



# #Write4Climate

Adapting to Climate Change in Rural India

MANUAL FOR MEDIA

# Imprint

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# About the Manual

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The world of journalism is witnessing tectonic changes. The shifting political, economic, technological and environmental contexts are posing new challenges to journalism. Climate change is one such. It is a complex beat for journalists as the subject not only has several dimensions to it but it is also evolving constantly.

Climate change defies ways of traditional journalism. It is a cross-disciplinary subject (spanning from water to international relations and diplomacy), does not fit into known geographical categories (local, national, regional etc.) and most important, is not an obvious story. Climate change is not an event but a process. It is not restricted to political boundaries. It does not fit into a conventionally defined journalistic 'beat'. On top of it, climate science - from which most of climate-related actions flow - is constantly evolving and is fraught with uncertainties. No other subject in a newsroom is this challenging and complex.

To enable successful navigation through this maze and communicate to people different dimensions of climate change, journalists need not only need to be fully equipped but also have the capacity to update their knowledge and skills. This manual has been designed as a tool to help journalists do so, particularly in the Indian context. The emphasis is on adaptation aspects since it directly deals with impacts of climate change on communities and their livelihoods. A lot of training material is already available in public domain. Therefore, only important and relevant topics have been dealt with in detail. Journalists are encouraged explore themselves information and tools relating to subjects of their interest, guided by references provided at the end of each chapter.

Accurate and balanced communication of climate change science, policy, negotiations, adaptation and mitigation measures is critical, not just to inform individuals, communities, researchers, planners and policy makers but to spur action at various levels to face the challenge of climate change. Denialism, skepticism, misinformation and fake news regarding climate change are a formidable threat. Only informed and well equipped journalists can deliver right messages and empower communities to take action.



# Understanding Climate Change

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“ A change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods ”

–The UN Framework Convention on Climate Change (UNFCCC), Article 1

Climate change is one of the biggest news stories of our time. Climate change and its impacts have often hit news headlines in various parts of the world, including India, in the past two decades. It started as a science story – an issue discussed in scientific papers and research conferences, and something that interested scientists, climatologists, meteorologists and environmentalists. Over the years, climate change has become a subject which is not just a scientific and technical issue, but something that has a bearing on several sectors – energy, food, agriculture, livelihood, business, economy, consumption, transport, migration and so on. It is also a political story, a process of diplomatic engagement and perhaps a cause of unrest and conflict in some regions of the world. For news reporters and editors, therefore, climate change is a complex story presenting both challenges and opportunities.

News stories have to be necessarily based on facts, evidence and observations. For reporting on climate change, this would mean hard data about temperature change, ice melting and so on. It became clear in the 1980s to scientists that the global climate was changing, as reflected in the change in global temperatures, rise in sea levels and widespread melting of ice. In addition, extreme weather events such as heatwaves, cyclones and floods also began to be reported from many countries. It was in 1993 that the World Meteorological Organisation (WMO) – a global body functioning under the United Nations – began issuing consolidated reports on the status of the global climate. Over the years, these annual statements, along with multi-year analyses, released by WMO have emerged the most authentic records of global climate change. A multi-year report released by WMO in 2016 pointed out that the period 2011-2015 was the warmest five-year period on record globally.<sup>1</sup> During this period, global

temperatures were 0.57 degree c above the average for the standard reference period (1961-1990). The rise during the previous five year period (2006-2010) was 0.51 degree above average. The period 2011-2015 was the warmest five years for Europe, South America, Asia, Oceania and North America, and the warmth was widespread both on the land and in the seas.

It appears the worst is yet to come, as far as temperature rise is concerned. In 2016, the WMO reported in November 2016, the global temperatures were even higher than the record-breaking temperatures in 2015 - almost 1.2 degree Celsius above pre-industrial levels.<sup>2</sup> The trend continued the next year with the temperature rise in the first 11 months of 2017 making 2017 the third warmest on record, behind 2016 and 2015.

The average global temperature from January to September 2017 was approximately 1.1°C above the pre-industrial era, according to the WMO statement released on the opening day of the United Nations climate change conference in Bonn in November 2017. Parts of southern Europe, including Italy, North Africa, parts of east and southern Africa and the Asian part of the Russian Federation were record warm and China was the equal warmest. The northwestern USA and western Canada were cooler than the 1981-2010 average.<sup>3</sup>

Similar trend is reflected in data collected by the India Meteorological Department (IMD). The year 2016 was significantly warmer than normal in line with the global trend making it the warmest year on record since nationwide records commenced in 1901. The annual mean land surface air temperature averaged over the country during 2016 was 0.91 degree centigrade above the 1961-1990 average,



according to IMD figures released in January 2017.<sup>4</sup> The second warmest ever annual mean temperature was recorded in 2009 (0.77 degree above the long-term average) followed by 2010 (+0.7 degree). The year 2016 was warmer than last year by 0.24 degree. The country averaged seasonal mean temperatures during the winter season (January-February, with anomaly of +01.43 degree, warmest since 1901) and the pre-monsoon season (March-May, with anomaly of +1.36 degree, second warmest ever since 1901) mainly accounted for the above normal annual temperature for the year.

Another major indicator – the level of carbon dioxide in the atmosphere – also crossed a critical threshold globally during 2016. Globally averaged concentrations for CO<sub>2</sub> reached 403.3 parts per million in 2016, up from 400.00 ppm in 2015. This was a record annual increase of 3.3 ppm. Annual average global carbon dioxide concentrations in 2015 had reached 400 parts per million (ppm) for the first time. Scientists consider 350 ppm as the threshold. Concentrations of CO<sub>2</sub> are now 145% of pre-industrial (before 1750) levels. The rate of increase of atmospheric CO<sub>2</sub> over the past 70 years is nearly 100 times larger than that at the end of the last ice age. As far as direct and proxy observations can tell, such abrupt changes in the atmospheric levels of CO<sub>2</sub> have never before been seen, according to the WMO Greenhouse Gas Bulletin released in October 2017.<sup>5</sup>

The rise in CO<sub>2</sub> emissions seen in 2017 was partly due to the strong 2015/2016 El Niño, which triggered droughts in tropical regions

and reduced the capacity of “sinks” like forests, vegetation and the oceans to absorb CO<sub>2</sub>, the report said. The concentration of atmospheric methane reached a new high of about 1853 parts per billion (ppb) in 2016 and is now 257% of the pre-industrial level. The atmospheric concentration of nitrous oxide in 2016 was 328.9 parts per billion, which is 122% of pre-industrial levels. Global average figures for the whole of 2017 will not be available until late 2018. Real-time data from a number of specific locations indicate that levels of CO<sub>2</sub>, methane and nitrous oxide continued to increase in 2017.<sup>6</sup>

UN agencies like WMO have been in the forefront of gathering data about climate change to the world community, so that appropriate action could be initiated in the form of new policies and treaties to curtail greenhouse gas emissions. In 1988, WMO, along with another UN agency – United Nations Environment Programme (UNEP), established Inter-governmental Panel on Climate Change (IPCC) to regularly provide to all countries scientific assessment of climate change, its impacts and future risks. In the past three decades, it has emerged by far the most important scientific body on climate change. IPCC does not conduct scientific research on its own but it collates and analyzes scientific studies from across the world and presents its findings on a cogent manner for the scientific community at large and for policy makers globally. [SEE BOX on IPCC and its working]

Findings of IPCC have formed the basis for climate negotiations being held under the umbrella of the United Nations Framework

Convention on Climate Change (UNFCCC), with the over reaching goal of firming up international agreement to prevent and reverse climate change. We will explore in detail the role of UNFCCC in the next chapter.

Since its inception in 1988 the IPCC has released five multivolume assessment reports. The Fifth Assessment Report was released between September 2013 and November 2014. The Sixth Assessment Report is slated for release in the first half of 2022. In addition to Assessment Reports, the IPCC publishes Special Reports on specific topics. Special Reports have covered topics such as aviation, regional impacts of climate change, technology transfer, emissions scenarios, land use, land-use change and forestry; carbon dioxide capture and storage; and the relationship between safeguarding the ozone layer and the global climate system. All assessment as well as special reports can be accessed at IPCC website - <http://www.ipcc.ch>

The findings of the IPCC reflect global scientific consensus and are apolitical in character. Its assessment reports reflect the work and observations of thousands of scientists from around the world.

Through its working groups and assessment reports released periodically, IPCC has presented evidence about climate change and has projected future trends based on modeling studies and ground data. IPCC has also prepared separate reports on impacts, adaptation and vulnerability. In a nutshell, this

is what we know about climate change from reports of IPCC released so far, reported in its synthesis report<sup>7</sup>:

- From 1880 to 2012, average global temperature has increased by 0.85 degree C. This rise is not insignificant. Even one degree rise in temperature can have severe impacts. For instance, for each one degree of temperature increase, grain yields decline by about 5 per cent. Maize, wheat and other major crops have experienced significant yield reductions at the global level of 40 mega tonnes per year between 1981 and 2002 due to a warmer climate.
- Oceans have warmed, the amounts of snow and ice have diminished and sea level has risen. From 1901 to 2010, the global average sea level rose by 19 cm as oceans expanded due to warming and ice melted. The Arctic's sea ice extent has shrunk in every successive decade since 1979, with 1.07 million square km of ice loss every decade.
- Given current concentrations and ongoing emissions of greenhouse gases, it is likely that by the end of this century, the increase in global temperature will exceed 1.5°C compared to 1850 to 1900 for all but one scenario. The world's oceans will warm and ice melt will continue. Average sea level rise is predicted as 24 - 30cm by 2065 and 40-63cm by 2100. Most aspects of climate change will persist for many centuries even if emissions are stopped.

### **IPCC and its working**

The mandate of IPCC is to provide scientific assessment of climate change. It works through three Working Groups, a Task Force and a Task Group. The Working Group I (WG I) is tasked with assessing physical aspects of the climate system and climate change. This includes topics such as changes in greenhouse gases and aerosols in the atmosphere; observed changes in air, land and ocean temperatures, rainfall, glaciers and ice sheets, oceans and sea level; historical and paleoclimatic perspective on climate change; biogeochemistry, carbon cycle, gases and aerosols; satellite data and other data; climate models; climate projections, causes and attribution of climate change. The ambit of Working Group II (WG II) covers assessment of the vulnerability of socio-economic and natural systems to climate change, negative and positive consequences of climate change, and options for adapting to it. It also takes into consideration the inter-relationship between vulnerability, adaptation and sustainable development. The Working Group III assesses options for mitigating climate change through limiting or preventing greenhouse gas emissions and enhancing activities that remove them from the atmosphere.

- Anthropogenic greenhouse gas emissions (emissions resulting from human activities) have increased since the pre-industrial era, driven largely by economic and population growth, and are now higher than ever. This has led to atmospheric concentrations of carbon dioxide, methane and nitrous oxide that are unprecedented in at least the last 800,000 years. Their effects, together with those of other anthropogenic drivers, have been detected throughout the climate system and are extremely likely to have been the dominant cause of the observed warming since the mid-20th century.

While such scientific evidence collated by IPCC and data regularly generated by agencies like WMO point to climate change and its widespread impacts, media persons reporting on climate change are often faced with counter-arguments, particularly those raised by climate skeptics or climate deniers. Such people and groups often raise two points: climatic changes have been occurring on the earth for millennia and it is nothing new or man-made; if there is global warming, then why are some parts of the globe actually seeing colder temperatures.

Scientists and IPCC have addressed these two questions adequately with evidence and analysis, and their findings have been accepted by all UN members. The definition of ‘climate change’ as given in the United Nations Framework Convention on Climate Change (UNFCCC) says “change of climate which is attributed directly or indirectly to human activity that alters

the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods.”<sup>8</sup>(UNFCCC is an international legal framework on climate change. It has been discussed in detail in the next chapter.)

It is amply clear that climate change is something which is a result of direct or indirect human activity (scientists call human-induced change as anthropogenic), and which is in addition to ‘natural climate variability’. While changes do occur in climate patterns over long period of time, when we refer to ‘climate change’ we are essentially talking of human-induced changes in climate.

