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Report of leakge analysis for the Noel Kempff averted deforestation component

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Report on Leakage for the Averted Deforestation Component of the Noel Kempff Climate Action Project

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Forward

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Introduction

This section of the report addresses the potential for, prevention of, and possible quantification of leakage for the Noel Kempff Climate Action Project. The manuscript on leakage by Aukland *et al* gives more detail on some of the conceptual discussions used to address leakage, in particular the link between baselines and leakage, and the proposed conceptual framework used to classify possible sources and types of leakage for land use projects (see below).

The goals for this study are summarised as:

1. *An evaluation of the leakage that may have occurred since the establishment of the NKCAP and an estimation of what the longer term extent of leakage might be.*

2. – *Analysis of the NKCAP leakage prevention activities to see whether or not they have been effective in preventing or reducing leakage.*

3. – *Recommendation for future leakage prevention and monitoring – based on the results of the leakage quantification and the evaluation of existing leakage prevention measures.*

There are two aspects to the leakage analysis for the NKCAP. The first addresses the leakage associated with the averted land conversion and the second aspect is the leakage associated with the averted logging activities. The flow diagrams (Figures 1-3)show a conceptual overview of the possible sources of leakage according to the framework developed by Aukland *et al* in the draft paper attached. The generic framework is presented first, followed by an analysis for the averted land conversion and finally leakage associated with averted logging. These brief analyses are investigated in more detail throughout the subsequent reports.

Figure 1: Decision tree for identification of types of leakage likely to impact land use projects.

