

Linking scientific knowledge with policy action in Natural Resource Management

Tropical forest margins are not merely a constellation of species of trees, but are spatial or social spaces in which many stakeholders or actors contest over many issues, and plan or justify their actions based on their knowledge, values and representations.

Three main groups of actors are: local people, government and associated leaders of public opinion, and scientists. Each actor mobilizes their best available knowledge to manage forest margins, while struggling to define and defend their actions, cultural boundaries, and positions within the wider power structure (Fig. 1).

But sometimes they also interact, mobilize social relations and deploy various discursive means for the attainment of specific ends. The interaction of different actors in terms of their knowledge, interests, values, available resources and the structures attendant to such interaction are crucial considerations in sustainable forest management.

If science is to help in enhancing the stability of forest margins, reducing poverty and securing long-term conservation of forest resources, it has to communicate effectively with the two other knowledge - action pairs (Fig 1), as well as with the many shades of opinion within their group. A persisting challenge is the quest for better integration of the knowledge - action pairs of three main actors.

In more than ten years of work in the tropical forest margins, the ASB Partnership has tried various approaches. A recent effort to take stock, reflect on

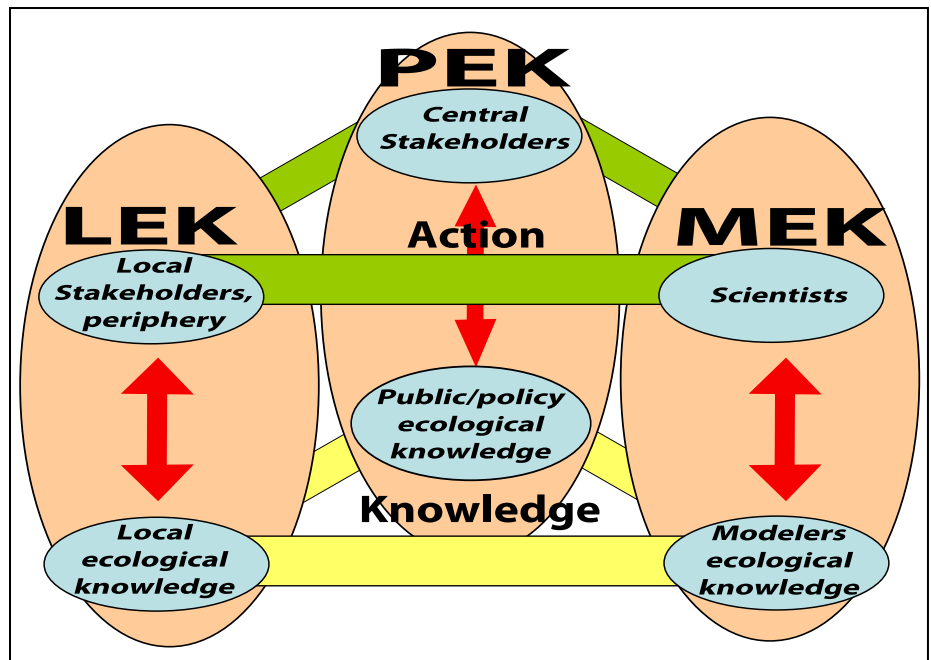


Fig. 1 - The actors have individual "knowledge-action pairs" with regards to forest management.

what has worked well and what the main challenges are enabled scientists to distinguish three types of knowledge that reside in each of the three main actors:

- **Local ecological knowledge, or LEK**, resides among local people and is embedded in local 'context',
- **Public space/policy ecological knowledge, or PEK**, concerned with immediate 'impact', and
- **Scientific, researchers or modellers' ecological knowledge, or SEK/MEK**, seeking generic 'mechanisms'.

Two simple approaches have not worked:

- a). Scientists and farmers generating new technology will not *in itself* lead to forest conservation,
- b). Scientists (or NGO advocates) advising policy-makers on how to handle the situation in forest margins for global benefits.

