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State level achievements of MDG – indicators in India during 1993/1994 – 2013/2014

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ABSTRACT

Purpose: According to the Government of India 2015 report on Millennium Development Goal (MDG), India is yet to achieve almost 50% of the goals set by UN. India being characterised by her diversity, progress in terms of the indicators of MDGs for the country as a whole averages out the prevailing state level variations. This paper attempts to explore the status of these goals during 1993–1994 – 2013–2014 at state level using 12 targets and 35 indicators relevant for India along with an attempt to explain inter-state variations in this regard.

Design/Methodology/Approach: Using the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) method, a Multiple Criteria Decision Making (MCDM) method, the states have been ranked in terms of all the indicators of MDGs. These ranks were then analysed using socio-economic and political factors to understand the root cause of variation.

Findings/Limitations: Ranking of the states considering all the indicators reveals the actual scenario in an effective way. The factors like state domestic product, state wise standard of education level, social backwardness and political leadership help in finding the link between the derived ranks and these socio-economic and political factors.

Original Value: Previous studies in this area have been carried out taking the indicators separately. However without a comprehensive idea with all the indicators, the overall impact cannot be understood effectively. This study is novel since it takes into account each state with respect to all the indicators taken together thereby providing a comprehensive view on the variation in the achievement of MDG goals.

Keywords: Millennium Development Goals; MDGs; Multiple Criteria Decision Making; MCDM; Technique for Order Preference by Similarity to Ideal Solution; TOPSIS; PCNSDP; education; social backwardness; political leadership.

INTRODUCTION

Over the last two decades of the 20th century, inequality in society within a country and across the countries was at the center stage of all discussions about world development. The United Nations

conferences and summits held during that period generated an unprecedented global consensus on a shared vision of development (UN Department of Economic and Social Affairs, 2007). This gradually led to the Millennium Summit in September 2000 when the world leaders came together at the United Nations Headquarters in New York to adopt the United Nations Millennium Declaration. To address countless development issues like right to development, gender equality, eradication of the many dimensions of poverty, sustainable human development, the Declaration committed nations to a new global partnership and set out a series of eight goals including 18 time-bound targets with a deadline of 2015 that have become known as the Millennium Development Goals (MDGs). These targets have further been translated into some indicators.

The Indian case

The Indian reaction to the MDGs was not very positive initially. As the promotion of MDGs was principally driven by United Nations Secretariat, International Monetary Fund, Organization for Economic Cooperation and Development and the World Bank, the effort was considered as an imposition of 'first world' countries upon 'third world' countries (Basu, 2007). Many questioned about usefulness and comprehensiveness of the goals. It was widely believed that MDGs were important not for a developing country like India, but for the least developed Sub-Saharan African Countries (Basu, 2007). Later gradual acceptance of the MDGs has been seen within government as well as well as among non-governmental organisations.

India's MDG-framework is based on the 2003 United Nations Development Group (UNDG) guidelines on concepts, definitions and methodology of MDG indicators which recognises 53 indicators (48 basic and 5 alternatives). In the context of India's national policies, 12 of the 18 targets covering all the 8 goals are considered for the tracking of MDGs. As a result 35 of the 53 indicators are required to be monitored for the 12 targets relevant to India (Ministry of Statistics and Programme Implementation, 2010). The goals, targets and indicators relevant for India can be seen in the following Table 1 (serial numbers of targets and indicators are given following the UNDG Guidelines 2003):

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Table 1 Goals, targets and indicators of India's MDG framework	
GOAL 1	ERADICATE EXTREME POVERTY AND HUNGER
Target 1	Halve between 1990 and 2015, the proportion of people whose income is less than one dollar a day
Indicators	
1A	Poverty Headcount Ratio
2	Poverty Gap Ratio
3	Share of Poorest Quantile in National Consumption
Target 2	Halve between 1990 and 2015, the proportion of people who suffer from hunger
Indicators	
4	Prevalence of underweight children under three years of age
GOAL 2	ACHIEVE UNIVERSAL PRIMARY EDUCATION
Target 3	Ensure that by 2015, children everywhere, boys and girls alike will be able to complete a full course of primary education
Indicators	
6	Net Enrolment Ratio in Primary Education
7	Proportion of Pupil starting Grade 1 who reaches Grade 5
8	Literacy Rate of 15—24 year olds
GOAL 3	PROMOTE GENDER EQUALITY AND EMPOWER WOMEN
Target 4	Eliminate gender disparity in primary and secondary education, preferably by 2005, and in all levels of education no later than 2015
Indicators	
9	Ratio of Girls to Boys in Primary, Secondary and Tertiary Education
10	Ratio of Literate Women to Men, 15—24 years old
11	Share of Women in Wage Employment in the Non-agricultural Sector
12	Proportion of seats held by women in National Parliament
GOAL 4	REDUCE CHILD MORTALITY
Target 5	Reduce by two-thirds, between 1990 and 2015, the under-five mortality Rate
Indicators	
13	Under Five Mortality Rate
14	Infant Mortality Rate
15	Proportion of 1 year old children immunised against measles
GOAL 5	IMPROVE MATERNAL HEALTH
Target 6	Reduce by three quarters, between 1990 and 2015, the Maternal Mortality Ratio (MMR)
Indicators	
16	MMR
17	Proportion of Births Attended by Skilled Health Personnel
GOAL 6	COMBAT HIV/AIDS, MALARIA AND OTHER DISEASES
Target 7	Have halted by 2015 and begun to reverse the spread of HIV/AIDS
Indicators	
18	HIV prevalence among pregnant women aged 15—24 years
19	Condom use to overall contraceptive use among currently married women, 15—49 years, percent
19A	Condom use rate among non-regular sex partners, 15—24 years
19B	Percentage of population aged 15—24 years with comprehensive correct knowledge of HIV/AIDS

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Table 1	Goals, targets and indicators of India's MDG framework *(Cont.)*
Target 8	*Have halted by 2015 and begun to reverse the incidence of malaria and other major diseases*
Indicators	
21	Prevalence and Death Rates Associated with Malaria
22	Proportion of Population in Malaria Risk Areas using Effective Malaria Prevention and Treatment Measures (% of population covered under use of residuary spray in high risk areas
23	Prevalence and Death Rates Associated with Tuberculosis
24	Proportion of Tuberculosis Cases Detected and Cured under DOTS
GOAL 7	*ENSURE ENVIRONMENTAL SUSTAINABILITY*
Target 9	*Integrate the Principles of Sustainable Development into Country Policies and Programmes and Reverse the Loss of Environmental Resources*
Indicators	
25	Proportion of Land Area Covered by Forest
26	Ratio of Area Protected to Maintain Biological Diversity to Surface Area
27	Energy Use per unit of GDP (Rupee)
28	Carbon Dioxide emissions per capita and Consumption of Ozone-depleting Chlorofluro Carbons (ODP Tons)
29	Proportion of the Households Using Solid Fuels
Target 10	*Halve by 2015, the Proportion of People without Sustainable Access to Safe Drinking Water and Basic Sanitation*
Indicators	
30	Proportion of Population with Sustainable Access to an Improved Water Source, Urban and Rural
31	Proportion of Population with Access to Improved Sanitation, Urban and Rural
Target 11	
Indicators	
32	Slum Population as percentage of Urban Population
GOAL 8	*DEVELOP A GLOBAL PARTNERSHIP FOR DEVELOPMENT*
Target 18	*In Co-operation with the Private Sector, make available the benefits of new technologies, especially Information and Communication*
Indicators	
47	Telephone Lines and Cellular Subscribers per 100 Population
48A	Internet Subscribers per 100 Population
48B	Personal Computers per 100 Population

