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**Tourism as an engine for sustainable development? Comparative analysis of the advantages and disadvantages of the primary exported products in Bolivia**

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**Summary:** This document provides an initial diagnostic of the tourism sector in Bolivia in comparison to the three most exporting sectors (mining, hydrocarbons, and agriculture-farming), focusing on various economic, social, and environmental factors. The goal is to provide a greater understanding of the dynamics and the potential of the tourism sector in Bolivia.

**Key terms:** Tourism, sustainable development, gender inclusion, Bolivia

**JEL Classification:** E24, J16, L83, Q01

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## 1. Introduction

According to the “*Municipal Atlas of the Sustainable Development Goals in Bolivia 2020*” (Andersen et al., 2020) municipalities with higher scores with respect to the sustainable development goals (ODS) tend to have more tourist activities. However, in spite of the apparent importance of this sector, the relationship between development and tourism still has not been easy to investigate or study in Bolivia. This document provides an initial diagnostic of the tourism sector in Bolivia compared with the more important sectors in economic, social, and political terms (mining, hydrocarbons, and agriculture/farming). The goal is to have a better understanding of the dynamics and the scopes of the tourism sector. Additionally, it identifies the strengths and the weaknesses of the tourism sector, in comparison to the other sectors. Finally, this document provides the analytical bases, with a wide perspective, that helps decision-making with regards to tourism.

## 2. Methodology

This document analyzes and makes comparisons of the following sectors, with the objective of having a better understanding of the behavior and the dynamics of the tourism sector in Bolivia:

1. Mining
2. Hydrocarbons
3. Agriculture/farming
4. Tourism

The dimensions of analysis of each of the sectors are as follows:

1. Sectoral GDP
2. Income from exports
3. Job creation for men and women
4. Income from labor, by gender
5. Deforestation
6. Greenhouse gas emissions
7. Contamination

## 3. Calculations detailed

### 3.1. Sectoral GDP

The sectoral GDP for the industries analyzed (mining, hydrocarbons, agriculture/farming, and tourism) were estimated using the book *The Economic System of the local Systems: the potential of the 339 municipalities of Bolivia*, (Análisis-Real, Latinoamérica, 2018). It presents indicators at the municipal level of all the municipalities in Bolivia. It used the

indicator of gross production value, since in agreement with the definition of the National Statistics Institute (INE)<sup>1</sup> is that which is closest to the sectoral GDP.

### 3.1.1. Mining

For the mining sector, they identified 130 municipalities with a positive gross production in the mining sector. The production is equivalent to 21,339 millions of Bolivianos per year. Table 1 shows this amount at the departmental level.

*Table 1. Gross production in the mining sector, 2016*

Department	Number of municipalities with a positive gross production in mining	Percentage of municipalities with a positive gross production in mining	Gross production in mining (millions of Bs per year)
Chuquisaca	4	14%	29
La Paz	49	56%	5,903
Cochabamba	11	23%	252
Oruro	14	40%	3,335
Potosí	25	63%	10,960
Tarija	3	27%	16
Santa Cruz	11	20%	405
Beni	5	26%	388
Pando	8	53%	51
Bolivia	130	38%	21,339

*Source: authors' calculation based on data from the book Análisis Real-Latinoamérica (2018)*

Only 38% of municipalities in Bolivia have a positive gross production in the mining sector. It also represents approximately 5.3% of the total gross production in Bolivia. The department of Potosí contributed the most to the sector with 51% of the gross production. The department of La Paz contributed approximately 28% of the total gross production.

<sup>1</sup> <https://www.ine.gob.bo/index.php/publicaciones/como-se-calcula-el-producto-interno-bruto-en-bolivia/>

### 3.1.2. Hydrocarbons

With respect to the hydrocarbon sector in Bolivia, 21 municipalities have a positive gross production, equivalent to 24,249 millions of Bolivianos per year. This can be seen in Table 2 at the departmental level.

*Table 2. Gross production of the hydrocarbon sector, 2016*

Department	Number of municipalities with a positive gross production in the hydrocarbon sector	Percentage of municipalities with a positive gross production in hydrocarbons	Gross production in the hydrocarbon sector (millions of Bs per year)
Chuquisaca	3	10.3%	2,885
La Paz	0	0.0%	0
Cochabamba	1	2.1%	898
Oruro	0	0.0%	0
Potosí	0	0.0%	0
Tarija	5	45.5%	15,671
Santa Cruz	12	21.4%	4,795
Beni	0	0.0%	0
Pando	0	0.0%	0
Bolivia	21	6.2%	24,249

*Source: authors' calculation based on data from the book AnálisisReal-Latinoamérica (2018)*

Only 6% of municipalities in Bolivia have a positive gross production in the hydrocarbon sector. In comparison to the mining sector, this positive production is concentrated in a smaller number of municipalities, and has a smaller presence in the departments of Bolivia. However, it also represents a higher gross production, having a value of 6% of the total gross production in Bolivia. The department of Tarija contributes the most to the hydrocarbon sector, with 65% of total gross production. The department of Santa Cruz contributes 20% of the gross production in Bolivia.

### 3.1.3. Agriculture and farming

In contrast to the other sectors (mining, hydrocarbons and tourism) the agricultural and farming sectors is present in 99.7% of Bolivian municipalities, with the exception of Huachacalla in Oruro, the only municipality in Bolivia that does not have a positive gross

production in agriculture and farming. For this reason, the table does not show the number of municipalities with a positive gross production in the agriculture and farming sector.

*Table 3. Gross production in the agricultural and farming sector, 2016*

Department	Gross production in the agriculture, farming, and fishing sector (millions of Bs per year)
Chuquisaca	1,526
La Paz	3,891
Cochabamba	6,158
Oruro	767
Potosí	1,317
Tarija	1,395
Santa Cruz	20,076
Beni	2,243
Pando	224
Bolivia	37,597

*Source: authors' calculations based on data from the book AnálisisReal-Latinoamérica (2018)*

Table 3 shows that Santa Cruz is the department with the highest contribution to gross production in Bolivia, at 53% of the gross production of this sector. This is much higher than second place, Cochabamba, which contributes 16% of the total gross production in Bolivia.

