

**Western Sahara War Archives,  
between archives and GIS:  
how to map a war remotely ☐**

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**Abstract:** This paper presents a comprehensive study on the II Western Sahara War, leveraging GIS and historical cartography to monitor and analyse the conflict remotely. Data collected from military communiqués are standardized, and analysed. Between November 2020 and November 2023, 4,306 attacks were recorded, with a noted decline in frequency, attributed to the efficacy of Morocco's defensive strategies. This work underscores the critical role of physical geography, particularly the challenging desert environment, in shaping military strategies and outcomes. The study also delves into guerrilla tactics employed by the POLISARIO Front, emphasizing the importance of rapid, flexible operations and the use of local knowledge and support. The findings provide a detailed overview of the conflict dynamics in Western Sahara and illustrate the potential of GIS and historical cartography in conflict monitoring and analysis.

**Keywords:** Historical Cartography, Western Sahara, GIS, Western Sahara War Archives

**Resumen:** Este artículo presenta un estudio exhaustivo sobre la Guerra del Sáhara Occidental, en el que se aprovechan los SIG y la cartografía histórica para seguir y analizar el conflicto a distancia. Se normalizan y analizan los datos recogidos de los comunicados militares. Entre noviembre de 2020 y noviembre de 2023, se registraron 4.306 ataques, con una notable disminución de la frecuencia, atribuida a la eficacia de las estrategias defensivas de Marruecos. Este trabajo subraya el papel fundamental de la geografía física, en particular el difícil entorno desértico, en la configuración de las estrategias y los resultados militares. El estudio también profundiza en las tácticas de guerrilla empleadas por el Frente POLISARIO, destacando la importancia de las operaciones rápidas y flexibles y el uso de conocimientos y apoyo locales. Las conclusiones ofrecen una visión detallada de la dinámica del conflicto en el Sáhara Occidental e ilustran el potencial de los SIG y la cartografía histórica en el seguimiento y análisis de conflictos.

**Palabras clave:** Cartografía histórica, Sáhara Occidental, SIG, Archivos de la Guerra del Sáhara Occidental

## Introduction

*Ejército de Liberación Popular Saharawi*<sup>1</sup> is the armed branch of *Frente Popular para la Liberación de Saguia el Hamra y Rio de Oro*<sup>2</sup> and, by extension, the Armed Forces of *Sahrawi Arabe*

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<sup>1</sup> ELPS

<sup>2</sup> Frente POLISARIO (in english POLISARIO Front)

*Democratic Republic*<sup>3</sup>. They are, however, a liberation movement of popular origin (Hodges, 1983; Omar, 2017). And like all popular liberation forces, they use guerilla combat methods and tactics (Jensen, 2013).

It is not our intention to explore in detail the history of the actions of POLISARIO Front and ELPS. We will only summarise them in order to demonstrate the efficiency of guerrilla tactics when applied in the context of desert warfare, in this case in the Sahara Desert.

By the end of WWII, the western empires started to crumble and fall apart (Droz, 2006). The Spanish were no different. Spite the decline as a world power, Spain stood as one the European empires that reached the 20<sup>th</sup> century (Ortega, 2001). However, the stress of the Riff War, would overextend the thin Spanish army stationed in Africa. Franco dictatorship would be a factor of instability (Esteban & Timón, 2015; Hassan, 2019; Iglesias Amorín, 2015; Martín, 1973; Ortega, 2001).

In the wake of the independence of Morocco from France in 1956, the Moroccan royal house immediately started to overtake Spain as the primary powerhouse in the region (Esteban & Timón, 2015; Hassan, 2019; Martín, 1973; Ortega, 2001). Shielded in a nationalist rhetoric put forth by *Istiqlal* party<sup>4</sup>, first *Mohammed V* and then *Hassan II*, the Moroccan royal house, tried to annex Mauritania, parts of Algeria, *Ifni* and the other Spanish territories in the North and, Western Sahara (Hodges, 1983).

*Mohamed V* created pressure on Spain by using the *Jaich at-Tabrir*<sup>5</sup> allowing him, to annex *Ifni* (Esteban & Timón, 2015; Hassan, 2019; Iglesias Amorín, 2015; Martín, 1973; Ortega, 2001). Later, Hassan II embarked on a political campaign, in order to spread Morocco's influence in north-west Africa. He wanted to establish his hegemonic power over the region, (re)creating, in his mind what constituted the former Pre-colonial Morocco. This political stance would be defended on the United Nations General Assembly<sup>6</sup>. Mauritania would join the claim, thus resulting in a massive discussion during the 2318<sup>th</sup> plenary meeting held on December 13<sup>th</sup> 1974. So, in order to clarify if either of those claims were valid under the General Assembly 1514 (XV), the UNGA would request an advisory opinion to the International Court of Justice<sup>7</sup> in 1975. This request had two questions. Number one, was Western Sahara *terra nullius*<sup>8</sup> at

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<sup>3</sup> SADR

<sup>4</sup> Independence Party

<sup>5</sup> Liberation Army

<sup>6</sup> UNGA

<sup>7</sup> ICJ

<sup>8</sup> Latin expression meaning “nobody’s land”. It has been in use since the 19<sup>th</sup> century as legal term in International Law as principle invoked by States as a justification to the claim of occupation of a strip of land.

the time of the Spanish colonization. If the response was negative, the follow up question was if there any type of ties whatsoever with either Morocco or Mauritania (ICJ, 1979). The ICJ would issue its opinion in October 1975 after analysing all sort of documentation (ICJ, 1980). The first question was refuted, but, in spite some tribes of Western Sahara had some ties to both Morocco and Mauritania, the Court found no sovereignty ties. (ICJ, 1975). Issuing an opinion against the claims of Morocco and Mauritania. *Hassan II* would claim the contrary, that the court had agreed with Morocco (Hodges, 1983).

