Environmental Sustainability Index: Andhra Pradesh

Increasing importance has been given to the integration of environment and economic development in policy-planning process. However, particularly in case of India, data deficiency clearly affects the policy making process. Lack of focused information about various sustainability issues, at state and national level, is not available to various stakeholders like policy makers, private sector, Non Governmental Organizations (NGOs), preventing any further sustainability analysis. Environmental Sustainability Index (ESI), developed by Centre for Development Finance attempts to address these issues of environmental sustainability. ESI, formulated primarily as a diagnostic tool for informing and empowering policy makers, citizens, researchers and activists, seeks to fulfil three main objectives. First, to provide information to ensure evidence-based policy making; second, to facilitate prioritisation of budget allocation between various resource sectors and lastly, to measure and monitor sustainable development at the state level over time.

This research project is an effort to map the current sustainability levels of the Indian states, while simultaneously projecting their ability to protect the environment in the future. Dimensions of sustainability are captured through forty-one indicators, culled from a wide range of themes such as air, water, land, forests, and impacts of pollution on ecosystem and human health and policy responses by various stakeholders. Based on the aggregate score, states are categorised into five groups: 'most' sustainable (top 20 percentile), 'more' sustainable (60-80 percentile), 'moderately' sustainable (40-60 percentile), 'less' sustainable (20-40 percentile) and 'least' sustainable (bottom 20 percentile).

Each state's environmental resources, capabilities and hence challenges differ from others. Hence the tool compares the states across six peer groups; created on the basis of GDP per capita and contribution to India s GDP. Sub index analysis of peer groups reveals a pattern; similar environmental issues are being faced by states with comparable growth trajectories. Consequently, a deeper analysis of successful sectoral policies is initiated to enhance knowledge about policy initiatives and outcomes at state level. In this context, this case let series aims to highlight initiatives (in terms of policy and implementation measures) taken by various state governments to tackle a plaguing environmental issue in their peer group.

This case let focuses on ***Andhra Pradesh***, categorized under "*yellow*" state which signifies that it scores in the 41-60 percentile category. Even though the state had exploited its ground water in the last, it is addressing the problem by setting up various institutions for effective management of water resources. The following sections provide a snapshot of ESI score and highlight some of the key policies and programs adopted by the State.

ESI Snapshot

ESI Group	Yellow
Other states in same ESI group	Kerala, Tamil Nadu, Karnataka, Goa, Maharashtra
% Contribution to overall India's GDP	8.02
SGDP per capita / annum	32754
% population living below poverty line	8.49
Population density per square km area	293

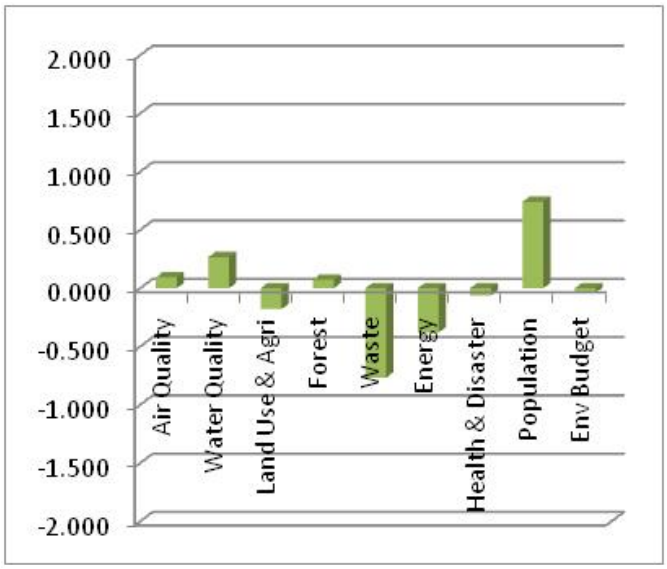

Figure 1: ESI of Andhra Pradesh in 9 Sub-indices

Columns that lies above the X axis depict a better than average performance (as compared to all 28 states). Columns that lie below the X axis depict a less than average performance (as compared to all 28 states). The height of a column indicates the degree to which a state has performed better or worse than others in that particular sub index. All values are in standardized scores. All sub indices are adjusted to ensure that higher values indicate better performance in that aspect of sustainability.

The spider chart shows the sustainability of states in terms of Driving Force-Pressure-State-Impact-Response. All values are standardized scores. Values farther from the centre indicate better performance. A state's higher positive score in 5 different components add up; and higher green area indicates better performance by the state in all components.

