

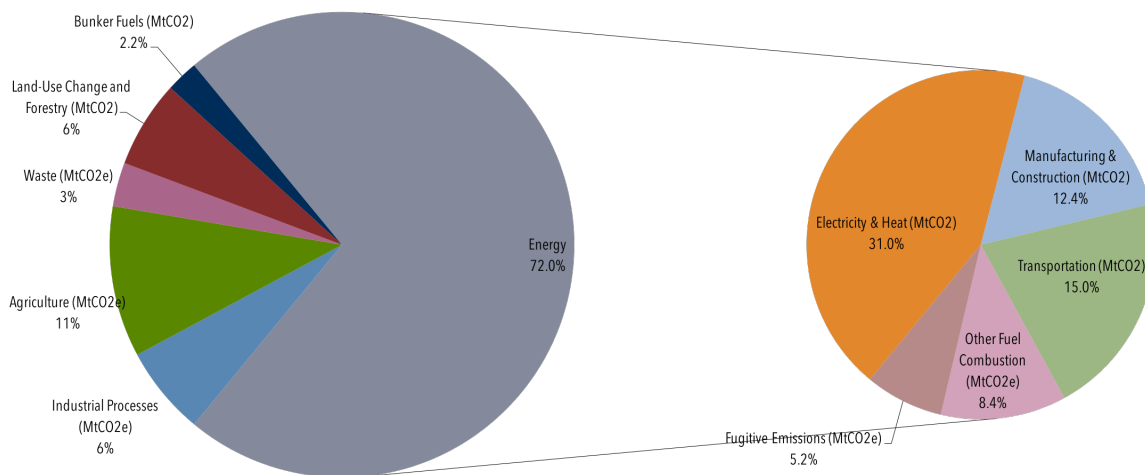
## Climate Change: A global problem that needs both global and local solutions

Climate change is an environmental issue that has gained much of the world's attention in recent years. From Al Gore's *An Inconvenient Truth* in 2006, the Paris Agreement in 2015, to Donald Trump's recent political decisions, climate change has become one of the most talked about and hotly debated issues both in media and politics. Despite 90-100 percent scientific consensus on anthropogenic climate change (Cook, et al. 2013, Orestes 2004, Doran and Zimmerman 2009, Anderegg et al. 2009, Carlton et al. 2015), there still seems to be an ongoing debate whether or not it is real, at a time when many vulnerable countries already experience climate change impacts.

The Earth has seen climate change throughout its history; natural causes such as variations in sunlight and volcanic eruptions (National Aeronautic Space Administration, n.d.) have contributed to this. However, while these natural causes still affect the Earth's changing climate today, their influence is now considered too small and they occur too slowly to explain how rapidly the Earth has warmed since the 1800's (ibid).

According to the Intergovernmental Panel on Climate Change (IPCC) (2007), there is strong evidence that global warming in the last century has not been caused by internal variability alone. In fact, the IPCC synthesis report (2014, p.2) has made it clear that "warming of the climate system is unequivocal" and humans have clearly influenced this:

"Human influence in the climate system is clear, and recent anthropogenic emissions of greenhouse gases in highest in history."



**Figure 1: Global manmade Greenhouse Gas Emissions by sector, 2013. Source: Center for Climate and Energy Solutions (n.d.)**

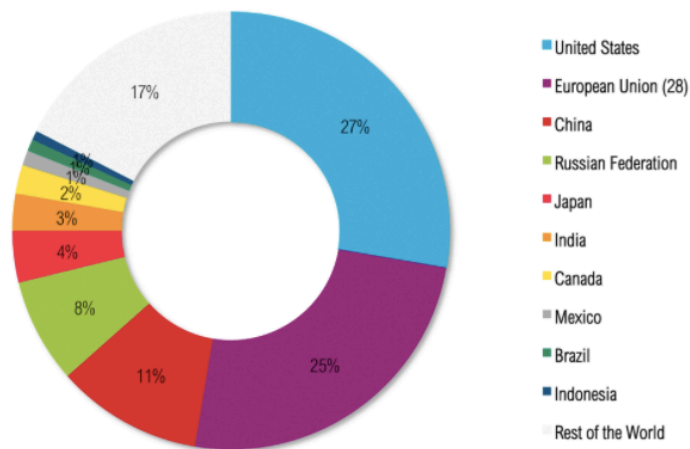
As Figure 1 suggests, 72 per cent of manmade global greenhouse gas (GHG) emissions comes from the Energy sector, including electricity and heat and other fuel combustion. The next largest contributor to GHG is agriculture at 11% and land use and forestry at 6 per cent.

