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The Price of Transition

Opening Remarks of the Editor in Chief

Recently, it has significantly increased the level of tension and the amount of diplomatic-hooligan rhetoric in communicating of large states, showing a significant reduction of mutual trust. It is not limited to rhetoric only, economic sanctions, trade wars, demonstrative military exercises have become commonplace, and whole regions of the world have plunged into protracted conflicts with the use of heavy weapons and everyday human and other victims. Opening the pages of newspapers, for example, of 1930s, we will, however, be surprised that all these features distinguish the approach of the world to a new world war. And it soon, after several years of negative energies pumping became a monstrous reality. Suffice it to say that the Soviet Union lost 19 thousand people in it every day.

The outcome of the war became the fundamental changes in the world economic system. The war, as noted by the then official documents «shaken to its foundations the life of many peoples and nations and changed the face of the world." For the Soviet Union «the most important economic result of the Second World War» it was recognized the disintegration of a single, «all-embracing» world market, the formation of «two camps», with different historical perspectives. Although the real story went

more tortuous paths, but the disappearance at the end of the 1980s, of the «world socialist camp» with the restoration of a «single, all-embracing» global market by no means put a period on its fragmentation processes. Moreover, today it can be believed that the loss of Russia, the legal successor of the Soviet Union, of a number of advantages got after the Second World War, as well as the crisis of the Yalta world order opened up new opportunities to set the strategic goals to build the institutions of an alternative world economic order, together with the countries, who before, in the bipolar world were not ready for this kind of partnership. By law of the historical parallels and the result of this aggravating global tension it could be the formation of a number of economic and political poles, able to offer other than accepted today, solutions of the world problems. The scenario to resolve them on the basis of the hegemony of a single civilizational system has demonstrated significant weaknesses. The major among them — the existing both potential and temptation to build not harmonious but selfish, monopolized, unjust institutions of world trade, investments, and international relations.

It is also important to remember history. Generally, the three key participants of the Second World War meant «world domination» as its most important targets: both Germany and the United Kingdom, and the United States.

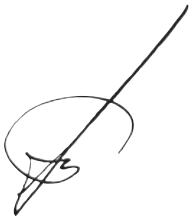
For Germany, it meant the establishment of their power, together with Japan and Italy over Eurasia and the colonial system of France and the UK, especially in Asia and Africa. For the UK it was the preservation of the empire, which had a global significance and relied on the dominance of the pound sterling in the world trade and settlements. For the US, it was a question of creating a new global monetary, financial and trade system based on the dollar, economic, scientific, technological and organizational leadership.

All the players focused on the «world domination» meant the removal of obstacles to its achievement. The structure of the obstacles was different for each participant. As well as the adequacy of estimates of these barriers and its abilities to overcome them. Today such stakes — on the world domination, are undoubtedly the anachronism. However, just as the British Empire was able to maintain more than 30 years, from 1913–14 to 1945, its influence despite of the economic power going away from under its feet, and today's world order, based on the present currency, technological and military dominance, will be held by its beneficiaries despite the changing world.

In this context, the main question now — whether the world could change to the new world order, explicitly multipolar, without such a terrible price as the world war paid for the reluctance of some to leave the scene, and the other to break into it, not paying attention to anyone's interests. Therefore, it is so important today the development of successful macroregional cooperation systems that are emerging on every continents and across the globe for a variety of reasons. And the unions are strong when based on the strength of the economic mutually beneficial partnership and compatible goals and values, their harmonious ensemble.

It should be said that for a genuine success of integration projects, there are necessary appropriate moral grounds. The now prevailing economic model fuels the

corresponding moral environment. Its features — the cult of consumerism and corruption, collaterality of responsible creativity, egoism and aggression. This matrix of values continues to infect the public consciousness and the traditional culture. To be successful the mega-uniting projects need a synthesis of new idea. It should link the future and the past, it will, no doubt, a great idea, motivating, sense-making going from the ideals of beautiful creativity, not from the objectives of the catching-up but from the orienting points of the faster development, not from war but from peace and harmony.



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"The Partnership of Civilizations"
Journal, Professor, RANS Academician

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The Partnership of Rising Civilizations: Summits of BRICS and SCO

To Accelerate the Pace of the Transition from a Model of Development Based on the Factors of Production and Investment, to the Innovative Model of Development

Part of the speech at the 17th General Assembly of the Members of the Chinese Academy of Sciences and the 12th General Assembly of the Members of the Chinese Academy of Engineering. June 6, 2014

Xi Jingping **—**
Chairman of the People's Republic of China

Currently, all Party members and people of all ethnic groups are striving for the completion of the building of a moderately prosperous society' in all respects and the realization of the Chinese Dream. The 18th CPC National Congress put forward an important plan for the implementation of an innovation-driven strategy, and emphasized that scientific and technological innovation is pivotal to improving social productivity and the comprehensive national strength, so it must be put in a core position in our overall national development. This is an important strategy made by the CPC Central Committee, following a general analysis of the domestic and international situations, and of the overall picture of our development.

The 21st century heralds a new round of scientific, technological and industrial revolution. Global scientific and technological innovation has exhibited new trends and features. Cross- disciplinary integration is accelerating, new disciplines continue to emerge, and scientific frontiers keep spreading. Significant breakthroughs are being made or expected in basic scientific fields such as the structure of matter, the evolution of the uni-

verse, the origin of life and the nature of consciousness. Widespread diffusion of information, biological, new-material and alternative-energy technologies has brought about a green, intelligent and ubiquitous technological revolution.

The boundaries between research into basic and applied sciences, technological development and industrialization in the traditional sense are becoming increasingly blurred. The chain of scientific and technological innovation has become more flexible, technology upgrading and conversion have become quicker, and industry upgrading continues to speed up.

Scientific and technological innovation is constantly transcending geological, organizational and technological limitations. It intensifies the competition between innovation systems and makes innovative strategic competition more important in the competition for comprehensive national strength. Scientific and technological innovations, like a fulcrum which is said to be able to lever the earth, always create miracles. This has been proved in the development of contemporary science and technology.

In face of the new trends of scientific and technological innovation, the world's major countries are seeking to make new scientific and technological breakthroughs and gain competitive edges in future economic as well as scientific and technological development. We cannot afford to lag behind in this important race. We must catch up and then try to surpass others.

Since the introduction of the reform and opening-up policy some three decades ago, China has made remarkable achievements in social and economic development. Its economy has leapt to No. 2 in the world, and many of its major economic indices rank high on the world's list.

Nevertheless we must be clear that our economy, though large in size, is not strong. Its growth, though fast, is not of high quality. The extensive development model featured by economic grorvth mainly driven by factor inputs such as natural resources is not sustainable.

Now, the total population of well-off countries in the world is about 1 billion, while China has more than 1.3 billion people. If we are all to become modernized, the well-off population must more than double. If we are to consume as much energy in production and daily lives as the present well-off people do, all the existing resources in the world would be far from enough for us! The old path seems to be a dead end. Where is the new road? It lies in scientific and technological innovation, and in the accelerated transition from factor-driven and investment- driven growth to innovation-driven growth.

A few days ago, I read an article which argued that the Third Industrial Revolution would be a Robot Revolution. It asserted that robots would change the pattern of the global manufacturing industry, and China would become the world's largest robot market. The International Federation of Robotics predicted that the Robot Revolution would create a market value of trillions of US dollars.

Hardware and software for producing robots are becoming increasingly mature, the production cost keeps dropping and the functions robots can perform are more diversified thanks to the integration between robot technology and the new generation of information technology, such as big data, cloud computing and the mobile Internet, and the rapid develop-

ment of 3D printing and artificial intelligence. Military unmanned aerial vehicles, self-driving cars and home-service robots have been put into application. Some artificially intelligent robots have pretty sturdy self-thinking and learning ability.

Robots are dubbed "pearls on the crown of the manufacturing industry." A country's achievement in robotics research, development, manufacturing and application is an important yardstick with which to measure its level of scientific and technological innovation and high- end manufacturing. Major robot-producing companies and countries have stepped up their efforts to gain advantages in terms of technology and markets.

I couldn't help wondering: China will be the largest robot market in the world, yet can its technology and manufacturing capability sustain it through the competition? We should make better robots and seize bigger market shares. There are many such new technologies and new fields. We should size up the situation, take the overall picture into account, and make plans as soon as possible and implement them solidly.

To carry out the innovation-driven strategy, the basic thing for us is to enhance our independent innovation ability, and the most urgent thing in this regard is to remove institutional barriers so as to unleash to the greatest extent the huge potential of science and technology as the primary productive force. Most importantly, we should unswervingly follow an independent innovation path featuring Chinese characteristics, stick to the guiding principles of independent innovation, leap-frogging development in key sectors, and development supported by science and technology and oriented towards the future, and speed up the pace of building an innovative country.

Years of painstaking efforts have resulted in great progress for China in science and technology, and China has entered the advanced ranks in the world in some important fields. In certain fields, it has become a "forerunner" or "parallel runner" instead of a "follower." China has entered a vital period, when new industrialization, application of information technology, urbanization and agricultural modernization are forging ahead simultaneously, in parallel or interactively. This has created ample space and an unprecedentedly strong momentum for independent innovation.

I have repeatedly said that the great rejuvenation of the Chinese nation can in no way be realized easily. In fact, the stronger we become, the greater resistance and pressure we will encounter. That's why we say that timing and resolution are vital, as historical opportunities are often ephemeral. Now we have an important historical opportunity to promote scientific and technological innovation. We must not miss it, but seize it tightly.

We are blessed with a solid material foundation laid over the 30-plus years of reform and opening up, and the fruits of persistent innovation, which are favorable for the innovation-driven strategy. Hence, we should take the initiative and adopt a proactive strategy. As to scientific and technological policies of great strategic value to our countiy and nation, we should make up our minds and act without any hesitation. Otherwise, we will let slip the historical opportunity, and may even have to pay a higher price.

In March 2013 I talked about scientific and technological innovation at a group

discussion with scientists during the First Session of the 12th National Committee of the Chinese People's Political Consultative Conference. Generally speaking, the foundation of our scientific and technological innovation is not solid enough; our independent innovation ability, especially in the area of original creativity, is not strong. We still have to depend on others for core technology in key fields. Only by holding key technology in our own hands can we really take the initiative in competition and development, and ensure our economic security, national security and security in other areas.

We cannot always decorate our tomorrows with others' yesterdays. We cannot always rely on others' scientific and technological achievements for our own progress. Moreover, we cannot always trail behind others. We have no choice but to innovate independently.

Facts prove that it is self-sufficiency that has enabled the Chinese nation to stand among the world's independent nations, and independent innovation is the only path to the summit of science and technology. With this understanding, we should waste no time in making a difference. We cannot keep on talking year in and year out but do nothing about making a drastic change.

Of course, we don't mean to make independent innovation behind closed doors or all by ourselves. We shall never reject good experiences from others, from any part of the world. We should engage in international scientific and technological exchanges and cooperation more proactively, and make good use of both domestic and international resources.

Science and technology are global and time- sensitive, so we must have a global vision when we move forward. Currently, important scientific and technological breakthroughs and their accelerated application are highly likely to reshape the global economic pattern, and change the nature of industry and economic competition.