Real progress requires engaging all three Knowledge to Action pairs – but how?



Four main questions	Take-home messages
How can independent scientific inquiry add value to an already complex situation?	<p>Scientific knowledge is more likely to be integrated into other actors' decision making when it is perceived by them to be Salient (relevant), Credible (true) and Legitimate (unbiased). Achieving such shared 'SCL' perceptions requires active management of the science – action boundary.</p> <p>Management of the science – action boundary is needed for free flow of ideas and evidence, but with restrained levels of 'control.'</p>
How can 'boundary work' in such settings be done effectively?	Boundary agents play crucial roles in effective boundary work. Pointers are provided to boundary agents who want to build and maintain shared perceptions of the SCL of actors' respective knowledge contributions.
How can progress be made, when boundary work involves multi-stakeholder negotiations in the midst of conflicts and widely divergent ambitions?	Dynamic knowledge-action linkage may need to build a shared understanding of the landscape and a facilitated process of negotiations, initially in a 'safe space' protected from external interference.
Isn't all this 'natural resource management' work too site-specific for 'international public goods' production?	Replicability can be obtained by integrating 'boundary work' across scales from local to global, leading to linked 'boundary objects;' and by training of 'agents' with competence and skills in boundary work.

Virtues and risks of independent scientific enquiry

Linking newly acquired or well-established knowledge with actions for sustainable development can only work where 'lack of knowledge' is among the key constraints. Scientists have in the past explored different ways of linking knowledge with policy (Fig 2).

In the past, model (version 0) where science leads to international public goods that will be spontaneously taken up by well-intended private sector or public institutions had its advocates.

With an increase in the two-way interaction between science and practice,

however, uptake of results increased, alongside direct rewards for scientists who promised to deliver exactly what was demanded. Such 'demand driven' research may require some form of protection from interference.

Institutions managing the semi-permeable boundary arose, stimulating the flows of ideas but protecting science from 'interference' (version 1).

In fact, in the application of new knowledge, the complexity of local stakeholders and the scarcity of 'win-win' solutions, make that uptake of new ideas more complex, requiring negotiations along the various tradeoffs (version 2).

Tradeoffs increase the complexity for 'boundary agents' who may need to understand and manage the biases in accessing external knowledge by less-empowered local actors.

In confronting these models with the recent experience in developing countries, a fourth model appeared (version 1) in which there is no 'boundary problem', as there is no independence of research. Only statements supporting the status quo will pass the acceptability test. This is the version that has dominated in human history, and has only been slowly (and partially...) abandoned in some societies.

The linkage between knowledge and action thus needs to be evaluated as a two-way process in which the capacity for scientific enquiry to come up with new analyses of problems and potential solutions is dependent on the arrangements at the boundary. Two possible pitfalls are:

- (1) complete independence will lead to missed opportunities for early application; and
- (2) strong control will suppress independence.

Management of the boundary is urgent and may require more explicit recognition and institutions than currently exist.

