***Proposal for audio production - FAO's work on Climate Change***

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*Country*: Macedonia   
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Based on the research of Aleksandar Kirkovski

*Title of the production*: **Climate change: the challenge of the 21 century**

*Topic*: In the recent years it is obvious that we are facing with a climate change, locally as well as globally. How that does affects our living, our food supply, the living conditions and the geography as a whole? As the climate continues to warm, the major changes may occur in the structure and function of ecosystems, ecological interactions and geographical cover of species with predominantly negative consequences for biodiversity. Warmer temperatures and changes in precipitation are likely to affect the environment and migration patterns of many species of wildlife. The scope of the deployment of many species will change, some species that are not able to move or adapt may face extinction. Increased floods and droughts as part of climate change are predicted to increase the risk of destroying the array of plant and animal species. How does all this affects out local environment?

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**What is climate?**

Climate is a multi-mode atmospheric phenomenon over a place or some parts of the country. It is determined by multi-observation and study of meteorological elements and phenomena. What will the climate be, depend on climatic factors, such as geographical location, topography, altitude, proximity to the surrounding seas, currents, atmospheric currents, vegetation and man. From these factors depends on whether at that place there will be a greater or lesser amount of heat, precipitation, then waters in the rivers, the richness of flora and fauna, and of course human activity in the environment. Especially climate impact has on the economy, so agriculture, forestry, then traffic, tourism, lifestyle it depends on it. How does the climate change, the more we need to prepare for the changes. But climate change is not just happening now, the climate has changed throughout geological history of Earth. In the past the Earth have occurred glacial periods or global cooling or minimum, then the occurrence of global warming or the appearance of interglatiation i.e. the emergence of so-called maximum. These periods alternately changed depending on the change of astronomical, physical and geological - geographical factors. Today we are in the process of warming climate, influenced by anthropogenic (human) factor more intense manifest.

**Warming of the climate and global warming** is the increase in average air temperature near the Earth's surface and oceans since the mid-20th century and its projected continuation. Joint Government Panel on Climate Change (IPCC) concludes that the observed temperature increase since the mid-20th century was largely due to rising concentrations of gases that produce the greenhouse effect, and the resulting string human activities such as burning fossil fuels and deforestation. Climate model projections presented in the report of the IPCC show that global land surface temperature will probably rise by 1.1 - 6.4 ºC over the 21st century. The uncertainty of this estimate comes from the use of models with different sensibility concentrations of gases that cause the greenhouse effect and the use of different estimates of future emissions of these gases. Most studies and research focus on the period up to 2100, but expected global warming to continue even if emissions stopped. This is due to the great capacity of the warming of the oceans and longevity of carbon dioxide in the atmosphere. Increasing global temperature will cause sea levels to rise and will change the amount and distribution of rainfall. Warming is expected to be the greatest in the Arctic and would be followed by a continuous retreat of glaciers, permafrost and sea ice. Other likely effects represent changes in the frequency and intensity of extreme weather, the extinction of many species and changes in agricultural yields. Warming and related changes will vary in different regions of the world, although the nature of these regional variations is uncertain. The political and public debate continuously reviews global warming, its causes and what act will be taken in response. Most national governments (187 countries by the end of 2009) have already signed the Kyoto Protocol aimed at reducing greenhouse gases.

**Monitoring and registration of climate change**

Evidence of the warming of the climate system include the observed increase in global average temperatures of the air and oceans, the great melting of snow and ice and rising global average sea levels. The most common measure of global warming is the movement of the average temperature near the earth's surface. Expressed as linear motion, this temperature increase by 0.74 ± 0.18 ° C in the period from 1906 to 2005 year, but the rate of warming during the second half of this period was almost double compared to the period as a whole. Temperatures in the lower troposphere have increased between 0.13 and 0.22 ° C per decade since 1979, according to satellite measurements of temperature. It is believed that the temperature was relatively stable for two thousand years before 1850, with varying regional fluctuations such as the medieval warm period and the little ice age. Applied measurement instrument became available in the late 1800's, surpassing the previous record set in 1998. The global temperature is subject to short-term fluctuations that mask long-term trends and can temporarily mask. The relative stability of temperature from 2002 to 2009 is one such episode. Temperature changes vary across the world. Since 1979 the country temperatures rose twice as fast than the temperature of the ocean. Also the northern hemisphere is warming faster than the south because there is more land and larger areas with seasonal snow cover and ice into the sea. The thermal inertia of the oceans and slow responses of other indirect effects mean that climate needs centuries to adjust to changes in the forcing. Studies shows that even if the gases with greenhouse effect stabilize the level of 2000, it would appear further warming of about 0.5ºC.

