In this book the new geologistic geo-economic infrastructure, known as the Transeurasian Corridor of Razvitie (TCR) is discussed. The Latin transcription «Razvitie» of a Russian word meaning «development» is used to avoid a unnecessary parallels with any other geo-economic, geopolitical projects existing in the international community.

The TCR as a multi-infrastructure should be regarded as a sophisticated dynamic assembly platform aimed at the advancement of a new technological and socio-cultural formation, rather than as a tube with a high capacity for transporting cheap goods from China to Europe, without any relevance to the territory along which these goods pass. The TCR should be constructed within the system of the future markets that do not exist at the moment.

Transeurasian Corridor of Razvitie: new dimension of cooperation

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Executive Editor
prof. Y. Gromyko

The book is focused on the issue of long-term investments of a new type. The book is comprised of two visions developed by representatives of Russian and Italian business circles. The first vision is devoted to the elaboration of the new financial instruments for the long-term investments that are developed by the Long-term Investors Club. The second vision is centered on the subject of long-term investments, in particular, the Transeurasian Corridor Razvitie (the TCR). Financial instruments and investment objects are regarded as two interconnected problems that must be solved in order to find a positive way out of the current world economic crisis.

The prospects of Russian-Italian technological cooperation within the Transeurasian Corridor Razvitie are analyzed by an expert from Germany

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THE TRANSEURASIAN CORRIDOR OF RAZVITIE AS A PLATFORM FOR LONG-TERM INVESTMENTS OF NEW TYPE

Mikhail Baydakov, Yury Gromyko

1. TRANSFORMATION OF WORLD FINANCIAL-ECONOMIC MAP — POSSIBLE RUSSIAN-ITALIAN INITIATIVE

This book invites you to participate in a project aimed at forming an investment platform of a new type. This platform is to unite divided groups of interests, assets, strategies of action, the goal being to create an operational mechanism for the integration of different institutional structures, various international agents and actors for forming a new strategy.

The necessity of such platform is viable due to the lack of a realistic strategy for the development of the world economy, not within the liberal paradigm with its idea of short-term speculative financial dealings. Abandoning liberal values in the economical sphere leads us to terra incognita in terms of new approaches towards investments, institutional mechanisms of international cooperation and forms of planning the joint projects.

Nowadays it is still unclear which country and what continent can be a locomotive for surmounting the re-

cession in world economy. The Chinese economy that is slowing down in its development, America, which during Obama's presidency did not produce any global creative projects are characteristic illustrations of this depressed situation. There is obvious need for consolidation of attempts in a certain, unknown direction. But the crucial question is how to identify this direction, how to identify the key dangerous areas, the most attractive zones? The question is still open both in terms of identifying the problems and proposing new solutions. And this Russian-Italian initiative endeavors to start the discussion of these problems. It is clear that this direction cannot be reduced to the strengthening of control over the activity of international financial groups, it is necessary to identify common space for joint creative projects.

The common problem that must be solved is rethinking the principles of globalization and formation of a new, more sustainable and just world order. We should depart depart from the globalization of private financial pools in the zone of maximum speculative profit, that is estimated on spot with application of telecommunicate signals on change of exchange rates and money substitutes. And we should rather focus on the identification of common prospective interest which can be reached through cooperation in the sphere of science and technology, management, industry, finance. The main task is to create new industrial production assets of a new type and its spatial allocation through the creation of new generation infrastructures. These infrastructures that determine the transport, in its broad sense, of the quality and quantity of needed resources energy, information, materials, technologies, become the main factor of production and forming stable settlements and towns.

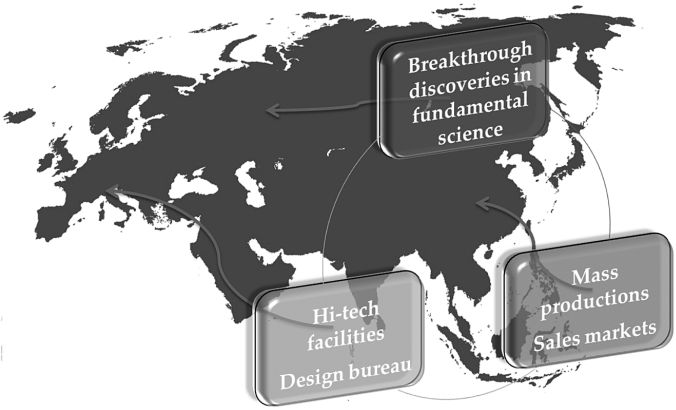
Perhaps this sphere for undertaking the collective efforts, taking into account the interests and possibility of all the parties involved, should be designed together. In order to take this step it is necessary to abandon the liberal paradigm in the economy, the view of the state as a "night watchman", and the denial of planning and orientation on short-term speculative dealings under the effect of chaotically changing prices.

Rejection of short-term speculative dealings and transfer to the long-term financial investments is obligatory and very important but not a sufficient condition for finding the way out of the world economic crisis. Long term orientation of investments indicate the time period of the action and provide freedom from the neurotic need to have "everything all at once".

But this time period, around 10–15 years, should be supplemented by the space for real creativity. Only when together can a considerable time-span and a geo-economical sphere, free from new technology be the main prerequisite for forming the new investment platform. Thus, for instance, as a result of mobilization for the battle with fascism, modernized industry in the USA and in ruined Europe after the Second World War, eagerly working with new technology, formed a development core, and have united in an "engine" determining the development of the world economy in the post-war years.

The idea of forming such an investment platform is to create a common wealth generating pool in the Russian territories (including Western and Eastern Siberia, the Russian Far East, Central Asia) together with Western Europe, and its technological and financial groups on the basis of good-neighboring, mutually profitable, trade exchange with China. Basically, the aim is to form a new

wealth generating pole on the territory of Eurasia, which will be supplementary to the Chinese pole.



The formation of this new public wealth generating pole in the Eurasian territories is very important in times of crisis and ongoing world recession. First of all the specially organized and strongly created new pole that will generate public wealth may become a driving force that pulls the economic world out of recession. Secondly, this new public wealth generating pole can make the competition for world preeminence between the major economic powers of China and the USA less fierce. Thirdly, it is difficult to talk about the formation of multi-polar world without emergence of a new independent wealth generating pole. A pole of influence not supported by a wealth generating pole can only be capable of producing plans and geostrategic ambitions.

However, this new wealth generating pole is not only seen as a pole of natural growth of national economies and supranational bodies. For the formation of such a pole it is necessary to organize, design and specially plan the devel-

opment systems. According to our approach the development systems are opposed to the systems of growth.

In our opinion, this public wealth generating pole, or platform, may be based on the multi-infrastructures that connect the whole Eurasia; energy, transport, information, water, settlements, education, health promotion, household, and ensure the formation of new industries and reclamation of the territories of Russia. This is not simply about acquiring existing and proven factories or about the transportation of developed and functioning technology from, say, Germany to Siberia or from Japan to Khabarovsk in the Far East, but is also about developing fundamentally new technological solutions based on the results of the Russian fundamentally practice orientated sciences in collaboration with Western European technology centres that support the translation of experimental solutions into new, groundbreaking technology.

Moreover, in order to make plans for locating different factories and settlements to form strategic working places for Russian youth and international engineering groups, it is firstly necessary to create a geologistic, geo-economic infrastructure which would operate within the global system, in medium and long-term dynamics. In order to construct something, first you should identify the topics and metrics of the upcoming construction, and then advance to the new type of countability and then, accountability.

In this study this new geologistic geo-economic infrastructure is called the Transeurasian corridor of Razvitie (TCR). We use the Latin transcription "Razvitie", a Russian word that means "development", to avoid unnecessary parallels with any other geo-economic, geopolitical projects existing in the international community. The TCR as a multi-infrastructure should be regarded as a sophisticated dynamic assembly platform aimed at the

advancement of a new technological and socio-cultural formation, rather than as a tube with a high capacity for transporting cheap goods from China to Europe, without any attention to the territory along which these goods pass. The TCR should be constructed within the system of the future markets that do not exist at the moment, not just the pre-existing market system.

The new industries and production lines, the introduction of new energy capacities, new resources, the building up of new settlements should be arranged along the new assembly platform. At the same time, everything that is created on this platform and around it is subordinated to the principle of logistic-dynamic arrangement: transport of goods, services, people, technologies, energy, the principles of connecting components and intensive scientific hubs among different technological centers. Moreover, ensuring such transportation implies the revolutionary development of transportation systems themselves. In this respect the Transeurasian Corridor of Razvitie is aimed not only at the transfer of goods, services and people from point A to point B but it is regarded as a dynamic system for changing technological systems: from the old techno-industrial formation to the new one. The system of transport infrastructures should embrace new solutions for the transportation of energy, information, people, goods, and services.

2. DEVELOPMENT VS. GROWTH

The creation of new generating public wealth core on the Eurasian territory is opposed to the inertia of natural processes of economic growth usually easily supported by the financial capital.

Financial capital has always used natural tendencies, forecasting some nearest and further consequences, initiating rational correction and self-movement. The logic of such correction and adjustment is quite clear. The world is threatened by the ecological disaster due to the increasing population in Asia, wiling to reach the standard of living of developed countries such as Europe, the USA, Canada and Japan. It is necessary to change the technology set from resource-extracting to waste recycling technology first of all, in the sphere of energy and transport, the most harmful for nature and cultural traditions of local communities. It is important to develop new eco-friendly technologies, not to endanger the existence of mankind on Earth. In other words this is a new type of growth, by which the principles of limitations to the applied technologies are formulated. However, the main basis for actions is the natural manifestation of the processes of growth.

Were the new pole, generating public wealth in the Eurasian territories; Eastern and Western Siberia and Central Asia, to be formed the natural logic of self-development would have to be discarded. Russia has winessed demographic downfall, in Kazakhstan population density is quite low even by comparison to the neighboring province of Xinjiang, China, not the most populated province in China. Therefore, some other principles of action should be elaborated. This concerns the formation of conditions for population increase, not only using the strategy and logics of natural growth. This implies that the main task is not only to forecast the upcoming processes and its correction, but also the initiation, programming, designing of another type of processes.

These other types of processes are called the processes of development as opposed to the processes of growth.

Both the processes of growth and of development should be managed. Neither the processes of growth nor the processes of development exist without special socio-institutional management mechanisms. However, in contrast to growth processes, the development process implies that vast groups of the population consciously identify and realize a certain trajectory of advancing the future, which is important for them. Development can only occur when there is self-organization within the clear and approved trajectory of action. In the case of economic growth the members of social groups and institutions do not need to specially identify the strategy and aims for self-organization and do not act in order to change the existing conditions to meet the stated goals. They operate within the existing socio-economic conditions, not willing to change them. For instance, vast masses of the poor, rural younger population naturally tend to move to cities, get rich and increase the standard of living and consumer requirements.

In the second case initiative groups start forming the network of new settlements to create new, not pre-existant living conditions, including transport, energy infrastructure, new forms of production, new medical and educational institutions, and household systems. At the same time, it should be realized that after the creation of such infrastructures some natural processes start, characterized as growth. However, first of all, conditions for the direction of growth should be created.

In this second case the main zone of business expansion is the empty space not full of new technological solutions, but with a lot of unexhausted resources. This free space, open for innovations and development, should be filled with new technologies, unknown before, not with existing institutional mechanisms. The task is to elaborate

the new infrastructure and technological solutions, form potential lifestyles and new forms of settlements, organizations that will become the basis for the reorganization of European space and possibly social and socio-cultural spaces. It is necessary to take a step in the future in the interests of all mankind, thus, the new technologies, institutions and infrastructure solutions should be perceived as a new boundary of technological and social progress.

This progress becomes possible if from the very beginning there is a notion of coherence of the whole Eurasian continent, and the Eurasian landmass is split into spatial platforms where the new public wealth generating poles appear. Evidently, these new spatial platforms should be identified according to geographic, geo-cultural and geo-economical characteristics. But the main question for organizing these territorial platforms is the principle of interaction among Russian and European business circles.

The principle of interaction of German high-tech corporations with Chinese business groups is well known. This type of interaction was oriented at the transfer of modern production lines and some turn-key factories to China. In case of Russian and European interaction it concerns quite another topic, quite different aims: interaction among European high-tech centers, small and medium-size enterprises with Russian universities representing Russian fundamental practice oriented science, major Russian corporations, Russian universities, dealing with creation of new generation technologies and infrastructures with participation from financial centers, realizing long-term investment strategies. We believe that this formula deserves special consideration especially in times of financial crises and recession, when certain global strategists attempt to see the causes of world economic crisis in the sluggishness of the finan-

cial-administrative establishment and ruling groups in Europe. This formula surely needs to be concretized and improved in certain aspects, to be implemented in this book and in other publications. In this case we would like to expand on the following point. This interaction is aimed at the advancement of the new techno-industrial formation, with the creation of specific intellectual industry. This intellectual industry is herewith known as metaindustry, meaning the industrial complex working for the transformation of existing industries. This intellectual infrastructure cannot be limited to financial and administrative institutions. This intellectual infrastructure is based on experimental devices: lasers, chips, crystals, "smart devices", "smart morphology", based on new physical principles and effects. The experimental devices should be turned into new technologies (or technological components) that can become the basis of new industries, expelling the outdated technologies of previous technological formations. Moreover, the creation of new technologies from the experimental devices should be the subject of interaction and communication between Russian scientific groups and Italian technological centers, small and medium size intensive scientific enterprises. Russian groups should focus not on purchasing existing devices (based on well-known physical effects and principles), such as, for example, a 3D printer, where the laser technologies and electron beam melting in vacuum is already connected with digital technology. Russian scientific circles should rather participate in the process of elaborating new technological solutions and a new instrumental-technological package.

One of the main problems of forming an intellectual infrastructure of metaindustry is training professionals

capable of realizing new technological solutions and creating new industries for the formation of next generation infrastructure. In this respect, the principle of cooperation between the Russian and Italian sides should be regarded as "division in labor", rather than "division of labor", meaning cooperation across borders for producing new technology as opposed to a division where one side produces turnkey technologies and other side only realizes them.

Such cooperation across the borders is an another approach towards globalization, seen as a new context of macro regional connectivity of the world aimed at production of new goods and services based on the new infrastructure solutions by the international financial and technological groups. In this respect the historical predecessor of a similar intellectual connectedness is the Trans Siberian route, representing the principle of civilizational development and introduction to the business environment of the large empty spaces of Siberia and the Russian Far East. The new zones for economic activity are formed around a new infrastructure. It was only after the implementation and operation of the Trans Siberian railway line that the Russian farms in Siberia became the major importers of butter to Europe (the butter was imported to Europe, in 1898 its volumes reached about 2,5 thousand tones, in 1900 about 18 thousand tones, and in 1913 more than 70 thousand tones[1] because a means of fast delivery appeared. Thus, the merchants ensured the development of the Siberian territories through the trade of butter.

The Transeurasian Corridor of Razvitie traces back to the Trans Siberian railway as a tool for enhancing eco-

1 http://www.voskres.ru/idea/rasputin2.htm

nomic activity across the macro-region through the formation of new infrastructures. This is also seen as a certain repetition of the idea of the land bridge, which was discussed 20 years ago and which was often regarded by American strategists as a Chinese aspiration for territorial expansion as a projection of geo-economical and geopolitical influence outside the PRC territories, in Central Asia and the Far Eastern region.

The Transeurasian Corridor of Razvitie implies cooperation across borders with European financial-technological groups for the creation of new technological solutions that can become the basis for the new infrastructures and industries of the next generation and also for the creation of new settlements and population growth in Siberia and the Russian Far East.

The last point, the creation of necessary conditions for the growth of families and development of settlements, is regarded by the Italian counterparts as a shared value. Since Italy is one of the European nations with the strongest Christian traditions, all the strategic decisions take into account the values of family, children, and human life. If a decision leads to reduction of living space, it is regarded as a wrong one no matter what financial gains it promises. The Transeurasian Corridor of Razvitie is a complex systemic project, aimed at widening the living space and simultaneous advancement of principally new technology, based on the exploration of new physical principles and effects. In general the formula for cooperation on the TCR topic should be the following: good-neighbor relations, mutually profitable trade with China and "division in labor" with Europe to create new technologies, infrastructures and to create organizational systems in the new formation.

3. THE TRANSEURASIAN CORRIDOR OF RAZVITIE AS OPPOSED TO THE "FINANCIAL BUBBLE". WHAT IS THE REALITY OF THE NEW FORMATION?

What opposes the formulated approach? In our opinion, the issue of development and creation of next generation of infrastructure contradicts the logic of forming another financial bubble.

The main task is to ensure the connection of long-term financial instruments with the infrastructure solutions in order to take a real step towards the creation of new technologies, application of knowledge, new organizational forms of activity and people's consciousness, that determine the new potential and advancement of the new socio-cultural formation. In this respect "long-term" does not signify an exact long period of time, the duration of which is quite arbitrarily selected. The time limits are determined by considering the real possibilities of constructing the infrastructure objectputting it into operation and returning the invested assets. However, the vast time period of realizing the considerable infrastructure object is embedded in the social time, with its changes in science, engineering, society and the international community. While operating and identifying the time periods of the project realization, the importance of the project and the role of applied technological solutions are usually adhered to in the future, although these parameters are already known at the beginning of the project realization. The significance and the role of the project surely changes with time. Therefore, there are two main possibilities of elaboration and realization of the project: assembling the global infrastructure from the technological elements that are known today and

are accessible (in this case the system can be assembled and re-assembled from the existing components) or to create a system that is open to change, resulting from the new fundamental knowledge of physical principles and effects. This openness will lead to a certain instability in the infrastructure platform but will open up new perspectives for future infrastructures and new ways of knowledge application.

It would seem that an element of new, unknown knowledge based on new physical principles and effects is not necessary in this scheme. It may also seem that the construction should rather be built from the existing components, similar to the "LEGO" principle, and then estimating the overall cost of the widening and even infinite system of new solutions and elaborations.

However, the problem is that the realization of the stated construction needs time, "social time", when we can witness the non-linear growth of population on the Earth which needs more energy, and is becoming more harmful to nature. Therefore, if not advocating the Malthusian approach of artificial limitation of the Earth population under the control of international organizations, then, the population growth on Earth should be accompanied by surpassing the growth of technologies, increasing the capacities of mankind and also conserving and sustaining nature. Thus the elaboration and creation of a global infrastructure project should be centered on the institutional organization of different international groups for acquiring new knowledge and its transfer into technologies at every phase of the project lifestyle, rather than creating an infrastructure construction of exact technological components. The latter can also lead to the uncontrolled creation of the infrastructure bubble. At the same time there are two significant challenges; in-

creasing the capacity (the speed, the energy capacity on the territory) but also the reduction of energy costs and reproduction of nature potential. Such technologies, increasing the growth of capacity and reducing the pressure on nature (reducing the rate of oil and gas consumption in the context of population growth is crucial for identifying the value of money). Nowadays the value of any national currency unit is assessed by the price of a kilowatt per hour, which is identified by the correlation of technologies to the production processes including ecological fines that should be introduced (for radioactive waste, the increase in temperature of water and air, emission gases). Therefore, it is important to create within the TCR a constantly operating organizational mechanism for producing the technological elements of the infrastructure through the transfer of experimental devices into technologies, rather than filling the designed infrastructures with ready, well-known technological components. The very elaboration of the TCR project should be organized in such a way that new project elaborations could be introduced into the project. It is not right that the major infrastructure project be based only on technological solutions that are known at the begining of the project, as such it would be out of interaction with the representatives of fundamental science and the designers of new technological elaborations.

4. INTERNATIONAL INTERACTION PLANNING AND PROJECT MANAGEMENT

However, this means, that some of the most critical technology of development of international infrastructure project is the technology of organization and man-

agement of international interaction for planning during all the levels of project realization.

It is clear that the mechanism of international planning presupposes diversity management within undefined social-economical and social-political environment. Decrease in the risks according similar planning, presupposes correct communication organization, collective activity among scientific, technological, educational, financial and administrative groups. As a technology of organization, of communication, thinking, activity we propose the utilization of sessions of strategic scenarios. Work on the shared vision and identification of the problems gives an opportunity to significantly decrease uncertainty, with the choice based not on the abstract projected alternatives, but on the proposals of problems solutions. In the first stages of interaction the word project has an absolutely different meaning, of course.

In our opinion, when we use the word "project", at the first stages of organization of communication between different participants, we speak about a "project" as the mutual outlining of the circuit of the uncertain future by business groups and we identify problems of interaction, not solve some puzzle from the sphere of project management. We will surely go to the project management and to the estimation of project, but firstly the area of the mutual agreements to be delineated as a general plan of the common activity is to be specified. The project activity within the given context is the creation of the new form of interaction between international partners, including corporation activity, scientific centers, financial groups, groups leading pre-research and political strategists, etc. The materials presented in this book are arranged to specify the circuit of the possible common agreements and initiate the demands of the participants relatively the project.

The project management on the base of making the demands relatively to the project from the initiative of all the participants is the most important aspect of systems of planning and management. **Development of the system of demands for the TCR** is the primary task. It is important for the TCR system to be connected not only to the creation of technological solutions, but with the spread of those solutions to the different spheres of practice. The spur pioneer character of the used solutions within the TCR is the development of the leading technologies of a new class for practical usage to be transferred to new spheres of utilization. That process of technologies spill-over from the TCR tank to the different spheres and branches of infrastructure development is to be specifically placed in the requirements of TCR creation management.

One of the most important tasks in the creation of the TCR investment program and project`s architectonics of the present program is to answer the question "How are the new financial institutes (long-term investments funds) are bound with technological solutions?". To find and indentify that bond we propose to design a network of new institutes as metaindustrial agencies or project agencies for metaindustrial promotion. The main target of these agencies is to develop projects to clarify the strategic level of TCR formation, and on the other side to develop projects with specific solution versions within the created infrastructures (railways, large cities subway modernization, roads, water ways, power networks, localization of high-tech industries with sustainable employment, settlements). It is these agencies that are to be the base for the international expert groups establishment to estimate the future of the proposed projects.

5. LARGE-SCALE INTERNATIONAL PROJECT INVESTMENT. INVESTING AS AN ACTIVITY

The main requirement for the projects and the program on a strategic level is to be attractive for long-term investments from independent holders of capital, with the exception of banks, as sovereign and pension funds.

An important aspect is the clarification of the conception of investing in such large-scale projects. The authors of this book suppose that one of the most important reasons for the word financial crisis is the dominance of short-term financial transactions. Investors interested in long-term investments in infrastructure projects are often punished and suffer due to the current institutional arrangements for the regulation of financial markets. That approach correlates significantly with the creed of such investment gurus as John Bogle[2]. He supposes that the tragedy of the current world, particularly American finance, is the well established culture of financial speculation, the cornerstone of which being fugacity and orientation to vote for the asset price, not the real value of its price; that takes time. To overcome the approach to investment as a generally speculative activity we need to reject the maniac focus of the financial actor of stock price changing and to move to the management of long-term cycles of cost creation, including those based on the development and realization of infrastructure projects and further utilization of created infrastructure in general or specific parts.

This view of investment, when it is perceived as a practical activity, and cannot be reduced to a set of abstract

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[2] John Bogle. The Clash of the Cultures: Investment vs. Speculation.- John Wiley&Sons, Inc., 2012, Mode of access: [http://www.amazon.com/The-Clash-Cultures-Investment-Speculation/dp/1118122771].

formulas and mathematical models that replace work, is very important to the authors of this work. In that case, investment activity appears to be a more complicated institution rather than a scientific discipline. Scienctific theoretical knowledge is used in investment activity (how can system approach and special calculating be dealt?), but the activity itself cannot be reduced to knowledge and to some abstract formula, as it also includes a support of specific values and establishment of interaction forms and communications with the representatives of other spheres; engineers, designers, scientists, managers, strategists, risk appraisers. That kind of examination of investment allows the border of well-known approaches to investment to be crossed, when it is identified with some economic-mathematical discipline, and it is supposed that to make an adequate investment decision one needs to find the correct mathematical formula of short-term calculation of stock price change. However it appears that leading finance politicians and geniuses of investment such as John Bogle and Warren Buffett consider such a view to be deeply wrong and search for conditions to overcome it. Investment is a sophisticated independent practical activity, not a scientific subject or science discipline.

From this view of investment as a practical mental activity follow very specific requirements for the management of cash flow at different stages of the individual subprojects of a complex infrastructure project.

Attracting liquidity to continue to the next phase of the project, should be considered as a practical negotiation process, as a special activity of designing forms using fragments of infrastructure or new technological solutions that will attract another portion of the financial

resources, not only in the plane of movement of the calculation formula based on the perception of cash flow as a naturally continuing process. And the more complex the architecture of the infrastructure project, the more difficult should be the design of forms used in the separate fragments of the infrastructure and technological solutions on the basis of scenarios of the results of the implemented project. Long-term investment involves layered activities and future construction on the basis of the inclusion of an infinite number of potential actors in the activities used in fragments of the infrastructure project. If the methods of use of infrastructure and its management are not specifically constructed, the infrastructure will be reduced from material system structures, to "iron".

The financial tools for the development and realization of infrastructure projects, as the 'Marguerite' tool fund were proposed by the long-term investments club, officers of the 'Cassa Depositi e Prestiti' bank. On the basis of the results of the work it is necessary to answer the question of how the financial tools need to be established to work with Transeurasian Corridor of Razvitie projects on all the stages of realization. For instance, do we need to create special international project obligations entitled Transeurasian Corridor of Razvitie or is the creation of a fund with the basket of capital issues of a few corporations (Russian railways, Federal grid company, resource companies), interested in development and realization of the TCR project more correct?

The given system of stated questions also defines the group of materials collected in this book to stimulate further dialog and make specific practical decisions. The book is a product of the interaction of three institutions: the Italian bank 'Cassa Depositi e Prestiti', the Russian bank "Millenium" and the Institute of Advanced Studies.

In the first part of the book articles from the positions of the 'Cassa Depositi e Prestiti' bank (Franco Bassanini and Edoardo Reviglio) are presented. The situation in the world and European financial markets within the period of continuing world crisis and the basic issues to be solved to create the successfully acting tools of long-term investment are discussed in the articles. Furthermore, in the first part the Italian economist Paolo Raimondi proposes his vision of how new financial instruments, elaborated by members of Long Term Investors Club, can be used to launch the "Transeurasian Corridor of Razvitie" project.

In the second part, written from the position of the Russian bank 'Millenium' and the Institute of Advanced Studies (Mikhail Baydakov, Yury Gromyko and Victor Zyukov) the practical-conception vision of a large-scale Transeurasian Corridor of Razvitie project is discussed.

In the third part of one of the ideologists of the Eurasian bridge, Jonathan Tennenbaum, discusses the opportunities and prospects of participation in European scientific-technological groups within the present large-scale project during the continuing economic recession.

The aforementioned parts of the book have more a problem-staging character, with the proposal to the intellectual centers of Russia and Italy to expand the discussion of ideas of Transeurasian Corridor of Razvitie. Besides which, the Institute of Advanced Studies, has developed a number of proposals for possible requirements for the TCR as examples. These materials are also included in the book in the form of a separate application.

In particular, the institutional mechanisms of project realization on the basis of property management and a contract system for creating the Transeurasian Corridor of Razvitie are examined as an insurance policy of political and financial risks, with analysis of practical cases of

developing of the regions of Russia and the conditions of spatial development through resettlement of Russia along the future route of the TCR.

PERSPECTIVES FOR PROJECT FINANCING IN EUROPE

Franco Bassanini and Edoardo Reviglio*

1. The future of Europe depends on delivering together three objectives: fiscal consolidation, social inclusiveness and durable and sustainable growth. Only steady and substantial economic growth can ensure debt sustainability in the long-term and at the same time create favorable conditions for improvements in labor markets and welfare.

One way to increase potential growth, create jobs and social inclusion is to enhance long-term investment in tangible and intangible infrastructure and in the real economy.

Policies for enhancing investment in infrastructure, energy, environment and TLC, as well as in innovation, high education. R&D and SMEs, should become one of the central pillars of the new European "Growth Com-

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* This paper is a partial revision of two recent speeches given by Franco Bassanini. The first, at the Conference *The need to foster long-term investment in Europe in favor of infrastructure — Project bonds and beyond*, held at the European Parliament on September 6th 2012; and the second in the Session, *Improving the financing of projects to favor growth in the context of deleveraging and fiscal discipline*, at the *Eurofi Financial Forum 2012*, September 28th 2012, Brussels,. We wish to thank Gino del Bufalo of the Research Department of Cassa depositi e prestiti (CDP) for his precious contribution in the preparation of this paper.

pact". However, these policies cannot be financed mainly by public resources. Under the Fiscal Compact rules, public budget constraints are going to be binding in the coming years unless we decide to finance infrastructure and growth by issuing Eurobonds. Such a solution, however, will be politically feasible only after a significant reinforcement of the political integration and of the democratic governance of the European Union. In any case, the involvement of private capital markets and, more generally, of global long-term private saving, is crucial to ensure the resources necessary to finance these huge investment projects.

In the coming years, the demand for long-term investment in project financing is expected to grow globally at very high rates. Volumes in project and infrastructure debt reached around 350 billion US dollars in 2011 and grew at 15% annually over the last few years. As the world population continues to grow, emerging countries become industrialized, and developed countries need to replace aging infrastructure, the need for project financing will continue to grow. It is estimated that over 50 trillion US dollars in capital investment will be required for roads, water, energy, airports, telecommunications, and rail between 2010 and 2030 in OECD countries alone[1]. Current estimates point to European infrastructure investment needs of about € 2.0 trillion until 2020, in NGN and Trans-European Networks (Transport as well as Energy), to achieve the 2020 Agenda targets.

There is, therefore, a general need to increase the global share of financing for long-term investment (LTI) at the expense of the short-term financial and speculative

[1] OECD (2011), *Infrastructure in 2030: Telecom, Land Transport, Water and Electricity*.

investment. This is the reason why countries all over the world and international regulators should create the best and most favorable conditions for foster LTIs with strong positives externalities for economic growth and human well-being. Or, at least, to remove the regulations that currently penalize them in favour of short-term speculative finance and investment.

2. Before the crisis, the European banking system financed around 2/3 of the debt side of the project financing initiatives (PFI) worldwide. The long-term institutional investors (LTIs) backed around 40% of the long-term (LT) bank financing for infrastructure (through corporate and structured bonds).

The financial crisis and the resulting new regulatory framework have undermined this well-functioning model. In fact, the European banking system is at a critical crossroads. Deleveraging and new regulatory pressures are strongly limiting its capacity for long-term lending[2]. This has special negative effects on project financing and on European investments and economic growth.

In the last quarter of 2011, according to recent BIS data, loans for project financing dropped by 39% for weaker EU banks[3] and by 18,3% for other EU lenders. Market sources are in line with BIS data. The project finance bank market is still open for new financings, but tenors and amounts have been significantly scaled-back. The cost has risen. Given current liquidity conditions in the loan syndication market, few banks are willing to take

[2] See, European bank funding and deleveraging, in BIS Quarterly Review, March 2012; and Gert Wehinger, Bank deleveraging, the move from bank to market-based financing, and SME financing, in Oecd Journal: Financial Market Trends, Volume 2012, Issue 1.

[3] The 31 banking groups with EBA capital shortfalls, plus all Greek banking groups.

material underwriting risks. In addition, there are also growing attempts, by many European banks, to sell their project financing portfolios on secondary markets. If we consider that before the crisis over 90% of loans to PFI was financed by European banks, then we must admit that we have a serious problem.

Let us briefly recap why this is happening. Then we will try to add few policy suggestions and, finally, we will raise some questions on what can be expected in the near future.

There are four major issues which should be taken into account in the current situation: (1) the shortfall of capital and the effects of Basel III on capital and liquidity ratios on LTIs; (2) the liquidity shortage in the European financial system (3) the need to clean-up European banks balance sheets and, last but not least (4) the regulatory differences among national systems, which are often already priced by the market, but are not taken into proper consideration by regulators and EU legislators.

