

Morice and Lakes Innovative Forest Practices Agreement

Regional Economic Impact Model

Final Draft Report

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Key Messages

1. The forestry sector is most closely linked to the domestic services and the rest of the economy (primarily retail) sectors. Any changes in the forestry sector will have the greatest indirect impact on services and retail.
2. The forestry sector has a weak positive relationship with the agriculture sector and the visitor sector. Positive (negative) impacts in forestry result in positive (negative) indirect impacts in agriculture and visitor activity, but the effects are minimal.
3. Similar to forestry, the visitor sector is strongly linked with services and the rest of the economy (retail). The visitor sector also has a weak positive relationship with agriculture and forestry.
4. Agriculture is weakly linked to all of the major sectors with the exception of the rest of the economy (retail).
5. Under scenario 1 a 5% increase in the AAC of the Morice TSA results in increased economic activity across all sectors of the economy. Similarly, a 5 to 10% reduction of the AAC in the Morice TSA leads to decreased economic activity across all sectors of the economy.
6. A 10% increase in visitor activity can partially, but not completely offset the negative impacts of a 5 to 10% decrease of the AAC in the Morice TSA.
7. Increasing agricultural exports by 10% benefits all sectors of the economy, but can only minimally offset any negative impacts associated with a 5 to 10% reduction of the AAC in the Morice TSA.

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1 Introduction

General equilibrium (GE) economic impact models are standard tools for assessing the economic impacts of proposed industrial projects, major events, issues concerning international trade, and domestic government policy changes (Miller and Blair, 1985; Pyatt and Round, 1985). Every sector of an economy is linked to other sectors, whether directly through transactions (purchases and sales), or indirectly through competition for labour, capital, and land for use in the production process. GE models account for sector linkages and provide a more complete picture that an impact on one sector can have on other sectors and the overall economy of a region.

In addition to general acceptance by economists, general equilibrium methods also have a legal precedence through their use in the socio-economic components of environmental impact assessments. Two theoretical streams exist within the GE approach; fixed price approaches and flexible price approaches. The difference between the two approaches relates to the specific assumptions inherent to each.

Methods from both approaches are used in this study. Borrowed from the fixed price framework, a social accounting matrix (SAM - a hybrid regional economic database) constructed from a variety of data sources is used to provide baseline indicator levels and the base on which more flexible tools are constructed. A region-specific computable general equilibrium (CGE) model (a flexible price technique) of the Morice-Lakes (M-L) IFPA economy is used to simulate the potential impacts and future indicator levels of a variety of scenarios related to forest management.

The CGE model framework described in this report was first developed for use in the Foothills Model Forest region in Alberta. Since its original application, the FMF framework has been adopted in several other regional planning initiatives including the government of Alberta's Northeast Slopes Integrated Resource Management Pilot Program, the Robson Valley Enhanced Forest Management Pilot Program, and the ongoing Mountain Pine Beetle Initiative. In addition to the current application of a CGE model in the M-L IFPA, CGE techniques are currently being applied in the McGregor Model Forest and under the federal governments Mountain Pine Beetle Initiative.

2 General Equilibrium Modeling

2.1 Overview of General Equilibrium Approaches

There are two primary approaches used to estimate economy-wide or general equilibrium socio-economic impacts of changes in an economy: fixed price (the input-output (I-O)/SAM model), and flexible price (the computable general equilibrium (CGE) model).

Each approach is valid under certain circumstances and the less flexible I-O/SAM approach is an important building block for the more flexible CGE approach. Table 1 offers a comparison of the general features of the two model approaches at a glance.

Table 1: Overview of General Model Features

	I-O/SAM	CGE
Occurrence	Common	Rare
Complexity	Simple	More Complex
Data Requirements	Low	Medium
Role of Prices	Fixed	Endogenous
Technology	Fixed	Not necessarily fixed
Supply of Inputs	Excess capacity	Constraints possible
Time Frame	Extreme short-run	Variable
Sector Impacts	Unidirectional	Multidirectional
Theoretical Structure	Linear	Non-linear

Fixed price models, such as input-output (I-O) and social accounting matrices (SAM) are the most common GE tools, but also the most limited in scope of analysis, and rigidity and realism of assumptions. For example, basic input-output models do not account for the competition among sectors for land, labour and capital. Factor inputs are assumed to be available without limit. However, fixed price approaches remain popular due to the availability of data (at the national and provincial level), and low cost of use.

Flexible price models, such as computable general equilibrium (CGE) are less common, but allow a limitless relaxation of the assumptions in fixed price models. Two streams of research have developed that specifically compare fixed and flexible approaches (Seung et al., 1997; Partridge and Rickman, 1998; Schreiner et al., 1999; and Patriquin, 2000) and examine the use of GE models to assess policy changes, global market fluctuations, and natural disturbance on the state of regional economies or specifically in natural resource and forest dependent regional economies (Alavalapati et al., 1996; Marcouiller et al. 1996; Alavalapati and Adamowicz, 1999; Alavalapati et al., 1999; Patriquin et al., 2002; and Patriquin et al., 2003).

The findings of the above studies indicate that, while room for improvement exists, GE techniques can provide valuable insight into the potential impacts of changes in natural resource management. Although CGE models are fairly uncommon on a regional scale, there is general agreement that they do provide unique insights not available using the more widely applied fixed price techniques. The model adopted for this project is known as computable general equilibrium (CGE). The CGE framework adopted for the M-L IFPA has a solid grounding on economic theory, but is still flexible enough for practical application.

2.2 General Structure of the M-L IFPA CGE Model

The model specified in the following section is deterministic in nature and based on a small, open economy such as the M-L IFPA region. Table 2 displays the generalized equations that form the theoretical structure of the M-L IFPA CGE model.

