

# Commission on Nomadic Peoples

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# Reindeer management in conflict and co-operation.

## A geographic land use and simulation study from northernmost Sweden

*Lennart Bäck*

This article presents the results of a three year study concerning reindeer herding and its related land-use problems in northernmost Sweden. Reindeer herding belongs to the extensive type of agriculture referred to in the international literature of economic geography as nomadic herding. As has occurred within nomadism in other parts of the world, freedom of movement for Swedish reindeer herding has successively lessened due to several different types of exploitation. A serious problem for reindeer herding is that herders act as a single small interest group without having direct interests in common with other actors. There are a number of branch organisations with powerful economic and personnel resources lined up against the herders such as water power projects, forestry, transportation, mining, tourism and recreation. On the other hand, the number of reindeers has increased during the 1980s primarily as a result of difficulties in slaughtering and selling the meat. This implies that wear and tear will arise and the conflict situation will intensify.

### Introduction

During the period 1990–1993 a group of researchers at Uppsala University studied Swedish Sami land use problems with special emphasis on the northern parts of Samiland in the northernmost of Sweden, an area bordering Finland and Norway (See Figure 1).

Furthermore, during the 1980s, a group of researchers at Uppsala University was engaged in an environmental impact assessment of the construction of the new highway, running between Kiruna and Narvik. The studies which are outlined in e.g. Bäck and Bäck (1986), Bäck *et al.* (1989, 1990), Strömquist (1985) can be regarded as pilot studies for the studies of reindeer management presented below.

The main goal of the project was to develop scientific methods for the analysis of conflict with the aid of geographical information systems (GIS). The use of GIS means that the distribution of varying geographic variables can be stored in databases. After that, it is possible to combine, analyse and visualise these spatial data by means of dif-

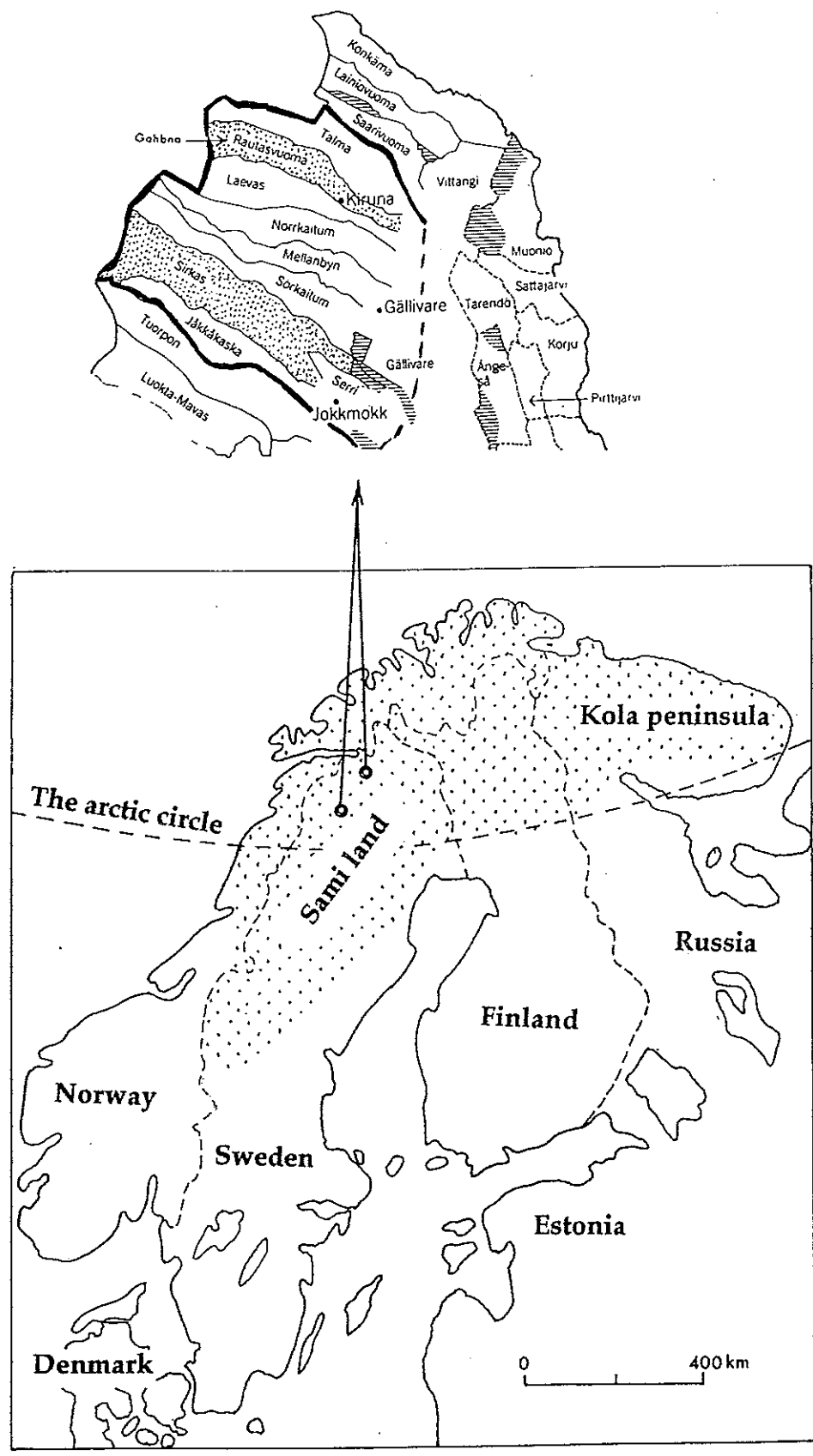
ferent softwares. Maps are constantly in focus. We attempted to develop a simulation model in which the change in variables over time played an important role. The project aimed at an analysis of reindeer herding with a long-term perspective.

