



Performance of tropical
production and processing
systems department

Green Ologbo project **Management plan**

Proposals and recommendations for follow-up of
the “Green Ologbo” project initiated under
SIAT/ CIRAD collaboration



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Abbreviations

AFD : Agence Francaise de Développement
BDP: Biodiversity Plot
BOD: Biochemical Oxygen Demand
COD: Chemical Oxygen Demand
DO: Director of Operations
EHS: Environmental, Health and Safety
EM: Estate Manager
Envt M: Environmental Manager
EO: Environmental Officer
FSC: Forest Stewardship Council
HCV: High Conservation Value
IPM: Integrated Pest Management
INRAB: Institut de Recherche Agronomique du Bénin (Benin Agricultural Research Institute)
MOU: Memorandum of understanding
RM: Relation Manager
RSPO: Roundtable on Sustainable Palm Oil
TDS: Total Dissolved Solid.
TSS: Total Suspended Solid
WCED: World Commission for Environment and Development
WHO: World Health Organization
WOC: West Ologbo Concession

Executive summary

The Green Ologbo project was initiated under collaboration between Presco/Siat and CIRAD.

Presco has acquired some new land in the Ologbo area for oil palm development and aims to implement a sustainable project, the "Green Ologbo" project. The company has called upon the expertise of CIRAD, and a scientific research programme has been established, focusing on research and studies for a plantation design and practices that most effectively integrate environmental and social challenges.

Aude Verwilghen, the CIRAD agro-ecologist who was assigned to Presco in early 2005 to implement the scientific programme and coordinate the Green Ologbo project, is now leaving and handing over the project to Presco staff. The purpose of this document is thus to give recommendations and tools to Presco management for follow-up of the Green Ologbo project, notably in relation to monitoring (what should be monitored and how?).

Although Presco and its expansion project at Ologbo clearly aim to comply with all the RSPO (Roundtable on Sustainable Oil Palm) principles and criteria, our focus in the Green Ologbo project mainly concerns conservation aspects (sustainability of nature and life support, with emphasis on biodiversity and ecosystem services) as well as local development and the social well-being of surrounding communities (sustainability of communities, social and economic development of local people).

Based on the results of the preliminary environmental and social assessments carried out (including high conservation value identification), a large conservation area has been identified to be set aside from oil palm planting and to be actively protected. Recommendations are given for the management of this conservation area, for good agricultural practices in the oil palm plantation and for consideration of social issues.

So far, the system in place has been reasonably effective in combating threats to the conservation area. And, as achieved for other estates, Presco is following good practices in the plantation. In terms of social issues, although a lot has been achieved since the start of the project, we believe that there is still room for improvement (notably related to land use conflicts). The company should also take particular care to provide adequate support to the newly recruited environmental manager, Dr. Greengrass, for her to develop and enforce the Environmental Management System (EMS).

Conservation and social actions plans detail operations to be carried out in each area (infrastructures, demarcation of the conservation area, patrols, agricultural practices, communication and raising awareness, documentation, monitoring, etc.), with related prerequisites, persons responsible and timetable.

There is a need to monitor what measures are in place to meet objectives (basically: how is implementation of the action plan progressing?) as well as to assess the effectiveness of measures in place and the real impact of Presco on the human and natural environment.

For this, we are proposing to follow up indicators that have been separated into two types:

- strategic indicators, to assess the success in meeting long term goals (i.e. conservation of natural resources, communication and raising environmental awareness/education, local development and social well-being);
- operational indicators, to monitor, in the shorter term, if the means of meeting these goals are in place / if actions have been taken in accordance with the action plans.

Information for those indicators can be gathered from the ecological and socio-economic monitoring that has been set up.

A detailed protocol is developed for each kind of monitoring (vegetation monitoring, fauna monitoring, hydrological monitoring, soil monitoring, socio-economic monitoring) and we focus on some specific recommendations for some of them.

Because of the unavailability of some of the consultants, some monitoring will not be carried out as planned (fish, hydrological and butterfly). For some, other human resources need to be found if possible (e.g. fish survey), otherwise they could be left out as they are not crucial. For others (e.g. hydrological), we propose simple in-house monitoring for implementation.

A few adaptations are proposed for large mammal, bird and insect monitoring. This is in order to take into account the recruitment of Dr. Greengrass (availability of in-house skills) and to be able to compare the diversity and abundance of certain groups/taxa inside the protected area with those inside the oil palm plantation. We also suggest that the environmental manager asks the consultant in charge to develop other protocols, in order, for example, to assess the effect of the BDP on insect species and their diversity in the oil palm plantation. This could be discussed further with A. Verwilghen.

We strongly recommend searching for other human resources to carry out vegetation monitoring (collaboration with international scientist(s) could be established for this). Some surveys could also be taken over internally (in-house monitoring to be done by the environmental manager).

Based on the preliminary investigations carried out in 2007, we suggest monitoring the impact of oil palm growing on soil fertility / soil health compared to other land use (forest, slash and burn cultivation). Such monitoring could be launched in 2009. Results from the gypsum trial set up in 2008 could be used in this framework. Protocols will be discussed later with Dr. X. Bonneau, and a proposal submitted to Siat/Presco.

Socio-economic surveys in local communities should be carried out by the Presco team with the collaboration of Dr. B. Chambon, as was done in 2007. Later, based on data analysis of the 2007 and 2008 surveys, and on the work of the trainee to be carried out in 2009, the protocol will be adjusted and the most appropriate indicators chosen.

I. Introduction

The Green Ologbo project was initiated under collaboration between Presco/Siat and CIRAD. Presco has acquired some new land (7,300 ha already acquired and about 3,700 ha requested for acquisition) in the Ologbo area for oil palm development (see map in appendix) and aims to implement a sustainable project, the “Green Ologbo” project, promoting biodiversity conservation and ecosystem services, as well as enhancing local development and social well-being. The company has called upon the expertise of CIRAD, and a scientific research programme has been established, focusing on research and studies for a plantation design and practices that most effectively integrate environmental and social challenges.

Aude Verwilghen, the CIRAD agro-ecologist, who was assigned to Presco in early 2005 to implement the scientific programme and coordinate the Green Ologbo project, is now leaving and handing over the project to Presco staff.

The purpose of this document is thus to give recommendations and tools to Presco management for follow-up of the Green Ologbo project, notably in relation to monitoring (what should be monitored and how?).

It should be noted that links are made with RSPO (Roundtable on Sustainable Oil Palm) principles and criteria but we do not cover all of them in this document. Issues related, for example, to occupational health and safety will not be tackled here. In fact, although Presco and its expansion project at Ologbo clearly aim to comply with all those principles and criteria, our focus in the framework of the Green Ologbo project mainly concerns conservation aspects, as well as local development and the social well-being of surrounding communities.

Although the document concentrates on monitoring, it also covers the issues of a management plan.

Firstly, a reminder is given of project objectives implied by the sustainability goal.

Actions in accordance with both environmental and social viewpoints are then detailed, and summarized actions plans are provided.

With a view to monitoring, a framework of indicators is proposed, including operational indicators for day-to-day follow-up of the project in accordance with the action plan, and strategic indicators to assess whether general project objectives are being met on a more long-term basis. Some specific recommendations are made for ecological and socio-economic monitoring, and a detailed protocol for each kind of monitoring (vegetation monitoring, fauna monitoring, etc.) is also given.

II. Green Ologbo project and “sustainable development”: what objectives are implied

The Green Ologbo project aims at sustainability, but what do we really mean by sustainability?

Sustainable development has many definitions, the most common of which is the one from WCED (1987): “Development that meets the needs of current generations without compromising the ability of future generations to meet their needs and aspirations.” Basically, one usually speaks about improving the quality of life of people without degrading the environment. And sustainable development is usually portrayed as the interface between economic, environmental and social sustainability: the three “Ps”, People, Profit, Planet, being regarded as the three pillars of sustainable development.

Those definitions clearly comprise two dimensions: the notion of development - to make better - and the notion of sustainability - to maintain - (BELL & MORSE, 2002). But they also raise many questions, for which the US National Academy of Sciences report (1999, cited by KATES *et al.*, 2005) gives a review:

- What is to be sustained? Three major categories, as well as intermediate categories for each, were identified: nature (earth, biodiversity, ecosystems), life support (ecosystem services, resources, environment), community (cultures, groups, places)
- What is to be developed? Similarly, three major categories as well as intermediate categories for each, were identified: people (child survival, life expectancy, education, equity, equal opportunity), economy (wealth, productive sectors, consumption), society (institutions, social capital, states, regions)

- For how long? The time period concerned has been defined from as a little as a generation (about 25 years) to forever – to when surely nothing is sustainable -.

Under the RSPO (Roundtable on Sustainable Palm Oil) initiative, sustainable oil palm production is “comprised of legal, economically viable, environmentally appropriate and socially beneficial management and operations” (RSPO, 2007).

On this basis, eight principles have been developed under several criteria (see appendix):

Principle 1: Commitment to transparency

Principle 2: Compliance with applicable laws and regulations

Principle 3: Commitment to long-term economic and financial viability

Principle 4: Use of appropriate best practices by growers and millers

Principle 5: Environmental responsibility and conservation of natural resources and biodiversity

Principle 6: Responsible consideration of employees and of individuals and communities affected by growers and mills

Principle 7: Responsible development of new plantings

Principle 8: Commitment to continuous improvement in key areas of activity

Although Presco and its expansion project at Ologbo clearly aim to comply with all those principles and criteria, for sustainable development in its broad sense, the focus under the Green Ologbo project has mainly been on conservation aspects (sustainability of nature and life support, with emphasis on biodiversity and ecosystem services) as well as on local development and the social well-being of surrounding communities (sustainability of communities, social and economic development of local people).

Therefore, though they are of course taken into consideration on the ground (by the financial, human resources and environmental departments), issues related to long-term economic and financial viability (principle 7) and to some environmental and social aspects, such as occupational health and safety (principle 6), as well as some other areas (e.g. principle 1) are not tackled in this report.

It should also be noted that, although everything is clearly linked, and that measures taken inside the protected area and inside the plantation have effects on each other, and that the estate and its surroundings should thus be considered as a single agroecosystem, it is easier for management and reporting to distinguish between actions related to the conservation area set aside from planting, and actions to be taken inside the oil palm plantation.

This is reinforced by the fact that one could hardly talk of real “conservation” or “biodiversity conservation” in the planted area (given the high degree to which the natural ecosystem is transformed in an agro-industrial oil palm plantation); one therefore speaks more of environmental friendly actions or good agricultural practices.

Moreover, given the size of the estate (less than 10,000 ha) and of the protected area (about 3,000 ha), the effectiveness of a biodiversity conservation policy on this scale could be questioned (at least for biodiversity issues).

III. From policy to action

III.a. Conservation aspects: what to protect and how

Following RSPO guidelines, the conservation value of the concession has been assessed in accordance with the HCV (High Conservation Value) concept developed by FSC (Forest Stewardship Council).

The aim is to preserve high value species and habitats, considering exceptional or critical ecological attributes (e.g. endemic, endangered species or ecosystems), the services provided by the ecosystem (e.g. erosion control, watershed protection) and social functions regarding cultural, ecological, economic or religious significance (e.g. non-timber forest products, holy sites).

Based on this policy and on the results of the assessment carried out (environmental impact assessment including HCV identification), a large conservation area (basically covering wetlands, remaining forest habitats – which host or might host valuable species- and including large riparian buffer zones) has been identified and is being demarcated in order to be set aside from planting (see

land use map in appendix). The shape of this conservation area, detailed in the following section, has been designed in accordance with the preservation of biodiversity and ecosystem service objectives, but it also takes social constraints into account.

Issues related to the management of this conservation area are also developed below.

Inside the planted area, which has been chosen for planting because it has no high conservation value, the objectives are not the same and “biodiversity conservation” can hardly be talked of. However, good agricultural practices can be implemented in order to reduce the negative impact of the oil palm plantation on biodiversity and on ecosystem services. Basically, the aim is to reduce the environmental impact of agricultural practices (e.g. pollution due to fertilization and pest management) but also to maintain ecosystem services and enhance some kind of diversity which could in fact be fruitful to the planter (species conservation for IPM, soil conservation, etc.). Details on those practices are given in the related section.

It should be noted that, with a view to guiding actions, ecological monitoring has been initiated to assess the impacts of the Ologbo project on the natural environment (see section IV).

♦ **Setting aside of a conservation area**

The protected area includes riparian forest and swampy areas that are of no economic value in terms of plantation development (due to low production and the high cost of drainage). They do, however, have significant value in terms of protecting the river floodplain ecosystem that is critical for watershed functioning (water catchment and flood control, sediment and nutrient retention, etc.) and for wildlife conservation.

Buffer zones along swamps and watercourses, including sloping areas that will reduce the risk of erosion and act as additional watershed protection and wildlife corridors, are also set aside. For those already degraded, a reforestation programme should be put in place (see management section).

The forested areas left inside the concession are integrated into the protected area. Although it is a degraded secondary forest (intense logging was going on), fauna and flora inventories carried out (GREENGRASS, 2006, 2007; MWANSAT, 2007; OGUNJEMITE, 2007; BLUE FIN, 2004; SOENGAS LOPEZ, 2005; TURSHAK and MANU, 2006; WARREN, 2007) have revealed some valuable diversity and the presence of vulnerable or endangered species, such as the chimpanzee and the white throated monkey. As the vegetation survey also demonstrated that this forest has a potential for regeneration, it is important to preserve this habitat and its associated species. Moreover, this forest ecosystem also plays a role in local climate regulation.

The protected area design also includes a wildlife corridor joining the northern and southern areas of the West Ologbo concession. This corridor includes part of the riparian swamp forest of the two major rivers (the Ossiomo River and the Ogba River), marking the southern and the western boundaries of the concession, allowing the movement of wildlife between the concession and areas outside it. On a larger landscape level, the protected area may therefore act as a refuge for wildlife coming from areas around it.

The preliminary surveys have revealed a high encroachment rate of the remaining forest on its eastern and northern sides (mainly due to the activities of the Ologbo and Ogbekpen communities). The oil palm plantation, as defined on the land development map, will act as a buffer zone to protect the conservation area from this rising human pressure.

The rivers and streams bordering the western and southern sides of the concession are also a threat to the integrity of the protected area, because they represent access routes for those wishing to conduct illegal activities, particularly logging. In order to act as a clear demarcation of Presco’s concession and to allow monitoring and supervision of the most remote conservation areas, it has been recommended that a road be opened and a strip of oil palms be planted along the swamps at the western and southern limits of the concession, which are not demarcated by the main plantation (the strip, composed of the road and three rows of palms, 45 – 50 metres in width, should allow free movement of wildlife species).