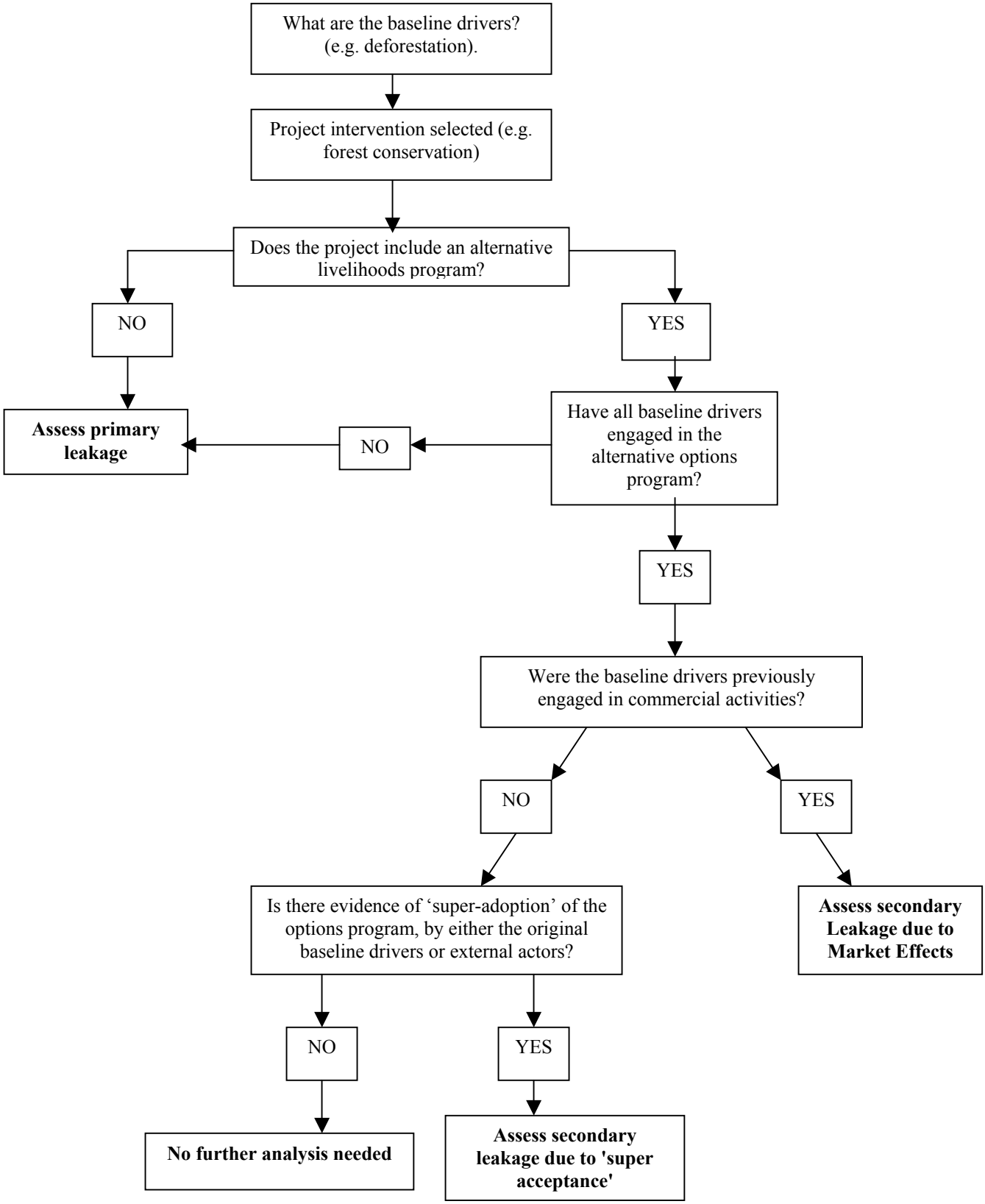


Figure 2: Decision tree for identification of types of leakage associated with averted land conversion activities.

