OBSERVATOIRE DU SAHARA ET DU SAHEL

ADAPTATION FUND

ADAPT-WAP PROJECT

"INTEGRATION OF CLIMATE CHANGE ADAPTATION MEASURES IN THE CONSOLIDATED MANAGEMENT OF THE TRANSBOUNDARY WAP COMPLEX"

Design of a Multi-Risk Early Warning System (drought, floods and bushfires) in the WAP complex area

Terms of Reference

For the recruitment of a design office or a group of design offices

[AO/OSS/ADAPT-WAP_EWS/260820-26]

August 2020

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ACRONYMS

ADAPT-WAP	:	Integration of climate change adaptation measures in the consolidated management of the trans-boundary W-Arly-Pendjari - WAP complex
EW	:	Early Warning
CC	:	Climate Change
WTBR		W Transboundary Biosphere Reserve
OSS	:	Sahara and Sahel Observatory
MR-EWS	:	Multi-Risk Early Warning System
ToRs	:	Terms of Reference
UNISDR	:	United Nations International Strategy for Disaster Reduction
WAP	:	W-Arly-Pendjari
UNESCO	:	United Nations Educational, Scientific and Cultural Organization
ICDSS	:	Information Circulation and Decision Support System
UNISDR	:	United Nations International Strategy for Disaster Risk Reduction

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1. CONTEXT OF THE MISSION

The W-Arly-Pendjari (WAP) Complex is one of the most important compositions of trans-boundary terrestrial ecosystems in Africa. Listed as a UNESCO World Heritage Site in July 2017, this complex is shared by three countries: Benin, Burkina Faso and Niger[1]- and consists of a network of protected areas including the W Trans-boundary Biosphere Reserve (WTBR)[2], the Arly park and the Pendjari park.

The WAP complex provides a significant biological diversity which contributes to the economic and social development of the West African sub-region. Its inherent natural resources are a major asset for local populations whose livelihoods are mainly based on agriculture, livestock, fishing, hunting, forest resources (wood and non-wood forest products) and tourism.

Given all the potential it provides, the WAP complex is a highly rated and popular area, with an influence that extends over approximately 40 km from its protected areas, housing more than 500 cities and villages and a total population of 1 million (approximately 700,000 in Benin; 200,000 in Burkina Faso and 100,000 in Niger) who are split into 4 main socio-professional groups: farmers, fishermen, breeders and hunters.

The WAP complex area is thus subjected to multiple pressures and threats marked by:

- *Droughts leading to uncontrolled pastoral movements;*
- *Floods threatening the safety of populations and plains because of the loss of crops;*
- *Uncontrolled bush fires leading to degradation and reduction of forest areas;*
- *Abusive cutting for the exploitation and sale of firewood and charcoal leading to very important degradation of wooded areas;*
- *The expansion of agricultural land at the expense of forest areas, which puts pressure on natural resources, loss of ecosystem services and reduced potential for carbon sequestration.*

Pressures and threats on the WAP complex are exacerbated by the effects of Climate Change (CC), since it is located in an agro-pastoral region marked by high inter-annual rainfall variability. The area is a highly rated area for agricultural migrants and an important crossing point for transhumant livestock, all attracted by the relatively greater availability of natural resources. Due to CC, it could constitute a refuge for a greater number of migrants and transhumants and therefore be subjected to greater pressures.

In order to help address this situation, the three riparian countries have initiated the ADAPT-WAP "Integration of climate change adaptation measures in the consolidated management of the WAP trans-boundary complex" regional project. This project is funded by a grant from the Adaptation Fund for a four-year period (2020-2024). It is implemented and executed by the Sahara and Sahel Observatory (OSS), in collaboration with the three beneficiary countries.

The ADAPT-WAP regional project aims to strengthen the resilience of ecosystems and improve the livelihoods of the populations of the WAP complex in relation to climate change, through the establishment of a Multi-Risk Early Warning System (MR-EWS) relating to droughts, floods and bush fires and the implementation of concrete adaptation measures.

The project was designed to consolidate the synergy and allow the three beneficiary countries to combine their efforts for the sustainable management of the complex and natural resources, while minimizing the conflicts caused by climate change between the different users.

