CASE STUDY
Category: ICTs and Climate Change Strategy

Climate Change, Innovation & ICTs Project

Centre for Development Informatics (CDI), University of Manchester, UK
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# Supporting Strategic Decision-Making on Climate Change Through Environmental Information Systems: The Case of ENVIS

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## Initiative Overview

Climate change is an imposing challenge faced across all continents. Emerging economies like India are no exception, with climate change impacting not just agriculture but rural ecosystems more broadly and urban environments too (Govt of India 2008). India has some advantages, though, in being able to learn from the mistakes and experiences of the industrialised world, and to take advantage of new technologies; including information and communication technologies (ICTs).

ICTs have a multiple relationship to climate change. On the one hand, the ICT sector itself and operation of the technology is estimated to contribute c.2 percent of global carbon emissions (Houghton 2009). On the other, ICTs could play an important role – through 'smart' applications – in reducing the carbon footprint of sectors sourcing the other 98 percent of emissions. ICTs will also have an important role to play in development of adaptive capacity (Ospina & Heeks 2010). But in this case study, the focus in not specifically on mitigation or on adaptation, but on ICTs' relation to a third strand of the connection between climate change and development: strategy; that is, the formulation of government policies, civil society initiatives and other high-level plans to address the challenge of climate change through e-enabled awareness and capacity building.

The key requirement for strategic decision-making is good information and, with this objective, the Environmental Information System (ENVIS) was set up in 1982 in India. It was significantly strengthened in 2002 through stronger institutional networks and updated ICTs with the support of the World Bank's Environmental Management Capacity Building Technical Assistance Project (EMCBTAP). ENVIS is a network of distributed subject-area centres seeking to support integration of national efforts in environmental information collection, collation, storage, retrieval and dissemination. It is basically a clearinghouse mechanism providing pointers to distributed environmental information for decision makers, policy planners, scientists and engineers, researchers, etc.

As of 2011, ENVIS consisted of 76 network partners all located in India ( http://envis.nic.in/envis_list.asp), of which 46 are subject-specific, encompassing information on the following areas:

- Environment and Energy Management
- Ecology and Ecosystems
- Flora, Fauna and Conservation
- Environment Law and Trade
- Media, Environment Education and Sustainable Development
- Chemicals, Wastes and Toxicology

The remaining 30 partners fall into the "State of Environment" category, comprising those who provide information for the individual States in India on topics such as: eco-friendly technologies, coastal ecosystems, carbon and other emissions, green buildings, renewable energy, National Action Plan on Climate Change, etc.

Most partners have an ENVIS-specific website (often in addition to their own corporate site), intended to act as a portal for environmental information. Some 20 of these address climate change and the underlying causes of climate change with information on topics such as clean technology, renewable energy, ecological conservation, as well as on climate change itself.

## Application Description

ENVIS is a largely decentralised system consisting of the focal point located in the Ministry of Environment and Forests, and the chain of 76 network partners: a set of institutions throughout the country which host an ENVIS Centre. The physical infrastructure hosting the Centres' ENVIS-specific data is a storage area network of India's National Informatics Centre (NIC), using Internet Information Server as the platform together with MS-Access and MS-SQL 2008 databases. Figure 1 shows the intended infrastructure of ENVIS, providing secured information on climate change and other issues through its portals.