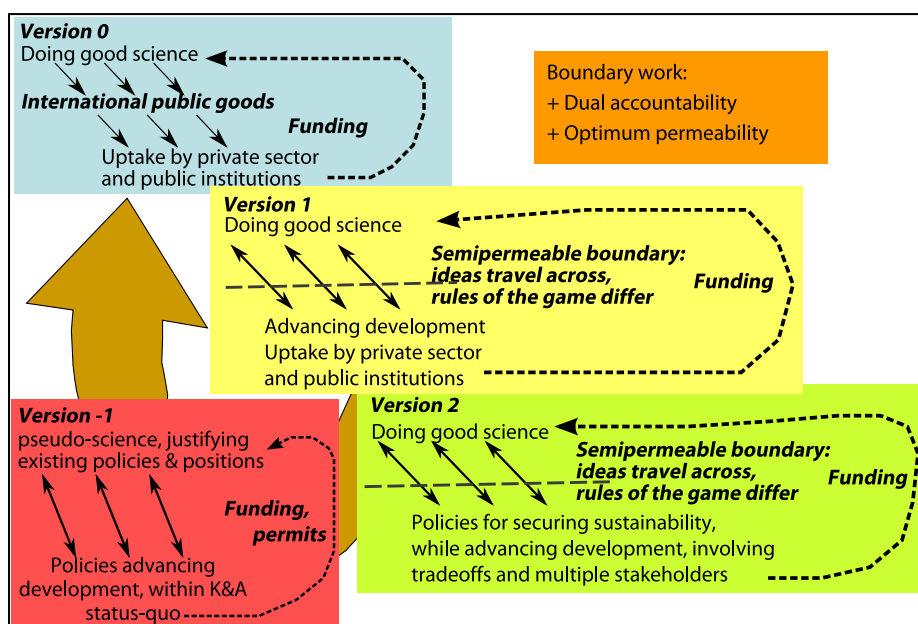


Fig. 2 - Versions of efforts by scientists to link their knowledge with users

How can scientific knowledge influence policy action?

1. Science-policy boundary work, influencing Kpol -> Apol
- 2A. Participatory Action Research, influencing Aloc via Kloc; 'proof of principle'
- 2B. Negotiation support from Aloc to Apol, via Kpol
3. Ascii => Apol: scientists' policy advise/prescriptions (no good ...)
4. Empowerment of Kloc (or Aloc) on its way to Apol (not easy without challenging Ksci/Kpol)

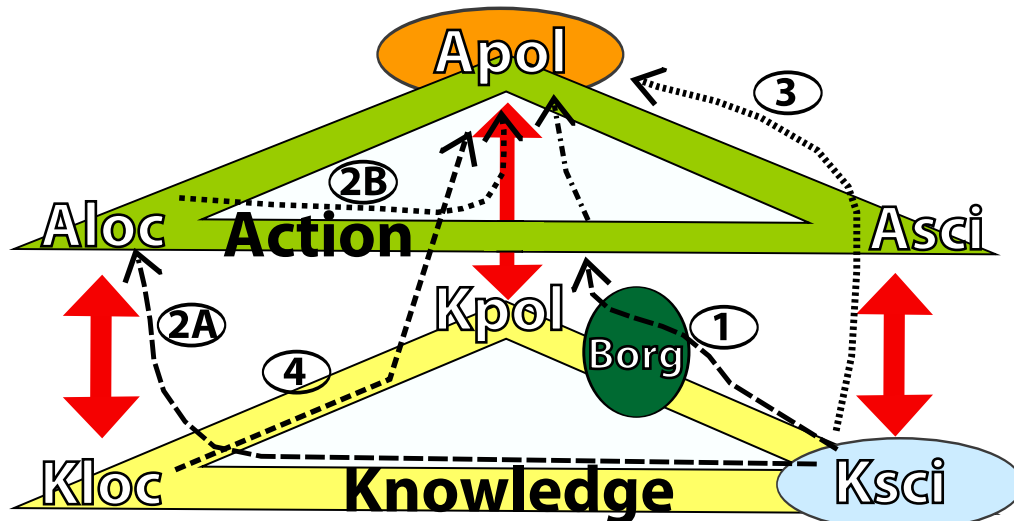


Fig. 3 - Pathways of actor engagement

Multi-actor negotiations in the knowledge+action world

The 'Negotiation Support System' was developed by ASB scientists to assist local communities in the forest margin and government authorities to step outside of their history of conflict and agree on secure tenure for 'squatter' communities in exchange for protection of the remaining forests and transformation of monoculture to multi-strata coffee gardens.

It engages all in the creation of new 'reality' in the local context, challenging existing paradigms - for example, in the government's initial mind, all types of coffee destroy watersheds and only natural forest or trees planted by foresters can secure water-flows. With scientific data, a new space for understanding needed change is created, at least at the local level.