Table 2: Generalized Specification of the Complete M-L IFPA CGE Model

1. $L_j = X_j - (W - (\alpha_w W + \alpha_{Kr} R_j^K + \alpha_{Dr} R_j^D))$	$j = 1, 2, \dots, 6$
2. $ELF = \sum_{j=1}^6 \beta_j L_j$	$j = 1, 2, \dots, 6$
3. $K_j = X_j - (R_j^K - (\alpha_w W + \alpha_{Kr} R_j^K + \alpha_{Dr} R_j^D))$	$j = 1, 2, \dots, 6$
4. $D_j = X_j - (R_j^D - (\alpha_w W + \alpha_{Kr} R_j^K + \alpha_{Dr} R_j^D))$	$j = 1, 2, \dots, 6$
5. $X_{ij} = X_j$	$i, j = 1, 2, \dots, 6$
6. $X_{jc} = Y - P_j$	$j = 1, 2, \dots, 6$
7. $X_i = \sum_{j=1}^6 \varphi_{ij} X_{ij} + \eta_i X_{ic} + \theta_i E_i + \eta_g G_j$	$i = 1, 2, \dots, 5$ $j = 1, 2, \dots, 6$
8. $E_i = -\phi(P_i - Wp_i + er)$	$i = 1, 2, \dots, 5$
9. $P_j = \sum_{n=1}^6 \delta_{nj} P_n + (\delta W_j + \delta_{K_{rj}} R_j^K + \delta_{D_{rj}} R_j^D + \delta_m PM_j + \delta_T GT_j)$	$j = 1, 2, \dots, 6$
10. $Y = \alpha_i ELF_i + \alpha_i W + \zeta_i K_i + \zeta_i R_i^K + \lambda_j D_j + \lambda_j R_j^D + \lambda_g G$	$i, j = 1, 2, \dots, 6$

Table 3 indicates the endogenous variables contained within the M-L IFPA CGE model. Note that depending on the scenario in question, various endogenous variables can be switched with exogenous variables. This allows for a greater degree of flexibility in the range of scenarios and solution techniques possible.

Table 3: Endogenous Variables in the Model

L_i $i=1,\dots,6$	Labour employed in sector i
X_i $i=1,\dots,6$	Output of sector i
R_i^K $i=1,\dots,6$	Rental rate of capital in sector i
R_i^D $i=1,\dots,6$	Rental rate of land in sector i
D_i $i=1,\dots,6$	Land employed in sector i
X_{ic} $i=1,\dots,6$	Final demand for output from sector i
Y	Household income
P_i $i=1,\dots,6$	Domestic price of output from sector i
E_i $i=1,\dots,5$	Exports from sector i
ELF*	Employed Labour Force
W*	Wage rate
* If W is endogenous ELF is exogenous and vice versa	

Table 4 indicates the exogenous variables contained within the M-L IFPA CGE model. Again, depending on the scenario in question various variables can be switched between endogenous and exogenous.

Table 4: Exogenous Variables in the Model

K_i $i=1,\dots,6$	Capital employed in sector i
D_i $i=1,\dots,6$	Land employed in sector i
X_{ic} $i=1,\dots,6$	Final demand for output from sector i
WP_i $i=1,\dots,6$	World price of output from sector i
E_r	Foreign exchange rate
G_i $i=1,\dots,6$	Government expenditure in sector i
PM_i $i=1,\dots,6$	Price of imports in sector i
GT_i $i=1,\dots,6$	Indirect taxes in sector i
WLE	World labour export
GTF	Government transfers to households

The M-L IFPA CGE contains six sectors and three primary factors of production (land, labour, and capital). The six producing sectors include: agriculture, forestry, service, public, visitor (tourism), and a composite sector comprised of the ‘rest of the economy’. Various assumptions are made with respect to the treatment of these variables in the model. The labour supply is assumed fixed (i.e., the migration of labour between the region and the rest of the world is not considered). The labour market is modeled under the Keynesian assumption of a rigid wage rate. Under this assumption, adjustments in the

3.1 Economic Indicators

There are five categories of economic indicators for which baseline data has been collected and future levels will be simulated. The Table below displays general information on each indicator (Patriquin et al., 2004).

Table 5: Economic Indicators Selected for the M-L IFPA

	Indicator	Explanation
1	Revenue	Revenue represents the gross amount of economic activity (in dollars) that takes place in the region on an annual basis. Revenue is the product of quantity and price in an economic market (example, revenue is the total value of sales).
2	Net Regional Product (NRP)	Net regional product is the combination of all dollar payments for labour, capital, resource rents, and indirect taxes (example, net regional product is the amount of “value-added” activity). Unlike revenue, net regional product represents the value of goods and services produced in the region in a year.
3	Royalties & Indirect Taxes	Royalties are the dollar rents paid by firms to the government for use of publicly owned natural resources. Indirect taxes are any taxes other than income or corporate.
4	Labour Income	Labour income is the dollar amount paid by firms to employees (example, salaries, wages, etc.).
5	Employment	Employment is measured as the number of individuals with primary employment in an individual industry.

3.2 Baseline Data

The following Tables indicate the baseline economic information derived for the M-L IFPA Region. The regional data should be considered average annual estimates based on the period of 1999-2002. Patriquin et al. (2004) discusses the hybrid methodology used to compile the regional data and provides an economic overview of the M-L IFPA region. The data below is adapted from Patriquin et al. (2004); however, in this report, baseline employment is reported as the number of primary jobs in each sector rather than the total number of employment positions.

Table 6 Baseline Revenue (\$)

Agriculture	5,411,574
Forestry	508,849,057
Services	13,418,571
Public	61,412,342
Visitor	133,948,821
ROE	346,237,250
Total	1,069,277,616

Table 9 Baseline Labour Income (\$)

Agriculture	695,877
Forestry	113,527,607
Services	7,553,357
Public	24,153,262
Visitor	25,032,572
ROE	60,784,835
Total	231,747,510

Table 7 Baseline Net Regional Product (\$)

Agriculture	1,523,233
Forestry	240,017,187
Services	9,628,664
Public	36,595,947
Visitor	34,022,854
ROE	81,834,932
Total	403,622,817

Table 10 Baseline Primary Employment (#)

Agriculture	100
Forestry	1,310
Services	429
Public	454
Visitor	1,188
ROE	1,864
Total	5,345

Table 8 Baseline Royalties and Indirect Taxes (\$)

Agriculture	584,835
Forestry	88,313,333
Services	1,748,072
Public	6,938,025
Visitor	2,822,250
ROE	5,098,600
Total	105,505,115

4 Simulation Scenarios and Results

The M-L IFPA CGE model was used to assess the potential future impacts of natural resource management policy and regulatory changes.

4.1 Scenario Descriptions

In total, six scenarios were examined involving positive and negative impacts on AAC in the Morice Timber Supply Area (TSA), increased tourism in the overall M-L IFPA region, and an increase in agricultural exports from the overall region. The purpose of this scenario analysis is to provide an examination of the sensitivity of the economy to various changes in land using sectors. The following Table provides a brief description of the scenarios that were simulated for the M-L IFPA. These scenarios are hypothetical and were selected in order to provide a preliminary sensitivity analysis.