### 3.1.4. Tourism

Within the tourism sector in Bolivia, they identified 271 municipalities with a positive gross production, equivalent to 16,669 millions of Bolivianos per year. Table 4 shows this at the departmental level.

*Table 4. Gross production in the tourism sector, 2016*

Department	Number of municipalities with a positive gross production in the tourism sector	Percentage of municipalities with a positive gross production in tourism	Gross production in the tourism sector (millions of Bs per year)
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Chuquisaca	27	93.1%	749
La Paz	67	77.0%	5,492
Cochabamba	41	87.2%	2,541
Oruro	16	45.7%	412
Potosí	29	72.5%	1,088
Tarija	11	100.0%	557
Santa Cruz	52	92.9%	5,176
Beni	18	94.7%	576
Pando	10	66.7%	78
Bolivia	271	79.9%	16,669

*Source: authors' calculations based on data from the book AnálisisReal-Latinoamérica (2018)*

Unlike the previously analyzed sectors, the tourism sector is more diversified across the regions of Bolivia. 80% of municipalities in Bolivia have a positive gross production in the tourism sector. This represents a gross production of 4.1% of total gross production in Bolivia. The department of La Paz contributes the most to this sector with 33% of the total gross production. The department of Santa Cruz is second with a 31% contribution to total gross production.

### 3.2 Income from exports

With respect to income from exports, Table 5 shows that the mining sector has the highest revenues registered on average from 2016-2019, with an equivalent to 3,786 million USD. In contrast, the tourism sector only registered an average of 799 million USD over the same period.

In the following subsections, we detail the activity of the sector analyzed with respect to incomes from exports.

*Table 5. Exports of the tourism, mining, hydrocarbon and agriculture sectors (millions USD)*

	2016	2017	2018	2019	Average 2016-2019
Tourism	739	803	816	837	799

Mining	3,047	3,878	3,994	4,225	3,786
Hydrocarbons	2,180	2,680	3,089	2,785	2,684
Agriculture (no forestry)	1,114	1,025	1,025	936	993

Source: INE (Bolivia: Exports by economic activity and primary products per year, 1992-2021).

### 3.2.1. Mining

The INE provides data on exports by economic activity and primary products. To calculate exports of the mining sector, we included all the products under the activity, “Extraction of Minerals,” among which the most important are zinc, silver, lead and metal. There are also three industries that are directly related to mining: Metallic Gold, Metallic Tin, and Metallic Silver. Table 6 shows the export value of these four groups from 2016 to 2019, and the average for the 2016-2019 period. We will use the average over these years for this comparative analysis.

Table 6. Exports for the mining sector (millions USD)

	2016	2017	2018	2019	Average 2016-2019
Extraction of minerals	1,900	2,392	2,406	2,106	2,201
Metallic Gold	743	1,066	1,190	1,739	1,184
Metallic Tin	295	336	318	285	309
Metallic Silver	109	84	81	95	92
Total Minerals	3,047	3,878	3,994	4,225	3,786

Source: INE (Bolivia: Exports by economic activity and primary products per year, 1992-2021).

### 3.2.2. Hydrocarbons

To calculate exports of the hydrocarbon sector we included not just the “Extraction of Hydrocarbons” activity (Natural Gas and Fuel), but also the industry named “Products of the Refining of Petroleum.” Table 7 shows the value of exports of these three groups for the 2016-2019 period, and the average for the period.



*Table 7. Exports of the hydrocarbons sector (millions USD)*

	2016	2017	2018	2019	Average 2016-2019
Natural Gas	2,049	2,581	2,970	2,720	2,580
Fuel	85	52	72	21	57
Products of the Refining of Petroleum	46	47	47	43	46
Total hydrocarbons	2,180	2,680	3,089	2,785	2,684

*Source: INE (Bolivia: Exports by economic activity and primary products per year, 1992-2021).*

### 3.2.3. Agriculture and farming

To calculate the exports of agriculture and farming, we sum all of the exports under the “Agriculture, Farming, Hunting, Fishing, and Forestry” activity. However, we exclude those related to Forestry and Fishing (Chestnuts, Coffee, Cocoa, Wood, and Fishing). We include two areas in the “Industry Manufacturing” that are important: Derivative Soy Products and Derivative Sunflower Products (see Table 8).

*Table 8. Agricultural exports (millions USD)*

	2016	2017	2018	2019	Average 2016-2019
Seeds and soybeans	31	6	3	5	8
Quinoa	81	75	81	91	92
Other agriculture	137	117	116	102	127
Farming and raw leather	0	0	0	0	0
Derivative soy products	859	694	806	712	776
Derivative sunflower	41	44	50	55	93

