

DEVELOPMENT OF PARTICIPATORY INSTITUTIONS FOR REINDEER MANAGEMENT IN NORTHERN FINLAND: PRELIMINARY SYNTHESIS AND REPORT

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PREFACE

This report is a summary and preliminary synthesis of the work conducted under Work package 1 (WP 1) of the RENMAN project ('The Challenges of Modernity for Reindeer Management: Integration and Sustainable Development in Europe's Subarctic and Boreal Regions'). RENMAN is funded by the European Commission's 5th Framework Programme 'Quality of Life and Management of Living Resources' during 2001-4. The objective of RENMAN is to create an open discussion forum for individuals who care about the future of reindeer management under the pressures of modernity. Open dialogue requires mutual trust and co-operation, both of which can be facilitated with appropriate institutions that are based on participation. The development of participatory institutions for reindeer management has been the task of Work package 1 of RENMAN. The leaders of WP 1 are professor Janne Hukkinen from the Laboratory of Environmental Protection at Helsinki University of Technology (HUT), Finland and professor Ludger Müller-Wille from the Department of Geography at McGill University, Canada. The members of the research team include Pekka Aikio (Sámi Parliament), Hannu Heikkinen (HUT), Outi Jääskö (Muotkatunturi Reindeer Herding Co-operative), Ari Laakso (University of Lapland), Hannu Magga (Lapland Reindeer Herding Co-operative), Satu Nevalainen (Kuivasalmi Reindeer Herding Co-operative), Kaisa Raitio (University of Joensuu) and Nina West (University of Lapland).

In the course of RENMAN, the HUT Laboratory of Environmental Protection has published several reports on the challenges and opportunities of reindeer management in the Finnish society. Three reports summarize the results of annual workshops between reindeer herders, officials and researchers: 'Reindeer herders speak out: Problems, decision-making opportunities and research needs in reindeer herding as seen by herders in the Province of Lapland, Finland' (HUT Laboratory of Environmental Protection publication Technology, Society, Environment 1/2002), 'The value of reindeer herding culture in Finland: Challenges for administration, management and control' (Technology, Society, Environment 1/2003) and 'The future of reindeer management: Report of the EU RENMAN project workshop in Kittilä, Finland, 13-15 August 2003' (Technology, Society, Environment in press). In a report entitled 'Can the mosquito be heard in heaven? Reindeer herders' analysis of changes in reindeer herding in Finland's Lapland during the 20th century', three reindeer herders, Hannu Magga, Satu Nevalainen and Outi Jääskö, describe changes that reindeer management has undergone in their own co-operatives as a result of social and environmental disruptions (Technology, Society, Environment 3/2003). Finally, in a report entitled 'More initiative, fewer complaints: The views of Finnish administration on the development of participatory institutions in reindeer management' (Technology, Society, Environment 4/2003), Kaisa Raitio from the University of Joensuu

and Hannu Heikkinen from HUT analyze expert interviews conducted during the RENMAN WP 1 on current problems and policy options in reindeer management.

The development of participatory institutions in WP 1 has taken place in the context of and in collaboration with nine other RENMAN WPs representing both social and natural sciences, and pooling together scientists from Bulgaria, Canada, Germany, Norway, Finland and Sweden. The other WPs have focused on comparing cultural and scientific knowledge on reindeer herding (WPs 2 and 3), transferring knowledge from Fennoscandia to Russia (WP 4), systems analysis of reindeer management in northernmost Europe (WP 5), remote sensing of reindeer herding practices (WP 6), the extent, productivity and nutrition value of vegetation vital for reindeer (WPs 7 and 8) and the physical, microbiological and hygienic properties of soil and water in the reindeer herding area (WPs 9.0, 9.1, 9.2 and 10).

On behalf of the entire WP 1, we would like to thank all reindeer herders, officials and researchers who have helped us in the course of RENMAN for their trust and collaboration.

Otaniemi (Finland), Montréal (Canada) and Kiiminki (Finland)

Janne Hukkinen, Ludger Müller-Wille and Hannu Heikkinen

I. PRELIMINARY SYNTHESIS: INSTITUTIONAL CHANGE IN REINDEER HERDING

Reindeer (*Rangifer tarandus*) has been hailed as an icon in the past and present representing northern people and environment. Whereas the Sámi, the aboriginal people of northernmost Europe, see it as their thread of life both in cultural and economic terms, the neighboring Finns to the south have integrated this animal as another additional element into their emerging agricultural cycles (Figures 1 and 2). Today, both these peoples in Finland's reindeer herding region are under considerable pressures for change internally and externally due to modernization and globalization processes. These current processes are accompanied by the reindeer also having become an iconoclastic and emblematic symbol and an element of international image building for Finland globally. Finland as a country appears to be representative of the mythical North, world-wide tourism with Santa Claus and acolytes and, even, of Finnish corporate business and products such as Finlandia Vodka or Nokia.

Both worlds - the reindeer herders or owners and the Others - afford reindeer quite different values, spaces and conditions for their existence. They are, in fact, worlds apart. The research projects under the RENMAN program were designed to delve deeply behind the existing discrepancies. They were also aimed to obtain an understanding of the disagreements and conflicts over how, what for, in what ways and for whom reindeer should be managed in a limited geographic space with a diverse population and an increasing, wide-ranging interest in different resources (Müller-Wille 2001). For that

purpose Workpackage 1 (WP 1, Helsinki University of Technology) focused on the inevitably ensuing institutional changes that are needed to cope with future challenges in managing reindeer and its ecosystem as well as maintaining distinct cultures and livelihoods. Institutions are here understood as the formal rules and informal codes of conduct that guide the actions (in this case, those pertaining to reindeer management) of individuals and organizations in a society (Hukkinen 1999).

1. OBJECTIVES: DEVELOPMENT AND DESIGN OF POLICIES

The projects in Workpackage 1 (WP 1) set as their major objective the development of participatory institutions, i.e., the promotion of designs and negotiations of policies for reindeer management that will have a direct impact on the local conditions and on the prospects for securing an acceptable level of quality of life. The participatory expectations also included the continuation of appropriate, locally developed management tools and regimes that will safeguard the continued utilization of living resources, i.e. reindeer and vegetation under specific environmental conditions. Furthermore, the maintenance of diverse cultural expressions and different approaches to livelihood were to be recognized and respected by these research endeavors. The goals were to be attained through the research team's direct involvement locally and through the application of adaptive and flexible research methodologies.

