

Projet Collaboratif



CLIM-RUN

Climate Local Information in the Mediterranean
region Responding to User Needs



WP5 – Tourism Case Studies
Task 5.1 Organization of periodic meetings & surveys

Case Study: Tunisia

Report surveys and workshop

Project No. 265192– CLIM-RUN

7th Framework Programme
Underpinning work to enable provision of local scale
climate information (annual to decadal timescales)

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1. Summary

CLIM-RUN “Climate, Local Information in the Mediterranean Region, Responding to User Needs” is a program that seeks to establish the foundations for future climate services (pertinent services used by the different categories of actors) at the regional as well as local levels in the Mediterranean. The project focuses on tourism, energy and natural disasters sectors.

The Work Package 5 (WP5) of the CLIM-RUN program aims at conducting case studies on the tourism sector. A case study is going to be conducted on Tunisian tourism, given the importance of this economic sector for the country and its sensitivity to climate and climate change. The Research Group on Climate Variability and Man in Tunisia (GREVACHOT) at the University of Tunis is a partner program. It is responsible for conducting the Tunisian case study whose objective is to establish climate services through launching a communication channel between the partners who are responsible for the development of climate services and the actors in the tourism sector who are asked to articulate their needs in climate information.

An inception workshop of the project had already been organized by the research unit GREVACHOT at the University of Tunis in June 2011. The objective of the workshop was to present the program CLIM-RUN and WP5/protocol, show its interest in tourism actors, and sensitize them to join. The workshop also aims at defining the steps to be followed for achieving the various stages of WP5 protocol for the case of Tunisia including the conduct of a survey on the needs of the tourism sector in terms of climate information.

The second workshop which was held in December 18, 2011 followed a survey. The workshop’s objective was to present the survey’s first findings and discuss them with the participants.

The present report presents the results of this first phase on the discussions with the tourism actors through a survey. It consists of four components:

- The first part presents the Tunisian tourism sector with its strengths and weaknesses, its sensitivity to climate and climate change.
- A second one deals with the involvement of actors of this sector in the project (the approach that was conducted: identification of the actors, the survey and at last the workshop)
- The third part records and presents the results of this first phase of the study. This section includes the expectations of the actors in climate services, as reflected in the results of the survey and in the discussion and interventions of the participants in the workshop. The last point of the report provides the next steps of the study. Attached is the report, the list of the targeted actors and the questionnaire.

The report deliberately insists on the limits and shortcomings of the approach taken during this first phase of the study in order to examine the possibilities of avoiding them in the next stages of the program's implementation.

2. Representation of the Tunisian Tourism Sector

2.1. Tunisia: a major tourist destination

Tunisia is classified among the top 50 world tourist destinations (34th in the international ranking of 2007). Giving the 5 to 7 million tourists a year (from 2005 to 2009), 250 000 beds and 34.62 million overnight stays (2009), Tunisia is one of the major tourist destinations in the southern Mediterranean next to Egypt and Morocco. She outnumbers Morocco in tourist bed capacity (429,060 thousand beds in Egypt, 250 000 thousand beds Tunisia and 152.93 thousand beds in Morocco in 2009). It is the same for the number of nights (126.53 million overnight stays for Egypt, 34.62 million overnight stays for Tunisia and 12.52 million overnight stays in Morocco in 2009). Tunisia ranked third behind Egypt and Morocco in the number of international tourist arrivals (12.5 million arrivals in Egypt, 8.34 million for Morocco and Tunisia 6.9 million in 2009).

2.2. A Major Role in the Country's Economy

The sector revenues represent 7% of GDP, generating between 18 and 20% per year of foreign exchange earnings and cover over 51% of the deficit of trade balance. The tourism share of total job creation in Tunisia is around 12%. 95 400 direct jobs and 286,200 indirect jobs in 2008 are linked to this sector. It is now estimated at a ratio of 5 Tunisian employees in the tourism sector. Furthermore, it has an important knock-on effect on other economic sectors including transportation, communications, crafts, construction... Table 1 reflects the importance of the tourism sector for the Tunisian economy.

Table1. Importance of the Tunisian tourism sector

	1987	1997	2008	2009
Number of hotels	443	662	836	
Capacity available bed.	100 456	178 176	238 495	250 000
Capacity put into operation	86 496	154 829	197 780	
Arrivals at frontiers of non-residents	1 874 734	4 263 107	7 048 999	6 901 406
Arrivals at frontiers of European	1 547 637	2 845 952	4 106 675	3 743 509
Arrivals at the borders of the Maghreb	265 057	1 281 298	2 779 859	2 999 100
overall bed nights	18 556 793	29 795 812	38 112 352	34 623 504
Nights spent by non-residents	17 515 741	27 684 239	35 048 653	
Nights spent by residents	1 041 052	2 111 573	2 111 573	
Average length of stay	9,3	6,5	5,0	
Occupancy rate (%)	58,8	52,7	52,7	
Tourism receipts (in millions of dinars)	550,2	1565,3	3077,3	
Value added (in million dinars)			1 917	
Share of GDP			7 %	
Coverage rate of the trade deficit	77,0 %	60,1 %	50,6 %	
Share of exports			17 %	
Investments (million dinars)	63	360	253,6	
direct jobs	40 182	71 300	95 398	
indirect jobs			286 194	

Additionally, tourism is the highest producer of local taxation and constitutes a funding source for the realization of equipments.

2.3. An essentially seasonal seaside resort

The tourism boom began in the 1960s and it was fostered by a number of factors: a climate characterized by a significant sunshine duration, and 1,300 km of sandy beaches whose significant part is geographically close to Europe

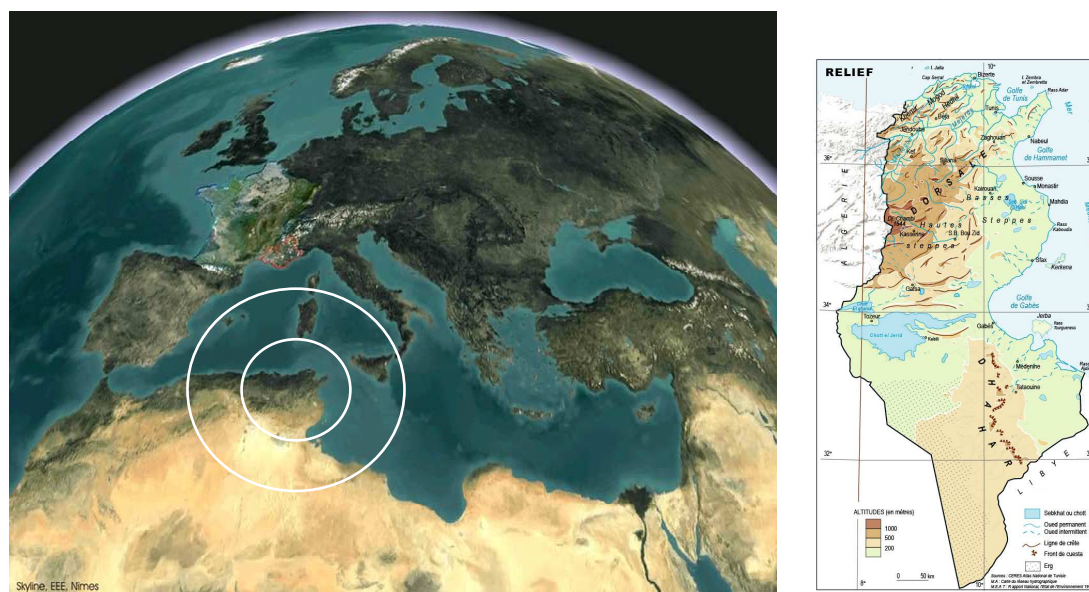
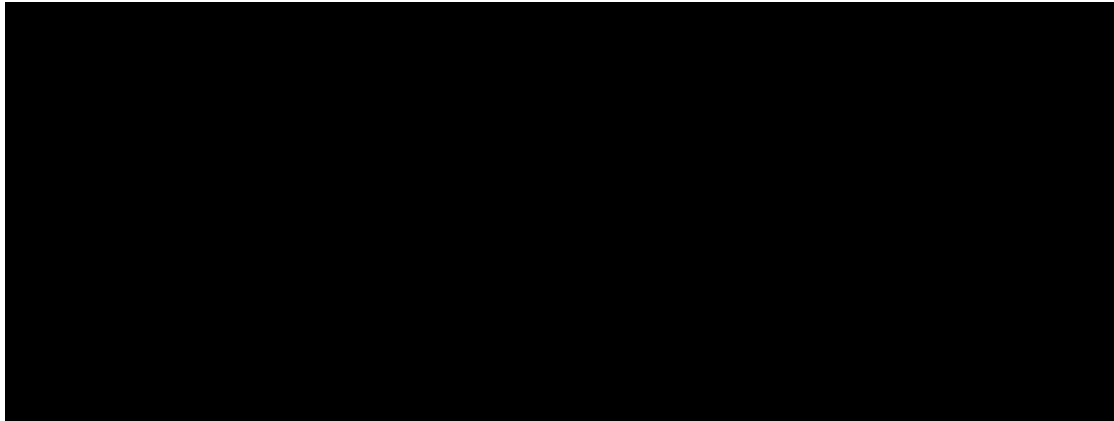


Figure 1: Tunisia: It's Geography

It should be noted however that Tunisian tourism is an almost standardized mass tourism, it is essentially based on two important natural determinants: the sun and the sea (Hénia 1. et Alouane T. 2007). The coastline accounts for 95% of tourism investments and functional beds. The high season that runs from April to October (Figure 1) recorded 73% arrivals of non-resident tourists. This results in a homogeneous thrust of “the product” and its “consumers”.



Source : Hénia et Alouane, 2007

Figure2: Monthly frequency (% of annual total) of overall nights

This standardization is reductive of real tourist abilities of the country (Hénia et Alouane 2008). This tourism which is essentially seaside resort (93% of nights) proved to be insufficiently profitable (poor regional and seasonal distribution of little diversified activities, low occupancy and sojourn rates). And thus in a context of strong competition, the country's politics has recently taken a new direction that aims at diversifying the tourism product (Saharan, ecological, cultural, health spa tourism ...)

2.4. Insufficiently exploited important climate-tourist Potential

En In addition to its 1300 km of coastline and beautiful beaches, Tunisia has:

- A rich landscape



Figure 3: Rich landscape of Tunisia

- A very rich historical heritage (more than 3000 years of history, very diverse Berber, ancient, and Islamic heritage), many sites and monuments are listed as internationally renowned World Heritage.



