

## **IMPACT OF ENVIRONMENTAL CATASTROPHES AND ENERGY CRISES ON INTERNATIONAL ECONOMIC DEVELOPMENT**

All global problems of today are closely linked, so their isolated solving is virtually impossible. Thus, the ensuring of further economical development of natural resources implies the prevention of the growing environmental pollution, or it in the foreseeable future will lead to an ecological catastrophe on a planetary scale.

The essence of the global environmental and energy crisis is in growing conflict between the ensuring of productive activity and stability of the natural environment.

Thus, the demand for oil and gas increases, and their stocks decline. Thus, until 2030 we can expect an increase in energy consumption at 37-50%, while existing stocks can be exhausted in 50-60 years. All this leads to the creation of the energy market, where consumers, not producers, will compete. It is necessary to unite the efforts of the international community in order to overcome the impending energy crisis. [1]

Climate change is a global problem in its essence and consequences, and presents a unique challenge for the economy: it is the largest and large-scale market failures that the world has ever seen. Therefore, economic analysis should be comprehensive and cover a long period of time, to take into account various risks and uncertainties, and to investigate the probability of significant change.

There is no problem of choice between the cessation of climate change and economic growth and development. Changes in energy technologies and the structure of economies have reduced the relationship between greenhouse gases emissions and rising incomes, especially in some developed countries. With significant, carefully-thought-out measures it is possible to make the economy of both developed and developing countries not «carbon-dependent», while maintaining economic growth.

Number of greenhouse gases in the atmosphere (including carbon dioxide, methane, nitrous oxide and other gases derived from industrial production) increases as a result of human activities. Climate change is caused by greenhouse gas emissions from economic activity. Due to the fact that greenhouse gases were previously considered as safe effects of economic activities caused by them damage was not included in the calculation of production costs. While economic development was accompanied by an increase in welfare, the hypothesis

of global warming had remained vague threats to humanity in the long term, but not in the near future. The situation requires decisive and immediate action to change existing attitudes and behavior.

The severity of climate change will be unevenly distributed. Some branches, such as building, can benefit from global warming. Others, such as industry, will not be greatly affected by climate change only with taking energy saving measures. However, such sectors as agriculture, insurance, water supply, tourism and so on will be affected quite strongly. It is more important for the economy not so much an increase in average temperature or moisture, as increasing in extreme weather phenomenon. (Table 1).

The data shows that ignoring climate change will lead subsequently to a leveling of growth in the economy. Our actions over the coming decades could create a substantial threat of destruction of economic and social activity in the second half of this century and into the next century, on a scale comparable with the great wars and the economic depression of the first half of the twentieth century. It will be extremely difficult or even impossible, to reverse these changes. Elimination of climate change — a strategy of growth for the long term, and it can be done without limiting the aspirations for growth of rich or poor countries. The sooner we take effective measures, the less their value.

Evaluating the Kyoto Protocol, we must take into account the level of knowledge and the realities of 10-year-old and practices of international activities in general. «Green» criticized the protocol for weakness, that it only slightly inhibited the growth of greenhouse gases in the atmosphere. However, in practice there was only one alternative: either the phase, which was agreed in Kyoto, or nothing.

The Kyoto Protocol requires that 38 developed countries on average for 2008-2012 generally do not exceed about 95% of greenhouse gas emissions in 1990. For the EU countries the level of commitment — 92%, USA — 93% for Japan and Canada — 94%, Russia, Ukraine and New Zealand — 100%, Norway — 101% Australian — 108%, and Iceland — 110%. Later the U.S. and Australia refused to participate in the protocol. The United States were facing the political ambitions of Gore and Bush in conjunction with weak economic study to

Table 1

**Forecast of climate change due to changes in the extreme weather phenomenon  
and climate by mid-end of the XXI century [2]**