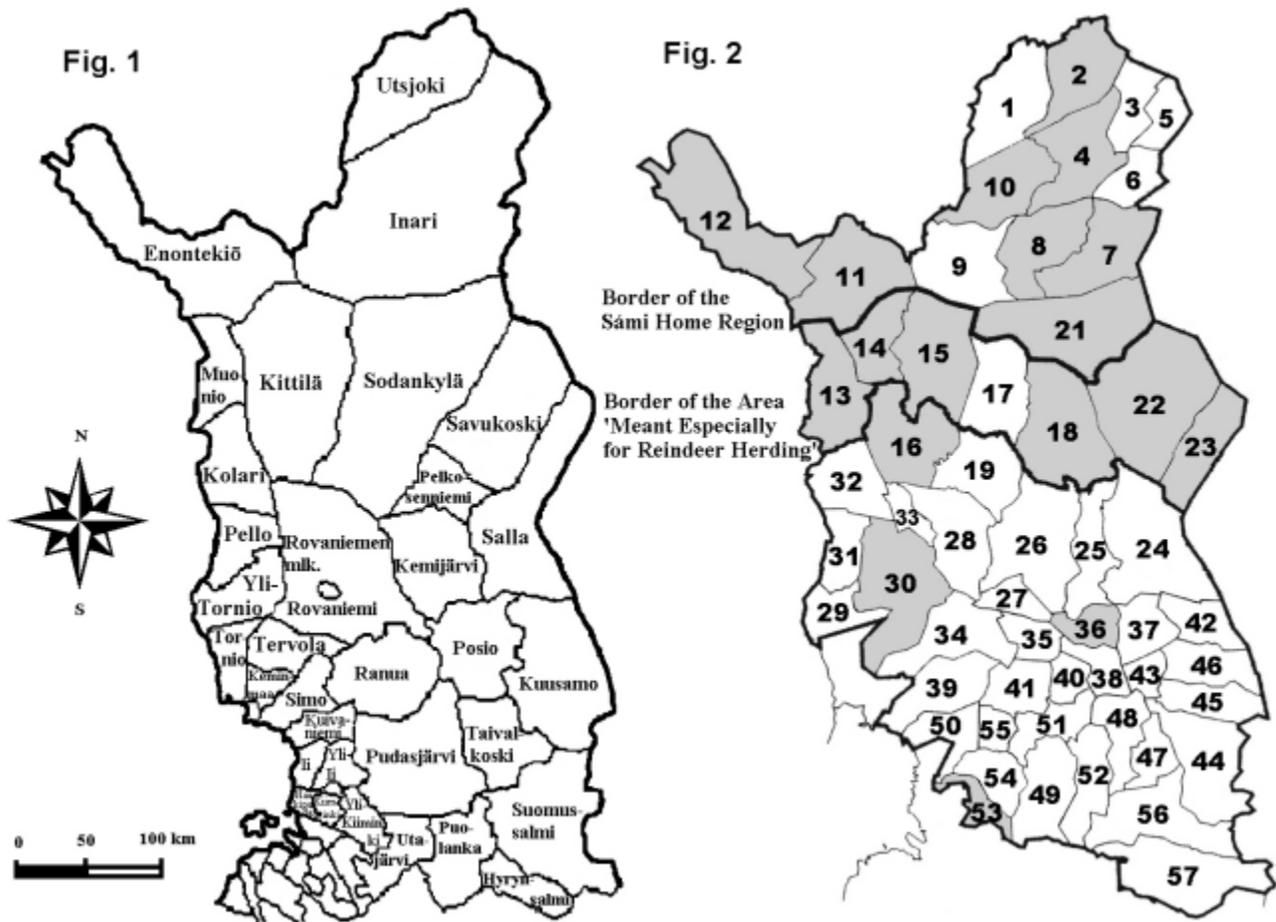


Fig. 1: Municipalities in northern Finland

Fig. 2: The home reindeer co-operatives of herders participating in the RENMAN-WP 1 workshops (2001-2003)

N:0	Reindeer Co-operative		
1	Paistunturi	19	Syväjärvi
2	Kaldoaivi	21	Lappi
3	Näätämö	22	Kemin-Sompio
4	Muddusjärvi	23	Pohjois-Salla
5	Vätsäri	24	Salla
6	Paatsjoki	25	Hirvasniemi
7	Ivalo	26	Pyhä-Kallio
8	Hammastunturi	27	Vanttaus
9	Sallivaara	28	Poikajärvi
10	Muotkatunturi	29	Lohijärvi
11	Näkkälä	30	Palojärvi
12	Käsivarsi	31	Orajärvi
13	Muonio	32	Kolari
14	Kyrö	33	Jääskö
15	Kuivasalmi	34	Narkaus
16	Alakylä	35	Niemelä
17	Sattasniemi	36	Timisjärvi
18	Oraniemi	37	Tolva
		38	Posion-Livo
		39	Isosydänmaa
		40	Mäntyjärvi
		41	Kuukas
		42	Alakitka
		43	Akanlahti
		44	Hossa-Irni
		45	Kallioluoma
		46	Oivanki
		47	Jokijärvi
		48	Taivalkoski
		49	Pudasjärvi
		50	Oijärvi
		51	Pudasjärven-Livo
		52	Pintamo
		53	Kiiminki
		54	Kollaja
		55	Ikonen
		56	Näljänkä
		57	Halla

For the three-year research period (2001-2003) WP 1 was continuously present in the Finnish reindeer management area through its locally employed researchers who are permanent residents and members (herders or owners) of three different reindeer herding co-operatives. Furthermore, team members (cf. List under IV.) spent a considerable length of time in a large number of co-operatives and elsewhere conducting 45 formal interviews with key experts, participating in reindeer herding activities throughout all seasons, making site visits and observations and engaging in intense discourses. Further local continuity and relations were established through three workshops that were held as the project's major focus in two different locations in August of each project year. These workshops had participation of almost 30 people each. In all 52 people (12 women, 40 men) participated in these workshops; 29 active reindeer herders or owners from 18 co-operatives (among them six women), eight administrators and politicians and 15 researchers (also from other RENMAN projects) became part of this social process (cf. List under III.). Next to the research team, the continuity of the reindeer herders' involvement was maintained by six of them being present and engaged in all three workshops.

These activities raised the level of public awareness among herders, administrators and researchers locally, regionally and nationally. The aim to maintain fair regional and professional representation and participation of the various interests in reindeer management was largely achieved, if not to full satisfaction (for example, with respect to gender balance and higher involvement of civil servants).

The participatory research methodology was adapted to local and regional circum-

stances. It evolved into a blend of experiences from cultural anthropology, human geography, sociology and studies in environmental management and protection; the research team's practices were based on sound ethical principles for the conduct of research. WP 1 chose Participatory Action Research (PAR) as the major approach and methodological tool to overcome the still existing barrier between scientists and practitioners ('stakeholders') who are, in fact, the experts in reindeer management (Müller-Wille & Hukkinen 1999). In that respect it is of paramount importance that practitioners are equally involved in the formulation of research problems and in the preparation of grant applications right from the conception of projects.