However, it is still in doubt as it is not clear whether this road and oil palm strip will have a positive or negative impact on the protection of the conservation area, because it also means easier access for everyone else, not only for the protection team. It might thus increase human pressure in the area,

whereas it has in fact been greatly reduced for some months due to the effectiveness of the patrol team (notably against illegal logging, although a reduction in logging activities in this area, which rely on access through streams and swamps, might be mainly related to the dry season), but also due to some other factors such as the desertion of Ugbohibo village due to security issues (so there are no more people settled there permanently for farming). If an access road is opened up along the western boundary, human pressure might increase again and be hard to control.

So, it would probably be advisable to wait before opening up this road and planting the oil palm strip (meanwhile, the protection team can patrol the footpath along the boundary, which is currently being demarcated). In order to leave some time to see how things evolve (is there an increase in logging activities during the rainy season, is the protection strategy implemented by Presco efficient enough as it is designed at the moment, what will be the effect on the conservation area of implementing the SPDC/NCF-BAP project in the nearby Ekhewan and Gili Gili forest reserves, etc.?) and allow management to properly weigh up the positive and negative effects.

♦ **Management of the protected area**

The conservation area set aside from planting needs to be actively protected in order that threats such as farm encroachment, logging, hunting and over-exploitation of non timber forest products will be reduced over time.

Demarcation of the area under protection (both for awareness of the location limits and for access for patrolling), with a clearly defined boundary and signboards, is progressing well. Efforts should be continued to complete demarcation in the western and southern area, where farming (specifically around the Ikara concession) and logging activities are a threat. Completing demarcation of the eastern boundary, along the riparian areas, is not such a priority as farmers have already deforested the whole area up to the edge of the swamp. Likewise, the area along the Ossiome river swamp north of Well 3 camp has already been farmed and its delimitation can wait until plantation development in this area, or after tackling the issue of the future of this camp (resettlement?); it might indeed be a source of conflict and quite difficult to protect the riparian buffer zone if the Well 3 camp people are still around.

Roads and bridges along the boundary of the concession are essential for easier access to the area. However, it is obvious that, due to limited availability of heavy machinery, it will probably not be possible to work on this before land development for oil palm planting.

Checkpoints have been erected at strategic locations. Gates should also be built.

The law enforcement team in place since mid 2007 has so far been reasonably effective in combating threats to the conservation area. Beside their law enforcement duties that are carried out in collaboration with the local police with the support of the Forestry Department, the ecoguards play a very important educational role, by raising awareness among local communities.

However, recently, the number of ecoguards employed has been considerably reduced compared to the initial team (dismissal and resignation) and new recruitment is thus necessary.

Moreover, in addition to the role that the ecoguard teams play, an environmental and conservation education/awareness programme was launched in 2007, in collaboration with the local consultant. Various activities are being carried out by the consultant team in order to inform local communities of the project and to educate them and Presco staff on environmental and conservation issues. In 2007, all the human settlements located within the Ologbo Estate were visited at least twice and all categories of people (elders and opinion leaders, youths, women etc) were addressed through meetings and seminars. Lectures for students and teachers of the junior and senior secondary schools in the catchment area were also held and conservation clubs have been set up in those secondary schools.

This programme should be continued on a yearly basis, with a least: one information and communication visit per settlement and per year, some lectures in schools, and follow-up of the conservation action club to ensure their vitality. The protected area manager should work closely with the person in charge of the programme, notably in following up activities of the conservation clubs set up in the schools and in setting up new activities, for example visits to the site with the children.

In-house training and awareness raising for Presco staff were also launched in 2007 in collaboration with the consultant. However, only senior and some junior plantation staff have been involved so far. This should be carried out for the plantation contractors at the Ologbo estate as soon as possible and then extended to all staff (all operations and all estates).

Seminars for the ecoguards to improve their skills on how to raise awareness should also be organized in collaboration with the consultant.

Getting the support and involvement of the surrounding communities is indeed essential for the success of the project.

Therefore, a memorandum of understanding has been signed with local communities regulating access to the conservation area; these should be renewed / updated as needed.

In order to strengthen protection activities, conservation policy must also ensure a reduction in pressure on the conservation area by providing alternative economic activities. It is necessary for peaceful relationships with local communities, given the impact of restricting access to the remaining forest land on those communities (see surveys carried out in the framework of preliminary assessment).

These social concerns related to conservation will be tackled in section III.b related to social aspects.

As already mentioned, riparian buffer zones are maintained along watercourses (delimited on the map, demarcation on the ground is under way), but most of those areas have been encroached upon for farming by local communities (a satellite image would enable easy location of those deforested areas). Under the conservation strategy which is now in place, those areas will be actively protected and farmers will have to move as scheduled in the signed MOU. However, it would be advisable to facilitate regeneration by planting native trees.

The reforestation programme should concern only the riparian area along watercourses and not the other degraded areas in the rest of the conservation area. Firstly because it is costly (in terms of both money and time) and resources should thus be focussed on priority areas. Secondly because, although vegetation cover is crucial for the buffer zone to play its role for watershed protection, having a few fallow areas in the conservation area will not be so harmful and the diversity of habitat may, on the contrary, favour some species (e.g. food resources for some species).

For implementation of this reforestation programme, collaboration with Dr. Izikhuemen (former Ologbo Area Officer), who is very keen on tree planting and has a tree nursery at Ologbo, could be worthwhile (contact has already been made with him with that in mind).

Funds could be raised from DOEN or from AFD (Agence Française de Développement) -see contacts made by P. Vandessel.

Presco management is acting for conservation in its concession, taking into account surroundings on the scale of its catchment area. But there is also a need for the company to be vigilant as to what is happening on a wider scale (e.g. regional scale). Indeed, this may affect 1) what is going on inside the Presco concession and notably the conservation efforts of the company inside the protected area; 2) the role of this protected area on a regional scale.

For example, the SPDC/NCF project for the nearby Gili Gili and Ekhewan Forest Reserves may have some influence: if this project is a not a success and if, on the contrary, the Gili Gili forest that was still preserved is more severely encroached upon 1) it may increase human pressure on the western border of the protected area, 2) the conservation value of the Presco protected area might increase owing to the depletion of surrounding natural habitats. It should also be noted that development of the surrounding oil activity and the planned rehabilitation/building of roads to Ikara and Koko, will surely create a great amount of disturbance in the protected area.

♦ **Good agricultural practices in the oil palm plantation**

Biodiversity plot

The ex-Obasuyi concession, in the northern area, is farmland, fallow land and grassland of very low conservation value. Planting started in 2007 and so far 568 hectares have been planted with oil palm. In this concession, a small protected area of about 12 hectares, called the "biodiversity plot" has been set aside. This is old fallow land and its location was chosen because the vegetation inside was the most diverse and included a larger proportion of young trees than that in other areas.

Its small size means that its role in conserving the natural biodiversity of the area is limited. However, it may be interesting to study its role in integrated pest management (considering that it may be a refuge for small mammals, insects and birds).

The proposed land use patterns for the areas to be acquired (in the northern part of Ologbo Forest Reserve and parts of the former Piedmont Concession) also include some small biodiversity plots.

Given the relative homogeneity of the natural ecosystem in this area (no swamp area, no forest patches), the size and form of these plots were chosen in order to fit in with plantation blocking. Their location was chosen in order to form a kind of corridor from the southern stream, crossing through the middle of the plantation, with the hypothesis that this design will encourage wildlife populations (including natural predators of pests) to range widely and evenly across the whole plantation area. This design may be subject to modification (pending more detailed surveys of the area to be carried out after acquisition). However, the same total acreage should be kept.

Standing trees

Furthermore, where possible, trees have been left standing in the field as part of the integrated pest management policy of the company. These trees act as refuges for birds of prey that will prey upon rodents, which are one of the main groups of pests in oil palm plantations.

The objective set was one tree per 25 hectare field (and this should still be the target for less degraded areas to be planted in the West Ologbo concession), however, due to the very low density of trees in the former Obasuyi concession, the actual density is about one tree / 40 ha in this area.

Riparian buffer zones

See previous sections.

Soil

The concession is quite a flat area (few risks of erosion) and there is a majority of good soils (red soils so called "Terres de Barre") in the area proposed for planting. However, particular care should be paid to the soils due to their very high susceptibility to compaction revealed by soil observations (BOURGEON, 2006; BONNEAU, 2007, 2008).

Land clearing and preparation operations should use as little heavy machinery as possible, in order to avoid topsoil removal and soil compaction.

In the estate, other appropriate measures to avoid soil erosion and to maintain soil fertility should be taken (already in place where appropriate) for example:

- legume cover crop to prevent surface run-off, and to increase the nitrogen and organic matter contained in the soil.
- targeted and optimised fertiliser applications to rectify deficiencies in soil fertility, based on regular monitoring of plant nutrient status (leaf sampling to be started in 2010). Through targeted fertilizer applications, the total nutrient input should be very similar to the nutrients exported and nutrient losses to surface and ground water, as well as losses through volatilization, will thus be minimized.
- EFB and sludge residue (tricanter cake) returned to the fields and fronds stacked along the interrows.
- boiler residues used as road binding material to reduce erosion and dust.

Use of pesticides and herbicides

As usually done in the other Presco estates, ecofriendly or less hazardous practices should be put in place in order to minimize the use of pesticides and herbicides.

Requirements for an integrated pest management (IPM) system, which is the key to sustainable pest control, include: no prophylactic use of pesticides, routine checking of the phytosanitary status of the plantation for early detection of diseases and infestations, adequate cultural practices such as destroying or neutralizing breeding sites (e.g. old felled plantation palms are sold for palm wine tapping, which at the same time reduces breeding opportunities for pests such as *Oryctes* because sapless palms decompose more quickly).

The main recommendations for sustainable weed control are: during land preparation, eradicate guinea grass and *Eupatorium* by hand; in the planted areas restrict spraying to the minimum areas necessary (palm circle), while maintaining the interrow manually or mechanically; introduce changes to the active ingredients in the programme, in order to reduce the risk of developing herbicide resistance; maintain good ground cover; do not remove soft epiphytes from palm stems (they provide a habitat for predators of the main foliage pest).

If pesticides, herbicides or fungicides are necessary, managers should consider selectivity and minimum quantities to reduce ecobalance disruption. Accurate records should be kept of the chemicals used (product, volume applied, area of application, etc.).

Of course, any chemicals in WHO (World Health Organization) 1A and 1B classes or any pesticides/chemicals banned by national legislation and international agreement should not be used.

Paraquat, as recommended by the Berne declaration and the International Union of food and agricultural workers (IUF), should also be banned.

III.b. Social aspects to take into account

As mentioned in the introduction, health and social conditions (occupational health and safety) for the workers will not be considered in this report, but only with the issue of local development and social well-being of surrounding communities.

A preliminary social impact assessment was carried out before implementation of the Green Ologbo project (in the framework of the ESIA carried out by Blue Fin in 2003). It was completed by additional surveys and analyses at the very beginning of the project (RENEVOT, 2005; SOENGAS LOPEZ, 2005).

These socio-economic analyses revealed that, whether through the oil palm plantation in the farmlands or grasslands, or due to establishment of the protected area (restricted access), Presco's footprint will cover a very large territory¹ (even more so if the northern area of the forest reserve is acquired) and it will have considerable impacts on the livelihood of local populations.

The Ologbo area has attracted migrants for a very long time because of easy access to land (despite the forest reserve status) and good soil for agriculture, along with employment opportunities, notably at the Piedmont company (which has since left).

Presco has acquired the west Ologbo concession, which was the only forest area remaining in the Ologbo Forest Reserve, and it is thus no longer available for farming, although it was considered by local people as the most fertile area (given the fact that the free area and the other part of the forest reserve have been farmed for a long time). Moreover, the local populations claim that, if it is de-reserved, the government should have attributed the land to them for farming rather than to Presco. On the other hand, Presco feels that there is a need to protect this area of conservation value, which is being severely and very quickly encroached upon, and that the only way to do so is for it to be managed by a private company.

However, if Presco acquires the three thousand hectares left in the northern area of the forest reserve, composed of grasslands (degraded land), cultivated and fallow land, land scarcity will really become an issue. This will surely lead to changes in social organization, with the departure of recent migrants, but will also very probably result in social conflicts. This could be minimized, for example, by attributing some of this land, after de-reservation and acquisition by Presco, to some local people for oil palm smallholder development.

Presco expansion will not only have an impact on farming activity, but also on other subsistence activities, such as collection of non-timber forest products (bush meat, medicinal plants, firewood, etc.). The poor people, who have less access to land for farming, will be the most affected by no longer having access to forest products, due to effective and strict protection of the remaining forest area by Presco.

Thus, the plan was first to give restricted access to the conservation area (farming and logging strictly forbidden, hunting forbidden at first and then regulated access according to population recovery status, regulated access for other forest products and for fishing) and to regulate that access by co-management with local communities. But that might lead to too many risks and problems, considering the local context (e.g. many ethnic groups which are in conflict for land /resource uses, so it is very difficult to organize co-management), to difficulties in regulating and monitoring access for different activities in the protected area (e.g. how to make sure that people who come for fishing and forest product gathering will not hunt?), and to the risk of palm fruit thefts in the plantation if people are passing through on their way to the protected area, etc.

Thus, in order to achieve the conservation target, a decision was taken to forbid all access to the protected area (except for harvesting of actual food crops), at least for a few years, till the forest has regenerated and the wildlife population has recovered.

As a way of counteracting the hunting ban in the conservation area (although hunting in the forest is in fact very limited due to the scarcity of wildlife), it might have been advisable to provide alternative sources of meat with a small-scale bush meat breeding project. However, small mammal breeding is

¹ About 7,300 hectares are already acquired, of which about 43% is set aside for conservation, and about 3,700 additional hectares are requested for allocation in the northern part of the forest reserve and in the piedmont concession, which will bring to total estate to about 11,000 hectares.

not easy (except for the grass-cutter, most of the species are quite sensitive and not easy to breed), and it would need skills, time and funding, firstly to conduct a feasibility study and then to implement and follow up such a project, if it appears to be feasible. It is thus not recommended to proceed along those lines for the moment (maybe a feasibility study could be carried out later), except if an opportunity can be found with UNIBEN for snail breeding (they have some people there who are working on snail breeding under palm trees, this could be implemented with outgrowers; see Mr Willow MODUGU, Department of Forestry and Wildlife).

In order to enhance the positive social impacts of Presco's new development and to reduce pressure on forest resources, the company's objective is to progressively support local development and improve the living conditions of the surrounding communities.

The new Ologbo development will provide more than 1,000 long-term jobs and some contract opportunities.

Additionally, as a general policy, one percent of the company's budgeted annual revenue is due to be allocated to support community development in the areas of education, water, electricity, roads, employment, economic empowerment and culture, based on the identified needs of each community.

Through the oil palm outgrower development scheme which has already started, farmers are assisted with planting materials and technical input to develop their own oil palm farms. As a means of strengthening conservation efforts in the protected area, it represents an alternative economic activity and an agricultural intensification opportunity.

