CASE STUDY
Category: ICTs and Climate Change Mitigation

Climate Change, Innovation & ICTs Project

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Reducing Carbon Emissions through Videoconferencing: An Indian Case Study

Author: Debendra Kumar Mahalik

Initiative Overview

Globally, India ranks second in terms of population and among the five most-polluting nations, due to its size but also due to a relative lack of implemented initiatives to check and reduce carbon and other emissions (Parikh et al 2009, Lu et al 2011). The major emitters are construction and manufacturing, but the direct and indirect carbon emissions of the transport sector contribute around 14% of the total; a contribution that is forecast to rise inexorably in coming years (Singh 2006, Parikh et al 2009). The carbon emissions from transportation relate to both social and business uses and, within the latter category, some contribution occurs from travel relating to official government meetings.

Those meetings are an integral part of the functioning of government – to receive information about the current status of responsible areas; to make decisions including policy decisions; and to track the progress of decision implementation. Given India's large size – even within its individual states – many government meetings require attendees to be transported by carbon-emitted means. This case study outlines one initiative in Orissa state which sought to reduce the requirement to physically transport meeting attendees, by making use of information and communication technology in the form of videoconferencing (VC).

Application Description

Orissa is a state in eastern India, about 600km by 400km at its widest points with a population of around 41 million. It has 30 districts and the state capital at Bhubaneswar. The videoconferencing project provided VC capability in 32 locations – one "studio" for each of the district headquarters plus one for the Chief Minister, and one for the State Assembly. In each district, an air-conditioned room was identified near to the offices of the District Collector (the head official), and the facility was for use by any senior district officials. The Chief Minister's installation was for his sole use; the facility in the State Assembly was for other high-level state officials.

The videoconferencing facility was first begun in India in 1995; being the responsibility of the National Informatics Centre (NIC), a nodal agency of the central government, falling under the aegis of the Ministry of Communications & Information Technology. It was first installed in Orissa in 1998, and is now one of 490 VC locations managed by NIC.

As summarised in Figure 1, each of the studios has 10 to 12 person seating capacity, and they are ultimately connected out to the backbone network operated by NIC, which provides links not just to

the other sites in Orissa but also to all NIC VC locations (for example, Chief Ministers in all other state capitals around the country). The backbone network typically operates via a 512kbps line but in some remote locations may use a 128kpbs line or satellite-based communication. The videoconferencing facilities in each studio are standard VC equipment – a camera, microphones and sound system to transmit data to other locations; a 42-inch LCD television to present data from other locations. The codec and decoder provide the software and hardware that convert the analogue audio-visual data into digital format for transmission, and vice versa for data from other locations. In addition, there is an electrical back-up facility in case of power cuts, and a stand-by line in case of problems with the main network connection (NIC n.d.). NIC utilises a multipoint conference server (MCS) which allows multiple sites to participate in a live videoconference and share both audio-visual and document data. It also allows either voice-activated and chairperson-controlled conferencing.

Locally, each studio is managed by staff from the State Informatics Office, who work in the districts. Users book sessions in advance and NIC lists a cost of Rs.3,000 (c.US$60 plus tax) per hour for a point-to-point meeting, with additional charges levied for multi-point meetings (ibid.).