However, in October 1975 Morocco had already sent soldiers to Western Sahara, in preparation of the “Green March”. *Hassan II* not waiting for the ICJ, sent in military forces disguised as civilians into Western Sahara, and stationed troops on the border. In November Morocco and Mauritania would officially invade (Besenyó, 2009; Hodges, 1983; Omar, 2017). While this was happening, and Mauritania, would reach an agreement with Spain to divide Western Sahara between the two African states, and in return, Spain would get a stake in Bou Craa, the Madrid Accords (Pinies, 1976). Mauritania being, in theory, the weaker army compared to Morocco, and after several attempts to fight both at the same time, POLISARIO Front decided to focus first on the Mauritanian forces.

This led to a change in combat strategy. It changed from a war which the main objective was to destroy the army to a war of attrition. This made the political and social pressure on the government in Nouakchott so unbearable that it had no choice but to withdraw and seek a peace agreement (Hodges, 1983).

The economic pressure of the war with POLISARIO Front became so intolerable that it reached 60 % of the Mauritanian national budget. But despite the involvement of France<sup>9</sup>, financial support from Saudi Arabia, Kuwait and the Ivory Coast, the internal situation combined with the financial situation dictated the signing of a peace agreement after a *coup-d'état*.

Morocco lost an important ally to the South and its moves to occupy the territories from where Mauritania retreated meant that the war effort doubled. The number of soldiers rose from 60,000 men to 120,000 men and the economic effort rose to 40 % of the state budget. It should be noted that between 1979-1989, the United States financed the Moroccan state and helped militarily by sending equipment, training and military advice, directly or via proxy. Saudi Arabia lent money to Morocco during this period. And Israel, alongside Saudi Arabia have also sold weapons to Morocco (Hodges, 1983; Jensen, 2013; Lourenço & Teixeira, 2023; Teixeira, 2022, 2023; Zunes & Mundy, 2022)

Taking advantage of the concentration of POLISARIO Front’s attention on Mauritania, Morocco took the opportunity to advance deeper into Western Sahara. Later, after the withdrawal

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<sup>9</sup> Which sent war material and provided military support from Senegal.

of Mauritania, it took the opportunity to occupy the southern part of Western Sahara, while bombing with napalm and white phosphorous (MARTIN BERISTAIN et al., 2015).

In terms of materials and Moroccan soldiers sent to the territory of Western Sahara, they were not prepared for the climatic conditions. And despite installing Westinghouse radar systems<sup>10</sup> during the 1980s, and being able to use Unmanned Combat Aerial Vehicles<sup>11</sup>, better known as Attack/Surveillance Drones<sup>12</sup>, some imported from the USA, and combat aircraft<sup>13</sup> (Jensen, 2013). The guerrilla tactics of POLISARIO Front, managed to cause considerable damage. Mobility and surprise attacks led to the destruction of a lot of military equipment, including bases. The seizure of military equipment and the capture of Moroccan soldiers (Hodges, 1983; Jensen, 2013).

They managed to force Morocco to retreat and change its strategy. Moving from a form of defensive-reactive warfare, in which it tried to react quickly against the guerrilla attacks, to a form of static defensive warfare, by building the military separation wall (Hodges, 1983; Jensen, 2013).

In other words, with the construction of the wall, Morocco set up a defensive system based on electronic detection systems (radars), with military bases in the first line, control bases in the rear lines and air bases on one side and mines on the other.

Exposed and under pressure, Morocco's static defensive war would eventually lead to a stalemate. This impasse dictated the *status quo* until the ceasefire of 1991. Despite the fact that POLISARIO Front was able to break through the wall to make incursions since the wall was built in several stages. The separation barrier it created between the POLISARIO Front and the rest of the Sahrawi population posed a serious obstacle to the effectiveness of the guerrilla tactics. It was one of the factors that contributed most to the progress of the mediation and negotiation efforts that resulted in the ceasefire.

On November 13<sup>th</sup> 2020, the long-standing cease-fire agreement between POLISARIO Front and Morocco was denounced by POLISARIO. A group of peaceful Sahrawi protesters, protesting against a new breach in the Berm<sup>14</sup>, in *Guergarat* was attacked by Moroccan forces (Ahmed & Jechtimi, 2020; Gali, 2020; Lourenço, 2020).

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<sup>10</sup> Imported from the United States and France.