Figure 4: Rich Historical Heritage

- Well-developed crafts

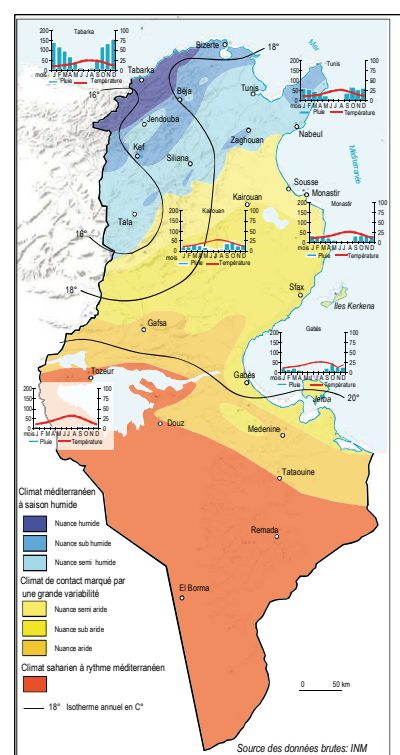


Figure 5: Diversity of Crafts industries and products

In addition to seaside tourism, Tunisia can offer quantities of diversified products that can meet different themes and motivations.

Tunisian climate (Figure 6) offers a very favorable place to move from tourism of almost standardized base to alternative forms of tourism with a more diverse and authentic products that have much more sense (Hénia L. et Alouane T. 2007).

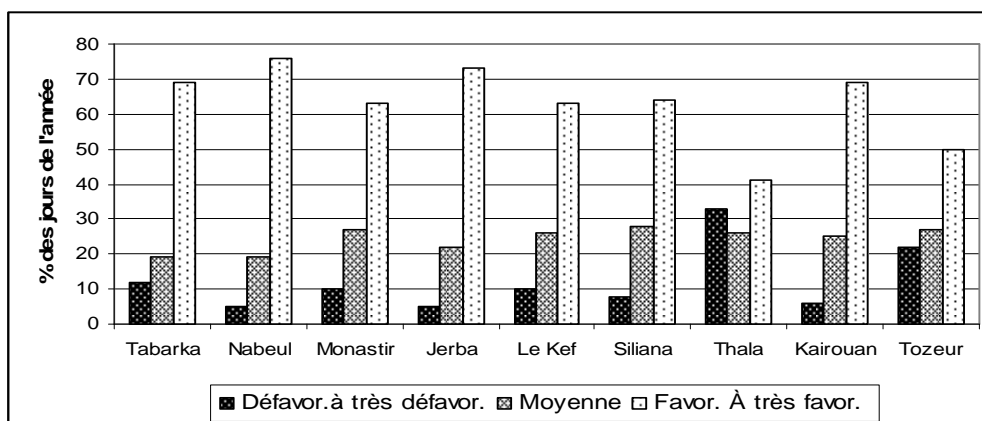
The ideal climate for outdoor activities is that characterized by thermal comfort and absence of atmospheric phenomena that may hinder those activities. A climate-tourist potential Index (IPCT), based on these two components (comfort level of the thermal environment and frequency of extreme atmospheric phenomena that may hinder the outdoor activities) was developed for Tunisia (Hénia et Alouane T. 2007 et 2008). This index that has been applied to stations representing different climatic regions of Tunisia reveals that:



Source : Hénia L. Atlas de l'eau, 2008

Figure 6: The climatic regions of Tunisia

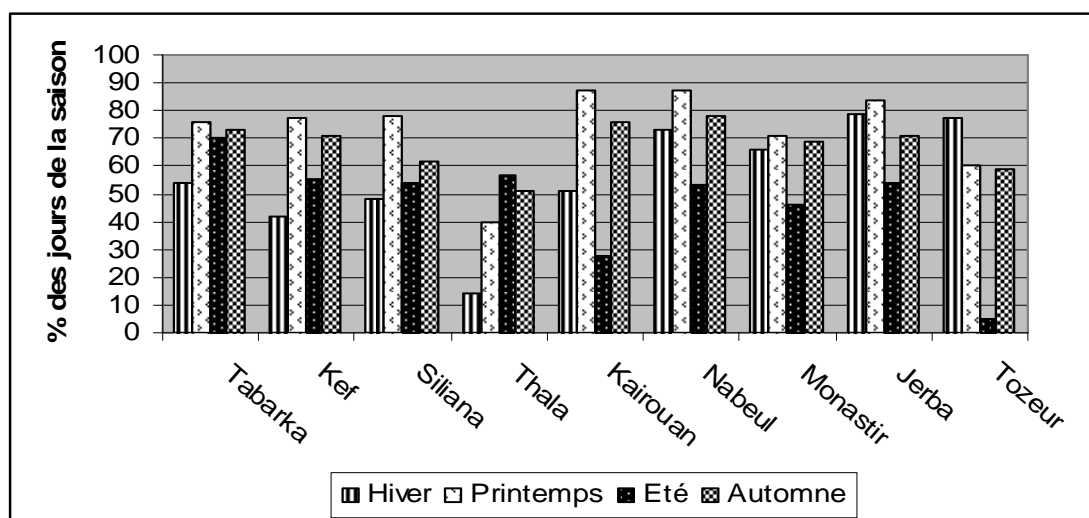
- The comfortable to very comfortable climate-tourist environment dominates throughout Tunisia (Figure 7).



Source : Hénia et Alouane, 2007

Figure 7: Frequency of types of climate-tourist environments

- Quite marked nuances across seasons and regions (figure 8),



Source : Hénia et Alouane, 2007

Figure 8: Favorable to very favorable seasonal incidence of climate-tourist environment

The intermediary seasons are the most comfortable ones. On the contrary, the summer atmosphere is the most difficult one because of the heat, but it is most favorable to tourism and in this sense it is quite emphasized in coastal areas. It is important to note however that summer is less stressful in the high altitude resorts, even compared to coastal stations. Winter outside the high continental areas is more comfortable than summer and particularly in the country's south. Seasonal and regional nuances deserve to be

exploited for the development of new tourism opportunities including third age tourism and retirees whose numbers increase in the source countries. Climate conditions are favorable for this type of tourism out of summer (soft and strong sunlight that favors Tunisia to its competitors in the northern Mediterranean). The Tourist low season is also more profitable than summer tourism (for example in 2008, \$ 445 per tourist during the low season and \$ 390 per tourist in summer).

2.5. Actors and organization of the Tunisian Tourist sector

2.5.1. The main actors

The sphere of participants in the tourism sector is very broad: public institutions, private actors, civil society organizations, etc whose fields of action fall at scales ranging from international to local moving through national and regional levels. They work in various fields (those of legislation, planning, development, promotion and marketing ...). In each of these areas climate information can find its place and the actors can be producers, users or links in the chain of communication and information dissemination. Figure 9 gives an idea of the sphere of direct and indirect actors in the sector.

At the head of public institutions that operate directly in the tourism sector we find that the Ministry of Tourism has a role in developing and implementing government policy in the field of tourism and to directly, or by through the subordinate institutions, and in conducting general, sectorial and cyclical studies and evaluations related to tourism. The main agencies and entities operating in the field of tourism which are under the Ministry are:

- The National Tourist Office of Tunisia (ONTT), responsible in particular for encouraging investment in tourism, marketing and control of the tourism product; regional tourist commissions, regional tourism offices Tunisian tourism abroad which are two entities that operate under the ONTT;
- Real Estate Agency of Tourism (AFT) responsible for the design and implementation of development plans, control of land and the establishment of basic infrastructure;
- Trade associations, Tunisian Federation of Hoteliers (FTH) and Tunisian Federation of Travel Agencies (FTAV);
- Public institutions of tourism training

Civil society, particularly through its NGOs of cultural nature like the Association for the Safeguard of the Medina of Tunis, as well as those working in the field of environment or ecosystem protection may have skills and especially play an operational role at the local level.

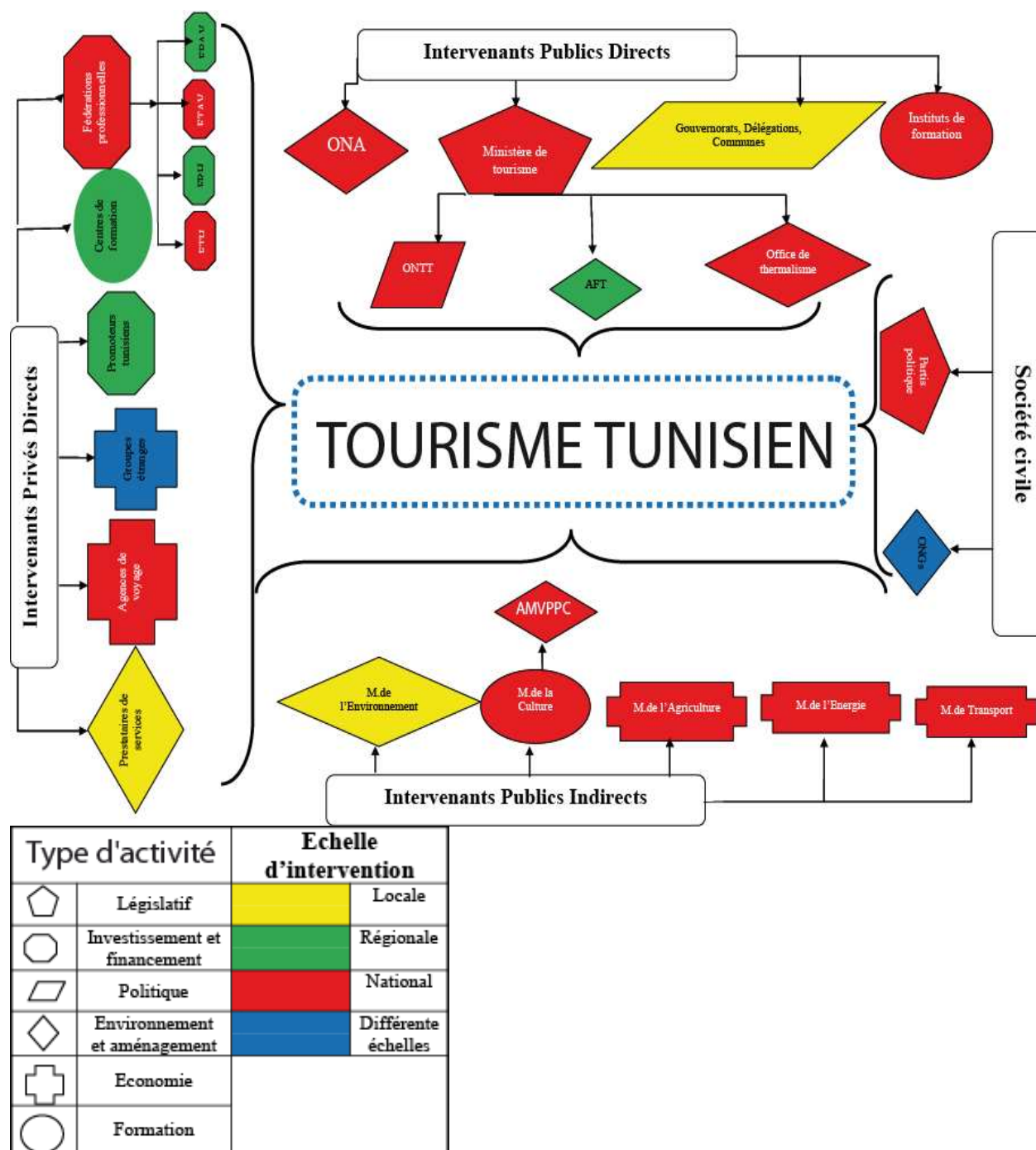


Figure 9: Key players in the Tunisian tourism industry

Tourism is a transversal sector interacting with many others. We therefore find other organizations that are related in a way or another to it that may play a role in the information production and some climate services for this sector. Table 2 shows those who are closely linked to the sector and that have relations with the climate service