Table 11: Description of M-L IFPA Scenarios

Scenario	Description
1	5% uplift in Morice AAC (equivalent to 2.83% of the total M-L IFPA AAC)
2	5% reduction in Morice AAC (equivalent to 2.70% of the total M-L IFPA AAC)
3	10% reduction in Morice AAC (equivalent to 5.15% of the total M-L IFPA AAC)
4	10% increase in M-L IFPA visitors
5	10% increase in M-L IFPA agriculture

4.2 Scenario Results

The following Tables summarize the simulated changes in the economic indicators for the respective scenarios. The scenario results are expressed in terms of the average annual indicator level after the shock and percent change from the baseline indicator level. Table 12 provides a snapshot of the impacts of each scenario on the overall regional total indicator level compared to the baseline level. The subsequent section examines the detailed sector impacts and tables containing the impacts on the rest of the province are located in Appendix B.

Table 12: M-L IFPA Scenario Comparison Chart

	Baseline	1 - +5% AAC		2 - -5% AAC		3 - -10% AAC		4 - +10% Vis		5 - +10% Ag	
	\$/#	\$/#	%	\$/#	%	\$/#	%	\$/#	%	\$/#	%
Total Revenue	1,069,277,616	1,086,320,079	1.59	1,053,046,641	-1.52	1,038,291,430	-2.90	1,091,216,984	2.05	1,070,005,665	0.07
Total NRP*	403,622,817	413,719,330	2.50	394,007,056	-2.38	385,265,586	-4.55	410,766,687	1.77	403,915,575	0.07
Total R and IT**	105,505,115	108,849,574	3.17	102,319,905	-3.02	99,424,303	-5.76	106,628,160	1.06	105,588,981	0.08
Total Labour Income	231,747,510	236,875,268	2.21	226,863,914	-2.11	222,424,347	-4.02	236,535,850	2.07	231,908,865	0.07
Total Employment	5,345	5,426	1.52	5,268	-1.45	5,197	-2.76	5,520	3.27	5,355	0.19

*Net Regional Product

**Royalties and Indirect Taxes

4.2.1 Scenario 1

Scenario 1 is a simulation of what the economy of the M-L IFPA region would like with a five percent uplift of the AAC in the Morice TSA over the baseline (or an equivalent 2.83% uplift in the overall AAC of the M-L IFPA region). The simulated shock would result in a new AAC level of 2,059,173 cubic meters (up from 1,961,117 cubic meters) in the Morice TSA and a new AAC level of 3,657,229 cubic meters (up from 3,461,117 cubic meters) in the overall IFPA region.

The results indicate an economy wide increase (across all sectors) in revenue, NRP, royalties and indirect taxes, labour income, and employment. This means that as the AAC of the region increases, the positive impact ripples throughout the other sectors. Domestic services and the rest of the economy (primarily retail and mining) are the sectors with the greatest linkages to forestry and, therefore, benefit the most from an increase in AAC. Impacts on forestry appear to have a very minimal effect on the agriculture and visitor sectors. Based on the current structure of the economy, the positive shock to AAC has a very minimal positive impact on the visitor sector. However, if the uplift in harvest levels has a dramatic affect on the forest in the long run, future preference of visitors may change the structure of the economy resulting in a new relationship between the visitor sector and the forestry sector.

A five percent increase of the AAC in the Morice TSA yields a simulated \$12.3 million increase in forestry sector revenue and an increase in the overall economy-wide revenue of \$17.0 million. The increase in forestry activity also results in an increase of \$8.7 million in NRP from the forestry sector and an overall increase of \$9.8 million of NRP in the M-L IFPA economy. Forestry accounts for \$3.2 million of the \$3.3 million change in overall royalties and indirect taxes. Forestry also accounts for \$4.1 million of the overall \$5.1 million increase in total labour income and 48 of the 81 total primary employment positions generated from the uplift in AAC.

The Tables below indicate the detailed changes in the economic indicator levels.

4.2.1.1 Scenario 1 Detailed Impact Tables

Revenue (\$)	Baseline	Simulated Indicator Level	Level Change	% Change
Agriculture	5,411,574	5,448,039	36,465	0.67
Forestry	508,849,057	521,144,379	12,295,322	2.42
Services	13,418,571	13,585,274	166,703	1.24
Public	61,412,342	61,679,789	267,447	0.44
Visitor	133,948,821	134,205,391	256,570	0.19
ROE	346,237,250	350,257,206	4,019,956	1.16
Total	1,069,277,616	1,086,320,079	17,042,463	1.59

NRP (\$)	Baseline	Simulated Indicator Level	Level Change	% Change
Agriculture	1,523,233	1,537,336	14,103	0.93
Forestry	240,017,187	248,761,055	8,743,868	3.64
Services	9,628,664	9,760,903	132,239	1.37
Public	36,595,947	36,762,424	166,477	0.45
Visitor	34,022,854	34,091,598	68,744	0.20
ROE	81,834,932	82,806,013	971,081	1.19
Total	403,622,817	413,719,330	10,096,513	2.50

Royalties (\$)	Baseline	Simulated Indicator Level	Level Change	% Change
Agriculture	584,835	590,250	5,415	0.93
Forestry	88,313,333	91,530,603	3,217,270	3.64
Services	1,748,072	1,772,080	24,008	1.37
Public	6,938,025	6,969,587	31,562	0.45
Visitor	2,822,250	2,827,952	5,702	0.20
ROE	5,098,600	5,159,102	60,502	1.19
Total	105,505,115	108,849,574	3,344,459	3.17

Labour Income (\$)	Baseline	Simulated Indicator Level	Level Change	% Change
Agriculture	695,877	702,320	6,443	0.93
Forestry	113,527,607	117,663,438	4,135,831	3.64
Services	7,553,357	7,657,094	103,737	1.37
Public	24,153,262	24,263,137	109,875	0.45
Visitor	25,032,572	25,083,151	50,579	0.20
ROE	60,784,835	61,506,128	721,293	1.19
Total	231,747,510	236,875,268	5,127,758	2.21

Employment (#)	Baseline	Simulated Indicator Level	Level Change	% Change
Agriculture	100	101	1	0.93
Forestry	1,310	1,358	48	3.64
Services	429	435	6	1.37
Public	454	456	2	0.45
Visitor	1,188	1,190	2	0.20
ROE	1,864	1,886	22	1.19
Total	5,345	5,426	81	1.52

4.2.2 Scenario 2

Scenario 2 represents a simulated five percent reduction in the AAC of the Morice TSA (equivalent to a 2.70% reduction in the total AAC of the M-L IFPA region). The five percent reduction would result in a new AAC level of 1,867,730 cubic meters (down

from 1,961,117 cubic meters) in the Morice TSA and a new AAC level of 3,367,730 cubic meters (down from 3,461,117 cubic meters) in the overall IFPA region.