Recently the European Banking Authority (EBA) released its final report on EU-wide recapitalization exercise. Overall, the exercise led to an increase in banks' capital positions by more than 200 billion euros. However, there is consensus now — among major banking analysts — that the capital shortfall is around 350–400 billion. Among the least "virtuous" banks are some of the largest French, German and Scandinavian ones. This makes the general framework even more worrisome, since together they compromise over 50% of the entire European banking industry.

As we all know, banks can improve (regulatory) capital ratios by mean of:

(1) capital increases on the market — but at current share prices the amount that can be raised and the re-

sulting potential dilution effect make market capital increase quite burdensome — however, it should be the most recommended solution because the cost of deleveraging would be more fairly divided between shareholders and the economy, which needs LT financing;

(2) cutting dividends and increasing retained earning — this has a double counter-effect (a) it lowers the dividend-yield thus making investment in bank stocks less attractive and (b) pushes banks towards shorter-term (more speculative) and more remunerative investments thus resulting in potentially more volatile (and riskier) investment;

(3) finally; restructuring their assets portfolios by selling their more expensive assets in terms of capital charges — i.e. risk weighted assets (RWA) — which is already part of the current deleveraging process.

Furthermore, funding conditions for European banks deteriorated in late 2011. As a matter of fact, the ECB decided to supply banks in the euro-area with two special longer-term refinancing operations (LTROs) at particularly favorable conditions. It has been estimated by the BIS that, of the cumulated roughly 1 trillion euros LTROs, one third was used (especially by Italian and Spanish banks) to do "carry-trade" (buying sovereign bonds), one third was re-deposit with the ECB in order to cover much of the potential funding needs from maturing bonds over the next few years, and finally only one third left was used to lend to real economy. The two ECB LTRO operations have temporarily eased the short-term liquidity crisis. But they could not do much for medium- and long-term financing of the economy, and in certain cases had depressive effects on some banks' share prices (reputational effects).

In addition, Basel III does not help[4] with its new liquidity ratios (now under revision), which are very important for project financing; similarly, long dated floating swaps will have higher spreads.

On liquidity, Basel III promotes two prudential ratios that entail minimum binding standards: a Liquidity Coverage Ratio (LCR), aimed at promoting banks' resilience to liquidity risk over the short-term (a 30-day period); and a Net Stable Funding Ratio (NSFR), aimed at promoting resilience over a one-year horizon[5]. In addition, a leverage ratio computed as shareholder's capital over total assets was introduced to ensure a hard minimum capital level, regardless of the structure of risk-weights in bank balance sheets[6].

Of course, in order to comply with new regulatory requirements, and with exacerbated liquidity constraints, banks will be encouraged (a) to put their long-term, and above all project finance portfolios on the market; (b) to seek long-term funding in difficult market conditions;

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[4] It should be noted that the short-term and long-term liquidity ratios are related. The short-term funding ratio is driven by two factors: the liquidity buffer on the asset side of the balance sheet and the outflow on the liability side. More long-term funding on the liability side means less outflow, hence a higher liquidity ratio and a smaller liquidity gap.

[5] The LCR is defined as the stock of high-quality liquid assets divided by total net cash out-flows over the next 30 calendar days (≥100%); the NSFR is defined as the available amount of stable funding divided by required amount of stable funding (>100%).

[6] It should be noted that the short-term and long-term liquidity ratios are related. The short-term funding ratio is driven by two factors: the liquidity buffer on the asset side of the balance sheet and the outflow on the liability side. More long-term funding on the liability side means less outflow, hence a higher liquidity ratio and a smaller liquidity gap.

(c) to avoid long-term financing by focusing on short-term liquid assets[7].

Industry analysts[8] estimate the total shortfall to be about 1.3 trillion euros in short-term liquidity and at about 2.3 trillion euros in long-term liquidity for European banks.

Moreover, many (large) European banks still need to undergo a serious cleaning up of their balance sheets. A European TARP-like process should have been done at the beginning of the crisis. It was a lost occasion. BIS recently estimated that about one third of deleveraging might involve the selling or writing-off of low-rated securitized assets and other risky loans.

Finally, the Banking Union will require homogenization of different national regulatory frameworks. This will imply tougher conditions in some national banking systems. It will be a difficult and, at times, a painful but healthy process.

In short: The state of the European banking industry is under severe stress and this will especially penalize

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[7] "Basel III introduces new liquidity requirements for banks through its liquidity coverage ratio. In its current form, the LCR could penalize undrawn revolving credit facilities made to special-purpose vehicles by requiring 100% coverage. However, the impact on banks will be minimal because, as the law firm Linklaters points out, these facilities represent a relatively small percentage of banks' debt exposure. On the other hand, the LCR could threaten the use of letters of credit, which are prevalent in project finance. Local country regulators can set the Basel III liquidity coverage ratio requirement, and Linklaters has indicated that a coverage level of 25% or higher might make letters of credit economically unattractive to banks unless they were tied to concessions from sponsors." Basel III And Solvency II Regulations Could Bring A Sea Change In Global Project Finance Funding, Standards & Poor's, October 2011.

[8] McKinsey (2010), Basel III and European banking: Its impact, how banks might respond, and the challenges of implementation, McKinsey Working Papers on Risk, Number 26, November.

long-term financing to the economy and thus economic growth. It will take time before European banks recover and some changes in their business model are expected.

3. In the meantime, will other financial institutions be able to substitute European banks in long-term lending as the latter continue to deleverage? Can banks, asset managers and bond market investors from other countries (maybe coming from less restrictive regulatory frameworks) partly take over the business of European banks? Can other European institutional investors get directly into the business of financing infrastructure?

Actually, the European Directive Solvency II for the insurance industry[9] dampens the holdings of long-term assets by traditionally longer term institutional investors (in search of appropriate financial instruments/assets in order to match the duration-gap implied in their business models) such as life insurance, and pension funds which have historically been the main providers of LT financing for banks.

Of course, it is most unlikely that the European financial systems will change radically in the medium-term, from a bank-based into a capital market-based US style system. The cultural, regulatory and structural differences between the financial systems on the two sides of the Atlantic are too great. The European financial system will probably become a more mixed but, for the time being, still a mostly bank-based system.

But, while we wait for the European banking system to recover, some changes must take place.

[9] There is an European Commission call to extend the scope of Solvency II to the pension fund industry.

To support PF and PPP initiatives, the ECB may take into consideration a 6–9 years LTRO. The two previous three years LTRO faced successfully the short-term liquidity crisis. A very long-term refinancing operation (VLTRO) of a much smaller size (100/200 billion) could be successful in overcoming the present medium/long term crisis. A binding condition, eligible of this especially dedicated facility, should be the presentation of good quality LT collaterals (including the best guaranteed PFIs) and with a full documentation proving that it will be used only for LTI. This new type of ECB facility may be granted to large development banks (EIB, KfW, CDC, CDP, etc.) and/or to all European banks. Moreover, the projects to be financed should be fully bankable, following a satisfactory due diligence process.

At policy level, a number of actions have been already taken. But much more should be done in the near future, for instance in the following directions: (1) re-calibration of prudential regulatory framework (2) new EU LT financial instruments (3) mitigation of non-regulatory risk, and (4) introduction of fiscal incentives and other regulatory incentives.

First, to give a strong boost to investments in infrastructure it is crucial to rephrase the regulatory framework (Basel III-CRD IV, Solvency II, IORP, IFSR) that — as today — penalize LTIs. It is not a question of easing the financial stability framework, but to find appropriate fine-tuning solutions which assure financial stability and at the same time help the financing of economic growth, without which financial stability, as a whole, could tomorrow itself be at risk.

The definition of a new regulatory framework friendlier to LTIs is suggested by the Jacques de Larosière and Mario Monti Reports, by many Eurofi forums papers and

by the European Commission in the Communications on A New Single Market Act[10], on A Comprehensive European international investment policy[11], and on The EU Budget Review[12].

But, notwithstanding this broad consensus (among the majority of experts, scholars, bankers and politicians) on the need of a new regulatory framework and new instruments more favorable for LTI, the international and European regulators seem to be still prisoners of a procyclical and short-termist cultural approach.

Second: new EU financial instruments are needed both on the equity and on the debt side.

On the equity side, the Marguerite and the InfraMed Long Term Infrastructure Funds have been well received by the market. They should be taken as prototypes for a series of LT Funds (providing both equity and mezzanine, as is the case for the Energy Efficiency Fund) for infrastructure and/or other sectors, such as innovation and mid-cap high growth SMEs, venture capital, public utilities, urban development, health, etc. After the crisis, in fact, there is, at least in Europe, a huge equity crunch and a great need for LT equity to stimulate LTIs in the economy

On the debt side, the large national development banks (EIB, KfW, CDC and CDP), may consider to join forces creating a single or several common funds for debt (backed by guarantee schemes) for infrastructure and, and more generally, for LTIs.

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[10] European Commission Communication, Towards a new Single market Act, 27th October 2010 – COM(2010)608.

[11] European Commission Communication, Towards a comprehensive European international investment policy, 7th July 2010, COM(2010)343.

[12] European Commission Communication, The EU Budget Review, 19th Oct. 2010, COM(2010) 700.

Within such context, the EU Project Bond Initiative, together with the EIB, becomes crucial for the financing of the European recovery and infrastructure investment. Moreover, a new market of EU Project Bonds and the scaling back of bank lending to this sector translates into an important opportunity for institutional investors involvement, particularly given the long duration nature of project/infrastructure asset.

Public guarantee schemes and/or tax incentives are necessary even for the success of the Project Bond Initiative (PB). Project bond markets date back to the mid-1990's. Issuance grew significantly via Triple-A wraps from monoline insurers (up to 26 billion globally). The market collapsed in 2008 with the demise of monolines and has since recovered (16 billion in 2011). Many notable transactions were executed in 2010 and 2011 with tenors as long as 25 years and investment grade project bonds have priced in the 200 to 400 basis points range (comparable to bank debt cost, but with longer investors).

There are, generally, two types of project bonds: Those which are directly issued by the project companies (as it is the case of the EU project bonds); and those which are issued in the US directly by "Municipalities" and by "Public Authorities", with significant tax rebates. During the 2008–2009 period, under Obama's recovery plan, 200 billion dollars of Build American Bonds (BABs) have been issued. In the US the project bonds issued directly by project companies, without tax rebates, are fewer, worth less than 3 billion dollars.

It must be stressed that the US Build America Project Bonds model is based on the concept that authorities and municipalities in the public sector can finance PF initiatives by issuing project bonds (with a subsequent bundling of several projects) because they are not counted as pub-

lic debt. In Europe such a model could not be replicated and this is why in the Project Bond Initiative the issuer must be a project companies and not a public authority or a municipality or the State itself. The Eurostat rules, then, represent clearly a limitation to the development of a large European market for project bonds.

The success story of Obama's BABs is due also to tax rebates granted to these kinds of project bonds. A special credit-enhancing guarantee by the EIB is provided in the Project Bonds initiative launched by the EU Commission. But so far, no tax incentives have been contemplated by policy makers at the European level[13]. Moreover, the projects eligible to be financed by the PB guaranteed by the EIB are now limited to Ten-T, Ten-E and NGN. I suggest to extend guarantees and fiscal incentives also to other European LTIs with strong positive externalities for growth and competitiveness.

Project finance assets typically involve a strategic asset with high barriers to entry, a monopolistic position, and/or the certainty of demand and price that comes with a long-term off-take contract or revenue agreement; these attributes result in a stable and predictable cash flows. The long tenor of contract, such as power purchase agreements in power projects or long term concession agreements in infrastructure projects, give rise to lengthy and stable revenue streams. Finally, according to a recent Moody report, ultimate recovery rates for project finance loan market are high (averaged 76,4% over the years 1983–2008 and 57% of recovery were fully restructured or repaid), relatively stable across economic cycles and in

[13] "The neutralization of the withholding tax applied in some EU countries would facilite the interest of a large base of international real money investors.", Natixis, Infrastructure Debt, July 2012.

any case statistically higher than corporate loans. Even through the recent financial crisis, default rates for project finance debt remained at low levels.

According to the rating agency Standard & Poor's[14], project finance transactions have performed well in the past three years even as economic conditions worsened and corporate default rates accelerated.

In addition, there is evidence that, from 1992 to 2008, project finance ratings performed better than corporate issuer credit ratings for several reasons. In particular, the collateral and security packages — typically present in projects — increase credit protection providing also a stable revenue stream.

Many project finance transactions have long-term supply agreements with various counterparties, which mitigate many of the risks associated with operating in merchant markets.

As a matter of fact, Standard & Poor's analysis shows that recoveries from defaulted projects have been relatively strong and have averaged 72% since 2001, with significant sectorial heterogeneity. Transport and the power sectors have the highest recovery rates, 90% and 85% respectively.

Within such context, the EU Project Bond Initiative, together with the EIB, becomes crucial for the financing European recovery and infrastructure investment. Moreover, a new market of EU project bonds and the scaling back of bank lending to this sector translates into an important opportunity for institutional investors involvement, particularly given the long duration nature of

[14] Standard & Poor's (2010), *Figuring The Recovery Rates When Global Project Finance Transactions Default*, Global Credit Portal — RatingsDirects, October.

project/infrastructure asset. Today, institutional investors, already finance (directly or indirectly) about 40% of project financing initiatives. Infrastructure bonds represent an "asset class" which matches well long term liabilities held by life insurance, pension funds and SWFs. An involvement which may grow, also in Europe.

The development of PFI and PPP requires good projects as well as some environmental conditions, such as a good and stable regulatory framework, with reasonably low regulatory and bureaucratic costs, a reliable judicial system and an efficient as well as technologically skilled public administration and government services. To assure these conditions strong political action is needed, especially in some European countries.

Fourth, the EU Member States should support PF and PPP with tax incentives. Tax incentives, to increase the attractiveness of the PFIs, may serve both growth and fiscal consolidation objectives, up to the point at which the incentive does not overpass the new fiscal revenues directly produced by the new investment, net of substitution effects. Tax incentives should be provided also to promote long-term saving and long-term shareholding.

To promote investment in the New Generation Networks (NGN) in order to reach the European broadband target, in particular, the European and the national regulators could design systems of tariffs based on Regulatory Asset Base (RAB) — at the condition that the infrastructure is open to all operators in the market.

4. At the market level a stronger role may be taken over by institutional investors. However, we cannot expect that alone they can substitute banks. For project financing, for example, they can leverage on bank flexibility in financing the construction phase of infrastruc-

ture projects by providing — after that — the long term refinancing of the project investments. In this way they could become a powerful long-term financial engine for a strong, balanced and sustainable growth.

At the global level the largest institutional investors (insurance, pension and mutual funds) hold asset worth about 49 trillion euros — of which 16 trillion at the European level. Despite a recent increase in allocation to infrastructure, it has been estimated that less than 2% of total assets worldwide is invested in infrastructure as an asset class[15].

To conclude. We need to make changes in the EU prudential regulation to increase the potential of European banks in lending long-term and to increase the appetite of institutional investors for infrastructure as an asset class. We need to take action for two reasons: first, to give more power and competitiveness to European financial industry in fostering LTIs and, second, to make European project financing attractive also to non-European investors.

The demand for LTIs globally is going to be huge in the future. The regions of the world which will be able to attract capital will have a competitive advantage. It is time that EU policy makers understand this challenge. The time to act boldly is now.

[15] Estimates provided by Morgan Stanley (2011).

LONG-TERM INVESTMENT, DEVELOPMENT AND INNOVATION IN THE XXI CENTURY

Franco Bassanini, Edoardo Reviglio*

1. THE LONG RUN TRENDS IN GROWTH AND DEVELOPMENT OF THE GLOBAL ECONOMY

Great transformations are going to characterize the XXI Century. The flow of history will accelerate, unleashing energies which will be difficult to control. Almost two thirds of the world population, mostly in Asia, will switch from self-consumption to consumption, from the closed circuit of an agricultural economy to the open source of a market economy. By mid-century billions of people could reach levels not seen since the post-war rebuilding of Europe and Japan and the era of high growth mature economies. World economy will experience exceptional demand for capital investment. World population will

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grow from 7 to 9 billion by 2050; GDP should rise, in the same period, from 72 trillion USD (at PPP) in 2010 to 380 trillion USD in 2050. The fastest growing regions according to forecasts are Africa (7.0%) and Developing Asia (5.4%). As a result, North America and Western Europe is expected to fall from 41% in 2010 to just 18% in 2050, while Developing Asia's share is predicted to rise from 27% of world GDP to 49% in 2050. China is expected to overtake the US to become the largest economy in the world by 2020 — to be in turn overtaken by India by 2050. According to forecasts Africa by 2050 may have a share of global GDP that is higher than the US and Western Europe (12 per cent vis-a-vis 11 and 7 per cent, respectively). This, of course may be subject to all kinds of unpredictable events, and anyway does not mean necessarily the US and Europe are doomed to decline. But for Western economies in the next decades the challenge is as great as ever (see figures 1–4).

Looking ahead, both China and India, have huge investment requirements[1]. It has been recently estimated that, to keep pace with urban population growth, China will build one New York City every two years. And India over the next two decades will build a Chicago each year. The impact of such powerful rates of growth, urbanization and development will represent a great challenge for the environment and challenge the scarcity of natural resources of our planet. The Question Mark is whether technology and innovation will discover new solutions to manage the making of such a great transformation

[1] Most of the data presented in this paragraph are from: *"Global Growth Generators: Moving beyond 'Emerging"*, Global Economics View, Citi, 21 February 2011.

that will be not only possible, but globally, naturally and geopolitically sustainable. Technology may represent the only solution to the problem. However, the quality of institutions is also important. If current development patterns remain unchanged the majority of the world's current population (a population that almost everywhere is living longer) will see effects of enormous relevance on the planet. In 2030 the demand for energy will be 50% greater than today and 80% of this demand will be for fossil fuels. CO_2 emissions will increase by around 60%. Another very precious common good — water — will face severe effects after the "boom of investment and consumption" which will take place in the next Century. Here, we hope, technology will show all its powers to solve the problem. Let's not forget, however, that technological breakthroughs are in the hands of chance (by surprise). The size of investment in science and technology is a measure of the effort and not of the probability of success in finding solutions. Anyhow, a good university system, free to do basic research is the *conditio sine qua non* for scientific and technological major discoveries. We must, therefore, become very bold at a national, regional and global level in investing in R&D, not only in the development phases, but also, and maybe primarily, on the level of basic research.

In the XXI Century most of the people in the world will aim to have the same living conditions and sustainable growth of the advanced world. The rest of the world is right — on grounds of justice — to ask for the same living conditions. But it is also economically convenient and politically binding to share the size of this exceptional global growth phase. This will need a strong world governance, most probably around the G-20. It will require also the exchange of "best practices", to achieve a global high

tech, cultural and social welfare system — great environmentally sustainable infrastructure systems and smart energy policies that you can find in Europe and in most advanced countries. Europe (more generally, the advanced world) should "export" this "model" — as well as the "finance and know how" to produce it — around the world. Despite the very high investment rates of the fast growing late starter/converging economies, the consumption growth is also already a significant driver of domestic demand in many of these countries. Total consumer spending in Asian economies is likely to exceed total consumer spending in the Euro area during the next two years and that of the US within a dozen year. The proximate driver of this consumption boom is the growth of the "middle class" of fast growing Asia and Latin America. However, even though total investment spending in Asia's fast growing economies could exceed the total investment spending of the US and Europe, the per capita numbers suggest that the convergence process may have several decades (in the case China), or even several generations (in the case of India) to go. Mature economies — which should have a comparative advantage in capital goods production — take advantage of the export opportunities created by these high investment rates to very different degrees.

The speed of globalization has increased in the last twenty years. It has been based on some key factors: A geopolitical factor: with the fall of the Berlin Wall, and the shifting of the political power from the Atlantic to the Pacific; A technological factor: the spread of the use of IT and the lowering cost of transportation; An economic factor: Asia producing low-cost goods and America buying them on credit; A financial factor: creating global virtual money.; An ideological factor: the "political apotheosis" of free market economy.

2. THE IMPLICATIONS OF LONG TERM SHIFTS IN GLOBAL INVESTMENT AND SAVING

In mature countries, there is a pressing need to finance innovation, environmental programs and infrastructure along with preparing for the consequences of an ageing population; in developing countries, the income per capita catching up process is requiring vast investments in infrastructure (transportation, TLC, energy...). Mature economies will also need to increase their share of long-term investment (LTI) to exit the crisis, to reinforce their growth rates and competitiveness on global markets and to ensure public debt sustainability (successful fiscal long-term consolidation requires both stricter fiscal policy and more economic growth). Emerging countries with high saving rates will be increasing their domestic demand. They will need to import more long term capital, especially in the form of direct investment. Indeed, their financial markets are insufficiently developed and, in spite of large current account surpluses in some countries, they will be relying for quite a long time on "global" financial funding. Given the scarcity of long term finance, the competition for capital will be intense. The coming investment boom will put sustained upward pressure on real interest rates unless global saving increases significantly. In future economic growth saving will not increase enough, leaving a substantial gap between the willingness to save and the desire to invest. This difference between the demand for capital to invest and the supply of saving will likely increase real long-term interest rates.

Across Asia, Latin America, and Africa, the demand for new homes, transport systems, water systems, factories, offices, skyscrapers, hospitals, and shopping centres has already caused a jump in investment. Considering the

still very low levels of capital that these countries have accumulated, these high investment rates could continue for decades.

The coming investment boom will have relatively more investment in infrastructure and residential real estate. Consider that emerging economies already invest more than twice as much in infrastructure as mature economies (5.7 percent of GDP vs. 2.8 percent). The gap is seen in all categories of infrastructure and is particularly large in transportation (e.g., roads, airports, rail), followed by power and water systems. Estimation of future real investment demand in 2030 is equal to 4 trillion dollars for infrastructure, 5 trillion dollars for residential real estate, and 15 trillion dollars for other productive assets in a consensus global growth scenario (see figure 5)[2].

If the demand for investment is growing more in the emerging world rather than in the advanced economies. The same is true for the savings rates. Collectively, developed countries' gross national saving fell from 22.7 percent of their GDP in 1980 to 19.7 percent in 2008. However, the pattern differs across countries. The national saving rate fell more in the United States than in any other mature country, from 20.6 percent of GDP in 1980 to 12.7 percent in 2008. In contrast, gross national saving rates were relatively stable in France and Germany. Households account for most of the drop in national saving in many developed countries. The combined household saving rate fell from 12.3 percent of GDP in 1980 to 6.1 percent in 2008 in the sample of developed countries, reflecting sharp declines not only in the United

[2] See, "Farewell to Cheap Capital? The implications of long-term shifts in global investment and saving", McKinsey Global Institute, December, 2010.

States, but also in Australia, Canada, Italy, Japan, South Korea, and the United Kingdom, among others. In the emerging markets and in the oil exporters countries saving rates gave increased reaching the 34 and the 42 per cent of global GDP, and leaving only 16 per cent to the advanced countries (see figures 6 and 7). Now, if we consider the long term forecast of GDP growth — which we briefly presented above — we can understand what kind of change will take place in the evolution of global savings and investments in the future of world economy.

Policy makers should understand that capital investment can lay the foundation for long-term economic growth, increasing both profits and living standards. Investment is needed to create the factories and equipment that make goods, the roads and rail that help move goods, and the laboratories and schools that foster innovation. Strong growth expectations will spur strong demand for investment. Rapid economic growth in emerging markets has therefore boosted their investment rates. China's investment rose to 43.9 percent of GDP in 2008, up from 35.0 percent in 1990. It rose even higher in 2009, to 49 percent of GDP, as the government increased public investment to stimulate the economy during the global recession. China is now investing at rates that surpass the peak rates of Japan (39.7 percent in 1970) and South Korea (39.9 percent in 1991). India's investment rate climbed to 39.5 percent of GDP in 2008, up from 23.5 percent in 2000 (see figures 8 and 9).

As emerging markets continue to grow and urbanize, they are likely to drive the global investment rate higher. Moreover, global saving in advanced economies will be reduced by aging populations; expenditures to ensure health care, pensions, and social services it is expected to strongly rise and also the potential additional consump-

tion tends to lower gross savings in mature countries. The consequences of these imbalances on the global balance of power in the next decades will need a great dose of solidarity and a philosophy based on the global common good. Innovation and technology, we all hope, might make the difference. But the challenges for the future of the planet are unprecedented in history of humankind.

3. THE ROLE OF INNOVATION IN ECONOMIC DEVELOPMENT AND GROWTH

Knowledge, Innovation and R&D

Part of the challenges of XXI Century development depends on scientific discoveries and technological innovation as a fundamental driver of sustainable global economic growth. A fundamental part of technological innovation is the activity of Research and Development (R&D). Activity on R&D depends on — direct and indirect — public intervention and policies and on private initiatives and the market. What, in general, determines the propensity to invest in R&D?[3].

There is, in market economy, a general under-propensity to invest in R&D. This is because there is a fundamental difference between public, social rate of return and private rate of return of search activity. It has been shown, by large empirical evidence, that if knowledge is not appropriated, then it becomes a sort of public good, this increases its potential diffusion and then its potential output growth. This hints at the need of various forms

[3] See G. Dosi, *On the determinants of investment in innovative activities in business firm, LTIs Venice Forum, Towards a Sustainable Future: The Role of Long-Term Investment*, 28 and 29 October 2010.

of public intervention in the innovation activity. What determines the propensity to invest in R&D by private profit-motivated actors?

First, the fundamental drivers are sector-specific technological opportunities — search is higher in ICT than in textile, because there is much richer pool of potential opportunities of innovation in ICT rather than textile.

Second, it depends on sector specific ways of doing search. In particular, according to Dosi[4], some sectors have a strong innovation activity based on expensive and formalized processes of search with high costs, while others are characterized by informal processes of innovation diffusion with the presence of "externalities" associated with learning by doing and learning by using dynamics.

Third, the role of appropriability as a determinant of the propensity to innovate (and in particular International Property Rights), should not be overstated. There is evidence that in increasing the scope and tightness of propriety right increase the rate of innovation. On the contrary, the increase in the number of claims on components of complex technology might actually hinder the project of innovation. The message is: decrease the scope, breath of property right protection, if you want to increase the rate of innovation.

What can the public do to increase the general problem if there is underinvestment in search?

First, public start up, public support for high tech start ups — few people know, for example, that around 60% of venture capital in the US comes directly from Federal Funds.

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[4] See Dosi G. (1988), *"Sources, Procedures, and Microeconomic Effects of Innovation",* in *Journal of Economic Literature*, Vol. 26, No. 3 (Sep., 1988), pp. 1120–1171

Second, subsidies and tax rebase on private R&D. They tend to be, however, quite expensive. In the past more discretional policies have been more effective — such as US implicit industrial policies associated with the military and space programs of Japan; implicitly discretional industrial sector based policies. They have been much more effective. The subsidy pays an overdue submission to market-friendly ideology, on the assumption that the market knows better than the public. The market knows better where to make money in the short term, but it might be that we want the private to go in another direction, we want to make profitable what for the private actor what we know is good in the long term but is unprofitable in the short run.

Third, a fundamental public role in the generation of new knowledge comes from universities and public laboratories. The idea is that we should prefer a society that publicly generates knowledge that is freely available under the condition of no appropriation.

The general message is: the challenge is to have a sort of innovation-friendly Keynesianism that focuses with a similar massive investment resources, that existed in space and military programs in the past, that focuses on, among other things, a huge, ambitious environmental program that fulfil both Keynesian purpose and technology-focusing purpose.

The European Institutional Framework for Innovation

Strong institutions and policies are at the centre of EU long term vision. At the top of the "Lisbon Agenda" (2000) is the establishment of a competitive, innovative and knowledge-based society, capable of sustainable growth, creating more and better jobs and greater social

cohesion. With the economic and financial crisis, the ambitious objective of the Lisbon Agenda has been partly overtaken by the need for a recovery plan for the financial sector. Especially now, it is important to stimulate long-term investment in knowledge with the aim to create conditions for a sustainable and durable growth with potential benefits for future generations.

Innovation in products, services, business and social processes and models has been placed at the heart of the "Europe 2020 Strategy"[5]. Innovation is a key driver of social and economic prosperity and of environmental sustainability. According to recent estimates, achieving the target of spending 3% of EU GDP on R&D by 2020 could create 3.7 million jobs and increase annual GDP by close to 800 billion euros by 2025. The "Innovation Union" is one of the seven flagships announced in the "Europe 2020 Strategy"[6] and the new European Commission Communication advocates a strategic and integrated approach to research and innovation. It aims to improve conditions and access to finance for research and innovation, to ensure that innovative ideas can be turned into products and services that create growth and jobs. The EU Budget Review[7] proposed that the full range of EU instruments for research and innovation work together in a Common Strategic Framework, with link to other EU programmes — Cohesion policy Funds and Education programmes.

At its meeting on 4 February 2011, the European Council concluded that: Innovation contributes to tackling the most critical societal challenges we are facing.

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[5] COM(2010) 2020.

[6] COM(2010) 546 *Europe 2020 Flagship Initiative Innovation Union.*

[7] COM(2010) 700.

Europe's expertise and resources must be mobilized in a coherent manner and synergies between the EU and the Member States. The european Research Area to be completed by 2014 is important to create a genuine single market for knowledge, research and innovation. Private investment in innovative products and services should be encouraged, in particular by improving framework conditions. It's fundamental to the creation of the Digital Single Market by 2015. There is the need to lift remaining legal and administrative obstacles to the cross-border operation of venture capital.

In conducting fiscal consolidation, Member States should give priority to sustainable growth-friendly expenditure in areas such as research and innovation, education and energy the full range of research and innovation financing instruments work together within a common strategic framework. In February 2011, the European Commission launched a public debate on the key issues for future EU research and innovation funding programmes for the next Multi-annual Financial Framework (MFF)[8].

European Finance for Innovation and Growth

The EU has set up a number of programs and financial instruments for *Innovation and High Growth SMEs*. The CIP *(Competitiveness and Innovation Framework Programme)*. The European Commission has mandated the European Investment Fund (EIF, part of the EIB Group) to manage a 1.1 billion facility within the CIP. These funds will be split between venture capital — with

[8] The Green paper, *Towards a Common Strategic Framework for EU Research and Innovation funding*. COM(2011) 48.

the *High-Growth and Innovative SME Facility* (GIF) — and guarantees — with the *SME Guarantee Facility* (SMEG) — to cover the period 2007–2013. The *Risk-Sharing Finance Facility* (RSFF) introduced in 2007 was the first "European scale programme" to use debt-based finance to complement the more traditional financing means for *Research, Development and Innovation* (RDI) such as grants as those available under the European Commission's *Framework Programmes* (FP), or equity as provided by the European Investment Fund (EIF). The *Structured Finance Facility* (SFF) of EIB was established in 2001 to generate value added by providing additional support to priority projects through instruments with a risk profile that is higher than that usually assumed by the Bank. The SFF was established with a focus on the high priority sectors of Trans European (infrastructure) Networks (TENs), the Innovation 2010 Initiative ("i2i"), energy and cooperation in partner countries.

The need for an European Innovation and Technology Growth Fund

The success of the RSFF needs to be complemented now by the creation of another new European instrument on the equity side; a EU endorsed *Equity Fund for Innovation and Technology Growth* (ETGF). "Innovative European Growth Mid-Caps" form a large and crucial segment for the future of European economy and competitiveness. They are characterized by a unique asset class in terms of risk/return financial as well as industrial and economic perspective (potential platform for growth to consolidate technology-enabled industries; large reservoir of qualified job creation across Europe; and signifi

cant pan-European GDP increase. The ETGF would invest in high potential driven growth companies. At least 50% of the fund would be in RSFF eligible investments. Open to value creation in sector such as clean and renewable technologies, ICT and MedTech. The sponsors may be the same core sponsor of the Marguerite Fund.[9] And as with Marguerite, it should also be open to other EU-27 long term financial investors.