Table 2: Major public agencies interacting with the tourism sector

Institution	Interaction Field
Ministry of Environment and its agencies (ANPE, APAL..)	<ul style="list-style-type: none"> - Observing and monitoring the evolution of the coastline, creating the balance between development and coastal protection, - Management of protected natural areas
Ministry of Culture	<ul style="list-style-type: none"> - Monitoring and maintenance of heritage sites - Management of heritage sites to be ready for visits - Cultural events (Festival of Jazz, classical music ...)
Ministry of Agriculture	<ul style="list-style-type: none"> - Observation and monitoring of water consumption by sector - Observation and monitoring of water quality (swimming, and mainly thalassotherapy) - Prospects of food supply of tourist facilities
Ministry of Energy	<ul style="list-style-type: none"> - Observation and scientific monitoring of energy resources and consumption by sector -Energy saving measures tailored to the tourism economy
Ministry of planning	<ul style="list-style-type: none"> -The Town Planning Code, -Construction standards (thermal insulation, choice of materials ...
Ministry of Health	<ul style="list-style-type: none"> -Health tourism product development in coordination with the tourism sector.
Ministry of Transport to which is linked the National Metrology Institute (INM)	<ul style="list-style-type: none"> -The role of the NMI is fundamental in the sphere of participants in relation to climate services, because it is the largest producer of information on weather and climate.

According to TEC/MEDD/GTZ 2010

2. 5. 2. Outlining: the salient aspects

Two aspects are worth mentioning at this level:

-The institutional framework of the Tunisian tourism industry favors a hierarchical structure rather than a transcendental one between the different actors. This is likely to hamper the

project at the local level. Strategic studies on tourism sector, including the strategic study on tourism in 2016, propose to improve and restructure the institutional framework. These include:

- * Decentralization of the administrative decision so that the local authorities involved in the development sector, can benefit from some flexibility. It aims also at establishing a permanent communication (which is absent today) between local communities and regional commissions.

- * The establishment of a projects' structure,

- * Creating a structure of promotion and marketing and a structure specialized at vocational training in tourism and including professionals to these structures.

- The grip of foreign Tour Operators (TO) on marketing the Tunisian tourism product, the strong dependence vis-à-vis Tour operators resulted in deteriorating service quality and the development of a destination image at a low cost and in the present context which matters for us the lack of concern is manifested in the climate service. The discussions initiated by various participants in the sector led up to strategic elements including:

- * Online sales development,

- * Open skies, the Tunisian destination has so far suffered "an excessive protectionism of the sky" justified by fears of a collapse of the local pavilion in case of influx of foreign airlines (TEC / MEDD / GTZ 2010).

In sum, the new model of Tunisian tourism development considered (see among others, Tourism Strategy Study 2016) will bring about new actors and new roles for some categories of existing actors and will be more conducive to a better awareness of interests of the climate service.

2.5.3. Weaknesses

- * Tunisian tourism has not followed the changes that the world tourism has undergone: a classically- dominated accommodation.

- * The concentration of infrastructure on the coastline and a serious lack of infrastructure in the interior regions of the country despite the importance of their tourism potential,

- * marketing heavily dependent on tour operators, very few hotels have an operational website.

- * The weakness of the system of supervision and training of tourism, with a lack of diagnostic services,

* little diversified offer; despite all efforts in this regard, the Tunisian tourism remains largely sea resort and virtually all other products (golf, thalassotherapy, Saharan tourism and other offers) are products that benefit the sea resort tourism

* The State undertakes the task of promoting tourism and it in fact provides a promotion of the overall image of the destination, without necessarily focusing on the regions and on specific products. There is no regionalization of the promotion where all tourism actors take their responsibility.

3. Tunisian Tourism, Climate and Climate Change

Tourist destinations are sensitive to climate, its changes and its future developments. The climate has a direct impact (on the level of comfort climate tourist environments) and also indirectly on the tourism sector through its effects on water resources, ecosystems, the sea level, and on the beaches ... The climate is also involved at certain components of accommodation management such as air-conditioning. The current climate of Tunisia which is rather favorable to outdoor tourist activities may be affected by climate change that will engender direct or indirect effects on the country's tourism sector.

3. 1. CC: effects on the climate-tourist Environment

Tunisian tourism will bear the effect of CC on the climate of Tunisia and the issuing countries.

In Tunisia, the temperature's rise within the CC improve the comfort level of the thermal environment of winter and will be conducive to the development of tourism products other than bathing (hiking, ecotourism, tourism in the third age ...) On the contrary, The summer season should know the worsening of the discomfort due to heat waves, the frequency of heat waves, next to the thermal degradation of respite nights, resulting in amplification of the risk of sunburn and heat stroke (table 3).

Table 3: Effects of CC on the seasonal climate of Tunisia

Summer	Winter	Intermediary seasons
<ul style="list-style-type: none"> - Extension of the hot season at the expense of intermediary ones - The heart of the summer is becoming more and more uncomfortable because of the heat (dangerous for the fragile bodies) -The swimming season lengthens and extends beyond the hot season 	<ul style="list-style-type: none"> - Warmer winter - Improvement in the climate comfort level -Unfavorable environmental regression 	<p>Benefit from the improved conditions for the third generation tourism that has a cultural and ecological purpose</p>

The intensification of heat and summer climate discomfort will result, in addition to the accommodation management, in the massive use of air-conditioning and on therefore increase water needs. In the source countries of tourists to Tunisia, the CC will bring about improved thermal conditions mainly heat for winter. If winter becomes less cold in these countries, will the European tourist go for the mild winter in the Southern Mediterranean? Doesn't the intensification of summer heat in Tunisia discourage people particularly vulnerable ones to spend a holiday in Tunisia during this season?

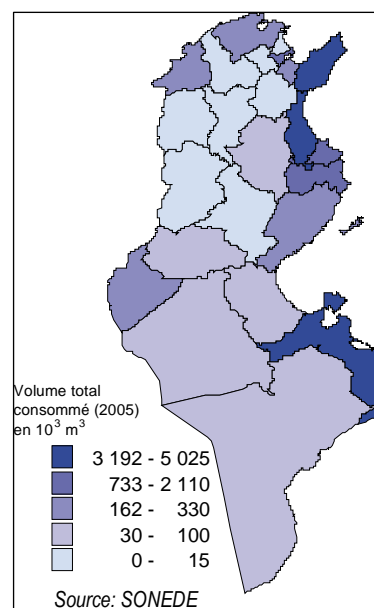
3. 2. Threat of accelerated sea-level rise along the coast

Accelerated sea-level rise due to global warming is a threat to the coast and consequently to Tunisian tourism given the fact that Tunisian tourism is fundamentally seaside resort. Observation (Roman ruins exist today under water) as well as tide gauge data (port of Sfax) reflect the current sea-level rise in Tunisia. The effect of CC on the sea level, adding to other complex phenomena (subsidence of land, anthropogenic factors), cause the decline or even the disappearance of some beaches. It is now estimated at 400 km of coastline are threatened by the sea-level rise. In the longer run, the coastal retreat is threatening the infrastructure (hotels, marinas, golf courses ...) built on the coastline. The phenomenon may be worsened by extreme events such as the storms. The CC will indirectly address a fundamental element of productive capital (which is the seaside) of the Tunisian tourism industry.

3. 3. The scarcity of water resources

Water resources in Tunisia are modest, very irregular and highly in demand. Despite the policy and management tools of the resource in place, it remains very fragile and highly vulnerable to CC. These changes will result in a decrease in rainfall and an increase in temperature and therefore in water needs (MARH 2006). Competition between users, already very strong these days, will increase with the CC and will affect the tourism sector (which

now pays the highest water prices.) The pressures put on the resource by tourist activity, concentrated in time (summer season) and in space (coastal and southern Tunisia, Figure 10), become more and more problematic and will have repercussions in terms of operating costs, but also in terms of health security



Source : Hénia L Atlas de l'eau 2008.

Figure 10: Tourist water Consumption

3. 4. The stakes of the carbon constraint in air transport

Tourism accounts for approximately 5% of global carbon emissions in the world mainly due to airline transportation. The issue of cutting emissions will surely affect air-transportation and will influence the price of this type of transportation. Tunisian tourism industry will suffer as 64% of tourists arrive in Tunisia by air and air traffic represents more than 95% of European entries. (MEDD / GTZ / TEC, 2010)

3. 5. The developed knowledge

It exists in Tunisia a relatively large body of knowledge and data on climate, climate change, vulnerability and adaptation of certain components of the natural environment and economic sectors to climate change. This available body of knowledge and data, although they are not void of shortcomings, can serve as a basis for the development of climate services destined for the tourism sector. We try here to present the existing literature that might be of interest for the tourism sector.

- Studies conducted in particular by climate researchers (PhD theses, research papers, books and published articles) and in which rain, temperature, and extremes phenomena (floods, heat waves, cold waves ...) are widely studied in Tunisia. Some of these studies focus on the climate environments in the different tourist regions of the (Alouane T. 2001) or on the tourist- climate potential of the country (see, among others, Henia L. and T. Alwan, 2007,

2008). An overall index of tourist-climate potential is a seaside-potential index developed for Tunisia (Henia and Alwan, 2007)

- Studies that focus on certain non-climatic resources of tourism that is coastline and especially the beaches. These studies are conducted by morphologists including morphologists (including Ouslati A. 2004) or by designers in the field of coastal environment development. Water resources and ecosystems have also been the subject of several studies (see among others, Henia dir., 2008, MARH 2006) in which tourism can draw relevant information.

- Studies that focus on Tunisian tourist climate vulnerability to climate change (and Henia Alouane 2008, TEC / GTZ 2010). Based on IPCC s projections (particularly at the regional level, Southern European Mediterranean region) and projections which are specific to Tunisia these studies present scenarios of future Tunisian climate-tourist potential evolution.