In traditional international playgrounds, the rules are set by others, and we play games by the established rules. Seizing the important opportunities made available by the new scientific, technological and industrial revolution means that we should be part of the games, and yet we can play a major role in the construction of the playgrounds, even at the beginning, so that we can make rules for new games. We will not have a chance if we are not capable enough to be part, indeed a major part, of the construction team. Opportunities are always for those who are fully prepared, and for those who are independent-minded, aspiring and persevering. We cannot move forward by leaps and bounds unless we do so with innovation.

Geo-scientist Li Siguangtel said, "Science exists because of new discoveries made by it. It would die without new discoveries" [1]. French writer Victor Hugo said, "Things created are insignificant when compared with things to be created.'' The direction of our scientific and technological development is innovation, innovation and more innovation. We should attach great importance to breakthroughs in basic theories, step up the construction of scientific infrastructure, continue to push ahead with basic, systematic and cutting-edge research and development, and provide more resources for independent innovation. We should actively integrate and make good use of global innovation resources. In response

to our current and future needs, we should selectively participate in the construction and use of the world's major scientific appliances, and research and development bases and centers.

We should seize strategic opportunities in key scientific and technological realms, select strategically important segments and priority areas relevant to overall and long-term development, and promote collaborated innovation and open innovation through effective and rational resource allocation. We should build an efficient and strong supply system of key generic technology, work hard to make great breakthroughs in key technology and hold key technology in our own hands.

"A person with sharp ears can hear sounds others cannot, and a person with keen vision can see things others cannot. "[2] There is no end to scientific and technological innovation. Scientific and technological competition is like short-track speed skating. When we speed up, so will others. Those who can skate faster and maintain a high speed longer will win the title. Xun Zi [3] asserted, "If a gallant steed leaps only once, it can cover a distance of no more than ten steps; if an inferior horse travels for ten days, it can go a long way because of perseverance. If a sculptor stops chipping halfway, he cannot even cut dead wood, but if he keeps chipping, he can engrave metal and stone.

Our scientists and engineers should bravely shoulder their responsibilities, overtake others, and find the right direction, to which they should stick. They should have the courage and confidence to blaze new trails, overcome difficulties and seek excellence, and audaciously make world-leading scientific and technological achievements.

The implementation of an innovation-driven development strategy is a systematic project. Scientific and technological achievements can generate real value and pay off only if they meet the needs of the country, the people and the market, and only after they have gone through the stages of research, development and application.

I have been wondering about the reason why our science and technology gradually lagged behind from the late Ming (1368–1644) and early Qing (1644–1911) dynasties. Studies show that Qing Emperor Kangxi [4] was very interested in Western science and technology. He invited Western missionaries to give him lectures on astronomy, mathematics, geography, zoology, anatomy, music and even philosophy. More than 100 books on astronomy were introduced to him. When did he study these subjects, and for how long? He continuously studied them for two years and five months sometime between 1670 and 1682.

He began his study quite early, and learned quite a lot. The problem was that, at that time, although some people were interested in Western learning and learned quite a lot of it, they did not apply what they had learned to social and economic development. Rather, they simply talked about the knowledge.

In 1708 the Qing government asked some foreign missionaries to draw a map of China. It took them ten years to complete The Map of Imperial China - the first of its kind at that time. However, this important work was confined to the imperial storehouse as a top-secret document, away from the public eye. Therefore, it had no impact on social or economic development. But the Western missionaries who had drawn

the map took the data back to the West and had it published. Hence, for quite a long time the West knew China's geography better than the Chinese people did.

What can we learn from this story? It means that science and technology must be combined with social development. No matter how much one has learned, it cannot possibly have any impact on society if the knowledge is merely put aside as a novelty, refined interest, clever trick or doubtful craft.

For years, our scientific and technological achievements could not be smoothly converted to productivity. Why? Because there were institutional bottlenecks in the scientific and technological innovation chain and loose connections between the various links in the innovation and conversion process. It is like a relay race: The second baton carrier is not there or has no idea of where to head when the first arrives.

To solve this problem, we must further scientific and technological system reform, change mindsets and remove institutional barriers hindering scientific and technological innovation, properly handle the relationship between government and market, and better integrate science and technology with social and economic development. We must open a channel through which science and technology can boost industrial, economic and national development. We must spur innovation with reform, accelerate the construction and improvement of a national innovation system, and let the well water of innovation gush out fully.

If we compare scientific and technological innovation to a new engine driving our development, reform is an indispensible ignition system with which to start the engine. We should take more effective measures to improve the ignition system, and let the new engine run at full speed.

While carrying out the reform of the scientific and technological system we should prepare ourselves to solve difficult problems, and implement the relevant decisions made at the Third Plenary Session of the 18th CPC Central Committee. We should put scientific and technological innovation in the center of our overall national development, speed up the preparations for the innovation-driven development strategy, and draw road maps and timetables for important tasks in this regard.

The reform of the scientific and technological system should be carried out at the same time as social and economic reform. We should reform the planning and resource allocation mechanism for the national scientific and technological innovation strategy, improve the performance evaluation system and incentive policies for officials, further cooperation between industries, universities and research institutes, and solve key problems obstructing the conversion of scientific and technological achievements as soon as possible.

We should vigorously improve coordination in scientific and technological innovation so as to avoid fragmentation and isolation, as well as overlapping and repetition in campaigns launched by departments in various fields. We should set up a national innovation system within which experts in all fields can interact and collaborate to achieve high efficiency.

We should improve the infrastructure of scientific and technological innovation, build and improve the national scientific and technological reporting system, and make innovations in the survey system, and national scientific and technological

management information system as soon as possible, so as to maximize resource sharing. We should deploy the innovation setup around the industrial setup as well as the capital setup around the innovation setup. We should focus on national strategic goals and pool resources to tackle key scientific and technological problems pertaining to the national economy and the people's livelihood.

We should move faster to improve the basic research system, with the focus on cutting-edge basic research, key common technology, and high-tech for public welfare and that of strategic importance. We should double our efforts in completing important national scientific projects, and race to the front of international scientific research. While centering on scientific and technological innovation, we should also accelerate innovation in product, brand, industrial structure and business model. We should carry out the innovation-driven strategy throughout the modernization process.

While furthering the reform of scientific and technological systems, we should pay attention to a magic wand vital to our success — our socialist system. We have made many noticeable achievements in science and technology this way. This practice must not be given up! We should let the market play a decisive role in allocating resources and the government plays its role better. We should step up planning and coordination as well as collaborative innovation. We should pool our efforts to accomplish big tasks, and focus on important, cutting-edge and basic research.

"To accomplish extraordinary feats, we must wait for extraordinary persons." Competent personnel are the most crucial factor for scientific and technological innovation. Respecting them has long been a fine Chinese tradition. As described in The Book of SongsBring Wen of the Zhou Dynastyrespected competent people, who hence flocked to him, so his country became strong and prosperous. They are the most important factors for a country's long-term development. We need them for our great national rejuvenation. The more talented, the better; the more knowledgeable, the better.

China is a country rich in manpower and wisdom. The wisdom of our 1.3 billion people is our most precious possession. Knowledge is power, and competent personnel shape the future. If we want to get to the forefront of global scientific and technological innovation we must discover, nurture and retain such people throughout the whole process of innovation. We must train a large number of high-caliber, creative scientists and engineers.

We are proud of having the greatest number of scientists and engineers in the world. Nonetheless, we face a serious structural deficiency of innovative scientists and engineers, particularly world-class and other leading and high-caliber ones. The education and training that our engineers have received so far are not geared towards production and innovation.

"If you want one year of prosperity, then grow grain; if you want ten years of prosperity, then grow trees; if you want one hundred years of prosperity, then you grow people".[5] We should make human resource development a top priority for scientific and technological innovation. We should improve the mechanism for training, recruiting and using competent personnel. We should work hard to foster a contingent of world- class scientists and engineers and

other leading and high-caliber ones, as well as high-level innovation teams. We should focus on training young innovative scientists and engineers for the front lines.

We should perfect our competence- nurturing mechanism according to personnel development laws. "We should respect a tree's nature, and let it grow freely".[6] We should not seek quick success and instant benefits, or try to help young shoots grow by dragging them up. We should encourage both competition and cooperation, and promote a rational and orderly flow of competent personnel. We should attract outstanding experts and scholars from overseas for our scientific and technological innovation. We should create a social environment that encourages innovation and values success while tolerating well-intentioned failure. We should improve the competent-personnel evaluation system and create ample space for such people to give full play to their talents.

The future belongs to the young. Innovative young people are the source of our creativity and the best hope for our scientific and technological development. "I beg Old Man Heaven to bestir himself, and send down talented people of more kinds than one." [7] Academicians should not only be pioneers in scientific and technological innovation, but also guides for young people. I hope that they will shoulder their responsibility in nurturing young scientists and engineers, instruct them through words and actions, and continuously discover, train and recommend competent personnel, so that innovative people can stand out from the crowd. Young scientists and engineers should be dedicated to science, develop innovative thinking, tap innovative potential and enhance innovative ability'. They should continue to push ahead while learning from previous generations.

Notes

1. Li Siguang (1889–1971) was a famous Chinese geologist and one of the founders of China's geomechanics.
2. Li Siguang: "What Have Geologists Done in the Scientific Frontline?", The Complete Works of Li Siguang, Vol. 8, Chinese ed., Hubei People's Publishing House, 1996, p. 243.
3. Xun Zi (c. 325–238 BC) was a philosopher, diinker and educator of the late Warring States Period. He believed that man could conquer nature, and that human nature was evil. His book Xun Zi summarizes and develops the philosophical thoughts of Confucianism, Taoism and Mohism in the pre-Qin Dynasty period.
4. Emperor Kangxi (1654–1722) ruled the Qing empire from 1661 to 1722.
5. Sima Qian: Records of the Historian (ShiJi). Sima Qian (c. 145 or 135-? BC) was a historian and writer in the Western Han Dynasty. The book, China's first biographical-style historical and literary masterpiece, covers more than 3,000 years from the legendary Yellow Emperor to Emperor Wu of the Han Dynasty.
6. The Book of Songs (Shi Jing) was the earliest collection of poems in China. It contains 305 poems collected over some 500 years from the early Western Zhou Dynasty (c. utli century-771 BC) to the middle of the Spring and Autumn Period (770–476 BC).
7. Gong Zizhen: Miscellaneous Poems of 1839 (Ji Hai Za Shi). Gong Zizhen (1792–1841) was a thinker, historian and poet in die Qing Dynasty (1644–1911).

Ideals and the Highest Standards of the Silk Road

Answers to questions the newspaper People's Daily — Rénmín Rìbào, August 3, 2014

Alexander I. Ageev—
Director General of the Institute for Economic Strategies RAS, Doctor of Economics, Professor, RANS Academician

The importance of Russia's participation in the construction of the "Silk Road Economic Belt".

"In today's geopolitical and geo-economic culture it is customary to take into account the effect of mutual development not only of partners of cooperation or competition, but also mutual development as the subjects proper and the external environment of their activities. Indeed, since the early 2st century in the humanitarian and economic culture, in political thinking it began to penetrate the principles of quantum mechanics, relativity theory and complexity that fundamentally changed the scientific picture of the world in the first half of the 20th century. At least almost every reader of newspapers knows now about the "butterfly flapping wings effect".

In this context, the world in the full sense of the word today, is interdependent, and countries are interdependent and affect each other, even in the role of a passive observer.

So before to evaluate the importance of Russia for the Silk Road Economic Belt project it should be recalled the outlines of the strategic initiative.

