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The geomatization of the covid-19 care offer for the ORSEC Plan in Algeria

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ABSTRACT/RESUME

Abstract: *Currently in Algeria, the epidemiological situation of the COVID-19 pandemic expresses a very strong spread of the virus on the national territory, with a certain disparity between the wilayas. Currently, 34 wilayas are in sanitary confinement. Additional provisions have been implemented as part of the national policy to combat the spread of the virus. Stakeholders in this area are always looking for appropriate solutions for the strategic management of the pandemic. However, the traditional method of managing the different operations of intervention and coordination between the representatives of all the modules constitutes an obstacle to the proper management of the plan of Organization of the response of Civil Security. This paper attempts to combine several scientific tools for the fight against the coronavirus in Algeria.*

The Geomatization of the Covid-19 Care Offering ensures the transition from a classic to a localizable digital state that facilitates decision-making before, during and after the crisis. To achieve our goal we used Esri's ArcGIS solutions to acquire, abstract, archive, analyze and display COVID-care offering data19 to handle the medical care and hygiene module and the various modules of the ORSEC plan in a dashboard and coordination between the different strategic actors.

*Glaring inequities left the majority of wilayas unprepared for the COVID-19 pandemic according to a new COVID-19 Care Supply Index (*C19-CSI*). we recorded a rate of 2.08% represented by Algiers as the most prepared wilaya that demonstrates the strong centralization of the Algerian health system , and a rate of 18.75% for the 9 wilayas moderately prepared while a rate of 79, 16% making 38 wilayas the least prepared in the face of covid-19. The new version of the proposed ORSEC plan could be a real coordination tool between the different strategic actors in Algeria.*

I.Introduction

In December 2019, Wuhan became the center of an epidemic of pneumonia of unknown cause, which attracted intense attention not only in China but internationally. [1]On 25 February 2020, the World Health Organization (WHO) declares the first case of Covid19 in Algeria [2]. In crises such as the pandemic, that has just exterminated humanity today; in these conditions, the ORSEC plans show their effectiveness and efficiency. Covid 19 pandemic, which disrupts humans, socio economic activities

and the environment. Human health risks are central to the actions and means implemented in the field of civil
security.

However, despite the importance of the concept of risk, how have been approaching, defined and presented often varies from one actor to another to properly frame what the concept of risk will be throughout this study, the following definition will be used: The concept of risk for responding to health emergencies implies that we are dealing with two fundamental elements. On the one hand, the possibility of a phenomenon or event occurring at a given location that could cause damage. This commonly referred to as a «hazard». On the other hand, we need to find elements in this environment such as people, buildings or activities exposed to and vulnerable to this hazard. We will refer here to the notion of «vulnerability» [3] Moreover, States are always looking for solutions for the strategic management of major risks and disaster situations through a civil security response organization system "ORSEC". This plan aims to organize and direct relief in the event of a natural or accidental disaster. In Algeria, the legal basis of this Civil Security Response Organization and by extension of security and civil protection these provided by law no. 04-20 of 25 December 2004 on "Major risk prevention and disaster management in the context of sustainable development».

Moreover, by Decrees 85-231 and 85-232 setting out, for the first, "the conditions and modalities for the organization of the implementation of interventions and relief in the event of a disaster". In addition, for the second "disaster risk". As well as Decrees, 20-69 and 20-70 related to the prevention and control of the spread of Coronavirus (COVID-19).

The purpose of our problem is to find a solution adapted to the shortcomings of the management of the ORSEC plan in Algeria. In other words, a way to locate, save and capitalize geographic data related to the Covid-19 rescue organization. The aim is to transmit and share them among all stakeholders and to integrate them into the different management, analysis and decision-making activities. The main objective of this work is to set up a GIS geographical information system to assist in the real-time decision-making of aid organization, through the development of a geographical database, dedicated to exchange and analysis applications of the various modules of the ORSEC plan. Through the process of geomatization, this French term used by the staff of the regional county municipality (MRC) to describe both the process and the result of the development of Geo Acton [4].

We suggest that this term used as the process of moving from a classical approach to a localizable digital approach, in other words, geomatization is localizable digitization.

On the one hand, the GIS will provide management assistance based on functional and decision-making support based on several thematic analyzes.

Spatial analysis is a true tool for identifying priority locations of the Covid-19 care offering in times of crisis [5]. Mapping the results will be a user-friendly and relevant way, which is clearly more explicit than a table filled with numerical values. The expected result is the implementation of a complete system, manageable, secure and accessible to the different actors of the ORSEC-Covid19 plan.

II. Materials and methods

II.1. Geographical and administrative situation Of study area

Algeria, the gateway to Africa, occupies a major place because of its geographical location, covering 238, 1,741 km2 with a total population of 43 million habitats [6]. Algeria is a very heterogeneous country composed of physical elements, economic conditions, social practices and government actions. Algeria divided into 48 wilayas but according to the latest division of law n ° 19-12, relating to the territorial organization of the country (2019) Algeria is administratively composed of 58 wilayas. For a better organization of this gigantic territory. (Figure 01)

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Figure 01. location map of study area

II.2.State of health in Algeria

In 2020, Algeria has 583 public health establishments, including 15 CHU (2.57%), EHU (0.17%), 79 EHS (13.55%), 206 EPH (35.33%), 9 EH (1.54%) and 273 EPSP (46, 83%). The total number of beds in public health facilities is 73240 beds per 42 million inhabitants. The human resource is 261,996 physicians at the level of all public health structures. In the private sector, we have a number of 369 clinics with 42 medical clinics (11.38%), 279 surgical clinics (75.61%) and 48 diagnostic clinics (13.01%). We also have 8,347 general practitioners, 10,620 specialists, 7,526 dental surgeons, 10,700 outpatients, and 938 in the private practice group. 25.8% of hospitalization activities carried out by university hospitals (CHU) with a capacity of 16,671 beds. Only the university hospital (EHU) in Oran, which have a capacity of 1,087 beds. While 50.7% of hospitalizations are in 206 public hospitals (EPH) with a capacity of 38,200 beds and 09 hospitals (EH) of which 05 are general hospitals with a total capacity of 1325. In addition, 23.5% of EHS are specialized hospital facilities, with a total number of 79 EHS, with a capacity of 12,426beds.The following specialties are available at the EHS level: cancer centers, mother and child, psychiatry, functional rehabilitation, are using the CHU, EHU, UH, EPH that carry out 76.5% of the Covid-19 pandemic management activities because the material resources and human resources are available in these structures. However, the EHS remains specialized in the essential heavy pathologies. For this reason, we have been working on data from these health care facilities that handle Covid-19 hospitalization in Algeria.

