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Economic Development and Foreign Direct Investment: How to Create Sustainable Development
An Analysis of the Potential for Sustainable Development on the Indian Subcontinent

Summary: Focusing critically on the effects of the conditions for foreign direct investment on sustainable growth in the recipient country, this paper analyzes the potential for investments in environmental innovations in India. The definition of sustainability applied in this paper incorporates economic development and investment which promotes environmentally and socially friendly production and innovation. As the Indian economy experienced strong growth in GDP in recent years, but is still lagging behind in providing the basic needs of clean water, clean air and proper waste management for households and companies, the necessity for sustainable development exists. From a methodological point of view this paper uses macroeconomic data to evaluate quantitatively the potentials and needs of Indian states. This results in a state ranking showing the potential for sustainable development in selected Indian states, based on economic and environmental indicators.

Key words: Sustainable development, Regional analysis, Foreign direct investment, Environmental indicators, India.

JEL: R11, F23, O11, O57.

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India, which started introducing major economic reforms in the early 1990s, has experienced GDP growth rates of around 8% and 9% (Nathalie Homlong and Elisabeth Springler 2009, p. 10) in recent years, far above the growth rates of western industrialized nations like the USA or European Union member states. Despite this rapid growth, social development indicators are lagging behind, as the United Nations Development 2009 report points out, where India is ranked 134 out of 182 countries (United Nations Development Program (UNDP) 2009). Additionally there are major environmental problems which put pressure on India's development, such as the lack of organized garbage collection, the fact that about 90% of residential waste water remains untreated (Wirtschaftskammer Österreich (WKO) 2006a, p. 64) and insufficient energy supply in combination with poor air quality.

Given these socio-economic and environmental problems, the goal of future economic development and foreign direct investment has to be the provision of so-

cially and environmentally sustainable development. Consequently this requires an adequate measurement of economic development, which is to be found in the concept of *sustainable development*. Numerous institutions like the United Nations Development Program, the Global Footprint Analysis or aspects of the Sustainable Livelihood Framework provide alternative concepts by which to measure sustainable economic growth. These approaches put the individual at the center of the analysis and discuss the immediate impacts, which are manifested as multi-causal relations, between economic growth and livelihood assets - like human, natural, financial, social and physical capital - or poverty and human development.

The definition of sustainable development applied in this paper draws heavily on these concepts, but focuses on the evaluation of attractiveness of regions for investment and innovations, which provide the potential for improvements in sustainable development. Unlike narrow development concepts, which put a strong emphasis on the economic background for assessing the attractiveness for investments in a region, this paper aims to provide a rationale for investments that take the socio-economic and environmental strengths and weaknesses of a region or a nation into account. Environmental technology projects can help to provide sustainable development in regions which are lagging behind environmentally and socio-economically, and foreign direct investment is a major force in introducing and applying environmental technology in India, and can help to boost sustainable development.

This means that the approach used in this paper focuses on the existence of an adequate business climate, which means that the companies' investments in environmental technology projects is at the center of the analysis. As a result of the right choice of location, positive effects for livelihood assets, in other words positive socio-economic and environmental effects, can be created. The relation between economic development and socio-economic and environmental effects is driven by a *multidimensional framework* of administrative commitment and economic reform. With the use of 13 indicators this paper presents such a multidimensional framework that enables a ranking of regions according to their potential to promote sustainable development.

The paper proceeds as follows: stylized facts about the environmental situation in the areas water, air, energy and waste management are presented in Section 1. In Section 2 a quantitative analysis is conducted of the potential for investments leading to environmental improvements in selected Indian states. Section 3 presents a conclusion and an overview of further steps towards improving sustainable development in India.

1. Stylized Facts on Environmental Issues

As presented above, the definition of sustainable development applied in this paper focuses on economic development in combination with improvements in socio-economic and environmental standards. The following four areas water, air, energy and waste management provide the highest potential for socio-economic and environmental development on the Indian sub-continent.