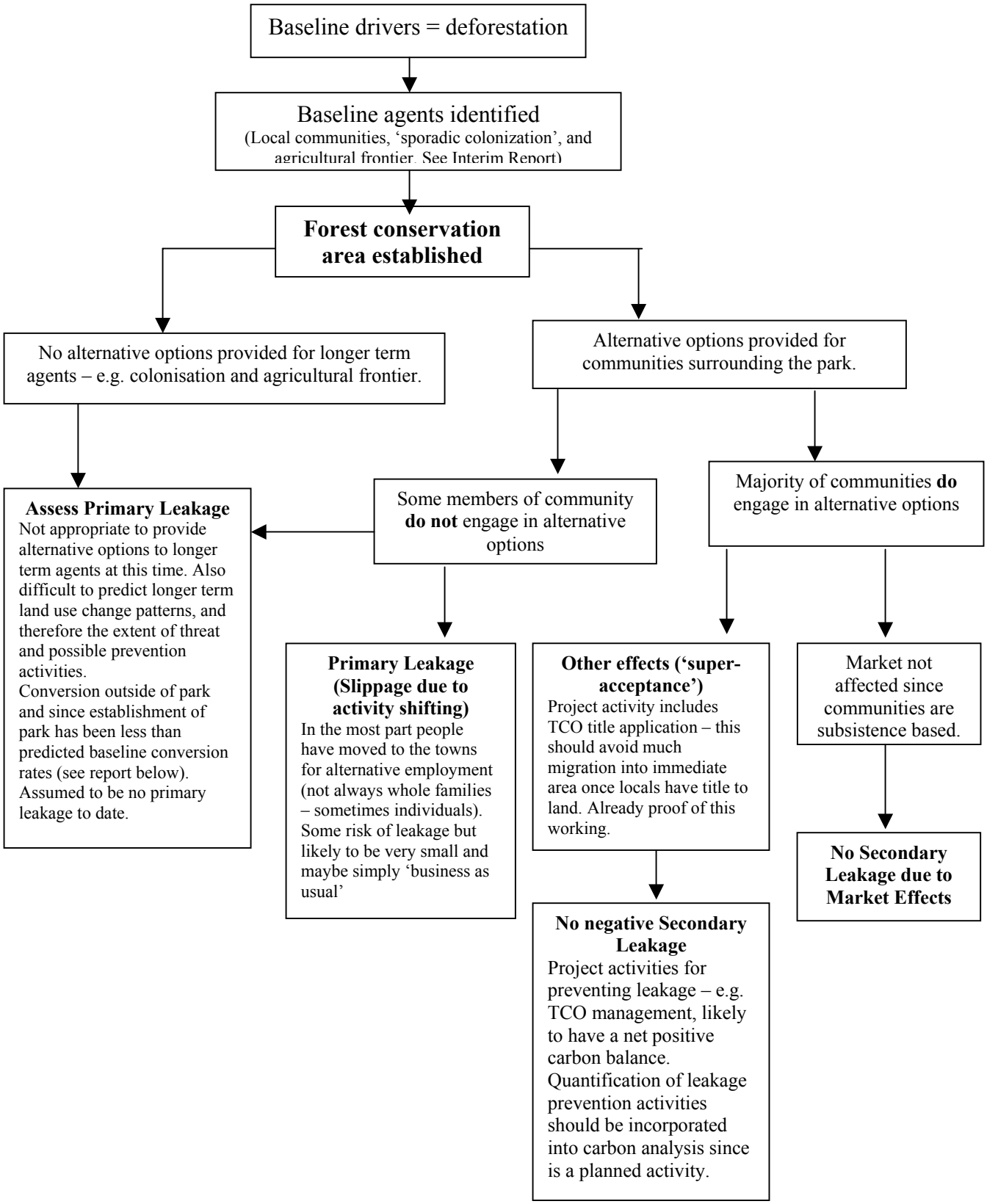
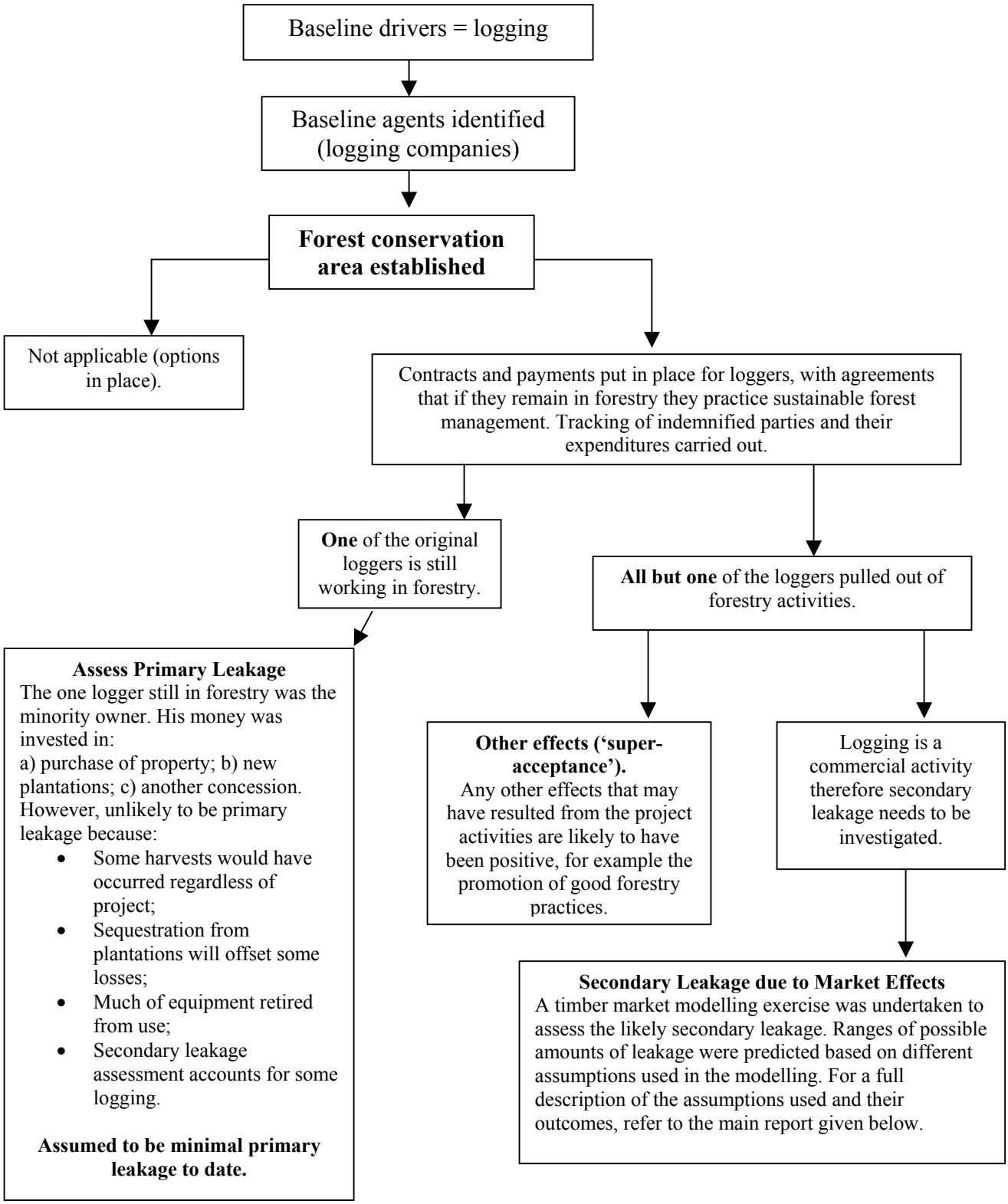


