SCIENTIFIC JOURNAL OF ACCOUNTANCY, MANAGEMENT, AND FINANCE
ECONOMIT JOURNAL

Use of Big Data and Business Intelligence Platforms to Boost the Tourism and Travel Sector in the Province of Fianarantsoa, Madagascar

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Abstract:

The dynamization of Tourism in the Haute Matsiatra Region (Isalo, Andringitra, Ranomafana) is considered favorable to the promotion of Tourism and important for the sustainable development of the rural areas concerned. They are exploited by local visitors. However, currently, there is an inspiration for new openings and new and more original horizons throughout Madagascar. The idea of launching the "dynamization of tourism", using Big Data and Business Intelligence, is somewhat conceived as an exclusive speech to incite tourists to discover new destinations even more authentic than many others. However, we would like to propose that the aim of the dynamization of tourism is to make the assets dynamic, to valorize and capitalize on the natural wealth of the region for the purpose of tourism, and to develop the areas in a sustainable way.

Keywords:

Tourism, Big Data, Business intelligence, MongoDB

I. Introduction

Tourism is systematically considered by the decision-making authorities as the priority solution for economic development. It is still today one of the main answers to the problems encountered by a country or, on a smaller scale, a region. Indeed, in a difficult economic context, faced with a declining economy, the priority of regions in terms of reviving economic development is the use of tourism (Hilbert and López, 2012).

In this sense, at the regional level, institutional actors play a fundamental role in these choices by establishing public policies. In terms of tourism, regional or local tourism development plans are put in place by a multitude of organizations depending on the level to which they belong.

Moreover, digital mutations seem to upset all the principles mentioned (Dumontroty, 2014). This is why Big Data and Business Intelligence are used to boost the tourism and travel

sector in the Faritany of Fianarantsoa. Given these observations, can we say that the use of Big Data and Business Intelligence is an infallible lever to respond to the problems of development of the tourism and travel sector in the Faritany of Fianarantsoa.

II. Review of Literature

2.1 Big Data: Mega data

The quantitative explosion of digital data has forced researchers to find new ways to see and analyze the world. It's about discovering new orders of magnitude regarding the capture, retrieval, sharing, storage, analysis, and presentation of data. Literally, these terms mean Big Data, mega data, big data or massive data. In a Big Data system, there is no explicit schema for the data, the data is not structured. The objective is to store the entirety of the raw data, without transformation and without choice because we do not know in advance what we will do with it (Le journal, CNRS, 2013).

It is about the value that data can generate for the leader of an organization, the "intelligence" that data could produce (Hamel & Marguerit, 2013). For organizations, this value manifests itself as much through the improvement of existing services as through the creation of new services in order to continually find new sources of revenue (Hamel and Marguerit, 2013).

a. Cloud and Grid

The phenomenal growth of Big Data requires efficient infrastructures and new computing paradigms to accommodate the enormous volumes and velocity of data.

In the era of Big Data, it is common for companies to build dedicated clusters, usually consisting of off-the-shelf hardware. These clusters run Big Data platforms (such as Hadoop and NoSQL systems) to efficiently host large volumes of data. They allow real-time processing and high availability (Li and Manoharan, 2013; Mayer-Schrönberger and Curier, 2013).

The computing grid is generally concerned with the federation and coordination of heterogeneous sub-organizations and resources that may be dispersed over geographically distant areas. It aims to hide the complexity of the coordination of sub-systems from users and to give them the illusion of a global system (Perera and Guanarathne, 2013).

Since its inception, cloud computing has been immediately adopted by Big Data applications. Most cloud providers offer Big Data platforms as a service. They allow customers to run their applications without worrying about managing the infrastructure and its costly maintenance.

The label "Big Data" represents the transition in high-performance computing from purpose-built hardware (i.e., Sun Microsystems, CRAY, etc.) to an approach that leverages standard hardware through the use of smaller, less expensive devices that can be clustered together. This is accomplished by using approaches such as "divide and conquer" by dissecting computational problems into smaller chunks both in terms of data and computation and spreading it out over smaller, less powerful, but much cheaper hardware.

MongoDB thus presented is one of the most popular classes of computer clusters for Big Data. We are going to the Business Intelligence technique.

b. Business Intelligence

The data is restructured, enriched, aggregated, reformatted, and nomenclatured to be presented to the user in a semantic form (meaningful business views) that allows decision-makers to interact with the data without having to know its physical storage structure, star schemas that allow facts and measures to be broken down into hierarchical dimensions, pre-prepared reports that can be parameterized, and more synthetic and interactive dashboards. Once the data is stored, cleaned, consolidated and accessible, it can be used. Depending on the needs, different types of extraction and exploitation tools will be considered.

In short, Business Intelligence is a discipline that allows, through its various components (ETL, Data warehouse, OLAP cube, reporting tools) to collect, consolidate, mode, and restore data from different sources in order to extract useful information for analysis (predictive analysis), to provide accurate answers to the company's questions, to improve the company's performance, to anticipate future problems by providing solutions and to make good decisions. BigData has become a fact in today's world, a real issue to manage in terms of infrastructure, and a necessity in our daily life. This huge amount of data could be processed by efficient processing algorithms (Taniar and al., 2018).

2.2 Data Collection

Several means are used for the data collection, the data are based on the evolution of the number of visitors, and the different types of fauna and flora. The study starts with the bibliography and webography reference. Formulate also a series of questions in the form of a survey form, the field trips in all the Directions of MNP (Madagascar National Parks) are also of great importance to complete the data. The obtained information was then completed through surveys with members of the rural population, and tourist guides.

We present our results based on data obtained from park managers

a. Geographical Distribution

These researches and studies were undertaken in the Haute Matsiatra Region of the Fianarantsoa Province.

1. Sampling and Collection

The evolution of the numbers and the different types of fauna and flora were collected in Isalo, Andringitra, and Ranomafana. After the collection of all the data, they were all compiled and recorded in a database to be able to better manipulate them and to make a decision according to time and evolution.

2. Physical Geographic Materials: National Parks
Presentation of the National Park of Isalo

The Isalo National Park is a protected area of Madagascar, declared a "National Park" in 1999.

It is a mountainous massif of Jurassic sandstone, extending for nearly one hundred kilometers in the north-south direction, and cut by deep canyons and bristling with peaks.

The Isalo National Park has an area of 81 540 ha, extending for nearly one hundred kilometers in the north-south direction. The erosion of the rock has carved a ruinous relief

varying from 820 to 1240m of altitude with deep canyons, rivers, and abundant rocky vegetation. The Park is also the home of makis and other lemurs.

The fauna, it includes 55 species of birds and some reptiles and mammals, including the catta or maki lemur, the Verreaux's sifaka, and the tawny eulemur.

For the aridest areas, the slightest rocky crevice shelters succulent plants whose roots, trunks, stems, or leaves store runoff water - pachypodiums, aloes, and euphorbias.

At the bottom of the canyons, constant humidity maintains luxuriant vegetation. Palm trees, pandanus, and ferns cluster in sparse clumps along the waterways (Razafimanahaky, 2017).

Presentation of the National Park of Andringitra

Located 47 km south-east of Ambalavao and with an area of 31 160 ha, the Park of Andringitra has its unique landscape appeal, the biodiversity is not left out thanks to the presence of about thirty species of terrestrial orchids, which make the fame of the Park. Andringitra offers various mountain hikes including the unavoidable ascent of "Pic Boby", the second but unique accessible roof of Madagascar, which culminates at 2 658 m.

In addition to the spectacular landscapes of high mountains, cascades, waterfalls, and natural pools, there are 106 species of birds, 16 species of insectivores, 11 species of rodents, 13 species of lemurs, 57 species of amphibians, 35 species of reptiles, 48 species of non-flying mals (rodents, insectivores, carnivores, and primates) (Diez, 2016).

Presentation of the National Park of Ranomafana

Ranomafana National Park, established by Decree No. 91-250 of May 7, 1991, and officially inaugurated on May 31, 1991, is part of the network of protected areas managed by ANGAP.

The Park of Ranomafana is located not far from the city of Fianarantsoa and covers nearly 41,600 hectares of tropical rainforest. You can venture into the forest maze and discover species that you will not see anywhere else on the island, including endangered species.

The Protected Area is constituted by a dense humid evergreen forest containing exceptional biodiversity, with a high degree of endemism (about 87%), but threatened by anthropic pressures.