1.1 Water

With an availability per inhabitant of 1.704 cbm (Bundesagentur für Außenwirtschaft 2007a, p. 13), the water resources in India are considered to be in chronically short supply. Irrigation lays claim to about 85% of the total water supply, followed by households with 7%, industry with only 2%, energy with 1% and other user groups with 6% (estimates for 2010, Central Water Commission 2007). 90% of the urban and 96% of the rural population have access to water supply near their dwelling (Bundesagentur für Außenwirtschaft 2007a, p. 13), but only an estimated 39% have access to water within their house or apartment, with 65% in cities and 27% in rural areas (Homlong and Springler 2007). Since the public water supply system in many regions in India is inadequate and unreliable, about 70% of the irrigated land is watered with groundwater and 80% of the water used by households is groundwater (John Briscoe and R.P.S Malik 2006, p. 8). Pollution of groundwater by industries, fertilizers, pesticides, and human and animal fecal matter in parts of India is therefore especially problematic for the life quality of the Indian population, and also rivers and coastal waters are affected by pollution (Central Pollution Control Board).

According to the Census of India in 2001, 56% of the urban population and 20% of the rural population have access to "improved sanitation", with 22% of the urban and 2% of the rural population having access to a private sewage connection (World Health Organization (WHO) 2006).

1.2 Air

India's megacities are faced with poor air quality. Two main areas of air pollution can be distinguished: CO_2 emissions and RSPM emissions.

As Bas van Ruijven et al. (2008, p. 1653) point out, Indian mega-cities like Kolkata, Delhi, Pune or Kanpur reach average volumes of RSPM (*respirable particulate matter*) which are more than 10 times higher than comparable data for Western industrialized cities like Paris, London, Milan or even Athens. The major source of the rise in RSPM pollution is the drastic increase in the number of vehicles in the last few years, which account for over 60% (WKO 2006b, p. 5). First steps to diminish RSPM volumes in mega-cities started with the introduction and further development of *compressed natural gas* (CNG), which was introduced in public transport in Delhi as early as 2003. Similar to the increase in RSPM, CO_2 emissions have also been rising significantly. Estimates for future CO_2 emissions forecast an increase of up to 1.5 metric tons of emissions per capita by 2030 (Energy Information Administration 2007). The energy sector has to be targeted with investments and innovations, as it is a major source of CO_2 emissions.

1.3 Energy

Similar to the problems mentioned in the areas above, when it comes to the provision of energy the Indian state also suffers from a level of production that is too low to satisfy the increasing demand for energy. The average shortfalls in electricity supply per year between 2002 and 2008 ranged from 7.1% to 9.8%, with peaks between 11.2% and 16.6%. Hydropower contributes 25% and other forms of renewable en-

ergy account for just 8% of India's energy production. With their 53%, coal power plants represent the largest share. The high share of coal as an energy source contributes to air pollution, as pointed out in Section 1.2. Energy production varies clearly between different regions, with the highest production in the South of India, followed by the West and North of the country, while the East and Northeast contribute only a small share to the total energy production (Central Electricity Authority 2008). Inefficiency and transmission losses are substantial, ranging according to different studies from 25% (Bundesagentur für Außenwirtschaft 2007b, p. 12) to 52% (WKO 2006a, p. 6).

1.4 Waste Management

There are distinct variations between the extent of waste management: between 50 and 90% of the waste in cities across India is collected. Of the collected waste, about 94% are disposed in landfills without prior treatment of any kind. There are also clear differences between different cities in the quantity of waste produced. Furthermore, there are variations in the share of compostable waste and recyclable waste (Federation of Indian Chambers of Commerce and Industry (FICCI) 2006), which is of importance for the potential operation of (profitable) recycling and compost plants, as well as waste-to-energy-plants. The Municipal Solid Waste Rules from 2000 stipulate the establishment of waste treatment plants, the decontamination of existing landfills, and increased waste separation and recycling (Ministry of Environment and Forests 2000). The cities are responsible for realizing these goals, but only 9% of class I – cities (cities with more than 1 million inhabitants) have followed the guidelines concerning waste treatment and only 1.4% those referring to landfills (P.U. Asani 2005, p. 3).

In spite of the existence of laws governing the proper treatment of dangerous waste, large quantities of toxic waste are illegally disposed into rivers or in landfills without prior treatment (Dinesh C. Sharma 2005).

