

## **ASSESSING THE EFFECTS OF PARTICIPATION IN IPCC: IMPLICATIONS IN CAPACITY BUILDING OF SCIENTISTS FROM DEVELOPING NATIONS IN RESEARCH FOR ADAPTATION AND MITIGATION**

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### **ABSTRACT**

One of major limitations in getting unbiased and balanced approach towards current climate change problem is inadequate participation of scientists from developing countries in IPCC assessment process. Current shortcomings in involving an adequate number of scientists from developing countries and to propose approaches to address this issue have been addressed in this paper. Implications of the involvement to climate change adaptation and mitigation research have been discussed at length. Scientific output of scientists is an important indicator of their career growth and also significant motivator for enhancing participation in IPCC assessment process. Impact of involvement of scientists in IPCC in terms of their scientific output has been assessed. We have made a statistical analysis of the origin of experts in the past assessment reports to reflect the participation. Scientific output in the form of number of peer reviewed papers published has been obtained and statistical t-test carried out for the significant change. The paper describes the results from these analyses and proposes appropriate recommendations for participation and capacity building.

**Keywords:** Impact, competence building, IPCC Assessment, Developing country, Researcher, Inference

### **1. Introduction**

The Intergovernmental Panel on Climate Change (IPCC) was set up in 1988 under the auspices of the United Nations Environment Program (UNEP) and the World Meteorological Organization (WMO). Its main task is to assess existing scientific literature concerning the various aspects of a possible anthropogenic climate change, carried out by the Panel's three Working Groups (WGs) (WG I- climate science, WG II- the impacts of climate change, and WG III- economic and social dimensions). The IPCC process is unique in its magnitude. It is unique in terms of the breadth of scientific themes and issues that are assessed, and not least, in terms of the vast number of participants that are involved in the process at one stage or another – as contributors, lead authors, expert/government reviewers or delegates (Agrawala 1998a; b; Zillman 2008).

A recent report to the IPCC Plenary has examined trends in the participation, proposed recommendations to improve it. Efforts have been made to enhance this participation over the course of the assessment cycles to date (Ho-Lem *et al.*, 2011). In assembling the teams of authors for the assessment process, IPCC seeks to have balanced representation in terms of disciplinary and regional average (Doherty *et al.*, 2009). One of the important concerns in this regard is the participation of scientists from developing countries (Ho-Lem *et al.* 2011; Biermann 2001). Developing countries'

scientists are provided support to attend IPCC meetings through the IPCC trust fund. In addition many cases the Technical Support Units for the common meeting groups provide access to authors to library and bibliographic facilities and tools as part of the assessment process.

While it is generally accepted that these measures, including increased participants of developing countries' scientists in the assessment process contribute towards capacity building, there is little literature that quantifies or assesses the benefits to developing countries' scientists out of this participation (Vasileiadou *et al.*, 2011; Ho-Lem *et al.*, 2011). This paper attempts to address this issue by examining whether there is any effect on scientific output of developing countries' scientists associated with this participation in the IPCC process. While a clear attribution may be difficult to establish, by testing of publication output over a period of time before, after and spanning an assessment cycle, tentative relationships between participation and output may be identified. For the purpose of this paper we focus on scientists for the Least Developing Countries (LDC's).

The remainder of the paper is organized as follows. The next section summarizes data regarding participation in the 2<sup>nd</sup> 3<sup>rd</sup> and 4<sup>th</sup> assessment reports. We then examine the publication output of all lead and contributing authors from LDCs using publication and related information from web of science. The final section concludes with some implications for capacity building.

## 2. Trends in Participation

Data on authors in assessment reports have been taken to study the analysis of participation of countries in IPCC and implications on capacity building. Assessment reports viz. second assessment report (SAR, 1995), third assessment report (TAR, 2001) and fourth assessment report (AR4, 2007) have been considered for the authors' involvement. Coordinating lead authors, lead authors and contributing authors in each working group in these three assessment reports have been identified with respect to their country affiliation. Data for authors were taken by examining the author lists in the assessment reports. It is assumed that the country affiliation as mentioned in the assessment reports are accurate. It is indeed possible that authors' affiliations might change during and between assessment cycles; however we believe that this would not affect the overall conclusions.