The key point in the PAR methodology is that research is based on equal partnership negotiated between the experts (reindeer herders) and the external scientists (RENMAN), allowing both to experience and practice each other's worlds, be it in reindeer management or science. Furthermore, research questions are driven and formulated from within the community concerned in conjunction with scientific methods to hone the problems, arguments, and ensuing research results in cooperation with all engaged parties. This approach stresses direct communication, an atmosphere of open exchange, flexibility and mobility in research actions, solution to personnel issues, and appropriate ways for publications (cf. Hall 1979; Hiebert 1999). All these points were carried out in a co-operative fashion. Furthermore, the local variations in cultural and linguistic expressions - Sámi and Finnish - were respected. For example, we stressed the use of native languages rather than accepting the established role of English as the scientific *lingua franca*, which often is exclusive to 'stakeholders'.

2. INTEGRATIVE ANALYTICAL APPROACHES

In the WP 1 projects, the main integrative and interdisciplinary analytical approaches consisted of the workshops as a social process. In addition, structured interviews and their systematic analysis, and regional studies on changes in reindeer management were carried out by the team members, four of whom who were also local practitioners.

The three **workshops** were used as tools for integrating opinions and statements of different parties. Through their participation in the workshops, the different parties could formulate issues and concerns, research questions and, finally, recommendations for the development of effective participatory institutions in reindeer management. This procedure made certain that the diverse approaches to reindeer management were defined by the inside and not by the researchers from the outside. The stages in the procedure were as follows.

- Participation in workshops (working groups and plenary sessions);
- compilation of minutes prepared by the research team for comments and revisions; first complete draft;
- circulation of draft to all participants for comments, statements and revisions;
- editing of final report based on feedback respecting the diversity of comments and voices;
- publication and distribution of reports to all participants and specifically identified clienteles (e.g. all reindeer households throughout the Finnish reindeer herding region).

The questions posed in the formal **interviews** with herders and administrators (managers, civil servants) were formulated by the research team with input from both herders and administrators. One of the interviewers was both a reindeer herder and member of the research team. The questionnaire thus represented a cross-section of issues around the modernization of reindeer management drawing from interdisciplinary and intercultural experiences.

The **regional studies** conducted in three reindeer herding co-operatives were based directly on the expertise of practitioners who analyzed and reflected upon the changes that had occurred in their own reindeer herding communities during the second half of the 20th century. These practitioners have broad expertise and detailed knowledge of both social and natural components of their environment, which they brought to bear in their extensive treatises.

WP 1 also facilitated an open discussion among social scientists, natural scientists and practitioners by organizing working meetings and site visits for all workpackages within the RENMAN research program. These events contributed to a better understanding of each party's approaches, goals, concepts and working methods. Moreover, joint site visits were organized under the guidance and control of reindeer herders in their own reindeer herding co-operatives. The ensuing discussions stressed the role of ethics as an integral element in the conduct of research including permission, consent and partnership. Still, despite the good intentions, these meetings did not lead to a deeper integration of research practices among the workpackages. Rather, some limited progress was achieved by acknowledging the conceptual and methodo-

logical divides that continue to exist among social sciences and natural sciences, with the reindeer herders very much caught in the middle.

3. KEY FINDINGS

3.1 Participatory institutions

Obstacles for new designs and negotiations of participatory institutions in reindeer management were identified in the still existing entrenched divisions between reindeer herders and central bureaucracies, such as the National Reindeer Herders' Association (Paliskuntain yhdistys, PY) funded by the Ministry of Agriculture and Forestry (maa- ja metsätalousministeriö, MMM). Misguided images and ignorance related to reindeer matters seem to be the cause to this uneasy situation. Furthermore, issues touch upon the choice of management tools, policies and regimes. Moreover, there lingers an endemic distrust among the parties involved in reindeer management, be they herders, administrators or scientists. The prevailing hierarchy of institutional structures also continues to support a certain degree of rigidity, inflexibility and conservatism that hampers initiatives, creativity and thus progression on all levels from local, regional, national and to international or European.

Current informal or formal institutions need to redefine their positions and relationships between the local and the international levels. These institutions are the informal but socially and economically important 'siida' or 'tokkakunta' (herding unit), the formal 'paliskunta' (herding co-operative), PY (association with central management tasks), MMM (ministry establishing national policies for reindeer management), and, finally, the European

Union which issues binding directives. The opportunities for change need to be pursued constructively through a process of establishing public awareness of overarching issues. Open fora such as the workshops mentioned above rally herders around socio-political and cultural initiatives leading to actions and changes. The emphasis in institutional restructuring must be on participation, local power and control in order to attain results that secure and enhance reindeer management. This overall conclusion does not surprise us in light of earlier studies on the prerequisites of sustainable governance of natural resources (Berkes and Folke 1998; Gunderson et al. 1995; Hanna et al. 1996).

3.2 Quality of life

Reindeer herding in Finland in the early 2000s represents a livelihood and style of life for some 800 to 1 000 families who rely on a stock of around 200 000 reindeer for part of their income each year. The difficulties to maintain an acceptable quality of life are manifold because herders and owners need to engage in a multitude of tasks in order to make ends meet in circumstances of limited growth. Furthermore, management practices vary from place to place dependent on environmental and socio-economic conditions.

The diversity of management practices within the reindeer herding co-operatives in northern Finland should be better represented in current Reindeer Herding Law. The three regional zones which are insufficiently identified in the current legislation are, from north to south, (1) the Sámi Home Region with its Sámi management patterns within the boreal and tundra ecosystem, (2) Finnish reindeer herding within the boreal forest, (3) reindeer keeping as an element of Finnish

agriculture. Each zone has its own unique potentials. However, the zones have to be given more explicit individual attention to enhance their conditions and opportunities. At the same time, there are similarities among the two northern zones that could lead to cooperation and integration. Still, there is a prevalent tendency today to level off 'reindeer herding' as being the same in all areas. Even in Norway and Sweden the label 'Norwegian' and 'Swedish' reindeer management is applied despite the fact that the Sámi have the right to reindeer herding practices with some specific exceptions.

Obstacles to securing an acceptable quality of life for communities in the reindeer herding area can be seen in the general suspicion and prejudice prevailing on the national level among the general public and in administration. The position of MMM on reindeer management is clear: the ecosystem cannot sustain more pressure by reindeer grazing and management practices. Thus the number of reindeer has to be decreased through quota, resulting in fewer and fewer reindeer owners. Quotas on ownership curtail the economic feasibility for small-scale owners.

Opportunities need to be pursued to strengthen the concept of 'livelihood' (incl. culture and language) as encompassing reindeer management and not confuse it with profit-making commercial enterprises based on free-market economy and its inherent system of competition. In this context, concepts which their propagators argue for on scientific grounds, such as 'overgrazing', 'pasture capacity', 'ecologically sustainable reindeer management', and/or 'quota system', carry considerable political clout with decision-makers whose policies have a direct impact on local reindeer herding communities and the herders' income level. These

concepts need to be scrutinized in their content and validity in order to attain socio-economic equity for the 'stakeholders' in reindeer management (for general discussions cf. Hanna & Jentoft 1996: 47-50; Hukkinen 2001).