India being the second most populated country in the world, India's progress with respect to 35 indicators of MDGs as indicated above is considered to have a decisive role in determining its global status. According to the Government of India 2015 report on MDG, for about 50% of the targets the country is lagging behind marginally (moderately on-track) or significantly (slow or almost off-track). For goals 3 (Promote Gender Equality and Empower Women) and 8 (Develop a Global Partnership for Development), the India's progress is on-track. For goals 2 (Achieve Universal Primary Education) and 4 (Reduce Child Mortality),

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India is moderately on-track. For goals 6 (Combat HIV/AIDS/Malaria and Other Diseases) and 7 (Ensure Environmental Sustainability), the country's progress is a mixed one – some targets are on-track and some other are moderately on-track. However for goals 1 (Eradicate Extreme Poverty and Hunger) and 5 (Improve Maternal Health) some targets are almost off-track. Following this report, indicator wise achievements are summarised below:

Indicator 1A (Poverty Headcount Ratio)

India has been pretty successful in bringing it down. In fact India achieved the target well ahead of time, as in 2011—2012 the all India figure was 21.9% which was supposed to be 23.9% by 2015 to reach the target.

Indicator 2 (Poverty Gap Ratio)

The country has witnessed nearly 50% decline in this ratio during 2004—2005 to 2011—2012 in both rural and urban areas which is quite impressive.

Indicator 3(Share of Poorest Quantile in National Consumption)

Regarding the above indicator, India's performance appears to be quite poor. In urban areas the indicator has declined from 8% in 1993—1994 to 7.1% in 2011—2012 whereas in rural areas it declined from 9.6% in 1993—1994 to 9.1% in 2011—2012.

Indicator 4 (Prevalence of underweight children under three years of age)

The proportion declined from 43% in 1998—1999 to 40% in 2005—2006 which is not much significant.

Indicator 6 (Net Enrolment Ratio in Primary Education)

This indicator has shown an appreciable performance though falling short of universal achievement - an increase from 84.5% in 2005—2006 to 88.08% in 2013—2014.

Indicator 7(Proportion of Pupil starting Grade 1 who reaches Grade 5)

A steady increase of this proportion from 78.08 in 2009—2010 to 86.05 in 2011—2012 is observed.

Indicator 8 (Literacy Rate of 15—24 year olds)

This youth literacy ratio has increased from 61.9% in 1991 to 86.14% in 2011 which is quite commendable.

Indicator 9 (Ratio of Girls to Boys in Primary, Secondary and Tertiary Education)

Indian situation is worthy of mention with respect to this indicator. Gender Parity Indexes of Gross Enrolment Ratio in primary and secondary education in 2013—2014 are found to be 1.03 and 1, respectively, although in tertiary level the value is less than 1 (actual figure being 0.89) in 2012—2013.

Indicator 10 (Ratio of Literate Women to Men, 15—24 years old)

The above ratio has shown very good progress in 2011 census data. At all India level, the value is 0.91.

Indicator 11(Share of Women in Wage Employment in the Non-agricultural Sector)

Regarding this, India's performance is evidently poor. The estimated share as per the NSS 68th round (2011—2012) is 19.3% with corresponding figures for rural and urban areas being 19.9% and 18.7%, respectively.

Indicator 12 (Proportion of seats held by women in National Parliament)

The proportion is remarkably low in this country. There are only 65 women representatives out of 542 members in Lok Sabha and the corresponding figure for Rajya Sabha is 31 out of 242 seats as in January 2015.

Indicator 13 (Under Five Mortality Rate)

With respect to this indicator in India, an overall reduction of about 60% happened during 1990 to 2013, which is appreciable.

Indicator 14(Infant Mortality Rate)

With a sharp decline in this rate in India, the value has stood at 40 per 1000 live births as against 80 per 1000 live births in 1990.

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*Indicator 15 (Proportion of 1 year old children
immunised against measles)*

For the above indicator, estimated value stands at 74% in 2009 with a
commendable improvement over the value of 42% in 1992—1993.

Indicator 16 (MMR)

The status of the above at all India level is standing at 167 per 100,000
live births in 2011—2013 as against the corresponding figure of 437 in
1990, which is considered to be a significant improvement.

*Indicator 17 (Proportion of Births Attended by
Skilled Health Personnel)*

In spite of achieving a considerable progress in this indicator, universal
coverage is still a far cry for India. 76.2% of births were attended by
skilled health personnel in 2009 as per Government of India and UNICEF
Report.

*Indicator 18 (HIV prevalence among pregnant
women aged 15—24 years)*

This indicator in India is showing a significantly declining trend from
0.89% in 2005 to 0.32% in 2012—2013.

*Indicator 19 (Condom use to overall contraceptive
use among currently married women,
15—49 years, percent)*

National Family Health Survey III in 2005—2006 reveals that the value
of this indicator is only 5.2% at all India level which is evidently a very
poor performance.

*Indicator 19A (Condom use rate among non-regular
sex partners, 15—24 years)*

India has registered a 19% increase in the above rate from 51.9% in
2001 to 61.7% in 2006 as per the Behavioural Surveillance Surveys of
2001 and 2006. It has further increased to 74% in 2010 as per the 'Con-
dom Promotion Impact Survey 2010', which is a significant one.

*Indicator 19B (Percentage of population aged
15—24 years with comprehensive correct knowledge
of HIV/AIDS)*

Considering the above indicator, India's performance is moderately
good revealing an improvement from 22.2% in 2001 to 32.9% in 2006 as
per the Behavioural Surveillance Surveys of 2001 and 2006.

Indicator 21(Prevalence and Death Rates Associated with Malaria)

Regarding this, malaria prevalence has considerably come down consistently at all India level from 2.12 per thousand in 2001 to 0.72 per thousand in 2013, however malaria deaths have registered a rise from 440 in 2013 to 578 in 2014.

Indicator 22 (Proportion of Population in Malaria Risk Areas using Effective Malaria Prevention and Treatment Measures)

Due to non-availability of data, measurement of India's progress in this indicator is skipped in the Government of India 2015 report on MDGs.

Indicator 23 (Prevalence and Death Rates Associated with Tuberculosis)

Considering the above indicator, tuberculosis prevalence has considerably reduced from 465 in 1990 to 211 in 2013. Tuberculosis deaths per lakh population have shown a decline from 38 in 1990 to 19 in 2013 which is quite commendable.

Indicator 24(Proportion of Tuberculosis Cases Detected and Cured under DOTS)

Due to non-availability of data, measurement of India's progress in this indicator is skipped in the Government of India 2015 report on MDG.

Indicator 25 (Proportion of Land Area Covered by Forest)

There is a moderate progress made by India regarding the above indicator — forest cover increased by 5871 sq.km during 2011—2013.

Indicator 26 (Ratio of Area Protected to Maintain Biological Diversity to Surface Area)

India has made a steady progress as per the report with respect to this. The network of protected areas comprising National Parks, Wildlife Sanctuaries, Community Reserves and Conservation Reserves cover 158645.05 sq.km of the country's geographical area in 2014 as against 155475.63 sq.km in 2000.

Indicator 27(Energy Use per unit of GDP)

India has experienced a moderate percentage annual increase of the ratio of the estimate of total energy consumption during the year to the estimated mid-year population of that year — to the tune of 8.76% from 2011—2012 to 2012—2013.