The most important questions posed by this study were:

- (1) Which type of conflicting interests occur between reindeer herding and other land use forms within the studied Sami villages?
- (2) Which interest poses the greatest threat to reindeer herding?
- (3) To what extent is consultation occurring?
- (4) Is GIS a suitable tool for illuminating and explaining the current and potential land use conflicts within the investigated reindeer herding areas?

Reindeer herding exists in conflict and/or co-operation with nature, other industries, and recreational activities. The project, therefore, acquired a multi-field perspective, in which the geographic characteristic, i.e. the space aspect, played a central role in the investigation. As background material we therefore chose to use available maps, such

Figure 1. The spread of the study area



as vegetation maps, topographic maps, and key maps (county land use planning maps), as well as primary data in the form of field studies, interviews and secondary statistical data.

The studies contain data from 10 Sami villages and have so far resulted in one research report (Bäck *et al.* 1992) and two final essays (Tillberg 1993; Grandin 1993).

### The development of reindeer herding

The Sami can be looked upon as the original population of the Arctic area of the Nordic countries and the Kola peninsula. As far back as 1539 the well known map of Olaus Magnus, the Carta Marina, shows animals and people in the area. The latter probably illustrated Sami hunting for wild animals with bow and arrow. The oldest relics found of Sami are from the Komsaculture, who inhabited the area between Tromsö and the Kola peninsula as far back as 8000 years before Christ. During the last few years relics have also been found of people who lived in the northern parts of Sweden 6000 years ago. These people probably immigrated from the east, namely Finland and Russia, right after the most recent inland ice withdrew 10,000–8000 years ago. According to some theories the Sami have been established in Scandinavia since before the last inland ice movements. (Fjellström 1986.)

Since the beginning of history the Sami have used natural resources for survival, especially with regard to hunting and fishing. It is known that the Sami paid taxes to the crown in the 14th century. The Sami villages have, until the 16th century, had the formation of a hexagonal pattern adjusted to the fishing and hunting culture of the past. (Lundgren 1987.)

The nomadism of the Sami did not arise until late in the 16th century. According to Ruong (1981) the development of reindeer herding has moved towards a monoculture, away from the old diverse sources of income of which a number of domestic reindeers

was an integral part. This shift from a hunting and fishing culture to reindeer herding could have been caused by the growing interest of the nation-state in Samiland, and by settlers starting to claim their right to this area.

The Sami saw following their herds as the best way to protect their interests. The villages reformed into long, narrow settlements adjusted to the reindeers' natural migration pattern.

From the beginning of the 16th century until the end of the 19th century the Sami moved long distances with their reindeers. The Sami were nomadic people in those days. From this perspective reindeer herding was very intensive and Sami families followed the reindeer herd all year round.

In 1751 the so-called Lapland boundary was fixed. The purpose of the boundary was to protect Sami access to hunting and fishing. In the 19th century the colonisation of the North of Sweden began. The nation-state wanted a more effective utilisation of nature reserves and over time this weakened the Sami right to land. The so-called cultural boundary was fixed in 1867. In 1886 economic controls were drawn up through the reindeer owners association. In the legislation after 1928 we can see the imposition of social control as some Sami were separated from their villages of origin and forced to move to other Sami villages. Finally, the most recent legislation of the reindeer owners association since 1971 imposed cultural controls leaving only a few Sami with the right to herd reindeer and to fish and hunt.

In 1985/86 a new common law concerning the housekeeping of natural resources was founded in Sweden. Under this law land and water areas important for reindeer management are as far as possible protected against the kind of exploitation that can severely hamper its operation. Parallel with this legislation it was observed that the decision so to exclude called state interests from the reindeer herding was not based on adequate knowledge of Sami land use. This resulted in documentation of the land use