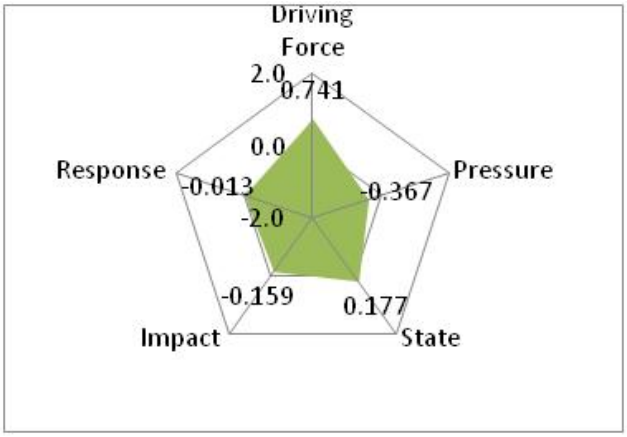

Figure 2: ESI as per DPSIR framework

Introduction

Andhra Pradesh is the fifth largest state in the country in terms of area and population. It has an area of 275 thousand sq. Km, covering 8.37 per cent of the total national geographic area. The state also accounts for 7.41% of India's population (Government of Andhra Pradesh), out of which over 73% of the state population depends on agriculture for their livelihood. Water resources development and canal irrigation is, accordingly, the mainstay for agriculture development. (Arena, 2007)

The total annual yield of surface water[1] is assessed at 2,746 Tmc[2], of which the major contribution comes from Godavari, Krishna and Pennar rivers. Godavari contributes about 1,493 Tmc, which constitutes 54% of the total annual yield of surface water. Replenishable groundwater in the state is assessed at 1,068 Tmc. (Reddy & Kumari, 2007)

The average annual rainfall in the state is around 925 mm, resulting in around 24.4 million ha Mcm of water received through rainfall. (Reddy, 2005) While the state receives up to 500mm rainfall from south-west monsoon, majority of the rain (upto 1,100mm) is received from retreating monsoons.

The total utilization of water in the state is estimated to be around 65169 Mcm[3], with irrigation accounting for almost 99% of the total water consumption. (Irrigation and Command Area Development Dept.). Irrigation requirement in the state has surged drastically. There has been an increase in total irrigated area (net) from 27.47 lakh ha in 1995 to 45.27 lakh ha in five years, as about 70% of the population of Andhra Pradesh depend upon agriculture. (Reddy & Kumari, 2007) This is further aggravated by the fact that rice is the most prominent crop grown in the state, with its cultivation requiring a substantial amount of standing water.

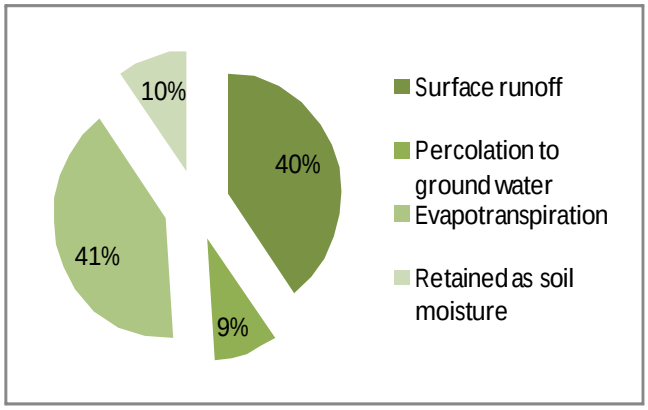

Figure 3: Categorisation of water received through rainfall (%)

Groundwater Management

India is the largest groundwater user in the world, with an estimated usage of around 230 cubic kilometres per year, more than a quarter of the global total. With more than 60 percent of irrigated agriculture and 85 percent of drinking water supplies dependent on it, groundwater is a vital resource for rural areas in India. World Bank has already expressed

[1] Rivers
[2] Thousand million cubic feet
[3] Million Cubic Meters

concerns regarding the over-exploitation of groundwater resources in Andhra Pradesh. (The World Bank, 2010)

Based on the area irrigated at state level, the contribution of groundwater based irrigation to the state's GDP was estimated to be about Rs.70 billion in 2004-05. Besides catering to the irrigation needs, groundwater is an important resource to meet the drinking water needs in the rural areas (estimated to be about 80%), industries and other domestic needs. (AFPRO, 2006)