In education and training, the EIB wants to concentrate on improving the quality of education on offer, notably through the implementation of the lifelong learning concept also supporting the European Higher Education Area and the European Research Area. The agenda for research and development is equally ambitious. EIB support will go to R&D in IT as a crucial enabling technology for implementing the knowledge-based economy. Both emerging technologies and new technologies in mature sectors are important. Emerging technologies expected to have a significant impact on the economy are; for example, life sciences (mainly biotechnology) and material sciences (notably nanotechnology). New technologies in sectors such as steel, chemicals and agro-food have the benefit of incremental innovation and productivity gains. Environmental technologies reflect the importance attached to energy efficiency and climate change in transport, manufacturing and process industries, power generation and renewable energies, such as hydrogen, solar, wind, and second generation bio-fuels.

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[9] For more details on new European financial instruments and, in particular, on the Marguerite Fund see the Chapter by the same Authors in this volume "Perspectives of Project Financing in Europe".

4. THE ROLE OF LONG TERM INVESTMENTS IN THE DEVELOPMENT AND GROWTH OF GLOBAL ECONOMY IN THE XXI CENTURY

How can growth and innovation be financed if there is no public money? Since the 2007 crisis the public finance of advanced economies has been under stress. The level of public debt/GDP ratio of G-7 countries soared to post-war levels. For the "advanced economies" within the G-20, this ratio peaked to 102% in 2009 and is expected to reach 122% in 2014. According to IMF, 10 to 15 years of fiscal adjustment are needed to return to pre-crisis levels of public debt. Public budgets are drained by government interventions to save financial institutions and other sectors hit by the crisis. Revenue losses, automatic stabilizers, and higher interest payments constitute the main part of government debt increase. Most advanced economies need to lower their deficits and their debt substantially. Public debt ratios are still rising in most advanced economies, with financing needs at historical highs. For emerging economies, even if the fiscal outlook is more favourable, this general condition reflects strong capital inflows and low interest rate more than structural policy of fiscal recovery.

Therefore, in the coming years debt reduction will have to face the negative effects of low growth rates and the increasing cost of the welfare state. In addition, the economy should support a growing population of ageing citizens. The problem is therefore "structural" not just cyclical. Restoring sustainable debt over the medium term will indeed be a very challenging task. International capital flows can match the long-term exit-strategy policy mainly based on strong investments in infrastructure and innovation (see, for instance, Obama's infrastructure plan and the EU "2020" strategy).

In Europe, we expect that the global demand for infrastructure, energy and innovation will grow rapidly. For instance, the overall cost of the Trans-European Transport Network (TEN-T), still to be financed, has been assessed at around 500 million euro by 2020. The overall cost investments in Energy and Climate Change are estimated in over 2,500 billion by 2020. It includes energy infrastructure, energy generation, renewable energies, and environment systems and infrastructures. Investing in R&D and infrastructure requires a long-term perspective, due to the time horizon of project realization. As far as they are productivity-enhancing, large scale R&D and fixed capital investment contribute to lung-run economic growth. At the same time, they express their potential returns only after several years. Such kinds of investments are mainly related to the improvement of the business and consumer environment, by modernising the interconnection framework, by lowering the transport costs, and by supporting the green economy, among other things. Long-term investment may also induce sustainable growth, employment and global stability. It generates stable cash flows over longer periods and financially sustainable long-term risk-adjusted rates of return. In developed financial markets, long-term investment is usually countercyclical and thereby mitigates volatility, stabilizes the economy, and sustains growth. In presence of credit constraints, however, long-term investment can face a higher liquidity risk and weakens, sometimes, the solidity of the industrial and banking sectors.

Long-term investors are characterized by a low reliance on short-term market liquidity, due to stable resources, often made of regulated or guaranteed deposits, long-term savings products or long-term borrowing. They usually have a robust capital base, which relies mainly on reserve

accumulation and enables them to absorb short-term fluctuations in financial markets (drawing on reserves in bad years and feeding them in good years). Long-term investors comprise major financial institutions financing economic development, sovereign wealth funds, pension funds, public retirement funds, insurance funds, etc. The main characteristics of long-term investors are: the ability to retain assets longer than other market players, even in crisis periods, in this way playing a counter-cyclical role on financial markets; investments in — often illiquid — capital or debt instruments that yield a profitable return in the long-run, such as those issued by companies operating in sectors like general interest utilities, infrastructures, innovation projects, renewable energies and the like; liabilities that differ in quality from those of other financial investors; investments that are typically carried out with performance and risk targets calculated on a long-term basis.

Long-term investors may play a key role in sustaining and attracting capitals for strategic investments, looking at a new economic model oriented to "common" rather than "consumer goods". Long-term investors do not generally seek speculative IRR or strong capital gains, due to the clear social responsibility that they usually have in their mission. They are willing and capable of keeping long-term assets and liabilities in their books. They are able to spread risks between generations.

After the financial crisis, new and feasible ways to channel major capital flows from the global market to long-term infrastructural initiatives should be sought. These initiatives should have strong 'positive externalities' for the environment, the energy sector, the transport sector, R&D, human capital, TLC, and the economic system as a whole, while using the least amount of public

resources possible. Public and private sectors must work together to build new forms of complementarities. New rules and incentives for PPPs and PFIs and new financial instruments should be introduced. New architectures for equity funds, project bonds, debt instruments and, more generally, credit-enhancing initiatives must be considered. A new regulatory framework — more friendly with long-term investment or, at least, not discriminatory against it — is needed. This should involve accounting standards, prudential principles, and corporate governance, as well as 'ad hoc' systems of fiscal incentives.

5. CONCLUSION

The XXI Century will be an age of great challenges. Innovation is going to be a main driver of strong, balanced and sustainable growth. New financial instruments and systems of incentives and rules for long term investments may help private equity funds and mid-small Cap in high innovation and growth sectors. Large public procurement programs at a national, regional or even global level, are the best ways to foster and spread around innovation potentialities.

But the real challenge, we believe, is to have a sort of innovation-friendly Keynesianism that focuses with a similar massive investment resources, that the US had in space and military programs in the past (i.e. Strategic Defence Initiative SDI launched in 1983) on, among other things, huge, ambitious environmental and high tech programs that fulfil both Keynesian purpose and technology-focusing purpose. We believe that the EU has ample margins to raise on global markets Euro Debt to finance very large programs of such a nature.

Figures

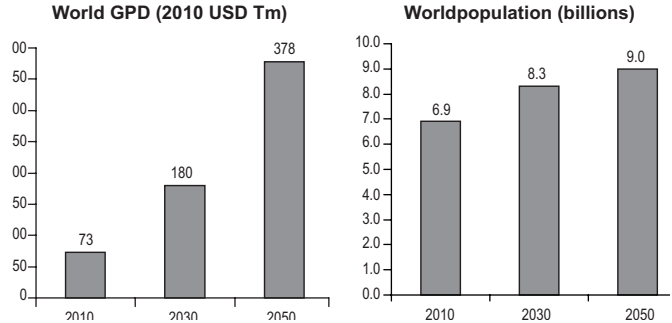


Figure 1. World GDP and population. Source: Citi (2011)

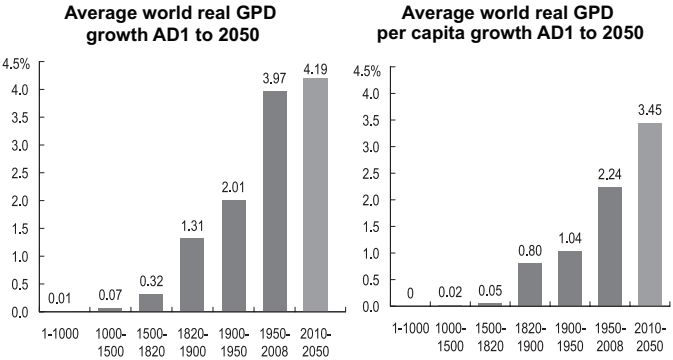
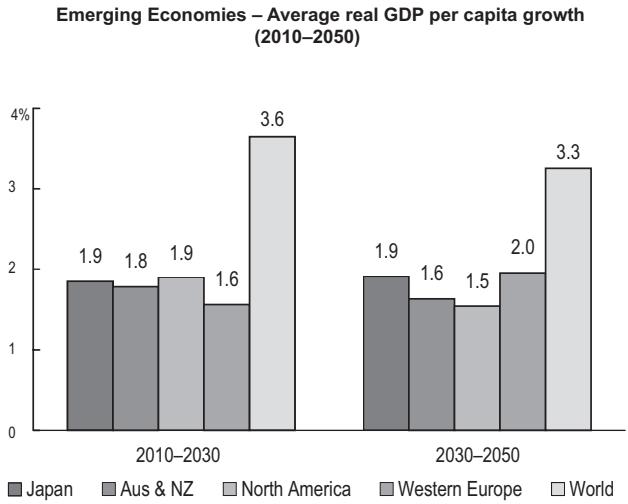


Figure 2. World real GDP growth. Source: Citi (2011)



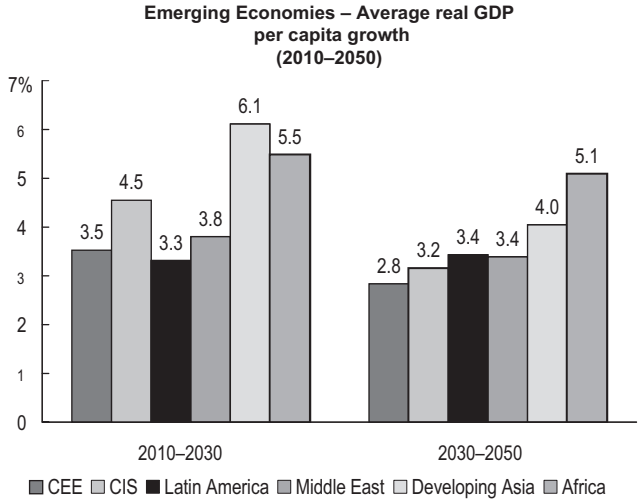
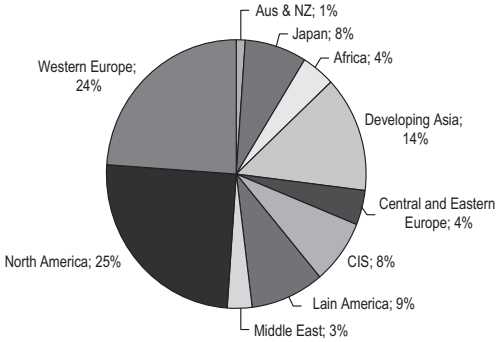
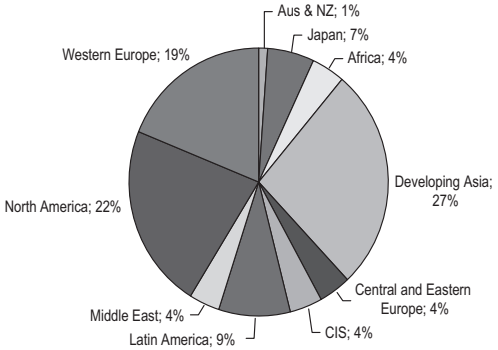


Figure 3. Real GDP per capita growth: advanced vs emerging economies. Source: Citi (2011). GDP per capita measured in PPP USD

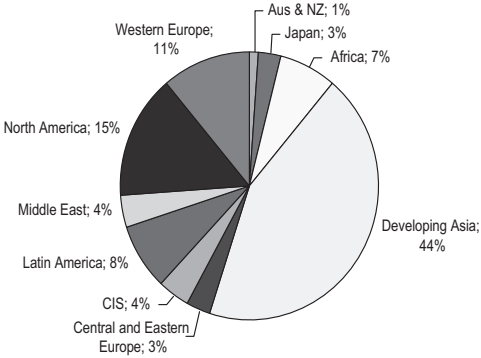
Composition of World GDP, 1990



Composition of World GDP, 2010



Composition of World GDP, 2030



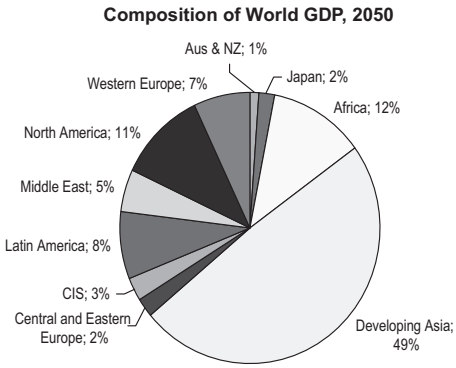


Figure 4. World real GDP composition. Source: Citi (2011)

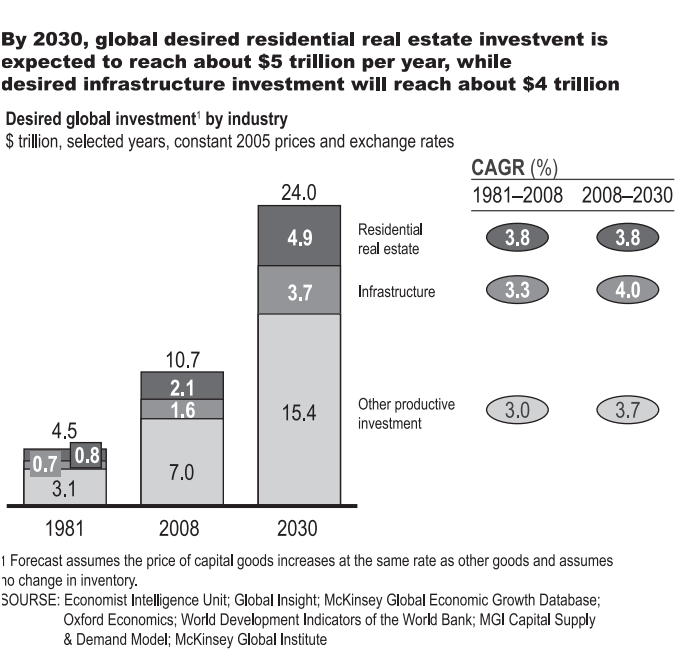
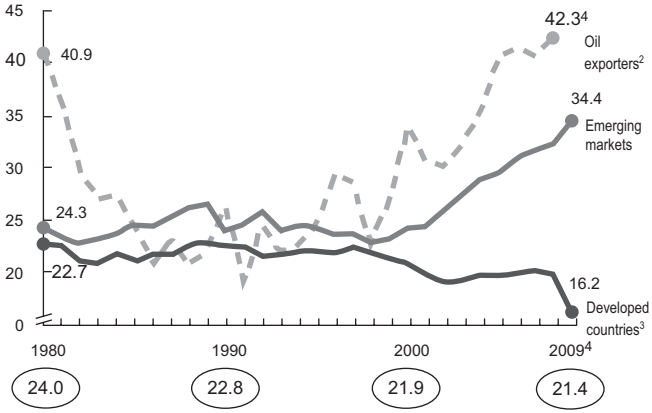


Figure 5. Desired global investment

Saving rates in developed countries have declined over the past 30 years

Gross national saving rate[1]
% of global GDP

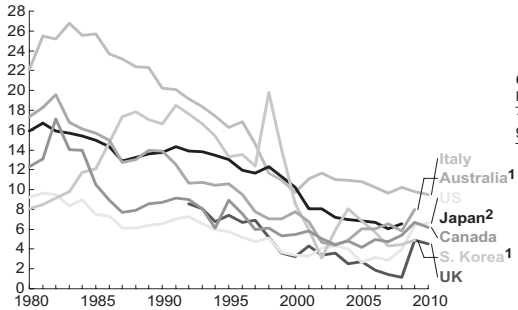


1 Gross saving by households, corporate sector, and government sector for 111 countries.
2 Algeria, Angola, Azerbaijan, Iran, Kazakhstan, Kuwait, Nigeria, Norway, Saudi Arabia, United Arab Emirates, Venezuela.
3 Countries with average 2004–08 GDP per capita > $14,500 (world average), excluding developed oil exporters.
4 Estimates based on a smple of 52 countries (equivalent to about 85 percent of global GDP); data for oil exporters throung 2008.
SOURCE: CEIC; Haver Analystic; McKinsey Global Economic Growth Database; World Development Indicators of the World Bank; McKinsey Global Institute.

Figure 6. Gross saving rate dynamics

Household saving rates in many developed countries have declined substantially

Household gross saving rates, 1980–2010
% of GDP



	Change, Percentage points		
	1980–90	1990–2000	2000–10
Italy	-1.9	-10.5	-0.2
Australia[1]	-3.4	-6.2	0.2
US	-2.7	-3.2	3.2
Japan[2]	-2.1	-3.5	-3.7
Canada	-3.6	-3.3	0.8
S. Korea[1]	8.6	-8.1	-3.7
UK	n/a	-5.3[3]	1.3

1 Data available through 2009. 2 Data available through 2008. 3 Covers 1992–2010.

Figure 7. Household gross saving rate

TCR FUND, PROJECT BONDS, PPP GUARANTEES HOW TO FINANCE LONG TERM INVESTMENTS IN INFRASTRUCTURE, NEW TECHNOLOGIES AND MODERNIZATION

Paolo Raimondi, Economist

One of the most significant challenges, if not the most important one, is the creation of a mechanism to finance the progressive realization of the TCR projects. Here are a few reflections which, we hope, can stimulate more ideas and proposals.

First of all this effort will require an extraordinary dimension of credit and other financial facilities that must be put in action. It will definitively imply several hundred billions of euros, if not more. A preliminary evaluation has not been done yet. It is probably useful to compare it with the "Trans-European networks" (TEN) projects and with the 20–20–20 targets. The Trans-European Networks (TENs) are large infrastructure networks of transport, energy and telecommunications underpinning the developmental and integration goals of the European Union. The "20–20–20" targets set three key objectives for 2020: a 20% reduction in EU greenhouse gas emissions from 1990 levels; raising the share of EU energy consumption produced from renewable resources to 20%; a 20% improvement in the EU's energy efficiency.

Preliminary estimates point to European infrastructure investment needs of between € 1.5 trillion and € 2.0 trillion, around € 150–200 billion per year. More specifically, from now until 2020, investment needs are estimated as follows: € 500 billion in the transportation sector, for the implementation of the Trans-European Transport Network (TEN-T) programme; € 1,100 billion in the energy sector, by public and private entities for the implementation of the Tans-European Energy Networks (TEN-E), thus divided: a. € 400 billion on distribution networks and smart grids; b. € 200 billion on transmission networks and storage capacity; c. € 500 billion to upgrade actual and build new generation capacity.

In addition, between € 38–58 billion and € 181–268 billion in the telecommunication sector, to achieve the European Commission's broad band target.

Second. The best approximation of the financial mechanism and governance structure will be a Development Fund and a cluster of funds related to it and oriented by it. An example could be the most successful mechanism experienced in the last 60 years, the Kreditanstalt für Wiederaufbau (KfW), the German bank of reconstruction, which more than any other institution was responsible for making Germany the industrial and technological power of our present time. Created under the auspice of the Marshall Plan, the KfW used American financial grants to create a credit mechanism to finance infrastructure and industrial projects. At the beginning it worked to establish the communication and productions lines destroyed in WWII and later it functioned as the pivotal instrument for technological modernization and innovation. One very important aspect of its functioning was its decision to reintegrate into its base capital all profits and other financial returns produced by investment activi-

ties. In this way it became a permanent and self expansive credit mechanism.

Third. It is required to define the range of the new financial instruments which will be proposed for use in order to overcome the present credit and financial restrictions worldwide. The support against the "credit crunch" and to the lack of supply of equity for infrastructure has been one of the main objectives of several institutions during and after the crisis. One of the main consequences of the global financial crisis and the attempts to bail out the entire banking system was the huge OECD debt's growth: from 78% of GDP in 2005 to 94% in 2009. It is expected to increase even more in the next years, so as to reach a peak of 108% of GDP in 2013. The opposite is true for emerging economies. During the crisis, their public debt remained more or less constant at 35% of GDP. Situation of debt, pressure for money, money available for LTI, market value, in the next decades we expect a huge increase in demand for capital investment which will go from today's almost USD 11 trillion to USD 24 trillion by 2030.

Fourth. A very important role in the realization of a multi continental long term development project will be played by the insurances and guarantees we will be able to generate for its continuous functioning. The market for US federal government securities is around USD 2 500 billion. An equivalent amount of European sovereign debt would be around 13.5% of the European Union's GDP. This is a relatively modest portion of the EU-27 member state total public debt, which is equal to 84% in 2010. It is a modest portion, but sufficient, however, to finance truly significant strategic investments. This could, within 5–7 years, lead to the creation of an European Project Bond Market of approximately € 110–200 bil-

lion, depending on the form of the EU backed support as a debt service guarantee or as a subordinated loan.

As indicated above, it is known that the financial requirement to realize the transport trans-European network alone is estimated to be about 400 billion euros for the 2007–2013 period. To reach to the objective of the 20–20–20 strategy approved in 2008 by the EU, at least 1.000 billion euros will be needed for a period of 10 years alone in the renewable energy and in the energy efficiency sectors.

It is obvious that private intervention is essential for the realization of such investments. But to involve private finance, which has itself been heavily hit by the crisis, requires precision timing and the costs of the project realization, a stable framework of rules and new financing structures and instruments. Private investors tend to be reluctant to put their capital in long term investments.

The answer is in different forms of Public-Private-Partnership (PPP) where at the beginning the equity component, which should be covered mostly by the public finance, ought to be of a relevant dimension. In the PPP initiatives we can find a useful instrument to finance strategic investments.

Here we need to define a way to deal with the different risk of construction, of traffic and of material availabilities related to the different projects in such a way as to overcome the public finance limitations and to involve a strong combination of intervention from the public sector, long term investors and private operators.

The Development Fund is the most convenient solution because it can combine public/private participation according to an agreed division of responsibilities. It can be very flexible in governance and in management. It can decide to use private and public expertises in different fields, both financial as well as in project evaluation.

At the beginning the Development Fund should be in charge to define the global strategic project and to initiate some of the most fundamental aspects of the project itself, such as the construction and the modernization of the high speed train connections of the TCRs. It must have at least four basic departments, eventually more if required.

The first one is the strategic planning and strategic governance which will be in charge of the management and of the overall decisions; the second one should be in charge of the feasibility studies with specialists also able to assess the productivity of the projects; the third one will be in charge of the financial organization to attract and collect capitals in different forms and to make sure that the credit flows in a transparent, efficient and timely way to realize the project; the fourth department will have one of the most sensitive responsibilities, connected to competence and security, related to the procurement process.

The capital participation in the strategic Development Fund should give a majority control to the capitals coming from the governments involved in the TCR project. For a number of reasons, that could be explained on other occasions, the European side should be represented by the European Union and not by the single European States. Russia and the other interested members of the Commonwealth of Independent States should indicate the way they intend to participate.

We strongly suggest also having a unified voice from the CIS side to avoid unnecessary divisions. A unified approach from both sides will make sure that decisions inside the Fund will be successfully made, after that the preliminary interregional questions and priorities have been debated and solved. For the beginning it is convenient to proceed with a European Union-CIS collaboration later to be opened to China and to others.

We could foresee that such a Fund be controlled for 70% by the two public entities, the European Union and the CIS countries, with 35% each, while the remaining 30% will be for the private participation.

Among the private participants the most welcome are primarily the pension funds and other funds directly related to people's savings. The reason is to attract those capitals which are very close to the functioning of the real economic sectors and of their productive labour components.

It is important to win these financial sectors to sustain long term investments in infrastructure and in new technologies and modernization because these sectors could appreciate more easily the effects of these types of investments in producing real income and new qualified jobs. Likewise insurances, investment funds, banks and companies and other private sources of capitals will be invited to participate. Also these private participations could be divided according to geographical and other connecting origins.

If necessary, under the strategic Development Fund, a network of other funds could be created eventually related to geographical areas of development or to sectoral and technological areas. For example, funds more related to the promotion of special areas, of electricity grids instead of train transportation, housing, R&D sectors, new technologies clusters, SME' participation, etc.

The model to be followed for these funds could be the same used for the Development Fund. Or, in the case of a more geographical focus, the participation of capitals coming from the regions in discussions could have a majority or at least a bigger share.

In this context, for example, one can follow the very positive and effective model of the Marguerite network of equity funds proposed and realized in the context of the Long Term Investors Club strategy. Here the expertises

of the European network of the Caisse des Depots/Cassa Depositi/KfW/EIB are very advanced and in many cases their results have been already tested successfully.

The Development Fund and the related network of funds will be based on a combination of equity and debts to create the required credit lines to support the project's realization. The equity will come from the direct capital participation of the shareholders.

We envisage that the capital formation will be based primarily by liquidity, state budget allocations (from European and national budgets), state bonds and shares of state controlled entities. This is to make sure that the basic capital has the best quality guarantees and backups. For that which concerns European capital participation, there should be titles with the best rating provided by the European Central Bank,

One may also consider direct capital participation in the form of some of the most solid private corporation shares, but this should have, for example, a special certification by the ECB. After the failures of the private rating agencies before and during the present global crisis and the related scandals, we should exclude their so called "triple A" quality grade as the basis to define an acceptable title.

We should also exclude all other titles related to the financial derivative markets. This more conservative approach should push the ECB to change its criteria in titles and assets evaluation and, among other things, to create an independent rating agency monitored by some suggested European institutions.

Another way to have public capital participation is through a quota of the gold reserves, at a very realistic (non risky) evaluation, and through the allocations of government owned physical assets (buildings, land, raw

materials, etc). This second possibility obviously has to be prepared by specially created agencies with the task to evaluate and to manage such assets. Such agencies will operate with capitals/titles representing such assets.

Private investors would participate in the capital of the Fund through special financial vehicles which would adopt the same standards of investment applied for public participation.

One of the main tasks of the Fund will be the creation of enough credit for the projects. Clearly this will be distributed over a longer period of time, due to the simple fact that we are speaking of long term investments and long term management of the TCR development policy. Its capital base should be big enough, but in any case it will not be sufficient without additional new financial instruments.

One of the most important of such new financial instruments should be the project bonds. Project bonds could be issued both by the strategic Development Fund and by the other funds and they will be related directly to the realization of a part of the project or one of its specific segments, technologies or innovations.

Project bonds will be constructed in such a way as to attract particularly private institutional investors interested in long term secure projects. Participants will see that they can have a decent return while at the same time they could take part in investments in the real sectors of the productive and new technologies-based economy whose realization will be the guarantee for economic growth and stability producing more income and better qualified and better paid jobs. Such investments would be the best contribution to overcome the present crisis which fosters insecurity, instability, unemployment, austerity and market restrictions. The long term titles could positively

affect the financial markets that are continuously threatened by financial volatility.

Project bonds will be measured and valued in relation to a segment of the project by a competent agency and then placed on the market through special authorized public and private institutions which fulfil certification and given standards of seriousness, qualification and transparency. In a similar way the state bonds are allocated on the market today.

They should be constructed in such a way as to attract particularly private savings, pension funds and insurance funds. For this they should respond to specific conditions and give concrete guarantees. For example, in the case of money coming from citizens savings one could apply the same State minimum capital guarantee given to each person in the European Union for their savings kept in a bank account, which today is about 110.000 euros per person.

This will be definitively important for Russian savings, for example, because it is know that so far Russian citizens do not have much confidence in their own national banks and hold back their savings or give them to international financial institutions whose activities tend to be short term and sometimes highly risky and speculative. Clearly planned and well presented and guaranteed project bonds could indeed convince many Russian and other citizens to consider them as a sound investments, whose return will be financially but also through the development of the productive economy and more and better employment.

A second participation form in the TCR could be through Eurobonds and similar bonds linked to other Eurasian regions. Eurobonds are issued directly by the European Union in relation to the restructuring of the national debts but also for the technological moderniza-

tion of the SME and other economic players. In this second possibility they could be used for European SME involved in the TCR project when their participation will require an advancement in technologies.

One very important aspect of the TCR Fund and project will be the guarantees for the investors we will be able to create. Such guarantees must be realistic a clearly defined to show the convenience for investors to participate.

One of the immediate guarantees could be in the form of fiscal treatment. It is clear that the long term investments could not be treated a short term financial operations. Unfortunately both Basel III and Solvency III do not make any difference between long term and short term investments. In this way the long term operations are punished and undermined.

A better fiscal treatment could simply be in the form of lower taxes. Government agencies should indicate the criteria to define what a long term productive investment is. They should include such specific investments in a priority list and consequently treat them in a different way.

A second type of guarantee could be in the form of a state guarantee in investment financial returns. This is easier for Fund bonds because their return is related to a fix interest rate. But also this could be helped by an additional state guarantee that would intervene to make sure that for a number of years not only the Fund but also the governments provide a bond solvency and interest rate payment guarantee.

For that concerning equity participation, a correct policy could be more complex but also more decisive in order to reach a successful result. How can private capitals be convinced to invest in equity when it is known that a very successful project will begin to produce some return only after few years and after its complete or partial

realization would be functioning at a level to produce an income?

One way to answer to such a challenge would be, for example, for the Fund and the State to give some guarantees of a basic financial return for a number of years. This operation could be based on a mix of interventions: partial financial returns, better fiscal treatment for the participants in relation to the level of their participation, rights to partially manage the project and to partially participate in the collection of fees, services, tariffs, etc. in relation to different projects.

Another important instrument already used, for example, by the EIB in infrastructure investments is the risk-sharing instrument financed by the European Commission. A special Risk Sharing Finance Facility was created to cover EIB risk in its financing of long term research, development and innovation with qualified firms, research centres and other institutions but with low credit worth or non investment grade. It is also extended to local banks that provide credit for R&D for high tech middle size enterprises. This allows finance mediators to free more capital and participate in larger financing.

A second instrument is the so called *mezzanine* fund for quasi-equity and hybrid capital financing of SME projects. This implies guarantees for specific and more risky aspects of an investment to facilitate other private financial participations for the realization of a project.

The EIB has already developed a Loan Guarantee to Transportation TENs (LGTT), co-financed by the EU Commission, to supply a guarantee called "contingent mezzanine debt" for traffic risks in the first years of the exploitation of a transport project. This guarantee reduces risks linked to the project and creates the possibilities for other private financial participation. Indeed project

bonds, whose interest and capital payments depend exclusively on the project capability to generate adequate profits, are very rare.

A way to maintain private capital participation and to secure a strategic investor could be to offer loyalty shares which replace the dividend payment with a warrant. The warrant could be of a special qualities, related to the time of loyalty and therefore to some rights and privileges for whom hold them. This will also help to align shareholder and management objectives.

It is also very important to be able to offer, if the conditions allow them, different kinds of guarantees (preference, minimum interest payment guarantee, tax reduction, etc) for the titles issued by those entities explicitly created to finance a project. In such situations project bond investors could benefit from a higher credit worthiness on their titles, or on tranches of them, with the possibility to count also on the project evaluation competences of such entities. This would make it easier to find project bond buyers on the market. The same result of credit enhancement could be reached by financing subordinate emission tranches of project titles so as to make the senior tranches surer and therefore more attractive for specific private investors. One could also consider creating new guarantee products to cover some specific risks, like those ones related to the extra cost of project construction, financial performance and others.

Indeed, the TCR represents a major strategic conceptual, productive and technological revolution. Its long term credit support is a fundamental financial revolution as well.

A NEW VISION OF THE TRANSEURASIAN CORRIDOR OF RAZVITIE

Mikhail Baydakov, Yury Gromyko, Victor Zyukov

1. THE TRANSEURASIAN CORRIDOR OF RAZVITIE AS A CONCRETE SCENARIO TO GUIDE THE WORLD OUT OF THE TRANSITION OF THE DEADLOCKED WORLD ORDER, BASED ON DOLLAR HEGEMONY

Many well-known Nobel prize winners, such as Krugman, Stiglitz, Mandale believe that the USA is unable to overcome the economic recession despite the special anti-crisis measures implemented by the Obama government.