<sup>11</sup>UCAV

<sup>12</sup> For example, the Bayraktar TB2 and the General Atomics MQ-9 Reaper (Predator B)], tanks [ For example, the T-54, M1A1 Situational Awareness, M1A2M and M1A1 U.S. Marine Corps version

<sup>13</sup> For example, the F-1 Mirage and F-16 Fighting Falcon fighters, and the AH-64 Apache attack helicopter

<sup>14</sup> Name by which the Moroccan military defense wall built in Western Sahara, is more commonly known.

By doing so, Morocco violated point 3, section 3.1, section 3.2 and subsection 3.2.1. of the cease-fire agreement (*Military Agreement N°1*, 1997). This action forced the Sahrawi Arabic Democratic Republic<sup>15</sup> to promptly denounce the cease-fire agreement and to resume the war (CEAUP, 2021; Gali, 2020; Lourenço, 2020; Teixeira, 2022). Hence bringing an end to the twenty-three years cease-fire agreement, signed by both parties in 1997.

## 1. Historical Cartography

Statistics are a powerful, and yet neglected tool, that help historians to achieve a greater understanding of events, “*Maps, graphs, and statistics are tools to describe patterns in data. Explaining the patterns is an additional step requiring the traditional skills of an historian.*” (Gregory, 2008, p. 124). Statistics can provide useful insights, allowing the researcher to visualise the patterns in his dataset, that otherwise he wouldn't see. When it's mixed with spatial statistics<sup>16</sup>, creates a multi-variable approach, allowing the overlay of multiple aspects. Thus, creating links between phenomena<sup>17</sup>.

Spatial statistics are an amalgamation of three key components: spatial realm, time realm and thematic realm. This requires one realm to be represented, a simplification of a realm and to fix a third realm (Gregory, 2008). Thematic maps utilize to its fullest the spatial realm of the datasets, the fix realm. However, this typology of maps cannot properly handle time. In this order, the time realm will always be a single set point or a comparison between two set points, the simplified realm. Upon these two realms are superimposed a theme, the represented realm. These simplifications of data generate problems. It relies on an oversimplification of reality, by omitting some aspects over others. It needs the creation of polygons to represent, usually, man-made artificial zones, which limits the data. And only displays one or two aspects (Gregory, 2008). In a way, acting like quantitative data. Needing further qualitative explanation of the patterns. Because it only shows the physical connections, not the reasons behind the interactions between different locations and social actors.

In spite of its limitations, space is important to the understanding of the phenomena. It allows the researcher to break large spaces into smaller, more feasible ones to study the larger aspect. Allowing for a more personal behaviour/interactions between components and the space

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<sup>15</sup> SADR

<sup>16</sup> It's the branch of statistics that studies geographical related datasets of social nature not related to pure economics.

<sup>17</sup> For example: Is growth in population in an area linked to an increase in crime in the same area? Statistically speaking, they are two different datasets, that alone can only imply correlation. When superimposed onto a map, can lead to confirmation, or not, of the correlation. We can see, or not, the physical link, but we will still need more qualitative data to actually confirm our hypothesis.

(Gregory, 2008). Whenever a historian applies those tools to his research, a new field opens up: Historical GIS (Bodenhamer, 2008; Gregory, 2008)

Historical GIS tries to understand/demonstrate the patterns regarding the spatial nature within a historical phenomenon through the means of applying quantitative and qualitative data onto maps (Bodenhamer, 2008). The idea is to represent the physical aspects of the historical phenomena, by reducing complex interconnected web of social actors, different events and different locations<sup>18</sup> (Bodenhamer, 2008). Meaning, it helps to visualize the datasets of a historical event in an applied way, reducing the complexity to an easier to read, near schematic structure. Such as migrations patterns, troop movements, population growth, temperature and heat distribution, empires borders, trade routes. These representations can shed some light over phenomena. Allowing a glimpse of the reasons behind migrations movements, city construction/growths patterns, resources explorations, battlefield selections, routes selections ... *“Historical GIS is concerned with taking data in this firm and turning into knowledge and new scholarship about the geographies of the past”* (Gregory, 2008, p. 124).

The integration of GIS technology contributes for a more complex analysis. We can see, at the same time, the different scales of the event, either in time or space. For example, the evolution of resource exploration and its impacts on migrations, city building and housing patterns. We can also track troops movements along a battlefield. The clash of armies and the building of fortifications. When the first example is alongside with the second, we might see reasons for a war, better comprehend the strategies used, and the post war evolution or the pre-war escalations of tensions (Bodenhamer, 2008)

*“This integrative ability means that historian can construct multiple perspectives [...] We can shift scales quickly, zoom in and out, and view level of detail. Spatial relationships can prompt questions we might otherwise ignore; we can build intuit connections for further exploration.”*  
(Bodenhamer, 2008, p. 223).

Consequently, in order to understand the situation in Western Sahara, we need first to characterize the environment.

## **2. Theatre of Operations: Desert**

Physical geography plays an important role in any scenario of human evolution/action. The temperature, the presence or absence of drinking water, the existence of extreme landforms. All of this determines how the social actor acts in relation to the environment around him and how he is affected by it. This is even more evident in war scenarios, especially those that take place in terrain considered to be extreme.