In this regard, the Fifth Assessment Report of IPCC released in 2014 states the following:

The evidence for human influence on the climate system has grown since the IPCC Fourth Assessment Report (AR4). It is extremely likely that more than half of the observed increase in global average surface temperature from 1951 to 2010 was caused by the anthropogenic increase in GHG concentrations and other anthropogenic forcings together. The best estimate of the human-induced contribution to warming is similar to the observed warming over this period. Anthropogenic factors have likely made a substantial contribution to surface temperature increases since the mid-20th century over every continental region except Antarctica.



## Essential reading and sources for reference

**IPCC Reports** - IPCC Assessment Reports cover the full scientific, technical and socio-economic assessment of climate change in four parts – one for each of the Working Groups (impacts, adaptation and vulnerability) and plus a Synthesis Report. The Fifth Assessment Report was released in 2014 and the Sixth Assessment Report will be released in 2022. In the meantime, IPCC will keep releasing special reports. IPCC reports are considered authentic sources of information and data which can be quoted in news media.

**Emissions Gap Report 2016** - Since 2010, United Nations Environment (UNEP) has produced annual Emissions Gap Reports as an independent scientific assessment of how actions and pledges by countries affect the global greenhouse gas emissions trend. Download the report from <http://web.unep.org/emissionsgap/>

## Sources to follow for news breaks, experts and multimedia



World  
Meteorological  
Organisation



India  
Meteorological  
Department



Intergovernmental  
Panel on  
Climate Change



Indian Institute  
of Tropical  
Meteorology,  
Pune



India  
Environment  
Portal



Divecha Centre for  
Climate Change,  
Indian Institute of  
Science, Bangalore



Climate Change  
section of United  
Nations Environment  
Programme



Campaign to keep  
carbon dioxide  
threshold at  
350 ppm



Germanwatch  
E.V.

- Twitter handles: @UNFCCC, @IPCC\_CH
- Twitter hashtags: #adaptation, #mitigation #climaterisk, #vulnerability, #GHGemissions

Anthropogenic influences have likely affected the global water cycle since 1960 and contributed to the retreat of glaciers since the 1960s and to the increased surface melting of the Greenland ice sheet since 1993. Anthropogenic influences have very likely contributed to Arctic sea-ice loss since 1979 and have very likely made a substantial contribution to increases in global upper ocean heat content (0–700 m) and to global mean sea level rise observed since the 1970s.<sup>9</sup>

On the second point of skeptics about warming and cooling, it is pertinent to note that ‘climate change’ is a much wider term and more accurate than ‘global warming’ (which only refers to rising temperatures). While the average global temperature is rising, some parts of the world may, in fact, become colder due to several climatic factors.

The ‘greenhouse effect’ is a natural process without which the Earth would not be hospitable enough to support life. But we humans have enhanced this effect to the point where it is leading to climate change. Some greenhouse gases are produced through natural processes but a majority is increasingly produced by human activities and they form a blanket around the earth. This traps more heat from the Sun near the earth’s surface, instead of letting it escape back into space. Major greenhouse gases are carbon dioxide and methane. Global atmospheric concentrations of carbon dioxide, methane and nitrous oxide have increased sharply due to human activities since 1750 – when industrialisation began in Western countries. These concentrations now far exceed pre-industrial values which have been determined from ice cores spanning many thousands of years, according to IPCC.



# Response to climate change at global, national and state level

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“ Few countries in the world are as vulnerable to the effects of climate change as India s with its vast population that is dependent on the growth of its agrarian economy, its expansive coastal areas and the Himalayan region and islands. It also entails tradeoffs with economic growth and social development in the short run that needs to be factored in the policy matrix, where eradication of poverty is one of the foremost priorities ”

–Intended Nationally Determined Contributions (INDC) document, Government of India, 2015<sup>10</sup>

The first assessment report of IPCC was released in 1990, two years after IPCC was formed by WMO and United Nations Environment Programme (UNEP). The report gave out a clear message - global warming is happening and something has to be done about it. It was taken as an urgent call of action and government under aegis of the UN quickly put together the first legal framework on climate change in the form of the United Nations Framework Convention on Climate Change (UNFCCC). It was opened for signing at the United Nations Conference on Environment and Development held in Rio de Janeiro, Brazil in June 1992. This was a landmark conference, popularly known as the Earth Summit.

Since it came into force on March 21, 1994, UNFCCC has remained as the most important platform of collective global response to climate change. It is the centerpiece for multilateral action to combat climate change. As its name says, it sets a framework and a process for agreeing to specific actions that can be taken over time, through the process of negotiations and consensus. We needed a global treaty on climate change because this phenomenon is global in nature and does not respect national or regional boundaries. The atmosphere or the ‘carbon space’ is common to the planet.

By ratifying this convention, all the countries have accepted that “human activities have been substantially increasing the atmospheric concentrations of greenhouse gases, that these increases enhance the natural greenhouse effect, and that this will result on average an additional

warming of the Earth’s surface and atmosphere and may adversely affect natural ecosystems and humankind”.<sup>11</sup> The ultimate objective of this Convention and legal instruments emanating from it is “stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.” Such a level should be achieved within a timeframe sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner.

One of the key principles of the Convention is ‘common but differentiated responsibility’ – which means that it is responsibility of all the countries to reduce greenhouse gas emissions but the needs of developing countries should be kept in mind while fixing reduction targets. The Convention accepted that the share of greenhouse gas emissions produced by developing nations will grow in the coming years, given their state of economic progress. This principle was operationalised in Kyoto Protocol – which parties to the UNFCCC negotiated and sealed in 1997 and which came into effect in 2005. Under this legally binding treaty, industrialized countries had to limit their emissions as per an agreed schedule, while the action by developing countries was deferred. The Kyoto Protocol also brought to fore concepts of carbon credits and ‘clean development mechanism’ which allowed developed countries fund mitigation measures in developing countries and but carbon credits.

### Tips for smart reporting

The best way to keep a tab on new reports being released is to join the press list of respective organizations (IPCC, UNEP etc) which send out alerts, press releases etc. All major events are streamed live and journalists anywhere in the world can 'attend' press conferences virtually.

Over the years, Kyoto Protocol became somewhat ineffective and controversial because of several reasons. All industrialized countries, which were major emitter of greenhouse gases in the past and present had not joined it. And those who had ratified and made commitments have shown reluctance to continue. Moreover, carbon trading and other market-based mechanism, in effect, did not result in limiting emissions from industrialized countries. They were merely helping developing or less developed countries to emit less by funding green projects there.

Another point was the fact that countries like China and India, which were developing and less industrialized when the Protocol was negotiated, had joined the league of major emitters of greenhouse gases owing to rapid economic growth. Overall, the rich countries are against a climate regime which sets different targets for different sets of countries.

Therefore, after several rounds of negotiations (See box Road from Rio to Paris) among Parties to UNFCCC, the Conference of Parties (COP) held in Paris on December 2015 adopted a new agreement called the Paris Agreement which has no binding targets and does away with the differentiation between developing and developed countries. For the first time since UNFCCC was adopted in 1992, all countries have been brought on a common platform to

make efforts to combat climate change and adapt to its effects. The central aim of the Paris Agreement is to strengthen global response to the threat of climate change by keeping a global temperature rise this century well below 2 degrees Celsius above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5 degrees Celsius. In addition, it aims to strengthen the ability of countries to deal with the impacts of climate change.

However, there will be no legally binding targets on any set of countries for limiting or reducing greenhouse emissions. All that countries will have to do is submit their national efforts in the form of "nationally determined contributions" (NDCs) and strengthen these efforts in future. All parties to the Agreement will be required to report regularly on their emissions and on their implementation efforts. In 2018, they will take stock of the collective efforts in relation to progress towards the goal set in the Agreement. There will also be a global stock taking every five years to assess the collective progress towards achieving the goal of keeping a global temperature rise below 2 degrees. The agreement came into force on November 4, 2016 and by the end of November 2016, 114 out of 197 parties to UNFCCC had ratified the Paris Agreement.



# Road from Rio to Paris

1992	At the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro in 1992, the United Nations Framework Convention on Climate Change (UNFCCC) was signed, which sets the framework for negotiating specific agreements, such as the Kyoto Protocol or the agreement negotiated in Paris.
1997	Under UNFCCC, a Protocol was elaborated and adopted at the climate change conference in Kyoto in December 1997. The Kyoto Protocol sets binding targets for limiting or reducing greenhouse gas emissions for the majority of the developed countries listed in Annex I to the Convention.
2001	The more specific rules for implementing the Kyoto Protocol were adopted at the climate change conference in Marrakesh in 2001 (the “Marrakesh Accords”).
2005	For the Kyoto Protocol to enter into force, it had to be ratified by at least 55 Parties, including Annex I Parties. This requirement was fulfilled in 2004 and it entered into force on 16 February 2005.
2007	After the Kyoto Protocol entered into force in 2005, the international negotiations aimed at preparing a new, broader agreement. In 2007, the Conference of the Parties in Bali (CoP 13) decided “to launch a comprehensive process to enable the full, effective and sustained implementation of the Convention through long-term cooperative action”, with the aim of reaching an agreement two years later (“Bali Action Plan”).
2009	A document in line with the Bali Action Plan was prepared at the Conference of the Parties in Copenhagen in 2009 (“Copenhagen Accord”). This document included a commitment by developed countries to mobilise climate finance amounting to USD 100 billion per year by 2020, from public and private sources. However, by the end of the COP, Parties did not agree on the Copenhagen Accord but only “took note” of it.
2010	Parties at CoP 16 in Cancún in 2010 agreed on several important decisions - known as the “Cancún Agreements”. They recognised that deep cuts in global greenhouse gas emissions were required to limit the increase in the global average temperature below 2 degrees C above pre-industrial levels. The Parties agreed on enhanced action on adaptation and called for nationally appropriate mitigation commitments and actions, and established a mechanism for technology transfer.
2011	The COP 17 In Durban in 2011 decided to establish a second commitment period under the Kyoto Protocol.
2012	One year later, this second commitment period was agreed on at COP 18 in Doha, as an amendment to the Kyoto Protocol known as the Doha Amendment. It defined additional emission reduction commitments for 38 Annex I Parties for the period 2013 to 2020.
2013	The climate change conference in Warsaw in November 2013 made significant progress towards preparation of a new agreement. It requested the Ad hoc Working Group on the Durban Platform for Enhanced Action (ADP) to elaborate specific elements for a draft negotiating text. Parties were invited to initiate or intensify domestic preparations for their Intended Nationally Determined Contributions (INDCs) to a new agreement.
2014	During the negotiations in Lima, progress was made on a range of technical issues and the international community expressed its willingness to commit itself to a global climate agreement. But diverging opinions remained, which had to be tackled subsequently.
2015	The Paris Agreement was adopted with an objective to strengthen the global response to climate change by keeping a global temperature rise this century below 2 degrees above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5 degrees. The agreement required all Parties to make efforts through nationally determined contributions (NDCs) and to report regularly on their emissions and on their implementation efforts.