Reindeer herding represents one of the prime opportunities to develop co-management practices for the utilization of 'common pool resources' (CPR) which are the pastures, mainly public lands. Herders themselves are the very 'stakeholders' to observe and understand the conditions of pastures for the use by reindeer. They are also the people who suffer most directly from the misuse of the CPR or benefit from its sustainable use. Hence the herders are the people who possess the efficient and rather inexpensive means to manage CPR because they have strong motivations to attain modes of sustainable use (for detailed discussions of CPR cf. Mackean 1996: 223-224, 228-229; Ostrom et al 1994: 301-304, 319-329; Ruckelshaus 1998: xii-xiii).

4. POLICY RECOMMENDATIONS

The following summary includes four sets of policy recommendation. First, we will articulate points of negotiation for improving local conditions and quality of life among reindeer herders, as presented by reindeer herders themselves in the workshops. Second, we will outline a set of institutional and organizational recommendations for improving the reindeer management regime, as synthesized by the WP 1 research team. Third, we will recommend ways of improving the integration of knowledge sets between scientists and practitioners in reindeer management. Finally, we suggest how meaningful partnerships in reindeer research could be facilitated in the future.

4.1 Points of negotiation for improving local conditions and quality of life for reindeer herders

The following points represent a cross-section of recommendations and proposals that have emerged from the workshops. They are not based on consensus, thus they include divergent views and contradictions.

- Legal and socio-economic strengthening of existing institutional structures that support local initiatives;
- negotiating co-management regimes to strengthen local and regional involvement and cooperation (e.g. Land Use Council);
- co-management regimes need to obtain powers to restrict economic activities, such as unbridled tourist activities in herding areas, if they become harmful to the local population;
- there is an urgency in the Sámi Home Region to forge understanding, trust and cooperation among reindeer herding co-operatives, municipalities, Sámi Parliament and Metsähallitus (Finnish Forest and Park Service) with respect to development plans and policies (e. g., forestry policy, zoning practices);
- transfer responsibility of reindeer and general resource management and utilization to the Sámi Parliament in the Sámi Home Region;
- recognize and allow for the differences within the Finnish reindeer herding region when policies and development plans are considered; the southern agriculturally based reindeer owners pursue different practices compared with Sámi herders in the northern timberline forests or

open tundra; furthermore, the type of other land uses and their relationship with reindeer herding differ markedly from zone to zone;

- strengthening the legal base for reindeer herding livelihood (incl. gathering, fishing, hunting, tourism and stewardship of the land);
- securing cultural and linguistic expressions for both Sámi and Finns in reindeer management;
- levels of subsidies need to be adapted to the regional variations in the costs incurred by reindeer herding.

4.2 Recommendations for improving the reindeer management regime

During our research we have observed that many reindeer researchers and officials hold the mistaken assumption that reindeer herding in Finland is a self-sustaining, low-intensity management system, which really requires just modest monitoring of a few general indicators (such as the number of reindeer) because of its considerable self-correcting capacity. In fact reindeer management takes place in an ecosystem under intensive human domination and often has the characteristics of a high reliability management system (van Eeten and Roe 2003; Hukkinen 1999). Modern reindeer management takes place in an ecosystem intensively dominated by a variety of human activities that compete with reindeer herding, including forestry, tourism and hydropower. Furthermore, modern reindeer management has over the past five decades been forced to make fundamental, quick and reliable adaptations to a number of external events imposed by modernity and globalization, including reservoirs, forestry practices, tourism, and slaughterhouses. Since reindeer man-

agement in Finnish Lapland bears the marks of a high reliability management system, the notion of reliable ecosystem management has much to offer to improve reindeer management. The promise of reliable management for reindeer herding can be articulated in terms of the following recommendations.

4.2.1 Guide reindeer management with dynamic sustainability bandwidths instead of fixed carrying capacity indicators

There are already signs that reindeer management will in the future be more and more guided by sustainability indicators. However, currently applied indicators assume that fixed carrying capacities can be determined for the ecosystems within which reindeer management takes place. This is an untenable assumption in real-time sustainability management. Indicators that assume fixed carrying capacities are simply not operational in modern reindeer management, which is characterized by numerous just-in-time operations with high reliability requirements, such as tightly scheduled calf marking and culling with airplane assistance, EU-regulated slaughtering with tightly scheduled veterinary inspection, part-time herders with other jobs to handle, and fewer and fewer herders to manage it all. To set fixed targets for any of these aspects of the complex reindeer management system would make it unmanageable.

A more effective way of managing the just-in-time and reliability requirements is by **bandwidths**, since all of the above-mentioned just-in-time and reliability features act as de facto or de jure bandwidths for management. Bandwidth management permits the consideration of management implications under bounded

carrying capacities, that is, under carrying capacities that depend on alternative assumptions of what the future social and ecological context of reindeer management will be. The bandwidth approach enables dynamic reindeer management because bandwidths are *inevitably* breached or exceeded at some points of the operation -- precisely because they have to be dynamically updated in light of empirical, real-time management experience. EU regulations for slaughterhouses, for example, are avoided in many alternative ways. Reindeer can be slaughtered at the culling site if it is for 'home consumption,' but the meat can nonetheless end up in the informal market. Some reindeer herders are avoiding the EU-regulated slaughtering legitimately by direct sales to customers (cf. Jodha 1996: 215-218; Baden 1998: 60-61).

4.2.2 Address incompatibilities between reindeer quotas and meat markets

Reindeer meat markets currently operate in an informational asymmetry created by the combination of quota regulation by the state and price fixing by a few large meat purchasers. The state (i.e., the MMM, PY and the Fish and Game Research Institute) publicizes the actual numbers of reindeer, the maximum allowable numbers of reindeer and the number of reindeer that have to be slaughtered per co-operative well in advance of the slaughtering season. Reindeer meat is purchased by a few large meat processors who therefore have full information of the number, weight and age of reindeer to be slaughtered each year. The result of the uneasy combination of planned and market economy is downward price fixing by the meat purchasers.

Several remedies come to mind. The most obvious solution would be to declare all reindeer statistics and quotas confidential. Alternatively, following the planned economy model, the state should commit itself to securing an agreed-upon income for reindeer herders regardless of the meat price. In the third alternative, the market economy model, reindeer quotas would be turned into marketable commodities. In such a system, a co-operative that slaughtered less than the allowable amount would have assets to sell in the quota market, whereas a co-operative that slaughtered more than the allowable amount would have to purchase additional quotas in the quota market. The fourth alternative would follow the advice given by many reindeer herders during the workshops and scrap the quota system altogether and replace it with local self-regulation. The rationale here is that given the reindeer herders' tradition in self-regulation under the old siida system, given their intimate knowledge of pasture conditions and given their inherent interest in maintaining a viable livelihood in the long run, local determination of slaughtering schedules would be the best way of securing sustainable reindeer herding.