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<sup>18</sup> Both in time and space.

Western Sahara it is the westernmost part of the Sahara Desert. It has an area of 266,000 km<sup>2</sup>, of which 78.5 % is arid<sup>19</sup>. In climatological terms, it falls into the Subtropical Climate classification, in the Hot Desert Climate (BWh) subcategory on the Köppen-Geiger scale. It has a temperature range that varies between 23°C (in February) and 50°C (August) during the day. With a relative humidity of between 60% and 65% and 0.4 - 1.4<sup>20</sup> rainy days per year.

There is a prevalence of *Harmattan* wind, a dry, dust-laden wind with a north-east-east direction. During the winter-spring period, *Sirocco* winds occur, a warm and humid wind with a south-east-south-west direction, loaded with particles of sand and dust.

With the rekindling of the sparks of war, in order to understand the context in which the data is collected, it is necessary to understand the effects that a theatre of operations in a desert environment has at the following levels:

- Equipment/Armour;
- Units/Soldiers;
- Strategy.

### 3. Equipment/Armour

One of the main characteristics of an army, in any period of history, is the equipment it uses in combat. It's not much different today. The big difference is the large-scale use of firearms in all branches of the Armed Forces. They can be small calibre and for individual use, such as pistols and assault weapons or heavy calibre and used in medium-long range artillery weapons, as a form of support for infantry units or mechanised cavalry units.

Another, and this time major, difference is the widespread use of aviation as units capable of affecting the theatre of operations. With the introduction of the ability to fly into the art of war, a new chapter has been opened in the art of combat. With the help of helicopters, it is possible to pick up a unit at one point and take it to another point in the theatre of operations, in a faster, more effective and efficient way. Combat aviation enables far more effective operations, from support actions to the prior neutralisation of potential threats, such as attacks on fixed artillery positions, battalions of mechanised units and fortified positions. In very simplistic terms, a firearm consists of a short/medium/long-range weapon, with single fire, semi-automatic, automatic, or mixed fire, which fires a type of ammunition of a certain calibre<sup>21</sup>.

<sup>19</sup> Natural water sources are rare, and most are saltwater sources.

<sup>20</sup> The precipitation rate that varies between 0.03 mm/day in July and 0.27 mm/day in October.

<sup>21</sup> Calibre is the metric that measures the width of the rifle barrel or the width of the cartridge, e.g. 5.56 NATO, 7.62 × 51 mm NATO, .50 BMG.



The firing is a mechanical action that generates heat, which all components must withstand. Weapons capable of continuous fire have to withstand these high temperatures for a longer period of time.

For this reason, when the theatre of operations is a desert, where the temperature ranges are irregular, the risk of damage to the firing tubes is greater. Both by the action of heat<sup>22</sup> during the day, and by the cold<sup>23</sup> at night (Gilewitch et al., 2014). The same applies to the fluids, rubbers, tyres<sup>24</sup>, engine components<sup>25</sup>, cooling systems, fuel intake control, afterburner systems<sup>26</sup>. Sighting system<sup>27</sup> can be compromised and lead to potentially catastrophic breakdowns and failures. The vehicle or weapons system may become partially or completely inoperable or lead to serious failures during use (Army & Corps, 2021).

Stronger sunlight contributes to faster degradation of plastics, pressurised gases, lubricants and some chemicals, while it can also tamper with infra-red and thermal systems<sup>28</sup>. Light Refraction, better known as *Mirages*, can cause problems with target acquisition, making the potential target appear closer than it really is. If this factor is not taken into account, it can lead to a loss of the element of surprise and position reporting or to an overshoot or undershoot, leading to unnecessary expenditure of ammunition and unnecessary stress on the system and components.

The electronic equipment is also highly sensitive to extreme temperature variations. When exposed to high temperatures, electronic components can go into meltdown or simply shut down the entire system completely. Communications over long distances are difficult and can be the reason why aeroplanes and helicopters cannot fly. Radio spectrum decreases during the day and at night static can cause communications difficulties (Army & Corps, 2021). Static electricity discharges can lead to fires. Batteries need to be monitored, as they lose their charge more quickly in hot weather.

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<sup>22</sup> Internal and external.

<sup>23</sup> Rapid heating and rapid cooling can cause unwanted cracks and/or bends in the barrel.

<sup>24</sup> Exposure to heat is greater, since the tires will be in contact not only with atmospheric heat, but also with the temperature of the ground they will be in contact with.

<sup>25</sup> Fluid transport hoses, such as petrol, can melt.

<sup>26</sup> A system used in jet or reaction engines, essentially used by aircraft and some tanks, such as the M1A2 Abrams tank, use systems of this kind to reuse elements that have not been burnt in the first pass through the engine. An afterburner system reuses these particles in order to generate an additional power boost.

<sup>27</sup> Optical, Digital or Laser Sights

<sup>28</sup> Heat Seeking Targeting Systems or Night Vision Goggles.

Wind, but especially the particles of sand that winds carry, affect the operational capacity of aircraft. They can cause atmospheric pressures that make flight impossible, accumulation of sand in engines, rotors, air intakes and outlets. The Sahara Desert is prone to sandstorms that can last for days (Army & Corps, 2021; Gilewitch et al., 2014).