It, as we know, this initiative was announced in September 2013 in Astana by the PRC Chairman Xi Jinping. It was intended to give impetus to the balanced development of the West and East, not only in China, not only in Central, South and West Asia, but the whole Eurasian continent. Moreover, it is easy to see an even broader orientation of the initiative — its horizons go to the Asia-Pacific and European economic "rings" that is obvious.

What is less obvious — also to Africa and South America.

It was also stressed that this initiative has nothing to do with external compulsion to cooperate, and comes from natural motives for cooperation. It is precisely this "naturalness" that is already gaining ground on the continent, whether it is trade and economic ties between China and the countries of Central Asia, Russia and Europe. They constitute an already established foundation for a new wave of cooperation.

However, the achieved scale of trade and economic cooperation is absolutely insufficient from a height of both opportunities and threats, and prospects.

That is why in almost all directions (with Russia, the countries of South-East Asia, Central Asia), the Chinese leadership made important statements of intent already by 2020 to raise the level of mutual trade and investment not less than twice. With an annual GDP growth rate of 7–10 percent in China — these figures are absolutely natural for China and certainly attractive to all its partners.

Such is the brief philosophy and arithmetic of the One Belt, One Road initiative.

At the level of philosophy, without a doubt, it is shared by all to whom it is addressed.

At the level of practical implementation, and also without a doubt, its implementation will face obstacles. And surprisingly, it is Russia that could play a key role in neutralizing most of the obstacles for the SREB construction.

Among these obstacles is, first and foremost, of particular note to name three.

First, the tense military and political situation around the land, water and air routes of the project. As you know, historically, at least three land routes of the Silk Road formed. On the two of them there are already sparked sharp clashes with the prospect of aggravation.

Those routes that are associated with Russia and Kazakhstan are among the least dangerous and the shortest. However, it should be noted that the increase in tension on the western borders of Russia and Central Asia, the introduction of the U.S. and the E.U. sanctions mean the attempts of global competitors proactively to restrict access both of Russia and China on the European market, both economically and physically.

Second, the economic profitability of the project. To reduce it simply to transit infrastructure of cargoes from East to West, and, vice versa, is an understandable, but narrowed idea of benefits. Only under the full economic and social development of space, each kilometer of existing and new thoroughfares will be a source of economic prosperity. High design capacity of each kilometer of several threads of the Silk Roads — that is the target objective, which is behind the OBOR initiative.

Third, the institutional compatibility. Among potential SREB project participants there are countries representing several civilizations. China — as rightly once remarked Lucien Paye — the first French Ambassador to China, a friend of de Gaulle, "this is a civilization that passes itself off as a country." Since that time when most modern SREB project participants were part of the same empire, many centuries passed and layered a set of nuances in cultures and life experiences of now separate states. In addition to the sympathies it has accumulated a lot of "phobias", and most importantly — developed the features of internal structure that require efforts to agree.

However, there are more factors here in favor of SREB than barriers. The main among them — is a deep clarity and attractiveness for a post-Soviet man of historical experience of China. There are reasons to believe that in the Chinese society there are deep sympathies for their north-eastern neighbors.

It should also be recalled that at the beginning of the 19th century, when in Europe it was over a series of Napoleonic wars, China produced 33% of world gross product, while Germany, Great Britain and France combined — 14%. The European traders paid for Chinese goods with silver. However, in 1913, China produced less than 9% of the world gross product, and in 1950 — less than 5%. But the years pass, and new-generation of fighters appear. History forges them. The union with the USSR allowed starting a planned national project of building socialism. Let it be though "70 percent right and 30 percent erroneous." In 2000, the specific share of China in the world economy reached 17.5 percent. Today, China has practically returned to the two-century old status.

By itself, such a historical zigzag, and the decline and recovery, is instructive, worthy of the deepest respect. For modern Russia this lesson is especially significant. The development is subject to the inexorable laws of cyclicity. China's aspiration for a "moderate well-off" is willing to share, obviously, all the SREB partners. And in cultures of all partner countries there will inevitably be coming to the fore those elements that favor openness, innovation, flexibility, initiative, a wide participation, and search for harmony.

There is another aspect — strategic. Each country and each strategic project has its own area of vital interests, so to speak — "strategic borders", extending far beyond territorial boundaries. Today these borders, in fact, extend to space and oceanic latitudes. To defend the interests of the country alone under such scale of interests — it is difficult, if possible at all. By the example of the United States it can be seen clearly. The famous work of P. Kennedy about the rises and falls of the great powers shows the fundamental fact and the reason for the decline of the great — overload by military costs, excessive efforts to achieve the military dominance. Therefore, to provide "small well-being ", as well as any scale of prosperity, one can not only by increase in the military and technological power as by increasing the number and quality of the Allies, the volume and diversity of cooperation.

And the unions are strong when based on the strength of the economic mutually beneficial partnership and compatibility of goals and values, their harmonious ensemble.

So if the role of Russia is assessed in all these four aspects in the implementation of the SREB, then it is quite organic. First, as a reliable and significant in terms of volumes supplier of raw materials and fuel for the growing Chinese economy.

Second, as a partner in the development of an innovative economy and infrastructure of the "Silk Road."

Third, as a partner in providing military and political security and resolving key collisions, important to China and Russia.

Fourth, as an associate in the transition of their countries and the world as a whole to a new stage of evolution on the principles of peace, harmony, growth of wisdom and knowledge.

The Importance of the Project for the Development of Russia.

The SREB Project is able to give impetus to the transformation of Russia on principles consistent with its historical experience and the core value system. Economy of the country that established over the past quarter-century is one-sidedly built mainly in western, first of all — the Western European economic area, and is linked to the dollar exchange rate system. A considerable amount of powers in the field of regulation has been liberalized and significant assets — privatized. It enviably followed from these properties the leveling down of the requirements for the quality of education and science, the armed forces and defense industry, limitation of the horizon of responsibility in world affairs, a weak interest in the integration process not only with the eastern neighboring areas, but even with the CIS countries. This economic model is not only exhausted itself, but from the very beginning, when it was made a political choice in its favor — "shock therapy" was not the best and most satisfactory scenario of development. Let me recall that the "Chinese Path" was considered as one of the three scenarios then in 1989–1991. It was, unfortunately, rejected by the then authorities of the country not yet divided.

In this regard, the importance of the SREB project for the Russian is threefold.

First, it means a change of the vector of economic dynamics of Russia in favor of the East and the eastern regions of the country.

Second, it means moving to a model of economic development, more relevant to the realities and needs, rather than the dogmas and its outmoded attachments.

Third, it means launching powerful energies of co-development through the development of little-developed space and its saturation with the communication networks.

What Cities Will Be a Part of the SREB?

Strictly speaking, the philosophy of SREB is not limited to neighboring cities, for example, with the Russian-Chinese border. This is too literal interpretation of the project. The Silk Road is the symbol. It emphasizes, of course, the flow of silk from ancient China to the rest of the world. And today's China is the world's largest exporter. But on this road it has always been a reverse flow. It is implied that they must be balanced.

Today the «silk metaphor» means all types of communications between China and the world. Including sea and space. Hence — it makes no sense to limit the project only to closely adjoining infrastructures and enterprises to rail and motor roads. Thus, the Northern Sea Route (NSR) is also a part of the project. Growing in recent years, the volume of Chinese traffic clearly demonstrates this. Accordingly, Tiksi and Salekhard, Norilsk and Kazan, Kurgan and Omsk, and not only Khabarovsk, Irkutsk and Blagoveshchensk — these are all cities — potential and very promising SREB project participants. After all, the economy is omnipresent. Apparently, the configuration of Russian cities involved in SREB, will develop naturally and partially competitively.

What are the Benefits for Them?

They are obvious: increase in investment, employment, quality of life, range of vision and communication.

The SREB Project could possibly rely on its standard of investment and social activity and social-environmental responsibility. After all, there are known examples of predatory and rapacious attitude towards nature of many corporations which value only the profit and here-and-now success. The SREB project can and should be guided by the very highest demands on the economy, leading to the development of the personality, harmonization of its relations with others and nature. The "silk" metaphor is opposed to the metaphor "iron", "road" — emphasizes the ideal of development and not regress.

In other words, instead of strategies of "economic killers" undermining the regions and countries, depleting them, leading to the economic and spiritual impoverishment of the population, the SREB project can introduce into the life the original strategies of prosperity and beauty, that Chinese and Russian cultures are so rich in. One of the strategically important topics here is the "organic farming." The SREB partner standard, for example, might require only the use of technologies with reduced impact on nature and the cultivation of environmentally friendly products only.

Thus, the very inclusion of projects in the mega-project SREB would set the highest standards of quality with respect to products, management, and co-operation.

What Role will Russia Play in Building SREB?

The OBOR initiative is currently under active discussion. It has not found legal and organizational clarity yet. Therefore, the role of Russia today can be described in the context of probability and taking into account the principle announced by the Chairman of the PRC of naturalness and avoiding of anybody's hegemony in the SREB construction.

Obviously, the SREB concept is a framework. The main thing in it is the desire for coordinated and balanced development. In itself the objective is to coordinate the development of several very large, large and small countries — is a challenge. It is in its complexity matches in with the program of extravehicular activity. Therefore, for all the countries — participants in the first place, it is important to decide on the resources and institutions of developing a real goal-setting and the inclusion of all stakeholders of this huge project. Russia, developing its eastern territories with regard to designs and prospects of the SREB can make a major contribution to its success.

Second, a special responsibility of Russia — contribution to the development of transport infrastructure. It is about the revival of the BAM, building power of the Northern Sea Route, building of the Vostochny Cosmodrome, construction of the newest logistics hubs, etc.

Third, it is necessary a careful study of prospects and formats of cooperation in the development of mineral resource base, taking into account the harmonized interests of the SREB parties.

Fourth, providing security on the Eurasian continent; and the sea routes that enwound it. Potentially dangerous situations are many here. Suffice it to mention Afghanistan.

From practical subjects that affect the formation of the extent of Russia's participation in the SREB project, it is crucial to link it with the achieved and planned status of the Eurasian Economic Union (EEC). In the long term, not so, perhaps, distant, the SREB and the EEC integration process-

es may successfully resonate. The evaluation of the SREB project as an alternative to the EEC is an obvious simplification. The modern economy has the nature field in which the different "fields of cooperation" may well overlap.

What are the SREB Prospects?

In short — they are excellent. The reason for such an assessment is partly irrational, partly — pragmatic. The first comes from the feeling that both China and Russia, and other countries are objectively interested in creating the SREB, experience internally impatience and dissatisfaction with the usual course of events. It is time to do something great. The world indeed is going through a serious and comprehensive crisis that provokes a lot of threats, sudden and predictable. Changes are required. Someone recently had hopes that someone the only one, the strongest will cope with the increasing difficulties. But the power is not just about money and weapons, but also the truth. The truth of life.

If the regulators of our existence do not lead only to prosperity, but also to man-made crises, wars, conflicts, all sorts of social pathologies, then it is required to change something in how economy and politics is arranged in the world. The margin of safety in the Peace of Westphalia or the Yalta-Potsdam is not infinite, and attempts to undermine them are an increasingly insistent.

In this context, the OBOR is the initiative of such transforming scale. It is interesting and positive by that.

The second reason — pragmatic. In improving the coordination of the markets there is a significant growth potential of productivity. Today, markets are built largely geographically unnatural. As an example — the most popular now "Maritime Silk Road" is through the Suez Canal, and therefore twice as long and expensive. There are a lot of examples of such kind. Too many parasitic monopolies are on the now communication lines. In addition, there are too many obvious and unobvious barriers to cooperation, and again bringing rent to the players who straddled them. A special problem is the contradiction between the real and financial sectors. It also requires better coordination and the removal of trade and economic barriers for equitable development.