products					
Total agriculture and farming	1,150	934	1,057	964	1,096

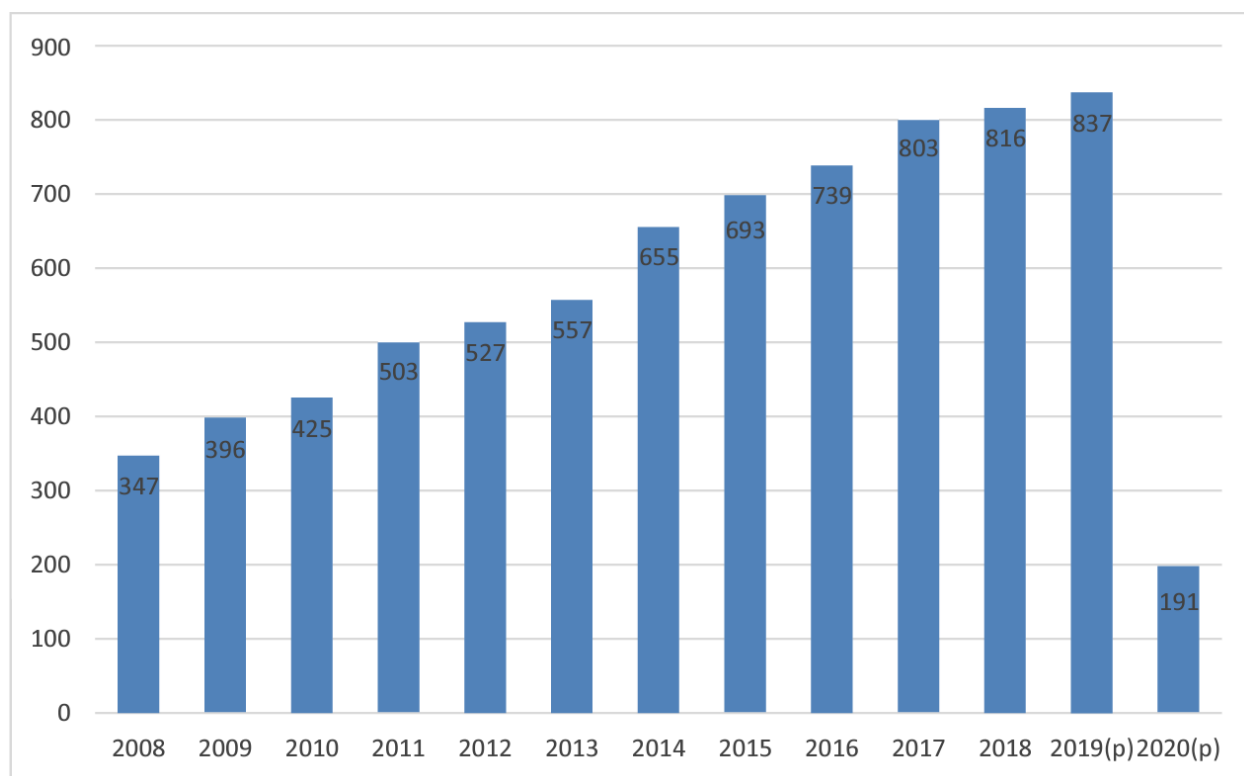
Source: INE (Bolivia: Exports by economic activity and primary products per year, 1992-2021).

3.2.4. Tourism

The tourist spending of visiting foreigners in Bolivia are not included in these INE export statistics, since the products and services do not leave the country. However, in terms of the generation of foreign currency, the spending of foreign tourists is equivalent to exports, and the INE calculates spending by tourists each year. Graphic 1 shows that these spendings were increasing at an annual rate of 7.8% in the decade leading up to the pandemic, bringing in 837 million USD in 2019. For the comparative calculation, we use the average of the 2016-2019 period, which is 799 million USD, slightly more than the incomes from the exports of soy and soy derivatives.

The growth rate of these incomes (7.8% per year during 2010-2019) was much higher than the growth rate of all exports (2.7% per year) during the same period. However, the pandemic had a negative impact on the tourism sector. In 2020, the tourism sector experienced a steep fall of -77% from 2019 to 2020 (see Graphic 1). This fall is due to the quarantines, all of the biosecurity measures imposed in every country, and the requirement of taking a COVID-19 test before entering Bolivia. Even so, the tourism industry registered a total of 191 million USD, which is remarkable given all the travel restrictions in place due to the pandemic.

Graphic 1. Tourist spending of foreigners in Bolivia, 2008-2020<sup>(p)</sup> (in millions of dollars)



Source: National Statistics Institute - Central Bank of Bolivia - Vice Ministry of Tourism - Director General of Tourism

Note: (p) Preliminary

### 3.3. Job creation for men and women

The generation of employment for the four industries selected, with an analysis by gender, was estimated using the book *The Economic System of the local Systems: the potential of the 339 municipalities of Bolivia*, (AnálisisReal-Latinoamérica, 2018). It presents the indicators at the municipal level for all Bolivian municipalities. They used the indicator *population employed* in the distinct sectors for analysis.

Table 9. Employment in the mining, agriculture, hydrocarbon and tourism sectors, 2016

Sector	Population	Participation
Mining	113,520	2.3%
Hydrocarbons	3,882	0.1%
Agriculture and farming	1,532,501	30.7%
Tourism	189,869	3.8%
Total	4,992,106	100.0%

Source: authors' calculations based on the book *AnálisisReal-Latinoamérica* (2018)

Table 9 shows that although sectors such as mining and hydrocarbons have a high level of gross production, they generate little employment. The tourism sector, despite its considerably lower level of gross production, provides more jobs.

In the following subsections, we detail the creation of jobs, by gender and department, for the four sectors analyzed.

### 3.3.1. Mining

The mining sector, which covers 2.3% of the total population, has a vast difference between the participation of women and men in this sector.

*Table 10. Employment by gender in the mining sector by department, 2016*

Department	Men/Total employment	Women/total employment	Number of men	Number of women
Chuquisaca	91.6%	8.4%	751	69
La Paz	89.5%	10.5%	33,766	3,963
Cochabamba	93.9%	6.1%	1,588	102
Oruro	92.3%	7.7%	12,919	1,082
Potosí	93.4%	6.6%	54,301	3,852
Tarija	84.4%	15.6%	27	5
Santa Cruz	88.7%	11.3%	2,720	347
Beni	90.7%	9.3%	7,740	789
Pando	97.5%	2.5%	554	14
Total	91.8%	8.2%	114,365	10,225

*Source: authors' calculations based on data from the book AnálisisReal-Latinoamérica (2018)*

Table 10 shows that the participation of women in mining is minimal. Only 8.2% of all people employed in mining are women. The department that has the highest female participation in the sector is Tarija. However, in absolute terms, the number is not statistically significant. On the other hand, La Paz is the second highest department in terms of the participation of women in this sector; 10.5% of people working in mining are women.