II.3.Geomatization process

Our work is part of a policy of implementing the ORSEC-Covid-19 geomatics plan and adapting it to our nation, using a Geographic Information System as a management and decision support system and other geomatics techniques. In this work, we gave an overview on the technique of geomatization, which is a new technique of transition from a classical approach to a digital approach all respect, the rules of passage. Geomatization is a new scanning technique in a spatial, temporal and semantic dimension. When researching the choice of methodology to follow in this work, we found that the best methodology dedicated to the development of a management assistance plan ORSEC-Covid19 methodology based on the 5 GIS functionalities. This choice proved to be adequate and perfectly suited to our working context, as it allowed us to benefit from the advantages of each of the methodologies, but also to develop an ORSEC-Covid19 management assistance without neglecting any dimension. (Figure2)

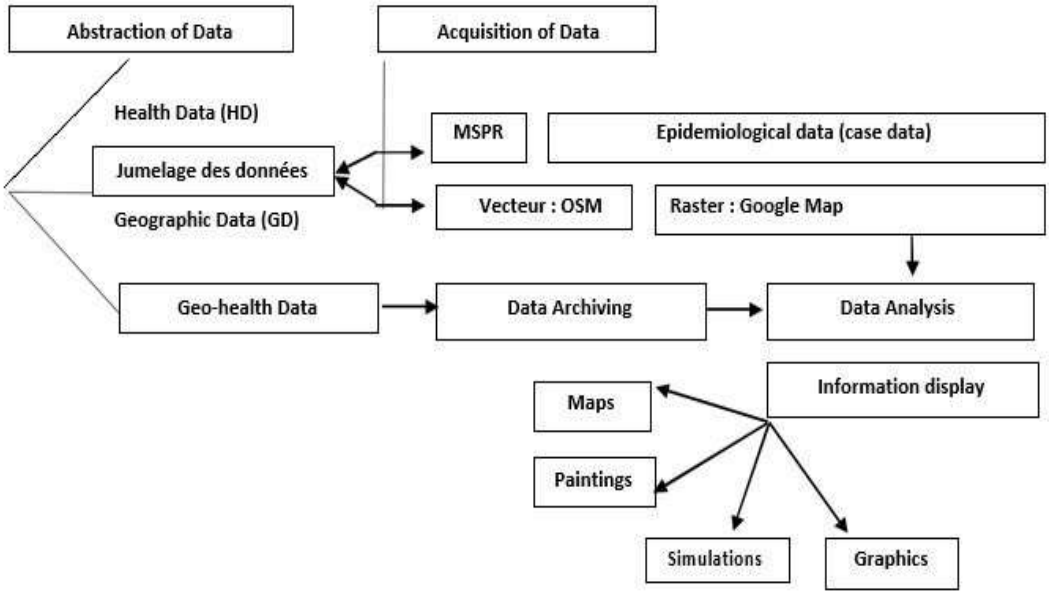

Figure 2. *Geomatization method*

II.3.1 data acquisition

Data acquisition is the most important phase and the most sensitive point for the implementation of a specific Covid-19 ORSEC, the data in geomatics depends on its accuracy, its recent date and its required form (numerical data). Furthermore, the method of data collection depends on the nature of the data, the level of detail Desired, and usable means. When the data are already available, it is necessary to know if:

- are they in the right format?
- have they the right resolution?
- are they recent enough?
- Do they cover the entire study area?
- Isn't the cost too high?

In our geomatics strategy, we used several sources according to the following data categories:

- Data on the means and resources of intervention modules
- Case data (Epidemiological survey)
-Geographic environment or study area data in Raster and Vector format: OSM, Sentinel Satellite Imagery and Google earth.

In this study, we have identified on the module medical care evacuation and hygiene data they have obtained from the Ministry of Health and Hospital Reform and data on material and human resources

II.3.1.1. Epidemiological data

We have directly collected Case data from the official MSPRH platform and, we own integrated into the database to analyze the risk of epidemic. Case data infected with the COVID-19 virus from the beginning of the epidemic in Algeria from 02 March 2020 to 15 June 2020 from the Ministry of Health, Population and Hospital Reform (Ministry of Health and hospital reform of Algeria 2020).

II.3.1.2 Environmental data

In this part, we have used several sources of collection of geographical data, which are very important in the analysis. The table shows the format of the data and their sources (Table 01).

II.3.1.3. evacuation and hygiene medical care module data:

The medical care, evacuation and hygiene module they own placed under the authority of the Ministry of Population Health and Hospital Reform and is responsible for all operations related to public health, including taking all preventative measures against Covid-19. It is also responsible for the health control of food products, environmental hygiene, individual and collective hygiene and sanitary evacuation.

These data they have collected from the Ministry of Health, Population and Hospital Reform (Table02).

II.3.2 Data abstraction

The primary objective of this method was to bridge the gap between the needs of users and the solutions of computer scientists. Admittedly, its purpose is nevertheless to facilitate the design of IT projects by making it possible to analyze and formalize users' "needs" very early on. For the implementation of our database (ORSEC-COVID19-ALGERIA) we used the object-oriented modeling (Entity/Association) of MERIS to map our geographical database, our conceptual data model (MCD) are composed of 39 entities, 21 Association and 59 association links.

Table 01. Data source used for Geomatization and Covid-19 ORSEC implementation

Data name	Format and source	Extent	Date	Data state
Satellite images Resolution 1m	Raster of ArcGIS Online	National	2020	Very good condition
Land use	Vector of Open Street Map	National	2015	Improved temporal resolution

Table 02. Human Resources and Physical Resources of the Medical Evacuation and Hygiene Module:

WILAYA	SC	App	Ane	Rea	Epi	Infe	Pp	Ne	Nef	Car	Ps	ISI
Adrar	79	19	23	0	1	1	4	1	2	3	5	1
Chelif	158	26	18	11	0	6	8	2	6	4	1	1
Laghouat	119	21	2	9	2	4	2	2	6	4	0	0
Oum Bouaghi	127	17	28	1	0	5	4	5	4	3	0	0
Batna	198	116	38	9	9	3	0	4	6	2	0	0
Béjaia	197	40	36	0	3	8	8	4	6	7	5	0
Biskra	107	50	17	1	0	4	2	1	2	1	0	0
Béchar	88	13	2	0	0	2	4	1	1	2	0	0
Blida	238	75	16	32	8	25	16	17	7	19	0	0
Bouira	96	56	17	0	1	7	10	2	7	0	0	0
Tamanghasset	35	17	9	0	1	5	2	4	4	2	0	0
Tebesa	60	13	0	4	0	4	1	2	0	0	12	0
Tlemcen	296	57	39	3	10	20	14	3	28	8	0	0
Tiaret	32	14	16	0	2	5	4	0	3	3	0	0
Tizi Ouzou	307	77	59	7	12	24	132	4	23	17	11	17
Alger	1195	340	291	57	34	4	43	22	51	69	5	13
Djelfa	165	35	22	3	1	4	6	2	2	2	6	0
Jijel	140	26	13	0	2	12	5	3	3	2	4	1
Sétif	178	88	36	0	21	28	17	22	8	14	3	4
Saida	27	0	10	0	1	4	3	0	4	2	0	0
Skikda	53	5	1	9	3	11	5	1	7	3	0	0
Sidi Belabas	150	88	10	4	14	9	8	1	14	11	0	0
Annaba	145	39	37	14	8	17	7	16	14	13	0	0
Guelma	38	8	22	8	2	9	6	3	3	4	0	0
Constantine	110	23	69	8	15	26	16	23	4	10	1	1
Medea	162	37	7	5	4	4	5	4	4	8	0	0
Mostaganem	29	10	23	0	3	4	5	1	4	4	0	0
Msila	106	20	13	1	1	7	5	0	7	1	0	1
Mascara	83	16	28	0	0	3	2	0	4	3	4	3
Ouargla	85	21	9	1	3	6	4	1	5	6	0	0
Oran	547	224	45	19	27	17	35	13	21	14	18	0
El Bayadh	51	18	3	03	3	3	2	0	4	4	0	0
Illizi	28	6	1	5	0	0	1	0	2	4	0	0
Bordj Bouariridj	98	33	7	1	5	7	8	2	6	1	0	0
Boumerdes	57	20	19	0	0	10	7	3	7	5	1	0
El Taref	36	11	15	0	0	6	2	1	3	4	1	0
Tindouf	43	7	0	0	0	1	0	1	2	1	0	0
Tissimsilt	99	7	7	4	1	4	0	1	2	2	1	0
El Oued	61	18	10	2	1	1	0	0	3	1	0	0
Khenchla	140	13	16	0	1	8	0	0	1	2	2	1
Souk Ahras	57	6	19	0	1	4	0	3	4	2	0	0
Tipaza	236	85	34	0	1	8	2	7	11	6	1	0
Mila	64	29	15	0	1	7	4	3	5	5	0	0
Ain defla	62	23	7	0	2	2	3	1	2	5	1	0
Naama	47	25	12	3	0	0	2	0	3	3	0	0
Ain timouchent	80	35	06	10	2	4	5	0	7	7	0	0
Ghardaia	61	14	07	02	2	0	4	0	8	5	0	0
Relizane	60	13	12	1	1	2	1	0	1	0	0	0
Total 48	2434	846	766	124	209	355	415	187	331	298	81	43

Sc: Scope, App: Respirator, Ane: Anesthesiologist-resuscitator, Rea: Resuscitator, Epi: Epidemiologist, Infe: Infectiologist, Pp: Pneumo-Phtisiologist, Ne: Neurologist, Nef: Nephrologist, Car: Cardiologist, Ps: Psychologist, ISI: Critical Care Nurses.

II.3.3 archiving of the data

Our database consists of several geospatial layers that facilitate analysis before, during and after the crisis. The Geodatabase consists of several sets of entity classes and each class contains several entities. (***Figure3)***It contains a custom toolbox with geo-processing templates (Builder Template). To better detail the database schema, we used an X-Ray for Arc Catalog extension to create a data dictionary,

Which is a catalog containing information about datasets stored in a geodatabase containing: the names of the attributes, the meaning of the codes, the scale of the source data, the accuracy of the locations and the map projections used? The data dictionary is the result of the analysis phase of existing needs in terms of geospatial data [7]. Our geographic database we have 15 Feature Datasets and 43 Feature Classes (Annex 01).