4.2.3 Regard reindeer herders as managers of a high reliability ecosystem

The critical periods of reindeer management, such as culling, differ in no significant way from any other just-in-time operation with high reliability requirements. During such periods, reindeer herders become the equivalents of real-time control room operators, whose cognitive models about reindeer herding activities are based on cumulative experience with northern ecosystems and cultures. This cumulative experiential knowledge is a

key element of reliable reindeer management, because it essentially provides instructions for management actions in 'impossible' situations, often based on experience gained from analogous historical situations. Formal recognition of local management expertise also creates a self-reinforcing cognitive-institutional path dependency: governance of a local ecosystem by a community that lives within and depends on that ecosystem reinforces local expertise, which in turn reinforces the governance system (cf. Johda 1996: 215-218; Mckean 1996: 228-229; Ostrom et al 1994: 323-324; Heikkinen 2002: 197, 313-320; Hukkinen 1999; Hukkinen in press).

4.2.4 Bring government researchers together with reindeer herders to make decisions on reindeer management in the field

Relying on local expertise alone is not enough in modern reindeer management. Bringing the MMM scientists and planners with their satellite images, field measurements and other scientific information into the field with reindeer herders would have the capacity to improve reindeer management operations. Today, however, the profession is polarized into opposing camps, where reindeer herders perceive the state ecologists, planners and officials as ideologically opposed to the livelihood of reindeer management, and the ecologists, planners and officials see the reindeer herders as a backward community unreceptive to modern management ideas. We suggest that for the dynamic reindeer management goals, or bandwidths, to be specified, intensive collaboration and communication will be required among diverse experts, including reindeer herders, scientists, and officials. Bandwidths thus constitute a novel 'knowledge management interface' be-

tween pragmatic and scientific knowledge on the ecosystem (cf. Ostrom et al 1994: 328-329; Hanna & Jentoft 1996: 47-50; Heikkinen 2002: 332-333; Hukkinen 2003; Hukkinen in press).

4.2.5 Conduct gaming exercises over reindeer management utilizing the cognitive models of a wide range of experts

Gaming exercises are one way of implementing the two earlier recommendations. There needs to be a formal procedure by which the equivalent of a 'control room' for reliable reindeer management is created and by which the various stakeholders of reindeer management are brought together. Gaming exercises between reindeer herders, officials and scientists would simulate in a realistic setting the organizational and cognitive processes taking place in actual real-time decision making during critical events such as calf separation or culling. During gaming exercises, the significance of complex systemic linkages, important path dependencies and critical events in reindeer management operations could be explored by permitting a diverse group of experts to participate in simulated real-time decision making in the same control room. Consideration of options and justification of real-time decisions would be based on a wide variety of models, ranging from verbally articulated experiential models to more formalized computer models (van Eeten and Roe 2003; Hukkinen in press; Ostrom et al 1994: 75-97). The workshops organized under RENMAN WP 1 are the first experiment with such gaming in reindeer management. Future exercises should have influential mandates from the reindeer management administration at MMM, including precise agendas to resolve specific reindeer management issues.

4.2.6 Redefine strategic coalitions of interest groups in reindeer management

In any rapidly changing livelihood, one can expect to see a marked contrast between how the livelihood is formally instituted and organized to manage itself and how the livelihood is in fact being managed daily in informal practices. The tension between the formal ways of doing things and the informal ways found to be practical in the face of real-time management contingencies also holds the seeds of institutional and managerial innovation (Heikkinen 2002: 232-234; Hukkinen 1999; Hanna & Jentoft 1996: 47-50). Such is the case with reindeer herding in Lapland. Reindeer herding and endangered predator protection are in public discussion often assumed to have conflicting interests and are consequently separated organizationally under public administration. Yet there are voices in the reindeer herding community who feel that with the right incentives predator control would fit well with reindeer management. Just as there is a price per head of reindeer, there could be a price per head of predator, and the overall management of both predators and reindeer could be handed over to the reindeer herders. In fact, reindeer herders and environmentalists have already found each other in a political coalition over another environmental issue, namely, that of protecting Lapland's old growth forests, which ensure a crucial winter feed for reindeer, tree lichen.

The latter example illustrates another tension between formal and informal arrangements. The prime target of the criticism by environmentalists and reindeer herders against the cutting of old forests is the Finnish Park and Forest Service, an agency of the MMM formally responsible

for protecting the sustainability of Finnish forests. Here a worthwhile institutional experiment would be to regard reindeer herders as comprehensive natural resource managers at the local level. In addition to reindeer management, they could become local representatives of the Ministry of and assume the duties of predator control and forest management.

The third example of the mismatch between formal and informal arrangements is the relationship between reindeer management and agriculture. The MMM, supported by the common agricultural policy of the European Union, treats reindeer herding largely as a special kind of livestock agriculture, and has crafted its regulations and subsidies for the livelihood analogously to those in place for agriculture. Most reindeer herders are insulted by the analogy and perceive themselves as a unique type of livelihood worthy of regulatory treatment tailored to their particular needs. Our analysis indicates that the reality is more diversified than this. In southern Lapland, reindeer management has evolved into a livelihood in which relatively small domesticated herds often co-exist with and even assume agriculture. In northern Lapland, reindeer management is much more based on grazing by semi-domesticated animals in relatively large herds. Consequently, it would make sense to develop reindeer management policies that take into account this geographical diversification. It would also make sense to formally strengthen the de facto coalition between reindeer herders in southern Lapland and farmers in the rest of Finland.

The described coalitions result from the complexity of informal institutions and practices in reindeer management. It is also evident that those coalitions shift constantly, in accordance with the de-

mands of real-time reindeer management and often against expected political allegiances.

4.2.7 Determine networks of reliability at different scales that enable differentiated management-strategies for reindeer herders

This recommendation follows from the complexity of institutions and interest groups in reindeer management. The result of this complexity is that often the high reliability networks do not follow the scales or divisions of existing organizations. Take what is probably the most significant administrative unit from the point of view of day-to-day reindeer management, namely, the reindeer herding co-operative. Many reindeer herders perceive the boundaries of the co-operative as hindrances to sensible reindeer management. In many northern co-operatives, for example, landscape differences such as fells versus rocky forests, or cultural differences such as Sámi versus Finnish culture, have resulted in subdivisions in herding practices ('tokkakunta' in Finnish or 'siida' in Sámi). In contrast, many co-operatives in southern Lapland experience the need to collaborate intensively across the boundaries of co-operatives, particularly during the critical periods of calf marking and culling. The result is that the high reliability networks of reindeer herding break the assumed organizational scales both downscale and upscale: often large co-operatives in fact function as a set of smaller herd communities that may actually collaborate more with herd communities in neighboring co-operatives than ones within their own co-operative, and smaller co-operatives in fact collaborate to the extent of constituting a much larger co-operative.