Political and media debates aside, more people and institutions have acknowledged the reality of anthropogenic climate change. For example, 69 per cent of Americans believe that global warming is happening and 52 per cent believe that it is caused by human activities (Marlon et al., 2016). With the fact that climate change is largely caused by humans and with the growing acknowledgment by the public and institutions, climate change must be addressed with solutions that will lessen GHG emissions from human activities. This paper aims to look at current solutions at the global level, its effectiveness, and how integrating local solutions may help in addressing climate change.

## CLIMATE CHANGE: A GLOBAL PROBLEM

Climate change is a global problem — it is a problem that transcends boundaries. While not all countries have contributed the same amount of GHG emissions in the atmosphere, many countries that have contributed little are bearing the impacts of climate change.

**Cumulative CO<sub>2</sub> Emissions 1850–2011 (% of World Total)**



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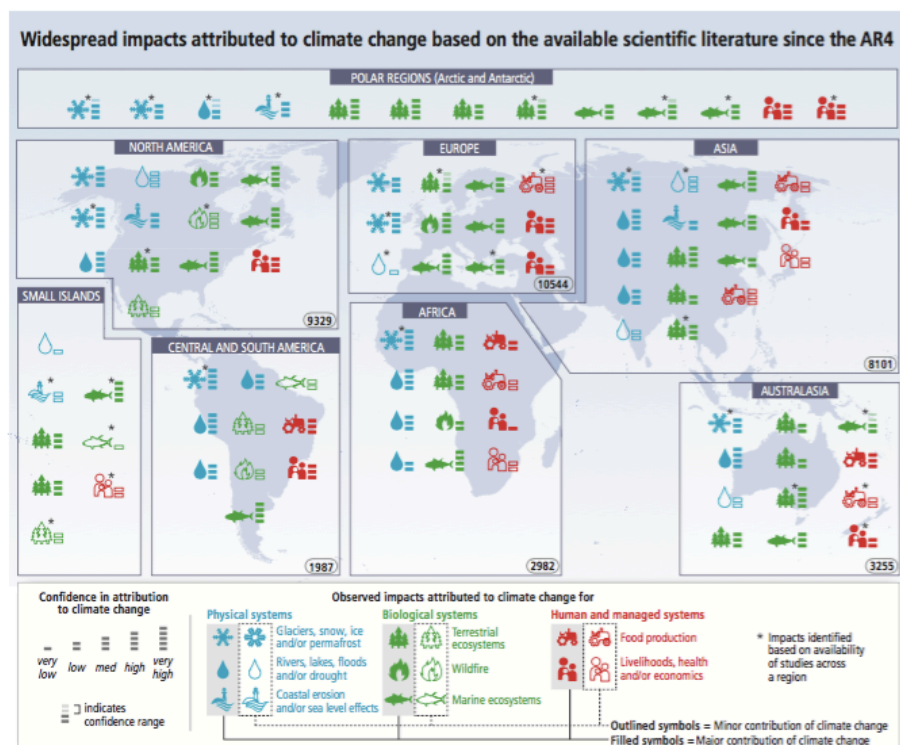
**Figure 2: Cumulative CO<sub>2</sub> emissions from 1850-2011 by country.**  
**Source: Ge et al. World Resources Institute (2014)**

From 1850-2011, only 32 countries have contributed to 75 per cent of CO<sub>2</sub> emissions, with the United States and the European Union being the top two

emitters. On the other hand, all 185 countries have cumulatively contributed only 17 per cent of the world's CO<sub>2</sub> emissions in the last century. Meanwhile, climate change impacts such as extreme weather events, sea level rise, heat waves, and drought are mostly felt in the "rest of the world." In fact, according to a report by the German Watch (2017), the 10 countries most affected by extreme weather events in the last 20 years are from Latin America, Southeast Asia, and South Asia.

CRI 1996–2015 (1995–2014)	Country	CRI score	Death toll	Deaths per 100 000 inhabitants	Total losses in million US\$ PPP	Losses per unit GDP in %	Number of events (total 1996–2015)
1 (1)	Honduras	11.33	301.90	4.36	568.04	2.100	61
2 (2)	Myanmar	14.17	7 145.85	14.71	1 300.74	0.737	41
3 (3)	Haiti	18.17	253.25	2.71	221.92	1.486	63
4 (4)	Nicaragua	19.17	162.90	2.94	234.79	1.197	44
5 (4)	Philippines	21.33	861.55	1.00	2 761.53	0.628	283
6 (6)	Bangladesh	25.00	679.05	0.48	2 283.38	0.732	185
7 (8)	Pakistan	30.50	504.75	0.32	3 823.17	0.647	133
8 (7)	Vietnam	31.33	339.75	0.41	2 119.37	0.621	206
9 (10)	Guatemala	33.83	97.25	0.75	401.54	0.467	75
10 (9)	Thailand	34.83	140.00	0.22	7 574.62	1.004	136

**Figure 3: Table shows Top 10 countries most affected by extreme weather events. Source: German Watch, Global Climate Risk Index (2017)**



**Figure 4: Impacts of climate change will be felt globally. Source: IPCC Climate Change Synthesis Report (2014)**

Moreover, as seen in figure 4, other climate change impacts will be felt globally and will not be limited to the top country emitters. The cause and effect of anthropogenic climate change happen in different locations (Schroeder, 2017).