In order to maintain peaceful and fruitful coexistence with local populations, notably with regard to the issue of sustainable use of natural resources and land, Presco should follow two fundamental principles of intervention: participation, which means permanent dialogue (information, consultation) and the effective involvement of all the stakeholders, and contractual agreements, which means implication and reciprocal commitment between Presco and all the other stakeholders based on consensual rules.

So far:

- there is a public relations manager in place, who is in charge of all issues related to local communities and other stakeholders,
- people were allowed to express their views during the EIA process and the additional socio-economic surveys carried out in connection with the project. And they are always free to meet with the public relations manager to expose their grievances when disputes arise,
- information meetings were organized at Presco for community leaders and all other representatives of the various stakeholders,
- an awareness and information campaign has been conducted by an outside consultant (and will be renewed on a yearly basis), in addition to the continuous awareness/information work undertaken in the field by the ecoguards and Presco managers,
- a memorandum of understanding has been signed with local populations to regulate access and usage of natural resources inside the protected area,
- there is an understanding with local police for law enforcement in the protected area,
- a strong relationship has been built with the Forestry Department.

However, there is room for improvement.

Indeed, there is no real and formal participatory platform set up. Meetings and contact with local communities take place but mainly when disputes rise. That is why it is very important to maintain the yearly awareness/information campaigns via the outside consultant, with systematic visits to each settlement at least once a year. It is an opportunity for Presco to be informed of the perception of the project by the local communities and of potential grievances before they become real issues.

There is also a need for all procedures to be documented (mechanisms for communication and consultation, for dispute resolution, for calculating and distributing compensation, etc.). A record of all communication with stakeholders and actions taken (process of resolution and outcome of disputes) should also be kept (they are already in most cases) and filed more systematically, notably with a view to external audits.

Land disputes at the former Obasuyi concession need to be settled fairly. If it appears, after field surveys, that Presco has destroyed some crops beyond the limit of the concession, compensation will have to be paid. Fair compensation should also be paid if crops are destroyed in the process of any road construction (preliminary surveys need to be carried out beforehand: recording the "owner" of the farm, the location -with GPS- and area of the farm, the crops in place).

It should be noted that, in order to guide actions, socio-economic monitoring has been initiated to assess the impacts of the Ologbo project on the natural environment (see section IV).

III.c. The issue of human resources

♦ Adapting company expertise

With the recruitment of Dr. E. Greengrass as the environmental manager, also in charge of managing the protected area, Presco has acquired new in-house expertise in conservation. It shows the deep commitment of the company to the Green Ologbo project.

There is a plan to recruit an Environmental Officer, to replace the previous officer who resigned in August. It should be done urgently, as the environmental, health and safety (EHS) matters are all pending since then.

Dr. Greengrass is in charge of EHS matters and will be responsible for supervising the environmental officer. However, as it is not within her field of expertise, we strongly recommend providing her with adequate support from the group environmental manager, M. P. Bois d'Enghien. He should come to Presco for at least one week, preferably when the new environmental officer has been recruited, in order to train her, to lay the foundations for implementing a proper environmental management system (EMS) and provide a work plan.

It is very important, as also indicated by Dr. X. Bonneau, to employ a dedicated staff to ensure follow-up and inputting of experimental data (PR CP 01, PR CP 02, PR CP 03, piezometer monitoring, etc); or at least to make this work a clear part of the duties of one member of plantation staff, particularly as new experiments have been set up.

♦ Calling upon outside expertise

Some good collaboration has been established with reliable consultants. But it is not the case for all the outside expertise called in.

Whatever the case, there is a need to provide precise terms of reference for the work to be done, to closely monitor field work and revise the report carefully.

For some areas, notably for vegetation monitoring (see section IV.c.), it is strongly recommended to change the consultant and establish collaboration with international universities / scientists.

III.d. Conservation and social action plans

The following are the conservation and social action plans proposed to meet the objectives detailed above.

They are working documents for operations and should be updated on a regular basis (at least once a year). Management needs to keep track of the previous versions in order to be able to communicate on progress.

Conservation action plan - Ologbo Estate
Update February 2008

Activity	Objective	Prerequisite	Person responsible *	Timetable
Infrastructures				
1. Rehabilitate the boundary roads of the WOC	<i>Access to the area for operations + clear demarcation of the concession</i>	Availability of heavy machinery	EM	As planting develops
2. Build bridges (x3) along the boundary road of the WOC	<i>Access to the area for operations</i>		- DO for contact with contractor and instructions to TD - EM and TD for implementation	As road is rehabilitated
3. Build bridge over pipeline (road along east border of the WOC).	<i>Access to the area for operations</i>		- DO for contact with contractor and instructions to TD - EM and TD for implementation	As road is rehabilitated
4. Open a road to join the ex-Obasuyi concession to the WOC	<i>Access to the area for operations / alternative access through Obasuyi rather than Ologbo town</i>	- Get the official approval of Forestry Dpt - Compensation issue - Availability of heavy machinery	- RM for negotiation with Forestry Dpt for approval. - EM for implementation	Before end 2008
5. Seek and close all other access roads to Ologbo concession (logging roads, etc.)	<i>Protection of the conservation area and security of the estate</i>	- Availability of heavy machinery - Boundary road rehabilitated	Envt M, in collaboration with EM	During road rehabilitation
6. Build iron gate at existing checkpoint locations (main entrances Ikara side, pipeline road, concrete road coming from Ologbo)	<i>Protection of the conservation area and security of the estate</i>	Agreement with other users: Ikara/Eruma community, drilling company, Fed. Gvt	Envt M , in collaboration with EM and TD	As planting develops
7. Build checkpoint and gate at the main access for the northern area (road coming from ex-Obasuyi concession)	<i>Protection of the conservation area and security of the estate</i>	The road joining the ex-Obasuyi concession to the WOC is opened	Envt M , in collaboration with EM and TD	As soon as the road is opened

* : EM: Estate Manager, DO: Director of Operations, TD: Technical Director, EO: Environmental Officer, RM: Relations Manager, Evt M: Environmental Manager

Demarcation of the conservation area				
8. Demarcate the boundary of the conservation area (path for patrolling, red signalling, information panel)	<i>Protection of the conservation area (signalling of the limits, access for patrolling).</i>	Availability of surveyor (recruiting another surveyor to assist G. Chiowa?)	Envt M	Before end 2009
9. Open a road along the eastern and northern boundary of the conservation area (to replace the existing footpath)	<i>Protection of the conservation area (access by car) Access for operations in the oil palm plantation</i>	Availability of heavy machinery	EM	As planting develops
10. Open a road and plant a strip of 3 palms along the western and southern border of conservation area	<i>Protection of the conservation area: easier access for patrolling (car) and "psychological barrier" to limit encroachment (Presco "print" in the field).</i>	Call into question: will it have a positive or negative effect on the protection of the conservation area (develop activity and thus encroachment in this area because of easier access / hard to control)?	EM, in collaboration with Envt M	Should probably wait for a while (until estate is developed?) to properly weigh up the positive and negative effects.
Biodiversity Plots at Obasuyi				
11. Demarcation of BDP : contour road, signboards, etc.	<i>Protection of the BDP</i>	Conflict about the limit of the concession to be solved, in order to set the eastern limit of the BDP	Envt M , in collaboration with EM	- Contour road: to be completed as soon as the limits of the concession are set - Signboards: as soon as demarcation is completed
Reforestation programme				
12. Reforestation of the Obasuyi BDP	<i>Trial before extending the programme</i>		Envt M & Pieter Vandessel	
13. Reforestation of the degraded riparian area	<i>Restore the habitat for effectiveness of buffer zone along rivers and stream</i>	If trial in BDP is conclusive If funds are raised	Envt M & Pieter Vandessel	Starting in 2009
Patrols				
14. Ecoguards to patrol in the conservation area according to plans	<i>Protection of the conservation area: awareness and law enforcement</i>	A patrolling strategy is established and revised as needed	Envt M	Ongoing / Continuous
15. Recruit new ecoguard(s)	<i>Protection of the conservation area: enforce the capacity of the protection team</i>		Envt M	As needs occur
16. Provide continuous training for the ecoguards			Envt M	Annually
17. Provide / ensure sufficient means of transport (running Presco motorbike or allowance for use of personal motorbike)			Envt M	As needs occur

18. Provide / ensure adequate equipment			Envt M	As needs occur
Collaboration and partnership (see social action plan)				
19. Develop or maintain relations with / support of local police, army, forestry dpt	See social action plan	See social action plan	See social action plan	See social action plan
20. MOU with local communities concerning access to the protected area	See social action plan	See social action plan	See social action plan	See social action plan
Planting				
21. Develop the oil palm plantation in the Ologbo concession	<i>Act as buffer zone for the protected area</i>		EM	Starting in 2008 (after Obasuyi planting), in the northern area of the WOC
Agricultural practices				
22. Protect standing trees in the new planting (as far as possible 1 tree / field)	<i>Enhance integrated pest management</i>		EM, in collaboration with Envt M	
23. Take GPS position of each standing tree in the oil palm plantation and provide a map	<i>Records for monitoring</i>		Envt M, in collaboration with EM	Before end March 2008 for previous planting, then annual update
Communication and raising awareness (see social action plan)				
24. Carry out awareness/education campaigns among surrounding communities and Presco staff	See social action plan	See social action plan	See social action plan	See social action plan
Monitoring				
25. Carry out ecological monitoring (see detailed protocols in appendix)	<i>Assess the impact of the project on the natural environment. Assess the effectiveness of protection measures</i>	Outside consultants and / or in-house human resources available	Envt M	See protocols
Documentation				
26. Document specific management plans (IPM, erosion control, etc.) and procedures for each operation	<i>Development of EMS: facilitate implementation of operations</i>	Human resources available	Envt M , in collaboration with EM & EO	2008
27. Organize record keeping and reporting for easy control of indicators (see operational and strategic indicators)	<i>Development of EMS: facilitate internal monitoring and external auditing</i>		Envt M , in collaboration with EM & EO	As from beginning 2008

Social action plan - Ologbo Estate
Update February 2008

Activity	Objective	Prerequisite	Person responsible	Timetable
Local development				
1. Develop the outgrowers scheme	<i>Enhance local development, reduce pressure on the protected area by providing economic alternative</i>		EM	Continuous
2. Develop infrastructure and implement social actions (health, education, culture, etc.) according to community needs	<i>Enhance local development</i>		RM	Continuous
Human resources				
3. Assign clear responsibilities along with documented job description	<i>Facilitate</i>		DO	
4. Recruit an environmental officer	<i>Development of the EMS</i>		DO	As soon as possible
5. Training of the environmental supervisor in place (E.G. Greengrass)	<i>Development of the EMS</i>		DO	
6. Recruit / assign staff dedicated to follow-up and inputting of experimental data (PR CP 01, PR CP 02, PR CP 03, piezometer monitoring, etc)	<i>Ensure appropriate follow-up of experiments in place</i>		DO	
Communication and raising awareness				
7. Carry out awareness/education campaigns among surrounding communities	<i>Increase awareness on environmental and conservation issues (for the protection of the conservation area) and encourage local communities to be more receptive to the Ologbo project</i>	Outside consultants and / or in-house human resources available	Envt M	Annually
8. Carry out awareness/education campaign among Presco staff	<i>Increase awareness on environmental and conservation issues for the protection of the conservation area and for implementation of good agricultural practices inside the plantation</i>	Outside consultants and / or in-house human resources available	Envt M , in collaboration with EO	To be carried out for plantation contractors at the Ologbo Estate before mid 2008. To be extended to all staff (all operations and all estates) before

				end 2008.
Partnership				
9. Develop or maintain relations with / support of local police, army, forestry dpt	<i>Protection of the conservation area: strengthen ecoguard team effort</i>		Envt M , in collaboration with RM	Ongoing / Continuous
10. MOU with local communities concerning access to the protected area	<i>Protection of the conservation area: strengthen ecoguard team effort</i>		Envt M , in collaboration with RM	Ongoing / Continuous
Monitoring				
11. Carry out socio-economic monitoring (see detailed protocol in appendix)	<i>Assess the impact of the project on the human environment</i>	Outside consultants and / or in-house human resources available	Envt M	Annual
Documentation				
12. Document procedures for each operation	<i>Development of EMS: facilitate implementation of operations</i>	Human resources available	Envt M , in collaboration with RM & EO	2008
13. Organize record keeping and reporting for easy control of indicators (see operational and strategic indicators)	<i>Development of EMS: facilitate internal monitoring and external auditing</i>		Envt M , in collaboration with RM & EO	As from beginning 2008

IV. Monitoring

There is a need to monitor what measures are in place to meet the objectives (basically: what progress is being made in implementing the action plan?) as well as the effectiveness of measures in place and the real impact of Presco on the human and natural environment.

For this, it is proposed that indicators that have been separated into two types should be followed up:

- strategic indicators to assess the success in meeting long-term goals,
- operational indicators to monitor, in the shorter term, whether means/actions for meeting these goals are in place/have been achieved.

Strategic indicators

- To determine in the long term whether or not the main objectives / general goals and targets have been met, by monitoring the state of some variables used as indicators, for example, of ecosystem health or social well-being, or by gauging / measuring a process (a pressure, a process or a driving force) which in turn will influence these states.
- Usually long-term indicators, to monitor broad evolutions.
- State or process indicators.

We have classified these indicators into three major groups that reflect the main long-term goals of the Green Ologbo project:

- I. Conservation of natural resources
- II. Communication and raising environmental awareness / education
 - Information/communication
 - Environmental and conservation awareness / education programme
- III. Local development and social well-being

Operational indicators

- To monitor operational progress for activities implemented under the action plan. That is to say, gauge the necessary progress in Presco's response to achieve the long-term goals (achieve adequate values for strategic indicators).
- Usually short or mid-term indicators.
- Indicators of responses and means.

We have classified these indicators in seven major groups, reflecting a round-up of the main activities implemented in connection with the conservation and social action plan for the Green Ologbo project:

- I. Protection and restoration of the area set aside for conservation (conservation area and BDP)
- II. Good agricultural practices in the oil palm plantation
- III. Ecological monitoring
- IV. Communication and environmental awareness / education
- V. Local development
- VI. Socio-economic monitoring
- VII. Planning and management

The following are:

- summary tables with indicators
- specific recommendations for some issues related to monitoring
- detailed protocols for each kind of monitoring.

