Sahrawi Arab Democratic Republic

First Indicative Nationally Determined Contribution

Office of the Prime Minister

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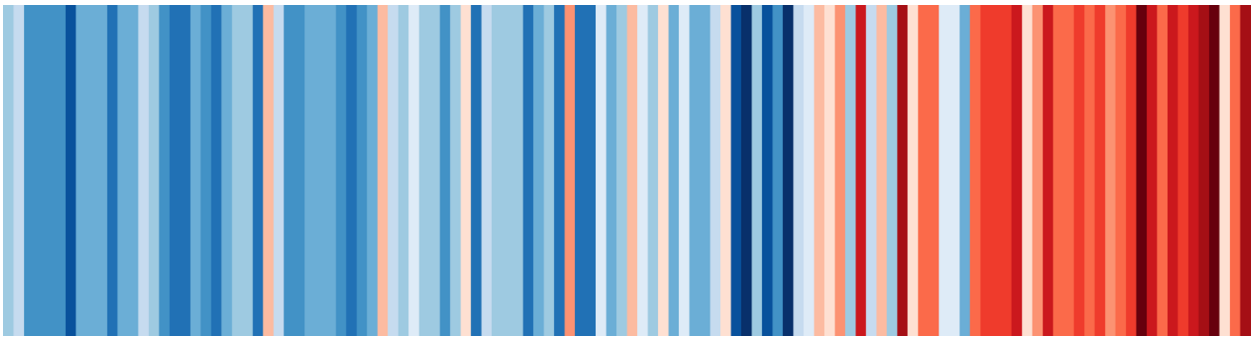

Foreword

The government of the Sahrawi Arab Democratic Republic (SADR) is committed to the goals set out in the Paris Agreement of limiting global heating to well below 2°C above pre-industrial levels, pursuing efforts to limit warming to below 1.5°C, enhancing adaptive capacity strengthening resilience and reducing vulnerability to climate change, contributing to sustainable development and ensuring an adequate adaptation response. The SADR is committed to the multilateral processes established under the United Nations Framework Convention on Climate Change (UNFCCC). Upon completion of the decolonization process, the establishment of full sovereignty over Western Sahara (currently designated by the UN Special Committee on Decolonization as a Non-Self-Governing Territory), and accession the membership of the United Nations, the SADR commits to becoming a party to the UNFCCC, ratifying the Paris Agreement, and participating fully in the mechanisms under the Agreement, including negotiations. Pending the completion of the decolonization process and UN membership, the SADR will seek observer status under the UNFCCC.

This indicative NDC (iNDC) represents a first step in the SADR's participation in global efforts to address the climate crisis through mitigation and adaptation. It summarises the mitigation landscape and the landscape of climate change impacts, risks and vulnerabilities as far as is possible based on currently available information. It proposes a number of wide ranging mitigation and adaptation actions to be undertaken by the government of the SADR. Most of these are conditional on external financial and technical support as a consequence of the SADR's current national circumstances. As a priority, the SADR will seek technical and financial support to build its capacity to prepare an updated iNDC, and ultimately a formal NDC, based on recognised methodologies for assessing emissions and developing mitigation strategies.

The government of the SADR views this iNDC as a foundation for future action to address climate change and for full participation in the relevant international processes and mechanisms under the UNFCCC. It represents a first step for the SADR in building its capacity to address the climate crisis. We implore the international community, including the multilateral organisations responsible for shaping and managing global climate governance and finance mechanisms, to recognise the situation of the SADR and the Sahrawi people, and to include them in these mechanisms in the spirit of principles of equity, transparency and accuracy as set out in the Paris Agreement. The SADR has made a negligible contribution to global greenhouse gas emissions. However, its geographical location, current environmental and climatic conditions, the context of conflict and displacement, and its resulting low economic and technical capacity, mean that the SADR is extremely vulnerable to the impacts of climate change. Supporting the Sahrawi people and the SADR to reduce this vulnerability is essential if global climate governance and finance mechanisms are to avoid inadvertently supporting military occupation and colonialism, and exacerbating the risks, impacts, injustices and inequities they are intended to address.

Acknowledgements

This indicative NDC was prepared by a team of Sahrawi and International experts with technical support from Garama 3C, who coordinated the preparation process. Contributors include (in alphabetical order by surname): Joanna Allan (University of Northumbria), Simon Anderson (IIED), Mulay El Bechir Dedi (Association Secours Sahraoui), Oubi Bouchraya Bachir (SADR Ministry of Foreign Affairs), Saleh Brahim (SADR Ministry of Water and Environment), Taleb Brahim (SADR Ministry of Economic Development), Sidi Breika (SADR Ministry of Foreign Affairs), Mohamed Ould Cherif (ASESO), Nick Brooks (Garama 3C Ltd. and University of East Anglia), Joanne Clarke (University of East Anglia), Sara Eyckmans (Western Sahara Resource Watch), Aliyen Kentaoui (Ministry of Foreign Affairs), Lena Reimann (Vrije Universiteit Amsterdam), and Jeffrey Smith (Carleton University).

Contents

1 Introduction

This Indicative Nationally Determined Contribution (INDC) has been developed by the Sahrawi Arab Democratic Republic (SADR) and sets out climate change vulnerabilities, risks and impacts, and mitigation and adaptation actions, for the non-self-governing territory of Western Sahara, in which the decolonisation process has not yet been completed. Western Sahara is currently divided into an area that is illegally occupied by Morocco (the Occupied Territory), and an area (the Liberated Territory) controlled by the Frente Polisario, the national liberation movement which constitutes the Government of the SADR. The Sahrawi population is distributed across the Moroccan and Polisario-SADR controlled areas and the Sahrawi refugee camps in neighbouring Algeria.

This iNDC affirms the SADR's commitment to the goals and principles of the Paris Agreement and sets out a vision for climate change adaptation and mitigation in the SADR that is compatible with the Agreement (Annex 1). It identifies mitigation and adaptation priorities, needs and actions. The actions identified include those that can be taken immediately under the current circumstances, given access to the appropriate resources, and those that are contingent on the completion of the UN mandated decolonisation process. External technical and financial assistance is essential for the realisation of these actions, and to rapidly develop the capacity of the SADR to address climate change through mitigation and adaptation, including the capacity to design, cost, finance and implement many of the actions identified in the iNDC. Such assistance is also required in order to address principles of equity and transparency as set out in the Paris Agreement, and wider issues of climate justice.

This iNDC addresses issues of climate justice related to the SADR's status and the vulnerability of the Sahrawi population, particularly those whose vulnerability is amplified by their status as refugees.

The iNDC provides a foundation for the participation of the SADR in global efforts to address climate change through mitigation and adaptation, and for the SADR's participation in global climate governance and finance mechanisms.

2 National circumstances

2.1 Western Sahara and the SADR: recent history and current status

The SADR was proclaimed on 27 February 1976 to fill the legal vacuum in the context of Spain's unfulfilled obligation to lead the territory of Western Sahara to its decolonisation, and the withdrawal of the Spanish administration from the territory. Following Spain's withdrawal, Western Sahara was invaded militarily by Morocco and Mauritania. A 16-year war ensued between the Frente Polisario - the national liberation movement - and the invading Moroccan armed forces. In 1975, the International Court of Justice issued an Advisory Opinion rejecting both Morocco's and Mauritania's claim to Western Sahara. While the Islamic Republic of Mauritania withdrew from the conflict in 1979, when it signed a peace treaty with the Frente Polisario and officially recognized the SADR as a sovereign state, Morocco continues to occupy most of

Western Sahara. In 1991, the United Nations brokered a ceasefire between Morocco and the Frente Polisario, recognised equally by the UN as the two direct parties to the conflict. Notwithstanding the Moroccan invasion, the SADR continues to consolidate its sovereignty, symbolised by its fully fledged membership of, and role as a founding member of, the Africa Union, and its extensive global diplomatic relationships. More than 80 countries have recognised the SADR as a sovereign state.

Under the terms of the 1991 ceasefire, the United Nations established the United Nations MIssion for the Referendum in Western Sahara (MINURSO), tasked with monitoring the ceasefire and organising a referendum on self-determination. Due to Moroccan obstructionism, this referendum has not taken place and, as has been the case since 1963, the situation in Western Sahara continues to be treated as an issue of decolonization by the United Nations, with Western Sahara being designated as a Non-Self-Governing Territory (NSGT) by the United Nations Special Committee on Decolonization.[1]

Since the signing of the 1991 ceasefire and Military Agreement #1, Morocco and the Frente Polisario have controlled the Occupied Territory and the Liberated Territory respectively. These areas are separated by the Berm, a physical barrier constructed by the Moroccan Armed Forces (FAR), comprising earthworks, military outposts and minefields. Approximately half of the Sahrawi population live as refugees in five camps around the city of Tindouf in Algeria. These camps together with the localities situated in the Liberated Territory house the Government of the SADR. The Sahrawi government maintains a military and administrative presence in the Liberated Territory. Sahrawi from the camps regularly visit the Liberated Territory, which also hosts a small but significant permanent civilian population, whose numbers are limited by a lack of resources and infrastructure, and risks related to military conflict.

The remainder of the Sahrawi population lives under Moroccan occupation to the west of the Berm. Morocco has adopted policies in the Occupied Territory to encourage the settlement of Moroccan nationals. The illegal exploitation of occupied Western Sahara's natural resources by Morocco, and trade in these resources with other nations, is a source of considerable controversy and has been the subject of numerous legal challenges. Most recently, the General Court of the European Union annulled two trade agreements between the EU and Morocco, covering farm products and fisheries, on the grounds that these agreements involved the exploitation of Western Sahara's natural resources without the consent of its people. The general Court confirmed that the Frente Polisario is "recognised internationally as a representative of the people of Western Sahara", and thus has the capacity to bring an action before the Court to defend the right of the people of Western Sahara.[2]

In November 2020, the 1991 ceasefire broke down, following the invasion of the prohibited buffer zone extending 5km east of the Berm by the FAR. This invasion was in response to protests by Sahrawi civilians against the export of natural resources from the Occupied Territory via a road through the buffer zone near Guergerat. The breakdown in the ceasefire resulted in the resumption of hostilities between the Frente Polisario and the Kingdom of Morocco.

It is in this context that the Government of the SADR presents this indicative Nationally Determined Contribution (iNDC) for the territory of Western Sahara, comprising both the Occupied Territory west and north of the Berm, and the Liberated Territory east and south of the Berm.

[1] https://www.un.org/dppa/decolonization/en/nsgt. The decolonisation process requires full self-determination as mandated under UN Security Council Resolutions 621 (1988), 690 (1991), 809 (1993) and 1033 (1995).
[2] https://curia.europa.eu/jcms/upload/docs/application/pdf/2021-09/cp210166en.pdf

2.2 Climate change in the national context

Under the 1991 United Nations ceasefire agreement in Western Sahara, the Frente Polisario and the Kingdom of Morocco are recognised by the UN as the two equal parties to the conflict. However, despite this formally recognised parity, failure to organise the UN-mandated referendum and to resolve the conflict has prevented the SADR from being recognised as a full UN member state. This prevents the SADR from participating in international climate change processes and mechanisms to which Morocco has full access as a UN member. Consequently, of these two otherwise equal parties to the conflict, only Morocco can be a party to the United Nations Framework Convention on Climate Change (UNFCCC) and a signatory to the Paris Agreement. The SADR, and the Sahrawi people it represents, remain locked out of these mechanisms and the wider global climate change governance and finance architecture. As a result of this situation, the SADR has no voice in climate negotiations or wider climate change governance processes, and effectively no access to international climate finance or technical assistance through which it might otherwise build its capacity for climate change mitigation and adaptation, and reduce its considerable vulnerability to the impacts of climate change. This is contrary to many of the principles recognised in the Paris Agreement, including those of climate justice, country-drivenness, participation and transparency, and the consideration of vulnerable groups and indigenous and local knowledge.

Through climate diplomacy and access to international climate finance, Morocco has been able to position itself as a climate leader, hosting COP7 and COP22 in Marrakech. These led to the Marrakech accords and the Marrakech Partnership for Global Climate Action, focusing on capacity building in developing countries and the implementation of the Paris Agreement respectively. Until recently, Morocco was listed on the influential Climate Action Tracker website Morocco as one of only two countries that are “1.5°C Paris Agreement Compatible” (the other being the Gambia). This status was based on emissions calculations covering the combined territories of Morocco and occupied Western Sahara. In September 2021, Climate Action Tracker amended its map to show Western Sahara as a distinct territory, and downgraded Morocco’s performance to ‘almost sufficient.'[3] Morocco’s continued inclusion of Western Sahara’s lower per capita emissions in its own carbon accounting is contrary to the principles of transparency and accuracy in Article 4 of the Paris agreement, given Western Sahara’s status as a non-self-governing territory and thus as a territorial entity that is external to and distinct from the national territory of Morocco.

Morocco has established the Agence pour la Développement Agricole as a National Implementing Entity under the Adaptation Fund, and CDG Capital Private Equity as an accredited national entity under the Green Climate Fund. These entities allow Morocco direct access to climate finance from both these funds, with the GCF providing Morocco with an estimated $229.3m for climate change related projects.[4] The Clean Development Mechanism (CDM) website lists 16 projects in Morocco. Up to the end of December 2020, Morocco had received $293.8m of approved climate finance from multilateral climate funds, while Algeria and Mauritania had received $13.8 and $74.4m respectively. The state of Palestine, whose situation is analogous to that of the SADR, received $28.3m. The SADR had received no climate finance.[5]

As well as taking advantage of its access to climate governance and finance mechanisms to support climate mitigation and adaptation within its internationally recognised borders, Morocco has also exploited these mechanisms to entrench its occupation of Western Sahara. In 2006, Morocco submitted a project design

[3] https://climateactiontracker.org/countries/
[4] https://www.greenclimate.fund/countries/morocco#overview
[5] Based on data from Climate Funds Update at https://climatefundsupdate.org/data-dashboard/regions/

document for the Foum el Oued Wind Farm Project near El Aaiún in occupied Western Sahara to the Clean Development Mechanism (CDM), one of the climate finance mechanisms under the UN UNFCCC. While this application was turned down by the CDM, the Foum el Oued wind farm, in occupied Western Sahara, was registered in 2013 under the Verified Carbon Standard (VCS), a programme for voluntary carbon offsetting.[6] In 2016, the Moroccan Agency for Sustainable Energy (MASEN) issued a Green Bond, audited by UK/French company Vigeo Eiris. The bond, worth €106m, has Moroccan investors and is supporting solar power projects named Noor Laayoune, Noor Boujdour and Noor Ouarzazate IV. Noor Laayoune and Noor Boujdour are in occupied Western Sahara (Noor Ouarzazate IV is in Morocco).[7] Significantly, the 80MW Noor Laayoune and 20 MW Noor Boujdour solar plants are listed among the Moroccan Agency for Sustainability Energy (MASEN) projects intended to deliver Morocco's goals of providing 42% and 52% of its energy from renewables by 2020 and 2030 respectively, according to Climate Action Tracker.[8] Morocco's ability to achieve its climate targets, and to comply with the Paris Agreement, are thus partially dependent on the development of renewables infrastructure in occupied Western Sahara, meaning that Morocco's contributions to achieving the Paris goals are directly dependent on colonialism.

Through such mechanisms, climate finance is being used to promote development in the occupied territory for the benefit of the occupying power, while being denied to the displaced and refugee Sahrawis, further entrenching the structural inequalities caused by the conflict, contrary to principles of climate equity and justice. The websites of organisations working on climate change and international development, and maps in the academic literature on climate change, frequently depict the entire territory of Western Sahara or the Occupied Territory as part of Morocco, contrary to Western Sahara's official UN status. This is another way in which climate change action and research often inadvertently normalises and supports the occupation.

The conflict itself acts to exacerbate climate change vulnerabilities, risks and impacts in a number of ways. The Sahrawi refugees in the camps around Tindouf are exposed to a number of hazards that are exacerbated by climate change (see §5), including flash floods and heat extremes. Infrastructure and services in the camps are basic and fragile, and thus vulnerable to the physical impacts of climate extremes. Poverty, reliance on international aid, and the fact that the camps are geographically constrained in a harsh desert environment all act to increase the vulnerability of the refugee population. Refugee status means that the inhabitants of the camps have very limited access to financial and other resources with which they otherwise might address this vulnerability. Without the representation of a sovereign UN member state, the Sahrawis are denied access to most forms of climate finance that could otherwise be accessed to build resilience and support adaptation. Resources for sustainable, low-carbon development are similarly elusive for the displaced and refugee Sahrawi population.

In the Occupied Territory, access to resources is conditional on acceptance of Moroccan sovereignty, and the Sahrawis are marginalised in favour of Moroccan settlers. Traditional Sahrawi nomadic lifestyles are severely constrained, resulting in a loss of indigenous knowledge relating to the environment and natural resources (see §6.8). In the camps, the forced sedentarisation of Sahrawis resulting from their status as refugees has a similar effect. The partition of Western Sahara prevents integrated approaches to climate

[6] See https://carbonmarketwatch.org/2013/11/07/watch-this-ngo-newsletter-7-voluntary-carbon-market-approves-wind-farm-project-on-occupied-land-previously-turned-down-by-cdm/. Last accessed 6 September 2021/

[7] See https://www.climateaction.org/press-releases/masen_africa_based_climate_bonds_pioneer_issues_moroccos_first_ever_green_b, last accessed 6 September 2021.

[8] https://climateactiontracker.org/countries/morocco/policies-action/

change mitigation and risk reduction, while the physical impacts of the conflict and partition increase environmental vulnerability to climate change (see §6.1).