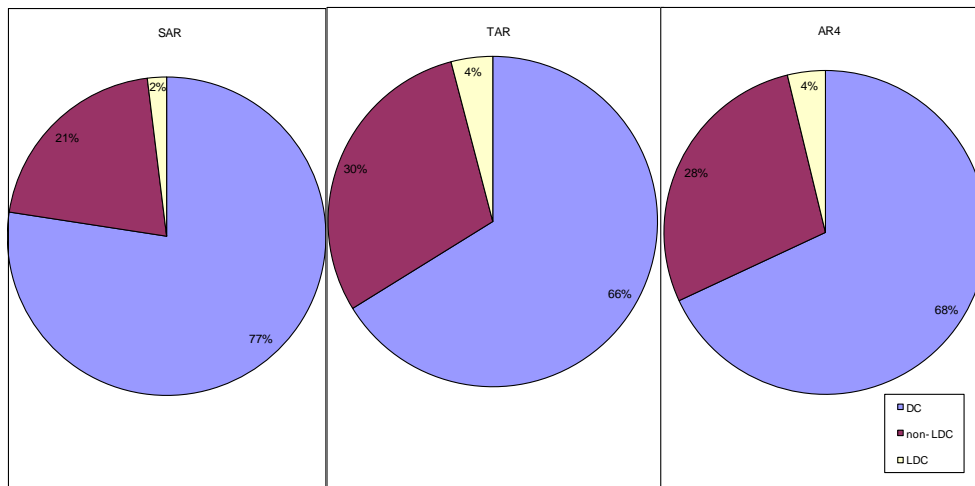
Countries were grouped into developed and developing countries (as per UNDP [www.undp.org](http://www.undp.org)). For the analysis in this paper they are assembled into three main groups: developed country (DC), non-LDC and LDC. The LDC and non- LDC groups make developing countries cluster. Scientists play different roles in the IPCC process as lead author (LA), coordinating lead author (CLA), contributing author and review editors. For the purpose of this paper, CLAs and LAs are grouped together as 'authors'; and contributing authors as 'contributors'. There is a substantial difference in the level of involvement of authors and contributors; and this we felt to be a useful classification to explore the effect of the degree of involvement.

Absolute numbers as well as percentage share of authors and contributing authors from DC, non- LDC and LDC in each working group for each assessment report have been taken for the analysis of trend in participation. Percentage share of authors from different country group in each working group has been calculated for each assessment report to get trend in participation of country group in each working group through the period of AR4.

About 71% of all authors in the IPCC assessment reports are accounted by the countries of North America and Europe (36% and 35%, respectively). However, Asia (11%), Oceania (7%), Africa (5%) and South America (3%) account for the rest. The analysis of count of experts clearly shows that the majority of experts were coming from the developed countries contributing 68% of authors of AR4 WGI+II+III (Fig. 1). In addition, while the share improved from the SAR to the TAR, the share of authors from developing countries did not increase between the TAR and AR4. Involvement of LDC and non- LDC authors is not the same in all working groups, being larger in WG II. This is likely due to the regional chapters in the WG II contributions. Share of authors from LDC are very low (2-4 %). From SAR to TAR, it doubled and stagnated in AR4 (Fig.1). The stagnation of non-LDC/EIT/LDC (here, EIT is Countries with

Economies In Transition) participation between the TAR and AR4 justifies that measures required improving their participation. In this context it should be noted that funds for EIT countries' scientists have been reduced in size, as members of the EU, those were supposed to provide these support, have been encouraged to maintain their respective experts and delegates.

Percentage share of Authors from different country group



**Figure 1.** Percentage share of Authors from different country groups in the three Assessment Reports

Total number of authors (WG I, II & III) from DC has gone up from SAR to AR4. A slight decrease in number has been noticed from SAR to TAR and an increase is noticed from TAR to AR4 (Fig. 1). Maximum number of authors in this country group has been for WG II throughout SAR and TAR. Working group I has taken this position in AR4. While number of authors for WG II from SAR to AR4 decreased both WG I and III have shown consistent increase in number. Share of working groups in SAR was not equally distributed and biased towards working group II, having significantly high in comparison to both WG I and III. This is balanced in TAR and AR4.