One cannot but mention the currency area, which may arise between the countries — participants of the SREB project.

The improvement of coordination is highly important also in matters of security, prevention and surmounting the effects of natural calamities.

In any case, the success of the project will be the consequence of its initial conceptual elaboration, negotiating skills of the parties, the resistance to various kinds of stress tests, launching the efficient institutions of implementation.

It should be said that for the genuine success of the SREB project there are necessary the relevant moral grounds. The now-dominant economic model fuels the corresponding moral environment. Its differences — the cult of consumerism and corruption, the collaterality of responsible creativity. This matrix of values continues to infect the public consciousness and the traditional culture on all the post-Soviet space and in many respects - in China. The struggle is going with this value-trend. In some countries, the virus is opposed by the revival of the religious value systems, in others there

are partially survived or revived the Soviet institutions, in third — there are introduced tough authoritarian institutions, in fourth there is an open struggle for the ideals of the future. To be successful, the mega-uniting projects require a synthesis of a new idea.

It should link the future and the past, it will, no doubt, be a big idea, motivating, sense-making, going from the ideals of beautiful creativity, not from the objectives problems of the catching-up but from the reference points of the faster development. The catching-up always loses.

International planetary defence system "Citadel"

Concept for creation

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Introduction

The present concept provides a brief description of the asteroid-comet hazard (ACH) and main approaches to creation of an international Planetary Defence System (PDS) "Citadel" for ensuring the Earth safety.

The existence of the ACH was scientifically substantiated at the end of the 20th century. It was shown that collision of a many-kilometre celestial body with the Earth will immediately destroy the civilisation or throw its development back for centuries. Bodies of tens and hundreds meter size can generate tsunami that will wash away coastal settlements if they fall down to the ocean water area. If they fall down to the land area they can destroy a big city or even a state, disrupt telecommunication and energy services, damage nuclear and chemical plants, storehouses for toxic waste products, etc.

That is why, scientific. public and governmental institutions in many countries of the world and also international organisations (United Nations Organisation, Parliamentary Assembly of the Council of Europe, Organisation for Economic Coop-

eration and Development and others) pay growing attention to this problem.

Since the ACH is an extremely serious risk factor for the civilisation, the development of measures for ACH prevention should become an important task for the mankind in the 21st century. The implementation of this task appears realistic since most PDS components — rocket and space technologies, nuclear weapons, communication, navigation and control systems, etc. — have been created. Many of these components were developed for military purposes. Now there is a unique opportunity to use them not for destruction but for protection of the mankind.

It is clear that the PDS should be developed by joint efforts of the whole mankind. Thus the Concept of the Creation of an International PDS "Citadel" (presented here in brief) is built on research and development made by specialists in different countries. Detailed description of various aspects of the PDS development is presented in their works. References to them are included in the list of publications in the Bibliography.

1. Asteroid-Comet Hazard

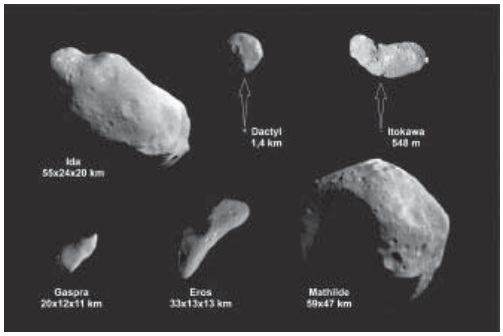
1.1. ASTEROID AND COMET CHARACTERISTICS

Asteroids

The name "asteroid" ("starlike") comes from Greek words "aster" — star and "eidos" — like. The name was given to small bodies in the Solar System which are seen like stars even through a telescope because of their relatively small dimensions.

Asteroids are stone, stone-iron or iron bodies of irregular shape and the size from few meters to 1000 km *(Fig. 1)*. Their density is from 1 to 6 g/sm^3.

Fig. 1. *Asteroid's photos made by spacecrafts (Photo: NASA, JAXA)*

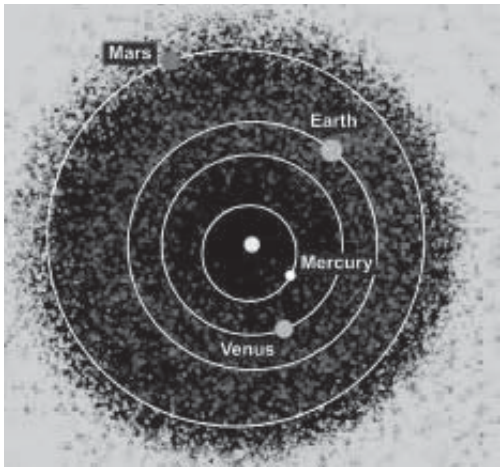


Most asteroids are located in the Asteroid Belt that lies between orbits of Mars and Jupiter (green dots in *Fig. 2*).

However, some asteroids have orbits nearing the Earth orbit and even crossing it. They are named near-Earth asteroids (NEAs) (red dots in *Fig. 2*).

Periodically NEAs collide with our planet and this leads to catastrophes of

Fig. 2. *Asteroid locations on 11.11.2011 (Minor Planet Center Data)*

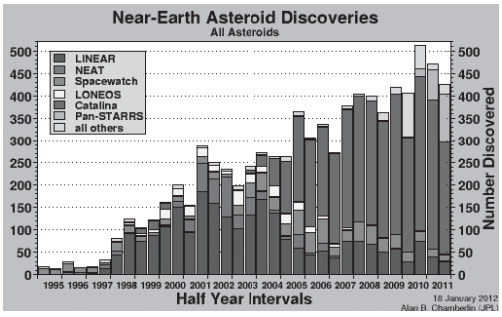


different scale. The velocity of NEAs collision with the Earth is estimated from 12 to 50 km/s.

The number of NEAs of more than 50-meter size (close to the size of the Tunguska meteorite that exploded above the Siberian Taiga in Russia in 1908) is about 2 million. Only about 9000 of them have been discovered during the 17-year period of running the NEA Observation Programmes *(Fig.3).* The majority of them is discovered in the USA within the limits of the program «Spaceguard survey».

Therefore, we know orbits of a negligible part of all NEAs. *Consequently, any moment there is a threat to come into collision with an unknown asteroid.*

Fig. 3. *NEAs Detection Dynamics*



Comets

The name "comet" comes from the Greek word "kometes", which means "star with a tail". It refers to small bodies of the Solar system, which consist of a nucleus and a gas- dust cover surrounding it. Comet nucleus is a mixture of water ice and dust with trapped volatile substances. These substances start to evaporate while nearing the Sun and a gas- dust cover — "coma" appears around the nucleus. Its diameter can reach 2 million kilometres.

The nucleus and the coma comprise the comet head. Under the light pressure, the gas-dust component starts to move away from the nucleus in the direction opposite to the Sun and stretches into a long cloud named comet tail *(Fig. 4).* Its length can reach 200 million kilometres.

Comet nuclei are bodies of irregular form *(Fig. 5),* from hundreds of meters to 50 kilometres in size, possibly even larger. Their surface is covered by a dust crust up to 1 m thick.

The density of their substance is from 0.1 up to 1.5 g/cm^3. The density of the head and tail gas-dust component is negligibly low.

Fig. 4. *Hale Bopp comet*

Fig. 5. *Comet nuclei photos made by spacecrafts (Photo: IKI RAS, NASA)*

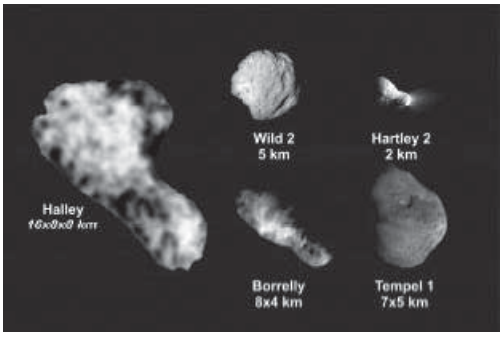


Fig. 6. *Areas of comet nuclei concentration within the Solar System and orbits of some comets*

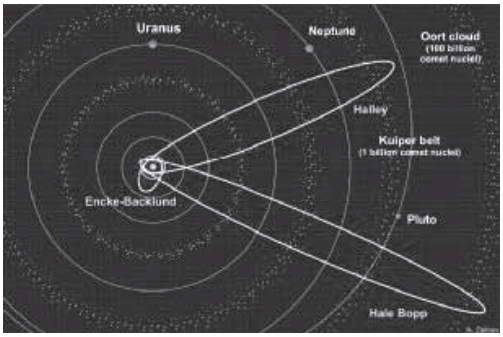
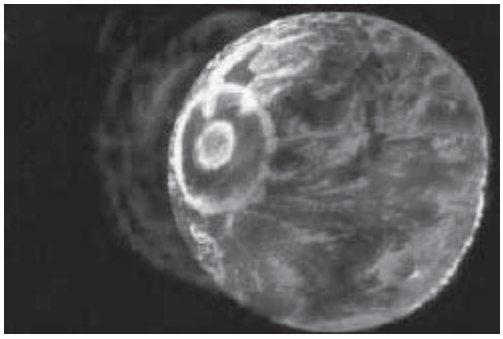


Fig. 7. *Global catastrophe 65 mln year ago (A. Kring and D. D. Durda, 2003)*



Most comet nuclei are located beyond the Solar System in the Oort cloud, in the Kuiper belt, lying beyond the Neptune orbit and also between the massive outer planets *(Fig. 6)*. The Oort cloud and Kuiper belt include more than one hundred billion comet nuclei.

Comet nuclei change orbits and move towards the Sun because of the gravitational perturbation caused by massive planets and close stars and also because of comet collisions. Some of them, named near-Earth comets (NECs), are nearing the Earth. These comets can collide with the Earth at velocities from 12 to 72 km/s.

About 90 NECs have been discovered by now. The whole number of NECs of more than 100 meter size can exceed 20 thousand.

1.2. CONSEQUENCES OF ASTEROIDS AND COMETS NUCLEI COLLISIONS WITH THE EARTH

Collisions with the Earth cause catastrophes of global, regional and local character depending on dimensions, velocity and other parameters of asteroids and comets nuclei.

Global Catastrophes

During the last 600 mln years, about 60 collisions with celestial bodies of more than 5 km diameter have taken place and led to global catastrophes. One of them occurred in the area of the Yucatan Peninsular 65 mln years ago. The Chicxulub crater was formed as a result of the impact of a 10 km size celestial body. This impact caused the extinction of 75% animal and plant species including dinosaurs.

There is a theory that the Noah's Flood could be the result of a celestial body falling on the ocean, which caused a giant tsunami that swept across continents.

Regional Catastrophes

Collisions with bodies of size from hundreds of meters to kilometres, which take place in the periods from tens to several hundred thousand years lead to regional catastrophes. One of them took place, 12,900 years ago when a comet nucleus of several kilometres in diameter exploded above North America. As a result of the explosion, biosphere of the continent was burnt down and together with it the culture of ancient Indians — Clovis — was terminated.

Local Catastrophes

Local catastrophes caused by objects of tens to hundreds meter size take place in periods from tens to several thousand years. The destruction area can exceed territories of largest megalopolises and even small countries. The falls of Arizona and Tunguska meteorites might serve as examples of this phenomenon.

