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Dynamic Sustainability Assessment: The Case of Russia in the Period of Transition (1985–2007)

Stanislav Edward Shmelev*[1]

Russia has experienced twenty years of economic and social change, which has had a substantial impact on the regional and sectoral patterns of the development of its economy, infrastructure, the quality of the environment, and the well-being of its people. The current economic revival offers new opportunities and presents new challenges for the sustainable development of Russia.

The paper employs the UN Sustainable Development Framework of Indicators and assesses the sustainability of Russia using multi-criteria evaluation methods, namely the uncertainty randomization multi-criteria evaluation method "Analysis and Synthesis of Parameters under Information Deficiency" (ASPID). The analysis covers economic, environmental, and social trends in Russia's development between 1985 and 2007 and assesses the sustainability of this development from the point of view of multiple criteria.

The results show the potential of multi-criteria methods for sustainability assessment at the macro level and offer useful insights into the multidimensional nature of sustainability and the role of priority setting in the evaluation process. Such an analysis reveals the degree of harmony in sustainable development policy. It shows how different sets of priorities determine the outcome of multidimensional analysis of sustainability and could potentially help in assessing progress and designing new policy instruments. This paper is one of the first to apply multi-criteria methods to macro sustainability analysis in a dynamic setting.

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1. Introduction

Economic, social, and environmental aspects of the development of Russia have been the focus of considerable research recently: Granberg et al. (2002), Lvov (2004), Reteyum (2004), Kuzyk and Yakovetz (2005), Belozerov et al. (2005), Glazyrina (2006), Ryumina (2007), Kalinichenko, Surovtsov and Shalabin (2007). The history of sustainability analysis in Russia goes back to the works of Konstantin G. Gofman and his colleagues, who founded the Russian school of the economics of natural resource management, or "ecological economics" as it was sometimes called by Gofman (Gofman, 1998, Fischer-Kowalski, 2007). Sustainability analysis of specific sectors of the economy such as the energy sector, which is currently the key driving force of the Russian economy, has been undertaken in e.g. Aslanyan et al. (2005), although social aspects of the development of the sector have been addressed only briefly. The current issues of sustainable development in Russia have also begun to attract international attention (Oldfield, 2001, Oldfield, 2003). However, there are still gaps in research on the comprehensive assessment of sustainability at the macro scale in Russia, in the interpretation of the links among the different social, economic, and environmental processes and effects, and in strategic forward-looking analysis from the point of view of multiple criteria. The exclusive priority given to facilitating economic growth by doubling GDP is definitely limiting the sustainable development potential of the Russian economy.

Sustainable development, understood here as harmonious development, considering environmental limitations, is essentially a multidimensional problem. It involves simultaneous analysis of environmental, economic, social, and institutional aspects of the development of a state, a city, or a region. The problem of sustainability at the macro scale has been addressed by many researchers: Daly and Cobb (1989), Daly (1994), Pearce and Atkinson (1993), Costanza and Patten (1995), Max-Neef (1995), Pearce, Hamilton and Atkinson (1996), England (1998), Hanley et al. (1999), Neumeyer (2000, 2003, 2004), Lawn (2001, 2003). Alternative sustainability indicators, such as the Human Development Index (HDI), Adjusted Net Savings (ANS), and the Index of Sustainable Economic Welfare (ISEW), have been developed. The Human Development Index (ul Haq, 2003) is estimated for all countries of the world at the UN and is published in the Human Development Reports (UNDP, 2009). The Adjusted Net Savings indicator (Pearce and Atkinson, 1993) is currently calculated regularly by the World Bank (World Bank, 2002). Adjusted net savings are an indicator of weak sustainability. The methodology of ISEW, developed by H. Daly and J. Cobb (Daly and Cobb, 1989), has been applied to the UK (Jackson and Marks, 1994), Sweden (Jackson and Stymne, 1996), the Netherlands (Gerlagh et al., 2002), Austria (Stockhammer et al. 1997) and other countries. The methodology of applying multi-criteria methods to environmental problems has been developed

by Roy (1985), Janssen (1993), Munda (1995), Larichev (1979), Larichev (2002), Hovanov (1996) and other researchers. Recent applications of multi-criteria methods to the analysis of sustainable development indicators can be found in Munda (2005), among other sources.

It should be pointed out that, despite the value of single dimensional approaches to sustainability assessment – in terms of easy communication and use in policy making – there are fundamental problems, highlighted in Martinez-Allier, Munda, and O'Neal (1998). Such problems include the issues of incomparability of values: can environmental and economic goods be substituted for one another in principle? What are the limits for such substitution? Have societies already reached these limits? Which production functions (Cobb-Douglas, CES type, etc.) should be used to describe most accurately the use of natural and economic factors of production? Which weights should be used in such an assessment? There are also dynamic aspects to the problem. Discounting issues is a serious matter: can one discount environmental damages in principle? Is substantial damage experienced far in the future considerably less important than damage inflicted today? It seems that we need to analyse the whole dynamic trajectory of development to be able to understand the dynamics of sustainable development. Some of these issues were addressed by Shmelev and Labajos-Rodriguez (2009).

