

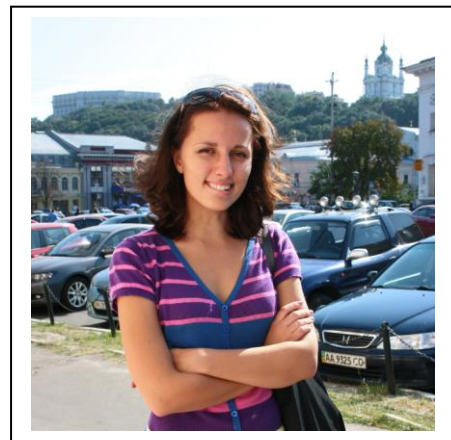
**WEBINAR\***  
**on:**  
**CLIMATE CHANGE AND ENVIRONMENTAL MIGRATION**

*Participants:* Prof. Yuriy Posudin



and 4-years students of Ecology, National University of “Kyiv-Mohyla Academy”( 2011-2012 Academic Year)

Ksenia Bystrevska

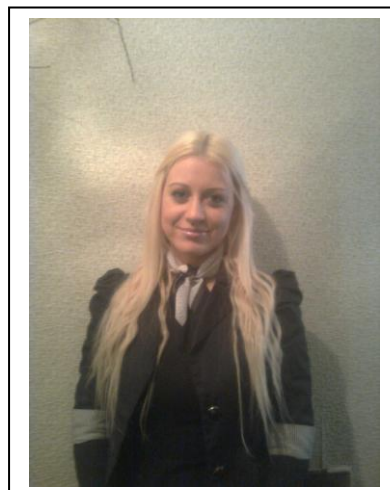


Ganna Vakulenko

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\* The term webinar is short for Web-based Seminar, a presentation, lecture, workshop or seminar that is transmitted over the Web

Tetiana Dmytrash



Katerina Norenko



Darya Sofiuk



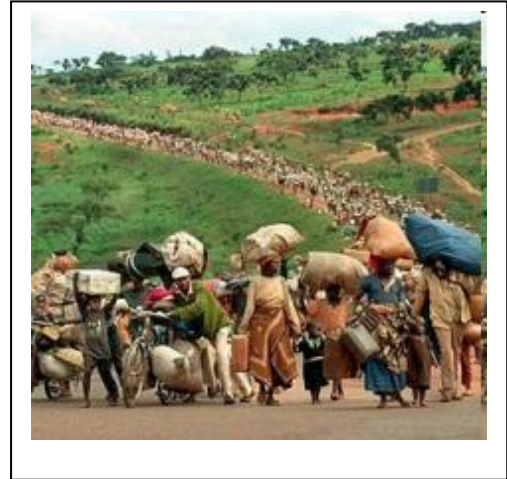
Maria Faticov

### Yuriy P. *Opening word.*

*Climate* is an average weather condition, characterized by such indicators as average temperature of Earth's atmosphere and oceans, rainfall intensity, frequency of solar radiation and other variables that can be measured and predicted due to many years of meteorological observations.

A significant factor is the growing world population.

So we need to understand how climate change is associated with quantitative and qualitative characteristics of the population, including migration of the population.