There is the Barringer Crater in Arizona (USA). It is 1.3 km in diameter and 170 m deep. It was formed about 50 thousand years ago after the fall of an iron-nickel asteroid which was 40–60 m in size and had a mass of 300 thousand ton.

The explosion energy of the Tunguska Meteorite was from 10 to 100 megaton (Mt) in trotyl equivalent. It leveled near 2000 km2 of forested taiga.

This exceeds twice the territory of the City of Moscow. It also caused the taiga conflagration that continued about two years.

Impacts for the Last 100 Years.

During the last 100 years falls of four celestial bodies of up to 40–60 m size on the Continental Part of the World have been recorded. If the World Ocean area is also taken into account, this means that impacts on the Earth of such bodies take place approximately every 10 years. Up to 1 Mt explosions at the higher levels of atmosphere take place every month.

Falls of such celestial bodies to military and civilian nuclear units, chemical plants, toxic waste storehouses, etc. can cause significant human losses and material damage. It can also become "a trigger" for a global ecologic crisis or a military conflict.

Fig. 8. *Regional catastrophe 12,900 year ago (www.boulder.swri.edu)*

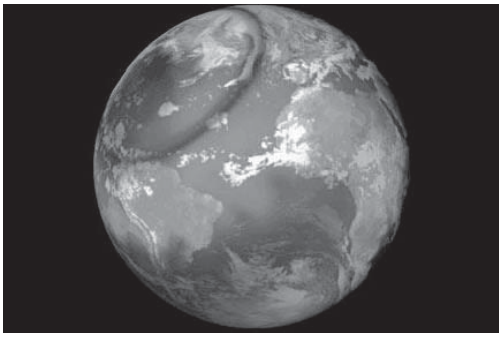


Fig. 9. *Barringer Crater (Photo D. Roddy)*

Fig. 10. *Main well-known events for the last 100-year period*

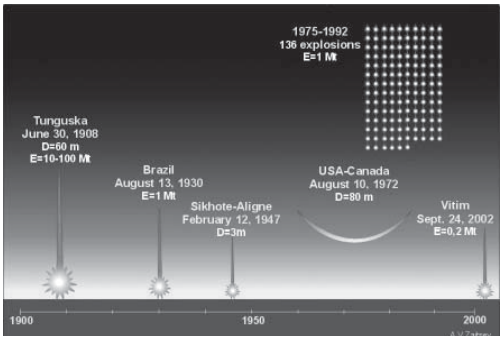
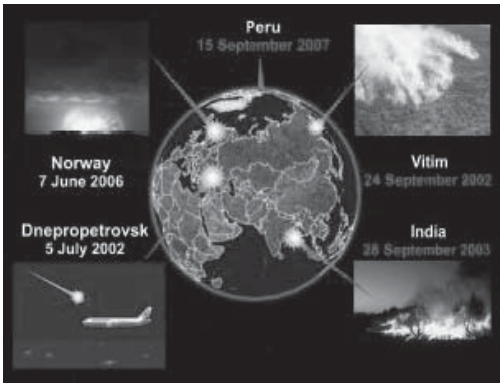


Fig. 11. *Events of the 21st century*



Impacts in the 21 Century

Already five noticeable events related to the falls of celestial bodies took place at the beginning of the 21 century.

5 July 2002. An above earth explosion of a small asteroid (bolide) near Dnepropetrovsk (Ukraine), was erroneously interpreted as a rocket attack against a civil aircraft.

24 September 2002. An explosion of about 0.2 Mt took place in the river Vitim basin. It leveled near 100 km2 of forested taiga.

28 September 2003. The Sudusudia village in India was burnt as a result of big bolide fragments fall. One person died and 20 persons were injured.

7 June 2006. An explosion took place in the Norway Highlands. Its capacity was comparable to the Hiroshima nuclear bomb.

15 September 2007. As a result of the explosion near Karankas village in Peru, a crater 30 m in diameter and 6 m deep appeared.

The asteroid-comet hazard is a serious risk factor for our civilization because any moment a catastrophe ranging from local to global scale can take place.

2. International Planetary Defence System "Citadel"

International PDS "Citadel" is designed for prevention of collision of asteroids and comet nuclei with the Earth.

PDS "Citadel" should include two echelons:

— echelon for short-term (operative) reaction (ESTR) "Citadel-1";

— echelon for long- term reaction (ELTR) "Citadel-2".

The creation of the ESTR is necessary because it is impossible to detect in advance all dangerous celestial bodies (DCBs). Most DCBs are small and difficult to detect. For instance, approximately 99.5% of NEAs are from ten to hundreds meters in size *(Fig.12).* The detection of such bodies is most likely when they are already close to the Earth — from several days to months before the collision. For timely protection from this hazard an ESTR permanently ready for action is required.

If needed, the ELTR may be developed on the ESTR's basis or protection from larger DCBs.

Fig. 12. *Distribution of NEAs in size*

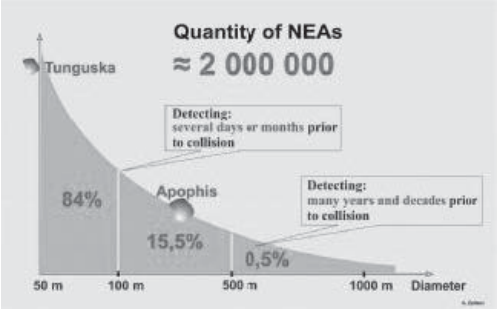
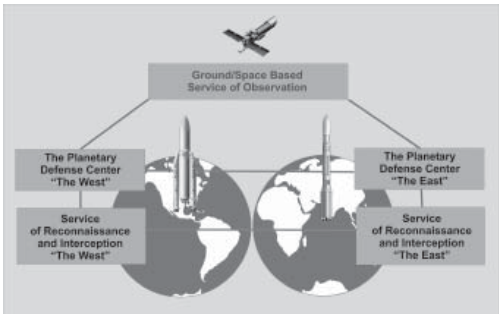


Fig. 13. *Composition of the echelon for short-term reaction "Citadel-1"*



2.1. ECHELON FOR SHORT-TERM REACTION "CITADEL-1"

The ESTR is designed for protection from DCBs, which can be detected several days/weeks/month before the collision.

2.1.1. Composition and Function of the ESTR Components

An ESTR should include *(Fig.13):*

— Ground- and Space-Based Surveillance Service (GSBSS) for DCBs detection and investigation;

— two Segments of the Reconnaissance and Interception Service — "East" and "West" for identification of DCBs characteristics and for protection from DCBs;

— two Regional Planetary Defence Centres (PDC) "East" and "West" for managing ESTR services.

In addition the ESTR can include auxiliary (reserve) service:

— services for forecasting the regions and consequences of DCBs impact.

2.1.2. ESTR Operation Scheme

The ESTR "Citadel-1" operation will include the following functions.

DCB detection

DCB detection will be provided by the GSBSS. Space Observation Segment (SOS) will comprise the main part of the GSBSS. It will include the observational spacecrafts (SCs), equipped by optic and infrared telescopes. These SCs will be located on near-Earth and interplanetary orbits and, in the future, on the Moon.

The SOS will guarantee detection of DCBs nearing the Earth even from the side of the Sun at least several days before the collision. This cannot be done by earth-based telescopes.

Investigation and Reconnaissance

After the detection of a DCB, the ground- and space-based surveillance facilities will

Fig. 14. *DCB detection*

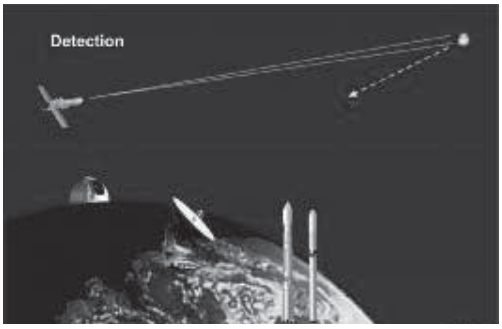
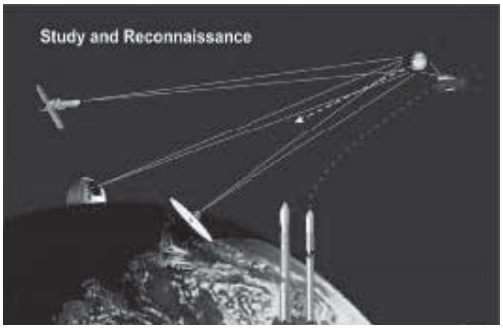


Fig. 15. *DCB investigation and reconnaissance*



join where appropriate the study of its characteristics. This will be done by optic telescopes and ground-based radars. More detailed study of the DCB characteristics will be performed by small class reconnaissance SCs (mass 100–200 kg).

An engineering model of the DCB will be built in the PDC as a result of complex processing of obtained information and the best option for protection from the DCB will be chosen.

Interception

To put an impact on the DCB for deflecting it from hitting trajectories or, if needed, for destroying it, intercepting SCs with devices for action will be launched. Mainly devices of short-term (impulse) action will be used — kinetic impactors and nuclear explosive devices. This is needed because of short DCB approaching times and high rendezvous velocities of intercepting SCs with DCBs.

Modern rocket-space and nuclear technologies allow creating the operative protection from DCBs of size up to several hundred meters, i.e. from about 99.5% of NEAs. Defence from remaining 0.5% of NEAs and NECs, which can be detected many years before the collision, will be performed by the ELTR.

2.1.3. ESTR Auxiliary Service

ESTR auxiliary (reserve) service are needed to support main ESTR means in case of:

— threat of a DCB's big fragments (tens meter size) fall after the DCB was destructed near the Earth;

— short time reserve before a DCB collision with the Earth that prevents using main LSTR means for the interception.

Forecast Services

If the prevention of DCB collision of with the Earth is impossible, it is necessary to take a set of measures for minimisation of the space catastrophe damage. This includes evacuation of population, material and cultural values, dangerous products and objects from the expected collision areas. For implementation of these measures, it is necessary to establish a service for forecasting regions to be hit by DCBs and consequences of these impacts.

The service will forecast regions to be hit by DCBs on the basis of information from the GSBSS of the LSTR "Citadel-1"and from the SCS. After complex processing of

Fig. 16. *DCB interception*

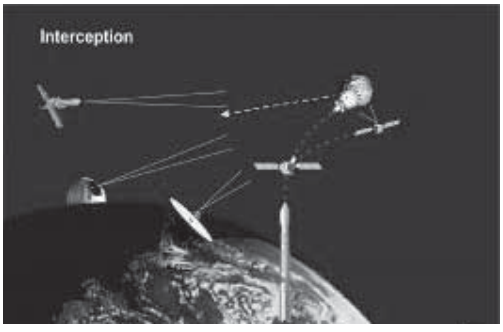
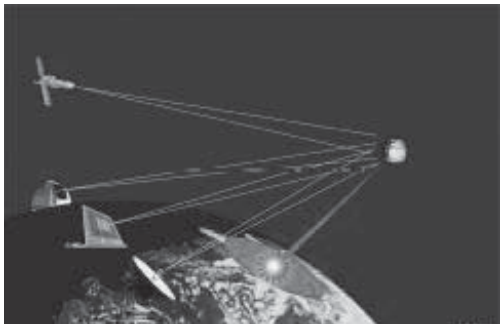


Fig. 18. *Forecasting of the region to be hit and evacuation*



the data, a forecast of conditions for the DCB entry into the Earth atmosphere will be provided. Calculation of the DCB motion in the atmosphere, forecasting of the regions to be hit, simulation of the DCB explosion process and assessment of possible consequences will be performed. On the basis of these data a set of actions will be elaborated for emergency prevention and reducing possible losses by means and efforts of national and international emergency services.