### 3.3.2. Hydrocarbons

The hydrocarbons sector is the sector with the lowest level of job creation in all of the analyzed sectors. Total employment in the hydrocarbon sector is only 0.1% of total employment in all sectors. Additionally, job creation is very limited for some departments specifically. Likewise, there is a vast difference between the participation of women and men in the sector, slightly lower than the mining sector. However, given the lower employment, the figures are very small for both men and women.

*Table 11. Population employed in the hydrocarbons sector by department, 2016*

Department	Men/Total employment	Women/Total employment	Number of men	Number of women
Chuquisaca	99.1%	0.9%	399	4
La Paz	0.0%	0.0%	0	0
Cochabamba	89.2%	10.8%	79	10
Oruro	0.0%	0.0%	0	0
Potosí	0.0%	0.0%	0	0
Tarija	89.8%	10.2%	2,402	273
Santa Cruz	90.2%	9.8%	645	70
Beni	0.0%	0.0%	0	0
Pando	0.0%	0.0%	0	0
Total	90.8%	9.2%	3,525	357

*Source: authors' calculation based on data from the book AnálisisReal-Latinoamérica (2018)*

Table 11 shows that the participation of women is very low. Only 9.2% of all jobs in the hydrocarbon sector are held by women. In absolute terms, the department that has the highest participation of women is Tarija, where 10.2% of all jobs in the sector are held by women. This group represents 77% of all women in Bolivia employed in the hydrocarbon sector.

### 3.3.3. Agriculture and farming

The agriculture and farming sector is the sector with the highest level of job creation in Bolivia<sup>2</sup>. It employs 30.7% of the total population. Additionally, the agricultural and farming sector is present in all the departments in Bolivia, in contrast to the hydrocarbon sector.

*Table 12. Population employed in the agriculture and farming sector by departments, 2016*

Department	Men/Total employment	Women/Total employment	Number of men	Number of women
Chuquisaca	56.1%	43.9%	70,811	55,341
La Paz	53.3%	46.7%	208,946	182,891
Cochabamba	54.3%	45.7%	178,315	150,141
Oruro	54.2%	45.8%	35,885	30,276
Potosí	59.4%	40.6%	111,973	76,502
Tarija	54.1%	45.9%	41,242	35,032
Santa Cruz	63.2%	36.8%	185,849	108,316
Beni	60.9%	39.1%	31,315	20,118
Pando	60.5%	39.5%	6,927	4,525
Total	56.8%	43.2%	871,265	662,141

*Source: authors' calculations based on data from the book AnálisisReal-Latinoamérica (2018)*

In the agriculture and farming sector the gender gap in employment is much smaller compared to the mining and hydrocarbon sectors, since 43.2% of all jobs are held by women (see Table 12). The departments with a higher number of women in this sector are La Paz, Cochabamba, and Santa Cruz.

### 3.3.4. Tourism

The tourism sector represents approximately 4% of the total employed population. 76.2% of this 4% are women, as tourism is the industry with the highest percentage of women employed out of all analyzed sectors (see Table 13). This sector has a presence in every department in Bolivia, and in every department women hold more than 70% of jobs in this

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<sup>2</sup> El segundo sector con mayor nivel de generación de empleo es el sector de comercio y transporte, abarcando 24.3% del total de la población ocupada del país. Sin embargo, este sector no es parte de nuestro análisis.

sector. Without a doubt, of the four sectors analyzed in this document, tourism is the most inclusive sector in terms of gender.

*Table 13. Population employed in the tourism sector by department, 2016*

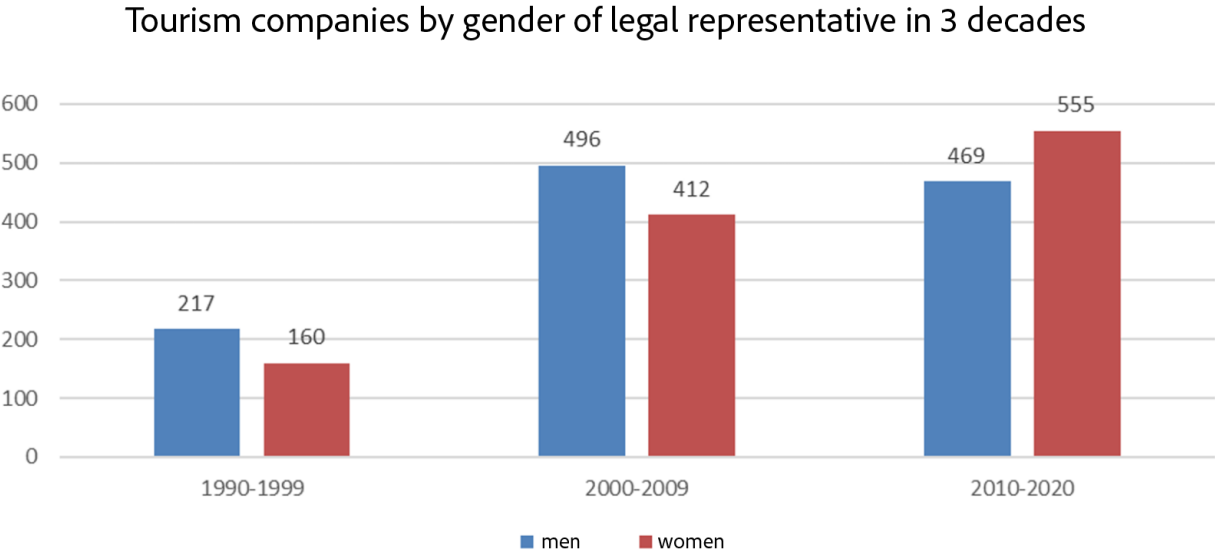
Department	Men/Total employment	Women/Total employment	Number of men	Number of women
Chuquisaca	18.3%	81.7%	1,692	7,574
La Paz	27.4%	72.6%	15,030	39,794
Cochabamba	22.5%	77.5%	7,849	27,050
Oruro	18.5%	81.5%	1,029	4,525
Potosí	17.3%	82.7%	1,445	6,906
Tarija	18.6%	81.4%	1,866	8,184
Santa Cruz	24.7%	75.3%	14,414	43,869
Beni	22.1%	77.9%	1,236	4,368
Pando	21.6%	78.4%	658	2,380
Total	23.8%	76.2%	45,219	144,650

*Source: authors' calculations based on data from the book Análisis Real-Latinoamérica (2018)*

The departments with the highest participation of women with respect to the total number of people employed in the tourism sector are Potosí, Chuquisaca, Oruro and Tarija, where more than 80% of jobs are held by women.