Given the expected results, the project is based on the following four components:

[1]The WAP complex and its riparian zone covers nearly 50,000 km² (43% in Benin, 36% in Burkina Faso and 21% in Niger).

[2] WTBR covers a total area of approximately 3,916,648 ha and is shared by (3) countries - Benin with 2,048,313 ha, Burkina Faso with 833,335 ha and Niger with 1,034,900 ha.

- **Component 1 -** Integration of aspects related to climate change in the plans and management tools of the WAP complex;
- **Component 2 -** Design and implementation of a Multi-Risk Early Warning System (MR-EWS) (droughts, floods and bush fires);
- **Component 3 -** Improving the resilience of ecosystems and people's livelihoods through the implementation of concrete adaptation actions;
- **Component 4 –** Awareness-raising, communication and capacity building for a consolidated, integrated and sustainable management of the WAP complex.

Component 2 of the project on the establishment of an MR-EWS, is one of the most important points for achieving the project objectives. EWS is defined as "a set of capacities necessary to generate and disseminate timely and meaningful warning information to enable individuals, communities and organizations at risk to get prepared and act appropriately and in due time to reduce the possibility of damage or loss» (UNISDR, 2009).

Through this component, the project aims to establish an operational, reliable and efficient MR-EWS to minimize the negative impacts of natural disasters threatening the integrity of ecosystems and to ensure the safety of the populations living next to the WAP complex. Moreover, this MR-EWS should help respond effectively to emergency situations by facilitating the conduct of intervention plans by users and stakeholders. In other words, the system should process aspects and data related to forecasting, avoidance and protection. This system would allow the users/beneficiaries to systematically receive relevant information prior to a disaster (drought, floods and bushfires) in order to make informed decisions and take adequate measures to reduce such risks. In order to be effective, the system must be integrated within the social context and be based on the involvement of all stakeholders and communities of the complex.

Distribution details of the affected riparian cities by country are found in Annex 1. Hereinafter the area of interest to be taken into account within the framework of the MR-EWS of the WAP complex.