IV.a. Operational indicators

In blue: not yet in place (to be confirmed, depending on funding and availability of human resources)

Protection and restoration of the area set aside for conservation (conservation area and BDP)

Indicator	Periodicity	RSPO C&I related
1. Protection of the area set aside for conservation		5.2, 6.2, 7.1, 4.4 (b)
Infrastructures		
1.1. Nb of km of access road (boundary concession road + access from Obasuyi concession) rehabilitated or created	Annual report	
1.2. Nb of checkpoints and gates at main access points in place and properly maintained	Annual report	
1.3. Nb of station camps in place and properly maintained	Annual report	
1.4. Nb of km of conservation area boundary demarcated	Monthly and annual report	
1.5. Nb of information panels installed along the conservation area boundary	Monthly and annual report	
1.6. Conservation area boundary is maintained on a regular basis (every two months)	Annual report	
Equipment		
1.7. Nb of days Hilux used	Monthly and annual report	
1.8. Nb of days motorbikes used (with distinction between Presco motorbike & personal motorbike)	Monthly and annual report	
1.9. Fuel consumption for motorbikes (including motorbike allowance)	Monthly and annual report	
1.10. Equipment bought	Annual report	
Human resources		
1.11. Nb of ecoguards employed	Monthly and annual report	
1.12. Nb of days of training for ecoguards	Annual report	
1.13. Adequate supervision of ecoguard team (competence and time availability) (see also VII)	Annual report	
1.14. Environmental manager in place with responsibilities for management of the protected area (see also VII)	Annual report	
Patrols		
1.15. Number and duration of patrols	Monthly and annual report	
1.16. Nb of illegal camps destroyed (poachers or loggers)	Monthly and annual report	
1.17. Nb of arrests made	Monthly and annual report	
1.18. Nb of cases brought to court	Monthly and annual report	
Communication and awareness (see VII)		
Collaboration / partnership		
1.19. Nb of meetings held/attended (with specifications of stakeholders: e.g. forestry department, etc.)	Monthly and annual report	
1.20. Nb of MOUs signed (with specifications: e.g. local communities)	Annual reports	
1.21. Areas of collaboration	Annual reports	
2. Reforestation of the degraded riparian area		5.2, 7.1, 4.4. (b)
2.1. Area reforested	Annual report	
2.2. Records of seedlings planted	Annual report	

Good agricultural practices in the oil palm plantation

Indicator	Periodicity	RSPO C&I related
1. Minimization and control of agrochemical inputs		
Integrated pest management		4.1, 4.4, 4.5, 4.6
1.1. IPM plan documented and current	Annual plan updated	4.5 (a)
1.2. Records on agrochemical uses (including active ingredients used, area treated, amount applied per ha, number of applications, period of application) are kept	Monthly report	4.6 (a,b)
Pesticide and herbicide use: - 1.3. Percentage use justified - 1.4. Nb of agrochemicals of class 1A & 1B (WHO classification) or listed by the Stockholm or Rotterdam Conventions or Paraquat used - 1.5. % of area treated - 1.6. Amount applied per ha	Monthly report / Annual statement	4.6 (a) 4.6 (b) 4.6 (b) 4.6 (b)
1.7. Nb of standing trees left in the planted area / % related to the actual planted area	Annual report	4.5. (a,b)
Fertilizer inputs		4.2, 4.3, 4.4
1.8. Records of fertilizer inputs are kept	Monthly report / Annual statement	4.2 (a)
1.9. Proportion of fertilizer application done according to recommendations	Annual report	
2. Minimization and control of erosion and degradation of soils		
2.1. Mean number of passages per field by heavy machinery during land clearing and soil preparation	Annual report	4.2, 4.3, 7.4
Erosion control: - 2.2. Percentage of planting on slopes above 20° (38%) - 2.3. Management strategy in place for planting on slopes above 10° (20%) - 2.4. Cover crop coverage - 2.5. Road maintenance programme in place (management of rainfall runoff)	Annual report	4.3. (a), 7.4 4.3. (a), 7.4 4.3. 4.3. (c)
Nutrient recycling strategy: - 2.6. Area over which EFB (and other by-products such as POME, sludge, etc.) are applied - 2.7. Area over which palm residues are kept in the fields after pruning or replanting	Monthly report / Annual statement	4.2 (b)
3. Implementation of a zero burning policy		
3.1. Area burned in new developments and in replanted areas	Annual report	5.5 (a)

Ecological monitoring

Indicator	Periodicity	RSPO C&I related
1. Monitoring the effectiveness of protection measures on habitats and wildlife conservation		5.1, 5.2, 8.1
1.1. Data collected and report available for vegetation monitoring : - forest conversion rate, timber exploitation rate - forest structure and species composition, regeneration rate	Annual Every five years	
1.2. Data collected and report available for bird monitoring	Every two years	
1.3. Data collected and report available for large mammal monitoring (notably primates)	Annual survey	
1.4. Data collected and report available for insect monitoring	Every two years	
2. Monitoring the impact of the oil palm plantation on the water regime and water quality		5.1, 4.4, 8.1
2.1. Monitoring of surface water (water regime and biochemical characteristics of water in rivers and streams)	At least twice / year	
2.2. Monitoring of piezometers: - data collected - data computerized and sent to CIRAD	- Twice / week - Once /week	
2.3. Monitoring of rain gauge at Ologbo: - data collected - data computerized and sent to CIRAD	- Every day - Once /week	
3. Monitoring the impact of the oil palm plantation on soil health		5.1, 4.2 (b), 4.3 (e), 8.1
3.1. Data collected and report available	Every five years (to be confirmed)	

Communication and environmental awareness / education programme

Indicator	Periodicity	RSPO C&I related
1. Information / communication		
1.1. Consultation and communication process/procedures are documented	Annual report	6.2 (a)
1.2. Record of all communication with stakeholders and actions taken are kept	Annual report	1.1., 6.2 (c), 6.3 (b)
1.3. Nb of interactions (meeting, letter, etc.) between Presco (relations manager, protected area manager, headman ecoguards, etc.) and the stakeholders	Annual report	6.2
1.4. Nb of meetings held by the outside consultant	Annual report	6.2
1.5. Nb of interaction requests to Presco by the stakeholders that were refused	Annual report	6.2, 6.3 (a)
2. Implementation of an environmental and conservation awareness / education programme		5.2, 6.2, 7.1
2.1. Nb of meetings / awareness sessions for Presco staff	Annual report	
2.2. Nb of meetings held with local communities by Presco	Annual report	
2.3. Nb of meetings held with local communities by the outside consultant	Annual report	
2.4. Proportion of settlements in the catchment areas visited at least once a year by the outside consultant	Annual report	
2.5. Nb of seminars/lectures carried out in schools	Annual report	
2.6. Nb of teaching materials distributed	Annual report	
2.7. Nb of conservation clubs established	Annual report	
2.8. Nb of visits in school for implementation of conservation clubs / follow up of conservation action clubs	Annual report	
2.9. Nb of students who have visited the Ologbo Estate (conservation area and oil palm plantation)	Annual report	
2.10. Nb of projects/activities initiated (inside or outside the framework of conservation action clubs)	Annual report	

Local development and social well-being

This table is just indicative. Work on socio-economic monitoring is ongoing, led by Dr. B. Chambon (indicators are in the process of being developed and the protocol needs to be adjusted).

Indicator	Periodicity	RSPO C&I related
1. Peaceful and fruitful coexistence with local populations, notably sustainable use of natural resources and land		
1.1. Procedures (e.g. for compensation calculation and process) are documented and accepted by all parties	Annual report	6.2 (a), 6.4 (a,b)
1.2. Record of all disputes with stakeholders and actions taken are kept	Annual report	2.2., 6.2 (c), 6.3 (b)
1.3. Proportion of disputes solved	Annual report	2.2
2. Contribution to local development		
2.1. Procedures (e.g. identification of communities' priorities and needs, selection of outgrowers, pricing mechanism for FFB, etc.) and detailed action plan (e.g. schedule of activities) are documented	Annual report	6.2 (a), 6.10
2.2. Number of planters and acreage involved in the outgrowers scheme for the Ologbo area	Annual report	6.1, 6.11
2.3. Percentage turnover (pro-rated to planted area) injected in social actions for local communities	Annual report	6.1, 6.11
2.4. Number of persons employed by Presco and percentage recruited from local communities	Annual report	6.11

Socio-economic monitoring

Indicator	Periodicity	RSPO C&I related
1. External monitoring		6.1, 6.2, 8.1
1.1. Data collected during awareness campaign and report available	Annually	
2. In-house monitoring		6.1, 6.2, 8.1
2.1. Survey among local population: - data collected - data computerized (Sphinx software) and sent to CIRAD	Annually till indicators and protocol are adjusted, then every 2 years (to be confirmed).	
2.2. Documentation review: data collected and report available	Annually	

Planning and management

Indicator	Periodicity	RSPO C&I related
1. Planning		5,1, 6.1, 8.1
1.1. Conservation and social action plan available and updated	Annually	
2. Resource allocation		5,1, 8.1
2.1. Budget allocation for implementation of conservation and social action plans	Continuous	
2.2. Competent environmental officer in place	Continuous	4.8
2.3. Environmental manager /supervisor in place and appropriately trained	Continuous	4.8
2.4. Protected area manager in place	Continuous	5.2

IV.b. Strategic indicators

In blue: not yet in place (to be confirmed, depending on funding and the availability of human resources)

Conservation of natural resources (protection/restoration of the conservation area and good agricultural practices in the plantation)

Indicator	Methodology	Periodicity	Human resource	Time cost	Related RSPO C&I
1. Conservation and restoration of ecosystems and habitats					
<i>Indicators of state of the environment:</i>					
- 1.1. Area of each habitat inside the protected area (conservation area & BDP)	- Vegetation monitoring: field surveys & remote sensing Mapping	Yearly survey	External Internal ²	Two weeks ³	5.2
- 1.2. Structure of vegetation and regeneration rate inside the protected area	- Vegetation monitoring: field surveys in permanent plots	Every five years	External	Two to three weeks	5.2
- 1.3. Surface water: level, flow and biochemical characteristics in rivers and streams (suitable indicators to be developed)	- Hydrological survey: field observations and laboratory analysis	- At least twice / year	- External / Internal	- One week	4.4
- 1.4. Ground water: rate of reduction of the level of the water table compared to the previous year	- Piezometer monitoring	- Record twice / week, yearly report	- Internal	- Continuous	
- 1.5. Rate of reforestation of the degraded riparian area	Field survey & remote sensing Mapping	Annual report	- Internal	Two weeks	4.4 (b)
- 1.6. Chemical and physical soil characteristics in the conservation area and the plantation (suitable indicators to be developed)	- Soil profile observations and laboratory analysis	As from 2009 Periodicity to be determined	- Ext / Int	To be determined	4.2 (b)
<i>Indicators of pressure on the environment</i>					
- 1.7. Encroachment rate (forest clearance for farming) inside the protected area	- Vegetation monitoring: field surveys & remote sensing - Protected area manager report (qualitative): records during field activity	- Yearly survey - Yearly report	- External - Internal	- Two weeks ³ - One-off field visits	5.2
- 1.8. Exploitation rate (timber exploitation) inside the protected area	- Vegetation monitoring: field surveys - Protected area manager report (qualitative): records during field activity	- Yearly survey - Yearly report	- Ext / Int - Internal	- Two weeks ³ - One-off field visits	5.2
- 1.9. Nb of incidents with illegal loggers inside the protected area	- Patrol reports (records during field activity)	Daily report, monthly & annual summary	Internal	Continuous (patrol)	
- 1.10. Nb of direct or indirect evidence of illegal logging inside the protected area (logged tree, camps, sound of chainsaw).	- Vegetation monitoring: field surveys - Patrol reports (records during field activity)	- Yearly survey - Daily record, monthly & annual reports	- Ext / Int - Internal	- Two weeks ³ - Continuous (patrol)	5.2
- 1.11. Nutrient status of the plantation	- Leaf analysis: N, P, K, Ca, Mg, Cl and B levels / content	- Annual as from 2010 (3-year-old palms)	- Int / Ext	One week	4.2 (b)

² Photointerpretation and ground thruth for satellite image could be done internally

³ Two weeks in total for the whole vegetation survey

2. Conservation and rehabilitation of species					
<i>Indicators of state of the environment</i>					
- 2.1. Population status and trend of key species or groups (flagship spp., bioindicators) inside the protected area	- Fauna survey: birds, large mammals (with a focus on primates), insects (+ focus on butterflies), fishes - Observations during patrols	- Fauna survey: Birds, insects & fishes: every 2 years Mammals: yearly - Patrols : continuous	- External Internal ⁴ - Internal	- Fauna survey: Birds: one month Primates: five days Large mammals: two weeks Insects: one week Butterflies: one week Fishes: one week	5.2
- 2.2. Population status and trend of key species or groups (bioindicators, pests or natural predators) inside the planted area	Fauna survey: birds (+ focus on birds of prey), insects	Every 2 years	External		
<i>Indicators of pressure on the environment</i>					
- 2.3. Nb of incidents with poachers inside the protected area	- Patrol reports (records during field activity)	Daily report, monthly & annual summary	Internal	Continuous (patrol)	5.2
- 2.4. Nb of indirect evidence of poaching inside the protected area (camps, snare or cartridge found, sound of shots)	- Vegetation monitoring (exploitation rate): field surveys - Patrol reports (records during field activity)	- Yearly survey - Daily record, monthly & annual reports	External Internal	- Two weeks ² - Continuous (patrol)	5.2
- 2.5. Quantity of pesticide use / ha / year - 2.6. Quantity of pesticide use / ha / year	- Plantation reports	Annual report	Internal	Continuous	4.6 (b)

⁴ To be done internally when human resource is available (E.G. Greengrass for primate and large mammals surveys).

Communication and environmental awareness / education

Indicator	Methodology	Periodicity	Human resource	Time cost	Related RSPO C&I
1. Information/communication					
- 1.1. Nb of interactions between Presco or Presco representatives and the stakeholders	- Socio-economic survey - Records of all communications (Presco files)	Annual report	- Ext / Int - Internal	- Documentation: continuous (+ review: one day / year) - Awareness campaign: one month /year	6.2
- 1.2. Nb of interaction requests to Presco by stakeholders that were refused	- Socio-economic survey - Report of environmental and conservation awareness programme - Records of all communications (Presco files)	Annual report	- Ext /Int - External - Internal		6.2, 6.3 (a)
- 1.3. Perception of Presco by local communities and other stakeholders (a suitable indicator has to be developed)	- Socio-economic survey - Report of environmental and conservation awareness programme	Annual report	- Ext / Int - External		2.2
2. Environmental and conservation awareness / education programme					
- 2.1. Nb of settlements, of schools, of students, involved in the programme	Report of environmental and conservation awareness programme	Annual report	Ext / Int	- A few questions during socio-economic survey (see III for total duration of socio-economic survey)	5.2, 6.2, 7.1
- 2.2. Nb of visits to schools and of meetings in villages	Report of environmental and conservation awareness programme	Annual report	Ext / Int		
- 2.3. Perception of the protected area by local communities and other stakeholders	- Socio-economic survey - Report of environmental and conservation awareness programme	Annual report	Ext / Int		

Local development and social well-being

This table is just indicative. Work on socio-economic monitoring is ongoing, led by Dr. B. Chambon (protocol to be adjusted and final indicators to be selected after trial period).

