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# Methodology of Land Use Priorities and Conflicts Study

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## Abstract

Studies based on land uses are essential in order to carry forward development-oriented studies in any part of the world. Land use denotes how land is utilized to provide things and services. The land use of an area will not remain the same throughout all times. Changes will keep on occurring in land use from time to time on the basis of quantities and acreage. Change in land use is only an outcome of the interaction between man and environment. As rapid developmental activities are going on, following resettlements in the Northern Province of Sri Lanka, changes are also taking place also in land use. Since too many changes are occurring within a short period, it becomes necessary to find out the priorities and controversial issues therein. Thus, the object of this study is to find out the priorities and conflicts in the land use found along selected river basins (Kanagarayanaru, Peraru and Paliaru) in Northern Sri Lanka. Primary and secondary data have been obtained for this study. Geographical Information System in addition to polymorphic analysis method has also been used to co-ordinate and evaluate the agricultural, settlement and environmental priorities. It is important to calculate the weightage for the classes of factors that influence the co-ordination of agricultural, settlement and environmental priorities, using the process of step-by-step analysis. Saaty's (Saaty and Vargas, 1991) comparative scale has been used for the process of step-by-step analysis. Pairwise comparison system has been used to evaluate the weighing of factors and thereby land use priorities and conflicts have been calculated. Weighting values were issued to 104 gramasevaka divisions and by overlaying weightage the areas for the co-ordination of agricultural, settlement and environmental priorities have been ascertained. By overlaying these priority maps, conflicting land uses have been identified. Conflicts arise particularly in areas where land

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uses do not suitably tally with the physical environment and also due to the unplanned land use activities undertaken by the peasants. Thus, it has been possible to identify the conflicts in land use through the study of land use priorities. This study has thus helped to identify land use priorities and conflicts, and it is hoped that it will serve as a guide for further studies undertaken in the river basins of Northern Sri Lanka as well as in other river basins in the future.

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**Keywords**

Land use • Priorities • Conflicts • River basins

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## Introduction

Studies based on land use are important to carry forward development-oriented activities in any part of the world. Land use denotes how land is utilized to provide things and services. Whereas the term land use refers to the human activities found in a particular land area, the term “land cover” refers to the natural and artificial features covering that area (Anderson 2001). According to the option of world food and agricultural institution, land use refers to the activities undertaken by the local population in an area. The land use of an area will not always be of the same nature. The change will be occurring in land use according to time, quantity and extent. Physical, biological, technical, economic, institutional and political factors wield much influence in these land use changes (Lambin and Ehrlich 1997). Information related to land use is essential to handle land resources efficiently. Information on land uses is determined through land use surveys. Such surveys help to gather the correct information on how land resources of the country are utilized, contemporary changes in land use, evaluation of land use suitability and on land use planning (Sante-Riveira et al., 2008). Land use changes are infecting an exposition of the inter-relation between man and the environment. Various changes in land use are brought about by events like increase in population and rapid urban development time to time and place to place. These changes on social, economic and political bases may take place rapidly or slowly according to circumstances. Within the last thirty years, a number of land use changes have occurred in the research area, due to the internal war. The need to regularize these is seen in the research area. Most land areas here used without proper planning are found under unsuitable land use patterns. After the war, many great changes are occurring in land use. As a result, conflicts also have appeared among the land use priorities. Due to this classifying land use of the research area under three heads, viz. agriculture and agriculture-oriented land use, environmental protection-oriented land use, and settlemental and settlement oriented land use, the priorities in land use have been identified on the basis of (1) the preference of the people in the research area and (2) the prevailing land use systems. In other words, the trends of land use, suitability of land use and the preference of the people in the research area form the main factors that decide the land use priorities.

## Literature Review

This is a review that includes materials collected after reading several local as well as international research articles. Thu (2012) is a scholar who in his study about the conditions prevailing in East Timor wrote his article about, "Availability of land, arising of land conflicts, various land rights and the livelihood of people after the internal war." An analysis of land access should be helpful in understanding the multifaceted nature of land ownership problems that crop up in a situation that follows such a war. One cannot simply be satisfied with the opinion that the conditions for land access are related only to the assets concerned. In fact, they are also entwined with local historical conflicts, cultural traditions and the broad changes brought about by the displacement of societies. The results of this research illustrate that the destruction of assets alone cannot be attributed to those historically prevailing conflicts which had in the past been undoubtedly a cause for the disturbances and that they still contribute directly to the problems related to unsolved asset ownership, available resources and development activities, and thereby lead to present as well as future conflicts. This research is also helpful in determining the livelihood strategies adopted by people in such war situations, the land conflicts arising among people, their livelihood partners and to suggest the type of solutions to such problems.

Cour et al. (2008) undertook a research known as "Decision-aid in Tanzania for the management of land resources in the Ruaha river basin." Conflicts and competitions were surmounting among the uses of water resources in this river basin. This research aims at suggesting combined strategies to estimate the availability of water resources, to efficiently allocate such water resources and to manage the available natural and water resources. The data collected for this research have been analyzed through the GIS and results obtained.

In Iran, Sadeghi et al. (2009) conducted a study of the Brimuand watershed which has an extent of 9572 ha. This was named "Maximization of land use in water shed scales." This research was done for the purpose of determining the most suitable land allocation for various land use patterns, reducing soil erosion and increasing benefits. Primary and secondary data for this research were analyzed through the sensitivity analysis method and results obtained.

Kopacz and Twardy (2011) conducted a study to emphasize the permanent maintenance of the grasslands found in the Raba river basin in the Carpathian mountain ranges between the years 1980 and 2005. The main aim of this research was to estimate the changes that occur in the land use patterns in grasslands and open lands. The primary and secondary data for this research were analyzed through the regression method and results obtained.