Total contributing authors (CAs) in DC have been significantly high in TAR. Dominant share of CAs in SAR and TAR has been of WG I and is replaced by WG II in AR4. Number of CAs in WG II has been almost constant in all three assessment reports. Percentage share as well as number of CAs in working group III has significantly increased in AR4. A balance in share by all working groups in AR4 is seen.

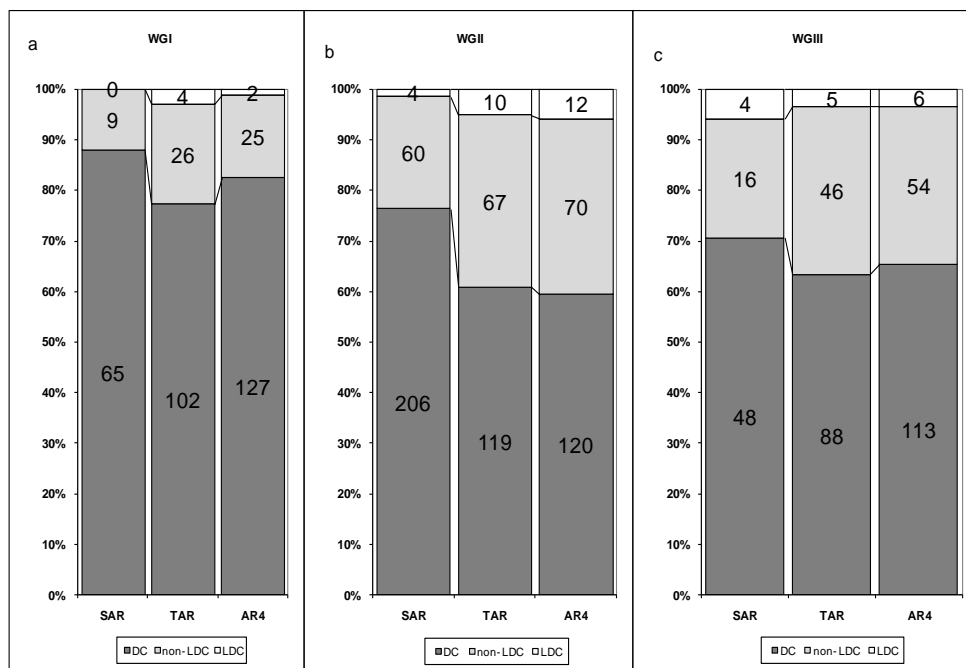
CAs from non-LDC and LDC are dominant by working group II. It is noticeable that from LDCs, there are no contributing authors for working group I and III in both SAR and AR4. While, DC have made a balance in participation for all three working groups in AR4 for contributing authors, non-LDC and LDC are far behind to have balance among these three working groups. Therefore, there is a need to increase the number of scientists to work in the activities of WG I and III in non-LDCs as well as LDCs.

The analysis depicts that dominant share of experts in all three working groups is by DC. It is noticeable that there is no participation from LDCs in WG I in SAR (Fig. 2). The dominance of DC in the activities of working group I in SAR as well as in TAR and AR4 is quite visible. In AR4, the share as well as number of authors for WG I from LDCs has decreased. LDCs are needed to expand their knowledge base in science of climate change which is activities of WG I. A significant increase in number of authors from non-LDC in WG I from SAR to TAR is noticed. This increase in number has also increased the share of non-LDC in WG I, also. Non-LDC number is almost constant from TAR to AR4 but its share is decreased. This

indicates that there is need for more experts from non-LDC working in area of science of climate change, so that a sizeable participation from these countries could be achieved.

LDC contribution in WG II in SAR is minimal (~1%). The number of authors in WG II has increased more than two fold from SAR to TAR and also AR4. This increase has reflected in share also and it is about 4% in TAR and AR4. A significant increase in share but not in number, by non-LDC in working group II from SAR to TAR is noticed (Fig. 2). The number of authors from non-LDC in WG II has been almost constant from TAR to AR4. This reflects an observation that there is no significant increase in either number or share by non-LDC as well as LDC in WG II from TAR to AR4. There is need to increase activities of working group II through increasing the participation from non-LDC as well as LDC. As least developed countries of developing countries are more vulnerable to climate variability and change, participation from these countries to study the impacts, vulnerability and adaptation in detail is more required. Therefore, significant increase in participation from non-LDC and LDC in activities of WG II is needed. These countries’ policy makers as well as international bodies are required to encourage scientists to take their research work in the field of activities of WG II.

