

4 Cumulative Impact Assessment

4.1 Methodology

Cumulative impacts include the impacts of existing projects and conditions, those of the proposed project(s), and those of other developments that are realistically defined at the time the environmental impact assessment is prepared and would impact directly on the project area.

The projects' **area of influence** include the primary project site(s) and related facilities; associated facilities that are not funded as part of the project but whose existence depends exclusively on the project and whose goods or services are essential for the project; areas potentially affected by cumulative impacts; and areas potentially affected by impacts from unplanned but predictable developments caused by the project that may occur later in time or at a different location. As noted above, area of influence considered in this study is the western Uruguayan departments of Rio Negro, Soriano and Paysandú as well as the Rio Uruguay littoral of the Argentine department of Gualequaychú.

For this CIS, the primary projects considered are the Orion (Botnia) and CMB (ENCE) pulp mills and their associated facilities and areas of influence as described in their disclosed EIAs⁵.

The descriptions of the projects are also briefly summarized in Chapter 2 of this report (above) for ease of reference.

Additional projects or facilities have been incorporated into this CIS on an individual basis by discipline, based upon the judgments of the team member(s) in that discipline. For example, the discharge from the Fray Bentos domestic waste water collection system has been included in the water quality modeling due to its significance in the existing environment, the possibility that it could be upgraded in conjunction with project development, and its implications for cumulative impacts on the aquatic environment in the vicinity.

Existing biophysical, socio-economic settings are also summarized in Chapter 3 of this report, above, for ease of reference. Additional details of the projects' settings are provided in the projects' respective Environmental Impact Assessments as disclosed, as well, and are available at the URLs noted above.

The **spatial boundaries** for this CIS extend to the limits of the area of influence (as above) based upon identified impacts by discipline. The overlay of such discipline-based limits of identified impacts provides the overall area of influence for the projects proposed in this CIS (see below).

The **temporal boundaries** for this CIS are provided by the major milestones in the projects' life cycles. The significant steps in their life cycles include:

- Feasibility and detailed design
- Construction

⁵ EIA and related documentation for CMB, <http://www.ifc.org/ifcext/spiwebsite1.nsf/2bc34f011b50ff6e85256a550073ff1c/9b67b10ae7244d32852570b6007d293e?OpenDocument>;

EIA and related documentation for Orion, <http://www.ifc.org/ifcext/spiwebsite1.nsf/2bc34f011b50ff6e85256a550073ff1c/ead20d36b50195a5852570ba005a25dc?OpenDocument>.

- Operation and maintenance
- Decommissioning

As noted above, the details of the timelines of the two proposed projects are not synchronous. One is under active construction and believed to be on the order of 6 to 12 months ahead of the other at the time of writing, although both companies had completed their EIAs for disclosure by mid-2005. Present expectations are that the Orion plant would go into operation in 2007 and the CMB plant would start up in 2008.

The overall timeline for the CIS analyses (both plants), then, is:

- Construction: 2005 – 2008
- Operation and maintenance: 2007 – 2048

The two plants' impacts with respect to timeline issues will be distinguished as required during the detailed CIS analyses.

A forty year life for the plants has been adopted for this CIS, though the actual life of the plants may vary depending upon technological and economic developments that cannot be reliably predicted this far in advance. Decommissioning has not been considered in detail in this study for similar reasons; there is ample time during the projects' lives to develop and implement an appropriate decommissioning plan.

Finally, accidental or emergency events have not been included in this CIS due to their rare and unpredictable nature. Both companies have prepared emergency response plans for such unpredictable events and are making the necessary preparations for their implementation at the appropriate phase of the projects' development. The individual project EIAs present each company's emergency preparedness and response plans as of the time of those EIAs disclosure.

4.1.1 CIS Process

Figure 4.1 summarizes the process used for carrying out this CIS under the management and oversight of IFC. The figure shows the major steps in the process, the approximate timing of their occurrence, associated activities in the IFC review and approval process, and associated public consultation and stakeholder engagement activities. The latter included both those related directly to the CIS and those undertaken by the CAO office that provides World Bank Group oversight of both IFC and MIGA to the time of writing of this draft report.

In the third quarter of 2005, through a competitive bidding process, IFC selected PCI Americas to undertake the CIS beginning with a thorough review of the EIA documentation publicly disclosed on the World Bank Group Infoshop website for both projects during 2005 (see Terms of Reference in Annex J). These documents provided one significant input to the CIS as did communications from various interested parties that are noted on the figure.

Towards the end of the third quarter of 2005, IFC decided, in consultation with PCI Americas (the selected lead consultant for the CIS work) to augment the original study team with additional specialists and resources. Among these specialists was a team of Uruguayan and Argentine social scientists commissioned to undertake a social assessment of Paysandú, Rio Negro, Soriano and Gualaguaychú departments to strengthen the socio-economic baseline data considered in the CIS. In addition, Malcolm Pirnie provided additional expertise on air and

water modeling to the PCI team to carry out specialized modeling exercises in those disciplines. IFC also retained a specialist consultant/advisor with expertise in cumulative impacts assessment to assist with the CIS.

4.1.2 Public Consultation and Engagement

Overall, public engagement assisted in the scoping and focusing of the contents of the draft CIS. Public consultation and disclosure activities are integral components of the EIA requirements for projects that IFC finances⁶.

Both Botnia and ENCE carried out consultation activities in support of their EIA activities for their respective projects. Details are available in the disclosed documentation⁷ (at the URLs provided above). Table 4.1 summarizes the two projects' consultation and disclosure activities between Mid-July 2002 and November 2005.

⁶ Details of these requirements are available at the following web site: <http://www.ifc.org/ifcext/enviro.nsf/Content/Disclosure>. Further information on how consultation and disclosure are to be implemented during project review is provided in the IFC Environmental and Social Review Procedure available at the following web site: <http://www.ifc.org/ifcext/enviro.nsf/Content/ESRP>

⁷ See note 5 above.

Figure 4.1 - CIS Process

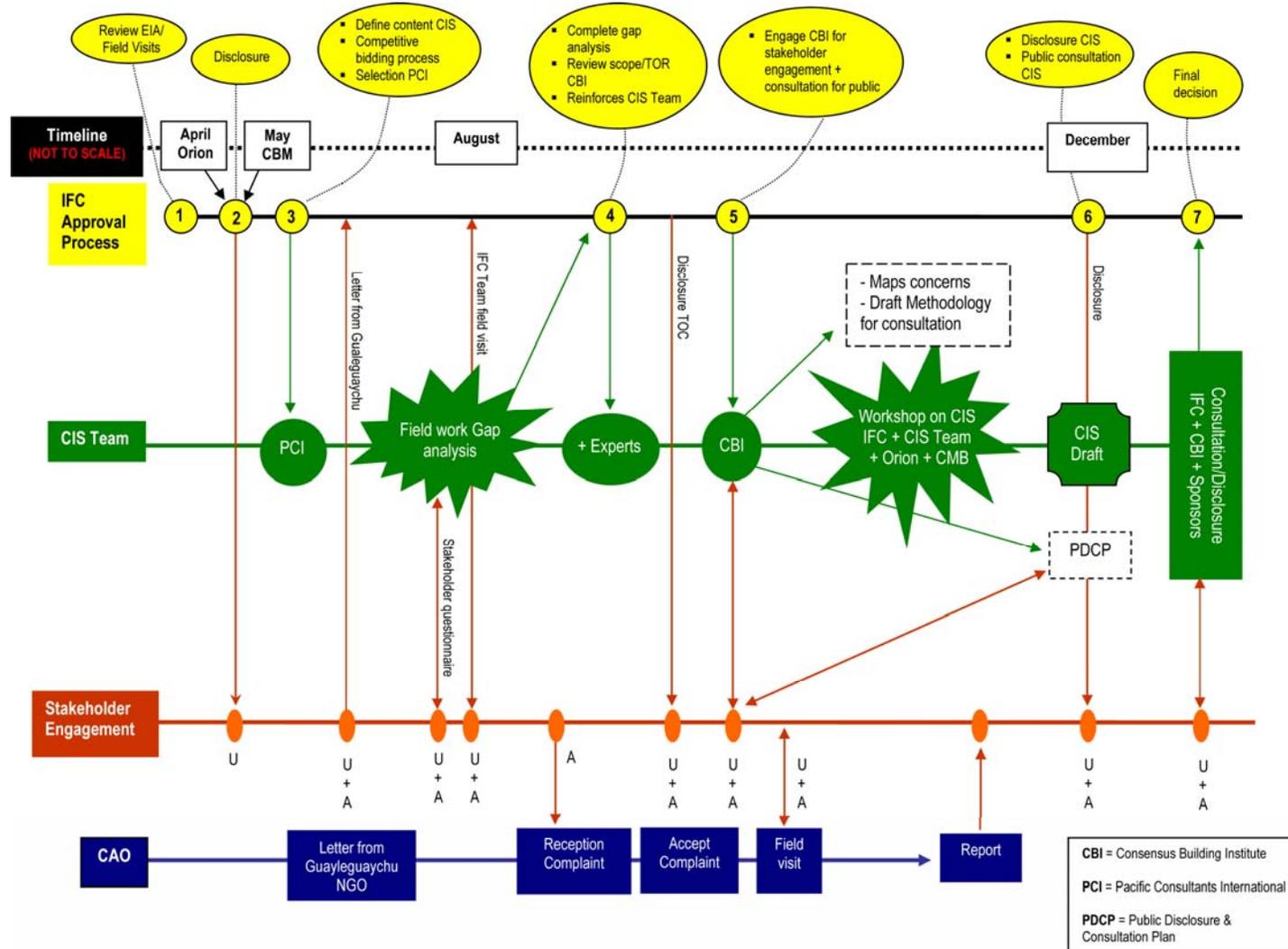


Table 4.1 – Disclosure and Consultation Activities for Botnia and CMB

Type*	Participants	Year	Date	Location	Company
A	Senate's Environmental Commission	2002	15-July	Montevideo	ENCE
B	Forest Producers Association	2002	16-July	Montevideo	ENCE
A	Minister for Housing, Planning, Env, DINAMA	2002	17-July	Montevideo	ENCE
A	City Mayor and Rio Negro Representatives	2002	18-July	Fray Bentos	ENCE
D	CARU	2002	19-July	Paysandú	ENCE
D	Departmental Councils	2002	19-July	Las Cañas	ENCE
B	Eufores Local Staff	2002	19-July	Fray Bentos	ENCE
E	Local Press	2002	20-July	Fray Bentos	ENCE
C	Local Environmental NGOs	2002	20-July	Fray Bentos	ENCE
C	Trade Union Association Panels	2002	22-July	Montevideo	ENCE
D	Technicians/academics (Pulp Seminar)	2002	26-27 July	Montevideo	ENCE
A	DINAMA	2002	November	Montevideo	ENCE
C	Open house	2002	June-July	Fray Bentos	ENCE
D	Public Hearing	2002	21-July	Fray Bentos	ENCE
E	Media Press Release	2003	24-October	Regional	Botnia
E	Media Press Conference	2003	30-October	Montevideo	Botnia
A	Argentine Environmental Authorities	2003	03-November	Buenos Aires	Botnia
C	First Meeting with NGOs	2003	04-November	Montevideo	Botnia
D	Informative Meeting with Rio Negro	2003	05-November	Fray Bentos	Botnia
D	Public Forum Soriano and Rio Negro	2003	02-December	Fray Bentos	Botnia
E	First Journalist Familiarization Tour	2003	February		Botnia
D	Scientific Seminar	2004	March	FB and M	Botnia
D	Informative Meeting Mercedes	2004	March	Mercedes	Botnia
D	Informative Meeting Fray Bentos	2004	01-March	Fray Bentos	Botnia
D	Informative Meeting Fray Bentos	2004	26-March	Fray Bentos	Botnia
E	Press Conference Montevideo	2004	June-July	Montevideo	Botnia
E	Second Journalist Familiarization Tours	2004	June	Finland	Botnia
A	Presidents of CARU	2004	June	Buenos Aires	Botnia
E/D	Publication of Espacio Botnia	2004	August		Botnia
A	First Authorities Delegation (Political Parties)	2004	1-8 August	Finland	Botnia
C	Public Hearing	2004	28-29 October	Concordia, AR	Botnia
D	Public Hearing	2004	21-December	Aromina	Botnia
E	Television Espanola	2005	20-January		ENCE
A	Agregados Navales	2005	04-March		ENCE
A	Transport Minister and commission	2005	03-April	Montevideo	ENCE
D	Pulpwood Conference	2005	14-April	Montevideo	ENCE
A	Canadian Ambassador and Commission	2005	26-April		ENCE
C	Radio Interview/Gualeguaychú	2005	9-May	Gualeguaychú	
A	Deputies from PP Movement	2005	20-May		ENCE
A	Deputies from PP Paysandú/Nacional	2005	03-June		ENCE
A	Spanish Diplomatic Commission	2005	06-June		ENCE
A	Deputies Patrone and Varela	2005	21-June		ENCE
E	Radio and TV adds	2005	18-July		Botnia
A	Uruguayan Diplomats	2005	July	Montevideo	ENCE
E	Media of Montevideo	2005	11-August		ENCE
A	Meeting with Senator Rafael Michellini	2005	12-August		ENCE

D	Reps of CARU and Forest Producers Society	2005	17-August		ENCE
A	National Administration of Ports	2005	22-August	Montevideo	ENCE
D	Stakeholder consultations with IFC	2005	28 Aug-Sept 2		Botnia
D	Stakeholder consultations with IFC	2005	28 Aug-Sept 2		ENCE
B	FEMESA Assoc of Spanish Companies in UR	2005	30-August	Montevideo	ENCE
A	Comission of Environmental Deputies	2005	31-August		ENCE
D	Participation in the Rural Exhibition in Prado	2005		Prado	ENCE
E	Participation on TV Program Americando	2005	August		ENCE
A	Comission for Labor Deputies	2005	09-September		ENCE
A	Junta Departamental Paysandú	2005	21-September	Paysandú	ENCE
E	Interview with BBC Journalists	2005	28-September		ENCE
A	Minister of Labor and Commission	2005	30-September	Montevideo	ENCE
A	Deputies Mañana and Borsari	2005	20-October	Montevideo	ENCE
A	President of Uruguay	2005	21-October	Montevideo	ENCE
A	Senate's Environmental Commission	2005	26-October	Montevideo	ENCE
A	Consulate for Spain	2005	28-October		ENCE
A	BID Directory	2005	03-November		ENCE
A	Directory of Antel	2005	07-November		ENCE

*Type	A) governmental institutions	34
	B) private sector	2
	C) civil society	37
	D) tripartite	17
	E) media	55
	Total	146

The consultations listed above were carried out, in part, to comply with Uruguayan environmental assessment disclosure and consultation requirements for their projects but, more broadly, to promote understanding and build support for the projects among concerned and interested parties in Argentina as well as Uruguay.

As part of the CIS process, IFC contracted the Consensus Building Institute (CBI) – a non-profit organization specializing in facilitated dialogues, mediation and negotiation – to carry out an additional independent assessment of stakeholder perceptions and concerns about the mills and recommend strategies for possible stakeholder dialogue. The purpose of the assessment was to: 1) better inform the IFC and other stakeholders about the range and depth of stakeholder concerns and perceptions regarding the mills; and 2) recommend potential ways to engage stakeholders in a dialogue and a review of the draft CIS.

The stakeholder assessment reflects more than 80 interviews with a diverse range of stakeholders related to the proposed mills. CBI conducted most interviews during the final weeks of November in the two populated areas closest to the proposed plants, Fray Bentos in Uruguay and Gualequaychú in Argentina, and in Montevideo, Buenos Aires and Washington, DC. CBI's team of six assessors included two from Argentina, one from Uruguay and three from the United States.

CBI sought to interview stakeholders representing the full range of opinions about the mills. CBI identified and spoke with civil society groups, non-governmental organizations (NGOs), business associations, public officials, and interested citizens such as tourism operators, local

business owners, fishermen, farmers and plantation owners. CBI also spoke with IFC and representatives of Botnia and ENCE. Several stakeholders who oppose the mills declined interview requests, citing concerns that IFC had not established clear terms of engagement for stakeholder consultation.

