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Monsoon: A Planning Commission of India

From the Chairman's Desk

The giant distillation apparatus operated by mighty nature in its laboratory of 'bio-sphere' is called Monsoon. In the Asian continent and particularly in Indian Sub-continent the annual event most anticipated by the largest population on the Earth and repeated year after year for the centuries and millenniums is called Monsoon. Every year, India receives huge amount of fresh water through rains. On average if all the annual Monsoon rain-water is stored and not allowed to drain in the river or soaked in the ground, whole Indian land would be flooded with more than one meter of pool of water!! Yet humans who are so proud to have deciphered the atoms, genes and space, the Monsoon rains are only partially understood and infamously difficult to predict in terms of its exact date of arrival, its spread and its intensity. The theories and models of these chaotic circulations in atmosphere are still evolving. Intergovernmental Panel on Climate Change (IPCC) describes Monsoon as a tropical and subtropical seasonal reversal in both the surface winds and associated precipitation, caused by differential heating between a continental-scale land mass and the adjacent ocean. That sounds complicated. Suffice it to say that more than half of the agricultural land in India is irrigated by Monsoon and Monsoon rains also feed remaining land irrigated by man-made reservoirs in. So nearly 20 percent of India's GDP and more than 60 percent of its agrarian population depends solely on Monsoon.

The purchasing power of the 60 percent of population is directly dependent on Monsoon that drives the manufacturing and servicing sector on which remaining 40 percent population depends. Thus good monsoon means improved quality of life of the people in villages as well as cities of India. Bad monsoon can also pull down the democratically elected governments due to rise in food

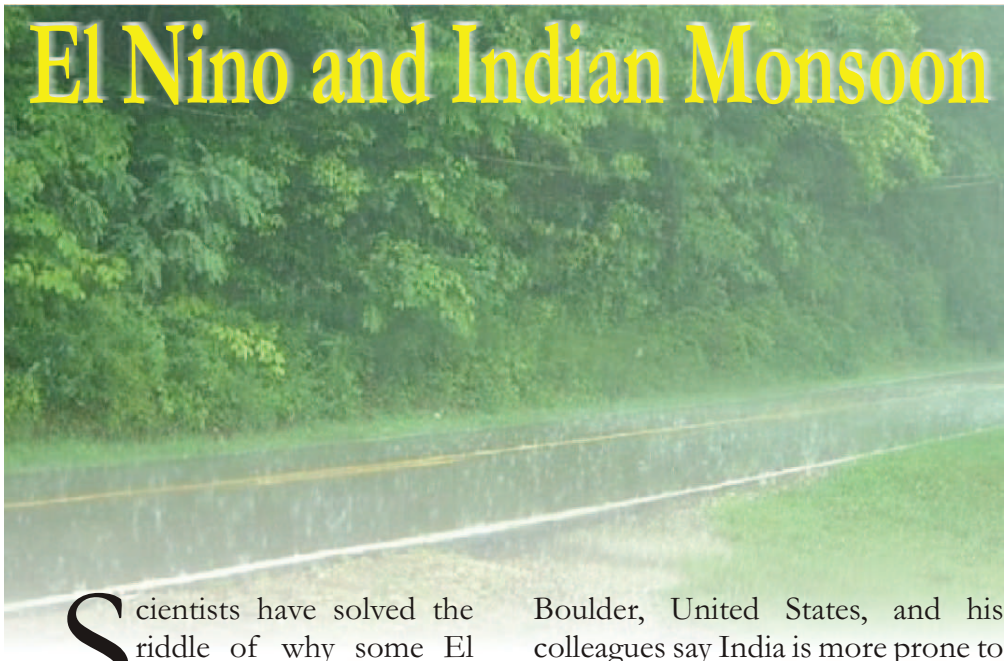
prices and inflation that affects all sectors of the society except the rich. So, bad monsoon heralds threat to the politicians. The real author of all the reports of the Indian Planning Commission is Monsoon! What we generally forget, most of the times are that good monsoon also means healthy ecosystem on which the life on the Earth depends. Not only Monsoon feeds river systems, but it also nourishes and sustains floraand fauna. The services like pollination, sustainable forestry, fresh water fishing, feeding the ground water aquifers, cleansing of unwanted natural waste etc. are indirectly provided by Monsoon. Monsoon is the driver for the Sustainable development.