The GRAP Plan specifies that the development of the peripheral zone is a main management objective for the organization of Ranomafana National Park if we want to guarantee the conservation of the natural wealth it shelters and the ecological goods and services it provides. The latter deserves to be developed to encourage the appropriation of the communities.

The National Park plays the role of regulator of the water resources (thermal waters, rivers, more particularly the NAMORONA on which depends the Hydroelectric Power Station which provides electricity to the main cities of the region). It is also the water reservoir for the riparians and for the whole downstream region of the South-East in relation to the Park. The forest is a factor in the maintenance of fertility and the protection of the grounds

Thanks to its natural attractions and relative accessibility, Ranomafana National Park is open to tourism and generates funds that contribute significantly to the financing of the development of its peripheral zone through appropriate micro-projects.

The National Park of Ranomafana is an essential step during the visits to the Big Island. Indeed, the Park makes discovered a unique fauna composed of rare species of fauna and flora unfortunately in the process of extinction.

The Park is surrounded by mountainous massifs through which it is possible to make incredible hikes that will not fail to delight the most athletic

III. Results and Discussion

We have chosen 3 databases of different types, to make the comparison, which are:
- Apache Cassandra for the column-oriented;
- MongoDB for the document-oriented;
- Project Voldemort for the key value

And we set a number of criteria.

3.1 Milestone Reached

a. Primary Data Storage

The following table shows this primary data storage.

Table 1. Primary Data Storage

Apache Cassandra	Yes, no problem
MongoDB	Yes, no problem
Project Voldemort	Yes, no problem

So it's no problem and we can go to the next step.

b. Use of Cloud

The following table shows the use of Cloud.

Table 2: Use of Cloud

Apache Cassandra	Yes, there are just a few configurations needed for Cassandra to easily integrate into the Cloud
MongoDB	Yes, MongoDB can easily be deployed to the Cloud.
Project Voldemort	No, not currently

According to these results, what about compatibility with OS.

c. Compatibility with OS

The following table shows the compatibility.

Table 1: Compatibility with OS

Apache Cassandra	Cassandra is compatible with Windows, Mac OS X and Linux platforms (Ubuntu, Red Hat, CentOS)

MongoDB	MongoDB is compatible with Windows, Mac OS X, Linux (Debian, Ubuntu, Fedora, CentOS and Gentoo) and Solaris platforms
Project Voldemort	Voldemort is compatible with Windows and Linux (Debian) platforms

According to these results, there is good compatibility.

d. Client Libraries for Languages Used in an Application

The following table shows client libraries for languages used in an application.

Table 4. Client Libraries for Languages Used in an Application

Apache Cassandra	C#, C++, Clojure, Erlang, Go , Haskell Java, JavaScript , Perl, PHP, Python, Ruby, Scala
MongoDB	Plus de 27 librairies Actionscript, Lua ,MatLab, Perl,PHP, PowerShell, Prolog, Groovy R , Ruby, Scala, Smalltalk , C, C#, C++, Clojure, ColdFusion, D , Dart , Go , Haskell, Java, javaScript, Lisp
Project Voldemort	Ruby, Node.js, PHP, Python

These are the languages that can be used.

d. SQL queries

The following table shows SQL queries.

Table 5. SQL queries

Apache Cassandra	Yes, Cassandra has a SQL-like query language called CQL.
MongoDB	Yes, MongoDB has a SQL-like query equivalent called Query Expression Objects.
Project Voldemort	No, Voldemort does not have a SQL-like query language, which is normal because Voldemort is a key/value database and it is therefore not possible to make complex queries on the values.

Let's see the next step.

e. Graphical Interface and Management of Administrative Tasks QL Series

The following table shows the graphical interface and management of administrative tasks QL queries.

Table 6. Graphical Interface and Management of Administrative Tasks QL queries

Apache Cassandra	In the DataStax Enterprise version, a graphical administration and monitoring console is available. The console is called DataStax OpsCenter.
MongoDB	10gen, the company that developed MongoDB, does not offer a graphical monitoring and management console; however, the MongoDB Open Source community has developed various monitoring and administration interfaces
Project Voldemort	Voldemort does not offer a graphical console, but has a command line interface for administration and monitoring of the cluster nodes.

With these results in mind, we move on to the next step.

f. Open Source Communities

The following table shows Open Source Communities.

Table 72. Open Source Communities

Apache Cassandra	There is a large and active Open Source Community using Cassandra.
MongoDB	The MongoDB community is very active on forums/blogs; there are many components, such as patches, APIs, libraries client developed by the MongoDB community
Project Voldemort	Voldemort has a small Open Source community

Having the results on Open Source Communities, we decided to see the documentation and training sessions.

g. Documentation and Training Sessions

The following table gives Documentation and training sessions

Table 8. Documentation and Training Sessions

Apache Cassandra	An exhaustive documentation
MongoDB	Complete documentation available online on the solution's website
Project Voldemort	Little documentation available online

3.2. Results of the Comparison

After the comparison made, we note that the two solutions MongoDB and Cassandra have answered present all the aspects; nevertheless, it is necessary to decide between the model to adopt, Cassandra or MongoDB.

It would be difficult to answer this question, but the answer to this question is related to the type of our application. If we chose Cassandra, it will be easier to administer (adding machines, scaling, etc.). On the other hand, the flexibility of JSON files pushed us to choose MongoDB.

Table 9. MongoDB Ranking in December 2017

339 systems in ranking, December 2017

Rank			DBMS	Database Model	Score		
Dec 2017	Nov 2017	Dec 2016			Dec 2017	Nov 2017	Dec 2016
1.	1.	1.	Oracle	Relational DBMS	1341.54	-18.51	-62.86
2.	2.	2.	MySQL	Relational DBMS	1318.07	-3.96	-56.34
3.	3.	3.	Microsoft SQL Server	Relational DBMS	1172.48	-42.59	-54.17
4.	4.	4.	PostgreSQL	Relational DBMS	385.43	+5.51	+55.41
5.	5.	5.	MongoDB	Document store	330.77	+0.29	+2.09
6.	6.	6.	DB2	Relational DBMS	189.58	-4.48	+5.24
7.	7.	↑ 8.	Microsoft Access	Relational DBMS	125.88	-7.43	+1.18
8.	↑ 9.	↑ 9.	Redis	Key-value store	123.24	+2.05	+3.34
9.	↓ 8.	↓ 7.	Cassandra	Wide column store	123.21	-1.00	-11.07
10.	10.	↑ 11.	Elasticsearch	Search engine	119.78	+0.37	+16.51

Moreover, very recent statistics from Solid IT, published in December 2017 on the DB-Engine site, revealed that MongoDB is ranked fifth among all DBMSs, and first among all NoSQL DBMSs, globally. Figure 1 shows the capture of the top 10 DBMSs among 339 according to Solid IT (CNRS, 2013).

3.3. Software Architecture

Figure 1 describes the software architecture.