The results indicate a reduction in the level of each indicator across all sectors, including a minimal negative impact on the visitor sector. Total regional revenue decreases by \$16.2 million primarily due to a direct negative impact on the forestry sector of \$11.7 million. \$8.3 million of NRP is lost directly from the forestry sector comprising the majority of the \$9.6 million reduction in the total NRP of the region. The five percent reduction of the AAC in the Morice TSA results in a \$3.1 million drop in royalties and indirect taxes in the forestry sector with an overall sector wide drop of \$3.2 million. Overall labour income is reduced by \$4.9 million with an impact on forestry labour income of \$3.9 million. A five percent reduction in the Morice TSA AAC results in a simulated loss of 45 primary forestry jobs and a total loss of 77 primary employment positions from the M-L IFPA region.

The Tables below indicate the detailed changes in the economic indicator levels.

4.2.2.1 Scenario 2 Detailed Impact Tables

Revenue (\$)	Baseline	Simulated Indicator Level	Level Change	% Change
Agriculture	5,411,574	5,376,845	-34,729	-0.64
Forestry	508,849,057	497,139,185	-11,709,872	-2.30
Services	13,418,571	13,259,805	-158,766	-1.18
Public	61,412,342	61,157,630	-254,712	-0.41
Visitor	133,948,821	133,704,468	-244,353	-0.18
ROE	346,237,250	342,408,707	-3,828,543	-1.11
Total	1,069,277,616	1,053,046,641	-16,230,975	-1.52

NRP (\$)	Baseline	Simulated Indicator Level	Level Change	% Change
Agriculture	1,523,233	1,509,801	-13,432	-0.88
Forestry	240,017,187	231,689,664	-8,327,523	-3.47
Services	9,628,664	9,502,722	-125,942	-1.31
Public	36,595,947	36,437,396	-158,551	-0.43
Visitor	34,022,854	33,957,383	-65,471	-0.19
ROE	81,834,932	80,910,090	-924,842	-1.13
Total	403,622,817	394,007,056	-9,615,761	-2.38

Royalties (\$)	Baseline	Simulated Indicator Level	Level Change	% Change
Agriculture	584,835	579,678	-5,157	-0.88
Forestry	88,313,333	85,249,255	-3,064,078	-3.47
Services	1,748,072	1,725,207	-22,865	-1.31
Public	6,938,025	6,907,966	-30,059	-0.43
Visitor	2,822,250	2,816,819	-5,431	-0.19
ROE	5,098,600	5,040,979	-57,621	-1.13
Total	105,505,115	102,319,905	-3,185,210	-3.02

Labour Income (\$)	Baseline	Simulated Indicator Level	Level Change	% Change
Agriculture	695,877	689,741	-6,136	-0.88
Forestry	113,527,607	109,588,707	-3,938,900	-3.47
Services	7,553,357	7,454,560	-98,797	-1.31
Public	24,153,262	24,048,619	-104,643	-0.43
Visitor	25,032,572	24,984,401	-48,171	-0.19
ROE	60,784,835	60,097,886	-686,949	-1.13
Total	231,747,510	226,863,914	-4,883,596	-2.11

Employment (#)	Baseline	Simulated Indicator Level	Level Change	% Change
Agriculture	100	99	-1	-0.88
Forestry	1,310	1,265	-45	-3.47
Services	429	423	-6	-1.31
Public	454	452	-2	-0.43
Visitor	1,188	1,186	-2	-0.19
ROE	1,864	1,843	-21	-1.13
Total	5,345	5,268	-77	-1.45

4.2.3 Scenario 3

Scenario 3 represents a simulated ten percent reduction in the AAC of the Morice TSA (equivalent to a 5.15% reduction in the total AAC of the M-L IFPA region). The ten percent reduction would result in a new AAC level of 1,782,834 cubic meters (down from 1,961,117 cubic meters) in the Morice TSA and a new AAC level of 3,382,834 cubic meters (down from 3,461,117 cubic meters) in the overall IFPA region.

The results of scenario 3 yield a reduction in the level of each indicator across all sectors and are double the impacts under Scenario 2. Total regional revenue decreases by \$31.0 million primarily due to a direct negative impact on the forestry sector of \$22.4 million. \$15.9 million of NRP is lost directly from the forestry sector comprising the majority of the \$18.4 million reduction in the total NRP of the region. The ten percent reduction of the AAC in the Morice TSA results in a \$5.8 million drop in royalties and indirect taxes in the forestry sector with an overall sector wide drop of \$6.1 million. \$7.5 million of

labour income is lost from the forestry sector, contributing to an overall loss in total labour income of \$9.3 million. A ten percent reduction in the Morice TSA AAC results in a simulated loss of 87 primary forestry jobs and a total loss of 148 primary employment positions from the M-L IFPA region.

The Tables below indicate the detailed changes in the economic indicator levels.

