“Pixelising the Commons” and “Commonising the Pixel”: Boon or Bane?

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“The divide between ecology and economics can be bridged through RS/GIS technology”

Statement by an environmental scientist at a recent round-table on interdisciplinarityorganized by the Indian Society for Ecological Economics

The information technology (IT) revolution of the past decade has coincided with a revolution in spatial IT on all three fronts: imaging, positioning, and processing. Advances in imaging or remote sensing (RS) have made available high-resolution satellite imagery at fairly accessible prices, almost rendering traditional aerial photographs obsolete. Hand-held global positioning systems (GPSs) are not only affordable but now are able to indicate position within 10m accuracy or better with the removal of “selective availability” (a euphemism for manually-induced noise) in May 2000. And powerful geographic information system (GIS) software are now available on PCs that are themselves becoming simultaneously faster and cheaper. No wonder then that “RS/GIS technology”, as this combination of spatial IT is better known, is the ‘in thing’ today not just with geographers, but also ecologists, environmental scientists, even some social scientists, and certainly with planners and managers in departments of forestry, watershed development and agriculture. And the fact that India has been at the cutting edge of commercial satellite imagery in recent times has perhaps lent added visibility to this technology in the South Asian region.

How and to what extent can these technologies, this “pixelisation of the commons”, realistically “bridge the divide between ecology and economics” or (more modestly) contribute to CPR research today? And to what extent can the adoption of these technologies in CPR management, i.e., the “commonisation of the pixel”, be socially beneficial? I discuss these questions with special reference to the South Asian region, which is characterised by much higher population densities, more intense use of land resources, higher diversity in vegetation and land-use, and incomplete and out-of-date information on tenure as compared to (say) the USA or even the Amazon region where RS/GIS technologies have been developed and most intensely applied.

In theory, the primary contribution of RS/GIS technology to CPR research is to detect the dependent variable, the “condition of the resource”, objectively, accurately, precisely, comprehensively and repeatedly. RS/GIS can help researchers integrate information on some explanatory variables such as tenure, soil condition, land-use in non-CPR lands, and proximity of towns or roads. Finally, resource users or managers could use RS/GIS as a planning and monitoring tool, and for the mapping and legitimisation of tenure.

Pixelising the commons

Remote sensing undoubtedly provides a “true-to-life” picture of the resource, a picture that often gives the lie to official statistics, as the study by the National Remote Sensing Agency on deforestation in India did back in the 1980s. But the interpretation of this picture is always a value-loaded exercise, driven by perceptions of what environmental or social value is desired. Ignoring this fundamental fact endows RS/GIS outputs with a false aura of objectivity and a tendency to use information classes in a careless and misleading manner. E.g., the Forest Survey of India claims to map forest cover but actually maps tree cover of all kinds, including that in farm forestry and coffee plantations.

In terms of interpretational accuracy and finer distinctions in information classes, there is no doubt that the higher resolution data available today have improved our capacity to identify certain land-uses, particularly in the South Asian context where land-use parcels can be very small. E.g., in forest maps of the Western Ghats region prepared by the French Institute, Pondicherry in the 1980s using Landsat MSS data of 70m resolution, betelnut plantations were routinely merged with forest; these can now be distinguished IRS-1C (24 m resolution) data in most cases. But increased spatial resolution cannot do much to resolve spectrally similar classes other than providing textural information. E.g., separation of forest from

coffee and of harvested cropland, abandoned cropland and grassland are major challenges, as the work of Moran and others in the Amazon, that of Billie Turner and his colleagues in the Himalayas, and by this author in the Western Ghats shows. This separation might only be possible, if at all, with multi-season data, or with hyper-spectral or radar images, all of which are very expensive propositions. These limitations of RS are not well advertised, and the tendency is to work with what can be distinguished rather than what should be distinguished.