**Which gases causing the greenhouse effect? Where they originate and how they change?**

Many gases with greenhouse effect as water vapor and carbon dioxide (CO2), occur naturally. But the burning of fossil fuels and other human activities add huge amounts of CO2 and other gases to the natural mixture at a faster pace than ever before. Other important gases causing the greenhouse effect produced by human activities are methane (CH4), nitrous oxide (N2O), hydrogen, fluoro carbon (HFC) and sulfur hexafluoride (SF6). Scientists have concluded that this is primarily due to human activities.

**What are the consequences of global warming?**

• Heat waves and periods of unusually warm weather

• Warming of the oceans, sea level rise and coastal flooding

• Melting glaciers

• Warming of the Arctic and Antarctica

• Spread of disease

• Sooner arrival of spring

• The range of animals and plants are changing, just like the population

• Bleaching of coral reefs

• Rains, heavy snowfall and flooding

• Droughts and fires

**How climate changes affect ecosystems?**

Some ecosystems have already been affected by climate change. As the climate continues to warm, the major changes may occur in the structure and function of ecosystems, ecological interactions and geographical cover of species with predominantly negative consequences for biodiversity. Warmer temperatures and changes in precipitation are likely to affect the environment and migration patterns of many species of wildlife. The scope of the deployment of many species will change, some species that are not able to move or adapt may face extinction. Increased floods and droughts as part of climate change are predicted to increase the risk of destroying the array of plant and animal species.

**Climate change in Macedonia**

As we have noted before climate change globally. Climate change in the country can be seen from several world researches on climate change relating to the Mediterranean region (including Macedonia). From these we expect significant adverse changes already in the middle and especially the end of this century. Thus, according to research from the US agency NOAA (National Oceanic and Atmospheric Administration), this region is becoming drier. In the last 20 years, ten winters were exceptionally dry, and the appearance of dry winters is particularly significant from 1970 onwards. According to other research predicts the average air temperature in Macedonia until 2050 to grow by 1.9 degrees, and by 2100 to only 3.8 degrees, while rainfall will decrease by 5%, i.e. 13% the end of the century (compared to 1990 as reference). It is expected summers to become hotter, with the rise in temperature of only 5 degrees (average) by the end of the century, while summer rainfall will decrease outstanding 37% (3)! What is even more worrying, temperatures are expected to increase the most in the southern parts of the Republic Macedonia (where the already high), and most precipitation to decrease in the central and southern regions (where the already small).

Under similar study it has done professor - Ivica Milevsky, and the same was published on IGEO Portal, you can see that the climate in the Republic Macedonia is changing. From the same survey is taken into account the 30-year period from 1985 to 2014 year, which according to the length considered climatological representative. From the data obtained it appears that average temperatures measuring points are about 0.2 to 0.8 degrees higher than in the period 1951-1980 year. Thus, the average multi-annual temperature in Skopje, according to recent series already 12.6 degrees Celsius or 0.4 degrees higher than the period 1951-1980. Similar value climbed temperature and measuring point Solunska Glava. Slightly bigger increase is in Shtip, which for the recent period has an average temperature of 13.4 degrees to 12.8 degrees for the period 1951-1980 year. The differences are even more pronounced at Demir Kapija and Gevgelija, where average temperatures have values ​​of 15.1 and 15.3 degrees Celsius, or nearly a full degree higher than the period 1951-1980 year. Only the data on temperatures in Ohrid, Resen and some higher dimensional places in the western part of the state are almost unchanged. The increase in average temperatures has been particularly emphasized in the last 20 years, from 1990 to today. It is characteristic that there is growth in the temperatures in the summer months: June, July, August, and September. At the same time, almost all meteorological stations registered reduced average annual amount of precipitation and about 5%. On the other hand, seems to be increased intensity of rainfall, showing frequent day extremes which reached over 100 mm.

Climate change in the country, can reflect and feel on short to medium and long term, and in a short period can cause serious problems with rising torrents, floods and erosion, such as the floods last year, with the largest part of Pelagonija, Shtip and Tetovo have experienced serious damage. It also can be manifested by the frequent fires, which are increasingly intensifying in the last decade. Certainly in the medium and long term, climate change may create even more serious problems in water supply, irrigation, agriculture, obtaining hydropower, increased erosion, the occurrence of droughts, and many others, and change most would hit the regions of Tikves, Gevgelija Strumica and Dojran.

Republic of Macedonia as a country cannot do much about global climate changes that are under way, because it should primarily be actively commit the world's largest economies and industries that produce the most "greenhouse" gases. However, Macedonia is a signatory and active participant in the various protocols and conferences that contribute to raising awareness of the population and to reduce the negative trends and consequences of changes. At home, it is time to prepare strategies, plans, programs and urgently act to address or mitigate the aforementioned negative effects, especially in potentially riskiest regions.