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Indicator 28 (Carbon Dioxide emissions per capita and Consumption of Ozone-depleting Chlorofluro Carbons)

For India the Carbon Dioxide emission reveals quite a significant increase of 235.57% in 2014 over 1990. However, consumption of Chloroflour Carbons has shown a significant decrease from 5614 ODP[1] tones in 2000 to 290.733 ODP tones in 2010.

Indicator 29 (Proportion of the Households Using Solid Fuels)

At all India level, use of solid fuels in the form of fire wood, crop residue/cow dung cake/coke, etc. for cooking has decreased marginally from 74.3% in 2001 to 67.3% in 2011.

Indicator 30 (Proportion of Population with Sustainable Access to an Improved Water Source)

India is pretty successful with respect to the above indicator. At all India level 87.8% households had access to improved source of drinking water in 2012. In fact, the target of halving the proportion of households without access to safe drinking water sources from its 1990 level has been achieved.

Indicator 31 (Proportion of Population with Access to Improved Sanitation)

India's progress regarding the above indicator is quite sluggish. As per the NSS 2012 report, 43.4% of households at all India level did not have any access to sanitation.

Indicator 32 (Slum Population as percentage of Urban Population)

According to Census 2011 report, 17.2% of urban households are located in slums. A decadal growth of 37.14% in the number of slum households is observed which is pretty high.

Indicator 47 (Telephone Lines and Cellular Subscribers per 100 Population)

In terms of the above indicator India has made tremendous progress. The overall tele-density at all India level is 76% as on 31st July 2014.

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[1]Ozone Depletion Potential.

Indicator 48A (Internet Subscribers per 100 Population)

India's progress regarding the above indicator is not much appreciable. Wireline and wireless connections taken together, the percentage of internet subscribers has increased from 16.15 in June 2013 to 20.83 in June 2014.

Indicator 48B (Personal Computers per 100 Population)

Due to non-availability of data, measurement of India's progress in this indicator is skipped in the Government of India 2015 report on MDG.

Motivation

Against this backdrop of a mixed progress of MDG indicators, the matter calls for a deeper analysis. More so, India being a diverse country with 36 States and Union Territories, the all India figures do not give any effective idea about the State level variations and if the variations are very high such figures appear to suppress lots of information defeating the very purpose of MDG adoption. So the indicators of MDGs need to be considered at State level, then only the lagging states can be identified and given special thrust accordingly. An attempt was made by the Government of India to consider the status of MDGs at state level in 2010 special edition of report. But due to non-availability of State level data for many indicators, the attempt was not a very successful one. Not only that, no further effective updation of State level analysis can be found in government reports. The present paper attempts to carry out a comprehensive analysis taking all the indicators of MDGS (relevant for India) and all the States of India (barring Union Territories other than the National Capital Delhi). The problem of data non-availability has been countered by taking some proxies which is discussed elaborately in Section III (Data and Methodology). After that other socio- economic conditions like overall economic situation of the States expressed by Per Capita Net State Domestic Products, social backwardness of the States expressed by Scheduled Tribe population as a percentage of overall population in each State and total literacy position of each State have been taken into consideration to explore some possible reasons for State wise variation in MDG indicators. The rest of the paper is organised as follows: Section II provides Objectives of the study followed by Data and Methodology in Section III. Section IV deals with the Results and Interpretation. Section V concludes the paper.

OBJECTIVES OF THE STUDY

1 To rank all the States in terms of values attained for all the indicators of eight goals taken together in 2013—2014 using Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) method.

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2 To rank all the States in terms of per capita net state domestic product, total literacy rate, percentage of ST in total population separately in 2013—2014.

3 To examine rank correlation between 1 and 2 above taking each pair of ranks separately.

4 To repeat the same exercise for 2003—2004 and shed light on the decadal change in the overall situation and related policy implications.

DATA AND METHODOLOGY

The 35 indicators of MDGs as discussed in Section I are taken up for ranking the states in this paper. So data on 35 variables have been collected from numerous sources. However national statistical system does not have an independent statistical exercise exclusively focused on quantitative monitoring of MDG indicators.

The data used in this paper are based on a variety of sources including administrative data compiled by Central Ministries and information gathered from periodic national surveys and censuses carried out by the Government of India. Due to non-availability of State level data for some indicators, some proxies are taken.

A comprehensive description of the goal wise indicators used in this study along with data sources is given below:

GOAL 1

Indicators:

1A   Poverty Headcount Ratio (Tendulkar Methodology);
      Source: Planning commission, renamed as NITI Aayog.
2   Poverty Gap Ratio (MRP[2] Consumption Distribution);
      Source: Planning commission, renamed as NITI Aayog.
3   Percentage Share in Consumption of Bottom 20% Of Population (MRP Consumption Distribution);
      Source: NSS Data.
4   Proportion of Underweight Children (<3yrs) (Percentage);
      Source: NFHS Data.

GOAL 2

Indicators:

6   Net Enrolment Ratio (Primary);
      Source: Ministry of HRD.
7   Proportion of Pupil Starting Grade I Who Reaches Grade V;
      Source: Ministry of HRD.

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[2]Mixed Reference Period.

8   Literacy Rate of 15—24 year olds;
       Source: Office of Registrar General of India.

GOAL 3

Indicators:

9   Gender Parity Index (Primary, Secondary and Tertiary);
     Source: Ministry of HRD.

10   Gender Gap in the Literacy Rate;
     Source: Census Data.

11   Share of Women in Wage Employment in the Non-agricultural Sector;
     Source: NSS Data.

12   Percentage of Seats held by women in Rajya Sabha;
     Source: MOSPI[3].

GOAL 4

Indicators:

13   Under 5 Mortality Rate;
     Source: Office of Registrar General of India.

14   Infant Mortality Rate;
     Source: Office of Registrar General of India.

15   Proportion of 1 Year Old (12—23 Months) Children Immunised Against Measles;
     Sources: 2009 Coverage Evaluation Survey, UNICEF and GOI.

GOAL 5

Indicators:

16   MMR (Deaths per 100,000 Live Births);
     Source: Office of Registrar General of India.

17   Proportion of Births Attended by Skilled Health Personnel;
     Source: NFHS Data.

GOAL 6

Indicators:

18   HIV Prevalence among Pregnant Women Aged 15—24 years (Percentage);
     Source: NACO[4], Department of AIDS Control, GOI.

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[3]Ministry of Statistics and Programme Implementation.
[4]National AIDS Control Organization.

19   Condom Use Rate of The Contraceptive Prevalence Rate
Among Currently Married Women, 15—49 Years (Percentage);
Source: NFHS Data.

19A   Condom Use during Last Sex with Non-Regular Partner
(Percentage);
Source: NACO, Department of AIDS Control, GOI.

19B   Comprehensive Correct Knowledge about HIV Transmission
and Prevention (Percentage);
Source: NACO, Department of AIDS Control, GOI.

21   Prevalence and Deaths Associated with Malaria;
Source: Directorate of National Vector Borne Disease
Control Programme.

22   Malaria Incidence Rate (Percentage) [PROXY TAKEN];
Source: Directorate of National Vector Borne Disease
Control Programme.

23   PrevalenceRate per 100,000 population and Percentage
Died Associated with Tuberculosis;
Source: National Tuberculosis Control Programme Reports,
GOI.