Rajendra Shende
Chairman, TERRE

View from Matheran in Western Ghats (2600ft. above sea level) on 28 May just before arrival of Monsoon

Same view from Matheran on 28 August in rainy season

El Nino and Indian Monsoon



Scientists have solved the riddle of why some El Niño events cause the Indian monsoon to fail while others do not, which may lead to more accurate forecasts of drought. The extremes of weather associated with El Niño are caused by the periodic warming of the surface of the Pacific Ocean.

Severe droughts in India have always occurred in El Niño years, yet every El Niño does not cause monsoon failure and drought — a mystery that researchers have been struggling to crack.Accurate monsoon prediction is crucial to India's economy: nearly one-fifth of the country's gross domestic product comes from agriculture. Even moderate crop failures have severe economic and societal impacts. Research published shows that it depends on whether the surface of the equatorial Pacific Ocean is warmest in the east, along Latin America, or closer to the centre. Martin Hoerling of the National Oceanic and Atmospheric Administration (NOAA) Earth System Research Laboratory in Boulder, United States, and his colleagues say India is more prone to drought when the warm Pacific temperatures typical of El Niño extend westwards into the central Pacific Ocean.The team analysed 23 strong El Niño years and their links to 13 droughts and 10 drought-free years in India, using satellite observations of sea surface temperatures and historical data of rainfall over central India.

Having found that drought was associated with warm water in the central Pacific, they used computer models to mimic the patterns, which confirmed their findings. The researchers suggest that the "two flavours of El Niño" might affect the Indian monsoon differently through the tropical Walker circulation — an east-west wind over the Pacific . The scientists say their research does not rule out the possibility that other factors, such as Indian ocean temperatures, also play a role. And changes in ocean temperatures brought about by human-induced climate change could also affect the intensity of the Indian monsoon, they add.

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Ref: SciDevNet.

Quick Question

One millimeter of rainfall is the equivalent to:

- ❍ **One liter of water per square meter**
- ❍ **One bowl full of water in the metering instrument**
- ❍ **One inch of water per Sq. Ft.**
- ❍ **One millimeter of water per square millimeter**

If you know the answer, send in your entry to us at : Terrepolicycentre@gmail.com

Rain Gardens - Storm Water Mitigation

- **What is a Rain Garden?**
- **How to Install a Rain Garden**
- **Rain Gardens - Storm Water Mitigation**
- **Rain gardens benefit everyone**

They are popping up everywhere, from backyards to businesses, schools to churches. They are colorful, beautiful and vibrant. They also serve a vital purpose as attention turns again to the health and cleanliness of our local waterways.

They are rain gardens. Many gardeners have heard the term "rain garden" but are still not familiar with the usefulness and benefits these easy-to-create gardens provide. Not only are rain gardens beneficial to the property owner, but to our natural streams, rivers, lakes and wetlands as well.

Chad Casper, with the Winnebago County Land and Water Conservation Department, said continued development of our land results in more untreated water being fed into our waters.

"Development continues every year, which results in more buildings, more concrete and other impervious surfaces" Casper said. "This results in more runoff and pollution from rainwater not being able to infiltrate into the ground.

"One practice that can help is a rain garden. Rain gardens use the natural rainfall as their source of water.

This water will then stay on site and infiltrate into the ground before running onto our streets and collecting pollutants. The water that enters a storm sewer is not treated and goes directly to our lakes and streams."

In addition to the filtering and cleansing effects of a rain garden, there are other benefits.

"The rain gardens not only help clean the water, they also decrease the amount of water stressing our storm sewers" Casper said. "This will decrease the chances of flooding in urban areas. They also create a small area of habitat for birds and butterflies."

In addition, rain gardens are low maintenance.

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Famine without deficit in Monsoon

It is popular belief that Famine is caused by the lack of adequate harvest and inadequate monsoon. Dr Amartya Sen, Nobel Laureate has proved that this is not necessarily so.