Unruh (2008) studies the land ownership problems of war-affected countries, particularly Somalia, Uganda, Angola, Ethiopia and Siberia. This is a characteristic research done on the basis of sustainable livelihood programs in order to identify the postwar land ownership problems and develop sustainable livelihood of village farmers.

"The effect of changes brought about in the land use patterns of the central parts of Heine river basin in Northwest China" was a research carried out by Nain et al. (2014). Land use data for this research have been obtained using aerial photographs and land set T.M images. Results obtained after the analysis of the data showed that the extent of agricultural land had increased from 15.38 to 43.60% during the periods 1965–1986 and 1986–2007.

Thus, several research articles have been read and suitable material for this research collected.

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## Research Objective

The purpose of this research is to identify the priorities and conflicts found in the agricultural, environmental and settlement land use in the research area.

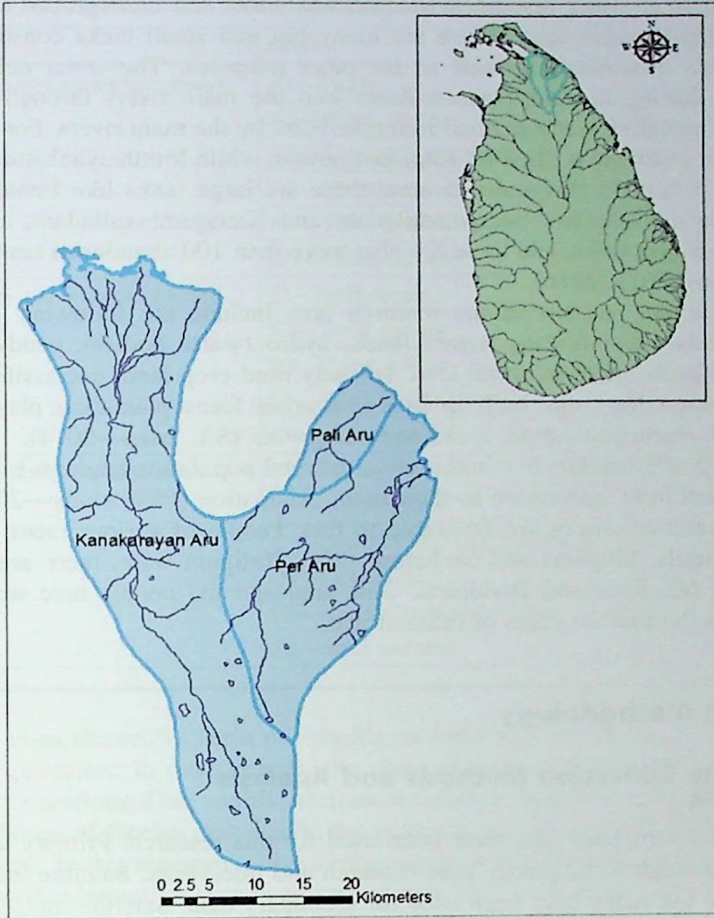
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## The Research Area

Out of the five administrative divisions in the Northern Province, the research area spreads into the three districts of Mullaitivu, Kilinochchi and Vavuniya. Generally, research areas are formed on the basis of administrative limits. However, this research area has natural river basins for its borders. In other words, the research area is that area which includes the basins of Kanagarayanaru, Peraru and Paliaru. It is bounded on the north by Jaffna lagoon, on the northwest and east by Indian Ocean, on the south by Vavuniya south regional secretarial division and on the west by the regional secretarial divisions of Poonakari and Manthai. This research area is situated between latitudes  $8^{\circ} 52' 54''$  and  $9^{\circ} 31' 18''$  N. Longitudinally, its location is between  $80^{\circ} 20' 41''$  and  $80^{\circ} 44' 50''$  E. Wholly and partly the following nine regional secretarial divisions come within the research area: -Vavuniya, Vavuniya north, Puthukudiyiruppu, Oddusuttan, Karaithuraipattu, Thunukkai, Karaicchi, Kandawalai and Pacchilaipalli. Likewise, 104 gramasevaka divisions also come within this research area wholly and partly. The total extent of the research area is 136,511.62 ha (1365.11 km<sup>2</sup>). This is 2% of the total area of Sri Lanka. The location of the research area can be observed in Fig. 6.1.

In keeping with the fan-shaped landscape of the research area, the three rivers in the dry zone drain toward north and northeast directions. These three rivers seem to be seasonal streams. This area has a monsoon climate. Average temperature ranges from 28 to 30 °C. This area receives a rainfall from 1250 to 2000 mm. Rainfall is received from both southwest monsoon and the northeast monsoon (Sri Lanka map 2013). According to the soil classification of Sri Lanka, the soil resources of the research area belong to the low country dry zone variety. These soils have an acid content of 6–7 (pH value) (Sri Lankan map 2014). More alluvial soil is found along the basins of Kanagarayanaru, Peraru and Paliaru. The distribution of alluvium is found particularly more in the areas including Kilinochchi,





**Fig. 6.1** Location of the research area

Uruthirapuram, Vattakacchi, north of Ramanathapuram, Kandavalai, Umaiyalpuram, Korakkankattu, Mayavanoor, Mavadiyamman, Mutthaiyankattu, Thanduvan, Peraru, Katsilaimadu, Thatchadamban, Kanagarayankulam south, Marailuppai, Tharmapuram and Putthuvettuvan.