24   Tuberculosis Cure Rate (Percentage);
Source: National Tuberculosis Control Programme Reports,
GOI.

GOAL 7

Indicators:

25   Percentage of Forest to Total Geographic Area;
Source: India State of Forest Reports, GOI.

26   Protected Areas to Maintain Biological Diversity (National Park,
Wildlife Sanctuaries, Conservation Reserves, Community
Reserves);
Source: Ministry of Environment, Forests and Climate Change,
GOI.

27   Installed Generating Capacity of Electricity (in GW)
[PROXY TAKEN];
Source: MOSPI.

28   Average SO 2 μg/m^3 in Residential Areas [PROXY TAKEN];
Source: Central Pollution Control Board.

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29   Households per thousand Using Solid Fuels (Firewoods and Chips +DungCake); Source: MOSPI.

30   Proportion of Population with Sustainable Access to an Improved Water Source;
      Source: NSS Data.

31   Proportion of Population with Access to Improved Sanitation;
      Source: NSS Data.

32   Slum Population as percentage of Urban Population;
      Source: Office of Registrar General of India.

GOAL 8

Indicators:

47   Teledensity – Telephone per 100 Population; *Source*: TRAI[5].

48A   Internet Subscribers per 100 Population; *TRAI*.

48B   Percentage of Households Having Computers; *Census Data*.

MULTI CRITERION DECISION MAKING

In this paper Multiple Criteria Decision Making (MCDM) approach has been applied in ranking the States considering all the State wise values of the indicators summarised above. In a typical MCDM environment, there are a number of alternatives to be assessed on the basis of their preference order. There are many MCDM techniques available (Hwang and Yoon, 1981; Yoon and Hwang, 1995; Zeleny, 1982), among which the TOPSIS proposed by Hwang and Yoon (1981) is a very intuitive and effective one. The basic principle employed by TOPSIS is that the best alternative should have the shortest distance from the ideal alternative, which is both intuitive and important. A review of the TOPSIS method is provided below:

The MCDM environment

Suppose that there are all together K alternatives to be assessed and the best alternative is to be selected. Let the alternatives be denoted by $S1,\ldots, SK$. there are also N criteria identified to assess the alternatives, which are denoted by $C1,\ldots, CN$. The kth alternative's value on the nth criteria is obtained as xkn, and is written as

$$Sk = (xk1,\ldots, xkN), 1,\ldots, K \text{ and } Cn = (x1n,\ldots xkn), n = 1,\ldots, N$$

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[5]Telecom Regulatory Authority of India.

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The ideal solution

It is both intuitive and feasible to compare each alternative with an 'ideal alternative' to solve the assessment or decision-making problem. TOPSIS adopts an intuitive approach to the construction of the best and worst alternative and calls them the ideal and the negative-ideal alternatives or solutions. The ideal alternative S_+, is formed by taking all the best values attained on each criterion by some alternatives, and can be explicitly denoted by:

$$S_+ = \left(x_{+1}, \ldots, x_{+N}\right) = \left(\min_k\left\{x_{k1}\right\}, \ldots, \min_k\left\{x_{kM}\right\}, \max_k\left\{x_{km+1}\right\}, \ldots, \max_k\left\{x_{kN}\right\}\right)$$

and the negative-ideal alternative S_-, comprises of all the worst criterion values attained by some alternatives, and is denoted by

$$S_- = \left(x_{-1}, \ldots, x_{-N}\right) = \left(\max_k\left\{x_{k1}\right\}, \ldots, \max_k\left\{x_{kM}\right\}, \min_k\left\{x_{km+1}\right\}, \ldots, \min_k\left\{x_{kN}\right\}\right)$$

The TOPSIS procedure

With the above notation and explanation, the TOPSIS procedure for assessing the ranking can be described as follows:

*Normalise the nth criterion vector C_n in to TC_n:

$$TC_n = \frac{C_n}{\|C_n\|} = \left(\frac{x_{1n}}{\|C_n\|}, \ldots, \frac{x_{kn}}{\|C_n\|}\right) \equiv \left(t_{1n}, \ldots, t_{kn}\right), n = 1, \ldots, N$$

where $\|C_n\| = \sqrt{\sum_{k=1}^{K}(x_{kn})^2}$ is the Euclidean length or norm of C_n, so the new criterion vectors have the same unit length and are thus unit free and directly comparable. Under the new criterion values, the kth alternative, S_k, and the ideal and negative ideal solutions S_+ and S_-, are transformed to TS_k, TS_+ and TS_-, respectively:

$$TS_k = \left(tk1, \ldots, tkN\right) = \left(\frac{x_{k1}/\|C_1\|, \ldots, x_{kN}\|}{\|C_1\|}\right), k = 1, \ldots, K$$

$$TS_+ = \left(t_{+1}, \ldots, t_{+N}\right) = \left(\frac{x_{+1}/\|C_1\|, \ldots x_{+N}}{\|C_N\|}\right)$$

$$TS_- = (t_{-1}, \ldots, t_{-N}) = \left(\frac{x_{-1}/\|C_1\|, \ldots x_{-N}}{\|C_N\|} \right)$$

*Define the distances of S_k and x_+ as the weighted Euclidean distance of TS_k from TS_+:

$$d(S_k, S_+) = \|w \bullet (TS_k - TS_+)\| = \sqrt{\sum_{n=1}^{N} \left[W_n (t_{kn} - t_{+1}) \right]^2}$$

$$= \sqrt{\sum_{n=1}^{N} \left[W_n \left(\frac{x_{kn} - x_{+n}}{\|C_n\|^2} \right) \right]}$$

$$= \sqrt{\sum \left[W_n \left(x_{kn} - \min_j \{x_{jn}\} \right) C_n \| \right]^2 + \sum_{n=M+1}^{N} \left[W_n \frac{\left(x_{kn} - \max_j \{x_{jn}\} \right)}{\|C_n\|} \right]^2} \quad k = 1, \ldots, K$$

Here '•' is vector product operator and w is an N-dimensional weight vector whose elements represent the relative importance of the N criteria. Similarly, the distance of S_k from S_- is defined as the weighted Euclidean distance of TS_k from TS_-:

$$d(S_k, S_-) = \|w \bullet (TS_k - TS_-)\| = \sqrt{\sum_{n=1}^{N} \left[W_n (t_{kn} - t_{-n}) \right]^2} \sqrt{\sum_{n=1}^{N} \left[W_n \left(\frac{x_{kn} - x_{-n}}{\|C_n\|} \right)^2 \right]}$$

$$= \sqrt{\sum_{n=1}^{M} \left[W_n \left(x_{kn} - \max_j \{x_{jn}\} \right) C_n \| \right]^2 + \sum_{n=M+1}^{N} \left[W_n \left(\frac{x_{kn} - \min_j \{x_{jn}\}}{\|C_n\|} \right) \right]^2} \quad k = 1, \ldots, K$$

*Rank the K alternatives preference order by their relative closeness to the ideal alternative S_+, which for the kth alternative is defined as:

$$r(S_k, S_+) = \frac{d(S_k, S_+)}{\left[d(S_k, S_+) + d(S_k, S_-) \right]}, \quad k = 1, \ldots, K$$

The assessment criterion of TOPSIS is that the it smaller the value of $r(S_k, S_+)$ which ranges between 0 and 1, the more preferred the alternative S_k.