The stakeholder assessment revealed a sharp divide between stakeholders who are optimistic about jobs and economic development stemming from the mills and stakeholders who see the projects as a fundamental threat to the environment, tourism, agriculture, fishing and their overall quality of life. CBI grouped stakeholder concerns and perceptions into the following areas:

- Economic development and job opportunity;
- Community quality of life;
- Eucalyptus plantations and changing land use;
- Effects on fishing and agriculture from pollutants; and
- Appropriateness of proposed plant sites, controls and monitoring.

CBI also asked stakeholders about their perceptions of a possible joint review of the mills impacts. Many stakeholders said a joint review of the draft CIS may offer a useful opportunity to address their concerns and issues. However, many stakeholders are skeptical, and said they would require assurances that joint review of the mills impacts would be meaningful and transparent; include broad stakeholder representation; provide opportunity for the review of all credible information; and respect sovereignty and community self-determination.

The CBI assessment notes that those stakeholders most optimistic about the mills' positive impacts and those most concerned about their negative impacts have become highly polarized and mutually distrustful. In order for the joint review to be productive, it will need to be based on explicit commitments from the concerned national and sub-national governments, IFC, the companies proposing to build the mills, and civil society stakeholders in both Uruguay and Argentina to engage in a good faith effort to resolve substantive questions about the mills impacts, and to explore the full range of siting, design, construction and operational options.

The findings of CBI's stakeholder assessment are summarized below in Table 4.2 and the full assessment report is attached as Annex H to this report. These findings are generally consistent with the views that have been expressed by stakeholders in earlier consultations undertaken by each of the companies as well as with representations made by public interest groups to IFC regarding project concerns subsequent to the disclosure of the EIA documentation for both projects. Subsequent to the public disclosure of the draft CIS, CBI will issue its recommendations for public engagement between IFC, the companies and stakeholders in the review of the draft CIS findings. These recommendations, along with the technical analysis of the degree and range of expected cumulative impacts, will therefore help guide the process of further engagement.

In addition, the Office of the IFC/MIGA Compliance Advisor Ombudsman (CAO) has also met with some stakeholders in response to a complaint received on September 23, 2005. The complaint alleges that the projects will create toxic, noxious emission incompatible with tourism and agriculture and also raises concern about the regulatory capacity to monitor and enforce environmental standards⁸.

⁸ Information on the activities of the CAO with respect to these projects can be found at the following web site: http://www.cao-ombudsman.org/html-english/complaint_cmb.htm.

Table 4.2 - Summary of Stakeholder Assessment Findings

Issue	Range of Perceptions and Concerns	
Plant-related jobs and activity	<ul style="list-style-type: none"> • Most significant source of jobs in decades for Fray Bentos • Economic activity already being felt • Uruguay's biggest foreign investment • Chain of economic activity expected throughout region 	<ul style="list-style-type: none"> • Job opportunities may be exaggerated • Less-polluting activity could produce same benefits • Small businesses might get overlooked
Effects on tourism	<ul style="list-style-type: none"> • Effects on tourism uncertain or minimal • Fray Bentos's Las Cañas beach houses in demand from plant staff/contractors • Gualeguaychú may feel little impact from plants 	<ul style="list-style-type: none"> • Tourism in region may plummet • Gualeguaychú expects loss of tourism jobs to outstrip benefits from plants • Gualeguaychú sees tourism as fundamental economic driver • Drop in tourism may undermine Gualeguaychú's entire economy, real estate
Quality of life - Environment	<ul style="list-style-type: none"> • Economic activity will improve quality of life 	<ul style="list-style-type: none"> • Plants are direct threat to quality of life/values • Key concerns: Foul odors, toxic emissions (air, water), traffic, loss of bio-diversity/habitats, landscape
Quality of life - Social	<ul style="list-style-type: none"> • Social services – health, education etc – will improve in Fray Bentos 	<ul style="list-style-type: none"> • Influx of construction workers may increase prostitution, venereal disease, crime, drunk driving
Eucalyptus Plantations	<ul style="list-style-type: none"> • Plantations extract more value from land, especially marginal lands • Creates greater chain of economic activity than other land uses 	<ul style="list-style-type: none"> • Aggressive use of land, drains aquifers, compacts soils, increases fire dangers • Provides fewer rural jobs • Concentrates landownership • Threatens habitats • May threaten Guaraní aquifer • Requires more investment in roads
Effects on Fishing	<ul style="list-style-type: none"> • May have little to no impact 	<ul style="list-style-type: none"> • May contaminate river, killing fish/making them inedible • River already strained with agrochemical runoff • Mills located in front of spawning ground • Information unclear, distances in studies incorrect • Families rely on river for subsistence
Effects on Agriculture	<ul style="list-style-type: none"> • May have little to no impact • Honey exporters expect no impact on ability to sell abroad/prices 	<ul style="list-style-type: none"> • May impact beef, poultry, dairy, snail, rabbit and blackberry production and exports • Honey producers in vicinity won't be able to export • Impact area may be much larger than stated

Mill sites, size	<ul style="list-style-type: none"> • Efficient location to take advantage of wood supply, transport • Size not unprecedented; mill complex in Brazil is bigger 	<ul style="list-style-type: none"> • Too close to populated areas • Should consider moving to more remote location, Atlantic coast • Impacts difficult to predict because size is unprecedented
Monitoring	<ul style="list-style-type: none"> • Uruguay regulators said willing to shut plants if non-compliant • New national/local monitoring entities being created • Governments ask United Nations for assistance 	<ul style="list-style-type: none"> • Uruguay lacks technical capacity • Political and economic pressures will reduce effectiveness • May lack consistency over mills' lifetime • Bi-national entity should monitor
Technology	<ul style="list-style-type: none"> • Mills will comply with European regulations as of 2007 	<ul style="list-style-type: none"> • Mills won't comply with European regulations as of 2007
Transportation/ Chemicals	<ul style="list-style-type: none"> • Fray Bentos creating new emergency response teams 	<ul style="list-style-type: none"> • Increased risk of road accidents • Increased risk of chemical spills • Fray Bentos lacks resources to respond to chemical/industrial emergency • Chemical suppliers create new risks
Views on public engagement to review mills' impacts	<ul style="list-style-type: none"> • Engagement/dialogue must have pre-defined set of topics • Must not be used to stage protests • Must be a safe space for civil dialogue • Meetings open to general public are often unproductive 	<ul style="list-style-type: none"> • Must be accountable and transparent, with clear rules of engagement • Must first receive a sign that concerns will be acknowledged and responded to • Process can't be rushed • Meetings should strike balance between being open to public, and being a manageable size
Views on convening dialogue	<ul style="list-style-type: none"> • IFC could convene process, hire neutral facilitator 	<ul style="list-style-type: none"> • Stakeholders should identify a mutually credible convener • Some initial suggestions: CAO office, Bi-National Technical Commission, Key public officials
Views on quality of current information	<ul style="list-style-type: none"> • Companies have provided extensive amounts of credible information • Uruguay regulators have shared comprehensive information with Argentina • IFC is committed to reviewing scientific material from stakeholders 	<ul style="list-style-type: none"> • Basic data such as distances incorrect in company reports, calling into question all information • Uruguay regulators haven't shared enough detail with Argentina • Stakeholders lack clear language to understand impacts • Cumulative Impact Study questioned because of comments from initial lead writer • Opponents want an opportunity to present their scientific studies • A panel of experts could provide a mutually credible source of information • Experiences from communities with functioning mills should be considered

4.1.3 Analysis of Cumulative Impacts

This study has employed a number of specialized techniques and methodologies for the analysis of cumulative impacts by discipline. Several of these are described in the Annexes to this report in addition to those described in this report itself. They include sophisticated, standardized computer modeling techniques for the analysis of air emissions and effluents to water, for example. Other methodologies used are generally quantitative to the extent that is feasible in the given discipline and within the constraints of this particular study. One example is projections for expected truck traffic for comparison with recent surveys by in-country agencies. Other methodologies utilized in this CIS are qualitative in nature and rely significantly, if not primarily, on the judgments of the relevant expert(s) on the CIS technical team.

The results of the CIS analysis with respect to the significant impacts identified by all of these techniques and methodologies are summarized at the end of this chapter. Annex I provides the detailed tables on the cumulative impact (CI) analysis upon which the summary of significant impacts is based.

Overall, each of the discipline-based judgments is brought together in one place using a common format to come to the conclusions of the CIS.

4.1.4 Cumulative Impact Identification and Management

The general approach to determination and management of impacts was in a step-wise process as follows:

- Study area and timeline
- Projects/activities including associated facilities
- Analytical techniques and professional judgment
- CI Identification and assessment of significance
- CI Management possibilities

The study area and timelines were outlined above. Project activities and associated facilities are based on descriptions in the respective EIAs as supplemented in this report. Analytical techniques are described by discipline in the following sections of this report or in the accompanying Annex to this report, as appropriate to the specific disciplines.

Cumulative impacts were identified and their significance determined by those techniques supplemented by the professional judgment of team members, as required. Management possibilities for the significant cumulative impacts identified are summarized to enable those impacts to be optimized (mitigated if negative and enhanced, as possible, if positive).

The management possibilities from the cumulative impacts analysis are expected to be integrated, as appropriate, into the multiple management plans and commitments for optimizing the projects' impacts. A growing number of organizations and groups have expressed interest in being involved with monitoring programs, as for example, in the areas potentially impacted by the projects. These groups and organizations are in addition to the pulp mill companies whose commitments to impact management are outlined in their EIAs and in addition to the groups who are already undertaking or actively planning to carry out monitoring activities in the area. The list of such stakeholders has been lengthening regularly and the comprehensive discussions around the details of the programs, including their implementation, documentation,

reporting and disclosure have not been completed. The current status of these issues is summarized briefly in Chapter 5 of this report. These issues will continue to be actively discussed for some time.

4.2 Plantations

Since the 1980s, Uruguay has had a program to promote the development of plantation forestry through donor support (such as the World Bank) and through government tax and subsidy programs. These plantations have specifically been developed on less productive agricultural and grazing land. Development of the forestry sector has been seen as a way to improve the productive use of lands that had formerly supported an extensive cattle raising industry, which has declined significantly in recent years.

As these plantations have developed, Uruguay has exported both round wood (whole logs) and wood chips to international markets. Uruguay is now encouraging the development of further value-added processing of these forest products and the two pulp mills intended for development in the Fray Bentos area are part of this development of Uruguay's industrial base.

The environmental impacts of plantation development have been addressed in the individual impact assessments prepared for these investments or through the sustainable forest management certification process. These potential impacts include those associated with changes in land use and those due to land preparation, planting, management and harvesting of the trees. In all cases, these impacts have been found to be low to medium, and can be readily mitigated.

The purpose of this review, then, is to identify any additional additive or synergistic impacts due to the two pulp mill projects. Both projects, Orion and CMB, have their own plantation companies (Forestal Oriental, or FOSA, and EUFORES, respectively) with significant plantation holdings. Both companies also purchase wood from other third-party plantation companies, under short or long-term contracts. It is important to note that these plantations are currently producing round wood and chips for export. With the development of these mills, this wood will instead be directed to domestic pulp production. More detailed consideration of the plantation situation is presented in Annex B of this report.

Potential cumulative impacts of the two mills could include the following:

- Conversion of additional land to plantations, to supply the mills;
- Encouragement of additional plantation development in the region by other third parties;
- Encouragement of additional plantation development in other areas of Uruguay;
- Encouragement of development of plantations in natural forest areas; and
- Additional plantation development may force smallholders off their lands.

These potential cumulative impacts are discussed below.

4.2.1 Conversion of additional land to plantations, to supply the mills

The Orion plant will require 3.5 million m³ of wood per year, and the CMB mill will need approximately 1.7 million m³ per year, a total of 5.2 million m³ per year for both. On the basis of average annual production rates, a total of 208,000 ha of plantation would be needed to supply this amount of wood, just for these two plants. At present, the total planted area in this region of western Uruguay, within economic distance of the plants, is approximately 172,000 ha. The two companies are planning to plant an additional 65,000 ha to ensure consistency of supply in the intermediate to long term. The following table summarizes the plantation situation.

Table 4.3 - Impact of Plantation Forestry in Western Uruguay

Total land area – Western Region	6,326,000
Total forest priority soils	847,588 ha
Total current planted area, all species	171,880
% of land area planted	2.7%
Additional eucalyptus planting expected	65,000 ha
Total potential planted area	236,880 ha
% of total area to be planted	3.7%
Planted area required by mills	208,000 ha
% of land area required for support of mills	3.3%

In this region of Uruguay, approximately 850,000 ha of land have been designated as “Forest Priority Soils”, on which forest plantations are encouraged. So far 172,000 ha of this has been planted, which is 2.7% of the total land area of the region. Even when an additional 65,000 ha are planted, this will rise to 3.7% of the land area. Thus, the cumulative impact of the demand of the two mills will amount to an additional 1% of the total land area of the region. Conversion of 1% of the landscape to plantation forestry is a relatively small change in the visible landscape and is not likely to be readily apparent at anything but a local scale. This cumulative impact is therefore not considered to be significant.

4.2.2 Encouragement of additional plantation development by other third parties

Both Orion and CMB are working, through their plantation companies, to ensure a reliable supply of pulpwood from their own plantations. It is unlikely that a large number of independent land owners would make a long-term investment in plantation development in this area in the future hope of supplying the mills when both Orion and CMB have their own reliable supply. It is theoretically possible that other wood products industries (sawmills, furniture manufacturers, panel producers) may wish to develop operations in the future, but there is no program to promote this nor are there any known plans for such operations. Such developments could not be considered to be cumulative impacts of the presence of the two mills. It is therefore unlikely that the establishment of the pulp mills will encourage significant development of plantations by other third parties, and this potential cumulative impact is neither significant nor likely.

4.2.3 Encouragement of additional plantation development in other areas of Uruguay

Transportation costs are the main controlling factor in wood supply, and it is generally not competitive to source wood from greater than about 200 km from the mills. There may indeed be wood available in the northern region (especially thinnings from plantations operated to produce larger round wood) and also in the central to southeast, but it is less likely that these

would be competitively priced, and very unlikely that landowners in those regions would establish new plantations with the intention of supplying the new pulp mills, especially when those mills are already planting areas nearby to supply their own wood.

It is therefore not likely that these pulp mills will encourage additional planting in other regions of Uruguay, and this potential cumulative impact is not considered to be significant nor is it likely.

4.2.4 Encouragement of development of plantations in natural forest areas

This potential impact is unrealistic for several important reasons. It is clarified above that it is unlikely that the mills will induce further planting beyond the expected 65,000 ha which the companies will develop. These plantations will be certified under FSC, which prohibits the development of plantations in natural forest, and in fact requires the delineation of protected areas of natural forest as part of the plantation area. Conversion of natural forest to plantation is also contrary to government regulations.

It is therefore unlikely that the pulp mills will encourage development of plantations in natural forest, especially because it would be illegal and would jeopardize the certification of their plantation operations, and this potential cumulative impact is not considered to be significant nor is it likely.

4.2.5 Additional plantation development may force smallholders off their lands

There is no evidence that this type of impact is occurring in the region where Orion and CMB have their plantations. Most of the companies' plantations were purchased from absentee landlords in a willing seller-willing buyer relationship, at prevailing market rates. The companies report that they can be very selective in their land purchases, as they have had numerous offers to them of land for purchase. No lands are purchased from unwilling sellers. Further, other evidence shows that employment on the plantations is greater than in the declining cattle-raising economy in this area, and that those involved in on-farm labor have improved job opportunities.

It is therefore unlikely that the pulp mills will play any role in driving smallholders off their lands, and this potential cumulative impact is not considered to be significant.

A variety of other charges of negative environmental impacts have been leveled at plantation forestry in the past, including detrimental effects on water tables, soil degradation and reduction of biodiversity. Extensive research on these issues indicates that such concerns, if they are valid, are very site-specific and species-specific. These issues are addressed in the companies' environmental studies, and are further reviewed in Annex B. None of these issues are considered to be a cumulative impact of the pulp plants' operations.