Figure 2. Annual reindeer pasture

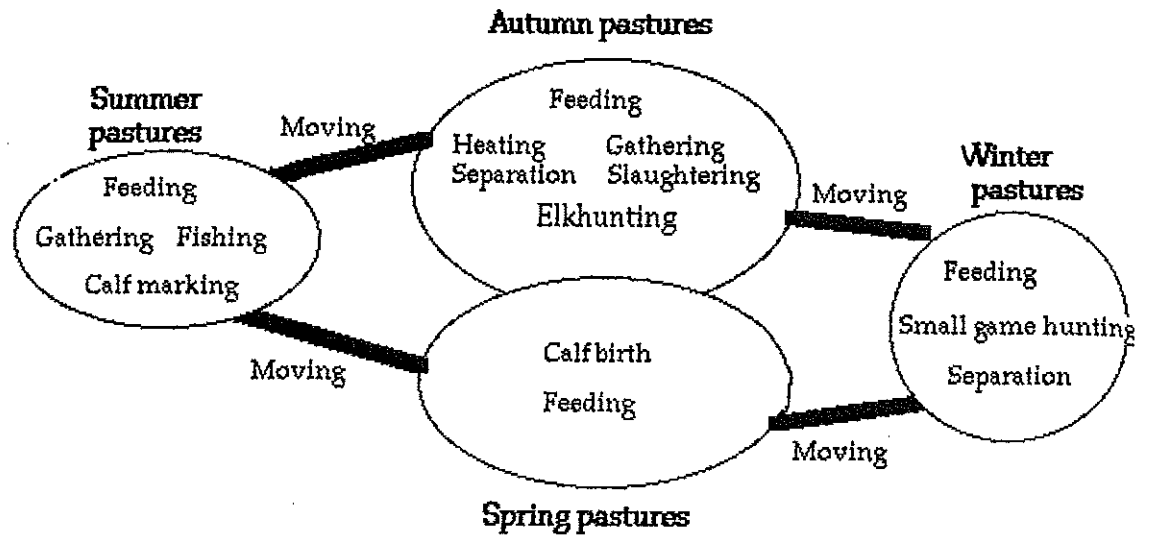
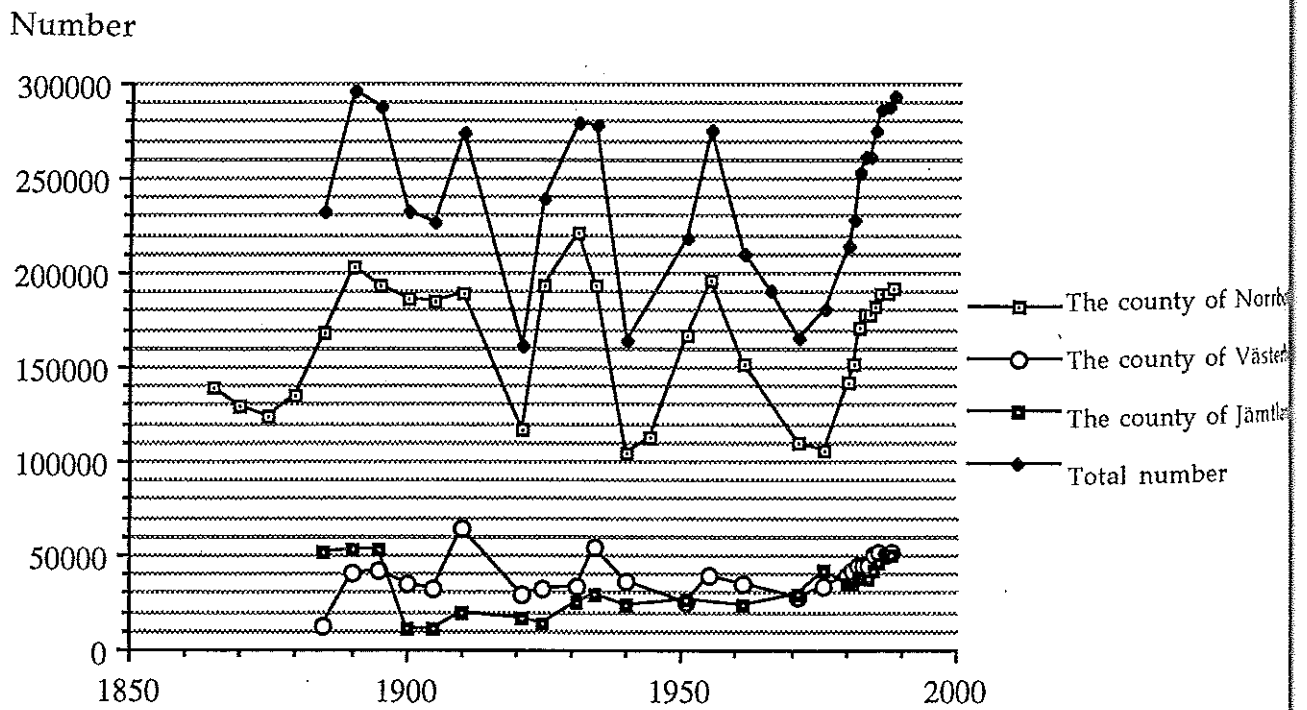


Figure 3. Number of reindeers distributed at county level 1865–1988



by Sami villages which has been a great help to studies of reindeer management.

During the 20th century Swedish reindeer herding has gradually become more and more extensive as the animals are no longer kept as livestock or for providing milk. Nowadays the reindeer stay freely and Sami families live in Swedish communities, and with road access and modern transport technology they can still reach their herds relatively quickly. After the 1950s the traditional nomadic culture of the Swedish Lapland ceased to exist. The Sami started to use modern aids such as cars, aeroplanes and snow scooters. The mechanisation of reindeer herding produced demands for large investments in machinery. Today the Sami are an integrated part of the national and international economic system.

According to official statistics there were about 58,000 Sami living in Northern Europe in 1986, out of which 35,000 lived in Norway, 17,000 in Sweden, 4,000 in Finland and 2,000 in Russia. The Sami themselves consider this figure much too low, according to their figures the Sami population is about 100,000. Today most Sami find their income in areas of work other than reindeer herding. It is thought that nowadays no more than 2500 reindeer herding Sami are active.

The Swedish Sami are organised into 51 villages. Here we differentiate between three different forms of reindeer herding and therefore three types of Sami villages, namely:

- (1) The mountain Sami villages, which extend over large areas of Samiland. The mountain villages amount to 33. Every year long migrations take place between the summer pastures in the mountains and the winter pastures in the forest lands east of the mountains.
- (2) The forest Sami villages number are 10 in all and are found within the area of coniferous forest east of the mountain range in the northern part of Sami land.
- (3) The concession Sami villages are found east of the so-called lappland boundary in the northernmost part of the county of Norrbotten. To receive a permit to

keep reindeers in this area it is obligatory to own or manage a farm here. Today there are altogether 8 concession Sami villages.