2. Quantitative Analysis: Potentials for Sustainable Development

To apply the above definition of sustainable development in a multidimensional framework in a quantitative analysis, 13 indicators have been chosen, which represent the economic potential for investment together with the environmental and socio-economic status of selected Indian states. The dataset constructed for the quantitative analysis in this paper is based on data from Laveesh Bhandari and Sumita Kale (2007; various states), Bundesagentur für Außenwirtschaft (2007a), FICCI (2006), and Central Statistical Organisation (2006). In all cases the most recently available data is used. As Indian states show considerable variation in their economic development, comparative regional studies (see among others Johannes Wamser and Peter Sürken 2005; Deutsche Investitions- und Entwicklungsgesellschaft, Institut für Management- Markt- und Medieninformationen GmbH, Rödl&Partner 2007) focus primarily on the development of those eleven Indian states that provide the best administrative, legal and economic framework for innovation and investment (espe-

cially for foreign direct investment): Andhra Pradesh, Delhi, Gujarat, Haryana, Karnataka, Kerala, Maharashtra, Punjab, Tamil Nadu, Uttar Pradesh, and West Bengal. The selected indicators include six basic economic development indicators and seven environmental and socio-economic indicators. The reason for selecting these six economic indicators is to evaluate the investment climate of the respective state. In most analyses of foreign direct investment and in studies which focus on the ranking of potential investment areas, different approaches - mainly *cost or market driven* approaches (see among others John H. Dunning 1993; Wilfried Altzinger 1998) - are distinguished. Such a distinction does not seem to be useful for the analysis of regions within a sustainable development approach. Studies which, as in our paper, focus on a regional ranking based on cost- or market-driven approaches, imply clear causal relations between e.g. wage levels and the attractiveness of a region. Given a cost-approach a lower level of wages would lead to a higher ranking of the region. Such a result cannot be argued within the underlying concept of sustainable development that is applied in this paper, which focuses on the simultaneous promotion of economic and social development. Therefore the indicators used for the economic analysis in this paper were specially selected for their neutrality in the cost-market distinction. Of course the authors are aware of the fact that specific indicators indirectly promote a cost- or market-driven approach. This would e.g. be the fact for the cost approach, when labor productivity is taken into account. Also the decision-making process might be biased due to the influence of governmental support in monetary and non-monetary terms. Any monetary support could shift the cost structure, whereas the promotion of e.g. environmental awareness could enlarge the market for these companies. This paper assumes that firms do not usually incorporate these long-term indirect effects in their location decision process and therefore regards these variables as "neutral".

2.1 Economic Indicators

The indicators presented in this section are the focus of the regional development analysis by Homlong and Springler (2009). Some of the data and methodology in this analysis have been updated, so that certain ranking results have shifted. The following economic indicators are included in the analysis:

Labor productivity: Labor productivity is an important criterion for the development potential of a region and is neutral in the cost-market distinction. The data used in this paper build on the annual rate of industrial production, measured as the total production volume of the secondary sector divided by the number of workers. Although the number of workers published in official statistics might be biased, as workers who work less than six months in the sector are not included in the worker-statistics, this approach is chosen, as it is assumed that this bias is similar for all regions in India and can therefore be neglected in the regional ranking.

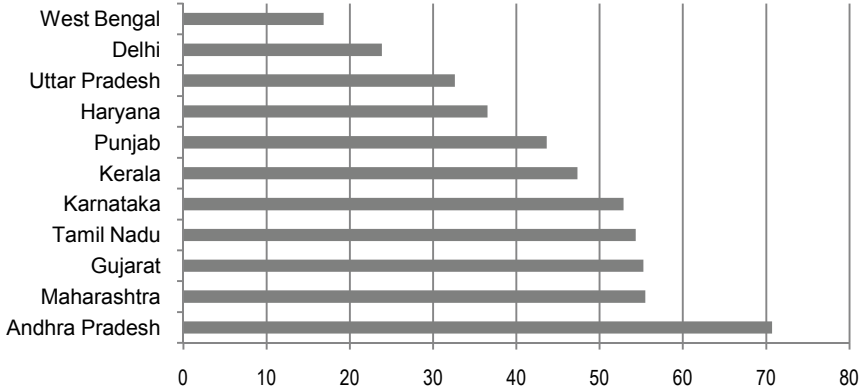
The potential of workers as well as their social capabilities are measured by the indicator *education*: numerous partnerships between foreign and Indian companies, which aim to promote long-term sustainable growth for the Indian subcontinent, require that workers have a certain level of education. The indicator is measured as the ratio between the number of institutions of higher education, which include uni-

