1. Must we change?
2. Can we change?
3. Will we change?
1. Must we change?
Solar radiation in the form of lightwaves passes through the atmosphere.
The Largest Source of Global Warming Pollution Is the Burning of Fossil Fuels

Billion Metric Tons of Carbon


Data: U.S. Department of Energy/CDIAC
CO$_2$ is being released into the atmosphere faster than at any time in at least the last 66 million years.

The hottest 17 of the 18 years on record have been since the year 2001, with the hottest four years being 2014, 2015, 2016, and 2017.

Data: NASA/GISS
Much of Europe was placed on “red alert” as temperatures exceeded $111^\circ F$ ($44^\circ C$).
A guard faints due to the heat.
The temperature in Sydney reached 117°F (47.3°C) — the city’s hottest day in almost 80 years.
Hatay, Turkey

July 4, 2017

This road melted in the heat.
On May 19, 2016
India set a new all-time high temperature record of

124° F (51° C)
The Indian government distributed drinking water as temperatures set new records.
At least 2,330 people died in the 2015 India heat wave.
Greenland

- April 11, 2016

Data and image obtained using Climate Reanalyzer (https://cci-reanalyzer.org), Climate Change Institute, University of Maine, USA
Arctic Sea Ice Extent, Last 1,500 Years

Data: Kinnard, C., C.M. Zdanowicz, D.A. Fisher, E. Isaksson, A. de Vernal and L.G. Thompson. (2011). Reconstructed change in Arctic sea ice over the last 1,450 years. Nature letter, DOI:10.1038/nature10581, Fig. 3
What happens to our Earth when the average temperature goes up?
93% of the extra Heat trapped by manmade global warming pollution goes into the Ocean

© Tom Van Sant/Geosphere Project, Santa Monica/Science Photo Library
Global Ocean Heat Content

• Change Since 1950

Ocean Heat Content ($10^{22}$ J)

Evaporation

Precipitation

The Hydrological Cycle

Water Returns to the Sea

Sources: Oak Ridge National Laboratory, U.S. Dept. of Energy; © Getty Images; © Pond5
How Does the Climate Crisis Impact Hurricanes?

1. Warmer oceans lead to more intense hurricanes
2. Hurricanes intensify much more rapidly
3. Warmer air holds more moisture, leading to heavier downpours
4. Storm surge increases due to sea level rise
5. A “wavier” jet stream can hold storms in place longer
Hurricane Harvey crossed waters in the Gulf of Mexico that were up to 7° F (4° C) hotter than normal, up to 200 meters deep.
Hurricane Irma

• September 10, 2017

Irma remained a Category 5 hurricane for three straight days—a new global record since satellite tracking began.

Source: 2017 NASA Earth Observatory
So the downpours get bigger
Globally, floods and extreme rainfall events now occur four times more often than in 1980.

Data: Munich Re via The Guardian
At least 1,400 people have died in flooding across South Asia during the 2017 monsoon.
Agartala, India

• August 11, 2017

Hundreds of thousands of people have been affected by monsoon flooding in 2017.
Chennai, India

- November 17, 2015

The torrential rains in Tamil Nadu affected two million people.
Rishikesh, Uttarakhand State, India

- June 18, 2013
Liuzhou City, China

• July 12, 2017
Rio de Janeiro, Brazil

- December 11, 2013
Rising temperatures remove moisture from the Ocean and also from Land
Tamil Nadu is experiencing its worst drought in 140 years.
South Africa’s Western Cape province faces its worst water shortage in 113 years.
Upsala Glacier, Argentina

Photos: © Greenpeace/De Agostini/Daniel Beltra
Indian glaciers have already started melting....

Pindari Glacier, Himalayas

1936

2006
Unnamed Glacier, Southwest Greenland

Summer 2013

Images courtesy Anders Bjørk, © Natural History Museum of Denmark/Tholstrup (2013) and Danish Geodata Agency (1935)
Declining Ice Mass in Greenland

Monthly Change in Ice Mass (Gigatonnes)


-3,500 -3,000 -2,500 -2,000 -1,500 -1,000 -500 0 500 1,000 1,500 2,000 2,500 3,000 3,500

Source: NASA
Images courtesy Anders Bjark, © Natural History Museum of Denmark/Tholstrup (2013) and Danish Geodata Agency (1935)
We are already seeing the beginning...