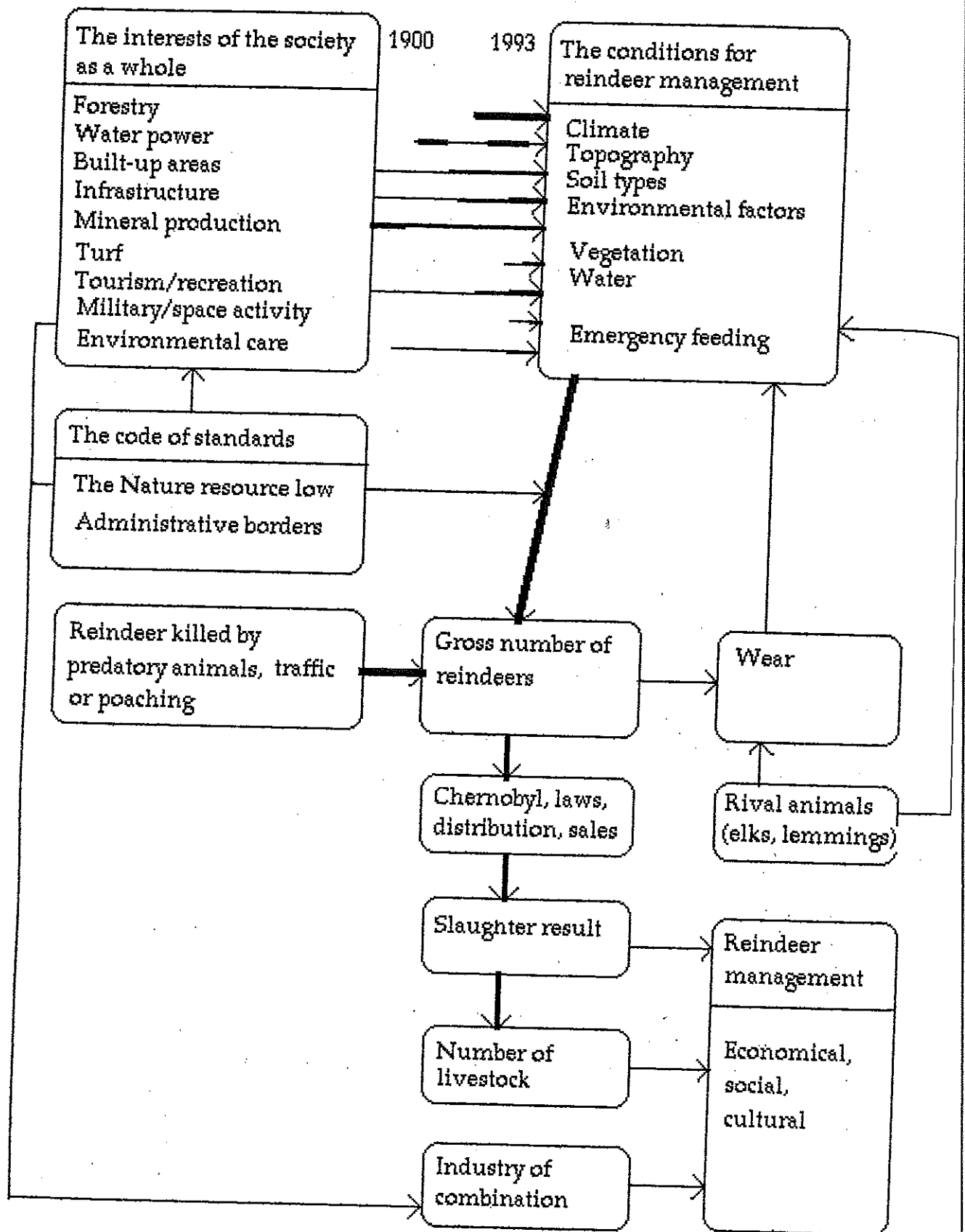
### Natural pre-conditions of reindeer herding

Reindeer herding is an industry which requires large areas of land and is dependent on natural pastures, suitable terrain and vegetation which protects the animals, while not hindering the gathering or migration of the reindeer. Reindeer management is affected by weather conditions, such as temperature changes, wind, snow and ice which necessitate the periodic utilisation of land and water during different pasture seasons over different years. The topography and the climate allows the reindeer to use different pastures. The biggest natural threat to the reindeer is when crusty snow or ice covered snow make it difficult to reach the pasture and, as a result, a large number of reindeers can starve to death in a fairly short period of time.

Reindeer herders use different pastures at different times of the year. During the summer a pasture high in protein is used while the winter pastures consist of a reindeer moss which is high in energy. The tracks along which the reindeer move are defined by natural conditions; topography, access to pasture and suitable roundup areas. (Gustavsson 1989.)

The movement of reindeer of the mountain Sami villages follows destined annual patterns (see Figure 3) in which reindeer either stray freely or are moved between different pasture with the turn of the seasons. These areas of pastures can vary from one year to another. The reindeer herding year is divided into eight periods 1. early spring when reindeer are moved from winter pastures to their calving grounds, 2. spring i.e. May which is normally the calving period, 3. early summer when the reindeer move towards the high mountains in small groups, 4. summer when the reindeer graze

Figure 4. Reindeer management in conflict and co-operation



on the high mountains, 5. early autumn which is normally the time of the year when the slaughter takes place, 6. autumn which is the reindeer mating season, 7. early winter i.e. October till December when the reindeer move towards the winter pasture and finally, 8. winter when the reindeer graze in the forest lands. (Manker 1975.)

The migration of the reindeer varies in length and nature. The mountain reindeer can move up to 300–400 kilometres between the summer and winter pastures. These migrations also entail a vertical movement as the summer pastures are situated in the high mountains (about 1200 meters above sea level) and the winter pastures are situated in the forest lands (about 50–300 meters above sea level). The reindeer of the forest Sami and the concession Sami move shorter distances within the forest lands.

Reindeer management is carried out over 40 percent of the area of Sweden of which 60 percent is used for pasture during spring, summer and autumn and about 40 percent is used for winter pasture.

### The number of reindeers

The investigations conducted so far have shown that the number of reindeer in Sweden increased relatively dramatically during the 1980s. This was due to difficulties in marketing reindeer meat owing to the "Chernobyl effect" and weather conditions which increased the availability of fodder.

It must be pointed out, however, that the number of reindeer has fluctuated between 150,000 and 300,000 with a relatively even periodicity during the last 100 years. (Figure 3). Seen from this perspective, the situation today is not unique. On the other hand, the Sami today have greater possibilities to influence natural conditions, such as through the provision of emergency feedings. An interesting question today is, therefore, whether we will now see a drastic reduction in the number of reindeer, or whether the

size of herds will stabilise or even increase during the 1990s.

According to the Sami we interviewed, extremely hard winter and spring conditions occurred during the years of 1934/35, 1935/36, 1955, 1967 and 1973. In the good years in between reindeer herds escalated in numbers. During the whole of the 1980s reindeer herds experienced a rapid increase. These fluctuations are caused by the so-called climatic hazard; when the climate exhibits relatively large and uncharacteristic oscillations so making every year of reindeer herding more or less unique (Niia 1988). Apart from the climate, epidemics also effected the reindeer population, e.g. in 1911.

### The results of the investigation

According to Arell (1983) Sami villages are influenced by many different land use interests. The relationship between several of the variables affecting reindeer management illustrated in figure 4 i.e. in a framework in which the actors, the natural pre-conditions and social rules all affect reindeer management. The importance of the different variables varies over time.