The conflict itself thus serves to exacerbate climate change risks. In addition, the international climate governance and finance architecture works to advantage one party to the Western Sahara conflict (Morocco) while excluding and disadvantaged the other (SADR). This architecture denies a voice to the Sahrawi people and their representatives in international climate change processes as long as the conflict remains unresolved and the decolonisation process incomplete. It also denies the Sahrawi people access to the material resources required to reduce their vulnerability, build their adaptive capacity, and secure the development of a prosperous, sustainable, low-carbon society. The channelling of climate finance and technical support to one party in the conflict at the expense of the other serves to further disadvantage and exclude the already marginalised Sahrawi population, while advantaging the other party and facilitating its military occupation of Western Sahara. This is an example of climate finance worsening the inequalities and vulnerabilities that it is ostensibly intended to address, on a country-wide scale, while also supporting colonialism in Africa – an extreme example of climate injustice. The colonial nature of Morocco's climate change activities, and indeed the international climate change architecture, is underlined by Morocco's dependence on the development of renewables in occupied Western Sahara to meet its international climate change obligations under the Paris Agreement.

3 Methodological approach

As a result of the conflict in Western Sahara and the exclusion of the SADR from international climate governance and finance mechanisms, climate change issues in the SADR have received very little attention. Information relating to climate risks, impacts and vulnerabilities in the SADR is scarce, and there are no long-term observational climatological or meteorological records. Data on greenhouse gas emissions are extremely limited. The settlements and infrastructure that generate the majority of greenhouse gas emissions are concentrated in the Occupied Territory and are under Moroccan control, and these emissions are aggregated with those of Morocco in its own reporting.

These considerations, and the national circumstances outlined above, have influenced the approach taken to the development of this iNDC, which covers the entire territory of Western Sahara, including the areas controlled by Morocco and the SADR. The iNDC discusses the Sahrawi refugee camps in Algeria in terms of population vulnerability to hazards and impacts associated with climate variability and change, as mediated by the conflict and the displaced Sahrawis' status as refugees. Energy and emissions associated with the refugee population are also addressed as far as is possible, given that these will need to be considered in a unified SADR once the decolonisation process is complete.

The scarcity of data relating to greenhouse gas emissions and their sources, and the very low capacity of the SADR to develop emissions inventories, means that emissions estimates are based on secondary data sources. The landscape of energy and emissions is described as far as possible from a combination of primary sources (for the areas under the control of the SADR government) and secondary sources (for the areas currently under the control of Morocco). There is an urgent need to further develop the SADR's capacity in the area of emissions estimation and accounting.

The lack of formal monitoring and analysis of climate variability and change, and associated climate hazards in the SADR, represents a significant gap in the knowledge that is required for the development of policies, strategies, plans and actions to address climate risks. This INDC therefore includes a synthesis of information relating to the climate and environment of the SADR, historical changes and variations in

climate, potential future climate change, and key climate hazards. This is based on a combination of quantitative data from global climate datasets, documentary sources, and qualitative information from the Government of the SADR and other sources. This provides a basis for the subsequent discussion of climate change risks, impacts, vulnerabilities and responses - the first attempt at such a synthesis for the SADR. The component of the iNDC addressing adaptation describes the key climate risks, impacts and vulnerabilities in different sectors, and identifies potential adaptation actions based on this understanding of risks, impacts and vulnerabilities.

Based on the above assessments of mitigation and adaptation, a set of priority mitigation and adaptation actions is identified. Some of these are contingent on an end to the conflict, for example mitigation and adaptation actions in the occupied territory, and policy and other actions to address climate change throughout the entirety of an independent SADR. Other actions can be taken immediately. These include mitigation and adaptation actions in the Liberated Territory, and actions that can reduce the vulnerability of the displaced Sahrawi population and enhance their access to clean energy. Where actions are identified they are classified as conditional or unconditional, with the latter requiring external support for their development and implementation. With some limited exceptions based on existing estimates, this iNDC does not attempt to estimate costs associated with these actions. These will be assessed in the context of updates to this iNDC provided appropriate technical support can be secured.

4 Climate, environment and climate change in the SADR

4.1 Geography and climate

The SADR is situated in northwest Africa, bordering Algeria, Mauritania, Morocco and the Atlantic Ocean. Elevation ranges from near sea-level along the coastal littoral to around 600m above mean sea-level in the northeastern parts of the SADR where the Tindouf Basin extends into the territory. The climate is arid, although the SADR receives more rainfall than similar latitudes in the interior of the Sahara. In the north, this rainfall is channelled into the major watercourse of the Saguia ElHamra, which is fed by a dense drainage network distributed across the higher elevation northeastern areas. In the south, where there is less topographic variation, drainage networks are less dense and the major watercourses are mostly dormant and infilled with sediment. The largest drainage channel here is the mostly dormant Uad Atui.

There are no long-term observational meteorological records from Western Sahara. However, global gridded datasets indicate a long-term (1901-2020) mean annual temperature of 23.4°C averaged across the SADR. Mean monthly temperatures for the same period range from 17.6°C in January to 29.0°C in August. Temperatures are lower in the coastal regions and higher inland.

The same datasets indicate an average annual rainfall of approximately 40mm, averaged over the entire territory.[9] This is consistent with estimates from the middle of the twentieth century which indicate average annual rainfall of 30-40mm, with this rising to over 50mm in the elevated region of the Guelta Zemmour (Dubief 1953).

[9] Based on data from the CRU CY dataset obtained via the CEDA archive at: https://data.ceda.ac.uk/badc/cru/data/cru_cy/cru_cy_4.05/data/pre.

Most rainfall occurs from November to January. This is followed by progressively lower rainfall from February to April. Almost no rainfall occurs from May to July. Some rain occurs in August, with a large increase in rainfall in September. Average rainfall is much lower in October before increasing in November (Figure 1).

These rainfall averages over the entirety of the SADR mask significant differences between north and south. In the north, rainfall is generated mostly by Atlantic westerlies and can occur from September to May (Figure 1). In the south, rainfall is negligible from March to July, with some rainfall in August and a peak in September associated with the northernmost extension of the West African Monsoon (Figure 1). Rainfall can occur but is very low from October to February. The fact that rainfall is higher in September than October across the SADR and also in parts of the north indicates that the monsoon rains can also affect more northerly locations.

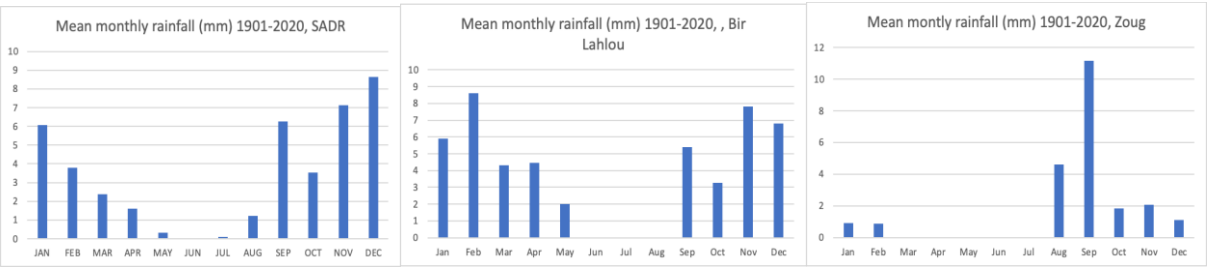

Figure 1. Long-term (1901-2020) mean monthly rainfall over the entire territory of the SADR (left) and in the vicinity of Bir Lahlou in the north (centre) and Zoug in the south (right).

4.2 Historical changes in climate

Direct observations of changes in climate variables for the SADR are not available, as there are no meteorological observing stations that contribute to global observational climate datasets in the territory of Western Sahara. Therefore, data on historical changes in climate have been extracted from global gridded datasets. These use a variety of scientific techniques to estimate the values of climate variables in areas where there are no observations, based on interpolation using observational data representing adjacent areas. Here we use temperature and precipitation (rainfall) data from the CRU TS 4.04 and the CRU CY Version 4 datasets from the Climatic Research Unit (University of East Anglia) and UK Met Office (Harris et al. 2020)[10], extending back to 1900. CRU TS data are available at a resolution of 0.5° x 0.5°, while the CRU CY data are national averages, representing spatially averaged data over the entirety of Western Sahara. Additional temperature data, extending back to 1850, were acquired from the Berkeley Earth Surface Temperature Project via the Carbon Brief interactive temperature tool.[11]

1. 4.2.1 Historical changes in temperature

The Berkeley temperature data indicate a warming over Western Sahara of between 1.6°C and 1.8°C depending on location, based on the difference in annual mean temperatures averaged over the periods 2011-2020 and 1850-1879, for 1°x1° grid cells. Warming is lowest along the coast, and greatest inland in

[10]For data sources see: https://crudata.uea.ac.uk/cru/data/hrg/.

[11] https://www.carbonbrief.org/mapped-how-every-part-of-the-world-has-warmed-and-could-continue-to-warm

the south-central areas of the Liberated Territory. This is significantly above the global average warming of around 1.2°C since the pre-industrial period.

The CRU CY temperature data indicate significant warming over the SADR during the twentieth century, with most of this warming occurring since the early 1970s, reflecting global trends (Figure 2). Annual mean temperature averaged over Western Sahara has increased by 1.1°C between 1901-1930 and 2011-2020. Warming is greatest in Spring (March-May) at 1.5°C, and lowest in winter (December-February) at 0.9°C. These figures are very similar when the later period is extended to 1991-2020.

Monthly and annual maximum temperatures averaged over the SADR are approximately 6°C higher than the equivalent mean temperatures in the CRU CY dataset. Increases in maximum temperatures are similar to increases in mean temperatures in the CRU CY data. The highest monthly maximum temperatures occur in July and August, reaching around 37° in the hottest years. These values are calculated by averaging the daily maximum values for each month for each grid cell, and then calculating a spatial average. This spatial and temporal averaging, and the interpolation based on data from stations outside Western Sahara, inevitably will mask much higher temperatures occurring on certain days in certain locations. A recent analysis indicates temperatures in excess of 50°C in the vicinity of Bir Lemuesat in Mauritania, near the border with Western Sahara, and in southwestern Algeria in the area in which the refugee camps are located.[12]

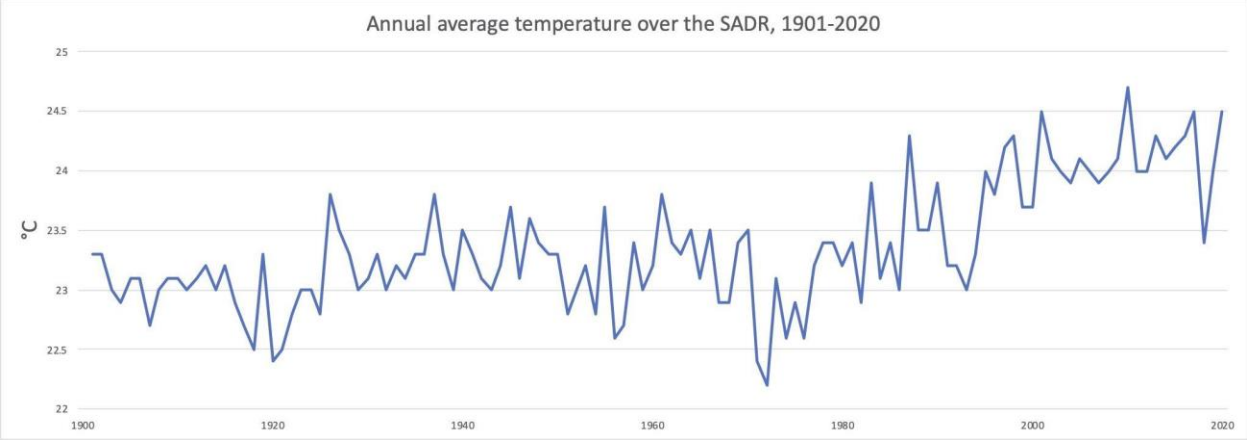

Figure 2. Time series of annual mean temperature, averaged over the territory of the SADR, from 1901-2020, based on CRU CY data.

Figure 3 shows changes in monthly mean and maximum temperatures for 2011-2020 and 1991-2020 compared with 1901-1930, based on the CRU CY data. Differences in maximum temperatures are greater when 1901-1930 is compared with 2011-2020, suggesting an amplification in heat extremes over the last decade. These data indicate that warming has been strongest in spring (March-May), particularly in May, when increases in both mean and maximum temperatures peak at 1.8°C. A secondary warming maximum of around 1.2°C is evident in October, suggesting that the effects of global climate change on regional climate are most prominent in the transitional seasons, at least in terms of temperature.

[12] https://www.bbc.co.uk/news/science-environment-58494641

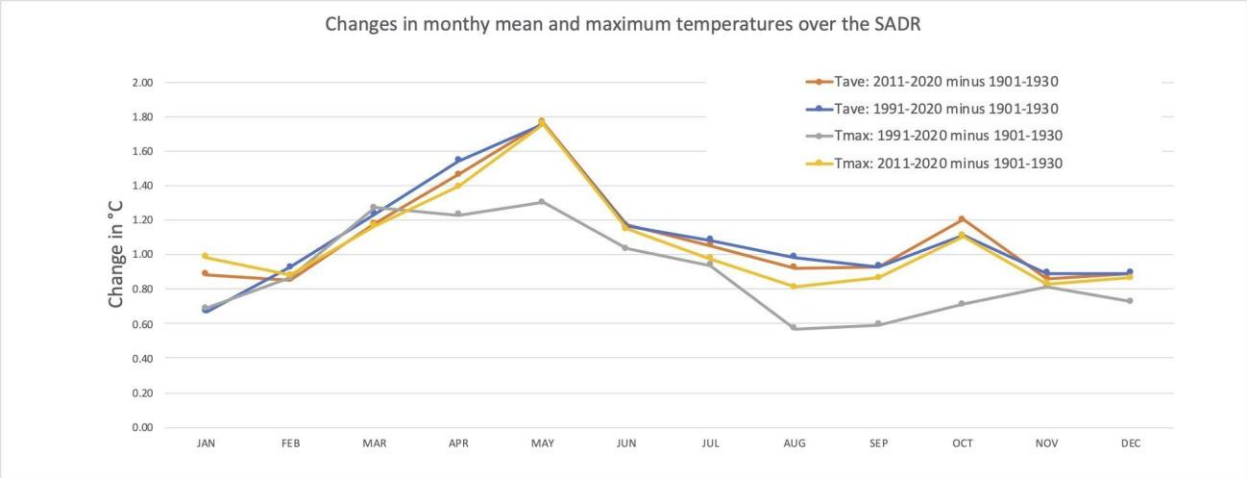

Figure 3. Changes in monthly mean and maximum temperature over the SADR using different comparison periods, based on CRU CY data.

2. 4.2.2 Historical changes in rainfall

No clear long-term trends are evident in rainfall time series from the CRU TS dataset averaged over the territory of the SADR (Figure 4), although higher resolution data from the same source suggest some reduction in rainfall in the region around El Aaiún since around 2005, and a slight decline in rainfall in the far south of the SADR between about 1950 and 1970.

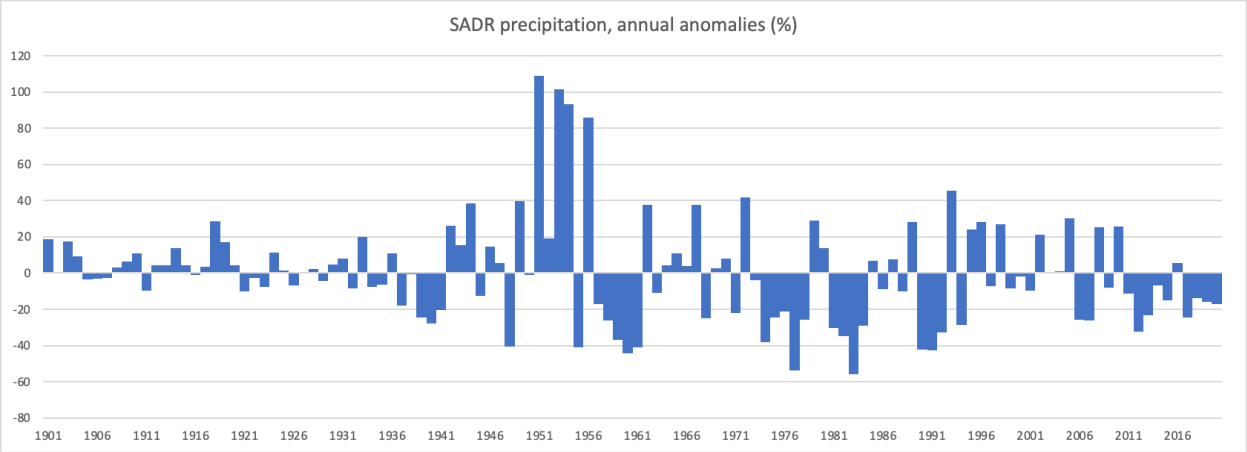

Figure 4. Time series of percentage annual rainfall anomalies for the SADR from 1901-2020, based on CRU CY data.

4.3 Climate projections

4.3.1 Temperature

Annual average temperature projections from KMNI climate explorer,[13] based on CMIP5 multi-model averages and a climate sensitivity of 3.1°C, indicate a warming of 1.5°-2°C along the coast of SADR and 2°-3°C inland by 2051-60 relative to 1901-1930 for moderate to high emissions scenarios consistent with current and likely future emissions trajectories. By 2081-90, warming increases to 2°-3°C across most of the SADR, reaching 3°-4°C in the most easterly regions. These projected increases should be compared with the 1.1°C of warming already experienced over the SADR relative to the same reference period. Warming in the interior Saharan region of southwestern Algeria, where the Sahrawi refugee camps are located, is similar to that in the eastern regions of the SADR.