During recent decades Russia has undergone dramatic structural economic, social, and institutional changes. These changes included deregulating prices; reviving the tradition of entrepreneurship; withdrawal of the previously substantial state support for science; attraction of foreign direct investment; development of the resource-extraction economy; relaxing terms and conditions for international trade; an initial dramatic deterioration and then a slow recovery in the level of consumption and quality of life; and the introduction of a flat tax rate in 1997, which accelerated the growing differentiation between the rich and the poor. Joining the Kyoto Protocol in 2004, determining the emergence of government commitment on stabilizing CO_2 emissions, record high rates of economic growth in several recent years, and declining life expectancy are additional brushstrokes in the complex picture of the development of the Russian economy.

In the light of the above, it seems crucial to assess the progress of Russia towards sustainability by taking a "systems" or "holistic" perspective. This article will provide an overview of economic, environmental, and social aspects of the development of Russia over the course of the past 20 years and will therefore explicitly analyse the sustainability of Russia's development. The multidimensional development path of Russia will be assessed with the help of multi-criteria methods, and an analysis of the complex trends and causes of unsustainability will follow. Application of multi-criteria methods could support the analysis of trade-offs among economic, environmental, and social priorities.

The author will argue that the relative neglect of environmental and social aspects of the development of Russia has and continues to have long-term consequences for sustainability. Spatial aspects of the development of Russia present another challenge, which has not been addressed adequately in the past.

2. Existing approaches to measuring sustainability

First, the aggregate sustainability measures, such as HDI and ANS, will be discussed, followed by a detailed analysis of the economic, environmental, and social aspects of Russia's development. It should be emphasized that such aggregate methods assume that component indicators are perfect substitutes, and that major progress in one of them can compensate for negative tendencies in many others. Such a peculiarity masks the existing multidimensional nature of the development process. It is for this reason that the author suggests new methods for the assessment of progress in the field of sustainable development, based on the application of multi-criteria methods. The article will conclude with an application of multi-criteria assessment tools and analysis of multidimensional development trends.

Human Development Index

The Human Development Index (HDI) is a composite measure, assessing achievements in three main areas of human development: life expectancy, measured with the help of the Life Expectancy at Birth index; education, measured with the help of the Adult Literacy index; and good quality of life, measured with the help of real GPD per capita at PPP (ul Haq, 2003). It should be noted that this paper uses statistical data from 1985 to 2007, supplied to the UNDP by the Russian Government (UNDP, 2009); data on the component indices for 2006 are not available.

The changes measured by the HDI in Russia were characterised by a substantial drop from 0,858 in 1991 to 0,804 in 1993 and a minimum of 0,747 in 1997. Starting from 1998, a moderate growth in the HDI in Russia is observed, and in 2007 its value reached 0,817 (the most recently available figure at the time of publication of this article) (UNDP, 2009). It is interesting to see how the changes in HDI are determined by the changes in the indices composing it. The growth in HDI from 1998 was observed in the context of the continuing decline in the life-expectancy index; however, the dynamic growth in GDP and the moderate increase in the education index have led to the general change in the trend and the positive dynamics of the Human Development Index. It should be noted that from the 28th place in the world in 1980 and 34th in 1990, Russia dropped to 52th place in 1992 and reached an absolute minimum in 1995 (72th place). In 1999 Russia occupied the 55th place, in 2000 the 60th, and in 2002 the 57th; but unfortunately in 2005 it declined to 67th and in 2007 it reached 71st place. The following countries were slightly higher than Russia according to their level of development in 2007: Albania, Belorussia, Romania, Bulgaria, Malaysia; the following were slightly lower: Macedonia, Brazil, Columbia, Peru, and Turkey. The position of Russia was considerably worse than the position of Poland, Slovakia, Hungary, Lithuania, Argentina, Chile, Mexico, and Venezuela. The position of Russia was better than the position of Ukraine, Georgia, Iran, Thailand, China, Jordan, Tunis, Gabon, Algeria, Indonesia, and Mongolia.

The Human Development Index for Russia for the period from 1985 to 2007 according to the UNDP reports is shown in Figure 1.