In WG III, share of authors from LDCs has decreased from SAR to AR4 (Fig. 2). However, their number has increased slightly. Share of authors from non-LDC is increased from SAR to TAR and has been almost constant from TAR to AR4. This depicts that the number of scientists need to be increased in the field of activities of WG III so that an equitable participation as well as balanced inputs from these countries’ groups could be achieved.



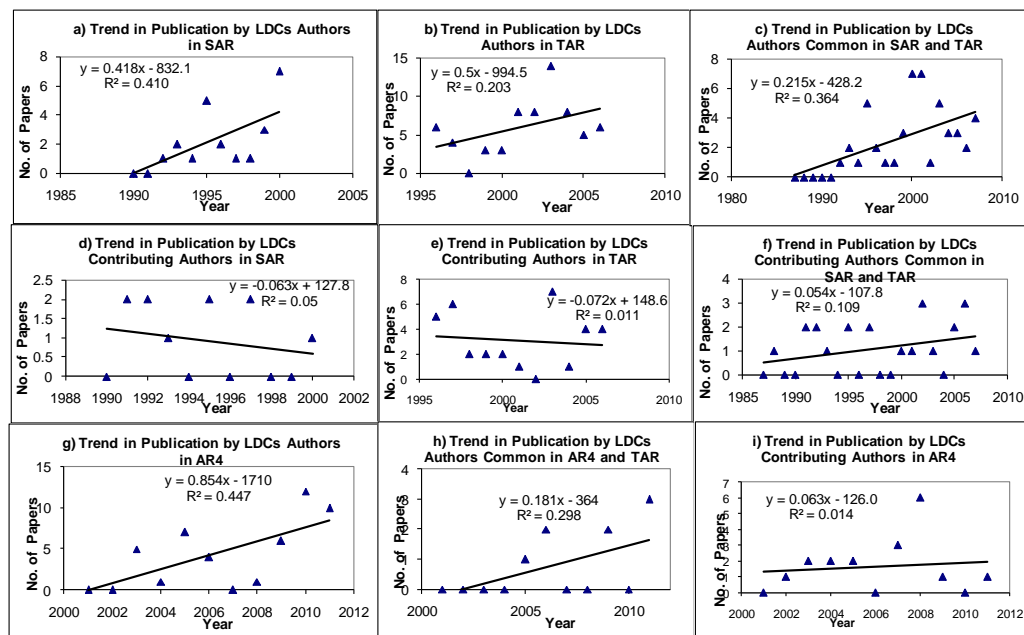
**Figure 2.** Share of authors by each country group in the three assessment reports in a) WG I, b) WG II and c) WG III.

### 3. Effect on Capacity Building

Impact of participation in IPCC process on scientific output of the scientists from LDC has been assessed by authors’ and contributing authors’ peer reviewed journal publications. Annual total number and weighted with citation till date published papers in peer reviewed journals by authors and contributing authors of LDC have been obtained from Scopus and Web of Science websites. Authors and contributing authors for SAR, TAR and AR4 have been selected for the impact of participation on capacity building.

Period of 11 years, five years before the publication of the reports and five years after it has been taken for the study of influence of IPCC on scientific output of authors. For example, for second assessment report which was published in 1995, the period from 1990 to 2000 has been taken. Similarly for TAR, which was published in 2001, the period from 1996 to 2006 has been fixed for the analysis. AR4 which came out in 2007, the period from 2001 to 2011 has been selected for examination of the scientific output of the scientists. T-test has been performed on the data for annual total count as well as weighted count with citation to test the significant change in these indicators. Linear trend in total count and weighted count for 11 years period has been obtained by regressing these against year. Single authored and multiple authored publications have been segregated and proportion of multiple authored publications to total publications has been calculated to get the information about the collaborative work so expansion of scientific knowledge. This proportion has been calculated for each year and trend in it over 11 year period has been looked at to get insight for capacity building.

Number of papers published in peer reviewed journal by authors and contributing authors from LDC participating in SAR, TAR and AR4 has been retrieved. These annual number, one of scientific output indicators of scientists are plotted for 11 years period viz. for SAR scientists, 1990-2000, for TAR scientists, 1996-2006 and AR4 scientists, 2001-2011(Fig. 3). Trends in this scientific indicator have been assessed. Publications with multiple authors have been separated and ratio to total number of publications has been calculated to know the extent of collaborative research work of scientists.