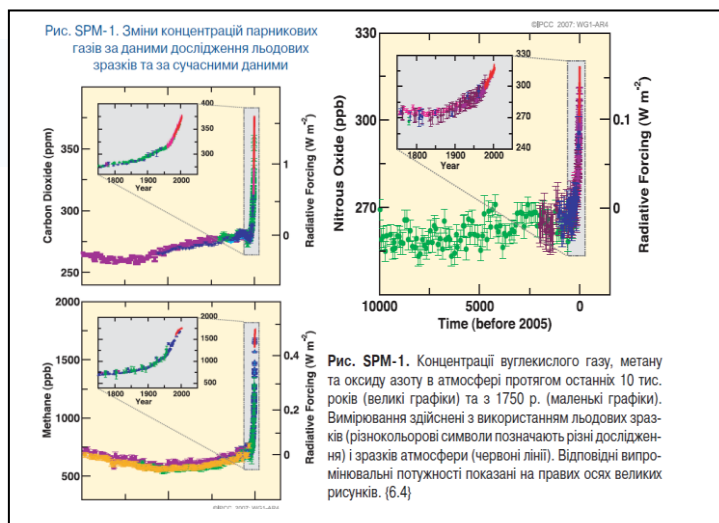
### *Question: What is climate change?*

**Maria F.** Climate change is climate variability of the Earth as a whole or of its individual regions over time. This process is accompanied by changes in global temperature and precipitation due to natural variability or human activity.

### *Question: What are the causes of climate change?*

**Darya S.** The main natural factors causing climate change include the geometry and orbital variability of our solar system, solar flares and storms, solar wind, and the eccentricity orbit the globe's.

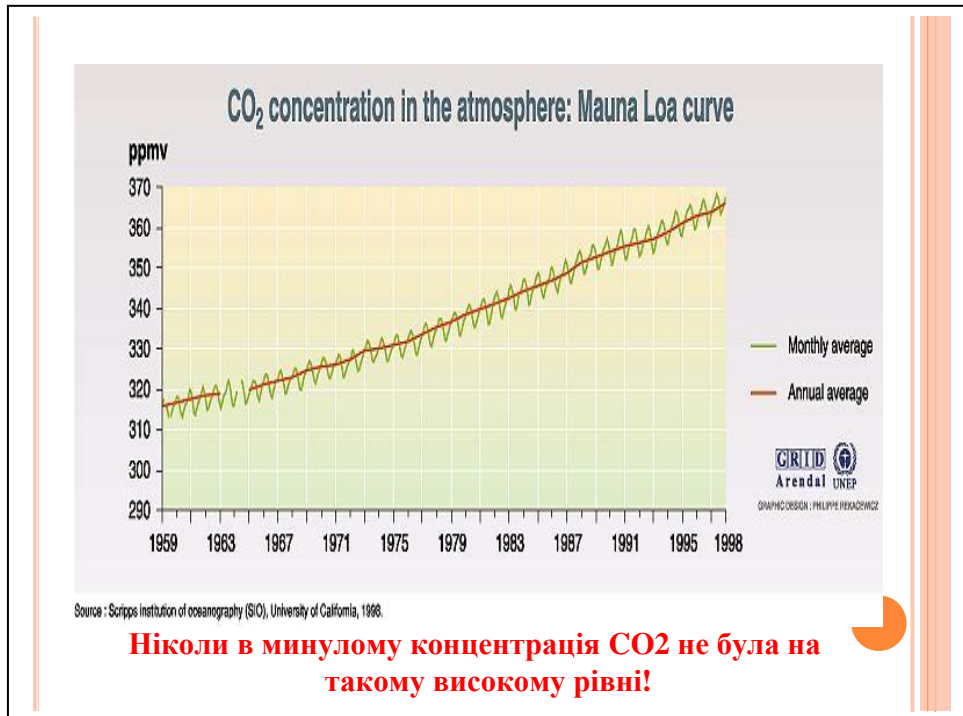
Anthropogenic factors that contribute to climate change are related primarily to pollution and global warming that are induced by greenhouse gases. Current experience shows that the content of carbon dioxide (CO<sub>2</sub>), nitrous oxide (N<sub>2</sub>O), methane (CH<sub>4</sub>), halogenoderivative hydrocarbons and tropospheric ozone (O<sub>3</sub>) in the atmosphere increases as a result of commercial activity.