4.3 Integration of knowledge sets

From the point of view of WP 1, the key interfaces for improving knowledge integration in the RENMAN project are as follows:

Between WP 1 researchers and reindeer herders. Integration was achieved in the WP 1 research projects through the premise of equal partnership between scientists and practitioners. This was practiced by organizing joint meetings and workshops, employing reindeer herders as researchers and by preparing co-authored publications. By encouraging these types of partnerships, local initiatives, responsibility as well as real power positions, locally based reindeer herding practices (e.g. co-management regimes) would achieve a more efficient, holistic, inexpensive, accurate and fair approach to the management of common resource pools in comparison with the existing sectoral style, which is more cumbersome and less equitable. Reindeer and pastures are part of the social capital that herders and owners need to redefine to secure its future.

Between other WPs and reindeer herders. To facilitate the RENMAN objective of equal partnership and collaboration between researchers and reindeer herders, WP 1 organized a seminar on participatory research ethics in Vuotso in 2001 for all RENMAN WPs, with a key note presentation by a Sámi and a researcher, Anni-Siiri Länsman. The seminar concluded with an agreement that all RENMAN researchers will contact the co-operative prior to any field visits. Contact persons were also identified. Apart from a few unannounced field visits, the agreement was by and large followed.

Between RENMAN and policy makers. Interaction between WP 1 researchers and the reindeer administration in Finland was very positive. Despite underlying historical tensions between officials, researchers and herders, the workshops were perceived by all parties to be a positive step to the right direction. The workshop process should be continued and given policy making powers. The impact of RENMAN at the level of EU policies remains to be seen.

Between RENMAN and other research groups. In recognition of the need to share information on ongoing socio-cultural reindeer research in Finland, WP 1 asked the Thule Institute of the University of Oulu to organize a workshop on the topic in February 2002. Ten ongoing research projects in Finland were presented, followed by a discussion of possible collaboration. The seminar provided the participants with key background information that has helped them pursue research synergies and avoid overlapping work.

Among RENMAN WPs. Integration among the WPs has taken place at the annual Project Coordination Committee meetings and through numerous informal contacts between RENMAN researchers. Despite occasional difficulties in integration, which have been due to lack of resources for extensive translations from Finnish to English and differences in research approaches, the RENMAN has by and large been a very successful multi-disciplinary research project with a clear problem-oriented focus. To facilitate a more inter-disciplinary research approach, future projects should invest considerable resources in adequate pre-project discussions to agree on the integration of research paradigms and approaches.

Among RENMAN WP 1 researchers. WP 1 has been extremely successful in integrating its researchers in intensive discussions on substantial research issues, despite the large geographical distances between individual researchers. Annual workshops have provided opportunities for mutual brainstorming, and each workshop report is the result of intensive collaborative editing. Collaborative workshops, brainstorming sessions, co-authoring and co-editing have proven to be fruitful modes of knowledge integration that can be emulated elsewhere as well.

4.4 Partnerships in research

This relation was achieved through the application of PAR. The approach needs to be applied consistently throughout and beyond projects to attain the goal of fair equity in research and science:

- any grant application needs to be conceived by both scientists and practitioners jointly from its inception to allow for meshing of ideas leading to sound research with appropriate results for policy development;
- any co-management structure needs to have the decision-making powers to shape the future of reindeer management; any feeling of an illusionary 'theater of democracy' needs to be avoided; this would only widen the gap between practitioners and managing administrators and lead to opposite results in this process.

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II. SUMMARIES OF PROJECTS AND PUBLICATIONS

1. WORKSHOPS ON THE FUTURE OF REINDEER MANAGEMENT AND PARTICIPATORY INSTI- TUTIONS

Workpackage 1 organized a series of three workshops as a forum for the formulation of problem areas, concerns and issues as well as recommendations and scenarios for reindeer herding management. Next to logistics and amenities for the participants the research team provided for the documentation of this process through an interactive exchange of ideas and texts. Each workshop's results were published and widely distributed. These reports have served as a base for further research, discussions and debates around the future of reindeer management in northern Finland.

1.1 Workshop 1, Tankavaara, Vuotso, 24 to 26 August 2001

Reindeer Herders Speak Out. Problems, decision-making opportunities and research needs in reindeer herding as seen by herders in the Province of Lapland, Finland (Hukkinen et al 2002)

The first workshop brought together 27 people, researchers (9, all from RENMAN) and reindeer herders (18) who came from the Lappi Reindeer Herding

Co-operative (7), where most of the on-site studies were conducted, and from 10 other co-operatives (11) distributed from south to north. The names of reindeer herders had been suggested through a variety of sources (personal contacts, known public figures, interviewees). A requirement was that people played an active role in reindeer management within their own co-operative or on the regional level.

The workshop's deliberations in working groups and plenaries established items that were put together as check lists and were repeated for each area such as (a) identifiable problems, (b) proposed recommendations and, finally, (c) urgent research needs. The areas on the checklist covered in sequence (1) administration, (2) institutions, (3) continuation of livelihood, (4) cultural dimensions and (5) environmental problems. Each section included a range of detailed items with explanations.

The workshop's report was widely distributed in reindeer management circles but also to all 1 800 reindeer herding households whose list was made accessible through the National Association of Reindeer Herding Co-operatives. The ensuing discussions between reindeer herders and the research team led to the preparation of the second workshop which created a focus on specific themes to be dealt with.

**1.2 Workshop 2,
Levi Lappi Village, Kittilä,
23 to 25 August 2002**

The value of reindeer herding culture in Finland. Challenges for administration, management and control. (Hukkinen et al 2003)

The second workshop expanded the range of participants by inviting reindeer herders, administrators and politicians as well as researchers from outside the RENMAN research programs. In all 32 people joined this workshop: 19 reindeer herders from 16 co-operatives: 10 from the Sámi Home Region (8 co-operatives), 6 from the central regions (5) and 3 from the southern fringe (3): there were 2 regional administrators and 1 politician as well as 10 researchers (incl. RENMAN) and organizers.

The thematic topics covered following areas: (1) society's role in solutions for reindeer herding's problems, (2) the conflict between community and market forces, (3) relations with other land use practices, (4) reindeer numbers and pasture conditions, (5) subsidies and compensations in reindeer herding, (6) the position of the National Association of Reindeer Co-operatives, (7) central administration in reindeer herding, (8) the European Union and central slaughter facilities, and (9) research, expertise and planning.

Each item was thoroughly discussed in working groups and plenary sessions and resulted in an extended report identifying in detail each problem area by formulating proposal that were prepared for the third workshop. This report was distributed to all participants, reindeer co-operatives, administrators and researchers.

**1.3 Workshop 3,
Levi Lappi Village, Kittilä,
13 to 15 August 2003**

The future of reindeer management (Heikkinen et al in press)

The third and final workshop became the crucial threshold for the process of participatory action research which was the principle behind this open-ended social process. The actors, i.e. the participants (incl. the research team of WP 1), had the outcome in their hands. This time the number of participants was 28 with 13 reindeer herders from 12 co-operatives, 6 from the Sámi Home Region (5 co-operatives), 4 from the central area (4) and 3 from the south (3), 9 researchers (3 from outside RENMAN) and 6 administrators from the national, ministerial and regional levels.