## Summary of the Paris Agreement<sup>12</sup>

- *Long-term temperature goal* (Art. 2) – The Paris Agreement, in seeking to strengthen the global response to climate change, reaffirms the goal of limiting global temperature increase to well below 2 degrees Celsius, while pursuing efforts to limit the increase to 1.5 degrees.
- *Global peaking* (Art. 4) –To achieve this temperature goal, Parties aim to reach global peaking of greenhouse gas emissions as soon as possible, recognizing peaking will take longer for developing country Parties, so as to achieve a balance between anthropogenic emissions by sources and removals by sinks of greenhouse gases in the second half of the century.
- *Mitigation* (Art. 4) – The Paris Agreement establishes binding commitments by all Parties to prepare, communicate and maintain a nationally determined contribution (NDC) and to pursue domestic measures to achieve them. It also prescribes that Parties shall communicate their NDCs every 5 years and provide information necessary for clarity and transparency. To set a firm foundation for higher ambition, each successive NDC will represent a progression beyond the previous one and reflect the highest possible ambition. Developed countries should continue to take the lead by undertaking absolute economy-wide reduction targets, while developing countries should continue enhancing their mitigation efforts, and are encouraged to move toward economy-wide targets over time in the light of different national circumstances.
- *Adaptation* (Art. 7) – The Paris Agreement establishes a global goal to significantly strengthen national adaptation efforts – enhancing adaptive capacity, strengthening resilience and reduction of vulnerability to climate change – through support and international cooperation. It also recognizes that adaptation is a global challenge faced by all. All Parties should submit and update periodically an adaptation communication on their priorities, implementation and support needs, plans and actions. Developing country Parties will receive enhanced support for adaptation actions.
- *Support* (Art. 9, 10 and 11) – The Paris Agreement reaffirms the obligations of developed countries to support the efforts of developing country Parties to build clean, climate-resilient futures, while for the first time encouraging voluntary contributions by other Parties. Provision of resources should also aim to achieve a balance between adaptation and mitigation. In addition to reporting on finance already provided, developed country Parties commit to submit indicative information on future support every two years, including projected levels of public finance. The agreement also provides that the Financial Mechanism of the Convention, including the Green Climate Fund (GCF), shall serve the Agreement. International cooperation on climate-safe technology development and transfer and building capacity in the developing world are also strengthened: a technology framework is established under the agreement and capacity building activities will be enhanced through, inter alia, enhanced support for capacity building actions in developing country Parties and appropriate institutional arrangements.
- *Global Stocktake* (Art. 14) – A “global stocktake”, to take place in 2023 and every 5 years thereafter, will assess collective progress toward meeting the purpose of the Agreement in a comprehensive and facilitative manner. Its outcomes will inform Parties in updating and enhancing their actions and support and enhancing international cooperation.

### National level response

UNFCCC represents comprehensive architecture for global climate governance. Under this, countries have agreed to initiate actions on matters such as agriculture, energy and natural resources as they develop national programmes to slow climate change and adapt to its impacts. The Convention also obliges Parties to share technology and to cooperate in other ways to reduce greenhouse gas emissions from energy, transport, industry, agriculture, forestry and waste management.

In response to this process, India came out with its first set of actions on climate change in the form of the National Action Plan on Climate Change (NAPCC) in 2008. This is a multi-pronged, long term and integrated strategy for climate change, aimed at achieving key goals in the context of mitigation and adaptation to climate change. Under this plan, eight missions have been formulated in specific areas of energy, habitat, water, sustaining Himalayan ecosystem, forestry, agriculture and strengthening the scientific knowledge on climate change. As a follow up of this action, all states and union territories have also prepared state action plans on climate change to address state specific issues on climate change.

The NAPCC clearly mentions that India will have to work towards sustainable development while advancing its economic objectives. The plan is based on the following principles<sup>13</sup>:

- Protecting the poor and vulnerable sections of the society through an inclusive and sustainable development strategy, sensitive to climate change

- Achieving national growth objectives through a qualitative change in direction that enhances ecological sustainability, leading to further mitigation of greenhouse gas emissions
- Devising efficient and cost-effective strategies for demand side management
- Deploying appropriate technologies for both adaptation and mitigation of greenhouse gas emissions extensively as well as at an accelerated pace
- Engineering new and innovative forms of market, regulatory and voluntary mechanisms to promote sustainable development

Eight national missions form the core of NAPCC – National Solar Mission, National Mission for Enhanced Energy Efficiency, National Mission on Sustainable Habitat, National Water Mission, National Mission for Sustaining Himalayan Ecosystem, National Mission for Green India, National Mission for Sustainable Agriculture and National Mission on Strategic Knowledge for Climate Change.

While several of these programmes were already part of ongoing actions, NAPCC noted that they may need a change in direction, enhancement of scope and effectiveness as well as accelerated implementation. NAPCC was envisaged as an evolving programme which could be modified based on new scientific knowledge and technologies.





In the run up to the COP in Paris in December 2015, all the parties were asked to prepare and submit a document called Intended Nationally Determined Contributions (INDCs). The COP at its 19th session in Warsaw in November 2013 had invited all Parties to initiate domestic preparations for their INDCs. These are voluntary action countries plan to take to limit greenhouse gas emissions. In order to facilitate clarity, transparency and understanding, all the Parties were asked to provide quantifiable information with clear reference point, time frames and periods for implementation, scope and coverage, planning processes, assumptions and methodological approaches for estimating and accounting for anthropogenic greenhouse gas emissions. These intentions were supposed to be “fair and ambitious” so that they can contribute towards achieving the objective of the Convention as set out in its Article 2.

In October 2015, India released its INDC document. Under this, India has expressed its intention to reduce “emissions intensity of its GDP by 33 to 35 per cent by 2030 from 2005 level and to create an additional carbon sink of 2.5 to 3 billion tonnes of CO<sub>2</sub> equivalent through additional forest and tree cover by 2030”.<sup>14</sup> India also decided to anchor a global solar alliance, INSPA (International Agency for Solar Policy and Application) of all countries located in between Tropic of Cancer and Tropic of Capricorn. The document stated that the government has taken a series of steps to “de-couple the Indian energy system from carbon in the long run”. Despite facing development challenges like poverty, housing shortage, electricity and food security, India has set a voluntary goal of reducing the emissions intensity of its GDP. A slew of policy measures to promote low carbon strategies and renewable energy have resulted in the decline

of emission intensity of GDP by 12% between 2005 and 2010.

India has also set up a National Adaptation Fund with an initial allocation of Rupees 3500 million (USD 55.6 million) to combat the adaptation needs in key sectors. This fund is assisting national and state level activities to meet the cost of adaptation measures in areas vulnerable to adverse effects of climate change. The Fund has so far sanctioned amounts totaling Rs 236 crore for adaptation projects in different states.<sup>15</sup>

#### **How states are responding to climate change**

If the challenge of climate change has to be addressed, the response should translate into action. And this is not something which can be achieved only through conventions, agreements and intentions at international level only. Countries have developed national plans on climate change, but ultimately they have to be put in action at the local level where impacts of climate change are being felt. The situation on the ground varies. It is more so in a large country like India which is so diverse in terms of climatic zones and other factors. Vulnerability to climate change may vary from state to state or region to region. The problems of a hilly state like Himachal Pradesh are totally different from a coastal state like Kerala or an arid state like Rajasthan, and they will all need different solutions. Sometimes, the ground situation within a state may also differ, like in West Bengal where hilly regions have different issues to be addressed than the rest of the state. The impacts of climate change on agriculture vary from region to region, crop to crop.

In light of this, every state was asked to develop a State Action Plan on Climate Change in 2009.

### **Eco villages for climate adaptation in HP**

Eco-village is an emerging concept in India. To demonstrate villages as models of sustainable development, Government of Himachal Pradesh has launched Eco Village Scheme through Department of Environment, Science & Technology (DEST) in active collaboration with local communities. In the first phase five villages have been identified to be developed as eco-villages, key elements of which include environment sustainability through responsible natural resource management practices, community participation, use of modern and clean technology & practices, convergence of resources available for development to promote climate resilient and ecologically sustainable development with interventions in the areas of water management, waste management and irrigation, sustainable agriculture/ horticulture, energy conservation, spring-shed and natural resources management & climate change adaptation. The approach will not only help those stakeholders who are working to implement sustainable community development programmes but also will set benchmarks for others to adopt and bring a radical change in thinking process of the communities at large in the state, especially in inculcating environmentally responsible behaviour.

[Source: Department of Environment, Science and Technology. (2017). Eco-village Scheme Guidelines]

### **Climate resilient livestock production in Punjab**

Punjab ranks among the top five milk-producing states of India, with animal husbandry being the second most important economic sector for the state, after agriculture. Climate change and the projected rise in temperatures is expected to reduce livestock production. To address these challenges, the Punjab State Council for Science and Technology, Government of Punjab, is implementing a project to ensure sustainable levels of livestock production through scientific interventions, assisted reproductive technologies, water use efficiency in fodder cultivation, climate-resilient housing for cattle, disease forecasting for preventing breakout of bovine diseases. The project also encourages livestock farmers to harness co-benefits by housing stray cattle. Another measure being developed under the project is weather-linked insurance for compensating these farmers when there is a decrease in milk yield because of climate change. The project also focuses on effective gender participation with 30% of the project beneficiaries being women.

[Source: Punjab State Council for Science & Technology (2015). Towards Climate Resilient Livestock Production System in Punjab]

### **Making farm households adapt to climate in Telangana**

The newly developed state of Telangana is in a semi-arid zone and has a predominantly hot and dry climate which gets further aggravated due to the changing climate. This project, sanctioned under the National Adaptation Fund for Climate Change, aims to enhance the livelihoods of the farming community in certain villages of Mahabubnagar district by implementing suitable, science-based, climate-resilient agricultural interventions. The project proposes to promote sustainable agriculture practices in the region through the adoption of activities such as soil and water conservation, water conservation through efficient and assured irrigation practices, developing climate-resilient cropping patterns, developing forecasting models and disseminating knowledge experience to the wider population. The project is expected to benefit more than 2000 farming households of the district, particularly small and marginal farmers, of which 30-50% of the beneficiaries will be women.<sup>16</sup>

## Tips for smart reporting

Journalists covering climate change often experience overload of information from different sources, so be careful while signing up for newsletters and daily updates. Develop your own list of experts and sources – a mix of international, national and local - based on your needs and subject of interest.

Now, almost all the states and union territories have developed such plans and submitted to the Ministry of Environment, Forests and Climate Change. Several of these plans have been approved and texts of these plans are available on the website of the ministry. The formulation of SAPCCs is one of the largest in climate planning at sub-national level in the world. Several national and international agencies were involved in helping state governments prepare these plans through a consultative process.

The state plans provide a framework of action for responding to effects of climate change in each state. Most of them are based on a uniform template which spells out vulnerabilities of the state in relation to a changing climate and the state government's approach for adapting for current and future impacts.

A 2015 analysis of SAPCCs showed that most states have relied on national-level, or narrow sectoral studies outlining current and future impacts of climate change.<sup>17</sup> Most plans deal with adaptation and have a limited focus on mitigation of greenhouse gas emissions. Some plans include GHG inventory and explore the potential of renewable energy and other clean technologies. The plans outline strategies in a range of sectors, particularly which are critical for local livelihoods, like agriculture, water, transport, energy, industries, urban development, and forestry. Action, timelines and budgets vary significantly across states. A bigger challenge is the fact that climate change adaptation and action is still not priority for many states though they have state action plans in place. There is limited or no knowledge and research about likely or projected impacts at district or city level or in terms of individual crops or impacts on biodiversity. This situation makes the work of journalists more relevant as well challenging. They can highlight the gaps in understanding and point to possible solutions to both policy makers as well as general public.

While noting that state climate plans provide an

important institutional platform to mainstream concerns of environmental sustainability into development planning, another review of state action plans pointed out gaps in approach, process, formulation of outcomes, and implementation efforts.<sup>18</sup> There is a tendency to view the state plans as vehicles for generating implementable actions rather than an opportunity to redirect development towards climate resilience. In fact, the review said, the state plans could be more effective if they are viewed as an effort to update sustainable development planning rather than as an end in themselves.

An analysis of eight state climate action plans, released in 2018, revealed that climate vulnerability assessments done only in some states and they too are very broad and general.<sup>19</sup> Some of the states are now proposing studies of comprehensive region- and sector-specific vulnerability assessments in their respective state plans. State action plans also lack state or local level future climate projections for specific time periods. The activities proposed in state action plans are not always central to the problem, but have been proposed just to obtain money from the central government.

Most states have not conducted a detailed comprehensive vulnerability assessment so far, even though it has been proposed in their respective state plan. These plans have simply listed out adaptation strategies for various sectors without giving any details about how they intend to mainstream them. "SAPCCs are not a ready-to-act plan yet. Climate adaptation strategies given in state plans are broad generalizations, giving the impression of a wish list.