**Climate Change 2007: The physical science basis**  
[http://www.ipcc.ch/pdf/reports-nonUN-translations/ukrainian/report\\_ukrainian.pdf](http://www.ipcc.ch/pdf/reports-nonUN-translations/ukrainian/report_ukrainian.pdf)

**Yuriy P.** The greenhouse effect is essential for human existence and cause of climate change. Heat balance is disturbed as a result of greenhouse effect and the global surface temperature is increased due to changing the concentration of greenhouse gases that can provoke climate change.

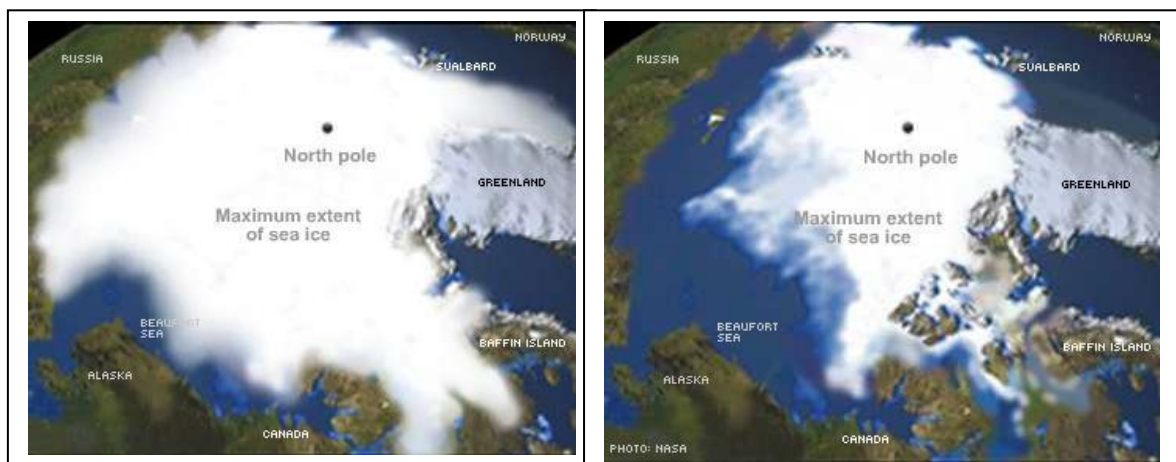
**Tetyana D.** The Report of the Intergovernmental Panel on Climate Change dated 02.02.2007 states that "This increase in emissions of greenhouse gases from human activities is the biggest cause of climate change recorded."



As a result, the average temperature on Earth has increased by 0.7<sup>0</sup> C since 1850 and from 1995-2006, 11 of those 12 years were recorded as the warmest in the last 150 years.

**Ganna V.** Increasing global temperature leads to melting polar ice and thermal expansion of the volume of the ocean, eventually increasing the world ocean level.

The sea level rose by 0.17 m from 1961 to 2003; with an average of about 1.8 mm (1.3-2.3) annually. Since 2003, annual rate of rise is 3.1 (2.4-3.8) mm.



**Ksenia B.** If Greenland melts, sea level rise is about 7 meters. However, if you melt all the polar caps, 4 million square kilometers of land which 310 million people (5% world population) inhabit will be under water.

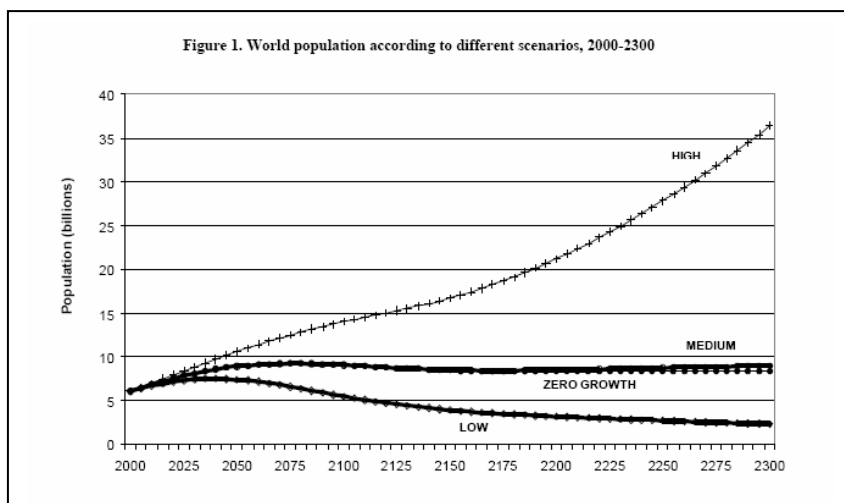
**Maria F.** The greenhouse effect and global warming affect flooding areas, where hundreds of millions of people live; coast erosion; inhibiting the formation processes of primary production; changes in the quality of surface and groundwater. Global warming is the cause of natural disasters such as severe floods, hurricanes, tsunamis and drought.