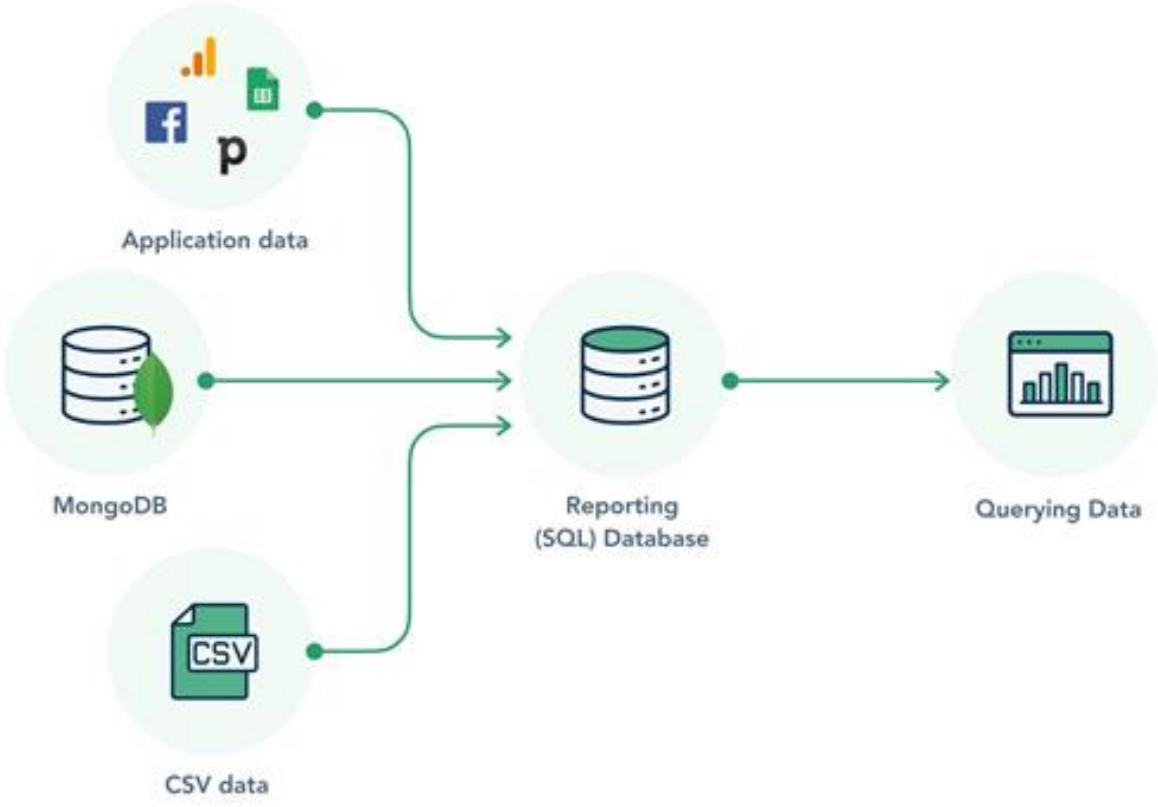

Figure 1. *Software Architecture*

3.4 The Isalo National Park

The table below shows the evolution of statistical data on the number of visitors to Isalo Park from 2015 to 2019.

Table 9. Evolution of Statistical Data on the Number of Visitors to Isalo Park from 2015 to 2019

Nationalities of visitors	**January**	**February**	**March**	**April**	**May**	**June**	**Julay**	**August**	**September**	**October**	**November**	**December**	**Total**	**%TVP**	**%TVF**
American	33	35	39	127	172	112	297	407	161	404	275	99	2 161	**8,3**	**10,5**
Argentinean	2				2	2	5			5			16	**0,1**	**0,1**
Australian	14	2	8	41	14	92	27	30	35	16	48	18	345	**1,3**	**1,7**
Austrian	3	1				1	19	21	22	2	2	13	84	**0,3**	**0,4**
Basque	0									8			8	**0,0**	**0,0**
Belgian	9	2	6	69	42	21	133	254	201	87	26	14	864	**3,3**	**4,2**
Brazilian											1		1	**0,0**	**0,0**

Cameroonian	0						5						5	**0,0**	**0,0**
Canadian	2	2	7	31	10	12	35	55	65	7	49	26	301	**1,2**	**1,5**
Chilean	0			2			2	2		11			17	**0,1**	**0,1**
Chinese	37	11		20	15	20	37	41	45	35	18	6	285	**1,1**	**1,4**
Corsican													0	**0,0**	**0,0**
Croatian				16									16	**0,1**	**0,1**
Czech/Slovakian	8	4		9		5	7	17	13	26	19	3	111	**0,4**	**0,5**
Danish			3	5	7		3	23	13	7	4	2	67	**0,3**	**0,3**
Dutch													0	**0,0**	**0,0**
Ecuadorian													0	**0,0**	**0,0**
English	36	11	38	108	77	139	269	305	95	351	380	65	1 874	**7,2**	**9,1**
Estonian											16		16	**0,1**	**0,1**
Finnish											20		20	**0,1**	**0,1**
French	159	117	163	351	320	174	376	587	507	738	460	172	4 124	**15,9**	**20,0**
German	44	28	83	151	161	86	209	410	133	535	144	44	2 028	**7,8**	**9,8**
Greek	1		6	2	5	1					1		16	**0,1**	**0,1**
Hollanders	9	5	12	93	85	91	260	360	375	427	165	23	1 905	**7,3**	**9,2**
Hungarian	10	11	6	20		2	4	14	24	45			136	**0,5**	**0,7**
Indian	7					11	8	16	20	9			71	**0,3**	**0,3**
Iranian									2				2	**0,0**	**0,0**
Irish									1				1	**0,0**	**0,0**
Israeli			3	4		2	7	17	15			2	50	**0,2**	**0,2**
Italian	39	6	22	52	90	174	196	396	409	139	142	72	1 737	**6,7**	**8,4**
Japonese	3		1	6	54	4			25	55			148	**0,6**	**0,7**
Kenyan		1										1	2	**0,0**	**0,0**
Korean						2	2	22	35	2		2	65	**0,3**	**0,3**
Kuwaiti													0	**0,0**	**0,0**
Litchuanian										4			4	**0,0**	**0,0**
Lithuanian		16					2	2			19		39	**0,2**	**0,2**
Luxembourgish													0	**0,0**	**0,0**
Mahoran													0	**0,0**	**0,0**
Malagasy	218	93	133	330	255	276	588	1213	756	664	460	291	5 277	**20,3**	**25,5**
Maltese							2	2		12	1		17	**0,1**	**0,1**
Maroccan													0	**0,0**	**0,0**
Mauritian	1												1	**0,0**	**0,0**
Mexican	7			4						5		2	18	**0,1**	**0,1**
Monegasque													0	**0,0**	**0,0**
New Zealander	5	1	3	2		2	6	6	5	39			69	**0,3**	**0,3**
Norwegian	2	8	23	12			10	10	15	24	29	22	155	**0,6**	**0,8**
Peruvian													0	**0,0**	**0,0**
Polish	122	136	53	19	42	14	11	11	37	37	41	44	567	**2,2**	**2,7**
Portuguese	8			4		5			21	41	6	5	90	**0,3**	**0,4**
Reunionese	2								9				11	**0,0**	**0,1**
Romanian				8								2	10	**0,0**	**0,0**

Russian	20	6	2	27	50	10	13	13	31	24	5	15	216	**0,8**	**1,0**
Scottish										6	1		7	**0,0**	**0,0**
Senegalese													0	**0,0**	**0,0**
Singaporean													0	**0,0**	**0,0**
Slovenian											22		22	**0,1**	**0,1**
South Africa	1					1	186	186	111	28	4	6	523	**2,0**	**2,5**
Spanish	54	4	19	29	55	38	146	295	274	28	69	43	1 054	**4,1**	**5,1**
Suissais	16	3	19	27	71	24	48	223	221	330	36	30	1 048	**4,0**	**5,1**
Swedish	3	3	22	7	27	5	3	3	10	45	22	6	156	**0,6**	**0,8**
Taiwanese		2											2	**0,0**	**0,0**
Tanzanian													0	**0,0**	**0,0**
Thai												1	1	**0,0**	**0,0**
Tunisian							4	4					8	**0,0**	**0,0**
Turkish				11			1	14	5	32	10	10	83	**0,3**	**0,4**
Uganda												2	2	**0,0**	**0,0**
Ukrainian	4	2		27		2	3	17	16			5	76	**0,3**	**0,4**
Venezuelan										5			5	**0,0**	**0,0**
Total	**879**	**510**	**671**	**1614**	**1554**	**1328**	**2924**	**4976**	**3707**	**4233**	**2495**	**1046**	**25 937**	**100.0**	**100.0**

Source: Annual Statistics of Visitors (MNP ISALO), 2020

In general, the number of visitors to Isalo Park is increasing from 2015 to 2019.

Foreign visitors are much more numerous than Malagasy visitors and especially foreign adults.

The period of high season is the months of July, August, September, and October

3.5 The Andringitra National Park

The table below describes the evolution of the number of national and foreign tourists visiting Andringitra Park from 2016 to 2019.