4.2.3.1 Scenario 3 Detailed Impact Tables

Revenue (\$)	Baseline	Simulated Indicator Level	Level Change	% Change
Agriculture	5,411,574	5,345,274	-66,300	-1.23
Forestry	508,849,057	486,494,006	-22,355,051	-4.39
Services	13,418,571	13,115,475	-303,096	-2.26
Public	61,412,342	60,926,077	-486,265	-0.79
Visitor	133,948,821	133,482,332	-466,489	-0.35
ROE	346,237,250	338,928,266	-7,308,984	-2.11
Total	1,069,277,616	1,038,291,430	-30,986,186	-2.90

NRP (\$)	Baseline	Simulated Indicator Level	Level Change	% Change
Agriculture	1,523,233	1,497,591	-25,642	-1.68
Forestry	240,017,187	224,119,302	-15,897,885	-6.62
Services	9,628,664	9,388,230	-240,434	-2.50
Public	36,595,947	36,293,262	-302,685	-0.83
Visitor	34,022,854	33,897,865	-124,989	-0.37
ROE	81,834,932	80,069,336	-1,765,596	-2.16
Total	403,622,817	385,265,586	-18,357,231	-4.55

Royalties (\$)	Baseline	Simulated Indicator Level	Level Change	% Change
Agriculture	584,835	574,990	-9,845	-1.68
Forestry	88,313,333	82,463,772	-5,849,561	-6.62
Services	1,748,072	1,704,422	-43,650	-2.50
Public	6,938,025	6,880,641	-57,384	-0.83
Visitor	2,822,250	2,811,882	-10,368	-0.37
ROE	5,098,600	4,988,597	-110,003	-2.16
Total	105,505,115	99,424,303	-6,080,812	-5.76

Labour Income (\$)	Baseline	Simulated Indicator Level	Level Change	% Change
Agriculture	695,877	684,163	-11,714	-1.68
Forestry	113,527,607	106,007,942	-7,519,665	-6.62
Services	7,553,357	7,364,745	-188,612	-2.50
Public	24,153,262	23,953,490	-199,772	-0.83
Visitor	25,032,572	24,940,610	-91,962	-0.37
ROE	60,784,835	59,473,397	-1,311,438	-2.16
Total	231,747,510	222,424,347	-9,323,163	-4.02

Employment (#)	Baseline	Simulated Indicator Level	Level Change	% Change
Agriculture	100	98	-2	-1.68
Forestry	1,310	1,223	-87	-6.62
Services	429	418	-11	-2.50
Public	454	450	-4	-0.83
Visitor	1,188	1,184	-4	-0.37
ROE	1,864	1,824	-40	-2.16
Total	5,345	5,197	-148	-2.76

4.2.4 Scenario 4

Scenario 4 simulates a ten percent increase in visitor sector activity in the M-L IFPA region. In this scenario there is no impact on AAC. In other words, the total AAC of the region remains constant at 3,461,117 cubic meters in the overall IFPA region. The strongest linkages of the visitor sector are with the domestic services sector and the rest of the economy (primarily retail). The visitor sector also has a weak positive relationship with forestry, agriculture, and the public sector.

The results of scenario 4 yield a positive impact in the level of each indicator across all sectors. Total regional revenue increases by \$21.9 million with \$12.2 million derived from the visitor sector and \$5.4 million derived from the rest of the economy (retail). \$3.3 million of NRP is gained directly from the visitor sector comprising the majority of the \$7.1 million increase in the total NRP of the region. The ten percent increase in visitor activity results in a minimal \$1.1 million increase in indirect taxes. \$2.4 million of labour income is gained in the visitor sector, contributing to an overall gain in total labour income of \$4.8 million. A ten percent increase in visitor activity results in a simulated gain of 115 primary visitor sector jobs and a total gain of 175 primary employment positions in the M-L IFPA region.

The Tables below indicate the detailed changes in the economic indicator levels.

4.2.4.1 Scenario 4 Detailed Impact Tables

Revenue (\$)	Baseline	Simulated Indicator Level	Level Change	% Change
Agriculture	5,411,574	5,456,360	44,786	0.83
Forestry	508,849,057	511,318,446	2,469,389	0.49
Services	13,418,571	13,714,029	295,458	2.20
Public	61,412,342	61,916,590	504,248	0.82
Visitor	133,948,821	146,193,680	12,244,859	9.14
ROE	346,237,250	352,617,877	6,380,627	1.84
Total	1,069,277,616	1,091,216,984	21,939,368	2.05

NRP (\$)	Baseline	Simulated Indicator Level	Level Change	% Change
Agriculture	1,523,233	1,540,554	17,321	1.14
Forestry	240,017,187	241,773,303	1,756,116	0.73
Services	9,628,664	9,863,039	234,375	2.43
Public	36,595,947	36,909,826	313,879	0.86
Visitor	34,022,854	37,303,696	3,280,842	9.64
ROE	81,834,932	83,376,269	1,541,337	1.88
Total	403,622,817	410,766,687	7,143,870	1.77

Royalties (\$)	Baseline	Simulated Indicator Level	Level Change	% Change
Agriculture	584,835	591,485	6,650	1.14
Forestry	88,313,333	88,959,489	646,156	0.73
Services	1,748,072	1,790,622	42,550	2.43
Public	6,938,025	6,997,532	59,507	0.86
Visitor	2,822,250	3,094,401	272,151	9.64
ROE	5,098,600	5,194,631	96,031	1.88
Total	105,505,115	106,628,160	1,123,045	1.06

Labour Income (\$)	Baseline	Simulated Indicator Level	Level Change	% Change
Agriculture	695,877	703,790	7,913	1.14
Forestry	113,527,607	114,358,246	830,639	0.73
Services	7,553,357	7,737,216	183,859	2.43
Public	24,153,262	24,360,422	207,160	0.86
Visitor	25,032,572	27,446,476	2,413,904	9.64
ROE	60,784,835	61,929,700	1,144,865	1.88
Total	231,747,510	236,535,850	4,788,340	2.07

Employment (#)	Baseline	Simulated Indicator Level	Level Change	% Change
Agriculture	100	101	1	1.14
Forestry	1,310	1,320	10	0.73
Services	429	439	10	2.43
Public	454	458	4	0.86
Visitor	1,188	1,303	115	9.64
ROE	1,864	1,899	35	1.88
Total	5,345	5,520	175	3.27

4.2.5 Scenario 5

Scenario 5 simulates a ten percent increase in agricultural exports from the M-L IFPA region. Similar to scenario 4, there is no impact on AAC considered in this scenario. In other words, the total AAC of the region remains constant at 3,461,117 cubic meters in the overall IFPA region. Visitor sector activity is also held constant at the baseline level. The strongest linkages of the agricultural sector are with the rest of the economy (primarily retail) and to some extent forestry. The agriculture sector also has a weak positive relationship with forestry, agriculture, and the public sector. However, the agricultural linkages are weak overall.

A ten percent increase in agricultural exports yields a simulated \$0.7 million increase in the overall economy-wide revenue. Most of the indirect increase in revenue is derived from indirect increases in retail activity. The increase in agricultural exports results in an overall increase of \$0.3 million in NRP and \$0.1 million in royalties and indirect taxes. Again, most of these benefits are derived indirectly through other sectors. The increase in agricultural exports results in a \$0.1 million increase in labour income primarily derived indirectly through the retail sector. The increase in exports also leads to a direct increase of 7 primary jobs in agriculture and a total of 10 new primary positions in the M-L IFPA region.

