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Floods may be the norm

Global warming may call for great intervention in the flow of rivers, says S.Ananthanarayanan.

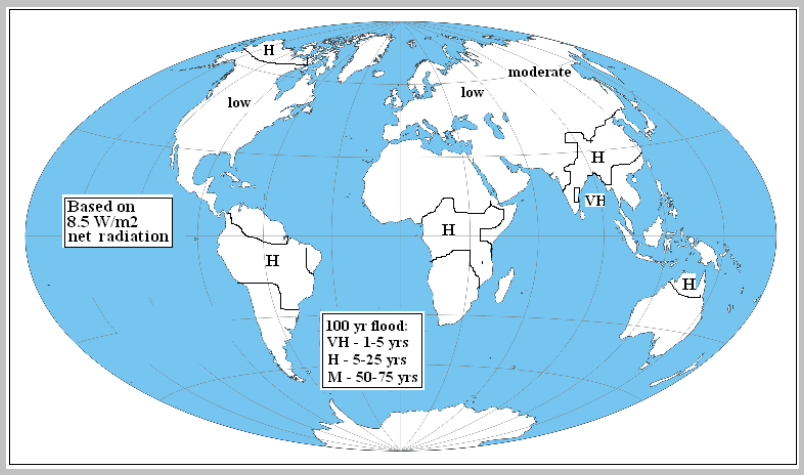
The recent disaster in Uttarkhand has led to much criticism of agencies that are said to have promoted silting of rivers and has questioned the need for mini hydel projects in the area. But 60 hours of heavy rainfall and continued discharge from the glacier sources of the Bhagirathi and the Alaknanda may not have been contained in any case. Wider understanding of the drivers of climate, which would make such situations more frequent in the coming decades, may help press in vital adaptation measures that many regions in the world need to undertake.

Yukiko Hirabayashi, Roobavannan Mahendran, Sujan Koirala, Lisako Konoshima, Dai Yamazaki, SatoshiWatanabe, Hyungjun Kim and Shinjiro Kanae from institutes in Tokyo and the University of Bristol, UK, report in the journal, ***Nature Climate Change***, their analysis, for the first time, of the data in eleven different climate change models, which concludes that Southeast Asia, Peninsular India, eastern Africa and the northern half of the Andes would see a large increase in flood frequency. This finding contrasts the results of different, stand alone studies, whose forecasts are similar but reserve a wide margin for error.

As easily the gravest climate related disaster there is, floods are a public concern that deserves cooperative international address. In 1988, two UN organizations, the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP), set up the **Intergovernmental Panel on Climate Change** (**IPCC**), a multinational, scientific intergovernmental body, representing more than 120 countries and chaired by Mr Rajendra K Pachauri of India. The IPCC compiles reports and research carried out the world over and serves as an internationally recognized advisory body. Although the IPCC shared the 2007 Nobel Peace Prize with Al Gore, much of its advice has gone unheeded.

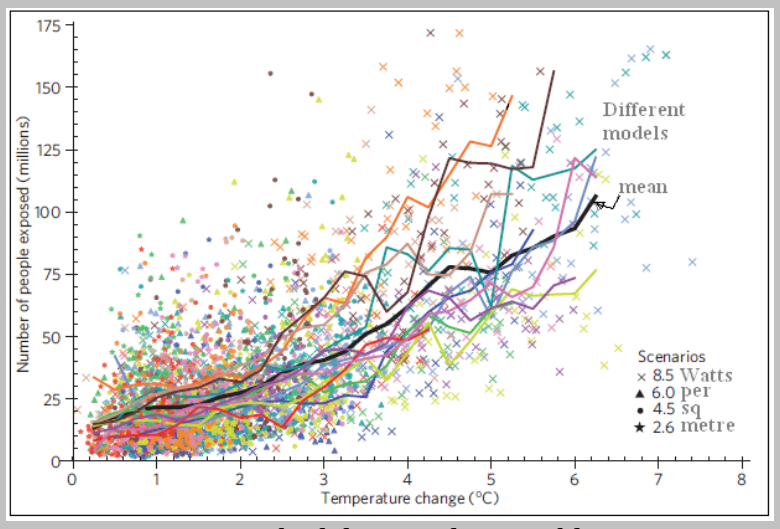
The methodology of making forecasts of flood risk is through assessing the dynamics of evaporation, winds and precipitation, in what is called the ***atmosphere-ocean general circulation model*** (***AOGCM***). The models use daily river discharge data and other meteorological information that is publicly available and some of the models have factored in the expected warming of the world. But the data needed, like daily runoff, is typically not easily available and the studies have had to make to do with what they could get. The IPCC ***special report on extremes***, dubbed the ***IPCC SREX***, said, “Overall there is low confidence in projections of changes in fluvial floods. Confidence is low due to limited evidence and because the causes of regional changes are complex.”

In the study now reported, outputs of the latest 11 AOGCMs were made use of to work out a world-wide projection of changes in flooding. Daily runoff data of AOGCM simulations that were used include historical simulations (1850-2005), forced by natural causes, like volcanic and solar effects, and man-made, like greenhouse gases and ozone, and future simulations (2006-2100), based on different projected greenhouse gas concentration levels. The future simulations consider a range of net warming of the earth by the sun, from a low, 2.6 Watts to a high, 8.5 Watts for every square metre, in the year 2100.



The object of the study was to assess the change in the chances of a particular level of river discharge in the year 2000 and in the year 2100. The river discharge equal to the 100 year maximum was chosen as the particular level. Using simulations for the periods 1971-2000, the level of river discharge which was the 100 year flood in the year 2000 was worked out for each location. Simulations for the period 2071-2100 were then carried out to assess how often the same levels would be reached in the year 2100. The findings, shown in the picture, are that in southeast Asia, the Indian peninsula, eastern Africa and northern South America, the 100 year maxima of 2000 can be expected every 5-25 years. And in one part of south east India, this would happen every 2-5 years!

The study followed through with analyses of the impact of the high flood frequency after taking into account the population affected. The higher frequency of floods in southern latitudes, which have high population, would accentuate the human impact. This becomes sharper with the projected increase in population during the rest of the century. The next analysis done was to connect projected rise in global temperature with the population affected by floods. The estimated populations affected, in 2010, without accounting for population rise, was compared with respect to levels of warming. The results show dramatic increases in the numbers affected and should act to bring home the need for fixing demanding targets for greenhouse gas control.



“Despite the limitations in our methodology and inevitable uncertainty in regional and basin-scale projections, the results of this study signify the necessity for adequate adaptation and mitigation strategies on a global scale: adaptation to intensified floods and mitigation of greenhouse gas emissions. Major attention should be paid to lower-latitude countries where flood frequency and population are both projected to increase,” say the authors in the paper.

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