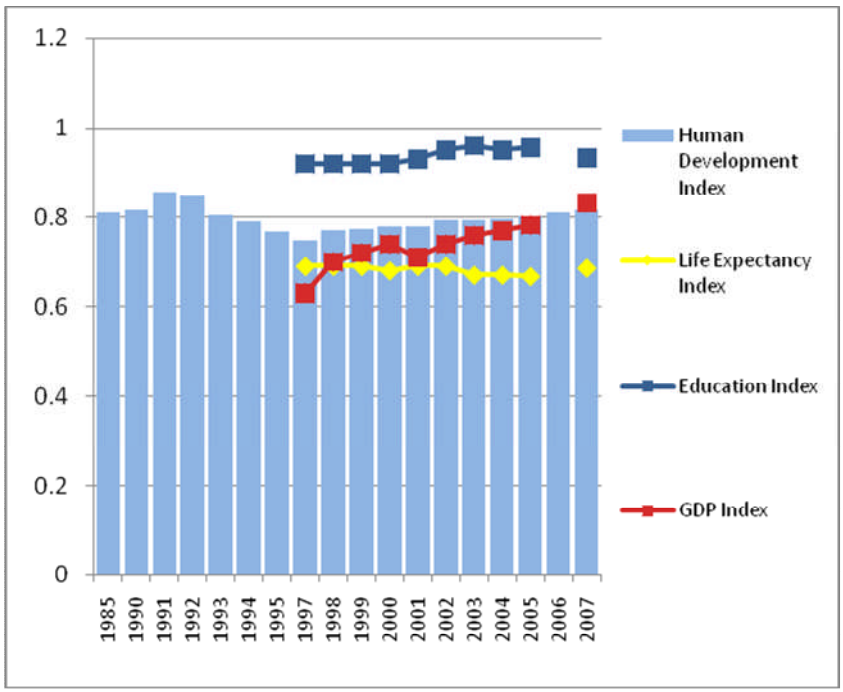

Figure 1. Human Development Index in Russia, 1985–2007, and its constituent components. (United Nations)

It can be seen that full comensurability' compensability between GDP, life expectancy, and education determined the change in the trend when the growing GDP and improved education index outweighed declining life expectancy. The complexity of the development pattern in HDI, therefore, was hidden in the linear aggregation procedure. If the incommensurability of values considered here (education, economic growth, and life expectancy) and their different nature and different units of measurement are taken into account, the complexity of the development pattern is revealed. The overall choice of the set of indicators becomes a very important factor, since the number of criteria and the composition of the set will affect the assessment of the development trend.

Adjusted Net Savings

Adjusted net savings, an indicator of "weak sustainability", denotes the level of capital that is accumulated within the economy, less the depreciation of both produced and natural capital, and environmental damage. "Weak" sustainability assumes that any type of capital is perfectly substitutable for natural capital as an input to production. From the adjusted net savings point of view, for example, a nation which reinvested all of its profits from the exploitation of non-renewable natural resources in the formation of human capital through its educational system would have imposed no net opportunity cost on the country's future citizens (World Bank, 2002).

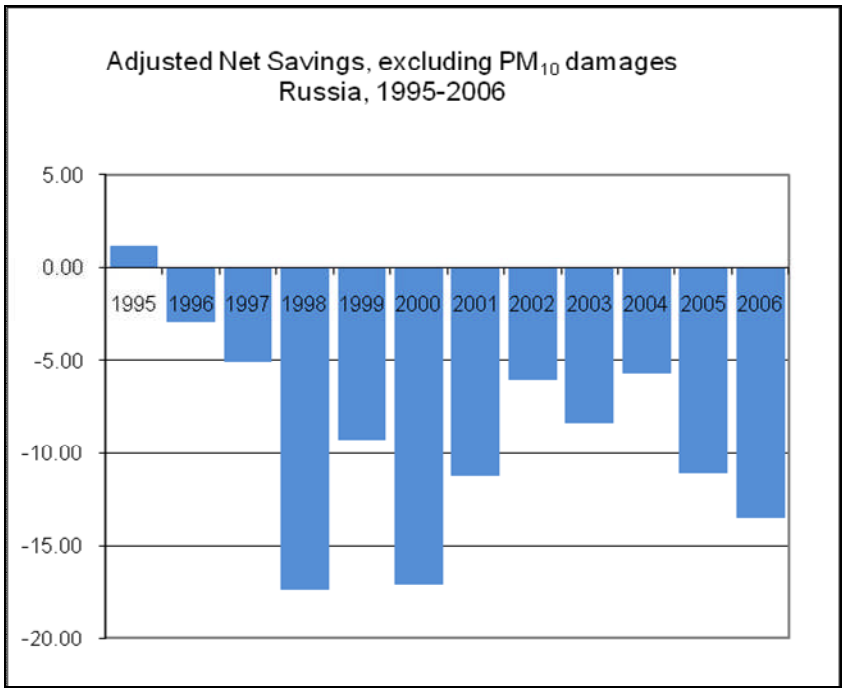

Figure 2. Adjusted Net Savings, Russia (source: World Bank)

As can be seen from Figure 2, Adjusted Net Savings in Russia declined from 1995 to 1998, a trend which was determined by a decline in gross national savings, an increase in the consumption of fixed capital, net depletion of forest, energy, and mineral resources, and CO_2 damage. Since 2000 there was a tendency for the ANS to increase, but even in 2004 its value had not risen above 0, a state of affairs which can be characterized as a struggle to minimize levels of unsustainability; from 2005 the decline became more pronounced. The most recent data of 2006 characterize the situation as critical, with a level of ANS worse than in any year except 1998 and 2000, taking into account all 12 years from 1995 to 2006.

If the issue of incommensurability of values is given serious consideration, it becomes apparent that Russia's growing GDP and declining life expectancy cannot be considered equal substitutes. There is a clear need for development to be both beneficial for the economy and not

destructive to the population and the environment. This requires application of new methods of strategic policy analysis and decision making. The use of multi-criteria methods seems to be beneficial for such analysis for the following reasons: multi-criteria tools allow simultaneous consideration of several development objectives, and interaction between decision makers and the decision support systems allows a deeper understanding of the links between different parts of the system and emergent properties of the system. Multi-criteria tools are capable of showing the trade-offs among the often conflicting priorities, and they provide rankings of scenarios or alternatives based on multidimensional preference relationships.