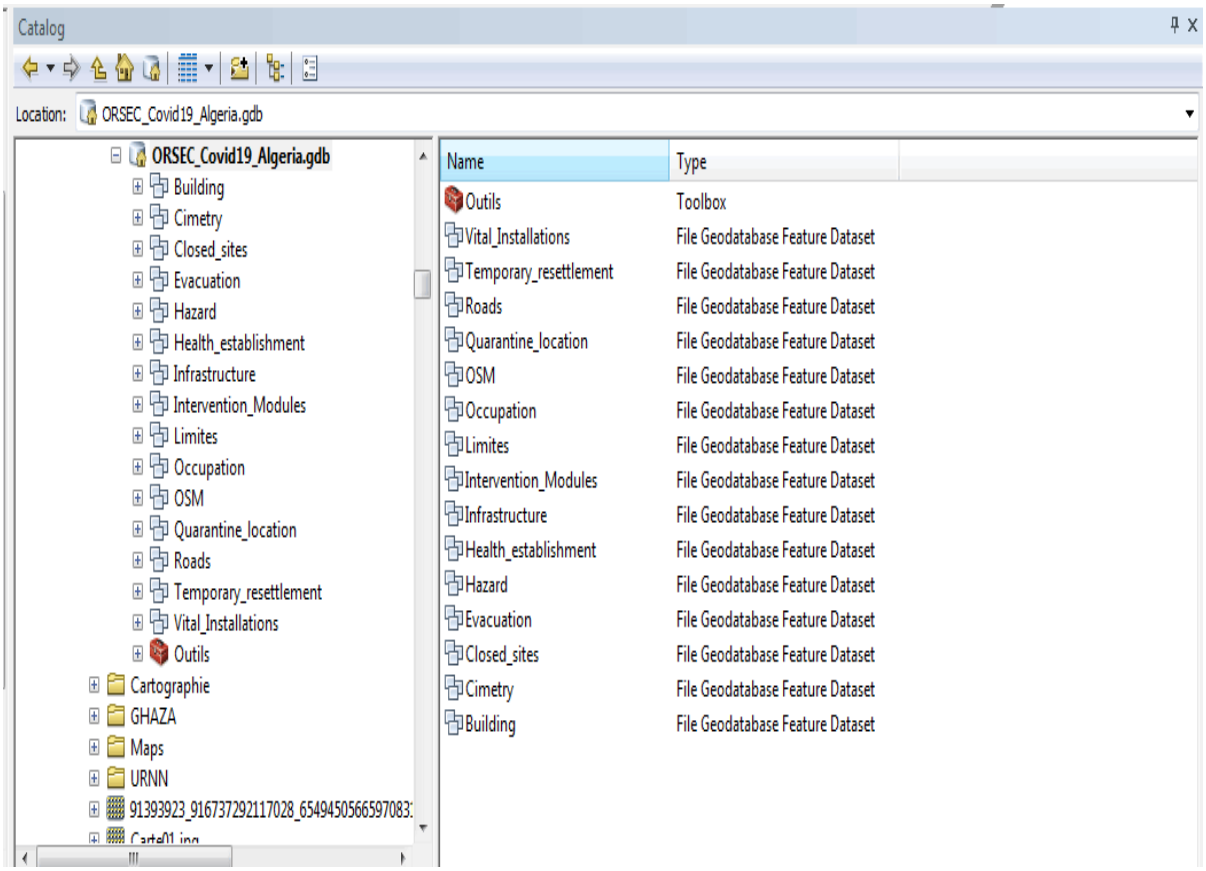

Figure 3.*ORSEC-Covid19-Algeria database*

II.3.4 Data analysis

The analysis of territories has undergone an important evolution thanks to geographic information systems. GIS is an innovative technology that has made it possible to map and monitor rapidly changing phenomena on the earth's surface [8].Analysis by making it possible to study the spatial relationships between objects of the same theme but similarly between objects of different themes (relationship between the distribution of the population and that of hospitals). [9] The analysis of the data is an indicator of the efficiency and capacity of a geographical information system. In addition, the analysis facilitates the decisions, to choose a site of the temporary accommodation; a site of a logistic base; a site for the quarantine; to choose the routes of accessibility to the hospitals; to the sites of resettlement.

In addition, to see the wilayas, municipalities or sites that are the most vulnerable and least prepared, and finally to draw new data, to choose the routes of accessibility to the hospitals, to the sites of resettlement.

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II.4. Covid-19 Care Supply Index (C19-CSI)

We used the Covid-19 Care Supply Index is a set of indicators for the wilayas into three classes: the most prepared, moderately prepared, not prepared.

In this section, we used 3 indicators of Covid 19 care supply and 13 sub-indicators. The first indicator is the screening where we calculated the average of the screening instruments for each wilayas (Scanner, Fixed Radio, and Mobile Radio); we have indicated each means as sub-indicators:

I1= (Ui1+Ui2+Ui 3)/3
The second indicator related with most important human resources for the management of covid-19 (Anesthesiologist-CPR, Resuscitator, Epidemiology, Infectiologist, Pneumo-Phtisiologist, Neurologist, Nephrologist, Cardiologist, Psychologist and Intensive Care Nurses).
I2= (Ui 4+ Ui 5+ Ui 6+ Ui 7+ Ui 8+ Ui9+ Ui10+ Ui11+ Ui12)/10
The third indicator represents the total number of respirators which means the most important in the management
I3= Ui13
Where our Care Offering Index Covid 19 is: C19CSI = (Sum)/3
Or the Sum=I1+I2+I3

Our indicator ranked by: 0-100.
In order to present our cartographic index, we have used the method of discretization by class of equal amplitude. Discretization by equal amplitude class is the mapping of quantitative series by grouping values into a limited number of classes for transcription readability [10]. For the analysis of the spatial distribution of the Covid-19 care offering, we used the same-amplitude discretization method is very simple. We first have to measure the range of the series (48), then we have to determine the number of classes we want in our case, we used three classes. To do this, we used a single geographic entity to present our Covid-19 Care Offering Index (***Figure4***).

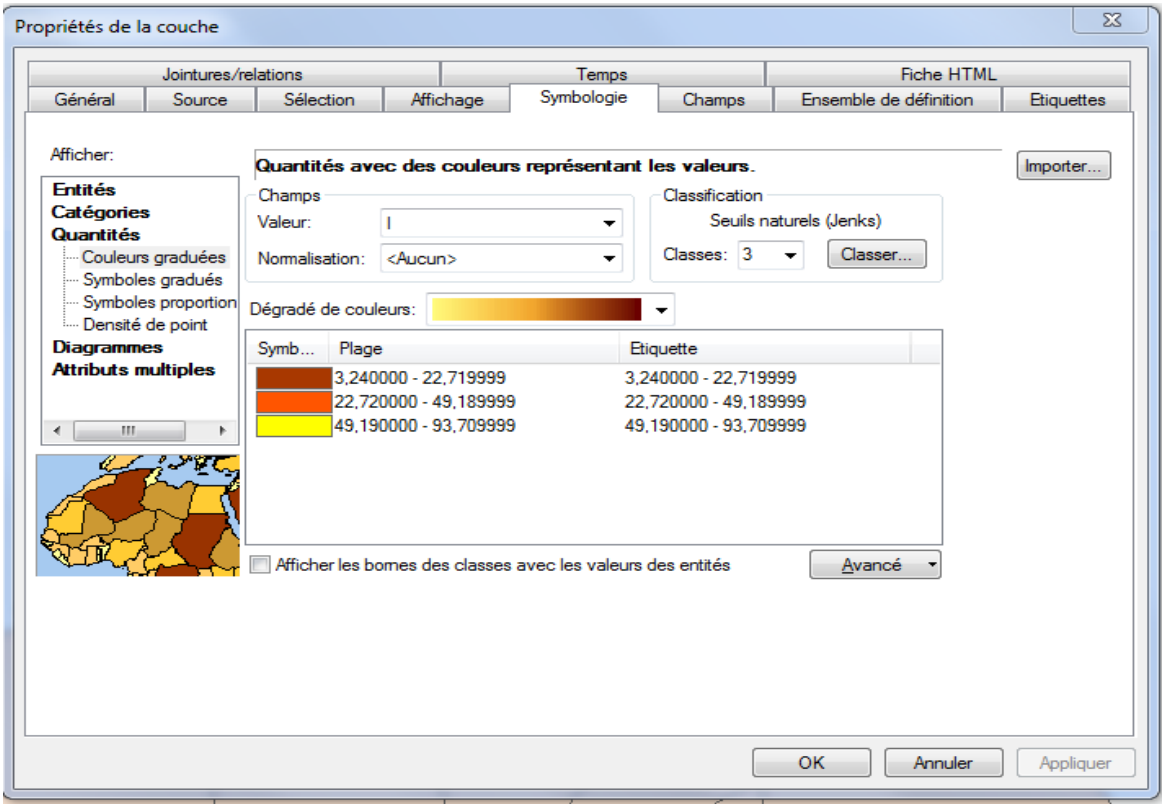

Figure 4.Properties for discretization (ArcMap)