A large number of the management and the senior positions of the tourist companies in Bolivia are occupied by women. According to information from "Fundempresa," Bolivia's commercial record, in Bolivia there are 1,238 (48%) companies founded by women, and 1,323 (52%) companies founded by men. In addition, the percentage founded by women increased from 48% in the 1990s to 54% in the 2010s (see Graphic 2).

Graphic 2. Tourism companies by gender of legal representative in 3 decades



Source: Fundempresa (2020)

3.4. Generation of labor income (by gender)

The level of labor income for men and women in the four sectors of interest were estimated using the INE 2019 Household Survey. They used the average of the variable *y<sub>lab</sub>* (labor income (Bs./month)). Additionally, they used the classification of the primary economic activity *s06b\_12a\_cod*, to identify workers in each of the sectors of interest.

3.4.1. Mining

They identified 187 people working in mining in the survey (economic activity codes: 7, 729, 7291, 7292). Using the sampling weights of the INE, they calculated the average income for men and women working in the mining sector. The results are found in Table 14.

Table 14. Labor incomes in the mining sector, 2019

	Participation	Average labor income (Bs./month)	Interquartile range of incomes (Bs./month)
Men	96%	3,600	2,500-5,153
Women	4%	2,308	1,300-2,988
Total	100%	3,597	2,400-5,000

Source: authors' calculations based on data from the INE 2019 Household Survey



Only 4% of workers in the mining sector are women, and they earn on average 36% less than men per month. Miners on average have 9 years of education (incomplete secondary).

### 3.4.2. Hydrocarbons

In the survey, they identified only 25 people that were working in the hydrocarbon sector (economic activity codes: 6, 6,100, 6,200, 46,611). Using the sampling weights of the INE, they calculated the average income for women and men working in the hydrocarbon sector. Table 15 shows the results.

*Table 15. Labor income in the hydrocarbon sector, 2019*

	Participation	Average labor income (Bs./month)	Interquartile range of incomes (Bs./month)
Men	77%	6,138	4,550-8,558
Women	23%	7,683	4,713-8,352
Total	100%	7,683	4,550-8,558

*Source: authors' calculations based on data from the INE 2019 Household Survey.*

In Bolivia, the hydrocarbon sector generates little employment. However, the few jobs that exist are relatively lucrative. Additionally, women that are employed in this sector tend to be better paid than men. The workers in this sector typically have 17 years of education (college degree).

### 3.4.3. Agriculture and farming

In the survey, they identified 4,409 people who work in the agricultural sector (economic activity codes: 1, 10, 11, 12, 14, 111, 112, 121, 139, 141, 144, 1111-1282, 1411-1629). Using the expansion factor assigned by INE, they calculated the average income for men and women working in the agricultural sector. Table 16 shows the results.

*Table 16. Labor incomes in the agricultural sector, 2019*

	Participation	Average labor income (Bs./month)	Interquartile range of incomes (Bs./month)
Men	53%	1,158	530-2,382
Women	47%	625	250-1,364
Total	100%	942	408-2,120

*Source: authors' calculations based on data from the INE 2019 Household Survey*

The distribution of gender in the agricultural sector is almost equal, but women earn 46% less than men. The typical level of education in this sector is 6 years for men and 5 years for women.

#### 3.4.4. Tourism

In the survey, they identified 631 people who were working in different subsections of tourism: hotels, restaurants, travel agencies, tourist guides, interprovincial passenger transport, and airports. (Economic activity codes: 55101-55109, 56111, 79110, and 52230). Using the expansion factor assigned to INE, they calculated the average income for men and women, working in the agricultural sector. Table 17 shows the results.

*Table 17. Labor income in the tourism sector, 2019*

	Participation	Average labor income (Bs./month)	Interquartile range of incomes (Bs./month)
Men	29%	2,723	1,732-4,100
Women	71%	2,160	1,500-3,031
Total	100%	2,300	1,516-3,283

*Source: authors' calculations based on data from the INE 2019 Household Survey.*

Table 17 shows that the tourism sector is dominated by women (71%), but women earn on average 21% less than men per month. On average, the level of education in this sector is 10 years (secondary incomplete), but 25% have 6 or less years of education, while another 25% have 12 or more years, which implies that the sector generates employment for a large range of women.

#### 3.5 Deforestation per sector

According to Global Forest Watch, Bolivia lost 6.67 million hectares of forest between 2001 and 2021<sup>3</sup>. From 2016 to 2019, the annual average deforestation rate was 568,000 hectares/year. These are the data that we used for our comparative analysis.

Practically all of the deforestation can be attributed to the agricultural sector. According to Müller, Pacheco & Montero (2014), from 2000 to 2010, approximately 30% of the deforestation observed was caused by mechanized agriculture, while 52% was caused by farming, and 18% by small-scale agriculture. There are no similar calculations for the 2010-2020 decade, but it is probable that the agricultural sector continues to be the sector responsible for the deforestation of Bolivia. Therefore, we attribute 100% of the

<sup>3</sup> <https://www.globalforestwatch.org/dashboards/country/BOL/>

deforestation to the agricultural sector and zero to the other sectors (mining, hydrocarbons and tourism).

### 3.6 Emissions from greenhouse gases

In this section we estimate the level of emissions of greenhouse gases in the four sectors of interest.