2.2. ECHELON FOR LONG-TERM REACTION "CITADEL-2"

The level for long-term reaction is designed for protection from DCBs, which can be detected many years before their collision with the Earth

2.2.1. Composition and Function of the ELTR Components

The composition and function of the ELTR can be identical to those of ESTR. Since the ELTR is intended for protection from collisions with many-kilometre bodies which happen extremely seldom, some ELTR components may exist in a "virtual" form. Corresponding projects for these ELTR components should be included into the framework of the "Mobilisation Plan for the Earth Protection". They should quickly be implemented in a dangerous situation.

2.2.2. ELTR "Citadel-2" Operation Scheme

Similar to the ESTR the ELTR operation will include the following main functions.

DCB Detection

DCB detection will be provided mainly by the GSBSS of the ESTR. Whole celestial sphere surveys in periods from several weeks to several months will be needed for detection of comets many years before their possible collision with the Earth. This service can be based mainly on astronomic observatories located all around the world and equipped by powerful telescopes.

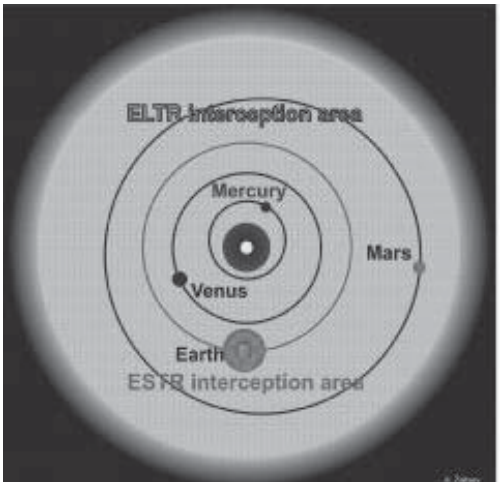
Investigation and Reconnaissance

Similar to the ESTR, ground- and space-based surveillance means and reconnaissance SCs will be used for studying DCBs. In some cases most powerful launch vehicles belonging to world space agencies, will be needed for launching these SCs.

Interception

Interception schemes will be similar to schemes of interplanetary flights to asteroids, comets and other bodies of the Solar System, which were implemented many times. As a rule, intercepting means will deflect DCBs from hitting the Earth trajectories. Depending on DCB characteristics, parameters of their orbits and available time reserves a wider, than for ESTR, spectrum of means for action can be used. For DCBs with big inclination to the ecliptic plane and/or big eccentricity that make landing or escorting impossible because of high rendezvous velocity, devices of short-term (impulse) action will be used, like for the LSTR. In other cases, methods of gentle long-time action can be used. They can be divided into methods of direct and distant action. The direct-action methods are rocket propulsion systems of various types (using chemical propellant; electric nuclear engines, using a substance from celestial bodies, and so on), methods for changing the DCB's albedo, etc. The distant-action means are laser facilities, solar concentrators, "gravitational tractor," and so on.

Fig. 19. *Areas of DCBs interception*



The interception area accessible for modern means is located approximately between orbits of Mars and Mercury (Fig. 19). In the course of time, it will expand with the development of new more efficient launching means.

2.3. BASIC MEANS FOR THE PDS "CITADEL" ESTABLISHMENT

The development of the ESTR will be based mainly on the existing technologies. The creation of the ELTR will need elaboration of some new technologies. This refers mostly to superpower launching, intercepting and impact means.

Space means for Monitoring (Detection)

For creation of observational SCs, experience of space agencies in designing various telescopes can be used. These are "IRAS" (NASA/SERC/NIVR), "Astron-1" (IKI of RAS), "Hipparcos", "ISO", "Herschel" (ESA), "COBE", "Spitzer", "Kepler", "WISE" (NASA), "HST" (NASA/ESA), "AKARI" (JAXA), "COROT" (CNES/ESA) and others.

Ground- and Space-Based Investigation and Reconnaissance Means

The tracking and study of discovered DCBs can be performed by telescopes of the world network of astronomy observatories. For more precise determination of their characteristics, planet radars (Yevpatoria and Ussurijsk, Russia; Goldstone, USA and Aresibo, Puerto Rico), together with the world network of radio-telescopes, can be used. For these purposes, SCS optic and radar means belonging to military forces of some countries can also be used for these purposes.

For creation of reconnaissance SCs, experience in design of equipment and SCs for study of asteroids, comets and planets of the Solar System will be used. These are "Vega-1 and 2", "Fobos-2" (IKI of RAS), "Giotto", "Rosetta" (ESA), "Galileo", "NEAR Shoemaker", "Deep Space-1", "Stardust", "Deep Impact", "Dawn" (NASA), "Clementine" (BMDO/NASA), "Cassini" (NASA/ESA/ASI), "Hayabusa" (ISAS) and some others.

The design of reconnaissance SCs should allow various countries to use their launch vehicles, equipment for SC control, communication systems and so on.

Interception Means

For creation of SC-interceptors, experience in designing the above mentioned SCs and also experience in developing the MDS will be used.

Means for action

The development of kinetic and nuclear means for action will be based on the experience of similar devices creation for military purposes. The ELTR creation will require the development of new super powerful means for action and other new technologies.

Launch vehicles and Ground-based Infrastructure

For launching SCs to the operational orbits, a wide spectrum of launch vehicles available in space agencies can be used. This refers also to the ground-based infrastructure for preparation and launching SCs and also to SC control, communication, etc.

Experience in design of launch vehicles "Saturn-5" (USA), "Energia" (Russia) and nuclear rocket engines should be used for creation of super powerful launch vehicles for the ELTR. The development of an space transport module based on a nuclear power reactor of megawatt class in Russia will also be useful.

The mankind has all necessary basic technologies for creating the ESTR and, partially, the ELTR of the PDS

3. Organisational, Financial and International Legal Foundations

In addition to dealing with serious scientific and technological problems, the PDS creation will require solving of a wide spectrum of organisational, legal, financial, ethic and other problems of international character. For this purpose, corresponding legal foundations need to be elaborated. They can be presented in the form of an International Treaty "On the Principles of Ensuring the Earth's Defence Against Asteroid and Comet Nucleus Impact Hazards" (below in the text — Treaty).

The following principles should govern the elaboration of the Treaty text:

1. The Treaty formation should be based on a concept of the PDS preliminary agreed by the international community. The PDS "Citadel" Conception can be used as an option.

2. An international status should be given to the legal basis of the PDS creation and maintenance.

3. The highest priority should be given to international activities on the PDS creation. They should be performed on the basis of specially elaborated international management mechanisms.

4. The legal basis must have binding juridical character for states taking part in the PDS creation.

5. The legal basis can be structured with reference to areas of tasks (scientific, technological, organisational, financial and others) or stages of the PDS creation.

6. The Treaty must provide a series of measures to guarantee protection of any state or object from DCBs (to exclude "the non-use dilemma", which means cancelled protection of some states for putting pressure on them in order to change the geopolitical situation or even destroy them). Possibility of the PDS creation by a set of states united in a single military and political association or other blocks should be eliminated.

7. The Treaty should include main principles for establishing and using of an international fund — Mankind Insurance Fund — for financing, developing, maintenance and modernisation of the PDS.

8. The Treaty should include regulations for operation of planetary defence regional centres.

9. The Treaty should define mechanisms for technological and legal integration of current and future missile-space and other means (PDS components), which are under national jurisdiction, into a global international infrastructure.

In addition, the following principles should be built in the Treaty draft in accordance with the tasks for stages of implementation.

Stage of Developing the PDS Project

1 The PDS should be formed on the basis of specially created international components and national means including space industry branches, military establishments and emergency services.

2. Measures should be defined for preventing new weapon creation under the cover of PDS means elaboration, for instance, use of small asteroids for bombing objects on the Earth ("asteroid weapon").

3. The status of "Patrimony of Mankind" should be attributed to technologies used for the PDS in order to guarantee the PDS integrity and "permanent readiness" status until replacements of the technologies by new ones (modernisation) takes place.

4. Provisions should be made for utilisation of the PDS means after their warranty periods expire.

5. "A Mobilisation Plan for the Earth Defence" should be developed in order to engage all necessary resources of mankind in case of a global catastrophe threat. If the catastrophe avoidance is impossible, the plan should anticipate an escape the greatest possible number of inhabitants of the Earth.

Stage of Building and Testing the PDS Components

1. Reservations to some international space law provisions should be adopted in order to allow an actual testing of nuclear devices which are the most efficient means for protection from DCBs. It is clear that nuclear devices used in the PDS should not be regarded as components of nuclear weapon. The same refers to the PDS operation.

Stage of "a Standby Alert"

1. Measures for guaranteeing prompt provision of information about emerging space threat to respective institutions should be developed. The "dilemma of reporting" — the possibility to delay or conceal information about a DCB discovery — should be eliminated.

2. Regulations on warning population about a space threat should be elaborated in order to avoid mass panic ("notification dilemma").

Stage of Application of the PDS Components

1. Mechanisms for guaranteeing taking timely decisions on the use of the PDS means at the international level should be elaborated. The "no-use dilemma" should be eliminated.

2. The possibility of using military means, for instance, the MSD, for the planetary defence should be anticipated.

3. The elimination of using the PDS means for military purposes should be assured ("dilemma of use").

Stage of the PDS Application Consequences

1. Measures for compensating possible damage to some countries or regions in case of debris fall as a result of near the Earth DCB destruction should be elaborated.

Together with the Treaty drafting, additional agreed understandings of existing international treaties and agreements, which include provisions relating to protection from asteroid and comet nucleus impact hazards, need to be adopted.

Table 1.

Phases	Years							
	1	2	3	4	5	6	…	10
1. Organisational								
2. System project								
3. Development of the ESTR for the PDS								
4. Development of the ELTR for the PDS								

4. Phases of Creation of the Planetary Defence System "Citadel"

Main stages of the PDS are presented in the *Table 1*.

These stages will include the following activities:

Phase 1. Organisational

— forming the Mankind Insurance Fund;

— elaboration of international legal foundations

— establishing of the Planetary Defence Centres — "East" and "West";

Phase 2. System Project

— the development of the international PDS System Project;

— more precise identification of the PDS establishment costs.

Phase 3. Development of the ESTR for the PDS

— development of ESTR project;

— development and testing of ESTR components;

— putting the ESTR into the "standby alert" condition.

Phase 4. Development of the ELTR for the PDS

— development of ELTR project;

— development and testing of ELTR components;

— putting the ELTR into the "standby alert" condition.

At Stage 3, observational, reconnaissance, and intercepting SCs will be developed on the basis of the best world astronautics practice. Their design should allow various countries to use their launch vehicles, equipment for SC control, communication systems and so on. At this stage, imitation experiments for testing interaction schemes for DCB detection and tracking and demonstration projects for testing means and methods for DCB Investigation and interception will be carried out

At Stage 4 main attention will be paid to the development of new super powerful launch vehicles and means for action.

At following stages, modernization of the PDS components will be carried out as new technologies become available.

Expenses for the creation of the ESTR for the PDS will amount to 15-20 billion USD.

The creation of the ELTR will require much higher expenses. They will be identified at the project development stage.