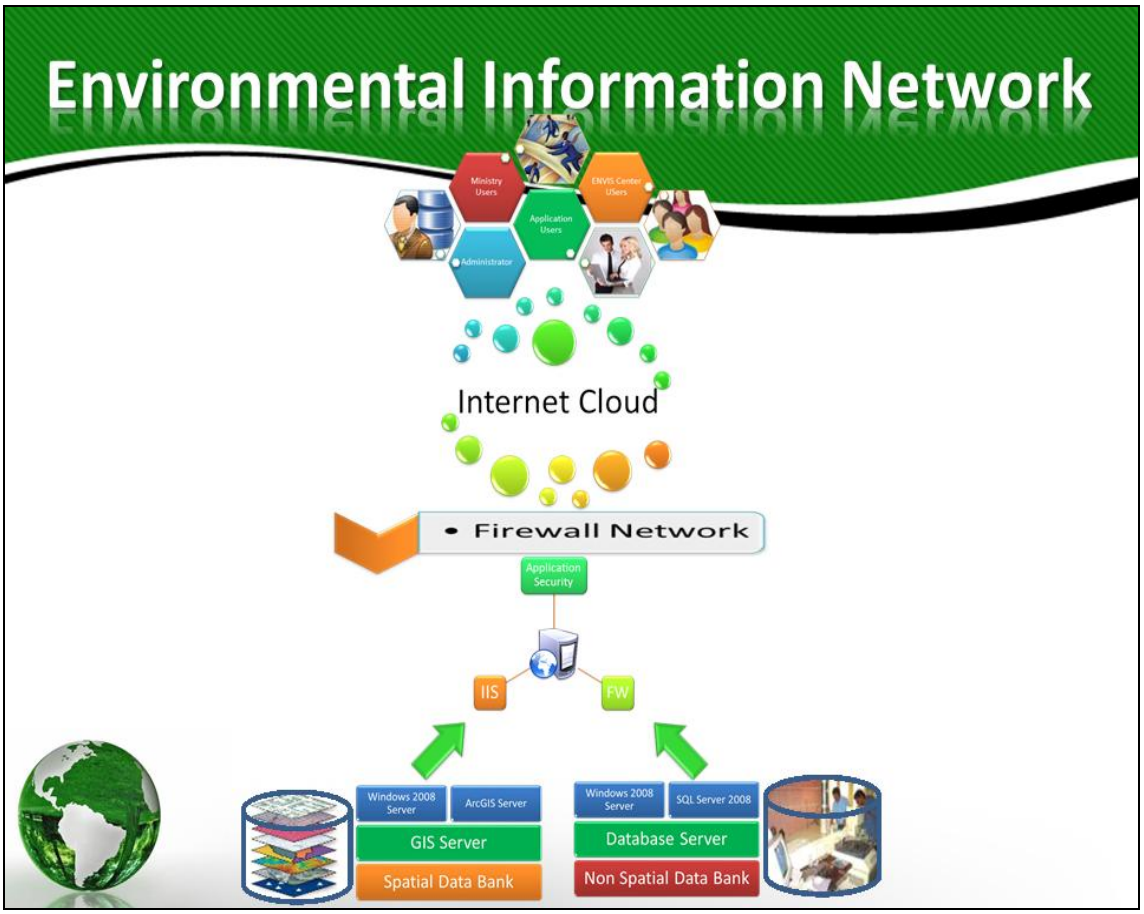


**Figure 1: Outline of ENVIS (source: NIC)**

NIC provides a secure channel for partners to update their ENVIS-specific websites through a virtual private network. Outwith ENVIS, but feeding into its content, GIS and remote sensing technologies are utilised by some Centres to monitor and compare different climate change-related parameters. ENVIS has developed a comprehensive database known as the Indian State-level Basic Environmental Information Database (ISBEID: http://164.100.194.5:8080/isbeid/) with 17 modules on various environmental subject areas to assist the State ENVIS Centres.

As noted, individual ENVIS Centres often operate their ENVIS-specific website in parallel to their

organisational website. One example of an active ENVIS Centre website is that of the Energy and Resources Institute (TERI) - http://terienvis.nic.in/. Well-supported by the parent Institute, this site contains information on renewable sources of energy and green buildings, and provides GIS-supported maps on energy consumption etc. Some Centre sites also attempt outreach and engagement through interactive discussion forums, "kids' corners" and the like.

## Formal Drivers and Objectives/Purpose for ICT Usage

The initial driver behind ENVIS in the 1980s was much broader than just climate change; being a more general concern with the growth of environmental issues – particularly pollution and conservation – and the need for some co-ordinated means of accessing information. In 2002, with the World Bank's EMCBTAP support, the ambit of ENVIS got broadened to include a greater focus on climate change. ENVIS got a further climate-specific fillip in the same year, when COP8 – the annual international climate change meeting – was held in New Delhi. The value of this focus has been confirmed subsequently with growing awareness of the current and future negative impact of climate change; and the need for information has grown steadily as more and more organisations in public, private and NGO sectors develop strategic plans that are focused on, or incorporate, climate change. ENVIS was set up to help meet this kind of information need. ICTs are now an essential foundation for this activity; particularly as information users increasingly expect – and demand – quick access to user-friendly and interactive information.