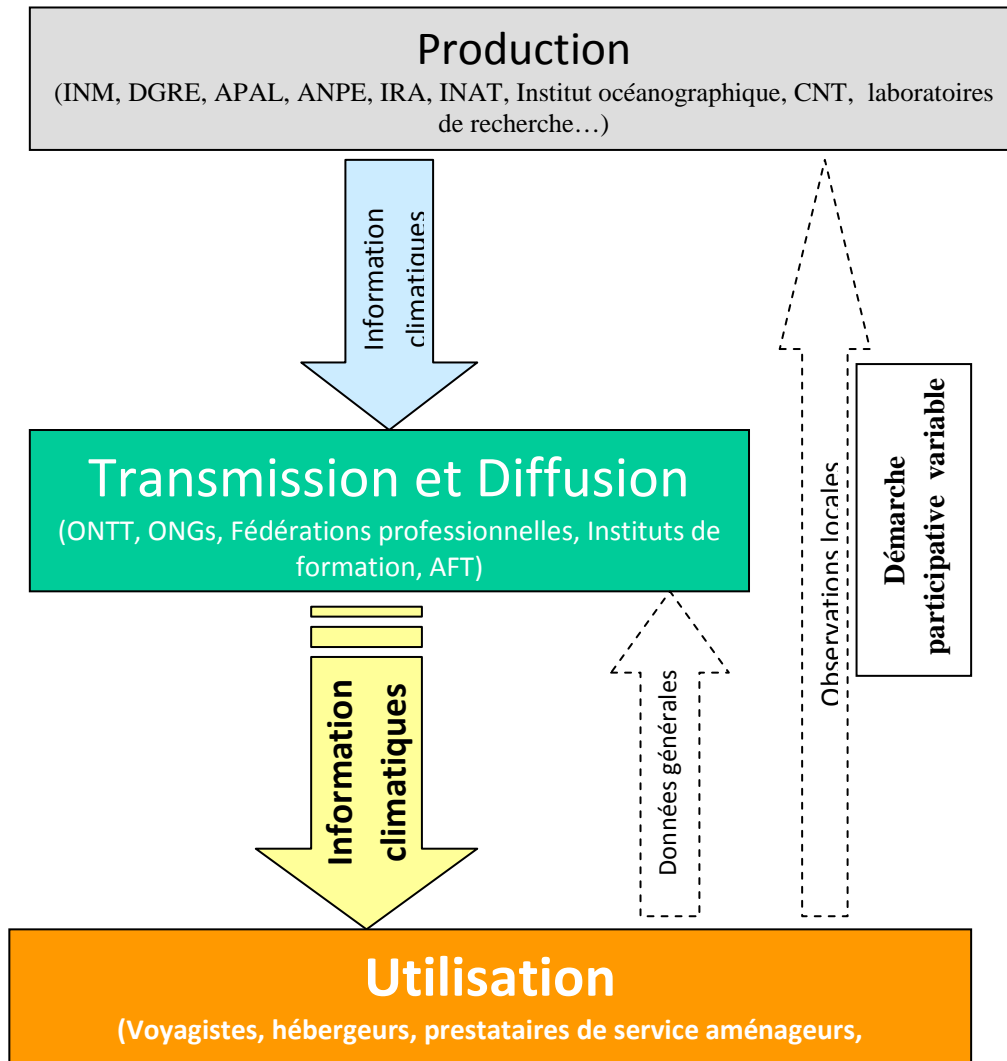
- Sectoral studies on vulnerability and adaptation to CC (on the coast, on agriculture and ecosystems, oases, on water resources and health), of which some results are of particular interest for the tourism sector. These studies are conducted by Tunisia to meet its commitments to the UN Framework Convention on Climate Change. The coastline (fundamental non-climatic resource for tourism) alone has been the subject of two studies on vulnerability and adaptation of this resource to the accelerated sea-level rise. The first date 2000 is entitled "Elevation of accelerated sea-level, vulnerability and adaptation" (MEDD / IHE 2000). The second was devoted also to the vulnerability and adaptation of the Tunisian coastline facing the EANM. It has allowed the completion and update of the first one. This is actually a three-volume report entitled "Study of environmental vulnerability and socio-economic development of the Tunisian coast facing an accelerated sea-level rise due to climate change and identification of a strategy adaptation "(MEDD / IHE, 2007, 2008). A third study on the coastline is underway whose purpose is to draw a map on the vulnerability of the Tunisian coasts to CC.

The last sectoral study on vulnerability and adaptation to climate change deals with tourism (Tourism and climate change: impact assessment and preparation of national adaptation strategy, MEDD / TEC / GTZ, 2010). This study provides a detailed analysis of the sector with its strengths, its weaknesses and its sensitivity to climate change. The study also proposes a package of measures to meet the challenges posed by CC on tourism. The study contains a large amount of information on Tunisian climate-tourist potential, on the likely effects of climate change on climate and non-climate resources of tourism on Tunisia. The large amount of information provided by the proposed literature suffers, however, from some shortcomings. Among these we mention those concerning:

-
- the Climate range weather forecast (next month), often a recommendation made by tourism actors interviewed,
 - climate modeling and definition of future scenarios of its evolution mainly at the regional level
 - CC Indicators,
 - Indicators and indices of climate-tourist potential and its variation in time and space,
 - The climatic requirements of each tourist activity,
 - The climatic expectations of tourists,
 - The effect of climate and its variation on some non-climatic tourism resources such as energy,
 - The lack of details that allows the knowledge of the contribution of tourism to the Tunisian overall greenhouse effect. Tourism contributes in its turn to CC by emitting CO₂ and other greenhouse gas emissions. This dimension remains poorly documented for the case of Tunisia.

It should be noted also the often scattered data and information, the poor coordination and poor communication between departments holders of data and information. It should be noted however that the sphere of actors involved at this level allows the establishment of a system of adequate flow of information between producers and users of this information (Figure 11)

Figure 11: The Main actors involved in climate information flow (type scheme after Berard))



4. Actors' Involvement: approach

4.1. Actors' Identification

At the beginning of this first phase of field work, identification of actors who are involved in the project is necessary. For this, the GREVACHOT called upon the expertise of JM Chapoutot who is a tourism expert.

After a comprehensive tracking, the choice was guided by the search for contacts and key operators who can play a key intermediary role in the information flow. There is also a kind of willingness to reach a variety of profiles: hotelier, operators of recreational activities (water, ports, excursions ...), and representatives of tour operators, trade associations, and private investors, administrative people (ONTT, Ministry of Tourism ...). Our Concern was also to have actors of the country's different tourist regions. A list of some sixty people of very different profiles was finally developed. Table 4 shows the categories of the requested actors.

Table 4: Categories of requested actors

Intervention domain	Actors'categories
Global/international	Hosts Tour operators Port activities
National	Hosts Tour operators public administration professional organizations Experts Media
Regional	Regional Tourist Offices Regional Federations of Travel Agencies Beach activities

4.2. The Fieldwork

4.2.1. Objective

The fieldwork aims at:

- seeking the advice of tourism actors on present climate variability , its future evolution, and its impact on tourism activities,
- Knowing their climate information needs on the basis of present and future operation of tourist facilities,
- enabling ,during the workshop, the tourism actors' expectations on climate services to emerge.

4. 2. 2. General approach

In order to involve as many actors as possible in the project, CLIM-RUN WP5 protocol, relating to the tourism case study, promotes direct contact. Thus we used the survey /interview approach which has been carried out in the following steps:

- Transmission of the questionnaire by e-mail. The objective behind that was to give the targeted people time to have a look at it
- Request appointments via email and in case no response is received we try by phone,
- Meeting/interview with the actors.

During the interview, information was provided on the workshop and then the invitation was sent via email.

4. 2. 3. Involved Actors:

At the beginning of this first phase, and in order to promote to the maximum the actors' involvement in the project, the questionnaire was sent by e-mail to forty people. Most of them responded. But some actors have preferred not to answer. In addition, a number of solicited actors did not respond to the request for appointment because of the political context through which the country was going. The January 14 revolution, the first elections that were held in October 23, and the serious current crisis in the Tunisian tourism industry are the main reasons, adding to the reasons specific to the organization of Tunisian tourism, namely its strong dependence on T.O. The response of an actor to whom the questionnaire was sent gives an idea about the lack of interest in the question in some targeted people. Answer: *"I've just read your questionnaire, I find it good, but not being familiar with the matter, my opinion may not have much interest. It is perhaps better to explain the relevance of this questionnaire and its usefulness: What will be the tangible benefits, be it small or large, on the tourist activities? "*

We have finally met a number of actors who are directly or indirectly involved in the sector (hosts, restaurant owners, seaside activities, tour operators, crafts industry, media, tourism experts, administration.). It is worth mentioning here that these respondents demonstrated much interest in the project and have got precise answers to most questions.

4. 2. 4. Used Materials

The questionnaire used for the survey was developed on the basis of the questionnaire proposed in the WP 4. After discussing the questionnaire during the inception workshop of the case study of Tunisian tourism (a workshop organized by the GREVACHOT in June 2011 in Hammamet, see summary report on the site of CLIM RUN), we thought of reworking the structure of the questionnaire (by a tourism expert and climatologists at GREVACHOT) and adapt it to the Tunisian case study in order to make it more comprehensible to the actors. The document includes a paragraph at the beginning to raise a prior awareness to the subject

(almost a page). The second and third pages of the questionnaire are allotted to information concerning the nature of the speaker and finally the questionnaire developed in three pages, for a total of 6 pages (see Appendix). The first questions are on the respondent's point of view on time and climate change and the latter's future evolution and their effects on his or her tourism field. This is followed by questions on the level of considering climate information in his or her field of activity and the mobilization process of tracking information. These are questions about the needs and wishes on climate services. Despite the work done on the questionnaire by the Tunisian CLIM RUN team, to condense it and put it in a form that facilitates its understanding by those involved in tourism, some actors, to whom the questionnaire was sent, find out that it is written in too technical terms as can be inferred from the response of one of them, sent to our expert J. Chapoutot:

Answer: "I studied the questionnaire, I find the questions so relevant but the terms used are very technical, which makes understanding them so difficult and I'm surprised that my answers will meet your expectations. Moreover, the scale used (binary, yes or no) reduces the flexibility of the respondent, I would have frankly chosen a semantic differential. "

4. 2. 5. Key points

We can say that the choice of the surveyed people has been very judicious reference to their interest shown for the project and their specific and clear answers to the various aspects of the survey. This proved to be a positive point of this first phase. The following points summarize their responses to different parts of the questionnaire:

Part 1. Viewpoint on the weather, climate and climate change:

- * Coastal erosion seemed a very worrying phenomenon, which is logical in the case of a good seaside product and regarding its economic consequences, and in terms of marketing.
- * Seasonal climate which currently paces the tourist flows, may be affected by the CC and this is likely to pose problems for professionals about new adaptations.
- * Changes they have observed in periods of bird migration in the north-west and times of emergence of desert animals, which causes them to change their products in terms of marketing and equipment.

- Part 2. Mobilization Process of adopted climate information

Responses to questions included in this part of the questionnaire reveal that given the type of marketing (via T.O) practiced by the vast majority of professionals; the latter cannot have decision-making process of mobilizing and using Information on weather and climate. The relationship of tourism professionals with clients is a service relationship. Customers have a commercial relationship with T.O. Even when professionals have created a portal on their

activity, this portal does not include information on weather and climate. If necessary, climate information is sought quickly and easily from “tourist-weather forecasting sites” for free.