Experts predict a 66% increase over the next years in the number of cyclones, torrential rains in the tropics, drought, development of coastal erosion in some regions and flooding due to sea level rise of about 3 mm per year. Thus, Western Europe should be particularly vigilant with regard to repetition of emergency heat, like the situation in 2003. The number of hurricanes, however, will diminish, but their intensity will increase.



*Question: What trends of the dynamics of population growth on the globe are typical?*

**Yuriy P.** A significant cause of global pollution is a growing world population. In 2011, the world's population reached approximately 7 billion. In terms of forecasting population growth, (particularly in 2300) there are three indicators: average growth (9 billions), low (2.3 billions) and high (36.4 billions).



The world population growth rate is affected by industrialization - the process of social and economic changes due to humanity moving from a pre-industrial society to an industrial one, and urbanization – increasing the portion of population that lives in urban areas due to migration from rural areas or by natural fertility.

A characteristic feature of demographic growth is the appearance of megapopolis – cities with populations over 1 million inhabitants. About 30 cities had population that exceeds 8 million inhabitants in 2006.



Worldwide energy consumption, fertilizer use, the concentration of pollutants (such as carbon dioxide, nitrogen dioxide, hydrogen sulfide, sulfur dioxide, hydrocarbons, etc.), shortage of arable land, and the accumulation of radioactive wastes are all caused by the exponential growth of world population.

Mankind has already reached or will reach its highest levels of fossil fuel extraction in the near future: oil – in 2007, coal – in 2025, gas – in 2025. Additionally, by 2050, electricity consumption due to hydroelectric power stations will increase by 40%. The emergence of armed conflicts around the world is often motivated by the demand for fossil fuels.

The growth of the world's population and the corresponding increase in energy consumption, lack of food, deterioration of water and air quality due to industrialization and urbanization, and the impact of pollution all lead to an unprecedented crisis of environmental change.

**Katerina N. IPCC** (Intergovernmental Panel on Climate Change) has developed three possible scenarios. The good scenario shows that the temperature rise will lead to an increase in water shortages in some regions of South Africa and the Mediterranean by 20-30%, reducing the area of agricultural land in tropical regions. Every year 10 million people will suffer from flooding.

The second, bad scenario predicts a situation in which 4.1 billion people will suffer from water scarcity, 150 to 550 million from hunger; and flooding of coastal areas will affect 11 to 170 million annually. Meanwhile, young, educated people will migrate to richer countries.

Finally, in the last, dangerous scenario the water availability will reduce by 30-50% in South Africa and Mediterranean countries and 15-35% of the fields in Africa and Australia will be devastated. By 2050, 160 million people and 420 million people by 2100 will suffer from annual floods. 200 million people will be displaced as climate migrants by the end of 21st century as some regions of the Sahara desert, China, and Southern Asia will be completely deserted.

***Question: What are the consequences of global climate change?***

**Tetyana D.** Environmental impacts that include changes to geographical habitats of biological species and the climate of southern and eastern provinces changing to “semiarid” while northern regions will obtain the features of steppe. About 50% of the flora will be under threat of becoming extinct by the end of the century.