versities, colleges and other institutions of national importance (there is no ranking between disciplines as it is assumed that any kind of higher education promotes the social capabilities of the population and increases the general educational level of the region) and the size of urban population. This means that the indicator measures not the actual number of persons with higher education, but the potential for development in the near future. Especially due to the current transformation of the society and the increasing role of women in the labor force, this indicator seems to give a better picture of the socio-economic situation in a region than the ratio of current higher education degree holders would do. The justification for this indicator is derived from a survey which includes more than 80 interviews with Indian firms, their foreign partners, and public administrative offices. For a detailed analysis on the importance of education see Homlong and Springler (2009).

An indicator to measure the socio-economic effectiveness of the administrative structure and the potential for foreign direct investments in a region is the *ratio of the organized sector*. In general the Indian secondary sector is split up into so-called registered and non-registered companies (less than 10 employees). The more restrictive and overprotective the labor law, the greater the incentive not to register a company. As very restrictive labor laws are said to diminish a business's flexibility in production, registration is avoided. Although the motivation to set up strict labor laws is to improve the social situation of workers, the contrary will be the effect once companies design their legal background in such a way as to avoid registration. As a result, workers are left without labor protection. According to our analysis, a high ratio of the organized sector (high number of registered companies) reflects well-designed social protection, which is not overprotective but provides social benefits for workers. Therefore the ratio of the organized sector correlates positively with investment potential in the empirical analysis and fulfills the requirements of socially sustainable investment and development.

Another indicator strongly related to the position of the workers in the economy is the level of *labor conflicts* in a region. The higher the ratio of man-days lost compared to the overall number of workers in the region, the lower the investment potential.

The commitment and effectiveness of the public administration to promote economic development is measured by the number of *special economic zones administrated in the area*, as well as by the *investment quota*. It has been reported numerous times in the past that the willingness of national and international companies to invest has been hampered by long and difficult administrative procedures. The indicator *investment quota* shows the ratio of the number of actual investments that occurred to the number of industrial entrepreneur's memoranda, which represent the willingness of a company to invest and expand. We are aware of the fact that the effective investment also depends on the overall economic climate and potential prosperity of the sector, but it can be assumed that the Indian states would be affected similarly by an overall decrease in expectations. Therefore such trends should not affect the relative investment climate of the respective Indian state.



Source: Authors' calculations.

Figure 1 State Ranking. Economic Indicators

The results of this economic analysis are presented in Figure 1 as an overall ranking of the 11 selected Indian states. All indicators described above, apart from the indicator *industrial dispute,* are positively correlated with economic development and investment potential. With its more than 70%, Andhra Pradesh shows the highest overall score on economic indicators, followed by Maharashtra and Gujarat. With less than 20% West Bengal has the lowest score.

The total ranking is computed as an average of the relative single rating of each indicator; all indicators have equal weight in the analysis. The highest potential score is always shown as 100% and symbolizes the highest score reached in the respective indicator. This method is applied as companies do not usually select a location or investment region because of one specific factor, but focus on the overall investment climate. This means that an Indian state that earns a medium score on all indicators might be ranked highest in the total scoring, as other states fluctuate between very strong and very poor performances. Therefore Figure 2 gives an overview of the individual results of each indicator in the respective state.

The effect that an extremely poor score on one indicator might have on the total ranking is visible with the indicator industrial disputes. Data show that the amount of man-days lost is far bigger in West Bengal than in any other state. As the relative position of each state and each indicator (I) is computed as follows: $I = (x1\text{-}xmin) / (xmax\text{-}xmin)$, the poor performance of West Bengal leads to very good results for the other states. On the other hand, this method makes it possible for an extraordinarily good performance on one specific indicator manifest itself, as it is e.g. the case with Tamil Nadu. This state is far ahead in the scoring of the indicator productivity compared to the other states. In this state the individual socio-economic indicators show that the workers enjoy a comparatively good and secure position, while the administrative effectiveness of the state seems to fall behind. Compared to that, the state Haryana shows a much stronger focus on the effectiveness of administrative structures to attract companies. This can be seen by the high scores on the indicators in-