The government policies are also responsible for famine. Example id the Bengal famine in 1943 when 1.5 and 4 million people died of starvation, malnutrition and disease, out of Bengal's 60.3 million population, half of them dying from disease after food became available in December 1943.

The orthodox explanation of the famine, from the Famine Inquiry Commission of 1945 was that the Indian provincial and national governments and the British government chose to believe, without evidence and in denial of the evidence, that Bengal had plenty of food available, and so they provided far less food relief than was needed, and many people died.

Amartya Sen (1976) challenged this orthodoxy, reviving the claim that there was no shortage of food in Bengal and that the famine was caused by inflation, with those benefiting from inflation eating more and leaving less for the rest of the population.

Sen claimed that there was in fact a greater supply in 1943 than in 1941, when there was no famine. This is the explanation that the Bengal Government and other governments believed and acted on in 1943."

Ref: Amartya Sen, 1976

Floods in India

India, being a peninsular country and surrounded by the Arabian Sea, Indian Ocean and the Bay of Bengal, is quite prone to flood. As per the Geological Survey of India (GSI), the major flood prone areas of India cover almost 12.5% area of the country.

Every year, flood, the most common disaster in India causes immense loss to the country's property and lives.

India Flood Prone Areas

The states falling within the periphery of "India Flood Prone Areas" are West Bengal, Orissa,Andhra Pradesh, Kerala, Assam, Bihar, Gujrat,Uttar Pradesh, Haryana and Punjab.

The intense monsoon rains from southwest causes rivers like Brahmaputra, Ganga, Yamuna etc. to swell their banks, which in turn floods the adjacent areas. Over the past few decades, central India has become familiar with precipitation events like torrential rains and flash floods.

The major flood prone areas in India are the river banks and deltas of Ravi, Yamuna-Sahibi, Gandak, Sutlej, Ganga, Ghaggar, Kosi, Teesta, Brahmaputra, Mahanadi, Mahananda, Damodar, Godavari, Mayurakshi, Sabarmati and their tributaries.

Highest flood prone areas in India

Though the north-Indian plains prone to flood more, the "India f flood prone areas" can be broadly categorized in three divisions:

- Ganga Basin : The Ganga Basin gets flooded mostly in the northern part by its northern tributaries. The badly affected states of the Ganga basin are West Bengal, Bihar and Uttar Pradesh.
- Besides the Ganga, rivers like Sarada, Rapti, Gandak and Ghagra causes flood in eastern part of Uttar Pradesh. The Yamuna is famous for flooding Haryana and Delhi. Bihar experiences massive dangerous flood every year. River Burhi, Bagmati, Gandak, Kamla along with many small rivers contribute to that. In West Bengal, rivers like Mahananda, Bhagirathi, Damodar, Ajay etc. causes floods because of tidal effects and insufficient river channels.
- Brahmaputra and Barak Basins: The river banks of Brahmaputra and Barak gets flooded due to the Surplus water found in the Brahmaputra basin and the Barak basin. These rivers along with their tributaries flood the northeastern states like West Bengal, Assam and Sikkim. Jaldakha, Teesta and Torsa in northern West Bengal and rivers in Manipur often overflow their banks.
- Central India & Deccan Rivers Basin : In Orissa, spilling over of river banks by Mahanadi, Baitarni and Brahmani causes havoc. The deltaic area formed by these three rivers is thickly populated. Even some small rivers of Kerala and mud stream from the nearby hills add on to the destruction. Southern and central India observes floods caused by Narmada, Godavari, Tapi, Krishna and Mahanadi due to heavy rainfall. Cyclonic storms in the deltaic regions of Godavari, Mahanadi and Krishna even floods the coastal regions of Andhra Pradesh, Orissa and Tamil Nadu occasionally.
- Refer to the table given below to get an idea about the damage caused in the India flood prone areas:

Average Annual Flood Damage (1953 - 1999)	
State	Area liable to Floods (million Ha.)
Total Damage	Rs. 13,400 milion
Area Affected	8.11 hectare
Crop Area Affected	3.57 million hectare
Human Lives Lost	1579 Nos.
Cattle Lost	95,000 Nos.