## Stakeholders

The central stakeholders are the focal agency – the Ministry of Environment and Forests – which hosts the ENVIS Secretariat, and the National Informatics Centre. Then there are the network partners, forming the ENVIS Centres, who are drawn largely from a mix of State-level Departments of Environment and Pollution Control Boards, research-oriented or environment-oriented NGOs, and university institutes. The intended recipients of information from the Centres vary from partner to partner, but would include government policy-makers, local NGOs, planners, firms with commercial interests in climate change and the environment, scientists/engineers, and concerned individuals.

## Impact: Cost and Benefits

The annual ENVIS budget is approximately US$1.5m, with much of the money devolved to the individual partners to pay for their ENVIS Centre work; each one receiving somewhere in the region of US$13,000 per year. Initial investments for capacity building included expenses for hardware, website design and content development. Subsequent funding has covered the salaries of an ENVIS co-ordinator and an IT assistant who undertake website maintenance, updating of content and databases, and engagement of stakeholders through interactive forums. Funding also covers training, travel and consumables.

The benefits of ENVIS itself should be seen as those of coordination and scale economies; enabling the individual Centres to develop and disseminate information on climate change and environmental issues to their target audiences. The ENVIS websites of the partner Centres vary significantly. Some no longer appear to exist; many exist but are clearly in need of updating; and a few are active and providing what should be valuable information. The example of TERI's ENVIS site was noted above, and the Centre for Media Studies - http://cmsenvis.cmsindia.org/ - provides a current guide to environmental news.

More typical examples include:

- The ENVIS site of the Institute of Tropical Meteorology - http://envis.tropmet.res.in/index.htm - provides climate change and other information that could be used by policy makers, but might more likely be seen as introductory educational material. The portal has poorly-designed static information that needs to be updated and a "Kid's Corner" that was non-functional at the time of writing.

- The ENVIS site of the Madras School of Economics - http://envis.mse.ac.in – is fairly well-designed, and contains a useful introduction to environmental economics. The portal does, though, require content updating in relation to policy briefings and newsletters.

The ENVIS website itself - http://www.envis.nic.in/ - could be strengthened with new publications, initiatives to increase its reach, updated interactive forums and result-oriented stakeholder discussions for inputs on key policies. Overall, and at the time of writing, the content age is mixed with some frozen in 2006 alongside updated material relating to recent (2011) meetings.

## Evaluation: Failure or Success

At the time of its 2002 upgrade, ENVIS no doubt performed an important function. It cemented a network of organisations working on environmental issues, and led a number of the partner organisations to expand their remit to include climate change and associated information as part of their thematic area. It created a base of information that fed into COP8, and which also encouraged greater participation with that event. And it provided a number of partner organisations the technological means and support to develop their own websites and reach out to a wider audience.


**Figure 2: ENVIS-Related Evaluation Meeting**

Since that time, it is clear that ENVIS' role has been more challenging, as institutions have built their own ICT and web infrastructure, enabling them to interact directly with their client constituencies. There have been reports and meetings (e.g. see Figure 2) that are constituency focused. However,

overall, it is impossible to judge the most important intended impact: whether ENVIS-supported information has been used for strategic climate change decision-making. It certainly was in 2002 at COP8. For many of the websites – which are not actively updated – it currently seems unlikely that they are having much impact. Some individual partners for individual issues – such as production of "State of the Environment" reports by some of the State-level Centres that include issues like energy use and climatic conditions, such as the TERI-based material on fuelwood consumption, or such as the Institute of Tropical Meteorology's $CO_2$ emissions inventory – may have been of value and/or may provide a valuable baseline for future use.

The ENVIS Secretariat does have ambitious plans: it has initiated a "State of Environment Atlas" which contains spatial information on environmental parameters; access to mapped socio-economic and natural resource information; and an interactive geo-spatial website highlighting status and trends of environmental parameters, with tools for more interaction. The Secretariat has also proposed development of a dedicated ENVIS Centre for climate change which would bring together all climate change-related activities of the current ENVIS Centres in the network.

## Enablers/Critical Success Factors

The **expertise of partner organisations** is central to whatever impacts ENVIS can lay claim to. It is through these organisations that any data of value is generated and, perhaps at times, utilised for strategic decision-making related to climate change and other environmental issues.

**NIC's informatics expertise** has been a necessary component; most particularly in the early stages of the 2002 upgrade when partners had to rely heavily on NIC for both technology and skills. It will also be central to any future upgrade plans.

