun, and this is a very serious and growing vulnerability in the intensifying struggle for a new world order. The scenarios depend on the relationship between nationalism (Americanism) and globalism. And aging will influence this relationship. Of course, the scenarios outlined are just tendencies that could never manifest themselves in their full form, but these scenarios show possible tendencies and their interaction and combinations of which will ultimately create a new alignment of forces and balance. It is not possible to discuss these scenarios and their likelihood in detail.

Scenario One: The senility and decline of the developed world and the emergence of new actors on the scene. This scenario refers to the possibility of the World System division into a 'young South' and an 'aging North,' provided that the latter fails to cope with the consequences of global aging while the former develops major leaders capable of changing the balance of power (primarily India).

Scenario Two: Young countries invigorate the World System. It is possible that, if the foundations of the world order provide some opportunities for demographically and economically growing countries, this may temporarily invigorate the whole World System. However, this dynamism will be exhausted by the end of the century.

Scenario Three: Global conservatism. However, if the world order is strengthened with developed countries at the top, conservatism may start to spread to younger countries. At the same time, as noted by Jackson *et al.* (2008), an aging developed world may struggle to remain culturally attractive and politically relevant to younger societies.

Scenario Four: Activity as a national strategy and policy, despite global aging. However, the struggle for a new world order in the situation of depopulation and aging in the developed world, could lead to a certain rise in the aging countries of the developed world. Aging countries will be forced to become more active and increase their birth rates, which could give an impetus to the development of new reproduction-related technologies.

Scenario Five: agist neocolonialism. Capital and corporations will increasingly involve young and mature generations in less developed countries, raising their standards of living and thereby providing for the older generation in their own countries (see Grinin and Korotayev 2010). This will undoubtedly strengthen globalization and interdependence between the young and old parts of the World System. Zones of influence related to language, traditions and geopolitics will emerge based on remote work (see in particular Grinin, Malkov, and Korotayev 2023). The growing importance of content management systems, as mentioned above, will reduce physical presence, leading to a sharp increase in the number of remote foreign workers. This will undoubtedly be facilitated by advances in translation systems. Lingua Google (or something similar) will appear in the world as an active part of contacts.

Let us emphasize that these are all scenarios for the next 50 years. By the end of the century, the situation will change significantly as older countries will adapt to aging, and the younger countries will no longer be so young. Cybernetic society will be formed (see Grinin, Grinin, and Korotayev 2024: Ch. 15). In this context, other scenarios are possible, such as a consensus on an aging world or the dominance of new actors.

Political-Technological Scenarios

Another two scenarios have been constructed for the period up to the end of the current century, although many of their features may appear much earlier, especially with respect to the electronic state.

Scenario Six: The emergence of an electronic state resulting from the powerful development of socio-technical self-managing systems. As we have already mentioned, during the Cybernetic Revolution, many self-managing systems will emerge in production, economy and everyday life. Among these systems, socio-technical self-managing systems (SSSs) will play a special role, using Artificial Intelligence to regulate various social and administrative relations. They perform social and administrative functions (*i.e.* control, verification, distribution, security, rating and other functions) using a set of technologies with the minimal or no human intervention of officials and specialists. Thus, they can be used by authorities at different levels (as well as by the state as a whole, and by the administration of service centers where such regulation is considered by the authorities as necessary: airports, places of mass gatherings, *etc*.).

In the *political* and *administrative* sphere, significant, one might say revolutionary, changes in governance will occur in connection with the development of self-managing systems, since these systems will manage many social and administrative relations. This will happen at the level of individual administrative units and cities (the so-called smart cities), as well as at the level of the state as a whole. In other words, the development of the SSS in one way or another pushes society towards the formation of what we call an *e-state*. However, there are important points to emphasize. We understand the e-state to be a state with a significantly reduced number of civil servants and the supervisory bodies we are accustomed to, due to the fact that many management functions will be carried out mainly, and somewhere completely, with the help of SSS technologies (see Grinin, Grinin, and Korotayev 2021a, 2024). This could also affect democratic procedures.

Thus, there will be a sharp reduction in the number of officials and managers, which will lead to a ‘cheapening’ of the state and a reduction in the drawbacks associated with management (corruption, bureaucracy, *etc.*). However, this will also create a number of problems. On the one hand, the development

of socio-technical self-managing systems makes a transition to direct democracy through permanent electronic voting quite possible. Yet, on the other hand, the use of self-regulating systems in governance will lead to increased technological and political control. We assume that as a result, a unique political regime will emerge, a kind of *democratic authoritarianism*. Finally, the role of the elderly people in politics will increase sharply and, accordingly, age will become an important line of political agitation (see Grinin, Grinin, Korotayev 2021b]).