The results of this series of workshops will lead to the formulation of visions, scenarios and recommendations that are grounded in the final discussions and the review of the documents by all participants. It is quite apparent that the opinions and voices were not unanimous. Neither was it the objective to achieve consensus - an impossibility. Rather, the results are seen as a contribution to the continuation of very much needed discussions on the future of reindeer herding. The report is currently under review and will be ready for publication by early 2004.

**2. CAN THE MOSQUITO BE
HEARD IN HEAVEN? REINDEER
HERDERS' ANALYSIS OF CHANGES
IN REINDEER HERDING IN
FINLAND'S LAPLAND DURING
THE 20TH CENTURY
(HEIKKINEN ET AL. 2003)**

The objective of the regional studies on recent historical changes in reindeer herding practices was to obtain a detailed insight into varying local processes as seen by the practitioners themselves who participated fully in these processes. All three authors of the following studies are involved in reindeer management and related livelihoods based on local renewable resources. All three own reindeer and have been active politically in their local communities shaping changes to policies, economic development and social affairs. None of the authors is a trained researcher or academic. Thus these treatises break conventional academic borders by drawing directly from life experiences within the communities which are translated into the structured framework of a systematic study of changes in reindeer herding during the 20th century. The authors' tasks were formidable knowing that their presentations would be scrutinized along any other scientific writing coming out of the RENMAN research program. The results show the wealth of detail and the analytical skills that the practitioner exudes working with situations in real life and making constant decisions for the well-being of the community and the animals.

**2.1 Losses and adaptations in reindeer herding in the Lappi Reindeer Herding Co-operative due to considerable environmental changes since the 1950s
(Magga 2003)**

This report is divided into three major sections. In the first, the author discusses the historical development of reindeer herding and related livelihoods such as hunting, fishing, berry gathering, hay-dairy agriculture and handicraft. In addition, he provides a detailed analysis of the activities that have shaped reindeer herding practices: summer calf marking, fodder provisions (hay, leaves, etc.), herding work, round-ups, book keeping (live and slaughter animals), pasture assessment and conditions, fences, settlement patterns and infrastructure. In the second section, environmental changes and degradation are analyzed in relation to the encroachment of industrial forestry and major hydro-electric developments since the 1950s which have resulted in displacement of people and their homes and the loss of pasture to reindeer herding. The more recent impact of large-scale tourism and recreation is highlighted as well. Lastly, the author discusses the contemporary developments in reindeer herding that copes with the integration of modern technology and financial, administrative and legal demands as well as social changes in the small communities of reindeer herders.

2.2 Alta vita - the impact of environmental change on traditional livelihoods in Lomajärvi (Nevalainen 2003)

The author tells the story of her own community which spans just more than 100 years or five generations of existence in the boreal forest of Finnish Lapland. The number of inhabitants hovered between 3 and 27 during that period with a peak in 1950 and a current population of 9 in three households. The story of the Lomajärvi families is one of expanding into the forests by hunting, fishing and hay-dairy farming (cattle, sheep, goats), and carving out a niche supplemented by acquiring reindeer. Herding, in fact, was a new activity to be learned by becoming integrated into the local herding co-operative and participating in the regular herding activities. The 1950s brought changes to the infrastructure and introduced forestry which competed with reindeer herding over space and pasture. By the early 2000s adaptations have occurred by reindeer owners keeping their reindeer fenced in over longer periods during the seasons and feeding them additional fodder. Today, with seven reindeer owners and a stock between 180 and 250 animals, reindeer herding still plays a defining and major role in the life of this small community.

2.3 The impact of environmental pressures on reindeer herding in the Paadar-Muotkatunturi Reindeer Herding Co-operative (Jääskö 2003)

The author provides an account of the historical events in the reindeer co-operative since 1945. She divides the period up to the early 2000s into four eras highlighting particular characteristics for each one. The first period is the 'old time' from 1945 to 1963 when reindeer herding practices were still very much localized and closely tied to the environment in a self-sufficient way. This was followed by a period of rapid modernization and mechanization from 1964 to 1973, which began with the introduction of the snowmobile and ended with the oil energy crisis. From 1973 to 1994 the co-operative experienced boom and bust cycles which were caused by difficult economic times resulting in people seeking work elsewhere and by the Finnish Park and Forest Service beginning its felling campaign in the region. All this had a considerable impact on the co-operative's success in reindeer management. The author lets the latest period begin in 1994 when the co-operative started actively to pursue the case against the forest authorities' felling policies and activities detrimental to reindeer herding. With some limited success the co-operative revitalized its energies focusing on sound management practices in reindeer herding that would provide the community with a base to secure an acceptable standard of living.

3. MORE INITIATIVE, FEWER COMPLAINTS: THE VIEWS OF FINNISH ADMINISTRATION ON THE DEVELOPMENT OF PARTICIPATORY INSTITUTIONS IN REINDEER MANAGEMENT (RAITIO & HEIKKINEN 2003)

The purpose of the study was to analyse the views of reindeer herding administration concerning the development of participatory institutions. Also their views on the challenges and needs in current herding were studied. The data consists of 25 semi-structured thematic interviews, which were carried out in the state administration at the central and regional levels, as well as in municipalities and other relevant administrative organisations of reindeer herding. These include the Sámi Parliament, the Association for Reindeer Herding Co-operatives, Forest and Park Service (Metsähallitus) and Finnish Fisheries and Game Research Institute. The views of the interviewees were compared with those of the reindeer herders based on data collected in the RENMAN project.

The 25 interviews show that the representatives of the various administrative organisations share a common goal for reindeer management: to promote reindeer herding which is *based on natural pastures (as opposed to feeding) and which provides the herders employment and income*. From this perspective, two main challenges were identified: (1) the scarcity or poor condition of the pastures and (2) weak profitability of herding as an occupation. The latter was most often understood as the consequence of the former. This view correlates well with the one presented by reindeer herders themselves. However, it should be noted that the representatives of the municipalities

were more positive toward feeding of the reindeer than the other respondents. This view was based on the idea that reindeer herding needs to be modernised. Representatives of municipalities saw feeding and fodder farming as a way to strengthen and widen the local economy as a whole.

Despite the fairly broadly supported goal, there was no common view found regarding the reasons for the challenges, nor the needed solutions. The views differed considerably also among representatives of the same organisation. The views can be placed on a continuum, in which one end represents the idea that the internal choices made by the herders as well as their lack of professionalism cause the challenges for the occupation. This view was common to representatives of the MMM and Metsähallitus (Forest and Park Service). The representatives of the Sámi Parliament, the Association for Reindeer Herding Co-operatives and the municipalities formed the other end of the continuum. They emphasised the role of competing land users and political decision-making process as a whole, which create the challenges in the first place. Consequently, the latter emphasised as a solution the need for a stronger position for reindeer herding over other land-uses in crucial pastures. That would enable reindeer herding to be based on natural pastures also in the future. The subsidies were recommended to be targeted toward supporting young beginners and the work (herding) itself, instead the amount of animals. In contrast, the former considered current land use regulations sufficient and emphasised the need for herders to take initiative and to develop their profession at the local level. The views of the regional state administration fell in between these two extremes.