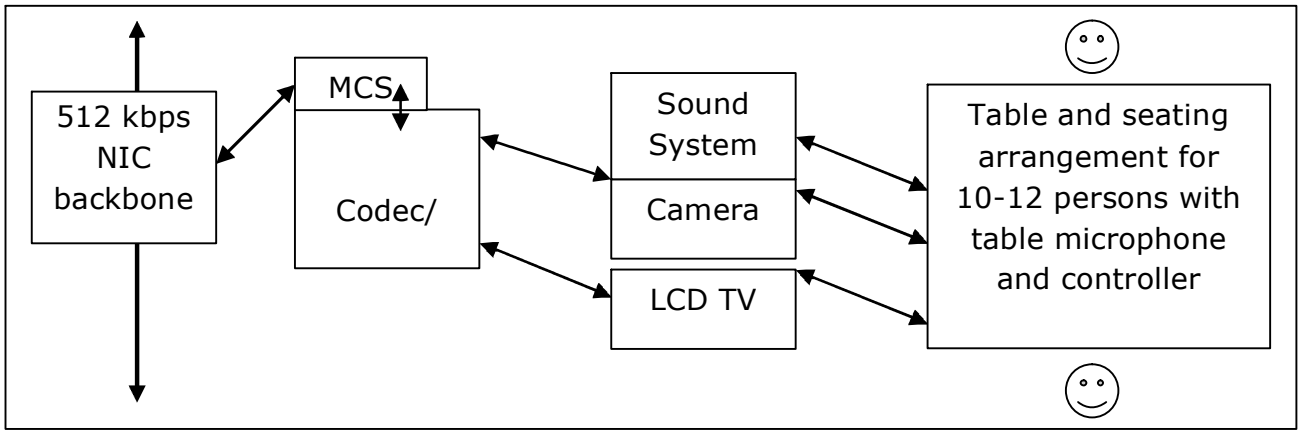

Figure 1: Orissa State Videoconferencing Studio

Formal Drivers and Objectives/Purpose for ICT Usage

The drive to install the videoconferencing facility came initially from the NIC itself, and was relatively techno-centric – a desire to demonstrate and extract value from NICNET, their cross-India network. Given that the installation was initially undertaken some years back, there was some recognition of the environmental value, but the rationale was more focused around savings of time and cost for those involved.

However, the potential environmental value of the application has come to be recognised more over time, as concerns about climate change have grown. To some extent, one can therefore see emissions-reduction as an emergent driver and purpose for this particular type of ICT usage.

As noted above, government officials must engage in discussions on a whole variety of issues, and this has traditionally been done by physically moving those decision-makers to a single location. Given India's rather centralised model of government decision-making, this has meant frequent car journeys for district officials to the state capital; a continuous source of CO_2 emissions given that district headquarters lie up to 400 km from Bhubaneswar. Hence, videoconferencing provides an alternative that can make some contribution to climate change mitigation by dispensing with the need for some journeys, allowing meetings to be held virtually.

Stakeholders

The main stakeholders are as outlined already. The key users are the Chief Minister and other high-level state officials such as ministers of particular state departments, and their equivalents at the district level including the District Collector. Other potential users include public services like courts, health, family welfare, etc. The system is managed and maintained by the National Informatics Centre and local-level IT staff within the state government.

Impact: Cost and Benefits

The videoconferencing facility is most definitely used (see Figure 2), as the following sample indicates:

- March 2011: Chief Minister directs all District Collectors via VC to electrify all villages in the state by 2012.
- May 2011: Chief Minister reviews progress of National Rural Employment Guarantee Scheme with District Collectors; also advises Collectors to attend to public complaints within certain specific time periods.
- June 2011: Chief Minister review and discusses specific departmental schemes with District Collectors.
- June 2011: Chief Minister discusses the impact of unseasonably-heavy rain with Collectors in particular affected districts.
- June 2011: Chief Secretary discusses and reviews Schemes for Traditional Forest Dwellers with all District Collectors.

In each of these cases, at least one car-full of personnel would otherwise have travelled from each district headquarters to Bhubaneswar.

Source: eOdisha.com (2011)

Figure 2: Chief Minister Videoconferencing

The financial cost of the VC facility can be calculated as shown in the following tables (sourced from discussions with NIC officials).

Item	Cost
VC equipment	Rs 800,000
LCD TV	Rs 60,000
Camera	Rs 10,000
Room furnishing	Rs 100,000
Other expenses	Rs 30,000
Total	*Rs 1,000,000*
US$ Total	***c.US$20,000***

Table 1: Videoconferencing Studio Installation Costs

Item	Cost
Technical support charge	Rs 10,000
Electricity and internet charges	Rs 80,000
Other contingency charges	Rs 10,000
Monthly Total	*Rs 100,000*
US$ Annual Total	***c.US$24,000***

Table 2: Videoconferencing Studio Running Costs per Month/Year

Given that there are 32 studios across the state, then we can estimate a total five-year installation and operational cost as: 32 x (US$20,000 + (5 x US$24,000)) = c.US$4.5 million.