#### 4. Units/Soldiers

Like equipment, units and soldiers are adversely affected by extreme conditions. The main concern is dehydration, and by extension sodium loss<sup>29</sup>, due to high temperatures. Soldiers at rest, can lose a quarter of their body water per hour. Low temperatures of the desert, however, can lead to hypothermia, which can cause frostbite and death (Army & Corps, 2021).

With high temperatures and low humidity, the body's temperature regulation function<sup>30</sup> occurs more frequently. However, this process is almost invisible, as the sweat is instantly dried, leaving no visible traces on the skin. A loss of 1.8 litres represents a loss of around 2.5% of body weight and a 25% decrease in efficiency. The loss of 15 % of body weight, if not treated immediately, leads to severe health problems, and ultimately, death (Army & Corps, 2021).

Sunlight is another risk factor. Repeated exposure can also cause sunburns, the appearance of blisters<sup>31</sup>, melanoma<sup>32</sup>, eye fatigue, vision impairments and facilitate the deregulation of body temperature, through extreme heat.

The high speed of the wind reduces visibility, destroys territorial marks and reduces communication capacity, which in turn can lead to soldiers getting lost from their platoon. Furthermore, wind can cause bodily harm, through either cut or/and wind burn. It may irritate soft tissue, like the lips, leading to difficulty in eating or causing eye infections (Army & Corps, 2021).

#### 5. Tactics

A desert is a scenario of extreme conditions as we have seen, where any poorly planned action can result in scenarios far worse than simple combat. The physical and mental strain is at

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<sup>29</sup> Via salt loss

<sup>30</sup> Sweating

<sup>31</sup> Which, if left untreated, can lead to infections.

<sup>32</sup> Skin Cancer

least 2x that of a so-called “normal” combat scenario<sup>33</sup> (Army & Corps, 2021). The ability to utilise vast areas of the desert in order to move combat forces quickly over long distances is imperative, since the terrain provides favourable conditions for long-distance shooting as well (Army & Corps, 2021; Gilewitch et al., 2014).

The geomorphology of the terrain is another “unknown”. It is quite easy to hide land mines under sand. Places where it seems safe to drive heavy machinery, can turn into quicksand due to the existent landforms<sup>34</sup>, or they can be nothing more than sand dunes<sup>35</sup> (U.S. Army & U.S. Marine Corps, 2021). A sand desert can also turn into a mountainous desert overnight.

Venomous animals<sup>36</sup> and parasites are another set of dangers that exist in a desert environment. Nonetheless, all deserts are unique and complex scenarios and the Sahara is no exception (Gilewitch et al., 2014). It is a desert with little room for manoeuvre, in which large columns of tanks are easily constrained. The use of heavy mechanised cavalry is therefore inadvisable. The use of the air force is conditioned by atmospheric conditions. This makes the use of lighter, more mobile units essential.

Smaller units of infantry and light mechanised cavalry are the key to effective combat in this theatre of operations. POLISARIO Front fully adapted and knowledgeable of these conditions successfully employs guerrilla tactics (Jensen, 2013).

## 6. Guerilla Tactics

According to Mao Zedong the guerrilla units can be recruited from the social masses The aim is to form paramilitary units<sup>37</sup>, smaller than a normal battalion<sup>38</sup>. Mao argues that two types of units should be formed: defensive and offensive. While the offensive units carry out the operation, the defensive units cover the retreat. Serving as a distraction, drawing attention to another area. As cover units, opening fire or as escape units.

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<sup>33</sup> Extreme conditions of the climate and terrain make it easier to wear down the morale, physique, equipment and soldiers.

<sup>34</sup> Such as old riverbeds or mountain escarpments.

<sup>35</sup> They can be more than 30 metres high and stretch for kilometres, requiring them to be bypassed in order to cross safely.

<sup>36</sup> Palestine Yellow Scorpion, Varano, Noth African Desert Viper.

<sup>37</sup> Which may or may not work together with the regular armed forces

<sup>38</sup> The aim is to form cells capable of working independently, but centralized, either by neighborhood, city or region.

Combat units should be organised into:

- Platoons, the smallest units, composed of 3-6 units
- Battalions, made up of 2-4 Platoons
- Regiment, made up of 2-4 Battalions
- Brigades, made up of 2-4 Regiments

The aim is to wage unconventional warfare for an indefinite period of time. As its main strength is the masses of the population the troop movements, for example, even within occupied territory, become much easier. In theory, the population of that territory is an ally (Guevara, 1964). Facilitating the integration into the social fabric of guerrillas who may come from outside. They can help make guerrillas “disappear” after a successful or unsuccessful attack. Serving as a logistics facilitator, allowing guerrillas in the heart of occupied territory to be resupplied with food, weapons and ammunition (Guevara, 1964).

