Crimson Publishers
Wings to the Research

Opinion

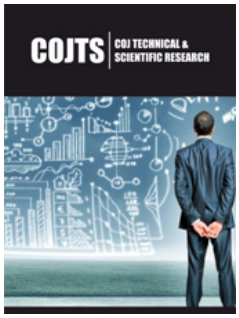
Integrated Educational Framework in Climate Science

Sushil Kumar D*

Visiting Scientist, Centre of Excellence in Climate Modelling, IIT Delhi, India

President, Foundation for Education and Research in Climate Change

Formerly Professor and Head, Centre for Atmospheric Sciences, IIT Delhi, India



***Corresponding author:** Sushil Kumar Dash, President, Foundation for Education and Research in Climate Change

Submission: November 28, 2022

Published: January 17, 2023

Volume 4 - Issue 1

How to cite this article: Sushil Kumar D. Integrated Educational Framework in Climate Science. COJ Tech Sci Res. 4(1). COJTS. 000580. 2023.

Opinion

It is an accepted fact that the global climate is changing and climate crisis is knocking at the door. In addition to the rise in earth's mean surface temperature, sea level rise and snow/glacier melting, there are more serious weather changes in terms of extremes in rainfall and temperature. In addition, occurrence of more intense cyclonic circulations, thunderstorms and forest fires are the cause of concern. Urban heat island effects are felt increasingly all over the world. Air pollution is another deadly problem. All the above unusual weather and climate related issues are creating challenges for the survival of mankind in terms of loss of life and property. The causes of warming are known scientifically, but actions required to mitigate are complex and difficult. That is the main issue. What is needed is action from all possible angles. International treaties and appropriate actions at the national levels are taking us in the right direction. However, much more actions are needed even at the individual level. Basically, weather and climate are the results of nonlinear interactions between the earth, atmosphere and ocean. The physical processes in the earth-atmosphere-ocean system such as entering of the solar radiation into it, secondary radiation being emitted from the surface of the earth, the chemical composition of the atmosphere, the radiative forcing, greenhouse effect, global warming, daily weather events happening and other such phenomena are very complex and interlinked. During the last one and half century or so, scientists have been working hard to understand these processes taking place all the time and have made tremendous progress in getting more quantitative measurements of the relevant climatic parameters through various improved instruments such as sensors, radars and satellites; developed mathematical coupled models using a set of well understood and sound coupled mathematical equations and state-of-the-art computers. Today, scientists all over the world are continuously working to bring weather forecasts and climate projections as close to the reality as possible with the help of advanced techniques including Artificial Intelligence and Machine Learning.

Climate changes give rise to related disasters and hence loss of life and property. Workload for resilience building is multifaceted. There comes the role of Private organisations, Meteorology related Societies, Academics and Citizens at large. It is very important for the school children to learn about the climate related issues so that they will think about out-of-the-box solutions when they grow. General public should be aware of the impending climate problems so that they will try for mitigation at the individual levels and adaptation strategies. Policy makers should be in the know of the climate information so that they will plan for suitable policies. In a way, all sections of the society should be empowered by knowledge at their respective levels. It is well known that knowledge shows the way for appropriate solutions and education is the best medium to spread knowledge. Education enhances the knowledge and training helps developing more skills. This article is an attempt to highlight some activities in the education sector that can help us to face the climate emergency.

Teachers Training and Students Knowledge Generation

Teachers are the backbone of any society. By training a teacher, one trains several others in the way of cascading effect. Leaving aside few countries, Climate Science is not taught as part of regular curriculum in schools and colleges of large parts of the world. There is an urgent need for that. More institutions of higher learning and state-of-the-art research will help to a great deal. In addition, it is necessary to mainstream the climate science by bringing weather and climate events into the class room discussion while teaching specified topics laid down in the curriculum of basic science such as Physics, Chemistry, Mathematics and Biology. This is because of the fact that science of weather and climate is interdisciplinary in nature and it covers all important basic science subjects. Science teachers in schools and intermediate colleges have adequate knowledge to explain weather and climate phenomena once they are exposed to different aspects of climate. They can be trained quickly by experts so that their knowledge on salient features related to climate change will percolate to their students through participatory programmes.

Short Term Courses for Climate Related Organisations

Climate change has impacts on several sectors of the society. As mentioned earlier, the important stake holders of climate services include agriculture, human health, water availability, coastal ecosystem, forests, disaster management, NGOs, local administrators and overall the policy makers. Persons working in these sectors not necessarily have adequate knowledge and information about all the dimensions of weather and climate science. Since climate services are very important, the stake holders need to have reasonable knowledge about several key aspects of weather and climate.

Training on the Use of Climate Data for Impact Studies

Today, weather and climate data are available from several sources freely online. These data are from the observed as well as model sources. Several weather and climate scientists are using such data in their R&D and publishing important results. Scientists in the impact sciences such as agriculture, human health, water availability and environmental sciences are eager to use climate data in order to examine the present and future relationships of important parameters in their sectors with the climate. With the improved technical tools like AI and ML the importance of Data Science has increased many folds. These scientists should be given opportunity to understand and use the vast climate data available from numerous sources.

Region Based Thematic Workshops

Every country has its own climate calamity peculiar to that region. Heat waves, Cold waves, Cloud bursts, Flash floods, Urban flooding, Landslides, Forest fires, Coastal inundation, Tropical cyclones, Typhoon, Tornadoes, sea level rise and several other weather phenomena are region specific and hence need focus in that region. Outreach programmes on thematic topics when conducted in the concerned regions will be very effective and beneficial to the people. These programmes covering not more than a couple of hours will be more effective when people relate their day-to-day experience with weather to the teaching materials. Today, technology can be harnessed to conduct seminars on the virtual modes aimed at a select group of people of similar background.

Programmes for Awareness Generation

Considering the complexity of the climate change, its origin, uncertainties and tremendous adverse impacts on the society, it is of paramount importance that various facets of climate science and climate change reach the people of all sectors in the society. There are several ways. Awareness about the extreme weather events and related safety issues can be explained to the people in batches even in the virtual mode. Human contribution to climate change can be explained to the people in simple local languages which will be understood by them in town hall seminars and also in schools and colleges. There can also be short interactive sessions with the people in different regions. Another important way is to prepare very short duration videos for the social media for distribution. It should be noted that the impact on the general mass will be more when such messages are for short duration of 2-3 minutes or so. Such short but important messages will have multiplying effect on the public. Weather and climate science has grown enormously in the last century due to the advancements made in observational network, scientific understanding, mathematical models and technology. To educate people about the climate change issues one needs to teach them based on their own experiences. It is highly necessary to involve all the sections of the society. The best mode of climate education is Public, Private and Academia (PPA) collaboration. Involvement of citizens in the science of climate will help the mankind a great deal. Knowledge will arm the people to be ready to face the unusual weather and be ready for the future climate changes. It should be known to all that although reduction of greenhouse gases and consequent global warming are matters of complex global geopolitics, all sections of the society including teachers, students, stake holders, scientific societies, NGOs and the general citizens have important roles to play. It is seen that start-ups are very effective in finding solutions to several problems in day-to-day life with the help of present day technology. In addition to climate actions by the National Governments, it is also important to encourage and support start-ups by fresh graduates and young entrepreneurs in the direction of long-term solutions. It is possible to encounter the climate crisis through the spread of knowledge and problem-solving using science and technology. Thus, the future will be much better than anticipated due to the warming.