Conclusions

The following conclusions can be made on the basis of research and development conducted by international experts:

1. The possibility of catastrophic collisions of asteroids and comet nuclei with the Earth makes necessary the implementation of measures for prevention or minimization of consequences of these collisions.

2. Modern technologies allow to start the practical development of means for defence against the asteroid-comet hazard.

3. The development of the International System of Planetary Defence "Citadel" is one of the possible ways to secure the planetary safety.The echelon for reaction at the short-term level "Citadel-1"will comprise the basis of this system.

4. The short-term reaction echelon can be built in 5-7 years. This will guarantee protection of the Earth from asteroid and partially from comet threat.

5. The Planetary Defence System must be developed by efforts and means of all mankind including the financial input. A Mankind Insurance Fund must be established for this purpose.

6. The defence against asteroid-comet hazard requires the development of international legal instruments. They might be presented in the form of an international treaty "On the Principles of Ensuring the Earth's Defence Against Asteroid and Comet Nucleus Impact Hazards"..

7. Coordinating functions for the establishment and maintenance of the Planetary Defence System might be taken by the UN, viz the International Centre for Planetary Defence specially established under the aegis of the UN and the Centre's Regional Departments.

8. Providing planetary defence can be regarded as a test for the mankind in its ability to meet global challenges. The proposed project of Planetary Defence System "Citadel" can become the first global project of the third millennium, which will defence the Earth from cosmic threat.

9. Implementation of the project demands first of all overcoming the main moral barrier — all people and particularly state leaders must realise their mutual responsibility for preserving the mankind, the biosphere and all cultural, moral and material values created by billions of people living on our planet.

Abbreviations

ACH — asteroid-comet hazard
ASI — Italian Space Agency
BMDO — Ballistic Missile Defense Organisation, USA
BMEWS — Ballistic Missile Early Warning System
CNES — National Center for Space Studies, France
DCB — dangerous celestial body
ELTR — echelon for long-term reaction
ESA — European Space Agency
ESTR — echelon for short-term (operative) reaction
GSBSS — Ground- and Space-Based Surveillance Service
IKI of RAS — Space Research Institute of the Russian Academy of Sciences
ISAS — Institute of Space and Astronautic Science, Japan
JAXA — Japan Aerospace Exploration Agency, Japan
NASA — National Aeronautics and Space Administration, USA
NASU — National Academy of Sciences of Ukraine
NEA — near-earth asteroid
NEC — near-earth comet

NIVR — Netherlands Agency for Aerospace Programmes
PDC — Planetary Defence Centre
PDS — Planetary Defence System
RAC — Russian Academy of Cosmonautics by K.E. Tsiolkovsky
RAS — Russian Academy of Sciences
SC — spacecraft
SCS — Space Control System
SEC ESR — Science-Educational Center of Emergency Situations Research, RF
SERC — Science and Engineering Research Council, UK
SOS — Space Observation Segment

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Great Silk Road and Prospects for Development of Civilizational Tourism

Work Together to Build the Silk Road Economic Belt

Part of the speech at Nazarbayev University,
Astana, Kazakhstan. September 7, 2013

Xi Jingping —
Chairman of the People's Republic of China

More than 2,100 years ago during the Han Dynasty (206 BC–AD 220), a Chinese envoy named Zhang Qian was twice sent to Central Asia on missions of peace and friendship. His journeys opened the door to friendly contacts between China and Central Asian countries, and started the Silk Road linking the East and West, Asia and Europe.

Shaanxi, my home province, is right at the starting point of the ancient Silk Road. Today, as I stand here and look back at history, I seem to hear the camel bells echoing in the mountains and see the wisps of smoke rising from the desert, and this gives me a specially good feeling.

Kazakhstan, located on the ancient Silk Road, has made an important contribution to the exchanges between the Eastern and Western civilizations and the interactions and cooperation between various nations and cultures. This land has borne witness to a steady stream of envoys, caravans, travelers, scholars and artisans traveling between the East and the West. The exchanges and mutual learning thus made possible promoted the progress of human civilization.

The ancient city of Almaty is also on the ancient Silk Road. In Almaty, there is a Xian Xinghai [1] Boulevard, which got its name from a true story. After the outbreak of the Great Patriotic War in 1941, Xian, a renowned Chinese composer, found his way to Almaty. By then, he was worn down by poverty and illness and

had no one to turn to. Fortunately, the Kazakh composer Bakhitzhan Baykadamov took care of Xian and provided him with the comfort of a home.

It was in Almaty that Xian composed his famous works: Liberation of the Nation, Sacred War and Red All over the River. He also wrote the symphony Amangeldy based on the exploits of the Kazakh national hero. These works served as a rallying call to fight Fascism and proved immensely popular with the local people.

Throughout the millennia, the peoples of various countries along the ancient Silk Road have written a chapter of friendship that has been passed on to this very day. More than 2,000 years of exchanges demonstrate that on the basis of unity', mutual trust, equality, inclusiveness, mutual learning and mutually beneficial cooperation, countries of different races, beliefs and cultural backgrounds are fully able to share peace and development. This is the valuable inspiration we have drawn from the ancient Silk Road.

Over the past 20 years, the relations between China and Eurasian countries have grown rapidly, and the ancient Silk Road has gained new vitality. In a new way, it is lifting the mutually beneficial cooperation between China and Eurasian countries to a fresh height.

A neighbor is better than a distant relative. China and Central Asian countries are close and friendly neighbors. China values its friendship and cooperation with these countries, and takes improving these relations as a foreign policy priority.

China's relations with the Central Asian countries now face a golden opportunity' of growth. We hope to work with these countries to strengthen trust, friendship and cooperation, and promote common development and prosperity' to the benefit to all our peoples.

— We should pass on our friendship from generation to generation and remain good neighbors living in harmony. China is committed to peaceful development and an independent foreign policy of peace. We respect the development paths and domestic and foreign policies pursued independently by the people of every country. We will never interfere in the internal affairs of Central Asian countries. We do not seek to dominate regional affairs or establish any sphere of influence. We stand ready to enhance consultation and coordination with Russia and all Central Asian countries to sustain harmony in our region.

— We should firmly support and trust each other and be sincere and good friends. Rendering each other firm support on major issues concerning core interests such as sovereignty, territorial integrity, security and stability underlies China's strategic partnership with the Central Asian countries. We will reinforce trust and cooperation with the Central Asian countries bilaterally and within the framework of the Shanghai Cooperation Organization (SCO) [2] to combat the "three forces" of terrorism, separatism and extremism as well as drug trafficking and organized transnational crimes, and this will create a favorable environment for promoting economic development and improving the well-being of the people in this region.

— We should vigorously enhance practical cooperation and be good partners of mutually beneficial cooperation. Both China and the Central Asian countries are at a crucial stage of development, and we face unprecedented opportunities and challenges. We have all set medium-

to long-term development goals based on our national conditions. Our strategic goals are the same — to ensure sustainable and stable economic development, build a prosperous and strong nation and achieve national revitalization. Therefore, we need to enhance practical cooperation across the board, use our good political relations, geographical proximity and economic complementarities to boost sustainable growth, and build a community of shared interests and mutual benefit.

— We should expand regional cooperation with a more open mind and broader vision, and achieve joint progress. Global economic integration is accelerating, and regional cooperation is booming. The Eurasian region has a number of regional cooperation organizations. The members and observers of the Eurasian Economic Community (EAEC) and the SCO are from Eurasia, South Asia and West Asia. By intensifying cooperation between the SCO and the EAEC, we will create further space for development.

To forge closer economic ties, deepen cooperation and expand development space in the Eurasian region, we should take an innovative approach and jointly build an economic belt along the Silk Road. This will be a great undertaking benefitting the people of all countries along the route. To turn this vision into reality, we may start in specific areas and connect them over time to cover the whole region.

First, we need to step up policy consultation. Countries should have full discussions on development strategies and policies, adopt plans and measures for advancing regional cooperation through consultation in the spirit of seeking common ground while setting aside differences, and give the policy and legal "green light" to regional economic integration.

Second, we need to improve road connections. The SCO is working on an agreement on transport facilitation. Its early signing and implementation will open up a major transport route connecting the Pacific and the Baltic. On this basis, we can actively discuss the best way to improve cross-border transport infrastructure and work towards a transport network connecting East Asia, West Asia and South Asia to facilitate economic development and travel in the region.

Third, we need to promote unimpeded trade. The envisaged economic belt along the Silk Road is inhabited by nearly three billion people and it represents the biggest market in the world, with enormous, unparalleled potential for trade and investment cooperation between the countries involved. We should discuss a proper arrangement for trade and investment facilitation, remove trade barriers, reduce trade and investment costs, increase the speed and raise the quality of regional economic flows and achieve mutually beneficial progress in the region.

Fourth, we need to enhance monetary circulation. China and Russia already have sound cooperation on settling trade in local currencies, and have made good progress and yielded rich experience in this respect. This good practice can be shared with others in the region. If our region can realize local currency convertibility and settlement under the current and capital accounts, it will significantly lower circulation cost, increase our ability to fend off financial risks, and make our region more competitive internationally.

Fifth, we need to increase understanding between our peoples. Friendship be-

tween peoples is the key to good relations between states. To pursue productive cooperation in the above- mentioned areas, we need the support of our peoples. We should encourage more friendly exchanges between our peoples to enhance mutual understanding and traditional friendship, and build strong public support and a solid social foundation for regional cooperation.

Notes

1. Xian Xinghai (1905–1945) was a Chinese musician.
2. The Shanghai Cooperation Organization (SCO) is a permanent intergovernmental international organization established on June 15, 2001, in Shanghai (China) by six countries — China, Russia, Kazakhstan, Kyrgyzstan, Tajikistan and Uzbekistan. Its prototype was the Shanghai Five Mechanism. The main goals of the SCO are strengthening mutual confidence and good neighborly relations among the member countries; promoting effective cooperation in politics, trade and economy, science and technology, and culture as well as education, energy, transportation, tourism, environmental protection and other fields; making joint efforts to maintain and ensure peace, security and stability in the region; and moving towards the establishment of a new, democratic, just and rational political and economic international order. The heads of state meet once every year, and the heads of government meet at fixed time, alternatively in each of the member states.

Exchanges and Mutual Learning Make Civilizations Richer and More Colorful

Part of the speech at the UNESCO Headquarters. March 27, 2014

Xi Jingping —
Chairman of the People's Republic of China

Civilizations become richer and more colorful through exchanges and mutual learning, which form an important driver for human progress and global peace and development.

To promote exchanges and mutual learning among civilizations we must adopt a correct approach with some important principles. They, in my view, contain the following:

First, civilizations come in different colors, and such diversity has made exchanges and mutual learning among civilizations relevant and valuable. Just as the sunlight has seven colors, our world is a place of dazzling colors. A civilization is the collective memory of a country or a nation. Throughout history, mankind has created and developed many colorful civilizations, from the earliest days of primitive hunting to the period of agriculture, and from booming industrial revolution to the information society. Together, they present a magnificent genetic map of the exciting march of human civilizations.

"A single flower does not make spring, while one hundred flowers in full blossom bring spring to the garden." If there were only one kind of flower in the world, people would find it boring no matter how beautiful it was. Be it Chinese civilization or other civilizations in the world, they are all fruits of human progress.