Such changes can bring about enormous transformations in states' domestic and foreign policies, and changes in the leading geopolitical actors will inevitably lead to serious, not yet entirely clear, changes in the struggle for a new world order.

Scenario Seven: The Formation of a Cybernetic Society. In our opinion, as a result of the largely symbiotic development of the process of global aging and the adaptation of society to it, on the one hand, and the powerful development of self-managing systems, on the other hand, a new type of society will emerge – a cybernetic society. This society will be formed as a result of the completion of the Cybernetic Revolution and will be: a) super-technological; b) sociotechnologically regulated at all levels; and c) a society in which the division into age categories will become socially much more significant, as a result of the aging process, than today (*i.e.,* age will become a much more important social marker than it is today). A cybernetic society is a society that will emerge (and is already emerging) as a result of the completion of the Cybernetic Revolution. On the one hand, it will be closely linked with crucial technological changes in the management and regulation of our life activities at all levels. And on the other hand, it is inextricably linked with the process of global aging, because aging becomes an integral part of society. As it develops and the institutions of society adapt to it, it will change all spheres of society: technological, economic, consumption, social, ideological, and so on. The main characteristics of this society are outlined in the work by Grinin L., Grinin A., and Korotayev (2024: Ch. 15).

However, technological development not only brings relief in a number of aspects, but also threatens the freedom, dignity and privacy of individuals and their comfort. This is especially true for the elderly, who are particularly vulnerable from psychological point of view. Therefore, adapting to aging requires the adaptation of technological innovations to the principles of a free society. And this is a serious problem to be solved, which is already felt very clearly today and is already causing social protests.

The present issue, subtitled *Long-Term Trends and Our Future*, is the twelfth in the series.

The present Yearbook consists of four sections: (I) Technological and Demographic Long-Term Trends: Past, Present and Future; (II) Toward to Singularity? (III) Political Science in Global Perspective; (IV) Reviews and Notes.

Section I 'Technological and Demographic Long-Term Trends: Past, Present and Future' includes two articles.

According to **Leonid E. Grinin and Anton L. Grinin** ('Demographic Transformations in the Historical Process in the Light of Technological Development: Theoretical Approach'), the analysis of the demographic component and the demographic dimension of historical process has unfortunately not been sufficiently studied in the social sciences. The demographic development of humankind is even more rarely studied in its close connection with technological development. However, this is an extremely important aspect that can not only explain essential dimensions of the development, but also provide a basis for explaining current processes and forecasting our futures. Moreover, in many ways, it is an integral aspect of analysis, because it focuses on people, the population, that is the main subject of society and humanity. Accordingly, the changes in demographic parameters (both quantitative and qualitative) have an impact on the entire social system, from technology to ideology as well as on the World System as a whole. Population growth is undoubtedly the most important driving force of the development of society. The most important subsystem of society, which constitutes its material basis, combines population and production. The link between demography and production is seemingly obvious, since, on the one hand, production determines population growth opportunities and, on the other hand, population size affects the production and other opportunities of a society. However, this relationship is not so simple and is also non-linear, and in addition, the correlation between the demographic and production components of societies changes significantly over the course of the historical process. It is also not always so easy to explain strong fluctuations and transformations in population dynamics.

In the present study, the authors provide an analysis of the demographic development of humankind in its close connection with technological development, including the 21st century trends. This work, consisting of two articles, aims to provide a theoretical framework for the correlation between the development of production and technology, on the one hand, and demographic transformations, on the other, during the historical process, and to describe all major demographic transformations during human history. The work describes the historical types of population reproduction (TPR) and the reasons for their change. All this makes it possible to make a forecast about the vectors and main features of the coming demographic transformation in the twenty-first century.

This article describes theoretical approaches and models of the connection between production revolutions (Agrarian, Industrial and Cybernetic) and the largest demographic transformations, and also reflects important points influencing population growth and its limitations. It is shown that the production revolution and the development of the production principle cycle in general change the type of population reproduction, and together they provide the most

powerful impulse for the qualitative reorganization of the entire social structure and social relations and further world-system configurations. The authors conclude that every production revolution is followed by a fundamental change in demography. And vice versa, population growth causes such changes in society and inter-societal relations, communications and diffusion of innovations that it greatly accelerates technological development. However, there are many nuances and external inconsistencies in this correlation that require explanation. The latter are given in the second article, which also makes predictions about future demographic transformations.