4.2.5.1 Scenario 5 Detailed Impact Tables

Revenue (\$)	Baseline	Simulated Indicator Level	Level Change	% Change
Agriculture	5,411,574	5,696,668	285,094	5.27
Forestry	508,849,057	508,972,014	122,957	0.02
Services	13,418,571	13,431,398	12,827	0.10
Public	61,412,342	61,438,751	26,409	0.04
Visitor	133,948,821	133,972,260	23,439	0.02
ROE	346,237,250	346,494,572	257,322	0.07
Total	1,069,277,616	1,070,005,665	728,049	0.07

NRP (\$)	Baseline	Simulated Indicator Level	Level Change	% Change
Agriculture	1,523,233	1,633,495	110,262	7.24
Forestry	240,017,187	240,104,629	87,442	0.04
Services	9,628,664	9,638,839	10,175	0.11
Public	36,595,947	36,612,386	16,439	0.04
Visitor	34,022,854	34,029,134	6,280	0.02
ROE	81,834,932	81,897,092	62,160	0.08
Total	403,622,817	403,915,575	292,758	0.07

Royalties (\$)	Baseline	Simulated Indicator Level	Level Change	% Change
Agriculture	584,835	627,169	42,334	7.24
Forestry	88,313,333	88,345,507	32,174	0.04
Services	1,748,072	1,749,919	1,847	0.11
Public	6,938,025	6,941,142	3,117	0.04
Visitor	2,822,250	2,822,771	521	0.02
ROE	5,098,600	5,102,473	3,873	0.08
Total	105,505,115	105,588,981	83,866	0.08

Labour Income (\$)	Baseline	Simulated Indicator Level	Level Change	% Change
Agriculture	695,877	746,249	50,372	7.24
Forestry	113,527,607	113,568,967	41,360	0.04
Services	7,553,357	7,561,339	7,982	0.11
Public	24,153,262	24,164,112	10,850	0.04
Visitor	25,032,572	25,037,193	4,621	0.02
ROE	60,784,835	60,831,006	46,171	0.08
Total	231,747,510	231,908,865	161,355	0.07

Employment (#)	Baseline	Simulated Indicator Level	Level Change	% Change
Agriculture	100	107	7	7.24
Forestry	1,310	1,310	0	0.04
Services	429	429	0	0.11
Public	454	454	0	0.04
Visitor	1,188	1,188	0	0.02
ROE	1,864	1,865	1	0.08
Total	5,345	5,355	10	0.19

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6 Appendix A

6.1 Procedures for Using the M-L IFPA CGE

6.1.1 Master File Contents

The M-L IFPA CGE model was created in MS Excel 2000, but can also be operated in MS Excel 97. The name of the “master” file is *M-L IFPACGE MASTER FILE.xls*. The M-L IFPA CGE master file contains 8 worksheets. The table below displays the worksheets and a brief description of the contents.

Table 13: Master File Worksheet Descriptions

	Worksheet Name	Contents	Category
1	Input	Contains blue shaded cells for data input related to varying levels of annual allowable cut, visitor activity, and agricultural exports	Input Sheet
2	IFPA Output	Output of M-L IFPA average annual indicator levels reported for the scenario and comparison to baseline tables	Detailed Output Sheet
3	BC Output	Output of the average annual indicator levels for the additional impacts on the rest of the province	Detailed Output Sheet
4	M-L IFPA CGE	M-L IFPA detailed model technical coefficients and matrices	Internal/Structural
5	M-L IFPA SAM	M-L IFPA social accounting matrix (baseline economic data)	Internal/Structural
6	BC Input	Automatically updated input sheet for impacts on the rest of the province	Internal/Structural
7	BC CGE	BC detailed model and technical coefficients and matrices	Internal/Structural
8	BC SAM	BC social accounting matrix (baseline economic data)	Internal Structural

Worksheet 1 (*Input*) is the only worksheet that requires manual editing during a scenario. **When starting a new scenario analysis always ensure to save the master file as another file first!**

Worksheets 2 (*IFPA Output*) automatically updates when changes are made to worksheet 1. Note that computation times will vary with the speed of your computer processor.

Worksheet 3 (*BC Output*) automatically updates when changes are made to worksheet 1.

Worksheets 4-8 are locked from editing via password protection (password = IFPA2004). These worksheets should not be edited and exist for the purpose of automating various output pages as part of the internal model system.

6.1.2 The Simulation Procedure

The following steps outline the simulation procedure:

1. **Open** the “master” file *M-L IFPACGE Master File.xls* in MS Excel 2000 or MS Excel 97.
2. “**Save as**” a file with the name of the scenario being conducted. This should ensure that the “master” file is never inappropriately edited.
3. On worksheet 1 (**Input**) enter new scenario values in the blue shaded cells.
4. **Review** the automatically updated output pages on worksheet.
5. **Copy and paste** the output tables on worksheet two in to another document or;
6. **Save** the file again before closing.