The close connection between reindeer management and several of the variables is accounted for below. In certain respects this report reflects the historical course of events from the first impact of the infrastructure, one of the initiating variables of conflict to affect reindeer herding, to the rise of environmental concerns which are the latest additions to these variables.

With the guidance of the above one can assume that there are both general trends for all Sami villages and specific pre-conditions for each Sami village. Land use conflicts between reindeer herders and the rest of society are acted out in a broad arena between local, regional and national interests.



### *The impact of the infrastructure*

The first roads and railways built in the far north of Scandinavia at the end of the nineteenth and beginning of the twentieth centuries brought the rest of the world closer to Samiland. During the 20th century the infrastructure has developed further bringing it into greater conflict with reindeer.

According to statistics, the number of reindeers killed in car accidents has increased rapidly from about 900 accidents in 1973 to 3000 in 1990. The majority of these accidents took place in the county of Norrbotten. Accidents between trains and reindeer reach at least the same figures.

The accidents rate varies from one region to another and is primarily dependent upon current weather conditions. The majority of accidents take place during winter when reindeers are lured onto the roads to lap up the salt that is put down to prevent traffic accidents caused by slippery roads.

In order to bring down the number of traffic accidents involving reindeer joint action has been taken between the Sami and the road authority. Preventative measures taken include luminous tape attached to few reindeers, new animal fences, reindeer warnings over the radio and temporary speed limits.

### *The impact of tourism and recreation*

When the infrastructure was established in Lapland in the end of the 19th century tourism got a foothold in the area. Since then the stream of tourists has steadily increased.

The number of overnight stays in hotels and log cabins has almost doubled between 1971 and 1989. As the reindeer can be disturbed in their natural habitat from a rather long distance away from the trails a higher frequency of tourists will obviously become a problem for the Sami. But if you consider the dispersal of tourists along the different systems of wandering tracks it becomes clear that increased pressure from tourism has only taken place near roads and train sta-

tions. At the same time the number of tourists visiting the remote areas of Lapland has decreased. Therefore tourists along the marked hiking tracks are not perceived as an immediate threat by the Sami. In those cases where the Sami can make a profit out of tourism through, for example, letting a log cabin or selling handicraft tourists are instead seen as a resource. A rapidly growing number of tourists could, however, become a threat in the future.

The increased use of the snow scooter for pure pleasure is, however, seen as a threat, especially when it takes place near calving grounds in the spring. Reindeer are sensitive to noise and easily scared off during calving. It is estimated that the number of snow scooters in Sweden has increased from around 20,000 in 1975 to about 150,000 in 1992, out of which a third can be found in the county of Norrbotten.

Another conflict situation involves hunting and fishing. According to laws of reindeer management only Sami with reindeer herds have the right to hunt and fish in the mountains. They also have the right to pursue commercial fishing. Those members of the local population who do not keep reindeers have been granted limited rights to fish and hunt provided they pay for a permit. For a long time the local population have expressed the desire for easier access to hunting and fishing. The Sami have protested against this. However, at present it looks as if the authorities will amend the legislation which would be a negative turn for the reindeer herders. The liberalisation of hunting and fishing rights, in combination with increased scooter traffic, is considered by many Sami villages to be one of the most serious conflict threats for the future.

Increased possibilities for public hunting and fishing in the mountain areas will undeniably lead to more snow scooters, cars and caravans which will, in the long run, lead to a need for better roads. Under such conditions the comparatively unspoilt natural resources will eventually be even more exploited.

### *The impact of mining and other activities exploiting the nature reserve*

Findings of silver in the Nasamountain in 1634 set off a wave of colonisation and exploitation of Samiland. When the border between Denmark/Norway and Sweden was fixed in 1751 it was decided that the Sami would be guaranteed sovereignty and access to land and water on both sides of the new border. At the same time the so-called Lapland boundary was fixed, which served the purpose of separating Sami from Swedish settlers. The settlers did not pay any attention to the new boundary and continued colonising the Laplands. The area became even more attractive when large resources of iron ore were discovered in the nineteenth century and the desire to exploit the north of Sweden was large. The birth of the iron ore mines in the principality of Lapland can be said to be the cause of the present day conflicts between different land use interests.

Forest industry and water-power require relatively large areas compared to the mining industry. On the other hand does the mining industry has a large indirect impact on the environment through the adjoining development of its infrastructure.

A different and, in the long run, more serious problem is the increasing exploitation of turf which leaves large areas of wasteland. The turf is found in bog areas and has always been important to reindeer, especially during periods of migration. In 2010, when it is said that Sweden should stop the use of nuclear power as a source of energy, the exploitation of turf could increase dramatically.

### *The impact of water-power*

Sweden has no resources of coal, oil or natural gas worth mentioning. However, the country is suited to the development of water-power having fairly heavy rainfall, a great high of fall and good sites for regulated dams. These were some of the reasons why the generation of water power first began in

Sweden 100 years ago. Since then successively more energy has been extracted from the rivers. The largest dam so far was built in the 1960s.

The surface area of reindeer herding land directly affected by the dammed up water does not seem to present a serious problem. However it has normally been prime reindeer pasture which has been flooded. Another problem related to dammed water is that the dams cut right through the traditional migrating tracks used by reindeer hindering their migration from winter pastures to summer pastures.

Yet another significant problem is the effect the dams have on fishing, one of the most important subsidiary industries for many Sami. The raised water level affects natural harbours, branches from nearby trees get stuck in fishing nets and the natural habitat of the fish is disrupted.

The dams did however produce benefits for the Sami in the form of substantial economic compensation for their losses. Another advantage of the dams is the improved relationship between the Sami and the State Power Board. New bridges, better roads, fences and easier movement along the rivers, provided by the State Power Board, are much welcomed by Sami and have helped to form a better relationship between the Sami and the authorities.