Extreme natural phenomena such as hurricanes, storms, heavy rains, droughts, and heat waves will become more frequent and intense. Currently, the number and magnitude of natural disasters in Ukraine has nearly doubled in between 2001-2005 in comparison to the end of the last century.



There will also be an increase in the number and magnitude of natural disasters. While redistribution of precipitation can lead to droughts in some regions, it can lead to flooding in others. This results in a loss in agriculture and a lack of drinking water for more than 500 million people on the planet as well as flooding that would affect hundreds of millions of people and atypically high

spread of infectious diseases. This kind of climate change could potentially cause the death of up to 50% of biodiversity on the planet.

Another result would be submerged marine coastal areas and damage to infrastructure due to a sea level rise of 0.2-0.6m by the end of the century. By the end of the century about 3 billion people will suffer from lack of water and 100 million people will be displaced from the annual flooding of coastal areas.

***Question: What is migration?***

**Maria F.** Migration (Latin *migratio* – Migration) – movement of people across borders of certain areas with a change of residence permanently or for a longer period of time.

The General Assembly of 2008 published the first official text that acknowledges that climate change may also lead to uncontrolled migration.

Moreover, climate change will modify the migration waves of populations threatened by environmental disaster and make access to drinking water even more difficult and especially so in areas at risk of increased tensions in international relations where water rights are a source of numerous conflicts, even wars.

**Tetyana D.** Climate change is one of the main factors that induces the increasing number of refugees in the world. This statement was announced by UN High Commissioner for Refugees Antonio Guterres.

According to Guterres, people forced to leave their former place of residence not only because of the unfavorable change in the environment, but also because of an outbreak of conflicts over resource allocation, which has shortened such as water. The world has 11.4 million refugees by the end of 2007 according to the reports of UN agencies on the problem of refugees (UNHCR). and 26 million internally displaced persons who have suffered from conflicts - said "Lenta.Ru". Another 25 million have become internally displaced persons, ie people who were forced to flee their homes, but to travel within their countries due to natural disasters.

**Ksenia B.** The Intergovernmental Panel on Climate Change (IPCC) noted in 1990 that climate change can have a significant impact on migration, as millions of people were forced to migrate due to shoreline erosion, coastal flooding, and degradation of agricultural land.





Dry lands are characterized by low levels of moisture in the soil due to scarce rainfall and significant evaporation. These areas occupy over 40% of the land surface of Earth and include a population of more than 2 billion of people.

Despite of the fact that large areas of dry lands are located within developed regions such as North America, Southern Europe and Australia, the the poorest regions of the world, such as Africa and Central Asia, have the largest portion of dry lands.



Coastal areas with 0-10 m above sea level will be particularly sensitive to environmental change in the future.

In countries with low levels of shoreline phenomena such as floods occur very frequently and affect entire communities and the lives and welfare of people living there. This is important because two-thirds of cities with populations over 5 million are at least partially located in coastal areas, including the rapidly growing urban centers of Asia and Africa (particularly in large river deltas).

Today, more than 220 million people are living in the deltas of the 11 largest rivers of the world. Some of these facts are important to the entire nation. About 30% of the Egyptian population lives in areas of low elevation coastal line near the Nile River. Bangkok is home for 24% of the population of Thailand. If it will be necessary to evacuate 30% of the population, these countries will absolutely have national disaster!

Mountain ecosystems are most sensitive to higher average temperatures in the 20th century. For example, warming of the higher altitudes in the Himalayas was three times higher than the global world average.



Ice melting in mountain areas increases the risk of floods from glacial lakes, threatening many villages in mountainous areas. During long rainfalls, melting ice significantly changes the mountain ecosystem and substantially affects the balance of many resources including energy sources.

**Katerina N.** Meteorological influence on migration can be divided into two causes: *climate processes* and *climate events*.