Given that the problem is global in scale, it is important to acknowledge the need for global solutions. The European Union, for example, has made this clear in their statement at the EU Insight (2009, p.1):

"The notion that any one nation only contributes a certain proportion of global greenhouse gases and should therefore adopt a wait-and-see approach, or do nothing, would inevitably lead to the breakdown of international negotiations and a failure to solve one of the 'great challenges of our time.'"

### **Global solutions: Necessary but are they effective?**

The United Nations Framework on Climate Change (UNFCCC) is an international platform that allows for global solutions. With the objective of stabilising greenhouse gas concentrations "at a level that would prevent dangerous anthropogenic interference with the climate system," (UNFCCC, n.d.a), the convention has become an important platform for nations to work together in finding solutions to address climate change.

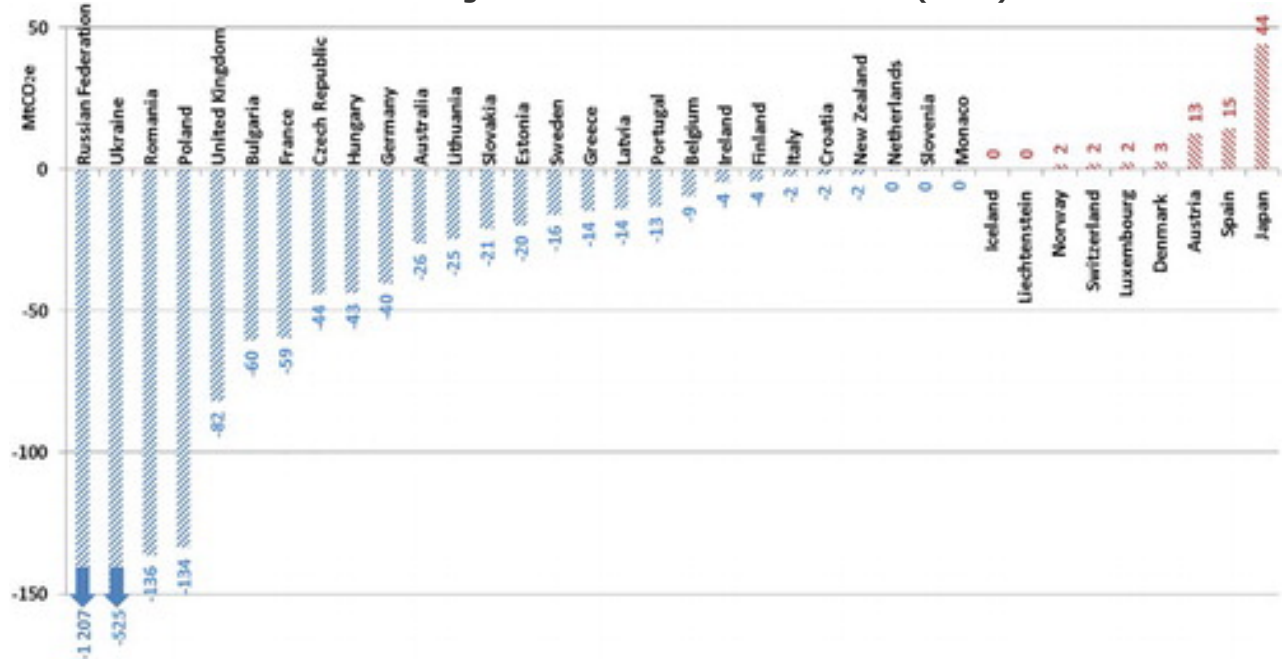
Through the UNFCCC, the Protocol was adopted in 1997 and the Paris Agreement in 2015. The Kyoto Protocol only commits industrialised countries (called Annex B countries) to lessen their GHG emissions under the principle of "common but differentiated responsibilities" (CBDR) (UNFCCC, n.d.b). On the other hand, the Paris Agreement requires all countries not only to voluntarily commit to lessening emissions but also in strengthening countries' abilities to deal with climate change impacts, or adaptation (UNFCCC, n.d.c).