A recent report by the UK Met Office on climate risks for the Middle East and North Africa (MENA) region, based on more-up-to-date modelling, suggests that "Western Sahara will be at least 2-4°C warmer than the current climate throughout the year, with larger increases during the hottest months" (Richardson et al. 2021: 14).

4.3.2 Rainfall

Climate projections summarised in the latest report from Working Group I of the IPCC (2021) suggest potentially large reductions in rainfall over most of the Maghreb and northern Sahara, and increases in rainfall over most of the Sahel and central Sahara, with the magnitude of these changes increasing with increasing global average temperatures. The transition zone separating these areas of increasing and decreasing rainfall extends from the northeast to the southwest of the SADR. These projections suggest possible reductions in rainfall in the northwest of the SADR and near the coast, and possible increases in rainfall in the eastern and southeastern regions of the SADR. However, likely fluctuations in the position of this transitional zone between wetter and drier conditions suggest increases in rainfall variability from year to year.

A recent analysis of climate projections by Almazroui et al. (2020) broadly reflects the IPCC projections, indicating drying over Morocco and northern Algeria but wetter conditions over most of the SADR for the period 2030-2059 under low to medium emissions pathways. Under high emissions scenarios the drying signal extends south from Morocco into the SADR, with wetter conditions being confined to the south of the SADR. The simulated increase in rainfall is strongest away from the coast. Under all emissions pathways, drying penetrates further south, and the area of increased rainfall retreats further inland (being confined to some of the eastern parts of the SADR), for the period 2070-2099. This is somewhat at odds with the IPCC projections, in which higher emissions scenarios are associated with intensification of the wetting and drying signals rather than any significant changes in the location of the wetter and drier areas. The exception is in the southern coastal regions where small increases in rainfall under 1.5°C of global warming give way to drying at higher levels of warming.

An increase in rainfall over parts of the SADR, most likely the south and east, therefore seems plausible. However, rainfall over the SADR is low, and the magnitudes of the projected changes are smaller than year-to-year variations in rainfall, particularly for lower levels of warming. Increases in rainfall amounts may

[13] https://climexp.knmi.nl/plot_atlas_form.py

also be accompanied by increases in year-to-year variability. Any increases in rainfall will also be offset by increased evapotranspiration due to higher temperatures.

4.3.3 Sea-level rise

Recent increases in sea-level along the coast of the SADR are comparable[14] with the observed global average sea-level rise of around 20 cm since 1900,[15] with the current increase being estimated at 3.4mm per year.[16] Future increases in global sea-level are uncertain but are likely to be in the region of 1m by 2100, with high-end estimates of 2.5m or more (Bamber et al. 2019).

4.4 Climate hazards and their evolution

Climate change will intensify many of the hazards that already affect the SADR. Higher average temperatures will be associated with more severe and protracted heat extremes, with increases in daily maximum temperatures likely to exceed increases in average temperatures. Climate models are likely to underestimate the most extreme high temperatures, as demonstrated by the recent very high temperatures experienced in other parts of the world. The frequency of very hot days, with temperatures in excess of 50°C, is likely to increase.[17]

Higher mean, maximum and minimum temperatures will increase evapotranspiration and reduce soil moisture, reducing runoff and groundwater recharge. Estimates from other arid regions indicate a decline in surface runoff of 6-10% per 1°C increase in temperature (Abu Taleb 2000, Agoumie 2003). Richardson et al. (2021) identify heat stress and reduced water available as priority risks for Western Sahara. IPCC (2021) projections indicate declines in soil moisture throughout the SADR, with larger increases in western regions.

Even if rainfall does not increase, there is the potential for an increase in rainfall intensity, with annual rainfall occurring in fewer, more intense rainfall events. Increases in rainfall intensity are apparent in observations from the Sahel (Panthou et al. 2018) and are anticipated to intensify under further warming (Berthou et al. 2019, Kendon et al. 2019). More intense rainfall would increase the risk of flash flooding, as is periodically experienced in the Sahrawi refugee camps.

Changes in atmospheric circulation and wind regimes have the potential to result in changes in dust mobilisation and transport, with implications for dust storm activity. While dust storm activity has declined since the 1980s in adjacent Sahelian areas (Middleton 2019), the future evolution of dust storms in the SADR and the wider Saharan region remains uncertain.

Sea-level rise will increase risks of episodic flooding associated with storm surges, as well as risks of saltwater intrusion into coastal aquifers and, ultimately, the permanent inundation of low-lying coastal areas. Storms associated with Atlantic cyclones already affect coastal areas in neighbouring Morocco (Mhammdi et al. 2020), and there is potential for climate change to influence storm tracks and intensity. Rising sea levels are expected to combine with more frequent and intense Atlantic storms to impact coastal regions in

[14] https://www.esa.int/ESA_Multimedia/Images/2020/09/Regional_mean_sea-level_trends_1993_2019
[15] https://climate.nasa.gov/climate_resources/133/sea-level-historic-data/
[16] https://www.nasa.gov/specials/sea-level-rise-2020/
[17] https://www.bbc.co.uk/news/science-environment-58494641

Western Sahara, accelerating erosion and increasing risks associated with flooding and storm damage to natural systems and infrastructure (Richardson et al. 2021).

5 Mitigation

5.1 Emissions estimates

The SADR has not yet established a system for monitoring, reporting and verification (MRV) of greenhouse gas emissions, and needs to build the capacity to do so. However, the European Commission's Emissions Database for Global Atmospheric Research (EDGAR)[18] provides estimates of greenhouse gas emissions by type, source and sector for all countries, including Western Sahara. The most recent data relating to CO_2 emissions are from 2019, with data on other greenhouse gases up to 2018 and estimates of emissions in terms of equivalent CO_2 up to 2015.[19] These estimates are based on data for the Occupied Territory only, with an estimated population of 582,480 (including Sahrawis and Moroccan settlers who have been encouraged by the Moroccan government to move to the territory). These emissions estimates exclude emissions from the Liberated Territory, the refugee camps, and from military activities on both sides of the Berm. The Occupied Territory, the Liberated Territory, and the refugee camps are therefore addressed separately below. An end to the conflict and the completion of the decolonisation process would have a significant impact on military emissions, and would permit the Sahrawi government and a returned refugee population to pursue a strategy of energy independence based on renewables. It would also allow a unified assessment of emissions across the entire territory of Western Sahara, fulfilling the criteria of transparency, accuracy, completeness, comparability and consistency as set out in Paragraph 13 of Article 4 of the Paris Agreement.

The downloaded EDGAR data indicate total emissions of fossil CO_2 for Western Sahara of 0.3 Mt in 2019. This follows a fall from 0.33 Mt in 2013 to 0.24 Mt in 2015, with a subsequent increase of 0.01 Mt per year (Crippa et al. 2020). Half of these emissions (50%) are attributed to transport, with 23% attributed to the power industry, 14% to other industrial combustion, 12% to buildings, and the remaining 1% to other sources.

CO_2 emissions per capita are estimated at 0.51 tonnes of CO_2, or just over 10% of the global average. This estimate ranks Western Sahara at 169 out of 208 countries, with comparable per capita emissions to Côte d'Ivoire, Nepal, Nigeria and Papua New Guinea. Western Sahara's per capita emissions are less than a third of those of Mauritania, a quarter those of Morocco, and less than an eighth those of Algeria.

EDGAR data indicate annual emissions of 13.9 kt of methane (CH_4) in 2019, almost all from fossil fuels, over half of which is the result of wastewater treatment and discharge (20%) and solid waste disposal (33%). Most of the remainder (45%) is associated with enteric fermentation, with a small amount (2%) from manure management.

[18] https://edgar.jrc.ec.europa.eu/country_profile/ESH

[19] Spreadsheets of data on emissions of specific gases are available to download, while calculations of total emissions and emissions of individual gases in terms of equivalent CO_2 are available up to 2015.

Emissions of nitrogen dioxide (N_2O) in 2019 are estimated at 165 kt, 70% of which result from direct emissions from managed soils. Wastewater treatment and discharge accounts for 15% of N_2O emissions, while indirect emissions from managed soils and atmospheric deposition of NOx and NH3 account for 5% each. The remainder of N_2O emissions come from road transport, manufacturing and other sectors.

Data for 2015 indicate total per capita emissions in terms of CO_2e of 1.58 tonnes per year, or just over three times the emissions of CO_2 alone. Most of this is associated with non-combustion emissions in the form of methane from fossil sources (presumably the burning of gas), which amount to 0.92 tonnes per year.

5.2 Energy and emissions in the Occupied Territory

5.2.1 Energy infrastructure

There are six power stations in Occupied Western Sahara, two in the area of El Aaiún (one powered by diesel, the other by gas turbine), and one each in Es-Semara, Bojador, Dajla and Auserd. Morocco imports Liquid Petroleum Gas (LPG) into occupied Western Sahara, mostly from the UK.[20]

There is today a 400 kV transmission line connecting occupied Western Sahara to Morocco. A second 400 kV connection between Agadir and the occupied city of El Aaiún is meant to be completed by 2023.[21] A 400kv power interconnection between El Aaiún and Dajla city is currently under construction (Res4Med 2018, 4). A 'Roadmap for Sustainable Electricity Trade Between Morocco and the European Internal Energy Market' was signed at COP22,[22] raising the possibility that the EU may import renewable electricity generated in occupied Western Sahara, contrary to international law that prohibits such exploitation without the consent of the occupied people.

5.2.2 Renewable energy developments

The exploitation of renewable energy resources in occupied Western Sahara plays a substantial role in Morocco's goal of sourcing 52% of its energy from renewable sources by 2030, with contributions of 20% from solar, 20% from wind, and 12% from hydropower.[23] Achieving these solar and wind targets is dependent on renewables projects in the Occupied Territory.

Currently there are three operational wind farms in Western Sahara. The 5 MW CIMAR wind farm in El Aaiún exclusively powers the CIMAR cement factory. The 50 MW Foum el Oued wind farm in El Aaiún currently supplies 100% of the energy required to operate the Bou Craa phosphate mine located 100 km inland (OCP Group 2020, 119). Indeed, the plant was built with the intention of "supply[ing] power directly to partner factories PhosBoucraa, the Office National de l'Electricité et de l'Eau Potable (ONEE) seawater desalination plant, and the Moroccan Airports Authority (ONDA).[24] The 200 MW Aftissat wind farm is operational, and will soon include a 400kV HV power line to connect the plant to the ONEE substation in the area of El Aaiún via the city of Bojador, thereby contributing to the connection of occupied Dajla city to

[20] https://wsrw.org/en/news/uk-takes-lead-in-gas-exports-to-occupied-western-sahara
[21] https://www.lebrief.ma/10078-exclusif-abderrahim-el-hafidi-lonee-accompagne-lessor-des-provinces-du-sud
[22] https://ec.europa.eu/energy/sites/ener/files/documents/2016_11_13_set_roadmap_joint_declaration-vf.pdf
[23] https://www.iea.org/policies/6557-morocco-renewable-energy-target-2030
[24] https://www.res4med.org/wp-content/uploads/2018/06/Country-profile-Marocco-2.pdf P.45

the Moroccan national grid. Off-takers of the wind farm will be LafargeHolcim Maroc, OCP, Sonasid, Ciment du Maroc and Air Liquide Maroc.[25]

Two wind farms in occupied Western Sahara are part of Morocco's wind programme: the 100 MW Tiskrad farm and the 300 MW Bojador farm. These two wind farms represent half of the programme's projected capacity. The offtakers for both will be ONEE.[26] Construction on the Bojador farm started in 2021.

All operational wind farms - except the privately owned CIMAR farm - belong to the portfolio of the Moroccan King's energy company NAREVA, as do the planned farms under the Integrated Wind Energy Programme.

Morocco has stated an intent to commission the 200 MW Aftissat II farm in 2022-2023.[27] In May 2020, the Moroccan Council for Competition disclosed that two fully owned subsidiaries of French company Voltalia SA (Voltalia Maroc and VLT Investment 6 BV) had set up a joint company called 'Parc Eolien de Ghrad Jrad SAS' for the development, realisation and exploitation of a 75 MW wind farm near El Aaiún. Three years before, Voltalia had obtained the status of independent electricity producer for the region around El Aaiún in the Occupied Territory.[28] A 900MW wind farm to support blockchain computing is also under development, with financial mobilisation for the first 36 MW phase occurring in 2021.[29] In 2021, A 40 MW wind farm will be installed to power the desalination plant in Dakhla, expected to benefit the nearby agri-industry.[30] The existing Aftissat wind farm is also used for industry (Allan et al. 2021). In October 2021, plans to change the location of a 200 MW wind farm that was supposed to be constructed in Safi (Morocco) to Dakhla, Western Sahara, were leaked.[31]

There are currently two operational solar plants in the Occupied Territory: the 85 MW Noor Laayoune (El Aaiún) and the 20 MW Noor Boujdour (Bojador) plants. Further additions to both plants are expected under the 800 MW Noor PV II project, which will be deployed at the above two sites in occupied Western Sahara. It is not yet clear how much of the total capacity will be installed at the two sites in Western Sahara, but the area reserved for these sites is considerably larger than that for the Moroccan sites. The newest planned addition at the time of writing will be in Dajla. The farm will be built adjacent to industrial greenhouses owned by the King, members of the Moroccan ruling elite, and French conglomerates (Africa Intelligence 2020). These greenhouses are responsible for draining underwater wells on a large scale (WSRW 2012: 16).

The development of renewable energy in the Occupied Territory thus supports the personal financial interests of the Moroccan ruling elite, facilitates unsustainable and potentially maladaptive water intensive agriculture, and provides financial returns and potentially energy resources to foreign interests at the expense of the Sahrawi people, and without their consent, contrary to international law.

In addition to the development of wind and solar power, the Occupied Territory is currently being surveyed in terms of its potential for generating geothermal energy (WSRW 2020a).

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[25] https://www.res4med.org/wp-content/uploads/2018/06/Country-profile-Marocco-2.pdf p.46-47

[26] https://www.res4med.org/wp-content/uploads/2018/06/Country-profile-Marocco-2.pdf P.48

[27] https://www.mem.gov.ma/en/Pages/secteur.aspx?e=2&sprj=111

[28] WSRW.org, 10.08.2020, Voltalia to construct wind farm in occupied Western Sahara, https://www.wsrw.org/a105x4784

[29] Construction Review Online, 14.12.2020, Morocco to be home to a 900 MW wind power plant in Dakhla, https://constructionreviewonline.com/news/morocco-to-be-home-to-a-900-mw-wind-power-plant-in-dakhla/

[30] https://wsrw.org/en/news/engie-globEldiligence-to-start-secretive-consultation

[31] https://www.africaintelligence.com/north-africa_business/2021/10/12/in-dakhla-akhannouch-benjelloun-and-windvision-are-powering-a-secret-wind-turbine-project,109697991-art

5.2.3 Non-renewable developments

Morocco's search for hydrocarbons in occupied Western Sahara began in 2001 when the Kingdom signed oil exploration agreements with the French company TotalFinaElf (now known as Groupe Total SA) and Oklahoma-based Kerr-McGee. In total, the Moroccan state owned oil company Office National des Hydrocarbures et des Mines, (ONHYM) has awarded licenses for seven oil and gas blocks in occupied Western Sahara.[32] The first companies to drill offshore, in 2015, were a partnership made of British Cairn Energy, US Kosmos Energy and Moroccan ONHYM. They did not find oil in commercial quantities, but Cairn and Kosmos have not ruled out returning to these blocks in the future. British/Irish company San Leon was the first company to drill for oil onshore occupied Western Sahara in 2015. Again, oil was not found in commercial quantities. Any exploitation of fossil fuel resources in the Occupied Territory would be both contrary to both international law and inconsistent with the Paris temperature goal.

The Government of the SADR has established the SADR Petroleum and Mining Authority (SADRPMA), charged with formulating and administrating state policy regarding the exploration for and exploitation of petroleum and minerals and implementing related law.[33] SADRPMA awards permits and petroleum licences which could potentially result in the exploitation of any commercially viable oil and gas reserves in the Liberated Territory and (once the decolonisation process has been completed) in the areas currently occupied by Morocco. These will be reviewed in the context of the SADR's commitment to achieving the Paris Goals once the conflict has been resolved and subject to external support and the availability of investment to secure the energy needs of the SADR via renewable energy.

5.3 Energy and emissions in the Liberated Territory

The Liberated Territory supports a small population of nomadic families and a small but significant civilian population at Tifariti, Buer Tiguisit, Mheiriz, Bir Lehlu, Mijek, Aguenit, Douggej and Zoug. A recent appeal for humanitarian assistance to address the COVID-19 pandemic indicated a population of over 60,000 in the Liberated Territory,[34] although recent reports indicate a significant migration from the Liberated Territory to the camps and Mauritania following the breakdown of the ceasefire between Morocco and the Frente Polisario in November 2020.

Emissions in the Liberated Territory have not been quantified but will comprise emissions predominantly from transport and military activity, the latter of which could be reduced significantly given an end to the Western Sahara conflict.

Solar power dominates in the civilian sector in the Liberated Territory. Administrative headquarters, public institutions, hospitals, dispensaries, water facilities and shops depend on solar energy. The hospital at Tifariti, which is financed by the government of the Spanish region of Navarra, uses solar energy with conventional back-up generators for emergency power. The Tifariti hospital is the principal health facility in the Northern Sector of the Liberated Territory and serves the administrative districts of Bir Lahlou, Mheiriz and Boir Tighisit, covering a significant proportion of the population of the Liberated Territory and the nomadic population that traverses the Western Sahara - Mauritania border.