Safety Tips for Floods, Cyclones & Tsunamis

Floods

Of all the disasters that regularly strike India, floods are possibly the most recurrent and impact large areas. India is one of the most flood-prone countries of the world, with 23 out of the 35 states and Union Territories vulnerable to floods (Source: MHA). In terms of geographical area, about one-eighth

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Floods in India...

From page no. 4... or 40 million hectares of land are prone to flooding, with 8 million hectares prone to annual flooding. All river basins of India are Vulnerable to floods. The main causes of devastating floods are attributed to heavy rainfall and antecedent conditions of catchment area, inadequate drainage, or breach in flood control structures like embankments and levees. Poor permeability of soil causes flash floods as water fails to seep down to deeper layers. Human interventions like constructions on riverbeds, poor planning and implementation, poor storm-water drainage and sewerage are main causes of urban floods.

Tropical Cyclone

According to the World Meteorological Organization (WMO), tropical cyclones are weather systems "in which winds exceed gale force (34 knots or 63 kmph)". A combination of warm sea temperatures, high relative humidity and atmospheric instability results in the formation of a tropical cyclone. These disasters are characterised by destructive winds, storm surges and torrential rain causing massive community disruption. A long coastline of 7516 Km has resulted in India's exposure to nearly 10% of all tropical cyclones. On an average, 5-6 tropical cyclones occur in a year in India, mostly in the Bay of Bengal. Post-monsoon cyclones occur most frequently and are generally more devastating in intensity. It is estimated that 58% of the cyclonic storms that form in the Bay of Bengal hit the coast in October and November. Strict implementation of Coastal Zone Regulations, efficient early warning dissemination mechanisms and construction of cyclone shelters and cyclone resistant housing practices are important mitigation measures to reduce the risk.

Tsunamis result due to vertical movement of the sea floor due to tectonic causes and result in vertical displacement of the overlying water column. This produces gigantic waves which travel at about 800 kmph and hits the coast as a wall of water destroying everything in its path. Tsunami wavers may be amplified by bathymetric features, making its height vary from coast to coast. The most recent and devastating tsunami that hit the Indian coast on 26 December 2004 led to a loss of 9395 lives and affecting 26.63 lakh people. The east and west coast of India and the island regions are vulnerable to tsunamis potentially generated by the subduction zone movement in Andaman-Nicobar-Sumatra Island Arc and the Makran area north of Arabian Sea.

An over-view about state-wise flood prone areas can be gained by checking the following table

State-wise Flood Prone Areas

	Area liable to Floods (million Ha.)				
Uttar Pradesh	7.336	Bihar	4.26	Punjab	3.7
Rajasthan	3.26	Assam	3.15	West Bengal	2.65
Haryana	2.35	Orissa	1.4	Andhra Pradesh	1.39
Gujarat	1.39	Kerala	0.87	Tamil Nadu	0.45
Tripura	0.33	M.P.	0.26	Himachal Pradesh	0.23
Maharashtra	0.23	J& K	0.08	Manipur	0.08
Delhi	0.05	Karnataka	0.02	Meghalaya	0.02
Pondichery	0.01	**Total**		**33.516**	