4.3 Biodiversity and Natural Habitats

Both plants are being constructed on land that was formerly used for agriculture. There is little or no original natural habitat on either site, as this entire area has a long history of agricultural use. Each site has some modified habitat which is being conserved to the extent possible.

Conversion of the total of 135 ha of these two sites to industrial use will have no significant impact on regional biodiversity as these sites have no significant biodiversity value and represent a small fraction of the rural land available in the region.

The development of plantations in the region is a positive factor as the plantations provide an improved habitat structure with more niches for a greater variety of flora and fauna, thus increasing biodiversity over the current grazing land conditions. Also, as part of the sustainable forest management certification of the plantations, there are requirements to set aside and conserve natural habitat as an integral part of the plantation operations. As a result, biodiversity is enhanced by these projects, not decreased.

No cumulative impacts of the two plants on biodiversity and natural habitat have been identified. The two operations do promote biodiversity on their plantations and this is a positive impact in each case, which has a simple additive effect in the region.

4.4 Air Quality

From an environmental point of view, air emissions and air quality are of most significant concern across a broad area because air emissions from the two pulp mills have the potential to be the most widely spread geographically in the project area. Across a variety of industrial sectors, the air emissions constituents of most concern are those arising from fuel combustion: particulate matter (PM), nitrogen oxides (NO_x) and sulfur dioxide (SO₂). At high concentrations these can have respiratory and other effects on human health, as well as producing acidic compounds which detrimentally affect the wider environment. For pulp mills, these constituents are of concern, along with odors generated during the pulping process. The odors of most concern are those produced by the following chemical compounds produced in the pulping process: hydrogen sulfide, methyl mercaptan, dimethyl sulfide and dimethyl disulfide. These four compounds are generally grouped together and measured as total reduced sulfur (TRS). These substances have foul odors which can be detected by humans at very low levels, and thus have a social impact if they are not collected and adequately treated at the pulp mill.

4.4.1 Background and Methodology

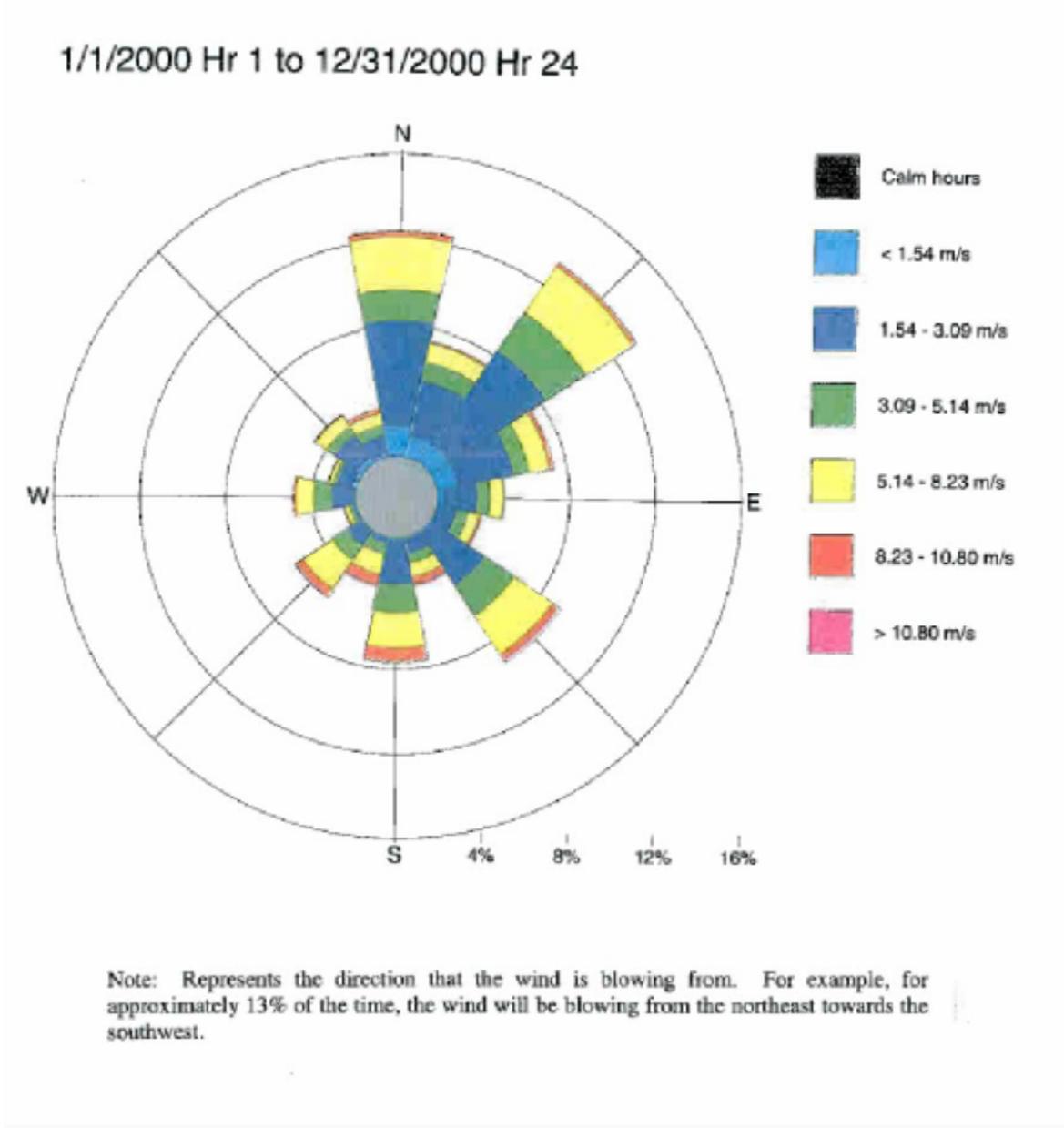
The EIAs for the two pulp mills each considered air emissions in detail and concluded that these emissions will be well controlled in the plants, using BAT technology, and will be well dispersed with the result that there were no significant impacts over the broader area. The Orion EIA also considered air emissions from the CMB mill as part of its review.

Due to public concern about air emissions, and particularly about odor, this Cumulative Impact Study reviewed air emissions in greater detail and carried out additional, more detailed, computer modeling of emission dispersion. This modeling used the Industrial Source Complex Dispersion Model version 3.0 (ISC3) which simulates plume impacts from industrial facilities and is the recommended tool for predicting ambient concentrations of steady state air pollutant emissions from industrial facilities by the U. S. Environmental Protection Agency (USEPA). Meteorological data used for the modeling are from 5 years of data from the Gualaguaychú meteorological station. A summary wind rose derived from this data for 2000 is presented in Figure 4-2. This clearly indicates that the dominant wind direction is from the north to northeast quadrants, or that the wind is blowing from Argentina to the southwest into Uruguay.

4.4.2 Results: PM, NO_x and SO₂

The results (Table 4.4 and 4.5) show that the predicted concentrations of particulates, SO₂ and NO_x will be within the most stringent world health standards throughout in the region. The

Figure 4.2 - Gualeguaychú, Argentina Year 2000 Annual Wind Rose



highest levels indicated by the modeling are predicted to generally occur nearer to the mills, and even here the predicted levels are still well within the standards designed to protect human health.

Table 4.4 - Maximum Cumulative Impacts

Maximum Cumulative Impacts (Orion and CMB Mills) - SO₂

Maximum Predicted Concentration (ug/m ³)	Averaging Period Evaluated	Health Standard * (ug/m ³)	Percent of Health Standard	World Bank Standard (ug/m ³)	Percent of World Bank Standard
2.7	Annual	32	8.3	50	5.3
21.7	24-Hour	30	72.3	125	17.4
43.9	3-Hour	1,300	3.4	-	-
49.7	1-Hour	690	7.2	-	-

* Health Standard represents the most conservative health standard identified.

Maximum Cumulative Impacts (Orion and CMB Mills) – NO_x

Maximum Predicted Concentration (ug/m ³)	Averaging Period Evaluated	Health Standard (ug/m ³)	Percent of Health Standard	World Bank Standard (ug/m ³)	Percent of World Bank Standard
4.0	Annual	30	13.3	-	-
32.6	24-Hour	150	21.7	150	21.7
74.6	1-Hour	190	39.3	-	-

Maximum Cumulative Impacts (Orion and CMB Mills) - PM

Maximum Predicted Concentration (ug/m ³)	Averaging Period Evaluated	Health Standard (ug/m ³)	Percent of Health Standard	World Bank Standard (ug/m ³)	Percent of World Bank Standard
1.7	Annual	50	3.3	50	3.3
13.6	24-Hour	120	11.3	70	19.4
31.1	1-Hour	250	12.4	-	-

Table 4.5 - Maximum Cumulative Impacts on Specific Receptor Locations

Maximum Cumulative Impacts on Additional Receptor Locations- SO₂

Additional Receptor Location	Maximum Predicted Concentration (ug/m³)	Averaging Period Evaluated	Health Standard (ug/m³)	Percent of Health Standard
Fray Bentos area	3.96	24-Hour	30	13.2
International Bridge	3.11	24-Hour	30	10.3
Mercedes, Uruguay	1.06	24-Hour	30	3.5
Nuevo Berlin, Uruguay	1.05	24-Hour	30	3.5
Gualeduaychú, Argentina	0.47	24-Hour	30	1.5
Nandubaysal, Argentina beach area	1.19	24-Hour	30	4.0
Las Canas Resort area	2.47	24-Hour	30	8.2

Maximum Cumulative Impacts on Additional Receptor Locations- NO_x

Additional Receptor Location	Maximum Predicted Concentration (ug/m³)	Averaging Period Evaluated	Health Standard (ug/m³)	Percent of Health Standard
Fray Bentos area	24.52	1-Hour	190	12.9
International Bridge	20.88	1-Hour	190	11.0
Mercedes, Uruguay	12.89	1-Hour	190	6.8
Nuevo Berlin, Uruguay	8.29	1-Hour	190	4.4
Gualeduaychú, Argentina	9.45	1-Hour	190	5.0
Nandubaysal, Argentina beach area	12.24	1-Hour	190	6.4
Las Canas Resort area	16.16	1-Hour	190	8.5

Maximum Cumulative Impacts on Additional Receptor Locations- PM

Additional Receptor Location	Maximum Predicted Concentration (ug/m³)	Averaging Period Evaluated	Health Standard (ug/m³)	Percent of Health Standard
Fray Bentos area	8.36	1-Hour	250	3.3
International Bridge	7.95	1-Hour	250	3.2
Mercedes, Uruguay	5.37	1-Hour	250	2.1
Nuevo Berlin, Uruguay	3.45	1-Hour	250	1.4
Gualeduaychú, Argentina	3.94	1-Hour	250	1.6
Nandubaysal, Argentina beach area	5.10	1-Hour	250	2.0
Las Canas Resort area	6.73	1-Hour	250	2.7

4.4.3 Results: Odor

Measurement of odor is complex, as it is based on several different compounds to which there is a range of sensitivities in the human population. Odor thresholds (the concentration which is detectable on average by people)⁹ have been determined for the compounds included in pulp mill emissions. As indicated in Table 4.6, during normal plant operations the highest concentrations were predicted by the model to be near the plants, and even in these areas the predicted concentrations are still less than the odor thresholds for these substances. As this is based on conservative assumptions, these results indicate that odors during normal plant operation should usually not be detectable anywhere in the region, including in Gualaguaychú and Nandubaysal.

Both mills are incorporating best available technology to collect and incinerate all odorous gases. However, there are three sets of conditions when odorous gases are likely to be released and odor will be detectable outside the plants. These are discussed below

Table 4.6 - Potential Cumulative Odor Impacts—Normal Operation

Air Pollutant	Averaging Period	Maximum Predicted Concentration (ug/m ³)	Lower End of Odor Threshold Range (ug/m ³)	% of Threshold
Hydrogen Sulfide	10 minutes	0.69	0.76	90.5
Methyl Mercaptan	10 minutes	3.59	3.93	91.4
Dimethyl Sulfide	10 minutes	0.77	2.79	27.7
Dimethyl Disulfide	10 minutes	4.54	23.1	19.7

* Maximum cumulative TSR concentration was predicted at a point near the CMB plant

Both mills are incorporating best available technology to collect and incinerate all odorous gases. However, there are three sets of conditions when odorous gases are likely to be released and odor will be detectable outside the plants. These are discussed below

Initial Plant Startup: Both plants expect that there will be an initial period of three to four months when the plants are first being commissioned and when testing of subsystems is taking place. During this period, there may be releases of some odorous gases, but quantities and times are difficult to predict. Computer modeling is not possible due to the complexity of the situation. Orion and CMB estimate, based on experience with other plants, that odors may be detectable out to 5 to 10 km on an infrequent basis. This will decrease as the equipment is tested and operations of the systems are harmonized. DINAMA specifies in its permit that odor should not be detectable for more than a total of 7 days per year, and this will be difficult to achieve during this startup period.

Planned Plant Startup and Shutdown: These are normal events for routine maintenance, and may reflect shutdowns of specific equipment or even the whole plant. These can be planned and carried out to minimize the release of odorous gases, although some release will occur

⁹ Obtained from “Questions and Answers about Kraft Pulp Mill Odors”, March 2005, Georgia-Pacific Corporation and Appendix 10 of the “Integrated Pollution Prevention and Control (IPPC) Draft Document on Horizontal Guidance for Odour Regulation and Permitting.”

when switching from one treatment unit to another (i.e., from the recovery boiler to the odorous gas boiler in the case of Orion, or to the flare in the case of CMB). Modeling of these conditions, using representative data, indicates (Table 4.7) that some odor exceeding threshold values would be detected within one to two kilometers of the mills, and these odor events would last for a short period (one hour or less) and would occur one or two times per year on average at each mill.

Table 4.7 – Potential Cumulative Odor Impacts—Planned Startup Conditions

Air Pollutant*	Averaging Period	Maximum Predicted Concentration (ug/m ³)	Lower End of Odor Threshold Range ug/m ³	% of Threshold
Hydrogen Sulfide	10 minutes	1.25	0.76	164.5
Methyl Mercaptan	10 minutes	6.55	3.93	166.7
Dimethyl Sulfide	10 minutes	1.41	2.79	50.5
Dimethyl Disulfide	10 minutes	8.29	23.1	35.9

* Maximum cumulative TSR concentration was predicted at a point near the CMB plant

Unplanned Plant Startup and Shutdown: These events cannot be predicted in advance, but are known to occur—unplanned power outages or equipment (pump, motor) failures can affect normal operation and result in odorous gases being released into the stacks. Depending on the circumstances, these events may result in odor impacts similar to those for the planned startup/shutdown situations, usually within 1 to 2 km of the mills. These odor events of varying intensity may occur up to five times per year at each mill, and would last for less than one hour. Under extreme, worst-case situations, which would be very rare and highly unlikely, odors might be detected at distances of up to 10 km, for very brief periods.

Cumulative Impacts: The two pulp mills lie on an East-West axis, so that if there were to be a cumulative impact of the two plumes, it would only be at those times when the winds are from the east or west. The wind rose (Figure 4.2) shows that these times are not very common. More importantly, the computer modeling of the dispersion of the plumes under normal operation shows that there are no situations where even the combined plumes result in air quality parameters being greater than standards or where any odors exceed human detection thresholds. During unplanned upset events discussed above, there is a small chance that if both plants had a shutdown at the same time, and the winds were from east or west, there could be a cumulative impact of odors from both plants in the same area. This is expected to be very infrequent. Also, the initial startup periods of the two plants will not coincide, so there should be no cumulative effects during those periods.

4.5 Water Quality

To provide a more extensive assessment of the potential cumulative impacts on local water quality (i.e., study area), an enhanced water quality impact evaluation was performed for wastewater emissions from the Orion and CMB mills. The modeling exercise utilized the internationally-recognized RMA2 hydrodynamic model and RMA 11 water quality model with model input files previously developed in support of the Orion EIA by Professor Ismael Piedra Cueva of the Universidad de la Republica, Montevideo. Based on a review of the model input parameters and assumptions, river bathymetry, flow data, water level data and the results of the calibration analyses, it was concluded that the RMA 2 and RMA11 models are appropriate

models for use in this analysis and that these models reasonably reflect hydrodynamic and water quality characteristics of the Rio Uruguay in the vicinity of the two discharges. The modeling was extended to cover both conservative and non-conservative (BOD and DO) water quality parameters.