The differing views of the problems and cures were related to views about the nature of reindeer herding in general: those putting more emphasis on the responsibility of the herders themselves saw reindeer herding primarily as an economic activity (herding as occupation). Those with a broader view of the causes also emphasised the cultural and social importance of reindeer herding in addition to its economic role (herding as a livelihood and a way of life). When addressing the challenges shared by most interviewees (and the herders themselves), it is important to clarify whether reindeer management is considered to be purely an economic activity or also a unique and endangered way of life and culture. The answer is likely to influence considerably the strategies with which the problems are tackled.

From the perspective of developing participatory institutions for reindeer herding the challenge is that the central state administration in Finland sees little or no need for self-improvement. Instead, they consider the currently existing institutions as satisfactory. In contrast, the regional state administrators as well as municipal authorities did consider the current system as being too top-down. They criticised also central administration for weak or obsolete communication with the other levels of administration as well as with the reindeer herders themselves.

To summarize:

- 1) The main cause of conflict between the administration and the herders lies in how each party defines the causes and consequences behind the problems of modern reindeer herding;

- 2) The best way to overcome this problem is to develop more holistic approaches instead of or in addition to the current sectoral approaches;
- 3) Lack of knowledge is not the only problem. For example, local administration seems to know very well the circumstances and arguments of reindeer herders, yet municipalities are responsible for the zoning decisions that benefit competing land uses at the expense of reindeer herding. Economic pressures persuade the local level to find new, more productive and short-term means to utilize the natural environment, instead of the less profitable traditional livelihoods. It is an open question whether the local administration favors reindeer feeding because it provides them with a means to prioritize tourism, forestry, mining, turf production and other more economic modes of production, or whether they have an honest aim to improve the productivity of reindeer herding.
- 4) The gap between each level of administration and the local level reindeer herders could be narrowed down by developing a) co-management practices, b) information flow between different levels of administration, c) more holistic analysis of current situations and d) legal reforms to get reindeer herding more stable rights and position towards competitive forms of land use.

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III. LIST OF WORKSHOP PARTICIPANTS (2001-2003)

Total: 52 people

Reindeer herders / owners (29)

(name, reindeer herding co-operative, place of residence)

Aikio, Pekka	(Lappi, Sodankylä)
Artijeff, Tarja	(Ivalo, Nellim)
Hannula, Marjatta	(Kemi-Sompio, Kuosku)
Hetta, Ari	(Lappi, Vuotso)
Jääskö, Outi	(Muotkatunturi, Angeli; RENMAN WP1)
Kantola, Jaakko	(Alakylä, Helppi)
Kyrö, Reijo	(Kyrö, Rattama)
Länsman, Jari Heikki	(Galdoaivi, Utsjoki)
Länsman, Vieno	(Galdoaivi, Nuorgam)
Magga, Erkki	(Lappi, Vuotso)
Magga, Hannu	(Lappi, Vuotso; RENMAN WP1)
Magga, J. Antti	(Näkkälä, Nunnanen)
Maijala, Juhani	(Oraniemi, Sodankylä)
Mattus, Petri	(Hammastunturi, Ivalo)
Morottaja, Antti	(Muddusjärvi, Inari)
Nevalainen, Pekka	(Kuivasalmi, Lomajärvi)
Nevalainen, Satu	(Kuivasalmi, Lomajärvi; RENMAN WP1)
Nikula, Esko	(Hammastunturi, Inari)
Näkkäläjärvi, Iisko	(Käsivarsi, Karesuvanto)
Paldan, Antero	(Pohjois-Salla, Salla)
Pokuri, Osmo	(Lappi, Vuotso; RENMAN WP1)
Ristimella, Taisto	(Muonio, Äkäslompolo)
Ruokamo, Timo	(Timisjärvi, Karjalaisenniemi)
Sainmaa, Martti	(Palojärvi, Pessalompolo)
Sieppi, Oula	(Lappi, Vuotso)
Tornensis, Juha	(Käsivarsi, Kilpisjärvi)
Tornensis, Eeva-Sisko	(Käsivarsi, Kilpisjärvi)
Vehkaoja, Mikko	(Kiiminki, Yli-Kiiminki)
Äärelä, Sakari	(Lappi, Vuotso)

Civil servants / politicians (8)

Alanko, Keijo	(Lapin TE-keskus, Rovaniemi)
Filppa, Jouni	(Paliskuntain yhdistys, Rovaniemi)
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Kankaanpää, Sakari	(Urho Kekkosen National Park, Tankavaara)
Osara, Matti	(Ministry of the Environment, Helsinki)
Tennilä, Esko Juhani	(Member of Parliament)
Tolvi, Timo	(Ministry of Agriculture and Forestry)
Viik, Pertti	(Paliskuntain yhdistys, Rovaniemi)

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Ruotsala, Helena	(University of Turku)
Sipilä, Pekka	(Oulu)
Tuisku, Tuula	(University of Oulu)

2) RENMAN (10)

Other workpackages (4)

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Helle, Timo	(Finnish Forest Research Institute)
Kitti, Heidi	(University of Oulu)

Workpackage 1 (6 [+ 4 under herders])

Heikkinen, Hannu	(Helsinki University of Technology)
Hukkinen, Janne	(Helsinki University of Technology)
Laakso, Ari	(University of Lapland)
Müller-Wille, Ludger	(McGill University, Canada)
Raitio, Kaisa	(University of Joensuu)
West, Nina	(University of Lapland)

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Hukkinen, Janne	(Helsinki University of Technology; principal investigator)
Jääskö, Outi	(Muotkatunturi Reindeer Herding Co-operative)
Laakso, Ari	(University of Lapland)
Magga, Hannu	(Lappi Reindeer Herding Co-operative)
Müller-Wille, Ludger	(McGill University, Canada; co-investigator)
Nevalainen, Satu	(Kuivasalmi Reindeer Herding Co-operative)
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Research Projects at the Laboratory

Barents, Ecological Modernization in the Barents Euro-Arctic Region through Institutional and Technological Innovations, 1999-2002. Funding: Academy of Finland.

PROB, In Search of Process-Based Regional Development Policy, 2001-2002. Funding: Nordic Council of Ministers.

SCulBio 2000, Socio-cultural Dimensions of Technological Change: The Case of Finnish Biotechnology, 2000-2004. Funding: Academy of Finland.

RENMAN, The Challenges of Modernity for Reindeer Management: Integration and Sustainable Development in Europe's Subarctic and Boreal Regions, Development of Participatory Institutions for Reindeer Management, 2000-2004. Funding: The European Union.

ManTra, Managing Transepistemic Innovation Processes, 2002-2003. Funding: Tekes National Technology Agency.

ANALOG, Analogy as an Analytical Approach to Industrial Ecology and Ecosystem Management, 2003-2006. Funding: Academy of Finland.

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