Figure 3: Decision tree for identification of types of leakage associated with averted logging activities.



1.1 An evaluation of the leakage associated with averted land conversion, which may have occurred since the establishment of the NKCAP.

One of the main types of leakage that can occur as a result of forest conservation projects is the shifting of land conversion activities to areas outside of the project, thus partially or entirely negating the GHG benefits associated with the prevention of such activities (Aukland *et al*, 2001). In the few years since the establishment of the NKCAP, the largest threat of leakage associated with land conversion is from the communities living on the border of the park. This is because the area is relatively isolated at present and land use change trends are not particularly evident in the area immediately surrounding the park. As a result, the project has been implementing leakage prevention activities with these communities and these will be assessed further below. This section will evaluate whether or not leakage associated with land conversion has occurred since the establishment of the NKCAP drawing on data collected by the project and from external sources.

The original methodologies suggested by EcoSecurities for assessing whether or not, and how much, leakage has occurred since the establishment of the NKCAP (see interim report section 2.4) proved to be inappropriate at this stage of the project. This was a geographically based approach, using various sources of statistics but due to the limited time that has passed since the project started and therefore the limitation and variability in data sources, which masks the trends that are being investigated. An alternative and simpler method is described below.

The projects "Apoyo Comunitario" or APOCOM programme has been carrying out ongoing monitoring in the 3 main communities surrounding the NKCAP, namely Florida, Piso Firme and Porvenir. The approach used is more 'people centred' than geographically based. Data that has been collected includes the number of families, forest conversion (mature and disturbed), agricultural data, information relating to health and education, etc. The information has been gathered via interviews with the communities and includes estimates of deforestation and population in years prior to the projects establishment. The results of this monitoring, which relate to land conversion, are given in Quispe and Vaca 2001 and their potential use is discussed in the Interim Report sent in August 2001.

The information relating to land conversion can be used to compare land conversion and carbon loss resulting from the communities' activities both before and after the establishment of the NKCAP (or 'project'), as shown in Table 1 below. Average carbon loss per year is calculated by:

$$\text{Average carbon loss per year} = H * C * F$$

Where:
H: average number of hectares converted per family per year
C: average net carbon difference between forest and agriculture per hectare (tC/ha)
F: total number of families in the community

Table 1: Average land conversion and carbon loss per year for the three key communities, before and after the establishment of the NKCAP.

	Forida	Porvenir	Piso Firme	Average
Before project establishment				
Mean deforestation (ha/yr/family)	0.70	0.73	0.46	0.63
Net carbon loss per ha	132.00	132.00	132.00	132.00
Number of families (mean)	45.00	79.00	70.00	64.67
Average carbon loss (tC/year)	*4,158.00*	*7,612.44*	*4,250.40*	*5,340.28*
After project establishment				
Mean deforestation (ha/yr/family)	0.65	0.98	0.97	0.87
Net carbon loss per ha	132.00	132.00	132.00	132.00
Number of families (mean)	24.50	88.75	83.50	65.58
Average carbon loss (tC/year)	*2,102.10*	*11,480.70*	*10,691.34*	*8,091.38*