Table 03. Ranking of Wilayas by Care Supply Index covi-19

WILAYA	I1	I2	I3	Sum	C19CSI
Adrar	18,66	4,36	12,67	35.69	11,89
Chelif	22,33	5,72	18,01	46.06	15,35
Laghouat	17	3,36	12,78	33.14	11,04
Oum Bouaghi	17	4,9	13,96	35.86	11,95
Batna	42	7	55	104	34,66
Béjaia	23	7,27	23,42	53.69	17,89
Biskra	25	2,8	28,93	56.73	18,91
Béchar	12,66	1,36	9	23.02	7,67
Blida	17	13,81	35,27	66.08	22,02
Bouira	16,33	4,36	20,89	41.58	13,86
Tamanghasset	9,66	2,7	9,78	22.14	7,38
Tebesa	13	1,9	9,3	24.2	8,06
Tlemcen	36	11,81	34,93	82.74	27,58
Tiaret	20,33	3,36	12,23	35.92	11,97
Tizi Ouzou	38,66	27,63	47,43	113.72	37,90
Alger	69	56,36	155,78	281.14	93,71
Djelfa	32,66	9,72	25,79	68.17	22,72
Jijel	14	4,36	14,78	33.14	11,04
Sétif	39,66	14,72	47,46	101.84	33,94
Saida	12	2,27	4,75	24.96	8,32
Skikda	21	4,09	10,69	35.78	11,92
Sidi Belabas	33	7,72	43,9	84.62	28,20
Annaba	16,33	11,72	22,35	50.4	16,8
Guelma	10,66	5,81	8,15	24.62	8,20
Constantine	15	18,54	18,84	52.38	17,46
Medea	23,33	4,36	19,89	47.58	15,86
Mostaganem	11,66	4,54	8,7	24.9	8,3
Msila	26,33	3,45	16,59	46.37	15,45
Mascara	19	4,81	13,27	37.08	12,36
Ouargla	19,33	3,81	14,71	37.85	12,61
Oran	39,66	18,27	89,64	147.57	49,19
El Bayadh	9,33	3,63	10,32	23.28	7,76
Illizi	7	1,36	4,78	13.14	4,38
Bordj Bouariridj	17	3,72	17,9	38.62	12,87
Boumerdes	13,33	4,9	12,74	30.97	10,32
El Taref	14	3,36	9,45	26.81	8,93
Tindouf	5	0,54	4,18	9.72	3,24
Tissimsilt	8,66	2,09	5,91	16.66	5,55
El Oued	10,66	2,27	33,93	46.86	15,62
Khenchla	12	3,09	9,36	24.45	8,15
Souk Ahras	7	3,45	5,48	15.93	5,31
Tipaza	17,33	6,63	36,32	60.28	20,09
Mila	16,66	4	16,55	37.21	12,40
Ain defla	14,33	2,27	13,2	29.8	9,93
Naama	12,33	1,81	13,04	27.18	9,06
Ain timouchent	15,33	3,45	17,92	36.7	12,23
Ghardaia	15,33	3,9	11,07	30.3	10,1
Relizane	13,66	1,72	9,46	24.84	8,28

II.5. the visual variables

The message of the map they articulated on semantic relationships between entities, set up by the designer. Cartographic semiology enumerates three relationships: association, differentiation, and order, and sets out rules for translating them into the symbols associated with the map objects. The definition of the symbol based on the six visual variables of Bertin (1967): size, value, texture, color, orientation and shape. To define a symbol, therefore, means to give a value to each of these visual variables [11].

In this section, we used a method of symbolization analysis to display several values in a single thematic map for mapping national human resources in order to present them in a single map. In this example, we have presented five different values (Pneumo- physiologist, Epidemiology, Infectiologist, Anesthesiologist-resuscitator, and Resuscitator).

For this, we used a mapping method using three visual variables (size, color, shape) to simplify the analysis. For the first visual variable for each value, we used five different sizes (50, 30, 20, 10, 5). The second variable is the five different colors represented in RGB (0, 0, 0), (230, 0,169), (190, 255,232), (255, 85, 0), (170, 255, 0). The third and represented by two forms, one type (Character Marker Symbol) with a font (ESRI Default Marker) and a Subset (Basic Latin) which takes a Unicode equal to 40 for the first and a Unicode of 33 for the second.

We have assigned a black symbol (0, 0, 0), a size 5 and a filled circular shape for all wilayas that have a value of zero from one or more specialists. In can clearly visualize the difference in the map display, for example, in the wilaya of Adrar in visualizing five circles, including one of color black, which means that there is no resuscitator in this wilaya. While in the wilaya of Tindouf visualizes that a single circle that represents the existence of an infectiologist, and the black dot represents the non-existence of the other 04 specialists. (Figure5).

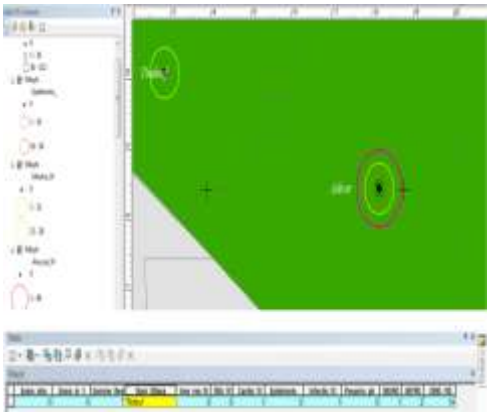

Figure5. Human resources in the wilayas of Tindouf and Adrar.

III. Results and discussion

The spatial distribution of human resources for the Covid-19 Evacuation Medical Care and Hygiene module they presented in the first part of Figure6, which displays 28 black dots, which interprets the lack of one or more specialists for each black dot. For example in the wilaya of Tindouf we have a yellow circle and a black dot, this means that we have the lack of four specialists in this wilaya. (Table01, Figure6). In addition, we have 34 black dots that represent one or more gaps in one of the following specialists (Figure7) shows the material resources of the medical evacuation and hygiene module.

This distribution demonstrates a major inequality in the health system in general and especially in the management of the coronavirus. We have 41.66% a total of 20 wilayas do not have resuscitation doctors, 4.16% a total of 2 wilayas does not have anesthesiologist-resuscitator. A percentage of 22.91% represent 11 wilayas do not have epidemiological doctors, 6.25% of 3 wilayas do not have infectious medicine doctors, 25% of 12 wilayas do not have a neurologist, 2.08% of wilayas without nephrologist, 12.5% of 6 wilayas do not have a pneumophtisiologist. 8,33% of four wilayas do not have a radiologist, and 64, 58% of 31 wilayas do not have a psychologist. In addition, 20 wilayas have no intensive care doctors, 8 in the east of the country, 3 in the center, four in the west, and 5 in the south. Following the analysis of the Medical Evacuation and Hygiene module which is the main module of the ORSEC-Covid19 plan, we identified several issues in the Algerian health system regarding the management of Covid-patients.19 starting with radiological screening a rate of 6.25% of a total of 3 wilayas do not have a scanner. We found that 93.75% present total of 45 wilayas do not have a lab.
We also show in the (***Figure8***) the material means where we have 14.59% a total of 6 wilayas, they have an interval of 6 and 8 Respirators, 18, 75% in total 9 wilayas, they have between 10 and 15 respirators, 31.25% a total of 15 wilayas, they have between 16 and 29.