The additional modeling effort focused on two alternative discharge scenarios: Alternative 1 consists of an analysis of discrete discharges of wastewater effluent from the city of Fray Bentos (OSE), the Orion project and the CMB project. Alternative 2 consists of a discrete CMB discharge and joint treatment of the Fray Bentos and Orion wastewaters with discharge at the Orion site.

An analysis for each alternative under a 6,000 m³/sec average river flow and 500 m³/sec low flow condition was performed. The 500 m³/sec flow condition is considered to be the worst case steady state flow condition for determining the potential cumulative impacts from the two projects. In addition to the steady state conditions, of particular interest is a condition that can cause a short-term change in Rio Uruguay surface water flow direction at the pulp mill sites from east-to-west to west-to-east. Accordingly, a dynamic flow analysis using January 2000 river flow and water level data was performed for both Alternatives 1 and 2 to determine the cumulative impacts of the discharges under this condition.

The principal findings and assessment of the cumulative impacts of the two projects are as follows:

- Under the 6,000 m³/sec average flow conditions, the modeling effort showed little potential for impacts outside of the mixing zones for the two pulp mill discharges. The plumes do not merge under these conditions and do not appear to have the potential for any cumulative impacts. Dilution factors outside of the mixing zone are greater than 1,000, indicating that any discharges from the mills should not be detectable using conventional analytical techniques.
- Under the worst case scenario of 500 m³/sec low flow and January 2000 dynamic flow conditions, the CMB and Orion plumes do merge and have the potential for cumulative impacts. However, dilution factors are still on the order of 100 to 200 along much of the Rio Uruguay shoreline between the CMB discharge and Fray Bentos under these low flow conditions, and changes in water quality are not expected to be significant or readily detectable in water quality monitoring. Dilution factors along the adjacent Argentine shoreline (Isla Sauzal) are generally greater than 1,000 under the steady state flow condition, although they can be reduced to between 500 and 1,000 during the January 2000 model runs representative of flow reversal conditions. Under no conditions is there any predicted effect on the Ñandubaysal beach area.
- It is important to note that the effluent from the mills at the point of discharge, before any dilution, is already a very high quality effluent (full secondary treatment) that has significantly reduced the suspended particulate (TSS) and readily degradable organic content (BOD) of the wastewater to levels where there is very low risk of adverse impact on aquatic species. The rates of dilution that the water quality model calculates provide a measure of how quickly an already good quality discharge will be further reduced in concentration to the point where there will be no adverse impact on aquatic species and water quality, and finally to levels where the discharge cannot even be detected by standard analytical methods of water quality

analysis. For an effluent discharge of full secondary treatment wastewater, a dilution of 100:1 is widely recognized as a level where there clearly will be no adverse impact on aquatic species. By the time such a high quality effluent discharge is diluted to 1,000:1, it will not even be detectable by standard analytical methods of water quality analysis. In simple terms, it is important to emphasize that between the point of discharge and the time the effluent is diluted 100:1 (the usual definition of a mixing zone), there will be very low risk of adverse effect on any biota. After reaching a dilution of 100:1, there will be no adverse effect even on the most sensitive aquatic species, and finally, by the time the dilution reaches 1000:1, it will be almost impossible to detect.

- There are concerns over exceedences of water quality criteria in the river, but these are due to untreated or poorly-treated municipal wastewater discharges. The pulp mill discharges will not significantly affect these conditions, with the possible exception of phosphorus, which can contribute to eutrophication, particularly under low flow conditions. The elimination of the Fray Bentos discharge under Alternative 2, would reduce the net increase in phosphorus load from the two mills versus current conditions by approximately 1/3 and help to mitigate any additional impact from the pulp mills
- The modeling work and sensitivity analyses have identified a potential slow-flowing circulation pattern in the bay areas along the Uruguay shoreline including an area immediately downstream of the proposed Orion plant site in a bay adjacent to mouth of the Yaguarete River. While no amount exceeding the water quality criteria in this area was indicated by the modeling, this area is still of potential concern, particularly in view of elevated background nutrient levels in the river.

Recommendations for mitigation measures and additional assessments include:

- **Combined Fray Bentos/Orion Treatment** – While the modeling results do not show a significant difference in the results for Alternatives 1 and 2, combined treatment of the Fray Bentos and Orion discharges should be considered. A properly designed combined wastewater treatment facility will further decrease the already low risk of cumulative impacts from the two mills by reducing the net increase in loading of phosphorus, nitrogen and fecal coli forms to the river.
- **Orion Effluent Diffuser Design Optimization** – The preliminary design for the Orion discharge diffuser is located at a depth of approximately 8.25 meters of water along the Rio Uruguay shore and is not located in the deeper main river channel. While the modeling did not show any amount exceeding water quality criteria as result of the pulp mill discharges, sensitivity analyses indicate that water quality in a low-flow bay immediately downstream of the proposed Orion plant site is of potential concern and should be carefully monitored. The OSE raw water supply intake for Fray Bentos is located approximately 3 km downstream from the Orion site and located 70 m off shore across the mentioned small bay. As part of final design, diffuser enhancements to extend it further into the main channel could provide enhanced dispersion of the effluent. The diffuser discharge location along with location of the OSE water supply intake are possible improvements affecting water quality. If the OSE intake were moved upstream of the Orion discharge, provisions for use of the existing intake under flow reversal conditions in the river should be maintained. Use of a near field dispersion models such as CORMIX or PLUME

could be used in support of this evaluation. Alternatively, relocation of the diffuser to a location downstream of the small bay area, and the Fray Bentos potable water intake could also be considered. Feasibility studies with required effluent modeling would be needed to evaluate this alternative.

- **Future Discharge Mixing/Tracer/Modeling Studies** – Once the discharges are constructed and the pulp mills are in operation, discharge mixing and tracer studies should be performed to confirm effluent dispersion, mixing and dilution. The mixing and tracer studies should be performed under average flow, low flow and flow reversal conditions reviewed in this study. They should also be integrated with the collection of simultaneous water quality data for use in the development and calibration of an enhanced water quality model for the area. The enhanced model could be used to determine future wastewater treatment requirements and the potential impact of new discharges in the area of the projects.

4.6 Solid Wastes

Solid wastes generated from Kraft pulp mill operations generally consist of the following:

- Wood Preparation Waste – bark, sand, grit and other debris associated with wood handling and preparation.
- Raw Water Treatment Sludge – a mixed organic and inorganic materials resulting from the chemical treatment and filtration of water for use in the production process.
- Green Liquor Dregs, Grit and Lime Mud – primarily inorganic solids generated from the chemical recovery process. They consist of impurities from the wood or chemicals used in production that must be removed to prevent build up of inert materials and non-process chemicals.
- Effluent Treatment Sludge – generated from the primary and secondary treatment of effluent. Primary sludge is a combination of non-recoverable fiber from the pulp mill and inorganic materials that settling the primary clarifier. Secondary sludge is mostly excess organic biomass from biological wastewater treatment.
- Ash/Sands – generated from combustion of wood residues and sludges and can include solids from air pollution control systems.
- Municipal Solid Waste – generated from non-production processes such as offices, kitchens and building materials from construction and workshops activities.
- Hazardous waste – pulp mills generate an assortment of hazardous wastes in small quantities, including oily rags, waste from spillage containment of chemicals and fuel, and used containers, among others.

A summary of the quantities of waste projected to be generated and the proposed management methods for the Orion and CBM projects are summarized in the following Table 4.8. A schematic diagram of wastes management practices in the proposed pulp mills is presented in Figure 4.3. The location of each project's landfill is presented in Figure 4.4

Table 4.8 - Solid Waste Generation and Management Summary

WASTE	ORION		CMB	
	QUANTITY	MANAGEMENT/DISPOSAL	QUANTITY	MANAGEMENT/DISPOSAL
	Tons/year		Tons/year	
Solid Waste				
- Domestic	3,500	Municipal Landfill	2,000	Municipal Landfill
a - Primary Sludge	6,000	Plantations/Compost	--	Bark Boiler
- Biological Sludge	--	Recovery Boiler	--	Bark Boiler
- Dregs	30,000	Industrial Landfill/Future Recycle	16,000	Industrial Landfill
- Grit	6,000	Industrial Landfill/Future Recycle	960	Industrial Landfill
- Lime Mud	4,000	Industrial Landfill/Future Recycle	800	Industrial Landfill
- Water Treatment Sludge	9,000	Industrial Landfill/Future Recycle	960	Effluent Treatment/Bark Boiler
- Boiler Sand/Ash	--	--	5760	Industrial Landfill
- Wood Yard, Bark, Ashes	8,000	Plantations/Compost	--	Bark Boiler
- Other	1,000	Plantations/Compost	--	--
Total Solid Waste	64,000		23,250	
Hazardous Waste	100-150	Off-site Disposal Facility per Approved Plan	80-100	Off-site Disposal Facility per Approved Plan

Figure 4.3 - Schematic Diagram of Waste Management in Pulp Mills

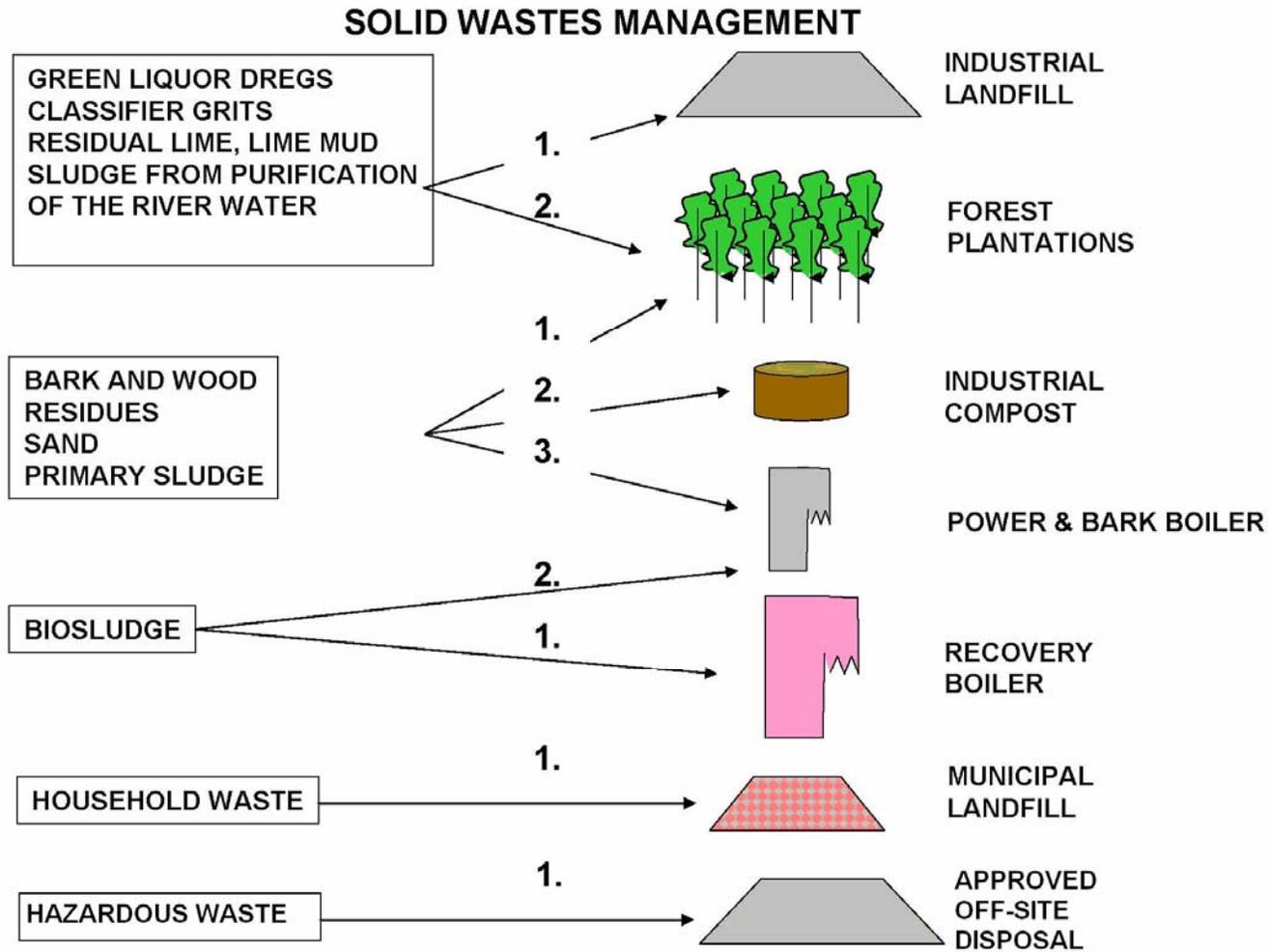
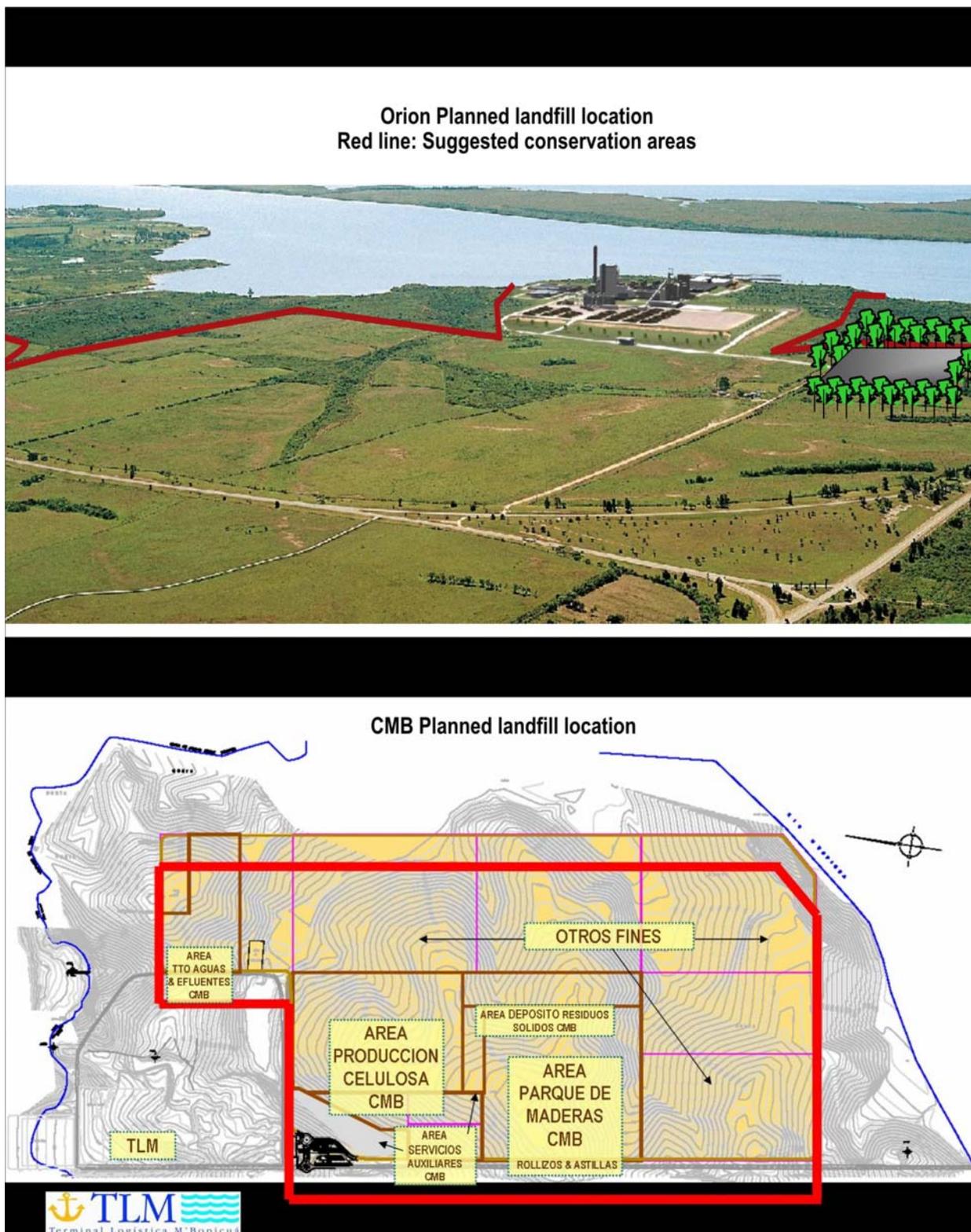


Figure 4.4 - Landfill Locations, Orion, CMB



4.6.1 Landfill Development

Both projects propose to construct on-site landfills for disposal of solid waste. The preliminary basis of design is as follows in Table 4.9.