Processes – slow irreversible changes: raising the level of the oceans, salinization of agricultural land, desertification, increasing water scarcity. For example, the gradual flooding of the Nile delta will force 6 million people to move and will flood 4.5 million square meters of farmlands.

Climatic events – sudden and dramatic hazards: hurricanes, typhoons, floods, storms. During 2000 alone, the aforementioned events affected 256 million people. For comparison – 211 million people only were affected by disasters during all of the 1990s.

**Question: Who are the "environmental refugees"?**

**Yuriy P.** We are living in a very difficult time from the point of view of the environment and at various environmental cataclysms. Global warming and pollution of human environment, sea level rise, erosion of the coast, floods, hurricanes, temperature anomalies, storms, droughts, earthquakes, and tsunamis are the main factors of population transfer and the emergence of *environmental refugees* – people who are forced to leave their place of residence and to move within the country or across its borders as a result of a sharp deterioration of the environment or environmental disasters, such as, the Chernobyl tragedy or loss of land due to global warming.

**Ganna V.** Climate changes since the beginning of mankind were driving force of migration. Great migration of peoples took place since the beginning of the IV Century BC and historians believe the main reason of this migration is climate change.

The term "environmental refugees" was proposed in the United Nations documents, in November 2005.

**Ksenia B.** International Organization of Migration [International Organization of Migration <http://www.iom.int/jahia/Jahia/lang/en/pid/1>] offers the following definition: "Environmental migrants – persons or groups of individuals who, for reasons of sudden or gradual environmental changes that affect their quality of life and health, are forced to leave home, or to plan such actions, and on a temporary or permanent basis, to seek refuge within their country or abroad. All persons who migrate for environmental reasons, are protected by international law on human rights."

**Yuriy P.** We can mention, for example, the migration of 1.5 million U.S. citizens in August 2005 as a result of Hurricane Katrina. About 60,000 Brazilians were forced to leave the northeastern regions of the country through the dry period during the 1970-2005. Environmental migration is particularly noticeable in Sub-Saharan Africa, but presents also an acute problem in Asia and India. 25 million people around the world were forced to leave their place of residence due to environmental degradation and desertification, according to latest estimates.

There are predictions that climate change causes large-scale migration in China and India. About 6 million climate refugees were estimated in China alone, many of which were provoked by the expansion of the Gobi Desert. Experts believe that sea level rise and reduction of coastal areas significantly increases migration from Bangladesh to India.

**Maria F.** Experts predict that "some areas will be inhospitable," and as a result, will lead to migration.

Recent index of Vulnerability to Climate Change 2011, designed by British consultancy Maplecroft, has identified 10 countries that are most affecting by climate change. This list includes Haiti, Bangladesh, Zimbabwe, Sierra Leone, Madagascar, Cambodia, Mozambique, Democratic Republic of Congo, Malawi and the Philippines.

**Katerina N.** People who migrate due to climate change can be divided into two categories: *climate migrants* and *climate refugees*.

Migrants are those who are moving according to their own desire in searching more attractive existence.

Refugees are forced to move by natural disasters; they migrate involuntarily.

Another distinguished category of "climate evacuees" people, who temporarily relocated within the same country (due to some natural disaster).

***Question: Are there models of climate migration?***

**Katerina N.** I should like to give some examples of such patterns of climate migration:

1) Reduction of temporary labor migration in West Africa.

In West Africa, family members, usually young boys or girls, have financial possibility after a good harvest to visit Europe in search of well paid job. But their recent situation is characterized by a number of dry years with poor harvest. As a result, more Africans are forced to stay home.

2) Migration of flooded coast.