[32] WSRW, A Platform for Conflict, 2014, available at https://wsrw.org/files/dated/2014-10-16/a_platform_for_conflict_web.pdf [accessed 7 October 2021]. P.8.
[33] SADR Mining Law of June 2014.
[34] Urgent Appeal: Effects of COVID-19 on the humanitarian situation of the Sahrawi refugees. Sahrawi Red Crescent, 28the April 2020.

The Government of the SADR has also piloted wind power in the Liberated Territory and is keen to expand small-scale wind and solar energy in the Liberated Territory. Pilot studies and projects indicate significant potential for such an expansion, but this is constrained by a lack of finance and the current military conflict.

The Association pour le Développement des Energies Renouvelables Sahara-Solaire-Solidaire is currently developing renewable energy systems in the Liberated Territory. These include an autonomous photovoltaic system for use in remote locations to deliver partial air conditioning in health facilities and electricity for lighting, refrigeration and medical equipment. This project is also examining the potential for solar thermal sterilisation of medical instruments.

Other projects involve the use of solar water pumps for small-scale irrigation and to provide water for livestock, supporting resilient livelihoods for Sahrawi households. The Association Secours Sahraoui, a non-profit association established in 2011, is investigating the potential to integrate existing solar power systems with wind power. Currently, the Association Secours Sahraoui has three active projects in the Liberated Territory backed by limited private finance, and is working with the Ministry of Water and Environment to develop an energy strategy for the Liberated Territory that can also be extended to the areas currently occupied by Morocco once the decolonisation process is complete. The SADR is currently undertaking a scoping study for the energy needs of a returned refugee population in the Liberated Territory. The envisaged energy sources considered in this scoping study are exclusively renewable.

5.4 Energy and emissions in the refugee camps

The most recent census of the Sahrawi refugee camps, undertaken jointly by UNHCR and WFP in 2018, indicates a population of 173,600 across the five camps in the vicinity of Tindouf in 2018.[35] Electricity access in the camps is based on a mix of conventional and renewable energy sources.

Historically, energy use has been very low in the camps. Following the Moroccan invasion in 1975, the Frente Polisario guaranteed a single gas cylinder for each refugee family, provided by the Sahrawi Ministry of Transport and Energy (MTE). Key buildings such as administrative buildings and hospitals were equipped with generators. Subsequently, solar energy was adopted as a pragmatic means of meeting the basic energy needs of a refugee population in a remote and harsh desert environment, with each household having at least one solar panel. Until 2016, small-scale solar represented the main source of energy for most households.

A Swiss humanitarian organization brought the first solar installation to Smara camp in 1987, initially to test the viability of solar energy in the context of the refugee camps. Further collaborations with mainly Spanish NGOs expanded solar energy resources in the camps. Most families in the camps have a solar panel, or solar panels, to meet their residential energy needs. The Association Secours Sahraoui has worked with the MTE and Spanish solidarity organisations to install and maintain solar energy units in the refugee camps.

In 2016, in collaboration with Algeria, the SADR began connecting some of the refugee camps to the Algerian grid serving the town of Tindouf, expanding energy access and enabling greater energy use within

[35] Sahrawi Refugees in Tindouf, Algeria: Total In-Camp Population, Official Report, UNHCR, March 2018. Available via https://www.europarl.europa.eu/doceo/document/E-8-2018-002896_EN.html and https://www.acaps.org/country/algeria/crisis/sahrawi-refugees.

households. To date, this initiative has met around 70% of the refugee population's energy needs, covering four out of the five refugee camps.

Increased connectivity to the Tindouf grid means that use of solar energy has declined, although Smara camp relies on solar power. Solar units continue to be maintained and also represent a resilient supply of electricity in the event of power cuts that may become more likely under climate change, due to increased demand and the direct impacts of extreme heat and other hazards on energy infrastructure (Burillo et al. 2017). The Association Secours Sahraoui is currently maintaining solar installations in El Aaiún camp and is continuing to train technical staff from the MTE, including maintenance tours of electrical installations.

No estimates of total or per capita emissions for the camps are currently available, although emissions from energy will be low due to low usage. Connection to the Algerian grid is likely to have resulted in an increase in emissions based on the shift from solar power and the greater availability of energy. These emissions will depend on the nature of the energy mix supplying the Tindouf grid. An expansion of renewables to adequately meet the energy needs of the Sahrawi refugee population, with external support via climate finance, would support both the energy independence of the refugees and help to reduce emissions in the near-term. The expansion of small-scale renewables would also provide an energy source that is readily transferable to and scalable in the territory of the SADR once the decolonisation process has been completed.

Additional emissions in the camps will be associated with transport. It is estimated that there is approximately one vehicle for every 2 to 3 families in the camps, suggesting somewhere in the region of 10,000 vehicles in total. Most of these vehicles are old. However, figures for mileage from which to calculate emissions currently are not available.

5.5 Mitigation actions

While data on emissions by sector are available for Western Sahara from other sources, these only address emissions in the Moroccan-occupied territory and exclude the Liberated Territory and the camps. To date, the Government of the SADR has not been in a position to estimate emissions in the territory it controls or in the Sahrawi refugee camps; or develop any formal mitigation policies, strategies or plans, due to capacity constraints related to the SADR's national circumstances and exclusion from climate finance mechanism that could fund technical support.

It is the aspiration of the SADR to participate fully in global mechanisms intended to mitigate climate change through reductions in greenhouse gas emissions. This will require estimates of baseline emissions for the entire territory of the SADR and the refugee camps, the development of emissions scenarios considering projected population growth and development, and the development of a system for monitoring, reporting and verification (MRV) of emissions. There is an urgent need for capacity building and technical assistance in these areas to support the Government of the SADR in its mitigation aspirations. Access to climate finance and international expertise to support this capacity building and provide support for assessment of emissions and the development of MRV systems is a necessary condition for the SADR participating meaningfully in global mitigation efforts and meeting its moral obligations as a member of the global community. Institutional and diplomatic support to enable the SADR to participate in processes under the UNFCCC is also a priority for driving the mitigation agenda in the SADR.

Under current circumstances, such support would enable emissions estimates for the camps and the Liberated Territory. While these emissions will be very small, they are currently excluded from global emissions accounting. Currently, only the proportion of Western Sahara's emissions associated with the Occupied Territory are accounted for, and these are misleadingly integrated with Morocco's emissions, as discussed above. Therefore, support for estimating emissions and undertaking MRV in a unified SADR is necessary to meet the Paris criteria of transparency and accuracy in emissions accounting.

The SADR is committed to the continued roll-out of renewable energy, particularly small-scale solar energy units in sparsely populated areas and smaller settlements within the territory of the SADR. Under current circumstances this roll-out can be implemented in the Liberated Territory. Upon completion of the decolonisation process it will be implemented in the remainder of the SADR. Pending the completion of the decolonisation process and the return of the refugee population to a unified SADR, renewable energy will be maintained and expanded in the refugee camps to complement mains electricity via the TIndouf grid and to deliver energy resilience in the event of power outages that may become more likely as a result of higher temperatures and other climate-related hazards. These measures can be carried out under the current national circumstances given sufficient funding. Accessing climate finance to support the expansion of renewable energy through individual units and mini-grids in the Liberated Territory and the camps is therefore a priority for the Government of the SADR, as is technical support to facilitate this access to climate finance. The Association Secours Sahraoui is currently seeking €20 million for rural electrification in the Liberated Territory to install seven small power plants powered by solar and wind energy, producing 30,000 MWh per year and benefiting 40,000-50,000 people.

Upon completion of the decolonisation process, the Government of the SADR will assess the energy needs of the entire territory of the SADR and conduct a feasibility study for delivering these needs entirely through renewable energy sources. The feasibility of developing and implementing a rapid pathway to net-zero emissions will be assessed, minimising reliance on offsets, carbon sequestration and the discounting of extra-territorial emissions. Any energy infrastructure that has already been developed in the areas occupied by Morocco, or that is at the planning or implementation stage in these areas, will be reviewed and assessed in this context.

6 Adaptation

The SADR and the refugee population in Algeria are highly vulnerable to climate hazards and the emerging and anticipated impacts of climate change. This vulnerability is a function of physical exposure to climate hazards on the one hand, and a suite of social, economic and political factors that amplify risk on the other. These factors include poor infrastructure, economic marginalisation, lack of access to natural resources in the areas occupied by Morocco, lack of access to technical expertise and international research networks and outputs, and exclusion from international climate finance and governance mechanisms. These factors severely constrain the SADR's capacity to respond to climate change risks and impacts through adaptation, resilience building and risk reduction measures.

Consequently, no assessments of climate risks, vulnerabilities or impacts in the SADR have been carried out to date. The discussion of adaptation in this NDC therefore incorporates a very broad, high-level assessment of vulnerabilities and impacts, to the extent that this is possible based on the available information. Vulnerabilities and impacts are discussed for a number of broadly defined sectors. For each sector, possible adaptation responses are also discussed. Along with the mitigation priorities discussed above, these responses represent a basis for the priorities and action plan presented in §7.

6.1 Environment, ecosystems and biodiversity

6.1.1 Vulnerabilities and impacts

6.1.1.1 Inland ecosystems

The SADR houses a rich variety of species and ecosystems, including oasis systems, desert scrub, dense acacia woodland, and coastal wetlands.

Many wadis are well-vegetated, and rainfall can result in the growth of savannah-like grassland. In the north of the SADR, biodiversity is concentrated along the wadis and escarpments associated with upland areas, whereas in the south, plant and animal species are concentrated around the numerous large granite outcrops. These locations play an important role in sustaining the ecology of the Sahara over long timescales, acting as biological reservoirs or *refugia* from which plant and animal species can expand during humid Saharan episodes.

Climate change has the potential to further reduce the extent of these *refugia* via the mechanisms of higher temperatures, increased aridity and reduced moisture availability. The vulnerability of these ecosystems to climate change is increased by anthropogenic pressures, including habitat disturbance and destruction, for example resulting from urbanisation, infrastructure development, hunting and temporary occupation by military personnel during times of conflict.

The most dramatic and direct impact of the conflict is the interruption of drainage systems by the Berm. Many locations are visible on satellite imagery where the Berm cuts across wadis, starving downstream sections of moisture, with a resulting decline in vegetation and habitat (Figure 5). These downstream impacts tend to occur in the Liberated Territory, due to the nature of the topography associated with the Berm. These locations thus experience the double impact of physical diversion of surface runoff coupled with increased evapotranspiration resulting from higher temperatures. In this way, the physical manifestations of the conflict combine with climate change to amplify risks to ecology and biodiversity. The Berm and the minefields that run along its length also pose a risk to wild fauna.

Figure 5. Google Earth imagery of wadis interrupted by the Berm in the vicinity of Oum Drega, centred on 23.943°N; 13.345°W (left) and 23.964°N; 13.290°W (right).

6.1.1.2 Coastal and marine systems and wetlands

The SADR houses a number of important wetlands, including four Ramsar sites (Wetlands of International Importance) in the occupied territory. These are wrongly listed on the Ramsar website as being located in

Morocco, providing an example of how international environmental governance has been co-opted into normalising Morocco's occupation of Western Sahara. The four sites are summarised below, based on information taken from the Ramsar website.[36] Names in brackets are those used on the Ramsar website.

1. **Saguia El Hamra (Oued Assaquia ElHamra)**, covering the lower reaches of the Saguia ElHamra in the vicinity of El El Aaiún, and including a swamp and an estuary. This is an important site for migratory birds and includes the three main Ramsar wetland types (marine and coastal, inland, and human-made). The site hosts scientific, educational, leisure and tourism activities but currently has no management plan. Climate change poses a potential threat to this site via possible reductions in water supply in the form of reduced runoff and enhanced evapotranspiration resulting from higher temperatures. Higher temperatures may also adversely affect water quality.
2. **Aftissat-Bojador (Côte Aftissate-Boujdour)**, stretching for 50km along the coast south of Cape Bojador. Home to several endemic and rare plant and animal species and another stopover point for migratory birds, this site consists of land located between a 70m high cliff and mobile dunes adjacent to a beach. No management plan is indicated. Sea-level rise and associated accelerated coastal erosion pose a risk to this site, particularly in the northern areas, where some land is already below the high-tide line.
3. **Bay of Dajhla (Baie d'Ad-Dakhla)**, a bay separated from the Atlantic Ocean by the Dajla peninsula, which consists of a system of dunes. This site encompasses a variety of important marine and terrestrial habitats and is home to numerous plant and animal species, including endemic, rare and vulnerable species. There is no management plan, and the further development of fishing and tourism, as well as the development of a nearby harbour, pose potential threats. Climate change threatens this site through changes in ocean currents and water properties (nutrients, temperature, oxygen content), sea-level rise, erosion and overtopping.
4. **Subject Imilili (Sebkhat Imlili)**, inland and south of Dajla, comprising a salt pan (sebkha) that is the remnant of a freshwater lake, and more than 160 permanent water pockets that support endemic and rare species including plants and fish, as well as migratory birds. No management plan is indicated. Climate change may affect this site via changes in groundwater recharge and water quality.

The lack of management plans for the above sites means that they are vulnerable to impacts associated with economic development, natural resource exploitation and tourism, which Morocco is encouraging in the Occupied Territory. Any environmental impacts from these activities may compromise the resilience of these important ecosystems and amplify their vulnerability to the impacts of climate change.

6.1.2 Potential adaptation options

The preservation of SADR's environment and ecology will be facilitated by the development of an inventory of important sites, sites at risk, and priority areas/systems for preservation and management. These sites would include wetlands such as the above Ramsar sites, oasis sites and other biodiversity hotspots such as species-rich wadis, higher-elevation areas and areas of high topographic variation. Monitoring of these sites would enable their health to be tracked and climate change impacts identified. Monitoring would enable particularly vulnerable sites to be identified and adaptive management plans developed. Adaptation measures would consist of a combination of conventional conservation measures to reduce stress on ecosystems and enhance their resilience, and other possible interventions such as the capture, storage

[36] https://www.ramsar.org/wetland/morocco

and diversion of water to compensate for climate-driven water deficits in specific ecologically important locations, and assistant inland migration for natural systems threatened by sea-level rise.

With the appropriate support, the above measures could be implemented in the Liberated Territory under the current national circumstances (subject to the outcome of the current phase of hostilities following Morocco's breaching of the ceasefire in November 2020), and throughout the SADR after independence. Following independence, the SADR would be in a position to develop management plans for the Ramsar sites discussed above, and other important coastal sites. These would include measures to regulate economic activities such as tourism and natural resource exploitation, as well as appropriate planning and zoning frameworks, in order to sustain the SADR's important natural heritage in the face of climate change impacts including water stress and sea-level rise.

An end to the conflict and the dismantling of the Berm would enable the rehabilitation of drainage systems and the restoration of ecological refugia damaged by their interruption. This would also reverse any fragmentation of ecosystems associated with the physical infrastructure of the Berm and disturbance by military activities.

6.2 Settlements, infrastructure, health & wellbeing

6.2.1 Impacts and vulnerabilities

Climate change impacts on infrastructure are closely linked with impacts on health and education, and other aspects of human wellbeing. Most of these impacts play out in urban contexts, and are therefore considered together here. However, impacts on infrastructure and human physical wellbeing also occur outside of urban contexts, and these are also discussed.

6.2.1.1 Risks associated with flooding

Floods periodically cause widespread damage to homes, infrastructure and food stores in the refugee camps. Heavy rains in the area around Tindouf in early October and again on 29th and 30th October 1994 caused flooding in the camps, killing eight people and leaving some 30,000 homeless.[37] On 10th and 11th February 2006, severe floods destroyed more than half the houses and all the schools in Auserd, Smara and El Aaiún camps, and badly damaged a further 25% of homes, leaving an estimated 50,000 people homeless. Community buildings collapsed, health clinics were rendered unusable, and hospitals, pharmacies and medical equipment were badly damaged.[38] Serious flooding associated with heavy rainfall occurred between 26th and 24th October 2015, damaging or destroying food stores and more than 17,000 homes.[39,40] Flooding associated with a storm and heavy rain on 15th August 2016[41,42] left some 2000 people homeless and partially destroyed six out of eight schools in El Aaiún camp. These floods also damaged three health centres and the main water tower.

[37] https://reliefweb.int/report/algeria/algeria-floods-tindouf-area-nov-1994-un-dha-situation-reports-1-4

[38] https://reliefweb.int/report/algeria/algeria-unhcr-airlift-delivers-vitElaid-flood-stricken-tindouf-camps

[39] https://reliefweb.int/report/algeria/flooding-sahrawi-camps-we-haven-t-got-time-wait

[40] https://www.unhcr.org/uk/news/briefing/2015/10/562a19706/devastating-flooding-affects-25000-sahrawi-refugees-tindouf-camps.html

[41] https://reliefweb.int/report/algeria/algeria-flash-floods-echo-red-crescent-un-ngos-echo-daily-flash-18-august-2016

[42] https://reliefweb.int/report/algeria/unicef-saharawi-refugee-camps-tindouf-algeria-humanitarian-situation-report-no-1-18

Damage to and destruction of food stocks by flooding undermines the already fragile food security situation in the camps, and floodwaters have the potential to spread water-borne diseases. Floods, like other disasters, have impacts on mental health, particularly where they result in homelessness or the loss of family members. The destruction of schools and other infrastructure by periodic floods in the refugee camps has a direct impact on children's education. Disruption and trauma related to the loss of housing and the wider impacts of floods will also affect children's learning, as will poor nutrition due to the precarious food security situation in the camps. The refugee population is particularly vulnerable to floods due to their physical circumstances and limited capacity to respond. As indicated above, flood risk is likely to increase due to an increase in the intensity of extreme rainfall, with the potential for greater adverse impacts on infrastructure and health.