Indicator	Methodology	Periodicity	Human resource	Time cost	Related RSPO C&I	
1. Peaceful and fruitful coexistence with local populations, notably sustainable use of natural resources and land						
Subsistence and access to natural resources (land availability, access to natural resources, production of food crops, etc), e.g.: - 1.1. Total farm land area (slash and burn) in the catchment area of the project - 1.2. Time taken from house to farm - 1.3. Time spent in the collection of firewood - 1.4. Ratio of hunting events : time taken coming back with animals - 1.5. Price of bush meat	Socio-economic survey	To be determined	Internal (data collection) / External (data analysis)	- Documentation : continuous (+ review: one day / year)	6.1	
Respect of culture and religion, e.g.: - 1.6. Nb of shrines preserved - 1.7. Funding by Presco of cultural and religious events	Socio-economic survey	To be determined	Int / Ext		- Socio-economic survey: one to two months (including data collection, data entry and data analysis); periodicity to be determined	6.1
Social relations, e.g.: - 1.8. Nb of complaints or grievances received from the local communities concerning land or natural resources - 1.9. Nb of complaints solved - 1.10. Rate of appropriateness of the actions (for local development) implemented in relation to the needs identified by the communities	- Records of all communications (Presco files) - Report of environmental and conservation awareness campaign - Socio-economic survey	- Annual report - Annual report - Annually (to be confirmed)	- Internal - External - Int / Ext			2.2, 6.2, 6.3 (a) 6.11
2. Local development and social well-being of surrounding communities						
Infrastructures and services (road, access to health and education, etc.) / living standards, e.g.: - 2.1. Nb of medical/health centres - 2.2. Nb of scholarships provided - 2.3. Appropriateness of the actions implemented in relation to the needs identified by the communities	- Records of all communications (Presco files) - Report of environmental and conservation awareness campaign - Socio-economic survey	- Annual report - Annual report - Annually (to be confirmed)	- Internal - External - Int / Ext	- A few questions during awareness campaign (see II for total duration of awareness campaign)	6.1, 6.11	
Economic benefits and their distribution (income, employment, change in farming system and agricultural practices, productivity, etc.) , e.g.: - 2.4. Education: ratio nb of children going to school : nb of children between 2 and 15 years old - 2.5. Food availability: ratio nb of meals / day : nb of meals with animal proteins - 2.6. Level of asset acquisition: housing, equipment, vehicles, land, etc.	Socio-economic survey	Annually (to be confirmed)	Int / Ext		6.1, 6.11	
2.7. Migratory rate: nb of families who left the area, nb of families who settled in the area	Socio-economic survey	To be determined	Int / Ext		6.1, 6.11	

IV.c. Some specifications and recommendations

➤ Ecological monitoring

◆ Vegetation

The objective of the vegetation survey is to monitor the integrity and the quality of the habitat inside the protected area, and to assess if the protection measures in place are efficient.

The encroachment rate by deforestation for farming could have been easily assessed through interpretation of a satellite image of the area. However, it is quite difficult to obtain a good quality image for this purpose (cloud cover), and moreover to procure it on a yearly basis (which will however be very costly).

It was thus decided to set up a very simple protocol based on in-house observations by the ecoguard team and the protected area manager, in addition to a yearly survey to be carried out by an outside consultant. If the outside consultant cannot come on a yearly basis, the yearly observations of forest conversion and logging intensity could also be carried out by the protected area manager (without recording the species).

In comparison to what was carried out last year, it is also proposed to add some observations in the swamp area, which could be carried out on a yearly basis by the protected area manager.

Although the encroachment and exploitation rate should be monitored on a yearly basis, there is no need for an in-depth vegetation survey of habitat quality (structure, composition, regeneration, etc. in permanent plots) to be carried out so regularly. This could be done, for example, every five years. Maybe the protocol and the sampling scheme for this survey would need to be revised. This should be discussed with the scientist contacted by Dr. Greengrass.

The yearly monitoring for encroachment by farming and logging intensity can be done by a local consultant.

However, owing to the poor quality of field data collection in 2007, it is recommended that the consultant for the long-term monitoring be changed. Indeed, it is important to have very reliable data as it is long-term monitoring, not carried out over single years. Building up long-term collaboration with scientists and universities abroad could be a good option (the work could for example be undertaken by a volunteer or a trainee assisted by a local botanist and supervised by a senior scientist from a university abroad). It could even be an opportunity for those scientists to have a field area to carry out additional scientific work. Getting more good quality scientists involved in the project would indeed be beneficial in broadening the reputation of the project.

◆ Birds

This was not done last year but it would be interesting to study how birds of prey use the standing trees left in the field in the oil palm plantation.

Some specific observations should be carried out during the general bird surveys by the ornithologist. Some very simple monitoring could even be implemented with day-to-day observations by the plantation staff (sight of birds perching on standing trees).

The ornithologist should be asked to propose protocols for this, in collaboration with the environmental manager and A. Verwilghen.

◆ Large mammals

As detailed in the table related to fauna monitoring, the opportunity will be taken to have Dr. Greengrass, who is now on the Presco staff, to implement a more complete and systematic survey of primates and other large mammals. Starting in 2008, the new protocol to be introduced by Dr. Greengrass should be implemented in place of the primate survey carried out in 2007.

◆ Insects

It is proposed to adapt the survey carried out in 2007 in order to compare the diversity and abundance of insects inside the protected area compared to those inside the oil palm plantation, at the Ologbo Estate. The proposed protocol for this survey should be reviewed by Dr. Mwansat.

A comparison could also be made between the plantation at Ologbo and the Obaretin Estate.

The comparison between age groups in the plantation at the Obaretin Estate should be maintained.

It would have been interesting to try to assess the effect of the BDP on the species and diversity of insects in the oil palm surroundings. Dr. Greengrass should ask Dr. Mwansat to propose a protocol for this, and it could be implemented later.

♦ **Butterflies**

The consultant, Mr. Warren, was unable to come in 2007 to complete the baseline study. It seems that he will not be able to carry it out in 2008.

This is not a big issue owing to the fact that this survey was initiated as part of conservation value identification, and was not absolutely fundamental (it was more an opportunity). We did not want to implement it for monitoring, because Mr. Warren is the only specialist in Nigeria and he is an expatriate so there was no guarantee of his continuous commitment. However, if he can come this year, it would still be interesting to complete the baseline survey (both in the protected area and in the oil palm plantation) and then another survey for monitoring could be carried out in a few years' time (5 to 7 years?) depending on the availability of human resources.

♦ **Fish**

Mr Baker, the consultant who was supposed to carry out the hydrological and fish surveys, has left Nigeria. It would be advisable to search for a local consultant to carry out the fish baseline survey and monitoring. Mr Baker could surely recommend somebody. Otherwise, Mrs Kadiri, from UNIBEN, could be contacted. Prof. Odiete, from Blue Fin (who carried out the first EIA), gave us the name of another resource person: Prof R.B. Ikomi, professor of fisheries at Delta State University, Department of Zoology (he was a student of Prof. Odiete, he has worked on fish in rivers at the Cowan Estate).

♦ **Hydrology**

A set of piezometers have been installed in a toposequence along two lines located to be as representative as possible of the different soil and hydrological situations in the West Ologbo concession. This enables us to observe water level variations and will provide information on the impact of the oil palm plantation. Once oil palms have been planted, it will also provide useful information on the performance of the palms depending on the water table level. Monitoring is carried out by Presco staff and data analysis by A. Verwilghen.

A rain gauge was installed near the Erume/Ologbo road two years ago and is monitored on a daily basis. It is important to carry on with data collection from that rain gauge, as data analysis has revealed some differences in rainfall between this area and the former Obasuyi area.

There were also plans to monitor surface water (level, flow and biochemical characteristics of water in rivers and streams in and around the concession), but this was supposed to be carried out by Mr Baker, who will definitely not be able to do it.

However, it seems important to set up at least some simple monitoring, which could be carried out by Presco staff (unless a reliable consultant is found for field data collection and analysis).

Mr. Baker should be asked for advice for protocols and measurement methods.

However, the following recommendations and guidelines can already be given:

- Biochemical parameters. The most important would be pH, nitrates, BOD (biochemical oxygen demand), COD (chemical oxygen demand), TSS (total suspended solids), TDS (total dissolved solids). This could be done on a yearly basis, or, better, twice a year (dry and rainy season) in the main rivers and tributaries. It could be included in the terms of reference for the outside consultants in charge of water and effluent monitoring at the Obaretin Estate. However, we recommend only monitoring what can be done internally at Presco (field observations and laboratory analyses), unless it is sure that reliable laboratory analysis can be found externally.
- Level, flow and turbidity of water. To measure water level, graduated poles driven into the river along the bank should be installed in the major rivers (e.g. at Erume and Ogpekpen for the Ogba river and near Well 3 camp for the Ossiome river), in its tributaries (the two small streams along

the pipeline road), and in the swamp areas (for example at the Erume gari camp small bridge). J. Baker should be asked for measurement methods for the other parameters. Data collection should be carried out at least twice a year (to be discussed with J. Baker) and the data are to be correlated to rainfall monitoring.

- In fact, it is assumed that the development of the oil palm plantation will have no or very low impact on the chemical characteristics of the surface water (very low risk: large buffer zone along the existing stream, low agro-chemical input, no mill so no effluent), so if a choice is to be made, it would be better to focus on the water regime -level and flow- of the streams and rivers (to complete piezometer monitoring), which might be more impacted by the oil palm plantation (hypothesis that, due to high demand for water, palm planting will disrupt the water regime in the area).

♦ **Soil**

A protocol for monitoring the impact of oil palm growing on soil fertility / soil health, compared to other land use (forest, slash and burn cultivation) was elaborated in 2006. However, it was invalidated due to unexpected problems during the test period (the soil at the Obasuyi concession, which was too hard, was unsuitable for carrying out bulk density measurements). A revised protocol was drawn up, but because of the high cost and time required to implement it, monitoring was ultimately abandoned.

This year, a gypsum trial has been set up in the former Obasuyi concession⁵, in collaboration with CIRAD (Dr. X. Bonneau) and INRAB (M. H. Aholoukpe). In this framework, soil observations and analyses are carried out.

This could be an opportunity to think again about carrying out the monitoring mentioned above (after a revision of the protocol, for example only taking into account forest and the oil palm plantation), as some of the results of the gypsum trial could be used, and maybe Mr Aholoukpe could carry out a few additional observations and analyses in the forest. This should be discussed, to see if it is possible to implement it in 2009.

It should be noted that the monitoring of oil palm deficiency status (N, P, K, Ca, Mg, Cl and B contents in leaf samples) that will start in 2010 will indirectly provide some information on soil fertility.

➤ **Socio-economic monitoring**

Socio economic monitoring was launched in 2007, in collaboration with Dr. B. Chambon.

This monitoring will help to:

- determine the impact of the Presco extensions on the local populations and how it evolves over time (access to natural resources and subsistence, local development, culture and religion, etc.)
- identify some relevant easy-to-use indicators to measure the impact of the estates on those populations.

Surveys are carried out by the Presco team in sample villages (catchment area and control villages). Presco is also in charge of data entry under Sphinx software (the company will have to acquire Sphinx software this year as it is currently using the CIRAD version).

Based on data analysis of the 2007 and 2008 surveys (to be done by Dr. B. Chambon), the protocol will be adjusted (notably in order not to be so time-consuming) and the most appropriate indicators will be chosen. It should be noted that the decision has been taken to postpone the arrival of the French trainee at Presco until 2009, in order to have sufficient background data to work on.

In addition to the systematic surveys, informal questions are also asked during meetings in villages in as part of the awareness campaign carried out by the outside consultant. Information from his report could thus be used to complete some of the indicators.

⁵ The purpose of trial PR CP 03 is to test different cultural techniques (subsoiling, gypsum application and EFB spreading), to prevent or at least reduce compaction of that sub-surface horizon in dry periods.

IV.d. Protocols

Vegetation monitoring protocol

Goal: conservation of the habitat inside the protected area

General objective: monitor the integrity and the quality of the habitat inside the protected area

→ Are the protection measures in place efficient (no degradation of the habitat inside the protected area)?

Objectives	Methodology		Periodicity and timing of measurement	Sampling scheme
	Obs/data type	Measurement method		
Monitor the forest conversion rate in the conservation area, as a measure of the human pressure on the site	Forest conversion rate: proportion of forest cover, old farm cover and newly opened land Mapping	Estimation through field surveys – Continuous recording of habitat type along established 30 m wide transects: - km of forest cover - km of old farm land - km of newly opened farm land Estimation through analysis of satellite images (photointerpretation and ground truth)	Annual monitoring Dry season (access to swamp area), same period each year (to avoid bias due to seasonality of land clearing for farming) Annual monitoring No specific timing, but same period each year (seasonality of land clearing and of vegetation reflectance)	Sample survey: a total length of 22.5 km ⁶ of transects established on dry lands all over the conservation area, located so as to be as representative as possible of the area (swamp forest is not well represented, but we assume that there is not much land clearing in such habitats). Permanent transects (same each year). No sampling: exhaustive
Monitor the exploitation rate in the protected area (conservation area and BDP) as a measure of the human pressure on the site	Logging intensity (stump/ha, % of undersize logged trees, species, logged trees) In addition, hunting intensity will be recorded	In dry lands: Continuous recording along established 30 m wide transects (15m each side): - signs of timber exploitation (number and species of exploited timber, girth size at felling level) - hunting signs (carbide dump, empty shells, traps, fire) In swamp forest: - same guidelines as for dry land data collection ⁷ , but implementing survey along river tributaries by canoe.	Annual monitoring Dry season (access to swamp area), same period each year (to avoid bias due to seasonality of hunting e.g.) Annual monitoring as from 2008. Dry season (easier access), same period each year (to avoid bias due to seasonality of hunting e.g.)	Sample survey: a total length of 22.5 km ⁶ of transects established on dry lands all over the conservation area, located so as to be as representative as possible of the area (excluding swamp forest). Will have to increase sampling (add transects) when new BDP is created. Permanent transects (same each year). In addition (in order to sample in wetlands): a total distance of about 5 km along the tributaries of the Ogba river and the Ossiomo river flowing inside the protected area.
Assess the natural regeneration of the habitat: vegetation	- Structure (for each habitat, for each plot) vertical stratification, canopy height, canopy cover);	Forest habitat (basic forest inventory in 25x25m ² quadrats): - number of layers, estimation of height		Ten (10) randomly selected 25x25m ² permanent plots along established transects and trails inside the protected

⁶ Variation from 2007 monitoring: Abuja transect (1.5km) not taken into account, one transect of 1km to be established in the north west of the conservation area (direction east-west, in order to have gradient to the swamp), one transect of 0.5 km to be established inside the BDP at Obasuyi.