Within the natural vegetation divisions of Sri Lanka, the research area comes within the tow country dry zone forest type. The varieties of trees in this forest include Satin, Naga, Palu, Ebony, Samandalai, Teak, Veerai, Yavarana, Punnai, Sirupunnai, Ilanthai, Itthivahai, Jungle mango, Jungle tamarind, Mahil and Manjavenna (Direct observation—2015, participatory field study—2016).

Two types of water resources, viz. surface water and underground water, are found in the research area. There are many big and small tanks constructed by man for his own needs as well as for other purposes. The water collected in big tanks during the rainy season flows into the main rivers through tributary streams. Thereafter, water is filled into reservoirs by the main rivers. For example, Iranaimadu reservoir is filled by Kanagarayanaru, while Mutthaiyankattu reservoir is fed by peraru. In this research area, there are large tanks like Iranaimadukulam, Kanagarayankulam, Semamadukulam and Kanagambikaikulam, also more than 100 smaller tanks, and there are also more than 100 abandoned tanks (Direct observation—2015, 2016).

The land use patterns of the research area include the following 19 types: dense forests, open forests, barren lands, hydro (water bodies), paddy cultivation areas, home gardens, scrub land, sparsely used crop land, unclassified lands, marshy lands, other crops, built up area, sand areas, forest plantation, playgrounds, grasslands, chena cultivation, rocks and mangroves (S.L. Map—2014).

While 35,803 families live in this area, the total population amounts to 117,806. 95% of them have agriculture as their main occupation (Field study—2016). The soil and water resources are favorable to this. People of various races live here such as Tamils, Muslims and Sinhalese (2%). Religion wise, there are Hindus, Christians, Muslims, and Buddhists. This area and the people here were badly affected by the past 30 years of internal war.

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## Research Methodology

### Data, Data Collection Methods and Analysis

Primary and secondary data have been used for this research. Primary data were collected through participatory field research and interviews. Satellite images and digital land use maps have been used for secondary data. Satellite images formed the main data source in finding out the periodical changes in land use. The images with 0.5 m spatial resolution obtained from the satellite “Geo – Eye” were used in this research. The research area is an area totally affected by the war. People got displaced and resettled. Land-based data as given below have been used to fulfill the purpose of this research:-

Agriculture and agriculture-based areas (paddy, home gardens, sparsely used cropland, mixed crops, (unclassified), trees (other crops), Chena cultivation, settlements and settlement-based areas (settlements, trade centers, home gardens, other building structures, play grounds) areas to be conserved in the environment (forest—dense, open and timber based), water bodies, marshy land and mangrove, grasslands, barren lands and shrubs, sand and rocky lands). These data have been divided into classes, each of which has been assigned 1–9 norms. This can be observed in Table 6.1. During the central committee discussions, the classes given the highest importance, and lowest importance by the people of the area were respectively assigned to 9 and 1 norms (Standards).

**Table 6.1** Classes and norms of factors that influence the priorities for the allocation of land use

Factors	Classes	Norms (position)
Agriculture and agriculture based	A1—Paddy	9
	A2—Home gardens	8
	A3—Sparsely used cropland	7
	A4—Mixed crops (unclassified)	5
	A5—Trees (other crops)	3
	A6—China cultivation	1
Settlements and settlement based	S1—Settlements	9
	S2—Trade centers	6
	S3—Home garden	8
	S4—Other buildings	5
	S5—Play ground	3
Environmental protection areas	C1—Forest	9
	C2—Water bodies	9
	C3—Marshes land and mangrove	7
	C4—Grasslands	6
	C5—Barren lands and scrubs	3
	C6—Sand and rock	1

Every class shown in Table 6.1 wields its influence in allocating priorities in different quantities. In other words, the class of each factor wields its influence at various situations. Due to this, various weightage values have been calculated for the classes of factors that decide the priorities for agriculture, settlement and environment. In this research, polymorphic analysis has also been used along with geographical information system to co-ordinate and evaluate the agricultural, settlemental and environmental priorities. It is important to calculate weightage using the step-by-step analysis for the classes of factors that influence in co-coordinating the priorities for agricultural, settlemental and environmental priorities. For this, Saaty's pair-wise comparison method has been used. Pair-wise comparison method has been used to value the weightage of factors. In this method, only two classes can be compared at a time (Yashon et al., 2014). Here too, the classes which contribute to co-ordinate the agricultural, settlemental and environmental priorities have been taken two by two and compared to provide the weightage of the classes. This process can be observed in the steps from 1 to 3 in Table 6.2. As an illustration, the weightage process for the factor including agriculture and agriculture-based classes has been calculated and shown for the gramasevaka division of "Periyaittimadu." Thus, all the aforesaid activities have been calculated for

**Table 6.2** Scales for comparing the process of hierarchical analysis function

Scales	Selected scales
1	Equal importance
3	Where one factor is of medium importance than the other
5	Where one factor is of (great) firm importance
7	Where one factor is of very (greater) very firm importance
9	Where one factor is extremely important than the other
2, 4, 6, 8	Intermittent values

Source Saaty and Vargas (1991)

the classes within which they come, in respect of all the 104 gramasevaka divisions in the research area covering agriculture and agriculture-based areas, settlemental areas and preferable environmental areas, and weightage values also obtained. The priorities scale used in comparing two classes in the process of step-by-step analysis is shown in the method arrangement of Table 6.2. This is a standard and popular method of scaling. Here the numbers related to the quantities are also given along with matters related to qualities. Values from 1 to 9 have been given in this scale. During the comparison of two classes, if both are found to be of equal importance, scale 1 is applied. If one factor is of medium importance, then scale 3 is applied. If it is in-between scale 1 and 3, scale 2 is applied therein. Thus, the other scale values applied on the basis of importance can be observed in Table 6.2.