Policies and Projects

Ground water resources have been exploited to large scale over the last three decades in the state. The trend started with shallow dug wells for drinking water. This was followed by the arrival of the submersible pump and deep drilling technology, as well as manufacturing of an indigenous drilling rig by the Water Development Society (WDS). Further, agencies like the Andhra Pradesh State Irrigation Development Corporation (APSIDC)[4] and the Integrated Tribal Development Agency (ITDA)[5] have drilled about 25,000 bore wells during 1975-1999, which has become more of a profitable business in the recent period. In tune with the efforts made, groundwater extraction is highest in the dry *Rayalaseema* region, reaching 72% with 52% over-exploited assessment units, 57% in *Telangana* and 50% in Coastal Andhra respectively. The Andhra Pradesh Water, Land and Tree Act 2002 has been legislated to control over exploitation of groundwater, and to safeguard drinking water resources. (AFPRO, 2006)

Andhra Pradesh Groundwater Bore well Irrigation Schemes Project (APWELL) was also implemented during the period April 1995 to March 2003, with two annual extensions. The project fully achieved its short-term objective by providing 3,462 groundwater irrigation facilities to small and marginal farmers, bringing an additional 35,000 acres under irrigation. (BIRDS)

In addition, Andhra Pradesh Farmer Managed Groundwater Systems Project (APFAMGS) was made operational in seven drought prone districts of Andhra Pradesh by July 2003 after taking on board a network of NGOS as nodal agencies. The project brought in better economic status for about 14,000 small and marginal farming families in seven drought prone districts of Andhra Pradesh and in totality covered 500 villages is drought prone areas.

Andhra Pradesh Water Management Project (APWAMP)

The lack of comprehensive water management in agriculture has caused concerns about water quantity, quality and equity in Andhra Pradesh. The benefits that the introduction of canal irrigation has brought are not uniformly spread amongst the farmers of the canal commands. Accordingly, ABWAMP had been initiated in the state in 2003 for a period of five

[4] APSIDC was established in 1974 as an autonomous corporation under the Government of Andhra Pradesh, with main objective to take up the onus to provide irrigation facilities to upland areas to uplift small and marginal farmers including SC's and ST's with the funds provided by Government, Institutions and beneficiaries etc. (Government of Andhra Pradesh)

[5] The main objective of ITDA is socio-economic development of tribal communities through income generating schemes allied with Infrastructure Development programmes and protection of the tribal communities against exploitation. (Government of India)

years with a holistic development goal. (Jacobs) The development goal of the project is the 'Improvement of the water use in agriculture and spreading of irrigation benefits to tail end areas and reservation of the agricultural production capacity of agricultural lands in irrigation canal commands of AP'. (Arena, 2007)The project was a collaborative effort by the GoI, the Dutch Government and Food and Agriculture Organization (FAO). Its implementing agency in India was the Acharya N.G. Ranga Agricultural University.

Irrigation Reforms

Agriculture is the mainstay of the people of Andhra Pradesh. However, while it's State Domestic Product (SDP) has risen by 82 percent in a decade (1993-94 to 2004-05); the contribution of agriculture sector to the SDP has decreased from 24.62% in 1993-94 to 13.14% in 2005. One of the major contributing factors towards the decline had been inadequate infrastructure for irrigation of fields. Only about 40% of area under agriculture in the state is irrigated through various sources both under rain fed and irrigated conditions. (AFPRO, 2006)

Institutional Setup

Consequently, with a view to disseminate the technology for higher benefits, the Andhra Pradesh State Irrigation Development Corporation Limited (APSIDC) has been formed as a State Government undertaking in 1974 with an authorized share capital of Rs. 10 crore which was subsequently enhanced to Rs. 125 crore. Until 2006, the APSIDC has created irrigation potential of 774,498 acres through 1,236 lift irrigation schemes at a cost of Rs.508. 02 crores. APSIDC has also commissioned 20,040 ground water schemes creating an irrigation potential of 334,800 acres at a cost of Rs. 244 crores. (AFPRO, 2006)

The mentioned schemes are in addition to the expenditure incurred by the Planning Commission for creation of irrigation potential in the state. As of 2000, Rs. 63846 million had been allocated over five decades, creating an irrigation potential of 4.96 million hectares.