I have visited the Louvre Museum in France and the Palace Museum in China, both of which house millions of art trea-

sures. They are attractive because they present the richness of diverse civilizations. Exchanges and mutual learning among civilizations must not be built on the exclusive praise or belittling of one particular civilization. As early as over 2,000 years ago, the Chinese people came to recognize that "it is natural for things to be different. Greater exchanges and mutual learning among civilizations can further enrich the colors of various civilizations and the cultural life of people and open up still greater alternatives in the future.

Second, civilizations are equal, and such equality has made exchanges and mutual learning among civilizations possible. All human civilizations are equal in value, and they all have their respective strengths and weaknesses. No civilization is perfect on the planet. Nor is it devoid of merit. No single civilization can be judged superior to another.

I have visited many places in the world. What interested me most during the trips was to learn about differing civilizations across the five continents, what makes them different and unique, how their people think about the world and life and what they hold dear. I have visited Chichen Itza, a window on the ancient Maya civilization, and the Central Asian city of Samarkand, an icon of the ancient Islamic civilization. It is my keenly felt conviction that an attitude of equality and modesty is required if one wants to truly understand various civilizations. Taking a condescending attitude towards a civilization cannot help anyone to appreciate its essence, and may risk antagonizing it. Both history and reality show that pride and prejudice are the biggest obstacles to exchanges and mutual learning among civilizations.

Third, civilizations are inclusive, and such inclusiveness has given exchanges and mutual learning among civilizations the impetus to move forward. The ocean is vast because it refuses no rivers. All civilizations are crystallizations of mankind's diligence and wisdom. Every civilization is unique. Copying other civilizations blindly or mechanically is like cutting one's toes to fit one's shoes — impossible and highly detrimental. All achievements of civilizations deserve our respect and must be cherished.

History proves that only by interacting with and learning from others can a civilization enjoy full vitality. If all civilizations are inclusive, the so-called "clash of civilizations" can be avoided and the harmony of civilizations will become reality; as a Chinese saying goes, "Radish or cabbage, each to his own delight."

Having gone through over 5,000 years of vicissitudes, the Chinese civilization has always kept to its original root. As an icon, it contains the most profound pursuits of the Chinese nation and provides it with abundant nourishment for existence and development. Deriving from Chinese soil, it has come to its present form through constant exchanges with and learning from other civilizations.

In the 2nd century BC, China started the Silk Road [1] leading to the Western Regions. In 138 BC and 119 BC, Envoy Zhang Qian [2] of the Han Dynasty (206 BC–AD 220) made two trips to those regions, disseminating Chinese culture and bringing into China grapes, alfalfa, pomegranates, flax, sesame and other products.

During the Western Han Dynasty (206 BC–AD 25), China's merchant fleets sailed as far as India and Sri Lanka where they traded China's silk for colored glaze, pearls and other products.

The Tang Dynasty (618-907) saw dynamic interactions between China and other countries. Historical records reveal that China exchanged envoys with more than 70 countries, and Chang'an, the capital of Tang, bustled with envoys, merchants and students from other countries. Exchanges of such a magnitude helped spread Chinese culture to the rest of the world and introduce other cultures and products to China.

During the early 15th century, Zheng He [3] a famous navigator of the Ming Dynasty (1368–1644), made seven expeditions to the Western Seas, reaching many Southeast Asian countries and even Kenya on the eastern coast of Africa, leaving behind many stories of friendly exchanges between China and countries along the route.

During the late Ming and early Qing (1644–1911) dynasties, the Chinese people began to access modern science and technology through the introduction of European knowledge in the realms of astronomy, medicine, mathematics, geometry and geography, which helped broaden the horizon of Chinese people. Thereafter, exchanges and mutual learning between Chinese civilization and other civilizations became more frequent. Naturally, there were conflicts, frictions, bewilderment and denial, but the more dominant features of the period were learning, digestion, integration and innovation.

Buddhism originated in ancient India. After it was brought to China, the religion went through an extended period of integrated development with the indigenous Confucianism and Taoism, and finally became Buddhism with Chinese features, thus greatly impacting the religious beliefs, philosophy, literature, art, etiquette and customs of China. Xuan Zang [4], an eminent monk of the Tang Dynasty, who endured untold sufferings as he went on a pilgrimage to ancient India for Buddhist scriptures, gave full expression to the determination and fortitude of the Chinese people to learn from other cultures. I am sure you have heard of the Chinese mythological classical novel Journey to the West [5] based on his stories.

The Chinese people enriched Buddhism and developed some special Buddhist thoughts in the light of Chinese culture, and helped it spread from China to Japan, Korea, Southeast Asia and beyond.

Over the last 2,000 years religions such as Buddhism, Islam and Christianity have been introduced into China, nurturing the country's music, painting and literature. China's freehand oil painting, for instance, is an innovative combination of its own traditional painting and Western oil painting, and the works by Xu Beihong [6] and other master painters have been widely acclaimed. China's Four Great Inventions — papermaking, gunpowder, printing and the compass, brought drastic changes to the whole world, including the European Renaissance. Its philosophy, literature, medicine, silk, porcelain and tea have been shared by the West and become part of its people's life. The book Travels of Marco Polo provoked widespread interest in China.

I think some of you might be familiar with the terracotta warriors and horses [7] of the Qin Dynasty (221–207 BC), one of the eight wonders in the world. After his visit to the site, President Chirac of France remarked that a visit to Egypt would not be complete without seeing the pyramids, and that a visit to China would not be complete without seeing the terracotta warriors and horses.

Ill 1987 this national treasure was listed as one of UNESCO's World Cultural Heritage Sites. Many Chinese legacies are ranked as World Cultural Heritage Sites, and World Intangible Cultural Heritage Sites and are listed on the Memory of the World Register. Here, I'd like to express my heartfelt thanks to UNESCO for its contribution to the preservation and dissemination of Chinese civilization.

Today, we live in a world with different cultures, ethnic groups, skin colors, religions and social systems, and all people on the planet have become members of an intimate community with a shared destiny.

The Chinese people have long come to appreciate the concept of "harmony without uniformity." [8] Zuoqiu Mingle, a Chinese historian who lived 2,500 years ago, recorded a few lines by Yan Zi [9], prime minister of the State of Qi during the Spring and Autumn Period (770–476 BC) in Zuo's Chronicles (Zuo Zhuanj [10]: "Harmony is like cooking thick soup. You need water, fire, vinegar, meat sauce, salt and plum to go with the fish or meat. It is the same with music. Only by combining the texture, length, rhythm, mood, tone, pitch and style adequately and executing them properly can you produce an excellent melody. Who can tolerate soup with nothing but water in it? Who can tolerate the same tone played again and again with one instrument?"

On the planet, there are more than 200 countries and regions inhabited by over 2,500 ethnic groups with a multitude of religions. Can we imagine a world with only one lifestyle, one language, one kind of music and one style of costume?

Victor Hugo once said that there was a prospect greater than the sea - the sky; there was a prospect greater than the sky - the human soul. Indeed, we need a mind that is broader than the sky as we approach different civilizations, which serve as water, moistening everything silently.

We should encourage different civilizations to respect each other and live in harmony, so as to turn exchanges and mutual learning between civilizations into a bridge promoting friendship between peoples around the world, an engine driving human society, and a bond cementing world peace. We should draw wisdom and nourishment and seek spiritual support and psychological consolation from various civilizations, and work together to face down the challenges around the globe.

In 1987, 20 exquisite pieces of colored glaze were brought to light from an underground tomb of Famen Temple in Shaanxi, China. They proved to be Byzantine and Islamic relics brought to China during the Tang Dynasty. Marveling at these exotic relics, I was struck by the thought that we should appreciate their cultural significance rather than simply admiring their exquisiteness, and bring their inherent spirit to life instead of merely appreciating the artistic presentation of life in the past.

Notes

1. The Silk Road was a trade thoroughfare on land connecting ancient China with South Asia, Western Asia, Europe and North Africa through Central Asia. The name derives from the bustling trade in silk and silk products from China to the western regions.
2. Zhang Qian was a minister of the Western Han Dynasty. He was dispatched by Emperor Wudi as an

envoy to die western regions (a historical name specified in die Han Dynasty that referred to die regions west of Yumen and Yangguan passes) in 138 BC and 119 BC, respectively, to seek alliances among local ethnic groups to fight against die Xiongnu, an aggressive tribe. His travels, as far as Central Asia today, tightened die ties between die central plains and die western regions and contributed remarkably to die opening of die ancient Silk Road.

3. Zheng He (1371–1433) was a navigator of die Ming Dynasty. He began his service at die imperial court in die early Ming Dynasty and was later promoted to be die Grand Director (Taijian) of die Directorate of Palace Servants. He eventually served as chief envoy during his seven grand sea voyages between 1405 and 1433 when he traveled to more than 30 countries and regions in Asia and Africa, including Southeast Asian countries, die Indian Ocean and die Red Sea, as well as die East Coast of Africa and Mecca — die sacred place for Islamic pilgrimages (Zheng He was a Muslim.). His expeditions were dubbed Treasure Voyages, which greatly boosted the economic and cultural exchanges between China and other Asian and African countries.
4. Xuan Zang (600 or 602–664), also known as Tang Seng, was an eminent monk of the Tang Dynasty, translator of Buddhist scriptures, and co-founder of the Vijnaptimatrata (Consciousness-only) School. He requested to take Buddhist orders at the age of 13, after which time he learned from many masters who confused him with different ideas, causing him a dream of journey to India — the western regions. His dream came true in 629 (or 627) when he headed to India for the study of Buddhist sutras. After his return to Chang'an, capital of the Tang Dynasty, Xuan Zang committed himself to translating 75 Buddhist scriptures in 1,335 volumes and writing a book, Great Tang Records on the Western Regions (Da Tang Xi Yu Ji).
5. Journey to the West (Xi You Ji) is a mythical novel attributed to Wu Cheng'en (c. 1500–c. 1582), a novelist of die Ming Dynasty. It recounts die legendary pilgrimage of die Tang Dynasty monk Tang Seng (Xuan Zang), who traveled to die western regions (India) to obtain sacred texts (sutras) widi his three disciples, Sun Wukong (Monkey King), Zhu Bajie (Pig of die Eight Prohibitions), and Sha Wujing (Friar Sand), and returned after many trials and much suffering subduing demons and monsters. It is dubbed one of die four great classical novels of Chinese literature, being Three Kingdoms, Outlaws of the Marsh and A Dream of Red Mansions.
6. Xu Beiliong (1895–1953) was a master painter and fine arts educator.
7. Terracotta warriors and horses of die Qin Dynasty (221–207 BC) were archaeological discoveries from die mausoleum of Emperor Yingzheng (259–210 BC), or die First Emperor of Qin — die first to unify feudal China. They were listed as one of UNESCO's World Cultural Heritage Sites in 1987. fol See note 11, p. 197.
8. [Zuoqiu Ming (556–451 BC) was a historian in die State of Lu during die Spring and Autumn Period.
9. Van Zi (?–500 BC), also known as Van Ying, was a prime minister of die State of Qi during die Spring and Autumn Period.

10. Zuo's Chronicles (Zuo Zhuan), also known as Zuo's Commentaries on the Spring and Autumn Amials, is believed to have been written by Zuoqiu Ming. Acclaimed as one of the Chinese Confucian classics, it is one of die three "commentaries" on die Spring and Autumn Annals, along with Gongyang's Commentary on the Spring and Autumn Annals (Gong Yang Zhuan) and Guliang's Commentary on the Spring and Autumn Annals (Gu Liang Zhuan).