Specific, result-oriented action plans with clear-cut expected outcomes are missing. There is no demarcation between business-as-usual and additional activities. Monitoring and evaluation of implementation is poor," the assessment has concluded.

In light of the roadmap to implement the set of Commitments (NDC) made by India, it is actions detailed in the Nationally Determined imperative to strengthen SAPCCs.

### Essential reading and sources for reference

**United Nations Framework Convention on Climate Change:** The website of UNFCCC – [unfccc.int](http://unfccc.int) – provides a wealth of information on aspects of the Convention, Kyoto Protocol and the Paris Agreement. It gives details of all the INDCs which have been submitted, action on mitigation, adaptation, technology transfer, finance and greenhouse gas inventories. It is a goldmine of information on different aspects of climate change.



**Ministry of Environment, Forests and Climate Change:** The climate change section of the ministry's website - <http://envfor.nic.in/climate-change-docs-and-publications> - provides a PDF versions of several documents, including the National Action Plan on Climate Change, INDC, State Action Plans on Climate Change and projects submitted for National Fund for Climate Change Adaptation.



### Sources to follow for news breaks, experts and multimedia

**State Climate Change Cells:** Every state has a climate change cell, which is housed in the Department of Environment, office of conservator of forests or state council for science and technology. The cell is usually headed by a nodal officer who is supposed to coordinate implementation of state climate action plan. Several state departments are involved in implementing different schemes under the state climate action plan.

**Newsroom of UNFCCC:** Journalists wishing to cover UNFCCC and climate change meetings must keep an eye on the newsroom of UNFCCC - <http://newsroom.unfccc.int/> - and sign up for alerts and updates. Every COP has a dedicated website and all press conferences held during the talks are streamed live. Fellowships are available for journalists to cover these talks.



**United Nations Development Program (UNDP):** The adaptation website of UNDP - <http://adaptation-undp.org/#> - features all developments relating to adaptation globally including case studies, analysis and other information from all over including India.



**International Institute for Sustainable Development (IISD):** This international non-profit body tracks all environment and climate change related events including annual negotiations. It sends out daily bulletins from such conferences and gives an insider's view of what happens in these meetings. Its end-of-the meeting bulletins explain everything about a particular climate change negotiation round. It is best to sign up for their daily updates. <http://www.iisd.org/>



**Centre for Science and Environment (CSE):** The green action group based in New Delhi has been covering climate change negotiations and other talks from a developing country perspective. It also holds workshops for media persons on climate change and offers fellowships on different subjects. <http://cseindia.org/content/climatechange>



**Adaptationcommunity.net**

**weADAPT.org**

**Asiapacificadapt.net**

### Tips for smart reporting

Always remember that climate change is all about ordinary people, and not about scientists, activists and policy makers. Test every story from this angle. Bring human angle in every story – be it on climate change impact, adaptation or a new funding mechanism. Putting voices of people, their pictures and quotes makes stories readable and creates a connect with audiences. For example, there is no point in writing about a heat action plan without telling do's and don'ts for people facing heatwaves.



# Handling an adaptation story

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In the context of climate change reporting, two phrases – mitigation and adaptation – crop up very often. It is necessary to have a clear understanding of these two key concepts for reporters covering the climate change story. These two terms figure in the UNFCCC and in all agreements and treaties as well as in national and state level climate action plans. Put simply, mitigation means “actions taken to reduce the flow of heat-trapping greenhouse gas emissions into the atmosphere”. These actions - or mitigation measures – could be in a single sector or across several sectors such as energy, transport, buildings, agriculture and forestry. For instance, any policy, plan or action to reduce emissions from cars and buses or from factories would be considered a mitigation measure. Mitigation is a key component of the UNFCCC which requires all Parties to “formulate and implement programmes containing measures to mitigate climate change” taking into account their responsibilities and capabilities.

On the other hand, adaptation refers to actions taken to respond to the impacts of climate change that are already happening or to prepare for future impacts. Adapting to the adverse effects of climate change, along with mitigation, is a major area of action under the Convention. As scientific reports from IPCC point out the world is already experiencing changes in mean temperature, shifts in the seasons and an increasing frequency of extreme weather events such as heatwaves, extreme snowfall and intense rainfall. As the climate changes, communities will have to learn to adapt by making modifications to processes, practices and structures that can reduce their vulnerability to climate change impacts.

By their very nature, adaptation solutions have to be localized and depend on local context. For instance, if a region is experiencing or likely to experience more floods or storm surges due to climate change, then adaptation measures could be in the form of building flood defences. If cropping patterns are changing due to increased variability or change in rainfall pattern, farmers in such areas will have to take to new crops that

can grow under such conditions and scientists will have to develop climate-resilient varieties of food and other crops. In the same way, businesses and corporations will also have to take to adaptation to manage risks of climate change. Adaptation measures and strategies – be it for communities, countries or corporations – need new technologies, innovative approaches and funding for implementation. There can be no ‘one-size-fits-all’ adaptation solutions. Adaptation by its very nature is locale-specific. Multiple stakeholders will have to work together to make adaptation happen.

Adaptation measures and development initiatives have a lot of synergy. Experts believe that several of the developmental programmes, especially those aimed at addressing poverty and livelihood, have an inherent climate-resilience side though not stated explicitly. Rural employment guarantee schemes, for instance can very well be leveraged to make poor households climate-proof while giving the poor access to income and assets. By ensuring regular wages even in times of shocks such as droughts and other such extreme events, employment guarantee schemes are, in effect, enhancing climate resilience of the poor. The works undertaken as part of such schemes - digging up wells, rejuvenating water bodies and watersheds - are designed to improve availability of water and help communities prepare for water stress conditions. Several other central schemes such as Integrated Watershed Management Programme, National Rural Livelihood Mission and crop insurance schemes are designed to help poor and vulnerable in rural areas. They have an adaptation angle. Journalists and media practitioners should be able to see such unseen links and highlight the gaps so that climate adaptation could be formally aligned with social protection schemes. .

Here we will discuss three stories picked up from Indian media outlets to illustrate how an adaptation story can be made interesting and how global climate change discourse can be inter-connected to weave a good story.

**Adaptation story 1 – This news feature story is focused on impacts of climate change on Indian farming and how farmers in some states are making their farming practices climate-resilient. The reporters spoke to not only farmers but also to scientists and representatives of voluntary agencies.**

### Smart crops getting more from less <sup>20</sup>

Chitra Narayanan and K V Kurmanath

V Ravichandran, a third generation farmer from Nannilam in Tiruvavur district of Tamil Nadu, says he is going to stop growing sugarcane in his fields.

“I am switching over to pulses now,” he says, pointing out that legumes overcome the cash crop’s problems, including high water consumption. It helps that the government has raised the minimum support price for lentils.

Ravichandran is just one among many farmers who are turning to smart crops, focussing on pulses, coarse cereals, vegetables and fruits that are climate smart. **[The story begins with the case of a community member- a face- and then gives a larger picture]**

The need is pressing as over 70 per cent of India’s poor live in rural areas and 52 per cent of them are in agriculture. Successive droughts have led to a scarcity of water and crops have failed. Forced to borrow, farmers are now in a terrible debt trap.

As global warming sets in, projections are that agricultural production worldwide will fall by 2 per cent per decade, even as food demand rises by 14 per cent each decade. Global bodies are also pushing climate smart farming in a bid to reduce agriculture’s carbon footprint. According to the Consultative Group on International Agriculture Research (CGIAR), a global consultancy, one third of all human-caused-greenhouse gas emissions comes from our food system. **[Sets climate change context for agriculture, states the problem or the issue]**

The solution is to go for climate resilient crops, diversifying the crop mix, using technology to reduce water use, enhance soil and cutting down on fertilizer use.

Some of these solutions are now coming from Indian Council of Agricultural Research (ICAR)’s project NICRA (National Innovations on Climate Resilient Agriculture) set up in 2011. As part of this project a host of model, climate smart villages are being created across the country supervised by the Krishi Vigyan Kendras (KVK). **[Presents a bouquet of solutions]**

It’s an ambitious project but the fruits of labour have been sweet, says Pradeep Pagaria, Programme Coordinator of KVK at Barmer in Rajasthan, a dry land that is now flowering. Pomegranate orchards and medicinal plants are now being grown by the villagers in addition to the traditional bajra, guarphal and castor oil plant.

Says Pagaria: “We have done four things - natural resource management, diversifying crops, building ecosystem and setting up VCRMs village climate risk management committees.” **[quotes a local expert, describes part of the solution]** States like Haryana, Punjab, Bihar are also piloting climate smart villages, some of them assisted by the CGIAR. But others, besides the government, have been also working on climate smart crops.

Medak, which has the highest number of farm suicides in Telangana, is a story of contrasts. Even as farmers who have stuck to input-intensive crops such as sugarcane, cotton and paddy are in deep distress, one particular belt has survived the famine. This belt grows millet.

Twenty years ago, the founder of the Millet Network of India (MINI), P V Satheesh set up the Deccan Development Society (DDS) and started an experiment with millets. DDS introduced hardy millet varieties in 75 villages in the area through a collective.

“Water-guzzling wheat and paddy will face tough challenges as temperatures increase. Millets are the way forward for countries like India where food security and nutrient security are a major challenge,” says Satheesh. “Growing crops with drought and heat tolerance is one method to adapt to the vagaries in climate. Millets are good candidates,” says B Dayakar Rao, Principal Scientist at Indian Institute of Millets Research (IIMR). **[quotes two external experts – one civil society representative and another scientist]**

Today MINI is a pan India alliance of over 65 institutions that promote different varieties of millet such as foxtail, kodo, pear millet and finger millet - ancient grains that had lost out to cotton and maize. Over 50,000 farmers are part of the alliance that has spread its activity to Uttaranchal, Nagaland, Odisha. A host of other organisations such as Canada’s International Food Security Research Fund and the International Development Research Centre, which runs Project Dhan in Tamil Nadu and Karnataka, are promoting millet farming too.

Professor M S Swaminathan’s Foundation too has been working on millets for nearly two decades trying to preserve the germplasm. He rues that with wheat, rice, corn, soyabean and potato becoming important, India’s food basket had shrunk with many of our old cereals or coarse cereals becoming near extinct. **[Cites example of another region, points to replicability of the solution]**

Now, as the health and environment benefits of these cereals percolate down, a revival of sorts is taking place.

Other crop experiments are also on. For instance agriculture scientists at the International Rice Research Institute (IRRI) are trying to create climate smart varieties of rice. Sahbhagi Dhan, a rice variety, is being tested in Odisha and Jharkhand. Drought resistant strains of maize too are getting into the fields.

But resource scarcity expert Indira Khurana, who is with global consultancy IPE says crops are only part of the story. “What is required is a package of agricultural practices that will withstand the pressures of climate change.” She explains these include a mix of biodiversity, technology and conservation. “Another important factor is to take care of marketing of this produce. Unless there are markets available these will not be cultivated by farmers,” says Khurana. Significantly, bodies like ICRISAT, are intervening and companies have started putting these smart grains on supermarket shelves. **[another expert voice adding more value to the story]**

Prem Singh, a farmer activist in Badokar Khurd, a village in Bundelkhand’s Banda district, shows that agriculture can be a sustainable. While people around him are reeling with drought, his patch is green. The farmer who practices organic cultivation believes it is because of his periodic proportionate farming method, which involves crop rotation and seed development. Instead of government seeds that guzzle water and urea, he chose traditional, local seeds. “Mono cropping is bad news. One-third of your land should be fruit trees and vegetables, one third pulses and grains, one third animal husbandry,” he says, pointing out the concept of rainbow revolution, an integral development programme of agriculture. **[The Hindu Business Line, June 6, 2016]**

**The story is about climate change and adaptation, but it is not alarmist or ‘gloom and doom’ story. Instead it is stating the problem and highlighting possible solutions, presenting evidence of success and showing possibilities of replication.**

**Adaptation story 2 – This feature talks about a success story from Punjab where farmers have made their farms drought-proof by constructing farm ponds that can provide water for their crops when monsoon is delayed (an impact of climate variability).**

### Farm pond as response to climate change<sup>21</sup>

**Manu Moudgil**

Climate change can be as big as the world and as local as your backyard. In North India, it manifests mainly through erratic rainfall. In Punjab and Haryana, the unseasonal downpour in March damaged crops over 55.5 lakh acre while the monsoon season saw a deficit of around 35 per cent. Data shows that the two states have consistently registered below normal rainfall since 1998, putting immense strain on the groundwater resource. The erratic weather has also been linked to the whitefly outbreak which damaged the current cotton crop.