These data show an increase in the average carbon loss per year since the establishment of the NKCAP when compared with the situation before the project. Population levels in the communities have remained relatively static since project establishment (Quispe and Vaca, 2001) therefore such results are unlikely to reflect an increase in demand for land due to population increases. The change in average carbon loss could be due to a number of factors, including:

a) The increase in land conversion is simply reflecting fluxes in data rather than actual trends in land conversion.
b) Project activities have resulted in increased land conversion in the years monitored so far.
c) Trends in conversion are reflecting expected baseline increases in conversion for the region, i.e. are not as a result of project activities.

The data used in Table 1 are based on interviews and meetings held in the communities. Data prior to the project are limited, whereas post-project data are based on thorough research and sampling and are likely to be accurate. This discrepancy and the fact that it is only 4 years since the project was established, may have contributed to the differences found in average land conversion and carbon loss shown in Table 1.

One of the project activities being carried out by APOCOM is the promotion of agricultural techniques and planning that will reduce the extent of forest clearing in the longer term. However, in the first few years of the programme some land redistribution has occurred in order to select appropriate sites and allocate land to families in preparation for longer term sustainable farming techniques. This may have caused the observed increase in land conversion, but is unlikely to be a long-term trend.

More importantly, it is necessary to consider whether or not the increases in land conversion since the project's establishment are simply a reflection of baseline trends in the Bajo Paragua region. If they are equal to, or less than, predicted trends in land

conversion that would have occurred without the project, then no activity shifting leakage associated with land conversion has occurred since the establishment of the NKCAP. A range of published deforestation rates exist that might apply to the region in which the NKCAP is located, many of which are given in Quispe and Vaca, 2001. Table 2 uses these deforestation rates to calculate the number of hectares that would be converted each year for the different deforestation rates and compares it with actual conversion. These calculations use a total forest area of 329,103 hectares, which is the forest area of the Bajo Paragua TCO[1]. It also represents the limit of the area monitored by the APOCOM programme and therefore enables a deforestation rate to be calculated from the data presented earlier in Table 1, as shown below:

Total forest area in TCO (ha)	329,103 ha
Mean annual deforestation in TCO (ha/yr)	184 ha/yr
Deforestation rate (%)	0.056 %

This allows comparison with published estimates of deforestation and land-use change, as shown in Table 2.

Table 2: Application of published baseline deforestation rates to the TCO area and comparison with actual land conversion.

Source*	deforestation rate %	details	deforestation ha/yr**
CUMAT 1992 (cited by Pachecho, 1998)	0.2	Deforestation in Santa Cruz department (1985-2000)	658
CUMAT 1992 (cited by Pachecho, 1998)	0.19	For the Amazon region	625
Morales 1993, 1996 (cited by Pachecho, 1998)	0.08 (1982-92) and 0.19 (1992-94)	For Chiquitania region	263 and 625
Morales 1993, 1996	0.25 (1988-92) and 0.38 (1992-94)	Deforestation in Santa Cruz department	823 and 1251
Davies 1993	1.04	For the Santa Cruz expansion area (under high pressure)	3,423
APOCOM data	0.056	Based on monitoring data for the TCO region	184

** For further information see FAN's final report 2001

*Assuming the TCO as the boundary with total forest cover = 329,100 ha

Note that all the published deforestation rates are higher than the values determined in reality since the establishment of the NKCAP. This would suggest that actual deforestation is less than would have been expected according to baseline conditions, and therefore that we can safely assume that there has been no leakage associated with averted deforestation to date.

[1] Local indigenous groups are allowed to apply for a TCO or 'Tierras Comunitarias de Origen' which will grant them the rights to sustainably manage the natural resources of an area of land. As part of the application for land title rights, the applicants must produce a detailed natural resource management plan. The Bajo Paragua TCO has been applied for by the communities surrounding the NKCAP, and for the purpose of this analysis it has been assumed here that it is representative of the area under the influence of these communities.