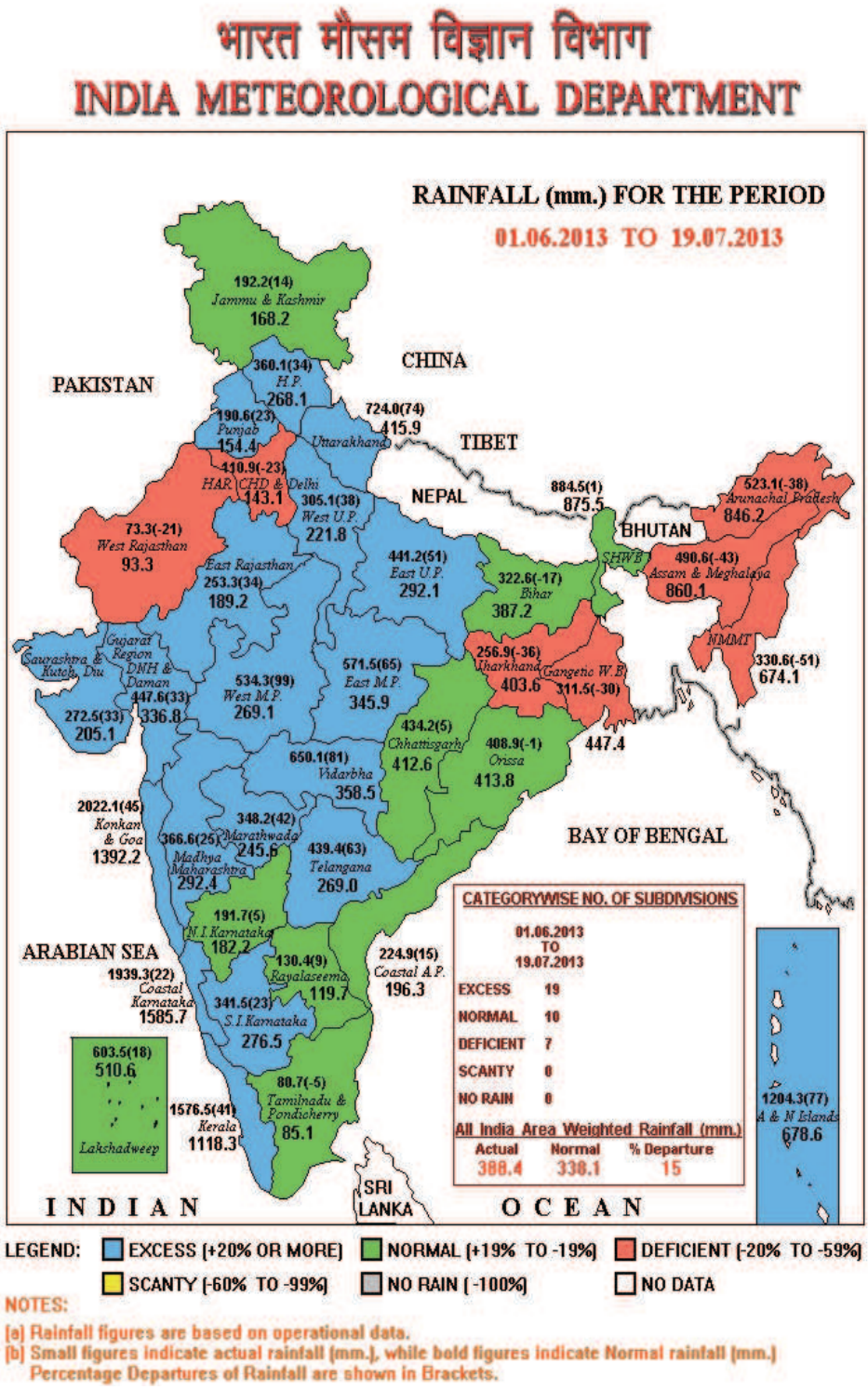
For Monsoon special

463.55 Inches

Is the average annual rainfall that Cherapunji in Assam, India received between 1971-1990 . It is the most wet city in the world. In 1860-61 it received 1,041.75 inches of annual rainfall , which is the record in the history since the rain recording began.

Rain Gardens - Storm ...

From page no. 3 "The native plants in rain gardens do not need any fertilizers and little Watering once established," Casper said. "One rain garden will not solve all our problems, but collectively, they can have a huge impact on protecting the environment." Typically, a rain garden is placed to receive water from the rooftop exiting the downspout. A slight slope helps to ensure that water from the downspout flows into the garden. The middle of the rain garden will hold water during heavy rain. Rain gardens can also be created along the sides and within roadside ditches. The following, in order of bloom time, are examples of native plants suitable for rain gardens: Blue flag iris, Columbine, Golden Alexander, Wild Strawberry, Lupine, Orange milkweed, Queen of the Prairie, Black-eyed Susan, Purple Coneflower, Prairie blazing star, Blue Hyssop, Lead Plant, Wild Indigo, Purple Prairie Clover, Beardtongue, Prairie Nodding Onion, Snakeroot, Swamp Milkweed, Boneset, Blue Vervain, Joe-pye Weed, Ironweed, Stiff Goldenrod, Cardinal Flower, Great Blue Lobelia, Turtlehead, New England Aster, Bottle Gentian.



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