3. Spatial–temporal aspects of development

In the following sections a spatial–temporal overview of the development of Russia over the past two decades will be presented.

The trend in GDP growth has been seen by most observers as a positive tendency. The growth of the internal economy after the crisis of 1998 helped to overcome the consequences of the reforms and contributed to the alleviation of poverty. However, if one considers the structure of production for the range of years starting in 1990, serious changes become apparent: a sharp increase in the share of wholesale and retail trade, and a decline in the share of agriculture and industry. At the same time, growth in the informal economy is observable, its share reaching 22–25 per cent in 2000.

Let us consider trends in the rate of domestic extraction of renewable and non-renewable resources in Russia (Shmelev, Giljum, 2004). Domestic extraction in Russia declined from 5.9 bln tonnes in 1992 to 4.3 bln tonnes in 1998, but has since increased and reached 5.0 bln tonnes in 2002, which largely reflects the peculiarities of resource-extraction-led economic growth in Russia.

Atmospheric CO_2 emissions in Russia grew constantly from the end of the Second World War to 1980, with a mild decline in the rate of growth since 1980. From 1989 and, in particular, from 1990/1991, CO_2 emissions began to shrink, a trend which was caused by a decline in production levels and structural changes in the economy. The lowest level of emissions, recorded in 1998, is comparable to the level of emissions between 1969 and 1970. From 1999 emissions started to grow again, but by the year 2002 they had not exceeded the values of the emissions recorded for 1996. As a whole, the existing tendency could be characterised as a positive one; however, having declared its commitment to the goal of doubling Russia's GDP without the proactive introduction of energy-efficiency measures, and also gradual transition to the use of renewable energy sources, Russia could face difficulties in meeting its Kyoto Protocol targets and subsequent commitments.

Social issues have been one of the most pressing problems for the Russian Federation over the past two decades. The dramatic fall in life expectancy (BMJ, 1993) has been attributed to the worsening incidence of heart disease, an increase in infant mortality, and a rise in the numbers of deaths due to trauma. Of these three, the most severe rise has been in cases of trauma, which include industrial and car accidents, suicides, killings, military accidents, and poisonings. Analysts link many of these to increased tensions in society due to loss of jobs, restructuring of the economy, and the stressful psychological climate in society.

The Gini Index of Income Inequality (measured for earnings) in Russia increased from 0.26 in 1991 to 0.409 in 1994 (larger values of the index correspond to larger inequalities between the rich and the poor). After a brief decline to 0,375 in 1996, the Gini Index went up to 0,4 in 2003, reaching 0,406 in 2004 and 0.423 in 2008. Thus, in this respect Russia moved from the level of present-day Austria, Luxembourg, and Finland to present-day Moldova and Ukraine, approaching the level of China, Turkey, the United States, and Uruguay.

Unemployment rates in Russia climbed from 5.2 per cent in 1992 to 13.3 per cent in 1998, and then went down again to 7.8 per cent in 2004. Inflation according to official data was always lower than that in Poland and approximately the same as in Ukraine.

The development of the Russian economy is characterized by extreme unevenness if the spatial dimension is considered. The most prosperous regions are Moscow city, the Moscow region, the oil- and gas-producing regions in the Urals and Siberia, and St Petersburg. The gross regional product in Moscow city is greater than that in less developed parts of Russia by a factor of more than 100.

In environmental terms, spatial diversity is also considerable, with the level of total air emissions from stationary sources in some regions reaching 100 times that in other regions.

4. Application of multi-criteria methods

Taking the UN Sustainable Development Indicator Framework as a starting point, we have decided to apply a multi-criteria assessment method to analyse the sustainability of the multidimensional development path of the Russian economy.

The Analysis and Synthesis of Parameters under Information Deficiency (ASPID) method, developed by Hovanov (1996), is based on the Bayesian model of uncertainty randomization. It is designed to compare complex objects, given a range of criteria describing their performance. To generate the set of weights used in the assessment, it takes into account non-numeric (ordinal) information on weight-coefficients values, determined by a system $\mathbf{OI(w)=\{w_r=w_s;\ w_u>w_v;\ldots\}}$ of equalities and inequalities for weight coefficients (indices **r, s, u, v** take values from set $\mathbf{\{1,2,\ldots,m\}}$), non-exact (interval) information on weight-coefficient values determined by a system $\mathbf{II(w)=\{a_j<=w_j<=b_j;\ldots\}}$ of inequalities and equalities (when $\mathbf{a_j=b_j}$) for weight-coefficients (index **j** takes values from set $\mathbf{\{1,2,\ldots,m\}}$, and incomplete expert knowledge. The final result of the assessment can be described as an ordering of analysed objects by estimated degrees of quality under evaluation (sustainability in our case). Therefore, within the framework of assessment, given the expressed priorities, the relationships of domination (in the sense of the chosen criteria set) emerge among the objects being assessed (a country's annual performance in our case). The red and blue intercepts of a straight line, seen in Figure 4, can be read in the following way: an abscissa of a midpoint of a red interval shows an average estimation of a correspondent object, while the interval's length is equal to the doubled standard deviation of the constructed aggregated preference index; an abscissa of a blue interval's right end shows the reliability for dominance relation between neighbouring aggregated estimations.

