Using research to assess extent of 'Climate injustice' in India

A research paper

Prepared by: IMRS Advisory, Bangalore

The context

The context was of Kyoto protocol, countries around the world debating to agree on commitments for larger carbon emission cuts to keep rising global temperatures in control. Government of India demanded 'common but differentiated' responsibility w.r.t carbon emission. Developed nations need to cut their CO_2 emissions not only to prevent climate change but also to allow developing world to catch up, without pushing the global temperatures beyond the crisis level.

Greenpeace, an international environment related NGO, asked a critical question – is there 'climate justice' in India? They wished to present a case to the Indian government to implement the principle of 'common but differentiated responsibilities' across the various economic classes within the country. They believed that there are critical linkages between development and environment sustainability, and that the rich contribute significantly to environmental pollution. They believed that at a per capita level, the rich in India contribute to as much carbon emission as do the developed countries.

They wished to make a point on 'climate injustice' in India and therefore 'common but differentiated climate responsibilities' of different socio economic segments, with the help of a market research exercise conducted across the country and across various socio economic classes.

This was broadly the given context in which this research was done.

The approach and the challenges

The key challenge in this brief was the fact that this was quite unlike any market research brief ever taken by us. This was in a category we would have never considered 'researchable'. Additionally, the findings had to be presented by Greenpeace to make their point before Government, public and media and therefore had to be impeccable in the broad approach and all finer details.

Therefore, in consultation with the client, it was agreed upon that we would need to do a first of its kind, face to face survey across the country ranging from the metros, medium to small towns and rural areas on domestic energy

consumption and transportation, covering both medium used and quantity for the same. Primarily, we would need to enlist all items of domestic energy use, confirm the type of energy source used, assess heaviness of usage and convert that to carbon emission with norms already established.

Domestic carbon emission was to be estimated from the following sources:

- Electricity consumption – appliance and capacity; in rural, pump set for field should be out of calculation
- Cooking Fuel consumption
  - Fire wood, gober and gober gas considered as renewable sources and not added to CO_2 emission
- Conveyance - Petrol / diesel consumption, flights taken

So the approach sounded simple - assess incidence and heaviness of the above mentioned and convert using norms to carbon emission.

Key challenges on the project, post arriving upon the broad approach were manifold:

1) **Who should be interviewed to represent the household?** – Post some pilots we figured that it would have to be a mix of person spending maximum time at home and also CWE. Person spending most time in the Household (not necessarily housewife or CWE) is best equipped to answer questions regarding heaviness of electricity consumption etc.
2) **Can people give exact estimate of how many hours each electric bulb / fan works in their house?** Difficult, not impossible. An alternative was to take electricity bill, but not all have bills, nor do all have a clear idea of bill amount in summer vs. winter etc. So we decided to follow a dual approach, we took details of each electric item and its consumption in the household and also validated this with electric bill estimates.
3) **How to factor in seasonality as bill amounts can vary by season?** Respondents were asked to give their estimated bill amount for winter months, summer months and rest of year. They were also asked to give their estimates of how many months would they classify as winter months, summer months and rest of year. Weighted average of seasonal bill with length of season (No. of months) was done to arrive upon annual electricity bill of the household.

4) **How to convert appliance related details to total electricity consumption?** We captured data on each electric appliance at household level - appliances used, nos. used, months used in (especially for seasonal appliances like heater / gyser etc), days used in a month, and no. of hours used per day. For electric bulbs, CFL, tube light, heater, gyser etc, watts were also recorded. For appliances like TV & refrigerator, same size of appliance can have different electric consumption for different brands and models and therefore, brand and model details were taken from HH and secondary estimates of their wattages were used. Thus, for all appliances, total electricity consumption was calculated. Comparison of this with estimated electricity consumption showed that the two estimates were in line (variance was within 5% error band); in few cases, these two had a wide variance, these cases were rejected from analysis. This appliance analysis was also used to assess contribution of different appliances to the total electricity consumption and therefore, total carbon emission.
5) **How to conveyance fuel consumption estimates** – It was easy to estimate consumption of petrol / diesel by 2 wheelers and 4 wheelers owned by the Household as the CWE would have estimates of how often and how much, they fill their vehicles. However, it became tricky when it came to usage of public transport. We took distance traveled estimates from the respondents and used other primary / secondary estimates to assess their fuel consumption estimates per km traveled to arrive upon consumption value of each individual.

There were many such issues which made the research a logistical nightmare. Post a pilot, we arrived upon solutions to all such issues and norms to be used for carbon emission conversion. Final methodology used for carbon emission estimation is detailed herewith.