The importance attributed to factors, when compared, is shown in method 1 in Table 6.2. Thus when paddy cultivation (A1) and home gardening (A2) are compared, as paddy is given extreme importance, it is assigned scale 9. Next, when home gardening (A2) and areas with lesser crop cultivation (A3) are compared, scale 6 is assigned thereto. Following this when areas with lesser crop cultivation (A3) are compared with tree crops (A5), scale 4 is assigned thereto. Likewise other factors also have been compared and assigned values.

The importance assigned to the classes of the above factors was decided also on the basis of the discussions that took place at the central committee. In step 1, in Table 6.2, when 2 classes re-compared, one can see the values assigned to the five classes, when comparing the two classes, and also the decimal values obtained when they were intercompared. For example, the value denoted as 9.00 in the cage indicated horizontally as A1, and vertically as A2, has been converted to 1/9 (0.11) in the cage indicated horizontally as A2 and vertically as A1. Similarly, the decimal values for the other factors also have been calculated.

Table 6.2—Calculation of weightage through the process of hierarchical analysis function.



**Step 1: Quantities (extents) selected through comparison of two classes****Periyaitthimadu**

Class	A1	A2	A3	A5	A6
A1	1.00	9.00	8.00	7.00	5.00
A2	0.11	1.00	6.00	5.00	3.00
A3	0.12	0.16	1.00	4.00	3.00
A5	0.14	0.20	0.25	1.00	2.00
A6	0.20	0.33	0.33	0.50	1.00

In step 2, the total average and percentage of all five classes have been calculated, and their weightage values are obtained through comparison of two classes.

**Step 2 (Table 6.2): Weightage values obtained through comparison of two classes**

Class	A1	A2	A3	A5	A6	Total	Average	Weightage values
A1	0.63	0.84	0.51	0.38	0.36	2.72	0.54	54.4
A2	0.07	0.09	0.39	0.27	0.21	1.03	0.20	20.6
A3	0.08	0.01	0.06	0.24	0.21	0.60	0.12	12.0

The weightage values obtained through the step-by-step analysis process in respect of five classes in the gramasevaka division of Periyaitthimadu can be observed in step 3.

**Step 3 (Table 6.2): Weightage values obtained in the process of hierarchical analysis function**

Classes	Weightage values
Paddy—A1	54
Home gardens—A2	21
Areas under smaller cultivation of crops—A3	12
Tree crops—A5	07
Chena cultivation—A6	06

More weightage values have been obtained for paddy cultivation through the step-by-step analysis while lesser weightage values have been obtained for Chena cultivation. Likewise weightage values have been given as shown in step 3, to areas under smaller crop cultivation, home gardening and tree crops. Similarly, in the case of agricultural and agriculture-based classes too, through superimposition of weightage, the 104 gramasevaka divisions have been assigned weightage values, and the areas for the co-ordination of agricultural, settlemental and environmental

priorities have been estimated. These have been classified and mapped. Accordingly, the areas that could be included for coordinating the priorities of the research areas have been recast into the highest, medium and lowest classes. Such activities (analysis) have been undertaken also for areas of environmental protection as well as for settlements and settlement-based areas.

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## Results and Discussion

### Land Use Priorities and Conflicts

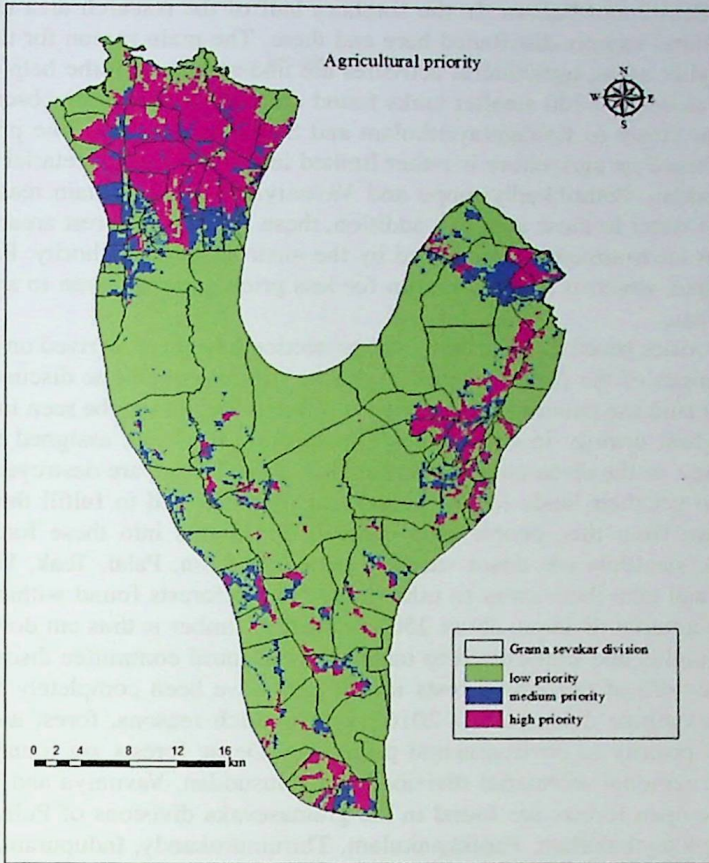
#### Priorities

Classifying the land uses prevailing in the research area, as stated in the methodology, into three, i.e., agriculture and agriculture-based, environmental protection-based land uses and settlement and settlement-based land uses, also taking into consideration the preferences of the people in the research area, the priorities for land use have been identified. That is to say that the existing trends of land use, suitable land uses and the preferences of the people in the area form the main factors in identifying the priorities of land uses. The agriculture in the research area and the priorities for agriculture-based land uses may be observed in Fig. 6.2.