The method was applied to two sets of 3 and 10 sustainability criteria over the same time period (1995–2003). Relational information on prioritisation of different criteria determined the weights, and as a result randomized estimates of domination of certain alternatives over others were obtained. The total list of criteria considered, based on the UN CSD Indicators of Sustainable Development (UN, 2007), is presented in Table 1.

Table 1. Sustainable development criteria applied to the analysis of the Russian economy (based on the UN CSD Indicators of Sustainable Development, 2007)

Theme	Sub-theme	Indicator
Poverty	Income inequality	Gini Index of Income Inequality
Health	Mortality	Life expectancy at birth
Governance	Crime	Crimes per 100,000 inhabitants
Atmosphere	Climate change	Emissions of CO_2
Fresh water	Water quality	Water pollution, nitrates
Economic development	Unemployment	Unemployment
Economic development	Macro-economic performance	GDP per capita

Economic development	Research and development	Expenditure on R&D as a GDP share
Consumption and production patterns	Energy use	Annual energy consumption per capita
Consumption and production patterns	Energy use	Share of consumption of renewable energy

Dynamic analysis

First, ASPID was applied in the case of three basic sustainability criteria: GDP per capita, CO_2 emissions, and life expectancy, representing economic, environmental, and social dimensions respectively (Figures 3 and 4). The years from 1995 to 2003 were considered, represented on the vertical axis of the diagram. In each assessed scenario a set of assumptions was used to illustrate the current policy priorities in the form of preference equalities and inequalities set.

First, the following priorities, reflecting the current policy trend, were set: GDP is more important than life expectancy; GDP is more important than reduction in CO_2 emissions; reduction of CO_2 emissions is more important than life expectancy. Such a set of priorities characterises the real development priorities in Russia.

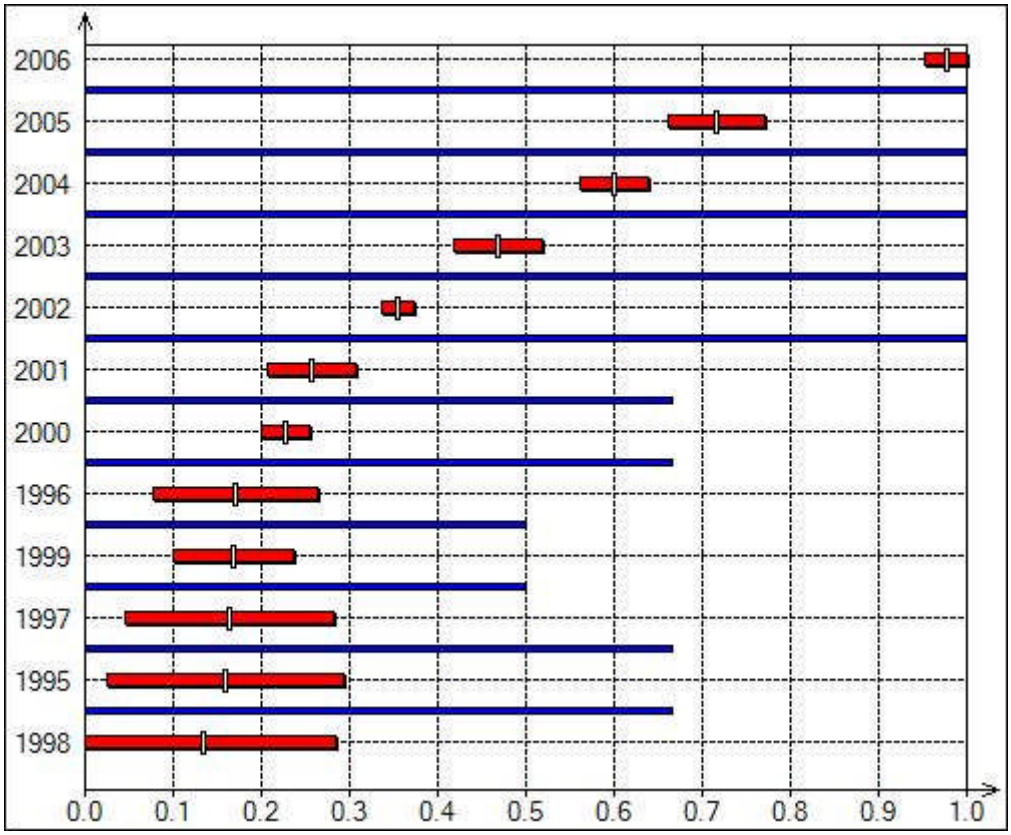

Figure 3. Assessment results, 1995–2003: GDP per capita, CO_2 emissions, life expectancy: current policy priorities