In principle a decision has been taken by the Swedish government to prevent some of the larger rivers from being dammed and thereby concentrating exploitation on the remaining rivers. This means of course that some of Sami villages have been and, in the future will be, hit very hard by dammed water while other villages have hardly been affected at all.

### *The impact of the forest industry*

Lundgren (1987) maintains that no competition existed over the land use between reindeer herding and forestry until the 1950s, but since then the situation has changed radically due to new principles of felling. In the early years of the forestry in-

dustry areas of deforestation were rather small, but increasing mechanisation between 1950 and 1970 meant areas of deforestation expanded rapidly. This led to several negative effects for reindeer management. During the 1950s and 60s the forestry industry started felling forests closer to the mountains. This caused a kind of reindeer moss important for the winter pasture to become extinct, the snow became more tightly packed and the opportunities for reindeer herding in the area deteriorated. It will be 70 years before this particular reindeer moss will grow again in these areas. As the deforestation area spreads the area of available reindeer pastures shrinks. The most serious conflict situation occurs where deforestation areas coincide with areas used for pasture during migration or calving.

Forestry affects the reindeer herding in different ways. The immediate consequences are loss of pasture and difficulties for reindeers moving over areas which have been cut through by ditches or ploughed. One of the more serious secondary effects on reindeer herding is the fact that due to the shortage of large stretches of pasture reindeer herds will have to be split up into smaller groups during periods of migration, which will mean increased labour costs. Policies of infrastructure expansion meant a large number of roads have been constructed which further contribute to the splitting up of reindeer herds as the roads are easy to move along and lure the reindeer away from their natural pastures.

The reindeers cause problems for the forestry industry as they damage newly planted forest. Today policy making has to be conducted after consultation between Sami and the forest industry. According to the Sami people these consultations are practically useless as the demands of the forestry industry are nearly always victorious.

### *The impact of the spread of built-up areas*

The Sami villages of the Swedish mountains are, as mentioned earlier, situated on narrow stretches of land within an east-west direction. During the 20th century a few towns have arisen to the east of the mountain range. Kiruna, Gällivare-Malmberget, Porjus and Jokkmokk are examples of such towns. This spread of built-up areas should be viewed as the effect of economic interests exploiting iron ore, water power and the forest. In several cases the new towns were situated in areas through which reindeers traditionally migrated to and from their winter pastures. This meant that the reindeer were forced onto new migration tracks and so had a choice fewer alternative migrating tracks. Some of the Sami villages had to use one another's migration tracks which created a heavier work load when combined with the separation reindeer of reindeer herds.

The continuous growth of these towns and their adjoining infrastructure of roads and airports will further restrict the natural movement of reindeer between winter and summer pastures. A comforting thought for the Sami is that the past few years have seen a negative population trend in the northern towns which has reduced the growth of these towns.

Nowadays the Sami have to gather the herd when approaching a town, divide the reindeer into small groups, and then try to force the herd past the built-up area and road traffic as quickly as possible. To keep the number of traffic accidents down and avoid disruption and traffic queues most of the movement past built-up areas takes place at night.

### *The impact of nature conservation*

The Swedish Environmental Protection Board has two, partly conflicting, purposes, on the one hand to protect nature and on the other to increase the rate and number of visitors to this Nordic wilderness. Several

Large national parks have consequently been established in Swedish mountain areas, and several more are planned. The purpose of the foundation of natural parks is, among others, to create favourable situations for predatory animals living in the area such as bears, eagles, wolves, lynx and wolverins.

The Sami problem is that according to the authorities predatory animals kill an estimated number of 5000 to 6000 reindeer every year. About 3000 to 4000 of the reindeer annually reported killed by predatory animals come from the county of Norrbotten. The Sami themselves say the figure is greatly underestimated. The predators are therefore a major threat to reindeer. If the number of predators increases as a result of a more effective nature conservation policy the number of reindeer killed will also increase. The Sami will, therefore, get permission to shoot more predators. The Swedish Environmental Protection Board has, as mentioned above, internally conflicting purposes but a conflict will also arise between the interests of the Sami and the Swedish Environmental Protection Board.

**To sum up;** Forestry is considered to be the biggest threat to reindeer management in the mountains of Norrbotten. Secondary threats to reindeer management are considered to be predatory animals and increasing human activities in the area, especially with regard to snow scooter traffic.

Different Sami villages experience a different conflict situation. For some of the villages water-power and the infrastructure constitute major problems. The Sami village of Talma, for example, sees the space station of Esrange as a threat. In the village of Gahba a nearby increase in recreational activities, such as Europe's northernmost golf course and ski-lifts, form a threat. All of this results in reindeer pasture successively being transformed to satisfy the interests of the majority of the Swedish population.

## A simulation study

We (Bäck *et al.* 1992) used geographical information systems (GIS). To study the impact of several different variables on the reindeer management. Several land use forms were digitalized from maps and other material. This was done in the CAD-program Power Draw. The information was then transferred to a so-called raster-GIS with the Macintosh MAP II program. The advantage of a raster-GIS is that large amounts of data can be manipulated in a short period of time. The definition of the rasterprogram was set to 200 meters.