#### 3.6.1. Mining

The mining sector overall causes emissions through electricity use. According to the 2016 Statistical Yearbook of Bolivia's Electricity Regulator, the mining sector in Bolivia used 698.25 Gigawatts of electricity in 2016, which is equivalent to electricity use in big cities (such as Sucre, Oruro, and Potosí), and 9% of total electricity consumption in Bolivia. In contrast, emissions caused by the use of fuel in the sector are relatively modest (see section 3.6.3.2. above). The electric energy of Bolivia is produced primarily by natural gas (69.5%), hydro energy (13.5%) and biomass (12.6%), while the contribution of solar energy (0.8%) and wind (0.3%) is still very low (Ministry of Hydrocarbons and Energy, 2021)<sup>4</sup>. Total emissions of CO<sub>2</sub> caused by the generation of electric energy in Bolivia increased by 13.4 million tCO<sub>2</sub> per year between 2016 and 2019<sup>5</sup>. We attribute 9% of these emissions to the mining sector, reaching approximately 1.2 million tCO<sub>2</sub>/year.

#### 3.6.2. Hydrocarbons

Carbon emissions from Bolivia's natural gas exports are attributed to the country that buys the gas, not Bolivia. However, the extraction of natural gas also generates methane (CH<sub>4</sub>) emissions. The most recent estimate of these emissions comes from the Third National Communication of Bolivia (Bolivia, 2020), where they estimated 715.60 GgCO<sub>2</sub>eq, which corresponds to 0.7 million tCO<sub>2</sub>eq.

#### 3.6.3. Agriculture and farming

The agricultural sector of Bolivia emits large amounts of greenhouse gases, primarily for the following three reasons:

- Burning of forests to clear land for cultivation or farming
- Burning of fuel for tractors and other machinery
- Methane emissions from livestock

In the following subsections, we estimate the emissions for the three components.

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<sup>4</sup> Flujo Energético Nacional – 2019.

<sup>5</sup> Según cálculos hechos para la actualización de los NDCs de Bolivia 2022.

### 3.6.3.1. Agricultural sector emissions caused by deforestation

According to Global Forest Watch<sup>6</sup>, Bolivia lost 6.67 million hectares of forest between 2001 and 2021, and the burning of this forest caused emissions of 3.01 gigatons of CO<sub>2</sub>. This corresponds with an annual average deforestation of approximately 333,500 hectares/year and emissions of 150 tCO<sub>2</sub>/year. However, from 2016 to 2019 the average annual deforestation almost doubled, with 568,000 hectares/year and emissions of 248 million tCO<sub>2</sub>/year. As mentioned earlier, practically all of these emissions are due to the agricultural sector (Müller, Pacheco, & Montero, 2014).

### 3.6.3.2. Agricultural sector emissions caused by fuel

In addition to the emissions caused by deforestation, the agricultural sector also causes emissions from fuel use, due to tractors and other heavy machinery.

The most recent National Energy Balance (Ministry of Hydrocarbons and Energy, 2021) documents the consumption of energy by the agricultural, fishing and mining sectors. Table 18 shows the results.

*Table 18. Agricultural, fishing and mining sectors energy consumption, 2016-2019*

	2016	2017	2018	2019	2016-2019
Diesel	1,231	1,199	1,460	1,632	1,381
Electricity	433	430	405	387	414
Sector total	1,664	1,629	1,865	2,019	1,795

*Source: Ministry of Hydrocarbons and Energy (2021)*

One barrel corresponds to 159 liters, so the agricultural, fishing and mining sectors burn approximately  $1,381 \times 1,000 \times 159 = 220$  million liters of diesel each year. Burning one liter of diesel emits 2.64 kg of CO<sub>2</sub>, so emissions from burning 1,381 Kbarrel of diesel per year would be  $1,381 \times 159 \times 2.64 = 579,689$  tCO<sub>2</sub>/year. The majority of this diesel is due to mechanized agriculture; only a small fraction is due to mining. This can be seen in the distribution of diesel sales in Bolivia. In the Colcha “K” municipality, which has the largest mine in Bolivia, an average of 1.7 million liters of diesel were sold per year from 2016 to 2018. During the same period, in the agro-industrial zone of Santa Cruz, 380 million liters of diesel were sold per year<sup>7</sup>. However, the mines use much more electricity (698.25 GWh in 2016<sup>8</sup>, which corresponds to 432.64 Kbp). Due to this, 100% of the diesel use shown in Table 18 can be assigned to the agricultural sector, and 100% of electricity use can be assigned to the mining sector. This means that the emissions of the agricultural sector

<sup>6</sup> <https://www.globalforestwatch.org/dashboards/country/BOL/>

<sup>7</sup> Según datos proporcionados por el Ministerio de Hidrocarburos y Energía.

<sup>8</sup> Según Cuadro I-8 del Anuario Estadístico 2016 de la Autoridad de Fiscalización y Control Social de Electricidad.

from diesel consumption rose to an average of 579,689 tCO<sub>2</sub>/year, which is a very small amount compared to the emissions caused by deforestation (0.2%).

### 3.6.3.3. Methane emissions from farming

More important than the emissions from diesel use are the methane emissions from livestock. For the calculation of historical emissions from the farming sector, they used data from the Third National Communication for the years 2006 and 2008 (Bolivia, 2020: p. 115). Then they extrapolated the emissions of CH<sub>4</sub> and N<sub>2</sub>O for the other years between 2001 and 2019, proportionally to the bovine livestock in Bolivia according to FAOSTAT.

Table 19 shows the emissions of the sector converted into millions of CO<sub>2</sub> tons using 23 potential warming factors for CH<sub>4</sub> and 296 for N<sub>2</sub>O, equal to the Third National Communication (Bolivia, 2020).