Methodology for carbon emission calculation

A) Electricity consumption

Step 1 – take the total monthly bill by seasons, weight by length of season and arrive upon annual bill

Step 2 - convert the bill to units, using the system followed by the electricity board

Step 3 – validate with appliances used and details of usage as explained above and arrive upon total units consumed
Step 4 – reject cases where variance between the 2 methods was more than 20%
Step 5 – convert all electric units to carbon estimates

B) Cooking fuel consumption
Step 1 – estimate the different fuels used, excluding electric as it is already covered and excluding renewable resources and estimate weight of fuel consumed
Step 2 – convert all fuel weight to carbon estimates

C) Conveyance fuel consumption
Step 1 – estimate fuel consumed by 2wheeler / 4 wheeler owned
Step 2 - estimate distances traveled on public transports, including air travel
Step 3 – distance converted to fuel weight
Step 4 – convert all fuel weight to carbon estimates

Add all the estimates above to arrive upon total estimates for the family and there-from calculate per capita carbon emission.
Caveat: This study aimed at estimating only carbon footprint emerging from personal domestic energy consumption. Commercial energy consumption in production of goods etc was not within its ambit. Therefore, any electricity / fuel consumption for commercial purposes was kept out of calculations even if the usage was happening within household. Examples of these are – water pump used for irrigation was kept out but electrical pump for home water was considered as personal energy consumption.

Key findings

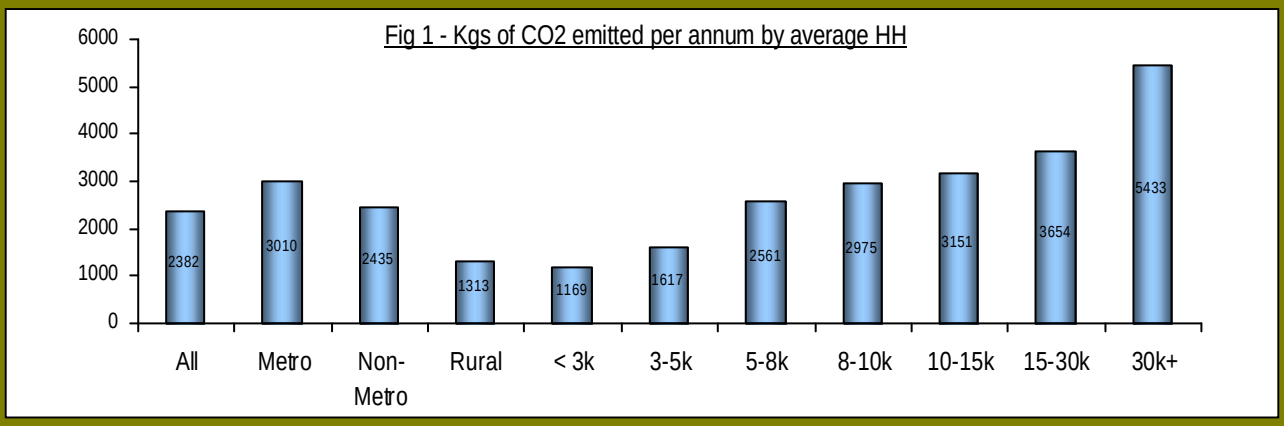
The findings proved the client's hypothesis and showed that a significant carbon footprint of India is contributed by a relatively small wealthy class. Greenpeace made a case of 'climate injustice' in India. They also shared this with the media and their report was published on their site as a whitepaper – 'Hiding behind the poor'.

Some of the key findings of this study are shown herewith:

1.1. CO_2 emission per household by different segments

Much higher CO_2 emission observed in metros and in higher income segments – direct correlation can be seen between CO_2 emission and pop strata / income. Average Carbon footprint of the highest income segment is almost 4 times that of the lowest income segment.