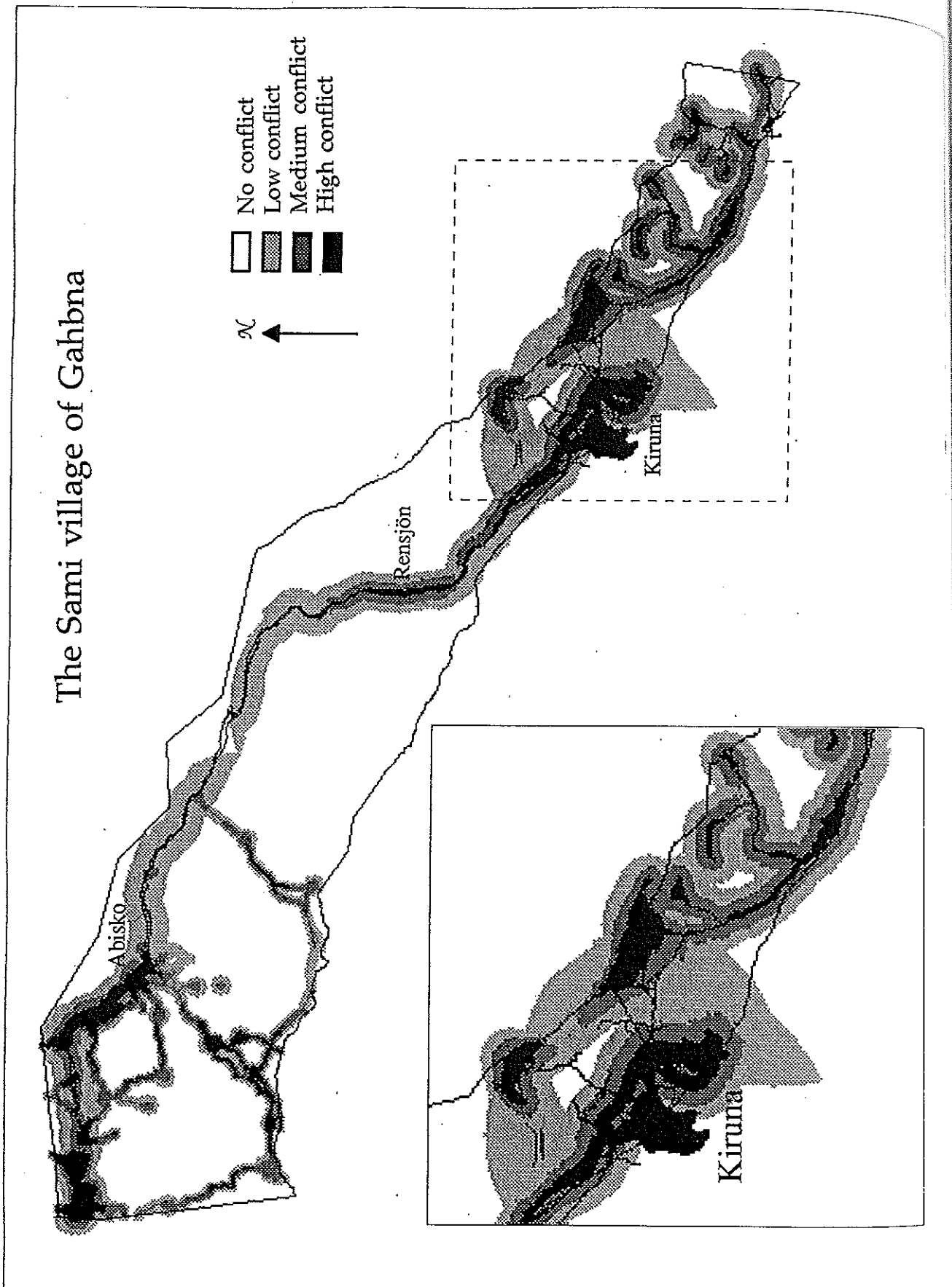
We assumed that the reindeer's natural habitat would be disturbed at a certain distance from, for example, built-up areas, tourist cabins, roads, and hiking tracks. The choice of variables has been made from a practical point of view. Forestry has not therefore been included in the simulation study despite the fact it poses the biggest threat to reindeer management. The final work was done using the Macintosh program MAP II. The results of our calculations show that some areas stand out as almost impossible to manage reindeer herding in.

As shown in Figure 5, reindeers of the village of Gahbnas are forced to pass through a comparatively narrow corridor to and from their winter pastures. The model was based on the assumptions of diminishing interference effects presented in Table 1.

At the next step of the model we altered our assumptions, halving the interference effect i.e. 5000 meters from the town boundary etc. The result, which is shown in Figure 6, appears to be that a smaller part of the mountain area is threatened by conflicts than in the first step of the simulation model.

For the village of Gahbnas we found that the most obvious conflict situation was to be found close to the town of Kiruna where the reindeers are forced to pass through a comparatively narrow corridor as they go to and from their seasonal pastures. A conflict situation between several different actors will then arise.

Figure 5. Simulation Model 1 over the Sami village of Gahbna



Continuous simulations will hopefully give us an answer to the question of Sami survival, when the level of exploitation will have reached the level at which it threatens Sami culture with extinction. So far the studies conducted show that GIS is an excellent tool for the dynamic analysis of several variables. Abrahamsson et al. (1983) also found that a multidisciplinary perspective is necessary when studying land use in Samiland, but when this was expressed the GIS-technique had not yet been used.

## Conclusions

It is not difficult to see how society has successively had an impact on reindeer management. With every new exploitation over the last 100 years reindeer pastures have diminished. The Sami themselves talk about "the politics of small steps" i.e. that while every interference with nature can in itself be seen as small we are talking about an escalating effect that will, in the end, have devastating consequences.

Table 1. Assumptions of diminishing interference effects

VARIABLE	COMPONENT	RATE OF INFLUENCE
Trade and industry	Built-up area	10 000 m from the town boundary
	Communications	2 000 m
	Airport	5 000 m
Tourist industry	Tourist cabins	1 000 m
	Hiking tracks	400 m
Reindeer management	Roundup areas	15 000 m from a reindeer field
	Migration tracks	3 000 m

The various types of consultations held over the past 20 years have not worked out. According to Niia (1984, 1988) the concerns of reindeer management have not been included in the planning process at a sufficiently early stage. No attention is normally paid to the cumulative effect of various types of exploitation and there is a lack of genuine knowledge about the Sami. However, in many cases, co-operation seems to have increased and is now working fairly well. This is true of the co-operation between the Sami and for example the National Road Administration, the military and the police.