Table 4.9 - Landfill Design Characteristics of the Orion and CMB Pulp Mills

Item	Orion*	CMB
Height (m)	20/10	5
Length	285/350	700
Width	165,290	100
Surface area (m2)	81,000/125,000	70,000
Volume (m3)	1,000,000	361,000
Capacity (years)	-	13

(*) Two alternative landfill configurations have been presented. Landfill capacity will be dependent on the quantity of wastes that is recyclable.

In general, both landfill designs will consist of the following:

- A low permeability soil or geocomposite bentonite liner over the compacted subgrade;
- An impermeable geomembrane (plastic) liner; and
- A leachate collection system consisting of high permeability material and perforated plastic piping

Both landfills would be located on their respective plant sites, which would minimize off-site truck traffic and provide for adequate landfill security and control. It will also allow collected leachate to be readily transferred to their respective effluent treatment facilities.

In case organic waste is stored, passive landfill gas venting systems would be installed to allow decomposition gases to vent to the atmosphere and avoid potential subsurface migration. Alternatively, these gases could be collected for combustion. After the landfills have reached their final grade, they would be covered with a low permeability barrier and soil suitable for revegetation.

4.6.2 Potential Impacts of Non-Hazardous Materials

Landfill installations may produce a number of impacts if they are not properly designed and operated, particularly in relation to leachate contamination. However, both landfill designs are consistent with state of the art practice for these types of non-hazardous wastes landfills. The landfills are designed to minimize potential environmental impacts to groundwater or adjacent surface waters. Both companies will ensure that their facilities are located in areas with suitable geology and soils, and include careful construction techniques and monitoring of the placement of the low permeability soil and geomembrane layer, to avoid potential leachate releases to the environment. They will include groundwater monitoring systems consisting of a network of upgradient and downgradient wells to monitor potential impacts and implement corrective actions as appropriate. They will also make provisions to inspect, weigh and record each load of wastes to verify waste generation rates and determine if corrective measure are required.

4.6.3 Hazardous Waste Generation

Hazardous wastes generated at the facilities will consist of a variety of materials including but not limited to small quantities of used oils, solvents, detergents/cleaning compounds, certain building and maintenance chemicals, fluorescent light bulbs, and laboratory wastes. Orion has estimated that 100 to 150 tons of hazardous materials will be generated on an annual basis. CMB has not yet provided an estimate, but their quantities are expected to be proportional to those of Orion.

Both projects will transport these wastes to an appropriate off-site hazardous waste management facility. However, at this time, only limited facilities exist in Uruguay for the management of these types of materials. Orion has indicated that they would export these materials in appropriate containment to a suitable facility in another country if necessary. Ultimately the location and management plan for these materials must be submitted and approved by DINAMA. While the quantities of hazardous wastes generated by these facilities is not large compared to other industries, these projects could be used as basis for Uruguay to develop appropriate management, transport and disposal guidelines, and future in-country facilities.

4.6.4 Potential Impacts of Hazardous Materials

Hazardous materials may produce soil and water contamination if they are not properly handled. Both companies have adequate plans for off-site government approved disposal of hazardous wastes. Given that the production of these materials is small and their characteristics are relatively benign, these wastes can be stored in a contained, lined area, until they can be sent to a government-approved disposal site.

4.6.5 Cumulative Impacts

No cumulative impacts, beyond the simple additive nature of the two facilities at the two sites in an area where there are none now, are expected from the management and disposal of solid wastes. Solids wastes transport and the activities around each landfill are restricted to the plant site. Landfill design and construction are secure in terms of avoiding possible leakages of leachate to the soil or rainfalls drains to the surface waters. No impacts on aquifers, including the Guarani Aquifer, are expected.

No cumulative impacts are expected from the management and disposal of hazardous wastes. Hazardous materials are small in quantity and can be readily handled in basic containment facilities using standard international procedures. These two pulp plants are the first large industrial operations of their type in the country, and their development could stimulate third parties, including the responsible government agencies, as well as the project proponents to start formal planning for this type of broader waste management issue on a regional, national or bi-national basis.

4.7 Social and Economic Aspects

There is expected to be a significant increase in local employment opportunities – both direct and indirect – during the construction of the two plants and their subsequent operations. As a result, there is likely to be an influx of job seekers into the department of Rio Negro. The socio-economic impacts of the two projects have been considered from the perspective of direct and indirect effects on the regional and national economy as well as on social services and quality of

life in the vicinity of the two plants. Finally, the impact of the projects on populations who depend on natural resources for their livelihoods has also been considered.

4.7.1 Economic Impacts

Different methodologies, prices and time periods were used by the consultants engaged by Orion and CMB to examine the macroeconomic impacts of the pulp mills.¹⁰ The resulting cumulative impacts include some adjustments to reconcile these approaches. The economic impacts discussed below combine three types of impacts:

- Direct Impacts – activities of the construction sector in building the pulp mills and carrying out all related work
- Indirect Impacts – activities of all other sectors directly related to building the plants and carrying out all related work and providing services to the mills and its employees (e.g., manufacturing, energy, construction, transport, food, lodging, etc.).
- Induced Impacts – activities induced by increases in consumption and investment as a result of the construction of the plants (i.e., the multiplier effect of direct or indirect earnings on wider economy).

A detailed evaluation of these impacts during both the construction and operation phases of both plants as well as a description of the methodology used in estimating these values are presented in Annex E.

The cumulative impacts of the two projects on the national and regional economy and on employment, as illustrated in Table 4.10, are likely to be considerable, in terms of economic performance, employment, balance of trade and tax revenue.

¹⁰HCG Environment Consultants , “Socio-Economic Study of the Impacts of the Botnia Pulp Mill Project” (Spanish version May 2004, English translation June 2004); Tea, Deloitte, Touche, “Economic Impact Study of the M’Bopicuá Pulp Mill (CMB),” (November 2003); Tea, Deloitte, Touche, “Update of the Economic Impact Study of the M’Bopicuá Pulp Mill (CMB)” (January 2005); ENCE, “Feasibility Study, M’Bopicuá Pulp Mill Project” (2004); *Handbook of Input-Output Table Compilation and Analysis* (New York: United Nations, 1999).

Table 4.10 – Cumulative Economic and Employment Impact for the Orion and CMB Pulp Mills

Impact	Region	Unit	Construction Phase (2005-2007)	Operational Phase (Typical Year)
Economic	Uruguay	USD Millions	417 (3.2% of 2004 GDP)	331 (2.5% of 2004 GDP)
Economic	Rio Negro	USD Millions	206 (112% of 2003 GDP)	223 (121% of 2003 GDP)
Economic	Soriano	USD Millions	33 (14% of 2003 GDP)	13 (6% of 2003 GDP)
Economic	Paysandú	USD Millions	41 (13% of 2003 GDP)	23 (7% of 2003 GDP)
Employment	Uruguay	Person-Years	18,699 (1.4% of 2004 Total)	12,593 (0.9% of 2004 Total)
Employment	Rio Negro	Person-Years	11,196 (109% of labor force)	4,773 (47% of labor force)
Employment	Soriano	Person-Years	1,337 (6% of labor force)	1,108 (5% of labor force)
Employment	Paysandú	Person-Years	2,421 (8% of labor force)	2,048 (7% of labor force)
Balance of Trade	Uruguay	USD Millions	- 1,100 (Similar to “normal” annual average)	+244 (Approx. 22% of “normal” trade deficit)
Government Revenues	Uruguay	USD Millions	+83 (2% of 2004 revenues)	+39 (1% of 2004 revenues)
Government Revenues	Rio Negro	USD Millions	-1.8 (19% of 2004 revenues)	+0.9 (10% of 2004 revenues)

Economic Performance – The economic impact of the two projects will be equivalent in value to about 3.2% of Uruguay’s 2004 GDP over the full three years of the construction phase and about 2.5% of 2004 GDP in each year of full capacity production (approximately 40 years for each plant). The impact on the country’s Gross National Product (GNP) is estimated to be 2.8% for the entire three year construction period and 1.5% for the years in which the plants are operating at full capacity. The Department of Rio Negro will receive the larger part of the impacts, equivalent to more than the entire gross departmental product in 2003 for the construction phase and for each year of full capacity production during the operational phase. The economic impacts will still be significant, though less, for the neighboring departments of Soriano and Paysandú.

Employment – The employment impacts will also be significant, accounting for an increase in the equivalent of 1.3% of the 2004 national labor force over the three years of the construction phase and equivalent to slightly less than 1% of the 2004 national labor force during each year of full capacity production. As Table 4.9 above indicates, Rio Negro would receive the largest employment impact, being equivalent to about 143% of its 2004 labor force over the construction period and 47% of the labor force during each year of full capacity production. However, current residents of Rio Negro would not be able to take full advantage of much of this expected job creation, as unemployment is currently reported at less than 600 persons. It can be expected that persons of working age not in the labor force will enter the labor force and the prospects of increased employment in the department will encourage migration from other parts of the country and day commuters from neighboring departments. The employment impact on

Soriano and Paysandú, while not as large as that for Rio Negro, will be important as both of those departments have a significant amount of unemployment. Table 4.11 illustrates the estimated employment that will be generated by the construction and operations phase of the two projects. Estimates of employment generated during construction phase are cumulative for a period of three years. Estimates for employment generated during operation phase are for one year of full operation. Only direct and indirect employment estimates are considered.

Table 4.11 – Estimated Employment Generated during the Construction and Operations Phases of both Pulp Mills (person years of full time employment)

	Construction Phase			Operations Phase		
	Orion	CMB	Total	Orion	CMB	Total
Direct	4,200	2,122	6,322	300	300	600
Indirect	5,710	2,885	8,595	3,976	2,094	6,070
Total	9,910	5,007	14,917	4,276	2,394	6,670

Balance of Trade – During the construction phase there will be a negative effect on the trade balance, approximately equivalent to the annual deficit registered during the “normal” years prior to the onset of the Argentine fiscal crisis in 2001-2002, at which time imports fell drastically. However, during the years of full capacity production of the pulp mills the positive trade flow generated by sales of pulp, less negative trade flows of reduced overseas log sales and imported inputs for the pulp mills, will offset about 22% of the “normal” trade deficit.

Revenues – Central Government revenues should total the equivalent of about 2% of 2004 revenues for the construction phase and for each year of full capacity production of the pulp mills should contribute slightly less than the equivalent of 1% of 2004 revenues. Incremental expenditures incurred to support the establishment of the pulp mills by the departmental government of Rio Negro total about USD 1.8 million, equivalent to about 19% of 2004 revenues. When the pulp mills are at full production it is estimated that about USD 916,000 will be collected annually by the Government of Rio Negro as additional revenue, equivalent to about 10% of 2004 revenues.

4.7.2 Potential Impacts of Labor Influx

The direct social impact in the construction phase of the pulp mill projects will be the influx of persons, primarily to Fray Bentos and its environs, attracted by the opportunities for employment. The actual scope of this influx is difficult to predict for a number of reasons, including the following:

- The extent to which the employed, underemployed or unemployed population living within commuting distance of the proposed projects – including both Uruguayan and Argentine population centers – will seek and obtain employment during construction is unknown;
- The extent to which non-local construction workers will migrate to the area in search of employment is unknown and is, in part, dependent on employment opportunities

with the pulp mill construction as well as other construction employment in the greater region;

- The capacity of contractors to provide, provide for, and manage their own labor force will vary from contractor to contractor.
- The extent to which the sequence of construction at both plant sites overlaps so that construction workers complete tasks at one site and move to the next depends on a wide variety of factors including project financing and manufacturing equipment delivery.

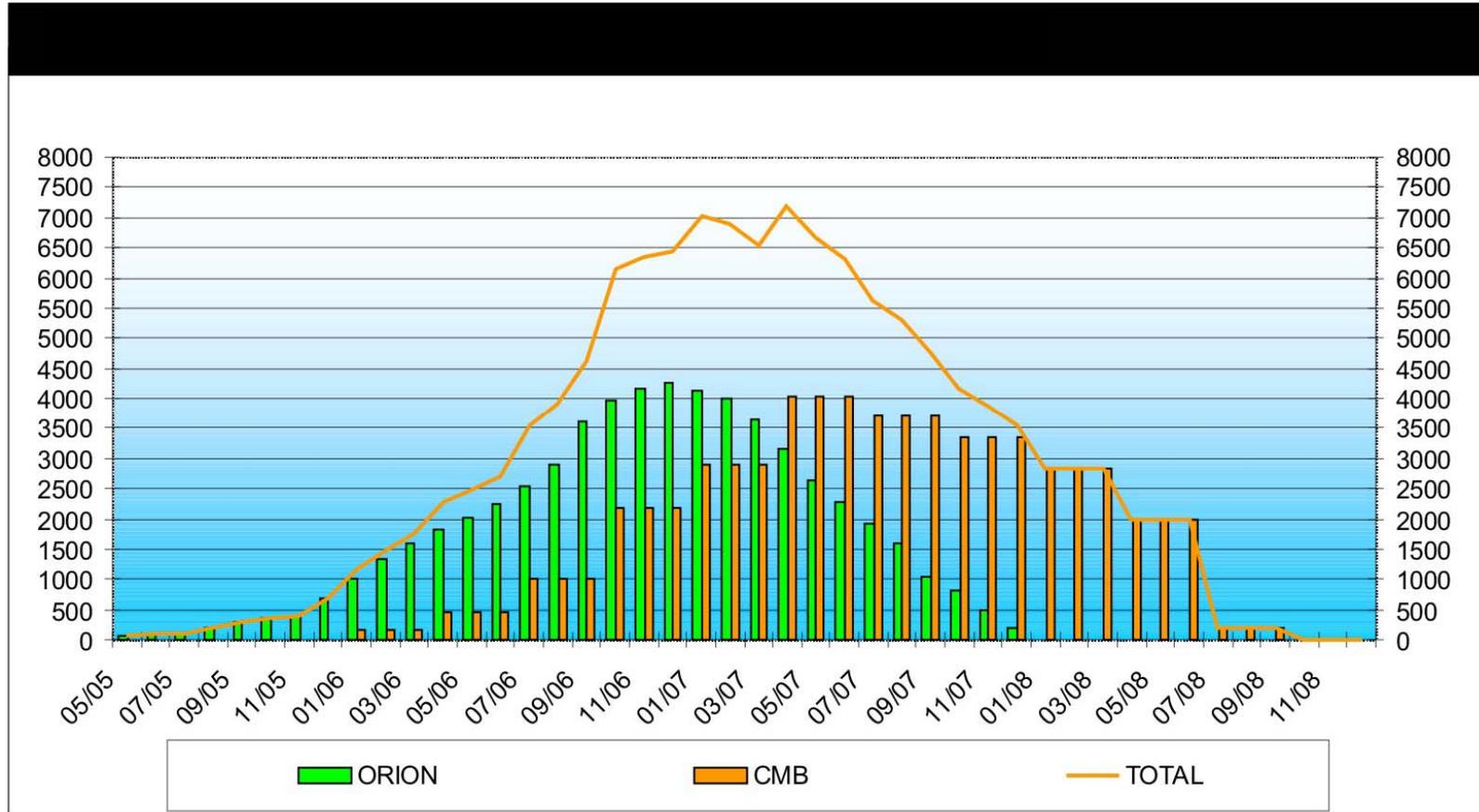
Figure 4.5 illustrates the estimated timing and volume of labor requirements for each project separately and for the projects combined. Both projects are expected to require 4,000 or more workers during their peak construction periods. However, the closer the project construction schedules coincide, the more intensive the requirements for workers will be. As Figure 4.5 indicates, the labor requirements of both projects combined could peak at over 7,000 workers.

