

Review of: "Climate Change Denial Theories, Skeptical Arguments, and the Role of Science Communication"

Viliam Novak¹

¹ Institute of Hydrology

Potential competing interests: No potential competing interests to declare.

Review of article: Climate change, denial theories, skeptical arguments, and the role of scientific communication, by Viet Phuong La et al.

This essay touched on a “hot” topic. It is true that among scientists there is nearly unanimous opinion that ongoing global changes (or climate change) are mostly the product of human activity. The fact is that in history, Earth experienced climate changes due to mostly external reasons (see Fig. 1 in the reviewed article), but those changes occurred slowly, over thousands of years. They are probably occurring even now, but their intensity is so slow that we are not able to measure it. Therefore, it is accepted that extraterrestrial reasons for climate change could be neglected in time intervals of tens, or even hundreds of years.

But there is a widely accepted statement that the climate change (or biosphere temperature increasing) is mostly due to the emission of carbon dioxide and its increasing concentration, and the mitigation strategy is based on a decrease in carbon dioxide emissions. It is not true. As was shown by Feldmann et al. (2015), the rate of energy (long-wave radiation) due to the increase in carbon dioxide concentration per year is 0.02 Wm^{-2} , but there are more important long-wave energy fluxes that contribute. Let's compare this effect with others.

There are other reasons for the Earth biosphere temperature increasing. In papers cited below, other reasons for biosphere heating are shown. For example, there is the annual increase of long-wave energy increasing due to the Sahara Desert area increase (0.0524 Wm^{-2}), which is more than twice the energy flux due to carbon dioxide emissions. Very importantly, a contribution to the Earth's temperature increasing (comparable to the Sahara Desert area increasing) is the increasing areas of impermeable surfaces. Such surfaces (transportation infrastructure, roofs) cover about 10% of EU countries' territory and strongly modify the structure of radiation fluxes. From such surfaces, about 90% of precipitation water outflows, and the available energy is not consumed by evaporation but is outflowed, thus increasing the temperature of the nearby environment. This phenomenon is known as the “heat islands” of cities. If the area of the impermeable surfaces is assumed to be 1% of the dry land, then the long-wave energy flux (heat flux) was estimated as 0.0565 Wm^{-2} , which is much higher than the flux due to carbon dioxide emissions. Clearing forests and using this area for agricultural production or dwelling areas is a reason for increased heat production too.

Rainforest clearing is contributing to the rate of average heat transport by 0.0206 Wm^{-2} , which is approximately the same rate as the contribution of carbon dioxide.

To conclude, the contribution of carbon dioxide emissions is responsible for about 0.3 energy (heat) fluxes, increasing the temperature of the Earth, but the influence of other reasons (instead of carbon dioxide) is usually neglected.

The above-mentioned reasons for global warming are not complete, nor exact, because of a lack of data. Another problem is to recalculate those energy fluxes to the temperature of the biosphere increase. The sum of the calculated average energy fluxes to the dryland surface was estimated as 7.46 Wm^{-2} , but the average energy flux to the Earth's surface from the Sun is 350 Wm^{-2} , which is about 20 times more than the estimated contribution by energy due to some human activities. To recalculate the contribution of “additional” fluxes to the Earth's temperature increase is difficult, due to a lack of reliable data, but in principle, it can be realized.

I would like to demonstrate quantitative data responsible for global warming and show that the increasing concentration of carbon dioxide is only one of many reasons for this phenomenon. Now, we are trying to demonstrate quantitatively the role of land structure changes in the energy balance of the Earth and the so-called climate change. But even actual information shows that climate change is reality, and the resulting effect is due to a combination of different reasons. Therefore, we should try to use any opportunity (as it is described in the reviewed paper) to inform politicians and to make their decisions properly.

Therefore, I think that the reviewed paper can help in the proper interpretation of current climate change, and I propose to publish it.

Literature

Feldmann, D.R., Collins, W.D., Gero, P.J., Torn, M.S., Mlawer, E.J., Shippert, T.J. (2015). Observational determination of surface radiative forcing by CO_2 from 2000 – 2010. *Nature*, 519, 339 – 343.

Novák, V. (2021). Ecosystems and global changes. *Acta Horticulturae and Regiotecturae*, Special Issue 2021. Nitra, Slovaca Universitas Agriculturae Nitriae, pp.70-79.

Novák, V. (2022). Global changes and the hydrosphere. *Acta Hydrologica Slovaca*, v.23, No.1, pp. 3- 9.

Novák, V. (2023). The influence of land use change on the transport of water and energy in ecosystems and climate change. *Acta Hydrologica Slovaca*, v.24, No.1, pp. 3- 8.