Information on the frequency and impact of flash flooding in the territorial area of the SADR is very limited. However, increases in the intensity of extreme rainfall events resulting from climate change are likely to increase the risk of severe flooding in both the camps and the territory of the SADR itself. This would exacerbate any existing risks associated with flood damage to housing, roads and other infrastructure.

One consequence of flash flooding within the territory of the SADR is the mobilisation and transport of mines and other ordnance, posing risks to nomadic populations and their livestock, military personnel, and others including informal migrants. A 2010 study reported 225 hazardous areas east of the Berm, and 244 west of the Berm, with new such areas still being discovered (Cucinotta 2010). A 2010 report indicates a total of 1427 casualties of mines and unexploded ordnance to 2017, including 56 deaths. In 2017 there were 11 civilian and 13 military casualties, including four deaths.[43] Increased risks of flash flooding and erosion may increase the transport of mines unexploded ordnance, making monitoring more challenging and increasing risks to life.

6.2.1.2 Risks associated with heat extremes

Heat extremes can affect infrastructure directly and indirectly. Direct impacts include overheating of electricity generators, transmission lines and substations, which can result in power outages (Burillo et al. 2017). Indirect impacts include increased electricity demand for cooling, which is likely to occur when infrastructure is most at risk from extreme high temperatures, amplifying the risk of power outages (Salimi and Al-Ghamdi 2020).

Heat extremes have significant health impacts, particularly on the eldery and those with other health conditions such as cardiovascular disease (Ebi et al. 2017). Extreme heat has been linked with an increased risk of occupational injuries and with adverse birth outcomes (Kuehn and McCormick 2017, Ebi et al. 2017). Power outages during episodes of extreme high temperature can increase health risks via their impacts on the functioning of health services and cooling systems, reducing the capacity of health services to cope and amplifying the impacts of extreme heat in urban environments.

The above risks will increase significantly as a result of climate change, which is likely to result in increases in maximum temperature significantly greater than those in average temperatures. The historical occurrence of extreme temperatures above 50°C near the border between Western Sahara and Mauritania and in western-central Algeria[44] suggests that such temperature extremes should be expected to occur regularly in future in the SADR and the refugee camps. Andrews et al. (2018) locate the SADR at the edge

[43] http://www.the-monitor.org/en-gb/reports/2020/western-sahara/casualties.aspx

[44] https://www.bbc.co.uk/news/science-environment-58494641

of the zone of 'extreme risk' where wet-bulb temperatures are projected to periodically exceed 34°C under a global warming of 1.5*C or more. Wet-bulb temperatures above this threshold pose severe risks to human health and productivity (Andrews et al. 2018). A wet-bulb temperature of 35°C has been proposed as an upper limit for human survivability by Im et al. (2017), while wet-bulb temperatures above 29°C are characterised as extremely dangerous (Kang et al. 2019). The forcible displacement of most of the Sahrawi population to camps in the hotter desert interior, and their exclusion from the cooler areas in the west of Western Sahara, where warming is likely to be less severe, means they are potentially exposed to existential risks from heat extremes as a direct result of the conflict and Morocco's occupation of Western Sahara.

6.2.1.3 Risks associated with dust storms

Dust storms can affect infrastructure, for example by reducing the efficacy of solar power generation and interrupting transport. Dust storms can also adversely affect human health. The camps are periodically exposed to intense dust storms similar to those that affect the Sahel region. Asthma is widespread in the camps, and any changes in dust mobilisation, transport and atmospheric residence time could exacerbate this and other health conditions.

6.2.1.4 Risks associated with sea-level rise and coastal storms

The greatest risks to infrastructure from sea-level rise and associated hazards (erosion, coastal storms) are at Dajla and the twin coastal settlements of El Aaiún and El Marsa, where built infrastructure including the port at El Aaiún is at risk from temporary or permanent increases of water levels of 1m. The coastal road that runs north from Foum El Oued to the Moroccan border is also less than 1m above current high-water levels, and will likely be subject to increasingly frequent inundation and damage in future. Infrastructure at Bojador, and land around Aftissat and La Guera are also at risk from increases in sea-level likely to be experienced before the end of the century. Sea-level rise and accelerated erosion will also lead to the loss of beaches in the Occupied Territory that Morocco is exploiting for coastal tourism in the occupied territory. Activities such as sand mining, practiced by Morocco in the coastal areas of the Occupied Territory will exacerbate these risks.[45,46,47]

Infrastructure, settlements and livelihoods are particularly at risk from sea-level rise in and around Dajla, and planned development may exacerbate these risks.

The current port at Dajla is situated on the sheltered eastern side of the promontory that forms the Bay of Dajla (Figure 6). The port is situated approximately 4km south of the city of Dajla and is principally a fishing and commercial port servicing the local region. It is also the only maritime gateway to the region. The city of Dajla is the largest urban centre in the southern region of the Occupied Territory (corresponding to the Rio d'Oro region) and, according to Moroccan statistics, has a population of 107,277.[48]

[45] https://wsrw.org/en/a105x2103

[46] https://coastalcare.org/2016/05/western-sahara-illegElbeach-sand-mining-in-laayoune/

[47] https://enactafrica.org/enact-observer/canarian-tourism-industry-built-on-western-saharan-sand

[48] POPULATION LÉGALE DES RÉGIONS, PROVINCES, PRÉFECTURES, MUNICIPALITÉS, ARRONDISSEMENTS ET COMMUNES DU ROYAUME D'APRÈS LES RÉSULTATS DU RGPH 2014" (in Arabic and French). Haut Commissariat au Plan. 8 April 2015.

Figure 6. Flooding of Dajla Peninsula during a 1-in-100-year extreme sea level event in 2050 under the moderate emissions RCP4.5 pathway (light blue) and in 2100 under the high emissions RCP8.5 pathway (dark blue). The red line marks the boundary of the Baie d'Ad-Dakhla / Bay of Dajla Ramsar site.

The peninsula on which Dajla city and the current port are located is no more than 10m above mean sea level, with the lowest elevations at the northern end of the peninsula where it joins the mainland. Here elevations are mostly between 0m and 1m, and do not exceed 2m above mean sea level. Recent modelling of extreme sea levels (ESL) indicates more frequent flooding of the Dajla peninsula, leaving the city and the port periodically cut off from the mainland and the port completely flooded (Tebaldi et al. 2021). These episodes are predicted to become more frequent throughout the 21st century (Figure 6).

Morocco has signaled an intention to construct a new international port and container terminal, Dakhla Atlantique, starting in 2022, as part of its wider port strategy and its strategy for the illegal exploitation of occupied Western Sahara. It has been stated that this new port will be located at N'tireft, 40 kilometres north of Dajla city, in occupied Western Sahara, and will replace Dakhla Atlantique as the principal fishing and commercial port in Western Sahara. Morocco's stated plans for the new port include an industrial fishing zone and new industrial and logistics areas. These actions presumably are intended to strengthen Morocco's occupation of Western Sahara and to intensify economic exploitation of the Occupied Territory, and would increase pressure on natural resources including fisheries and the wider marine and coastal environment. Morocco's stated plans imply a refocusing of economic activities away from the current Dajla Port will combine with increased flood risk and ultimately the periodic isolation of the Dajla peninsula from the mainland during extreme sea level events, exposing local people to the double impacts of economic marginalisation and sea-level rise. It is unclear whether any environmental and social impact assessment, or climate risk assessment, has been carried out for the new port.

6.2.2 Potential adaptation options

Under the current situation, urgent action is required to address the risk of flooding in the refugee camps. This is likely to take the form of more robust construction materials, for example replacing tents and mud-brick dwellings with structures made from concrete or some alternative with a lower carbon footprint. The current shift from mud-brick to concrete and cement to address flood impacts is associated with an increase in emissions. The identification and deployment of more sustainable materials and construction methods that provide comparable resilience benefits is desirable but requires external technical and financial support. Other flood mitigation measures including the creation of areas to direct and accommodate floodwaters, and early warning systems, would also be desirable.

Wider infrastructural impacts throughout the SADR might be addressed through the development of infrastructural (e.g. building) codes that address the need for infrastructure to be resilient to specific hazards and climatic thresholds (e.g. temperature extremes). These would include building standards to ensure that building design maximises passive cooling and minimises the need for active cooling (e.g. air conditioning).

In the coastal zones, adaptation plans need to be developed to address the threat of sea-level rise, involving appropriate zoning of infrastructure and activities and, where appropriate, allowing for the inland migration of coastal ecosystems as they respond to elevated sea-levels. These plans will be predicated on coastal risk and vulnerability assessments. Any development of coastal infrastructure including new port facilities should be based on sound risk assessments and the integration of appropriate adaptation measures. Following independence, the government of the SADR would critically review any such development plans considering climate change impacts, risks and vulnerabilities.

6.3 Water

6.3.1 Impacts and vulnerabilities

6.3.1.1 Water resources and use in the occupied territory

As discussed below, agriculture is a major consumer of water resources in the Occupied Territory. Abstraction of renewable groundwater reserves for agriculture will combine with the impacts of reduced

rainfall and higher temperatures (resulting in reduced runoff and recharge) to accelerate groundwater depletion. This is likely to encourage increased use of non-renewable water resources from fossil aquifers, depleting these resources at the expense of a returned Sahrawi population and future generations.

Morocco has installed desalination and wastewater treatment plants in the Occupied Territory to support its policies of settlement in, and economic exploitation of, occupied Western Sahara. In El Aaiún, a desalination plant with a claimed processing capacity of 26,000 m³ a day is set to be joined by a second plant with an apparent similar capacity at the end of 2021. A wastewater treatment plant with a claimed processing capacity of 18,600 m³/ day is apparently under development.[49]

The king of Morocco inaugurated a desalination vessel in the port of Dakhla in 2015, which it is claimed processes 1,500 m³ a day and supplies 75,000 people with drinking water.[50] In that same year, a wastewater treatment plant with a claimed capacity of 10,000 m³ a day was commissioned. In 2021, a wastewater treatment plant was announced to support Morocco's exploitation of fisheries in the Occupied Territory.[51] At present, a wind-powered desalination facility with a claimed capacity of 87,000 m³ is under construction near the Dajla peninsula to support agricultural expansion in the Occupied Territory, based on the conversion of 5,000 hectares of land to plantations and greenhouses.[52]

6.3.1.2 Water resources in the Liberated Territory

Water resources are very scarce in the Liberated Territory, and there are no permanent surface water bodies. Water is provided to nomadic families by truck and is stored in small-scale infrastructure such as tanks and bladders. Periodic rainfall recharges groundwater reserves, which are near to the surface in some wadis, particularly in the north. Following rainfall, water can be accessed in some wadis using hand-dug wells. In recent years, solar pumps have been used to access groundwater in a small number of pilot projects focused on small-scale agriculture. There are aspirations to expand solar pumping but this depends on the availability of finance. Water availability is a key constraint on the settlement of refugees from the camps, and on further development, in the Liberated Territory.

The Association Secours Sahraoui is implementing the Water for All project in the Liberated Territory and the border area of northwest Mauritania. This project has drilled 30 wells, supporting 70,000-100,000 people and 60,000-90,000 head of cattle, producing 1500-2000 m³ of water per day. This infrastructure is powered by solar and wind energy, at a total project cost of €1.5 million. This project provides regular training and employment for local technicians, engages in continuous monitoring and training of local teams, and encourages careful use of water to ensure the sustainability of the project.

Plans for an expansion of the Water for All project envisage 100 wells, 20 underground dams and seven water treatment plants serving 100,000-150,000 people and 150,000-200,000 head of cattle, producing 5000-7000 m³ of water per day, at a total project cost of €9 million.

[49] Moroccan Ministry of Equipment, Transport, Logistics and Water, 10.04.2021, Visite de Monsieur le Ministre de l'Equipement, du Transport, de la Logistique et de l'Eau dans les Provinces du Sud http://www.equipement.gov.ma/Actualites/Pages/Actualites.aspx?IdNews=3487

[50] Kingdom of Morocco, 08.02.2016, HM the King Inaugurates Oued Massa Seawater Desalination Vessel in Dakhla, https://www.maroc.ma/en/royElactivities/hm-king-inaugurates-oued-massa-seawater-desalination-vessel-dakhla

[51] Construction Review Online, 15.08.2021, Morocco to construct wastewater treatment plant in Dakhla, https://constructionreviewonline.com/news/morocco-to-construct-wastewater-treatment-plant-in-dakhla/

[52] Africa Intelligence, 06.12.2018, Morocco: and the Dakhla desalination plant is awarded to … https://www.africaintelligence.com/north-africa_business/2018/12/13/engie-and-nareva-obtain-dakhla-desalination-plant-contract-unopposed,108336419-art

6.3.1.3 Water resources in the camps

Most of the refugee camps obtain their water from large reservoirs and wells, with water being supplied to the populations of the camps via pipes and trucks. All water supplies to Bojador camp are delivered by truck. Wells in the vicinity of the camps experience low levels in summer, when water is scarce. This situation will be exacerbated by climate change; even if the rainfall that recharges these groundwater reserves does not decline, higher temperatures will result in increased evaporation, reduced surface runoff, and reduced groundwater recharge.

6.3.2 Potential adaptation options

Water scarcity is already a serious problem and climate change will place further stress on water resources. In the refugee camps and the Liberated Territory, adaptation measures based on water harvesting, storage and efficiency are urgently needed. These might include the construction of additional reservoirs and systems for channelling and capturing runoff, including small-scale domestic water harvesting systems. Small-scale groundwater abstraction based on decentralised renewables has been demonstrated in principle via pilot projects in the Liberated Territory and could be scaled up subject to assessments of sustainability. Installing such infrastructure will require external financial and technical support that could be provided through climate finance.

Similar measures might be implemented in the areas currently occupied by Morocco, once the decolonisation process is complete. However, a more systematic assessment of water resources, needs and current and projected use is required in these areas in the context of existing agricultural activities, industrial and commercial demands, and the needs of urban centres. Water use efficiency and the impacts of agriculture on renewable and non-renewable water resources will need to be addressed. Considerations of current sustainability, coupled with considerations of climate change impacts on both water availability and agricultural production, may point to more transformational adaptation measures including transitions away from water-intensive crops and agricultural systems, and their replacement with alternatives that are more suitable to the evolving climatic context.

6.4 Agriculture & food production

6.4.1 Impacts and vulnerabilities

6.4.1.1 Agriculture in the occupied territory

A key aspect of Morocco's illegal exploitation of the Occupied Territory involves water-intensive agriculture, with implications for sustainability under climate change. Moroccan government figures for 2019 estimate the area under agricultural area in the Occupied Territory at 230,000 hectares (130,000 ha and 100,000 respectively in the northern and southern regions). The irrigable area reportedly covers 5,543 ha in the northern Sagui ElHamra region, and 1,152 ha in the southern Rio d'Oro region. Drip irrigation systems are used on some 1,050 ha in each region.[53]

[53] Moroccan Ministry of Agriculture, Maritime Fisheries, Rural Development, Water and Forests - Department of Agriculture, Monographie de la région Dakhla- Oued Eddahab, http://www.agriculture.gov.ma/fr/region/dakhla-oued-ed-dahab and Monographie de la région Laayoune-Sakia El Hamra, http://www.agriculture.gov.ma/fr/region/laayoune-sakia-el-hamra

Agricultural activity in the northern Saguia El Hamra region, focused around El Aaiún, is undertaken on a smaller scale and geared towards covering local needs, with a particular focus on camel- and cow milk and cereal grains.[54] The contribution of livestock to the agricultural sector in these areas is relatively modest and does not yet cover local needs for either milk or meat. Moroccan figures from 2019 claim a population of 105,000 camels, 206,000 sheep, 302,000 goats and 2,800 cows. Most of this agriculture is rain-fed and therefore vulnerable to increased rainfall variability, and to projected declines in rainfall and soil moisture.[55] Hotter, drier conditions are expected to increase the water requirements of crops and livestock, increasing demand for irrigation and further stressing limited water resources.[56] Increased heat will increase stress on crops and livestock (particularly cattle) and also impact productivity and the length of the growing season. Increased temperatures are likely to increase the presence of pests.[57]

Agricultural production in the southern Rio D'Oro region, focused around Dajla, is characterised by small-scale meat-production (camel and poultry) and export-oriented industrial agriculture focused on early crops. Moroccan figures from 2019 claim 40,000 camels, 40,000 sheep and 30,000 goats, which are farmed for meat and milk. The Rio d'Oro reportedly has a favourable biotope for the production of white meat (at present only chicken and turkey, with a view to introducing ostrich). The production in the area reportedly covers 40% of the local demand: in 2019, it was reported that 500 tons of camel meat and 900 tons of white meat were produced. Morocco intends to increase this production to 1,970 tons per year. Between 2008 and 2019, two chicken rearing units and one turkey rearing unit were installed.[58] In that same timeframe, 15 units for camel breeding were created: a camel milk processing plant, 6 camel milk collection centres, 6 feeding centres, a cheese dairy and a drying unit for camel meat. Breeding is undertaken by local breeder groups and agricultural cooperatives.[59]

Tomatoes and melons are the main crops in Dakhla-Oued Eddahab, [60] In 2019, Morocco reported 85,000 tons of agricultural produce in the vicinity of Dajla.[61] The principal crops are tomatoes and melons, with cherry tomatoes - yielding between 80 and 120 tonnes per hectare – representing the majority of

[54] Moroccan Ministry of Agriculture, Maritime Fisheries, Rural Development, Water and Forests - Department of Agriculture, Monographie de la région Laâyoune-Sakia El Hamra, http://www.agriculture.gov.ma/fr/region/laayoune-sakia-el-hamra

[55] The latest IPCC projections indicate little change in rainfall in the interior regions of the western Sahel and Sahara, although there is considerable model uncertainty. Projections are robust in their indications of drier conditions in Morocco and the northwestern areas of Western Sahara. Based on projections represented on the IPCC Interactive Atlas at: https://interactive-atlas.ipcc.ch/.