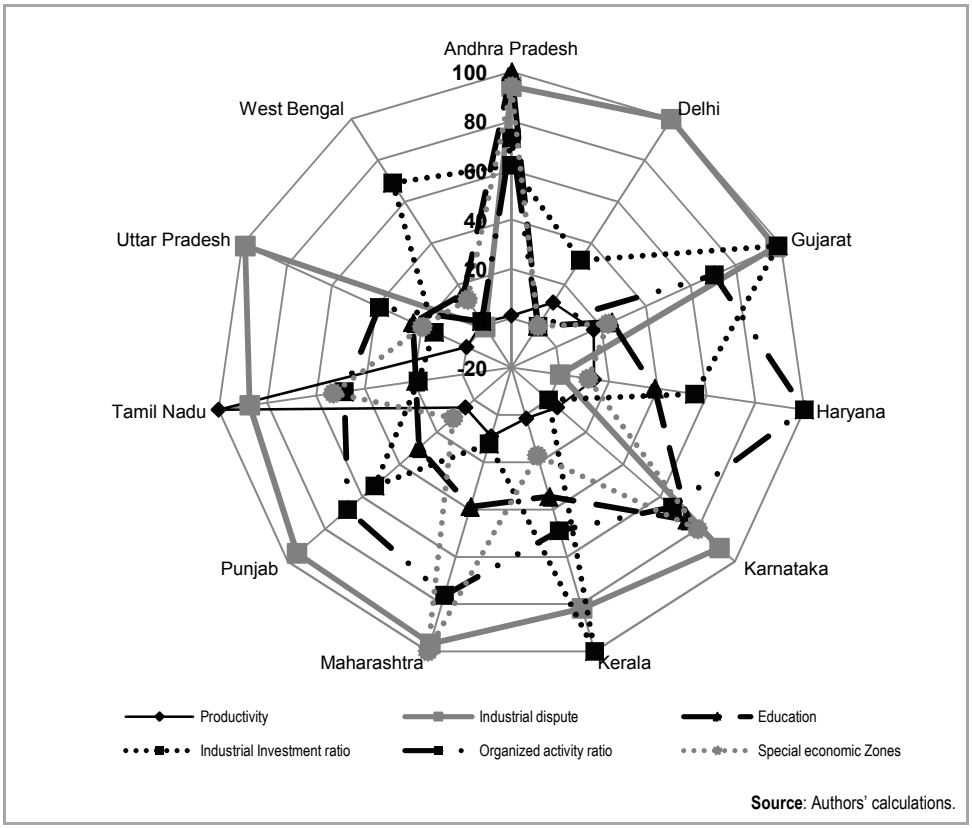


Figure 2 State Scoring per Indicator. Economic Indicators

dustrial investment ratio and organized sector activity. As it regards the overall assessment, Delhi, for example, shows poor results especially in the number of Special Economic Zones and the commitment of the state to promote further investment, as opposed to Andhra Pradesh, which achieves high scores on many indicators. Other states like, for example, Maharashtra, Kerala or Karnataka show some strengths and some weaknesses in indicators, so that they hold an overall medium position.

2.2 Environmental Indicators

From a methodological point of view the assessment of environmental indicators and the potential of the specific regions followed the same approach that is used for the economic indicators presented above. The selection of environmental indicators results from the needs and potentials in the four most important environmental areas, which are discussed in Section 1 of this paper: water, air, energy and waste management. All indicators used in the quantitative analysis have a positive causation and show the environmental potential of the region or the urban areas in the respective region.

All four areas represent the socio-economic needs, as well as the international pressure for improvement. As shown in Section 1 of this paper, especially water and energy are characterized by a shortage of supply. Furthermore, the area of energy production is strongly related to the need for cleaner air. Waste management, on the other hand, shows a strong correlation to the need to reduce water pollution.