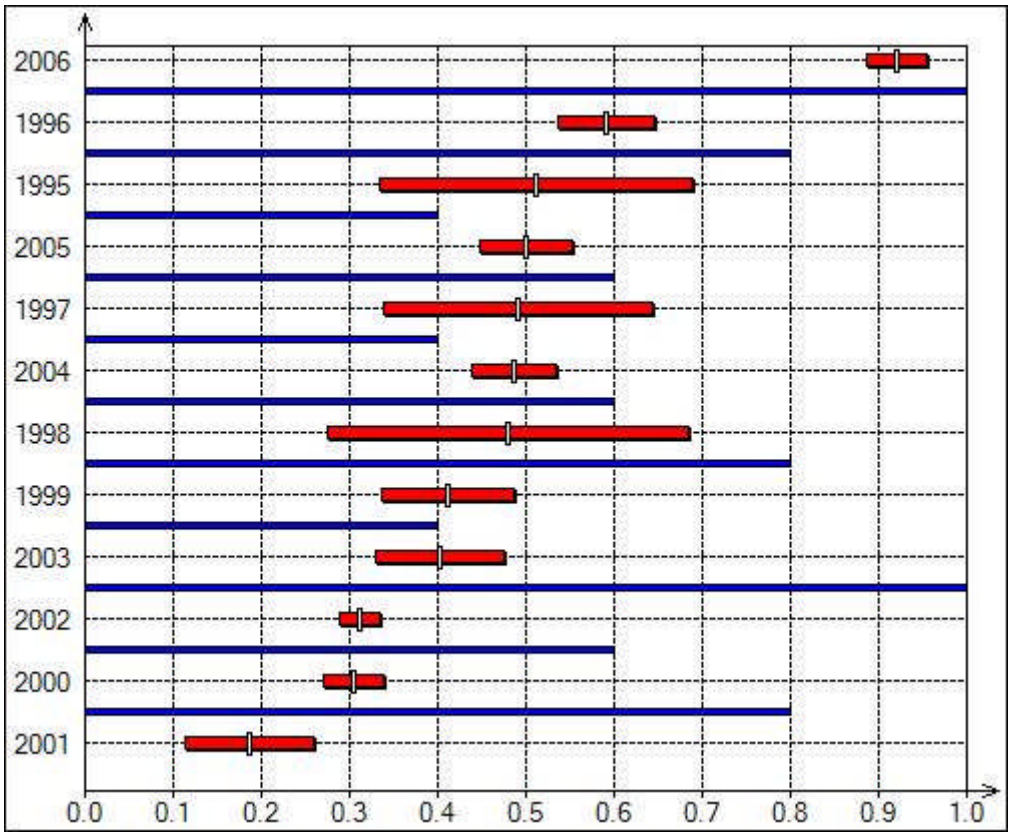

Figure 4. Assessment results, 1995–2003: GDP per capita, CO_2 emissions, life expectancy: more humanistic policy priorities

It can be seen in Figure. 3 that the year 2006 dominates 2005, 2005 dominates 2004, 2004 dominates the year 2003, and so on, revealing an overall positive trend starting in 2000. It should be emphasized that this positive trend appears under specific conditions of the relative importance of criteria, namely the priority of GDP over life expectancy and reduction of CO_2 emissions,, and the priority of CO_2 emissions reductions over life expectancy.

If, however, a different, more humanistic set of policy priorities is chosen (as opposed to more technocratic priorities) (Figure 4), i.e. life expectancy is considered to be more important than GDP, and reduction in CO_2 emissions is seen as more important than GDP, then the trend is seen to be changing, and the most sustainable years in this setting are 2006, followed by 1996 and 1995, then 2005, then 1997, then 2004, then 1998 and so on. The least sustainable years in this setting were 2001, 2000, 2002, 2003, and 1999.

In the more detailed analysis, the following 10 criteria were taken into account: *economic*: GDP per capita, Total Primary Energy Supply (TPES) per capita, share of renewables; *environmental*: CO_2 emissions, water pollution; *social*: life expectancy, GINI index of income inequality, unemployment rate, crimes per 100,000 inhabitants; and institutional: investment in R&D.

The first case (Figure 5) illustrates a current policy-priority scenario: GDP growth is more important than life expectancy and CO_2 emissions. As can be seen from Figure 5, given the assumptions above, the "sustainability trend" appears to be positive in the years until 2006 (with minor exceptions), with more recent years dominating the previous years.

If, however, a pro-environmental and more humanistic set of policy priorities is assumed – an increase in life expectancy and reduction in CO_2 emissions to combat climate change are more important than GDP growth, etc.– the picture becomes quite different (Figure 6). Now the years 1997 and 1998 dominate the other years, and since 1998 a decline in sustainable well-being is observed. The years 2005, 2006, and 1995 appear to be the least sustainable in this setting. It should be noted that due to the larger number of criteria in the extended set, the

uncertainties in domination, represented by the length of the red lines around the probabilities, are considerably higher.