Last year, the rainfall deficit was over 50 per cent and Punjab had asked for a Central assistance of Rs 2,350 crore due to a 15 per cent rise in irrigation cost. The state bought extra power and the farmers extra diesel to extract groundwater. Deepening of dried-up borewells was another expense. All this adds to the input cost of cultivation, leading to farm distress and suicides. On the pollution front, groundwater pumping in India contributes 16-25 million tonne carbon, which is 4-6 per cent of the country's total emission. **[Instead of a community voice or a case study, this story begins with statement of the problem, but it may not be a good idea to put statistics and data in the opening paragraphs]**

Traditionally, North India was gifted with rich soil and sufficient rainfall, besides large riverine regions which nurtured the crops. Monsoonal flood would be diverted into small reservoirs for later use. Dug wells filled the gap in dry season.

Introduction of new technology to pump out groundwater in 1960s helped in expansion of the irrigated area. Thanks to easier availability of groundwater, crops got drought-proof, resulting in a rise in crop production and farm income. But the declining water table has now set the reverse trend in motion. Most blocks of Haryana and Punjab are in the dark zones and yield low-quality water, impacting crop production.

In fact, the deteriorating groundwater quality is also making people migrate to better-off areas, a rerun of times when tribes moved in search of water.

At Sandharsi village in Patiala district, many original inhabitants have sold off their lands and migrated to other areas of Punjab in search of better water and soil.

Here, the good quality groundwater is available at a depth of over 1,000 feet, which only a local distillery has been able to access. Farmers make do with water at 600 feet but that impacts productivity. Former sarpanch Surinder Singh gave up farming after his all four borewells failed. He is now growing eucalyptus trees, running the family flour mill and selling milk.

But Sandharsi also has farmers who refused to be pinned down. When pushed to the wall, they decided to do something more than selling off and leaving. Harmesh Singh has two borewells but for six months he relies on a pond spread over half an acre on his farm. Once filled during monsoon, the pond holds over 37 lakh litre, enough to irrigate 13 acre of paddy fields twice. The consumption of diesel for irrigation also drops by one-fifth as the pump needs less power to lift pond water. This is a boon especially when monsoon is delayed and the power supply for irrigation is erratic. In case of heavy rain, the pond again cushions the impact of flooding. **[the success story of a farmer has been told in the middle of the story]**

The idea has also spread to neighbouring villages and around 15 farmers are known to have ponds in their fields in this area, thus reducing the constant dependence on government subsidy and the bore rig industry for irrigation. What's more important is that the initiative has come from individual farmers without any push from the government or non-governmental organisations.

Ask Harmesh, one of the first to dig a farm pond, about how he got the idea, and he responds with another question: "Isn't it common sense that a farm pond will help with irrigation?" Sadly, this common sense has become a rarity.

Ponds and wells had always been the lifeline of Indian agriculture. As groundwater became accessible, these long-serving companions were encroached upon overnight and were filled up to increase the cropped area. Today, dug wells are beyond redemption as water levels have receded to great depths. But ponds are still valid and irrigating fields in many parts of the country. In fact, they are more valid in present times of erratic rainfall patterns.

Lessons can also be learnt from Dewas district in Madhya Pradesh, which turned almost barren as borewells started failing. Today, 5,000 ponds in the district irrigate two crops a year. The movement, inspired by a single farmer digging a pond in his fields, got support from the state agriculture department, which started holding training sessions for large farmers who owned tractors and could afford to excavate ponds. Around 600 such ponds were dug without any financial support from the government. **[the scope of the story has been widened with information of another state – Madhya Pradesh. The case study, however, is not complete as the farmer who inspired digging of 5000 ponds has not been named.]**

Later, a subsidy was announced to take the initiative to small and marginal farmers. The chance of fake beneficiaries was little as the big farmers had already got ponds for themselves. The water harvesting structures also helped raise the groundwater table, thus reviving many a defunct borewell which had dried out.

In Marathwada, the region facing continuous drought, the Maharashtra government has now launched a farm pond scheme on a large scale to permanently deal with scarcity. **[a third state has been introduced but without any elaboration or justification. It could have been avoided.]**

The Centre, on its part, has formed a committee to suggest restructuring of the Central Groundwater Board and Central Water Commission. The main purpose is to hasten the process of aquifer mapping and irrigation reforms to reduce dependence on an increasingly erratic monsoon. While aquifer mapping will quantify the country's groundwater, irrigation reforms are meant for last-mile connectivity through decentralised water harvesting like farm ponds and check dams, besides water-efficient irrigation technologies like sprinklers and drip systems.

But instead of looking for government schemes, can the farmers themselves take up farm ponds? The few farmers at Sandharsi and surrounding villages are testimony to the resilience that comes with independent initiatives. Instead of doling out subsidy schemes, the state government can organise field visits for farmers to Sandharsi and Dewas. Farmers can spare a few bighas to collect rainwater, which will also recharge the defunct borewells.

It's not a quick task but not as costly and distressing as deepening of a borewell every few years. Many commentators appreciate how Punjab and Haryana always have green fields no matter the amount of rainfall. They don't acknowledge rumblings of the vault down under, and the carbon footprint that comes with groundwater pumping. Farm ponds will not only make this region water sufficient in the true sense but also reduce emissions, thus serving as both a climate change adaptation and mitigation measure. **[Policy makers and commentators have been mentioned but no expert has been quoted in the story, which is a serious drawback of this story.]**

**Adaptation story 3 – In this story from coastal areas of Gujarat, the reporter has highlighted the use of simple technique to building natural defences on coasts, so that surge of saline water due to high tides could be contained and plantations protected.**

### Replanting mangroves in Kachchh saves coast, people, world<sup>22</sup>

M M Paniyil

Hassan Bhai stretches his sinewy, sun-tanned, fisherman's arm's across a large swath of the Gulf of Kachchh and proudly shows the mangrove plantation that people from his village, Luni, nurture. Dots of green bob up and down the waterline in high tide over a stretch seven kilometres along the coast.

Hassan says the fishers love the mangroves, as fish grow, spawn and breed in them. They also protect the coast from storm surges, especially cyclones. An industry giant, the Gautam Adani group, that owns a port, power plant and a special economic zone in the nearby coastal town of Mundra, bankrolls mangrove regeneration — even though the move follows destruction of huge tracts.

Hassan often finds himself hiring villagers on daily wages to plant mangroves, chasing away Kharai camels, a Kachchhi breed that graze on mangroves, and arguing with Rabari nomadic pastoralists who bring them. **[the story begins with a case study, a community face and a solution to an existing problem]**

There is a buzz about mangroves in Kachchh amidst regeneration efforts and conflicts of interest. Still the buzz hides the real magic of mangroves in a warming globe. Mangroves are nature's best carbon sinks. They soak up and store excess carbon dioxide that blankets and warms up the globe.

Kachchh is the second largest mangrove habitat in the country, after the Sundarbans. It is perhaps on of the most difficult coasts for mangroves to grow because of extreme heat and salinity. Kachchh has also witnessed the most rapid destruction and fragmentation of mangroves due to industries, ports and mines, followed by rapid mangrove regeneration in recent times.

The local communities often work at cross-purposes. Nomadic pastoralists, especially Rabari camel herders are selling their herds, and migrating over long distances in search of fodder. They are still unwelcome in plantations and protected forest areas. They insist that grazing is good for mature forests, as it leads to trimming of old branches and promotion of new growth. Still planters are sceptical as a mature camel can eat 30-40 kg of fodder a day, a burden on young plantations.

Hassan and colleagues protect the plantations as they are more than a means for daily wages. They bring back memories of old Kachchh, when the coast had lush natural mangroves.

A new generation of ports, especially, have destroyed mangroves amidst building, maintaining and dredging operations and vessel movement on the creeks. Unsustainable grazing, timber and fuel wood harvest, erosion of shoreline, industrial impact, and grazing have been identified as pressures on mangrove ecosystems.

As if in penance – in reality, due to Ministry of Environment norms – the industries and the state government agencies have been on a drive to plant more mangroves in recent years. That is what has made Gujarat the state with the biggest net gain in mangrove afforestation, notching up an increase of 676 square km since 1987, though the net gain is roughly a tenth, considering the level of deforestation. Still the state has a total of 1,103 square km, most of it in Kachchh, making it the second biggest home of mangroves in India after West Bengal.

Now Gujarat Ecology Commission (GEC), a government agency that coordinates regeneration efforts, is upbeat about its success. About 30% of the regeneration efforts in Gujarat have used the community-based model, as studies suggest. Lomesh Brahmabhatt, a GEC field manager who manages plantation efforts, says the group is trying hard to win the trust of villagers. "People used to run away when our vehicles entered their villages," he told [indiadialogue.net](http://indiadialogue.net). "They thought it was Forest Department personnel coming to evict them. Then we gradually gained their trust and they welcomed us." **[A local expert/government official has been quoted to give a perspective.]**

Although the GEC model works, there are still challenges, experts note in a series of studies. Industry regeneration efforts tend to see local people just as daily labourers. Without ownership and long-term involvement, mangrove forests die and a large share of new plantations are failures.

Besides, mangrove destruction continues as industries expand, and plantations can never replace natural forests. In Kachchh especially, heat and high levels of salinity make mangrove growth painfully slow, with a low survival rate. Last but not the least, areas under the Forest Department and industry-sponsored plantations are largely off bounds for traditional communities.

These reasons lead to low levels of people's real participation in regeneration efforts.

Nevertheless mangroves are the lifeline of coastal fisherfolk, cattle, camels, fish and assorted marine life. "The missing bit is the carbon sequestration, though studies in Gujarat have shown the potential," G.A. Thivakaran, chief principal scientist of coastal and marine ecology at the Gujarat Institute of Desert Ecology (GUIDE), Bhuj, told [indiadialogue.net](http://indiadialogue.net). **[a scientific expert not directly connected with the project has been quoted. Such independent quotes add more value to a story.]**

Mangroves guzzle more carbon dioxide that warms the earth than any other forest. That is besides their multiple roles in protecting the environment with a highly adaptable rich biodiversity. As Cambridge marine scientist Mark Spalding describes, mangroves are the most carbon-rich forests on earth.

Studies have shown that a typical mangrove has 182 tonnes of biomass above ground per hectare. Models show that mangroves host 1.6% of the total tropical forest biomass though they occupy only 0.6% of tropical forest area. **[It is not clear if this is international, Indian or local data]** In effect mangroves have more than double the biomass compared with other tropical forests. The more the green biomass, the more carbon it can absorb. The mangroves of Kachchh, however, are sparse, so the biomass density is lower than the average.

Besides, mangrove forests bury peat — layers of carbon-rich soil formed from decayed vegetation — and they do not normally emit methane as in the case of other peat forests because of the salinity. That is extra storage space for carbon.

The staple mangrove species of Kachchh, *Avicennia marina*, grows on the front line, where the high tide floods the plantation longer, and the salinity is higher. However, it is not easy to plant and nurture this species amidst constant tidal and wave movements.

As Spalding noted in an article, "Mangrove restoration is one of the most optimistic conservation tools I can think of. Low cost, massive gain, local ownership, ecosystem services, community empowerment, climate change adaptation, carbon storage, fisheries enhancement, tourism, timber, fuel wood without fossil fuels."