Within the agriculture and agriculture-based land uses are included paddy, home gardening, Chena cultivation, other crops and crops of smaller cultivation along with cattle rearing (goats, cows and poultry, etc.). Agriculture and agriculture-based land uses occupy 30.89% of the total research area. The alluvial soil and the reddish brown soil found here (Vattakkacchi, Urutthirapuram, north of Ramanathapuram, Kandavalai) are very favorable to agricultural activities. Paddy cultivation is undertaken in larger extents within the gramasevaka division coming under the secretarial divisions like Karacchi, Kandavalai and Oddusuddan. Particularly the irrigational facilities available from Iranamadukkulam, Kanagarayankulam, Sema-madukulam, Mutthaiyankattukulam and Kanakampikaikulam are favorable for paddy cultivation in the research area. Apart from this, the water from Kanagarayanaru, Peraru and Paliyaru and the irrigation facilities from Iranaimadukkulam are very congenial, not only for paddy cultivation but also for other combined crop cultivation. Among the agricultural pursuits of the research area, maha and yala paddy cultivation, upland crops and the cultivation of cereals occupy an important place. Rain-fed chena cultivation is undertaken in areas like Thirumurukandy and Puttuvedduvan.

Agriculture and agriculture-based activities are found rather less in the regional secretarial divisions of Puthukkudiyiruppu and Karaithuraippattu in the research area. Though the soil resources here are congenial to agricultural activities, water is a big problem. As an illustration it is worth mentioning here that in 2015, 9 acres of upland cultivation got completely destroyed due to lack of water in the gramasevaka division of Mutthayankattu (Central Committee discussions—2016). The main reason was the drying up of well waters, due to insufficient rainfall. Though





**Fig. 6.2** Priorities for agricultural and agriculture-based land uses

smaller extents of agricultural activities were carried out in the above gramasevaka divisions, at a small scale, even those were destroyed by wild animals. Every year crops are destroyed by wild animals like elephants and wild boars in areas like Koolamurippu and Karuvelankadal. In the dry seasons, various crop diseases affect the agricultural activities of this area. For example in 2016, about 7 acres of chilly cultivation was ruined in the gramasevaka division of Karuvelankandal by “whitening” disease. Due to such reasons, people in these areas are reluctant to engage themselves in agricultural activities. In other words, though some of the physical factors in the research areas are favorable to agricultural activities, others are rather unfavorable.

In this respect, the priority areas advanced in agriculture are found mostly in the fertile areas closer to river basins. Particularly the highest priority areas of agriculture are lying near Iranaimadukkulam fed by Kanakarayanaru and in the river



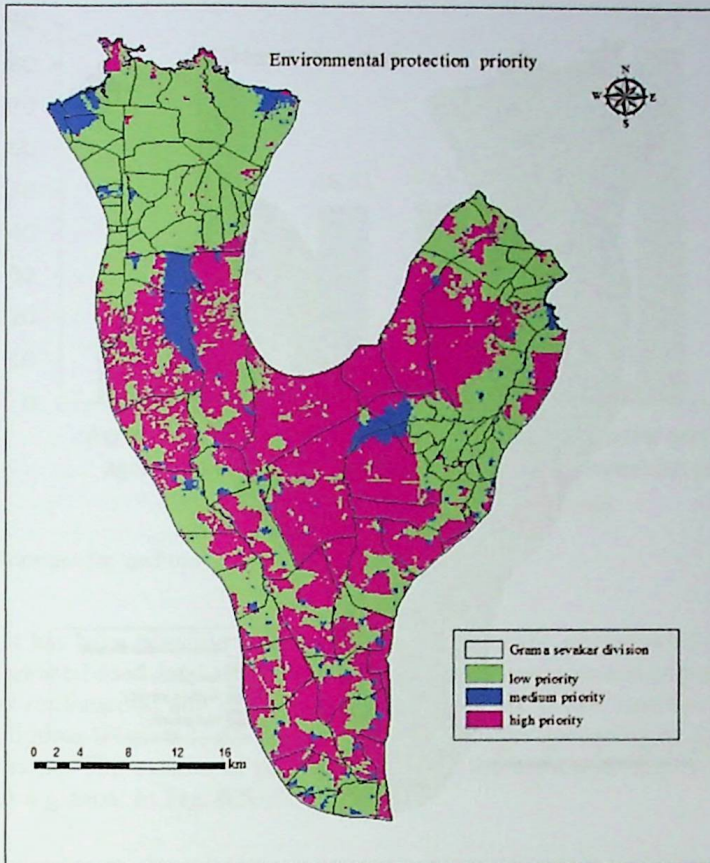
basins of Peraru and Paliaru. In the southern half of the research area also, there are agricultural extents distributed here and there. The main reason for this is that in such higher areas, agricultural activities are undertaken with the help of irrigation from more than 100 smaller tanks found close by. This can be observed well in the areas closer to Kanagarayankulam and Semamadukkulam. The priority for land uses based on agriculture is rather limited in the regional secretarial divisions of Oddusuddan, Puthukkudiyiruppu and Vavuniya north. The main reason being shortage of water in these areas. In addition, these are mostly forest areas and also declared as environmentally protected by the environmental authority. Population also is sparse, which is another reason for less priority being given to agriculture in these areas.

The priorities based on environmental protection have been derived on the bases of the opinions of the people arrived at during central committee discussions and the present land use pattern. The position of these priorities can be seen in Fig. 6.3.