Table 10. Evolution of the Number of National and Foreign Tourists Visiting Andringitra Park from 2016 to 2019

Nationalities of the visitors	2016	2017	2018	2019
Algerian	1	1	0	0
American	108	83	68	68
Argentinean	1	46	57	57
Australian	54	27	31	31
Austrian	5	62	103	103
Belgian	66	1	1	1
Brazilian		9	0	0
Bulgarian	20	20	28	28
Canadian	46	6	6	6
Chinese	8	1	2	2
Colombian	1	2	1	1
Czech	40			
Danish	12	9	3	3
Dutch		7	4	4
English	226	306	135	135
Estonian	1	3	0	0

French	529	473	468	462
German	157	149	100	104
Greek	7	2	2	2
Hollander	66	2	0	0
Hungarian	1	71	139	126
Icelandic	2	26	4	4
Indian		2	1	1
Indonesian	2	11	3	3
Irish	5	1	1	1
Israeli	35	69	76	71
Italienne	42	12	2	2
Japanese	8	1	0	0
Kenyan		2	2	2
Korean	1	1	2	2
Lithuanian	1	4	0	0
Malagasy	740	767	574	670
Malaysian	4	1	24	24
Maltese	2	2	0	0
Mauritian		1	0	0
Namibian		1	0	0
New Zealander	4	47	27	27
Norwegian	1	7	0	0
Pakistani	1	10	5	5
Polish	38	7	0	0
Portuguese	7	6	6	6
Reunionese		73	24	24
Romanian	3	95	80	75
Russe	20	1	3	3
Scottish	4	129	105	105
Seychellois		7	12	12
Singaporean		8	6	6
Slovenian	4			
South African	30			
Spanish	132	3	4	4
Sri Lankan				
Swedish	8			
Swisss	66			
Thaie				
Tunisiean	3			
Ukrainian	9			
TOTAL	**2521**	**2574**	**2109**	**2180**

Source: Annual Visitor Statistics by Nationality (MNP Andringitra)

3.6 The Ranomafana National Park

Evolution of the visitors of the National Park of Ranomafana

Table 11 describes the evolution of domestic and foreign visitors to the Park in 2016.

Table 11. Evolution of the Number of Tourists who Visited Ranomafana National Park in 2016

Nationalities of visitors	**January**	**February**	**March**	**April**	**May**	**June**	**Julay**	**August**	**Septembe r**	**October**	**November**	**December**	**Total**	**%TVP**	**%TVF**
American	24	10	78	102	143	85	205	201	250	282	326	91	**1 797**	**7,7**	**9,4**
Argentinean	0	0			0	0	0	0	0	0	0	0	**0**	**0,0**	**0,0**
Australian	7	6	10	11	47	27	27	104	98	98	61	19	**515**	**2,2**	**2,7**
Austrian	0	2			13	2	5	24	34	35	20	14	**149**	**0,6**	**0,8**
Basque	0	0			0	0	0	0	0	0	0	0	**0**	**0,0**	**0,0**
Belgian	4	5	37	53	51	31	55	54	167	230	30	25	**742**	**3,2**	**3,9**
Cameroonian	0	0			0	0	0	0	0	0	0	0	**0**	**0,0**	**0,0**
Canadian	1	1	10	25	23	23	61	17	52	81	29	4	**327**	**1,4**	**1,7**
Chilean	0	0			0	0	0	0	2		0	2	**4**	**0,0**	**0,0**
Chinese	21	5		5	17	17	24	17	35	65	17	45	**268**	**1,1**	**1,4**
Corsican	0	0			0	0	0	0	0	0	0	0	**0**	**0,0**	**0,0**
Croatian	0	0			0	13		0	0	0	0	0	**13**	**0,1**	**0,1**
Czech/Slovaki	3	12	2		0	20	21	13	12	14	16	1	**114**	**0,5**	**0,6**
Danish	0	0		5	13	3	23	8	18	22	28	0	**120**	**0,5**	**0,6**
Dutch	0	0			0	0	12	0	0		0	0	**12**	**0,1**	**0,1**
Egyptian										2	0		**2**	**0,0**	**0,0**
English	14	18	65	98	123	98	158	210	211	246	323	63	**1 627**	**6,9**	**8,5**
Estonian	4	13				0	0	1				0	**18**	**0,1**	**0,1**
French	100	62	151	199	318	297	511	484	550	742	305	135	**3 854**	**16,4**	**20,1**
German	23	27	52	61	192	92	192	288	198	221	346	103	**1 795**	**7,7**	**9,4**
Greek	0	0			0	0	0	2	12	15	2	4	**35**	**0,1**	**0,2**
Hollanders	12	4	45	24	137	121	302	248	312	343	234	114	**1 896**	**8,1**	**9,9**
Hungarian	0	0			2	2	1	2	15	11	0	2	**35**	**0,1**	**0,2**
Indian	5	0			8	9	12	0	0	3	3	5	**45**	**0,2**	**0,2**
Iranian	0	0			0	0	0	0	0	0	0	0	**0**	**0,0**	**0,0**
Irish	0	0			2	0	0	0	7	10	0	0	**19**	**0,1**	**0,1**
Israeli	0	0			87	7	14	14		5	0	0	**127**	**0,5**	**0,7**
Italian	8	18	65	76	1	55	153	942	330	410	64	46	**2 168**	**9,2**	**11,3**
Japanese	6	2		5	1	5	45	6	16	36	3	15	**140**	**0,6**	**0,7**
Kenyan	0	0			13			0	0	0	0		**13**	**0,1**	**0,1**
Korean	0	1		2	0	0	0	0	5	15	2	0	**25**	**0,1**	**0,1**
Lithuanian	0	0			0			0	0	0	2		**2**	**0,0**	**0,0**
Luxembourgis	0	0			0	0	0	0	0	4	0		**4**	**0,0**	**0,0**
Malagasy	143	81	183	306	258	244	397	714	619	686	462	236	**4 329**	**18,5**	**22,6**
Malaysian	0	0			0	0	0	0	0	0	0		**0**	**0,0**	**0,0**
Maltese	0	0		1	0	0	10	0	0	2	0		**13**	**0,1**	**0,1**
Mauritian	2	0			0	0	0	4		4	0	1	**11**	**0,0**	**0,1**
Mexican	0	0		2	4	0	0	0	0	6	0	0	**12**	**0,1**	**0,1**
Moroccan	0	0			0	0	0	0	0	0	0	0	**0**	**0,0**	**0,0**
New Zealande	0	0		8	0	3		0	0		0	2	**13**	**0,1**	**0,1**
Norwegian	2	0		2	4	0	0	4	11	31	26	0	**80**	**0,3**	**0,4**
Polish	55	66	7	15	1	4	22	16	26	64	73	23	**372**	**1,6**	**1,9**
Portuguese	0	0	7	15	2	2	37	0		0	2	0	**65**	**0,3**	**0,3**
Reunionese	0	0			0	0	0	0	0	0	3	0	**3**	**0,0**	**0,0**
Romanian	0	0			0			1	2	5	1	1	**10**	**0,0**	**0,1**
Russian	6	7	4	7	0	0	0	4	13	33	20	5	**99**	**0,4**	**0,5**
Scottish	0	2		2	3	0	2	0	0	1	0	0	**10**	**0,0**	**0,1**
Singaporean	0	0			0	0	0	2			0	2	**4**	**0,0**	**0,0**

South Africa	0	0	5	7	0	2	2	0	25	58	18	0	**117**	**0,5**	**0,6**
Spanis	6	0		34	52	52	75	576	374	382	122	56	**1 729**	**7,4**	**9,0**
Sri Lankan	0	0			2	0	0	0	0	2	5	13	**22**	**0,1**	**0,1**
Swedish	3	3			14	0	0	0	77		70	0	**167**	**0,7**	**0,9**
Swiss	7	2	30	32	0	12	88	25		132	36	15	**379**	**1,6**	**2,0**
Taiwanese	0	1			0	0	0	12	0		0	0	**13**	**0,1**	**0,1**
Thai	0	0			20	0	0	0		0	0	20	**40**	**0,2**	**0,2**
Turkish	0	0	1		7	0	11	17	10	2	0		**48**	**0,2**	**0,3**
Uganda	0	0				0	1				0		**1**	**0,0**	**0,0**
Ukrainian	0	0				5	7	11	10	21	0		**54**	**0,2**	**0,3**
Zimbabwean											2		**2**	**0,0**	**0,0**
Total	**456**	**348**	**752**	**1097**	**1558**	**1231**	**2473**	**4021**	**3491**	**4319**	**2651**	**1062**	**23 459**	**100,0**	**100.0**

% of total park visitors: %TVP
% of total foreign visitors: %TVF
Source: Visitor Statistics RAN 93-2019 (MNP Ranomafana)

In this table, the Malagasy are the most numerous visitors to the Park, the foreign countries which have many visitors are notably: Germany, the USA, Great Britain, France, Spain, and Italy.

The high season period is the months of July, August, September, and October. Corresponding to the period of school vacations.

Foreign tourists from African countries visiting the Park are very rare and few in number.