A more ingenious Paul Krugman even claims in one of his latest books, with a sense of humor that America and the whole world can be saved only by an invasion of aliens that will lead to certain mobilization in society. Unwilling to come to this conclusion, the leader of economic thought in the USA shows that it is impossible to work out a scenario in which America and the world as a whole will come out of the economic crisis peacefully, based on self-mobilization. However, it is not for the lack of ideas by the prominent Keynesian economist. If Mr. Krugman comes to such ideas, then what can be heard from representatives of another wing: the anti-keynesian economic mainstream?

The representatives of neoliberalism are obviously in a conceptional stalemate — so-called short-termism (short-term financial investment and capital flows). Therefore, the current world crisis has become a natural consequence of the advancement of a liberal paradigm and timid attempts to correct it.

Does that mean that only an "invasion of aliens" and a war with them could provide an impetus for the world economy?

At the moment we are rethinking basic concepts and creating a new language, a new world view, in order to produce a long-term vision of how to transform the modern world system in a positive, non-defensive scenarios.

In our opinion such a language is provided within the world-thought-activity approach which is regarded as a system of forms of collective thinking, thoughtful communication and thoughtful action. These types of actions must be aimed at production, reproduction, consumption, exchange, distribution.

It is clear that apart from institutional forms there also exists such a notion as life — the strategy of significant population groups which serves as a basis in changing and transforming established institutions and organizational systems. This common life-strategy should be also identified and presented to estranged social groups.

The most important role within this approach is assumed by the state, in times of transition its role even grows. But the question is: what can be done if all the leading posts are taken up by advocates of a liberal economic paradigm? The only way out in such a situation is to elaborate a systematic project of development that must be implemented by "the state" as an actor and with the support of contemporary state institutions. The existence of such a pro-state project is a certain way to set a

norm of action for existing authorities. This project assumes much greater importance during the crisis, when state actors and politicians are expected to come up with original, non-standard actions.

The necessity to mobilize in order to overcome the current crisis means that there is a need for the formation of a mechanism that is the opposite of the capitalist form of scientific development and advancement of new technical systems.

According to G. Arrighi, the national capitalist state has been developing the capacity of its technical system mostly in order to produce a more powerful weapon than another rival capitalist state. Historically, the only state that acted according to such a paradigm was medieval China which built a special type of communication with its vassals and tributaries.

In contrast, currently the main goal is not to destroy the adversary state by might. American consultants gaily reassured Barack Obama's running mate Mitt Romney that Russians have lost the art of winning in the Olympic games and cannot create satellites either. At the same time this relaxed attitude (which is of course a disgrace) means that Americans will be unable to mobilize against the "Russian threat" to find the way out of the economic downturn — the reserves for motivation are almost exhausted.

Moreover, it is evident that Americans with a certain element of hysteria are still preserving their military contingent in different locations all over the globe and establishing new satellites that are responsible for containment and stability in restless regions. Among those satellites in leading countries that should be named are Turkey and Saudi Arabia, Qatar and other implacable friends of the United States of America. This rush advancement of mil-

itary might means that Americans are really afraid that someone could use the dollars and, like de Gaulle, could ask to replace the amount of paper money by its physical equivalent in gold which would mean the financial bankruptcy of the US. Such bankruptcy is inconsistent with the interests of other actors since the collapse of the dollar system would lead to chaos and the development of conflict areas. The Hobbesian war of all against all would lead to a world doomed in chaos.

What can be presented as an alternative to the capitalist way of scientific knowledge? Only a goal-oriented spurt to new civilizational formation based on the application of new technological principles and effects and, thus, new principles of social and personal consciousness. This spurt has nothing to do with the state machine. Furthermore, it is important that such an ambitious project be elaborated inside the state by several independent groups.

There is another important role: the formation of a new peaceful scenario to lead humanity out of the financial crisis which first broke out in the USA into the positive future.

An example of such a type of project that we propose is the Transeurasian Corridor of Razvitie (the TCR). It is the Transeurasian Corridor of Razvitie that is regarded as a means to mobilize European and Asian countries into building global infrastructure. This project for building production chains and organization of life-strategy of population masses is seen as a new way of global productive economic interaction. This project makes it possible to see a way out of the world economic system based on paper money not backed by the gold standard. Therefore, the TCR is regarded as a universal integrative remedy of infrastructure development for vast land masses as a real planetary project joining different parts of the world

(East and West), and continents (Eurasia and Northern America). This project approach also creates a possibility for development in Africa and Latin America together with Brazil.

This project involves a complicated process of communication and mobilization, a sophisticated system of dealings among actors with various interests around the common scenario of the TCR project. This is a first real coordinated attempt to emerge out of the recession for the visible profit of all its participants. It is a realization of a principle formulated by well-known political scientist V. N. Kuznetsov: "to ensure security through development". This is a very important principle, but the issue of the essence of "development" as a planetary phenomenon (not just Russian, American, or Chinese development). A development core can only be universal and planetary and cannot be built within the existing markets. Nor is it possible just to attempt to create a new market within the existing rules, because that also may turn out to be a new bubble. What is more, such a development core may even presuppose the rise of new civilization.

For international society the development principle is presumed to depart from power-using scenarios and war and repartition of zones of influence to the global creativity project and a new common wealth production project through the creation of UNITED SOCIO-CULTURAL SPACE. For Russia this is the only alternative not to be excluded and isolated from the world development trends, at the same time leaving possibilities for original independent actions. On the other hand, this is Russia that is able to initiate creation of material wealth production based on the principle of knowledge-technology based development, which is different from the economic principle of economic growth based on labor-intensive growth.

This project provides us with another vision of solving the problem of infrastructure development based on territory. This approach is much broader than ordinary geo-economics focused on the construction of new gas pipeline routes, fiber-optic cables, water routes and aqueducts and transport lines, since it involves repopulation of sizable territories of the planet. The TCR is a thought-activity organized system which is institutionalized on specific territory. This system is created so that everyone has access to certain capacities: the speed of movement around the territory, energy and electric power capacity, obtaining a SYSTEMIZED MATRIX of new materials (artificial and natural) and products, knowledge and information, water, soil, home with its usage in the eco-friendly environment. The main task here is to describe an infrastructure standard, identifying ensured conditions for the comfort and security of people.

Infrastructure seen as a planetary system of the thought-activity of different groups means the formation of common systematic standards for artificial and natural support. This is the most important step towards the new civilization which can only be built on the unalienable rights of people to use certain infrastructure. The creation of such an infrastructure is seen as the pre-condition for production and the vital activity of people is a goal-directed step towards the creation of a new realm of planetary wealth.

2. THE TRANSEURASIAN CORRIDOR OF RAZVITIE AS A CONNECTION OF NEW FINANCIAL INSTRUMENTS WITH NEW TECHNOLOGICAL ELABORATION IN METAINDUSTRIAL INSTITUTIONS AND PROJECT AGENCIES

Another important component consists of elaborated financial instruments aimed at the reorientation of savings and investments to the creation of new technologies from a new civilizational formation. By civilizational formations I mean a sophisticated complex of socio-cultural and technical and industrial formation. The main idea is to apply a long-term investment strategy for major infrastructure projects.

However, the key point is not to create a bubble out of "new" infrastructure projects or to initiate a new long-term, non-feasible infrastructure-building project or even to start forming a new huge market that does not exist today, but rather to create a new way of generating common wealth using the revolutionary principle of fundamental practice-oriented science.

This principle of generation of common wealth should then be transferred to other countries and regions with the necessary modifications. It is this change in the scientific principles underlying existing knowledge on the natural materials, that will lead to the transformation of social and individual consciousness forms in man himself and in society.

Profit can possibly be found in the form of generating common wealth itself and the return of investments can be ensured by this new way of acting and not just by the automatic flow of goods and services from certain "production mechanisms". Consequently, those who are creating new forms of activity and get money for its creation will have to modify this created form of work to pay off investors.

In our opinion, the new way of producing common wealth is an "engine", while goods and services, new forms of infrastructure, are the elements transported within this "machine". Therefore, the traditional investing principle, according to which the main aim is to build a certain system which will generate money automatically, thus reimbursing the investor, is wrong. The main goal is to reproduce constantly the breakthrough activity forms in new different conditions.

What is meant by breakthrough? Nowadays a subject should be created capable of producing several highly-complicated different networking systems. The investment club and its participants should know how to exchange:

1. Debts for participation in development projects;
2. Political guarantees against the risks of creating new, non-existing product;
3. Short-term benefits — for long-term participation in a profitable project (basically, the time of participation for money);
4. Risks of creation and applying new technology for the possibility of its replication;
5. Stable recognized currency for the new forms of wealth counting units in parallel non-state money units;
6. Spare space for the employment possibilities and industrial capacities;
7. Foreground projects, non-profitable in a certain time perspective (currently senseless forms of activity within the existing markets), for suspended possible surplus profit of a new future market;
8. New forms of networking among various international members of productive chains for the refusal of the increase in existing productive capacities;
9. New investment instruments for the plans of industrial clusters;

10. The components of the plan of communication in markets;

11. Derivatives and non-secured money for expert knowledge and symbolic capital (the old way of saving vs. the new forms);

12. Some elements of "financial alchemy" for new fragments of physical economy.

Such forms of long-term investment activity (the investments themselves are an obligatory algorithmic accountant activity) are seen as a meta-organization in relation to the development corridor which is being created.

The managing meta-organization, by definition, is more complex than the object of its management. However, those two forms must be interdependent and correspondent to each other. The method of acting exercised by the investment club must be in correspondence with the object of its activities, namely the TCR project.

Thus, the development corridor, presupposing a cluster of new infrastructure projects based on application of new technologies, physical effects and new principles of life organization, is more than a network, it is rather a form of managing exchange among different groups and networking communities. The TCR in its essence is a reticular integrator or **"intersector"** which effects the transfer from one type of network communication to another, from certain networks to others, the transfer from the managing impulse of certain networks to others, of two different networks in a form of new networking elements etc.

Indeed, the TCR is not only a transportation network but also an interdependent system of various forms of infrastructure that are interconnected but isolated one from another at the same time. This is a systemic body of a principally new type.

For example, in order to create a network of high-speed magnetic levitation trains it is necessary to increase the energy capacity, the density of energy flow on the territory and decrease energy degradation during the transmission process. That is why main lines for magnetic levitation trains must be estimated together with the estimations of energy corridors based on new devices that ensure increase in energy capacity but also diminish power inputs.

Thus, the main idea of connection between financial and investment mechanisms and new technological elaborations presupposes departure from a very common networking principle. The new principle is a principle of integrator networks and **"intersector"**. A discipline called "diakoptics" developed 60 years ago by the American engineer of Hungarian descent, Gabriel Kron, as a study of energy networks, has today been mastered and assimilated within contemporary markets.

However, it should be clear that the network as a principle took shape and even gained a preeminent position before the current financial and civilizational crisis. The networking form dates back to the time of the birth of capitalism. As was shown by Fernand Braudel — the networks of financiers, secret service agents, adventurists and robbers have molded the world system. But it is evident that modern networks, compared to the institutions of the 15–16th Centuries, cover much more numerous population groups. In order to overcome the contemporary crisis, the existing spontaneous form of communication and networking in the markets and world thought-activity as a whole also must be developed.

The overthrow of the existing types of networks with precise functional elements leads to chaos — this idea was expressed in the studies of Miguel Castell who named the

main types of such networks — the networks of producers, suppliers, experts, etc.

Such chaos was also witnessed by the representatives of hierarchical organizations when they had to deal with network organizations.

To manage a network there must be a more complicated meta-network organization — still opposed to the over-network chaos: in the form of network integration and network intersection based on the special project plan.

Apart from analysing networks, we should also concentrate on the "synthetics" of networks which is a more amorphous and networking object for consideration. At the same time what limits the possibilities for integration and interaction of networks in new forms and organisms? These are some special gravity systems, attractors based on their own, mostly unclear principles.

An axis for the interaction and reorganization of different networks must be the Transeurasian Corridor of Razvitie; a common base of unified socio-cultural space. The corridor itself presupposes a principle of reintegration of different networks (technological and social) within the TCR system). Different systems must assure this complexity, thus being attracted to new civilizational solutions.

In this respect within the development corridor there must be different types of networks: reproduction and reintegrative networks uniting already existing technological solutions; exploratory networks where new technological solutions, new physical, anthropological, thought-activity principles are revealed; networks covering new space along and around the corridor; networks for attraction of new knowledge; and, networks for replication of newly found technological solutions.

But why should all these different, functionalized networks, which can be isolated and be profitable separately,

coexist and be reintegrated within one development corridor? The answer is that it is necessary in order to get the maximum from the integration and concentration of different physical and socio-cultural principles and effects.

Therefore, the Transeurasian Corridor of Razvitie is regarded as an integrator of 4 different speeds of moving and living: ultrahigh-speed, high-speed, moderate, slow (for instance, water transport and life in a village 100 km from major landlines by transportation on a personal plane/helicopter). In its core the Transeurasian Corridor of Razvitie should be a system of disperse, multiple ways of life and participation in the production process for one person at several points along the corridor. What is more, the Transeurasian Corridor of Razvitie is a form of international, just integration through the scientific institutions of one country, innovative technological centers from another country, and a production system from another country. In this way the Transeurasian Corridor of Razvitie ensures maximum speed for the savings that could be used personally: in the form of the "smart house", new types of transportation, new productive devices. The Transeurasian Corridor of Razvitie should also become a reservoir for new high-tech projects (from the sphere of heavy industry to agriculture, biology and anthropology) that cannot be tried in other places. In this case the Transeurasian Corridor of Razvitie turns into an exchange matrix and reintegration of different materials both natural and artificial (including those that can only be produced by the space industry).

Such a matrix where everything can be exchanged for everything but only according to strictly established goals must be a base for attraction and integration among different types of networks.

So the success of the TCR project is guaranteed not by investment mechanisms themselves or just money; they only create certain requirements for the form and content of the projects. But the investors' activity is even more complicated than the work of construction of the Transeurasian Corridor of Razvitie in terms of planning and coordination.

It becomes clear that in order to formulate the Transeurasian Corridor of Razvitie project and then a sophisticated investment program and investment system project, first of all, exploration, research and communicative-negotiation experience must be conducted. Such research and elaboration can be done only by a network of metaindustrial agencies founded on the key points of the corridor that is being constructed.

3. THE TRANSEURASIAN CORRIDOR OF RAZVITIE AS A LOCOMOTIVE FOR SURMOUNTING THE RECESSION OF WORLD ECONOMY

This is the most important and the most problematic point because it lies at the core of our approach. The main solution here is that the TCR must be a territorialized system generating significant volumes of world wealth, to be transported through Russia. According to this vision, an isolated and autarkic Russia, existing only within its own problems and perspectives, building its own projects, is not acceptable. At the same time the inclusion of Russia into the world economy, which would mean loss of sovereignty, an independent position to formulate goals, plans and projects, is also unacceptable. The only way is to create a strong system of international

cooperation is in the form of new common wealth-generating system for the profit of international business circles.

How can Russia preserve its sovereignty and at the same time be an active partner in international cooperative networks? The only way is to set a precise plan of technology production of the next technical-industrial and socio-cultural formation, based on new physical principles and effects. This is all about creating fundamental practically oriented science which can be realized by revolutionary development in science and methodology. In this sphere Russia still possesses advanced leadership potential, which was initiated in Imperial Russia and really developed during the Soviet period.

Nowadays China is trying to gain the same potential and the Chinese leadership has done their best to found national original scientific and methodological schools. However in order to make the advanced potential of Chinese science and system of indigenous innovation a reality, the PRC still needs no fewer than 20 years.

Russia is in a totally different position: Russian elaborations from the point of creating new devices based on new physical principles and effects are still breakthroughs. A major part of them is not being transferred into technologies and Russians are not present in major technological markets. At the same time this type of activity from new theoretical thought (exploration into a new physical principle or effect) to technologies (new devices), new types of production and new life ensuring systems without any support from the existing profitable markets is the essence of the Russian type of development.

The Russian type of development does not have an obvious basis: not material, not organizational (based on obtaining multiple institutions), it is first of all oriented

at the creation of principally new potential and only after that, its capitalization. **This principle is certainly applicable in times of crisis: it can be realized to its full-scale only during crises.** This is different from a scientific race to gain new knowledge and build a new type of weapon to ensure the victory of one capitalist country over another. In this respect it is quite naïve to consider the scientific development stimulated by capitalism to be over.

Conversely, the development of science based on discovery of new physical and consenso (related to work with consciousness) principles and effects is only beginning. A new scientific-methodological task is to reproduce the plan of the Creator in the sphere of theoretical science elaborations: to bring scientific methodology back to religion to break its long-term dependence on capital. The scientist explores new principles and effects realized in technologies not to gain profit but in his aspiration for Truth and immortality. And precisely in the developing socio-cultural, social, socio-economic systems, theoretical and at the same time practically oriented science realizes this principle, this aspiration.

But the way back to religion and the formation of scientific-religious vision does not mean the decline in terms of scientific rigidity and analyticity. On the contrary, these indicators and the system of problematization and assessment of scientific character become more important, as scientific methodology needs to try everything. However, the discovery of new principles and effects of physics, of consciousness for creation of new technologies, based only on the process of cognition, people's aspiration for self-development is the main driving force of development. Cognition implies other important types of activity — creating projects, research, exploring etc.

Such a type of self-organization and acting is totally relevant in times of crisis, as was stated by Carlotta Perez: big business often stops investing in technologies that have already come on markets waiting for new mass technology to become popular and spread over the markets.

Now we are at the point where the Russian type of development — of advancement to new ways of generating common wealth — becomes extremely important.

This way of exploration, surely, should not be implemented in the form of extreme voluntarism or exercised without any understanding of the world situation — it should be proportionate to the state of science and global problems and solutions on the international arena. Not only systems approach, Russian mathematics and Russian global cosmism, but also the Russian knack and skill to create a principally new, previously non-existing device; a semiconductor, laser by Prokhorov, helicopter by Sikorsky, television by Zvorikin etc, should be the driving force of world development. Or we will not take this opportunity — as happened with Zvorikin and Sikorsky — and a new product; a "smart" device, will be replicated and developed for the technological market by the USA or China.

A very important question is who among the most developed countries will use this "Russian" principle of development and will make it its own way out of the world economic recession? Will Russia apply this principle?

We suggest that this Russian principle — fundamental revolutionary science as a basis for creation of technologies of the new industrial and socio-cultural formation — should be a platform for communication and negotiation with other countries that would like to become co-sponsors of the TCR project. Moreover, in all other situations Russia is unlikely to gain sovereignty or independence as a subject capable of realizing a real project of planetary significance.

China has already adopted the best Siemens technology and technologies developed by other western companies and is already prepared to show and present these technologies and their application according to Chinese standards to the rest of the world (Latin America, Africa and also Central Asia).

If we accept the idea that all crucial technologies have already been invented and the epoch of scientific discoveries is over and now there is only need for replication, then we should either try to be together with China or go on spreading the myth that Russia is only capable of supplying oil and gas and developing opera and ballet and is unable to create new devices and machine tools. And vice versa, we can use the existing technological and scientific advancements to create technologies using new physical principles and effects and, thus, build international cooperative ties and be far ahead of China and even the United States in our way to the creation of new technological markets.

The major point here is the creation of totally new technologies, applying new physical principles and effects as opposed to coming to the markets with new goods based on devices, mechanisms and technological solutions that have been known for a long time. This means that the current trend for uncontrolled replication, the so-called "development cancer", which is very popular among the producers of cell phones, tablet PCs and other telecommunication devices, must be reversed.

In this situation the answer to the question of finding the way out of the world economic downturn becomes obvious. It means Russia does not need to seek to be more active on world raw material markets or to create as many assembly plants as possible (signifying the economic growth of western transnational corporations) on its ter-

ritory, but rather to concentrate on production of totally new mechanisms, devices and systems.

The way out of recession implies an increase in strategic employment prospects that should be created according to the international plan for division of labor and organized on concrete territories in the existing or future settlements.

In this respect, jobs and settlements are two interdependent topics that should be addressed together and be a common topic for investments.

This issue goes far beyond the mere creation of well-paid jobs or building low-cost comfort housing. The main task is to make prospective settlements an object of investment for the population with high wages. The project must be aimed not at creating new well-paid jobs for Russians but rather at creating a matrix of international techno-industrial chains within the development corridor. While realizing this project, stable opportunities for employment will also appear.

In other words while formulating the development corridor project we need to plan a matrix of exchanges rather than the exact bargains for this or that group of goods. Only in this situation would we be able to find a solution for land-reclamation and creating new opportunities for employment in the context of this matrix of projects. At the same time there must be some exact calculations of certain transportation operations but the most crucial task is to construct the overall matrix.

The requirements from the Russian side are quite clear: as a result of exchanging raw materials, energy resources for mass consumption goods (from China and Japan) and for technologies and devices (from the EU), Russia, in its most vast territories, must create conditions for land-reclamation and the build-up of new cities, and should also proceed to a new technological formation.

That is why the notion of a "transportation matrix" is so important. In this respect transportation operation is related to the concrete territory through which it passes and therefore should lead to certain effects. The effect of such a transportation network through the territory is a more complex organization of activity and production on this land and, thus, an increase in the quality of life for its inhabitants. The newly constructed infrastructure should relate to the demands of development of the territory.

Consequently, the territory is developed and life is intensified for its inhabitants, the territory is not used extensively. For instance, the build-up of a gas pipeline can be done as an isolated line or may be built in a form of an apartment with access to gas on a vast territory. Similarly, the energy transfer may ensure the density of energy supply along this territory. The volumes of energy supply might be crucial for construction of high-tech and manufacturing industries on the given territory.

According to this approach, the TCR project is seen as a special form of organization of different processes: production, reproduction, consumption, exchange and commerce etc. As a result, new forms of trade and commerce on the territory lead to the advancement of: 1) social reproduction — in the form of new settlements; and; 2) reproduction of socio-productive systems ensuring the transfer to new technological formations and new strategies of consumption in the form of independent households.

From this point of view the main mission of the TCR project is to serve as a stimulus for the numerous groups of Russian youth to create systems of settlements to create a new technological formation in the intersection of different roads connecting Europe, Europe and Asia, Asia and America.

Such work (the creation of new settlements, industrialization and development of new technological levels in the socio-productive system) differs a lot from a traditional way of development characterized by the advancement of economic activity via migration of population from the village to the city.

This type of development of economic activity occurred about 350–400 years ago in Europe and we are witnessing the same processes now in China and India. The Chinese and Indian industrialization process is adjusted to this form of industrialization. But in the Eurasian heartland — Russia and Kazakhstan — there are not so many rural inhabitants to realize the same strategy for achieving economic growth. Therefore, there is need for another form of territorial reclamation; the increase in the growth of families controlling and developing certain territories.

This type of territory reclamation presupposes creation of temporary settlements with automatic systems of infrastructure, with an increase in the number of family members in the social realm. Such changes can be translated into reality only in a specific type of pendular infrastructure industrial migration.

In this perspective the global economic meltdown can be overcome through new industrialization, the build-up of new infrastructure and technologies of new techno-industrial formation, but not by the increase in economic activity and increase in individual consumption patterns — that is aspirated from the population growth in South-East Asia. This strategy also implies a change in consumption patterns, the departure from traditional forms to the creation of nuclear chains of individual households united in the settlements. Such a mode of consumption was already proposed by the governor of

the Belgorod region, Evgeniy Savchenko, where certain households join to form the investment pull for construction of roads between the city and their farms.

4. THE TRANSEURASIAN CORRIDOR OF RAZVITIE AS AN INTEGRATIVE INFRASTRUCTURE PLATFORM

The Transeurasian Corridor of Razvitie is regarded as an integrative infrastructure uniting rail transport, automobile mainlines, water roads, pipelines, small aircraft, dataways, and satellite surveillance systems.

The main purpose is to build common standards for the modernization and development of infrastructures of different countries involved in the project.

These standards should correlate with the following principles. First, along the territory of the TCR, the new transportation systems should be created, ensuring different speed and cargo volumes, different energy capacities for ensuring life-systems and factories.

Secondly, the TCR project should create conditions for resettlement and reclamation of territories.

Thirdly, there must be diffusion, spread, and technology spill-overs from the sixth techno-industrial formation to overall infrastructure systems.

Fourth, the TCR should ensure the construction and development above the traditional Soviet way of organization in industries.

Fifth, the TCR aims at applying standards of system engineering in the process of creating projects and using, developing and utilizing infrastructure.

Sixth, to construct a multi-infrastructural platform first one has to formulate the requirements of the needed products, and then fulfill the projects accordingly.

Seventh, such a sophisticated multi-infrastructural project can only be realized if there are special financial instruments — international project bonds that can be used by regional authorities, corporations, etc.

Special organization is required to formulate the requirements and satisfy them. This organization must be responsible for projects, elaboration, and application of all the systems of infrastructure on the designated territory.

This organization should actively engage in communication with industrial corporations, developing and integrating them in consortiums.

The "dark" side of financial capital is what we call the "deterritorialization" of the socio-economic sphere as opposed to the projects for territorial reclamation.

On the other side, financial capital, in contrast to industrial capital, presupposes the deterritorialization of prevailing forms of existence within this territory. In this respect deindustrialization in the USA and outsourcing of industrial facilities to third countries parallels the process of growth of the financial sector on Wall Street.

The advancement of the sixth techno-industrial and socio-cultural formation is connected to finding a solution for the territorialized economy. Financial mechanisms should be aimed at certain goals such as realization of the territorialization projects in the socio-economic sphere. The key to finding solutions to the world crisis lies in the two main pillars of the national economy system: financial capital and industrial capital.

We suppose that territorialization of socio-economic processes should correspond to the idea of multiplicity of formations of the Russian and world economy. Territorialization is related to institutional dynamics, transfer of institutions and technologies to new spheres and new regions: the institution of basic, practically oriented science, devel-

oping education, innovative industry. Territorialization should ensure reclamation and repopulating of territories.

Territorialization implies simultaneous implementation of the TCR project of the 6th technological formation through construction of magnetic levitation trains, railway trains of the 4th and 5th technological formation, but also energy and waterway systems in Eurasia (the united Eurasian water transportation system)[1]. It is clear that these transportation systems are characterized by different speeds, different life-styles, and organizational traits.

The main problem inherent here is a consequence of the existence of various formations in the Russian economy. Owing to this fact, the different systems and institutions within the Russian economy cannot be subordinated to one supposedly leading process, for instance, market economy organization. This is all about social economy, because economic institutions and features are inseparable from the social features. The analysis of the multiple formations existing within the Russian socio-economic system shows 5 main cross-sections for the projects of territorial development. Each cross-section is characterized by its own social mechanisms:

1. *The numerical increase in the population in Russia, the increase in the number of Russian families, ensure life-strategies and straightforward willingness to live in Russia on the part of the indigenous population.*
2. *The continuation of historical colonization of some underdeveloped Russian territories and construction of stable non-migratory settlements and also towns, where both settled and rotational strategies of living are persistent.*

[1] On this subject the articles by Belyakov A.A., Kozlov L.N. "Transport-Energetics Water System (TEWS) in Eurasia and the first priority projects".

3. *The formation of a labor market for the whole system of professions that are demanded in the currently existing form of market economy.*
4. *The analogue of Soviet construction strategies: the build-up of major engineering-construction industries, its reproduction and modernization of unique existing engineering and technical objects.*
5. *The submission of the 4th principle to the 3rd one. It is characterized by the development of instruments of financial capital, hyper-consumption institutions, the dominance of financial capital over industrial capital, network society.*
6. *Creation of the new techno-industrial and socio-cultural formation on the level of world development: this process can be initiated only by attracting the leading thinkers of the world, the representatives of unique practices and scientific groups.*

These six cross-sections can also be regarded as continuum points; that is, some interim systems can be formed in between to integrate the cross-sections in stable forms of socio-economic life.

The six realms and tasks of society and the national economy can be formulated in a certain matrix: all the tasks should be identified while discussing this matrix. As economists claim during the world economic crisis, energy and transportation infrastructure systems need certain investments, because reduced tariffs in these spheres influence the development of small and medium-sized businesses. Therefore, the question is, what types of infrastructure should receive investments first?

- The infrastructure of the next techno-industrial formation, that would lead the process of infrastructure development;

- Infrastructure existing within the 5th techno-industrial formation that is profitable on existing markets;
- Technological mega-infrastructure that can be serviced and reproduced only by government corporations;
- Infrastructure that ensures conditions for projects in waste lands, underdeveloped lands.

In our opinion, the priority object for investments should be comprised of all the above mentioned infrastructures, creating links between different types of infrastructure and the application of new technologies leads to technological re-equipment and development in the socio-economic sphere.

Therefore, the project to be created must be realized and evaluated in the form of a Transeurasian Corridor of Razvitie, modernization lines and new industrial sectors. The first task is to create the transportation systems of the new techno-industrial and socio-cultural formation. This corridor is based on rail lines for maglevs that can reach up to 500 km/h (this speed level is crucial for ensuring development and connectivity among cities and towns in Siberia).

Unlike capitalist advancement in the 19th century, it is not a matter of rail network development. The main characteristic of the Transeurasian Corridor of Razvitie is the connection and complex interaction of high-speed lines, dataways, highways, energy corridors and hyper-intellectual epistemic networks of high-tech instrumentation centers, located at crucial points along the main line.

Development corridors are characterized by the multifunctionality of the main elements along the main route. Thus, another name for the Transeurasian Corridor of Razvitie is the land bridge, *le ponte terrestre*, a bridge

across land. An example of the multifunctional character of the Transeurasian Corridor of Razvitie is not just the railway bridge connecting Sakhalin and the continent, but both the bridge and hydropower station that would create conditions for declining energy costs during construction of the bridge.

Modernization and reclamation lines ensure reorganization of the lands, creating development vectors in Russia towards the border countries and inside national territory. The methodology of territorial development is described in the works of A.D. Sobyanin and his group. Practically, these modernization axes and lines are reorganized and reoriented according to the rules of these guide lines.

The lack of such field lines results in the loss of functionalism, and, thus the project exists in isolation and loses its potential for realization. This is the case with the Russian Caucasus: currently there is need for advancement of modernization lines that would help to turn this region into an active communicative platform with Iran, Turkey, India and China.

The new sectors for the reclamation of the huge polar and northern territories of Russia can only be created on the basis of new generation infrastructure — for instance, nuclear mini-reactors with helium cooling, systems of small hydro power stations, wind power generators (magnetic) with orthogonal turbines, information infrastructure platforms; the collective access network for creating projects, production of new construction materials, to build new houses on the permafrost territories.

All the prerequisites and isolated scientific elaborations for the new generation infrastructure exist — therefore, there must be a target oriented program for new Northern high-tech cities. This program would be the

main vehicle for advancement to a new socio-cultural and techno-industrial formation. This new formation would be characterized by binary parameters.

On the one hand, it is aimed at creation of artificial life-supporting systems, not dependent on environment and natural conditions — applicable to deserts, permafrost territories, on the ocean floor, or in space. On the other hand, these systems should be eco-friendly. Therefore, the TCR project should deal not only with different types of infrastructure and infrastructure from different industrial formations, but it also must have different functions in terms of territorial development (while these territories exist in different time and development periods. High-speed trains are approaching the speed of aviation transport, while, for instance, water transport is slower than ordinary railway and automobile transport.

Nonetheless, this slow, natural rhythm of movement could be realized within the projects of the second socio-economic sphere: construction and formation of self-sufficient stable settlements. The main peculiarity of the next socio-cultural formation is the ability to live in different times in different time zones at the same time. This heterochronicity is present in very different socio-economic sectors.