For Che Guevara(1964) “[...] *guerrilla fighting is not passive self-defence; it is defence with attack [...]*”. The intention is to wear down enemy forces<sup>39</sup> and/or disperse their forces. Taking away their ability to respond quickly to events. Attacking lines of communication, supply lines, strategic defence points, using multiple attacks in multiple zones at the same time or using blitzkrieg methods. It consists of rapid attacks, using operational means capable of utilising the element of surprise to attack a target and withdraw within a limited and short period of time, so that the enemy is unable to respond. Or when the reaction forces arrive, the units that attacked are no longer there.

Attacks should be carried out where they are least expected, or where they are expected, but on the side that is most unexpected (Griffith, 1989). In order to make the best use of this means, they must use light weaponry<sup>40</sup> appropriate to the type of operation, fast vehicles and mobile means of communication<sup>41</sup>. The equipment must be easy to use and in line with their mission, or use material that can be obtained on site “[...] *The standard of equipment is based upon the nature of duties assigned [...] The equipment of guerrillas cannot be based on what the guerrillas want, or even what they need, but must be based on what is available for their use. [...]*” (Griffith, 1989). This requires an excellent knowledge of the terrain, local customs, fauna and flora. Mao identifies the need to study the theatre of operations, divide the terrain into smaller scenarios and establish various bases and support networks.

Precise, efficient and effective coordination is a necessity and is based on this knowledge. Thus, one of the first needs, after establishing the guerrilla groups, is to set up support bases, communication and supply lines (Griffith, 1989). It is from these bases that the operations will

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<sup>39</sup> Physically and mentally.

<sup>40</sup> Tactical weaponry such as assault weapons.

<sup>41</sup> Preferably disposable and which do not compromise the communications network.

be carried out. The targets chosen are crossing points, choke sections, places where the forces are more dispersed. The aim is to be quick and brutal, by exploiting the element of surprise. Lines of communication and supplies are also favoured targets (Griffith, 1989).

Another favourite target is symbols of morale. Attack where the enemy forces feel superior, through rapid incursions from and/or within occupied territory. Or through acts of sabotage, such as destroying bridges, preventing crucial access to a base or the arrival of support units. The destruction of surveillance and monitoring stations. Capturing soldiers is also a way of demoralising forces (Griffith, 1989; Guevara, 1964).

In short, the leadership of the guerrillas must be aware of the need to be on constant alert, the need to move quickly and tactical flexibility to operate in complex theatres of operations. The use of guerrilla warfare is not something that can be left to chance, its action is only possible with serious and comprehensive planning. The fact that each platoon functions as an independent cell must also be subordinate to an overall strategy. A balance must be struck between independence and centralised command. This strategy must include the use of regular forces in order to complement guerrilla activities or exploit the latter's actions (Griffith, 1989).

## 7. The Project and the Analysis

Faced with the events of November 13th, a media blackout and a history of denial and concealment of information by Morocco, CEAUP created a project to monitor the war. The platform we decided to use to provide information about the war was a digital platform (CEAUP, 2021). All the information collected from political, military and media documentation, is available in open access format and without restrictions.

In order to be able to analyse the phenomenon of the II Western Sahara War, a macro and a micro level of division of the theatre of operations was created. A symbolic language was established in order to facilitate the coding of data. A military region is coded as MRx. Sectors are coded as Sx. In graphic terms, each MR has been assigned a colour, and each sector a degradation of the colour of the corresponding military region.

The macro level is the largest geographical level of military activity and is made up of three military regions. Designated as MR1) *Oued Daraa* (Green); MR2) *Saguia El Hamara* (Yellow); MR3) *Rio e Oro* (Red) (Teixeira, 2022a). And at the micro level, where military operations take place, it is made up of thirteen sectors. These are designated as S1; S2; S3; S4; S5; S6; S7; S8; S9; S10; S11; S12; S13.

The data corresponding to the attacks is published by the SADR, in the form of military communiqués, on the website of the Sahara Press Service the official Sahrawi news agency (SPS, 1999). The military communiqués are published in Arabic, Spanish, French and

## Western Sahara War Map \_ Theatre of Operations Synthesis



Map 1 – Theatre of Operations of the war- The three MR and the thirteen sectors

English. In the collection protocol we established to collect press releases in Spanish. This choice is due to the fact that they contain the most information and are published most regularly. In terms of periodicity, the data is collected daily. The data collected are the dates of the attacks, the locations within the sectors that were attacked, the number of attacks carried out and additional information (such as battalion bases, radars, various infrastructures, where applicable, number of dead). The fact that *Hassaniya* is an oral dialect rather than a written one, created the problem of spelling out the names of locations. In order to overcome this difficulty, a partnership was set up with the Sahrawi Diaspora in France to create a list of standardised names.

Once collated, the data is entered into an Excel table. The names are compared with the database of already clarified names. The attacks are counted and transformed into statistical data, shown in graphs and maps.

As we can see in Table 1 between November 13<sup>th</sup> 2020 and November 13<sup>th</sup> 2023, ELPS made 4306 attacks, with an average 1435.33 attacks per year. Year 1 was the one with most

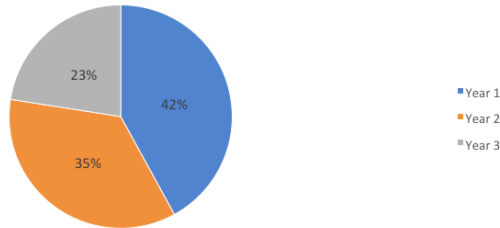
attacks counted, 1809 attacks. The least attacked year was year number 3, with a total of 920 attacks. The most attacked MR was MR1 comprising 53 % of the total of attacks, follow by MR2 with 30 %.

