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Attitude of the Committee of Geological Sciences of the Polish Academy of Sciences to the question of impending of global warming

Global climate change, and the more frequent occurrence of extreme weather-related phenomena has caused public anxiety over global warming that has been widely expressed. Many international initiatives as regards remedial measures have been proposed by politicians, by the International Panel on Climate Change (IPCC), active since 1988, as well as by ecological organizations.

Engaging in this important worldwide debate, the Committee of Geological Sciences of the Polish Academy of Sciences urges attention to 10 principal aspects of the problem. Awareness of these is essential, if reasonable and responsible decisions are to be arrived at.

1. Global climate has been determined by mutual interactions of the Earth's surface and the atmosphere, and primarily by periodically changing solar radiation. Climate is affected by Earth's annual motion around the sun and modified by thermohaline ocean circulation and air circulation. The location of mountain ranges and over geological time scales – by their uplift and erosion as well as by the movement of the continents.

2. Geological investigations prove beyond any doubt that **permanent change has been inherent in Earth's climate** since the very beginning. A change has occurred as mutually interacting cycles of varying duration, from several hundred thousands to a few years. Longer climatic cycles were affected by extra-terrestrial astronomic factors and by changes of the Earth's orbit, while shorter ones are influenced by regional and local factors. Not all of the climate-influencing phenomena and reasons for climate change have yet been recognized.

3. The Earth's climate has predominantly been warmer than at present. However, there have been some significant coolings that resulted in the development of extensive glaciations, in some of which ice sheets even reached the tropics. Therefore, any reliable forecasts of climate change, before discussion of prevention or neutralization, **should take** into account evidence from the geological past when, obviously, neither humans nor industry affected the Earth.

4. Since 12 thousand years ago, the Earth is **once again in the phase of cyclical warming** and now approaches its peak intensity. Just in the Quaternary that is over the past 2.5 million years, warm and cool periods interchanged many times, the phenomenon which has already been well recognized.

5. The present warming coincides with elevated contents of greenhouse gases in the atmosphere. Among these, **water vapour predominates** accompanied with much smaller quantities of carbon dioxide, methane, nitrogen oxides and ozone. This is nothing unusual, because the geological past has seen high levels of greenhouse gases in the atmosphere, occasionally even several times higher than at present, before humans appeared on the Earth.

6. **During the last 400 thousand years** – still without anthropogenic greenhouse influence – the content of carbon dioxide in the air, as indicated by ice cores from Antarctica, was repeatedly 4 times at similar or even slightly higher level than at present. Around the termination of the last glaciation, mean global temperature changed substantially several times over several hundred years, even by up to 10°C(!) in the northern hemisphere. Thus, this change was undoubtedly much more severe than the present warming.

7. In the **past millenium**, after warm medieval ages, by the end of the 13th century, a cold period started and lasted up the middle of the 19th century, then gave pace to another warm period in which we are living now. The phenomena observed today, specifically a **temporary** rise of global temperature, just reflect a natural rhythm of climate change. Warming of the oceans reduces their capacity to absorb carbon dioxide whereas a smaller area occupied by permafrost intensifies decomposition of organic matter in soil and therefore, stimulates increased emission of greenhouse gases. Volcanic activity on Earth, concentrated along margins of the lithospheric plates, mostly hidden in the oceans, supplies permanently (but not alike) the atmosphere with carbon dioxide. In the terrestrial system this gas is translocated from the atmosphere to the biosphere and lithosphere by photosynthesis, then combined in living organisms or in carbonate shells of marine organisms and after their death, stored in huge limestone beds at sea/ocean bottom and in organic matter on land.

8. Instrumental monitoring of climate parameters has been carried out for only slightly more than 200 years and exclusively on some parts of the continents that constitute a small part of the Earth. Several older measurement stations once set up in suburbs now appear, due to progressive urbanization, in the town centres which results among others in increased values of the measured temperatures. Profound examination of the oceans was initiated 40 years ago. Reliable climatic models **must not be based** on such a short measurement data base. Therefore, considerable restraint is desirable if ascribing exclusive or predominant responsibility to man for increased emission of greenhouse gases. The reality of such **arbitrary statement** on human influence **has not been demonstrated**.

9. It is certain that increased content of greenhouse gases in the atmosphere is connected partly with human activity. Therefore, all steps that restrain this emission and agree with principles of sustainable development should be taken, starting from a cease of extensive deforestation, especially in tropical areas. Various adapting measures that can mitigate effects of the recent trend of climate warming should be implemented by political decision makers.

10. Research experience in the Earth sciences suggests that simple explanation of natural phenomena, based on partial observations only and without consideration of numerous factors important for individual processes in a geosystem, leads generally to unreasonable simplification and misleading conclusions. Such opinions, embellished with political correctness, could be presumably inspired by lobbying circles that are interested in selling the particularly expensive so-called ecological energetic techniques and in storing (sequestration) of carbon dioxide in post-exploitation caverns, of natural gas included. However, such an approach is far from a reality. Undertaking of radical and extremely expensive economic activities that aim to delimit emission of **selected** greenhouse gases only when no complete analysis of the present climate change is available, can bring completely unexpected results.

The Committee of Geological Sciences of the Polish Academy of Sciences considers it necessary to propose interdisciplinary studies, based on comprehensive monitoring and modeling of the climate, including also factors other than the concentration of carbon dioxide in the atmosphere only. It would certainly give an opportunity to approach a better recognition of the driving forces of the climate on Earth.