**Figure 3.** Trends in Publication by LDC Scientists

This indicator of scientific output shows increasing trends in eleven years for authors from LDC in all SAR, TAR and AR4 (Fig. 3a, 3b, 3c, 3g, 3h). However, either decreasing or no trends are noticed for contributing authors (Fig. 3d, 3e, 3f, 3i). The increase in scientific output reflects that authors, that is, lead and coordinating lead authors of LDC have performed better after participation in IPCC assessment processes. This has been also observed in a plenary report based on survey which incorporated a questionnaire for the assessment (Lee and Ypersele, 2009). At the same time CA has shown decline in scientific output. This decline in the scientific output may be due to limited role in IPCC assessment processes.

Increasing trend in scientific output of LA and CLA is an indicator of better performance due to effective role in production of assessment reports of IPCC. T-test performed on the two datasets for prior and after participation in each SAR and TAR, depicts that there is significant change in output indicator in

SAR and TAR. Publications with multiple authors have increased with time, indicating that collaborative work by scientists involved in IPCC assessment reports has also increased. This may be due to their increasing contacts and ability to engage in collaborative work which indirectly IPCC process inherits.

As lead authors and coordinating lead authors from LDC have shown better performance after participation in IPCC assessment process, their number should be increased in the view of their collaborative research work and expansion of base of knowledge of climate change. These authors are capable of doing collaborative research work which is beneficial in terms of scientific output and socio-economy of their own country as well as world at large; need to be encouraged for their contribution to the knowledge of climate change, by national and international organizations.

#### 4. Conclusions and Implications

Foregoing analysis of participation of developing countries in IPCC processes and its implications on capacity building has resulted in the following conclusions:

- In IPCC process, scientists from DC are major contributor.
- Participation from non-LDCs and LDCs has increased significantly from SAR to TAR and stagnated in AR4.
- In AR4, almost a balance has been seen in share of number of scientists from DC for all working groups. However, this is lacking in both non-LDC as well as LDCs.
- Authors in non-LDC and LDCs are not distributed uniformly with respect to working groups, throughout the all three assessment reports. WG II has been dominant in all. It is noteworthy that there is no authors in WG I from LDCs in SAR.
- The relatively better participation of WG II may be because of regional chapters in this group. If the authors of regional chapters are excluded, the picture might change.
- Authors from non-LDCs in working group I and III are increased from SAR to AR4 while they are almost constant in working group II among all three assessment reports. There is a need to increase in number of authors from non-LDCs for working groups I and III to make a balance among all three working groups with increasing overall number.
- A decrease in number of authors from LDCs in working group I from TAR to AR4 is not good for capacity building on science of climate change in these countries. Therefore, there is a necessity to increase the number of scientists from LDC in WG I and III with increasing total number. Since, there is a decrease in authors from LDCs in WG I from TAR to AR4 is noticed, an increase in their number is more required to have a sizeable participation by this working group in IPCC assessment process as well as to expand the base of knowledge of science of climate change in these countries. This increase will be able to give these countries a better participation as well as balanced role in IPCC assessment processes. So, both country group's viz. non-LDC and LDCs are required to increase in number of authors for working groups I and III by focusing the areas and activities of these working groups.
- There is necessity to increase in overall number of scientists to work in climate change area from non-LDC and LDC. Since share by scientists from LDCs is too small, increase in their number is required for a sizeable participation by these countries.
- Activities of WG I and III i.e. science and mitigation aspects of climate change are more required from LDCs and non- LDCs.
- Lead authors and coordinating lead authors from LDCs have performed better in respect to their scientific output after participation in IPCC. However, contributing authors from LDCs have not done so.

- The increase in scientific output by lead and coordinating lead authors is mostly due to collaborative research work. This is due to their connectivity and ability to perform collaborative research work which is encouraged by IPCC process.
- Developing countries should enhance their knowledge base in climate change focusing on better understanding of science of climate change and its impact, adaptation and mitigation. International funding organizations should provide support to the research activities in climate change area in developing countries especially least developing countries to bridge the gap of participation as well as enhance capacity building.

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