Phenomenon and the trend	Major projected impacts on some sectors		
	Agriculture, forestry and ecosystems	Water resources	Industry, settlements and society
It is warm, less cold days and nights, warmer and more frequent hot days and nights in most parts of the land	Increasing yields in colder environments; lowering yields in warmer environments, enhancing the activity of insects	Impact on water resources, depending on snow melt; the impact on some sources of water supply	Reduced energy demand for heating; increased energy demand for cooling; deterioration of air quality in cities; less disruption to transport due to snow and ice; the impact on winter tourism
Warm periods / heat waves. The frequency is increasing in most land areas	The decrease in yields in warmer regions due to thermal stress; increasing the risk of natural fires	Increased demand for water; problems with water quality, for example, because of the fast-growing algae blooms	Reduced quality of life of people in warm areas without appropriate housing; implications for the elderly, very young children and poor people
Strong rainfall. The frequency of precipitation in most areas is growing	Damage to crops; soil erosion, inability to cultivate the land due to soil waterlogging	Adverse impact on the quality of surface and groundwater; pollution of water sources, water shortages can be mitigated	Damage Settlements, breach of commercial activities, transportation and normal life of the population; loss of property
Increasing area struck by drought	Land degradation, lower crop yields, damage to agricultural crops, crop failure; raising the death of cattle; raising the risk of fires	More widespread water stress	Water shortages for settlements, industry and population; reducing the capacity of hydropower; the potential for migration of population
Growing intensity of tropical cyclonic activity	Damage to crops; tearing trees from the roots of the wind, damage to coral reefs	Interruptions in the supply of energy causes disruption in public water supplies	Damage by floods and strong winds; cancellation insurance in vulnerable areas by private companies, the potential for population migration, loss of property
Increased number of cases of extremely high sea level (without tsunami)	Salinization of irrigation water, estuaries and freshwater systems	Reduced availability of fresh water due to saltwaters	The cost of strengthening the coast in comparison with the costs of land use change; the potential of population migration and infrastructure.

reduce emissions. Australia simply played safe, but now this country has ratified the Kyoto Protocol, and confidently implements the commitments. [3]

After accepting of the obligations of Kyoto there was a redistribution within the European Union: Germany and the UK reduced emissions by 15% or more, France and Finland had similar obligations as in Russia, and Portugal, Greece, Ireland were allowed to increase their emissions. It was not concerned developing countries. At the first stage of debugging it was too difficult to change traditions of the UN and to achieve numerical commitments even from such powerful countries as South Korea, Singapore, Argentina, not mentioning China and India.

By the end of 2012 there is every reason to expect

the conditions of the Protocol to reduce emissions for 36 developed country participants. In Canada, Japan, several EU countries there will be considerable difficulties, but they are surmountable. There is a large supply of allowances in Russia and Ukraine; Germany, France and the United Kingdom — the largest EU countries confidently carry out plans to reduce emissions. There is successful development of market-based approach to regulate emissions. European trading system is running and it is expected that the EU, Norway, Switzerland and Iceland will join to 27 EU countries.

The experience of all international activities and the Kyoto Protocol shows that preparation of a new agreement takes at least 2 years, and its ratification will take another 2-3 years. Therefore, it is in 2006-2007

Targets to reduce greenhouse gas

Purpose and proposals to reduce greenhouse gases	Nearest period (2012-2015)	Medium period (2020)	Long period (2050)
<b>Countries</b>	Kyoto Target (2008-2012)	Post-Kyoto	
<b>EU</b>	8%	20% (individually) or 30% (international agreement)	60-80% (international agreement)
<b>France</b>	0%	-	75%
<b>Germany</b>	21%	40%	-
<b>Italy</b>	6,50%	-	-
<b>Sweden</b>	4% growth (4% decrease - a national task to 2010)	25%	-
<b>United Kingdom</b>	12,5% (national task 20%)	26-32%	60%
<b>Australia</b>	8% growth	-	-
<b>Canada</b>	6%	20% compared to 2006	60-70% compared to 2006
<b>Japan</b>	6%	-	50%
<b>Norway</b>	1% increase (10% - reduction - a national problem)	30% (until 2030)	100%
<b>Ukraine</b>	0%	25%	-
<b>United States</b>	7%	-	-
<b>WORLD</b>	Peak of emissions	30%	At least 80%

practical acts were taken to prepare a new agreement. In December 2007 at the UN Conference in Bali the formal decision was taken to prepare a new international agreement for two years. Its signing is scheduled at the UN Conference in Copenhagen in December 2009. As starting point the IPCC recommendations were made: by 2050, reduction of global greenhouse gas emissions to levels below 50% from 1990 levels; by 2020 reduction of emissions of all industrialized countries in general, 25-40% (from 1990 levels).

It is hard to imagine a new agreement without the participation of the United States and other major countries, such as the EU, China and Russia. Five years of the Kyoto Protocol is very little time. There is a need for the opportunity to work for the future — to reduce emissions rapidly, realizing what benefits it will bring for 10-20 years or more. [4]

In recent years the number of goals related to climate change has significantly increased. National governments have adopted a wide range of purposes. (Tabl.2).