⁷ Protocol might be adapted. E.g. : maybe species identification will not be possible (monitoring to be carried out internally, not by botanist).

inventory and description	<ul style="list-style-type: none"> - Phytosociological indices (for each habitat, for each plot⁸): species composition (density, frequency, abundance, important value), basal area, Shannon-Wiener index - Indicators spp., IUCN red list spp. - Forest recruitment rate: frequency, % coverage 	<ul style="list-style-type: none"> and % coverage - number of trees and shrubs $\geq 1\text{m}$, sp. Identification, dbh measuring <p>Counting seedlings $\leq 1\text{m}$, identify species in $5\text{x}5\text{m}^2$ quadrats</p>		<p>area (5 plots in forest habitats and 5 plots in swamp habitat). One (1) randomly selected $25\text{x}25\text{m}^2$ plot in the BDP. Will have to increase sampling (add plots) when creation of new BDP.</p> <p>Tree (3) randomly selected $5\text{x}5\text{m}^2$ subplots demarcated within each plots</p>
Assess the reforestation efforts in the riparian area	Rate of reforestation in the degraded riparian area Mapping	Records of seedlings planted Field surveys and remote sensing: estimation of area reforested out of the whole area to be reforested	Annual monitoring End of planting period	Systematic survey

⁸ NB: This has yet to be calculated by the consultant for the 2007 data.

Fauna monitoring protocol

Goal: conservation of the fauna diversity inside the concession and enhance integrated pest management in the planted area

General objective: monitoring the abundance and diversity of fauna inside the protected area and, for some spp., inside the oil palm plantation

→ Are the measures in place for protection efficient (no degradation of biodiversity inside the protected area)? What is the status of biodiversity inside an oil palm plantation compared to other habitats? What is the influence of the conservation policy (setting aside protected area inside the Estate and leaving standing trees in the plantation) on biodiversity in the oil palm plantation and does it have a positive effect on integrated pest management?

Objectives	Methodology		Periodicity & timing of measurement	Sampling scheme
	Obs/data type	Measurement method		
A) Assess the population status and trend of birds all over the Ologbo Estate (the protected area and the planted area) + compare with that at the Obaretin plantation	<ul style="list-style-type: none"> - Indicator of abundance and diversity - Correlation between abundance and habitat types (forest, fallow/farmland, oil palm plantation of different ages, edges of forest-conservation area/plantation) - Indicators spp., IUCN red list spp. 	<p>Line transect: records of all birds observed or heard along predetermined routes (existing path and established transects) inside the protected area (conservation area and BDP) and inside the proposed planted area (already planted or not yet). Surveys conducted early morning (6.20-10.00) and in the evening (15.30 – 18.00).</p> <p>Habitat variables (density of trees, density of emergent, %canopy cover, % ground cover, density of saplings, density of climbers, height of trees and dbh) measured within one 10x10m² quadrat chosen randomly in each 200m section of each transect.</p>	<p>Every two years Wet and dry season survey if possible</p>	<p>Sample survey: routes located to sample representative portions of the different habitat types (forest, fallow/farmland, oil palm plantation of different ages, edges of forest-conservation area/plantation). Permanent routes (same each year)⁹ of between 1km and 2 km.</p>
B) Acquire some information on the use of the standing trees and BDP inside the planted area by birds of prey	<ul style="list-style-type: none"> - % of standing trees with nests (related to tree species) - Indicator of abundance & diversity of birds perching on standing trees (related to tree species) 	<p>Protocol to be set up in coordination with the ornithologist</p>		<p>Sampling scheme to be set up in coordination with the ornithologist.</p>
Assess the population status and trend of primates inside the protected area	<ul style="list-style-type: none"> - Indicator of abundance and diversity (encounter rate) - Indicator spp., IUCN red list spp. 	<p>- Reconnaissance survey: records of sightings and vocalizations of primates (sighting, vocalization, faeces, nest, footprints) along existing tracks and roads. Survey early morning and late afternoon.</p>	<p>In 2008 and then absorbed into the mammals survey as from the end of 2008. Annual monitoring if large mammal survey not in place.</p>	<p>Sample survey: routes chosen were located at three different sites in the conservation area that are considered to be representative of the conservation area. Non permanent routes. About 50 hours spent trekking (5 days of survey).</p>

⁹ Variation from 2007 survey: the routes used in the 2007 surveys that are inside the protected area should be re-used. Additional routes should be located 1) inside the proposed planted area, covering the existing planting inside the Obasuyi concession and the area to be planted inside the Ologbo concession, 2) inside the BDP, 3) at the edge of the conservation area and the proposed planted area.

Assess the population status and trend of large mammals inside the protected area	<ul style="list-style-type: none"> - Indicator of abundance and diversity - Correlation with habitat - Indicator spp., IUCN red list spp. - Frequency of observations of animals or signs of presence 	<ul style="list-style-type: none"> - Recess-transect: records of signs of large mammals (sighting, vocalization, faeces, nest, footprints) along transects of set length. - Records of observations during patrols 	<ul style="list-style-type: none"> - Annual monitoring December - Continuous 	<ul style="list-style-type: none"> - Systematic sampling. Permanent transects. Location and total length of transects to be set. - Random (patrol way)
Monitor insect diversity (species and abundance) inside the protected area as well as inside the plantation at Ologbo and at Obaretin (survey A: relationship between habitat type and insect diversity and abundance). + comparison between age group in plantation (survey B: effect of oil palm age on insect species and abundance)	<ul style="list-style-type: none"> - Indicator of abundance and diversity - Correlation with habitat (forest, fallow/farmland, oil palm plantation of different ages) - Indicator spp., IUCN red list spp. 	Pitfall traps (located 100 m apart) laid in each habitat type. Collection after 24 hours. Stored in 70% ethyl alcohol before counting and species identification. Sweep netting (100 m apart) in each habitat type. Catch emptied into a killing bottle before sorting, counting and identification.	Every two years	<p>Sample survey¹⁰ :</p> <p><i>A Survey:</i></p> <ul style="list-style-type: none"> - Ologbo Estate: permanent location (same area each year). A total of 20 pitfall traps in the protected area (10 in fallow/farmland, 10 in forest) + 10 in the oil palm plantation. A total of 100 sweep nettings in the protected area (50 in forest and 50 in fallow/farmland) + 50 the oil palm plantation. - Obaretin plantation: 10 pitfall traps and 50 sweep nettings in the oil palm plantation. <p><i>B survey:</i> Obaretin plantation: temporary locations, total of 25 pitfall traps with 5 in each age category in oil palm plantation (1, 2, 8, 12 and 20 years). A total of 250 sweep nettings with 50 in each age category in oil palm plantation (1, 2, 8, 12 and 20 years).</p>
Assess butterfly abundance and diversity all over the Ologbo Estate (protected area and planted area)	<ul style="list-style-type: none"> - Indicator of abundance and diversity - Correlation with habitat - Indicator spp., IUCN red list spp. 			
Monitor fish abundance and diversity ¹¹	<ul style="list-style-type: none"> - Indicator of abundance and diversity - Indicator spp., IUCN red list spp. 	Fish sampling from sample sites. Survey of fisheries, fish landings and fish markets for species data, quantities, market prices	Every two years	<p>Sampling sites based on stream/river morphology.</p> <p>Surveys of fisheries & fish markets in the area of the project (e.g. Ologbo, Koko, Ogbekpen).</p>

¹⁰ Proposed adaptation compared to 2007 survey. To be discuss with G. Mwansat.

¹¹ Optional (if specialist identified available)

Hydrological monitoring protocol

Goal: conservation of the water resource in the area of the project

General objective: monitoring the water resource in the area of the project

Objectives	Methodology		Periodicity & timing of measurement	Sampling scheme
	Obs/data type	Measurement method		
Monitor the annual variation of the water table level	<ul style="list-style-type: none"> - Level of water table - Correlation with deforestation and oil palm planting. 	<ul style="list-style-type: none"> - Monitoring of water level in permanent piezometers set in lines along established transects. - Record changes in habitat type along piezometer line (coverage of swamp, forest, farmland and oil palm plantation along the toposequence). - Percentage of forest, farmland and oil palm plantation in the concession (see data from vegetation monitoring). - Monitoring of deforestation on a broader level (Gili Gili forest) through remote sensing. 	<ul style="list-style-type: none"> - Twice a week (Monday, Thursday), morning - Once a year, July/August 	A total of 17 piezometers in a toposequence along two transects, located so as to be as representative as possible of the different pedological and hydrological situations in the concession. Distance between piezometers varies from 500 m to 25 m, depending on the topography. Two depths of piezometer (3 m and 1.2 m) depending on the level of the water table.
Monitor the quality (water regime and biochemical parameters) of surface water resources (streams and rivers) in the area of the project	Basic hydrological parameters of rivers and streams (e.g. water level, transparency/turbidity, flow rates, water temperature, pH, dissolved oxygen, conductivity, nitrogen, TSS). Choice of parameters to be based on the possibility of internal data collection and analysis.	Field observation and laboratory analysis.	At least twice a year (dry and rainy season). When possible: on a more regular basis for some parameters, i.e. water level and transparency (to be discussed with J. Barker)	Sampling sites based on stream/river morphology and access opportunities. See map of proposed sampling sites in appendix.

Details for piezometer and raingauge monitoring (data collection and analysis, maintenance, etc.) in appendix.
Proposed sampling sites for surface water resource monitoring in appendix

Soil monitoring protocol

Goal: conservation of the soil in the Estate

General objective: monitor soil health

→ What is the impact of the oil palm plantation on soil health, notably compared to forest? Are soil management and fertilization practices in the plantation efficient to maintain soil fertility and ensure soil conservation?

Objectives	Methodology		Periodicity & timing of measurement	Sampling scheme
	Obs/data type	Measurement method		
Monitor the impact of the oil palm plantation on soil health, compared to other land use (notably forest)	Measurements of the physical and chemical characteristic of the soil (details to be specified later: a protocol will be proposed in collaboration with Dr. X. Bonneau)	Soil profile observations + laboratory analysis	Every 5 years (to be confirmed)	To be determined (sampling in the oil palm plantation and in the forest inside the protected area).

Socio-economic monitoring protocol (B. Chambon, 2006)

Goal: Local development and social well-being of surrounding communities

General objective: monitor the impact of the Presco extensions on the local populations and how does it evolves over time (access to natural resources and subsistence, local development, culture and religion, etc.)

➔ - What is the impact of the Presco extensions on the local populations and how does it evolve over time (access to natural resources and subsistence, local development, culture and religion, etc.) ?

- Contribute to identifying some relevant easy-to-use indicators to measure the impact of the estates on those populations.

This table is just indicative: the protocol is to be adjusted and final indicators to be selected, after a trial period.

Objectives	Methodology		Periodicity & timing of measurement	Sampling scheme
	Obs/data type ¹²	Measurement method		
Assess respect of legal and customary land rights	<ul style="list-style-type: none"> - Legal title for land use - Map of recognized customary rights - Proof of compensation - Grievance from community (nb of complaints of grievance received from the community) 	<ul style="list-style-type: none"> - Official documentation - Survey among local leaders - Records of communications & action taken - Survey among local population / Records of communications and action taken 	Annually	<ul style="list-style-type: none"> - Systematic revision of documents - Systematic survey among leaders - Sample survey among local population¹³: five representative villages in the catchment area and two outside control villages, giving a total of 162 households
Gauge communication between local population and the company	<ul style="list-style-type: none"> - Documented consultation and communication procedures - Recording of all communications with stakeholders and of actions taken - Nb of interactions between Presco or Presco representatives and the stakeholders - Nb of interactions with Presco requested by stakeholders and refused by Presco - Agreement by the different stakeholders on the system used for dealing with complaints and grievances 	<ul style="list-style-type: none"> - Records of communications & action taken - Informal questions during awareness campaign conducted by the outside consultant - Survey among local populations by the consultant 	<ul style="list-style-type: none"> - Annually - Annually - Annually until indicators & protocol are adjusted, then every 2 years (to be confirmed). 	<ul style="list-style-type: none"> - Systematic revision of documents - Systematic awareness campaign: in all settlements of the catchment area - - Sample survey among local population: five representative villages in the catchment area and two outside control villages, giving a total of 162 households
Gauge degree of access to natural resources for the local population	<ul style="list-style-type: none"> - Access to bush meat (nb of meals in a week with bush meat, diversity of bush meat consumed in a week, price of bush meat, distance from the house to the trap, ratio nb of hunting trips : time taken coming back with animals in a week or month, etc.) 	Survey among local population (indicators to be adjusted after trial period for final selection)	Annually until indicators & protocol are adjusted, then every 2 years (to be confirmed).	Sample survey among local population: five representative villages in the catchment area and two outside control villages, giving a total of 162 households

¹² See B. Chambon, 2006 report for complete list of indicators used.

¹³ Details on sample survey among local population: five representatives villages in the catchments area (Ologbo, Ogbekpen, Obayantor II, Ikara / Erume, Abuja camp), two control villages far enough form the catchment area but with similar life style (Obadan, Ogaga), total of 162 households sampled (representative of ethnic groups, age categories, activities, native /period of migration).