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Choice of weights

A reasonably good approach to obtain internal importance weights is to use the entropy concept. It is a criterion for the amount of information (or uncertainty) represented by a discrete probability distribution, $p_1, \ldots, p_k$ and this measure of information was given by Shannon and Weaver (1947) as:

$$E(p_1, \ldots, p_k) = -\varphi k \sum_{k=1}^{k} pk1n(pk)$$

where $\varphi_k = 1/1n(K)$ is a positive constant which guarantees that $0 \leq E(p_1, \ldots, p_k) \leq 1$. It is noted that the larger the $E(p_1, \ldots, p_k)$ value, the smaller the variations among he p_k's and that 0 entropy means maximum information and 1 minimum information.

For the *n*th criterion vector $C_n = (x_{1n}, \ldots, x_{Kn})$ in our MCDM environment, let $X_n = x_{1n} + \ldots + x_{Kn}$ be the total value regarding the criterion. If we view a normalised values $p_{kn} = x_{kn}/X_n$ for $k = 1, \ldots, K$ as the 'probability distribution' of C_n on the K alternatives, we may similarly define the entropy of C_n as:

$$E(C_n) = -\phi k \sum_{k=1}^{K} p_k 1n(p_k) = \varphi k \sum_{k=1}^{K} \left(\frac{x_{kn}}{X_n} \right) 1b \left(\frac{x_{kn}}{X_n} \right), n = 1, \ldots N$$

and define the weights as

$$w_n = \frac{(1 - E(C_n))}{\sum_{j=1}^{N} (1 - E(C_j))}, n = 1, \ldots, N$$

RESULTS AND INTERPRETATION

TOPSIS ranks have been derived for the Indian States for 2003—2004 and 2013—2014 based on the values of the indicators for the corresponding years. The study considered data from 1993—1994 to 2013—2014. However for the year 1993—1994, values for more than 50% of the indicators are n ot available. So in final calculation, ranks for the two years that is, 2003—2004 and 2013—2014 could be calculated. Shannon's weights for each year, Relative Closeness Tables 2—5 are shown below:

Table 2 Shannon's Weights for 2013–2014	
Indicators	*Shannon's WT. (%) — '13–14*
Poverty Headcount Ratio	0.35
Poverty Gap Ratio — Rural (MRP Consumption Distribution)	0.51
Poverty Gap Ratio — Urban (MRP Consumption Distribution)	0.56
Rural % share in consumption of bottom 20% of population (MRP Consumption Distribution)	0.01
Urban % share in consumption of bottom 20% of population (MRP Consumption Distribution)	0.92
Proportion of Underweight Children (< 3yrs) (%)	0.79
Net Enrolment Ratio (Primary)	0.01
Proportion of Pupil starting Grade 1 who reaches Grade 5 (Grade V to I Ratio)	0.22
Literacy Rate of 15–24 year olds	0.26
Gender Parity Index	0.00
Gender Gap in the Literacy Rate	0.21
Share of Women in Wage Employment in the Non-agricultural Sector	0.20
Percentage of seats held by women in Rajya Sabha	2.26
Under Five Mortality Rate	0.11
Infant Mortality Rate	0.51
Proportion of 1 year old (12–23 months) children immunised against measles	0.35
MMR (Deaths per 100,000 live births)	0.14
Proportion of Births Attended by Skilled Health Personnel	0.05
HIV prevalence among pregnant women aged 15–24 years (%)	0.50
Condom use rate of the contraceptive prevalence rate among currently married women, 15–49 years (percent)	0.68
Condom use during last sex with non-regular partner (percent)	6.30
Comprehensive Correct Knowledge about HIV Transmission and Prevention (percent)	0.15
Prevalence and Deaths Associated with Malaria	1.96
Malaria Incidence Rate (%)	1.60
Prevalence Rate per 100,000 population and Percentage Died Associated with Tuberculosis	0.52
Tuberculosis Cure Rate (Percentage)	0.00
Percentage of Forest to total geographic area	0.69
Protected Areas to Maintain Biological Diversity (National Park)	1.25
Protected Areas to Maintain Biological Diversity (Wild Life Sanctuary)	1.21
Protected Areas to Maintain Biological Diversity (Conservation Reserves)	4.13
Protected Areas to Maintain Biological Diversity (Community Reserves)	7.67
Installed Generating Capacity of Electricity (in GW)	7.65
Average SO^2 μg/m^3 in residential areas	7.62
Households per thousand Using Solid Fuels (Firewoods and Chips+ Dung Cake)	6.08
Proportion of Population with Sustainable Access to an Improved Water Source	7.28
Proportion of Population with Access to Improved Sanitation	7.34
Slum Population as percentage of Urban Population	7.55
Teledensity —Telephone per 100 Population (in %)	7.31
Internet Subscribers per 100 Population	7.44
Percentage of Households having computers	7.61

Table 3 Relative closeness table for 2013–2014			
STATES	$d(S_{k'}\ S_+)$	$d(S_{k'}\ S_-)$	$d(S_{k'}\ S_+) + d(S_{k'}\ S_-)$	$d(S_{k'}\ S_-)/\{d(S_{k'}\ S_+)+d(S_{k'}\ S_-)\}$
ANDHRA PRADESH	365.98	3427.02	3793.00	0.0965
ARUNACHAL PRADESH	144.65	3647.32	3791.96	0.0381
ASSAM	355.22	3431.12	3786.35	0.0938
BIHAR	155.38	3707.31	3862.69	0.0402
CHATTISH GARH	1809.81	1946.48	3756.30	0.4818
DELHI	177.30	3745.55	3922.85	0.0452
GOA	172.88	3726.26	3899.14	0.0443
GUJRAT	959.82	2797.25	3757.07	0.2555
HARYANA	294.26	3514.13	3808.40	0.0773
HIMACHAL PRADESH	113.01	3749.60	3862.61	0.0293
JAMMU & K	66.06	3741.65	3807.71	0.0173
JHARKHAND	1610.03	2148.56	3758.60	0.4284
KARNATAKA	245.94	3533.87	3779.81	0.0651
KERALA	159.78	3724.61	3884.39	0.0411
MADHYA PRADESH	1286.10	2469.87	3755.97	0.3424
MAHARASTRA	722.64	3036.39	3759.03	0.1922
MANIPUR	175.76	3749.37	3925.13	0.0448
MEGHALAYA	441.50	3346.02	3787.52	0.1166
MIZORAM	254.28	3558.80	3813.08	0.0667
NAGALAND	180.63	3713.88	3894.51	0.0464
ORISSA	3752.29	70.80	3823.09	0.9815
PUNJAB	176.64	3722.49	3899.13	0.0453
RAJASTAN	554.16	3208.91	3763.07	0.1473
SIKKIM	169.30	3750.74	3920.04	0.0432
TAMIL NADU	276.49	3504.58	3781.07	0.0731
TRIPURA	210.16	3630.11	3840.27	0.0547
UTTAR PRADESH	801.97	2959.34	3761.31	0.2132
UTTARANCHAL	144.59	3728.41	3873.00	0.0373
WEST BENGAL	590.17	3182.37	3772.54	0.1564