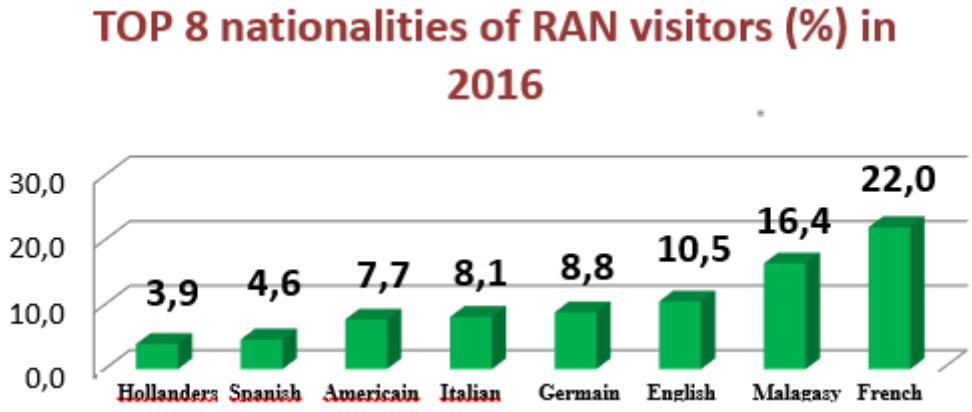

***Figure 3**. Top 8 nationalities of visitors to Ranomafana in 2016*

Table 12 describes the number of national and foreign visitors to Ranomafana Park in 2017.

Table 12. Evolution of the Number of tourists who Visited Ranomafana National Park in 2017

Nationalities of visitors	**January**	**February**	**March**	**April**	**May**	**June**	**Julay**	**August**	**September**	**Oktober**	**November**	**December**	**Total**	**%TVP**	**%TVF**
American	97	25	66	139	122	135	279	282	195	255	205	45	**1 845**	**6,7**	**8,5**
Argentinean	3		0	2	1	3	0	0	0	0	10	15	**34**	**0,1**	**0,2**

Australian	13		2	40	64	23	28	99	105	115	89	14	**592**	**2,2**	**2,7**
Austrian	8	5	4	7	12	20	4	2				8	**70**	**0,3**	**0,3**
Belgian		5	10	42	39	15	113	69	102	197	188	47	**827**	**3,0**	**3,8**
Brazilian	4						7	3			5		**19**	**0,1**	**0,1**
Bulgarian		2						5					**7**	**0,0**	**0,0**
Cameroonian										2			**2**	**0,0**	**0,0**
Canadian	14	8	3	11	29	39	37	43	45	61	54	54	**398**	**1,5**	**1,8**
Chilean										1			**1**	**0,0**	**0,0**
Chinese	1	17	12	16	14	47	27	45	40	55	25	35	**334**	**1,2**	**1,5**
Corsican													**0**	**0,0**	**0,0**
Croatian	3									5	5		**13**	**0,0**	**0,1**
Czech/Slovakia	31		3	29	3	4	37	23	22	25	22		**199**	**0,7**	**0,9**
Danish	14			14	2	3	23	4	4	21	11	2	**98**	**0,4**	**0,5**
Dutch									2	11	8	5	**26**	**0,1**	**0,1**
Egyptian													**0**	**0,0**	**0,0**
English	16	20	22	140	94	158	357	352	299	198	145	48	**1 849**	**6,8**	**8,6**
Estonian				2			2						**4**	**0,0**	**0,0**
French	115	101	132	365	337	238	431	992	838	957	578	177	**5 261**	**19,2**	**24,4**
German	64	36	101	193	261	174	267	223	185	350	152	50	**2 056**	**7,5**	**9,5**
Greek				3		4		4	6	16	14		**47**	**0,2**	**0,2**
Hollanders	16	27	35	125	180	140	297	549	132	264	175	75	**2 015**	**7,4**	**9,3**
Hungarian	5			4		1			5	15	9		**39**	**0,1**	**0,2**
Indian	1	2	5	4		2	9	9		12	5	1	**50**	**0,2**	**0,2**
Iranian												2	**2**	**0,0**	**0,0**
Irish	2					3				1	5	2	**13**	**0,0**	**0,1**
Israeli				1	1	30	11	2	4	2			**51**	**0,2**	**0,2**
Italian	38	4	17	97	128	96	254	241	335	375	259	46	**1 890**	**6,9**	**8,7**
Japanese	1	6	2		3	15	2	15	30	45	15	15	**149**	**0,5**	**0,7**
Kenyan								1	5	4			**10**	**0,0**	**0,0**
Korean					5	4	1		12	38	28	11	**99**	**0,4**	**0,5**
Lituanian			2		7	2							**11**	**0,0**	**0,1**
Luxembourgish							4	4					**8**	**0,0**	**0,0**
Malagasy	178	126	176	463	358	282	515	944	819	1 014	529	329	**5 733**	**21,0**	**26,5**
Malaysian			1	2						5			**8**	**0,0**	**0,0**
Maltese													**0**	**0,0**	**0,0**
Maroccan													**0**	**0,0**	**0,0**
Mauritian	2	2		2	7					4			**17**	**0,1**	**0,1**
Mexican	5				2		2			2			**11**	**0,0**	**0,1**
New Zealander						4	4	2	14	34	11	9	**78**	**0,3**	**0,4**
Norwegian	2	3	3	14	2				6	10	5	2	**47**	**0,2**	**0,2**
Peruvian			2										**2**	**0,0**	**0,0**
Polish	36	15	15	9	8	10	26	22	48	168	77	12	**446**	**1,6**	**2,1**
Portuguese	1			6	5	1	28	25	35	84	52	8	**245**	**0,9**	**1,1**
Reunionnese			2					1	4	4			**11**	**0,0**	**0,1**
Romanian			2			2		11	11	9			**35**	**0,1**	**0,2**
Russian	24	12	2	5	40	5	2	5	15	55	26	16	**207**	**0,8**	**1,0**
Scottish							4			13	21	4	**42**	**0,2**	**0,2**
Singaporean						3		2					**5**	**0,0**	**0,0**
South Africa				1		5	4		15	51	31		**107**	**0,4**	**0,5**
Spanish	14	21	41	59	40	56	183	340	331	369	113	51	**1 618**	**5,9**	**7,5**
Sri Lankan													**0**	**0,0**	**0,0**
Swedish	2			4			2	4	5	22	22	4	**65**	**0,2**	**0,3**

Swiss	12	17	8	37	21	26	60	38	45	163	123	23	**573**	**2,1**	**2,7**
Taiwanese			2		4			18					**24**	**0,1**	**0,1**
Thai							12						**12**	**0,0**	**0,1**
Togolese			1										**1**	**0,0**	**0,0**
Turkish					6	2	5		1	5	3		**22**	**0,1**	**0,1**
Ugandan													**0**	**0,0**	**0,0**
Ukrainian			2										**2**	**0,0**	**0,0**
Uruguayan							2						**2**	**0,0**	**0,0**
Vietnamese					6								**6**	**0,0**	**0,0**
Zimbabwean													**0**	**0,0**	**0,0**
Total	**722**	**454**	**673**	**1836**	**1801**	**1552**	**3039**	**4379**	**3715**	**5037**	**3020**	**1110**	**27338**	**100**	**100**

% of total park visitors: %TVP

% of total Foreign visitors: %TVF

Source : Statistique visiteur RAN 93-2019(MNP Ranomafana)

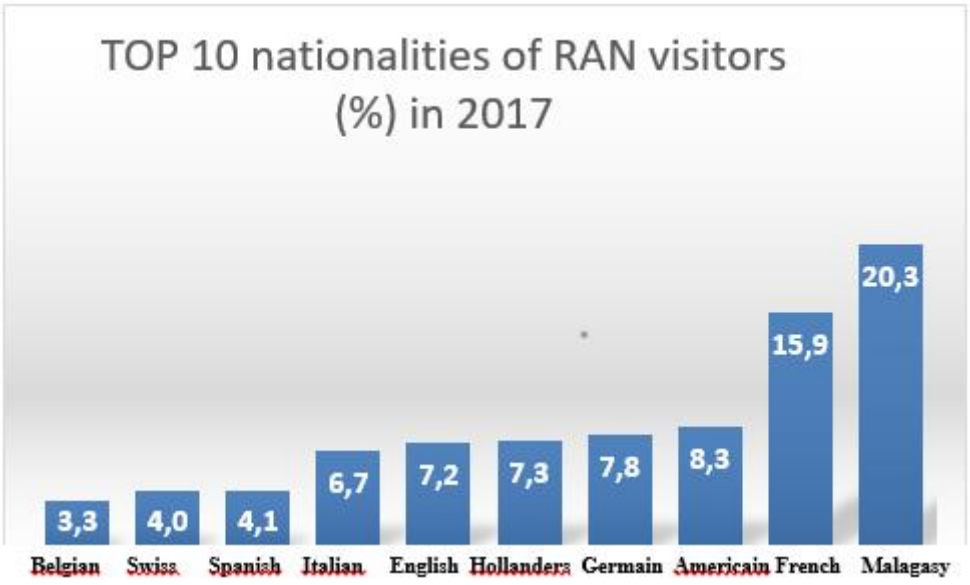

Figure 4. *Top 10 Nationalities of Visitors to Ranomafana in 2017*

Table 13. Evolution of the Number of Tourists who Visited Ranomafana National Park in 2018