These needs and interrelations between the areas are represented in the following by seven indicators. Due to the special needs of households to have access to (clean) water, the section *water* is overrepresented with three indicators: the indicator *sanitation* shows the average of urban households with access to piped water as well as drinking water and toilets. Despite the fact that differences exist between urban and rural areas, especially in regard to the access to drinking water, this paper focuses only on the urban situation due to the focus on urban areas in the data provision of the other environmental factors used. The other two indicators in the section *water* are *WRES* and *WSAV*. Ground and surface water resources are measured by the indicator *water resources* - *WRES*. While this indicator is primarily determined by the geographic and climatic conditions of the state, the indicator *WSAV* - *water saving* represents the ratio of water purification in urban areas.

To show the potentials for reduction in air pollution the indicator *AIR* is used, which compares the number of urban vehicles (private and public) to the size of the population. This indicator is directly derived from the arguments presented in Section 1, in which transport is detected as the main cause for the increase in RSPM in Indian cities. To show the potentials for savings and reductions in RSPM as a positive correlation, the number of vehicles is measured, not the volume of RSPM emissions.

The second area of air pollution, CO_2-emissions, is strongly interrelated with energy production. To account for this interrelation, the indicator *ENPRO* - *energy production* focuses on the potentials for alternative energy production. In a similar way to the indicators above, a high fraction or strong increase of alternative energy production in the past is evaluated as the potential for the future, as additional investments can build on existing knowledge and the specific strengths of the region. In spite of the overall need for additional energy production, methods which are problematic in the light of sustainable development, like energy from coal or nuclear power, are not included in the measurement of the increase in capacity. The increase in megawatts through wind, solar, hydro and biomass power plants is at the center of analysis.

Waste management is represented with the indicator *WAMA* - *waste management*, which shows the ratio of recycled and composted waste to the total amount of waste in urban areas, and *WAEN – waste to energy*, which shows the amount of energy resulting from waste treatment.

The overall ranking of potentials for improvements in environmental standards reveals a similar picture compared to the evaluation of economic indicators presented in 3.1. As Figure 3 shows, Andhra Pradesh scores highest also here, followed by Maharashtra. West Bengal scores lowest. It is interesting to observe that all states between the ranking of Kerala and Haryana show very similar results. Although the comparatively poor performance of Kerala in this respect might be surprising - since Kerala's development is strongly driven by tourism, the idea of eco-friendly touristic structures and by advertising its pristine nature - the scoring can be explained especially by the lack of water purification (see Figure 4).