Subsequent change at the central level will require the engagement of both these local and scientific actors, to address the rationale and formats of regulation and create space for learning (Fig. 3).

In fact, this example shows a 'new' way for scientific knowledge (K_{Sci}) to influence action at the public/policy level A_{POL} .

Previous approaches had focused on pathway 3 (scientists advising policymakers on what to do) and pathway 1 (scientists assisting policymakers to learn and chart their course of action). Pathway 3 rarely works; pathway 1 requires 'boundary organizations' to manage the interactions.

A fourth pathway aims at 'empowering' local stakeholders in their interaction with central policy knowledge/action pairs. Where existing policy has a monopoly over the use of 'science' to justify its positions, this may not work. Pathways 1 and 2 are not mutually exclusive, and may well be tried in conjunction.

Assisting change at local level probably lowers the threshold for assisting change at more central level - as long as it is not seen as too much of a 'threat' for the powers that be. Combining pathways with shortcuts into the public debate may work, depending on the urgency of the issue.

How to be effective in doing boundary work?

By reflecting on existing experience, the following list of ten points of advise emerged for persons/organizations who want to link scientific analysis and knowledge with local action and change.

Ten pointers in preparing for 'boundary work'

- 1). Expect more complex cases of multiple actors with their associated knowledge, contesting at both A and K levels, all using their own version of 'history' as justification; never underestimate nor over-estimate the ability of stakeholders to set their own course of actions.
- 2). Engage in interdisciplinary/ collaborative dialogues and consultations with all actors. Create open, safe space for intellectual enquiry: appreciate diversity, as long as it does not clash; refrain from value statements about other K; respect community norms and rules in use.
- 3). The meaning of words lies in the context of their use: don't trust that the meaning of the same words is the same for different groups.
- 4). Learning will often require the direct experience and empirical confirmation that alternative options do really exist: salience ('so what' outcomes), credibility ('how does it work' mechanisms) and legitimacy ('here, now and us' context, absence of foreign agendas).
- 5). Provide time for trust building: often a technical entry point can help to provide legitimacy to your engagement;

willingness to listen and answer questions of local stakeholders goes a long way to establish a two-way relationship.

6). Every type of boundary work requires double accountability, in moral if not formal sense; ensure backup and understanding at higher levels, as there may be times that the 'safe space' isn't quite so safe. Organizations may need to 'embed' boundary agents in appropriate structures and provide incentives to individuals to go beyond the call of duty, exploring ways of continually improving practice, and encouraging people to listen.

7). Guard the permeability of the boundary: 'ideas' can flow freely, 'control over what is true'; when 'politically incorrect' views or conclusions emerge, clarity is needed on the separate domains for empirical/scientific and public/domain knowledge

8). Knowledge sharing may aim not for maximum clarity (the researchers' aim) but optimal ambiguity: multiple K level interpretations can coexist, as long as they do not clash at the A level.

9). Live & walk the talk about separating scientific K from influencing conclusions: "although I personally had hoped otherwise, the outcome of the analysis/

experiment is..." Ensure that content/ substance and process of engagement are compatible and maintained.

10). Explore jointly how K to A linkages may have co-evolved, once there is awareness and appreciation of the relativity of all knowledge systems; Note that process is as important as the technical content/substance of the boundary work. Build a matrix for measuring program success.

Replicability via 'boundary work' and training of 'agents'

If change at any location requires an elaborate process with full scientific analysis and engagement, it is too costly and long-term to be of interest to investors in development. They may revert to the 'version 0' of Figure 2, investing in science that just produces 'international public goods', or the politically less complex 'version 1' of generating technology that is supposedly value and scale neutral. The argument of being too local in its impact has been a deterrent for investment in Integrated Natural Resource Management in the international agricultural research arena. Is there a counterpoint?