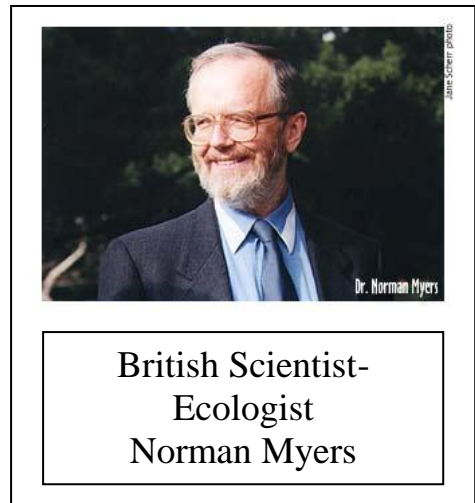
Residents of flooded areas will move to neighboring countries. Inhabitants of Bangladesh are moving to India and Pakistan and Indonesians from Sumatra to Malaysia. The people from some regions of Pakistan and Western India migrate to the United Kingdom, refugees from West Africa (former French

colonies) frequently migrate to France, and many refugees migrate from the South Pacific to Australia and New Zealand.

***Question: How many environmental refugees?***

**Maria F.** According to the UN the number of refugees was to reach 50 million in 2010, but this did not happen. We can say with confidence only a few hundred people were forced to move from flooded islands, and from the Arctic coast.

**Ksenia B.** Only one man tried to calculate climate refugees: British scientist-ecologist Norman Myers. He stated in the Report in 1995, funded by the Programme United Nations Environment Programme (UNEP) as well as by the governments of Great Britain and the United States, that there were at least 25 million those refugees around the globe. According to forecasts, this number must be doubled by 2010 and be increased to 200 million by mid century.



**Darya S.** Of course, climate is a very significant factor. For example, as it was shown in a study conducted in 2009, climate change appeared as significant factor responsible for the destruction of pastures in Mongolia, and in northern Africa and the Sahel.

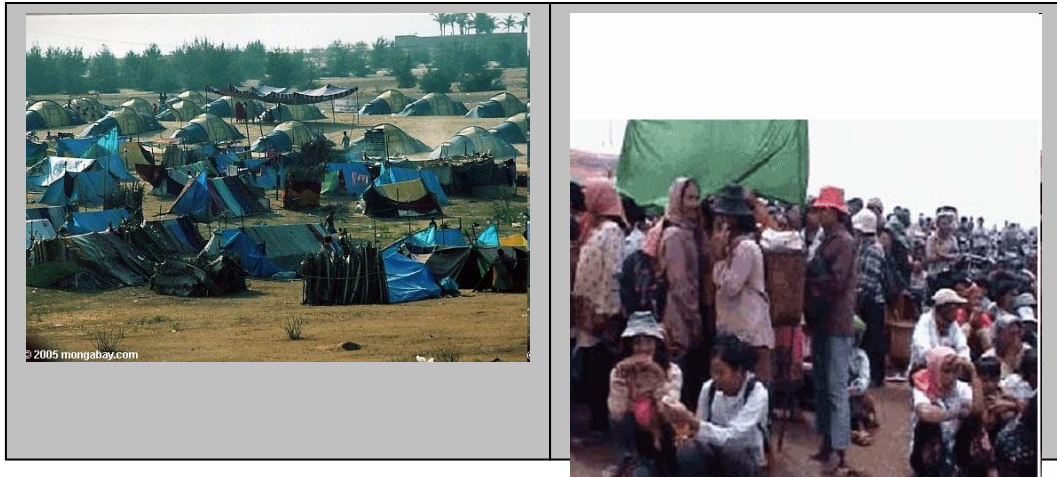
Most respondents in the survey "of environmental change and forced migration" claimed that they have migrated due to economic reasons, although the researchers found that the basis of these economic difficulties were related to the climatic changes.

They also noticed that the migration was relatively common form of response to floods and drought in the Sahel, Bangladesh, and elsewhere. For example, Ekvador inhabitants demonstrated massive migration to Europe after floods El Ninyo.

The researchers also found vast government resettlement program in Viet Nam and Mozambique, under which hundreds of thousands people were relocated due to increased floods and storms (which can be considered a cause of climate change).