*Table 19. Historical emissions of the farming sector (AFOLU 3A)*

	Bovine livestock (number)	Emissions (MMtCO <sub>2</sub> eq)
2001	6,500,096	12.2
2002	6,673,475	12.5
2003	6,851,256	12.9
2004	7,033,582	13.2
2005	7,217,507	13.5
2006	7,409,002	14.1
2007	7,586,526	14.2
2008	7,786,802	14.6
2009	7,985,230	15.0
2010	8,189,786	15.4
2011	8,400,439	15.8
2012	8,620,784	16.2
2013	8,847,434	16.6
2014	8,798,354	16.5
2015	8,948,602	16.8
2016	9,119,000	17.1

2017	9,304,000	17.5
2018	9,556,000	17.8
2019	9,741,474	18.3

Source: authors' calculations based on data from Bolivia (2020) and data from FAOSTAT.

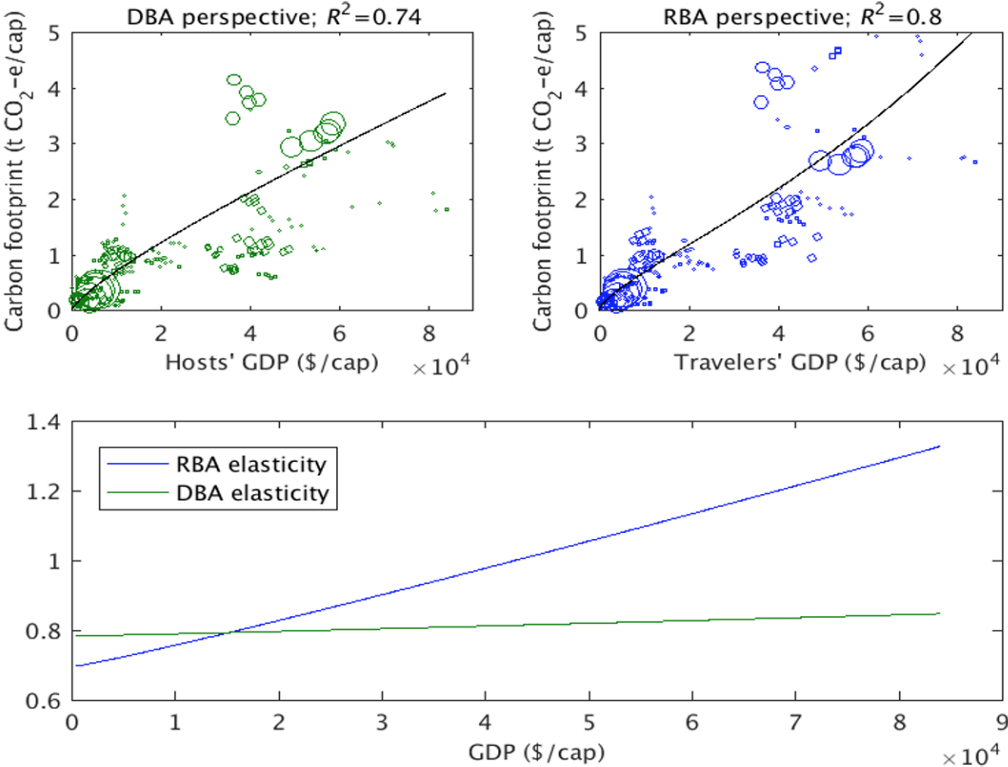
On average, from 2016-2019, emissions caused by CH<sub>4</sub> and N<sub>2</sub>O from farming rose 17.7 million tCO<sub>2</sub>eq per year. This sums to 248 million tCO<sub>2</sub> of deforestation and 0.6 million tCO<sub>2</sub> from diesel use, for a total of 266 million tCO<sub>2</sub>eq/year for the agricultural sector.

#### 3.6.4. Tourism

Lenzen *et al.* (2018) have constructed a base of global data on tourist spending by destination and residence of 160 countries. They also calculated the emissions associated with spending by tourists (transport, hospitals, food, souvenirs, etc.) in a direct and indirect manner. They calculate that the global emissions caused by tourism increased from 3.9 to 4.5 GtCO<sub>2</sub>eq between 2009 and 2013, representing approximately 8% of all greenhouse gas emissions worldwide in 2013. The authors reject the idea that tourism is low impact and that it could be an attractive option for low-carbon development. The growth rate of tourist spending during the time period analyzed (2009-2013) was much higher (88%) than the growth rate of greenhouse gas emissions (15%). In addition, the majority of emissions are caused by tourists from rich countries visiting poor countries, while the emissions in countries of medium or low incomes are very limited.

In agreement with the data of total emissions from tourism, tourist emissions in Bolivia are very low and close to zero (Lezen et al., 2018: Supplementary Information, pg. 22). They are slightly higher than the tourist emissions of Angola and Yemen. However, Graphic 3 shows that the tourist emissions per capita grow with the level of income (from 0 to 4 tCO<sub>2</sub>eq/person), and for the medium-low level of incomes in Bolivia the tourist emissions per capita are in the order of 1 tCO<sub>2</sub>eq/person. With these data, we can estimate that the tourist emissions of Bolivia are in the order of 10 million tCO<sub>2</sub>eq per year (including international and local transport, accommodations, food, purchases, activities, etc.).

Graphic 3. Elasticity of the carbon footprint of tourism to GDP per capita



Source: Lezen et al., 2018, Supplementary Information, pg. 40.

4. Comparative Analysis

In terms of sectoral GDP in 2016, the sectors that supported Bolivia the most were agriculture and farming (5,402 million USD) and hydrocarbons (3,484 million USD). The positive gross production of the tourism sector was lower (2,395 million USD). With respect to income from exports, the most important sectors from 2016 to 2019 were mining (3,786 million USD) and hydrocarbons (2,684 million USD). When analyzed in only these two dimensions (sectoral GDP and income from exports), the tourism sector does not appear to play an important role in the development of Bolivia. However, taking other dimensions into account, tourism becomes more important.