Spatial setting

Spatial data present another important aspect of sustainability analysis in the Russian context. Large disparities between Russian regions in the value of the gross regional product, life expectancy, and CO_2 emissions make spatial sustainability assessment an interesting and worthwhile exercise. We will show here two major results that correspond to the priorities set in the dynamic assessment: emphasis on life expectancy, and emphasis on economic output. It is interesting to note that if life expectancy is taken as a primary sustainability criterion, the first ten most sustainable regions become Ingushetija, Dagestan, Moscow, Kabardino-Balkaria, Karachaevo-Cherkessia, Severnaya Ossetia, Belgorod Oblast, Adygeya, Stavropol Oblast, and Krasnodarsky Kraj. If economic output is taken as the most important criterion, then Tyumen region (where a large proportion of the natural resources is mined) and Moscow (where the taxes are collected), followed by Tatarstan, Lipetskaya Oblast, Ingushetija, Tomskaya Oblast, St Petersburg, Omskaya Oblast, Belgorod Oblast and Dagestan, become the leading regions in terms of sustainability. The results of the analysis allow us to conclude that the development of Russian regions is characterized by extreme unevenness. Depending on the chosen set of priorities, absolutely different regions appear as more sustainable in the rating.

In this light, it seems extremely important and desirable to undertake similar regional assessments using larger criteria sets, including crime rates, income differentiation, unemployment, emissions of substances other than CO_2, resource use, generation of waste, consumption of energy, the share of renewables in the energy mix, and other sustainability indicators.

The methodology presented here could help to highlight regional problems that need to be addressed and could help to find the regional sustainability leaders that need to be supported. It should be underlined that such application of multi-criteria methods for the analysis of dynamic tendencies of sustainable development in the Russian context is undertaken for the first time.