Many would argue that the Kyoto Protocol, the first international treaty that was aimed at reducing GHG emissions, failed. Nordhaus and Boyer (1999) for example, note that the Protocol does not "bear any relation to an economically oriented strategy that would balance the costs and benefits of GHG reductions." McKibbin and Wilcoxon (2002), have described it as "deeply flawed agreement that managed to be both economically inefficient and politically impractical." In fact, the United States, the biggest country emitter, did not ratify the Protocol. Canada, another country made to commit under the Protocol, withdrew from it in 2011.

While big country emitters like the United States and Canada refused to take part in the Protocol, many countries followed through in mitigating their GHG emissions. According to Shishlov et al. (2016), of the 38 Annex B countries that committed to reduce GHG emissions, only 9 countries emitted higher emissions than they committed under the Protocol. These countries are

Austria, Denmark, Iceland, Japan, Lichtenstein, Luxembourg, Norway, Spain, and Switzerland.

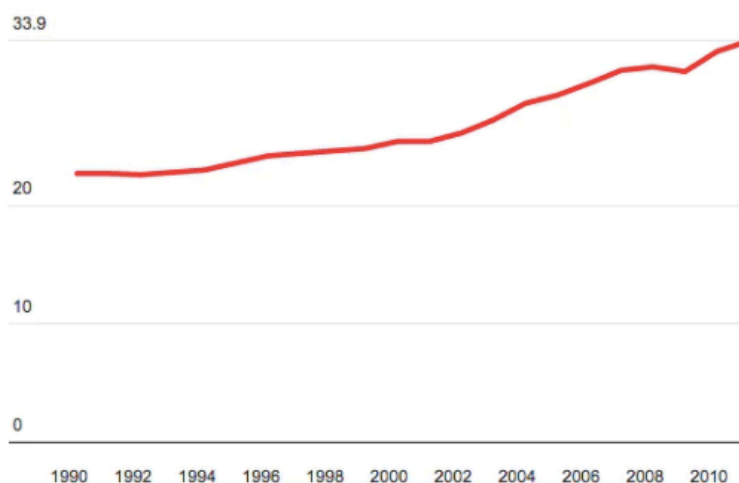
**Figure 5: Absolute difference between the average annual domestic emissions of Annex B-2012 countries for 2008–2012 and their respective Kyoto targets including LULUCF. Source: Shishlov et al. (2016)**



Additionally, Shishlov et al. (2016) finds that countries that have underachieved their targets have been offset by other countries, making the

“...average annual aggregated GHG emissions of Annex B-2012 countries in 2008–2012 24% below the base-year emissions, while their aggregate target was only 4% reduction. The overall Kyoto target has thus been overachieved by 2.4 GtCO<sub>2</sub>e.”

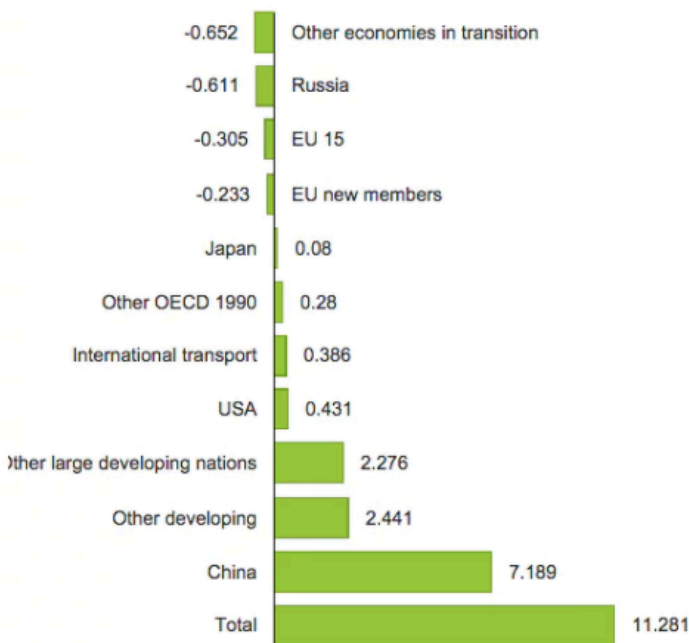
### Global CO<sub>2</sub> emissions



However, because the Kyoto Protocol only focussed on 38 countries, global carbon emissions have only gone up. With the failure to take into account growing economies such as India and China, the successes of the Kyoto Protocol has been blurred (Clark, 2012).