Nationalities of visitors	**January**	**February**	**March**	**April**	**May**	**June**	**Julay**	**August**	**September**	**October**	**November**	**December**	**Total**	**%TVP**	**%TVF**
American	24	10	78	102	143	85	205	201	250	282	326	91	**1 797**	**7,7**	**9,4**
Argentinean	0	0			0	0	0	0	0	0	0	0	**0**	**0,0**	**0,0**
Australian	7	6	10	11	47	27	27	104	98	98	61	19	**515**	**2,2**	**2,7**
Austrian	0	2			13	2	5	24	34	35	20	14	**149**	**0,6**	**0,8**
Basque	0	0			0	0	0	0	0	0	0	0	**0**	**0,0**	**0,0**
Belgian	4	5	37	53	51	31	55	54	167	230	30	25	**742**	**3,2**	**3,9**
Cameroonian	0	0			0	0	0	0	0	0	0	0	**0**	**0,0**	**0,0**
Canadian	1	1	10	25	23	23	61	17	52	81	29	4	**327**	**1,4**	**1,7**
Chilean	0	0			0	0	0	0	2		0	2	**4**	**0,0**	**0,0**
Chinese	21	5		5	17	17	24	17	35	65	17	45	**268**	**1,1**	**1,4**
Corsican	0	0			0	0	0	0	0	0	0	0	**0**	**0,0**	**0,0**
Croatian	0	0			0	13		0	0	0	0	0	**13**	**0,1**	**0,1**

Czech/Slovakia	3	12	2		0	20	21	13	12	14	16	1	**114**	**0,5**	**0,6**
Danish	0	0		5	13	3	23	8	18	22	28	0	**120**	**0,5**	**0,6**
Dutch	0	0			0	0	12	0	0		0	0	**12**	**0,1**	**0,1**
Egyptian										2	0		**2**	**0,0**	**0,0**
English	14	18	65	98	123	98	158	210	211	246	323	63	**1 627**	**6,9**	**8,5**
Estonian	4	13				0	0	1				0	**18**	**0,1**	**0,1**
French	100	62	151	199	318	297	511	484	550	742	305	135	**3 854**	**16,4**	**20,1**
German	23	27	52	61	192	92	192	288	198	221	346	103	**1 795**	**7,7**	**9,4**
Greek	0	0			0	0	0	2	12	15	2	4	**35**	**0,1**	**0,2**
Hollanders	12	4	45	24	137	121	302	248	312	343	234	114	**1 896**	**8,1**	**9,9**
Hungarian	0	0			2	2	1	2	15	11	0	2	**35**	**0,1**	**0,2**
Indian	5	0			8	9	12	0	0	3	3	5	**45**	**0,2**	**0,2**
Iranian	0	0			0	0	0	0	0	0	0	0	**0**	**0,0**	**0,0**
Irish	0	0			2	0	0	0	7	10	0	0	**19**	**0,1**	**0,1**
Israeli	0	0			87	7	14	14		5	0	0	**127**	**0,5**	**0,7**
Italian	8	18	65	76	1	55	153	942	330	410	64	46	**2 168**	**9,2**	**11,3**
Japanese	6	2		5	1	5	45	6	16	36	3	15	**140**	**0,6**	**0,7**
Kenyan	0	0			13			0	0	0	0		**13**	**0,1**	**0,1**
Korean	0	1		2	0	0	0	0	5	15	2	0	**25**	**0,1**	**0,1**
Lithuanian	0	0			0			0	0	0	2		**2**	**0,0**	**0,0**
Luxembourgish	0	0			0	0	0	0	0	4	0		**4**	**0,0**	**0,0**
Malagasy	143	81	183	306	258	244	397	714	619	686	462	236	**4 329**	**18,5**	**22,6**
Malaysian	0	0			0	0	0	0	0	0	0		**0**	**0,0**	**0,0**
Maltese	0	0		1	0	0	10	0	0	2	0		**13**	**0,1**	**0,1**
Mauritian	2	0			0	0	0	4		4	0	1	**11**	**0,0**	**0,1**
Mexican	0	0		2	4	0	0	0	0	6	0	0	**12**	**0,1**	**0,1**
Moroccan	0	0			0	0	0	0	0	0	0	0	**0**	**0,0**	**0,0**
New Zealander	0	0		8	0	3		0	0		0	2	**13**	**0,1**	**0,1**
Norwegian	2	0		2	4	0	0	4	11	31	26	0	**80**	**0,3**	**0,4**
Polish	55	66	7	15	1	4	22	16	26	64	73	23	**372**	**1,6**	**1,9**
Portuguese	0	0	7	15	2	2	37	0		0	2	0	**65**	**0,3**	**0,3**
Reunionese	0	0			0	0	0	0	0	0	3	0	**3**	**0,0**	**0,0**
Romanian	0	0			0			1	2	5	1	1	**10**	**0,0**	**0,1**
Russian	6	7	4	7	0	0	0	4	13	33	20	5	**99**	**0,4**	**0,5**
Scottish	0	2		2	3	0	2	0	0	1	0	0	**10**	**0,0**	**0,1**
Singaporean	0	0			0	0	0	2			0	2	**4**	**0,0**	**0,0**
South Africa	0	0	5	7	0	2	2	0	25	58	18	0	**117**	**0,5**	**0,6**
Spanis	6	0		34	52	52	75	576	374	382	122	56	**1 729**	**7,4**	**9,0**
Sri Lankan	0	0			2	0	0	0	0	2	5	13	**22**	**0,1**	**0,1**
Swedish	3	3			14	0	0	0	77		70	0	**167**	**0,7**	**0,9**
Swiss	7	2	30	32	0	12	88	25		132	36	15	**379**	**1,6**	**2,0**
Taiwanese	0	1			0	0	0	12	0		0	0	**13**	**0,1**	**0,1**
Thai	0	0			20	0	0	0		0	0	20	**40**	**0,2**	**0,2**
Turkish	0	0	1		7	0	11	17	10	2	0		**48**	**0,2**	**0,3**
Uganda	0	0				0	1				0		**1**	**0,0**	**0,0**
Ukrainian	0	0				5	7	11	10	21	0		**54**	**0,2**	**0,3**
Zimbabwean											2		**2**	**0,0**	**0,0**
Total	**456**	**348**	**752**	**1097**	**1558**	**1231**	**2473**	**4021**	**3491**	**4319**	**2651**	**1062**	**23 459**	**100,0**	**100.0**

% of total park visitors: %TVP

% of total Foreign visitors: %TVF

Source : Statistique visiteurs RAN 93-2019(MNP Ranomafana)

It results from the table 11 that it is the French, Italian, Dutch, American, German, Spanish, English who are the most numerous visitors and especially the Malagasy.

African countries do not interest Madagascar.

Table 14 describes the evolution of the number of domestic and foreign tourists who visited the park in 2019.