In the end, it was found that the frequency and amount of environmental disasters have increased and continued to rise due to climate change, and this strengthened the incentives for migration.

**Yuriy P.** Norman Myers states that millions of people worldwide migrate. Unfortunately, it is difficult to obtain accurate data on it, and even more difficult to determine the primary reason for migration.



***Question: What about the environmental migration in Ukraine?***

**Ganna V.** There was migration caused by climate change in Ukraine at the end of the II millennium BC (it was extremely dry), resulting gap of old economic ties.

**Tetyana D.** In Ukraine, migration from areas that become uninhabitable will take place.

**Maria F.** Currently the climate change provokes many economic and social problems. Ukraine doesn't enter the countries that suffer from catastrophic climate change due to its favorable geographical position. But it can become a place of residence of climate refugees from around the world.

Deputy Director of the Department of Ecology G. Veremiychyk noted that climate refugees will not necessarily come to Ukraine. However, according to forecasts, our country does not look dramatically in the process of global warming; in addition, this country has areas almost without people. "Certainly, overseas aware of this situation and will offer to Ukraine to take these refugees," - said G. Veremiychyk. According to experts, the climate refugees will appear and it will be necessary to be prepared for this situation and to begin the international talks now concerning what the international community will do with them.

**Yuriy P.** "The problem of global climate change may lead to a demographic catastrophe in Ukraine". This was stated by UN Resident Coordinator in Ukraine Francis O'Donnell, presenting on 27 of November, 2007, in Kiev, Human Development Report "Fighting climate change: Human solidarity in a divided world".

"In the next 25 years, Ukraine could face a demographic catastrophe, which can be compared with the Holodomor," – said O'Donnell, adding that in the coming 25 years, Ukraine's population could shrink by 25%.

## Conclusions:

**Ksenia B.** “Governments and agencies (organizations involved in providing economic assistance to developing countries) should help the poorest in the world to emigrate from areas vulnerable to floods and droughts” – the National Report UK states. The opinion of experts is that the cost of measures that can be implemented today to resolve the situation is much less than the damages after natural disasters tomorrow.

- Today phenomenon of "climate refugees" is widespread;
- It is difficult to establish the exact number of such refugees;
- The number of "climate refugees" will steadily increase due to current trends in the environment;
- It is necessary to use the principle of prevention (precautionary) in this situation.

**Ganna V.** Climate change is one of the largest causes of migration throughout the history of mankind.

Currently, it is difficult to count the number of environmental refugees in the world. This is because of two reasons. First, the number of climate refugees has not exceeded the number of refugees persecuted for other reasons. Second, the number of refugees is small, but it will slowly grow.



The problem of environmental refugees affects the entire world. Because of the scale of this problem, it is necessary to pay special attention and to develop measures to solve this problem and to prevent further consequences of migration.

**Katerina N.** Moreover, there is a risk of weakening economies through massive migration of people to cities and lack of food and water. The threat of ethnic conflict and political instability will be sharpened. Successful vaccination will be difficult and it will be very hard to prevent such dangerous diseases as visceral leishmaniasis (global parasitic disease that annually affects 500 thousand people). Also, gender discrimination will increase as women migrant workers will find it more difficult to get a job than male workers.

**Tetyana D.** It is necessary to use 1% of world GDP to prevent climate change consequences with existing technologies.

Inaction on climate change will lead to a loss of 5-20% of global GDP annually.

Europe will suffer with climate change caused by global warming. The growing impact of climate change on many biological and physical systems on a planetary scale are starting to show as are the strains upon the basic requirements for human viability around the world – access to water, food, health and the environment.

Effects of climate change are already noticeable and predicted to increase in Europe (especially so in the Arctic). All factors of the natural environment as well as the social and economic sectors of the continent can be influenced by climate change in future. We keep in mind that the relationship between climate change and its affect on ecosystems is not linear and even minor temperature fluctuations are extremely important.

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