

# Annex G: Transportation

Uruguay's transportation network will be impacted by the pulp mills in two ways: to supply wood and other supplies to the mills, and to transport pulp from the mills to ocean going vessels and to export markets. Pulpwood and other supplies could be transported to the mills by truck, barge, or rail, and pulp from the mills to ocean going by barge, or direct to ships by CMB.

## 8.1 Truck Transport of Pulpwood

The ORION mill will consume 3.5 million cubic meters of eucalyptus pulpwood per year. The flow of trucks to the ORION mill has been analyzed by Pike & Company, and the findings presented in a scientific forum in March of 2004.<sup>1</sup> In addition, truck and vessel traffic is discussed in section 3.2.6 of the ORION Socio-Economic Study (p. 42-43) and in section 3.3.5 of the same document (p. 58). Also, in Chapter 4 of the ORION EIA, section 4.3.1.2 through section 4.3.1.7 discusses the impact of truck traffic due to supplying the ORION pulp mill with wood. The only discussion of traffic impacts in the CMB documents appears to be in the Deloitte summary on economic impacts, which discusses the economic impact of the CMB mill on the transport sector.

On the following page is the map presented at the ORION scientific forum in March 2004, indicating the flow of truck traffic to supply only the ORION pulp mill with wood. For each road segment, the top number is the AADT for pulpwood trucks in 2011-2013, and the bottom number is from the Uruguayan Ministry of Transport, indicating the flow of trucks in 2002. For example, for the last part of Highway 2 going to the ORION mill, the map indicates 511/199. The 199 was the figure from the Ministry of Transport for 2002, and the 511 was calculated in the following way:

- The ORION mill requires 3.5 million m<sup>3</sup> of eucalyptus pulpwood when in full operation.
- For this calculation, it is assumed that all wood comes by truck, and nothing by train or barge. It is also assumed that all wood comes from Uruguay forests.
- The average truck to ORION's mill should transport 37.5 cubic meters. Dividing 3.5 million by 37.5 gives a total of 93,333 trucks arriving per year to the pulp mill.
- Dividing by 365 gives 255.7, and since each truck must make a return trip away from the mill, multiply by 2 to get 511.4, the AADT for all pulpwood trucks.

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<sup>1</sup> "Disponibilidad de madera en Uruguay y su flujo hacia Fray Bentos", Pike & Co., March, 2004. File attached.

As can be seen on the following map, the majority of ORION's wood flow will come down highway 24. The traffic flow was calculated by analyzing the plantation forestry "clusters" in western Uruguay, represented on the map by the dotted circles with the Department names (RNG = Rio Negro) and numbers. The volumes coming from each cluster was forecast, based on age class, species and growth rate, so the traffic flow is based on the real expected harvest schedules of the existing forests.



Pike & Company concluded their presentation on the traffic impact of wood flow to the ORION mill with the following table. If one includes trucks and all other vehicles, the Ministry of Transport estimated in 2002 that AADT (TPDA in Spanish) on the final segment of Highway 2 was 1,663. This will increase to

2,165 when the pulp mill is in full operation, or an increase of 30% in traffic. In addition, Pike & Company compared this level of traffic to Highway 14 near Gualeguaychú in Argentina, where TPDA in 2002 was 3,700 vehicles, including 1,427 trucks, or more than double the anticipated level in Uruguay when the pulp mill is in full operation.

TPDA actual en tramo final de Ruta 2 (Datos MTOP año 2002)	Camiones con zorra y semis	195
	Otros vehículos	1,468
	<b>Total</b>	<b>1,663</b>
TPDA futuro en tramo final de Ruta 2 (Estimación según escenario promedio 2011-2013)	Camiones con zorra y semis	697
	Otros vehículos	1,468
	<b>Total</b>	<b>2,165</b>
	Incremento	30%
TPDA en Ruta 14@Gualeguaychú (Argentina) (Datos de Vialidad Argentina año 2002)	Camiones con zorra y semis	1,427
	Otros vehículos	2,273
	<b>Total</b>	<b>3,700</b>

The pulpwood traffic flow for CMB is calculated as follows:

Wood consumption = 1.7 million m<sup>3</sup> per year (until 2015)  
 34 cubic meters per truck (lower figure due to higher % E. globulus and bark-on for 50%)  
 Total trucks per year = 50,000 to the pulp mill, or 137 trucks per day<sup>2</sup>  
 Total AADT = 274

A detailed road corridors flow for CMB's wood supply has not been completed, or made available as of August 31, 2005. On the above map, there would be no CMB trucks on the last segment of Highway 2, to the ORION mill, as the CMB entrance is before that turn. It is not possible to combine the traffic impacts without a detailed CMB corridors study, but from Pike & Co. there is an estimation of the CMB traffic flow. They estimate that one should add an AADT of 160 to Highway 24 (the segment just south of Nueva Berlin to the CMB mill) which would give a total of 420 (ORION) + 160 (CMB) = 580. Assigning the remaining CMB AADT of 114 to the ORION figure of 91 on Highway 2 from Mercedes, this would result in this segment having a total AADT of log trucks of 195.

#### Other vehicles

In addition to the increase in traffic related to hauling logs to the pulp mills, it is evident that there will also be an increase in other vehicles related to the project. This would include worker transport, support service vehicles, police and other public sector support traffic. It is estimated that these other vehicles would add 23% in "truck-kilometer equivalents" to the estimated truck traffic increase. These would be mostly cars and small trucks, and their impact would be clustered close to the pulp mills. To be conservative, it is estimated that an additional 50% of the log truck traffic should be included as "additional vehicles"

<sup>2</sup> Information source for this number of log trucks is from Gustavo Quartaro, Logistics manager for EUFORES.

impacting traffic near the pulp mills. Using the above example for the ORION mill only, this would mean that in 2011-2013, the traffic near the pulp mill on Highway 2 would include the 697 log trucks plus 1,468 other vehicles plus  $50\% * 511 = 255$  additional other vehicles, for a total of 2,420 TPDA. (511 was the increase in truck TPDA related to additional log truck flow for the pulp mill.)

It is important to mention that the above analysis assumes that all wood flows to the pulp mills will be by trucks on the Uruguay road system. There are two possible alternative wood flows which would reduce this traffic impact. The first involves potential wood flows from Argentina.

## 8.2 Barge Transport of Pulpwood

ORION currently estimate that perhaps 400-450,000 m<sup>3</sup> of eucalyptus pulpwood could be sourced from Argentina, from Eastern Entre Rios Province and southern Corrientes Province.<sup>3</sup> It is anticipated that the Argentina wood might flow by barge, likely loaded in an existing facility such as in Concordia, and barged directly to the mill. The eucalyptus plantations in Entre Rios are clustered close to the Uruguay river, and barge transport may be less expensive than truck for longer hauls, including no bridge tolls are involved. Each barge can hold about 1,000 tons, and 400-450,000 m<sup>3</sup> of *E. grandis* would be around 300-330,000 tons, or about one barge per day, on average. By using barges for this segment of their wood supply, ORION would reduce the number of trucks needed by 29, or a reduction in AADT at their mill by 58. This would make the AADT due to forestry trucks at the mill  $511 - 58 = 453$ .<sup>4</sup>

CMB is not currently planning to source wood from Argentina. They are already using a small vessel (1,500 tons) to transport woodchips from M'Bopicuá to Montevideo, and they are seriously considering using this vessel to transport pulp to Montevideo in the future. This means that on the back-haul, the vessel can take *E. globulus* from the Montevideo region back to the pulp mill, and the company may utilize this alternative. EUFORES (the plantation subsidiary of ENCE) has a long-term wood supply agreement with Mundial Forestacion, a Brazilian company with extensive eucalyptus plantations in the department of Florida. Using a vessel on the backhaul to M'Bopicuá might be the most economical way to transport this wood to the CMB mill. Currently their planning is not finalized, but if the back-haul concept is utilized, then there will be no increase in river traffic as the barge would have been returning to the pulp mill empty anyway.