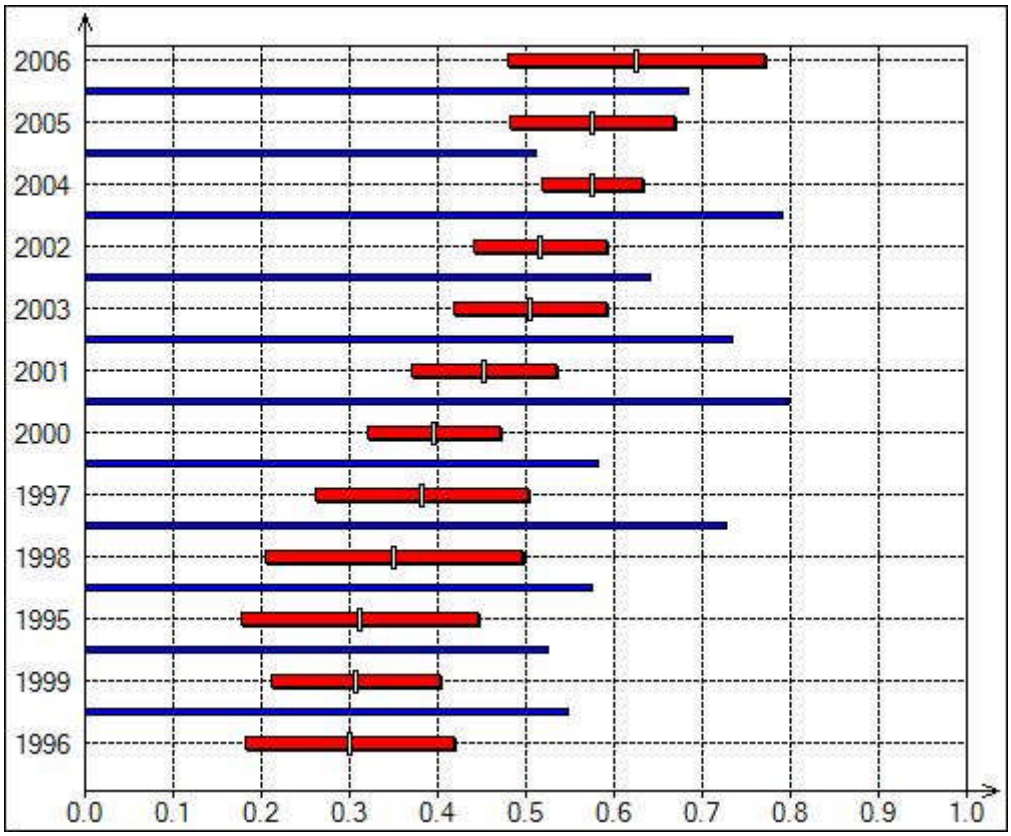

Figure 5. Assessment results: 1995–2003, 10 criteria: current policy priorities

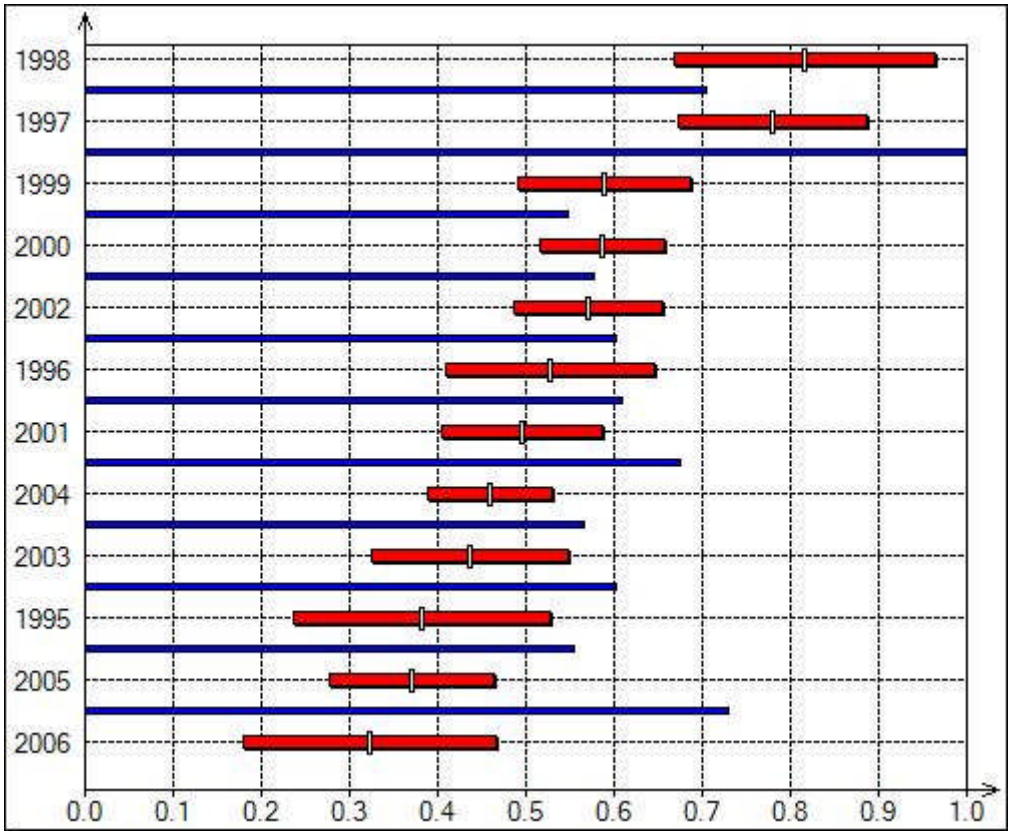

Figure 6: 1995–2006, 10 criteria: more humanistic policy priorities

Discussion

Treatment of many conflicting priorities simultaneously is a challenge that many national governments and international organisations are facing today.

We have seen that the positive trend in the Human Development Index, coupled with the increasing (but still negative) values of Adjusted Net Savings, as well as trends in the different additional sustainability criteria based on the United Nations Sustainable Development Indicators Framework, creates a multifaceted picture of the development of Russian society, complicated further by the enormous regional disparities.

Specific policy priorities, as was shown in the paper, can determine the result of the evaluation of "progress", the interpretation of which rests heavily on social consensus and shared values. We have seen that placing more emphasis on social aspects of development (such as longer and healthier life and reduction of income inequalities, as well as the environmental aspects, such as cleaner air, climate change mitigation, increased deployment of renewable energy technologies, and contribution towards the global sustainability as opposed to the increase in the GDP) changes the interpretation of the progress experienced in a particular time frame. Therefore, the hierarchy of policy priorities that are supported by a given society or the international community can stimulate a pattern of more or less sustainable development.

The solution to the current critical situation seems to be the following: a growth in education expenditure, increase in governmental investment and stimulation of private investment in the national economy; the use of cleaner technologies (minimization of CO_2 emissions), a transition to more extensive use of renewable energy (minimisation of natural capital depletion in the long run), as well as more efficient use of energy in different sectors, development of sustainable waste management systems, capable of returning valuable resources in the economic circulation and thereby reducing environmental impacts.

It can also be seen in the assessment that increased numbers of criteria bringing relevant dimensions into the evaluation framework further increase the degree of uncertainty of domination of particular periods of assessment over others, which is depicted in the length of the bars around the probabilities of domination in respective charts. Application of multi-criteria assessment methods, therefore, can be a valuable tool for policy analysis and may help to deal with high levels of complexity in a sustainability assessment problem. Such assessments can stimulate the debate on the nature of sustainability and the vector of development of particular countries or regions, and improve understanding of the links among the constituent parts of the multidimensional, evolving economy–society–environmental system.

Thus, the proposed approach offers a comprehensive framework for the assessment of sustainability at the macro level and could provide necessary support for policy makers in establishing priorities for development, as well as evaluation of progress in a multi-dimensional setting. In the context of the evolving economy of Russia, it seems that more emphasis is needed on the elicitation of social preferences and democratic articulation of different interests within society, so that social and environmental issues would become as important as the speed of economic development, and genuinely sustainable development could be secured. The proposed model also illustrates the need to conduct active policy in the fields, which are the areas of relative "unsustainability" in Russia. Additional measures to reduce the gap between the rich and the poor should be undertaken, for example with the help of a progressive taxation system; active government investments in science should support and develop the research potential of the sector; additional investment should be directed towards the development of the health-care system, development of environmental management systems, including the preservation of forests, development of waste management systems, development of renewable energy systems, as well as creation of the environment, capable of securing an increase in life expectancy. We would like to hope that Russia could achieve more progress in the field of sustainable development.

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