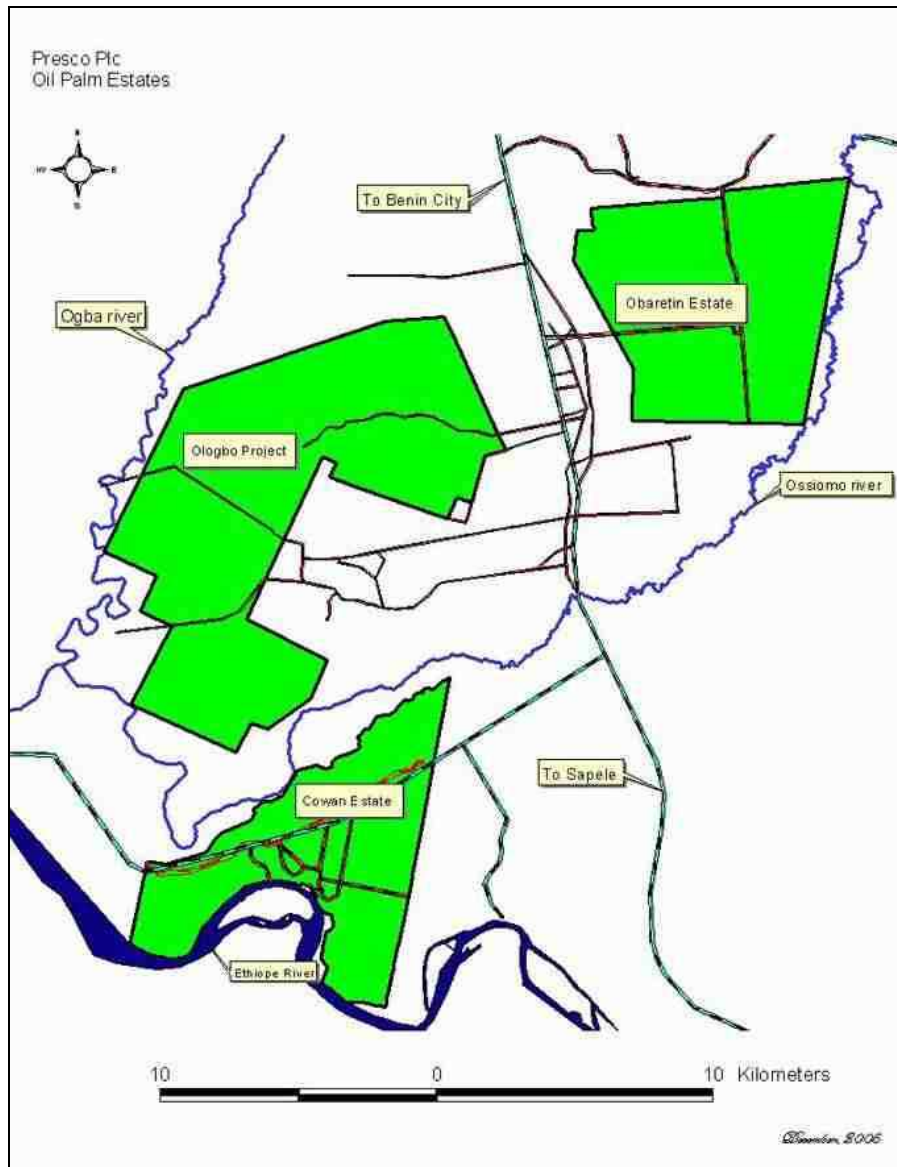
	<ul style="list-style-type: none"> - Access to fish (distance from the house to the net, nb of days between setting the net and collecting at least one fish, price of fish) - Access to forest products for food (nb of meals in a week with these products, price of these products, time spent in collecting the product, etc.) - Access to medicinal products (distance from the house to the place of collection, ratio traditional medicine bought : collected, price, etc.) - Access to fire wood (time spent for collection) 			
Assess state of activities to meet basic needs	<ul style="list-style-type: none"> - Availability of arable land (journey time from house to farm, nb of years of fallow, etc.) - Production of food crops & intensification (% of staple food bought and produced, price of main food crop products, etc.) - Dvpt of smallholder plantations (area of palm plantations with Presco planting material, etc.) - Decrease in farming activity (% of farmers that have stopped farming) - Employment by the company (nb of persons employed by Presco and income generated) 	Survey among local population (indicators to be adjusted after trial period for final selection)	Annually until indicators & protocol are adjusted, then every 2 years (to be confirmed).	Sample survey among local population: five representative villages in the catchment area and two outside control villages, giving a total of 162 households
Assess living standards of the local population	<ul style="list-style-type: none"> - Migration rate (nb of families leaving the area, nb of families settling in the area) - Children in education (ratio nb of children going to school : nb of children between 2 and 15 years old) - Food (ratio nb of meals / day : nb of meals with animal proteins) 	Survey among local population (indicators to be adjusted after trial period for final selection)	Annually until indicators & protocol are adjusted, then every 2 years (to be confirmed).	Sample survey among local population: five representative villages in the catchment area and two outside control villages, giving a total of 162 households
Monitor Presco contribution to local sustainable development	<ul style="list-style-type: none"> - Consultation of the populations for identification of the communities' needs - Social actions implemented (roads; water; electricity; medical centre; school, teaching stipend, scholarship provided) - Matching of the actions taken to the needs identified by the communities 	<ul style="list-style-type: none"> - Documentation - Survey among local population (indicators to be adjusted after trial period for final selection) - Questions during awareness campaign conducted by the outside consultant 	<ul style="list-style-type: none"> - Annually - Annually until indicators & protocol are adjusted, then every 2 years (tbc). - Annually 	<ul style="list-style-type: none"> - Systematic documentation - Sample survey among local population: five representative villages in the catchment area and two outside control villages, giving a total of 162 households - Systematic awareness campaign: in all settlements of the catchment area
Assess respect of culture and religion of	<ul style="list-style-type: none"> - Nb of shrines - Access to natural products necessary for 	Survey among local population (indicators to be adjusted after trial period for final selection)	Annually until indicators & protocol	Sample survey among local population: five representative

local population	the traditional festivities (diversity of forest products used, % of these products bought/collected, time spent for collection)	selection)	are adjusted, then every 2 years (tbc)	villages in the catchment area and two outside control villages, giving a total of 162 households
Gauge social relationship between local populations and the company	<ul style="list-style-type: none"> - Ratio complaints and grievance resolved through the system :/ total complaints and grievances received - Perception of local population regarding Presco 	<ul style="list-style-type: none"> - Documentation (records of communication) - Survey among local population (indicators to be adjusted after trial period for final selection) - Qualitative information / informal questions during awareness campaign conducted by the outside consultant 	<ul style="list-style-type: none"> - Annually - Annually until indicators & protocol are adjusted, then every 2 years (tbc). - Annually 	<ul style="list-style-type: none"> - Systematic documentation - Sample survey among local population: five representative villages in the catchment area and two outside control villages, giving a total of 162 households - Systematic awareness campaign: in all settlements of the catchment area

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Appendix I: Location of the project



Appendix II: RSPO principles and criteria (RSPO, 2007)¹⁴

Principle 1: Commitment to transparency

- Criterion 1.1 Oil palm growers and millers provide adequate information to other stakeholders on environmental, social and legal issues relevant to RSPO Criteria, in appropriate languages & forms to allow for effective participation in decision making.
- Criterion 1.2 Management documents are publicly available, except where this is prevented by commercial confidentiality or where disclosure of information would result in negative environmental or social outcomes.

Principle 2: Compliance with applicable laws and regulations

- Criterion 2.1 There is compliance with all applicable local, national and ratified international laws and regulations.
- Criterion 2.2 The right to use the land can be demonstrated, and is not legitimately contested by local communities with demonstrable rights.
- Criterion 2.3 Use of the land for oil palm does not diminish the legal rights, or customary rights, of other users, without their free, prior and informed consent.

Principle 3: Commitment to long-term economic and financial viability

- Criterion 3.1 There is an implemented management plan that aims to achieve long-term economic and financial viability.

Principle 4: Use of appropriate best practices by growers and millers

- Criterion 4.1 Operating procedures are appropriately documented and consistently implemented and monitored.
- Criterion 4.2 Practices maintain soil fertility at, or where possible improve soil fertility to, a level that ensures optimal and sustained yield.
- Criterion 4.3 Practices minimise and control erosion and degradation of soils.
- Criterion 4.4 Practices maintain the quality and availability of surface and ground water.
- Criterion 4.5 Pests, diseases, weeds and invasive introduced species are effectively managed using appropriate Integrated Pest Management (IPM) techniques.
- Criterion 4.6 Agrochemicals are used in a way that does not endanger health or the environment. There is no prophylactic use, and where agrochemicals are used that are categorised as World Health Organisation Type 1A or 1B, or are listed by the Stockholm or Rotterdam Conventions, growers are actively seeking to identify alternatives, and this is documented.

¹⁴ RSPO, 2007. RSPO Principles and Criteria for Sustainable Palm Oil Production. Including indicators and guidance. October 2007.53 p.

Criterion 4.7 An occupational health and safety plan is documented, effectively communicated and implemented.

Criterion 4.8 All staff, workers, smallholders and contractors are appropriately trained.

Principle 5: Environmental responsibility and conservation of natural resources and biodiversity

Criterion 5.1 Aspects of plantation and mill management that have environmental impacts are identified, and plans to mitigate the negative impacts and promote the positive ones are made, implemented and monitored, to demonstrate continuous improvement.

Criterion 5.2 The status of rare, threatened or endangered species and high conservation value habitats, if any, that exist in the plantation or that could be affected by plantation or mill management, shall be identified and their conservation taken into account in management plans and operations.

Criterion 5.3 Waste is reduced, recycled, re-used and disposed of in an environmentally and socially responsible manner.

Criterion 5.4 Efficiency of energy use and use of renewable energy is maximised.

Criterion 5.5 Use of fire for waste disposal and for preparing land for replanting is avoided except in specific situations, as identified in the ASEAN guidelines or other regional best practice.

Criterion 5.6 Plans to reduce pollution and emissions, including greenhouse gases, are developed, implemented and monitored.

Principle 6: Responsible consideration of employees and of individuals and communities affected by growers and mills

Criterion 6.1 Aspects of plantation and mill management that have social impacts are identified in a participatory way, and plans to mitigate the negative impacts and promote the positive ones are made, implemented and monitored, to demonstrate continuous improvement.

Criterion 6.2 There are open and transparent methods for communication and consultation between growers and/or millers, local communities and other affected or interested parties.

Criterion 6.3 There is a mutually agreed and documented system for dealing with complaints and grievances, which is implemented and accepted by all parties.

Criterion 6.4 Any negotiations concerning compensation for loss of legal or customary rights are dealt with through a documented system that enables indigenous peoples, local communities and other stakeholders to express their views through their own representative institutions.

Criterion 6.5 Pay and conditions for employees and for employees of contractors always meet at least legal or industry minimum standards and are sufficient to provide decent living wages.

Criterion 6.6 The employer respects the right of all personnel to form and join trade unions of their choice and to bargain collectively. Where the right to freedom of association and collective bargaining are restricted under law, the employer facilitates parallel means of independent and free association and bargaining for all such personnel.

- Criterion 6.7 Child are not employed or exploited. Work by children is acceptable on family farms, under adult supervision, and when not interfering with education programmes. Children are not exposed to hazardous working conditions.
- Criterion 6.8 The employer shall not engage in or support discrimination based on race, caste, national origin, religion, disability, gender, sexual orientation, union membership, political affiliation, or age.
- Criterion 6.9 A policy to prevent sexual harassment and all other forms of violence against women and to protect their reproductive rights is developed and applied.
- Criterion 6.10 Growers and millers deal fairly and transparently with smallholders and other local businesses.
- Criterion 6.11 Growers and millers contribute to local sustainable development wherever appropriate.

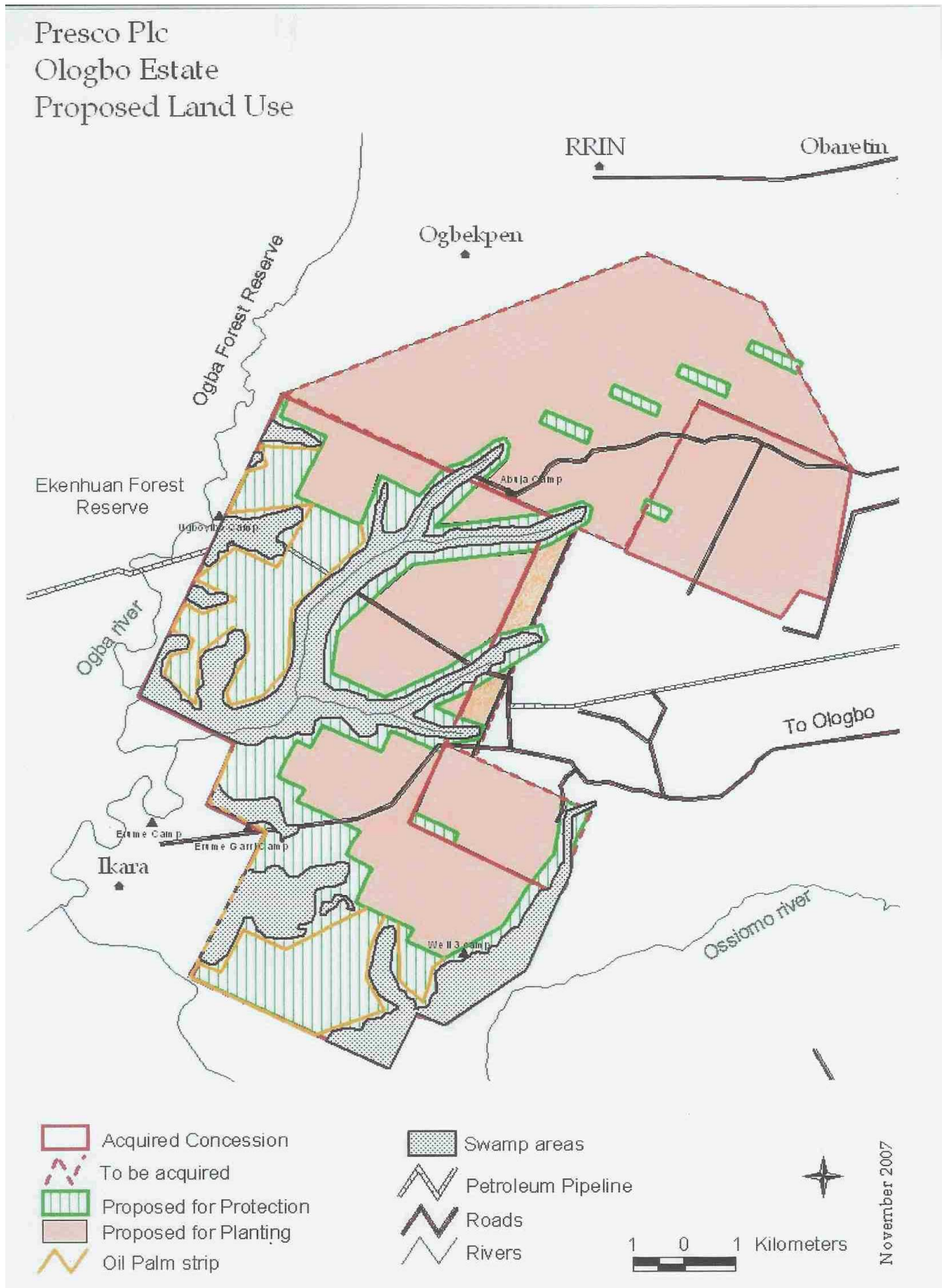
Principle 7: Responsible development of new plantings

- Criterion 7.1 A comprehensive and participatory independent social and environmental impact assessment is undertaken prior to establishing new plantings or operations, or expanding existing ones, and the results incorporated into planning, management and operations.
- Criterion 7.2 Soil surveys and topographic information are used for site planning in the establishment of new plantings, and the results are incorporated into plans and operations.
- Criterion 7.3 New plantings since November 2005 have not replaced primary forest or any area containing one or more High Conservation Values.
- Criterion 7.4 Extensive planting on steep terrain, and/or on marginal and fragile soils, is avoided.
- Criterion 7.5 No new plantings are established on local peoples' land without their free, prior and informed consent, dealt with through a documented system that enables indigenous peoples, local communities and other stakeholders to express their views through their own representative institutions.
- Criterion 7.6 Local people are compensated for any agreed land acquisitions and relinquishment of rights, subject to their free, prior and informed consent and negotiated agreements.
- Criterion 7.7 Use of fire in the preparation of new plantings is avoided other than in specific situations, as identified in the ASEAN guidelines or other regional best practice.