**Figure 6: Global CO<sub>2</sub> emissions from 1990-2010 show an upward trend. 1990-2010 show an upward trend. Source: The Guardian (2012)**

### Change in CO<sub>2</sub> emissions (GT), 1990 to 2011



**Figure 7: Change in CO<sub>2</sub> emissions in gigatonnes from 1990-2011. Source: The Guardian (2012)**

In fact, as we see in figure 7, while there has been a reduction in carbon emissions from economies in transition (EIT), Russia, and the European Union, and while there has been an increase in carbon emissions from other industrialised countries such as Japan and the United States, a significant increase in global carbon emissions have largely been contributed by China and other developing nations.

In addition, the commitments of the Kyoto Protocol will only be until 2020. With GHG emissions and global warming still on the rise, this was a problem that needed to be addressed. Parties to the UNFCCC agreed to negotiate on a new agreement, this time applicable to all countries. The first attempt in 2009 at Copenhagen would be a failure, while the second attempt in Paris would be a success.

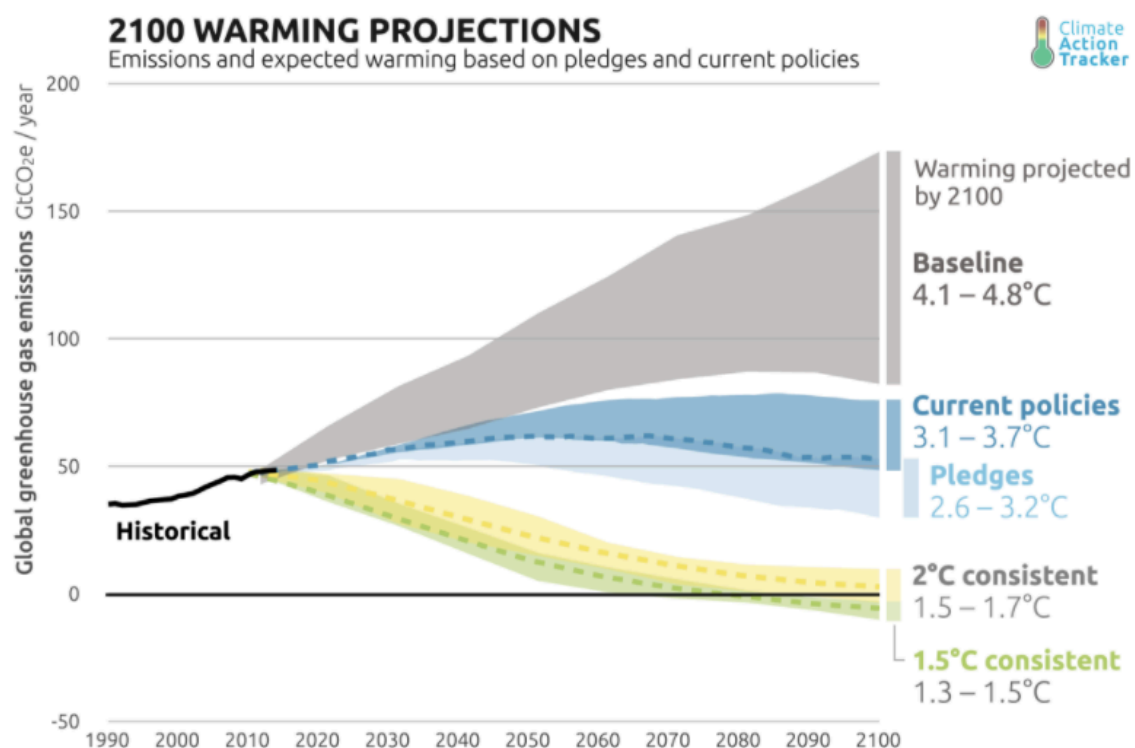
To date, the Paris Agreement has been ratified by 170 out of 197 countries parties to the UNFCCC and has entered into force last November 4, 2016 (UNFCCC, n.d.c). In the Paris Agreement, countries volunteer to implement their "nationally determined contribution" (NDC). And unlike the Kyoto Protocol that only focussed on mitigation, the Paris Agreement recognised adaptation as equally important. This is stated in Article 6, Section 1 of the Paris Agreement:

"Parties recognize that some Parties choose to pursue voluntary cooperation in the implementation of their nationally determined contributions to allow for higher ambition in their mitigation and adaptation actions and to promote sustainable development and environmental integrity." (Paris Agreement, UNFCCC, 2015)

Under article 2 section 1 of the Paris Agreement, countries have also committed to

“Holding the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels...” (Paris Agreement, UNFCCC, 2015)