Russia is facing a very difficult task of reclaiming its hydro resources. Many Russia is facing a very difficult task of reclaiming its hydro resources. Many analysts tend to claim that the most precious and scarce resource in the 21st century is water. The mastering of water resources implies the realization of the megaproject of the Eurasian Transport-energy water system, actively developed by a team of authors headed by A.A. Belyakov. The conceptual core of the project is formulated in this abstract: "the main water transport arteries of the continent should be

connected by the canals into one network, the conditions for navigation should be improved — the reconstruction to the water gate cascades (transportation element).

At the same time the hydro power potential of the rivers should also be realized — the construction of water power stations on the levels of cascades (energy components).

Apart from the transportation and energy components that form the Transport-energy water system (TEWS), there waterworks and ecological components can also be found.) The last two are connected with the regulation of river run-off through the reservoirs and its territorial distribution interbasin navigation canals"[2]. The authors of this project propose the creation of unified water transportation systems to connect the European and Asian parts of the Russian Federation.

"On the Asian territory of Russia there are no elements of the TEWS. The major rivers ensure acceptable dimensions for navigable passage even without locking. Since there are no constructed navigation passages along the hydrosystem of the Angara-Yenisei cascade, Vilyui, Colyma, Zeya, Bureya etc., the navigation transit along these routes is impossible. Thus, in the Eastern parts of the continent, the water basins are not connected and there are no possibilities for direct shipment in the latitudinal directions, though, in theory, interconnections between Russian and Chinese waterways in the Amur region can be created"[3].

The creation of different types of infrastructure that are operated at different speeds: slow and fast, should be determined on the basis of new technologies of the sixth

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[2] Cited from Belyakov A.A., Kozlov L.N. "Transport-Energetics Water System (TEWS) in Eurasia and the first priority projects".

[3] Ibid.

techno-industrial and socio-cultural formation. Subordinating old 19th century infrastructure to principally new technologies is possible due to the universal character of these new technologies. Such technological diffusion and the spread of new engineering solutions within the production, transportation, energy, ecological systems constitutes the appearance of a new object for investment and of the new meta-technological market.

This meta-technological market, where the technologies of the new techno-industrial formation are sold, identifies new opportunities for investments. To express it in hydro-engineering language, one could say: we need to dig a canal in order to connect it with the market of derivatives and to create a special water gate for the funds that are operated within this market.

The technological infrastructure platforms, created on the basis of the new technologies of the next techno-industrial formation can function as such a water gate. The diffusion zones and the spread of these technologies from one pilot project to other infrastructure systems demonstrate the universality of the meta-technological solution. However, some special groups and institutions should work to implement the diffusion of technologies with in the TCR project.

To make the TCR a multi-infrastructural project aimed at producing common wealth and based on cooperation and interaction among the European Union, Russia, Kazakhstan, China, Japan, and Korea, three different waves of modernization and innovation should occur.

The first wave implies the use of modernized transport and logistics corridors with reduced tariffs for the transportation of products created within the "Soviet" industrial formation (4th and 5th): from Southern, Western and Eastern Siberia to the central regions of consumption;

first-class flour to India and Indonesia, metal constructions and other machines to Iran, Uzbekistan, Afghanistan, Turkmenistan, Tadzhikistan.

The second wave presupposes the adoption of European technologies to increase the technological level of production plants. The products from these plants and factories can be exported worldwide. An example of the second wave of modernization is the export of synthetic rubber and polymers to India, China and Central Asia.

The third wave of modernization is based on the creation of instrument-making clusters and creation of instrument-making towns, where the devices based on the technologies of the 6th techno-industrial formation will be produced. This process can be implemented through the interaction of European technological centers and Russian scientific research institutes. The main aim of this interaction is to turn the experimental devices into the elements and components of the new industrial technologies and technological systems. The creation of a system of instrument-making plants requires a specific mineralogical base, which means exploring the rare earth metal of Northern Yakutia. These three waves of modernization should be initiated at the same time, developing the synergetic effect of the operation of the TCR.

Every wave implies its own object for interaction and discussion with foreign business circles. In terms of the first wave of modernization it concerns the production of various goods that will be in demand on the world markets, and the issues of optimization of freightage with possible modernization of transportation network.

The second case is connected to the supply of modernized technologies to prospective plants and factories producing the products that also will be in demand in the world markets. Secondly, the talks should be devoted to

the possibilities of investment, for buying and developing the industrial technologies.

The third wave of modernization, in terms of talks with businessmen, is transferred to the question of interaction between western technological groups and representatives of the Russian fundamental practically oriented science and investments for turning the experimental devices into the elements of technology and instrument-making industries.

Therefore, there is the need for a special activity to estimate the prospective products that would be in demand on the world markets, transport solutions, western technologies and also projects of new devices. Therefore, every micro-project needs its own logic and investment techniques. Therefore the metaindustrial project agency should elaborate a matrix of solutions and projects for cooperation among Russian and foreign industrial, scientific, financial groups.

5. THE HISTORY OF THE TCR TERM. THE DIFFERENCE BETWEEN THE TRANSEURASIAN CORRIDOR OF RAZVITIE AND LAND BRIDGE, CONTINENTAL LAND BRIDGE

The first time this term was used was in 1997 in a book edited: "The Eurasian Land-Bridge. The "New Silk Road" — Locomotive for Worldwide Economic Development" by German researcher of American origin, Jonathan Tennenbaum. Since 1996 Russians have also been discussing the formation of continental Eurasian land bridge.

On the other side, according to American researcher Kathy Woolf Braus the notion of the Eurasian continental land bridge was first coined by Kazuhide Nagayama

at one of the conferences where Tennenbaum took part. The researcher herself proposes to use the term "Railway Silk Road" that she formulated by the initiative of the Government and President of the Democratic Republic of Korea.

First of all, it is necessary to distinguish between the terms that may seem similar at first glance: land bridge, continental bridge, infrastructure corridor of development and, finally, the Transeurasian Corridor of Razvitie. These are not just abstract terms but exact political — managerial concepts with different organizational schemes underlying the concepts.

The idea of a bridge implies the connection between two points or development cores, namely the European Union and South-East Asia (primarily, China, Japan and Korea). But Russia is interested in this project not as a means for taking the transportation role unconnected with the quality of life on the territories the products go through. It is also evident that the land bridge is an alternative to shipping.

The Continental bridge is a construction uniting and connecting the whole continent.

The Infrastructure development corridor is a system aimed at civilizational development based on the infrastructural development.

This infrastructure principle is always highlighted by China with an emphasis on cheap labor. But there is no cheap labor in Russia it can only be attracted from Central Asia, which means burning some social problems in Russian cities.

At the same time the institution of fundamental science still exists in Russia and there is also a highly-educated population due to the operation of educational institutions, despite the inadequate policy. In the case of the

infrastructure corridor of development the factors of fundamental science and high-educated professionals should specially be taken into account.

But in Russia it is more important to organize the connection between Asia and Europe, ensuring development for Russia. The development of Russia is determined by four main components:

1. Overcoming the ueven development of Russian territories, especially underdeveloped Siberian Territories, East Siberia, the Far East; the creation of new clusters and industries there.
2. Systematic modernization of industrial complexs through the introduction of new technologies.
3. Reclamation of new depopulated territories.
4. Using the factor of Russian fundamental revolutionary and practice-oriented science for creation of the technologies of the next techno-industrial and socio-cultural formation.

What is more, the development process is not a natural phenomenon; there must be a strong subject, actor to launch the development. These groups of actors must be specially formed.

The realization of all these four principles enables discussion about the essence of the Russian type of development — Razvitie, and the Transeurasian development corridor (or Transeurasian corridor of Razvitie). This means a special principle of international cooperation, interaction among transnational corporations, funds, technological centers, scientific groups, to create a new huge platform for generating public wealth on the Eurasian landmass, and to make a way out of the world recession.

This means that many Russian initiative groups can take part in multi-infrastructural systems for the development of the territories. These groups should take the

responsibility for the formation of concrete modern production lines, new towns along the TCR, or being interface in the interaction with foreign industrial groups.

It becomes clear that the TCR project can be realized only if there is an independent actor formed in this project. Secondly, this project can be realized as a social entrepreneurial movement, where the new social class — a development class is being formed. The representatives of this new class will be the new leaders, eager to take modern western infrastructural solutions to Russia, to convert it into a profitable business and to build new industrial clusters on this base, to elaborate the projects of new settlements, to become their founders. Compared to Komsomol initiatives of the soviet period that were characterized by pseudo-enthusiasm and low-efficiency in their organization, this entrepreneurial movement should be connected to the creation of new mechanisms to create new settlements and new branches of industry, making its creators the proprietors of the new plants. Such businesses should be secured from racketing and bureaucracy.

As professor Tennenbaum outlines in his article written in 1997, the infrastructure corridor of development is aimed at making as many places as possible economically efficient. Economic efficiency, first of all, means the creation of new objects for the physical economy.

Some of the points along this line consume certain type of goods and others produce certain type of goods. The less producers along the TCR line and the less effective it is, the more destructive it is for the territory where it lies. In such a situation the creation of high speed trains only increases costs.

Therefore, the main problem in the process of forming the Transeurasian Corridor of Razvitie is to prepare groups that will apply new entrepreneurial schemes uniting pre-

viously isolated infrastructure (transport and tariffs, energy and energy tariffs, security systems, new settlements, personal transport, medical services, education etc.). The outline, that could be made out of Tennenbaum's article is that the TCR's effectiveness can be evaluated by the possibility of widening the corridor line, marked on the map, to the vast number of economically effective points on it. But how can this concept be realized?

The only way to implement it is when young people see that they can be proprietors of the new production lines, the new production chains for producing public wealth, getting the land around the corridor.

Basically, this approach leads to the creation of infrastructure equipped zones. These new infrastructures can be created in the form of a public-private partnership and can be hired when they start functioning. The place around and along these infrastructures should be given to the entrepreneurs for the new clusters and industries.

6. THE TRANSEURASIAN CORRIDOR OF RAZVITIE AS AN ARTERY OF RUSSIAN TECHNOLOGICAL MODERNIZATION IN THE CONTEXT OF INTERNATIONAL NETWORKS FORMING THE NEW TECHNO-INDUSTRIAL AND SOCIO-CULTURAL FORMATION

The central pillars of the TCR projects are definitely the techno-dynamics and socio-dynamics of the forms of thought-activity and life-activity in their development towards new, more complex institutional forms of techno-industrial and socio-cultural formation. Such evolutionary dynamics in the form of thought-activity organization should be in a guiding position while formulating and realizing the TCR project.

What is meant by "dynamics"? How it should be organized?

In reality, the core idea underlying the TCR project is the creation of a new civilizational development cluster that can be realized together with Europe and South-East Asia. Although the plan and conception of reclamation and development is initially formulated by Russia and Kazakhstan, this project is also interesting and beneficial for both China and the European Union.

This development cluster is formed not only according to natural mechanisms, the increase in the youth population, increase in the quality of life especially for the target population groups through trade mechanisms, but also by the application of some artificial mechanisms that create the projects of new settlements and infrastructure, new types of jobs, new forms of participation in cooperative division of labor internationally.

For Russia it is certainly very important for the TCR not to become just a transportation tube for cheap goods from China to Europe, indifferent to the territorial development along the territories it traverses.

The alternative is possible only if there will be new industrial centers on Russian soil with new advanced technologies, and if the TCR itself will be based on the technologies from the next socio-cultural and techno-industrial formation.

The new techno-industrial formation can be spread "focally" based on one central advanced technology. Such a magisterial technology is the magnetic levitation trains technology and laser based energy transfer (including electric-discharge). The main parameters of this main line must be ultrahigh speed and ultrahigh power capacity.

These parameters must be accessible on these territories but they can be used only when really needed so as

not to waste the ultrahigh speed and ultrahigh power capacity. In such conditions we can reach a certain civilization shift and create new, more advanced institutional systems. The access to ultrahigh speed transportation and ultrahigh power capacity is possible but the main question is how it will be used.

Managing energy flows, getting access to them along with the energy supply can be operated through smart grids, which should become the institutional regulators of the created industries by using higher energy capacity, economy regimes or using less high-powered systems.

What is the essence and the inner structure of this new techno-industrial and socio-cultural formation?

This is a formation that operates in higher density and higher power capacity energy flows, but at the same time is less wasteful in terms of energy use and environmental damage.

This formation must be more reasonable from the point of life supply systems and must be a driver of urbanization of another type.

The main characteristic trait of this type of urbanization is total opposition to the Moscow-type of urbanization. A dispersed system of one or two storey buildings in the natural landscape spread along the territories 100 km to each side of the high-speed landline. In order to move in this new civilizational system there must be new types of transport.

The core of the new techno-industrial and socio-cultural formation is not the insight of machine (which is typical of the 18–19th and the first half of the 20th Century) but the insight of device. The device is seen as a special tool to regulate machine tools and mechanisms based on new physical principles or effects used in a new form of human activity. These devices, while used within ex-

isting industrial systems, machines and mechanisms, can advance the processes of modernization and the development of already functioning productive industries.

Creation of new special industrial systems aimed at the modernization and reorganization of existing industries to create the industries of the new technological formation we call **meta-industry**. We suppose that Russia needs meta-industrialization rather than a second industrialization process in order to change and transform the existing industrial systems and connect them with the world economic and technological landscape. The main precondition for meta-industrialization in Russia is unity of the Development society in Russia, which will be eager to form this new civilizational cluster.

The TCR may become the main line of modernization for the entire Russian industrial complex if, along with western corporations and high tech firms, a special institution is founded for planning research and development that will formulate and put into practice new infrastructure and 'new technological inventions'.

Such an institution will open new horizons: to create a new system of industries; to transfer new engineering and technological as well as new institutional and managing solutions into other branches and spheres; to identify principles of change and renovation in the sphere of new technological and institutional discoveries. In our opinion the function of such a planning institution could be taken by de-territorialized meta-industrial agencies as opposed to a territorialized corridor of development with its specific inner organization.

To sum up, the creation of the TCR, which is regarded as the main means of launching the modernization of Russian industry, presupposes the identification of crucial technologies that are important for the world development of a new socio-cultural and techno-industrial formation,

rather than adoption of well-known western technologies (i.e. what is being done today by the Russian Railways).

These breakthrough technological solutions should be elaborated and put into production in cooperation with western companies. Another important factor to be taken into account, while identifying the necessary solutions, is the potential market capacity. The advancement principle means using the elaborations of Russian fundamental practically oriented science to construct new experimental devices to use new physical principles and effects.

In our opinion, the scientific groups and technologies that ensure the development of new techno-industrial and socio-cultural formation are the following: impulse-periodic solid-state laser, ensuring the laser-based energy transfer; maglev trains, moving in a magnetic field without friction; new type of nuclear reaction with nucleus resonant pumping; biophotonic technologies to manage bioplast reactions by ultraweak radiation; system of holographic 3-D large-size images. The new techno-industrial and socio-cultural formation will be formed around these new clusters of advanced technological solutions.

New physical principles and effects turn into new technological solutions in the creation of devices. The device is a certain tool that connects and divides old technologies in the existing industrial-productive infrastructure and at the same time new technologies of the new infrastructure.

The sphere where new working places will be created during the process of the TCR construction is instrument-making ("a system of instrumentation archipelagoes") and numerous groups of people should work to elaborate and construct new generation devices and then adjust them to existing infrastructure.

The construction of new "instrumentation settlements" along the TCR and the emergence of new social

strata working in the sphere of instrument-making does not mean that Russia should not be buying and using well-known western technologies. No, indeed, these technologies should certainly be bought and applied.

But after that, they should be fragmented into different types of devices so as to improve them and to create new generation devices. Preparation of new professionals in the sphere of instrumentation should be the main task while creating new perspective working places in Russia. These are professionals in the sphere of instrumentation who are to become the new strata ensuring connection between fundamental practically oriented science and major industrial productive infrastructures. Whereas during the Soviet period the main aim of secondary and higher education was to prepare an engineer, a mass worker in the military and heavy industry sphere to be capable of solving a large amount of quite primitive calculation tasks, today the main task is to make the people working in the instrumentation sphere, in its different sectors, the main sphere of creating products. A universal specialist in the sphere of instrumentation must be capable of constructing devices, planning the modes of its consumption, analyzing the possibilities of the technological change in the new device, discovering new physical effects and their application in new devices.

What is more, the principle of the TCR as a main line with a flow of power capacity is opposed to the principal of launching "local development" without relation to a certain landline. According to this approach, which is independent from energy transfer and goods transfer requirements, the life-activity processes and production can be managed at any point.

We believe such a territorial principle will be applicable to the development processes after the creation of the TCR

as so-called spinal cord ensuring the resettlement of the country. Moreover, this spinal cord of the country could also serve as a certain communication and transportation platform for the EU and Eastern Asia, assuring constant connection and interaction among major international technological, scientific, industrial and trade centers.

Thus, a communication and negotiating platform for Russian participation in the international division of labor must be centered on talks on cooperation between European technological centers and Russian scientific centers in order to construct new devices for the production of technologies of new techno-industrial and socio-cultural formation.

7. THE TRANSEURASIAN CORRIDOR OF RAZVITIE AS AN INTERNATIONAL BASIS FOR NEW INDUSTRIALIZATION IN RUSSIA AND FORMATION OF NEW INDUSTRIAL ZONES IN SIBERIA AND THE RUSSIAN FAR EAST

The initiation of the TCR project may give impetus to the industrialization processes in Siberia and the Russian Far East. But to discuss the conditions of such industrialization, we should analyze the existing universally adopted methods.

Generally the main principle of industrialization of Siberia and the Russian Far East could be called the parallelism between industrialization of those regions and the industrialization in the world economy. What does this mean?

This principle implies that industrialization in the Russian regions should follow the pattern of industrialization in other developed countries. It could be called the theory of industrial recapitulation: industrial onto-

genesis (the real forms of industrialization in Russia) recapitulates industrial phylogenesis (the historical pattern of industrialization).

The first step is to develop natural and mineral resources, then to go on to establish the processing industries (without its export), the next step is development of mechanical engineering and the next levels are development of high-tech industry and instrument-making. In other words, first we should extract wood and sell round timber to China, then start constructing wood processing plants at the place of stocking up and then develop a forest industry and so on. The question that arises here is why can we not start from the most advanced levels and then, after the projects devoted to the technologies of the new industrial formation, create projects to extract the region's raw materials. Or, according to this example, why not analyze the potential of developing dendrochemistry and mechanical engineering in this sphere and rely on the current market situation and adjust to the changing conditions within the existing markets?

The answer is obvious: in this situation we have to go far beyond the economy, thus, becoming active at setting strategic goals and not just adjusting to the existing market situation in an attempt to optimize the possible action within those markets.

A typical problem of current level of industrialization is isolation of the energy sphere from energy-intensive industries — the existing contradiction and antagonism between energetics and other spheres of industry. As a result, other corporations in other spheres of industry try to cut energy costs instead of regarding energetics as a base for a new step in industrialization. We witness a paradox the energy capacity of Eastern Siberia or of the Russian Far East is excessive with respect to the underde-

veloped industries of these regions. However the energy capacities are still deficient for the construction of new petrochemical, coal fuel chemical plants. In order to force industrial development, it is necessary to initiate a new investment cycle for development of energetics. But it is unclear whether the new production from new generation plants and factories will bring profit to its producers and in what time period.

The two options here for development are either that the national system of new industries serves only national demands or that this new infrastructure system be built in an open international context. Are we going to build new rail roads that will be located only on the territory of the Russian Federation or go far beyond the national territory? Will the new transmission facilities be built only on the Russian territories or are we trying to be an active member of the international energy system?

The first way of development resembles the Stalinist strategy of economic development in one specific country. The second way implies the creation of a new infrastructural basis for the development and advancement of industrialization.

The main risk with the second developmental alternative is the risk of preserving reliance on raw materials export. To avoid these risks we need to ensure conditions for transfering ecologically friendly energy resources and increase the volume and density of energy flows in order to use this energy capacity for energy-intensive industrialization (in the spheres petrochemistry, coal fuel chemistry, instrument-making) in the future. While not having such schemes of industrialization now, we sell the spare energy capacity to other countries — energy transfer to Japan, China, Germany, using the hydro potential of the Siberian rivers in Russia.

What is more, while discussing the international infrastructure system and the role of Russia in this system, we should estimate the prospective projects from the point of energy consumption. New hydroelectric power stations should be surely constructed according to new technologies and new systems of designing projects.

Consequently, industrialization itself can be realized in the form of an open international project, ensuring an infrastructure platform for this process. In addition, the infrastructure formation of the Transeurasian Corridor of Razvitie should be based on the elaboration and application of new devices, new sensors as elements and materials of this new infrastructure — thus connecting the elaboration of new infrastructure and a new round of industrialization.

The next round of the electrification of Eastern Siberia and the Russian Far East can be realized through the construction of the Turukhansk (Evenkian) hydroelectric power station. The volume of its energy capacity may be sufficient to initiate the industrialization process in Eastern Siberia and the Russian Far East.

The advocates of industrialization in Siberia and the Russian Far East claim that it is necessary to reduce transport and energy tariffs in order to ensure the competitiveness of the goods produced there.

But this means that energy and transportation spheres turn into financially inefficient spheres for the sake of the profitability of production in these regions. If we regard transport and energetics as parts of international open systems, where foreign investors and partners could be attracted, then it is possible that inner tariffs at certain time periods should be reduced by a certain extent compared to external tariffs. It is necessary for the industrial system of Siberia and the Far Eastern territories to become competitive with foreign companies.

Thus, the question that arises is how these firms can become competitive? In our opinion, it can be done through the creation of new instrument-making industries: lasers, ultra strong magnets, electronics, monitors, flat TV displays, condensers, fluophors, microwave filters, glass, oxygen sensors, radars, superconductors. The instrument-making settlements should have a mineralogical basis in order to create a powerful instrument-making industry. All the above mentioned devices and elaboration are based on the usage of rare-earth metals. At present, the production of rare-earth metals is controlled by China.

Russia has the second rank for the production of rare-earth metals: "According to experts, in the beginning of the 2000s (2002) the world balance reserves of rare-earth metals was about 116 mln tones, where Russia has the second place (30%), yielding only to China (43%), and having the first place according to predicated reserves (more than 200 mln tones)[4].

These reserves are concentrated in Apatity on the Kola Peninsula and in Northern Yakutia: "In Russia the rare-earth metal reserves are found in ores on 14 minefields, where the main part (60,2%) is in apatite-nephelinic ores on the Kola Peninsula, where the rare-earth metals cannot be extracted during processing. The rest of the reserves are found in loparite ore (Lovozersk minefield) — about 14,2% all-Russian reserves, rare earth-apatite ores of Seligdarsk minefield in the Republic of Sakha (Yakutia) (22,8%) and as associated components in rare earth metal of the Ulug-Tanzeksky minefield and oil-bearing sandstones Yaregsky minefield. Recently the world's biggest rare earth metal minefield in Tomtorsk was discov-

[4] http://www.equipnet.ru/market/chemistry/chemistry_496.html?mode=2

ered and tentatively exploited by weathering the crust of unique quality pyrochlore, monazite-crandallite ores (ancient redeposited placer). Ore in the Buran development area, for which priority development has been planned, contains an average of 6.8% of niobium pentoxide and 12.9% of rare earth oxides, that is, they are actually a natural rare metal concentrate. On the Buran site it is folded in a sheet-like deposit of about 1–2 km and a capacity of 2 to 35 m (average 7 m), covered by sedimentary rocks ranging from 20 to 90 m. In spite of the very difficult geographical and economic conditions, the large scale of the deposit and high concentrations of metals can be treated as priority areas for industrial development"[5].

This means that to create a modernized system of instrument-making industry it is important to build a resource base necessary for the functioning of those industries. This mineral resource base for the instrument-making industries should be accompanied by the attraction of Japanese, European, Korean companies to Russia, to elaborate new devices together with Russian producers. Therefore, the TCR project should be paralleled by the project of resettlement of southern and Northern Yakutia — for instance, the minefield of Tomtor. The main task is to start planning and realizing projects in the sphere of instrument-making within the new youth settlements along the TCR rather than enter the rare earth metals markets and take a stance there. The rare earth metals should be explored and their concentrates should be sold simultaneously with the planning of construction of instrument-making meta-industrial plants.

As has been mentioned before, one of the main components of the TCR project is the magnetic levitation trains.

[5] Ibid.

But for the reclamation of Tomtor the other type of transport is quite sufficient — the string transport by Unitsky. This type of elevated transport of the second level can serve as a basis for cheap freight traffic to the North of Yakutia, also as a complimentary line for the reclamation of Yamal within the "Industrial Urals — Polar Urals" program.

The parallel development of two types of transport (high-speed maglevs and Unitsky string transport) may be one of the main principal solutions for construction of the development corridor.

What is more, in order to build new magnetic levitation trains there is a need for development of magnets production, thus, there is a need for extraction of rare earth metals.

Therefore, the Transeurasian Corridor of Razvitie based on the mineralogical project for ensuring the development of instrument-making industry may be the basis for new industrialization of East Siberia and the Russian Far East.

8. THE TRANSEURASIAN CORRIDOR OF RAZVITIE AS A PLATFORM FOR THE NEW EURASIAN UNION

The development of the TCR project presupposes the existence of several different lines: the Trans-Siberian, the Baikal-Amur (BAM), the road through Kazakhstan, which means that the project may become the arena of cooperation for the Russian Federation and the Republic of Kazakhstan.

The joint project for the territorial development of the two countries can be the first step towards forming a Unified State. Moreover, if the TCR project becomes a joint building site for Russia and Kazakhstan, then the infrastructure platform would become a natural basis for

further industrialization and transfer to the new techno-industrial and socio-cultural formation. But in this case the TCR project should really be the joint project of the two countries, Russia and Kazakhstan, within which each country and each region has its own economic specialization in order to ensure and coordinate the different development strategies of the two union countries. Thus, it is necessary to take into account the vectors of development of the two countries while realizing the TCR project in the form of a single joint platform.

These differently directed vectors should be considered in light of the distribution of developmental risks, risks of uncertainty between Russia and Kazakhstan. One may use different models of development as an opportunity to share experiences in the realization of different development models.

Sectorial specialization is not likely to be a successful strategy — when, for instance, Russia is working on lasers and new materials while Kazakh specialists are working on robots. Russia and Kazakhstan should be producing all necessary types of products. The only differentiation possible is in how industrialization and modernization are organized.

To be specific, the main goal for Kazakhstan could be to transfer technology from abroad, to explore and use the most advanced technologies in raw material processing, transportation, petrochemistry, coal chemistry, the chemical industry, energy sector and metal industry, thus, attracting as many western advanced technology companies as possible. In this respect Russian strategy could be to cooperate with western partners in developing new technological elaborations and solutions based on previously unknown devices, to determine the process of generating new industrial sectors (laser production, chrome-lithogra-

phy, production of catalytic agents, etc). In this way, the sovereign states of the Eurasian Union will be able to solve two major problems: to borrow advanced western technologies and to elaborate new technological solutions.

Moreover, simultaneous realization of the two strategies — modernization of resource oriented, non-sophisticated manufacturing industries (the strategy "from below") and technology transfer from the West together with joint elaboration of new devices from the next techno-industrial formation (the strategy "from above") will then lead to a revolution in mechanical engineering, engine construction, robotechincs, and machine tool building. To proceed with the modernization of the entire machine tool production sector in the Eurasian Union, the role of Belarus and Ukraine with their machine tool capacities, construction tradition and scientific and engineering schools from the Soviet period, should also be seriously evaluated and included in overall plans.

Innovative industrialization at the current level of development cannot be reduced to the localization of industrial complexes into small complexes via application of 3D and 4D printers, or simply substitution of human-machine labor by robotechnics and automatic machines. The new step in innovative industrialization is to create previously non-existing smart-devices: "chips", "lasers", "scanner-steppers", "nanodiamonds", "nuclear minireactors with helium cooling", protonic oscillators, etc. These new elaborations then become the units to create the new infrastructure. They turn into instruments for the transformation of existing industrial systems in the energy sector, petrochemistry, machine tools building, instrument-making.

The main task is to master the technologies for production of new goods rather than just buying the goods ready

for use in Japan or Germany. The world leader is the one who is capable of creating newly elaborated and sophisticated gadgets. The American response in the arms race with the USSR was the creation of chips. The leading skill is to create new devices and apparatuses and then adjust them to the most advanced technological systems.

Another important task is to overcome the sectorial management system inherited from the Soviet period. This means that the new elaborations — new "units" of infrastructure — should be applied simultaneously to different sectors and branches of industry. This task can be fulfilled only if new innovative groups emerge to ensure the transfer and implementation of the new technological solutions.

The new subject crucial for the realization of the TCR project which has not yet appeared is a Eurasian "super-ethnos" which requires the TCR project to ensure stability and territorial development of its inhabited area. Such a Eurasian super-ethnos can be initiated as the European super-ethnos was during the collapse of the Transatlantic community, which in the Cold war period had been forged out of the European super-ethnos and North American super-ethnos. A Eurasian super-ethnos, unlike its European counterpart, has its own cultural identity; however, the two systems have very similar traditions of suprastate organization. Although this new union of states is not a new Soviet Union project, it goes beyond the idea of sovereign states.

9. RUSSIAN TECHNOLOGIES AND SMART DEVICES OF THE NEXT TECHNO-INDUSTRIAL AND SOCIO-CULTURAL FORMATION: THE CASE FOR THE INSTRUMENT-MAKING INDUSTRY

The real advancement of the sixth techno-industrial formation can occur in several major industries: nuclear power and hydrogen energetics, new materials making, bio-photonics, laser-producing, instrument-making as well as in 20–30 existing spheres. Currently it is clear that the information revolution, postindustrial society, and the network century have come into being, but they do not constitute the essence of a science-technological revolution.

Moreover, the statement of Alexander Neclessa about the fourth social class is also inaccurate and, thus, wrong. This class was employed by financial oligarchs thus creating a layer of lumpen-investors. These lumpen-investors lead the US into the economic crisis, which has still not been overcome.

On the other hand, the new techno-industrial formation should be composed of technical and humanitarian technologies at a new level of development, thus, defining internal qualities and identifying characteristics of the human being.

We are on the threshold of change, when most labor is not of a mass, primitive type conducted by people responsible for small segments of activity, but, rather, individual labor by master craftsmen with unique skills, capable of using some special high-tech instruments.

On one hand, for example, such instruments could be oscillators and catchers, or detectors. These new devices become a sort of "nervous system" of existing produc-

tion chains. The formation of new generation sensors to ensure sensitivity within the technological process, and to give operators the opportunity to understand what is happening at any point of the production cycle: the state of security layers, the temperature modes and so on.

Specific conductors elaborated by the "Nano-industry" corporation headed by M. Ananyan could serve as good examples of this strategy. Similar device supplements lead to the reduction of costs and materials and increase in the reliability level of the production process.

On the other hand, the production process should become the location for experiments, for the identification of more optimal regimes of experimental change, and creation of optimal process models.

Such an approach alters the view towards the economy of industrial processes, minimizing costs for materials and energy, and analyzing new effects of applying new technologies: for instance, the change in the constitution of steel, and new heterogeneous layers of covering.

Here, in case of steel production, the main aim is to change the entire production process, turning homogeneous steel into a heterogeneous material medium. The future of metallurgy lies in control over various material components of the heterogeneous medium. Alexander Chernopolsky and his group elaborated a full set of different devices, whose data can be accessed through Wi-Fi on a computer for further evaluation.

Obviously, the technologies and devices for changing the quality and refining the process of steel production is only one of the ways to advance toward the new techno-industrial formation.

Another important sphere is modern instrument-making, which creates opportunities for development in mechanical engineering and machine development.

Clearly, modern plane and automobile control systems cannot operate without modern electronics.

In this report you will become acquainted with several spheres of application of different devices. In hydroelectric engineering special sensors are used to obtain data about the water current and the state of turbine fins, to optimize the form of turbines and the components of composite materials used for turbines. Increased sensitivity of turbine operation modes is important for improving its mechanical parts and the whole system. These sensors are necessary for identification of optimal time working regimes in the specific water medium. Thus, these new sensors are crucial for modernization and development in mechanical engineering. The project solutions for the problems identified by the sensors should be realized in the form of details or certain reorganization of the machine elements.