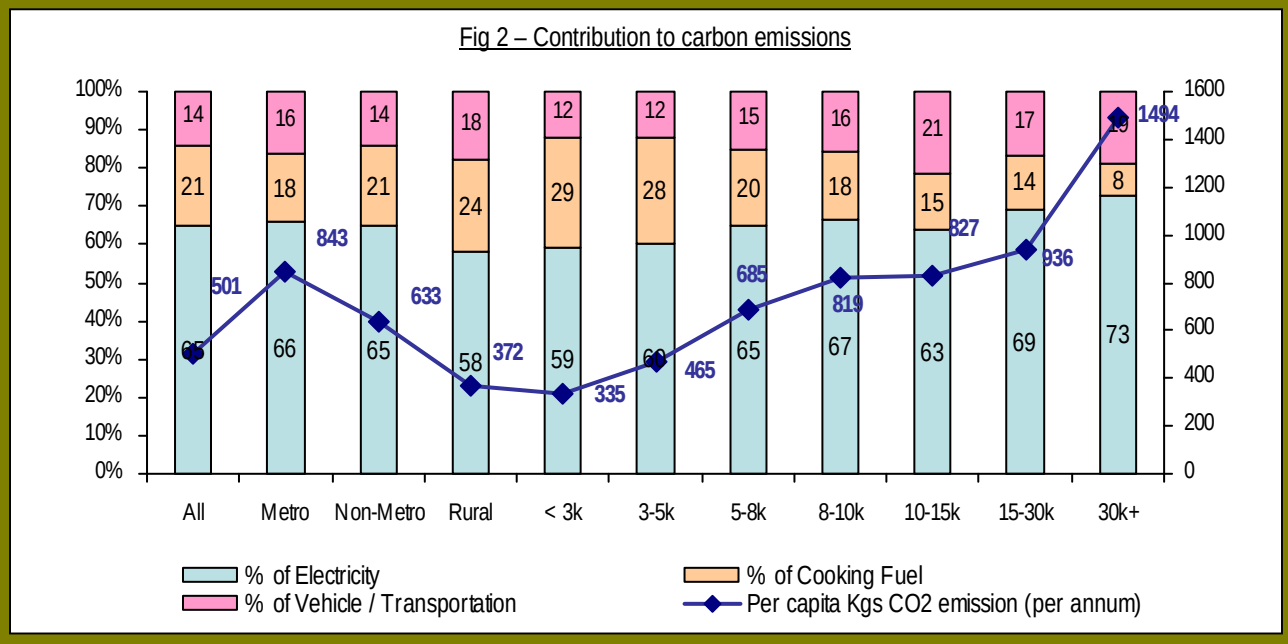
Fig 1 - Kgs of CO2 emitted per annum by average HH



1.2. Contribution of different energy sources in CO_2 emission for different income classes

The largest contributor to this carbon imprint is electricity, which contributes to about 2/3rd of all carbon emissions. % contribution of electricity increases as incomes increase - this is 59% in the lowest income group, going up to 73% in the highest income segment. Transportation % also increases with income levels, while % contribution of cooking fuel drops.

Fig 2 – Contribution to carbon emissions



1.3. Climate Injustice Quotient – across income segments in India

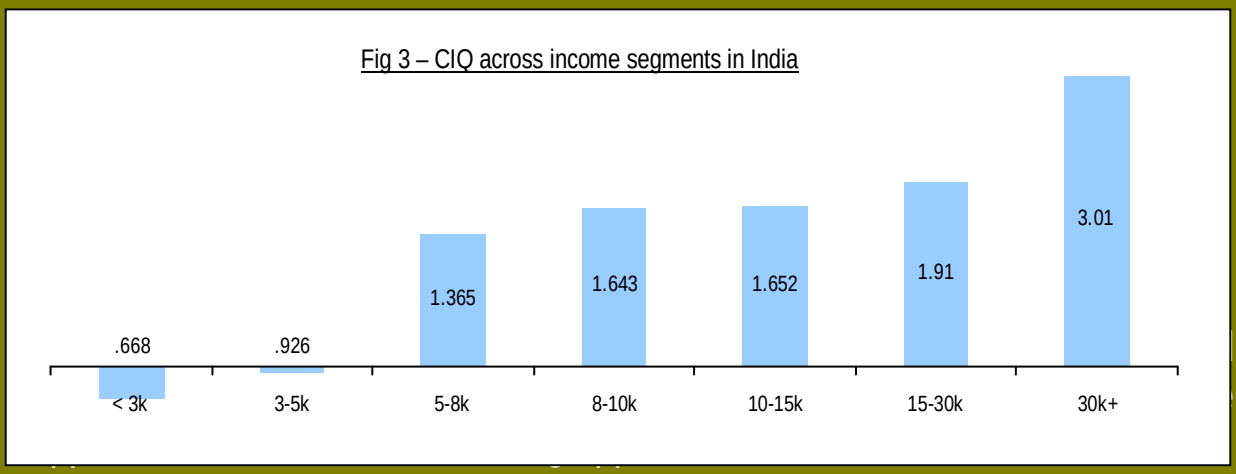
The concept of Climate injustice is simple – proportion of carbon emission of any segment as a ratio to the proportion of the population of that segment. The table below shows the inequality in carbon emission for different segments. Segments with CIQ of less than 1 are emitting less than average and the highest income segment here is emitting 3 times the average.