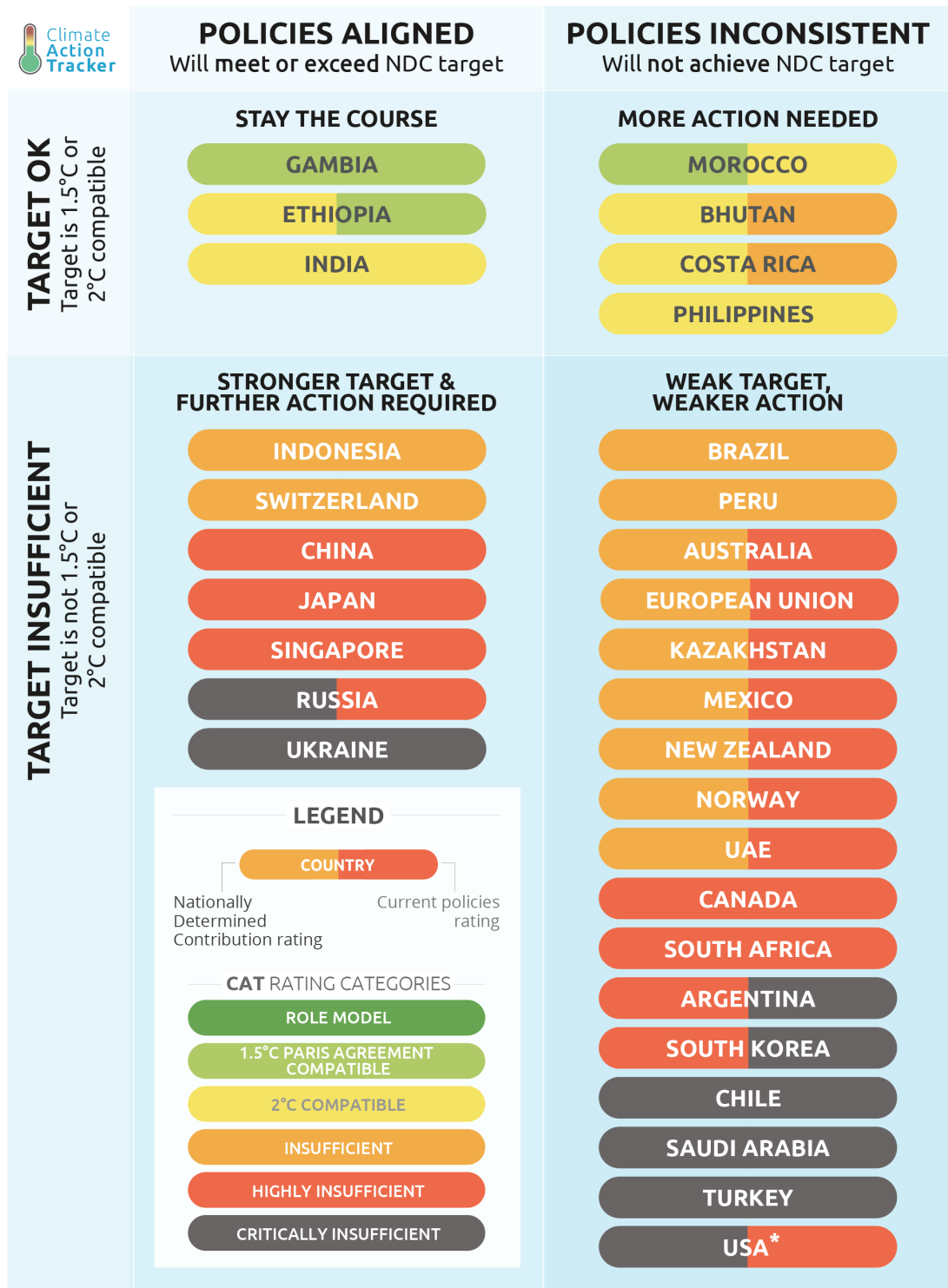
Countries are therefore expected to have NDC's that will help reach the target of 1.5°C-2°C of warming above pre-industrial levels. While countries have submitted their NDC's, the current warming projections including current policies and pledges range from 3.2°C-3.6°C (Climate Action Tracker, 2017).



**Figure 8: 2100 warming projections based on current country pledges and policies.**  
**Source: Climate Action Tracker, 2017**

Where is the gap coming from? According to Climate Action Tracker (2017), only a few countries are 1.5°C-2°C compatible, with policies aligned to their NDC's: Gambia, Ethiopia, and India. Only seven countries have 1.5°C-2°C compatible targets and four of them (Morocco, Bhutan, Costa Rica and the Philippines) do not have enough policy action to meet the targets they set. 24 countries have insufficient targets (ibid). Countries such as China, Japan, and Russia need to have stronger targets and further action. While countries such as the European Union, Australia, Norway, Canada, Saudi Arabia, and the United States have been categorised under “weak target, weaker action.”