Table 4 Shannon's weights for 2003–2004	
Indicators	*Shannon's WT. (%) — '13—14*
Poverty Headcount Ratio	0.20
Poverty Gap Ratio — Rural (MRP Consumption Distribution)	0.36
Poverty Gap Ratio — Urban (MRP Consumption Distribution)	0.35
Rural % share in consumption of bottom 20% of population (MRP Consumption Distribution)	0.02
Urban % share in consumption of bottom 20% of population (MRP Consumption Distribution)	0.03
Proportion of Underweight Children (< 3yrs) (%)	0.13
Net Enrolment Ratio (Primary)	0.00
Proportion of Pupil starting Grade 1 who reaches Grade 5 (Grade V to I Ratio)	0.04
Literacy Rate of 15—24 year olds	0.02
Gender Parity Index	0.01
Gender Gap in the Literacy Rate	0.19
Share of Women in Wage Employment in the Non-agricultural Sector	0.11
Percentage of seats held by women in Rajya Sabha	2.03
Under Five Mortality Rate	0.15
Infant Mortality Rate	0.16
Proportion of 1 year old (12—23 months) children immunised against measles	0.14
MMR (Deaths per 100,000 live births)	0.26
Proportion of Births Attended by Skilled Health Personnel	0.23
HIV prevalence among pregnant women aged 15—24 years (%)	1.34
Condom use rate of the contraceptive prevalence rate among currently married women, 15—49 years (percent)	0.69
Condom use during last sex with non-regular partner (percent)	6.31
Comprehensive Correct Knowledge about HIV Transmission and Prevention (percent)	0.19
Prevalence and Deaths Associated with Malaria	1.98
Malaria Incidence Rate (%)	1.55
Prevalence Rate per 100,000 population and Percentage Died Associated with Tuberculosis	0.61
Tuberculosis Cure Rate (Percentage)	0.00
Percentage of Forest to total geographic area	0.60
Protected Areas to Maintain Biological Diversity (National Park)	1.43
Protected Areas to Maintain Biological Diversity (Wild Life Sanctuary)	1.31
Protected Areas to Maintain Biological Diversity (Conservation Reserves)	5.01
Protected Areas to Maintain Biological Diversity (Community Reserves)	7.69
Installed Generating Capacity of Electricity (in GW)	7.68
Average SO^2 μg/m^3 in residential areas	7.64
Households per thousand Using Solid Fuels (Firewoods and Chips + Dung Cake)	6.48
Proportion of Population with Sustainable Access to an Improved Water Source	7.36
Proportion of Population with Access to Improved Sanitation	7.45
Slum Population as percentage of Urban Population	7.60
Teledensity — Telephone per 100 Population (in %)	7.39
Internet Subscribers per 100 Population	7.58
Percentage of Households having computers	7.67

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Table 5	Relative closeness table for 2003—2004			
STATES	$d(S_{k'}, S_+)$	$d(S_{k'}, S_-)$	$d(S_{k'}, S_+) + d(S_{k'}, S_-)$	$d(S_{k'}, S_+)/\{d(S_{k'}, S_+)+d(S_{k'}, S_-)\}$
ANDHRA PRADESH	378.28	3812.7	4190.94	0.0903
ARUNACHAL PRADESH	437.14	3756.0	4193.11	0.1043
ASSAM	1393.44	2797.6	4191.04	0.3325
BIHAR	113.08	4156.8	4269.93	0.0265
CHATTISH GARH	2100.60	2088.5	4189.08	0.5014
DELHI	129.39	4176.8	4306.18	0.0300
GOA	135.99	4131.8	4267.84	0.0319
GUJRAT	989.51	3200.0	4189.53	0.2362
HARYANA	533.98	3667.9	4201.85	0.1271
HIMACHAL PRADESH	71.78	4186.2	4257.95	0.0169
JAMMU & K	57.71	4185.9	4243.65	0.0136
JHARKHAND	2137.70	2051.9	4189.63	0.5102
KARNATAKA	698.20	3495.2	4193.36	0.1665
KERALA	117.73	4163.6	4281.30	0.0275
MADHYA PRADESH	1060.92	3128.6	4189.57	0.2532
MAHARASTRA	600.15	3589.2	4189.37	0.1433
MANIPUR	131.17	4157.2	4288.35	0.0306
MEGHALAYA	353.13	3857.5	4210.61	0.0839
MIZORAM	167.85	4069.5	4237.40	0.0396
NAGALAND	133.66	4150.0	4283.66	0.0312
ORISSA	4187.23	51.2	4238.48	0.9879
PUNJAB	129.18	4186.5	4315.65	0.0299
RAJASTAN	128.59	4166.2	4294.81	0.0299
SIKKIM	1098.69	3091.4	4190.08	0.2622
TAMIL NADU	122.84	4186.0	4308.85	0.0285
TRIPURA	327.41	3876.3	4203.75	0.0779
UTTAR PRADESH	284.79	3930.7	4215.49	0.0676
UTTARANCHAL	254.56	3949.7	4204.27	0.0605
WEST BENGAL	106.28	4175.0	4281.31	0.0248

COMPARING VARIABLES

Next, taking data on Per Capita Net State Domestic Product (at current price) in 2003—2004 and 2013—2014 States are ranked. The same exercise has been carried out taking ST population as a percentage of State population and total literacy rates in 2001 and 2011 (since

STATES	TOPSIS Rank	Per Capita NSDP Rank (largest to smallest values)	ST Population as a % of Total State Population Rank (smallest to largest values)	Total Literacy Rate Rank (largest to smallest values)
ANDHRA PRADESH	19	11	9	25
ARUNACHAL PRADESH	4	13	23	28
ASSAM	18	25	13	20
BIHAR	5	29	3	29
CHATTISH GARH	28	22	19	21
DELHI	10	1	0	5
GOA	8	2	11	3
GUJRAT	25	8	15	13
HARYANA	17	4	0	16
HIMACHAL PRADESH	2	10	6	6
JAMMU & K	1	20	12	24
JHARKHAND	27	26	18	26
KARNATAKA	14	14	8	17
KERALA	6	12	4	1
MADHYA PRADESH	26	24	16	22
MAHARASTRA	23	5	10	7
MANIPUR	9	28	22	11
MEGHALAYA	20	21	24	18
MIZORAM	15	18	26	2
NAGALAND	12	15	25	10
ORISSA	29	23	17	19
PUNJAB	11	9	0	15
RAJASTAN	21	17	14	27
SIKKIM	7	3	21	8
TAMIL NADU	16	6	2	9
TRIPURA	13	19	20	4
UTTAR PRADESH	24	27	1	23
UTTARANCHAL	3	7	5	12
WEST BENGAL	22	16	7	14

Table 6   Ranks of the states in 2013—2014

only census data can be found in this regard). Data tables corresponding to these three variables for the mentioned years are given in the appendix.

Ranks of the states (with respect to TOPSIS and other three variables mentioned above) are provided in the following Tables 6 and 7.

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STATES	TOPSIS Rank	Per Capita NSDP Rank (largest to smallest values)	ST Population as a % of Total State Population Rank (smallest to largest values)	Total Literacy Rate Rank (largest to smallest values)
ANDHRA PRADESH	19	11	9	25
ARUNACHAL PRADESH	4	13	23	28
ASSAM	18	25	13	20
BIHAR	5	29	3	29
CHATTISH GARH	28	22	19	21
DELHI	10	1	0	5
GOA	8	2	11	3
GUJRAT	25	8	15	13
HARYANA	17	4	0	16
HIMACHAL PRADESH	2	10	6	6
JAMMU & K	1	20	12	24
JHARKHAND	27	26	18	26
KARNATAKA	14	14	8	17
KERALA	6	12	4	1
MADHYA PRADESH	26	24	16	22
MAHARASTRA	23	5	10	7
MANIPUR	9	28	22	11
MEGHALAYA	20	21	24	18
MIZORAM	15	18	26	2
NAGALAND	12	15	25	10
ORISSA	29	23	17	19
PUNJAB	11	9	0	15
RAJASTAN	21	17	14	27
SIKKIM	7	3	21	8
TAMIL NADU	16	6	2	9
TRIPURA	13	19	20	4
UTTAR PRADESH	24	27	1	23
UTTARANCHAL	3	7	5	12
WEST BENGAL	22	16	7	14

Table 7   Ranks of the states in 2003—2004

Based on the above ranks, Spearman's Rank Correlation has been calculated and tested for significance for the following pairs of ordinal variables using SPSS 16.0:

1 TOPSIS Rank, 2013—2014 and Per Capita NSDP Rank, 2013—2014
   (TOPSIS_Rank2013_2014 and PCNSDP_Rank2013_2014).

2 TOPSIS Rank, 2013—2014 and ST Population as a % of Total State Population Rank, 2013—2014 *(TOPSIS_Rank2013_2014 and STPopPercent_Rank2013_2014)*.