The second article by **Leonid E. Grinin, Anton L. Grinin, and Andrey V. Korotayev** ('Demographic Transformations in the Light of Technological Development: Types of Demographic Reproduction in the Past and in the Future') aims at providing a theoretical framework for the correlation between the development of production and technology, on the one hand, and demographic transformations, on the other, during the historical process, and to describe all major demographic transformations during human history. The work describes the historical types of population reproduction (TPR) and the reasons for their change. All this makes it possible to make a forecast about the vectors and main features of the coming demographic transformation in the 21st century. In this article, the relationship between each production revolution and each production principle, on the one hand, and demographic transformations and type of population reproduction, on the other hand, is analyzed not just in a theoretical model, but in connection with the specific course of the historical process and those quantitative data, which science currently has at its disposal. When considering the defined correlation between transformations in production and demography, we give explanation to many important peculiarities.

All these ideas about demographic trends from the Upper Paleolithic to the end of the 21st century have also been summarized by us in a convenient tabular form. A particular attention is given to the analysis of the demographic transition in connection with the demographic transformations taking place in the last seven to eight decades; in addition, the connection between the ongoing Cybernetic Revolution and global aging is revealed. Forecasts are made about future demographic transformations associated with the development of the aging process and the formation of a new type of population reproduction. The article was prepared as a part of the research work of the state task of the RANEPA.

Section II 'Toward to Singularity?' includes one contribution.

Andrey V. Korotayev in his article ('The 21st Century Singularity in the Big History Perspective. A Re-analysis') argues that the idea that in the near future we should expect 'the Singularity' has become quite popular recently, primarily thanks to the activities of Google technical director in the field of machine training Raymond Kurzweil and his book *The Singularity Is Near* (2005). It is shown that the mathematical analysis of the series of events (de-

scribed by Kurzweil in his famous book), which starts with the emergence of our Galaxy and ends with the decoding of the DNA code, is indeed ideally described by an extremely simple mathematical function (not known to Kurzweil himself) with a singularity in the region of 2029. It is also shown that, a similar time series (beginning with the onset of life on Earth and ending with the information revolution – composed by the Russian physicist Alexander Panov completely independently of Kurzweil) is also practically perfectly described by a mathematical function (very similar to the above and not used by Panov) with a singularity in the region of 2027. It is shown that this function is also extremely similar to the equation discovered in 1960 by Heinz von Foerster and published in his famous article in the journal *Science* – this function almost perfectly describes the dynamics of the world population and is characterized by a mathematical singularity in the region of 2027. All this indicates the existence of sufficiently rigorous global macroevolutionary regularities (describing the evolution of complexity on our planet for a few billions of years), which can be surprisingly accurately described by extremely simple mathematical functions. At the same time it is demonstrated that in the region of the singularity point there is no reason, after Kurzweil, to expect an unprecedented (many orders of magnitude) acceleration of the rates of technological development. There are more grounds for interpreting this point as an indication of an inflection point, after which the pace of global evolution will begin to slow down systematically in the long term.

Section III 'Political Science in Global Perspective' contains one article.

The article by **Arno Tausch** ('International Political Science as a Global Centre-Periphery System') documents the enormous concentration of global access to the products of 'political science' published in the existing channels of communication. The author's analysis is based on a detailed and quantitative critique of the self-image of political science, which still seeks to disseminate the products of our work exclusively in English-language peer-reviewed journals based in the former, declining geographical and political centre of the world economy. We are trying to develop new perspectives aimed at increasing the international visibility of scientific work across our planet in the 21st century, beyond these established publication channels. A planet that is increasingly moving away from the leadership role of the United States of America and that is increasingly characterized by a plurality of cultures and languages.

Section IV 'Reviews and Notes' contains two reviews: a review by **Leonid E. Grinin, Sergey Yu. Malkov, and Andrey V. Korotayev** of *Reconsidering the Limits to Growth. A Report to the Russian Association of the Club of Rome* by Victor A. Sadovnichy, Askar A. Akaev, Ilya V. Ilyin, Sergey Yu. Malkov, Leonid E. Grinin, and Andrey V. Korotayev (Springer, 2023); and a review by **Jack A. Goldstone** of *Cybernetic Revolution and Global Aging. Humankind on the Way to Cybernetic Society, or the Next Hundred Years* by Leonid Grinin, Anton Grinin, and Andrey Korotayev (Springer, 2024).

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