The increase in population during the three to four years required to construct both plants will be heavily weighted towards men, and in particular younger men. A Social Assessment report commissioned for the preparation of the CIS considers the potential impacts of this scale of labor influx to the area and outlines efforts proposed by both project companies to manage the impacts of that influx. These are summarized in the following paragraphs and the full Social Assessment report is attached as Annex F.

Anecdotal evidence suggests that the influx of workers will not be long-lived. The experience of large construction projects in Uruguay such as the Salto Dam and the San Martin International Bridge indicates that the migrant workforce disperses from the construction zone, perhaps to other projects in the region, back to their homes or, to some extent integrate into the local population.

Nonetheless, an analysis of the regional social profile, especially of the economically active population, indicates that there is insufficient working age population to meet the labor requirements of plant construction in Fray Bentos and other population centers in the departments of Soriano, Rio Negro and Paysandú. Both skilled and unskilled workers will be recruited from throughout the region, including Argentina and Brazil. As a result, there will be increased demand on social services to cope with the increase in population, particularly in the areas of housing, health, public safety, education, transport as well as recreation and cultural activities. The major impact will be on the social services provided in the city of Fray Bentos. The specific impacts will depend on the numbers of local and commuting workers relative to non-local residents that that will occupy the positions created during the three to four years of the construction phase. There will also be associated impacts of population increase associated with ancillary economic activities that develop as the economy of the area grows.

Figure 4.5 - Estimation of Cumulative Impact on Required Manpower During Construction



Employment Training – Training of the local workforce for skilled and semi-skilled jobs will be an important means of regulating and managing the impacts of migrant workers. To maximize local employment generation, both companies have established agreements with the Ministry of Labor and Social Security and the National Employment Board to establish skills training courses to qualified trainees. However, the level of qualification of local workers and trainees as well as the desire for employment will limit the numbers of applicants for jobs during both the construction and operation phases of the projects. The timing and scope of construction schedules will demand additional labor force recruited from throughout the region.

Housing – The arrival of a large number of non-resident migrant workers will result in a substantial increase in the demand for housing, with the present available supply being quickly occupied and with an overflow into Mercedes which is within daily commuting distance of the plants. The cost of rental properties will increase, mainly in Fray Bentos and neighbouring areas. It is possible that, in order to satisfy housing demand, workers will congregate in temporary settlements in and around the city.

To address these impacts, Botnia, in coordination with the Land Management Unit of the Municipality of Río Negro, is constructing low cost housing to accommodate workers unaccompanied by families as well as suitable housing for its higher level employees. ENCE, has acquired land for the construction of housing for its technical and administrative staff. The Land Management Unit of the Municipality of Río Negro is coordinating with the National Directory of Land Use (DINOT), to plan for the expansion of urban areas, taking advantage of those areas, primarily in Fray Bentos, already having basic services and infrastructure.

During plant operations, there will likely be a reduction in overall housing demand and a corresponding reduction in the cost of renting. However, for more expensive properties there could be an increase in demand owing to demand by high level operational administrators, technicians and skilled labor involved in operation of the plants and of new enterprises supplying the pulp plants.

Public Health, Safety and Security – There will be an increase in demand for health services at all levels, particularly in Fray Bentos and its vicinity. Private health care will be needed for the workers in the plants, and their families, and for those employed in related activities. An increase in public health services will be required for those who cannot afford private health care; for example for families of workers with low levels of remuneration, itinerant workers and others, who might not be able to join the labor market and who have limited financial means.

Both Botnia and ENCE employ health specialists on their staff and have management plans to handle health risks and to prevent industrial accidents. Botnia has an agreement with the Ministry of Public Health (MSP) for 24 hour coverage inside its plants. ENCE has a system to attend emergencies within its construction site. The MSP is working out a strategy to attend to the increased demand for health care, including additional emergency facilities at the Fray Bentos Hospital, together with equipment to permit rapid diagnosis of serious multiple injuries and arrangements with neighbouring departments for rapid movement of patients. The MSP is putting into effect public health awareness and education campaigns to prevent and monitor any possible adverse health effects during the construction and operation phases of the plants including HIV/AIDS and sexually transmitted disease. Private health cooperatives in the various regional centers are planning a system of mutual cooperation.

The mitigation measures for the operational phase include sustaining and adapting those measures proposed for the construction phase so that they address the necessities of plant operations, e.g., issues of health, preventing industrial accidents and sustaining the safe and effective movement of people and freight by road.

Both companies have developed plans for coordination with local police to restrict and manage the influx of job-seekers and maintain public order during the construction phase of their plants. Similar arrangements have been made with the Fray Bentos fire brigade to enhance responsiveness to fires and other emergencies.

Education – There will be an increase in the demand for public and private primary and secondary education; the former mostly for the children of construction workers and the itinerant population; the latter for children of technical and management personnel. The amount of educational support required will depend on the characteristics of the incoming population and whether they are accompanied by their families.

Both companies have made arrangements with private educational institutions to provide schooling for the children of plant workers. The demand for private education in the area of influence will not fall with the reduction in employment, but rather is more likely to rise with the influx of more highly educated personnel involved in the operational phase of the plants. This demand will cover pre-school, primary and secondary levels.

Quality of Life – There will likely be changes in the quality of life for the population in the projects' area of influence, and most notably in Fray Bentos and in the surrounding area. The pace of life will increase with the influx of outsiders into the area, there will be an increase in traffic, with its attendant increase in noise and an increase in tourist and commercial activities. There will be greater demand for and supply of cultural and recreation events and activities. With the increasing population, it can be expected that there will be a rise in incidents of anti-social behaviour and in crime.

The Department of Río Negro is working on a plan to satisfy the demand for increased recreational and cultural activities, taking advantage of local facilities and professionals in the fields of music, theater and motion pictures. There is also a plan to reinforce the local police and for the elaboration of a plan to improve the security of the citizenry through the prevention of increases in the crime rate, and acts against property and persons. The companies are implanting strategies for communicating with the public through workshops and talks, enabling the residents of the area to ask questions or articulate their worries with regard to noise or other subjects related to the construction of the plants.

With the influx of population associated with both direct and indirect employment related to the pulp mill projects, there will likely be a temporary increase in the cost of goods and services. This increase will affect local residents living on fixed incomes or below the poverty line. However, local wages are expected to increase for the working population. These inflationary pressures are expected to be short-lived as the impact of the construction "boom" on the local economy passes and prices for goods and services fall.

4.7.3 Impacts on Natural Resource-Based Livelihoods

Tourism, apiculture and fishing are the principal natural resource-based activities in the area of the pulp mills. By far, tourism is the most significant and the sector is described in section 4.8.

There are an estimated 1,415 beekeepers in the Soriano, Rio Negro and Paysandú departments and another 700 in the area surrounding Gualaguaychú. A number of beekeepers are organized into cooperatives, which facilitate the marketing and sale of honey. The production of honey is generally complementary to other agricultural activities, including plantation forestry, and is for the majority a part-time activity. However, the production of honey in Gualaguaychú is reported to generate USD 4 million annually in export earnings. Because of the process controls planned for pulp manufacturing at both plants, air emissions from the plants will be well below concentrations which are known to have any effect on physiology or behavior of the bees, and as a result there should be no measurable impact on the area's apiculture. Also, there are no known cases where these transient and low levels odors have been picked up and accumulated in the honey.

The active river fishing population is estimated at 126 persons in the Uruguayan area of project influence departments and another 50 persons on the opposite bank of the Rio Uruguay. There appears to be an active sport-fishing enterprise on the local waters as well. Like beekeeping, fishing is for many a part-time activity although there are a number of subsistence fishermen who work the waters of the Rio Gualaguaychú and Rio Uruguay. These numbers may double during the April/May "season" during which fish catches using both active and passive techniques (e.g., weirs, nets and lines) range between 250 kg and 300 kg per day. Most of the fish catch is sold on the local market but some is sold to commercial buyers from outside the area, including Brazil. As with process controls for air emissions, wastewater discharges will be treated to levels that will have no impact on aquatic life, and will be rapidly diluted to undetectable levels in the river. As a result, they will have no impact on the riverine fisheries.

4.8 Tourism

Tourism is well established in and around the area of the pulp mills. In Uruguay, the riverside beach at Balneario Las Cañas in the Rio Negro Department, and hot springs to the north of Paysandú province attracted more than 80,000 visitors in 2004 during the peak summer months of January to March. Sports activities and cultural tourism in both Fray Bentos and Mercedes also attract many visitors but they are significantly less popular than the above.

Approximately 80% of the tourists visiting Rio Negro, Soriano and Paysandú departments originate in Argentina according to the Directorate of Tourism of the IMRN, particularly from the federal capital and the greater Buenos Aires area. The majority of tourists make their main destination Balneario Las Cañas on the Rio Uruguay to enjoy sunbathing and water sports. This destination is visited mostly in the summer, but it is also popular during Argentine national holidays, and long weekends.

According to a study of tourism in the Fray Bentos area approximately one quarter of the workforce in the city of Fray Bentos is involved in tourist activities.

Figure 4.6 - Fray Bentos: main plaza and old meat packing plant



Gualequaychú in Argentina is also an important center of tourist activity, particularly in the summer months of January, February and the first half of March. The main tourist attraction is the Carnival (in 2005 some 200,000 adult tickets were reported to have been sold), which supports approximately 1,500 families (Secretariat of Tourism of the Municipality). The Carnival complements the water sports and camping activities of weekend visitors and vacationers who largely originate in the Buenos Aires area. There are 12 beach camping grounds in the Gualequaychú department. The majority of these are on the Gualequaychú River, but the most popular area is Ñandubaysal on the Rio Uruguay. In recent years, the Municipality of Gualequaychú has begun to explore opportunities to increase and maintain tourist visits year-round, including further investment in spas, an automobile race track, a convention center, a thematic casino (during Carnival), nautical clubs, and protected natural areas.

There are several ways in which any industrial establishment (such as a pulp mill) could potentially affect the tourism sector in its area. These include:

- pollution of air and water during regular operation and during accidents, which negatively affects the environment within which tourist activities take place;
- effects of associated industrial facilities and activities (e.g., road, river and port traffic), which may be negative;
- visual effects, which distract from enjoyment of other tourist activities;
- negative press resulting from controversy associated with an industrial establishment that discourages tourist visits;
- direct positive impacts through actions of the industry to support development and operation of tourism and recreation infrastructure, sites or events, as part of its corporate role in the community; and,

- indirect positive impacts of the presence of the industry, which contributes to general economic development in the area and may lead to an increase in the number and quality of facilities such as restaurants and accommodation, which also serve tourists.

These potential impacts have been considered in the EIAs for the two pulp mills, particularly for the Orion mill which is closest to Fray Bentos and within view of the main beach area of Ñandubaysal on the Argentine side of the Rio Uruguay. These are reviewed below, with particular attention to the existence of any cumulative impacts of the two plants.

4.8.1 Direct pollution impacts

Computer modeling of air emissions, carried out for the individual EIAs and for this cumulative impacts study, indicates that there will be no significant impacts on air quality in the region. Odor is the main air quality parameter of concern with regard to tourism. However, both plants have included advanced technology to capture and eliminate these odors¹¹, and therefore odor, even at the plant boundary, will usually be below accepted odor thresholds (i.e., the level at which most people would be able to detect an odor) under most normal operating conditions. However, during the initial commissioning periods of both plants, it is expected that there will be some detectable odor in the vicinity of the plants and out to 5 to 10 km distance. This will occur over the first 3 to 4 months of plant operation. Once the plants are in full operational mode, there will also be both regular and unplanned startups and shutdowns of all or parts of the process, and these events also may result in some odors being released. These will usually be restricted to the vicinity of the mill but may occasionally extend out to 10 km. These odor events are expected to be infrequent and of very short duration. Under most circumstances, odor is predicted to be below detection limits in Gualeguaychú and Ñandubaysal, which are the focal areas for tourism in Argentina. There should therefore be no significant impact on tourism in these areas from odor, cumulative or otherwise (see Section 4.4 and Annex C for further details on the air quality study).

Wastewater from the two plants is treated to levels at which it poses no direct threat to aquatic life or recreational use of the river, and it is further diluted to undetectable levels within a short distance of the point of discharge. More detailed computer modeling, performed for this cumulative impact study, confirms the rapid dilution of the treated waste to undetectable levels, and this is true when both outfalls are considered together as well as separately. Even under the worst case scenarios, including rare events of upstream flow, there is no significant cumulative impact. The modeling also indicates that these effluent plumes remain close to the Uruguay shore and never at any time affect the Argentine side of the river.

Botnia has proposed providing treatment for the Fray Bentos municipal sewage effluent in the Orion mill wastewater treatment plant. This would result in more complete treatment of municipal wastes, along with eliminating the present downstream discharge that currently impacts water quality in the Las Cañas area. If this proposal is implemented, Fray Bentos would benefit from an enhanced public service and improved water quality downstream of the town, thus improving the water quality of the Las Cañas area.

¹¹ Atmospheric emissions treatment systems, including incineration of Total Reduced Sulfur, electrostatic precipitation for dust abatement and stack scrubbers to control SO₂ and Volatile Organic Compounds will be installed at both plants.

The event of a serious industrial accident at either or both plants during operation is highly unlikely as appropriate measures have been taken to prevent spills of chemical products, fires, contaminating emissions, etc. Because the plants are designed with the most advanced technologies, they do not include storage of large quantities of hazardous chemicals that would be a threat to the environment if there were an industrial accident. The worst case scenario for an industrial accident at the pulp mill would be an explosion of the recovery boiler. Its harmful consequences would be limited, like any boiler accident, to within a few dozens of meters of the boiler – in other words, within the project site – and would result in an immediate shutdown of the plant until the recovery boiler could be rebuilt.

4.8.2 Associated impacts

Related facilities and activities of the plants were also reviewed for their potential cumulative impacts on tourism. Truck transport (mostly of logs) in the plantation areas and on the roads leading to both plants is expected to increase. This will result in some cumulative impacts of traffic congestion at some intersections, and to the extent that this happens in the Fray Bentos area it may have some impact on tourist traffic in this area. This cumulative impact is considered to be low and relatively localized.

Barge traffic on the river will increase only slightly from present volumes with the operations of the plants. Currently roundwood and wood chips are shipped down river. Roundwood and chip exports will be replaced by pulp and returning vessels will transport chemicals and other raw materials used in the pulping process. This change is not predicted to have any cumulative impact on tourism.

The increase in forest plantation area is discussed further in section 4.2 of this report. This is not expected to have any negative impact on tourism, and in the longer term may increase the attractiveness of the area as habitat diversity increases and the nature reserves established by the two projects become recognized tourist sites.

4.8.3 Visual impacts

The Orion plant will be a visible new feature in the landscape, especially for tourist traffic crossing the international bridge en route to Las Cañas and other tourist destinations in Uruguay. The CMB plant will also be visible from the bridge, but further away and less of a visual presence. Reaction of tourists to these new industrial features will be very subjective. However, it is unlikely, that the sight of the plants will discourage tourists from continuing on to Fray Bentos, Las Cañas or other locations in the region.

Figure 4.7 - Simulated view of the Orion plant from Ubici Beach near Fray Bentos



The Orion plant will not be visible from Fray Bentos, except from the eastern end of the city, and particularly the beach at Ubici, which directly faces the plant. Figure 4.7 presents a photo from Ubici Beach with the plant superimposed on it. The plant will be clearly visible, and this may affect the desirability of use of this beach for some people. As noted above, there should be no significant impact on air or water quality from plant emissions.

Figure 4.8 - View from Ñandubaysal beach with the simulated Orion plant superimposed on the background



From Ñandubaysal, the Orion plant will be slightly visible on the horizon, adjacent to the San Martin International Bridge (Figure 4.8). From this location, the plant is not a dominant visual presence, any more than the existing building in Fray Bentos itself. There should be no

impairment of tourist use of this beach due to the presence of the Orion plant. The plants will not be visible from Gualequaychú, or from Las Cañas.