The Sunderbans mangroves have decreased by 20% in the last 40 years...
Flooding in Bangladesh

Flooding from sea level rise, storm surges and tidal surges are all leading to increased soil salinity in Bangladesh.
“Climate Change is a Medical Emergency.”

Professor Hugh Montgomery, Co-Chair, The 2015 Lancet Commission on Health and Climate Change

June 2015
Tropical Diseases on the Move
Aedes aegypti, the principal carrier of the Zika virus.
We now risk losing up to 50% of all living species in this century.

Source: Nicholas Stern, The Economics of Climate Change
Photo: © Dirk E. E. Eken/Shutterstock
Projected Yield Declines For Each 1°C of Warming

Maize -7.4%
Wheat -6%
Rice -3.2%
Soy -3.1%

These four crops make up two thirds of human caloric intake.

Images: [Corn] © EggHeadPhoto/Shutterstock; [Wheat] © AlenKadr/Shutterstock; [Rice] © ekotamaik/Shutterstock; [Soy] © Jiang HongYan/Shutterstock
Food Surpluses and Deficits

- 1965 – 2012

Net Trade, Millions of Tonnes
Water scarcity already affects more than 40% of the world’s population.
Water Scarcity’s Effect on GDP

- 2050

Countries that could lose up to 6% of GDP by 2050 under a business as usual scenario

Worldwide, air pollution kills 7 million people every year.
Deaths Attributable to Ambient Air Pollution

Deaths Per Year
- 0 – 4,999
- 5,000 – 19,999
- 20,000 – 49,999
- 50,000 – 149,999
- > 150,000

Data: World Health Organization, 2016
1. Must we change?
YES!
2. Can We change?
We have the solutions at hand...
Solar power in India is now cheaper than coal

Piyush Goyal, India’s Ex- Minister of State for Power, Coal and New & Renewable Energy
In September 2014, Delhi instituted net metering, allowing individuals to sell solar electricity to the grid.
Low hanging fruit!

India could save $42 billion each year with enhanced energy efficiency.
Chandrasan Village, Gujarat
The Indian states of Gujarat, Andhra Pradesh, and Telangana are all investing in large-scale solar energy initiatives.
Renewable Energy in India

Data: 2017 Indian Ministry of New and Renewable Energy (MNRE)
Cost of Crystalline Silicon Solar Cells

1976: $79.40/watt

Data: Bloomberg New Energy Finance
Suzlon Wind Farm, Ahmedabad

9% of India’s electricity capacity is in wind energy
Ahmedabad, India
Clean cookstoves use 50% less fuel and reduce toxic emissions up to 80%.
India aiming for all-electric car fleet by 2030, petrol and diesel to be tanked
## Countries Planning a Fossil Fuel Vehicle Phase-Out:

<table>
<thead>
<tr>
<th>Country/State</th>
<th>Date of Phase Out</th>
</tr>
</thead>
<tbody>
<tr>
<td>Norway</td>
<td>2025</td>
</tr>
<tr>
<td>Netherlands</td>
<td>2025 (passed by Parliament, pending in Senate)</td>
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<tr>
<td>India</td>
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<tr>
<td>China</td>
<td>“In the near future”</td>
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<td>Scotland</td>
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<tr>
<td>Britain</td>
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<tr>
<td>Germany</td>
<td>Date of phase-out pending.</td>
</tr>
<tr>
<td></td>
<td>Merkel: “The approach is right.”</td>
</tr>
</tbody>
</table>
2. Can We change?
YES!
3. Will we change?
In the 2015 Paris Agreement, India and virtually every nation in the world agreed to work together to achieve net zero greenhouse gas emissions.
Prime Minister Modi and French President François Hollande launched the International Solar Alliance in Paris on November 30, 2015.
125 Cities 9 States
183 Colleges and Universities
902 Businesses and Investors

All committed to the Paris Climate Agreement
Over 100 global companies have made a commitment to go 100% renewable.
Facebook: facebook.com/ClimateRealityIndia

Twitter: @tcrpindia

Website: www.climatereality.org.in

THANK YOU FOR YOUR TIME