In addition to the above comments, it is likely that the end result of the conversion of the forests may be more beneficial in terms of carbon storage in the longer term, than might have been the case in the business as usual scenario. For example, rather than convert for pure agricultural crops or animal grazing, the land may be used for agroforestry activities. If a more thorough analysis of the carbon flows associated with the leakage prevention activities were undertaken, the exact carbon effects would be clearer. Since the leakage prevention activities were planned activities at the time of project establishment, there is some case for them to be included in the project and baseline carbon quantifications.

1.2 An evaluation of the avoided deforestation leakage prevention activities.

An outline of the leakage prevention activities being carried out by the NKCAP was given in the interim report, and a more thorough description can be found in the project's Technical Operating Protocols (1999). With the assistance of the community programmes "Apoyo Comunitario - APOCOM" and the work of FAN, the communities surrounding the Noel Kempff park have developed a management plan for the natural resources of the Bajo Paragua TCO, for which they are applying for title from the government. The preliminary basis for a management plan (Catari *et al*, 1998) gives a more thorough description of how the TCO region will be sustainably managed, encompassing the leakage prevention activities within it. Assuming the TCO is granted and the communities manage the area as proposed in the management plan[2], it is likely that this will provide an effective buffer to the park, and a mechanism to prevent leakage associated with averted land conversion, because:

- Communities have an incentive to manage the resources sustainably if they have legal title to the land;
- Communities will have a legal right to refuse outsiders access to lands within the TCO;
- The planning and zoning process reduces the risk of uncontrolled forest conversion within the TCO, both through effective site choice for agriculture;
- Resultant sustainable forest management and agroforestry practices ought to ensure that forest products are provided without the need for ongoing forest clearance;
-

Already, even in the absence of the TCO confirmation, there is evidence that the ongoing activities are providing a mechanism for reducing land conversion in the region. These are outlined in FAN's report (Quispe and Vaca, 2001), but notably, an application by an outsider to clear 200 ha of forest in the Piso Firme area was refused by indigenous authorities as a result of ongoing TCO planning. There are likely to be numerous positive carbon benefits resulting from the projects leakage prevention activities, in particular the establishment of forest reserves within the TCO and a long-term reduction in the clearance of forest compared with predicted baseline scenarios (see section 1.1 above).

[2] It is understood that a more detailed and thorough management plan will be written for the TCO Bajo Paragua region.

Based on this information, there is little doubt that the leakage prevention activities being implemented by the project are eliminating the likelihood of leakage occurring as a result of clearing activities by the communities immediately surrounding the park. They have provided alternative options to forest conversion, within the context of applying for a sustainably managed TCO, which have been successful in preventing leakage to date.

In the longer term, the TCO is likely to continue to be an active prevention mechanism for leakage associated with land conversion by the affected communities, provided that a detailed management plan is proposed and the plans outlined are adhered to. However, depending on the threats to the forest in the longer term and the agents that would have influenced the predicted baseline, the project may require alternative activities in the future (as discussed below).

1.3 Estimating long-term leakage resulting from averted deforestation activities.

Predicting the extent of leakage that might occur in the longer term is a difficult exercise given the range of factors that may affect land use change outside of the project area, many of which may be unrelated to the project itself. The Interim Report discussed a number of tools that could be used to look at long term risks of leakage, including:

1. apportioning leakage to different baseline agents over time;
2. determining land availability for primary leakage, and the issue of time and boundaries;
3. conducting spatial land use change modelling.

The following sections look into each of these options in more detail, building on the work already presented in the interim report:

1.3.1 Apportioning responsibility for carbon offsets to different baseline agents over time

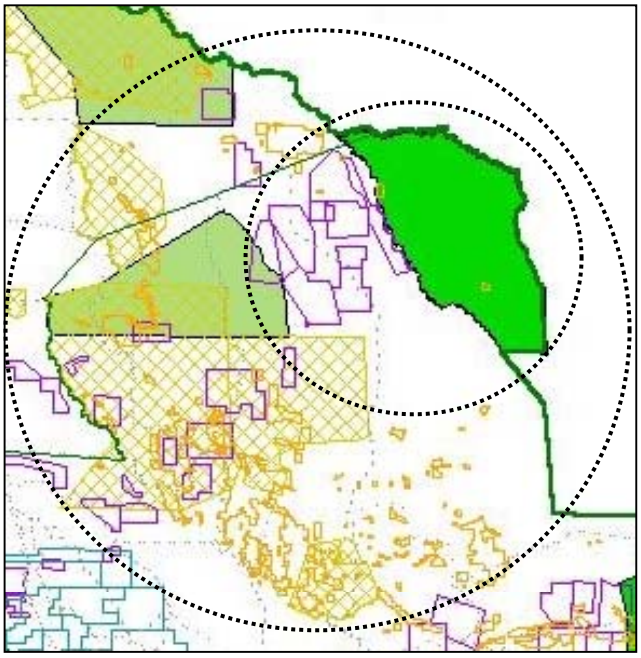
Due to the lack of definition associated with the baseline for averted deforestation for the NKCAP at this point in time, and therefore the difficulties in identifying baseline agents, this method of analysing the maximum potential for primary leakage may not be appropriate for this project at this stage. This approach, however, does provide a framework from which leakage prevention activities can be designed by focusing on the likely land-use change threats . A hypothetical example of how it can be used was given in the 2001 Interim Report and is shown again below:

	Short term (0-10 yrs)	Medium term (10-20 yrs)	Long term (20-30 yrs)
Local communities	2%	3%	5%
Migration 'sporadic colonisation'	0%	25%	0%
Agricultural frontier	0%	5%	60%

Once the baseline is defined, it may be possible to use this method combined with the framework for assessing leakage (Aukland *et al*, 2001) for identifying potential longer-term sources of leakage, and establishing a rapid quantification. An illustration of this is given in the introductory section (Figure 1).

1.3.2 Land availability for primary leakage and the issue of boundaries and time.

The idea of assessing whether or not there is 'land available' for primary leakage to occur outside of the project boundaries was introduced in the 2001 Interim Report. Using the data provided in FAN's report (Quispe and Vaca, 2001), this idea was to be further investigated. However, it was clear from the outset that the size of the total area included in such an analysis would be key to defining the amount of land available (availability being defined in terms of land title, protection, ownership etc.). This issue of 'boundaries' with respect to project responsibilities is a key one and is investigated further below in the schematic maps, with reference to the 'land availability' idea.

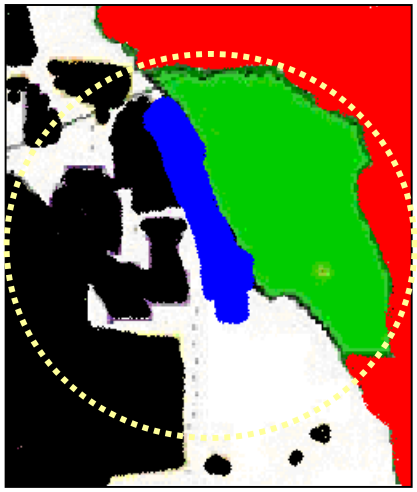


Map 1: This shows an excerpt from the land use map for Bolivia, which includes international, departmental and municipal borders; oil, mining and forestry concessions; TCO's, protected areas and proposed protected areas. The Noel Kempff Park is shown in bright green in the middle right of the diagram. If we use this as an example of how the 'land availability' idea can be applied, we could assume that only the white areas would legally be available for colonisation and for activity shifting type activities. Of course the size of the boundary used to calculate the number of hectares will influence the number of hectares available as illustrated by the overlying

circles. Following on from this idea, Map 2 below focuses in on the inner boundary. Assuming that we take Brazil out of the limits of the project's responsibilities (shaded red) and any areas with some form of legal title or protection (shaded black), there only remains a limited area of 'available' land (the white area). Map 3, shows the same, but with the proposed TCO included (blue).

Map 2:

Map 3:



The original idea had been to potentially use this method to show that instances of activity-shifting would be limited due to the land essentially 'running-out', i.e. there is only so much land that could be converted. This simple method is not going to be useful in this case, because it is evident from the maps that forested land is abundant compared with the amount of land that contributes to the carbon credits claimed by the project. It may be a useful tool for projects where the demand for land is much greater. However, if more detailed GIS and spatial modelling tools are used, baseline land conversion rates could be applied to the white areas. After a given number of years (for example the project duration) it may be the case that no forest is left other than the park (green) and areas already allocated (black), thus showing that ultimately primary leakage is negated by the time factor.