The devices are constructed by groups of designers who are linked and unified within one infrastructure unit. To achieve the projected goals, all specialists should have access to the centers of technological development. Such an environment should unite the groups of design regions spanning a 7–8 hour time difference, designers, researchers and creators who together work all 24 hours of the day. "The professional environment implies a network of super-competent people generating new scientific and engineering ideas. The professional infrastructure includes:

— The tools for designing,
— The tools for production,
— The tools for adoption.

The main feature of this system of tools is the possibility of access to the professional infrastructure by any entrepreneur: whether representing small or medium-size

business (even individuals). This would require a general refashioning various tools: for making projects (software and IP library) and also the production tools (flexible processing lines, especially in the sphere of microelectronics, micromechanics, optics and other high-tech industries, packaging etc.). The mechanism of adoption still needs to be elaborated, although it is already clear that there should be certain technologies (the systems of rapid prototyping etc.) and also organizational, financial and legal components to make up the elements of the techno park.

This professional environment, in essence, should be organized as a network of groups dealing with design and elaborating experiments and production and living in this infrastructure. The active subjects within this network are already super-competent specialists; so it is vital to assure effective creative life.

Therefore, it is important to realize that these super-competent experts tend to exist in such types of networks, so as to ensure their creativity it is essential not only to create working places of high quality and good living conditions but also long-term projects and network project groups[6]".

The modern instrument-making industry can only be based on a networking organization principle and should be connected to other technological spheres. These net-

[6] From the report of the conference on strategic planning **"STATE PROGRAM FOR GIVING ASSISTANCE FOR COMPATRIOTS MIGRATING TO THE RUSSIAN FEDERATION FROM ABROAD IN THE SYSTEM OF MANAGING LABOR FORCE IN THE REGIONAL DEVELOPMENT PROJECTS". THE GROUPS** "ASSISTING SUPERCOMPETENTS RETURN", MODERATOR S. USOLTSEV.

working connections, or communication points, provide an opportunity to form clusters for technology diffusion without distinguishing between types of businesses or industries.

At the same time, there is another important function of the instrument-making industry. Instrument-making is a set of new forms for the visualization of data. In this sphere one can find a strong connection between engineering-technical and humanitarian technologies, which is very important in terms of creating a new system imitating consciousness. We call such systems consciousness machines. The basic operation process here is schematization of ideas, or visualization of notions, of the object of thought or situation of interaction.

Building up such machines enables us to identify the main basic ways and modes of visualization for operations, accomplished through the application of these devices. Thus, there is space for the most original, creative processes of comprehension-thinking. This creative process of comprehension-thinking is interesting in terms of personal self-development, opening new opportunities for action in the future.

Regarding this function of instrumentation, the main question is whether the new techno-industrial and socio-cultural formation might be visualized in a certain form.

The question can also be formulated as follows: can we already design the institutions of the new techno-industrial and socio-cultural formation on the basis of smart devices that will ensure the transfer to the new techno-industrial formation? The main aim is to pass from an economy of identifying/guessing about future effects to a project-programme world-thought-activity economy. This type of economy provides a way to overcome the world crisis even at present. If the institutions of the next

techno-industrial socio-cultural formation are designed, they can become the object of long-term investments.

Is it possible to identify a list of possible smart devices required for designing new industrial clusters and instrument-making towns along the TCR? We suppose that it is possible that such a device or a complex of devices can be transferred into a technology or a specific product.

I. The first groups of these smart devices are "multi-devices" that ensure metaindustrial changes based on modern industries. These devices can be distinguished into groups according to their main physical principles and effects:

- Superconductivity systems;
- Semi-conducting systems in power electronics based on silicon carbide on silicon (SiC on Si);
- Nanostructured materials with new properties, such as: nanostructured silicon (with the new phenomena of burning and detonation of this material), nano-diamonds, detonation for machine-building and electronics, cavitation for optoelectronics, qubit-based computers;
- Catalyst systems on fiber-optic basis etc.

Apart from this group of elaborations, exact new devices can be described which can lead to new production lines on the basis of the new devices.

1. The scanner-stepper, based on the technology of nanolithography. This device is crucial for national production of chips, producing new optic devices, and making photograph of bioplast. The development of this technology demands further work with foreign chip production technologies, imported from abroad. Usually, the donor-country will sell chip factories (chip foundries) based on earlier technologies, which passed out of use 7–10 years ago. Therefore, assimilation of new foreign technologies

leads to a 10-year delay in the national industry. By contrast, if national producers are equipped with such scanner-steppers, they will be able to improve industrial chip-producing technology themselves. Reducing delay caused by foreign industries is necessary. Thus, the main task is to change the policy for purchasing technologies abroad and then to develop and improve the national system of production. One option is to buy those technologies from abroad that cannot be developed independently. Another option is to equip the technology bought from another country with a multi-device which surpasses this technology (in terms of technological level).

2. The high-power high-repetition pulse-periodic laser. There are a number of spheres for application of pulse-periodic lasers that are at different stages of development at present, such as:

a. Cutting and processing super-hard materials in the sphere of mechanical engineering (including metals, ceramics, certain types of plastics, also glass).
b. The advancement of cutting mechanisms of the ablation process in place of mechanical cutting in the sphere of mechanical engineering.
c. The miniaturization of LSI through application of high-accuracy lasers, being the main instrument for configuration of LSI elements, in the sphere of microelectronics.
d. The possibility to remove spilled oil and oil-products pollution from water storage surfaces in the sphere of oil production, oil refining, oil transport.
e. A new type of flame-cutting for extinguishing oil-wells in the oil-production sphere
f. Laser-based satellite launching in the sphere of space navigation. The energy source and fuel are stored on earth and are not included in the gross takeoff

weight of the space apparatus. This leads to a significant reduction in the cost of orbit injection for the freight. This technology is based on the air sample at the bottom of the vehicle, which is necessary for air shock wave and propulsive power, whereas the high repetition laser pulse makes this power permanent. The application of easy evaporable, polymeric material enables its application in the ionosphere and in a vacuum.

g. In the sphere of energetic: energy is transferred through a laser beam, characterized by a brief, high-power pulse. Such a plasma channel allows for transferring energy collected on the orbit to the Earth, from the projected space power stations (for instance, on vast farms with photovoltaic elements collecting sun energy). Moreover, there is a possibility to "catch lightning" — i.e., to collect static electricity from the cloud mass along the laser channel.

3. New generation spectrographs. The construction of devices based on the principle of electronic paramagnetic resonance with characteristics far more advanced than in existing devices. They may be applied to research of processes and material structures.

4. Nanomechanics; or the production of super-high precision machines. The spheres of research and elaboration include:

1) Super hard and high accuracy aeromagnetic guide ways
2) Aerostatic bearings
3) Aerostatic spindles
4) Magnetic-aerostatic linear drives
5) 3D-coordinate tables.

5. Laser phase polarizing microscopic techniques. Microscopic technique is based on research in the sphere of

phase polarizing laser emission in microscopes. This facilitated the construction of the modulation interference microscope, which accepts viewing samples with 3D-nanometric resolution and a high-frequency digital image (a frequency of about 10 cycles), which makes it possible to shoot nano-movies In addition, the application of a phase polarizing laser emission leads to the creation of microscopic techniques to observe anisotropy at the nanometer resolution. This opportunity has never been realized before and there are no comparable examples either in Russia or in other countries for such a device.

6. Devices based on the technology of phased-in matrix of laser diodes. The main principle is phase adjustment of the emission of lower-power semiconductor lasers, thereby considerably increasing the power of diodes in the one laser beam. This technology can be used in the following spheres:

a. In medicine to create compact and economic laser systems for treatment and operating in photodynamic cancer therapy, ophthalmology, surgery, or different type of diagnostics.
b. In spectroscopy – creating compact systems of spectroscopes and microscopes of high and super-high resolution.
c. To increase semiconductor laser output in all spheres of application.
d. To create high-power and compact laser systems integrated with energy sources.

7. High-power lasers in the ultraviolet spectrum. The application of high-power UV-lasers, including crystal-based:

a. For the effective treatment of tuberculosis by phototherapy medicine.
b. In the spheres of microscopes, spectrum, diffraction research, with the possibility to create an apparatus

for diagnostics of mode and inner structure of high accuracy materials.

8. Integrative diagnostic devices as an obligatory component of any innovative infrastructure for analysis of new materials and processes.

Apart from such types of devices, the "smart components" of technological systems based on new technological principles or effects; there are also new physical products that should also become the objects of production in newly created instrument-making towns.

9. Heart activity monitor (MHA) — a special electronic medical device for registration of photoplethysmogram, the blood at certain areas of the body, electrocardiogram (EKG), oxygenation and pulse rate. The device is a special chip that can be inserted into a cell phone.

10. Nuclear mini-reactors with helium cooling.

11. 3D transport: mini plane-helicopter by V. Pirozhkov (the plane with vertical takeoff).

II. Other groups of independent goods-devices are the instruments for designing, elaborating projects, and using such sophisticated infrastructure systems as the TCR. Online epistemic and visualization technologies, systems for automatic design of industries and infrastructure, rapid prototyping systems, other elaborations for working with new knowledge in order to transfer it into new projects and technological solutions.

III. Finally, one more group of objects is formed by the clusters themselves — for instance, the laser-building cluster, optoelectronic instrumentation cluster, power electronics cluster, catalyst producing cluster. For example, the modern meta-industrial cluster of optoelectronic instrumentation should be organized in the network form. The main points along this cluster can be distributed along the Russian territories — in Siberia and the Far East.

The main core, in the center, would be, for instance, in Saint-Petersburg around the Ioffe Physical Technical Institute, integrating many different scientific groups interested in the creation of next generation devices and objects, distributing new modeling centers around Russia. To ensure integration, the cluster should have diagnostics infrastructure. This can be realized within the new center for diagnostics and experimentation for the study of all new devices. The access to this center should be on a telecommunication basis, ensuring results and instruments for making projects, common standards and libraries.

To identify the instrumentation function as a key object for interaction between Russian fundamental science and Western as well as Asian (Japanese and Korean) technological centers, it is necessary to develop the underdeveloped territories of Eastern Siberia and the Russian Far East. It is important to create millions of new jobs through the creation of new industries, production plants, and factories, connected by the new transportation infrastructure and systems of resettlement.

However, to design new clusters around the transportation, energy, information, and pipeline infrastructure the main question to answer is: what is the essence of the cluster?

10. TERRITORIALIZATION AND DETERRITORIALIZATION AS THE MAIN PRINCIPLE OF ASSESSMENT OF THE TCR EFFECTIVENESS AS AN INSTRUMENT OF DEVELOPMENT

The main question that must be asked while assessing any planetary project involving Russia, is what will happen with the Russian territories and their population:

whether this territory will be lost (sold, rented out, taken away. Reorganized) and whether the population will grow (or, in contrast, diminish even more).

It is a well-known fact that financial capitalism is deterritorialized which means that it is not related to a territory: it may operate on any territory, may destroy any isolated territorial complexes, socio-cultural life complexes. The export of industrial plants and its outsourcing to third countries is also in a certain way deterritorialization.

Financial capitalism is indifferent to the country where the technological construction will be located and where the population will be working on primitive assembling plants. The principle of territorialization implies that this trend is indifferent to concrete people and that the territory will be reversed. The trend is changed when people, instead of working on assembling plants, start creating some "smart devices" based on new technologies that are important in the context of their socio-cultural and industrial conditions of this exact society: chips, lasers, smart glass, scanners-steppers etc.

From this point of view the Transeurasian Corridor of Razvitie's railways may become a form of deterritorialization if there is no special estimation: who should build and construct the locomotives, railing, sleepers, embankments, if it does not matter through which territory these ultra-cheap goods or raw materials should pass to come on the world markets.

The internet and the information-communication technologies (ICT) are also a deterritorialized construction as they were invented for the needs of financial capitalism: to know in real-time operation mode, the price and the exchange rate difference — that is what distinguishes the stock broker from ordinary average man.

That is why the advocates of financial capitalism are trying to build energy systems and transportation systems within the rules and principles of the internet. This tendency can be illustrated by locally important but generally irrational infrastructure bubbles such as string transport by Unitsky or smart grids. It may seem that such an approach would lead to mass territorialization, and any point, any place that was previously inconvenient, may be taken into account and may be turned into a development cluster. There is no more need to live around magisterial lines — gas and oil pipelines, rail roads, highways etc. The world and life can be organized around certain (to some extent around any) place.

However, there still is one problem: one should be willing to live in a concrete place, not to leave for the USA, Switzerland or, at long last, Bulgaria. As one of the cofounders of the Russian business school Skolkovo in a personal talk once asked: "why actually do you think that people should live in Russia?" The Japanese want to live on their islands thanks to the "Shinto" cult that convinces them that they live on blessed territory. If people do not have a strong identity connecting them with a certain territory, a certain place and do not have a feeling that their country and territory is blessed similar to Japanese beliefs, then there are no possibilities for developing this exact place.

Instead, we have random space filled by various quasi-internet constructions, indifferent to the territorial development networks-blastulas. Instead of developing "organs" with different functionalization — heart, brains, liver etc. — everything is replaced by one type "stem cells" without any specification. The main task is to increase the overall technological capacity without damage to nature

and to build a common development zone to form new civilizational organism.

This means that internet indifference to the concrete territories and self-organization of any groups and communities should be restructured around the major development project: a new infrastructure platform.

11. A NEW MECHANISM FOR STRATEGIC PLANNING AS A SOLUTION TO LEAD THE WAY OUT OF THE WORLD CRISIS AND PLAN OF DEVELOPMENT FOR RUSSIA, CONCRETE ACTIONS OF META-INDUSTRIAL PROJECT AGENCY

At a certain point the discussions are over and it is time for action. How can the TCR project be initiated and launched?

This is where the world-thought-activity approach should be applied as it is aimed at linking together model and project, research knowledge and plan, program and new objects for elaborating different epistemic constructions that exist within different systems.

Therefore, the core principle is to form a new international practice of development. To construct this new practice a new methodology should be developed because only a new methodology gives the opportunity to surmount the limits of existing knowledge, formulated as systems of methodic and operations, concrete indexes.

Usually, in such situations, scientists have two main strategies of behavior. They either create an ontological vision, which means that past experience and previous knowledge are set as examples and are regarded as obsolete truth. Or they regard the challenge as an ontological situation, using past experience and previous knowledge

as, according to their words, a situation that needs to be explored.

Exploration and research result in attempts to regard the past as an ontology and regard it also as the upcoming future. But how does one remain balanced in such a situation and not to propose any random solutions? However, the task is quite the opposite: to prepare for a new, unseen before action, based on existing applicable schemes. Therefore, the question is whether it is the state that must be the main actor in forming the new national and international infrastructure namely Transeurasian Corridor of Razvitie or either this new infrastructure must be in possession of a vast number of minor proprietors, and thus fragmentized.

A good illustration of a fragmentized and, thus, destroyed corporation is RAO UES (The Unified Energy System of Russia): after its collapse a long line of investors was already waiting at the doors of smaller energy generation companies, IDCG Holding (interregional distribution companies) and even FGC (federal grid company) willing to invest into energy ventures.

In our opinion, the best opportunity is for the state to be the main holder of the infrastructure project of the Transeurasian Corridor of Razvitie, at the same time it must not become the monopolist and the infrastructure must not be in possession of one ministry or one agency. How it can happen?

It can only happen if there is a new mechanism of interactive programming and planning with a step-by-step realization and analysis of its realization with further up-to-date correction and refinement of plans and programs. The results of this planning and programming should be concluded and finalized by the system of contracts among corporations, groups, universities, think tanks,

institutions and individuals. In this respect by the initiative of the Russian Railways company, which should be the main operator within the Transeurasian Corridor of Razvitie, a Federal contract system must be created that will be 100 times more powerful than the Federal that deals with ministerial tenders, security systems and free entrepreneurship security.

Such an approach is connected with the necessity to form a special integrative form for joint infrastructure creative action. The question then is why this centralized integrating body cannot be owned by a monopolist who is able to stop all the social initiatives and to dictate to all the participants his terms of use and exploitation of the new infrastructure?

We can depart from monopoly, firstly, through the creation of a common multimodal transportation infrastructure, ensuring construction of new plants and resettlement of the Russian territories. In order to develop all the territories equally and in a balanced manner taking into account concrete economic, social, territorial tasks, it is necessary to get rid of the disconnection among different government bodies and to secure the dominant role of the Russian railways instead of, for instance, water transport along the Russian territory. Secondly, the task is to assure equal status for the use of common infrastructure independently from price and political conditions.

At the same time, there should also be a centralized system of planning and building the Transeurasian Corridor of Razvitie, but not for its operation: its operation, service and repairing works should be done by special corporations. What is more, special concession mechanisms to include and attract private, international and national capitol should be elaborated as well as some non-government actors to operate certain parts of the

Transeurasian Corridor of Razvitie so as to construct new industries, build new cities and resettle the territories. As F. Pekhterev shows in his book, concession as one of the types of public-private partnership is opposed to the total destruction of privatization.

The main program underlying the TCR project, in fact, is to regard the perspectives of multimodal integrative infrastructure as certain "common wealth", and major corporations, groups and units should compete over the right to use it for construction of new cities, factories, to activate other groups. Since nowadays one of the main forms of making business is the distribution of budget among narrow circle of "ones mates", there is a need for a strong legal regime to access to operations with the "common wealth" of the Transeurasian Corridor of Razvitie for everyone who is capable of fulfilling the stated criteria (during the realization of this project there is a need for budget money and for money from foreign investors). It is evident that the TCR as public wealth, still needs to be created but participation in the process of its creation can also be profitable, thus, widening the processes of social development.

Another sophisticated problem is the problem of transformation of types of property within the created multi-infrastructure and of the forms of its operation and usage for construction of new clusters and systems of resettlement. This type of transformation is a real driving force for participation of different groups, communities and corporations in the TCR's realization.

This problem was demonstrated by Tomas Colopulos in his definition of "innovation". Real innovation, according to the innovation guru Colopulos, can be implemented only when there is redistribution and change in the forms of property that signify the way of organization

of the social life. Change here does not mean the shift from state to private property; it is rather about a complex mixture of different privileges for partial use of the created object, and financial dividends that are right for making decisions and management.

We have also to face the problem of financial assessment for forming the TCR project. Obviously, these assessments and estimations cannot be counted only in a form of the profit of some isolated corporations, because it does not reflect a common index outlining the creation of common wealth and its further capitalization. In this respect we need to go back to the most promising forms of investment assessment based on the quantification of a maximum integrative national economic effect[7].

Only in this case, the integrative national economic effect is seen as a new form of accountability for the TCR project as a medium to construct new clusters and resettle the territories. If this task is fulfilled, then the losses of the country, state, corporation, population not making this project can also be easily assessed.

Let me illustrate this idea with the following quotation of Pekhterev: "The methods of assessing the effects from new developments of industries and new development of resources, from the geographical exploration of a certain, already known district, from the acceleration of the development processes in regional economy, from the rationalization of interregional ties are resting to be less developed. Quantic measurements also do not include the social effect."

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[7] F. Pekhterev "Railways in the Russian system of transport communications: main issues and solutions", Moscow, 2012, pp. 415–416

Identification and classification of losses because of poor transport servicing are also of high significance. T.S. Hachaturov developed the following formula for identifying the period of recoupment of capital investment into productive infrastructure due to the decrease in losses and growth of net production in the main industries:

$$T=C/[(D-C)+\Delta NP],$$

where C = capital investments to this type of infrastructure; D = eliminated damage due to capital investment; C = year maintenance costs for this type of infrastructure; ΔNP = growth of net product.

To prove the necessity of developing main railroads, automobile roads another type of methodics was developed in order to assess the losses from the deficient transport servicing of other spheres of industry. The research in this field was guided by A.V. Komorov. In his research, conducted under the guidance of L.D. Contarovich and V.N. Livshitz, the best alternative was to choose a minimum of integrated national economic costs (a sum for the accounting year) counted for the certain basic year. What is more, another important index apart from capital investments and operation costs, there are also costs for transportation and storage of goods, time spent by passengers in transport or while waiting and effects taken out of it

The criterion used in the methodics for minimum integrated reduced losses is only a specific case for the maximal criterion of national economic effect. Using all the indicators the related formula of minimal integrated reduced losses should be transferred in the form of a maximal criterion of national economic effect. Thus, we can proceed from choosing the variant of preferable transport

according to the method of comparative effectiveness within the criterion of minimal integrated reduced losses to the general effectiveness method according to the maximal criterion of national economic effect.

Basically, the maximal integrated effect is the main tool for elaborating the TCR project as a whole and then we should apply some specific methodics, demonstrating how, having the minimal costs, not to lose the effect of increase in the united capacity of constructing the Transeurasian Corridor of Razvitie and resettlement territories. But the issue is that nowadays there is a lack of understanding of what this maximal integrated effect is, as every corporation and every proprietor only wants to see his personal, partial profit and accountability.

But to form traditional accountability the first issue is to form the new system of countability. To form this vision does not mean to collect some random ideas. The vision of this effect should be grounded in the integrated operative readiness of many public Russian and foreign groups for participation in elaboration and construction of this project. Therefore, some mechanisms and operational forms of such incorporation must be elaborated.

12. THE SPATIAL DIMENSION OF THE TRANSEURASIAN CORRIDOR OF RAZVITIE — RESETTLEMENT CLUSTERS OF THE RUSSIAN TERRITORIES WITHIN THE TRANSEURASIAN CORRIDOR OF RAZVITIE

The main problem with the formulation and creation of the Transeurasian Corridor of Razvitie project is the initiation of the artificial resettlement and reclamation of vast territories in Russia. This resettlement may be started only if groups of young entrepreneurs realize that they have an op-

portunity to build and resettle in vast territories collecting potential and opportunities step by step moving along the Russian territory. Basically, the country needs new a policy for resettling the territories of the country that would reverse the trend started 25 years ago — the most difficult time for Russia. The tendencies of spatial collapse and decrease in population in Russia are well-known, for instance,: E. Lezerovich claimed that "In each subject of the Russian Federation there is clear opposition between the center and the periphery in a concrete form of the competition of the central economic district including the central city in the republic, krai or region and surrounding territories and the rest of the territory of the subject of the federation. This tendency is illustrated by statistics showing that the absolute number of the population is diminishing while the number of inhabitants of regional center is constantly growing.

During the period from 1990 to 2002 in the areas surrounding economic centers, the number of inhabitants has increased which is just opposite to what was happening in the previous decade. The absolute quantity of the population has also increased. At the same time the part of inhabitants living in regional centers has declined, as well as the absolute quantity of the population of these regional centers diminishing by up to 70%. As a result, according to demographic data, the suburbs of regional economic centers are much more socially attractive and economically wealthy than the regional centers.

Since the "geometrical" periphery doesn't always overlaps with the "social" periphery within the subjects of the Russian Federation, it is better to regard peripheral territories of republics, krai (territories), regions not as concentric circles but rather taking into account the increase in the number of population living in certain economic centers as well as in the economic centers around capitals.

It is more rational to imagine the periphery as the concentric lines along the territory of rather big territories than as the main subjects of the Russian Federation"[8]. Rather, it should be about the formulation of new schemes for the organization of economic micro-regions, taking the population from the Moscow опухоль and small опухоль around republican, krai (territories) and regional centers.

The activity of the population can be intensified if population activists feel that there are some infrastructural solutions, some projects supporting their activities. We believe that on the territories of Russia and Kazakhstan people should have certain synthetic-nomadic ways of life, giving an opportunity to live and work in two or even three settlements at the same time. It is not a guarding method (?) with a fixed schedule, not a pendular migration for temporary work to the regional center from a small town.

This is a possibility to take an active part in a certain project which is realized on different territories simultaneously with 2–3 working groups with different functions. Some groups of people, some social strata already follow this way of life — movie actors, heads of big transnational corporations, the managers of distributive networks, the representatives of energy companies etc. But for the most part of the population such way of life is not acceptable and unknown. A person either lives in one and the same settlement or has to move to another place, or needs to go on temporary business trips to earn money.

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[8] E. Lezerovitch The concentration of population in the central subjects of the federation after the 1990/ The digest of the 25th session MARS/ ed. By S. Artobolevsky, L. Sincerov, Moscow, 2008, c. 173–181 [mode of access: http://demoscope.ru/weekly/2010/0407/analit02.php].

The project of the Transeurasian development corridor and newly developing infrastructure should be realized to achieve these goals. First of all, this can be achieved if along the main railroad line being at the core of the project, there is special activity to create new platforms of development, new settlements.

From the very beginning, these new settlements, new cities and towns should be included into the whole project of the Transeurasian Corridor of Razvitie and be connected with productive and consumption chains and bigger city-centers. Therefore, there should be plans for connection among production, marketing, communication, settlement projects among newly developed clusters, also ensuring a solution for major transportation, tariffs, judicial, financial issues.

Therefore, a new life style should be formed allowing people to live in different places at the same time in order to develop the territory that we have from our ancestors.

APPENDIX. WHAT ARE CLUSTERS AND HOW ARE THEY CREATED?

Epistemological approach

1. Is the branch-type of organization applicable to 21st century industry?
2. **The cost of the epistemological challenge**
3. The epistemological notion of clusters
4. Types of clusters
5. Clusters and all-Russian vertical of projects
6. Clusters as reserve systems for development
7. The epistemological hierarchy of clusters
8. Clusters as multi-scenarios
9. Clusters as a platform for integration of human consciousness and thinking
10. Benedict Spinoza's warning

1. Is the branch-type of organization applicable to 21st century industry?

The issue of cluster formation in the industrial development process is an attempt to find a solution to the well-known question: why aren't new technologies applied? One top-ranking politician organized a meeting among businessmen and scientists from the Russian Academy of Sciences. After many hours of presentations of scientific research, confirmed by foreign experts, the Russian businessmen were asked about their readiness to buy any of the proposed technologies and introduce them in their plants. None of the businessmen were ready to buy the results of scientific research. Does this mean that Russian business is not interested in development? I suppose that there is another reason underlying this situation.

The problem is that the technologies introduced are not comprehensible to the holder of financial activities. It is not clear whether these technologies can be applied within the existing industrial complexes or whether a new type of production must be created. Applying new technology to the industrial plant of the former technological formation can lead to serious dysfunctions, thus, reducing effectiveness, validity and profitability of production. Creating new industries without having analogies is a high risk venture as it is not clear how marketing strategies for an unknown project should be shaped. Usually, various elaborations of scientists presuppose the formation of new production lines and even new branches of industry. Another question is whether this form of branch-organization is applicable to the industrial development of the 21st century.

Is there one precise, scientifically approved form of answer to the stated question? It was elaborated by one of the major Russian economists, a specialist in the area of supercomplex systems and megaprojects — Mark Dvortsin. He

elaborated a special discipline — techno dynamics — for describing mechanisms of evolution and change of full-scale productive systems, including educational, industrial, and scientific institutions. Techno dynamics is a theory of institutional dynamics focused on analysis of technological change that determines conditions for new industrial systems in a changing institutional environment. This practical discipline shows that the innovative economy cannot be focused on only one problem, without changing the whole institutional and organizational environment. What is called an "innovative economy" paradigm does not show how to distinguish between the need to renovate the existing techno-industrial formation and the need to launch institutions of the new techno-industrial formation. Therefore, a term with much better expository power was coined by Yury Krupnov, which is the "economy of development". However, it is necessary to clarify that the term "development" is not an economic concept. First, the development process should be launched, its potential should be explored and only then should the potential be realized in the form of economic profit.

2. The cost of the epistemological challenge

How can a tendency of transfer to the new techno-industrial formation be characterized? The shift in institutional conditions for human actions happens due to the change in the main type of property. New formation is connected to the property for transfer of technologies from one sphere and its application in another branch of industry. The right of transfer and technology dynamics implies the development of intellectual property rights. The current state of intellectual property rights security in Russia is quite grave. A good example is the Microsoft law suit against the director of a rural school in Ponosov,

Russia and the proof of purchase of the application of the products of this company by Russian nuclear power plants and atomic submarines. The key problem here is that the environment for technological transfer is not formed by IT and communication technologies but by the epistemic technologies ensuring the possibility of identifying key technological solutions based on new physical principles and effects. These epistemic technologies are also important for the identification of the conditions of technological transfer from one branch of industry to the other. The new techno-industrial formation, which is being formed worldwide, will mostly be created in such an environment. Therefore, the issue is whether we will create our own epistemic environment or if it will be formed by any other country and all the benefits taken by others.

However, special platforms, ensuring technological transfer within the industrial systems should be created on the basis of epistemic practices and solutions. The process of forming industrial clusters is realized in this above mentioned process, since such platforms would unite fundamental practice oriented science, scientific and research elaborations and new high-tech production. In this respect clusters are not an attempt to be active in the sphere of industry, to produce any type of product. In contrast, using the words of Schopenhauer, clusters are not only the will (passion) but also a notion (meaning conception). However, the task of increasing production discipline and mobilization is still to be solved.

3. The epistemological notion of cluster

The importance of clusters can be explained by the necessity to unite different business projects within one industrial sphere, related to one technological area, to unite fundamental elaborations and modern systems for

designing new goods and the preparation for producing these goods

The unification within one managing system of knowledge and technologies will enable us to build the institutional pillars for the future cluster, uniting several still non existing branches of industry. The advancement of the cluster form of organization is related to the organization of techno dynamics process in the technological systems within one new techno-industrial formation. This goal can be reached through modernization and change and application of a set of new technological elaborations into the Russian industrial complex. The epistemological approach can be regarded as a development of ideas by Nobel Prize winner Michael Porter. This well-known economist used to define cluster in the following way: "[the] cluster or industrial complex — is a group of interconnected companies united through one organization, acting in one specific sphere, having a common activity where they are being complimentary to each other"[9]

The key issue for cluster formation here is not territorial-geographic convergence and unification of several production plants of different industries into one complex with simple functionalization (producer-consumer etc.). In contrast, the main idea is to develop several new elaborations existing in the form of experimental devices and based on new physical principles and effects to create on their basis new practices. The use of such new practices opens possibilities for reindustrialization of all the industrial branches of the former techno-industrial formation. From this point of view the cluster is based on several schemes of activity:

[9] Cited from the Russian edition: Michael Porter "Competition", Williams,2001, p. 207

1. The organization scheme of the full-scale industrial system, uniting fundamental practice oriented science (physics and mathematics as well as humanitarian science), innovative industry, and development oriented education.
2. The branch scheme organization of industrial-productive platform for functioning, operation, development of technologies of the previous techno-industrial formation. Management, organization, control.
3. The multi-branch scheme and polyspheric organization of practice. This scheme is necessary for analysis and organization of techno dynamics and the technological diffusion of new solutions not within the existing branches of industry or reparation, but rather according to the principle of susceptibility to innovations among various trans Russian groups that together form up the innovative infrastructure.
4. The scheme of organization and application of knowledge-logistics (postindustrial level) modernized industrial platform (neo industrial level of development) for the development of next generation devices.
5. The scheme of centrally organized breakthrough core in the market environment, which adjusts to the new technologies and adopts them at different speed and in the different modes.
6. The scheme for forming up double-purpose products on the mass production lines ensuring with the fixed quality of quality.
7. The double "marketing circle" scheme (from product to new lifestyle and from person utilizing this product to the new good). This type of schematization is necessary for marketing of the new devices and technologies for formation of new life style in Russia. This is

also crucial for forming up the fashion in Russia for creative thinking people.

8. The scheme of investment designing and building finance-engineering company for realization of mega-projects. This scheme is crucial for analysis of all the alternative projects and possible products and risk analysis instead of financial flows discounting.