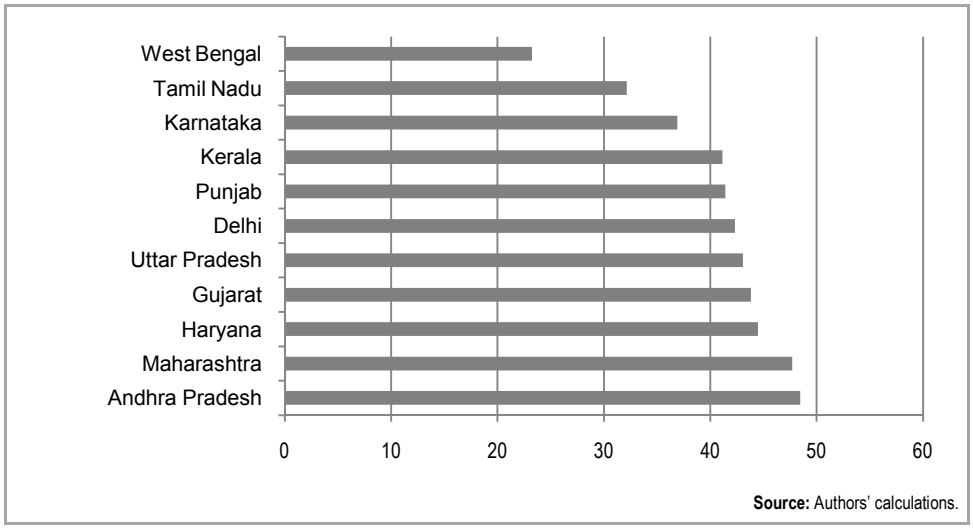


Figure 3 State Ranking. Environmental Indicators

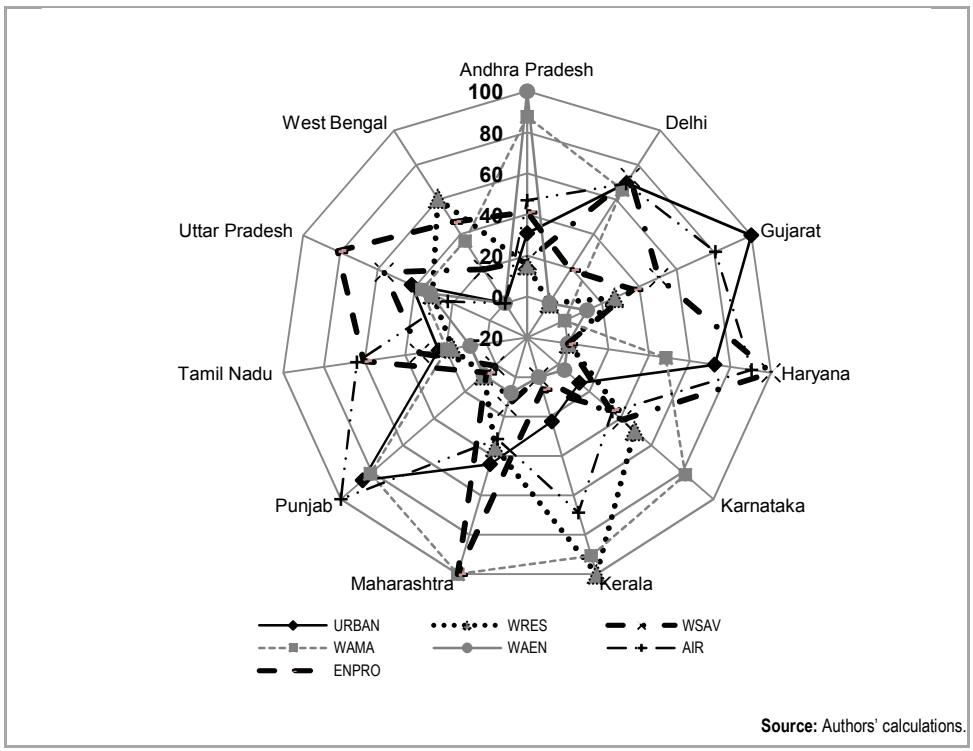


Figure 4 State Scoring per Indicator. Environmental Indicators

The fact that the ranking between the states is much closer for environmental factors than for economic indicators can also be seen in Figure 4, which represents the scoring on the individual indicators. More states, like Karnataka, Delhi or Uttar Pradesh, show medium positions in most environmental indicators. The indicator *waste to energy* might bias the overall scoring, as this approach is only used in a few states and not applied at all in others.

Overall it has to be noted that also those states which scored highest in the ranking applied in this paper have waste management or water quality standards that are not comparable with the standards in Western industrialized nations. This means that a score of 80% or 90% shows that measures have been taken, but the need for further development is far from being fulfilled. Therefore from an investment point of view, it seems to be plausible to start with the highest scoring regions, since some environmental awareness - which is a pre-condition for environmental projects that is not to be neglected - seems to have been created.