Number of projects to reduce emissions is rapidly growing. The UN FCCC has already filed more than 2000 projects, around 1000 were completely recorded, and they are implemented. Only the approved projects by 2012 will provide a reduction in emissions by 1 billion tons of CO<sub>2</sub>. Most projects in developing countries use economic Clean Development Mechanism of the Kyoto Protocol. The number of JI projects submitted to the UN FCCC, is growing rapidly. In general, it is expected that the Kyoto

Protocol by 2012 will generate more than 3000 projects with a total reduction in emissions of about 4 billion tons of CO<sub>2</sub>, and the amount of climate investment will be not less than \$ 30 billion. [5]

The most important outcome of the Kyoto Protocol would be, probably, its role as a catalyst throughout the climate activity: the development of worldwide energy-efficient technologies, renewable energy, support for science and education.

The principal peculiarity of the new agreement should be its direct connection with long-term global strategy to reduce greenhouse gas emissions. Science has almost answered the question what climate change is acceptable for nature and man: 2 ° C of global warming is the limit. If at 2 ° C «only» 500 million people by mid-century will suffer from a lack of fresh water, then at 3 ° C, their number will increase to 3 billion people. This sudden jump, of course, would be a severe impact on the world economy, especially on developing countries. By mid-century, 200 million people could migrate, which will inevitably affect the Ukraine. The Arctic permafrost zone will be greatly affected: there 2 ° C means 10 ° C and even more, which would require drastic change in infrastructure. To stabilize the future concentration of greenhouse gases in the atmosphere at a level of 550 parts by volume of CO<sub>2</sub>-equivalent per 1 million (which would limit the global effect of 2 ° C to mid-century to reduce the emissions of approximately 2 times the level in 1990). The global economy is able to reduce emissions

without significant losses. Their peak will be in the 2020-ies and after will be a significant decrease. Otherwise, the damage will be much higher: up to 5% of world GDP of direct monetary losses, and 10 or even 20% loss of global GDP on social catastrophes — migration, conflicts between countries, the mass loss of investment, etc. [2]

The three main ways of participation of countries in the future agreement must be:

- reducing emissions in developed countries, corresponding to a twofold reduction of emissions by 2050. The development of international and national market-trading mechanism by quotas and cost optimization;

- activity in major developing countries, massive development projects to reduce emissions, the introduction of new technologies, a significant reduction of specific emissions (per unit of GDP). These actions should also be linked with the global strategy to reduce emissions by 2050;

- assistance in adapting to climate change to the poorest countries and most vulnerable regions.

Climate policy will have more impact on the industries that consume much energy per unit of production, such as chemicals, cement production, aviation, metallurgy and all the fuel and energy sectors — oil, gas, coal and electricity production. Climate policy has also concerned those areas that produce commodities whose use is associated with high costs of energy (eg cars).

As the growing scarcity of resources and enhance the impact of exogenous factors the relationship between **agricultural** development and environmental protection is growing. It is possible to reduce the scale of the impact of agriculture on the environment, reduce the vulnerability of agricultural production systems to climate change and ensure that agriculture provided more environmental services. The solution is not to slow down the agricultural development but to form more sustainable production systems.

The first step is to create adequate incentives to this by strengthening property rights and the reduction of subsidies, leading to the depletion of natural resources. It is urgent to take measures to adapt agriculture to climate change, from which small farmers will be most affected — will suffer unjustly because their guilt in the incident is minimal. Thus, agriculture has great potential for economic growth, poverty reduction and provision of services in the environmental field, but to realize this potential, it is required active involvement of the state — providing key public goods, improving the investment climate, regulating natural resources and ensuring the desired results in the social field.

To agriculture has contributed to the solution of problems of development, it is necessary to improve

management of agriculture at the local, national and global levels. The state should increase its capacity for inter-sectoral coordination and the establishment of partnerships with the private sector and civil society. At the global level it is necessary to solve complex problems relating to inter-related agreements and international public goods. The empowerment of civil society and, in particular, producer organizations, plays an important role in improving the quality of governance at all levels.

Using the (often irrational) natural resources, agriculture can become a source, both beneficial and adverse effects on the environment. To date, it is the largest consumer of water, exacerbating the shortage. It is becoming a major cause of groundwater depletion, agrochemical pollution, soil depletion and global climate change, since it accounts for 30 percent of greenhouse gas emissions. But the same time agriculture is a major, often unrecognized provider of environmental services, connecting carbon, regulating watersheds and preserving biodiversity. As resource depletion, climate change and awareness of the environmental costs of traditional methods of natural resources in agriculture are becoming less acceptable. It is imperative to reduce the vulnerability of poor farming villages before climate change. Increased attention to the interaction between agriculture, natural resource conservation and the environment should become an integral part of agriculture for development.