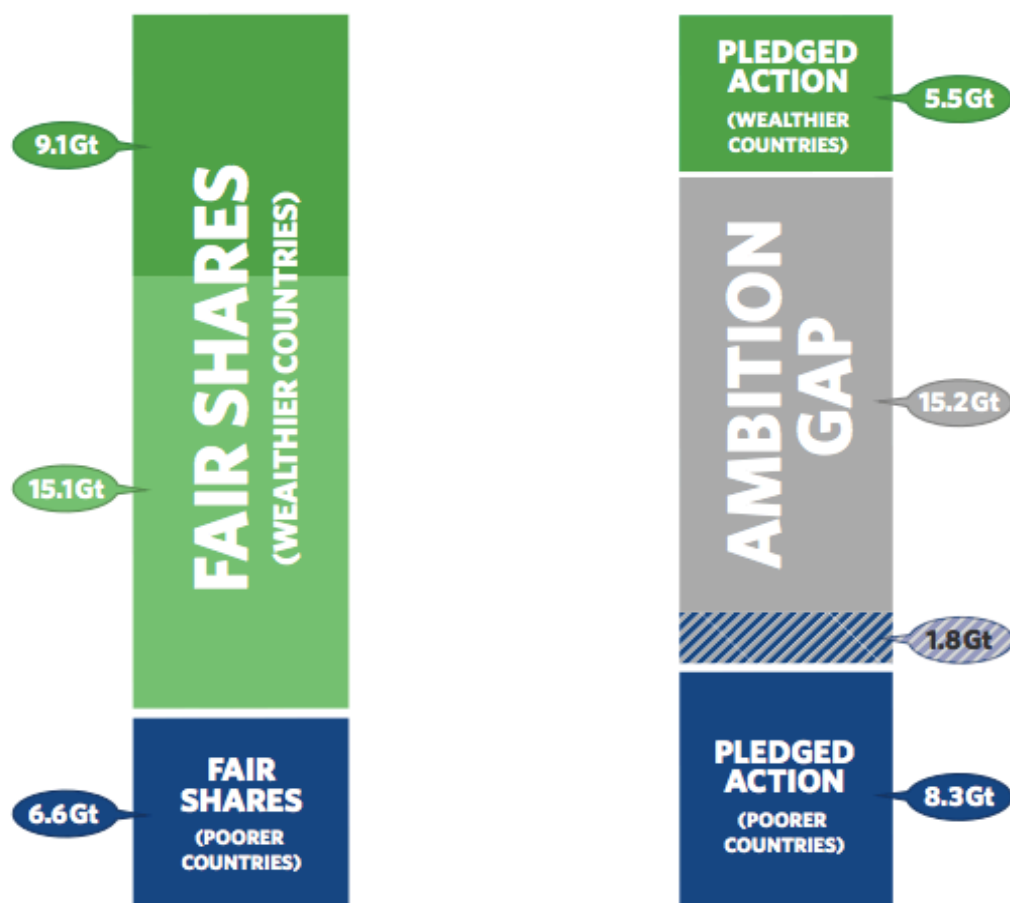


\* The CAT rating for the US is "Critically insufficient", based on the Trump Administration's intent to withdraw from the Paris Agreement. Implemented policies are insufficient to meet the NDC target.

**Figure 9: Table shows countries who have submitted their NDC's and whose commitments and policies have been analysed. Source: Climate Action Tracker (2017)**



High emitting countries both in the present and historically can be seen as also those with insufficient commitments, while countries considered to be low emitters have more ambitious targets under the Paris Agreement. This is considered to be a problem of “fair share” and “equity.” This is defined in the Fair Shares: A Civil Society Review of INDCs supported by Oxfam et al. (2015) as the responsibility of countries to commit their “fair share of global effort to tackle climate change” based on income and wealth, level of development and access to technologies, and their historical responsibility for GHG emissions. In short, fair share and equity depends on capacity and historical responsibility based on the UNFCCC’s principle of CBDR with respective capabilities and the “right to sustainable development” (Oxfam et al., 2015).



*In this chart, 'wealthier countries' are those with a fair share in excess of their domestic mitigation potential, and that therefore need to meet parts of their fair share through international action (financial, technological, and capacity building) to enable mitigation elsewhere. 'Poorer countries' have domestic mitigation potential larger than their fair share. The light green portion of the left bar offers an indicative proportion of wealthier countries' fair share that can be achieved through international action. The grey/blue hatched area of the right bar represents mitigation pledged by poorer countries that is conditional on international support.*

**Figure 10: Graph shows ideal fair shares from poorer and wealthier countries versus reality of pledges and commitments made by countries under the Paris Agreement.**

As seen on figure 10, poorer countries have committed more than their fair share while wealthier countries have pledged less than their fair share. International agreements need to be carried out nationally, with policies that would enable the effective implementation of an international agreement. Not all countries will have national policies in place. As was pointed out by Climate Action Tracker (2017) in figure 9, there will be countries that, despite having good commitments, will have inconsistent policies and in the end will not reach their targets.