3 TOPSIS Rank, 2013—2014 and Total Literacy Rate Rank, 2013—2014 *(TOPSIS_Rank2013_2014 and TotalLiteracy_Rank2013_2014)*.

4 TOPSIS Rank, 2003—2004 and Per Capita NSDP Rank, 2003—2004 *(TOPSIS_Rank2003_2004 and PCNSDP_Rank2003_2004)*.

5 TOPSIS Rank, 2003—2004 and ST Population as a % of Total State Population Rank, 2003—2004 *(TOPSIS_Rank2003_2004 and STPopPercent_Rank2003_2004)*.

6 TOPSIS Rank, 2003—2004 and Total Literacy Rate Rank, 2003—2004 *(TOPSIS_Rank2003_2004 and TotalLiteracy_Rank2003_2004)*.

7 TOPSIS Rank, 2013—2014 and TOPSIS Rank, 2003—2004 *(TOPSIS_Rank2013_2014 and TOPSIS_Rank2003_2004)*.

The results are presented below (Tables 8—14):

Table 8   Rank correlation between TOPSIS Rank and Per Capita NSDP Rank, 2013—2014

			TOPSIS_Rank 2013_2014	*PCNSDP_Rank 2013_2014*
Spearman's rho	TOPSIS_Rank 2013_2014	Correlation Coefficient	1.000	0.305
		Sig. (2-tailed)		0.107
		N	29	29
	PCNSDP_Rank 2013_2014	*Correlation Coefficient*	0.305	1.000
		Sig. (2-tailed)	0.107	
		N	29	29

Table 9   Rank correlation between TOPSIS Rank and ST Population as a % of Total State Population Rank, 2013—2014

			TOPSIS_Rank 2013_2014	*STPopPercent_ Rank 2013_2014*
Spearman's rho	TOPSIS_Rank 2013—_2014	Correlation Coefficient	1.000	0.162
		Sig. (2-tailed)		0.402
		N	29	29
	STPopPercent_ Rank 2013_2014	*Correlation Coefficient*	0.162	1.000
		Sig. (2-tailed)	0.402	
		N	29	29

Table 10 Rank correlation between TOPSIS Rank and Total Literacy Rate Rank, 2013—2014

			TOPSIS_Rank 2013_2014	STPopPercent_ Rank 2013_2014
Spearman's rho	TOPSIS_Rank 2013_2014	Correlation Coefficient	1.000	0.286
		Sig. (2-tailed)		0.132
		N	29	29
	TotalLiteracy_ Rank 2013—2014	Correlation Coefficient	0.286	1.000
		Sig. (2-tailed)	0.132	
		N	29	29

Table 11 Rank correlation between TOPSIS Rank and Per Capita NSDP Rank, 2003—2004

			TOPSIS_Rank 2003—2004	PCNSDP_Rank 2003—2004
Spearman's rho	TOPSIS_Rank 2003—2004	Correlation Coefficient	1.000	0.229
		Sig. (2-tailed)		0.233
		N	29	29
	PCNSDP_Rank 2003—2004	Correlation Coefficient	0.229	1.000
		Sig. (2-tailed)	0.233	
		N	29	29

Table 12 Rank correlation between TOPSIS Rank and ST Population as a % of Total State Population Rank, 2003—2004

			TOPSIS_Rank 2003—2004	STPopPercent_ Rank 2003—2004
Spearman's rho	TOPSIS_Rank 2003—2004	Correlation Coefficient	1.000	0.401*
		Sig. (2-tailed)		0.031
		N	29	29
	STPopPercent_ Rank 2003—2004	Correlation Coefficient	0.401*	1.000
		Sig. (2-tailed)	0.031	
		N	29	29

*Correlation is significant at the 0.05 level (2-tailed).

Table 13 Rank correlation between TOPSIS Rank and Total Literacy Rate Rank, 2003—2004

			TOPSIS_Rank 2003—2004	TotalLiteracy_ Rank 2003—2004
Spearman's rho	TOPSIS_Rank 2003—2004	Correlation Coefficient	1.000	0.251
		Sig. (2-tailed)		0.189
		N	29	29
	TotalLiteracy_ Rank 2003— 2004	Correlation Coefficient	0.251	1.000
		Sig. (2-tailed)	0.189	
		N	29	29

Table 14 Rank correlation between TOPSIS Ranks of 2003—2004 and 2013—2004

			TOPSIS_Rank 2003—2004	STPopPercent_ Rank 2003—2004
Spearman's rho	TOPSIS_Rank 2003—2004	Correlation Coefficient	1.000	0.608**
		Sig. (2-tailed)		0.000
		N	29	29
	TOPSIS_Rank 2013—2014	Correlation Coefficient	0.608**	1.000
		Sig. (2-tailed)	0.000	
		N	29	29

**Correlation is significant at the 0.01 level (2-tailed).

From the above results only two rank correlations are found to be statistically significant — between TOPSIS_Rank2013_2014 and TOPSIS_Rank2003_2004 and between TOPSIS_Rank2003_2004 and STPopPercent_Rank2003_2004.

Considering the first one, it implies a consistency in the process of progress for the States regarding all the indicators of MDGs taken together. The rank correlation coefficient is found to be 0.608 which is significant at 1% level of significance. From the rank tables it can be observed that barring a few exceptions ranks have not changed much for the States over the decade. For the State of west Bengal there is a drastic fall from rank 3 to rank 22 which needs proper introspection. Rank of Tamil Nadu has also fallen from 6 to 16. Lack of political leadership might have been one of the reasons for this performance of the two states which needs to be explored further. For Uttaranchal, Sikkim,

Karnataka, Assam and Arunachal Pradesh significant improvements can be observed in terms of ranking. For Arunachal Pradesh, Sikkim and Uttaranchal the changes are most remarkable (from 19 to 4, from 25 to 7 and from 14 to 3, respectively). It is interesting to note that Shannon's weights are highest for the indicators related to environmental sustainability and telecommunication and information technology. These have worked in favour of the three states mentioned above.

Considering the second significant correlation result between TOPSIS_Rank2003_2004 and STPopPercent_Rank2003_2004, it appears that social backwardness of States measured as percentage of ST population in total population might have been an impediment one decade ago, in the progress of the States in terms of MDG indicators. However, in 2013—2014, it is no more significant reflecting on an overall process of social inclusion which was indeed an important issue during the time of inception of MDGs.

Most interestingly, States' ranks with respect Per Capita Net State Domestic Product or Overall Literacy Rate have not shown any positive correlation with Topsis ranks either in 2013—14 or in 2003—2004. Some probable reasons can be discussed for these results.