Improving the sustainability of agriculture and its transformation into a provider of environmental services. Agriculture has a significant negative impact on the environment, but there are many opportunities to soften it. Environmental issues are inseparable from the broader perspective of agricultural development. The future of agriculture is inextricably linked to improving the quality of those natural resources on which it depends. Both intense and extensive agriculture are faced with environmental problems — but of different types.

Intensification of agriculture has led to environmental problems associated with the reduction of biodiversity, inadequate management of irrigation water, agrochemical pollution, as well as morbidity and mortality from pesticide poisoning. Many regions that are in less favorable agro-ecological situation, suffer from deforestation, soil erosion, desertification and degradation of pastures and watersheds. In the mountainous regions of East African soil erosion reduces the productivity of up to 2-3 per cent per year, and has other side effects such as siltation of water basins.

The solution is not to slow down the pace of agricultural development, but in search of more sustainable production systems and in expanding the role of agriculture as a provider of environmental services. Many promising innovations in the technical and

institutional levels may increase the environmental sustainability of agriculture, minimally affecting the economic growth and poverty reduction.

The introduction of payment for environmental services can help to overcome market failures in managing the impact of factors of production on the environment. Protecting water basins and forests is a source of environmental services (clean water, stable water supply of irrigation systems, carbon sequestration and biodiversity protection), suppliers of which may receive compensation from those who use these services. The interest to these issues is growing, especially in Latin America. In Nicaragua, the introduction of payments led to a reduction in the area of degraded pasture and arable land almost by 50 per cent and a shift to cattle grazing in environmentally sustainable pastures to conserve significant proportion of forest. Environmental certification of products also allows consumers to pay for sustainable environmental regulation, as practiced under the regime of fair trade or in the realization of coffee, grown on tree-shaded plots.

Agriculture and deforestation in developing countries are also major emitters of greenhouse gases: they are affected by 30 percent of all emissions. [6]

Plans of trading on carbon emissions — especially if the scope of their coverage will be increased so as to provide funding for measures to prevent deforestation and carbon sequestration in soil (eg, conservation tillage), — give the huge and not yet used the possibility to reduce emissions occurring due to changes in the use of agricultural land. On some measures to improve land use practices and livestock (eg, conservation tillage and agroforestry) are often benefited all parties: after the initial investment, they can contribute to a more productive and sustainable farming systems.

Global warming is one of the most uncertainties for agriculture. If the emissions will continue at current levels, then the world's average temperature is likely to rise by 2 ° C-3 ° C over the next 50 years, including rainfall and the frequency of extreme weather conditions. The effect is not distributed evenly. While many areas have become wetter, parts of the Mediterranean, South Africa, and parts of South Asia are becoming drier. Water deficit will increase in many areas, particularly in already dry parts of Africa and in areas of melting glaciers — an important source of irrigation water.

The agriculture, which employs 4,2% of the population of the EU, gives up to 1,7% of GDP in Europe. The temperature increase of 2 ° C can increase yields, but not in all regions and all years. Heat wave in 2003 destroyed from 30 to 40% of the grain harvest, and in France on poultry farms in the heat killed 4.5 million chickens. It is expected that due to the increased number

of droughts, poor crop years in Russia will be repeated about twice as often after 2020, and by 2070 in some regions, the yield decreased by 40%. The productivity of forestry in Northern Europe has increased by 10%, but in southern Europe will arise many problems: lack of water and heat waves will lead to drought, spontaneous forest fires, erosion and desertification. [6]

With moderate warming, crop yields, the increase in areas of temperate climate and the decline in the tropics are expected. Economics and climate models predict an increase in global crop production in mild and moderate scenarios of warming less than 3 ° C. But the combined effect of higher average temperatures, the great variability in temperature and precipitation, more frequent and intense droughts and floods, and reduce the suitability of water for irrigation can be devastating to agriculture in many tropical areas. One-third of the population of Africa is in danger of hunger, one-quarter in Western Asia, and approximately one-sixth in Latin America.