14.58% a total of 7 wilayas they have between 32 and 42 devices and 14.58% a total of 7 they have between 57 and 91 devices and 6.25% a total of 3 they have between 116 and 342 respirators. We identified three classes after the analysis of quantitative indicators of readiness that are globally related to material and human resources we found that 2.08% a rate that represents the wilaya of Algiers as the most prepared with a score of (93.71). 18.75% is the rate of moderately prepared wilayas (Oran, Tizi Ouzou, Batna, Sétif, Sidi Bel Abbès, Tlemcen, Tipaza) who have scored respectively (49.19, 37.90, 34.66, 33.94, 28.20, 27.58, 20.09). 79, 16% a rate making all other unprepared with 39 wilayas.

Similar results on the preparedness of African countries whey obtained in previous work, the authors ranked Algeria among the three countries that have an average ability to raise to respond to health outbreaks [12].

According to the Global Health Security Index, Algeria is ranked 173rd out of a total of 195 countries [13] with a score of zero for emergency preparedness and response planning, the exercise of response plans, the emergency response operation, the link between public health and safety authorities, and the communication of risks that are indicators of rapid response. Moreover, a score of zero for the integration of information on human health, animal and environment [14]. On the other hand, the Algerian population needed a training for the Population Response to Risks and the culture of risks. In this topic, the researchers used the AHP (Hierarchical Analysis Process) method to spatialize social resilience to the novel coronavirus; they revealed that the populations of 14 wilayas exhibits low social resilience to containment measures [15]. On the other hand, research results have shown the major importance of new geographic information and geomatics technologies. In our country for management and decision, support before, during, after health events, and even for the geomatization of the National Health System in this subject a researcher to conclude her research with a relevant recommendation on the establishment of a health [16].