Table 14. Evolution of the number of tourists who Visited Ranomafana National Park in 2019

Nationalities of visitors	**January**	**February**	**March**	**April**	**May**	**June**	**Julay**	**August**	**September**	**Oktober**	**November**	**December**	**Total**	**%TVP**	**%TVF**
American	97	25	66	139	122	135	279	282	195	255	205	45	**1 845**	**6,7**	**8,5**
Argentinean	3		0	2	1	3	0	0	0	0	10	15	**34**	**0,1**	**0,2**
Australian	13		2	40	64	23	28	99	105	115	89	14	**592**	**2,2**	**2,7**
Austrian	8	5	4	7	12	20	4	2				8	**70**	**0,3**	**0,3**
Belgian		5	10	42	39	15	113	69	102	197	188	47	**827**	**3,0**	**3,8**
Brazilian	4						7	3			5		**19**	**0,1**	**0,1**
Bulgarian		2						5					**7**	**0,0**	**0,0**
Cameroonian										2			**2**	**0,0**	**0,0**
Canadian	14	8	3	11	29	39	37	43	45	61	54	54	**398**	**1,5**	**1,8**
Chilean										1			**1**	**0,0**	**0,0**
Chinese	1	17	12	16	14	47	27	45	40	55	25	35	**334**	**1,2**	**1,5**
Corsican													**0**	**0,0**	**0,0**
Croatian	3									5	5		**13**	**0,0**	**0,1**
Czech/Slovakia	31		3	29	3	4	37	23	22	25	22		**199**	**0,7**	**0,9**
Danish	14			14	2	3	23	4	4	21	11	2	**98**	**0,4**	**0,5**
Dutch									2	11	8	5	**26**	**0,1**	**0,1**
Egyptian													**0**	**0,0**	**0,0**
English	16	20	22	140	94	158	357	352	299	198	145	48	**1 849**	**6,8**	**8,6**
Estonian				2			2						**4**	**0,0**	**0,0**
French	115	101	132	365	337	238	431	992	838	957	578	177	**5 261**	**19,2**	**24,4**
German	64	36	101	193	261	174	267	223	185	350	152	50	**2 056**	**7,5**	**9,5**
Greek				3		4		4	6	16	14		**47**	**0,2**	**0,2**
Hollanders	16	27	35	125	180	140	297	549	132	264	175	75	**2 015**	**7,4**	**9,3**
Hungarian	5			4		1			5	15	9		**39**	**0,1**	**0,2**
Indian	1	2	5	4		2	9	9		12	5	1	**50**	**0,2**	**0,2**
Iranian												2	**2**	**0,0**	**0,0**
Irish	2					3				1	5	2	**13**	**0,0**	**0,1**
Israeli				1	1	30	11	2	4	2			**51**	**0,2**	**0,2**
Italian	38	4	17	97	128	96	254	241	335	375	259	46	**1 890**	**6,9**	**8,7**
Japanese	1	6	2		3	15	2	15	30	45	15	15	**149**	**0,5**	**0,7**
Kenyan								1	5	4			**10**	**0,0**	**0,0**
Korean					5	4	1		12	38	28	11	**99**	**0,4**	**0,5**
Lituanian			2		7	2							**11**	**0,0**	**0,1**
Luxembourgish							4	4					**8**	**0,0**	**0,0**
Malagasy	178	126	176	463	358	282	515	944	819	1 014	529	329	**5 733**	**21,0**	**26,5**
Malaysian			1	2						5			**8**	**0,0**	**0,0**
Maltese													**0**	**0,0**	**0,0**

Maroccan													**0**	**0,0**	**0,0**
Mauritian	2	2		2	7					4			**17**	**0,1**	**0,1**
Mexican	5				2		2			2			**11**	**0,0**	**0,1**
New Zealander						4	4	2	14	34	11	9	**78**	**0,3**	**0,4**
Norwegian	2	3	3	14	2				6	10	5	2	**47**	**0,2**	**0,2**
Peruvian			2										**2**	**0,0**	**0,0**
Polish	36	15	15	9	8	10	26	22	48	168	77	12	**446**	**1,6**	**2,1**
Portuguese	1			6	5	1	28	25	35	84	52	8	**245**	**0,9**	**1,1**
Reunionnese			2					1	4	4			**11**	**0,0**	**0,1**
Romanian			2			2		11	11	9			**35**	**0,1**	**0,2**
Russian	24	12	2	5	40	5	2	5	15	55	26	16	**207**	**0,8**	**1,0**
Scottish							4			13	21	4	**42**	**0,2**	**0,2**
Singaporean						3		2					**5**	**0,0**	**0,0**
South Africa				1		5	4		15	51	31		**107**	**0,4**	**0,5**
Spanish	14	21	41	59	40	56	183	340	331	369	113	51	**1 618**	**5,9**	**7,5**
Sri Lankan													**0**	**0,0**	**0,0**
Swedish	2			4			2	4	5	22	22	4	**65**	**0,2**	**0,3**
Swiss	12	17	8	37	21	26	60	38	45	163	123	23	**573**	**2,1**	**2,7**
Taiwanese			2		4			18					**24**	**0,1**	**0,1**
Thai							12						**12**	**0,0**	**0,1**
Togolese			1										**1**	**0,0**	**0,0**
Turkish					6	2	5		1	5	3		**22**	**0,1**	**0,1**
Ugandan													**0**	**0,0**	**0,0**
Ukrainian			2										**2**	**0,0**	**0,0**
Uruguayan							2						**2**	**0,0**	**0,0**
Vietnamese					6								**6**	**0,0**	**0,0**
Zimbabwean													**0**	**0,0**	**0,0**
Total	**722**	**454**	**673**	**1836**	**1801**	**1552**	**3039**	**4379**	**3715**	**5037**	**3020**	**1110**	**27338**	**100**	**100**

% of total park visitors: %TVP

% of total Foreign visitors: %TVF

Source : Statistique visiteurs RAN 93-2019(MNP Ranomafana)

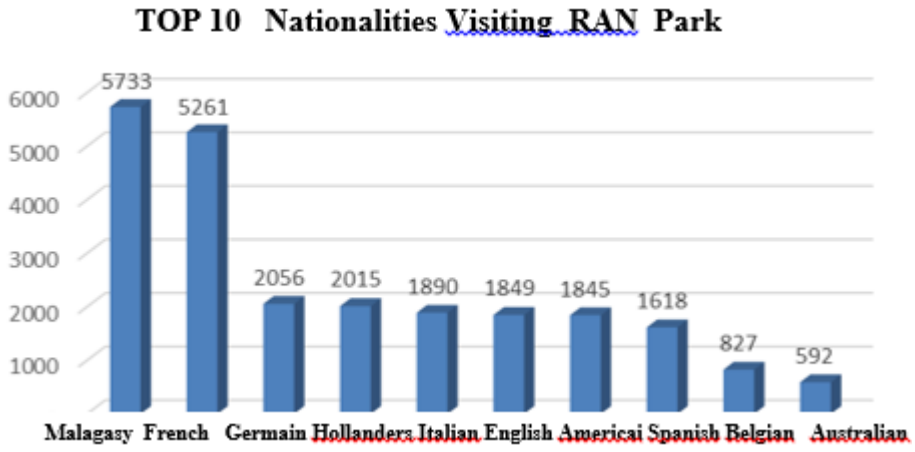

Figure 5*.Top 10 Nationalities of visitors to Ranomafana in 2019*

Table 15 describes the average length of stay of visitors to Ranomafana Park.

Table 15. Average length of stay of visitors in Ranomafana National Park

	2016	2017	2018	2019
Jours	20	21	17	20

Source: Statistique visiteurs RAN 93-2019(MNP Ranomafana)

3.7 Elements and Criteria of Decision Support for Malagasy and Foreign Tourists

They represent the actors of tourism, the tourist product, the different channels of promotion, and the elements of help for online communication.

3.8 Discussion

a. For Isalo National Park

Table 16 shows the average length of stay of visitors to Madagascar.

Table 16: Average length of stay of visitors to Madagascar

Year	2015	2016	2017	2018	2019
Day	20	18	20	21	20

The curve of the total evolution of the statistical data of the visitors from 2015 until 2019 in the Park of Isalo is represented on the figure 6.