Boundary work of the type described so

far will often lead to a 'boundary marker' or 'boundary object' that represents the negotiated shared understanding of multiple actors. These boundary objects can be of many shapes and forms: words, phrases, diagrams, legal contracts, maps, operational models. The more these truly represent the various perspectives, the more likely they are to persist.

They can also be of great help for 'adjacent' negotiation processes as long as local stakeholders recognize the similarity. A repertoire of such 'boundary objects' provides the experience for organizations and agents to replicate success – but never in a prescriptive manner. What form of boundary object will 'work' and provide shortcuts for local learning will remain hard to predict.

ASB scientists in South East Asia have developed a suite of diagnostic, interactive and communication tools that are based on the analysis of the three knowledge types and their overlap and contradictions as a step in locally negotiated change. Experience so far suggests that this can be a cost-effective way of linking scientific understanding and knowledge to local action as a step towards redirecting global change in more desirable directions.

The ASB Partnership for the Tropical Forest Margins is working to raise productivity and income of rural households in the humid tropics without increasing deforestation or undermining essential environmental services. ASB is a consortium of over 90 international and national-level partners with an ecoregional focus on the forest-agriculture margins in the humid tropics, with benchmark sites in the western Amazon basin of Brazil and Peru, the Congo Basin forest in Cameroon, southern Philippines, northern Thailand, and the island of Sumatra in Indonesia.

ASB Policy briefs aim to deliver relevant, concise reading to key people whose decisions will make a difference to poverty reduction and environmental protection in the humid tropics.

We acknowledge Nancy Dickson, Elizabeth McNie, Niken Sakuntaladewi, Leimona Beria and Thomas P. Tomich for their invaluable contributions and support to the Boundary Organizations project. Initial support for the "Boundary Organizations for Integrating Knowledge and Action in International Development" project was provided by a core grant from the US National Science Foundation (Award No SES-0621004). Supplemental financial support was provided by ICRAF through the RUPES and TULSEA projects.

This document may be quoted or reproduced without charge, provided the source is acknowledged. © 2009 ASB

Contributors:

Meine van Noordwijk, Delia C. Catacutan and William C. Clark

References

- Joshi, L., Schalenbourg, W., Johansson, L., Khasanah, N., Stefanus, E., Fagerström, M.H. and van Noordwijk, M., 2004. Soil and water movement: combining local ecological knowledge with that of modellers when scaling up from plot to landscape level. In: van Noordwijk, M., Cadisch, G. and Ong, C.K. (Eds.) *Below ground Interactions in Tropical Agroecosystems*, CAB International, Wallingford (UK). pp. 349-364
- Pfund, J.L., Koponen, P., O'Connor, T., Boffa, J.M., van Noordwijk, M. and Sorg, J.P., 2008. Biodiversity conservation and sustainable livelihoods in tropical forest landscapes; In: Laforzezza, R.; Chen, J.; Sanesi, G.; Crow, Th.R. (Eds.) *Patterns and Processes in Forest Landscapes: Multiple Use and Sustainable Management*. Springer, Berlin.
- McNie, E., van Noordwijk, M., Clark, W.C., Dickson, N.M., Sakuntaladewi, N., Suyanto, Joshi, L., Leimona, B., Hairiah, K., 2008. *Boundary Organizations, Objects and Agents: Linking Knowledge with Action in Agroforestry Watersheds*. Report of a Workshop held in Batu, Malang, East Java, Indonesia – 26-29 July 2007. Sustainability Science Program, Kennedy School of Government, Harvard University and World Agroforestry Center – ICRAF Southeast Asia. Working Paper nr 80. World Agroforestry Centre
- van Noordwijk, M., T. P. Tomich, and B. Verbist. 2001. Negotiation support models for integrated natural resource management in tropical forest margins. *Conservation Ecology* 5(2): 21. [online] URL: <http://www.consecol.org/vol5/iss2/art21>, 18 pp