Principle 8: Commitment to continuous improvement in key areas of activity

- Criterion 8.1 Growers and millers regularly monitor and review their activities and develop and implement action plans that allow demonstrable continuous improvement in key operations

Appendix III: Proposed land use map



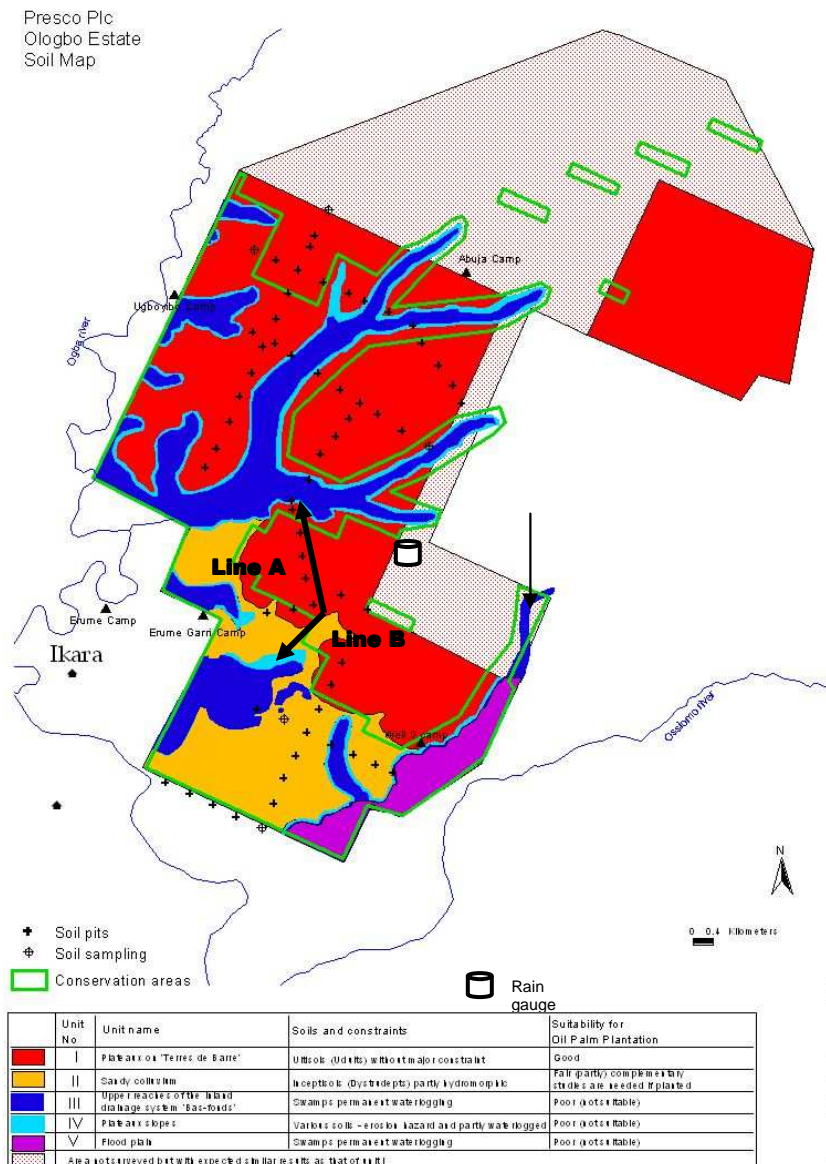
Appendix IV: Detailed protocol for piezometers and rainfall monitoring

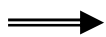
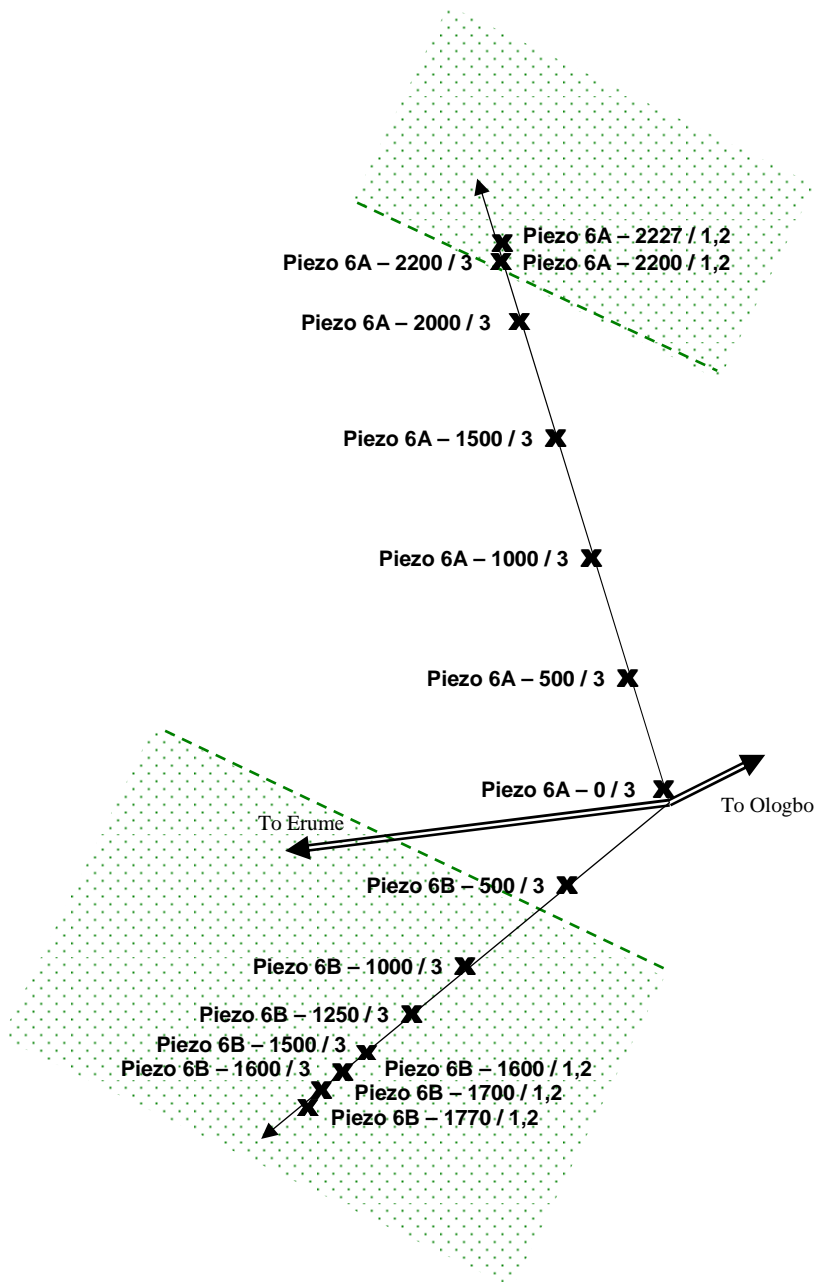
Description of experimental scheme in place

There are a total of 17 piezometers in a toposequence along two transects, located so as to be as representative as possible of the different soil and hydrological situations in the concession. Distances between the piezometers vary from 500 m to 25 m, depending on the topography (distance between piezometers decreases as the slope increases).

Piezometers at two different depths, 3 m and 1.2 m respectively, are installed depending on the level of the water table.

Data on topography and soil characteristics have been collected: a topographic record every 50 m along the two transects, a soil map of the area has been drawn up (Bourgeon, 2006), and specific soil observations at each piezometer location are available. Habitat characteristics were recorded (swamp, forest, farmland, oil palm plantation) over the entire length of the two transects when the piezometers were installed and are being monitored on a yearly basis. Rainfall is also recorded on a daily basis at the rain gauge installed along the border of the concession near the Ologbo/Erume road.





Road



Location of piezometers

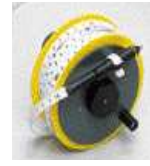


Limit of the conservation area

Protocol for data collection and data treatment

➤ *Equipment:*

- Eijkelkamp apparatus for measuring the water level: a sounding apparatus with acoustic and light signal: the probe is connected to a measuring tape with centimetre graduation.



Uses two LR 14 batteries (1.5 V). The supervisor should always make sure that there are at least two sets of spare batteries in advance. The person in charge of data collection should notify the supervisor when batteries are running out. Old batteries should be given back to the supervisor when replaced.

- Notebook with biro
- Watch
- Cleaning cloth
- Rucksack

➤ *Person in charge:*

- o data collection: Amechi Obara (Ologbo project field assistant), accompanied by David Osaigbovo (ecoguard leader).
- o data entry: plantation technical officer or environmental officer when in place; by now: Charles Erhahuyi.
- o supervision: protected area manager.

Data collection in the field

- *Time and frequency of measurement:* twice a week, on Mondays and Thursdays in the morning.
- *Operational instructions:*

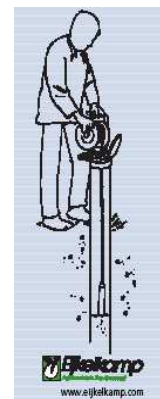
The water level is measured inside the piezometer tube with the sounding apparatus.

Before you leave the office, make sure that:

- 1) The apparatus is working and the battery is not too weak by testing it (wet finger on the probe),
- 2) The probe inside the sounding device is clean (remove the cap of the probe and clean the probe carefully with a cloth); the probe is very delicate so be very careful.

When you arrive in front of each piezometer:

- 1) Read the label on the concrete around the piezometer and record it in your notebook. If any degradation is observed, write it in your notebook and inform the supervisor as soon as you get back.
- 2) Check if the cap of the piezometer tube is in place: the handle on the top of the cap of the piezometer tube should be aligned with the hole (if not, it means that somebody has touched the cap, which should be reported to the supervisor and written in the notebook).
- 3) Remove the cap and place it on a clean area, to make sure that no sand gets onto it.
- 4) Remove the apparatus from your bag and make sure the probe is clean and dry by blowing into the holes of the sounding device.
- 4) Very carefully insert the sounding device in the piezometer tube (making sure it does not hit the tube wall) and unroll the measuring tape in order to lower the sounding device gently. Go very slowly, especially when there is no water and you are about to reach the bottom of the tube (3 or 1 metre in depth), in order not to hit the bottom with the sounding device, which might damage the probe.
- 5) When the probe touches the water, a clear acoustic (bip) and light signal (red light) is produced. If the cable is then lifted a little, the signal will stop. As soon as the precise point where the signal is produced is determined (when the probe has reached the water, the device can be moved up and down over very short distances for more accurate level determination), the user reads off the depth directly from the measuring tape.



- 6) Remove the sounding device gently, by rolling up the measuring tape, and place the apparatus on a clean area.
- 7) Immediately record the level and time in the notebook.
- 8) Clean the inside and outside upper part of the wall of the piezometer as well as the cap, paying particular attention to the screw (otherwise it will block with time). Be very careful that no dust, leaves or anything else falls into the tube during the operation.
- 9) Close the cap, adjusting the handle of the cap with the hole on the tube.
- 10) Dry the outside of the sounding device with the cloth and make sure the probe is clean and dry by blowing into the holes of the sounding device. Put all the items (apparatus, notebook, cleaning cloth, etc.) back into your bag.
- 11) Move to the next piezometer and repeat each operation.

When you have finished measuring all the piezometers in both lines, clean the apparatus and the probe: take out the cap of the sounding device and clean the probe with a wet cloth, dry it and replace the cap.

➤ *Format for data recording in the notebook:*

Date :

Name:

Section A

- Piezometer 6A – 0 / 3 =cm

Time:

- Peizometer 6A – 500 / 3 =.....cm

Time:

- etc.

Section B

- Piezometer 6B – 500 / 3 =cm

Time:

- Peizometer 6B – 1000 / 3 =.....cm

Time:

- Peizometer 6B – 1250 / 3 =.....cm

Time:

- Peizometer 6B – 1500 / 3 =.....cm

Time:

- Peizometer 6B – 1500 / 1,2 =.....cm

Time:

- etc.

Any observations (piezometer vandalized, cap not adjusted to the hole, etc.) should be recorded in the notebook and reported to the supervisor as soon as you come back from the field.

Data processing

Observations are written in a notebook in the field.

Coming back from the field, on the day of data collection, the records are copied onto a sheet of paper by the staff in charge of data collection and passed to the person in charge of data entry, who has to verify straightaway that no mistakes were made when copying the records (correspondence between the original records in the notebook and those on the sheet).

Data to be entered on a week basis in the excel files provided and the updated files to be sent to the supervisor and to the CIRAD agro-ecologist every week, in order to note any unusual data and react quickly.

➤ *For data Entry :*

Data to be entered in the excel files provided.

One file per transect/line (Line A, Line B)

One sheet per piezometer

Enter data from the "basic data" sheets

By convention:

- when there is no water, enter “3” when it is a piezometer at a depth of 3 m, and “1.2” when it is a piezometer at a depth of 1.2 m.
- When there is no data to enter: leave the cell blank.

Maintenance

- Regular slashing of the vegetation along the line and around each piezometer.
- Make sure the marker band attached to trees and poles along the line stays in place and is replaced as needed.
- Check the good condition of the piezometers (e.g. vandalism, tree fallen onto the piezometer, natural erosion of the concrete): any degradation should be reported to the supervisor the same day and adequate measures taken straight away, in order not to interrupt monitoring.

Additional data collection for correlations

Rainfall

➤ *Location:* rain gauge installed along the border of the Ologbo concession near the Ologbo/Erume road.

Time and frequency of measurement: every day (it is very important to do it every day, even if one thinks it has not rained in the area), as early in the morning as possible, as much as possible about the same time every day.

➤ *Equipment:*

➤ *Staff in charge:*

- data collection: the ecoguard leader David Osaigbovo (Amechi Obara for replacement as needed).
- data entry: plantation technical officer or environmental officer; by now: Charles Erhahuyi.
- supervision: protected area manager.

➤ *Data processing:*

Observations are written in a notebook in the field. Every day, the records are copied onto a sheet of paper by the staff in charge for data collection and passed to the person in charge of data entry, who has to verify straightaway that no mistakes were made when copying the records (correspondence between the original records in the notebook and those on the sheet). Data entry in the excel file provided has to be done on a weekly basis and the updated file is to be sent to the supervisor and to the CIRAD agro-ecologist every week, in order to note any unusual data and react quickly.

Habitat

Twice a year (end of February and November), the supervisor should monitor habitat conversion along the lines: record the limit of each habitat category by GPS, namely:

- secondary forest,
- land newly cleared for slash and burn farming,
- farmland / fallow,
- land newly cleared for oil palm planting
- oil palm plantation.

Appendix V: Proposed sampling sites for surface water monitoring