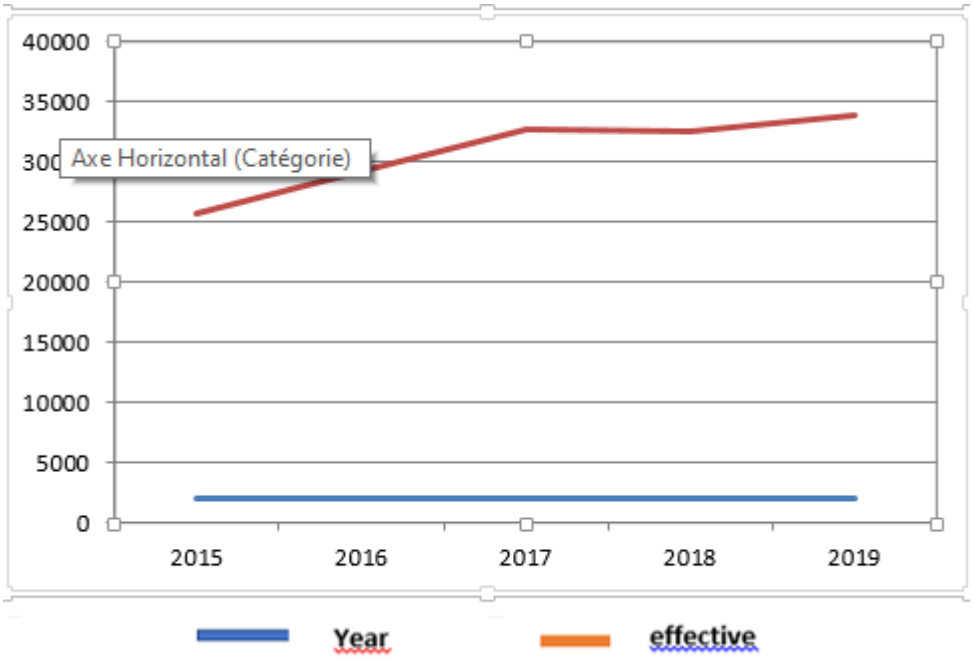

Figure 6. Curve of the Evolution of the Number of Tourists in the Park of Isalo

3.7 For Andringitra National Park

In this table, the Malagasy are the most numerous visitors to the Park, after the French and the English... The number of visitors decreases from time to time due to various parameters (insecurity, political instability, pandemic...).

Table 17 describes the average length of stay of visitors to Andringitra Park.

Table 17. Average length of stay of visitors to Andringitra National Park.

Year	2015	2016	2017	2018	2019
Day	15	21	17	21	20

Source : MNP Andringitra, 2020

The average length of stay of visitors in Madagascar is 2 to 3 weeks.

The curve of the total evolution of visitor statistics from 2016 to 2019 in Andringitra Park is represented in Figure 4.

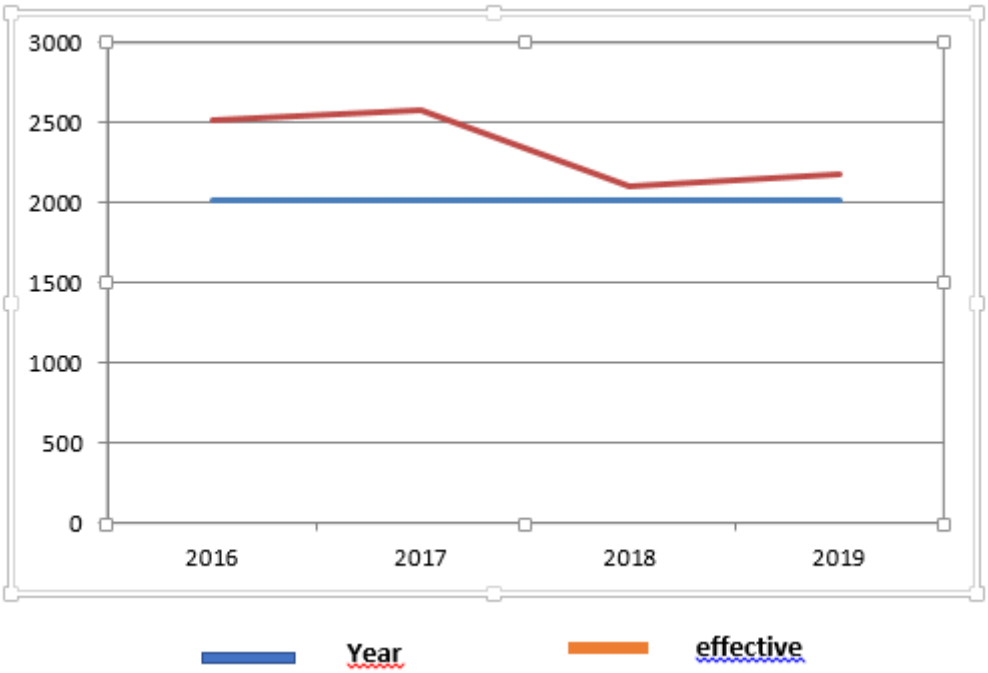

Figure 7. *Representative Curve of Statistical Data of Tourists in Andringitra*

3.8 For Ranomafana National Park

After the insertion of the data and the comparison made, we note that the two solutions MongoDB and Cassandra have answered present all the aspects; nevertheless, it is necessary to decide between the model to adopt, Cassandra or MongoDB.

This would be a difficult question to answer, but the answer to this question is related to the type of our application. If we chose Cassandra, it will be easier to administer (adding machines, scaling, etc.). On the other hand, the flexibility of JSON files pushed us to choose MongoDB.

Moreover, very recent statistics from Solid IT, published in December 2017 on the DB-Engine site, revealed that MongoDB is ranked fifth among all DBMSs, and first among all NoSQL DBMSs, globally. Figure 1 shows the capture of the top 10 DBMSs among 339 according to Solid IT.

Tourism is a transversal sector. Many branches of activity are linked to this sector. We can distinguish, among others, transport, hotel and restaurant industry, health, security... This transversality often leads to a disorganization of the sector.

In Madagascar, the actors in tourism are more or less organized and grouped together in associations. It can be seen that the actors are more organized at the national level than at the regional level.

The evolution of the number of visitors varies according to several parameters: time, organization, pandemic, security, political stability, etc. If there are pandemics or insecurity,

the number of visitors drops rapidly. The collection of all data is very useful to help people to make quick and effective decisions in the tourism sector.

IV. Conclusion

In a context where we speak more and more about the concepts of solidarity tourism, sustainable development, and local development..., we had the ambition to see, through the different relations between the actors of the tourist offer, the place that the local populations hold in tourism in the Haute Matsiatra Region. In our study, we designated as local actors the people who live and work at the level of the tourist sites, and, in the case that we studied, the actors who live in the three National Parks (Isalo, Andringitra, Ranomafana).

We made a presentation on the national parks of Isalo, Andringitra, Ranomafana and the evolution of the numbers of visitors during the last five years, and the elements of help to dynamize the tourism sector in the Region.

We have tried to give the theoretical tools that serve as a framework for analysis. We used Big Data and Business Intelligence to collect and manipulate all the data in the three National Parks and finally the choice of MongoDB. The use of BigData and Business Intelligence helped us to make decisions for Malagasy and foreign tourists to boost the tourism sector in the Faritany of Fianarantsoa.

Finally, the results of this study allow for obtaining a "testimony of effective behaviors of individuals working or acting in an institutional framework of which they give a practical interpretation in the current of their ordinary acts".

They allow to bring knowledge on the organization of the tourist offer on the Region, indispensable knowledge for better management of the activity, but also for a policy of sustainable development of the tourism sector and to help the visitors to find a fast and easy place to book a service thanks to a massive data collection.

References

CNRS, "The big data révolution ", (2013) Le journal n° 28.

Diez, S. (2016) « Hypothèse d'application à l'état des modèles big data déployés par le secteur financier »..

Dumontroty A., (2014). « Dans quelle mesure le tourisme durable intéresse-t-il les voyageurs, quelles seraient les motivations de ceux-ci et sont-elles généralisables dans le milieu montagnard? ».La demande en tourisme durable.

Hamel M.P. et Marguerit D., (2013) Quelles possibilités offertes par l'analyse des Big Data pour améliorer les téléservices publics. N°145

Hilbert M. and López P. , (2012) et « How to Measure the World's Technological Capacity to Communicate, Store and Compute information? », International Journal of Communication, n° 2, p. 1042–1055, disponible sur : <www.ijoc.org/ojs/index.php/ijoc/article/viewFile/1562/742>.

Li Y., Manoharan S., (2013). "A performance comparison of SQL and NoSQL databases", IEEE Pacific Rim Conference of Communications, Computers and Signal Processing (PACRIM), ISSN 1555- 5798.

Mayer-Schönberger V. et Cukier K., (2013) Big Data. A Revolution That Will Transform How We Live, Work and Think, Londres, John Murray, p. 52 [trad. fr., Big Data. La révolution des données est en marche, Paris, Robert Laffont, 2014].

Perera S., and Guanarathne T., (2013), "Hadoop MapReduce Cookbook", Packt Publishing, Print ISBN 978-1-84951-728-7. processing and grid databases", Wiley Publishing.

Razafimanahaky T. H., (2017). « Tourisme et tradition dans la zone périphérique du parc national de l'Isalo région Ihorombe ». Mémoire de Master.

Taniar D., Leung C. H. C., Rahayu W., and Goel S., (2018). "High-performance parallel database