Part 3. Views, needs and wishes for Climate Services

While at the beginning, the people surveyed have a limited interest in climate services, they make many wishes when they are illuminated on the optimal conditions for their use. For players whose product is time sensitive, the matters cited vary depending on the type of product commercialized and their geographic regions (coastal, interior, north, south ...). Among the parameters on which they would like to be informed are air temperature, sea water temperature, rain and wind. Another service is highly desired by respondents relates to the seasonal forecast which is very useful in terms of planning. This shows their dependence on seasonal climate, but also shows their willingness to adapt their businesses and innovate them with relation to future climate knowledge. The respondents have a critical eye on the price they need to pay when it comes to acquire climate information from the national services. This fact drives them to turn to international services providing free access to information.

4. 2. 6. Limitations

In this regard, two remarks should be emphasized:

- Many targeted actors have shown little interest in the subject which has somewhat slowed the process. The deep crisis that Tunisian tourism industry undergoes after the revolution is the main cause in addition to marketing dominated by T.O
- Despite the condensation and the attempt to adapt the basic questionnaire, certain issues have appeared too technical for those targeted actors

The next step is to:

- carry on the survey through targeting the actors whose activity is most sensitive to climate and its evolution and those with more firm action to gain a better insight into the needs of the Tunisian tourism industry in terms of climate services.
- Review the questionnaire in order to simplify the technical questions and make them more understandable to the actors who do not necessarily have a good understanding of the mechanisms of weather and climate.

5. Workshop

The workshop was held in December 18, 2011 in Hammamet in the Cap Bon. Hammamet was chosen for its importance as a tourist destination and its relative proximity to other major tourist resorts for instance that of Tunis and Sousse, Monastir-Skanes and Mahdia. The workshop was held as a direct result of the field survey.

5.1. Objective

Its objective was to:

- present the survey's results and discuss them with the actors,
- Validate a list of climate data and indicators relevant to the sector and make a first priority at this level,
- Discuss the form and content of climate services for Tunisian tourism industry.
- Think about the following steps.

The workshop was also an opportunity for:

- The presentation (particularly for participants who have not attended the first workshop in June 2011 in Hammamet by the Tunisian team project) of CLIM RUN and its WP5 destined to the case study of tourism,
- The presentation of the climate-tourist potential of Tunisia and the Tunisian tourism sector's vulnerability to CC,
- The presentation of the types of data and information produced by the National Institute of Meteorology that may constitute the basis of climate services for Tunisian tourism.

The objective of the workshop has been largely achieved, particularly the first results have been presented and discussed and priorities were validated.

5. 2. Participants

An invitation to the workshop, with a paragraph introducing the project and the agenda for this meeting were mailed to twenty actors (list attached) in the field of tourism, to a dozen of climatologists, and to specialists in the geography of tourism. An official invitation was sent also to the National Institute of Meteorology.

The delivery was made three weeks before the meeting.

A panel of actors consisted of 18 people attended the workshop. They came from Tunis, Kelibia, Hammamet, Sousse and Monastir. The actors' profiles were varied. We note in particular the presence of two representatives from the National Institute of Meteorology (NIM), a tourism expert who had served as Director in the Ministry of Tourism (J. Chapoutot, to whom the GREVACHOT entrusted the task of identifying the actors in the tourism sector and carrying out the survey), a representative of a travel agency in Hammamet, a hotelier from Sousse, researchers in tourism geography, in climatology, specialists in bioclimatology and human biometeorology. Also, the consulting firm TEC, represented by Adeline Cauchy and the project director CLIM RUN, PR. Paolo Ruti in his turn participated in the workshop

5. 3. The Workshop Process

The workshop took place between 9:30 and 16:30. It was based on two sections: a presentation section and a discussion one.

Presentations' Section

Presentations were structured around the following axes (see the workshop's program in the Appendix):

- The presentation of the project CLIM RUN and WP 5 on tourism and the concept of climate services,
- The climate of Tunisia, in the past, present and future is the tourist climate with its strengths and weaknesses. In the same axis, there was a presentation on the vulnerability of the Tunisian tourism industry to CC.
- Data, information and climate services that can be offered by the National Institute of Meteorology for the tourism sector,
- An axis which represents a masterpiece for the workshop focused on the survey of tourism actors. It is divided into two sections: a presentation showing the progress of the survey and another one showing the results.

Discussion Section

The discussion section was deliberately favored in this workshop. A long enough session was devoted to debate at the end of the morning session and another one in the afternoon, adding to interactions during the relatively short presentations and discussions have followed up each communication and helped to get strong reactions from the participants at each point of the program. All of these interactions have given an idea on the views of participants regarding the needs of the tourism sector in information, on the current system of production and dissemination of climate and weather information, on the uncertainties surrounding the future climate, and on present and future climatic and non climatic challenges facing the Tunisian tourism industry.

The Coffee break and lunch were also an opportunity for continuing the discussion, particularly between those producers of information (here the representatives of the NIM) and tourism professionals and researchers who attended the workshop.

5. 4. Key Points

The workshop was held in a satisfactory manner. The presence of two representatives from the National Institute of Meteorology had promoted the discussion. tourism actors as well as climate researchers at the workshop benefited from the presence of those two representatives of the main producer of climate data, that is the NIM, to express their wishes in terms of climate data and information (adapted to tourism) to be produced by the weather forecast, in terms of disclosure of information and the costs paid for weather and climate data generated by this service. The number of participants was eighteen which is not neither high nor small. It had promoted exchanges of ideas and fruitful discussions.

5.5. Limitations

The organizers have invited quite a large number of professionals in the tourism sector to attend the workshop. A limited number responded to the invitation, as opposed to researchers in climatology and geography of tourism who came in quite a huge number. As mentioned above, the main reason behind that low attendance to the workshop was the very difficult conjuncture through which the Tunisian tourism industry went after the revolution. Many hotels have been closed. Others have been struggling to attract customers. Thus, climate and climate change are not now among the major concerns of the actors in this field. Add to this the fact that the Tunisian tourism is mainly centered on the seaside summer resorts (which are characterized by their stability) and is therefore insensitive to the change in weather and climate. In addition, the Hammamet workshop venue was quite far from the tourist areas such as Djerba-Zarzis, southern Sahara or Tabarka. Moving from those areas to Hammamet and attending the workshop can be done in one day. For future workshops, the CLIM RUN team must think to draw nearer more professionals moving to major tourist centers (Northwestern, Cap Bon, Sahel and South). The fact of holding the workshop on a Sunday (day of choice for the activities of certain actors in the tourism sector) was also mentioned as another reason which probably explains the low number of actors who accepted the invitation.

For the next steps, we aim at organizing workshops in other tourist areas in order to reach the maximum number of actors.

It is also to solicit the involvement of the NIM, as the main data and climate information producer, to the project...

6. Review and results

6.1. Identified Key issues

6.1.1. Observed changes and impacts being felt

* Most interviewed people mentioned the increased frequency of extreme events that have more or less marked effects on their tourist activities: the discussed phenomena include floods that took place especially during the last decade mainly on the coasts (events 1999, 2003, 2006, 2007, 2009, 2011), storms and their effects on beach erosion, tornadoes (almost an unfamiliar phenomenon in Tunisia) which affected, in 2004 and 2009, tourist regions (east coast and the Cap Bon region of Mahdia), and more frequent and intense heat waves that result in additional costs at the level of air-conditioning and water needs.

* Specific examples of climate change observed by tourist guides, some actors in the tourism industry, including those who organize excursions into the Sahara and hiking in the forest

regions of the northwest of the country, they witness certain phenomena bind to climate change. These include the emergence in winter and in the Sahara of certain insects and animals who usually appear in summer, the increasingly precocious flowering of certain plants, and the changing of the migration period of certain birds. They distinguish that these phenomena reflect a change in the extent of the climatic seasons in favor of the hot season.

6.1.2. Outlook for future climate

Some actors say they are not interested in the issue of CC. Among the cited reasons, we mention: distant temporal horizons, uncertainties, and their activities' low sensitivity to climate.

But most actors have a pretty clear vision of the challenges of the future climate evolution for their tourism activities. These actors perceive CC as a threat than an opportunity. Probable threats related to future climate change which are discussed relate to:

- Beach erosion which is expected to intensify with rising sea levels and more frequent storms as part of CC; the natural productive capital crucial to Tunisian seaside tourism is threatened;
- Intensification of the summer heat which will have several negative impacts on the sector including increased energy needs for air-conditioning, increased water demand and competition between sectors for this very vulnerable resource in Tunisia, adding to the negative effect on the choice of Tunisia, by tourists, as a summer destination;
- Increased frequency of extreme events such as storms and floods.

Changing the scope and level of climate-tourist comfort of seasons is seen as a threat but also as an opportunity. The threat relates to the intensification of the summer heat and its negative effects mentioned above. The opportunity relates to improving winter and offseason comfort level, this improvement is likely to help tourism actors to diversify their tourism product in order to remedy its marked strong seasonality these days.

It is a vision based primarily on the negative effects of CC that dominates among the actors; it relates to beach erosion in relation to rising sea levels and storms, on increasing energy needs and water demand in connection with the intensification of summer heat and negative effects that can result in increased frequency of binding phenomena. Some actors, however, see that improving the thermal comfort of winter and the offseason can be an opportunity to exploit in order to diversify their tourism product.

6.2. Mobilization and communication of climate information

6.2.1. Get informed about weather, past and present climate

The past and present level of use of information on weather and climate varies depending on the types of actors and tourist activities.

* Those who most have mentioned their need for information on time are agencies carrying out activities like hiking, hot air balloons, boat tours, camel rides, submarine dives, hunting, golf ... The information which are sought relates to the wind, storms, sand storms, rain, air temperature sea water temperature ...

The information that these actors are using today is often qualitative and it is sought on the websites, so this is information which obtained quickly and at no cost. There is almost an absence of contact between tourism actors and local producers (including INM and scientists) of weather and climate information.

* Another category of actors in the tourism industry including hoteliers said they have no need for information on weather and climate, since the marketing of their tourism product is made by foreign tour operators.

6.2.2. Get informed about future climate

Lots of encountered actors say they were little informed about climate change and future climate of Tunisia as part of these changes. The little knowledge they have is from the media. They have no idea about the studies and information available in Tunisia in this field. Actors in the field of public administration of the tourism sector as well as some private actors of seaside tourism are, however, fairly informed about the issue of rising sea level in relation to the CC and its effects on beach erosion, the intrusion of seawater into fresh coastal groundwater, and degradation of the coastline in general. They hold information from the Ministry of the Environment and in particular from studies conducted by the Agency for Protection of Coastline Development. Contact with the National Institute of Meteorology and scientific researchers, as sources of information, remains very weak.

At the end of this first phase of the study, it appears clearly that the level of the use of climate information and the use of climate service in the tourism sector in Tunisia is low and there is little contact between industry actors and producers of information including NIM and scientific researchers.

Tourism actors do not have a clear idea of what research can bring neither in terms of bioclimatology tourism nor relevant data that can be provided by the NIM. They do not clearly understand the needs of their sector in terms of climate services.