One way to promote an interest could be ensuring long-term involvement of the local community in mangrove plantation projects, and ensuring short-term incentives in conserving plantations, as Thivakaran suggests.

Brahmbhatt gives the example of Asira Vandh, a village in Kachchh where people have planted and nurtured mangrove forests. The village is inhabited by Fakirani Jats, who have migrated long ago from Balochistan in today's Pakistan. Women go every morning in tractor trailers to the nearby forest to cut mangroves, and feed their buffaloes. Camel grazing is restricted.

The village elders said the success is due to their community leadership and the trust they had in institutions such as GUIDE and GEC that promoted plantation work. These institutions on their part see a future for this model to promoted afforestation, especially under climate financing.

Hassan agrees that if villagers have a sense of ownership, mangroves can be conserved better. As he recommends, the corporates and other agencies need to trust people more and, of course, pay more for their work.



These stories show that adaptation can be written about in multiple ways and in different settings. They also expose some missing elements. Adaptation activity, according to UNFCCC, spans five components—observation of climatic and non-climatic variables, assessment of climate impacts and vulnerability, planning, implementation and monitoring and evaluation of adaptation actions. The three stories discussed here highlight one or more of these aspects related to the concept of adaptation.

While all the three stories relate to the situation in rural areas highlighting vulnerability of local communities and how they are trying to adapt to climate change, these stories also include the big picture relating to climate change science as well as national and local policies. Members of communities and their individual or collective actions have been elaborated, along with views of scientists, experts and policy makers. Community voices in all climate stories, particularly those relating to adaptation action, are core elements of news stories and features but they need to be supplemented with quotes from experts or data from scientific studies. Such additional information and quotes provide proper context to community voices and can give readers a holistic understanding of adaptation issues.

Adaptation stories can emanate from multiple sources. Many Indian states have launched several adaptation projects in recent years. They are being funded and supported by national and international funding agencies, including the National Adaptation Fund for Climate Change under the Ministry of Environment, Forests and Climate Change. All such projects can yield a story if journalists can visit villages where these

projects are underway and talk to community members, local officials and experts. Adaptation stories can also emanate from community-led actions being run on their own without any support or help from any of the agencies. To identify such stories, reporters need to have deep understanding of the subject and develop a capacity to sense such stories. As mentioned earlier, reporters specializing in covering rural development may be better placed to cover adaptation as climate adaptation is weaved into programmes that seek to protect livelihoods and incomes of the poor and vulnerable communities. Farmers and local communities may be following certain practices based on traditional knowledge and collective wisdom, without knowing their work actually amounts to adaptation to climate change.

Another major area of climate change adaptation is reducing the risk of disasters, known as 'disaster risk reduction'. Climate change is projected to increase the occurrences and intensities of natural hazards like floods, cyclones, droughts and heat waves. Reducing risk from such disasters amounts to adapting to this reality by taking up preventive measures that reduce the risk of disasters. The idea is to ensure that hazards do not become full-fledged disasters. This includes a range of adaptation activities such as risk and vulnerability assessments, and strengthening climate information and early warning systems.

The following is example of a typical adaptation project taken up in a village in Tamil Nadu. It highlights impacts of climate change already being felt in the village and adaptation measures village community has initiated.

### Climate proofing a coastal village<sup>23</sup>

Avurivakkam is a small coastal community located in the Ponneri block of Tiruvallur District in Tamil Nadu.

The village is located near Pulicat Lake (a backwater lake of the Bay of Bengal). It is about 500 m away from the Buckingham Canal and 3km from the sea. Avurivakkam is home to approximately 912 people from about 126 families. The main source of income of the community is fishing and fish and dried fish vending.

The village has experienced a wide variety of climate-related impacts that have severely affected the livelihood of the community, such as an increase in temperature, changes in rainfall, sea level rise and extreme weather events (e.g. cyclones and floods). Extreme weather conditions and sea level rise, combined with other factors, have led to changes in fishing patterns and reduction in fish yields which affects income of the community. Coastal and soil erosion and severe damage to houses and infrastructure are other observed impacts of extreme weather events. As health and livelihood of the community has been impacted, this, in turn, results in illness, loss of employment and reduced credit worthiness. Due to the salination of groundwater, well water cannot be used for drinking and other domestic purposes. The village pond has become silted due to climatic changes and mismanagement; so availability of water for drinking and domestic purposes is a major issue.

To address the challenges of climate change and support adaptation, a pilot project was taken up to renovate the existing village pond and well (recharge unit). The pond, which is used for domestic purposes, will be deepened by 2m for increasing

the water storage capacity and capacity for rainwater harvesting during the rainy season which indirectly leads to groundwater recharging. The well currently has a volume of 49.06 cubic meters up to surface and stores around 50,000 litres of water during the rainy season. Groundwater recharging from the pond would recharge the well throughout the year, providing a stable drinking water supply to the village. The wall around the well will be raised for flood-proofing and the area around the well will be cleaned up. It will also prevent seawater intrusion in the pond and well as well as groundwater salination. Plantation work will be done around the pond in the form of fencing using coconut, casuarina and banana trees which is additional source of income for the community to be utilized for the operation and maintenance (O&M) of the pond. The purpose of the fence is to prevent pollution of the pond by animals and human activities.

The community has contributed in cash and in kind towards the pilot measure. Maintenance is required for the protection of the plantation from animals, the protection of pond water from getting polluted by animal and human activities and prevention of siltation of the pond. This will be taken up by the Project

Implementation Committee (PIC) of the village, which includes members of the Panchayati Raj Institutions (PRI), the local traditional Panchayat as well as members of Self Help Groups and Youth Groups. This pilot measure reduces the risk of climate related impacts (such as changes in rainfall patterns, increasing temperature and intensity and frequency of extreme weather events) and improves the adaptive capacity of the village by addressing drinking water scarcity, improvement of water quality, recharging of ground water accompanied by awareness raising and capacity building activities.

### Tips for smart reporting

The best way to get to know about new and ongoing adaptation projects and to track them is to 'follow the money'. This simply means keep an eye on projects being funded by national and international agencies such as the Adaptation Fund or the National Adaptation Fund for Climate Change. This can yield a lot of information for planning on-ground adaptation stories.

### Essential reading and sources of reference

IPCC report on adaptation: The global body on climate change has produced a number of reports on adaptation. An important one is the working group report on 'impacts, adaptation and vulnerability' released in 2014. This report has a section devoted to adaptation which covers adaptation needs and options; planning and implementation; opportunities, constraints and limits as well as economics of adaptation. <http://www.ipcc.ch/report/ar5/wg2/>

Adaptation Gap Report of UNEP: The UNEP publishes adaptation gap reports focusing on finance, technology and knowledge gaps in climate change adaptation. Find these reports here: <http://web.unep.org/adaptationgapreport/content/adaptation-gap-reports>

UNFCCC page on adaptation: Several actions have been initiated on different aspects of adaptation during the negotiations under UNFCCC. All these actions, roadmaps and agreements in adaptation have been detailed on UNFCCC website which gives an overview of adaptation measures at global level. <http://unfccc.int/adaptation/items/4159.php>

Adaptation Fund: The Adaptation Fund was established under the Kyoto Protocol of the UN Framework Convention on Climate Change, and has funded several projects in 63 countries since 2010 on climate adaptation and resilience activities. This list of projects, success stories and other details can be accessed at <https://www.adaptation-fund.org>.

### Sources to follow for news breaks, experts and multimedia

National Adaptation Fund for Climate Change: The Indian government has established this fund adaption projects in various states. The list of projected funded along with project reports are available on the website of Ministry of Environment. These projects can be a good starting point for follow up stories their status. <http://www.moef.gov.in/division/dpr>

State Climate Change Cells: Every state now has a climate change cell and many of these cells are funding adaptation projects also. It may be a good idea to look at the agenda of these cells and identify regions where adaptation projects being funded. In addition, a number of national and international agencies are involved in undertaking adaptation projects. They too can be a useful source.

### Tips for smart reporting

One can write a nice adaptation related story without even mentioning any of the keywords – climate change, climate-resilience or climate adaptation. In fact, all such jargon should be avoided. Given the preponderance of gloomy story on climate change or adverse effects, it is better to focus on solutions, which could mean a success story, community action or a new technology. One way to explore new angles in old stories would be to examine new policies, programme and policies from a climate perspective. For instance, a mundane business story on crop insurance can be pepped up with the climate angle.





# Reporting on climate change: challenges and pitfalls

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Writing a climate change story is a challenging task. In a typical newsroom, different people may have different notions about a climate change story. The subject does not fall into a well-defined beat. Though it started as an addendum to the environment beat, the subject actually encompasses a range of issues. The list includes water resources, energy, agriculture and food, science and technology, forestry, biodiversity, health, diplomacy, international relations and so on. Climate change has an interface with each of these subjects and reporters writing about climate change have to be equipped with an understanding of these issues. Alternatively, they must team up with other reporters in newsroom who cover these beats. Here some generic issues relating to the challenges reporters generally face while writing about climate change have been discussed. Some of them are also relevant for gatekeepers in media organisations such as sub-editors and news editors.

## Dealing with Jargon

One of the most common problems reporters face while writing about climate change is the use of technical words (jargon) and data. Those writing on the subject often get bogged down with jargon used by experts and do not bother to explain exact meaning of such terms. The best way is to avoid the use of technical terms altogether. The job of a reporters is to first understand those terms and then 'translate' them in a way that readers/viewers can understand. Even commonly used terms in newspapers such as 'adaptation', 'mitigation' and 'greenhouse gases' are actually jargon and they should not be used without proper explanation. Every sentence in a report should be clear and concise. Try and avoid acronyms as far as possible, particularly when reporting about scientific studies and climate change negotiations.

The following sentence, picked up from a news story, is an example of jargon use:

*Anthropogenic interferences* in the natural system are at the root of the problems of flood and erosion that have emerged to a menacing proportion in the State these days, said Chief Secretary VK Pipersenia. He was inaugurating a two-day workshop on application of *bioengineering techniques for mitigating riverbank erosion*, organised by the Assam State Disaster Management Authority (ASDMA) here today.

It could well have been written in the following way:

A top government official has blamed human interference for twin problems of flooding and erosion of soil along riverbanks in the state of Assam. Chief Secretary V K Pipersenia was speaking at a meeting organized by the Assam State Disaster Management Authority to discuss scientific ways to prevent riverbank erosion.

Here is another example of a jargon-loaded sentence in a news story:

The Indian Council of Forestry Research and Education (ICFRE) has pitched for conservation and cultivation of medicinal plants for *climate change adaptation in India at the Conference of Parties (COP22) United Nations Framework Convention on Climate Change (UNFCCC)*.

It could well have written this way:

Conserving medicinal plants and promoting their cultivation could help minimize impacts of climate change being felt in the country, India's top forest research agency has suggested at the ongoing UN climate change negotiations.

### Scientific facts vs human story






Those reporting on climate change stories often face the dilemma whether they should focus on scientific research findings or bring in a human angle in their story. There should be no doubt in the mind of any reporter about the importance of science in any climate change story – be it relating to a new research finding or any new project on climate change adaptation or any related subject like energy conservation. All climate change actions and policies follow evidence produced through research.

New aspects of climate science continue to emerge. So, one should not lose sight of science. However, scientific facts or findings or data need not be overpowering in a story or told

in a dull fashion. Scientific facts can be very well blended with human aspects of climate change. After all, the end goal of all climate research is to help humans either prevent further impacts of rising temperatures and other impacts of climate change or to help them adapt to those changes. It is this human angle which needs should be highlighted in a climate change story.