Balanced against this, we can try to calculate the savings enabled by videoconferencing:

- On average, district headquarters are 250km from the state capital, thus requiring each District Collector to make a 500km round-trip in a diesel-powered, air-conditioned car per meeting.
- Based on the typical fuel consumption of the Ambassador and related cars used (c.12 km per litre) and the cost of petrol (c.Rs.70 per litre), then the fuel cost per round-trip would be around Rs.3,000. It is the norm to estimate that total transportation costs (i.e. wear and tear, maintenance, depreciation) add the same amount again as the fuel costs. To this one can also add the additional costs (not salary) of the driver for two days of Rs.1,000. This therefore provides a direct cost figure of around Rs.7,000 per visit. (Of course, there are also the time costs of having senior officials out of station plus also costs for food and lodging in state facilities)
- Multiplying this up for all 30 District Collectors, the direct costs per meeting are something like Rs.210,000 = US$4,200. It is likely that the indirect costs of time, lodging, etc at least double this figure; with a reasonable estimate being c.US$10,000 per meeting.

Figures provided by one of the District Collectors suggest that the pre-videoconferencing norm was for two visits per month to be undertaken to the state capital. Were all of these to be foregone, then the annual saving would be US$240,000.

Of course District Collectors still do go to the state capital from time to time, but – in addition – there are many other meetings by other government officials that are foregone due to use of the videoconferencing facility. Taking the past five years' data, an average of 25 meetings per month are held in each of the videoconference facilities. Were those each to attract the savings attributed to

meetings of all District Collectors, then total cost savings of US$250,000 per month – US$3 million per year – would be attributable. In practice, not all the meetings by any means would have otherwise required a journey by all district collectors to the state capital – for example, there are VC discussions between the state capital and individual Collectors. However, there are also individual point-to-point discussions which mean that, state-wide, there are far more than just 25 VC meetings per month. Thus, while it is not possible to put an exact financial figure on videoconferencing, it is highly likely that the system far more than pays for itself in terms of the savings generated. (Noting that the financial flow means the state government is paying NIC typically around Rs5,000 (c.US$100) per meeting.)

Setting aside financial issues, the central concern of this case study is with climate change mitigation, and reduction in carbon emissions. Assuming that the cars driven are somewhere around the Euro-2 norms for emissions, that would indicate something like 200g/km of CO_2 emissions. Given each main meeting involves 30 trips averaging 500km each, then the per-meeting saving is 3,000kg of carbon dioxide. Very roughly (if we can assume the equivalent of five of these per month state-wide), then the VC system would lead to 180,000kg of carbon dioxide emissions per year (though the actual figure could vary quite a lot from this). (In addition, there would be 1,350kg of carbon monoxide, and 1,080kg of hydrocarbon particulates and NO_x emissions foregone.) It is very hard to estimate but, finally, we should also recognise the carbon emissions from the VC facility itself via electricity consumption, including the air-conditioning used in the rooms (though that should be balanced against the carbon costs of air-conditioning in the cars, which was not accounted in the calculations above).

Evaluation: Failure or Success

It must be recognised that there are large margins for error in the calculations provided above since exact figures are not available. However, it is certain that most videoconferencing meetings (assuming the alternative would have been a physical meeting rather than, say, email or a phone call) are contributing to climate change mitigation. They may do so only in a relatively small way but – if the assumptions above are close to correct – then videoconferencing in Orissa reduces carbon emissions by the equivalent of the CO_2 produced by a car travelling one million kilometres every year. (As noted above, the VC system may also save money for government, and reduces the emission of other pollutants.)

Figures show that usage of videoconferencing has been increasing over time. However, according to those interviewed, still only around five percent of total state meetings which could utilise videoconferencing do so. There is therefore great potential for future expansion, and for further climate change mitigation.

Enablers/Critical Success Factors

Fit of mitigation goals with other goals has helped to ensure the usage and degree of success of this project. If it was only related to mitigation goals, and those were the only benefits to be seen, it is unlikely the initiative would have succeeded. However, mitigation goals have been integrated into a broader picture – partly around formal goals (e.g. savings of time and money), and partly around less formally-stated goals (e.g. that NIC wishes to demonstrate the value of its ICT provision, that the Chief Minister is able to initiate meetings at short notice, that the district officials do find frequent travel to be tiresome).

