

# The Indian monsoon and climate change

## Walker Institute research

### Living in the shadow of the Asian monsoon

The monsoon across India, China and the rest of Southeast Asia affects the lives of more than one third of the world's population.

The Asian monsoon, like its counterparts in West Africa and Australia, is characterized by remarkable seasonal changes in

wind direction and is associated with heavy rainfall during the summer months.

How might the monsoon change in the future? Will it continue to exist in its present form, and if so, will floods or droughts be more common?

### India's dependence on the monsoon rains

The monsoon rains provide nearly 80% of the year's rainfall in India, making it critical for agriculture, for drinking water and for industry which often relies on hydroelectricity for power. So India's economy and societal infrastructures are finely tuned to the remarkable stability of the monsoon, and vulnerability to small changes in monsoon rainfall is very high. In 2002 a severe and unforeseen drought hit India's agricultural production and

economy hard. In August 2005 Mumbai experienced severe flooding, when more than one metre of rainfall fell in a single day.

These variations in seasonal rainfall are often related to weather in other parts of the world, such as El Niño events in the Pacific Ocean. Understanding the timing, duration and intensity of the monsoon is vital if we are to predict these periods of drought and flood.

### Advancing the science of monsoon prediction

Given the importance of the Indian monsoon for the livelihood of so many people, predictions about its stability and future behaviour are crucial. There is a pressing need to advance the science of monsoon prediction and its applications, as a crucial step in developing usable scenarios for assessing the socio-economic conse-

quences of climate variability and change.

Under the British Council UK-India Education and Research Initiative, the Walker Institute, together with the Indian Institute of Tropical Meteorology, are leading a project to bring together major groups in India and the UK to address the challenges of monsoon prediction.



*"We aim to combine India's detailed knowledge of the monsoon with the UK's capability in climate prediction to significantly accelerate the development of skilful monsoon forecasts.*

*This is essential for India as its economy develops rapidly, and the need to build resilience to the vagaries of the monsoon rains become more pressing. Ever since the 19th century the UK has had a keen interest in the climate of India, and we are very excited that the UKIERI has provided us with this opportunity to work together even more closely."*

*Prof Julia Slingo, UK leader in the UKIERI project on climate change.*

## How will climate change affect the stability of the Indian monsoon?

Climate models suggest that Asia's summer monsoon will persist. Indeed, the average summer rainfall may increase by around five percent, increasing water available for crop production, power generation and industry.

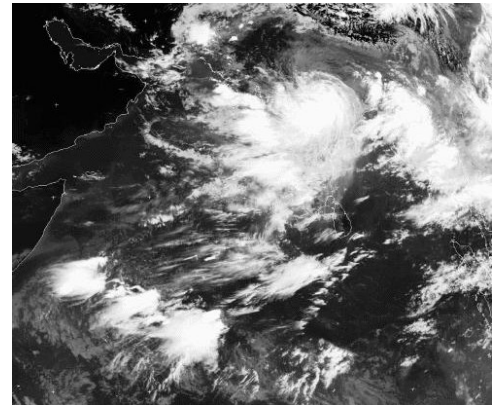
However, climate models also suggest greater variability in monsoon rainfall from year to year in a warmer world. So there could be greater range between flood and drought conditions, both of which could be more severe.

So, the Indian summer climate in the coming century looks to be wetter on average, together with flood and drought

conditions occurring more often. What we still need to answer is how the daily patterns of weather, such as levels of heavy precipitation or active-break events, may change in future monsoon seasons.

We do not yet have a full understanding of the processes going on, and we know that climate models perform poorly in this critical yet challenging region where the ocean, atmosphere, lowlands and mountains all interact.

The UK-India Initiative will be looking at these aspects and will be aiming to deliver better climate information on the Indian monsoon.



Active monsoon: 30 June 2007

## Science into action

In the future, the pressures of an increasing population will bring additional stresses on society and the environment, with serious implications for water resources, health and food security. So, the possibility that the monsoon may become less stable as a result of climate change has serious consequences for India.

The UK-India Initiative will also be developing new methods for interpreting cli-

mate forecasts in terms of tailored products at the local and regional level. In combination with three related projects we will explore how these products can be used to provide better advice on the effects of variability and possible changes in monsoon behaviour on food production, water cycle and ecosystem functioning, and extreme events and health in India.

### UKIERI: Delivering better climate information:

- Understanding how and why the monsoon varies.
- Developing capability to simulate the monsoon in climate models.
- Achieving skillful monthly and seasonal forecasts.
- Providing more confident projections of future climate change.
- Producing tailored climate products at the local and regional level.



Mumbai floods:  
26 July 2005

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