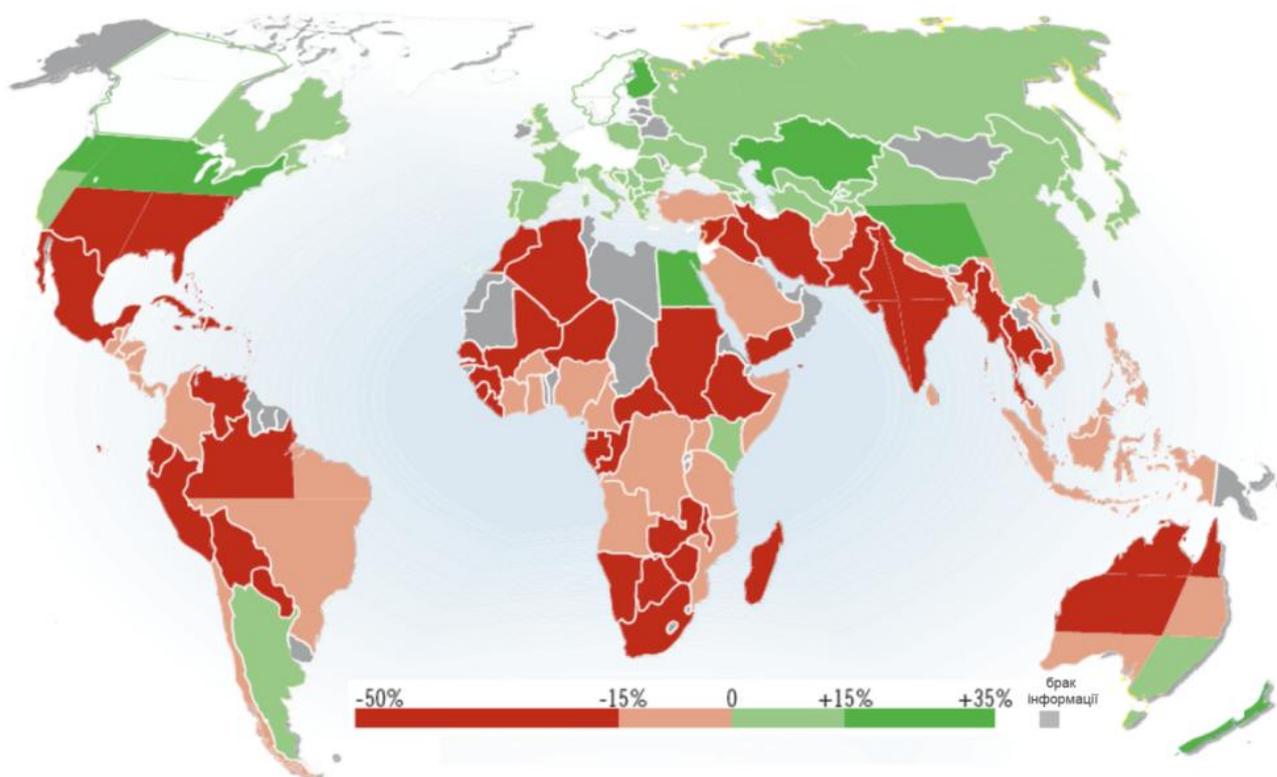
It is predicted a large impact of climate change on food prices globally by 2050. Some models predict more significant effects of climate change after 2050 with a further increase in temperature (fig.1.). But the greater impact is expected at the regional level. According to the scenario of not changing the climate, the agricultural gross domestic product in sub-Saharan Africa (the region with the highest impact of climate change) could decrease by 2.9%.

The climate change has an importance for the distribution of agricultural production. In the globalizing world, some adaptation may be accomplished through trade, if measures can ensure alternative livelihood areas under the greatest influence. But for much of the tropics, especially of sub-Saharan Africa, which adversely affected by climate change, trade can only partially fill the gap.

Climatic modeling indicates a very significant change in the patterns of production. One study summarized the results of six such models, has revealed future changes in production capacity by 2080-ies. The perspective looks bleak. At the global level, the potential of aggregate agricultural production will hardly affect climate change. However, averages conceal wide variations. As shown in Fig. 2. by 2080-ies the agricultural potential of the developed countries could increase by 8%, mainly as a result of a longer growing season of plants, whereas in the developing world it can be reduced by 9%, with the heaviest losses, estimated to suffer from Sub-Saharan Africa Sahara and Latin America.

**Chemical industry** is one of the most dynamic sectors in most countries because of introduction of new production and technology. But it is connected also with many contemporary problems of environmental pollution.

The composition of air emissions from chemical



**Fig. 1. Predicted transformation of the world agriculture performance in 2080 from climate change (including greenhouse gas emissions from fertilizer) [6]**

plants is also extremely diverse. Petrochemical production pollutes the atmosphere with hydrogen sulfide and hydrocarbons, the production of synthetic rubber — styrene, divinyl, toluene and acetone; alkali manufacturing—hydrogen chloride, etc. In large quantities such substances are emitted as oxides of carbon and nitrogen, ammonia, inorganic dust, fluorinated substances and many others.

One of the most problematic sides of chemical plants is spreading in nature of not previously existing connections. Among them especially harmful synthetic surface-active substances — surfactants (sometimes referred to as detergent) are considered. They are emitted into the environment during production and use in the home of various detergents. Proceeding from industrial and municipal sewage into water bodies, detergents are badly delayed by treatment facilities, promote the appearance of abundant foam in water, give it a toxic properties and odor, cause of death and rebirth of aquatic organisms and, very importantly, increase the toxic effects of other pollutants.