The highest priority in environmental protection has been assigned to forests by the people in the research area. Particularly more forests are destroyed without any plan to get their lands for the settlement purposes and to fulfill their timber needs. Apart from this, people who come in the nights into these forests from other areas, stealthily cut down valuable trees like Satin, Palai, Teak, Veerai and Yavarana and take them away to other areas. In the forests found within Karachi regional secretarial division, about 250–300 feet of timber is thus cut down within 2 h in the nights and transported to outer areas (Central committee discussions—2016). One-third of the Palu forests in this area have been completely destroyed (Central committee discussions—2016). Due to such reasons, forest areas show the highest priority to environmental protection. Dense forests are found particularly in the regional secretarial divisions of Oddusuddan, Vavuniya and Vavuniya north while open forests are found in the gramasevaka divisions of Puliyanukulam north, Panrikkeythakulam, Panikkankulam, Thirumurukandy, Indupuram, Vallipuram, Mannakandai and Mulliyavalai west. Trees for timber are grown in the gramasevaka divisions of Periyalththimadu, Ponnahar and Kombavil. The highest priority is given to the protection of the forest in the above gramasevaka division, because of the interest shown by the people.

Medium priority for environmental protection has been given by the people to water spots, marshy lands, marshi land vegetation, grasslands as well as for sandy and rocky areas, during central committee discussions. While Iranamadukkulam, Mutthayankattukulam, Semamadukulam and Kanagarayankulam are larger extents of water, there are also more than hundred smaller tanks. It is worth mentioning here that there are number of tanks in the southern half of the research area. It is adjoining them, that marshland mangrove; grass lands and unused bare lands are found. Sandy areas are protected by strict and tight laws. Without causing damage to the environment, sand is excavated only with permissions. It is worth mentioning here, that in rivers like Peraru and Kudamuruttiaru, permission is granted by environment-related officers including the gramasevaka, to transport 15 tractor loads of sand for a month.

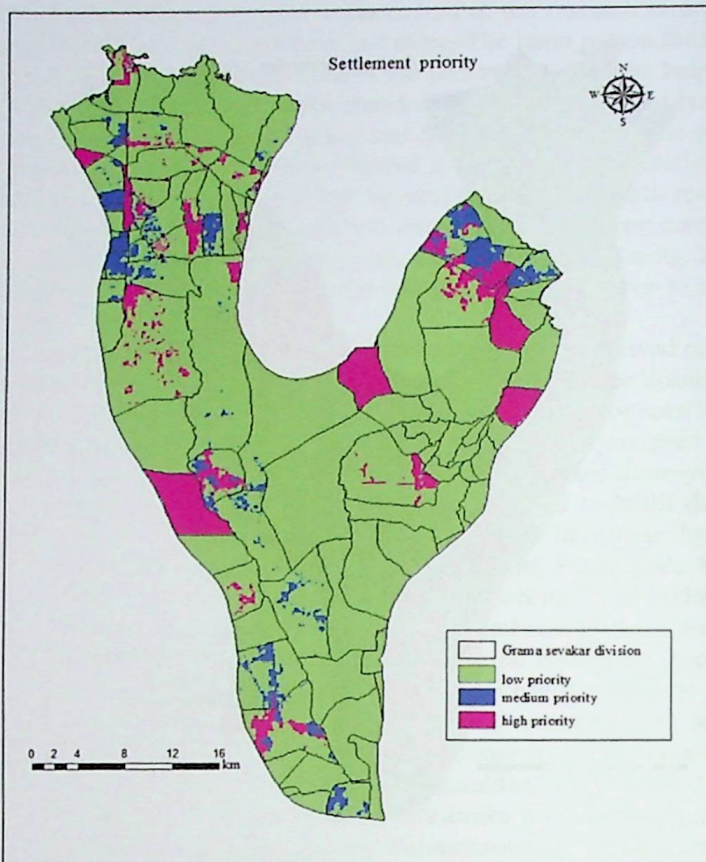




**Fig. 6.3** Priority for land uses based on environmental protection

On the basis of the people's opinions obtained at the central committee discussions in the research area, and the result of the researcher's direct field study, the priorities of settlemental and settlement-based land uses have been identified at three levels, viz. the highest priority, medium priority and lowest priority. This can be seen in Fig. 6.4.

Thus, Mankulam, Udayarkattu south, Puthukkudiyiruppu east, Kombavil, Mulliyavalai west, Kilinochchi town, Periyaparathan and Thirumurukandy gramasevaka divisions have been identified as having the highest priority for settlement and settlement-based land use. After resettlement, the gramasevaka divisions mentioned above are rapidly developing. Increased population, the availability of service facilities, possibility of fulfilling various needs (banks, hospital, school and the location of the main roads) within the same vicinity from the main reasons for the highest priority being given to settlemental and settlement-based land

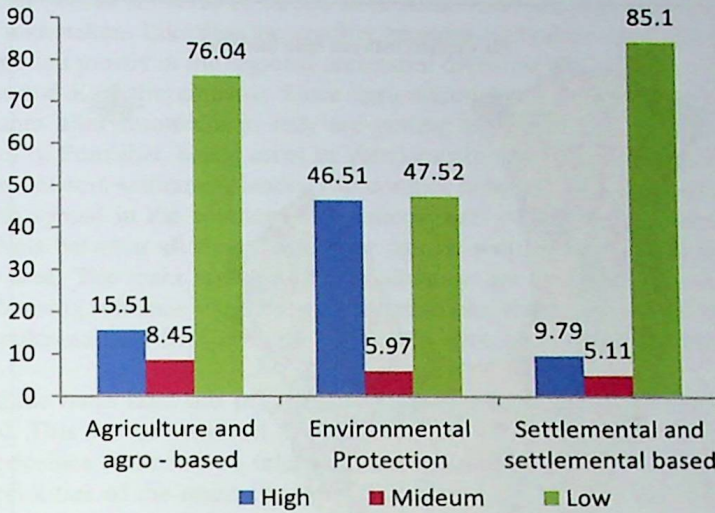


**Fig. 6.4** Priorities for settlemental and settlement-based land uses

uses in these areas. For example, the priority for settlemental and settlement-based activities may be seen very high along A9 main road (Jaffna-Kandy) and A35 main road (Paranthan-Mullaitivu).