The idea of clusters within the epistemological approach presupposes several important organizational principles:

Clusters: getting profit not only from export of raw materials. The main idea is to form clusters on the basis of scientific and technological complex solutions and also commercial instruments for ensuring conditions for industrial modernization and the advancement of new techno-industrial formations (new generation devices, mechanical engineering, new polymeric materials, nano technologies etc.). Therefore, the aim is to formulate and elaborate intricate techno-industrial complex solutions that will be profitable for potential investors. Such solutions, lying at the core of investment projects are the key precondition for forming a zone of profitable economic development not in the extractive sector of industry according to decisions taken by the President of the Russian Federation and the mission of the Russian industry.

Clusters are regarded as an experimental zone for elaborating basic solutions for regional development. These technological complexes, created and tested within the experimental zone, can then be spread on different territories of the country, thus, creating working places in the regions, also attracting Russian specialists from abroad.

Clusters ensure connection between fundamental science and complex technological elaborations. The key

advantage of cluster types of organization is the formation of complex technological solutions: the way from new knowledge about new physical principles and effects to the new industrial technologies, technological know-how for the creation of new devices and new generation instrumentation systems; from academician universities and research centers to different industries.

Knowledge management within clusters as the main condition for development economy. The existing circulation of knowledge (fundamental, technological, technical, scientific, humanitarian, economic) is a core process for application of new complex technological innovations and new forms of systems management in industry. In this respect the cluster is a fabric of complex practice oriented knowledge to identify the top key investment priorities.

Clusters ensure innovative infrastructure and finance engineering schemes for the realization of a megaproject. To realize and apply cluster solutions and modernization there should be special work for the elaboration of innovative strategies and finance-investment schemes in major corporations (such as the Russian Railways company). The principles of knowledge circulation, finance-engineering schemes, and innovative networking strategies must be elaborated on special humanitarian technologies. Therefore, the creation of clusters presupposes reorganization of technical, scientific and humanitarian knowledge.

Clusters as a learning organization. The key precondition for building up new generation industries is a constant retraining of managers and creators in the new cluster. In this situation the cluster is seen as a learning organization introducing and using new institutional schemes for activity.

4. Types of clusters

What is the main notion of cluster? Another question is what is our aim in the introduction of a cluster organized system of industries[10]? The formation of clusters is connected with 4 major circumstances:

1) Technological reproduction and reclamation of certain infrastructure platforms using the technological solutions related to the next techno-industrial and socio-cultural formation. For example, making use of all the new materials we start by modernizing the infrastructure of the Russian railways company. In this case a cluster or a multi-cluster is focused around the experimental zones where the new technological solutions are introduced. It is clear that some technological changes and innovations will soon lead to new ones etc. Such a type of cluster could be called an **infrastructure-innovative cluster**. This cluster is constructed around the guaranteed consumption line of products. If the new materials will be introduced into the construction of an infrastructure, the demand for production will be guaranteed. The main difficulties of forming such a cluster are organization, aggregation and interfacing among different types of solutions to ensure the stability of modernized infrastructure.
2) Another type of cluster is characterized by the application of new physical principles and effects in the new, still non-existing infrastructure. For instance, such an infrastructure is the launch of big-size satellites con-

[10] It is necessary to mention that the word "cluster" ethimologically means — bunch, brush, bush, which may add some new understanding, new image for the Russian audience.

stellation; satellites of large size, small size, nano-satellites that are used for multilevel observing systems. Such a new infrastructure could also be laser machine-tool construction, where compact lasers could substitute for existing machine tools. Finally, the system of health and maintenance and provision of "living food" (food that is not spoiled by aromatizers, flavorings, based on biophotonics) can also be used as an example of such an infrastructure. The main advantage is that this cluster should not be included in existing production systems. The main disadvantage is that it is never possible to assess profitability and demand for the products. The only way for building such types of clusters is with a state guarantee.

3) The third type of cluster can be called ultra-structural (in contrast to the infrastructural), or metaindustrial cluster. This cluster is aimed at building an industry to transform other industries. Such a transformational industry is called a metaindustry. A typical example of a metaindustrial cluster is the nano-electronic cluster. The proposals of new nano-electronic devices, based on new scientific elaborations can be used to modernize instrument-making plants of the previous techno-industrial formation. The main merit of this type of cluster is the possibility to form advanced technologies and arrange several new factories around it for its realization. The main difficulty of such a cluster is to reach several agreements around science-technical, financial, organizational, industrial solutions that are being made.
4) The fourth type of cluster should be called the cluster for "borrowing foreign technological platforms". The introduction of the new techno-industrial formation

can only be realized if there are all the conditions for the adoption of the newest technologies existing all over the globe. To be competitive on the world stage Russian needs to borrow and adopt a set of advanced technological platforms from abroad for Russian industrial needs. It is not about the adoption of technological lines, producing finished commodities. The main task is based on analysis of the adopted infrastructure platform and the technologies used within it to make the next step for development of the existing technological platform. The main merit here is that it is based on imported technologies. Usage and application of these technologies implies coming to the national markets and lower prices, compared to the other producers. The main demerits are the national culture of industrial-productive labor. Very often the cost value and the costs of production on the foreign technical platform.

It should be mentioned in the text are regarded as what was called "ideal types", thus, representing a certain matrix for analysis and formation of one particular cluster. Furthermore, usually one cluster unites the characteristics of several of them. It is necessary to understand that the main precondition of cluster work is the existence of the connection among fundamental science, design laboratories and elaborations by innovative centers.

5. Clusters and all-Russian vertical of projects

The creation of clusters is a central precondition for the realization of Putin's idea for national projects; project form of state management. As we know from history the claimed principles are often realized not by the one who was told to implement them, but rather by the one who is

brave enough to realize them. As the famous Chinese philosopher Laozi used to claim: "He who knows, does not speak. He who speaks, does not know". To whomever discusses the issue of project development in the Kremlin, assuring the oligarchs that there will not be any new national projects apart from the 4 National projects, the necessity of project development is apparent. The realization of this principle will result in a more active population that is trying to realize different development projects, thus, taking the functions of state power. The effective and successful projects are those that ensure high wages and comfortable living for the workers and creators of these projects. It is the quality of the projects that is the crucial point in terms of competition among companies for territorial development and the future. Today this future is rather related to the acquisition of financial actives and not to the creation of strategically important working places for young people. In this respect so-called market solutions (but in fact corporatist in its essence) are aimed at pumping out all the nature resources instead of increasing the density of population on the Russian territories. As many economists claim, money itself is not solution for the collapsing economy.

The cluster form of industry organization is aimed at the new form of labor organization and is aimed at collecting resources on the territory. Therefore, the main demerit of Gazprom is the lack of proposals for creating new strategically important working places and plans for projects that are interesting to young specialists, rather than the technological inefficiency and fast utilization of all the resources that the future generation will also need. Despite the fact that Gazprom spends a lot of money on social projects and tries to be a socially responsible com-

pany it does not open new perspectives. The main trouble for RAO UES is not the fact of the dissolution of the formerly unified energetics infrastructure but the fact that any of the new companies do not have new national ambitious and prospective project ensuring jobs for large groups of the population and building up new towns. The Russian Railways company, fighting with the upcoming organizational reform, also has an opportunity to form multicluster transnational innovative system for creating new industries and plants. Therefore, clusters as an institutions of the new techno-industrial and socio-cultural formation are the main vertical connecting all the projects on the different levels ensuring the process of regional and state development. Thus the Russian Railways company, with the ideas of the TCR, can ensure such a hinge for connecting and uniting different industrial cores and creating a common platform for development (a hinge: a term used in the works of Gian Guido Folloni, Italian politician and thinker).

All-Russian Projects vertical is a cluster form, which is centered not around speculative financial capital, but rather on projects in the sphere of physical economy. All the proposed projects are aimed at the formation of a new infrastructure for this physical economy.

6. Clusters as reserve systems for development[11]

Clusters are seen not only as a mechanism of transfer to the next techno-industrial and socio-cultural forma-

[11] The idea of reserve systems as a key elements of development economy is thoroughly analysed in the studies by A. Anisimov, the Counting Institute.

tion but also as a way of forming reserve development systems. The attempt to introduce new technological solutions to the existing organizing system or multiply the old technological solutions through market mechanisms will not lead to economic development. The realization of such strategies only diminishes the existing limited economic resources, Therefore, all grand plans and projects should be analyzed from the point of their prospects in an international context: are these projects aimed at new, technologies that will be in demand on the world markets or are these technologies necessary in third world countries that have already been bought in Russia via special state policy. Another important criterion is the strategic importance of the project as opposed to direct short-term profit. In contrast, nowadays many specialists in major corporations see their task to be the introduction of simplistic market mechanisms to the old technological elaborations. But such a strategy does not lead to major profit and, moreover, leads to degradation of science, making serious fundamental research impossible. In the long-term future this signifies the uselessness of the proposed solutions and uncompetiveness with the world analogues.

The real advancement of the new techno-industrial and socio-cultural formation should be based on the construction of the second parallel reserve system; another railway line but based on maglev technologies, building up new towns and cities, new energy lines of high power capacity — one of the biggest being the Turukhan water power station — without regard for secured demand. The proposal of such projects of second reserve systems is a possibility for the creation of a development market, to depart from discussion over issues about survival and

stagnation. Thus, cluster projects are the forms of reserve development systems.[12]

7. The epistemological hierarchy of clusters

At the same time it must be clear that clusters are not something "generally positive" — a new idea, or something "huge and great" — as it is usually described by publicists. In contrast, there is a concrete idea underlying the cluster form of industrial organization.

The cluster form of organization is the main opportunity to create a system of modern industrial platforms in Russia, based on special technological and even civilizational principles. The main strategy is to develop from the fundamental scientific elaborations to the new types of technics and technologies and then to new types of products and goods with clear marketing strategies, that have guaranteed demand in the world markets. The newly formed industrial platforms should be inserted in the system of national and world markets. However, in this process all have different functions and it is not for scientists to be responsible for the purchase of the new technologies — as it is often discussed in the technoparks and venture foundations throughout Russia.

Such "atomists",that aim to commercialize solitary elaborations and results of scientific research realize an important task which is not a strategic comparison with the necessity to create new industrial systems of produc-

[12] At the same time the new parallel systems should be regarded as the basic ones and the basic systems may be working as a reserve — in terms of development economy. For basic functioning processes, vice versa, the basic system are responsible for functioning and the new systems should have the reserve functions. However, the development economy still needs to be created.

tion. The participation in technoparks and venture funds, realization of principles of "innovative economy" are an important experience, although mainly resulted either in mass migration from Russia or in education for Russian specialists in how to sell/buy goods. But these advancements are not enough for the creation of new industrial multisystems with new marketing institutions necessary in the period of new techno-industrial and socio-cultural formation, requiring new professionals and specialists. The main role in this process of cluster formation is played by Russian fundamental science. Russian scientists, in contact with groups of innovative industrial specialists, will be able to produce and propose new physical effect and principles that will be converted into new technologies for the future advanced industry system. Only through this strategy Russia will be able to compete with the Chinese overtaking modernization strategy and Japanese innovative economy, based on rationalization of the existing forms of labor and production rather than from the new fundamental elaborations and new acquired knowledge.

At the same time in order to form clusters it is necessary to formulate a coherent vision of the whole new Russian multi-industrial system and to indentify the main measures to be implemented for its creation to avoid chaos and uncontrolled changes.

The next passage is our attempt to propose such scheme:

1. The first zone of clusters is formed by the clusters dealing with industrial organismic substances that are the basis of Russian multi-industrial system (the list of clusters is not full and should be completed and can be revised):

A. Cluster of nano-electronics and biophotonics, ensuring a sort of proto-enervation functions. This

cluster should deal with the new principles and effects needed for the creation of new receivers and oscillators and new element bases. In the future all this elaborations will be used in the new Russian industries.

B. The cluster of complex integrative automatic design systems seen as the brain tissue of the newly created system, necessary for designing and elaborating all the future projects — from car to space shuttle. This is what is usually so impressive for Russian academicians during their visits to US R&D centers: "They are designing a new Boeing and realizing it only on the computer. Then it is transferred to industry directly from computers!" Many academicians believe that this is the core of knowledge management. In the USA automatized design systems are operated within the country while assembly plants are situated in other countries. This is a very important level of industrial system. However, the main erroneous thought is that the new breakthrough is done today in this second cluster. In contrast, the real, hidden science-technical revolution is happening in the first cluster.

C. The cluster of new materials: plastics, polymers — using the metaphor of the organism it can be taken as the "the main tissues" — blood, lymph, epithelium.

D. The cluster of sensitive (high-accuracy) mechanics for constructing "joints and articulations" of the industrial organism.

E. Cluster of new energy technologies for the creation of fast reactors, elaborations for industrial usage of thorium and closed nuclear fuel cycle.

2. The second cluster zone — techno-industrial infrastructure for identifying the effectiveness of re-equipment of the industrial system.

A. The cluster of machine tools building and laser technics for designing the main tools.
B. Instrument-making cluster.
C. Robotic science and automatized systems.
D. Cluster for creating industrial modules.
E. Cluster for plastic and polymeric conjunctions.

3. The third zone is made up with production systems needed for the creation of final product units.

A. Power machines.
B. Aircraft construction industry.
C. Helicopter construction.
D. Rocketry.
E. Satellites construction.
F. Agricultural equipment.

It should be mentioned that every zone (every one of the three levels) can contain an infinite number of clusters. There can be identified some other groups and zones of clusters as well. The main idea for showing this cluster matrix is to illustrate that the development of new techno-industrial and socio-cultural formation is formed simultaneously in three zones, in different clusters: from the first zone to the third one. If we take, for instance, the Ford industrial revolution — according to the scheme it developed the third cluster zone, then second, and then the first one.

The third zone of cluster is about the creation of the final product. This product can be counted in units, lines etc. Such logics were typical of Soviet isolated industry branches and ministries. Nowadays, there is also a tendency for financing some isolate plants and factories that survived during the 90s. However, such a strategy will

never lead to the creation of a new multi-industrial truly innovative system. Nowadays the main task is to reach a breakthrough in the first cluster zone , and, first of all, in the first cluster of this zone. In modern conditions we do not need unique devices and products, but rather there is a need for infrastructural solutions. The creation of new a infrastructure implies the connection of unique solutions and serial decisions — at the level of management systems as well as while making the choice of the construction materials and making minor decisions.

In this respect, any new cluster should be connected to all the other clusters that are being created, as together they form a megaproject. And vice versa the megaproject can only be realized if split into several cluster projects with clear functions in the new system.

8. Clusters as multi-scenarios

The formation of clusters presupposes the identification of several scenarios, the operating systems necessary for building up the cluster. Several types of scenarios can be distinguished: the technical-realization scenario, the organizational-producing scenario, the marketing scenario, the investment scenario, the labor-force scenario, the institutional scenario.

The technical-realization scenario implies finding the solution to the question of what type of technology may be constructed on the new fundamental knowledge of new physical effects or physical principles. This scenario outlines the necessary forms of interaction between representatives of fundamental science and technicians capable of working on complex technological solutions.

The Organizational-producing scenario is necessary for outlining the type of serial production that can be created out of the experimental samples and prototypes.

The Marketing scenario implies the positioning of the new production on the markets, the identification of the possible demand for the new product, the conditions for the dealer to work in the marketing networks, designing a special style and mode of consumption for the new product for the people who buy the product.

The Investment scenario is necessary for assessing the prospects of the new products (services/technologies/infrastructure) of the projects, to outline all the organization projects, alternative project-units in the megaproject, risk assessment for each project at each realization step, constant analysis of stability of demand for the new product depending on the price of the project. A special new engineering company should be responsible for the realization of the investment scenario in the process of forming the cluster.

The special labor scenario is aimed at identifying the policy with the employees and different specialists who will have to work in uncertainty, with professionals in the different spheres and also a high technological flexibility and change-over of the modern post-Ford production lines.

Finally, the institutional scenario is an outline of the cluster organization, its step-by-step formation and development. The cluster is based on connection of 4 major technological groups, which are the technological basis of cluster:

1. Breakthrough scientific laboratories — prototype production to create new technologies (prototechnologies).
2. Design bureau for creating models and prototypes of technologies that can be assessed on experimental production lines.
3. Industry-technological groups capable of transferring production into serial, mass production.


The World
POLITICAL
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0 3000 Mi
Miller Projection
ARCTIC OCEAN
NORTH PACIFIC OCEAN
NORTH ATLANTIC OCEAN
SOUTH ATLANTIC OCEAN
INDIAN OCEAN
SOUTHERN OCEAN
WEDDELL SEA
ANTARCTICA
Greenland (DENMARK)
Franz Josef Land (RUSSIA)
Svalbard (NORWAY)
Novaya Zemlya
Alaska (U.S.)
CANADA
UNITED STATES
MEXICO
CUBA
COLOMBIA
VENEZUELA
PERU
BRAZIL
BOLIVIA
PARAGUAY
CHILE
ARGENTINA
URUGUAY
French Polynesia (FR.)
KIRIBATI
SWEDEN
FINLAND
NORWAY
UNITED KINGDOM
POLAND
UKRAINE
FRANCE
SPAIN
PORTUGAL
MOROCCO
ALGERIA
LIBYA
EGYPT
MAURITANIA
MALI
NIGER
CHAD
SUDAN
NIGERIA
ETHIOPIA
SOMALIA
ANGOLA
SOUTH AFRICA
TURKEY
IRAQ
IRAN
SAUDI ARABIA
KAZAKHSTAN
RUSSIA
MONGOLIA
CHINA
INDIA
PHILIPPINES
MALAYSIA
INDONESIA
PAPUA NEW GUINEA
AUSTRALIA
NEW ZEALAND
French Southern and Antarctic Lands (FR.)


Jan Mayen
(NORWAY)
Norwegian
Sea
Murmansk
White Sea
Arkhangel'sk
ICELAND
Reykjavík
Faroe
Islands
(DEN.)
Tórshavn
NORWAY
SWEDEN
FINLAND
Gulf
of
Bothnia
Helsinki
Bergen
Oslo
Stockholm
Tallinn
EST.
St. Petersburg
Rockall
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UNITED
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DENMARK
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Vilnius
RUSSIA
Yaroslavl'
Nizhniy
Novgorod
Moscow
Minsk
Dublin
IRELAND
Isle of
Man (U.K.)
Manchester
Amsterdam
NETH.
Hamburg
POLAND
Warsaw
BELARUS
Voronezh
Saratov
London
Brussels
Cologne
Berlin
GERMANY
Łódź
Kraków
Kiev
Celtic
Sea
Guernsey (U.K.),
Jersey (U.K.)
Lille
BELGIUM
LUX.
Luxembourg
Prague
CZECH REP.
Lviv
UKRAINE
Kharkiv
Paris
Munich
LIECH.
Vienna
SLOVAKIA
Bratislava
MOLDOVA
Chisinau
Donets'k
Volgograd
FRANCE
SWITZ.
Bern
AUSTRIA
Budapest
HUNGARY
Rostov
Ljubljana
SLOVENIA
ROMANIA
Odesa
Bay of
Biscay
Lyon
Milan
Zagreb
CROATIA
Belgrade
Bucharest
Sea of
Azov
Bordeaux
MONACO
Turin
SAN
MARINO
BOS. & HER.
SER.&
MONT.
Sarajevo
Black Sea
Bilbao
Marseille
ITALY
Sofia
BULGARIA
GEORGIA
Tbilisi
ANDORRA
Corsica
(FR.)
VATICAN
CITY
Rome
ALB.
Tirana
Skopje
MACEDONIA
İstanbul
ARMENIA
Madrid
Barcelona
Naples
Bursa
Ankara
Yerevan
PORTUGAL
Lisbon
SPAIN
Valencia
BALEARIC
ISLANDS
(SP.)
Sardinia
(IT.)
GREECE
İzmir
TURKEY
Palermo
Athens
Konya
Adana
Sevilla
Sicily
(IT.)
Gibraltar (U.K.)
Algiers
Tunis
MALTA
Valletta
Nicosia
Aleppo
Mosul
Kirkuk
Ceuta (SP.)
Oran
TUNISIA
Melilla
(SP.)
Mediterranean Sea
Crete
(GR.)
CYPRUS
LEB.
SYRIA
MADEIRA

4. Marketing specialists to spread the new production and create new stable modes of consumption.

The management role that ensures interaction among the 4 stated groups can be played by the Investment Council (identifying the top priority projects), the Expert Council (discussing different projects at different stages of preparation), the Creative center (preparing materials for the Expert Council and the Investors Council to make up final decisions).

9. Clusters a platform for the integration of human consciousness and thinking

The main two measures taken by the Presidential Administration of the 2000s were: the 2005 initiative on National projects and the 2007 Munich speech where Russia was stated to be an independent power with 1000 year history of existence of state and language. These actions, both on the internal and international arena, are quite different from the declarative statements that are heard from the Administration and other politicians. These two actions mark the beginning of building up a new mechanism to rule the country. Such actions can lead to serious changes in the country.

At the same time, since the 1990 the country has witnessed a serious degradation of forms of thinking and forms of organization of labor, which is connected to the overall socio-cultural degradation started with the collapse of the Soviet Union. The collapse lead to the loss of civilizational perspective for development, and this perspective still has not found. What is more, there is significant social inequality between the small groups obtaining unlimited financial resources and the vast population, including young people, who do not have stable salaries, which is an evident crisis sign on the background of the

continuing inflation. Representatives of various youth groups claim that they do not see their future and tend to immigrate to other countries. Putin's 2007 speech was not met with kindness and understanding among westerners. The revival of Russia is seen as a threat to American security. Russia is still under constant pressure from the US and the EU. Thus, the situation both outside the country and inside is quite grave.

In this situation the only way to avoid huge social protests and political turbulence within the whole country, to avoid an increase in police-protestants opposition, is to increase possibilities for creative activity. New clusters should be built in Russia with the creation of new railway lines, new roads, ports, new plants and factories and new cities and towns. This process of global construction — the construction of parallel reserve development systems — should be an object for just privatization of all its creators, including young people. This parallel reserve system should be based on the new lines of magnetic levitation plants, along which there will be new factories, new energy infrastructure etc. Only in this case the vast number of population gets positive strategic prospects — to create new cities and become its proprietors and inhabitants.

Therefore, the main task is to elaborate megaprojects of non-existing clusters, to create new economic actives and elaborate investment projects. To start implementing these projects there must be a special culture of elaborating megaprojects and finance-engineering institutions of a new type. These new institutions should be focused on financing the elaboration and implementation of megaprojects and specially created investment schemes.

10. Benedict Spinoza's warning

The creation and design of clusters in Russia should be implemented by several competing groups who have their own special methodology and concrete organizing technologies for forming up clusters. Then, the successful groups should get the right to put their projects into practice. It is evident that not a single cluster will be formed naturally. Nowadays in Russia, under the title "cluster", there are various objects and phenomena. They are the transfer of factories from Ukraine to Russia, the purchase of western technological lines for making up new production lines, reconstruction after the collapse of the Soviet Union, purchase and commercialization of the scientific discoveries of the 60-s. All the above mentioned aims are not strategic, meaning that they do not lead to the creation of one multi-industrial system of the next techno-industrial and socio-cultural formation. This also means that the industrial development will be blocked in the quasi-market, branch form of organization not leaving space for real competition, creating new monopolist companies. Such new clusters will resemble the industrial platform similarly to the Benedict Spinoza's statement: "the dog as a star and as a barking animal"[13], although still being called clusters.

Therefore, in reality we need organizational-managing, industrial-methodological groups that are capable of elaborating new organizational forms of clusters and new epistemic technologies, reorganizing different types of knowledge (fundamental scientific knowledge, marketing-humanitarian knowledge, technological knowledge, finance-engineering knowledge and strategic vision) to

[13] The famous saying by Benedict Spinoza, explaining the nominalism in the human consciousness when different things have the same names.

ensure the advancement of new cluster corporations. In this respect the main aim is to construct the product at any expense because the consumption mode and the new branch of industry will be constructed, in a certain way, spontaneously.

Here the main distinction should be made between what Gilles Deleuze drew between rhizome and tree types of organization. The rhizome can be started in any direction, being a map and not tracing. The rhizome metaphor signifies the principle of self-configuration and formation within the interacting systems. The traditional branch of industry is formed in the form of a fixed "tree" skeleton, as it is aimed at the production of one fixed type of production. But when we are discussing the cluster formation it should be oriented at rhizome type of organization. Cluster is made up of different types of activity, different professional systems and different scientific realms. The cluster unites previously autonomous systems of production. This becomes possible owing to the knowledge transfer and technology transfer from one system to another. Such transfer operations should be specially elaborated and designed.

The cluster presupposes the application of epistemic design. The epistemic design implies the creation of needed institutional form of organization for knowledge from different formations. The branch type of industrial organization is not opposed to the market and deal communication. It can adjust to the market, but it is not capable of launching new development projects. The cluster multi-industrial cross-branch type of development needs another type of consciousness and new type of action at the institutional level.

How can the cluster approach be used to project the future? How can clusters be created around the TCR

multi-infrastructure? It is possible only if initially there will be a special task to identify and construct consumption, sale chains, transport lines for the new products both inside the country and internationally (marketing logistics), and then through the special interactions and deals with western factories (Germany, France, Italy). To organize new factories there should be groups of young people who want to become rich and be proprietors of the new factories. Instead of old machine tools taken from Germany after the end of the Second World War, industrial systems should be bought for exact products of high quality.

Consequently, apart from the customs and logistics centers that are being created for the Russian Railways that are oriented at the exact function of transporting goods around the territory centers of marketing logistics should be created. These centers can be created within meta-industrial agencies along the TCR for advanced industrial products that are somehow connected to the transportation infrastructure. These centers enable the realization of the main strategic mission — to elaborate multilevel industrial plans for the reclamation of the Russian territories based on the new rail ways.

A VISION FOR EUROPEAN-RUSSIAN COOPERATION FOR THE CREATION OF NEW HIGH-TECHNOLOGY INDUSTRIES IN THE CONTEXT OF THE TRANSEURASIAN CORRIDOR OF RAZVITIE

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INTRODUCTION

In the following article we shall first examine the powerful motivations in Europe today in favor of close partnership with Russia for the launching of high-technology industries. We will then examine some essential elements of European Union industrial strategy, including the so-called "Key Enabling Technologies", as well as the crucial area of ultra-high power-density technology, where Russia possesses unique capabilities of commercial interest. We give examples of some "success stories" of high-technology start-up companies, which are relevant to the perspective for rapid commercialization of Russian inventions and prototype devices.

Unfortunately, present European economic policy and the present level of technological partnership with Russia are still far from being sufficient to counteract the effects of

the ongoing crisis. A crucial *new element* must be added: a strategic action which *"changes the rules of the game"* and creates an entirely new context and perspective for the creation of new, innovative industries on both sides.

This crucial element, as we argue in the second half of the article, is the development of *the Transeurasian corridor system*, based on large-scale infrastructure and urban development projects along key land transport lines connecting Europe with East Asia. We briefly sketch the basic principles of Transeurasian Corridor of Razvitie as a transformer and locomotive for a new wave of economic growth, and outline a "winning strategy" for European and Russian entrepreneurs in this context.

Finally we call for reviving the European-Russian culture of revolutionary scientific discovery, as the means of maintaining the flow of new technologies far into the future, and conclude with a remark on the need for innovative educational methods to prepare young people for the science-driven economy of the future.

1. CAN RUSSIA SAVE EUROPE?

The deepening financial and economic crisis in the European Union has created an entirely new situation with respect to Europe's relations with Russia. There are now extremely strong strategic motivations for Europe to join together with Russia to launch a *new wave of economic growth* in the entire common region, based on (1) *the creation of networks of new, highly innovative advanced-technology industries,* including *major investment into modernization and expansion of the scientific-technological-industrial potential of Russia,* in combination with (2) *large-scale infrastructure projects and urban development*

projects in the Transeurasian corridors connecting Europe via Russia and Kasachstan to East Asia.

This strategic perspective now appears as *the only real option* to escape from the increasingly disastrous economic situation in large parts of Europe, characterized by giant accumulations of debt, chronic budget deficits and extremely high unemployment — particularly among the youth sections of the population —, leading to the threat of social explosions and political instability. Even in relatively prosperous Germany, the financial situation of many localities is increasingly desperate, and the "cooling down" of growth rates in China, plus the growing recession in Europe itself, threatens to undermine the strong export position which has, up to now, been the main support of the German economy.

Meanwhile, until recently the economic policy debate in Europe has been dominated by a struggle between advocates of brutal financial austerity, on the one side, and proponents of neo-Keynesian monetary stimulus on the other side. Although it has become clear to nearly everybody that the present fiscal austerity measures are making the economic crisis worse, and even threatening to plunge Europe into a depression, the neo-Keynesian side has no solution to the severe structural problems afflicting the European economy and financial system as a whole.

More and more it is recognized that a solution to the crisis is only possible on the basis of *new measures to increase the creation of real economic wealth* — above all by *creating new high-technology industries* —, while at the same time creating new markets and expanding employment through the modernization and development of entire economic regions inside and outside the European Union.

Such development could easily be financed, in principle, by *re-directing the enormous flow of money-creation by*

central banks, attempting to stabilize the financial system, *into the real wealth-producing activities of the economy*, with emphasis on technological innovation. In this way the expansion of monetary aggregates would be balanced by real physical wealth-creation in the economy, eliminating the danger of inflation and providing the long-term basis for repayment of legitimate debts and liabilities incurred in the development process.

Apart from the mere *theoretical possibility* of such a solution, there are now many *concrete circumstances and concrete pressures* pushing Europe toward seeking *close partnership with Russia* in order to launch a new wave of productive economic development. Next we shall examine some of these factors, because they are decisive in determining the future shape and character of Euro-Russian cooperation.

2. CONCRETE MOTIVATIONS FOR A CLOSE PARTNERSHIP WITH RUSSIA FOR HIGH-TECHNOLOGY INNOVATION, GROWTH AND DEVELOPMENT

Strategic ambitions. Europe wishes to be a strong *independent* force in the world, a kind of "superpower" not in the military sense, but in the economic and institutional ("civilizational") sense. For this it is important that Europe should have its own, comprehensive scientific-technological and industrial base, including key areas such as nanotechnology, biotechnology, aerospace, nuclear technology etc. In this context it is very important to note that Europe sees itself strongly in competition with the United States, whereas Russia is *not* seen mainly as a competitor for Europe (apart from a few specific areas) but

rather as a potential *partner*. This is not only because of the reforms and policies of post-Soviet Russia; ironically, an important reason why partnership with Russia has special attraction for Europe in the context of competition with the United States, is because the Soviet Union, as a full-fledged superpower, was able to match and sometimes surpass the United States in strategic areas of science and technology.

Crucial challenges and requirements for the European economy. The following points are becoming more and more urgent in the present crisis. Every day now they are the subject of countless articles, reports, conferences and policy discussions in the European Union. Most of these challenges apply also to Russia, and we shall see how they can best by solved through a close partnership and synergy between Europe and Russia.

The urgent requirements for the European economy in the coming period include the *need*:

- to drastically increase real productivity and competitiveness, especially vis-a-vis the USA, Japan and China.
- to greatly expand exports of high-value goods, with emphasis on advanced technology
- to create large numbers of new, well-paying jobs
- to drastically improve future perspectives for young people, by increasing employment rates, educational levels and overall motivation
- to counteract growing regional disproportions and inequalities, improving the overall economic structure
- to counterbalance the economic costs and other effects of aging of the population, by increasing the overall productivity of the economy, including improving the quality and efficiency of the health sys-

tem, while at the time promoting higher birth rates among the younger population.

- to reverse the wasteful overexpansion of unproductive service sector employment in recent decades, re-emphasizing industry, strengthening the status and role of productive activity and scientific-technological R&D within the economic and social structure
- to counteract the loss of industry and jobs as a result of production moving to Asia
- to promote rapid technological innovation leading to emergence of new industries and firms offering unique products and able to achieve leading or even dominating positions in the world market.