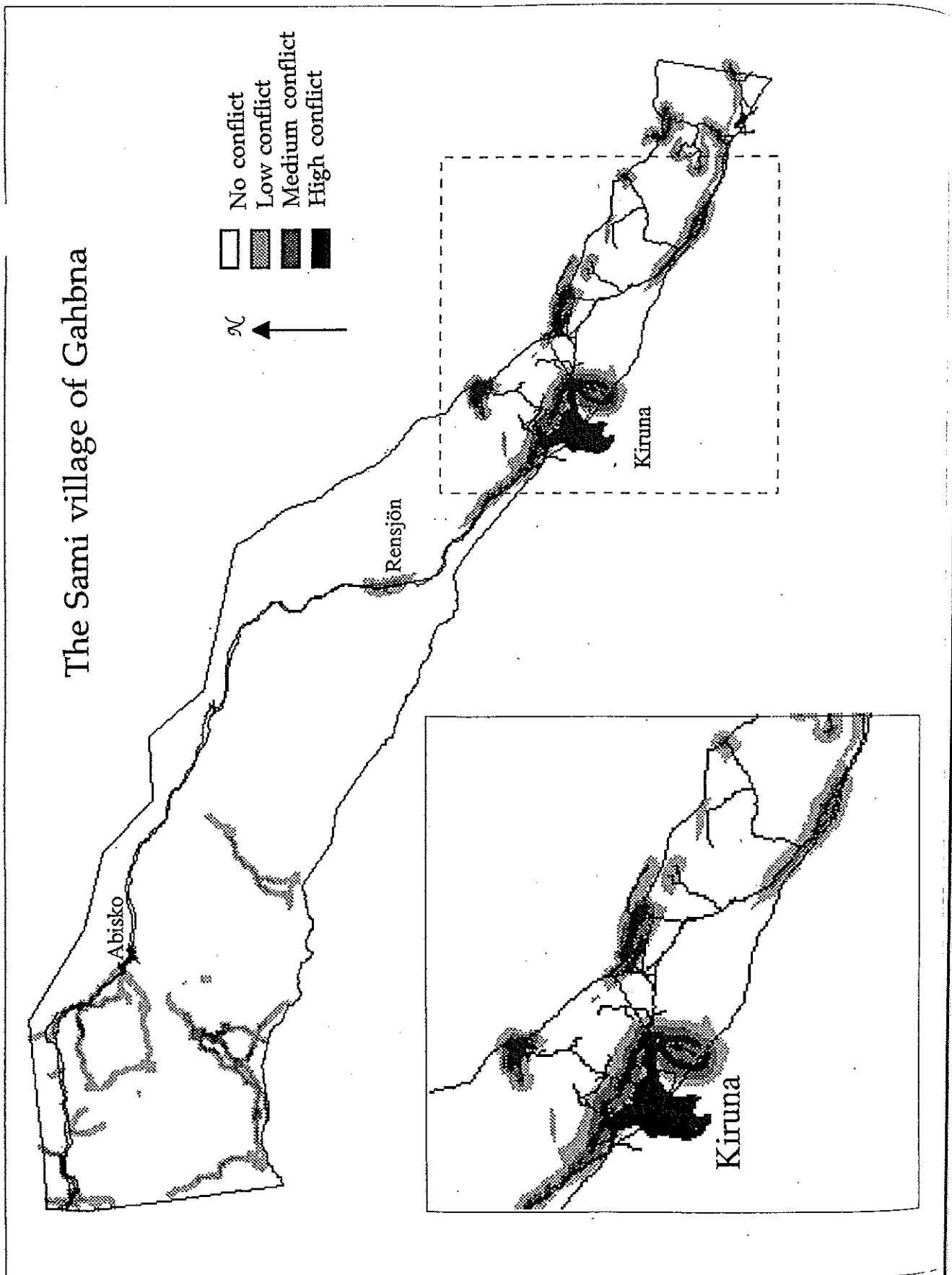
During the past year those Sami people who do not rely on reindeer herding as their main source of income have joined environmental care specialists in complaining

about the increasing numbers of reindeers which cause damage by overgrazing pasture.

The Sami reindeer herders see the situation from another angle, namely as an effect of the escalating exploitation of natural resources in combination with other acute problems, such as increasing difficulties in getting reindeers slaughtered.

The question now is whether the present situation has arisen through lack of knowledge or through a conscious policy of society as a whole. Is the conflict situation in Samiland a result of what we can see in other parts of the world, that is the ethnic cleansing of minorities. The situation today is clearly severe and it is obvious that Sweden must act quickly and decide whether or not it

Figure 6. Simulation Model 2 over the Sami village of Gahbna



wants an indigenous population in the country.

After having studied Swedish reindeer management it is easy to follow the thoughts of Käkönen (1991) when he describes how the economic and political powers of the world have, since the 16th century, expanded towards the Arctic peripheries with modernisation and the forming of dependency relationships as the inevitable consequences. In the footsteps of modernisation a disruption of old systems of social control and their economic base is inevitable. The periphery is used to enhance political power centre, through the extraction of both renewable and non-renewable resources.

Lehtinen (1990) has reached similar conclusions. From his starting point in northern Finland he argues that society as a whole has an affect on nature through passing on innovations to the Sami which can be used in reindeer herding and which in turn lead to ecological problems. In addition mechanisation and feeding of the reindeer has brought financial problems, as well as problems of excessive grazing and erosion. The situation is much the same in Sweden.

It is important to point out that the colonisation of the North has not only brought the Sami problems. It has also brought a higher standard of living through access to hospital care and other communal and private services.

Today society aims for a more efficient utilisation of natural resources which is one of the reasons why the rationalisation businesses into fewer but larger units is supported. For the last 200 years society has aimed for a more rational agricultural sector. The 1971 reindeer management act one of the main aimed is to raise the standard of living of the Sami to that of the rest of the population. This can be accomplished through creating more effective reindeer herding companies.

Niia (1984) however shows that the economy of reindeer herding is small-scale and based on a low use of natural resources,

compared to the economy of society as a whole. Traditional reindeer herding still depends on nature for survival. The aim for rationalisation within the rest of the society stands in conflict with this.

For the Sami to be able to continue their traditional way of life better documentation of Sami culture and its adjoining problems is required, and it is vital to make concrete the need for water and land in this documentation.

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*Reindeer separation during early winter*