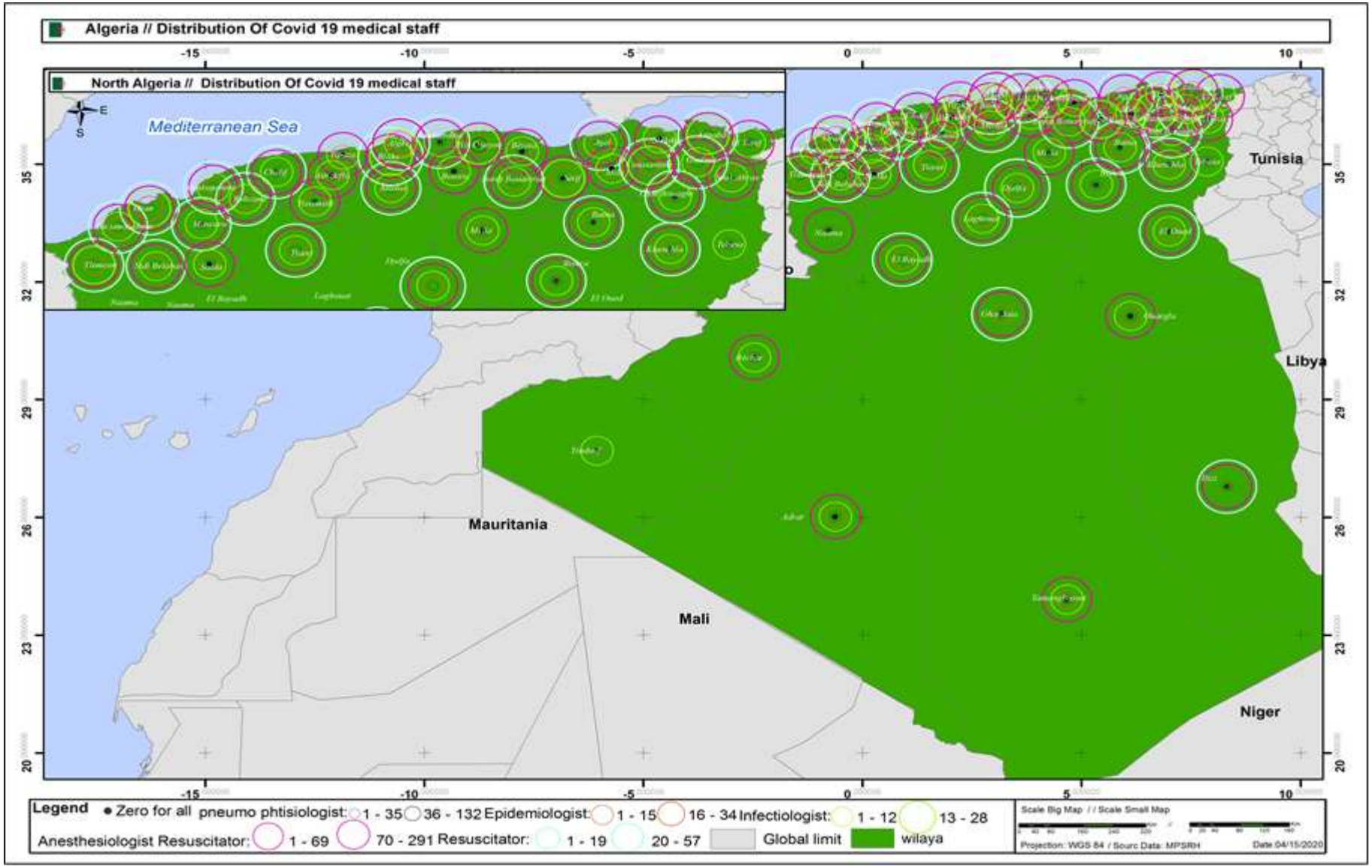

Figure 6. *Covid-19 Human Resources Part 02*

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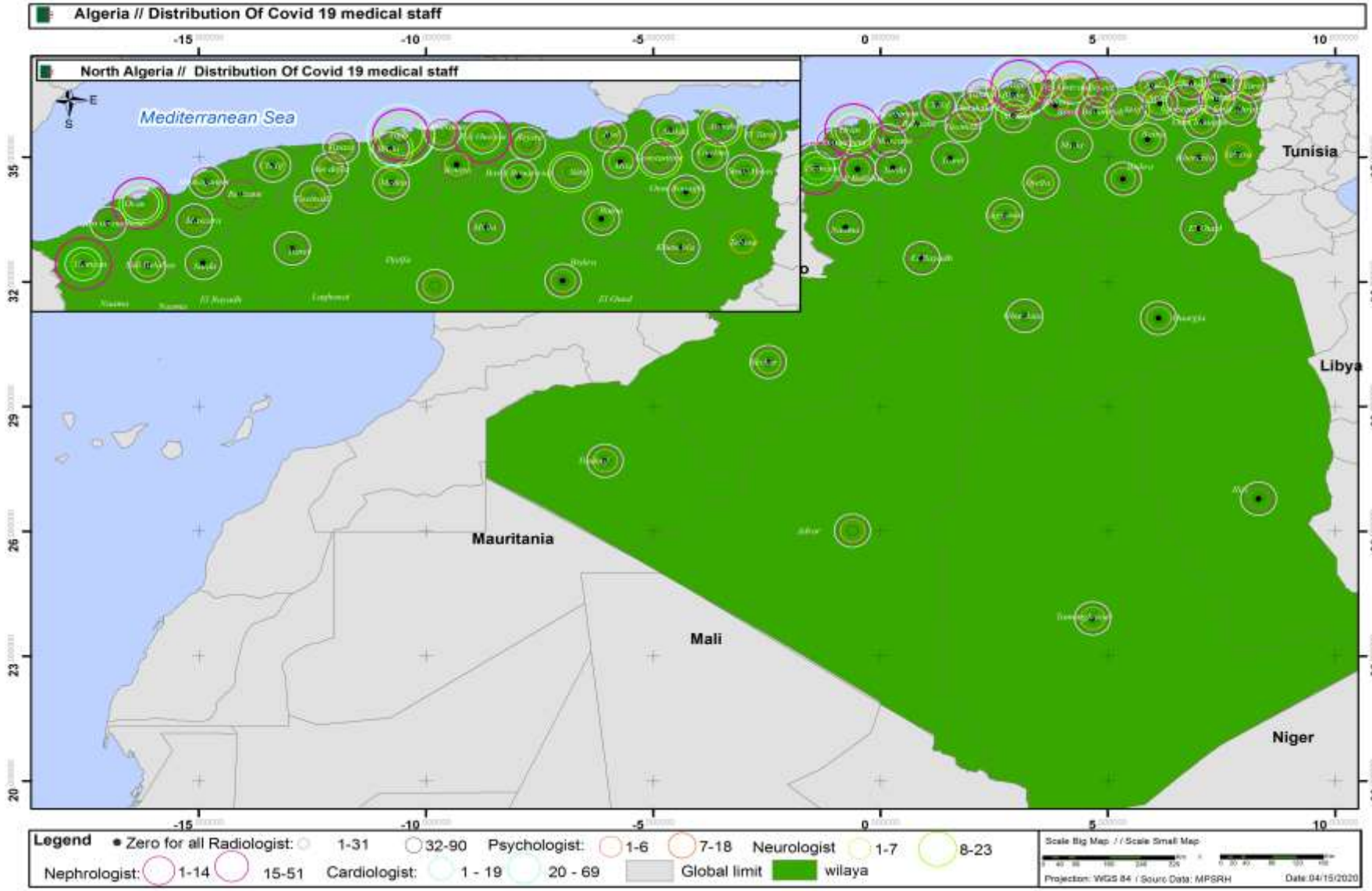