These are the main negative impacts on natural systems of the leading global industry. Naturally, the listed industrial influence is not confined: there are machine engineering, using the products of metallurgy and chemical industry and contributing to the scattering of many substances in the environment, and water-intensive

industries like pulp and paper and food, ensuring the same high proportion of organic contaminants environment, etc. Based on the analysis of the impact on the ecology of the three major industries it can be determined the nature and ways of industrial pollution for any industry, for which you need to know the specifics of production.

The main difference between the agricultural impacts of the industry is primarily in their distribution over large areas. Typically, the use of large areas for agricultural use is a radical transformation of all components of natural complexes. It is not necessarily destruction of nature, quite often it is the agricultural landscapes are classified as «cultural». [6]

**The financial sector** needs to adapt its domestic policies, proposed financial services and products to those new purposes, which are put before a company to reduce emissions. Restructuring of the financial sector is needed primarily to financial companies, if they want to maintain their stability in a changing environment. In order to finance companies were able to make a worthy contribution to overall global efforts to resist climate change, they will need to formulate a consistent, transparent and internationally agreed policies to reduce CO<sub>2</sub> emissions in the long term. Such a policy could be a guarantee for investors, ensure a favorable investment environment and expand opportunities for business

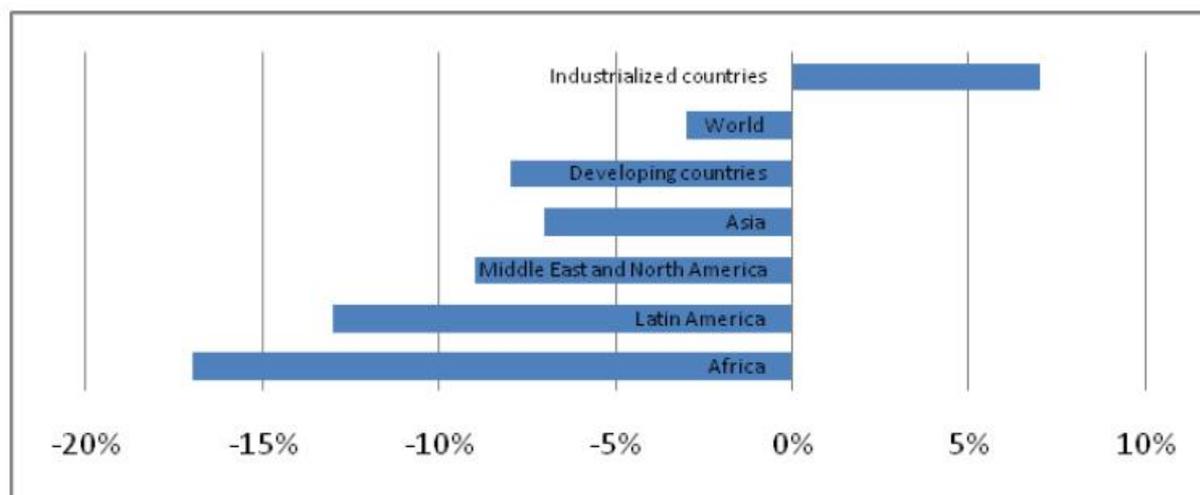


Fig. 2. Forecast of changes in world agricultural production capacity in 2000-2080. % [5]

development of customer-companies, which buy financial services.

To the financial sector can better adapt to changing political realities, financial companies must include the risk of climate change in the range of risks that are taken into account in forming of corporate strategy and policy, decision-making process and calculate the financial indicators for financial reporting purposes.

Climate change and climate policies affect the activities of the **insurance sector**, because its customers are forced to insure new risks that were not before. In recent years, there are many extreme weather events and phenomenon: typhoon “Katrina”, almost annual heat waves and floods in Europe, India, America. Every year it becomes increasingly clear that this was not an accident. Since climatologists are predicting an increase in frequency and intensity of extreme weather events, it can be expected to increase premiums in the event of damage to insured property, which has suffered from such weather. Therefore, insurers are considering climate change as a threat rather than as an opportunity.

A large number of tropical storms in 2004 increased the insured against weather damage to a record value — 32 billion euros. Although there is no convincing evidence that the frequency of tropical storms is directly related to the change of climate, increase in the number of storms has become a factor, which strongly influence on the activities of companies insurance.