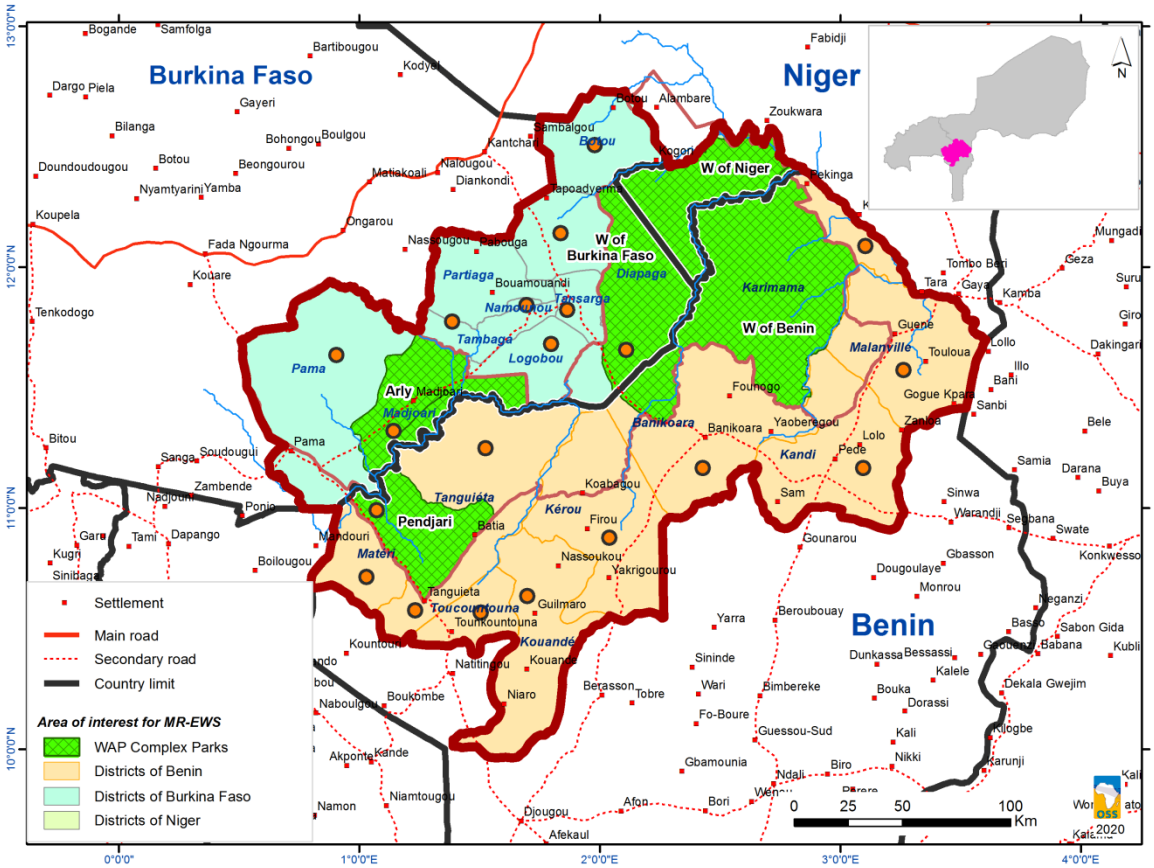

Figure 1: View on the area of interest for SAP-MR

These terms of reference are drawn up for the recruitment of a design office or a group of design offices to develop and implement an MR-EWS for the benefit of stakeholders and communities bordering the WAP complex[3].

2. METHODOLOGY AND COORDINATION WITH THE INSTITUTIONS

The natural resources of the WAP complex represent a major asset for the local populations whose livelihoods rely mainly on agriculture, livestock, fishing, forest resources and tourism. However, despite important previous programs and initiatives that have taken place there[4] in order to strengthen the sustainable management of natural resources and improve the living conditions of local populations, climate has not been adequately taken into account in the different management plans and tools of the WAP complex and responsiveness to the CC risks and impacts is almost missing. Indeed, the WAP complex area does not have an effective early warning system that can help these riparian communities prevent and manage risks, natural disasters and the negative impacts of climate change.

In response to this situation, a comprehensive MR-EWS will be the most important major asset for the local populations to pull the trigger for avoidance and adaptation actions to the CC effects.

By improving the responsiveness of vulnerable communities to the CC-related risks of natural disasters, the MR-EWS will make it possible to bridge the gap in terms of coordination of actions in response to emergency situations.

2.1. Methodological approach

The MR-EWS to be implemented will lead to a paradigm shift of the main operators involved in the WAP complex. It will mainly lead to the establishment of effective synergies between stakeholders and target groups[5] in order to combine efforts to carry out coordinated actions at different regional, national and local scales. The MR-EWS will also have the added-value of promoting:

- The involvement of local populations from the design of the system to the development of emergency plans, knowing that these populations will be involved in the identification and dissemination of risks;
- The promotion of good practices and synergies between countries and teams for the management of claims in the three countries;
- The sustainability of the system through the empowerment of national institutions;
- The establishment of national networks taking gender into account at the different scales of the MR-EWS;
- The promotion of information sharing between the affected countries.

The overall approach for the implementation of the MR-EWS gives paramount importance to the involvement of the communities bordering the WAP complex. It must, of course, be based on approved scientific techniques but also have focus on the communities involved in detecting the first signs of risks, information reporting to local authorities and in participation to the implementation of emergency plans *(figure 2)*.

[3]These are the stakeholders of the WAP complex, namely populations, communities at risk, users and managers of forest, pastoral and agricultural areas.

[4] We can name, the 'Protected Ecosystems in the Sahel in Africa project' (ECOPAS), the 'Support Program for the Entente Park' (PAPE), the 'Support Program for the Management of Protected Areas' (PAGAP)

[5] These include young people, women, private sector, NGOs, civil society.