Comprehensiveness has two advantages. The first is in the context of micro-level studies, i.e., those involving single or a few villages, which form the bulk of CPR field research. In such studies, an aerial photograph or a satellite image can provide information on landscape-level processes that may be masked or missed out in field sampling, such as the possibility that communities protecting one forest patch might be degrading other patches further away. Secondly, the combination of high resolution data, wide coverage and GIS-based integration has now opened up the possibility of moving CPR field research to the "meso-scale", by conducting multi-village analyses using secondary data on tenurial, socio-economic and bio-physical variables. This has been attempted with some success by researchers from the IFRI group at Indiana University in Nepal and this author in the Western Ghats. But the absence of upto-date and geo-referenced village-wise information on important variables such as tenure and soil quality will be a major bottleneck for South Asia. The problems of geo-referencing of satellite imagery itself need greater attention: in even moderately hilly terrain, IRS-1C LISS-3 data (of 24 m resolution) may have geo-referencing errors of up to 50m, unless one carries out highly sophisticated corrections using accurate digital elevation models, which are again an elusive input.

Repeated imaging is important at one level, as it gives multi-season data, although purchasing multi-season data is not an easy proposition. But perhaps the most important requirement for CPR research is longer time-series data that enable estimation of change in resource condition over several years and decades. Here, satellite imageries are available only from 1972 onwards, from different satellites and at much coarser resolution, making comparisons difficult. On the other hand, aerial photographs are available from at least the 1970s in India or earlier in Nepal at a resolution comparable to the highest satellite resolution available today. Fully exploiting the potential of archival aerial photographs would, however, require getting over the recent technological bias against aerial photographs and the much greater institutional restrictions on access to these valuable historical records that prevail in most of South Asia.

Commonising the pixel

The potential role and contribution of RS/GIS to CPR management is much more ambiguous and double-edged. As it stands, given the cost and complexity of the technology and the scale and resolution at which the data are produced, there appears little incentive for village-level institutions to use RS/GIS. Centrally located planners and project managers, however, find that these technologies increase the apparent comprehensiveness of their planning and the apparent objectivity, reach and accuracy of their monitoring. And donors are usually in favour of high-tech, funds-consuming, consultancy-requiring solutions. In the process, the much slower, obviously subjective and 'low-tech' approach of participatory project monitoring gets relegated to the background. Thus, at a time when the thrust of policy reform in CPR management in the region is ostensibly towards greater decentralisation, these technologies might ironically strengthen the forces of centralisation.

Admittedly, these technologies have also significantly empowered the so-called counter-mapping movement, a label for a host of independent efforts in Canada, Central and South America, the Philippines and Indonesia that involve working with indigenous communities to map their memories of ancestral rights and to understand and represent their alternate perceptions of the landscape itself through a bottom-up and participatory process (see Forum in the May 1998 issue of CPR Digest). Indeed, counter-mapping is seen as a way of mobilising communities to re-map CPRs and then to manage them. But counter-

mapping seems not to have gained much momentum in the South Asian region. Perhaps this is because, given historically mixed ethnicities, the concept of "indigenous communities" and their "ancestral rights" is not easy to articulate here. Or perhaps it is because of the much tighter control exerted by the state over maps and over the process of mapping in this region. It may be noted that the impetus for counter mapping has often come from the acceptance by the state of the need to re-map, be it because of court decisions in Canada or legislated mandates in the Philippines.

What has been experimented with in this region is participatory resource mapping (PRM), which is done in collaboration with the state machinery, possibly mediated by researchers. Examples can be found in some community forestry sites in Nepal and in the panchayat-level planning experiment in Kerala state in India. While both experiments have drawn some positive responses from villagers, in the absence of independent evaluations, it is not clear whether these efforts provide genuine autonomy of expression to the villagers, whether the maps provide truly meaningful input to planning, and whether the use of RS/GIS technologies in particular is cost-effective and feasible. As of now, the null hypothesis that RS/GIS technologies can add little value to villagers' intimate knowledge of their landscape remains to be disproved. And this hypothesis cannot be systematically tested until the framework of CPR governance provides sufficient space and autonomy for local villagers to take decisions regarding the resource, after which they can evaluate the contribution of any technology to the quality of their management. Till this radical change occurs, one should not expect the tail of RS/GIS to wag the dog of CPR management. And CPR researchers should explore and exploit these technologies without getting misled by the hype.

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