## Constraints/Challenges

**Low motivation and low user-orientation** are reflected in the failure to update much of the ENVIS Centres' website content, and in poor website design. These feed into a negative spiral – users coming to the sites will have difficulties finding the information they want and/or will find material to be outdated or with dead links and functionality. As a result, users will not come to the site, creating few pressures to improve.

These issues, in turn, relate to **lack of self-sufficiency** of the Centre websites, with some partners apparently happy to receive funds when provided, but unwilling to take on their own responsibility for the sites. In part, in certain cases, one may see a philosophy that the websites are not for the partners, let alone for users, but are created "for ENVIS".

Despite ENVIS' laudable attempts to create a co-ordinated network, including subject-specific sub-groups and ENVIS co-ordination meetings, there is still a **strong sense of "stovepiping"**; that is a lack of integration in a number of areas. In part, this was deliberate – attempting to foster local ownership, the Secretariat gave freedom of design to the ENVIS centres without seeking to centrally control and intervene. The result is a lack of consistency in website design and content, and absence of integration in content, so users have to trawl through individual websites rather than finding materials at a single source, as they would no doubt wish. ENVIS itself has also been somewhat disconnected from climate change initiatives within other departments of the Ministry of Environment and Forestry. Overall, this illustrates the challenging tension between devolved control and ownership versus data integration for network-based climate change information systems.

Finally, the project has also faced **informatics challenges**, ranging from the difficulty of getting all network members to use newer ICTs (particularly members in lower-level government departments), to the lack of "green IT" awareness within ENVIS itself, such that no energy accounting or benchmarking is yet undertaken for the project.

## Recommendations/Lessons Learned

**User participation** – that is, participation of the decision-makers, planners, etc. who will use climate change information – is essential when planning information systems to support strategic climate change decision-making. A first step would be to ensure design starts with a thorough user information needs assessment, but this can still backslide during implementation and operation. Therefore, what is needed is user participation throughout – the identification and involvement of a small group, who could ensure a steadfast attendance to the only people who really matter: those who will use the climate change information.

**Project and policy engagement**. As a companion to the first point, here the recommendation is that some means be found to get those within the individual data-providing locations (the ENVIS Centres in this current case) engaged with practice in some way. This could be providing information for a local project – perhaps a contentious one in which there are concerns about climate change mitigation, or in which adaptation to climate change is central. Or it could be providing information for a particular piece of climate change legislation or policy. All this helps focus those responsible for information systems on the needs of local users, and on ensuring the relevance and accuracy of the information they provide for that purpose.

**Base projects on motivation and incentives**. The difference between ENVIS Centre websites that are up-to-date and useful, and those which are not, is largely an issue of motivation of those involved. Climate change strategic information design is therefore not just a matter of matching content and design to user needs. It is also a matter of motivating – hence, of incentivising – the information system / website manager and clerical staff. This is not (just) a question of money, but also of broader motivations – seeing a value in the work being done; being recognised; etc. For example, a best website award that is popularised and coveted could be part of that process.

**Embrace newer technologies**. By and large, ENVIS has so far been designed around Web 1.0 technologies and Web 1.0 mindsets that – at best – broadcast static text. There are examples of forays into more powerful and more recent technologies, but climate change strategic information systems need to more fully embrace Web 2.0 and other high bandwidth-enabled technologies as broadband steadily diffuses in the developing world. Tools and support for video-conferencing and remote collaboration need to be widely disseminated and publicised so that system users make better use of them; allowing interaction between strategic decision makers, and between the decision makers and data providers, thus driving up the value and utilisation of information. Social media needs to be used to more effectively engage user populations (at least among the general public).

## Data Sources & Further Information

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Data for this case study was gathered via interviews with NIC, the ENVIS Secretariat and a number of individual ENVIS Centres. The author was associated with one of the ENVIS Centres herself, developing online reports on climate change, the Clean Development Mechanism, and other topics; and co-ordinating interactions on climate change, including use of ENVIS as a vehicle to strengthen stakeholder interaction during COP8. In addition, use was made of ENVIS evaluation reports undertaken by the ENVIS Secretariat; presentations by the NIC and ENVIS Secretariat, and secondary data from those ENVIS Centres with an emphasis on climate change.

## References

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Further information about the project and related resources can be found at: http://www.niccd.org



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