Even if the focus of the story is community action or impacts of climate change on the ground, scientific facts should not be ignored or suppressed. The objective should be to achieve a nice balance of scientific facts and human aspects. The following two examples illustrate these points about climate science stories:

**Resources to understand climate change jargon:**

				
Climate change glossary BBC	Glossary of climate change terms US EPA	How to speak like a climate change negotiator- Scientific American	UNFCC jargon buster- Climate Nexus	Key terms you need to know about climate change -Climate Reality Project

### Using data effectively

Yet another challenge reporters often encounter relates to the use of data. While dealing with any aspect of climate change – science, policy, adaptation, mitigation, finance, technology transfer – one often encounters a lot of data. Pick up any IPCC report or any national or sub-national action plan, you will find a huge amount of data. All research papers are usually full of intimidating data, graphs, charts and tables. The use of data is good to prove a point or to make a convincing argument. The challenge is to pick right data points and highlight the same in an easily digestible manner. But remember to avoid using data-related jargon in news stories. In some cases, data itself may be so compelling that it can yield a story. This means data is not just a means of visual presentation of facts or trends, but data can make a story by itself.

Data journalism gurus advise that reporters must ask a few basic questions before they begin to use data in their stories. As mentioned before, sometimes data itself can be the story lead or headline. In other cases, the purpose of using data can be to make story better or well-rounded. Data can also be used to supplement arguments being advanced or opinion being expressed in a story. At times, analysis of data can also yield a story. In all the cases, don't forget that the use of data in any form is to tell a good story. Therefore, loading you story with impressive graphs or charts from a research paper or an IPCC report will not make it rich unless data is contextualized to tell a story.

Here is an example of a good data story, which is based on a research paper:

## Agriculture In 115 Indian Districts Most At

Risk From Climate Change<sup>26</sup>

IndiaSpend.com, August 3, 2016

As floods ravage eastern and northern India, agriculture in 115 districts across 15 states is “highly vulnerable” to climate change, according to a May 2016 study, published in Indian Academy of Science’s journal *Current Science*.

The first to analyse 38 meteorological, agricultural and social data across all of India’s 572 rural districts, the study creates a climate vulnerability index for agriculture, divided into five categories of vulnerability: Very high, high, moderate, low and very low. The vulnerability index has already been used by the Indian Council of Agricultural Research to demonstrate climateresilient agricultural practices in 121 of either the “very

high” or “high” vulnerability districts identified by their study, study coauthor Alok K. Sikka, India representative and principal researcher at the International Water Management Institute, New Delhi, told IndiaSpend. While the study is possibly the most comprehensive yet, independent observers said it may yet be inadequate to inform local decision-making on climate change.

Most of the “very highly vulnerable” districts come from India’s western and peninsular regions. Rajasthan has 25 “highly vulnerable” districts, the most in this category nationwide. Gujarat, Madhya Pradesh, Karnataka, Maharashtra, Andhra Pradesh, Tamil Nadu, eastern Uttar Pradesh and Bihar also exhibit “very high” and “high” vulnerability, the study said.

Full story can be accessed here: <http://www.indiaspend.com/cover-story/agriculture-in-115-indian-districts-most-at-risk-from-climate-change-84356>

The story is based on the following scientific paper published in *Current Science*:

### RESEARCH ARTICLES

## A district level assessment of vulnerability of Indian agriculture to climate change

C. A. Rama Rao<sup>1\*</sup>, B. M. K. Raju<sup>1</sup>, A. V. M. Subba Rao<sup>1</sup>, K. V. Rao<sup>1</sup>,  
V. U. M. Rao<sup>1</sup>, Kausalya Ramachandran<sup>1</sup>, B. Venkateswarlu<sup>2</sup>, A. K. Sikka<sup>3</sup>,  
M. Srinivasa Rao<sup>1</sup>, M. Maheswari<sup>1</sup> and Ch. Srinivasa Rao<sup>1</sup>

<sup>1</sup>ICAR-Central Research Institute for Dryland Agriculture, Hyderabad 500 059, India

<sup>2</sup>Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani 431 462, India

<sup>3</sup>Natural Resource Management Division, ICAR, New Delhi 110 012, India

Assessing vulnerability to climate change and variability is an important first step in evolving appropriate adaptation strategies to changing climate. Such an analysis also helps in targeting adaptation investments, specific to more vulnerable regions. Adopting the definition of vulnerability given by IPCC, vulnerability was assessed for 572 rural districts of India. Thirty eight indicators reflecting sensitivity, adaptive capacity and exposure were chosen to construct the composite vulnerability index. Climate projections of the PRECIS model for A1B scenario for the period 2021–2050 were considered to capture the future climate. The data on these indicators were normalized based on the nature of relationship. They were then combined into three indices for sensitivity, exposure and adaptive capacity, which were then averaged with weights given by experts, to obtain the relative vulnerability index. Based on the index, all the districts were divided into five categories with equal number of districts. One more district was added to ‘very high’ and ‘high’ categories. The analysis showed that districts with higher levels of vulnerability are located in the western and peninsular India. It is also observed that the highly fertile Indo-Gangetic Plains are relatively more sensitive, but less vulnerable because of higher adaptive capacity and lower exposure.

**Keywords:** Agriculture, adaptive capacity and exposure, climate change, sensitivity, vulnerability.

mean and/or variability of its properties, and that persists for an extended period, typically decades or longer’. Although climate change is global in its occurrence and consequences, it is developing countries like India, that face more adverse consequences. Globally, climate change is seen as a failure of market mechanisms, wherein polluters have not had to pay for the negative externalities<sup>4</sup>.

Climate change projections made for India indicate an overall increase in temperature by 1–4°C and precipitation by 9–16% towards 2050s (ref. 5). However, different regions are expected to experience differential change in the amount of rainfall in the coming decades<sup>6</sup>. Another significant aspect of climate change is the increased frequency of occurrence of extreme events such as droughts, floods and cyclones. All these expected changes will have adverse impacts on climate-sensitive sectors such as agriculture, forest and coastal ecosystems, availability of water for different sectors and on human health.

The international negotiations on climate change have now rightly recognized that adaptation is as important as mitigation, when dealing with climate change. The world is already committed to a certain extent of climate change and even drastic mitigation efforts will not prevent the projected rise in temperature till 2100. Therefore, adaptive measures to deal with climate variability and change need greater attention, in terms of policy, research and institutional interventions. In order to develop and target appropriate adaptive measures, it is important to identify

### **'Climate change can lead to depression'<sup>24</sup>**

MUMBAI, February 19, 2017: Apart from the undeniable effect on the environment, climatic changes can lead to stress, anxiety, depression and post-traumatic stress disorder (PTSD) among people. **[The intro is loaded with jargon like PTSD and is badly written]** This is the essence of a study conducted by psychology students Esther Sukita and Ashwini K, who received the 'Best Paper in Genetic Resources and Climate Change' at the 8th Indian Youth Science Congress. **[it is not clear what kind of study was this – observational, anecdotal, clinical research, survey, theoretical, meta study]** The duo put forth a compelling argument regarding the significant mental and emotional effects of climate change without viewing it solely as a textbook concept.

Esther also listed climate change as one of the major causes for farmer suicides and increase among their PTSD levels. **[If the study has indeed identified that climate change impacts like extreme weather events as one of the reasons for farmer suicides in Maharashtra, then it should have been the lead.]** The pair also highlighted the high-risk coping behaviors adopted by these farmers as being ultimately damaging in the long-term

and a negative influence on their mental health. Esther said, "Any climate change-related disaster will lead to a trauma which affects their (farmers) normal condition of living. It also leads to depression when unable to cope with the trauma which, in turn, affects their performance level. When farmers don't know how to cope and end up committing suicide."

Speaking on counselling schemes they said, "As counsellors we look at how to make them aware of it beforehand so that they're better prepared for it mentally." In the three-day event with 'Food for all in the Anthropocene Age' as the theme, the pair chose a different approach and said, "Here we have discussed disaster management on very physical terms, like food and water, but what about mental health? Just because we have food and water doesn't mean we're going to be safe and happy." **[the story does not provide any details of the 'study', where it was done, how it was done, who did it – institution name not mentioned. Has the study been peer-reviewed, published? No data whatsoever has been given. It also does not contain any background, context of either climate change or farmers' suicides. No independent expert has been quoted or cited.]**

### **Your high-rise is warming the globe - Household emission tops Calcutta list<sup>25</sup>**

New Delhi, March 18, 2015: High-rise and glass-facade buildings, poor garbage management and inefficient heating practices have turned urban households into major collective sources of greenhouse gases (GHG), scientists have said after the first assessment of GHG footprints of India's mega-cities.

The researchers at the Indian Institute of Science (IISc), Bangalore, have found that urban households account for unexpectedly high proportions of the GHG emissions of cities, with Calcutta's domestic sector at the top, contributing over 42 per cent of the city's GHG footprint. Greenhouse gases such as carbon dioxide, methane and nitrous oxide in the atmosphere absorb heat from the Sun and are contributing to global warming.

The study has identified Delhi as the worst polluting metropolis - it released over 38 billion kg of GHG during 2009, the latest year for which pooled emissions data is available, followed by Greater Mumbai which spewed 22.7 billion kg, and Chennai with 22.1 billion kg.

The researchers say Calcutta's 19 billion kg footprint could be because of a mix of several factors - from lower levels of industrial activities to the greater use of public transport which would lower transport-related emissions. While GHG emissions have long been linked mainly to transportation, power plants and industrial activities, the researchers found that the GHG emissions from the domestic sector ranged from 17 per cent in Hyderabad to 42 per cent in Calcutta.

"This may seem like a surprise, but not when we take into account the changing architecture of our cities and our mismanagement of cities' solid and liquid wastes," said T.V. Ramachandra, a faculty member at the IISc Centre for Ecological Sciences. The study by Ramachandra and his colleagues at the IISc's Centre for Energy and Wetlands Research provides insights into the GHG emissions of cities sector by sector and is expected to help government departments and policymakers identify priority areas for actions to curb emissions.

The domestic GHG emissions emerge from everyday energy consumption by households through cooking, lighting, heating and the use of household appliances. The researchers say there are indications that changing architectural trends are dramatically increasing domestic GHG emissions. "High-rise apartments and buildings with glass facades tend to raise electricity consumption," said Bharath Aithal, a post-doctoral research scholar at the IISc and member of the study team. "Elevators, water pumps, apartments sealed off by glass windows - all of this contributes to emissions."

The researchers have observed that electricity consumption in areas of a city with a high proportion of traditional houses is on average about 1,700 units per person per year but jumps to between 12,000 and 15,000 units per person per year in areas with high-rise buildings with glass facades. Their study, published in the journal Renewable and Sustainable Energy Reviews, also shows how poor public transportation networks can influence a city's GHG footprints. Calcutta's transportation sector accounts for 13 per cent of the city's GHG emissions while Greater Mumbai's transportation GHG footprint is about 17 per cent.

### Of likelihood and confidence levels<sup>27</sup>

The synthesis report of the Fifth Assessment Report of IPCC published in 2015 states that the evidence for human influence on the climate system has grown since the IPCC Fourth Assessment Report (AR4). It says “it is extremely likely that more than half of the observed increase in global average surface temperature from 1951 to 2010 was caused by the anthropogenic increase in GHG concentrations and other anthropogenic forcings together.” The report also concludes that anthropogenic influences have very likely contributed to Arctic sea-ice loss since 1979 and have very likely made a substantial contribution to increases in global upper ocean heat content (0–700 m) and to global mean sea level rise observed since the 1970s. Evidence of observed climate change impacts is strongest and most comprehensive for natural systems. In many regions, the report says, “changing precipitation or melting snow and ice are altering hydrological systems, affecting water resources in terms of quantity and quality (medium confidence). Many terrestrial, freshwater and marine species have shifted their geographic ranges, seasonal activities, migration patterns, abundances and species interactions in response to ongoing climate change (high confidence).”