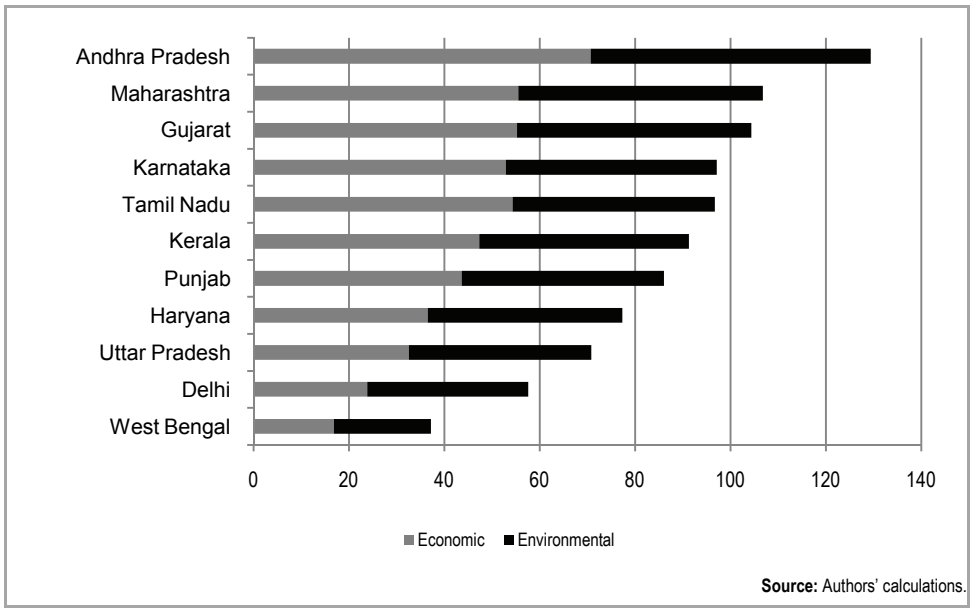


Figure 5 Total Ranking. Economic and Environmental Indicators

The total ranking of economic and environmental factors is not changed due to the more narrow scores on environmental indicators. As Figure 5 shows, Andhra Pradesh achieves in total almost 130% of the potential maximum of 200%, with 100% given for each of the areas of economic and environmental standards. This also shows the need for further investments and innovation, as well as the enormous differences between the states.

3. Conclusion and Outlook

The quantitative analysis shows that the indicators chosen provide a valid ranking of the regional potential for sustainable development. The indicators are neutral in the question of cost- or market-driven foreign direct investment, which means that the effects on socio-economic sustainability can be detected. Defining those regions with the highest development in social and environmental terms as those with the highest potential follows the hypothesis that a certain degree of environmental awareness has already been created in those regions and will lead to further improvements that might help to spread social and environmental awareness all over the Indian subcontinent. This does not mean that the responsibility of administrative authorities to provide further incentives is neglected in the analysis. On the contrary, the effectiveness of public action has to be improved in numerous areas. Among others, environmental technology projects need to be prioritized over other projects. Lack of funding on the state level is an issue which could be tackled through the provision of more international funding.

Besides commitment on the state level, also environmental laws and policies are crucial in improving sustainability. While India, especially in view of its status as a developing country, has an extensive set of environmental laws and regulations, the effective enforcement of these laws is often problematic. This was also pointed out in an interview with a joint Austro-Indian environmental technology venture, which the authors conducted in connection with a study about the potential for Austrian environmental technology companies in India. The interview partners from this company, which works with energy efficiency and waste management, stated that while the level of environmental laws in India is satisfactory, thereby providing good potential for improvements and for activity by environmental technology companies, enforcement of these laws is often a problem. In remote areas, companies comply much less with these laws, and by paying bribes companies in many cases get away with breaking environmental laws. In large cities like Delhi enforcement is much stricter (interview Ashok Kumar Gautam and Lalit Sharma 2008).

The responsibility for the enforcement lies with the Indian states. However, the authorities on the state level in many cases lack both the know-how and the financial funds to introduce environmental technology, and also lack the staff to monitor whether companies and municipalities comply with environmental standards (World Bank n.d. pp. 33-34). As pointed out by Gautam and Sharma (2008), corruption also plays a role in this regard. Furthermore, problematic policies, such as (too) low price levels for water and pricing systems which are not based on consumption, result in the inability of many cities to cover the costs of maintenance of the public water supply system, and often make investments in improvements impossible (Marie-Helene Zerah 2006, p. 146).

As several authors (see for example Andrew Chen and Jennifer Warren Kubik 2007; Organization for Economic Cooperation and Development 2009) point out, clear variations in the levels of investment in infrastructure are a key reason for differences in economic growth and attractiveness for FDI in different states. On the one hand, lack of infrastructure makes the respective states less attractive for FDI; on the other hand poor infrastructure like lack of waste treatment, water and sanitation

facilities result in unsustainable development paths. Since investments in infrastructure often require extensive funding, stronger focus on attracting private investors, who would not only build, but also operate facilities, is advisable (Chen and Kubik 2007). In the field of waste treatment BOOT (build, own, operate and transfer)-models are already in place in some Indian cities (Homlong and Springler 2009, pp. 171-172), and their numbers are increasing. However, in other areas like, for example, water supply, such schemes are difficult to realize with today's water pricing system, as mentioned above.

Therefore both a review of problematic policies and the proper enforcement of environmental laws would provide the grounds for further investments in environmental technology projects in India.

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