Relatively simple, tried-and-trusted technology forms the foundation for the VC systems. As seen by the fact that the VC facilities have been running for more than ten years, this is far from cutting-edge ICT. But that is much to its advantage since there are fewer items to go wrong, and

those that do can relatively quickly be fixed. For the meeting attendees, the simplicity of the technology make it relatively transparent: they can get on with their meetings without the need for extensive training, or for continuous technological interruptions.

Strong foundation of expertise is present, based in part on the National Informatics Centre team, which – as noted – has experience of rolling out videoconferencing throughout the country, and which has many years of familiarity with networking applications. And these are supplemented by the state informatics staff who by now also have expertise in dealing with the technology.

Constraints/Challenges

Motivational challenges to using videoconferencing still exist. In some cases district officials have multiple reasons for wanting to attend the state capital, and videoconferencing cannot substitute for all those. And on occasions – for example through concerns about security and privacy – officials wish to avail of face-to-face meetings, and videoconferencing is not seen as an option. Furthermore, while there has been encouragement to use VC – and the demonstrator effect of usage by the Chief Minister – there are no particular regulations, let alone mandatory requirements for its uptake. As a result, there is quite a gap between the number of meetings which could be undertaken by videoconference, and the number that actually are – thus the full potential for climate change mitigation has yet to be reached.

Limitations on awareness and technological infrastructure also impose constraints. On the first matter, VC usage is something like a members' club – once government officials have been first inducted, they become familiar with the process, and have a tendency to place VC into their mental map, and to make use of it on subsequent occasions. But there are many government officials still outside this "club" who are either unaware of the possibility of using VC or who – being unfamiliar and a bit uncertain – are unlikely to suggest it. This is exacerbated firstly by the association of usage of videoconferencing only with the highest-level officials, and by the relatively limited reach of VC: there are hundreds of sub-district (block and then panchayat) government offices that are outside the scope of this system. Again, then, the potential for climate change mitigation is substantially below what could be achieved.

Technological challenges also exist, though the main one is the challenge to this particular relatively high-cost studio set-up from lower-cost solutions; the most pervasive of which is Skype. In terms of climate change mitigation, though, use of Skype to substitute for journeys will help – further reducing carbon emissions.

Recommendations/Lessons Learned

Be ambitious in use of videoconferencing: whether in governments, private businesses or NGOs, staff spend a significant proportion of their time travelling to and from and attending physical meetings. All of this creates CO_2 emissions that could be mitigated. But this will only happen if organisations are ambitious in their use of videoconferencing. At present, and in part due to the use of high-cost studio-based VC approaches, videoconferencing has tended – as in Orissa – to be restricted to just a few senior members of staff. But this only touches the tip of the pyramid. To really make a significant impact on carbon emissions, organisations must be ambitious for VC – seeking to make it available to the widest possible range of staff.

Ensure maximum convenience of facilities: most likely staff only partially consider environmental issues when deciding how to undertake meetings; they are driven by habit, and also by their own personal costs and familiarities. All of this means that videoconferencing facilities must be as

conveniently placed as possible – very close to their existing offices, and demand of them as few knowledge and time costs as possible – for example, ensuring there are dedicated staff to set up and operate the VC; leaving users just to conduct their meeting, and be as little aware as possible of the technology.

Recognise implications of technological innovations: the end point of maximum convenience and lowest cost is to place VC facilities on the individual user's desktop or laptop. In technological terms, this is readily achieved via use of a webcam and services such as Skype. Some users will require assistance to get such systems up and running, particularly to understand multi-point and multi-person videoconferencing. However, such systems should minimise costs.

Consider regulatory guidance: use of videoconferencing occurs not just because the systems are accessible with low costs, but also because there is a positive driver to use them. Making staff aware of the carbon emission and financial benefits can help, but humans are creatures of habit, and will still tend to arrange meetings. It may therefore be necessary to introduce some regulatory regime to encourage or require staff to undertake fewer journeys, and greater use of videoconferencing.

Data Sources & Further Information

Debendra Kumar Mahalik (debendra_mahalik@hotmail.com) is Senior Lecturer in the PG Dept of Business Administration, Sambalpur University, Orissa, India.

The author is not connected directly with the VC initiative, but obtained data particularly via NIC staff based in Sambalpur, Orissa.

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EDITORS:
Richard Heeks
Angelica Valeria Ospina

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