7 Appendix B

7.1 Impacts on the Rest of the Province

7.1.1 Scenario 1 Detailed Impact Tables

Revenue (\$)	Baseline	Simulated Indicator Level	Level Change	% Change
Agriculture	3,497,694,364	3,497,755,568	61,204	0.00
Forestry	7,063,481,003	7,064,299,470	818,467	0.01
Services	99,353,187,729	99,354,069,223	881,494	0.00
Public	33,836,901,602	33,836,969,805	68,203	0.00
Visitor	8,514,156,433	8,514,226,767	70,334	0.00
ROE	104,527,641,869	104,528,454,441	812,572	0.00
Total	256,793,063,000	256,795,775,273	2,712,273	0.00
NRP (\$)	Baseline	Simulated Indicator Level	Level Change	% Change
Agriculture	1,149,000,000	1,149,026,222	26,222	0.00
Forestry	3,206,000,000	3,206,610,156	610,156	0.02
Services	50,775,000,000	50,775,520,189	520,189	0.00
Public	20,233,000,000	20,233,042,461	42,461	0.00
Visitor	3,504,000,000	3,504,029,981	29,981	0.00
ROE	26,752,000,000	26,752,213,191	213,191	0.00
Total	105,619,000,000	105,620,442,200	1,442,200	0.00
Royalties (\$)	Baseline	Simulated Indicator Level	Level Change	% Change
Agriculture	378,000,000	378,008,626	8,626	0.00
Forestry	1,502,000,000	1,502,285,856	285,856	0.02
Services	12,943,000,000	12,943,132,601	132,601	0.00
Public	1,555,000,000	1,555,003,263	3,263	0.00
Visitor	441,000,000	441,003,773	3,773	0.00
ROE	1,895,000,000	1,895,015,102	15,102	0.00
Total	18,714,000,000	18,714,449,222	449,222	0.00
Labour Income (\$)	Baseline	Simulated Indicator Level	Level Change	% Change
Agriculture	395,000,000	395,009,014	9,014	0.00
Forestry	1,680,000,000	1,680,319,733	319,733	0.02
Services	25,432,000,000	25,432,260,550	260,550	0.00
Public	16,448,000,000	16,448,034,518	34,518	0.00
Visitor	2,769,000,000	2,769,023,692	23,692	0.00
ROE	17,320,000,000	17,320,138,026	138,026	0.00
Total	64,044,000,000	64,044,785,534	785,534	0.00

Employment (#)	Baseline	Simulated Indicator Level	Level Change	% Change
Agriculture	53,715	53,716	1	0.00
Forestry	39,390	39,397	7	0.02
Services	353,550	353,554	4	0.00
Public	422,650	422,651	1	0.00
Visitor	160,830	160,831	1	0.00
ROE	874,375	874,382	7	0.00
Total	1,904,510	1,904,532	22	0.00

7.1.2 Scenario 2 Detailed Impact Tables

Revenue (\$)	Baseline	Simulated Indicator Level	Level Change	% Change
Agriculture	3,497,694,364	3,497,636,074	-58,290	0.00
Forestry	7,063,481,003	7,062,701,508	-779,495	-0.01
Services	99,353,187,729	99,352,348,208	-839,521	0.00
Public	33,836,901,602	33,836,836,647	-64,955	0.00
Visitor	8,514,156,433	8,514,089,448	-66,985	0.00
ROE	104,527,641,869	104,526,867,988	-773,881	0.00
Total	256,793,063,000	256,790,479,874	-2,583,126	0.00
NRP (\$)	Baseline	Simulated Indicator Level	Level Change	% Change
Agriculture	1,149,000,000	1,148,975,027	-24,973	0.00
Forestry	3,206,000,000	3,205,418,897	-581,103	-0.02
Services	50,775,000,000	50,774,504,580	-495,420	0.00
Public	20,233,000,000	20,232,959,561	-40,439	0.00
Visitor	3,504,000,000	3,503,971,446	-28,554	0.00
ROE	26,752,000,000	26,751,796,960	-203,040	0.00
Total	105,619,000,000	105,617,626,471	-1,373,529	0.00
Royalties (\$)	Baseline	Simulated Indicator Level	Level Change	% Change
Agriculture	378,000,000	377,991,784	-8,216	0.00
Forestry	1,502,000,000	1,501,727,755	-272,245	-0.02
Services	12,943,000,000	12,942,873,713	-126,287	0.00
Public	1,555,000,000	1,554,996,892	-3,108	0.00
Visitor	441,000,000	440,996,406	-3,594	0.00
ROE	1,895,000,000	1,894,985,617	-14,383	0.00
Total	18,714,000,000	18,713,572,168	-427,832	0.00

Labour Income (\$)	Baseline	Simulated Indicator Level	Level Change	% Change
Agriculture	395,000,000	394,991,415	-8,585	0.00
Forestry	1,680,000,000	1,679,695,492	-304,508	-0.02
Services	25,432,000,000	25,431,751,856	-248,144	0.00
Public	16,448,000,000	16,447,967,126	-32,874	0.00
Visitor	2,769,000,000	2,768,977,436	-22,564	0.00
ROE	17,320,000,000	17,319,868,546	-131,454	0.00
Total	64,044,000,000	64,043,251,870	-748,130	0.00
Employment (#)	Baseline	Simulated Indicator Level	Level Change	% Change
Agriculture	53,715	53,714	-1	0.00
Forestry	39,390	39,383	-7	-0.02
Services	353,550	353,547	-3	0.00
Public	422,650	422,649	-1	0.00
Visitor	160,830	160,829	-1	0.00
ROE	874,375	874,368	-7	0.00
Total	1,904,510	1,904,489	-21	0.00

7.1.3 Scenario 3 Detailed Impact Tables

Revenue (\$)	Baseline	Simulated Indicator Level	Level Change	% Change
Agriculture	3,497,694,364	3,497,583,084	-111,280	0.00
Forestry	7,063,481,003	7,061,992,887	-1,488,116	-0.02
Services	99,353,187,729	99,351,585,019	-1,602,710	0.00
Public	33,836,901,602	33,836,777,598	-124,004	0.00
Visitor	8,514,156,433	8,514,028,554	-127,879	0.00
ROE	104,527,641,869	104,526,164,471	-1,477,398	0.00
Total	256,793,063,000	256,788,131,613	-4,931,387	0.00
NRP (\$)	Baseline	Simulated Indicator Level	Level Change	% Change
Agriculture	1,149,000,000	1,148,952,324	-47,676	0.00
Forestry	3,206,000,000	3,204,890,629	-1,109,371	-0.03
Services	50,775,000,000	50,774,054,205	-945,795	0.00
Public	20,233,000,000	20,232,922,798	-77,202	0.00
Visitor	3,504,000,000	3,503,945,489	-54,511	0.00
ROE	26,752,000,000	26,751,612,381	-387,619	0.00
Total	105,619,000,000	105,616,377,827	-2,622,173	0.00