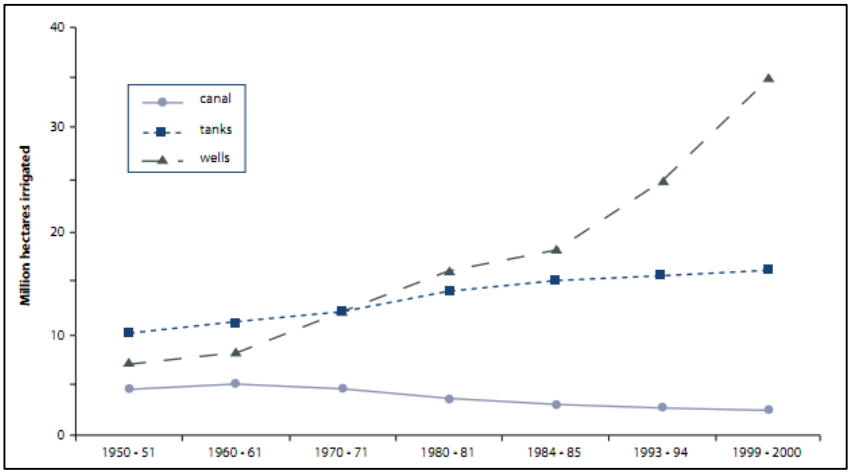

Figure 4: Area under irrigation in Andhra Pradesh (The World Bank, 2010)

Further, the Andhra Pradesh Farmers Management of Irrigation Systems (APFMIS) Act of 1997 was a revolutionary piece of legislation. It was the first of its kind in India, seeking to bring a paradigm shift in irrigation management. The Act contains broad provisions relating to the types of irrigation schemes, tiers of Farmers Organizations (FOs), elections, functions of FOs, resources, and penalties for offenses. Its salient features include the creation of new

autonomous institutions as legal entities, introduction of the concept of territorial constituencies, formation of Water User Association (WUA), and simplified procedures for taking up work and dispute resolution. However, the most noteworthy aspect of the Act is that it made the Irrigation Department, as a competent authority, fully accountable to the farmer organizations.

Farmer Organizations (FO)

Any management/regulation system in India has fallen victim to the top-down approach, highlighted by a visible disconnect between the competent authorities that take policy decisions and the people affected by such decisions. The disconnect leads to an inefficient system that is unable to cater to the needs of the people. Andhra Pradesh follows a bottom up approach to solve this issue.

The APFMIS, 1997 created WUAs, wherein all land holders in possession of land in an irrigation system become WUA members with voting rights. Moreover, each member has an equal contribution represented by one vote. The said Act also provided for five-year tenure for Farmer Organizations. The term FO covers different types of organizations, namely the Water User Association (WUA), the Distributory Committee (DC), and the Project Committee (PC). The primary body is the WUA.

Background	WUA Presidents	Territorial Constituency Members
Farmers	8,544	39,606
Business	213	438
Public Representatives	183	151
Professionals	58	118
Service Personnel	40	63
Contractors	35	35
Industry	27	54

Figure 5: WUA Presidents and Territorial Constituency Members in Andhra Pradesh *(Peter, 2001)*

In Andhra Pradesh a large portion of the irrigated area (73%) comes under the control of only 2,100 WUAs, or 20% of the total number of WUAs. Presently, Andhra Pradesh has constituted 10,292 Water user Associations and 173 Distributory committees. The major change in irrigation management has been greater role of the WUAs, rather than the irrigation agency. Another important shift, especially in major and medium irrigation projects, has been the realignment of territorial boundaries. New boundaries are not necessarily contiguous with existing village boundaries. It has been necessary to redraw boundaries on a hydraulic basis and prepare new records. (Peter, 2001)

The FOs have also been pivotal in various rehabilitation programmes, since farmers, on numerous occasions, were exposed to a new working environment. They had to negotiate for machinery at cheaper rates, persuade the village to take up maintenance works, and maintain records to enable payment.

A “mobilization advance” was, therefore, made available to farmers to start the work. Subsequent payments were given on actual taking up of work. Maintenance work had been taken up by WUAs during the fiscal years, 1998, 1999, and 2000. So far, 49,000 works have

been taken up at a cost of Rs. 4 billion ($94 million). Dramatic results were achieved during the first year as an additional area of 207,288 ha was opened to irrigation. Farmers in all commands have been able to get an additional production of 5-10 bags of paddy. Farmers now conduct participatory walkthroughs along with the irrigation agency, prioritize works, and take up works on their own. (Peter, 2001)

Results

The AP reform has been highly successful due to its timely linkage with a World Bank loan under the Andhra Pradesh Economic Restructuring Project (APERP). The $141 million loan is essentially designed to support the WUAs. APERP plans for minimum rehabilitation of 2.45 million ha under various irrigation projects. Minimum rehabilitation is envisaged at an amount of Rs. 1350/ha ($30/ha). (Peter, 2001)The government of Andhra Pradesh had also made a conscious decision to disburse the amount over a period of three years. This has had two distinct advantages. WUAs have gained experience in undertaking operation & management works; and the Irrigation Department and Finance Department have time to develop new procedures for dealing with user organizations.

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