According to the Association of British Insurers, the cost of insurance payments in the UK, related to damage from extreme weather events, by 2050 will double, reaching 3.3 billion euros. At the same time the most unfavorable weather for the year could cost insurers 20 billion euros. In Germany, the total damage from flood could reach 15 billion euros. Climate change increases

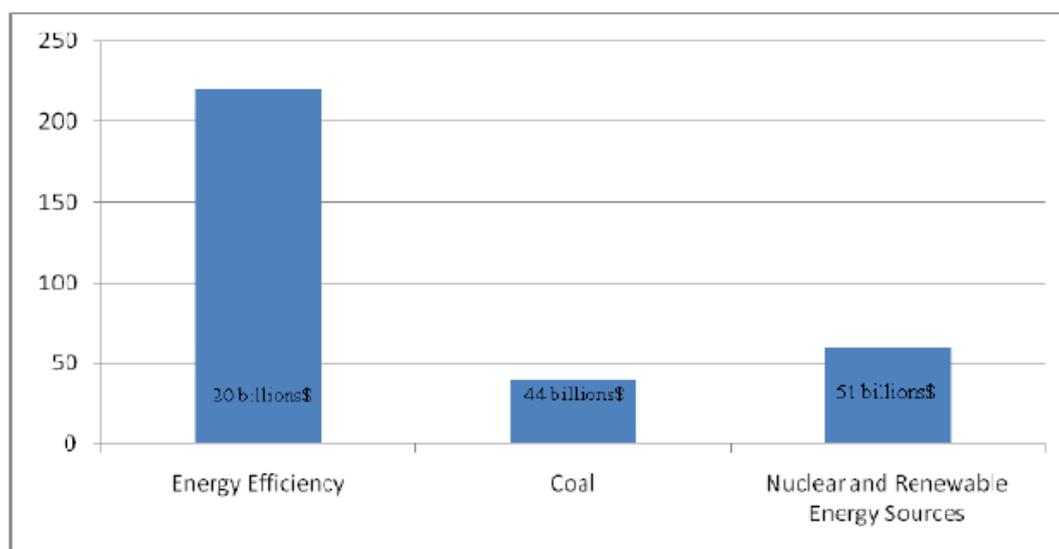
the risk of damage to private property at a rate of 2 to 4% per year.

Although over 98% people, who are affected by climate disasters, live in developing countries, the economic consequences of disasters are biased towards rich countries. This is due primarily to the fact that costs are calculated based on the value of property and insurance losses, which increase sharply. All eight climatic disasters after 2000 with inflicting damage amounting to over 10 billion dollars occurred in rich countries, six of them in the United States.

However, climate change also increases the need for the usual procedure of transfer of risks and opportunities for the development of insurance business, such as insurance projects to reduce emissions.

The banking sector plays an important role in financing climate projects and investment climate policy. The Banks manage their credit risk and develop new services to hedge weather risk. Adverse effects of climate change for banks are mainly associated with increased risk of non-return of loans and loans (credit risk) due to the fact that efforts to reduce emissions will lead to higher costs of those companies and industries whose activities are associated with significant carbon emissions. Price volatility in carbon markets (ie markets, CO<sub>2</sub> emissions, the markets for oil, gas and coal), and markets products that are relevant to climate change, increases the uncertainty of financial projections. For example, the price of one ton of CO<sub>2</sub> emissions for two years from June 2003 to January 2009 increased from 5 to 20 euros.

But climate change also creates new opportunities for the development of the banking business. According to the World Energy Council, the market volume of renewable energy sources by 2020 could reach 1.4 trillion euro. According to consulting firm Point Carbon, the



**Fig. 3. The results of investing in energy efficiency and new energy capacity compared with the changes in energy balance, 2005-2030 (projection), (million tons of oil equ.)**

volume of the global carbon market by 2010 could reach 200 billion euros. Use of Kyoto mechanisms can increase the profitability of projects in the energy sector by 15 percentage points (for example, projects to reduce methane emissions).

Emission permits trading creates a new relationship between the companies — cross-border relations, opportunities for exchange of various goods and products, and all this in a growing international context. Significant new investments, including international, will be invested in technologies that are characterized by significant value added. In this context, the main difficulty that needs to be overcome, related to the contradiction between the long-term objectives of investment policies and relatively rapid changes in government regulation.

Since 1970, some experts have considered the energy conservation as its additional source. They relied on the fact that the reduction of energy loss is comparable to the volume of its production, and often cheaper than production. In this respect, it is a very promising sector of buildings — both residential and industrial. With competent organization you can achieve good results, as is evidenced by some of the conclusions of the Third Working Group, studying the climate change mitigation in the Fourth Report of the IPCC (Intergovernmental Panel on Climate Change). This report has submitted to the general public this year.