Table 1 – CIQ across income segments in India

Income classes	Population (2007)	Share of population	Annual CO2 emission in billions	Share of Emissions	CIQ
All	112986615	100	566	100	1.000
<3k	432162957	38	145	26	0.668
3-5k	390796483	35	182	32	0.926
5-8k	155730946	14	107	19	1.365
8-10k	69178755	6	57	10	1.643
10-15k	53236409	5	44	8	1.652
15-30k	18804012	2	18	3	1.910
30k+	9956500	1	15	3	3.010

Graph below is a visual depiction of CIQ (Carbon Injustice Quotient) across income classes in India.

Fig 3 – CIQ across income segments in India



For this, first need is to make the findings of this study comparable to international studies. India's **overall** per capita CO_2 emission is estimated at 1.67 tons by World Research Institute, while the annual per capita CO_2 emission estimated by this study (personal domestic carbon emission) is 501

kg. This is 33% of the total and is inline with the sectoral division of CO_2 assessed by WRI. To enable comparison of per capita emissions of income classes with national CO_2 emission of other countries, the emissions were multiplied by a factor of 3.3 to ensure that total Indian emissions corresponded to an overall of 1.67 tons per capita.

Using this analysis, per capita emission and CIQ of income classes from India have been plotted on the international emission table given herewith.

Table 2 – CIQ in the world

Country / Income Class	Share of World population	Global emissions in Mln tons	Share of Global Emissions	CIQ	Per capita CO_2 emission (in Tons)
USA	4.45%	6871.7	20.38	4.58	23.06
Russia	2.12%	1915.7	5.68	2.68	13.49
Germany	1.22%	1013.3	3.01	2.46	12.36
UK	0.90%	658.8	1.95	2.18	10.98
Japan	1.90%	1351.5	4.01	2.12	10.64
France	0.90%	518.4	1.54	1.72	8.64
World	100.00%	33733.93	100	1	5.03
India (Monthly Income: Rs. 30k)	0.15%	49.52	0.15	0.99	4.97
Brazil	2.81%	849.5	2.52	0.9	4.52
China	19.55%	4963.1	14.72	0.75	3.79
India (Monthly Income: Rs. 15 to 30k)	0.28%	58.61	0.17	0.62	3.12
India (Monthly Income: Rs. 10 to 15k)	0.79%	146.62	0.43	0.55	2.75
India (Monthly Income: Rs. 8 to 10k)	1.03%	188.68	0.56	0.54	2.73
Sustainable Average Per Capita CO2 Emission					2.5
India (Monthly Income: Rs. 5 to 8k)	2.32%	355.24	1.05	0.45	2.28
Indonesia	3.66%	504.6	1.5	0.41	2.06
India	16.86%	1889.1	5.6	0.33	1.67
India (Monthly Income: Rs. 3 to 5k)	5.83%	605.13	1.79	0.31	1.55
India (Monthly Income: < Rs. 3k)	6.45%	481.85	1.43	0.22	1.11
Bangladesh	2.19%	122.4	0.36	0.16	0.83

The highest emission segment in India is less than the World average and has a CIQ of less than 1. However, sustainable development needs per capita carbon emission of 2.5 tons per annum. In India there are 4 income segments ie., about 150 mln people earning more than Rs. 8000 pm, who emit more than 2.5 tons of CO_2 per capita per annum. **For the balance 980 mln people to hope for development, and increase their carbon**

footprint, the top 150 mln will have to consider ways and means to reduce their carbon footprint.

Learnings for research

There were several learnings for us in the process of conducting this research. The most interesting learning for us was to experience using research in the hitherto unexplored category like environmental studies. If used rigorously in conjunction with other scientific secondary learnings, research can be used productively in sectors which might be perceived 'unresearchable' and significantly add to our social and environmental knowledge and understanding.

Another key learning in research context was that interviewing the CWE or HW alone may not be sufficient to map household consumption in many categories – this arena is the forte of the person who stays at home for the maximum time, who at times might not be the HW, especially in case of households with a working HW. Person spending maximum time at home can be an interesting concept and can be adopted as the main respondent in HH consumption mapping studies. Secondly, in most consumption mapping studies, we normally do not tend to explore and differentiate between household consumption & household production intended for commercial usage. This study starkly highlights that we may need to re-look at some taken-for-granted assumptions prior to approaching studies that map household consumption.

---X---X---X---