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<sup>3</sup> This wood flow is discussed in the section on plantations. There is a large surplus of small diameter eucalyptus wood in Entre Rios which currently has no market. As the Argentine government has been providing incentives to landowners in Entre Rios to plant eucalyptus, this potential new market in Uruguay is of great interest. Botnia's plan is to try to purchase no more than 20% of the eucalyptus pulplog supply available in that region, to avoid putting upward pressure on wood prices.

<sup>4</sup> It is certainly possible that the Argentina wood could come via truck. This is partly influenced by the fact that fuel costs in Argentina are, at least at the current time, significant lower than in Uruguay.

### **8.3 Rail Transport of Pulpwood**

A second strategy to reduce the use of trucks that both companies are exploring is the use of rail shipment. Currently, rail shipment to Fray Bentos is not feasible because the existing rail line is in need of extensive repair. There is a large and growing supply of eucalyptus available in the north central region of the country, in Rivera and Tacuarembó. In that region, much of the eucalyptus plantations have been managed to produce sawlogs, and in the next 5 years much investment is expected in sawmills and plywood mills. For example, a Chilean company has already started a plywood mill (Urupanel), and Weyerhaeuser (Colonvade) is currently building a plywood mill and has plans for several more wood processing facilities. These mills will produce a very large volume of residues, and their management practices produce a large volume of pulpwood from thinnings of the forest.

If these mills operators cannot find an outlet for their residues, it will be difficult for them to be competitive in the international markets. As this wood is 300-400 km from the pulp mills, trucking costs would be very expensive, and both companies are exploring renovating the rail system. EUFORES for example has already obtained proposals from a Chilean rail company interested in bidding to upgrade and operate the Tacuarembó – Fray Bentos line. The rates quoted in that proposal for pulplog and woodchip transport to the CMB mill are very competitive. Both CMB and ORION would need to construct about 7 kilometers of track to get railcars from the existing line to the pulp mills, but this is feasible at an acceptable cost to the sponsor companies.

Exact volumes of wood flow via the rail system have not been estimated, but EUFORES is discussing transporting about 480,000 tonnes per year via rail, and TileForestal is talking about a slightly higher volume. If approximately 1.0 million tonnes per year are transported by rail, that would replace around 33,000 trucks to the mills, or a reduction in daily flow of 91 trucks, reducing AADT by 182.

### **8.4 Transport Planning and Truck Scheduling**

When operations starts both companies will try to even out the flow of trucks during the day to the maximum extent possible. When too many trucks arrive at the mills at the same time, this leads to traffic congestion, and more waiting time for drivers and trucks waiting to be unloaded. These delays add to the transport costs. The ideal situation, from both the log yard and trucking company point of view, is to minimize the waiting time at the mill. This means that trucks can make more trips per day, allowing the more efficient use of trucks and helping to minimize truck operating costs for the mills.<sup>5</sup>

Both companies have already instituted new software planning programs for truck scheduling, and are developing sophisticated tracking systems (including

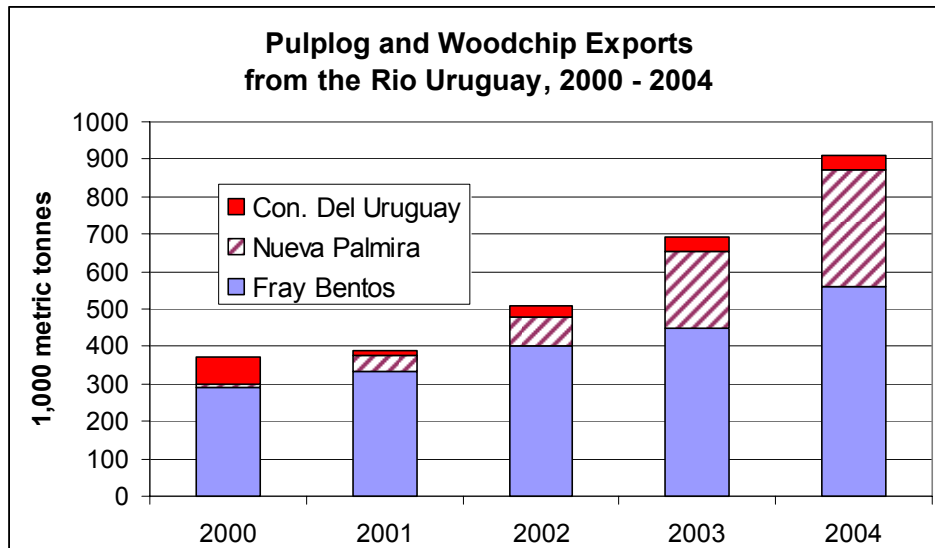
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<sup>5</sup> Both companies intend to use contractors to transport all logs to the mill.