With regards to the generation of jobs, despite the tourism sector generating lower incomes than exports, in 2016 the tourism sector generated approximately 4% of all jobs on the national level, more than the mining (2.3%) and hydrocarbon (0.1%) sectors together. Additionally, tourism generates more jobs for women compared to the other sectors. Approximately 70% of jobs in tourism were for women. This is a large achievement when compared to the other sectors studied, where women did not have even 50% of jobs. In 2016, the mining sector employed 2.3% of the total employed population, with 114,365 men and 10,225 women, which translates to 8.2% of jobs for women. The hydrocarbon sector employed only 0.1% of the total employed population,

with 3,535 men and 357 women, which translates to 9.2% of jobs for women. The agricultural sector does not exhibit gender employment gaps as large as the gaps in the previously mentioned sectors, since of the 1,534,406 jobs in agriculture, 43.2% were held by women. However, the jobs in agriculture and farming in Bolivia, in their majority, are not of good quality nor are they jobs where women can develop professionally or improve their quality of life. This point is where the tourism industry takes the lead, since it has demonstrated that it does not just generate more jobs for women, it also employs more women in positions of responsibility. According to the registry of commerce of Bolivia, “Fundempresa,” between 2011 and 2020 54% of companies related to tourism were founded by women.

With respect to the environmental dimensions, the tourism sector appears to be environmentally sustainable. In terms of deforestation, agriculture and farming are responsible for practically all of it, with a total of 568,000 hectares deforested per year between 2016 and 2019. Agriculture and farming generate the majority of greenhouse gas emissions, with 266 million tCO<sub>2</sub>/eq. The tourism sector in Bolivia only generates 10 million tCO<sub>2</sub>/eq.

#### 4.1. Summary of results

Key indicators	Mining	Hydrocarbons	Agriculture and farming	Tourism
Sectoral GDP, 2016 (millions USD)	3,066	3,484	5,402	2,395
Incomes from exports, average 2016-2019 (millions USD)	3,786	2,684	1,096	799
Employment of men, 2016 (number)	114,365	3,535	871,265	45,219
Employment of women, 2016 (number)	10,225	357	663,141	144,650
Average salary, men, 2019 (Bs./month)	3,600	6,138	1,158	2,723



Average salary, women, 2019 (Bs./month)	2,308	7,683	625	2,160
Average deforestation, 2016-2019 (hectares per year)	0	0	568,000	0
Average greenhouse gas emissions, 2016-2019 (millions tCO <sub>2</sub> -eq)	1.2	0.7	266	10

5. Conclusions and recommendations

This document compares the most important sectors in Bolivia with the tourism sector, with the goal of better understanding its limitations and potential. This initial diagnostic shows that tourism has the potential to be an engine of sustainable development and inclusive in terms of gender, since it generates more employment than the mining and hydrocarbon sectors together. It also generates more high-quality employment for women without a high environmental cost. One of the recommendations that arises in this document is that the private sector as well as the public sector needs to pay more attention to the tourism sector, so that Bolivia can benefit more from its virtues. Another recommendation is that more studies are necessary to better understand the relationship between tourism, sustainable development and gender.

## References:

- AnálisisReal-Latinoamérica (2018). *El Sistema Económico de los Sistemas Locales: el potencial de los 339 municipios de Bolivia*. La Paz, Bolivia: AnálisisReal-Latinoamérica y Fundación Jubileo. Junio.
- Andersen, L. E., Canelas, S., Gonzales, A., & Peñaranda, L. (2020). *Atlas municipal de los Objetivos de Desarrollo Sostenible en Bolivia 2020*. La Paz: Universidad Privada Boliviana, SDSN Bolivia.
- Bolivia (2020). Tercera Comunicación Nacional de Estado Plurinacional de Bolivia Ante la Convención Marco de las Naciones Unidas sobre Cambio Climático. *Ministerio de Medio Ambiente y Agua y Autoridad Plurinacional de la Madre Tierra*. [https://unfccc.int/sites/default/files/resource/NC3 Bolivia.pdf](https://unfccc.int/sites/default/files/resource/NC3_Bolivia.pdf)
- Fundempresa (2020). Minería de Datos y Bases de Datos. <https://www.fundempresa.org.bo/que-hacemos/mineria-de-datos-y-bases-de-datos>
- INE (2021). Base de Datos de Exportaciones. <https://www.ine.gob.bo/index.php/estadisticas-economicas/comercio-exterior/bases-de-datos-exportaciones/>
- Lenzen, M., Sun, Y.Y., Faturay, F., Faturay, F., Ting, Y.P., Geschke, A. & Malik, A. (2018). The carbon footprint of global tourism. *Nature Climate Change*, 8, 522–528. <https://doi.org/10.1038/s41558-018-0141-x>
- Ministerio de Hidrocarburos y Energía (2021). Balance Energético Nacional 2006 – 2020. Diciembre. La Paz: Ministerio de Hidrocarburos y Energía. <https://www.mhe.gob.bo/balance-energetico-nacional-2006-2020/>
- Müller, R., Pacheco, P. & Montero, J. C. (2014). El contexto de la deforestación y degradación de los bosques en Bolivia: Causas, actores e instituciones. *Centro para la Investigación Forestal Internacional (CIFOR)*, Documentos Ocasionales #100. Bogor, Indonesia: CIFOR.
- Guzmán Bayley, F. M, Loayza Ojeda, L. S., Nina Nina, A., Condori Cachaca, R. R. y Ancasi Maturano, C. A. (2021). Ingresos Tributarios 2020. *Boletín Económico*, Año 7, No 11, 2021. La Paz, Bolivia: Viceministerio de Política Tributaria. [https://repositorio.economiafinanzas.gob.bo/documentos/2018/VPT/DIRECCION/ES/DGET/BOLETIN\\_BEIGT/2020/Boletin\\_Economico\\_Ingresos\\_Tributarios\\_2020.pdf](https://repositorio.economiafinanzas.gob.bo/documentos/2018/VPT/DIRECCION/ES/DGET/BOLETIN_BEIGT/2020/Boletin_Economico_Ingresos_Tributarios_2020.pdf)