In 2007, the building sector accounted for about one third of world energy consumption and greenhouse gas (GHG) emissions. It is expected that in the next 25 years, the absolute energy consumption in buildings will increase, while retaining a constant share of the growing global volume. The increase in greenhouse gas emissions

will occur in virtually all regions of the world, including in countries with transition economies.

There are two ways to reduce GHG emissions. It is possible, firstly, to reduce energy consumption in buildings, and secondly, to move to low carbon fuels, including renewable energy. Now available a wide range of energy-efficient and low carbon technologies. On the basis of existing and new buildings can achieve savings of 50% and 75% respectively, which allows significantly reducing GHG emissions in this sector. Often real improvements either with little extra cost, or do without them. Incidentally, in countries with transition economies the reserve of emission reductions is very large. This use of energy-saving bulbs, improved insulation and central heating, use of efficient appliances and systems for regulating energy consumption. Numerous studies show that in countries with economies in transition it is possible to cut about 30% of baseline emissions with net profits by 2020. It is also clear that in countries with economies in transition, heat-saving technologies can save more energy than electro-saving ones. Household appliances and lighting technology investments return more quickly than isolation, and requiring large-scale investments replacement of buildings elements. Therefore, unit cost reductions by means of electro-saving technologies are lower than cost of energy-saving technologies. It should be noted that the evaluation of economic efficiency does not include financial evaluation of co-benefits of energy efficiency. For example, a contribution to regional economic development and new business opportunities, contribution to raising productivity and improving health, reduction of air pollution, transport, improving comfort and quality of life and so on. If such an assessment of associated benefits is included in the

economic analysis of technologies, unit costs of reducing emissions will be even lower.

Now the world economy must move to a strategy that will provide much smaller amounts of carbon-based fuels — creating products and services it is necessary to consume less power, and change the method of producing it in such a way that could use more low-carbon energy sources.

In many cases, to influence the energy balance in terms of economic development it is most effectively to invest in new generating capacity rather than in energy efficiency to free up additional capacity for growth. Fig. 3. shows that energy efficiency measures can provide up to 230 million tons of oil ekv. that almost 9 times more profitable than other measures. [5]

To ensure maximum efficiency of energy saving measures is possible only if society is aware of the inadmissibility of the unbridled consumption of energy. The most important task and focus on developing the energy policy of the state is implementing energy conservation, its priority funding and the adoption of appropriate legal base. Saving of energy will play a crucial role in the development of a model of State continuous development and ensure of energy and environmental security. Saving of energy is one of the highest priorities of the national energy policy for the entire foreseeable future.

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#### **Ryabchyn O. Impact of environmental catastrophes and energy crises on international economic development**

Influence of globalisation on formation of system of eco-energy security of the states is analysed, the role of influence of global eco-energy calls on branch development of economic is defined, level of power efficiency of national economies in the conditions of strengthening of ecological requirements to world economic to development is investigated and the estimation of progress and a condition of performance of the Kyoto report concerning minimisation of negative eco-energy consequences of globalisation is spent.

*Key words:* economy globalisation, a sustainable development, the international eco-energy security, the Kyoto report, global problems, power efficiency, climate change.

#### **Рябчин О. Вплив екологічних катастроф і енергетичних криз на міжнародний економічний розвиток**

Проаналізовано вплив глобалізації на формування системи еколого-енергетичної безпеки держав, визначено роль впливу глобальних еколого-енергетичних викликів на галузевий розвиток світової економіки, досліджено рівень енергоефективності національних економік в умовах посилення екологічних вимог до світогосподарського розвитку та проведено оцінку прогресу і стану виконання Киотського протоколу щодо мінімізації негативних еколого-енергетичних наслідків глобалізації.

*Ключові слова:* глобалізація економіки, сталий розвиток, міжнародна еколого-енергетична безпека, Киотський протокол, глобальні проблеми, енергоефективність, зміни клімату.

#### **Рябчин О. Влияние экологических катастроф и энергетических кризисов на международное экономическое развитие**

Проведен анализ направлений преодоления негативных экологических последствий глобализации, необходимых для развития системы международной эколого-энергетической безопасности ради осуществления быстрого перехода к глобальной экологической экономике, которая основывается на установлении рыночных механизмов возмещения выбросов парниковых газов, обеспечения государственного регулирования для смягчения и адаптации к последствиям климатических изменений и активизации международного сотрудничества между развитыми и развивающимися странами.

*Ключевые слова:* глобализация экономики, устойчивое развитие, международная эколого-энергетическая безопасность, Киотский протокол, глобальные проблемы, энергоэффективность, изменение климата.

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