GPS) so they know at all times where the trucks are located. The trucks will be spread out 24 hours per day, as much as possible. For the ORION mill, if the 256 trucks per day were to arrive throughout the 24 hour day, this would mean about 11 trucks per hour, or one truck every 5-6 minutes.<sup>6</sup> While trucks cannot be spread out exactly during the day, as mentioned the companies have economic cost incentives in reducing congestion as much as possible, resulting in minimizing transport costs.

### 8.5 Existing Traffic Flow for Pulpwood/Woodchip Exports

The preceding sections has looked at the total flow of trucks, barges, and trains to supply the pulp mill projects with pulplogs. It is important to mention that without the pulp mills, there would still be a significant amount of truck and river traffic, for pulplog and woodchip exports. The following chart shows the recent history of log and chip exports on the Uruguay river. Concepcion del Uruguay in Argentina is a very minor port---- all of the expansion in volume in recent years has occurred in Nueva Palmira or Fray Bentos.<sup>7</sup> The discussion of traffic impacts has compared the level anticipated with the pulp mills to the historic levels of 2002. But as can be seen in this chart, the volume of wood exports from Fray Bentos and Nueva Palmira increased by 82% between 2002 and 2004, and the volume in 2005 and 2006 is expected to be even higher.



According to estimates by Pike & Company, pulplog and chip exports from the ports of Fray Bentos and Nueva Palmira were about 500-600,000 cubic meters in

<sup>6</sup> We have discussed that the truck traffic flow will likely be reduced by use of barging and rail. However, the AADT is calculated based on 365 days per year. In practice, the trucks cannot haul every day because of rain --- the forest roads are not paved, and so effectively they might haul only 20 days per month. Thus the actual truck traffic flow to the mills may exceed the calculated AADT on any given day, even with the use of barge and rail.

<sup>7</sup> Note that Fray Bentos in this chart includes the woodchip volumes loaded at M<sup>3</sup>Bopicua.

2002, increased to 1.0-1.1 million m<sup>3</sup> in 2004, and will be 1.5-1.6 million m<sup>3</sup> in 2005-2006. If no pulp mills were built, then it can be assumed that exports would increase even higher in the future, to at least 1.9-2.0 million m<sup>3</sup>, or around 1.5 million tons. The AADT for trucks hauling 1.5 million tons of pulpwood, a reasonable minimum level to expect without the pulp mills in the future, would indicate an AADT of 274. As the maximum point of traffic flow on Highway 24 indicated an AADT of 580 when the mills are fully operational, then the increase due just to the pulp mills would be an AADT of 306 trucks. If exports increased even more than estimated here, due to having no domestic market and a surplus of wood, then the *increase* in traffic due to the pulp mill impact would be even less.

Of interest is the shift in truck traffic due to the pulp mills. In 2004, Forestal Oriental exported 312,000 m<sup>3</sup> of pullogs from Nueva Palmira, all of which were shipped to that port in the Fray Bentos to Nueva Palmira sector via truck. Once the pulp mills start up, that sector's truck flow will essentially cease. It will effectively be "replaced" by the flow of pulp via barges from ORION's mill to Nueva Palmira (see below). In addition, 413,000 tons (or 547,000 m<sup>3</sup>) of eucalyptus pullogs were exported from the Port of Fray Bentos. All of this wood was transported via truck through the town of Fray Bentos, to reach the port. This was a total of 13,767 trucks to the port, or more than 27,000 truck trips through the town per year. When the pulp mills begin operation, this truck flow also will effectively cease.<sup>8</sup> While there will be a significant increase in truck traffic due to the pulp mills, the traffic within the town of Fray Bentos will decrease.