1.3.3 Spatial modelling – using GEOMOD

Various discussions have taken place as to how GEOMOD can be used to 'model' potential leakage over the longer term, by specifying the presence of the project when running the modelling of forest conversion into the future and comparing this with the 'without project' model run. The difference between the two images should enable the project to infer what the potential for leakage is, in addition to providing a predictive tool for use in monitoring of actual land conversion over time. Manipulations of some of the variables being used in the modelling in order to reflect project leakage prevention activities, for example, reducing the number of hectares of forest converted annually by each family, would also enable predictions to be made of the likely impacts of the leakage prevention activities. This approach needs further investigation.

1.4 Recommendations for future leakage work and monitoring

Through the process of assessing the leakage prevention activities for the Noel Kempff project and attempting to quantify leakage from the averted deforestation activities, it has become ever more apparent that quantifying leakage is not a straightforward process. The numerous factors that affect conversion cannot be separated from those that may have resulted from project activities, particularly after such a limited period of time since project establishment. Generally, we have concluded that it is better to try and prevent and minimise possible sources of leakage than to quantify and account for leakage either before or once it has occurred. In terms of identifying and tracking potential leakage, we felt that understanding the baseline drivers and agents was crucial, thus focusing activities on specific groups of people rather than on the broader issues and geographical statistics. This does not preclude the use of spatial tools in predicting potential leakage and possibly monitoring of leakage prevention activities, but unless the agent causing leakage is identified, how can it be prevented? In the case of the NKCAP, this people based approach is the focus of the existing leakage prevention activities, for example providing alternative livelihood benefits for local communities Such activities have, to date, been successful.

The following points suggest some activities that could be carried out as part of the NKCAP's future leakage programme:

1. Continue monitoring land conversion carried out by communities in the region. This could probably be implemented at less frequent intervals in the future, for example every 5 years. Alternatively, communities may in the future be monitoring land management as part of the TCO management plan and such data could be audited on a 5-yearly basis. It is worth considering whether such reviews and monitoring could be incorporated into the more detailed management plan for the TCO which has yet to be developed (R. Vaca, FAN, 2001, pers. comm.). Provided conversion rates do not exceed baseline projections, no further action need be taken. If conversion rates do exceed baseline projections, then action should be reviewed at that stage.

2. Keep records of occasions when the TCO has resulted in the prevention of forest clearance, applied for by community members or outsiders.

3. Estimates of carbon benefits resulting from the leakage prevention activities. Since these activities are 'planned' activities, they ought to be incorporated into the project's carbon quantification.

4. If the project decides to adopt a spatially generated baseline e.g. from GEOMOD then it ought to be possible to monitor actual forest clearance over time (remote sensing tools) and compare against predicted forest clearance (outside of the park)

as generated by the model. If actual clearance is less than predicted clearance then it can be assumed that leakage is not an issue requiring further investigation.

5. Limit project responsibility for quantifying potential land-use change in the future, based on project boundaries and timeframes. Alternatively, review the longer term leakage at a later date when land-use change patterns are clearer and more predictable.

1.5 Summary and conclusions

- The leakage prevention activities of the NKCAP are focused on the land conversion activities of the few communities surrounding the park boundary.

- In the short term, since the establishment of the project, the leakage prevention activities have been successful at limiting conversion (and possible leakage) by these particular communities. Provided that the TCO status is achieved and sustainable management plans are implemented, leakage from these communities is unlikely to be an issue.

- However, it is likely that in the longer term, other sources of threats to the project area may become apparent and therefore constitute another source of potential leakage.

- At this stage it is impossible to specify the extent of longer term leakage. The area is still relatively isolated with limited conversion taking place and therefore land use change patterns in the region are difficult to predict. Longer term assessments of the leakage should be addressed once land use trends in the region can be identified.