Note the use of qualifiers like extremely likely, highly likely and medium confidence etc. used throughout the report. But each of them conveys a specific meaning. The confidence levels are based on the authors’ evaluations of underlying scientific understanding and expressed as a qualitative level (from very low to very high) and, when possible, probabilistically with a quantified likelihood (from exceptionally unlikely to virtually certain). A level of confidence is expressed using five qualifiers: very low, low, medium, high and very high, and typeset in italics, e.g., medium confidence. The following terms have been used to indicate the assessed likelihood of an outcome or a result: virtually certain 99–100% probability, very likely 90–100%, likely 66–100%, about as likely as not 33–66%, unlikely 0–33%, very unlikely 0–10%, exceptionally unlikely 0–1%. Additional terms (extremely likely 95–100%, more likely than not >50–100%, more unlikely than likely 0–<50%, extremely unlikely 0–5%) may also be used when appropriate.

### Communicating risks and warnings

News reports about climate change are often framed as ‘gloom and doom’ stories as they usually deal with warnings about likely impacts of climate change. Such reports are also about communicating risks and warnings associated with climate change. Most research papers on climate change are couched in scientific jargon such as probability, uncertainty, statistical significance and levels of confidence. IPCC reports which are supposed to provide scientific evidence about climate change to policy makers deploy concepts of likelihood and confidence levels while projecting future impacts of climate change (see the box ‘Of likelihood and confidence levels’). Any news report based on the IPCC findings will have to explain these terms and not leave any room for interpretation.

It is still a challenge for most reporters to clearly link individual extreme weather events with climate change (which by definition is man-made). Can urban floods caused due to heavy downpour in a short span of time or events like cloud burst in the hills be attributed to climate change? Sometimes reporters are under pressure to attribute all unusual weather events with climate change. While IPCC reports do mention that extreme weather events and

their intensity would go up as a result of climate change, but there are several caveats and uncertainties that apply to such statements.

A group of climate scientists and other experts have come together under an initiative named World Weather Attribution Initiative to analyse extreme weather events and determine to what extent human-induced climate change altered the odds of their occurring. An analysis of the Chennai floods of 2015 by this group has shown that not all heavy rainfall events are becoming more frequent due to human induced climate change, and that extreme weather events can also be a result of naturally occurring changes in the atmosphere such as changes in atmospheric circulation.<sup>28</sup> Vulnerability of people has increased due to factors like unplanned urbanization, changing demography and more people living in high-risk zones. These factors are exacerbating impacts of extreme weather events in terms of loss of lives and assets. Reporters should, therefore, exercise caution attributing linking every extreme event to climate change. It may deflect attention from other factors like unplanned growth or changing land-use patterns which may have been responsible for damage.

The following paragraph written by New York Mayor Michael Bloomberg after Hurricane Sandy lashed coastal areas in October 2012 is instructive in the way it communicates both risks and uncertainties of climate change:

“Our climate is changing. And while the increase in extreme weather we have experienced in New York and around the world may or may not be the result of it, the risk that it might be – given this week’s devastation – should compel all elected leaders to take immediate action.”

### Writing features, op-eds

Environment reporters and editors are often commissioned to write feature articles and opinion pieces (also called op-eds) in newspapers and digital news platforms. Such articles go beyond news stories and present a larger picture. For both features and op-eds, all the pointers discussed so far apply. Features are written to highlight a particular subject such as a success story or a community initiative in adaptation in a detailed manner. Here too concepts and ideas will have to be explained in simple language, experts and community voices will have to be quoted and science and data related to the subject will have to be included. All this can make a well-rounded feature. Merely quoting experts or only community voices will not be able to communicate the message. Features are a potent medium to talk about grassroots initiatives, innovations, success

stories and impacts of climate change. Like news stories, features too are supposed to be objective and present different angles of a story.

On the other hand, op-eds, as the name suggests are about expressing one’s opinion. This means these articles need to focus on one idea or an argument. One can discuss a new idea, a controversy, a new policy, legislation or a report in an op-ed piece. The objective of such articles is to initiate or enhance public debate or discourse on that particular issue. Remember that editors are always looking for new ideas and new arguments in op-eds, and not mere reiteration of existing ideas and notions. Just because you are writing an opinion piece does not mean that you can compromise on facts or overlook evidence. All good arguments are based on facts and evidence, otherwise they may sound hollow and rhetorical. It is necessary to do research and collect facts before writing an op-ed, and like a news story, take care to keep the language jargon-free. The objective of an opinion piece is to influence readers’ opinion and not impress them with heavy-sounding language. Take a clear position, build the argument with facts and evidence and write a definite conclusion focused on what you want to convey.

### Doing a multi-media story

Today we live in a truly multi-media world where ideas, thoughts and stories are being conveyed not only through words but with pictures, sounds,



video and graphics. As environment journalists working in the twenty first century – even if you are working for a print media organisation – it is necessary to be well-equipped in all forms or be a multi-media journalist. The story of climate change – be it impacts or adaptation – lends itself very well to the use of multimedia. It is always good to not just shoot pictures but also record live visuals while in the field to do a climate story.

A smart mobile phone and some basic editing software can help you do everything – right from writing to uploading a story with all additional audio-visual inputs. These days all ‘print’ stories are distributed through digital or online platforms. Usually all such stories are accompanied by related pictures. Now short videos of interviews or quotes of community members or visuals of an ongoing project can be uploaded along with the print story. Short podcasts can tell the same story in audio form, with all quotes and commentary. In the same way, compelling infographics can embellish a story. Data stories can include interactive graphics as well. Digital stories should also provide necessary links.

### **Accessing resources and sources**

One of the biggest challenges journalists face is the multi-sectoral nature of a climate change story. A climate change story does not fit in the traditional division of work in a newsroom because of its cross-cutting nature. Therefore, journalists may not find an all-in-one ‘climate

change’ expert to quote, unlike other subjects of coverage they are used to. For every story dealing with any aspect of climate change, one will have to depend on multiple sources of information and data as well as multiple experts to be quoted. Someone working on climate science may not be the right expert to be quoted for a story on mitigation or adaptation and vice versa. At the same time, a story on adaptation will also have to talk a bit about science, and a story dealing with science may have to mention about likely impacts of a new trend or finding on people and community. Therefore, climate change related stories have to include information and quotes from a number of experts or sources – scientists, officials, communities, international agencies, civil society representatives and other experts. This means a journalist wishing to write on climate change has to develop a wide database of experts for his or her work.

Fortunately, over the years India has developed expertise in climate change related subjects but, unfortunately, no database has been developed of experts who are willing to engage with media or have been trained to do so. Here, an outline of various types of sources has been given. Based on this an individual journalist can develop his or her own private list of experts.

A list of potential sources of news tips, data, quotes and important reports can be developed based on the following guidelines:



**Tracking international, national, state level and local institutions:** Reporters planning to write on climate change should prepare a list of institutions of relevance at all levels: international, national, state and local levels. For instance, at the nation level it is a good idea to be in touch with the Ministry of Environment, Forests and Climate Change and departments of environment and science and technology (S&T) at the state level. Most states now have a nodal agency or nodal officer on climate change. Climate change projects in states are executed through so-called line departments – those handling agriculture, horticulture, water resources, panchayati raj and so on. Other agencies like state disaster management agency may also be involved directly or in directly with work related to climate change. It is best if you identify relevant persons (top officials, communication officers) in all these agencies

and let them know that you are covering climate change and would be interested in getting information on a regular basis.

**Keeping an eye on scientific journals:** The science of climate change, its impact and adaptation is still evolving and new scientific studies are constantly being published. Therefore, climate change news based on new scientific findings form a good chunk of climate reporting. For this, it is necessary for reporters interested in climate science to keep an eye on some top journals like Science, Nature, Nature Climate Change, Journal of Climate, Geophysical Research Letters, Climate Dynamics etc. Multi-disciplinary Indian journal Current Science and journals published by Indian Council of Agriculture Research too publish papers on different aspects of climate change in India. Journalists can subscribe to newsletters of

Climate Change on Twitter

- UN Climate Change @UNFCCC
- Climate Reality @ClimateReality
- Nature Climate @NatureClimate
- World Bank Climate @WBG\_Climate
- Ministry of Environment, Forest & Climate Change @moefcc
- FAO Climate Change @FAOclimate
- Intergovernmental Panel on Climate Change @IPCC\_CH
- Green Climate Fund @GCF\_News
- UNDP Climate @UNDPClimate
- Yale Program on Climate Change Communication @YaleClimateComm
- India Climate Dialogue @ICD\_climate
- Centre for Science and Environment @CSEIndia
- Greenpeace India @greenpeaceindia
- India Environment Portal @indiaenvportal
- India Water Portal @indiawater
- India Science Wire @indianscinews

these journals.

**Official websites, newsletters of central and state governments:** Information relevant to your work may flow from a variety of official sources or it may just be available/updated on government websites. For instance, the NAPCC and all SAPCCs are available in the website of MOEFCC or on websites of climate change nodal agency of respective state. In the same way, adaptation projects (concept notes and Detailed Project Reports) approved or sent for approval to the National Adaptation Fund for Climate Change are also available on the website of MOEFCC. They provide all information including contact details of the nodal officer handling the project. Some state nodal agencies publish newsletters and periodically update their websites. One can subscribe to these newsletters and get new important research papers. They can also track new papers through portals and aggregators like Science Daily and Climate Science Watch.

**Developing contacts with academic and research institutions, climate change centres:** While it is good to get the latest research papers on climate change from scientific journals, it would be better if you stay in touch with people who do science and produce those papers. One can prepare a list of research institutes, universities and think tanks engaged in climate change related research. There is a vast number of research institutes in India interested in climate science and its different aspects. These include various Indian Institutes of Technology, Indian Institute of Science at Bangalore, Indian Institute of Tropical Meteorology and climate change centres at universities like Anna University in Chennai. One can identify institutes or individual researchers in a region, visit those labs, build personal rapport with scientists. This can ensure flow of information, research papers as and when they are published.



**Engaging with civil society, community organisations:** A climate change story can be told from several perspectives – science to community – and for this a variety of sources need to be tapped. Civil society organisations, national and international non-government bodies, social science research institutes can be a source of news. Several of them work with communities, grassroot organisations and climate adaptation projects. Some independent centres may be working on policy issues and financial aspects too. Climate reporters need to be in touch with them all the time.

For instance, the Centre for Science and Environment, the Centre for Policy Research, Tata Institute of Social Science, Greenpeace, Natural Resources Defense Council, Climate and Development Knowledge Network may all be good sources of information on different aspects of climate change. There are several state and local level NGOs working with communities on water conservation, climate-resilient agriculture and problems of coastal regions as well as hilly areas.

**Attending conferences and meetings:** Seminars, lectures, symposia, scientific meetings, exhibitions and other such fora provide a great opportunity for journalists to connect with scientists, policy makers, experts and community representatives. One can not only get information for stories but also develop personal contacts with sources of news. In technical and scientific meetings, scientists often present new findings which can form the basis of writing news stories. Panel discussions with experts from different fields can give reporters an overview of a subject and help them in writing well-rounded stories.

**Harnessing social media:** Social media, particularly microblogging platform, Twitter, has emerged as a major source of news and leads for environment journalists. Several organisations, experts, government departments, officials, ministers, news outlets, research journals and UN agencies use Twitter on a daily basis to about climate change. Twitter handle of such organisations and individuals can be harnessed to stay in touch with the latest in your field of interest. One can get to know about major events, press conferences, scientific events, climate change negotiations, and release of new research studies as well as reports by just following a select list of relevant Twitter handles. Twitter is also a good place to hunt for right experts for quoting in stories and getting in touch with them. On any specific topic, it is possible to get different shades of opinion. One can also get feedback on stories once they are done and shared in social media.

**Peer networking, EJ associations:** The number of journalists covering environment and climate change globally and in India is growing. Many of them are members of formal and informal networks such as mailing lists, associations and federations. Global and national bodies like the Society of Environment Journalists, Forum of Environment Journalists in India, World Federation of Science Journalists, International Federation of Environment Journalists, Earth Journalism Network are useful fora for journalists. These associations organize programmes, publish manuals, hold regular events and engage in other activities for professional journalists. It is useful to become members of such networks as it helps to stay in touch with what peers are doing and also to know about opportunities like fellowships, travel grants, events and training courses.



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