6.3. Actors' involvement

An actor who is involved in the project is an actor who sees the importance of climate service in his or her field and wants to be part of a well-structured communication system. The survey results as well as the discussions within the workshop reveal two categories of tourism actors.

6.3.1. A little enthusiastic category of actors involved in the project

The reasons are as follows:

- * Marketing Tunisian tourism product is conducted mainly by foreign tour operators. Thus, local actors do not feel the need of the climate service,
- * Tunisian tourism is basically a seaside tourism centered on summer season. This season is characterized by high stability of weather and climate, heat, sunshine and the almost total absence of rain which are virtually guaranteed each year. In this sense, the weather and climate do not pose any problem for this type of tourism,
- * Tunisian tourism industry these days faces several challenges, the socio-economic situation is considered the main determinant of the number of tourists in Tunisia, and climate is not but a secondary contextual factor.
- * Little knowledgeable industry actors of the advances in climatology and services that it can offer to their fields of activity.

6.3.2. A group of actors who expresses their interest in the project:

The reasons for this interest vary:

- * A sensitivity of their tourism product to climate and weather (hiking, ballooning, golf, ports' activities ...), representatives of tourism agencies active in these fields who were present in the workshop or surveyed showed their willingness to be involved in CLIM RUN project
- * Actors whose tourism product is vulnerable to climate change and who feel threatened in particular by the accelerated sea level rise (EANM) and / or degradation of water resources or the worsening of thermal discomfort of the hot season. The threat of accelerated sea level rise with the CC weighs on seaside tourism in various tourist regions of the country. The sea level rises today in Tunisia and the beaches of some hotels are affected by beach erosion. Some coastal areas are affected by floods. Tourism actors who have already faced these phenomena show interest in future climate and climate change projections. It is worth mentioning, however, that discussion with them (in the survey/ interview), reveals that most of their concerns and preoccupations relate to the adaptation of the coastline to the accelerated rise in sea level. With CC, the second concern for hoteliers is on water resources. Water in Tunisia is a scarce, fragile and highly coveted resource. tourism sector is the largest consumer of non-agricultural water (740 liters / day / bed marketed against 80 liters of domestic water / day / capita connected). This is the sector that also bears the highest water charging costs in Tunisia. CC along with global warming, increased evaporating power of the air and the decrease in rainfall will make competition between users for this resource more difficult. Many hoteliers are already forced to produce their own water by desalination. The stress of heat is a no less important stress, especially for Saharan tourism that does not operate

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independently from seaside tourism. It is rather a relay. The recommended solution is now air-conditioning. This solution which is already expensive risk of becoming even much more expensive under the effects of with CC. The fact that hoteliers are already facing the problem of degradation of beaches, water problem or the management of the summer heat, explains their interest in future climate and are looking for climate information but above all solutions to these problems (survey results).

* It is worth mentioning also that the National Institute of Meteorology (NIM) has demonstrated, through its two experts at the workshop, its interest in CLIM RUN project. They have presented climate services that can be produced by the NIM for the benefit of the tourism sector. They have largely contributed to the debate and asked to be a part of the project CLIM RUN.

6.3.3. Actors' interest in the project

This first phase of the study has revealed a pretty clear idea of the level of interest in the project that may have the different categories of actors (Table 5).

Table 5: Interest of actors who were invited to the project

very interested + + +	Interested + +	Moderately interested +	Not interested -
Seaside activities	Hosts	Travel Agencies general	restaurateurs
Seaside hosts, Saharan hostes	public administration		craft activities
Specialized travel agencies (hiking ...)	professional organizations		
water activities	media		
experts			

6.4. Expectations of actors on past and present climate

Through the survey results and from the Workshop the actors' expectations in terms of past and present climate information have been clarified.

6.4.1. A basic knowledge of the current climate and its recent evolution

By synthesizing the results of the survey, we can say that the actors are willing to have a basic understanding of the present climate and its recent development, which is to be compared with changes observed by the actors themselves, this change may serve as an indicator for future climate change. These include having:

- An inventory of climate-tourist potential of different regions of Tunisia, not just the coastline that has the lion's share of tourism in Tunisia, but also and especially for the interior regions that have significant tourist potential which is not yet exploited. This type of knowledge is considered as a support to the diversification projects of tourism products.
- weather forecasts and more specifically of atmospheric phenomena related to recreational tourism activities (rain, strong winds, sand storms ...). Another wish widely expressed by the seaside tourism actors is information on seawater temperature. This parameter has often been mentioned in connection with the problem of jellyfish. Besides the synoptic scale, for these projections, the actors seem to be very interested in forecasting the seasonal scale.
- A seasonal forecast for them that may constitute an aid to the planning.

Table 6: The information needs on present weather and climate expressed by actors of Tunisian tourism

Actors	expectations	Variables	Temporal Horizons	Resolutions	
				Spatial	Temporal
Service providers in the field of recreational activities: hiking, water sports, port activities, hot air balloons	Be informed on binding phenomena	-Extreme temperature -Wind (force and direction) -sandstorms -Rain -Tempests -air humidity	30 to 50 years And synoptic	Regional and local	Month Season week (average, extreme) and Daily forecast
- Experts - Planners - private investors	Tourist climate knowledge of Tunisia	Tourist-climate comfort index	30 years	Regional and local	Month and Season
- tour operators - Hosts	Seasonal forecasts	-Sea water temperature -air temperature	To be defined	Regions and sub-regions	Month and season
Seaside tour operators	Jellyfish invasion	- sea water temperature	5 to10 years	local	Month and season

6.4.2. Expressed Priority needs

The expectations expressed by the surveyed actors were discussed and further clarified during the workshop. Both the survey results and the discussion during the workshop allow a first prioritization of these expectations. It is therefore a number of products to make them available to satisfy the needs of tourism operators who have an interest or potential for climate service.

Product 1: Seasonal Forecast: developing seasonal forecasting (1-3 months) as a means of support for decision making in the field of short-term planning.

Seasonal forecasting emerges as a highly desired service by tourism actors who emphasize the value of having this type of information needed for short-term planning (one to three months).

The focus is mainly on seasonal forecasting of temperature in Tunisia but also in the tourists' source countries. The temperature difference, especially in winter, between the country of origin and the destination is a factor for choosing this destination.

In Tunisia, climate seasonal forecasting, especially rain, is performed by the National Institute of Meteorology (NIM) by the model ARPEGE-climate. The results of this forecast which is mainly qualitative and applied to rain are also not disclosed.

It seems that tourism actors and primarily travel agencies find it quite important to have information on the particular temperature, the month or two to three months ahead, at the country's level as well as at the transmitting countries. The regional forecasting is desired here.

Product 2: Weather forecasting related tourism activities: develop a fairly reliable prediction of weather oriented towards outdoor tourism activities at fine spatial scales(regional and local)

Many tourist activities are very sensitive to time regimes (port activities, balloon rides, golf ...) adding to extreme climate phenomena (high winds, sand storms, tempests, floods ...) may hinder the progress of these activities. tourism actors in relation to these types of activities wish to develop weather forecasting in general and of such extreme events in particular, oriented towards these types of tourist activities. For optimal use, this prediction must be sufficiently developed and reliable to time scales from 12 to 48 hours and at fine spatial scales (mainly local).

Weather forecasting produced today by the National Institute of Meteorology does not always meet the expectations of service providers in this area. This is a forecast oriented towards time-sensitive tourist activities. The produced information must be fairly reliable,

simple and accessible in terms of language for the user and it happens to him on time. In this context, it would be interesting to study (basing on available data sets of measurements and observation) recent developments in the regime of time, and frequency and intensity of extreme events, and understand current changes and their impact on tourism activities and especially to develop these types of knowledge at the local level and not be limited to coastal areas but should also target inland areas that have important tourist climate potential.

Product 3. Elaboration of climate tourist potential index: develop climate-tourist comfort indicators and indexes for different climatic regions of Tunisia.

This product aims at developing knowledge regarding climate and tourist potential of different topo-climates of Tunisia in order to exploit this potential to diversify the tourism product. These indexes should be able to express the level of climate comfort at seasonal, monthly and daily levels. They must be directed towards weather and climate sensitive tourism activities and based on knowledge of climatic requirements of tourists through a survey which covers various categories of tourists and tourist activities,

Product 4. Increasing the information on seawater temperature:

Seaside tourism occupies an important place among the Tunisian tourist products. One of the expectations of actors in tourism in this area is to be able to be provided with information on seawater temperature. This product has been mentioned in connection with the problem of jellyfish that is becoming increasingly alarming in some seaside resorts and also as a support in planning beach activities on the margins of the hot season and especially in the intermediary seasons.

6.5. Actors' Expectations on future climate

6.5.1. Expectations in relation to concerns deduced from observed developments and felt impacts

The most worrying change observed by the actors of Tunisian tourism is that of coastal degradation as a result of the advance of the sea. This is in addition to the scarcity of water resources, the increased frequency of extreme events, higher temperature, discomfort of the summer season (requiring a massive use of air-conditioning) and modification of the extended season. Through the survey, we can see that these concerns have driven the expectations of actors towards information on future climate. The needs evolve around projections of rising sea levels for decades to come, scenarios of the evolution of water resources as a result of CC, and on global warming and its impacts on energy needs.

Table 7: Information needs on future climate expressed by the actors of Tunisian tourism

Main actors	Expectations	Variables	Temporal horizon	Resolution	
				Spatial	Temporal
-Public administration - Seaside tour operators	Trend and evolution of the coastline	- Sea level - temperature and salinity of seawater	10 to 50 years	regional	Annual average and trend
- Hoteliers -public administration	The issue of water in Tunisia and especially in the South and along the coast	-Rain - surface water -Evaporation - water needs - coastal aquifers water(volume and salinity)	5 - 20 years	-national -regional -Local	Year and season
Hosts (in the Tunisian south)	Summer heat	-air temperature -energy requirements for air-conditioning	5 - 20 years	Region and sub-region	Season
-tour operators -Planners -private investors	Winter and intermediary seasons' Climate comfort level	-air temperature - comfort index -sea water temperature	5 - 20 years	-region and sub region and transmitting countries (comfort index)	Season
*seaside hosts *tour operators -Planners	Change margins of the tourist season	-air temperature and sunshine - water temperature	10 to 50 years	Region and sub region	Month
-providers of recreational outdoor activities -hosts	Climatic Conditions day/night	-Temperature -comfort index -air humidity	5 to 20 years	Region and sub-region	Day/night
-Planners and administrators - Experts	Tourists' future climate requirements	- temperature - sunshine - comfort index	50 to 10 years	Transmitting countries	Season

6.5.2. Expressed Priority needs

The discussion at the workshop helped to clarify the priorities of expressed needs in terms of climate services on future climate.

Product 1. Beach erosion in relation to rising sea level following CC: This is to develop projections on future evolution of sea level near the Tunisian coasts

The accelerated rise in sea level due to global warming is perceived as a threat to actors in the Tunisian tourism industry given the fact that:

- Tunisian tourism is fundamentally seaside resorts
- Morphological fragility of the Tunisian coast to this phenomenon
- The sea level rises today in Tunisia and the beaches are already affected
- Coastal protection is expensive today for public and private actors, actors in the field of tourism.