The gramasevaka divisions of Thirunagar north, Vivekananda nagar, Thirunagar south, Anandapuram, Baratipuram, Thiruvaiyaru west, Kanagambikaikulam, Vattakacchi and Semamadu have been identified as having the medium priority for settlemental and settlement-based land uses. These are areas developing after resettlement. Those identified as having the lowest priority for settlemental and settlement-based land use are the agricultural areas basic to the livelihood of the people and those including the important parts like forests, marshy lands, grass lands and marsh land vegetation. The people of the research area will never agree to undertake any settlemental and settlement-based land use activities, disturbing the situation already prevailing therein.





**Fig. 6.5** Priorities for land use

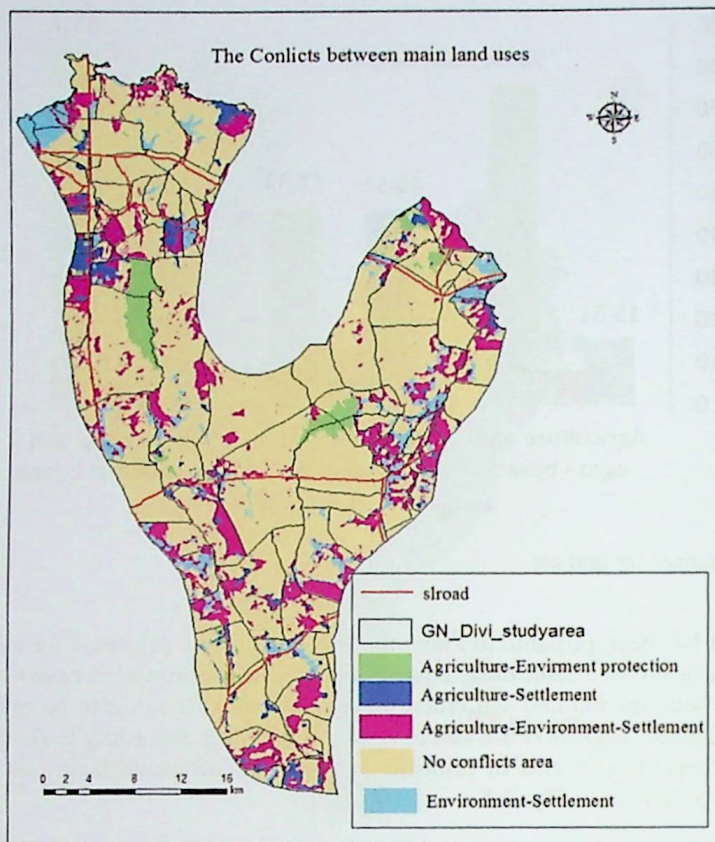
Thus, it has been possible to know the positions of the priorities for agriculture and agriculture-based land uses, environmental and environment-based land uses as well as settlemental and settlement-based land uses. It can also be observed in the three figures (Figs. 6.1, 6.2 and 6.3) how they differ according to the gramasevaka divisions. The extents of priorities between the aforesaid land uses can also be seen at a glance, in Fig. 6.5.

## Conflicts

The priorities of land uses pertaining to agriculture and agriculture-based activities, the environments to be protected and settlemental and settlement-based activities have already been obtained. Overlaying these priority maps, the conflicts in the land uses have been identified. Such conflicts occur particularly in areas where land uses do not in keep with the physical environment and also due to unplanned land use activities undertaken by the people. This can be observed in Fig. 6.6.

While conflict between agricultural and environmental protection is prevalent in about 5816 ha, the conflict between agriculture and settlement areas is found in about 6833 ha. Again the conflict between settlemental and environmental protection areas is found in about 93,611 ha. About 5233 ha of land is free of any conflicts. These are observed in Table 6.3.

The conflict between agriculture and environmental protection is seen mostly in the regional secretarial divisions of Oddusuddan and Puthukkudiyiruppu. After



**Fig. 6.6** Conflicts between main land uses

**Table 6.3** Conflicts between main land uses

No.	Conflicts	Extent (ha)	Percentage (%)
1	Agriculture-Environment Protection	5816.09	4.26
2	Agriculture-Settlement	6833.41	5.00
3	Settlement-Environment Protection	25,017.74	8.32
4	Agriculture-Settlement-Environment Protection	93,611.37	68.59
5	No conflicts area	5233.01	3.84
Total		136,511.62	100.00



resettlement, about six acres of forests have been destroyed and agricultural activities are undertaken. Likewise the conflict between agriculture and settlement has been identified mostly in the regional secretarial divisions of Karacchi, Kandavalai, Vavuniya and Karaithuraippattu. Since agricultural lands here are used for housing schemes after resettlement, they are getting converted into settlement areas. Two acres in Ponnahar, seven acres in Vattakkacchi and three acres in Indupuram have thus become settlement lands. The conflict between settlement and environment with spread in the southern and eastern parts of the research area. In fact, the conflicts between all three lands uses can be seen distributed throughout the research area. The main reasons for this situation are the development activities and the housing schemes after the war. For example, sixteen acres of field lands in Puliampokkanai and four acres in Kilinocchi have been converted to settlement areas.