Figure 7.*Covid-19 Human Resources Part 02*

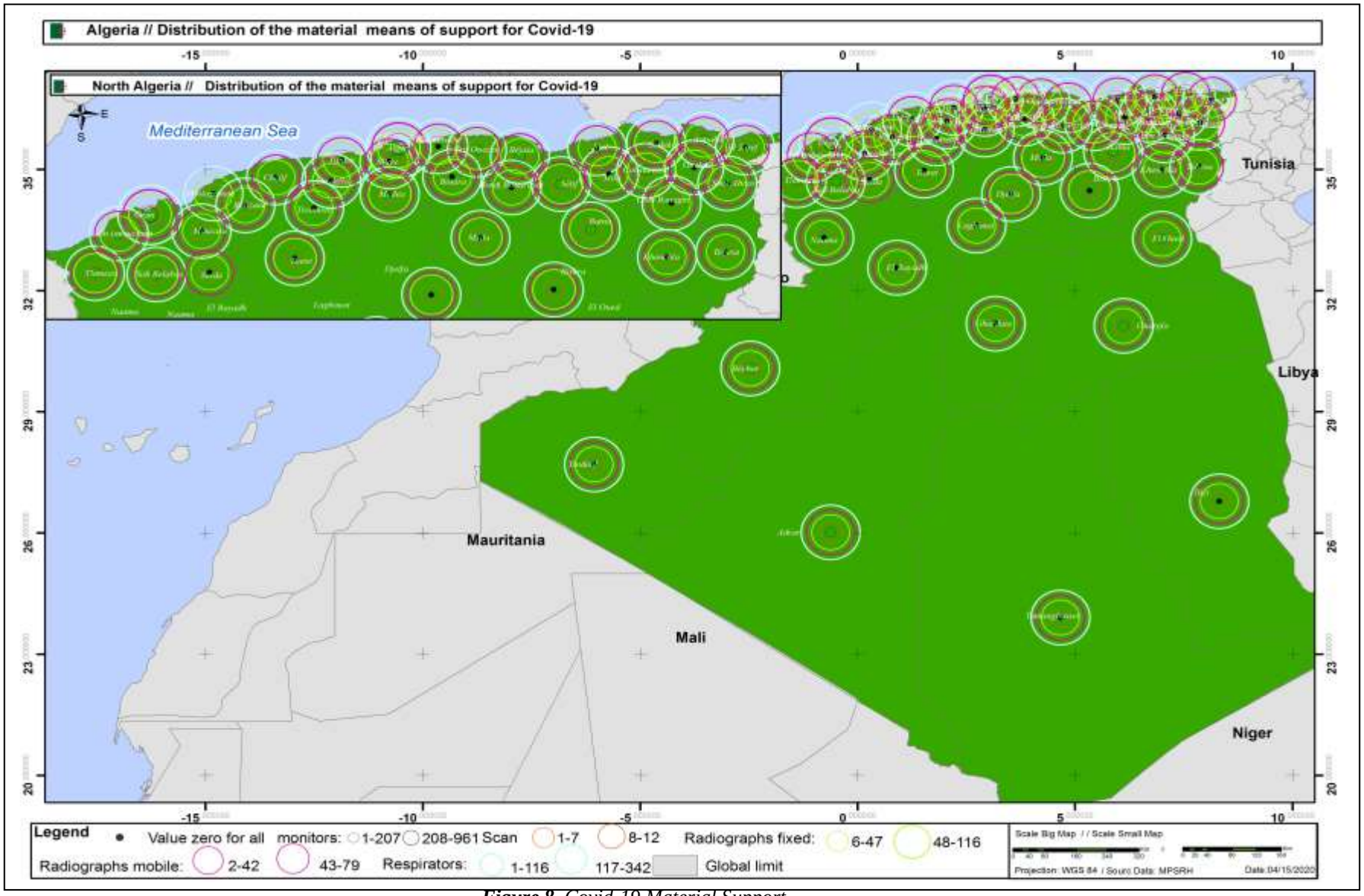

Figure 8. *Covid-19 Material Support*

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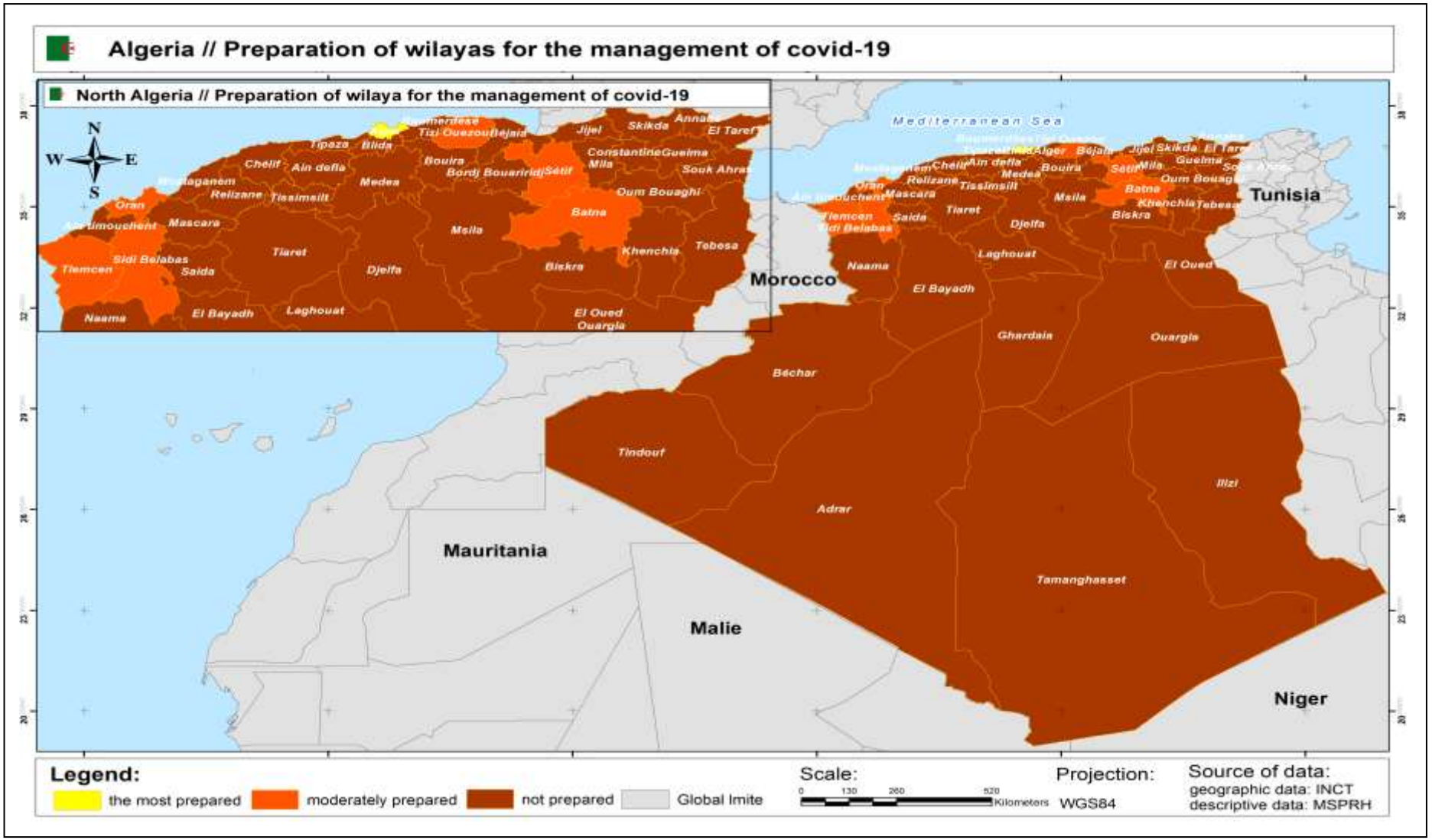

Figure 9. *The less prepared wilayas according to the qualitative*

IV. Conclusion

The growing number shows that our health system, because of its organization, no longer meets the social and demographic requirements for managing covid19 in terms of quantity. Nevertheless, it remains able to adapt to the changing realities and differentiated needs of the territories for the provision of care thanks to the quality of our specialists, the solidarity of our people, and the response of the population to the risks that this global health crisis can overcome. This health crisis is an example for all countries in the world to reconsider the health system, especially in Algeria, to restore respect for medicine and scientific research. In addition, our work is part of a policy to implement and geomatize the organization plan for the specific Covid-19 emergency response and its adaptation in Algeria, with a Geographic Information System as a management and decision support system. Indeed, the challenge is to build a simple and easy-to-use tool while keeping the complex nature that characterizes this management and its geographical attractions. The system we have developed allows, in addition to the management and organization of the relief, to carry out a set of geographical queries on the study area and thematic analyses of decision support. We included different modules that for use in the reporting, in the analysis of the Covid-19 pandemic, so we introduced the notion of geographic information in the administration of the ORSEC-plan-Covid19, offering stakeholders the opportunity to visualize the different modules involved and their interactions. Our application also makes it possible to share this information via an inter-organizational system. We believe that the collaboration and the flow of information between the different actors of the ORSEC-Covid19 will undoubtedly lead to a more adapted configuration of rescue and real-time response operations. We were able to develop a tool that satisfied users, thanks to the additional features that we found useful to integrate in order to facilitate the use of the system. In addition, we have tried to offer a comprehensive tool that covers all user needs so as not to disperse management and mapping data across different systems. In the medium term, the fundamentally geographical system will be integrate into the management culture of the ORSEC-Covid19 plan. However, it is necessary to complete and update the databases of the various modules. This work has taught us that it can be very interesting to explore areas totally.

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