The survey results as well as the discussion during the workshop show that this is one of the problems that concern most of the tourism actors in the development of future climate. Their expectation is to have clear information on this development over the coming decades, based on projections realized for the case of Tunisia. It is a helping tool for the selection and adaptation of solutions to this problem.

Product 2: The evolution of water resources: This is to develop projections of future evolution of water resources taking into account climate change

the survey results as well as the discussion during the workshops indicate that the water issue is a very serious problem for the tourism sector and the actors are aware that this problem will get worse with climate changes.

Water resources in Tunisia are indeed modest, very irregular and highly coveted. They are very fragile and very vulnerable to CC. The latter will result in a decrease in rainfall and an increase in temperature and therefore in water requirements. Competition between users which is already very strong these days will increase with CC and thus will affect the tourism sector (which now pays the highest water pricing.). The pressures put on the resource through tourism, condensed in time and space, will become increasingly problematic and will have impact in terms of operating costs as well as health safety.

Actors' Expectations in the field is to have information about future evolution of the resource for the coming decades and at a fine enough spatial scale (that of the tourist region).

Product 3. Future evolution of temperature: This is to study the future evolution of temperature, to identify its opportunities and constraints for the sector and identify its impact on its energy needs.

Related to global warming as part of CC, a first question that emerges as a serious problem throughout the survey results and discussion during the workshop which has to do with the link between the exaggeration of summer thermal discomfort and the inevitable increase in energy needs because of air conditioning use. The problem is particularly disturbing because Tunisian tourism is essentially summer tourism, air conditioning weighs today on the budget of hotels and Tunisia is a country which is poor in energy resources. Actors expect to have information about future summer temperature across the tourist region and its impacts on the needs on tourist facilities. This will be for them a tool for selection and adaptation of solutions to the problem.

At the level of this product, the actors cover also information about future developments (one to two decades) of thermal comfort level of seasonal climate:

- The different major types of climates, topography of the country (coastal, interior, Mountain, Sahara ...)
- In the source countries, since the climatic conditions of the tourist destination as well as the tourist's country of origin influence the choice of this destination.

Having the information on the thermal climate evolution at the seasonal level (at the regional level) and in the source countries can help them in planning, particularly to consider a seasonal and regional redistribution of tourism activities

6.6. Communication and access to information

6. 6. 1. Production of climate information which is tailored to the needs

It is primarily designed to promote the production of information tailored to the needs of actors in the tourism sector. It is also to promote easy understanding of this information. A recommendation of the workshop, in this context is to avoid using too technical words or use graphics which are difficult to understand by those involved in tourism. NIM (through its two representatives to the workshop) has identified the information needs of actors by category:

- * Climate prediction at seasonal level next to information on climate change and its impacts on the sector across the decade, particularly for the Ministry and travel agencies;
- * Weather forecasts (temperature, rain, sunshine, wind, humidity, atmospheric phenomena ... at synoptic scale), along with other data such as water temperature for swimming or ultra-violet sunshine; this information is linked to the types of tourism activities and in order to be useful they must fall within regional or even local levels. They are especially necessary for actors for instance facilitators and tourist guides

6. 6. 2. The issue of uncertainty and quality of information

The issue of uncertainty and quality of information was raised by respondents and also actors in the discussion during the workshop. These uncertainties relate to CC projections for Tunisia as well as the margin of error of weather forecasts in the short to medium term.

- For short-term weather forecasts, expectations of the actors is to have the forecasts, particularly on the atmospheric phenomena, at quite fine spatial and temporal scales that they can be used, locally, by the actors, in particular in the field of outdoor activities sensitive to the change in weather conditions. A forecast of the type “there is a sandstorm tomorrow in the south of the country” would gain interest for the users in the field of tourism if it contains more detail on the time of the day (morning, afternoon ...), the concerned sub regions, and the intensity of the phenomenon ... Narrowing the spatiotemporal scales of prediction reduces the uncertainty generated by the use of a forecast of general or regional form.
- For projections concerning future climate change within CC, the expectation is to have fine enough projections to temporal and spatial scales to Tunisia (region, sub-region and season) and an estimate of the uncertainty of results

6. 6. 3. The transmission of information

The workshop participants were asked first the question of free access to climate information. Access to data produced by the NIM is now to be paid which lead tourism actors to turn, if necessary, to the websites to quickly search for free information on climate and on the time even if it is not always reliable in terms of spatial and temporal scale of their activities.

During the discussion, some workshop participants discussed the experience of other sectors such as agriculture in terms of the use of climate services and information produced by the NIM. The latter produces and distributes, among others, an agro-climate newsletter, a bulletin for risks of forests fire, and other useful documents for agricultural activities. This experience can be transposed to the tourism industry, but by improving the current procedure for the mobilization and communication of information, often not very effective today (charging data, slow and cumbersome administrative procedures which hinder the on time arrival of information to the correct destination).

- Establish a system of effective communication between specialists and non specialists and between producers and users of information
- Attention was paid to three links in the chain of climate information
- The production of reliable and easily understandable information by non-specialist users,
- Information must be mobilized quickly
- It must arrive on time to a given destination.

6.7. The next steps

6. 7. 1. Work and exchanges with actors

This first phase of the case study of Tunisian tourism has helped to realize the limitations of the approach and find new ways to better involve actors. For the next steps, these include to:

- Rework the survey questionnaire (focusing on key issues, condense, simplify the language so as to make it more accessible to non specialists of weather and climate)
- Continue this first investigation targeting a wider platform of actors (different classes, different tourist areas ...), it is very desirable that the tourism expert will be accompanied, during the interviews, by a climatologist from "GREVACHOT»
- Prepare and start the survey to improve the ICT for Tunisia so that to adapt it to tourism activities, it is to conduct a survey among tourists themselves, to know their expectations of weather and climate,
- Organize workshops in other tourist areas, members of the Tunisian team of CLIM-RUN will move to the tourist areas which are distant from Tunis, in order to reach more actors
- Define the cooperation terms with the National Institute of Meteorology (NIM) which has expressed interest in the project,
- Disseminate the main results of this first phase of the study to actors who are interested in the project or who are potentially interested in it.

The idea of involving certain actors themselves in the development of the surveys seems relevant, especially, the NIM (for the preparation of the questionnaire), guides and tourism leaders who have shown their willingness to help our experts for conducting the survey of tourists.

6. 7. 2. Exchanges with other CLIM-RUN partners

This is to develop exchanges between the Tunisian team and other CLIM-RUN teams , including:

- Sharing of experiences and results of various phases of work through a system of exchange between partner teams who are integrated in the CLIM-RUN website
- Exchanges of information and climate data with other CLIM-RUN partners

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- Commission Nationale du Développement Durable (CNDD) : www.environnement.nat.tn
- Institut National de la Météorologie 'INM) : www.meteo.tn
- L'Agence Nationale de Protection de l'Environnement (ANPE) : www.anpe.nat.tn
- L'Agence Nationale pour la Protection et l'Aménagement du Littoral (APAL) : www.apal.nat.tn
- Le Centre International des Technologies de l'Environnement de Tunis (CITET) : www.citet.nat.tn
- L'Institut National des Sciences et Technologies de la Mer : www.instm.rnrt.tn
- Ministère du Tourisme : www.tunisietourisme.com.tn
- Ministère de l'Enseignement Supérieure, de la Technologie et de la Recherche Scientifiques : www.mes.tn
- Observatoire National de l'Agriculture (ONAGRI) : www.onagri.nat.tn,
- Office National de l'Artisanat (ONAT) : www.onat.nat.tn
- Office du Thermalisme : www.thermalisme.nat.tn

APPENDICES

Appendix 1: Glossary

AFT	Agence Foncière de Tourisme
AMVPPC	Agence de Mise en Valeur du Patrimoine et de la Promotion Culturelle
CC	Changement Climatique
CLIM-RUN	<i>Climate, Local Information in the Mediterranean region, Responding to User Needs</i>
CNDD	Commission Nationale du Développement Durable
CNT	Centre National de Télédétection
ENEA	Italian National Agency for New Technologies, Energy and Sustainable Economic Development
EANM	L'élévation accélérée du niveau de la mer
FRAV	Fédération Régionale des Agences de Voyages
FRH	Fédération Régionale de l'Hôtellerie
FTAV	Fédération Tunisienne des Agences de Voyages
FTH	Fédération Tunisienne de l'Hôtellerie
GREVACHOT	GRoupe de REcherche sur la Variabilité du Climat et l'Homme en Tunisie
GTZ	Deutsche Gesellschaft für Internationale Zusammenarbeit (<i>Coopération Allemande</i>) (German Agency for Technical Cooperation)
IHE	Ingénierie de l'Hydraulique de l'Environnement et de l'Équipement
INM	Institut National de la Météorologie
IPCT	Indice du Potentiel Climato-Touristique
MARH	Ministère de l'Agriculture et des Ressources Hydrauliques
MEAT	Ministère de l'Environnement et de l'Aménagement du Territoire (devenu MEDD)

MEDD	Ministre de l'Environnement et du Développement Durable
ONA	Office National de l'Artisanat
ONAGRI	Observatoire National de l'Agriculture
ONG	Organisation Non Gouvernementale
ONTT	Office National du Tourisme Tunisien
PIB	Produit Intérieur Brut
TEC	Tourisme Transport Territoire Environnement Conseil
WP5	Work Package 5

Appendix 2: List of actors

ALLANI Mehdi	Professionnel - Hôtelier	Balnéaire – Hammamet	info@lesultan.com
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BETTAIEB Ahmed	Professionnel - Agence de Voyages	Président de la Fédération régionale des agents de voyage du Cap Bon	
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RAÏS Chedly	Praticien - Expert	Environnement marin et côtier	
TOUMI Mohamed Ali	Professionnel - Agence de Voyages	Président de la FTAV	ftav@planet.tn

Appendix 3 : Survey questionnaire

PROJET CLIM-RUM

WP5 : Etude de cas, tourisme tunisien

Questionnaire de l'enquête (entretien) auprès des acteurs du tourisme

Le secteur du tourisme est un émetteur croissant de gaz à effet de serre, facteur du changement climatique. Les émissions qui lui sont attachées sont imputables au transport, tant pour les déplacements du lieu de résidence au lieu de destination que sur le lieu de destination, mais également à la consommation d'énergie fossile liée aux hébergements et équipements.

Mais le changement climatique devrait également avoir un fort impact sur le secteur. L'élévation du niveau de la mer qui amplifie l'érosion des plages, la fréquence accrue de phénomènes météorologiques extrêmes comme les canicules, le réchauffement des eaux de surface pouvant entraîner des pics d'eutrophisation ne devraient pas, en effet, être sans incidence sur les choix futurs des touristes.