It should be noted that steam from the boiler stack is an important component of the stack emissions from the pulp mills. When air temperatures are above 25°C, the plume from the stack of a correctly operating pulp mill will be almost always invisible. However, when air temperatures drop below about 20°C, i.e., during winter months when recreational use is lower, the steam in the stack emissions will quickly condense and the plume will be visible.

4.8.4 Adverse social climate

The controversy over these pulp mills may have a negative effect on tourism in the area, since negative press about this industrial development may discourage tourists from even considering visiting the area. It is difficult to determine if this would be a significant impact or not. If the protest over the plants subsides, there may be no long term effect.

4.8.5 Indirect positive impacts

Through their presence in this area, the plants will indirectly lead to further economic development. This may result in encouragement of service industries and other industrial development in the forest products sector. This general economic development will include support facilities such as restaurants, hotels and related facilities which also serve tourists, and further contribute to making the area a more attractive tourist destination.

4.8.6 Mitigation

Mitigation measures for cumulative impacts during the operational phase include management of emissions and water discharges, and emergency preparedness and response, which both companies have already included in their respective action plans. A public consultation and communication campaign will also be necessary to dispel unsubstantiated fears and concerns from the public.

To provide support to this important sector, the Directorate of Tourism of the Department of Río Negro is looking at ways to expand the availability of tourist sites in the area, for example by promoting a 'forest route' that includes a visit to eucalyptus plantations and the pulp mills.

For mitigation of visual impacts, the plants should consider vegetation buffer zones to shield the plants from view. This may be particularly useful for the Orion plant, to shield it from view from Ubici Beach and Fray Bentos. Both plants should also carefully consider the need for external lighting of their plants at night, as proper shielding of lights can help to make the plant less visible from a distance, and would make it less obtrusive from Ñandubaysal. The plants' main stacks can also be appropriately painted to make them blend into the sky and reduce the visual impact, but they would need to be equipped with strobe lights that operate even during daylight hours to ensure aviation safety.

4.9 Transportation

The transportation network in Western Uruguay will be impacted by construction and operation of the Orion and CMB pulp mills (see Fig. 4.9). The system will have two directional flows: wood and other supplies delivered to the mills by truck or barge or ship via the Rio Uruguay. The pulp production from the two mills will be exported by barge from the Orion mill to Nueva

Palmira for trans-shipment and ocean going vessels by CMB from M'Bopícuá Port. Under the current operating plans these are the main modes of transport that will be used but there are other alternatives, such as part of the CMB pulp may be trucked or barged to other loading points because of operating depth restrictions at CMB's Port of M'Bopícuá. The procedure for wood chip exports from M'Bopícuá Port currently is to load the ocean going vessel approximately 50%, and top-off in Montevideo where Eufores/ENCE have built an additional wood chipping plant.

Figure 4.9 – Transport Network Map

IBRD 34385



4.9.1 Cumulative Impacts on the Rio Uruguay

Table 4.12 below illustrates the estimated increase in river traffic expected as a result of pulp mill operations. This projected increase represents only an additional 34% in traffic volume (i.e., 647 vessels per year.) over current rates because the wood chip cargo currently being barged downstream from MTL and Fray Bentos to Nueva Palmira and Montevideo will be replaced by pulp.

Table 4.12 – Current and Projected Increase of Vessels on Rio Uruguay

Vessel Type	Current Traffic 2004	Projected Traffic
Ocean going vessels navigating Rio Uruguay	240 per year	No significant increase
Barges	1,925 per year	
Barges importing raw materials to pulp mills*	-	220 per year
Barges exporting pulp to Nueva Palmira & Montevideo	-	427 per year

To export its pulp production, the Orion mill will require 333 barges per year, each carrying 3,000 tons per barge, or an average of one round trip barge voyage per day increase to current levels of barge traffic (i.e., 5.3 per day). Orion estimates another 150 barge trips per year will be required to deliver chemicals and raw materials to the plant.

The CMB project will maintain ocean going vessels from the M'Bopícuá Port for export of pulp. Currently, these 50,000 ton capacity vessels are being used for export of wood chips to Nueva Palmira and into the Rio de la Plata. CMB plans to partially load vessels at M'Bopícuá and top off in Montevideo. This process will not generate a significant amount of additional large ship traffic in the river from M'Bopícuá to Nueva Palmira. The balance of CMB pulp would have to be moved from CMB to Montevideo, by barge, truck or rail (if the rail system is renovated and upgraded). If 3,000 ton barges are used, CMB would require 84 barges per year.

CMB may utilize large vessels returning for pulp loading to deliver these supplies but a conservative estimate of 70 additional barges per year has been made for the purpose of river traffic projections.

Thus, the operations of the two mills could result in a maximum of 647 additional barge trips per year on the Rio Uruguay up to M'Bopícuá. This level of traffic would add an additional 1.8 barge trips per day to the existing 5.3 trips per day.

The above analysis suggests that the increase in river traffic when compared to current traffic in 2004 will not be significant because the pulp export traffic will replace the current logs and wood chip volumes being exported or moved in river transport. Therefore the incremental increase will be less than the total volume of ships and barges required for the export of the pulp produced. Similar to the road traffic analysis, if the two pulp mills were not built (the "no project" alternative) then the logs and wood chip exports in the near future would continue increasing, also requiring more ships and barge traffic to occur in the river.

4.9.2 Cumulative Impact on Road Network

The road network in the project area of influence will be impacted during both the construction and the operation of the mills. Cumulative impacts on the road network during construction will occur for a period of about six months between mid-2006 and mid-2007 when the construction activities of both plants overlap (Figure 4.5). These impacts – including a potential increase in road accidents, an increase vehicular emissions and increased demands for road maintenance – will be greatest in the immediate vicinity of each plant. Both companies are developing management plans for road transportation in collaboration with the administration of the department of Rio Negro.

The approximate cumulative impact of truck traffic on the local road network resulting from the operation of both the Orion and CMB pulp plants is summarized in Table 4.13.

Table 4.13 - Cumulative Impact of Pulp Mill Operations on Local Road Network (Logging trucks per day)

	Current traffic	Total Estimated Traffic without Pulp Mills	Total Estimated Traffic with Pulp Mills
Route 24 from Paysandú to Junction of Route 2	137	274	580
Route 2 between San Martin Int'l Bridge and Mercedes	245	No data	336

At full capacity of 1.0 million TPY of pulp production, the Orion mill will require 3.5 million m³ of pulpwood per year.¹² The delivery of round wood to the mill will require approximately 512 daily return trips by truck on an annual basis between the mill and the surrounding forest plantations. The CMB mill at full capacity will consume 1.7 million m³ per year requiring approximately 160 return trips by truck per day. These numbers imply a significant increase in truck traffic particularly on Highway 2 between the access road to CMB and the junction with the international bridge (see Figure 4.9). There is a potential for congestion in this area, particularly at intersections. Even in the absence of the pulp mill projects, there is still expected to be increased traffic in the area due to potential increases in transport of wood as well as other agricultural commodities. With the Orion mill in place, wood transport to the port of Fray Bentos will be replaced by transport to the mill, and this will result in a significant decrease in truck traffic in the city itself. According to the transportation study attached as Annex G, the operation of the two mills could result in an additional 580 return trips by truck per day on the segment of Route 24 south of Paysandú to the intersection of Route 2 west of Fray Bentos. Data for the Orion project indicates a potential increase of 91 round trips per day by truck on the segment of Route 2 between plantation areas west of Fray Bentos and the San Martin International Bridge.

These numbers indicate that truck traffic will significantly increase on the road network of western Uruguay that serves the two mills. This increase will be particularly evident on Route 2 between the junction of Route 24 and the access road to MTL and the CMB plant, where there is potential for major traffic congestion. However, even in the absence of the two mills, existing truck traffic volumes are expected to double, at least on Route 24, with the continued growth of

¹² The number of trucks required will vary depending on the species mix for a mill. CMB uses a higher percentage of *E. globules globulus* which is denser, resulting in less volume per truck.

round wood and agricultural commodity exports via MTL, Fray Bentos port and Nueva Palmira. One benefit of the construction of the Orion plant in this regard is that existing round wood transport to the port of Fray Bentos will be largely diverted Directly to the mill site and, thus, bypass the city.

In addition to the potential for traffic congestion noted above, which will require traffic control and engineering solutions, the assessment of potential cumulative impacts of increased traffic as well as possible mitigating measures, include:

- **Safety:** The increase in truck traffic will require measures to control risks to pedestrians, including schoolchildren, living in communities that are typically located alongside rural roads in Uruguay. Driver training and dispatch controls can be utilized to maintain road safety.
- **Accidents:** The current and projected traffic volumes are relatively low because the transport network serves an area of low population density. Impact of the Increases in truck traffic and traffic congestion will be minimized with dispatch systems that keep the trucks adequately spaced apart and control speeds.
- **Air Pollution:** The traffic volumes forecast are relatively low for two lane roads, and with controlled spacing and continuously moving traffic any increase in air pollution should be minimal. For comparison the 2002 volume on Route 14 from Gualeguaychú to the bridge has an average daily volume of 3,700 vehicles, including 1,427 trucks, which is higher than the average volume for the Uruguay road sector forecast above with the two mills operating. Route 14 traffic, which will continue to increase, will probably contribute more congestion and air pollution than the Uruguay road sectors increase in truck traffic due to start-up of the two mills.
- **Increase in Road Maintenance:** The increase in truck traffic on the area's road sectors will require more frequent maintenance resulting in increased costs to the affected department governments. Compensation methods to increase maintenance funding accounts could be developed to charge users for the increased costs, by installing tolls with appropriate rates for the log hauling heavy trucks.

4.10 Regional Developmental Impacts

The proposed pulp mills will, as noted above, continue the development of the forestry sector in the region along lines that were planned and supported progressively and in detail since at least the mid-1980s. Multi-lateral donors assisted with studies and financing; the government of Uruguay agreed to pro-actively pursue such a development pathway in an environmentally and socially acceptable manner.

Construction and operation of the proposed mills will bring increased value-added benefits (both direct and indirect) to the local, regional and national economies, as well as providing a proportion of the overall value-added benefits of these operations in the region rather than exporting them to overseas or foreign jurisdictions.

4.10.1 Community development

Both companies have made significant and ongoing commitments to programs and activities that will bring community development benefits to their local and regional neighbors. These commitments are outlined in detail in the EIAs for the respective projects. Overall, the cumulative impacts of these programs are expected to be positive, bringing benefits to the local and regional communities and enhancing the direct and indirect economic effects of the projects. These effects will begin during the construction phase of the projects and extend throughout the operations phase. Individual components of the overall plans would vary in timing and intensity depending upon their specific natures and needs.

The Municipality of Río Negro, together with 12 major businesses in the Fray Bentos area (including Botnia and ENCE) has already constituted a 'development agency' with the objective of creating strategic projects to address the regional development implications of the projects on their surrounding areas. As this agency gets up and running it can be expected to liaise with similar organizations in neighboring areas in order to coordinate their ongoing activities, especially in areas where they might overlap and/or potentially interfere with each other's work.

Once again, the benefits of such development efforts are expected to be positive. They are designed to increase and distribute the projects' direct and indirect benefits to potential stakeholders in the larger area and reduce duplication of effort and inefficiencies in the programs' planning and implementation. Starting imminently, during or before the construction stage of the pulp mills, they can be expected to continue to have an active life throughout the operational phases of the plants as well, recognizing that different levels of activity are likely at different times in the programs' lifecycles.

4.10.2 Quality of life

The socio-economic studies carried out for this study identified quality of life issues in the study area and mitigation measures being undertaken to manage these issues. In summary, the study concluded that, during the construction phase of the projects, there would be:

- an increased pace of life with the influx of outsiders (most notably into Fray Bentos and the surrounding area), a concomitant increase in traffic with its attendant increase in noise, and an increase in tourist and commercial activities;
- a greater demand for and supply of cultural and recreational events and activities induced by market forces and encouraged or regulated by the local institutions;
- an increase in demand for rental accommodations leading to an overall increase in the cost of living in the city of Fray Bentos and in neighboring localities;
- a rise in incidents of anti-social behavior and in crime with the increasing population; and,
- a possible increase in social stratification in the city of Fray Bentos with the arrival of a significant number of employees associated with the plants in the middle or higher social levels.

During the operations phase of the projects, the socio-economic studies predict:

- a tendency towards greater social stratification in the city of Fray Bentos with the influx of operational personnel for the plants and other related industries in the higher social and educational categories; and
- fewer job opportunities for the population in the area during this phase because of the skills required.

Actions planned or in progress by the companies to deal with such quality of life issues include communicating with the public through workshops and talks, enabling the residents of the area to ask questions or articulate their worries with regard to noise or other subjects related to the construction of the plants. Specifically:

- during the construction phase, Botnia will establish a public telephone number so residents can ask questions or express their worries about noise or other subjects of concern;
- Botnia will publish a large circulation magazine in which it presents and analyses different topics related to its plants and activities in Uruguay and in Finland; and
- ENCE, jointly with the Faculty of Social Sciences of the University of the Republic, has conducted a number of public seminars with the members of the local civil society of Fray Bentos to explain the characteristics and implications of the construction works.

The Municipality of Río Negro is working on a plan to satisfy the demand for increased recreational and cultural activities, taking advantage of local facilities and professionals in the fields of music, theater and motion pictures.

4.11 Organizational Capacity

The success of social and environmental management activities depends critically on the capacity of the responsible organizations to implement their programs effectively. Sufficient human resources with the requisite skills to carry out their tasks are important elements for success. Ancillary and supporting resources are also required at appropriate levels and times for programs to be carried out effectively.

4.11.1 Corporate

The EIA documentation for the pulp mill projects outlines each project's commitments to social and environmental action plans to manage anticipated impacts from the projects. Overall, both companies have committed to programs that will pro-actively manage impacts within a social and environmental management system adequate to the task.

4.11.2 Governmental

The issue of the Government of Uruguay's capacity to provide the in-country regulatory oversight of the pulp mill projects has been raised by some interested parties.

DINAMA is Uruguay's environmental authority. It is part of the Ministry of Housing, Territorial Arrangement and Environment (MVOTMA). DINAMA is responsible for formulating, executing, monitoring and evaluating the "National Plan of Environmental Protection". It is also responsible for proposing and implementing the National Policy of Environmental Protection, aiming towards sustainable development for the country.

MVOTMA also houses Comision Tecnica de Asesoramiento de Medio Ambiente (COTAMA). COTAMA is an inter-institutional and multi-sector entity that provides advisory and coordination guidance on environmental issues. Its membership includes representatives from many ministries, government institutions and NGOs. COTAMA was responsible for the formulation of the National Law of Environmental Protection.

DINAMA's responsibilities and duties include the following:

- Formulate, execute, supervise and evaluate plans to (i) to measure and evaluate the quality of environmental resources (water, air, etc), and (ii) prevent the environmental impact of human activities;
- Evaluate control plans of public and private entities that will impact on the quality of the environmental resources; and
- Formulate and coordinate actions with public and departmental entities for the protection of the environment.

DINAMA's organizational structure includes 5 departments: (i) Assessment of Environmental Quality, (ii) Assessment of Environmental Impact, (iii) Environmental Control, (iv) Protected Natural Areas, and (v) Administrative. Its staff consists of 86 people, 47 of whom are either on short-term contracts or internships. On November 9, 2005, the responsible Minister announced that DINAMA has launched a public recruitment campaign to hire 28 technicians.

4.11.3 Bi- and multi-lateral organizations

CARU

The Comision Administradora del Rio Uruguay (CARU) resulted from the Rio Uruguay Statute endorsed by Argentina and Uruguay on February 26, 1975. CARU was created to "institutionalize the administration system of the Rio Uruguay" and ensure the "optimal and rational usage of the river". CARU has the ability to prepare and issue the relevant regulations for the administration of the river. These regulations are known as "Digesto sobre usos del Rio Uruguay" – a compendium of regulations approved by both countries. It includes a "Contamination Compendium", which provides norms related to environmental monitoring.