[56] USAID (2016). Climate Change Risk Profile – Morocco. https://www.climatelinks.org/sites/default/files/asset/document/2016_USAID_Climate%20Risk%20Profile%20-%20Morocco.pdf

[57] World Bank Climate Change Knowledge Portal (CCKP, 2020). Morocco Agriculture Sector Dashboard. https://climatedata.worldbank.org/CRMePortal/web/agriculture/crops-and-land-management?country=MAR&period=2080-20

[58] Moroccan Ministry of Agriculture, Maritime Fisheries, Rural Development, Water and Forests - Department of Agriculture, Filière Avicole, http://www.agriculture.gov.ma/fr/filieres-regions/viandes-blanches-doe

[59] Moroccan Ministry of Agriculture, Maritime Fisheries, Rural Development, Water and Forests - Department of Agriculture, Filière Cameline, http://www.agriculture.gov.ma/fr/filieres-regions/cameline-doe

[60] WSRW.org, 17.06.2021, Latest: Conflict Blueberries, https://wsrw.org/en/news/occupied-dakhlas-emerging-blueberry-industry

[61] Moroccan Ministry of Agriculture, Maritime Fisheries, Rural Development, Water and Forests - Department of Agriculture, Monographie de la région Dakhla- Oued Eddahab, http://www.agriculture.gov.ma/fr/region/dakhla-oued-ed-dahab

production.[62] Recently, blueberries have reportedly been introduced as a new export-oriented cash crop. One of the main export markets is Europe. However, since 2015, the EU Court of Justice has issued multiple rulings concluding that the EU-Morocco Trade Deal under which these commodities are imported to the EU could not be applied to Western Sahara, as it is "separate and distinct" from Morocco, which has no sovereignty or administering mandate over the territory. An EU-Morocco bilateral agreement can only affect Western Sahara in a lawful manner if the people of Western Sahara, through their UN-recognised representative the Frente Polisario, have consented thereto, the Court ruled, adding that there was no evidence suggesting they had done so.[63]

Agriculture as promoted by Morocco in the Occupied Territories is associated with multiple climate vulnerabilities. Heat stress is a limiting factor for crop productivity. For example, optimal temperatures for growing tomatoes are between 18.5° and 29.5° Celsius. Temperatures above 35° C result in reduced fruit sets, and temperatures significantly above this threshold can result in total yield loss.[64] In contrast, most melon varieties are quite heat-resistant and require less irrigation. However, they are at risk from climate-pollinator and climate-pesticide interactions: the impacts of climate change and pesticides on bee populations may have major implications for melon production.[65]

Agriculture in the Occupied Territory is water intensive. A study by INRA showed that on average, the production of 1 kg of tomatoes requires 100 litres of water in Morocco, compared to 10 litres of water in countries such as France.[66] Water requirements will be similar in occupied Western Sahara to those in Morocco, and it must be questioned whether this is an appropriate use of scarce water resources that will come under increasing stress from climate chance. Concerns have been expressed about the depletion of Dajla's underground water reserves by the agro-industry, both in leaked US diplomatic cables and in Moroccan media.[67]

Climate change will make agriculture as currently practiced in the occupied territory more challenging, reducing water availability and affecting crops and livestock through higher maximum temperatures. This will increase risks of reduced productivity and crop losses for crops such as tomatoes. Extreme high temperatures have been shown to adversely affect milk yields in cattle in other hot, arid environments, and to increase mortality in some breeds (Howden et al. 2008, Henry et al. 2018). The long-term physical viability of some of the agriculture practiced by Morocco in the Occupied Territories is therefore in question.

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[62] Moroccan Ministry of Agriculture, Maritime Fisheries, Rural Development, Water and Forests - Department of Agriculture, Monographie de la région Dakhla- Oued Eddahab, http://www.agriculture.gov.ma/fr/region/dakhla-oued-ed-dahab

[63] The Rulings for cases T-512/12, T-180/14, C-266/16, T-275/18 and combined cases T-344/19, T-356/19 and T-279/19 can be accessed at the site of the EU Court of Justice, http://curia.europa.eu.

[64] Tele Ayenan and others, Agronomy Journal (2019), "Accelerating Breeding for Heat Tolerance in Tomato (Solanum lycopersicum L.): An Integrated Approach"

[65] USDA – Southwest Regional Climate Hub and California Sub Hub (2015), Melons and Cucumbers, https://swclimatehub.info/system/files/Melons.pdf

[66] European Parliament - Committee on International Trade, 01.02.2012, Recommendation on the draft Council decision on the conclusion of an Agreement in the form of an Exchange of Letters between the European Union and the Kingdom of Morocco concerning reciprocal liberalisation measures on agricultural products, processed agricultural products, fish and fishery products, the replacement of Protocols 1, 2 and 3 and their Annexes and amendments to the Euro-Mediterranean Agreement establishing an association between the European Communities and their Member States, of the one part, and the Kingdom of Morocco, of the other part, https://www.europarl.europa.eu/doceo/document/A-7-2012-0023_FR.html?redirect

[67] WSRW.org, 06.04.2013, Dakhla farms depleting underground water reserves?, wsrw.org/en/archive/2557 and 22.06.2012, Wikileaks: US highlighted tomato water issue, wsrw.org/en/archive/2331

6.4.1.2 Fisheries

The maritime fisheries sector is one of Morocco's primary sectors, contributing up to 2.3% of the national GDP and making up 59% of the country's agri-food exports (15% of total exports).[68] With its own stocks endangered, fishing activity in the waters of occupied Western Sahara has grown in importance to the Moroccan fishing sector over the years. For 2018, the coastal area of occupied Western Sahara accounted for around 77.65% of the annual coastal and artisanal catches by the Moroccan fishing industry.

Harvesting of marine resources in the Occupied Territory is carried out mostly by Morocco's industrial and semi-industrial fishing fleets, although the artisanal sector is important for some supply-chains and for livelihoods (predominantly those of Moroccan settlers). Many foreign vessels, operating under illegal fishing agreements, are also harvesting living marine resources in occupied Western Sahara. Under Morocco's agreement with Japan, tuna longliners have access to occupied Western Sahara's waters. In addition, Morocco's fisheries agreement with Russia has resulted in Russian vessels trawling for pelagic species exclusively in occupied Western Sahara waters, with the onboard production of fishmeal and fish oil. Morocco also has a fisheries accord with the European Union that has allowed EU vessels to illegally exploit occupied Western Saharan waters: the EU Court of Justice concluded that the application of the EU-Morocco Fisheries Agreement in Western Sahara is illegal in its rulings of 2018 and 2021. This agreement between the EU and Morocco covers six types of fishing, including industrial pelagic trawling which is carried out exclusively in occupied Western Sahara. An astounding 92% of the catch under the EU-Morocco fisheries agreement is made in this fishing category – and thus in occupied Western Saharan waters, contrary to the above legal rulings.

According to the Moroccan Department for Maritime Fishing, 29 out of a total of 457 deep sea fishing vessels (6,34%) were active in Dajla in 2018, yet produced 40.93% of the catch (23,450 tonnes out of a total of 57,294 tonnes) for that particular fishing category for the year. In that same year, 91 out of 2,536 coastal fishing vessels (3.6%) and 6,217 out of a total of 17,278 artisanal boats (36%) were declared as operating in the waters of the Occupied Territory. These two categories combined caught 419,755 tonnes in the Saguia El Hamra region and 587,225 tonnes in the Dajla/Rio D'Oro region. Given the total volume of 1,296,757 tonnes caught in 2018, Western Sahara represented an astounding 77.65% of the total catches in these fishing categories combined.[69]

The rich fishing grounds have led to a sizeable processing industry along the coastline of occupied Western Sahara. The frozen fish sector in the Occupied Territories is bigger than that in Morocco. In 2018, 101 out of the 194 fish freezing companies registered in Morocco were actually established in occupied Western Sahara. Ten out of Morocco's 21 fish oil and fishmeal production facilities were located in occupied Western Sahara.[70]

The EU's 2017 evaluation report on its fish deal with Morocco revealed that except for sardines, all pelagic species "in the south" - i.e. Western Sahara - were either fully or overexploited, as a result of years of

[68] UNFCCC, 2016, Morocco: Nationally Determined Contribution under the UNFCCC, https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Morocco%20First/Morocco%20First%20NDC-English.pdf

[69] Département de la Pêche Maritime, Mer en Chiffres 2018, pp.9-12, http://www.mpm.gov.ma/wps/wcm/connect/803172ef-e0b2-4b49-818b-fd4735ab519a/Mer+en+Chiffres-DPM-2018-VF.pdf?MOD=AJPERES&CACHEID=803172ef-e0b2-4b49-818b-fd4735ab519a. File can also be downloaded here: https://vest-sahara.s3.amazonaws.com/skvs/feature-images/File/203/5f958d9601942_Mer%2Ben%2BChiffres-DPM-2018-VF

[70] Ibid, p. 37.

intense fishing by local, EU and other foreign fleets.[71] This dramatic conclusion was repeated by the UNFAO Fishery Committee for the Eastern Central Atlantic late 2018.[72] The FAO expects that climate change will exacerbate this situation through an increase in extreme weather events, ocean warming, changes in ocean current patterns, nutrient inputs and oxygen concentration, which may lead to a geographical readjustment of catch potential.[73] Morocco's illegal exploitation of occupied Western Sahara's fisheries sector is therefore environmentally unsustainable and highly vulnerable to the impacts of climate change.

6.4.1.3 Food production in the Liberated Territory

While food production in Western Sahara historically has been focused on mobile pastoralism, there is a historical tradition of opportunistic agriculture among the Sahrawi. The museum at Tifariti (the main settlement in the Liberated Territory) houses traditional Sahrawi agriculture implements associated with such opportunistic production involving the sowing of short-season crops immediately following significant rainfall in certain locations.

Some food production occurs in the Liberated Territory today, based on small-scale agriculture in community and home gardens, supported by irrigation using groundwater. Community Gardens are concentrated around Tifariti, Mhiriz, Aguenit, Zug and Bir-Lehlu. These are relatively large gardens producing fresh food that contribute towards meeting the needs of local schools and hospitals. Home gardens address the needs of the families, and are most common in Mhiriz and Tifariti. These gardens produce vegetables and fruit. The main vegetable crops are tomatoes, peppers, eggplants, cucumber, melons, watermelons, zucchini, carrots, turnips, beetroot, lettuce, spinach, Swiss chard, cilantro, parsley, onions, garlic and mint. Fruit trees include olive, fig, pomegranate and date palms.

Production in these gardens is based on manual labour, and no chemical fertilisers or pesticides are used. While the main type of irrigation in these gardens is flood irrigation, some gardens employ small drip irrigation networks. Some gardens include greenhouses where certain sensitive crops such as tomatoes and peppers can be grown.

Herds of camels and goats are maintained in the Liberated Territory. When pasture is abundant, some families travel to the Liberated Territory for periods of up to several months. However, the permanent population of nomads in the Liberated Territory is small, and restricted mobility resulting from the conflict and dangers associated with mines and unexploded ordnance limit pastoralists' movements and pose risks to both herders and their livestock. Recently, many families have left the Liberated Territory and migrated to the camps and Mauritania as a result of the resumption of the armed struggle following the breaking of the ceasefire on 13 November 2020 by Morocco. The lack of infrastructure, particularly access to water, also limits the potential for settlement and pastoralism in the Liberated Territory. A more restricted diet during extended sojourns from the camps to the Liberated Territory can exacerbate malnutrition in children.

The Association Secours Sahraoui has established the Agricultural Farms project to support small-scale agriculture in the Liberated Territory, the refugee camps and the border areas of northwest Mauritania. This project aims to reduce livestock mortality, malnutrition among the populations of the project areas, migration

[71] European Commission, 2017, Évaluation rétrospective et prospective de Protocole à l'accord de partenariat dans le domaine de la pêche durable entre l'Union européenne et le Royaume du Maroc, https://vest-sahara.s3.amazonaws.com/skvs/feature-images/File/245/5fca203168874_EUEvaluationMoroccoSept2017.pdf

[72] FAO, 2018, CECAF/SSCVIII/2018/2 E, Status Summary for Small Pelagic Stocks in the Northern Area of the Eastern Central Atlantic, http://www.fao.org/fi/static-media/MeetingDocuments/CECAF/CECAF-SSC8/2e.pdf

[73] FAO, 2018 Impacts of climate change on fisheries and aquaculture, Chapter 8: Climate change impacts, vulnerabilities and adaptations: Eastern Central Atlantic marine fisheries. http://www.fao.org/3/I9705EN/i9705en.pdf

to urban centres, and poverty. The project seeks to support 10 farms benefiting 200,000 to 250,000 people, including 1000-1500 camels and 5000-7500 sheep and goats, and producing 1500-2000 tones of fruits and vegetables and 2500-3000 tonnes of forage per year. This requires 100-150 hectares of land irrigated using pumps powered by solar and wind energy, at a total project cost of €2.5 million, less than 5% of which has been secured, through private finance. The project therefore currently consists of small pilots. The project aims to provide training to farmers and engages in regular monitoring to ensure sustainability. It aims to have a positive ecological impact by creating oasis-like microclimates.

The vision for scaling up the Agricultural Farms project involves 30 farms benefiting 250,000 to 300,000 people. The farms would support 3000-4500 heads of camel, 15,000-22,500 sheep and goats, and produce 4500-6000 tones of fruits and vegetables and 7500-9000 tonnes of forage per year. They would be maintained through 300-450 hectares of land irrigated using pumps powered by solar and wind energy, at a total project cost of €7.5 million. This scaling up could be achieved using climate finance.

Climate change has the potential to adversely affect water availability in the Liberated Territory, making access to groundwater potentially more challenging. This may occur if groundwater levels decline as a result of higher temperatures, increased evaporation and reduced surface runoff and recharge. Increases in the frequency and magnitude of extreme high temperatures may have implications for what crops can be grown. Extreme temperatures may also have impacts on animal health, productivity (e.g. milk) and fertility, as well as on the prevalence of certain pests and diseases affecting livestock (Volpato et al. 2013). Anecdotal reports indicate that a lack of rain in the Liberated Territory since 2017 have had an adverse impact on livestock, and some herds have been abandoned due to renewed hostilities following the breakdown of the 1991 ceasefire in November 2020.

6.4.1.4 Food production in the camps

When the Sahrawis fled their home land and sought a refuge in the southern western corner of the Algerian baren desert near the remote city of Tindouf, it was obvious that the shortage of water, the harsh climatic conditions,

When the Sahrawi refugee camps were established in the 1970s, water scarcity, poor desert soils, and the Sahrawi's historically nomadic culture with little role for agriculture, meant that the refugees were almost totally dependent on food aid from the international community. However, the Sahrawis adapted to their new situation by exploring agricultural possibilities, and some national farms were established in the late 1970s, for example the farm of Nkheila, which became an oasis. In the 1980s more farms were built, including the Garden Bougarfa in Smara camp, Zein Aram in Dajla camp, and the regional farm in El Aaiún camp. In that decade more small gardens were built at the Daira level, particularly in El Aaiún and Dajla camps.

Initially, all the work was done manually, but in the late 1970s agricultural machinery including tractors was introduced for ploughing. At that time, some chemical fertilizers and pesticides were used to enhance the soil fertility and control pests. The only form of irrigation used until the 1990s was flood irrigation. However, in 2001 the first farm to use only drip irrigation was established in Dajla camp. This farm was supplied with agricultural machinery to replace manual labour, and with modern greenhouses in which sensitive crops including tomatoes, peppers, eggplant, lettuce and cucumber were grown, producing excellent yields. Subsequently, drip irrigation networks and tractors were rolled out to other farms such as Nkheila, Smara, 9th June, Bougarfa and El Aaiún. These gardens exclusively use organic fertilizers, although chemical pesticides are employed when necessary.

Home gardens emerged in the camps in the 2000s as a result of the increased demand by the refugees for fresh food that is not included in food aid and that is not produced by the national, regional and local farms. These home gardens were established to meet the need for fresh foodstuffs, reduce dependency on food aid, and promote agricultural knowledge among the refugee population.

Each home garden is approximately 100 m^2 and includes a $9m^2$ greenhouse where families can grow sensitive crops, as well as a small open plot for the production of other crops. Each garden has a small drip irrigation network. All beneficiary families receive training in relevant agricultural practices, the production of organic fertilizers and pesticides, and the production of seeds. Currently there are more than 1200 home gardens distributed across all Sahrawi refugee camps.

As a consequence of the nomadic culture and heritage, meat and milk are the main components of the refugees' diet. As pasture is not available in the vicinity of the camps, a Sahrawi agricultural engineer has developed hydroponic units to produce high quality animal fodder improving milk and meat yields and quality. These low-tech hydroponic units are constructed with locally available materials and can be easily used, maintained and replicated.

Currently, small low-tech hydroponic and aquaponic units dedicated to the production of crops for human consumption are being developed in the camps. These units are efficient in terms of time, money, water, space and labour, and provide higher yields than the traditional home gardens.

Small-scale production and hydroponics could be scaled up given sufficient finance, providing valuable additional nutrition to complement food aid that is often lacking in nutritional diversity. The World Food Programme (WFP) classifies 30% of Sahrawi refugees as food insecure and a further 58% as at risk of food insecurity.[74] It estimates that 52% of Sahrawi refugee women suffer from anaemia. The WFP distributes approximately 134,000 in-kind rations to meet the basic food and nutritional needs of refugees based on a requirement of 2100 calories per day. This consists of six to nine commodities including cereals, pulses, sugar, vegetable oil and blended flood. An increase in the production of fruit and vegetables and other fresh foodstuffs in the camps could make a considerable contribution to addressing food insecurity and nutritional deficits.