C'est dans ce contexte qu'un projet de recherche financé par la Commission européenne a été lancé.

Il s'agit du **Projet Clim-Rum** : Climate Local Information in the Mediterranean Region Responding to User Needs

La Tunisie a été choisie en raison de la vulnérabilité du secteur touristique aux changements climatiques (Chypre et Haute-Savoie)

L'objectif de ce travail est de :

- ➔ Développer et tester un protocole de transfert d'information climatique qui soit pertinente et adaptée aux besoins des utilisateurs ;
- ➔ Favoriser et améliorer la circulation d'information liée au climat (variabilité passée et présente, projection future) entre les professionnels et le milieu scientifique.

Notre tâche consiste à recueillir votre vision sur la variabilité du climat passé et présent, son évolution future dans le cadre des changements climatiques et leurs incidences sur vos activités. Il s'agit également de connaître vos besoins en information climatique sur la base de votre fonctionnement actuel et futur.

Les informations recueillies dans ces entretiens sont uniquement utilisés dans le cadre du projet CLIM-RUM.

INTERVENANTS

- **Hébergeurs**

Hôtel balnéaire

2

Localisation

.....

Capacité

.....

Niveau de fonctionnement

International

.....

National

.....

Régional

.....

Local

.....

Hôtel urbain

2

Localisation

.....

Capacité

.....

Niveau de fonctionnement

International

.....

National

.....

Régional

.....

Local

.....

Maison d'hôtes

2

Localisation

.....

Capacité

.....

Niveau de fonctionnement

International

.....

National

.....

Régional

.....

Local	.....
• Restaurateur	<input type="checkbox"/>
Localisation	.....
Capacité	.....
Niveau de fonctionnement	
International	.....
National	.....
Régional	.....
Local	.....
• <u>Activités balnéaires</u>	<input type="checkbox"/>
Type	.....
Localisation	.....
• <u>Voyagistes</u>	
Agence de voyages	<input type="checkbox"/>
Représentant d'un TO	<input type="checkbox"/>
• <u>Activités portuaires</u>	<input type="checkbox"/>
Localisation	.....
Nombre d'anneaux	.....
• <u>Activités artisanales</u>	<input type="checkbox"/>
Localisation	.....
Type d'activité	.....
• <u>Médias</u>	<input type="checkbox"/>
Support papier	<input type="checkbox"/>
Support électronique	<input type="checkbox"/>
• <u>Administratifs</u>	<input type="checkbox"/>
Tourisme	<input type="checkbox"/>

Public	<input type="checkbox"/>
Administration	.....
Privé	<input type="checkbox"/>
Organisation	.....
Environnement	<input type="checkbox"/>
• <u>Experts</u>	<input type="checkbox"/>
Bureau d'études	<input type="checkbox"/>
Free Lance	<input type="checkbox"/>

ENTRETIEN

I. Regard sur la variabilité de la météo et le changement climatique

• Observez-vous leurs effets sur les pratiques touristiques ?

- | | |
|-----------------------|--------------------------|
| Non | <input type="checkbox"/> |
| Oui | <input type="checkbox"/> |
| Canicule | ..... |
| Tempête | ..... |
| Inondation | ..... |
| Érosion côtière | ..... |
| Changement climatique | ..... |
| Autres | ..... |

• Avez-vous des exemples précis ?

- | | |
|--------------|-------|
| Localisation | ..... |
| Datation | ..... |

• Conséquences ?

- | | |
|--------------|-------|
| Temporelle | ..... |
| Géographique | ..... |
| Économique | ..... |

• Observez vous des évolutions dans le comportement du climat ?

- | | |
|----------|--------------------------|
| Non | <input type="checkbox"/> |
| Oui | <input type="checkbox"/> |
| Précisez | ..... |

II. Processus de décision et mobilisation d'information au sein de votre structure

• Prise en compte des enjeux climatiques dans le pays émetteurs (partenariat)

- | | |
|----------|--------------------------|
| Non | <input type="checkbox"/> |
| Oui | <input type="checkbox"/> |
| Précisez | ..... |

• Prise en compte des enjeux climatiques dans le pays récepteur (activité, calendrier)

- | | |
|----------|--------------------------|
| Non | <input type="checkbox"/> |
| Oui | <input type="checkbox"/> |
| Précisez | ..... |

- Meilleure connaissance entraîne-t-elle une meilleure adaptation ? (échelle temporelle)

Non	☐
Oui	☐
Précisez	.....
- Votre portail donne-t-il des informations sur :

Indications météorologiques	
Non	☐
Oui	☐
Sur quelle durée	.....
- De quel type d'information avez-vous besoin ?

Données climat	
Présent	☐
Futur	☐
Projections socio-économiques	
Présent	☐
Futur	☐
Débats	.....
- Pertinence des délais pour prendre en considération les variations du climat

Quotidien	.....
Saisonnier	.....
Court, moyen (5ans)	.....
Au-delà	.....
- Utilisation des prévisions météo et des projections climatiques

Manière qualitative	.....
Manière quantitative	.....
- Avez-vous accès à ces informations ?

Oui	☐
Démarche personnelle	.....
Consultation de rapports	.....
Partenariat	.....
Non	☐
Pourquoi	.....
- Avez-vous une bonne connaissance/compréhension des modèles météo et climatiques existants ?

Oui	☐
Votre intérêt pour ces modèles ?	.....

Non

?

Est-ce un frein ?

.....

III. Avis sur les services météo et climatiques

- Intérêt d'un tel service ?

Outil d'analyse

.....

Outil de conseil

.....

Outil de sensibilisation

.....

- Quels sont les critères importants ?

Prévisions saisonnières

.....

Prévisions décennales

.....

Projections futures sur les CC

.....

Leurs résolutions

.....

Autres enjeux

.....

- Comment pourriez-vous utiliser ces données ?

Sensibilisation des acteurs

.....

Évaluation des impacts

.....

Vulnérabilité de l'activité

.....

Stratégie et adaptation

.....

IV. Quels sont vos souhaits, vos besoins en matière d'information ?

- Couverture géographique

Pays

.....

Région

.....

- Résolution spatiale

Littoral

.....

Ville

.....

Intérieur

.....

- Résolution temporelle

Journée

.....

Semaine

.....

Mois

.....

Année

.....

- Horizon temporel ?

Court terme

.....

Moyen terme

.....

Long terme

.....

- Types d'information

Température

Pluie

Humidité de l'air

Événement extrême



Autres

V. Avis personnel sur le service climatique

.

Merci pour l'intérêt que vous avez porté à ce document.

Appendix 4 : The invitation to the workshop

<p>Université de Tunis / FSHS</p>  <p>تغير المناخ والإنسان في تونس</p>	 <p>CLIM-RUN Climate Local Information in the Mediterranean region Responding to User Needs</p>
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Invitation

ATELIER CLIM-RUN en Tunisie

«L'information climatique au service du développement du tourisme en Tunisie »

Centre de Formation Touristique de HAMMAMET,

Le 18 décembre 2011, 9h30 – 16 h

Etant partenaire du projet européen CLIM-RUN, le GROUPE de REcherche sur la Variabilité du Climat et l'Homme en Tunisie (GREVACHOT) de l'Université de Tunis organise un atelier sur l'étude de cas du tourisme tunisien, le 18 décembre 2011 (de 9h30 à 16 h) au Centre de Formation Touristique de Hammamet et il vous invite à participer à cet atelier.

CLIM-RUN «*Climate, Local Information in the Mediterranean region, Responding to User Needs* » et un projet qui cherche à établir les bases des services climatiques futurs (des services pertinents et utilisables par les différentes catégories d'acteurs) aussi bien à l'échelle régionale que locale en Méditerranée. Le projet focalise sur les secteurs du tourisme, de l'énergie et des catastrophes naturelles. Une étude de cas est réservée au tourisme tunisien.

L'objectif est d'initier la construction des services climatiques par l'établissement d'un canal de communication entre les partenaires en charge du développement des services climatiques et les acteurs du secteur concerné (pour notre cas le tourisme) et qui sont sollicités pour formuler leurs besoins en informations climatiques.

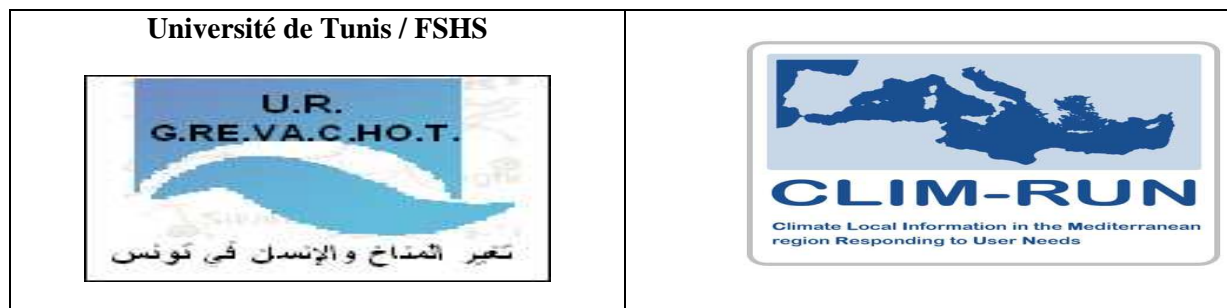
Vous êtes cordialement invités à cet atelier pour discuter et exprimer vos besoins en informations climatiques.

Merci de bien vouloir nous confirmer votre participation.

*Contact : latifahenia@yahoo.fr

Fax :71 567 551, tél. 71 566 950 poste 253

Appendix 5 : The workshop program



ATELIER CLIM-RUN en Tunisie

«L'information climatique au service du développement du tourisme en Tunisie »

Centre de Formation Touristique de HAMMAMET,

Le 18 décembre 2011, 9h30 – 16 h

Programme

- 9 h 20 : inscription des participants
- 9 h 40 : Présentation du programme CLIM-RUN (A. Cauchy, TEC / P. Ruti)
- 10 h : Climat de la Tunisie : Ressources et contraintes pour le tourisme (T. Aouane, GREVACHOT)
- 10 h 20 : L'INM : des capacités et des compétences au service de l'activité touristique (Y. Labbène, INM)
- 10 h 40 pause
- 11 h : La science du climat au service du secteur touristique (P. Ruti)
- 11 h 20 : Etude de cas, Tunisie : Présentation de l'enquête (J.M Chapoutot)
- 11 h 40 – 12 h 30 : Discussion
- 12 h 30 – 14 h : Pause déjeuner
- 14 h : Changement climatique et tourisme : Exemples de services climatiques pour le tourisme en Tunisie (L. Hénia, GREVACHOT)
- 14 h 20 : Etude de cas Tunisie : Présentation des résultats de l'enquête (J.M. Chapoutot)
- 14h40 – 16 h 30: Discussion (Attentes des acteurs en matière d'informations climatiques, priorisation des besoins en données, l'institutionnalisation des services climatiques, l'implication des acteurs dans la suite du projet, la formulation ...)
- 16 h 30: Clôture de l'atelier.