So far as Per Capita Net State Domestic Product is concerned, it gives only an average picture of the State's wellbeing ignoring the underlying distribution pattern of the same across the socio-economic classes which plays a greater role for achieving MDGs.

Next, consideration of total literacy rate probably does not give the actual picture about enlightenment of people in a State. So a more comprehensive index of education considering all levels might be a better choice for this purpose. However data availability becomes the greatest hindrance in this process

CONCLUDING REMARKS

After a thorough investigation of the status of MDG indicators across the States of India in the present study, it appears that the policy of social inclusion which is showing good results for the progress of MDG indicators as evident from the above analysis, needs to be continued even though formally the target period has ended in 2015.

Another important issue requires adequate attention. Given the fact that Per Capita Net State Domestic Product and Total Literacy Rates do not have much connection with the TOPSIS ranking of MDG indicators, it appears quite obvious that some other important factor is playing a larger role which is not captured here. Even though some limitations of the above two included factors have been mentioned in Section IV, it still remains to be understood why a low statistically significant correlation is also not found. For that matter, an obvious factor appears

be political leadership at State and Central level. Increased social inclusion might have also been a positive result of political leadership at center where the same political party remained in power for the period 2004—2014.
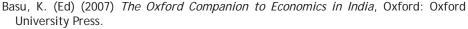
However due to lack of measurability of political leadership this factor could not be included in the study for the calculation of correlation. Remaining in power of the same political party for a long period may appear to be a necessary condition but not a sufficient condition for achieving political leadership. What is important is good political leadership for the betterment of development indicators since people get access to the facilities through a government run by any political party. Measurability of political leadership needs to be explored in any future study to do justice to the analysis about determining factors of progress in development indicators.

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BIOGRAPHICAL NOTES

Ranajit Chakrabarty has recently retired from University of Calcutta (Kolkata) after serving the University as Professor of Management for more than 40 years. He had more than 100 research publications in National and International Journals and he had produced about 15 PhD students.

Mahuya Chakrabarti is presently serving Bethune College, Kolkata (India) as an Assistant Professor of Economics. She did her graduation with Honours in Economics from Presidency College, Kolkata and later completed her Master's Degree in Economics from University of Calcutta with Statistics and Econometrics as her special paper. Ms Chakrabarti has recently submitted her PhD thesis in Marketing Management from the Department of Business Management, University of Calcutta under the supervision of Prof Ranajit Chakrabarty. Her research papers have been published in reputed journals like International Journal of Development Management, The IUP Journal of Marketing management, Research Journal of Economics and Business Studies, Global Vistas, etc.

Ayan Chattopadhyay born in Oct 1974, New Delhi, he has received BSc, BTech, MBA, PhD (Management), MIMA, FISBM and FIAEME. A Marketing professional with 15 years of experience; worked with GKB (Essilor), Sony, Samsung, Videocon, LG and presently heading Zonal Marketing for Eastern Zone of India at Future Retail Ltd. as Senior Manager. He is a Life Member of All India Management Association & Calcutta Management Association; Fellow of Indian Society of Business Management and International Association for Engineering & Management Education. He is a regular visiting faculty of Post Graduate Programs in Management for the last 10 years at IISWBM (Calcutta University), Kalyani University, Amity University and many more Management Institutions of repute. He has 22 publications to his credit in reputed National & International journals and received Turner's best performer award for channel management, National Scholarship award and Excellent Paper award at 9th China International Academic Seminar for Universities, Beijing, 2009

APPENDIX

S. No.	State	2013—2014	2013—2014
	Table A1 capita net state domestic product at current prices (Rupees)		
1	Andhra Pradesh	21,372	88,876
2	Arunachal Pradesh	19,029	84,869
3	Assam	12,821	46,354
4	Bihar	5362	31,229
5	Chhattisgarh	14,963	58,297
6	Delhi	49,494	219,979
7	Goa	57,369	200,514
8	Gujarat	26,672	96,976
9	Haryana	29,504	132,089
10	Himachal Pradesh	25,059	92,300
11	Jammu & Kashmir	15,318	58,593
12	Jharkhand	11,999	46,131
13	Karnataka	21,238	84,709
14	Kerala	24,492	88,527
15	Madhya Pradesh	13,722	54,030
16	Maharashtra	28,848	114,392
17	Manipur	13,732	36,937
18	Meghalaya	18,135	58,522
19	Mizoram	22,207	63,413
20	Nagaland	20,746	77,529
21	Orissa	12,645	54,241
22	Punjab	28,607	92,638
23	Rajasthan	15,738	65,098
24	Sikkim	22,062	176,491
25	Tamil Nadu	23,358	112,664
26	Tripura	20,357	60,963
27	Uttar Pradesh	10,637	37,630
28	Uttarakhand	16,982	103,349
29	West Bengal	20,548	69,413

Source: Directorate of Economics and Statistics of respective State Governments.

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S. No.	State	2001	2011
	Table A2 State-wise ST population as a % of total population		
1	Andhra Pradesh	6.59	7.00
2	Arunachal Pradesh	64.22	68.79
3	Assam	12.41	12.45
4	Bihar	0.91	1.28
5	Chhattisgarh	31.76	30.62
6	Delhi	0.00	0.00
7	Goa	0.04	10.23
8	Gujarat	14.76	14.75
9	Haryana	0.00	0.00
10	Himachal Pradesh	4.02	5.71
11	Jammu & Kashmir	10.90	11.91
12	Jharkhand	26.30	26.21
13	Karnataka	6.55	6.95
14	Kerala	1.14	1.45
15	Madhya Pradesh	20.27	21.09
16	Maharashtra	8.85	9.35
17	Manipur	34.20	35.12
18	Meghalaya	85.94	86.15
19	Mizoram	94.46	94.43
20	Nagaland	89.15	86.48
21	Orissa	22.13	22.85
22	Punjab	0.00	0.00
23	Rajasthan	12.56	13.48
24	Sikkim	20.60	33.80
25	Tamil Nadu	1.04	1.10
26	Tripura	31.05	31.76
27	Uttar Pradesh	0.06	0.57
28	Uttarakhand	3.02	2.89
29	West Bengal	5.50	5.80

Source: Census Data.

S. No.	State	2001	2011
	Table A3 State-wise total literacy rate		
1	Andhra Pradesh	60.5	67.0
2	Arunachal Pradesh	54.3	65.4
3	Assam	63.3	72.2
4	Bihar	47.0	61.8
5	Chhattisgarh	64.7	70.3
6	Delhi	81.7	86.2
7	Goa	82.0	88.7
8	Gujarat	70.0	78.0
9	Haryana	67.9	75.6
10	Himachal Pradesh	76.5	82.8
11	Jammu & Kashmir	55.5	67.2
12	Jharkhand	53.6	66.4
13	Karnataka	66.6	75.4
14	Kerala	90.9	94.0
15	Madhya Pradesh	63.7	69.3
16	Maharashtra	76.9	82.3
17	Manipur	70.5	79.2
18	Meghalaya	62.6	74.4
19	Mizoram	88.8	91.3
20	Nagaland	66.6	79.6
21	Orissa	63.1	72.9
22	Punjab	69.7	75.8
23	Rajasthan	60.4	66.1
24	Sikkim	68.8	81.4
25	Tamil Nadu	73.5	80.1
26	Tripura	73.2	87.2
27	Uttar Pradesh	56.3	67.7
28	Uttarakhand	71.6	78.8
29	West Bengal	68.6	76.3

Source: Census Data.