CARU has a total of 10 members, 5 for each country. Both countries changed their representatives on CARU during 2005¹³. Up to date listing of the members is available on the CARU website (www.caru.org.uy)

¹³ An up to date listing of the members is available on the CARU website at www.caru.org.uy

Bi-national Commission

The Bi-national Commission was officially created on May 31, 2005 as a result of an agreement reached between the President of Argentina and the President of Uruguay. Both the Argentine and Uruguayan Ministries of Foreign Affairs issued a joint communication (dated May 31, 2005) creating a "Technical Group" "as agreed between the Presidents of Argentina and Uruguay" to analyze the impact of the pulp mills, to exchange information and monitor the environmental impact of such pulp mills on the Rio Uruguay.

The communication states that the Technical Group will be composed of members of both ministries, national and provincial officials and will enjoy the support of the Universidad de la Republica (Uruguay) and Universidad del Litoral (Argentina). The joint communication also states that the commission will "issue a first report in 180 days". It is understood the report will be produced by January 30, 2006.

The Bi-national Commission has been holding a series of meetings during the last half of 2005. Joint communiques are typically issued outlining the activities of the Commission during each meeting and agendas for subsequent meetings.

UNEP

Recently, the Ministers of Environment of Uruguay and Argentina jointly sent a letter requesting the participation of the United Nations Environment Program (UNEP) to contribute to the monitoring of the paper mills.

4.11.4 Other Interested Parties

A number of other organizations and groups, including NGOs and other civil society representatives, have expressed interest in these projects in various ways. Consultations on the draft of this CIS are expected to provide for input from these interested parties, as well.

Overall, many parties are expected to have a role in developing the plans for the management and monitoring of the projects' effects. Such capacity is expected to benefit the local and regional social and biophysical environs and to assist in optimizing the projects' effects, including their cumulative impacts.

4.12 Summary of Cumulative Impacts

Annex I to this report includes two tables that summarize the potential cumulative impacts identified in this study. The methodology used was that described in Section 4.1 of this report. Table I.1 within Annex I summarizes the potential cumulative impacts during the construction period (2005-2008) for the two projects. Table I.2 within Annex I summarizes the potential cumulative impacts during the operations period (2007 – 2048) of these projects as adopted for this study.

The cumulative impacts judged to be significant (those judged to be 'high' according to the analytical methodology used) are summarized below, based upon the tables in Annex I.

4.12.1 Additive Nature of Cumulative Impacts

One recurring theme throughout this study is the fact that two very similar plants with similar impacts are being developed in relatively close proximity to each other, in a locality that has no such projects at the moment. Within a relatively short period of time, the development scenario for forestry in the region has moved from plantations for wood chips for export, to plantations to supply two pulp mills (one under construction and one about to start construction).

The simple additive effect of these two proposals, back-to-back, as it were, with no time to experience the effects in a step-wise, measured fashion has raised concerns related to potential risks and associated negative perceptions in people who share the regional environment and setting yet have had no direct experience with comparable developments. The simple, additive nature of many of the impacts is a result of the two proposals being considered in similar timeframes.

4.12.2 Cumulative Impacts during Construction

The following cumulative impacts are expected during the construction of the two pulp mill projects (2005 – 2008):

- **Economic Performance and Employment (jobs):**
 - The **economic** impact of the two projects will be equivalent in value to about 3.2% of Uruguay's 2004 GDP over the full three years of the construction phase and about 2.5% of 2004 GDP in each year of full capacity production (approximately 40 years for each plant). The impact on the country's Gross National Product (GNP) is estimated to be 2.8% for the entire three year construction period and 1.5% for the years in which the plants are operating at full capacity.
 - The **employment** impacts will also be significant, accounting for an increase in the equivalent of 1.3% of the 2004 national labor force over the three years of the construction phase and equivalent to slightly less than 1% of the 2004 national labor force during each year of full capacity production.
 - These impacts are judged to be positive; they are discussed in more detail in Section 4.7.1 (above) and Table I.1. Management possibilities are summarized in Table 5.1.
- **Labor Influx:**
 - The direct social impact in the construction phase of the pulp mill projects will be the influx of persons (heavily weighted towards younger men), primarily to Fray Bentos and its environs, attracted by the opportunities for employment.
 - An analysis of the regional social profile, especially of the economically active population, indicates that there is insufficient working age population to meet the labor requirements of plant construction in Fray Bentos and other population centers in the departments of Soriano, Rio Negro and Paysandu. Both skilled and unskilled workers will be recruited from throughout the region, including Argentina and Brazil.

- As a result, there will be increased demand on social services to cope with the increase in population, particularly in the areas of housing, health, public safety, education, transport as well as recreation and cultural activities. The major impact will be on the social services provided in the city of Fray Bentos. The specific impacts will depend on the numbers of local and commuting workers relative to non-local residents that that will occupy the positions created during the three to four years of the construction phase.
 - These impacts are judged to be negative; they are discussed further in Section 4.7.2 (above) and in Table I.1. Management possibilities are summarized in Table 5.1.
- **Influx of People (unplanned)**
 - There will also be associated impacts of population increase associated with ancillary economic activities that develop as the economy of the area grows.
 - In addition, there are expected to be job seekers and development of an informal service economy attracted to the sites and region by the large numbers of young male construction workers with relatively high incomes. Intensity of these impacts will depend upon relative numbers of such immigrants and policies and programs in place for the pro-active management of these impacts.
 - These impacts are judged to be negative; they are noted in Table I.1. Management possibilities are summarized in Table 5.1.
- **Quality of Life**

Quality of life issues identified during the construction phase include:

 - an increased pace of life with the influx of outsiders (most notably into Fray Bentos and the surrounding area), a concomitant increase in traffic with its attendant increase in noise, and an increase in tourist and commercial activities.
 - a greater demand for and supply of cultural and recreational events and activities induced by market forces and fomented or regulated by the local institutions.
 - an increase in demand for rental accommodations leading to an overall increase in the cost of living in the city of Fray Bentos and in neighboring localities.
 - a rise in incidents of anti-social behavior and in crime with the increasing population.
 - a possible increase in social stratification in the city of Fray Bentos with the arrival of a significant number of employees associated with the plants in the middle or higher social levels.

These impacts will be negative. They are discussed further in Section 4.10 of this report and summarized in Table I.1. Management possibilities are noted in Table 5.1.

- **Tourism and Recreation**

Impacts on tourism during the construction phase are all expected to be low to moderate and most relate to qualitative perceptions of changes in existing conditions. These include:

- Increased traffic congestion in the Fray Bentos area may have minor effects on tourist traffic to Las Cañas.
- Other effects on quality of life as listed in the section above may also make the area less attractive to tourists during this period.
- Rental of accommodation by construction workers may negatively affect availability of tourist accommodation.

4.12.3 Cumulative Impacts during Operations Phase

The following cumulative impacts are expected during the operations phase of the pulp mill projects (2007 – 2048):

- **Air (Odor emissions)**

- Odor emissions from the plants are predicted to be infrequent and restricted to the vicinity of the plant under most circumstances. However, there may be some odor affecting a larger area (out to 5 to 10 km from the mills) especially during the initial plant commissioning period.
- These impacts are negative; they are discussed further in Section 4.4 and in Table I.2. Management possibilities are summarized in Table 5.1.

- **Tourism and Recreation**

- The pulp mills could potentially affect the tourism sector through concern over the magnitude of the industrialization taking place in Uruguay. The perceived magnitude of the changes and their impact raises real concerns which need to be further addressed.
- Impacts of local odors from the mills have been noted above, and these specific concerns also contribute to the overall apprehension of the potential impact.
- These impacts were judged to be either positive or negative, depending upon the judgment of individual stakeholders or their (group) affiliation. They are discussed further in Section 4.8 of this report and summarized in Table I.2. Management possibilities, mentioned in Table 5.1, include further consultations with stakeholders to understand the issues in more detail and respond further.

- **Regional Development**

- Construction of the proposed mills will bring increased value-added benefits (both direct and indirect) to the local and regional area as well as national economies; a proportion of the overall value-added benefits of these operations will now stay in the region rather than being exported to overseas or foreign jurisdictions.
- The projects provide an impetus for further regional development initiatives, certain of which have already begun. The two companies have joined with twelve others to work with the Municipality of Rio Negro in a Foundation for strategic planning for the area and region. Pro-active management of such forward-looking programs offer the potential for substantial benefits and rationalized regional development opportunities for the future.
- These impacts will be positive. They are discussed further in Section 4.10 of this report and summarized in Table I.2. Management possibilities are noted in Table 5.1.

- **Sectoral Development (Forestry)**

- The proposed pulp mills will continue the development of the forestry sector in the region along lines that were planned and supported progressively and in detail since at least the 1980's. Multi-lateral donors assisted with studies and financing; the government of Uruguay agreed to pro-actively pursue such a development pathway in an environmentally and socially acceptable manner.
- These cumulative impacts are positive. They are discussed further in Section 4.10 of this report and summarized in Table I.2. Management possibilities are noted in Table 5.1.

- **Organizational Capacity – Governmental**

- Opportunities for increasing the capacity of host-country governments and agencies will arise from the impetus and revenues provided by these projects. Such opportunities will need to be managed pro-actively by those governments, as well as donor groups and others involved, to assure the positive potential is actually realized.
- These impacts will be positive. They are discussed further in Section 4.11 of this report and summarized in Table I.2. Management possibilities are noted in Table 5.1.

- **Resource-based Livelihoods**

- No impacts on resource-based livelihoods are expected from the operation of these two plants, but they are specifically addressed here because of the public concern about these aspects.

- Wastewater from the projects is fully treated to levels that pose no direct threat to aquatic life, and is further diluted by factors of more than 100 under all flow conditions, with the result that no impacts on fish populations, or the fishery, are expected.
 - Air emissions including odor are also well dispersed, and no impacts on physiology or productivity of honey bees are expected at the ambient concentrations predicted by the modeling.
- However, further consultation with stakeholders is recommended to more fully understand these issues and to develop management interventions, if applicable.

Table 4.14 - Summary of Cumulative Impact (CI Study Results)

Issue	Features of Significant CIs Identified				CI Management	Comments
	Constr'n Phase	Operations Phase	Positive	Negative		
Odor		√		√	Planned startup and shutdown events coordinated with meteorological conditions; Local warnings of events	Occasional and opportunistic (startup, shutdown and unplanned events)
Water Quality		√		√	Further investigate treatment of Fray Bentos wastewater in Orion facility, placement of municipal intake in relation to Orion outfall, and placement of both outfalls to further enhance mixing.	
Economic performance & Employment (jobs)	√		√		Maximize local and regional benefits, including supply chain	Seek medium and long-term benefits (ameliorate 'bust' after 'boom')
Labor Influx*	√			√	Companies and third parties plan and coordinate re: housing, health, education, local transport, social & cultural services	Lengthy lead-time for co-ordination of delivery
Unplanned influx of people*	√			√	Integrated Influx Management Plan required	Needs to be coordinated with local & regional authorities
Quality of Life*	√			√	Programs coordinated with third parties to manage (minimize effects)	Effects already being seen at low levels
Tourism*	√	√	?	?	Consult with stakeholders to identify further management opportunities	Profile and importance of issue to stakeholders suggest concerted and coordinated attention
Resource-based* Livelihoods		√	?	?	?	No impacts expected based on available scientific information; needs further attention, including consultation with stakeholders
Sectoral Development (Forestry)		√	√		Continue to advance medium- to long-term development opportunities, reinforcing long term trends & plans	Needs ongoing pro-active plans coordinated across region with broad stakeholder awareness & support
Regional Development	√		√		Coordinated plans to pro-actively pursue developmental potential	Third party links and involvement essential to success
Governmental Capacity	√	√	√		Companies cooperate with third parties to maximize projects' benefits	Donor, NGO and local communities' involvement & stakeholder awareness essential

* = urgent priority

5 Cumulative Impact Management

Botnia and ENCE have made commitments to the management of the identified social and environmental impacts associated with their projects. These are presented in detail in their respective EIA documentation that are available on the IFC website at the URLs noted earlier.

They include Social and Environmental Management (Action) Plans such as:

- Integrated Social and Environmental Management Systems
- Monitoring & Follow-up Plans
- Transportation Plans
- Hazardous and Non-hazardous Waste Management Plans
- Emergency Response Plans
- Public Consultation and Development Plans
- Community Development Plans
- Information & Communications Plans

The components of the projects' social and environmental management (action) plans can be expected to evolve as the projects themselves develop. They are 'living' documents that evolve in response to project and contextual changes; any modifications are implemented through appropriate change management procedures.

5.1 Cumulative Impact Management and Reporting

The management and action plan commitments associated with the significant cumulative impacts of the two plants identified in this draft of the CIS are summarized in Table 5-1, below. Each company will build its current commitments with respect to cumulative impacts, summarized here, into its ongoing management (action) plans for its project.

Table 5.1 - Summary of Management and Action Plan Possibilities for Significant Cumulative Impacts

Significant CI	Potential for Joint Action by Companies?	3 rd Party Involvement ?	Comments
<u>CONSTRUCTION PHASE</u>			
Economic performance & employment (jobs)	Yes	Yes	Optimize local & regional benefits through employment policies, training & supply chain benefits
Labor influx	Yes	Yes	Involvement in programs addressing demand for housing, health, education and social services
Influx of people (unplanned)	Yes	Yes	Pro-active management of opportunistic immigration (Influx Management Plans)
Quality of Life	Yes	Yes	Programs coordinated with third parties to manage (minimize effects)
Tourism perceptions	??	Yes	Consult with stakeholders to understand issues & respond further
Regional Development	Yes	Yes	Process initiated: Companies joined with 12 others to work with Mun. of Rio Negro in a Foundation for strategic planning for area & region
Governmental capacity	??	Yes	Respond as appropriate to optimize outcomes from project activities
<u>OPERATIONAL PHASE</u>			
Odor (TRS) emissions	??	No	Occasional and opportunistic (startup, shutdown and unplanned events). Explore coordination of responses to common external events.
Water Quality	??	Yes	Investigate cooperative action in treating Fray Bentos wastewater
Tourism perceptions	??	Yes	Consult with stakeholders to understand issues & respond further
Sectoral development (forestry)	Yes	Yes	Foster ongoing development of forestry sector in the region, including Argentina
Governmental capacity	??	Yes	Respond as appropriate to optimize outcomes from project activities

5.2 Cumulative Impact Management

Multiple organizations and groups have expressed an interest in or already been involved in preliminary planning for management of cumulative impacts associated with these projects.

As well as the pulp mill companies (including those involved with the plantations and all their contractors and sub-contractors), there are a variety of governmental (national, regional and local) agencies with responsibilities for impact management. They include ones with primarily environmental responsibilities (e.g., DINAMA, CARU, Bi-national Commission) as well as those with social and other regulatory responsibilities.

The controversy surrounding these projects and their financing has attracted attention to the whole question of how potential impacts will be managed. The recent history of these projects, with increasing numbers and kinds of oversight and review of the projects, has resulted in further suggestions along these lines. More can be anticipated when, for example, the Bi-national Commission releases its findings in January 2006. One recent example is an official request that the United Nations Environment Program (UNEP) assist the two national governments in implementing a monitoring program with respect to the projects' possible impacts.

Figure 5-1 shows a representative grouping of the organizations known or expected to become involved with management of the projects' impacts. This figure is indicative only and is not meant to be a comprehensive listing because, as noted, these issues are under active, ongoing review by several, if not many, parties.

For example, the figure focuses largely on formal organizations with explicit mandates or responsibilities in the region. The widespread discussion of the project has resulted in many other people and groups becoming engaged, as well. Other organizations representing civil society and others from a multiplicity of perspectives and interests can continue to be anticipated as the discussions continue. All will expect to have their voices heard.

One conclusion emerging from the consideration of these issues in this Cumulative Impact Study – and further suggestions and recommendations can be anticipated during the CBI-led consultations on the draft of this report – is that comprehensive planning is needed, including amongst and between many of these interested parties. All should expect open and rational review and discussion of these issues as they move towards resolution and implementation of the agreed solutions.

Harnessing of the recent levels of interest and associated commitments to shared resolution of the issues offers the promise of optimizing the management of potential impacts (mitigating the negative ones while enhancing the positive ones), including those of a cumulative nature, to the benefit of the environment, ecosystems and people of the region.

Fig 5.1 - Management of Projects' Impacts – Overview of Potentially Interested Parties