Climate change has the potential to affect the availability and quality of food aid in the camps via its impact on global food production, supply chains and commodity prices. The economic impacts of climate change on donor countries may also affect the flow of aid. Greater production within the camps themselves could go some way towards building resilience to these risks. Climate change impacts on water availability, and the impacts of increasingly extreme temperatures may directly impact food production in the camps, meaning there is a need for even more innovative piloting of small-scale food production. This could also be supported through adaptation finance.

6.4.2 Potential adaptation options

There is a need for adaptation strategies for the agriculture and livestock sectors throughout Western Sahara. The sustainability of agricultural activities in the Occupied Territory needs to be assessed urgently, and appropriate adaptation measures developed and implemented within the framework of full respect for

[74] https://www.wfp.org/countries/algeria

international law and the precondition of the consent of the people of Western Sahara. These measures might include a shift away from the most water-intensive crops; additional water harvesting, storage and efficiency measures; adoption of more heat-resistant crops or crop varieties; more sustainable production methods based on principles of 'climate-smart agriculture'; a review of livestock breeds in the context of evolving climate hazards, particularly heat extremes; and infrastructural innovations to manage extreme temperatures. Small-scale agriculture based on decentralised renewable energy, as is being piloted in the Liberated Territory, may be more sustainable than the industrial scale export-driven agriculture promoted by Morocco in the Occupied Territory. Assessment of groundwater reserves, recharge rates and sustainable abstraction levels, and monitoring of groundwater, will support sustainable water use.

Monitoring of fish stocks and changes in the marine environment, coupled with the development of and understanding of how these changes affect marine biological resources, is a prerequisite for the development of adaptation strategies for the fisheries sector, and should be a priority. Once the decolonisation process is complete, the SADR will establish scientific partnerships with countries that are export destinations for fisheries outputs to develop such monitoring systems.

An end to the conflict, the dismantling of the Berm, the clearing of munitions, and the development of small-scale (e.g. water) infrastructure in the Liberated Territory and the areas currently occupied by Morocco, would enable the rehabilitation of resilient, traditional pastoral livelihoods. With appropriate material and policy support, this could improve food security, provide economic opportunities and play a role in adaptation (see also below).

In the shorter term, and pending the completion of the decolonisation process and the return of the Sahrawi refugees to a unified SADR, small-scale food production could be scaled up in the camps and the Liberated Territory, based on efficient, sustainable water use supported by renewable technologies (e.g. solar pumps), and contextually appropriate, resilient crops. Agricultural innovation in the camps to adapt to higher temperatures, more frequent and severe temperature extremes, and reduced water availability, is also desirable.

6.5 Cultural heritage

6.5.1 Impacts and vulnerabilities

Western Sahara is rich in both tangible and intangible heritage. Tangible heritage encompasses both built and natural heritage and includes archaeological heritage, natural environments, and plant and animal diversity. Intangible heritage relates to the body of knowledge, practices and beliefs that has evolved over centuries. Tangible and intangible heritage interact through people's knowledge about, use of and relationships with the physical environment. While climate change and conflict threaten tangible and intangible heritage, both kinds of heritage can contribute to climate change mitigation and adaptation. However, the ability of people to use tangible and intangible heritage to address climate change is constrained by the conflict, which therefore undermines their adaptive capacity and increases their vulnerability.

6.5.1.1 Tangible heritage

Western Sahara is rich in natural heritage. Some of this heritage, and the threats to it from both the conflict and climate change has already been discussed (see above discussion of Ramsar sites, drainage systems and *refugia* and Box 1). As discussed above, the conflict has resulted in damage to natural systems, but it

has also ensured that many parts of Western Sahara have remained isolated, limiting disturbance to ecological systems. The corollary of this is that scientific knowledge relating to the nature, distribution and health of ecosystems and plant and animal species throughout Western Sahara remains extremely limited.

Box 1. UNESCO World Heritage List and Ramsar Convention on Wetlands

UNESCO is the United Nations Educational, Scientific and Cultural Organization. It hosts the World Heritage List which aims to ensure that the world's cultural and natural heritage is preserved through inscription of heritage of 'outstanding universal value'. The Ramsar Convention on Wetlands is an inter-governmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources.[75]

Both organisations require countries to become parties to the convention in order to inscribe natural and cultural heritage for preservation and protection. Only UN member states can become State Parties, therefore the SADR cannot be a member and inscribe its own heritage. Morocco is a member of both Ramsar and the UNESCO World Heritage Convention and can put forward sites for inscription.

Morocco has illegally listed three wetlands located in the occupied territory on the Ramsar Wetlands Convention. These are listed as Baie d'Ad-Dakhla (site 1470), Côte Aftissate-Boujdour (site 2377) and Oued Assaquia Al Hamra à La'youne (site 2382). In addition, Parc national de Dakhla (site 1183) is on the World Heritage Tentative List.

The Ramsar sites of Baie d'Ad-Dakhla (site 1470) and Côte Aftissate-Boujdour (site 2377) will be significantly and moderately impacted respectively by the combined effects of sea-level rise and coastal erosion by 2100 under a high emissions scenario (Fig. 6). In addition to socioeconomic impacts, this will also potentially impact the current ecosystems that make both these sites unique and eligible for listing on the Convention of Wetlands. A full environmental survey should be undertaken to ascertain what species will be directly affected and adaptation plans put in place to protect the most impacted parts of both sites.

Western Sahara's isolation and relatively abundant rainfall compared with other Saharan regions (McLaren et al. 2018) means that it is biologically rich, and the government of the SADR wishes to preserve this biodiversity in the face of climate change and local anthropogenic stresses. Biological resources include species with traditional practical and cultural uses, including Acacia that is the source of gum Arabic, edible wild plants, and plants used in traditional medicine. Interviews with Sahrawi nomads and refugees by Volpato and Puri (2014) identified 100 plant species, including five species that are highly culturally important and 25 forage plants that influence the taste and properties of camel milk.

These resources have both cultural and economic value. For example, the World Bank is supporting neighbouring Mauritania to expand gum Arabic production through the rehabilitation of Acacia woodland linked with sustainable landscape management.[76] There are extensive areas of Acacia woodland in the north of Western Sahara, for example in the Liberated Territory in the vicinity of the Uad Erni and Uad Ternit, which drain into the Saguia El Hamra. These biological resources are potentially at risk from climate change, but also offer potential for sustainable livelihoods given appropriate management and adaptation strategies.

[75] https://whc.unesco.org/en/list/; https://www.ramsar.org

[76] https://www-worldbank-org.uea.idm.oclc.org/en/news/feature/2016/07/06/gum-arabic-supports-green-growth-in-mauritania

The landscapes of Western Sahara themselves represent important natural heritage. Major drainage channels and granite outcrops act as foci for biodiversity today, and have been the focus of human activity for millennia. These features serve important functions as routeways and landmarks, and have cultural and practical importance for users of the landscape today, providing shelter and water, either via direct runoff or temporary hand-dug wells (McLaren et al. 2018). These functions could be compromised by climate change, for example through a decline in vegetation or water resources.

Archaeological features are concentrated around landscape features such as wadis, plateau, escarpments and outcrops. These features include important and little studied prehistoric burial grounds, rock art and settlement sites. Numerous such sites have been identified, surveyed and recorded in the Liberated Territory (e.g. Méndez 2012, Subils 2015, Clarke and Brooks 2018, López et al. 2018), but little work has been done on archaeological sites in the occupied territory. Some of these sites have already been damaged directly or indirectly by the conflict (Brooks et al. 2018). Climate change poses potential additional risks to these sites, including destruction by flash floods under novel rainfall regimes, and damage to rock art through changes in humidity, dust abrasion, and in microbial, plant and animal life at rock art sites and on the surfaces housing paintings and engravings (Brooks et al. 2020). Identification, monitoring and protection of sites at risk, for example with support from international bodies such as UNESCO, is necessary for the preservation of this important aspect of world archaeological heritage that offers a window on how past Saharan populations navigated episodes of rapid and severe climate change (Clarke and Brooks 2018, Brooks and Clarke 2021).

6.5.1.2 Intangible heritage

The culture and history of nomadism in Western Sahara is fundamental to Saharawi identity (Kent 2021). Reflecting other nomadic cultures, Saharawi nomadic practices have been acutely environmentally conscious.[77] This has been essential in an environment in which the Saharawi nomad "knew that the slightest error of judgement could decimate his herds and perhaps result in starvation and death. Survival required a remarkable sense of direction and knowledge of terrain (Hodges 1984: 77)." This intertwining of nomadism, knowledge of territory and culture is demonstrated through Saharawi art, cultural production and literature. Traditional poetry, for example, was, before the war, a pedagogical tool used to pass the knowledge and skills necessary for nomadism to Saharawi children (Awah 2010), and reflected nomadic uses of the territory, its geological features and its winds for navigation and survival (Allan 2020). Likewise, the particularities of Saharawi camel pastoralism have been shown to be entangled with culture (Volpato and Howard 2014).

This indigenous knowledge of landscape, environment and the distribution and condition of natural resources (e.g. biological and water resources) represents an invaluable resource for tracking and understanding climatic and environmental change. Such knowledge is especially important given the absence of meteorological and other formal records of climatic and environmental conditions. An intimate knowledge of the environment and how it is changing provides a valuable framework for coping with and adapting to climatic and environmental change, and for identifying and managing environmental risks.

[77] There is documentation of such practices. The oldest example of which the authors are aware is in Saugnier, F. and Brisson, P., *Voyages to the Coast of Africa by Mess. Saugnier and Brisson, Containing an Account of their Shipwreck on Board Different Vessels, and Subsequent Slavery, and Interesting Details of the Manners of the Arabs of the Desert*…, London: G.G.J. and J. Robinson, 1792, p.35. Shipwrecked Mr Saugnier, 'abducted' at Boujdour (modern day Western Sahara) by 'wandering Arabs,' marvels at the Saharawis' ecologically-aware practices such as their insistence on only using dead wood for kindling and never any live shrubs.

The conflict has undermined this indigenous knowledge, and by extension the capacity of the Sahrawi people to navigate, respond and adapt to climatic and environment change and variability. For example, knowledge of plants and their uses is related to age and nomadic experience, and forced displacement results in non-use of knowledge and a lack of transmission of such knowledge to younger generations, although refugees are re-engaging with traditions of pastoralism and nomadism (Volpato and Puri 2014). Indigenous Sahrawi knowledge of plants and their uses (including medicinal and cosmetic uses), and of camel diseases and remedies, has very practical economic and livelihood applications and should be preserved as a valuable resource for the SADR's development (Volpato and Puri 2014, Volpato et al. 2012, 2013, 2014, 2015).

Likewise, in the Occupied Territory, Morocco has enacted policies that impede nomadism, such as prohibiting the erection of tents. In this way, war, forced sedentarisation and occupation directly undermine the preservation of Saharawi cultural heritage. This heritage, and the environmental knowledge inherent in it, is an important source of adaptive capacity that enables the Sahrawi to navigate and survive in a highly dynamic and challenging environment. It provides a baseline for monitoring the impacts of climate change on the environment, on important biological resources, and on assets such as livestock. The preservation of this heritage is necessary to address the requirement in Article 7 of the Paris Agreement (p.9) that adaptation should be "based on and guided by the best available science and, as appropriate, traditional knowledge, knowledge of indigenous peoples and local knowledge systems."

6.5.2 Potential adaptation options

The government of the SADR has already taken actions to preserve both tangible and intangible heritage. Support for nomadic families in the Liberated Territory and the facilitation of movement between the camps and the Liberated Territory helps to preserve aspects of the traditional nomadic culture. However, most Sahrawi are forced to follow sedentary lifestyles as a result of occupation or exile as long as the current situation pertains. Opening up of the Liberated Territory with support from development assistance for sustainable, resilient livelihoods would enable Sahrawis to preserve their traditional culture and knowledge and apply this knowledge to adaptation challenges, building on the inherently adaptive nature of pastoral livelihoods (Krätli et al. 2013).

Policy support for traditional livelihoods and the preservation of dynamic and evolving local and indigenous knowledge will be critical for cultural and material wellbeing in the future as climate change unfolds. Such support can be provided in the Liberated Territory under current circumstances, and will be a priority throughout the SADR once the decolonisation process is complete.

Following the vandalism of multiple rock art sites by UN Peacekeepers from the MINURSO mission in 2006 (Merrill 2011, Brooks et al. 2018), the government of the SADR established the archaeological park of Rekeiz Lemgassem. This included practical measures to restrict and monitor access to important and threatened prehistoric burial grounds and rock art sites, to raise awareness of archaeological heritage and sensitise the Sahrawi population to its national and global significance. This initiative has suffered from a lack of resources and from the renewal of conflict, and urgently requires external support. The establishment of similar parks for other important cultural and natural heritage sites could play a significant role in the preservation of heritage. External support via bodies such as UNESCO could play an important role in enabling such preservation. Currently, political factors represent an obstacle to engagement with such bodies. Working to address such obstacles is critical to unlock potential support for preserving natural and other heritage in the face of climate change. Support for the identification, recording and monitoring of

natural and other heritage sites will be necessary for their preservation and adaptation, including assisted migration and relocation.

7 National mitigation and adaptation priorities

The above sections highlight a range of potential mitigation and adaptation actions through which the SADR can contribute to meeting the goals set out in the Paris Agreement. An end to the conflict is a prerequisite for reducing many of the climate risks and vulnerabilities identified in this iNDC, and for enabling the people of Western Sahara to participate meaningfully in global action to combat climate change through both mitigation and adaptation. Effective action on climate change in Western Sahara requires a just resolution to the conflict, the completion of the decolonisation process, and the realisation of self-determination as mandated under multiple UN resolutions. These outcomes are necessary if climate action as it relates to Western Sahara is to be compatible with the principles embedded in the Paris Agreement, including the principle of equity highlighted in Article 2 of the Agreement. These principles require adaptation to "follow a country driven, gender responsive, participatory and fully transparent approach, taking into consideration vulnerable groups, communities and ecosystems, and should be based on and guided by the best available science and, as appropriate, traditional knowledge, knowledge of indigenous peoples and local knowledge systems, with a view to integrating adaptation into relevant social economic and environmental policies and actions, where appropriate."[78]

In the absence of a resolution to the conflict, the SADR can take limited mitigation and adaptation actions in the territory it controls and in relation to the displaced Sahrawi population in the refugee camps. These actions can be supported by inclusion of the SADR in global climate finance and governance mechanisms, and through multilateral and bilateral climate finance. This is an urgent priority and can be achieved immediately given sufficient political will in the relevant multilateral organisations and the governments of their members and donors. The continued exclusion of the Sahrawi people from these mechanisms increases their vulnerability, reduces their capacity for mitigation and adaptation, and is contrary to principles of equity as articulated in the Paris Agreement, and wider principles of climate justice. The current situation, in which the global climate governance system focused on the UNFCCC effectively endorses and supports colonialism in Western Sahara, is politically and morally unsustainable. The SADR urges the international community to address this injustice swiftly, so the Sahrawi people can participate fully in humanity's collective efforts to address the climate crisis. Supporting the following actions, almost all of which will require external financial and technical support, and many of which require a resolution of the conflict and the completion of the decolonisation process, will ensure that global climate governance and finance mechanisms are aligned with the stated principles on which they, ostensibly, are based.

Table 1 below lists actions that have been identified as priorities for addressing climate change by the SADR. These actions include (i) institutional responses to ensure the necessary governance mechanisms are in place to address climate change, supported by the appropriate capacities, (ii) mitigation responses to put the SADR on a low carbon development pathway, and potentially a net-zero trajectory, and (iii) adaptation responses to address climate change impacts, risks and vulnerabilities. Responses include those that can be taken immediately given appropriate support, and those that can be taken once the decolonisation process is complete. In line with the indicative nature of this NDC, Table 1 represents a preliminary list of actions whose costs and feasibility require further analysis. Such analysis will be

[78] Paris Agreement, Article 7, paragraph 5, p.9.

undertaken and included in future updates to the NDC, and would benefit from external technical assistance itself.

Table 1. Unconditional and conditional institutional, mitigation and adaptation responses to address climate change in the SADR.