In addition, NDC's are not legally binding and do not have enforcement measures (UNFCCC, 2015). It does, however, have a ratchet up mechanism where countries are only allowed to submit more ambitious targets over time (ibid).

Bang et al. (2016) argues that the Paris Agreement may be effective in the short-term in terms of high participation and depth of commitments by countries. Bang et al. (2016) says the main concern is whether or not countries will be able to comply with their commitments. In the same study, long-term effectiveness of the Paris Agreement is said to be dependent on countries' trust to implement their commitments, and will be "significantly influenced by the response of large global emitters" (ibid).

While it is recognised that climate change is a global problem that would need global solutions, the question that needs to be asked is: are the global solutions currently in place such as the Kyoto Protocol and the Paris Agreement effective or do they simply go in favour of big country emitters? What then happens when nation states fail to follow through on their commitments or choose to withdraw from the international treaty, just as the United States government has announced it will do?

## **Local solutions**

Greatly undervalued in the international climate change regime is the importance of local solutions. While much of the attention has been put towards national policies following international treaties, local solutions such that of cities and states have recently been given the spotlight. For example, following United States president Donald Trump's declaration to withdraw from the Paris Agreement, much attention have been given to California, New York, and Washington for committing to do the work that the federal government refuses to do (Tabuchi and Fountain, 2017).

Michael Bloomberg (2017), former New York City Mayor, has been quoted in The New York Times saying, "We're going to do everything America would have done if it had stayed committed."

Stern and Zenghelis (2015) believe that creating solutions at the local level, particularly in cities, might be a big part of the solution:

"Cities are home to half the world's population and produce around 75% of the world's GDP and greenhouse gas emissions. By 2050, between 65% and 75% of the world population is projected to be living in cities, with more than 40 million people moving to cities each year. That's around 3.5 billion people now, rising to 6.5 billion by 2050; a huge and singular event in human history....

...However, cities are also a key part of the response. They afford multiple opportunities to dramatically reduce carbon emissions while sustaining prosperous standards of living. Indeed, there is no hope of reducing global emissions to safe levels if new and expanding cities are based on a sprawling, resource-intensive model of urban development."

In short, cities have been producing more GHG emissions than any other area in a country. It is also densely populated, making millions of people vulnerable to climate change impacts. If commitments fall through and global warming reaches 3°C above pre-industrial level, Asian cities such as Osaka, Shanghai, and Hong Kong will submerge underwater with a total of 31.1 million people affected (The Guardian, 2017). It only makes sense that local solutions such as in the city level take part in addressing the global problem of climate change.

Dhakal (2008, p.188) argues that, "cities have a considerable stake in both controlling emissions and lessening impacts and, therefore, have to play a leading role in mitigation and adaptation activities." Jaeger (2015), adds that local governments are also more effective in getting the public on board in engagement and stimulating local action.

Aside from the city level, individual actions are also needed in addressing climate change. Naomi Klein (2014) asserts that, "if we want to live within ecological limits, we would need to return to a lifestyle similar to the one we had in the 1970's, before consumption levels went crazy in the 1980's." Lifestyle changes and individual commitments will not be addressed in international treaties such as in the UNFCCC. However, local initiatives may help individuals lessen their carbon footprint. For example, the Quezon City government in the Philippines passed a resolution that calls for restaurants to include organic brown rice in their menus (Andrade, 2014). Brown rice, requiring only one milling process has lesser fuel use (Pulumbarit, 2013).

## **Conclusion**

Climate change is a global problem that needs global solutions. However, focussing on the global scale alone may not be the most effective way to address the problem. The Kyoto Protocol and the Paris Agreement, while both able to mobilise many countries into mitigating their emissions, have so

far proven to be insufficient in meeting targets. While global solutions are needed to address a large-scale problem, local solutions should also be given priority, especially when states and international mechanisms do not seem sufficient in addressing the problem.

"Think global, act local" is a phrase that can be heard often when talking about climate change solutions. While there is a need to address climate change at a global level such as in regulating fossil fuel emissions or land use change, it is also important to consider local solutions such as urban transportation and even individual consumption patterns. Using both the top-down and bottom-up approach where not only states but also communities and local governments can actively take part in finding solutions to both mitigation and adaptation may be an answer in closing the commitment gap.

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