Royalties (\$)	Baseline	Simulated Indicator Level	Level Change	% Change
Agriculture	378,000,000	377,984,316	-15,684	0.00
Forestry	1,502,000,000	1,501,480,263	-519,737	-0.03
Services	12,943,000,000	12,942,758,908	-241,092	0.00
Public	1,555,000,000	1,554,994,067	-5,933	0.00
Visitor	441,000,000	440,993,139	-6,861	0.00
ROE	1,895,000,000	1,894,972,543	-27,457	0.00
Total	18,714,000,000	18,713,183,236	-816,764	0.00
Labour Income (\$)	Baseline	Simulated Indicator Level	Level Change	% Change
Agriculture	395,000,000	394,983,610	-16,390	0.00
Forestry	1,680,000,000	1,679,418,670	-581,330	-0.03
Services	25,432,000,000	25,431,526,274	-473,726	0.00
Public	16,448,000,000	16,447,937,240	-62,760	0.00
Visitor	2,769,000,000	2,768,956,923	-43,077	0.00
ROE	17,320,000,000	17,319,749,045	-250,955	0.00
Total	64,044,000,000	64,042,571,762	-1,428,238	0.00
Employment (#)	Baseline	Simulated Indicator Level	Level Change	% Change
Agriculture	53,715	53,713	-2	0.00
Forestry	39,390	39,376	-14	-0.03
Services	353,550	353,543	-7	0.00
Public	422,650	422,648	-2	0.00
Visitor	160,830	160,827	-3	0.00
ROE	874,375	874,362	-13	0.00
Total	1,904,510	1,904,471	-39	0.00

7.1.4 Scenario 4 Detailed Impact Tables

Revenue (\$)	Baseline	Simulated Indicator Level	Level Change	% Change
Agriculture	3,497,694,364	3,497,701,697	7,333	0.00
Forestry	7,063,481,003	7,063,494,769	13,766	0.00
Services	99,353,187,729	99,353,425,834	238,105	0.00
Public	33,836,901,602	33,836,920,131	18,529	0.00
Visitor	8,514,156,433	8,514,304,147	147,714	0.00
ROE	104,527,641,869	104,527,866,856	224,987	0.00
Total	256,793,063,000	256,793,713,434	650,434	0.00

NRP (\$)	Baseline	Simulated Indicator Level	Level Change	% Change
Agriculture	1,149,000,000	1,149,003,142	3,142	0.00
Forestry	3,206,000,000	3,206,010,263	10,263	0.00
Services	50,775,000,000	50,775,140,511	140,511	0.00
Public	20,233,000,000	20,233,011,536	11,536	0.00
Visitor	3,504,000,000	3,504,062,966	62,966	0.00
ROE	26,752,000,000	26,752,059,029	59,029	0.00
Total	105,619,000,000	105,619,287,446	287,446	0.00
Royalties (\$)	Baseline	Simulated Indicator Level	Level Change	% Change
Agriculture	378,000,000	378,001,034	1,034	0.00
Forestry	1,502,000,000	1,502,004,808	4,808	0.00
Services	12,943,000,000	12,943,035,817	35,817	0.00
Public	1,555,000,000	1,555,000,887	887	0.00
Visitor	441,000,000	441,007,925	7,925	0.00
ROE	1,895,000,000	1,895,004,181	4,181	0.00
Total	18,714,000,000	18,714,054,652	54,652	0.00
Labour Income (\$)	Baseline	Simulated Indicator Level	Level Change	% Change
Agriculture	395,000,000	395,001,080	1,080	0.00
Forestry	1,680,000,000	1,680,005,378	5,378	0.00
Services	25,432,000,000	25,432,070,379	70,379	0.00
Public	16,448,000,000	16,448,009,378	9,378	0.00
Visitor	2,769,000,000	2,769,049,758	49,758	0.00
ROE	17,320,000,000	17,320,038,217	38,217	0.00
Total	64,044,000,000	64,044,174,189	174,189	0.00
Employment (#)	Baseline	Simulated Indicator Level	Level Change	% Change
Agriculture	53,715	53,715	0	0.00
Forestry	39,390	39,390	0	0.00
Services	353,550	353,551	1	0.00
Public	422,650	422,650	0	0.00
Visitor	160,830	160,833	3	0.00
ROE	874,375	874,377	2	0.00
Total	1,904,510	1,904,516	6	0.00

7.1.5 Scenario 5 Detailed Impact Tables

Revenue (\$)	Baseline	Simulated Indicator Level	Level Change	% Change
Agriculture	3,497,694,364	3,497,725,795	31,431	0.00
Forestry	7,063,481,003	7,063,485,348	4,345	0.00
Services	99,353,187,729	99,353,245,815	58,086	0.00
Public	33,836,901,602	33,836,906,428	4,826	0.00
Visitor	8,514,156,433	8,514,161,204	4,771	0.00
ROE	104,527,641,869	104,527,696,615	54,746	0.00
Total	256,793,063,000	256,793,221,205	158,205	0.00
NRP (\$)	Baseline	Simulated Indicator Level	Level Change	% Change
Agriculture	1,149,000,000	1,149,013,466	13,466	0.00
Forestry	3,206,000,000	3,206,003,239	3,239	0.00
Services	50,775,000,000	50,775,034,278	34,278	0.00
Public	20,233,000,000	20,233,003,004	3,004	0.00
Visitor	3,504,000,000	3,504,002,034	2,034	0.00
ROE	26,752,000,000	26,752,014,363	14,363	0.00
Total	105,619,000,000	105,619,070,385	70,385	0.00
Royalties (\$)	Baseline	Simulated Indicator Level	Level Change	% Change
Agriculture	378,000,000	378,004,430	4,430	0.00
Forestry	1,502,000,000	1,502,001,518	1,518	0.00
Services	12,943,000,000	12,943,008,738	8,738	0.00
Public	1,555,000,000	1,555,000,231	231	0.00
Visitor	441,000,000	441,000,256	256	0.00
ROE	1,895,000,000	1,895,001,017	1,017	0.00
Total	18,714,000,000	18,714,016,190	16,190	0.00
Labour Income (\$)	Baseline	Simulated Indicator Level	Level Change	% Change
Agriculture	395,000,000	395,004,629	4,629	0.00
Forestry	1,680,000,000	1,680,001,698	1,698	0.00
Services	25,432,000,000	25,432,017,169	17,169	0.00
Public	16,448,000,000	16,448,002,442	2,442	0.00
Visitor	2,769,000,000	2,769,001,607	1,607	0.00
ROE	17,320,000,000	17,320,009,299	9,299	0.00
Total	64,044,000,000	64,044,036,845	36,845	0.00

Employment (#)	Baseline	Simulated Indicator Level	Level Change	% Change
Agriculture	53,715	53,716	1	0.00
Forestry	39,390	39,390	0	0.00
Services	353,550	353,550	0	0.00
Public	422,650	422,650	0	0.00
Visitor	160,830	160,830	0	0.00
ROE	874,375	874,375	0	0.00
Total	1,904,510	1,904,512	2	0.00