**Theatre of Operations: Western Sahara**

	<b>Total of Attacks Per Year</b>	<b>Total of Attacks (2020-2023)</b>	<b>Average</b>	<b>Mode</b>	<b>Median</b>	<b>Standard Deviation</b>
Year 1	1809	4306	1435.33	#N/A	1527	426.95
Year 2	1527					
Year 3	970					

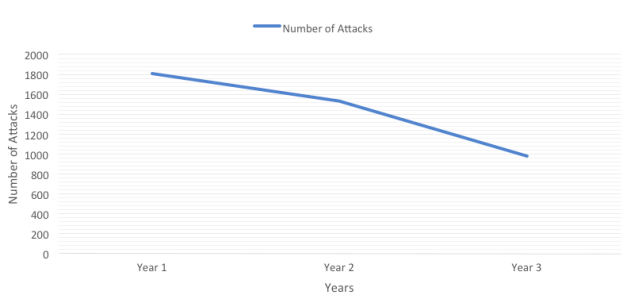
Table 1 – Theater of Operations: Western Sahara

**Total of Attacks per year**



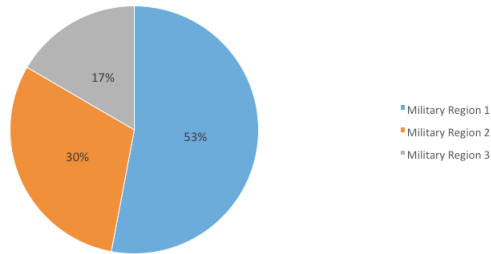
Graphic 1 – Total of Attacks per year in Western Sahara

**Evolution of the number of attacks made by ELPS during the II Western Sahara War (2020-2023)**



Graphic 2 – Evolution of the number of attacks made by ELPS during the II Western Sahara War (2020-2023)

**Total of Attacks per MR**



Graphic 3 – Total of Attacks per Military Region

Overall, the data indicates a downward trend. The total number of attacks has been decreasing yearly. Going down from a total of 1809 attacks in year 1 to 970 attacks in year 3. This stems from the efficacy of the wall as a defence system preventing the advance of the guerrilla fighters of ELPS. Only allowing the Moroccan army long range attacks, while relying on Drones strikes to counter-attack (SMACO, 2024).

Military Region	Year	Total of Attacks Per Year	Total of Attacks (2020-2023)	Average	Mode	Median	Standard Deviation
MR1	1	918	2281	760.33	#N/A	812	188.88
	2	812					
	3	551					
MR2	1	506	1310	436.67	#N/A	468	89.23
	2	468					
	3	336					
MR3	1	385	715	238.33	#N/A	247	151.19
	2	247					
	3	83					

Table 2 – Number of attacks per Military Region (2020-2023)

However, this is a double edge sword. Morocco over relies on its military technology. The *Forces Armées Royales* in 1956<sup>42</sup>, by recurring to Western consultants and trainers alongside the integration of soldiers from the former colonial army, the FAR became the main defence

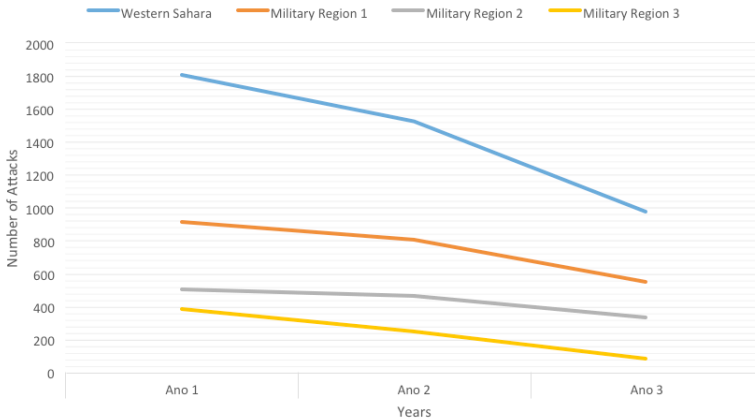
<sup>42</sup> FAR



weapon of the *Alawite* monarchy. After the alignment with the United States of America<sup>43</sup>, the forces entered an innovation phase (Teixeira, 2023), that integrated a massive amount of technology, buying new weaponry and supplies parts on regular bases from the US and Israel (Agency, 2018, 2019; SIPRI, 2024).

As we have seen, the harsh environment of a desert has the potential of causing tremendous problems. The Sahara Desert is no different. The devastating sandstorms can alter the battlefield in an instant, by blocking the skies, not allowing the aerial vehicles to fly, jamming all technological equipment, rendering it useless. The soldiers are in a constant stationary situation. In front of them is a military defence wall covered in barbed wire and minefields. The military defence wall is separating the territory of Western Sahara. Approximately 2/3 of it is under Moroccan occupation. So, it's a military wall that was built in the middle of the desert with military bases. In addition to all the risks we have mentioned that desert conditions can cause, we have to add the psychological fact of isolation feelings of the Moroccan soldiers. The important psychological effects on Moroccan soldier's health and moral are one of the issues of this kind of warfare. The carrying out of constant bombing raids by POLISARIO Front, makes it a war of low impact and attrition.