The three main land use priorities and the conflicts between them have been identified. This can be observed in Fig. 6.7.

The priorities and conflicts related to land uses are observed in Table 6.4.

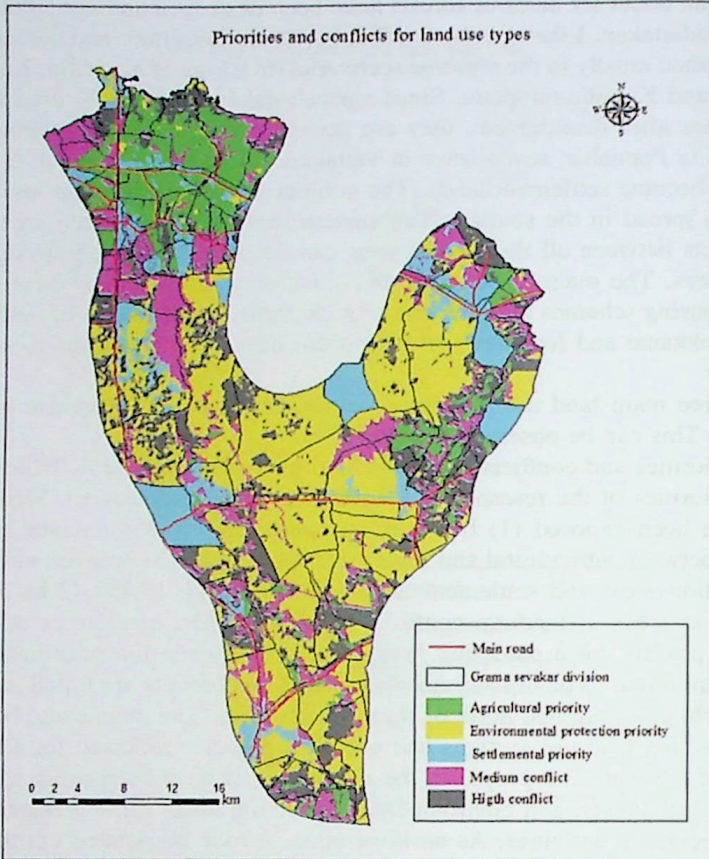
The priorities of the research area have already been discussed. Medium conflicts have been exposed (1) between agricultural and environmental protection areas (2) between agricultural and settlemental areas and (3) between environmental protection areas and settlement areas (See Fig. 6.7). 17,858.42 ha have been identified as areas of medium conflicts. In other words, medium conflicts occur when the priority for a particular land use is high, while the priorities for other land use are found to be of medium scale. Medium conflicts are found particularly in the south, northeast and north of the research areas. The main cause behind this situation is that land use systems had not been properly followed for a long time because of the war. The people in the research area have been using agricultural lands for settlements, and environmental protection areas for settlements as well as for agricultural activities. As an illustration, it may be pointed out that 2.4 ha of home garden lands have been converted to settlement lands in the regional secretarial division of Kandavalai. Such changes can be clearly seen in this chapter under the section land use changes.

If all three main land uses in the research area have high or medium or low priorities together at the same time, such areas are considered to be areas with the highest conflict. Such conditions are found mostly around the basin of Peraru. High conflicts are in 62% of the gramasevaka divisions in the regional secretarial division of Oddusuddan. Apart from this, high conflicts are also found spread along the south half and northeast quarter of the research area. This is due to the unplanned and unsuitable land uses adopted during the past period of war.

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## Conclusion

By knowing the priorities of land uses in the research area, it has been possible to find out the conflicts existing here in land use. In other words, where there are more than one priority in land use conflicts tend to crop up between/such land uses.



**Fig. 6.7** Priorities and conflicts related to land uses

**Table 6.4** Priorities and conflicts for land use types

No.	Priorities and conflicts	Extent (ha)	Percentage (%)
1	Agricultural priority	20,062.67	14.70
2	Environmental protection priority	60,199.58	44.10
3	Settlemental priority	13,373.37	09.80
4	Medium conflict	17,858.42	13.08
5	High conflict	25,017.58	18.02
Total		136,511.62	100.00



The main reason for more than one priority to arise is the existence of unplanned land use systems. Most of the gramasevaka divisions in the selected river basin are in the process of rapid development particularly building activities are progressing rapidly. More number of buildings have been erected in the gramasevaka divisions of Kilinochchi town, a small part of Ambagamam, Thirumurukandy, Vivekananda Nagar and Periyaparanthan. Particularly in areas adjoining main roads, one can observe the development of business institutions, service centers and the dense occurrence of settlements. All roads have been repaired, and transport is going on very efficiently. Former home garden and forest areas have been converted into areas with buildings while other areas have become cultivation lands. Though such changes are taking place, it is necessary that they are done with care. When lands are used for settlement purposes, it must be affirmed that they are of lesser importance for other land uses. For example, in recent times, the agricultural lands adjoining A9 road are getting converted to settlemental areas. This is the need of the hour. These changes are acceptable as they are occurring to meet the increase of population in these areas. However, the changes in forests are not altogether acceptable. They are likely to affect the equilibrium in the natural environment. Therefore, it is important that while paying attention to the land use changes in environmental, agricultural and forest cover areas, it is also necessary to find out the priorities and conflicts likely to arise. It has to be mentioned here that during war times the situation was not congenial to implement land use systems properly. Hence through this research, it has been possible to determine the priorities and conflicts in the selected river basins. Besides, it is also hoped that this research will be of guidance to future studies undertaken on the river basins of north Sri Lanka as well as on river basins elsewhere.

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