Actions		Requirements for implementation
Actions that can be taken immediately given adequate resources		
Institutional responses		
1	Establishment of cross-ministry unit for coordination of action on climate change	Unconditional – mandate & coordination from SADR government
2	Capacity building to support climate change unit and build capacity to address climate change through mitigation and adaptation actions across key ministries	Conditional on external technical support for training & sensitisation for key government staff, based on and expanding on this iNDC
3	Capacity building on engagement with external organisations working on climate change, and on accessing climate finance	Conditional on support from one or more external partners to provide capacity building, training and intelligence on global climate governance and finance
4	Development of climate change mainstreaming framework to facilitate integration of climate change considerations into policy and planning	Conditional on external technical support & realisation of (2)
5	Development of sectoral and cross-sectoral climate change policies and strategies informed by climate risk assessments	Conditional on external technical support & realisation of (2) & (3)
6	Inclusion of climate change in the school curriculum	Conditional on external technical support for training and sensitisation of teaching staff, e.g. via existing educational international partners
7	Development of climate negotiating capacity and support for youth and other groups to represent the Sahrawi people in international climate change contexts;	Conditional on external technical support for capacity building of youth with emphasis on ensuring equal participation of women and girls
Mitigation responses		
8	Review of current policies and licensing arrangements regarding fossil fuel exploration and potential extraction, and consideration of policy commitment to refrain from further such exploration and exploitation	Subject to existing legal agreements and conditional on external commitments of technical and financial support for meeting the energy needs of the population of SADR through renewables
9	Commitment in principle to net-zero pending identification of feasible net-zero pathway(s)	Conditional on external technical assistance for emissions assessment, scenario development, and identification of feasible net-zero pathways, and financial support for implementation of these pathways
10	Capacity building and training in greenhouse gas emissions calculation;	Conditional on external technical assistance for training to build expertise
11	Establishment of mechanisms for monitoring, reporting and verification (MRV) of greenhouse gas emissions compatible with mechanisms for reporting under the Paris Agreement;	Conditional on realisation of (9) and external technical assistance for development of MRV systems
12	Continued roll-out of access to clean energy to the Sahrawi population in the refugee camps - expansion of renewables has occurred in the camps but is slow and has partially stalled due to connection to TIndouf grid	External financial support is required for further expansion with mitigation benefits due to avoided emissions associated with grid
13	Rural electrification in the Liberated Territory, involving installation of seven small power plants powered by wind and solar, producing 30,000 MWh per year and benefitting 40,000-50,000 people, based on existing pilots by Association Secours Sahraoui	Conditional on external finance to provide required €20m of investment; implementing entity would be Association Secours Sahrawi which has existing technical capacity
Adaptation responses		

14	Establishment of meteorological monitoring stations in the camps and Liberated Territory to address the lack of such infrastructure in Western Sahara and the camps;	Conditional on external financial support for equipment, installation and maintenance, coupled with technical support for capacity building and training in operation, maintenance and data collection and dissemination
15	Development of early warning systems for floods, heat extremes and dust storms, initially focusing on the camps;	Conditional on external technical and financial assistance for assessment of feasibility based on climate information needs and availability, development of relevant capacity and infrastructure
16	Development of flood management systems in the camps and strengthening of infrastructure to withstand heavy rainfall and flooding;	Conditional on external financial and technical assistance for risk assessments, feasibility studies, and infrastructural interventions (most likely in partnership with UN and other humanitarian organisations in the camps)
17	Strengthening of built infrastructure in the camps, including domestic architecture, to withstand flood and other hazards, based on sustainable building materials and techniques, incorporating existing local responses, capacities and knowledge	Conditional on external financial and technical support; mitigation co-benefits in form of reduced emissions from cement which is currently being used to build stronger homes; potential to build on and scale-up existing innovation
18	Agricultural Farms project - current phase has received just under 10% of required €2.5m from private finance, for 10 farms benefitting 200,000-250,000 people (camels, sheep goats, fruit, vegetables, forage from 100-150 ha supported by solar & wind powered irrigation). Second phase scaling up to 30 farms requires €7.5m	Conditional on €2.25m of finance to complement seed finance of €250k from private sector for first phase, additional €5m for expansion in second phase; implementing entity would be Association Secours Sahrawi which has existing technical capacity
19	Development and scaling up of small-scale climate-smart food production in the camps using water-efficient technologies such as hydroponics and drip irrigation, based on existing capacity	Knowledge, capacity and technologies exist – conditional on financial assistance for scaling up
20	Water for All project in Liberated Territory, to create 100 wells, 20 underground storage units and seven water treatment plants serving 110,000-150,000 people and 150,000-200,000 head of livestock, producing 1500-2000 m^3 per day	Conditional on €9m of external investment; implementing entity would be Association Secours Sahrawi which has existing technical capacity; this would represent an expansion of the current phase involving 30 wells at a cost of €1.5m
21	Monitoring of environmental health in the Liberated Territory, identification of species and habitats at risk from climate change, and establishment of protected areas;	Conditional on financial assistance to facilitate survey, assessment and monitoring, based on existing indigenous knowledge
Actions that can be taken on completion of the decolonization process		
Mitigation responses		
22	Maintenance and, where appropriate, expansion of large-scale renewables infrastructure;	Conditional on technical and financial assistance for implementation of large infrastructure projects
23	Innovation, development and roll-out of small-scale, decentralised and mobile renewable energy technologies to support traditional nomadic lifestyles	Knowledge, capacity and technologies exist – conditional on financial assistance for scaling up
Adaptation responses		
24	Detailed coastal risk assessment and review of plans for development of the coastal zone to ensure these are compatible with adaptation needs	Conditional on technical assistance on risk assessment methodologies and financial assistance for data gathering & interpretation
25	Rehabilitation of drainage systems and associated ecological systems that have been adversely affected by the Berm	Conditional on technical assistance in mine and ordnance clearance, building on existing capacity developed through previous partnerships, as necessary condition for safe restoration of landscapes degraded by military infrastructure

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3. Annex 1. Quality Assurance of the iNDC

This annex sets out how the iNDC meets the criteria for quality assurance of NDCs as set out in UNDP's Climate Promis Quality Assurance Checklist.[79]

Criteria for quality assurance See: Climate Promise Quality Assurance Checklist (undp.org)	**Yes**	**Partially**	**No**	**Narrative explanation**
DIMENSION ONE: COUNTRY OWNERSHIP AND INCLUSIVENESS				
1. Have the key ministries, departments and agencies of government played an active role in revising the NDC?				The Ministry of Foreign Affairs has been the leading ministry in the development of the iNDC, in consultation with other key ministries and with support from the Ministry of Water and Environment, the Ministry of Economic Development, and the Ministry of Transport and Energy. All have provided input to the iNDC.
2. Have different government institutions from relevant sectors, at both the national and sub-national levels, been engaged and consulted on the NDC revision?				The iNDC is being issued by the Office of the Prime Minister, and has been developed in close consultation with multiple ministries (see 1) and departments at the national and sub-national level.

[79] https://www.ndcs.undp.org/content/ndc-support-programme/en/home/impact-and-learning/library/climate-promise-quality-assurance-checklist.html

3. Have private sector, civil society organizations, academia, vulnerable and marginalized groups, and other relevant stakeholders, been meaningfully engaged and consulted on the NDC revision? Has this engagement taken place at both the national and sub-national levels?				Representatives of the private sector and civil society (including from the refugee camps and the Sahrawi diaspora) provided significant input to the iNDC, particularly with regard to energy, water and agriculture. Sahrawi and international NGOs and academics have played a key role in coordinating and drafting the iNDC. Input has been provided by representatives of central government and organisations working at the local level.
4. Does the NDC include targets, measures and policies that are gender-responsive (e.g. gender indicators, mitigation/adaptation gender actions, sectoral measures/targets)?				The adaptation action proposed follows the PA Art 7 para 5 guidance on being gender responsive. Further development of gender responsive mitigation options is needed.
5. Does the NDC include targets, measures and policies that are children and/or youth-sensitive, and that address youth-specific needs and roles?				Yes, climate risks to young people and inclusive responses are proposed.
6. Does the NDC identify steps for an inclusive, just transition of the workforce?				All the measures proposed are considered as improving the wellbeing of Sahrawi people. Climate justice in the context of the UN mandated decolonisation process in Western Sahara is central to the iNDC.

7. Does the NDC include targets, measures and policies related to vulnerable groups, i.e. those highly impacted by climate and natural hazards, elderly, and indigenous people, etc.? (e.g. cobenefits of adaptation and mitigation measures in the health sector that address the needs of vulnerable groups)				The iNDC targets the indigenous Sahrawi people of Western Sahara, whose vulnerability is severely amplified by their status as refugees (in the camps) or as members of a marginalised population living under military occupation. The refugee population is particularly vulnerable to hazards such as flooding and heat extremes, which impact groups such as the elderly, infirm and children most. Adaptation measures to address these hazards have significant health benefits, while mitigation measures support sustainable livelihoods and food security.
8. Does the NDC include targeted awareness-raising, advocacy and education related activities?				A fundamental goal of this iNDC is to raise awareness of the contributions the Sahrawi people can make to climate action that, and to provide the previously excluded Sahrawi people with a voice in global climate governance and negotiations. The iNDC proposes specific actions among the Sahrawi population to build capacity for climate action within government and civil society, and to integrate climate change into school curricula.
DIMENSION TWO: ROBUSTNESS AND AMBITION				

2.1 MITIGATION	**Yes**	**Partially**	**No**	Narrative explanation
2.1.1 ROBUSTNESS				
1. Does the NDC include information elements identified in Decision 4/CMA.1 and its annex on clarity, transparency and understanding? (reference point, baseline, etc.)				Decision 4/CMA.1 is duly noted but given the circumstances of the Sahrawi people, the occupation of Western Sahara, and the displacement of a significant proportion of the Sahrawi population, data are currently unavailable. However, robust data on emissions from the occupied areas from third party sources are included, and the urgent need to capacity to generate relevant data is recognised in the iNDC.
2. Has quality assurance and quality control of data, methodologies, and other relevant information when revising the NDC (e.g. technical review) been carried out?				This iNDC conforms to the quality assurance criteria as far as possible given the circumstances outlined abpve.

3. Does the NDC align measures and priorities with long-term mitigation strategies?				The iNDC includes measures that can be taken immediately among the refugee population and in the areas within Western Sahara that are under control of the Sahrawi government, and measures that require the completion of the UN mandated decolonisation process. These near-term and long-term measures are coherent and compatible, but the latter require a solution to the current political and military conflict, the completion of the decolonisation process, and full self-determination for Western Sahara.
4. Is the NDC based on updated or new information on relevant sectoral trends? Does the NDC identify relevant sectoral or development priorities, strategies, policies, or plans?				This iNDC is completely new. No previous NDC exists for the SADR. The iNDC outlines the current status of, and trends relating to key sectors, given the available information.
5. Has the NDC revision process considered how to track progress made in implementing and achieving its NDC (e.g. identify the indicators that it selected to track progress, data availability, national institutional arrangements)?				Almost all of the measures proposed are conditional on external support, as a result of the national circumstances of the SADR. Indicators will be developed as part of the institutional capacity processes and strategy development outline in the iNDC, which will require external support. The need for an MRV system and capacity building for calculating emissions is identified explicitly in the iNDC.

2.1.2 AMBITION				
1. Does the NDC strengthen and/or add a GHG target that results in less cumulative GHG emissions compared to the previous NDC?				This is the first (indicative) NDC to be prepared by the SADR, which supports the Paris Agreement Goals and commits to making a fair contribution to global mitigation. The SADR will examine the feasibility of a net-zero target and a moratorium on fossil fuel exploration and production provided adequate external technical and financial support is available to design and implement the necessary strategies to realise these ambitions.
2. Has the NDC increased the scope of the unconditional component of its mitigation targets, compared to its previous NDC?				As above.
3. Does the NDC strengthen or add sectoral non-GHG target(s) (e.g., 50% renewable energy to 80%)				As above
4. Does the NDC include information on strengthened or new policies/actions for mitigation, compared to the previous NDC?				As above
5. Does the NDC increase the geographical coverage since the previous NDC and/or cover the entire geography of the country?				As above. The iNDC covers the Sahrawi refugee camps, the areas of Western Sahara controlled by the Sahrawi government, and the areas occupied by Morocco subject to the completion of the decolonisation process.

6. Does the NDC increase the sectoral coverage since the previous NDC and/or cover all sectors (as defined by the IPCC)?				This is a first (indicative) NDC for the SADR and principally covers energy production, with additional consideration of transport, water and agriculture.
7. Does the NDC increase GHG coverage since its previous NDC and/ or cover all gases (as defined by the IPCC)?				As above. The iNDC principally covers GHG emissions from the combustion of fossil fuels for energy and transport. Inclusion of other GHGs requires significant capacity building with external technical support.
2.2 ADAPTATION				
2.2.1 ROBUSTNESS				
1. Does the NDC include information elements identified in Decision 9/ CMA.1 and its annex on elements of an adaptation communication?				The iNDC includes the information categories set out in the Annex of Decision 9/CMA.1. This iNDC is coherent with this Decision as it increases the visibility and profile of adaptation and its balance with mitigation; it will strengthen adaptation action and requests support; it can be an input to the global stocktake; and, it will enhance learning and understanding of the adaptation needs and actions of the Sahrawi people.
2. Does the NDC include clear adaptation objectives in line with the Paris Agreement adaptation objectives?				Clearly set out in the iNDC document.

3. Has quality assurance and quality control of data, methodologies, and other relevant information been carried out when revising the adaptation components of NDC (e.g. technical review)?				This process using the checklist helps ensure the quality of the iNDC.
4. Does the NDC include quantitative or qualitative targets on adaptation and provisions for a monitoring and evaluation system for adaptation?				Monitoring included.
2.2.2 ENHANCEMENT				
1. Does the NDC reflect progress on adaptation planning and the linkages between the NDC and the NAP or other adaptation planning process or instrument?				This iNDC is the first statement on climate adaptation by the SADR.
2. Does the NDC include updated or new information on climate change impacts, risks, or vulnerabilities (e.g., climate and disaster risk and vulnerability assessments)?				The iNDC is the first synthetic statement of climate impacts and risks faced by the Sahrawi people.
3. Does the NDC include updated or new information on adaptation actions and/or economic diversification plans, including those resulting in mitigation co-benefits (e.g., sectoral/thematic adaptation actions)?				As above
4. Has the NDC increased the geographical coverage of adaptation activities since the previous NDC?				As above
5. Has the NDC increased the sectoral coverage of adaptation activities since the previous NDC?				As above

6. Does the NDC include adaptation actions in new sectors that are consistent with national and sectoral development priorities?				As above
2.3 CROSS-CUTTING ISSUES				
1. Does the NDC align with national, sectoral, and/or sub-national development strategies/plans, including the SDG implementation plan/roadmap?				The SADR government has developed this iNDC in a coherent way with existing policies.
2. Have the socio-economic impacts of NDC targets and measures been considered?				Nearly all the measures identified in the iNDC are conditional on external financial support. Such support would enable the expansion of energy access, improved disaster risk reduction, and support for resilient livelihoods, all of which would have positive socio-economic impacts and support sustainable social and economic development that is currently lacking. Socio-economic impacts in the areas of Western Sahara currently occupied by Morocco are contingent on the completion of the decolonisation process.
3. Has the NDC revision process considered the improvement of an MRV system for financial support?				No financial support has been provided to the Sahrawi for climate action. This iNDC could assist it identifying where such support should come from.

4. Has the NDC revision process considered the improvement of an MRV system related to SDGs and other cross-cutting issues? (e.g. indicators, parameters, baseline, and project targets highlight impacts on vulnerable groups such as, youth, women, children, etc.)				As above
DIMENSION THREE: FEASIBILITY				
3.1 FINANCE, COSTS, AND INVESTMENT				
1. Does the NDC include information on the costs and benefits of achieving GHG targets, non-GHG targets (such as cross cutting actions, gender, awareness raising, etc), and adaptation policies or actions?				Given the indicative nature of this NDC, Table 1 represents a preliminary list of actions whose costs and feasibility require further analysis.
2. Does the NDC include information on the costs of climate inaction?				Both the costs of autonomous adaptation by the Sahrawi people and the costs of inaction are borne by the same people. While financial costs have not been calculated, the nature of the social costs of inaction is clear, and is discussed in the iNDC.
3. Does the NDC include information on the financing strategy for achieving targets or implementing specific policies or actions (e.g., mainstreaming climate into national, sectoral, and/or subnational budgets)?				The iNDC implores the international community to recognise the situation of the SADR and the Sahrawi people, and to include them in climate finance mechanisms in the spirit of principles of equity, transparency and accuracy as set out in the Paris Agreement.

4. Does the NDC include information on NDC-related financial mechanisms established or being developed (e.g., national climate funds, green bonds)?				As above. Note the emphasis in the iNDC on scaling up of existing pilot projects funded by the private sector.
5. Does the NDC indicate detailed international grant and/or loan support?				No such support has been provided to the SADR and the Sahrawi people as a consequence of their systematic exclusion from international climate governance and finance mechanisms. This iNDC makes a strong case for redressing this inequitable situation.
6. Does the NDC indicate public funding sources for reaching identified targets and goals?				The limits to public funding from the SADR government are described.
7. Does the NDC indicate options to leverage existing or potential (local, regional or international) private sector investments for reaching identified targets and goals?				Under the current circumstances of the SADR and the Sahrawi people few points of leverage are available. However, opportunities to scale up existing pilot projects linking mitigation and adaptation are identified.
8. Does the NDC describe measures that are planned or being implemented to reduce investor risks and/or remove barriers to finance?				As above
3.2 INSTITUTIONAL ARRANGEMENT AND CAPACITIES FOR IMPLEMENTATION				

1. Does the NDC include information on institutional arrangements for NDC implementation with clear roles and responsibilities across key sectors and different levels of government structure?				To the extent possible in the circumstances of occupation, government in exile etc. these arrangements are set out.
2. Does the NDC describe capacity development efforts for government officials and/or other stakeholders?				The development of the iNDC itself has been an exercise in capacity development. In addition, the iNDC proposes specific capacity building activities that can be implemented given adequate technical and financial support.
3. Are the targets/measures within the NDC supported by national legislation and/or relevant legal frameworks?				Currently there are no national policy frameworks for climate change in the SADR. However, existing policies provide a framework for aligning climate action with national priorities.
4. Has the NDC identified policy, legal and regulatory gaps (e.g. barriers for implementing adaptation actions)				This iNDC highlights gaps and barriers, most importantly the exclusion of the SADR from global climate governance and finance mechanisms, and consequently from the technical and financial support that is available to other countries.
5. Does the NDC include policy recommendations or potential solutions to address policy/legal/regulatory gaps?				As above – the key solution to addressing barriers to climate action is the inclusion of the SADR in UNFCCC an related mechanisms.

6. Does the NDC include information on technical assistance needs either in terms of human resources or technologies?				The iNDC is a call for assistance of all forms. The Sahrawi people are at increasing climate risk and suffer huge deficits in terms of their adaptive capacity. A list of actions and the technical assistance required to implement them is included in the iNDC.