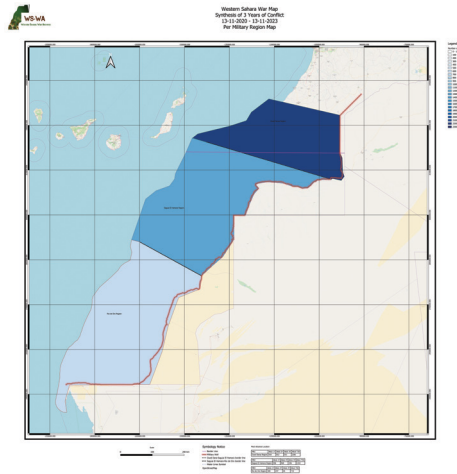
## II Western Sahara War: Evolution of the attacks (2020-2023)



Graphic 4 – II Western Sahara War: Evolution of the attacks (2020-2023)

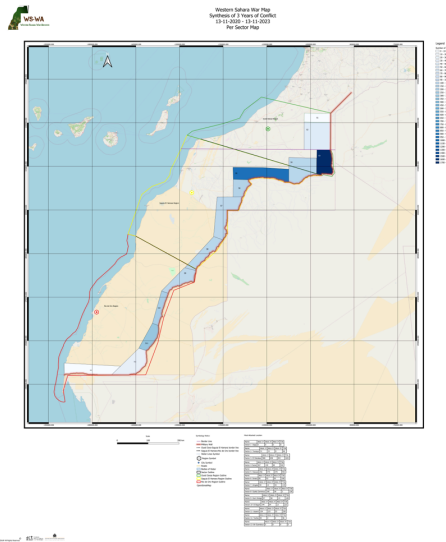
<sup>43</sup> USA

## II Western Sahara War: Evolution of the attacks (2020-2023)



Map 2 – Western Sahara War Map: Synthesis of 3 Years of Conflict (13-11-2020 to 13-11-2023) Per Military Region Map

## II Western Sahara War: Evolution of the attacks (2020-2023)



Map 3 – Western Sahara War Map: Synthesis of 3 Years of Conflict (13-11-2020 to 13-11-2023) Per Sector Map

## 8. Conclusion

War is a human activity that carries many risks. A war in which the theatre of operations is a desert adds to the difficulties. In addition to the health problems caused by exposure to thermal fluctuations, winds and dangerous animals, there are the implications that the same elements can have on weapons. Winds and sandstorms can render air assets inoperable. Thermal fluctuations can render combat equipment, weapons and tanks useless due to the ease with which extreme heat and extreme cold can cause equipment to buckle, tyres to burst and pipes to explode.

The psychological impact of the environment is also a factor. Inclement weather, the presence of venomous animals and the possibility of illnesses that can prevent the body from functioning properly are all factors that severely affect morale and psychological state.

The geography of a desert also causes problems. Dunes, old riverbeds that quickly become unstable. The sudden appearance of cliffs and rocky areas make it difficult for a conventional army to manoeuvre. It does, however, facilitate guerrilla manoeuvres.

Guerrilla warfare is an asymmetrical and unconventional form of combat. It requires the support of the local population and extreme knowledge of the geography of the place where it is being fought. In a desert environment, both factors are extremely important.

This was well demonstrated by the way in which the POLISARIO Front fought against the Spanish, Mauritians and Moroccans. The need by Morocco to build the wall is testimony to this superiority.

The military defence wall is an unavoidable element for the POLISARIO Front. In the 1990s it led to a state of stagnation and was one of the elements that led to the establishment of the Ceasefire Agreement, signed in 1991.

With the resumption of the war on November 13<sup>th</sup> 2020, problems arose again. Adapting to this new reality, POLISARIO Fronts guerrilla attacks still continue. So far, these attacks are mainly bombing raids against the wall.

It is within this context that CEAUP has developed the Western Sahara War Archives project. A digital platform that provides open access to all available documentation on the resumption of the conflict. Accompanying the documentation, the project team, using new GIS technologies, spatial statistics and historical research, provides statistical data on what is happening on the ground. Between 2020 and 2023, 4306 attacks were recorded. However, given the presence of the wall, the war is still in a state of low impact and friction.

Given this situation, the team's analyses show that the number of attacks is falling. This indicates that the war is not overcoming the stalemate it has been in since the 80s. Morocco continues to deny that the war is happening. But it has continued to employ the use of UCAVs. Maintaining its tendency to rely on the use of technological elements. This dependence, within a theatre of operations, could prove dangerous. With its soldiers trapped behind the Berm, buffeted by attacks from the POLISARIO Front, the psychological impact could be profound. Combined with a catastrophic failure of its technological resources, the course of the war could turn in favour of the POLISARIO Front.

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