

## Indian Monsoons: A Reflection

Growing up in the American Southwest, I always heard about the dangers of monsoons, but I never imagined how much power monsoons could have over so many people, and such an important economy. And it's not just economic, India has a very interesting and complex relationship with the monsoon. Too much or too little, too late or too early, and the rains can have seriously detrimental effects. Without it, India's already precious water resources would dwindle even further, putting the lives and livelihoods of countless millions at risk. Although few may realize it, the monsoons are truly the lifeblood of India.

First of all, the monsoon is inextricably linked with the agriculture sector, which employs over half of the Indian workforce. We learned a bit about the relationship between the monsoons and farming when we visited Dr. Rao's farm. One very important thing is that a large percentage of Indian farmers are still reliant on rain-fed agriculture, meaning that the amount of water their crops get depends solely on how much rain falls during the monsoon and the pre-monsoon showers. Of course, this means that these farmers are especially vulnerable to changes in monsoon rainfall onset, duration, and amount, and since they are already a vulnerable rural population, the impacts of climate change on the monsoon will be incredibly detrimental. Dr. Rao and his team have created a method of irrigation that decreases this vulnerability, but unfortunately they have not been able to upscale the model to as many farms as they might have liked. Another form of irrigation that could help with water reliability is drip irrigation, which is heavily subsidized by the government. But despite the subsidies, only around 10% of all Indian farms use drip irrigation. With this underutilization of irrigation techniques, too many of India's

farmers still rely entirely on the whims of the monsoon, leaving them highly vulnerable to the inevitable effects climate change will have on monsoon patterns.

In addition to these effects on rural agricultural populations, the monsoons also have important ramifications for the vast, and growing, urban population. The alarming population growth rates and inadequate infrastructure combined make for a very high flood risk that can affect millions of people in a very brief time, as was seen in the 2005 Mumbai floods. Many people were killed or injured, and the city was shut down for days. In the aftermath, efforts have been made to improve drainage and other infrastructure problems that seemed to have exacerbated the flooding, but it is unlikely that their efforts have been sufficient to neutralize the risk of this kind of disaster happening again. And even if they were, there are still many other megacities at risk that have been fortunate enough to not have any major incidents spur them into initiating this kind of overhaul, and therefore have made little to no effort to mitigate flood risks.

With both rural and urban population at risk from monsoons, clearly India has an especially strong motivation to mitigate climate change, and thus keep the monsoon patterns as steady as possible. But even with mitigation, efforts must still be made to decrease vulnerability, largely by improving the use of irrigation on farms and the infrastructure presence and quality in urban areas. Without these changes, the monsoon will keep its powerful hold over India, leaving them vulnerable in the face of global climate change.