Some important remarks should be added to these short points.

The experience of the present crisis has tended to alert Europeans to the dangers of the "American disease": the decline in employment in goods-producing industries and transition to a consumption-driven, so-called "post-industrial service economy"; with subsequent gigantic accumulation of ficticious financial assets. This disease began in the United States already in the late 1970s, accelerated greatly after the end of the Cold War and spread to Europe and other parts of the world economy. This trend was slowed down to a certain extent by the rise of China, India and some other developing nations, which have provided a huge new demand for industrial equipment and other investment goods, as well as increased competition on the world markets. It has been widely recognized in Europe, that those countries and regions which have best survived the financial crisis of 2008–2009, were those which had kept a strong industrial base.

Despite this, terms such as "post-industrial economy" and "knowledge-based economy" remain popular in present-day discussions in Europe and in Russia, and their imprecise use often leads to costly mistakes. It is true, for example, that today's state-of-the-art industry differs greatly from traditional models from the 19th century up to the 1960s and 1970s. Employment in energy-intensive heavy industry has decreased relative to other forms of employment, and automated machinery has replaced much repetitive human labor in the mass-production of goods. At the same time, however, *the scale and intensity of industrial production in the world economy has grown dramatically*!

In itself, taken in isolation, "knowledge" does not generate any real economic wealth; it can generate real economic wealth only when it has been transformed into *technology,* which is then applied to *real processes of physical production*. Furthermore, the effective transformation of knowledge into technology and technology into improved real-productive processes, is only possible on the basis of an already-existing industry, physical infrastructure and qualified industrial labor-power.

Healthy economic development is characterized not by the disappearance of industry, but rather by a *gradual shift in employment structure i*n the context of *constantly developing, increasingly innovative industrial activity.* The percentage of employment in consumer goods production decreases relative to employment in production of capital goods (plant and equipment), while at the same time the percentage of employment in scientific-technological research and development increases relative to direct employment in goods production. Ultimately, the requirements for scientific progress itself — including manned exploration of the solar system — becomes a more and

more significant factor in the growing demand for goods and services.

These remarks may seem obvious, but they are crucially important to correctly define the character of future European-Russian cooperation in the launching of a long-term wave of economic growth.

An additional point which brings Europe and Russia closer together, is a growing common recognition of the fallacies of neo-liberal "free market" economics ("market fundamentalism"), and of the need for centralized intervention to promote and maintain healthy economic growth. This common trend becomes particularly clear when we look at *industrial policy in the European Union*, which is presently focussed strongly on *strategies to promote the formation of new innovative high-technology industries*. As we shall see in the following paragraphs, Europe is now placing special priority on so-called *"Key Enabling Technologies (KETs)"* such as nanotechnology, photonics, biotechnology and new materials — all areas where Russia possesses significant, world-level capabilities.

3. THE ROLE OF "KEY ENABLING TECHNOLOGIES (KETS)" IN EUROPEAN STRATEGY

The Final Report of the European Union's High Level Expert Group (HLG) on Key Enabling Technologies defines these technologies by the following criteria:

«KETs are knowledge and capital-intensive technologies associated with high research and development (R&D) intensity, rapid and integrated innovation cycles, high capital expenditure and highly-skilled employment. Their influence is pervasive, enabling process, product and service innovation throughout the economy. They are of systemic relevance,

multidisciplinary and trans-sectorial, cutting across many technology areas with a trend towards convergence, technology integration and the potential to induce structural change... In particular KETs have two specific characteristics that separate them from other "enabling technologies": they are embedded at the core of innovative products and they underpin strategic European value chains..."

The specific areas, identified by the High Level Group and other European Union agencies, are: *nanotechnology, micro- and nanoelectronics, photonics, advanced materials and biotechnology.* Very often "advanced manufacturing methods" are also included in discussions of KETs.

It is useful to quote some short passages from the HLG report, because they explain clearly the enormous strategic importance European Union experts ascribe to these Key Enabling Technologies, and thereby also the growing interest in Russia's capabilities in the relevant areas.

"Mastering of KETs is absolutely required to ensure that we can produce future innovative products within Europe,and is therefore a strategic priority to ensure the competitiveness of European industry."

To demonstrate the very broad scope of applications of KETs, which make them essential to the whole economy of the future, the HLG report cites some brief examples:

"Combinations of KETs are embedded at the core of most advanced products. For example, an electric car is a combination of advanced materials for batteries, microelectronics components for power electronics, photonics for low consumption lighting, industrial biotechnologies for low friction tyres and finally advanced manufacturing systems to produce electrical vehicles at a competitive cost. Similarly a mobile phone incorporates microelectronic chips for communications, photonics enabled camera and optics, advanced materials for new tactile

screens, and so forth. A recent real-time avian flu test instrument incorporated biotech labels, microelectronics chips, laser based photonic detection, and nanotechnology optimised surfaces for fluidic processing."

The report also calls attention to the structure of European industry as a whole, including its supply chains, reflecting the fact that leading circles in Europe are convinced of the necessity to carry out an active industrial policy:

"KETs underpin strategic European value chains. The products based on KETs often serve as inputs of great added value that are integrated into more complex systems. It is these subsequent applications that drive major economic growth and competitiveness.

"The macroeconomic importance of KETs is that they can open up entirely new markets or underpin and enhance existing markets through accelerating technological progress with trickle-down effects on productivity and concurrent leaps in efficiency levels. In addition to feeding numerous full value chains, products based on KETs often serve as inputs of great added value that are integrated into more complex products. It is these subsequent applications that drive major economic growth and competitiveness.

"The global market in KETs, which comprises micro- and nanoelectronics, advanced materials, industrial biotechnology, photonics, nanotechnology and advanced manufacturing systems, is forecast to grow from € 646 Billion to over € 1 Trio by 2015."

A glance at the many conferences, programs and concrete projects launched in the recent period between Europe and Russia, is sufficient to demonstrate that *Russia is seen as a crucial* partner for Europe to gain a competitive edge in Key Enabling Technologies. Furthermore, key

Russian scientific institutions are looked upon as potential "*fountains of innovation*" for the future.

4. AN EXAMPLE FROM GERMANY

The benefits of European-Russian collaboration in the development of new high-technology enterprises have been demonstrated repeatedly already, especially with regard to the Key Enabling Technologies discussed above. Here a brief example from the German city of Dortmund.

Up until the 1980s Dortmund belonged to the heart of Germany's famous "steel belt": the Ruhr region whose economy was based on large-scale coal mining and steel production. The decline and finally total shut-down of the Dortmund steel mills threatened the city with total disaster. In reaction to this, many efforts were made to create new industries based on technologies of the future, including micro-and nanotechnology. One of the most successful initiatives in this direction was a facility called the "MTS.factory".

The MTS.factory houses a large collection of the most advanced, state-of-the-art production equipment and instruments for the fabrication and testing of micro-and nanotechnologies such as advanced microchips, microsensors, semiconductor lasers and other electronic and photonic devices, nanoparticles, nanocrystals, nanosurfaces etc. New companies, including especially enterprises in the start-up phase, can *rent* the use of this equipment in order to fabricate production-ready prototypes, to develop and optimize new production methods, to measure and certify the performance of prototype devices etc. At the same time, MTS.factory provides floor space, infrastructure and a variety of special services for new companies.

Although partnership with Russian scientists was not a priority in the founding of the MTS.factory, it is not an accident that one of the success stories of the MTS. factory was the *Optogan group*, launched by a group of Russian entrepreneurs and scientists from the famous Ioffe Institute in St. Petersburg and now one of the world's leading companies in the production of Light Emitting Diodes (LEDs).

After the initial founding of this company in Helsinki in 2004, the founding scientists came to Dortmund, utilizing the equipment and services of the MTS.factory to develop their innovative LED designs and fabrication methods to the point of readiness for commercial production. While still maintaining a branch at the MTS.factory, Optogan went on to create a huge LED and LED-module production facility in St. Petersburg, opened in 2010, with an investment of 3.35 billion Rubles, as well as a high volume chip factory in Landshut, Germany.

Another success story of the MTS.factory with origins in the former USSR, is *Klastech*. Klastech is today a leading world manufacturer of solid state lasers, pioneering the technology of diode-pumped solid state lasers (DPSS) with frequency conversion. Klastech was founded by Professor Fedor Karpushko, who in the Soviet period worked as a laser physicist member of the Academy of Sciences of Minsk, and now holds of 20 patents in the area of lasers and photonics. Karpushko began his activity as a private entrepreneur together with two collaborators in a room on the first floor of the MTS.factory. Thanks to the facilities available there, and to start-up support from the German government, Karpushko was able to carry out the commercialization of his DPSS technology, leading to a highly successful enterprise.

Needless to say, the MTS.factory provides an important example of methods and practices which could be applied on a much larger scale for European-Russian partnership in the launching of new high-technology industries.

5. COLLABORATION ON THE TECHNOLOGY OF ULTRA-HIGH POWER DENSITIES — KEY TO THE INDUSTRY OF THE FUTURE

Although not included in the list of "Key Enabling Technologies", Europe has a strong strategic interest in the area of *ultra-high-power-density technologies,* including X-ray lasers, particle-beam technologies and certain areas of nuclear technology, where Russia has a unique position.

The enormous economic importance of these technologies derives from the fact, that the overall productivity of an industrial economy is closely correlated with the *power-density* of primary technologies used in the generation and application of energy. Power-density is commonly measured in terms of kilowatts per square centimeter of the primary surface across which energy is transformed or applied. The correlation between productivity and power density (or energy-flux-density) is easily demonstrated by the history of technology, for example in the progression from animal power, to steam power, to the internal combustion engine. In each step there is an order-of-magnitude or more increase in the achievable power-density.

The importance of increased power-density in tools (machine tools) used for the forming of materials is also obvious, as exemplified by modern laser cutting machines which can cut through any material. The radius of the smallest area, upon which a beam of laser light can be fo-

cussed, is a function of the wavelength of the light. That, in turn, is one reason for the great technological interest of ultraviolet (UV) and X-ray lasers. In the future it may become possible to build gamma-ray lasers capable of splitting atoms and triggering nuclear reactions.

Although not widely recognized, nanotechnology frequently involves extremely high localized power densities. The total energy applied in nanotechnological devices is usually extremely small, but the energy is effectively concentrated on an extremely tiny area, on the scale of nanometers i.e. the scale of individual molecules. A related form of energy concentration, also closely correlated with productivity and important for many advanced technologies today, is the concentration of electromagnetic radiation into a very narrow frequency band.

Apart from economic productivity, the achievement of ultra-high power-densities has obvious military importance. For this reason it was a focus of great attention in the USSR and US during the Cold War. The accomplishments of Soviet science in this domain are extraordinary, and are now playing a central role in a series of "Mega-Science" projects being carried out in collaboration with Europe. An important example is the European Union's X-ray Free-Electron Laser (XFEL) project, based on ideas originally developed by the Butker Institute of Nuclear Physics in Novosibirsk. The XFEL facility, cofinanced by the Russian government (via RUSNANO) toget her with the EU, will generate up to 30,000 intense X-ray pulses per second — much more than similar projects in the US and Japan. These repeated pulses will enable researchers to make "movies", with atomic resolution, of the chemical reaction process, of how biomolecules move and change shape, how solids are formed etc. Besides applications to scientific research in a wide variety of fields, the XFEL

will be a powerful tool for the commercial development of new nanomaterials.

We should also mention *impulse-periodic lasers:* another important Russian development with potentially revolutionary applications for the transmission of energy and in other fields.

6. LIMITATIONS OF PRESENT EUROPEAN ECONOMIC STRATEGY AND THE URGENT NEED TO "CHANGE THE RULES OF THE GAME"

It would be possible to list many more "success stories" and promising directions of European-Russian partnership in the creation of new technology and new innovative industries. Unfortunately, despite strong efforts and despite the favorable orientation toward cooperation with Russia, the policies of the EU countries have still not been sufficient to overcome the effects of the financial crisis and create a new wave of growth. Also from the Russian side, the economic benefits of this collaboration have so far been rather limited. For one thing, the process from discovery to commercialization of new technology remains slow and risky, and many promising innovations are lost in the so-called "Valley of Death". Many initiatives to promote innovation in Europe and in Russia remain ineffective due to lack of sufficient resources and to difficulties with the present economic and market environment. A *fundamental weakness*, on the both sides, has been the tendency to try to *adapt to the present "rules of the game"* — trying to compete on the existing world markets, rather than taking decisive action to *create new markets* for the future.

In order to break through the present barriers, and generate a new wave of economic growth, something essential must be added: a major strategic thrust which *"changes the rules of the game"* and creates an entirely new context and perspective for the future.

Here close partnership between Europe and Russia becomes not only desirable, but *absolutely necessary*.

7. TRANSEURASIAN CORRIDOR OF RAZVITIE AS A TRANSFORMER AND LOCOMOTIVE FOR A NEW WAVE OF ECONOMIC GROWTH

As we shall argue now, the first and most urgently-required strategic actions, needed to unleash a long-term economic boom for Europe as well as Russia, are the following:

A program of large-scale infrastructure projects to develop a growing network of Transeurasian transport corridors, including modern transport, energy and communication systems, at the same time creating a "pearl-chain" of new industrial centers, towns and cities within the corridor region. Under the condition, that these projects utilize *the most advanced technologies available*, both directly and in the relevant *supply chains* for equipment and materials, *the Transeurasian corridor system becomes a gigantic engine for innovation*, generating a huge demand and stimulus for new products and new industries. This includes not least of all the Key Enabling Technologies, ultra-high power-density and nuclear technologies described above.

Most importantly the Transeurasian Corridors themselves — the band-like regions 50 kilometers or so on both sides of the Eurasian transport lines — will emerge

as properous, rapidly growing economic regions with world-class infrastructure. The growth of these regions will provide a constantly expanding market, as well as an attractive location for high technology enterprises, industrial research and development facilities, educational and scientific institutions and high-quality labor. It is even possible to foresee a significant emigration of the educated European population into the Transeurasian development corridors, parallel with investments by European companies into joint ventures, production plants and other facilities.

In addition, the *huge expanse of territory* in Russia and Kazakhstan in particular, which the Transeurasian transport lines pass through on their way from Europe to East Asia, opens up entirely *new spaces and new degrees of freedom for European-Russian cooperation*. Of particular importance is the possibility to create a large variety of special areas and zones ("ploshchadki") for *testing* innovative technologies under realistic conditions — new transportation technologies, new energy technologies, new materials and production techniques, new forms of city-building etc. — thereby greatly facilitating the process of development and optimization of new products and services. Needless to say, creating such a great variety of zones for real-life experimentation of new ideas and inventions is practically impossible in the densely settled areas of Europe. The Transeurasian Corridor regions in Russia, for example, will become ideal areas for activity and investment by European enterprises and agencies promoting the technologies of so-called "*smart cities*": new urban transport systems, digital health systems, efficient heating and lighting systems, recycling systems etc. Needless to say, it is much easier and more effective to test innovative technologies in new towns and cities, and

areas with an abundance of free space, than in old, high-populated urban centers in Europe.

8. KEY ECONOMIC PRINCIPLES OF TRANSEURASIAN CORRIDOR OF RAZVITIE AND THE CREATION OF NEW MARKETS BY LARGE-SCALE INFRASTRUCTURE INVESTMENT

Before going further it is essential to spell out the *essential economic principles of infrastructure corridor development*, which guarantee that the large-scale investments, required to create the system of Transeurasian corridors, will actually pay themselves back in macroeconomic terms. This is a *controversial* topic, because the advocates of "market fundamentalism" have always tried to portray large-scale infrastructure investments as wasteful and unprofitable. This is despite the undeniable, crucial role that great infrastructure projects have played in the rise of powerful nations — the transcontinental railroad and rural electrification programs in the USA, the Transsiberian railroad and GOELRO in Russia and the Soviet Union, and more recently the gigantic railroad development in China as well as — in a different way — the advent of internet, digital communication and other modern information infrastructure on a global scale.

The crucial *economic* point to be stressed here, and *key to the long-term perspective for European investment into the Transeurasian Corridor of* Razvitie, is that the main macroeconomic "payback" from large-scale infrastructure projects does not come in the form of direct income from the operation of railroads or other infrastructure; instead it comes from the expansion of the whole economic activity of a region or nation and the

increase in overall productivity which is made possible by the presence of that infrastructure. This *multiplier effect* is itself multiplied many times more, when appropriate economic policy measures insure that that advanced, innovative technologies are constantly "injected" into the entire investment cycle.

Here a crucial role is played by insuring a high rate technological innovation *not only* in *final products*, but in *the entire industrial supply chain* connected with Transeurasian infrastructure projects and the subsequent, constantly growing consumption and production in the corridor regions.

The European focus on Key Enabling Technologies (KETs) is of greatest importance in this context. We envisage the formation of a large number of *European-Russian joint ventures* and European investment into new Russian enterprises supplying KETs and other advanced technology throughout the relevant industrial supply chains. A most obvious example is the large-scale use of *new construction materials* based on applications of nanotechnology and advanced production methods, in infrastructure and urban construction in the Transeurasian Corridor regions.

For purposes of conceptualization, the typical infrastructure corridor can be visualized as a continuous strip of land, approximately 100 km wide, centered on a railroad (or magnetic levitation) line in the Transeurasian network. Now, parallel to the rail line, install high-capacity electric power lines, oil and gas pipelines, water supply systems, fiber optics communications lines, advanced energy production — including "inherently safe" forms of nuclear power, and so forth.

In this way, we have already created the most essential precondition for every kind of industrial, mining, agricul-

ture, and urban construction activity within the corridor. Any region in the corridor is not more than about 50 km distant from these main infrastructural "arteries." Hence, it is simple and economically highly efficient to "grow out" a network of infrastructural "branches" and "capillaries," connecting to the central infrastructural arteries, and supplying transport, energy, water, and communication services to any part of the corridor region. In practice, most of the basic "arteries" and related infrastructure for a typical development corridor will be financed by state investments and state credits. Construction of infrastructure "capillaries" will often be the function of local and regional governments. Investment, credit, tax, and state regulation policies will be directed at creating optimal conditions for the creation of modern farms, industries, and new urban centers within the corridor. Eventually, the result will be a "pearl necklace" of beautiful cities and towns, surrounded by regions of highly-productive agriculture, gardening, forestry and recreational areas, interspersed with smaller towns and villages.

An additional consideration is crucial to understanding the unique economic advantages of such corridor development: By transforming long-distance lines of transport, energy, or water infrastructure into "development corridors," we vastly increase the efficiency and economic impact of the infrastructure itself. Consider, for example, the construction and operation of a long-distance railroad line linking City A and City B across a large underdeveloped and underpopulated area. As long as the regions along the railroad line remain underdeveloped, they appear only as a *cost factor* in providing for the transportation of goods and persons between point "A" and point "B." The time and effort spent in traversing the distance between "A" and "B" is simply lost, with no posi-

tive economic effect. In fact, one of the major weaknesses of the economy of the former Soviet Union, was the relatively high transport costs incurred as a result of having to link together isolated raw materials deposits, processing and production centers, separated from each other by immense, relatively empty spaces.

What happens, however, when we develop a *dense fabric* of population centers, agricultural and industrial activities located along the entire length of a rail line? In that case, the distance A-B is transformed into an *economic "multiplier."* Immediately, the degree of utilization of the railroad and other infrastructure is greatly increased. Although the addition of local and regional traffic may require adding additional track lanes and various other improvements, the general rule holds true: The greater the density of exploitation of a transit route, the more efficient the system becomes, i.e. the lower the investment and operating cost per ton and per ton-kilometer transported.

The regions along the Transeurasian transport lines are both a huge market,and a large supplier of goods. Industries located between"A" and "B," can process certain goods and materials, transported along the line, into higher-value goods for further shipment. By this kind of development, *the transport connection between "A" and "B"takes on the role of a giant "production line,"* in which value is added to a portion of the goods as they move from one point to the other. An analogous effect occurs in passenger transport, when passengers exploit the possibility of making a stopover, to conduct some useful business in an intermediate location.

This potential for value-addition via industries located along the Transeurasian corridors between Europe and East Asia, is unique to rail and other land transport, and

has no equivalent in shipping over water. This adds to the already-existing advantages of higher transport speed and ease of tracking of cargo. Even when ships may stop at ports along the way, the manner in which containers are carried on ships — in multilevel stacks — makes selective loading and unloading of specific containers, in order to carry out additional manufacturing or processing steps, very inefficient. Also, in contrast to crowded ports, *the Transeurasian Corridors will offer practically unlimited space, as well as excellent infrastructure, for building up industrial plants and processing facilities that can make use of the flow of goods and materials along the corridor*. In the future we foresee a high level of European investment into industrial facilities located in the Transeurasian corridors, not only to exploit the greater proximity to markets in East Asia, but also to serve the growing markets inside the corridor regions themselves.

In summary, the unique economic advantages of infrastructure corridors derive mainly from the "positive feedback" of three factors: 1) the "bundling" of transport, energy, water, communications, and other basic infrastructure along a given route, provides ideal conditions for the growth of a band of intense agriculture, industrial, and population centers along that route; and conversely; 2) the growth in scale and density of economic activity along the entire length of such a route, greatly increases the efficiency, productivity, and the net positive economic effect of infrastructure improvements and other productive investments; 3) the possibility of locating production and processing facilities along the routes connecting large centers of economic activity, making optimal use of infrastructure and the overall flow of goods and materials.

9. A WINNING STRATEGY FOR EUROPEAN AND RUSSIAN ENTREPRENEURS

The Transeurasian corridor system is unique in respect to the fact, that it connects a population of over 500 billion in the countries of the European Union, with a population of over 1,5 billion people in East Asia. As an increasing amount of the total goods flow between these Europe and Asia will be carried by the Transeurasian transportation network — augmented by a growing economic turnover inside the corridors themselves — the Transeurasian corridor system will constitute a *the greatest single interconnected market*, in a sense the *greatest single physical-economic system in history*.

The gigantic scale of the populations and territories, brought together by the Transeurasian corridor system means on the one side a *gigantic market*, but also very *heavy competition*. In this context, a crucial "winning" strategy for European-Russian cooperation in the creation of innovative enterprises, is to place emphasis on developing *unique technological products*, having *high value-added* and *able to rapidly achieve a dominant or leading market position*. This strategy avoids price-competition, using rapid innovation and high R&D intensity to stay always ahead of low-cost producers in East Asia (and elsewhere), who are notorious in their ability to replicate products.

Quite naturally, the focus should be mainly on industrial capital-goods, rather than mass consumer-goods, and will generally aim "deep" into the supply chain, i.e. aim to providing key elements for production processes having major economic importance.

A variety of commercial "success-stories" and other examples show that *European and Russian entrepreneurs, scientists, engineers and technicians can work together ex-*

tremely effectively in the development of new processes and products. There is also intense discussion, in various European-Russian forums, about common measures to stimulate and support innovative start-ups.

Last year the Chairman of the Committee of Scientific-Technological Innovations and High Technologies under the Russian Chamber of Commerce and Industry, Vladimir Yevtushenkov, proposed to form a *"unified Euro-Russian Innovation Market"*, referring to statements by President Putin calling for Russian and Europe to combine forces in this crucial area of common economic interest.

From the European side it is generally acknowledged that a close synergy with Russia can greatly strengthen Europe's potential to compete technologically with the U.S. and Japan, by linking up with Russia's high-level scientific and technological capabilities, including in strategic areas such as aerospace, nuclear and high-power laser technology.

We see here a "winning strategy" for the period ahead. In the longer term, however, the European-Russian partnership for technological innovation can run into a *serious limitation*, due to a gradual weakening and even loss of the capability to generate *fundamental scientific revolutions*. This brings us to our final point.

10. REVIVING THE EUROPEAN-RUSSIAN CULTURE OF SCIENTIFIC REVOLUTIONS

This latter remark may seem strange or at least controversial to many readers. Are we not experiencing a fundamental scientific revolution today, as demonstrated by the emergence of nanotechnology, for example? No! The fundamental physical principles, underlying today's

nanotechnology, were already well-established *half a century ago*, with the development of quantum physics, quantum solid-state physics, quantum optics and related areas. Recent decades have seen constant progress on the level of *applications* of quantum theory, development of sophisticated methods of approximation and calculation, detailed understanding of specific quantum systems and processes at the quantum level, and breathtaking advances in technology etc. But all of this has occured *without any real fundamental revolution* – nothing comparable to the revolution unleashed by the discovery of the quantum of action and the wave-particle nature of matter by Planck, Bohr, Heisenberg, Schrödinger and others in the first two decades of the 20th century.

A similar situation can be observed in practically all other domains of physical science. The extraordinary advances in technology in recent decades, have occured without revolutionary transformations on the level of basic scientific principles. It is often difficult for scientists today even to *imagine* what a new scientific revolution might be. It is not uncommon to encounter the view, that science is today already *basically complete in terms of fundamentals*, and that the future will consist only in *a process of gradual elaboration and completion* of established basic theories, and further accumulation of experimental data and technological applications.

On the other hand, study of the development of human society over long cycles of history shows that *fundamental scientific revolutions (and analogous revolutionary improvements in human social practice) are the ultimate source of sustained increases in the physical productivity of human society*. Conversely: when there are no fundamental scientific revolutions, the rates of productivity growth, associated with technological improvements, tend to *de-*

crease, approaching some sort of asymptotic limit. This leads eventually to stagnation, and ultimately even to collapse, when the rate of technological advance is no longer sufficient to compensate for rising costs of resources.

Despite the revolutionary technological developments of the present period — exemplified by nanotechnology, photonics and their applications — there are many indications that the present mode of technological development is approaching limits, connected with the lack of fundamental progress in certain areas of physics.

Here are some *symptoms* pointing to the existence of such limits:

1. Failure so far to find practical ways to control and accelerate the process of radioactive decay of atoms. Related to this, failure to fully resolve the problems and drawbacks of present-day nuclear fission energy.

2. Failure to realize controlled nuclear fusion as a large-scale source of energy, at costs competitive with or lower than present thermal (fossile fuel) or nuclear plants, despite huge investments and many decades of fusion research.

3. Failure to produce qualitative breakthroughs in the realization of electric cars which would be truly competitive with vehicles based on the internal combustion engine. Related to this, failure to overcome certain fundamental limitations in present technologies for the storage of electrical energy.

4. Failure to realize fundamentally new technologies for space travel, able to drastically reduce the cost for launching into low Earth orbit, for example to below $200 per kilogram, and permit large-scale passenger transport in space.

5. Failure to realize low-cost high-temperature superconductors suitable for routine use throughout the economy.

6. Failure to develop general methods to cure cancer with a high success rate, without the use of toxic substances and ionizing radiation.

7. Failure to make decisive progress in the prevention and reversal of degenerative diseases of aging (such as dementia).

It is possible that some of the above challenges may be solved in the coming period by purely technical ingenuity, without fundamental new discoveries. But reflecting upon the reasons why the above tasks have so far seemed so difficult to solve, we find this is connected always with a certain kind of ignorance and lack of progress in addressing certain fundamental scientific questions. Of course, it is hardly possible to predict a scientific revolution before it occurs. But we can say that present-day science, while extremely sophisticated, lacks the conceptual-philosophical depth and the strong focus on fundamental issues, which characterized scientific work in Europe and Russia into the first half of the 20th century.

This makes it decisive for the *longer-term* success of a European partnership with Russia, to *revive, restore and renew* the *culture of scientific creativity* which has been responsible for nearly all fundamental progress in the history of physics, chemistry, biology, geology and other branches of natural science.

It is most remarkable to note, that the foundations of physical science as we know it today, are *mainly* the result of discoveries by the scientists of just *four nations*: Russia, Germany, France and Italy! Naturally, the United States developed an extremely powerful science capability, especially from the 1940s on — a capability which was at first "transplanted" from Europe, and then further developed on the basis of huge governments investments. The Unit-

ed States is justifiably famous for the enormous technological ingenuity of its scientists, engineers and inventors, and for the ability to rapidly transform new discoveries and inventions into industrial products. Thomas Edison and Henry Ford, for example, displayed *a typically American combination of talent for invention combined with entrepreneurial abilities*, which is very much worth studying and emulating in Europe and Russia. But in the area of *fundamental scientific discovery* — above all in theoretical science — the U.S. has been relatively weak, especially considering the enormous financial resources invested into basic research.

For these and other reasons it is important for Europe and Russia to actively work together to revive the *deep culture of fundamental science*, shared by both but gradually weakening since the early decades of 20th century, which has brought forth nearly all the revolutionary discoveries in natural science over the last 500 years. This unparalleled scientific creativity is no doubt connected with the influence of classical Greek philosophy, with elements of the Judeo-Christian tradition and with certain principles concerning the organization of scientific work, which can be traced back to Leibniz and the creation of the first scientific academies. An essential way to recover this tradition, is for young people to study the lives and work of the greatest scientists and scientific schools. In this respect the writings of Vladimir Vernadsky are of particular interest.

It is extremely important, in this context, to reverse the negative effects of so-called "americanization" of education. While preserving the best practices of classical scientific education and general education in Europe and Russia (including not least of all from the Soviet period), it will be crucial also to prepare young people for the highly innovative, science-driven economy of the future. This in-

cludes acquainting young people from early on with the functioning of modern economy and especially with the process of transformation from new ideas and discoveries into productive practice.

For these reasons we consider that the development of innovative approaches to education should be included among the priorities of cooperation between Europe and Russia in the coming period.

THE TRANSEURASIAN CORRIDOR OF RAZVITIE — CONCLUSION

One of the main problems underlying the ongoing world financial crisis is the lack of global initiatives that would open new horizons and give an opportunity to depart from the recession and budget deficit to the joint plans for development. There is no "locomotive" to drive the world economies out of economic downturn.

Therefore, the Session of strategic scenarios which is to take place on the 7–8 November 2012 in the University of Bocconi in Milan gives the new possibilities for the new prospects of a Russian-Italian and Russian-European collaboration. The essence of this collaboration is very grand and serious and is to be formalized in special strategic initiatives.

This project deals with the idea of the creation of a macro-regional common wealth generating pole as a new platform for the production and consumption of new goods, services and technologies. The formation of such a macro-regional system should be centered over the infrastructure project of the Transeurasian Corridor of Razvitie, uniting the economies of Europe (esp. Italy), Russia, Kazakhstan, China, Japan, Korea. The Transeurasian Corridor of Razvitie is a system of infrastructures: railways, automotive, energy, water, information, accompanied with the construction of new scientific centers and towns with a variety of new working places. The word Razvitie (or "development" — in English) here signifies a transfer

to the new techno-industrial and socio-cultural (new institutions of consumption, exchange, new lifestyles) formation through the mechanism of pilot projects on the European landmass, including Italy, Kazakhstan and Russia with its access to the Pacific rim.

The realization of such an infrastructural megaproject implies the application of new financial and institutional mechanisms, first of all, international long-term investments, elaborated in the Long-Term Investors Club, with active membership of the "Cassa depositi e prestiti" bank. It is necessary to consider the creation of other institutions: the institution of project bonds for the Transeurasian Corridor of Razvitie, institutions of risk insurance for private and state investors, the contracting system for the realization of the TCR project, systems of short, medium and long-term international planning and designing of the whole corridor system and planning of some top priority projects, the project of Moscow financial center for financing the projects of the Transeurasian Corridor of Razvitie. A very important step to advance this work, which will be started at the session in Italy, is the identification of key infrastructure projects, that can be regarded as a basis and as the first steps for the practical realization of the TCR project.

To start the practical realization of the plans based on the spectrum of presented ideas and conceptions that can be broadened; we propose to found a Metaindustrial Project Agency. This agency can be elaborated in the short run in collaboration with Italian and Russian counterparts to create the program for examining resources, conditions and institutional instruments for outlining the list of priority projects within the Transeurasian Corridor of Razvitie.

Transeurasian corridor Razvitie:
new dimension of cooperation

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