## **8.6 Transport of other supplies**

In the ORION EIA (Chapter 4 – Description of Operations), sections 4.3.2.1 and 4.3.2.2 discuss supplies of chemicals and other non-wood items to their mill. In total, Table 4-4 indicates a volume of about 143,000 tons of chemicals and other supplies will be transported to the mill via barge. Wood accounts for 95% of the ORION mill's raw material supplies, with these chemicals and other products representing 5%. (See Fig. 4.7). If an average barge is assumed to be 1,000 tons in the Uruguay river system, this would mean a total of 143 barges per year, if all were fully loaded. As the logistics of bringing in and storing chemicals will likely mean less than optimal shipping, it can be assumed that a total of 160-170 barges might be involved, assuming no chemical supplies are brought in by truck. Likely a combination will be used, and perhaps 150 barges per year will be required.

The World Bank currently has approved a related transport infrastructure loan to Uruguay, "Transport Infrastructure Maintenance and Rural Access." This study

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<sup>8</sup> There will likely be some continued export volume from Fray Bentos, for certain species or in certain years if a surplus develops. However, at the present both mills believe that virtually all pulpwood developed in the areas tributary to Fray Bentos and Nueva Palmira will go to the pulp mills.

will likely have useful information related to the impact of the pulp mills on the highway transport infrastructure in the area of the two pulp mills and plantations.

## **8.7 Pulp Transport**

All of the pulp which will be produced at the two pulp mills will be exported from Uruguay via ocean going vessels. The two companies have developed different logistics strategies for this pulp export.

### **ORION**

In section 4.5.2 of Chapter 4 of the ORION EIA, there is a discussion of three different options which were reviewed by the company in deciding how to export their pulp. Currently it is understood that ORION plans to barge all of its pulp to Nueva Palmira, where the company is involved in a joint venture to build a new transfer loading port. The pulp will be stored in warehouses at the port, and then loaded onto ocean-going vessels. Draft at Nueva Palmira is 32 feet, which is adequate for loading of the pulp carrier vessels which will be utilized. In total, ORION will be transporting 1.0 million tonnes of pulp via barge from its pulp mill to Nueva Palmira. Assuming 3,000 tons per barge, this will be a total of 333 barges per year, or an average of 1 barge per day.

### **CMB**

In the CMB EIA, there is not a description of their plan for pulp transport. From the logistics manager at EUFORES, it is understood that the current plan is to partially load vessels directly at their M'Bopicua port (TLM), and top off the vessels in Montevideo. Assuming vessels are loaded to 50% capacity at TLM<sup>9</sup>, this will mean that 250,000 tons of pulp will be loaded at TLM and 250,000 tons in Montevideo. The pulp will be transported to Montevideo by either barge, truck, or rail (assuming the rail is renovated). If it is assumed that the CMB pulp is transported to Montevideo via barge of 3,000 tons capacity, this will mean 84 barges per year, or less than an average of one per day.

## **8.8 Cumulative Impact**

Assuming that the CMB pulp is loaded 50% in TLM and 50% transported via barge to Montevideo, this will mean that a total of 1.25 million tons of pulp will be transported on the Uruguay river. (Including both ORION and CMB production) Once these pulp mills are in full operation, pulplog and woodchip exports from the Uruguay river are expected to cease, as all wood in that region of Uruguay is expected to move to the pulp mills. In 2004, a total of 909,000 tons of pulplogs and woodchips were transported on the Uruguay river, and this is expected to increase to more than 1.0 million tons in 2005 and possibly to 1.1-1.2 million tons

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<sup>9</sup> In 2004, woodchip carriers loaded at TLM were loaded to 42% of capacity, with the remaining 58% loaded in Montevideo.

or more in 2006. If the pulp mills were not to be constructed, forest industry experts in Uruguay believe that at least 1.5 million tons per year of logs and chips would be exported utilizing the Uruguay river. As a result this means that the increased river traffic to export the pulp will be more or less offset by the decreased river traffic due to elimination of pulplog and woodchip exports. Total "wood-related" (pulplogs, chips, pulp) tonnage on the river *will* increase by 66% over the volume of pulplogs and chips actually exported in 2004, but will not be larger with the pulp mills than it would be without the pulp mills.