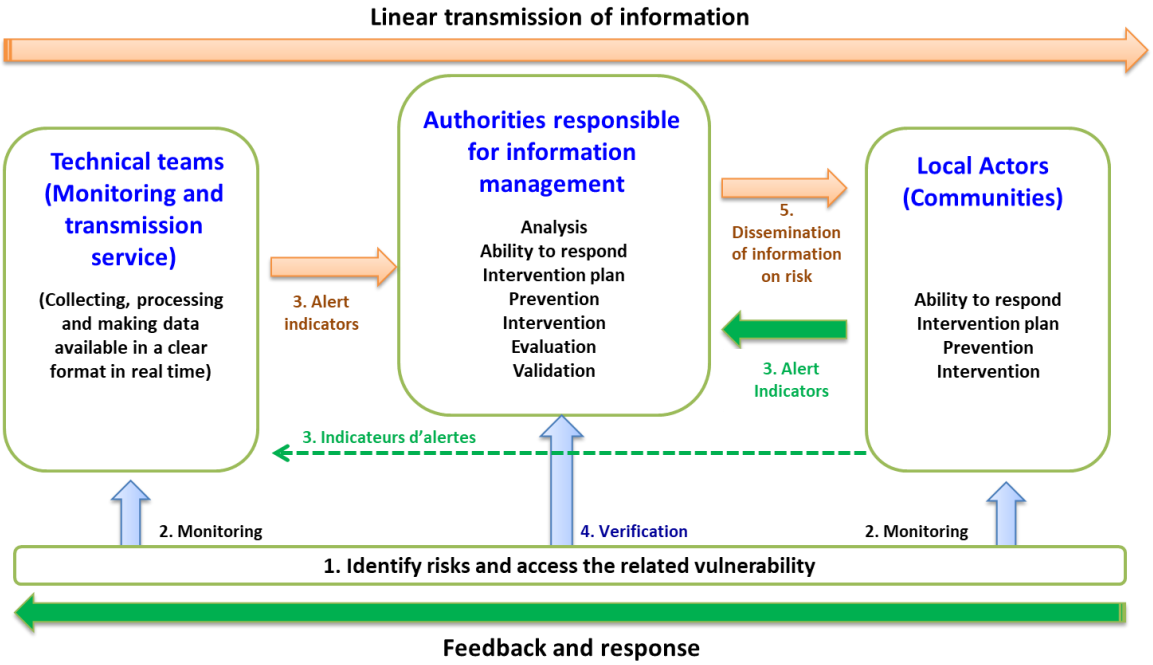

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Figure 2: Overview of t information circulation process in the MR-EWS for the WAP complex

2.2. Coordination with the national and regional institutions

The main outcome of this consultation will be a community early warning system for forecasting, avoidance and protection that will strengthen knowledge sharing, capacity and decision making on climate change, disaster risk management. This system will provide reliable information to the managers of the complex protected areas, in particular:

- The National Centre for the Management of Wildlife Reserves (CENAGREF) under the Ministry of the Environment and Sustainable Development of Benin;
- The National Office of Protected Areas (OFINAP), under the Ministry of the Environment, Green Economy and Climate Change of Burkina Faso;
- The General Directorate of Water and Forests under the Ministry of the Environment, Urban Health and Sustainable Development of Niger;
- National structures in charge of emergency aid, civil protection, Water and Forestry services, town halls etc. in the three beneficiary countries of the project;
- Specialized sector institutions whose mission is to manage the risks associated with specific hazards. These include: CILSS and its technical department (the AGRHYMET Regional Centre) based in Niamey, Niger;
- NGOs and Associations, Civil Society, professional organizations, rural populations bordering the complex (agricultural and pastoral) will equally benefit from the results of this system, through training and awareness-raising on CC and the importance of the EWS.

The work will be undertaken in close collaboration with the Regional Project Unit (RPU) hosted by the OSS (Tunisia).

3. OBJECTIVES OF THE SERVICE AND EXPECTED RESULTS

The overall objective of this consultation is to provide the WAP complex with tools for managing climate hazards and to overcome organizational and human shortcomings allowing better adaptation and resilience of ecosystems and the population to the challenges of climate change.

More specifically, the consultation aims to design a comprehensive MR-EWS, make it operational and guarantee its adoption and sustainability in the WAP complex area in order to support neighbouring communities in the forecasting and management of disaster risks.

In order to achieve these objectives, **four (04) completely complementary components** need to be established and according to the types of risks to be managed within the WAP complex:

- **Component 1 - Knowledge and analysis of risks:** systematic collection of necessary data, generation of information / indicators for risk and disaster assessment;
- **Component 2 - Operational monitoring, forecasting and issuance of warnings:** monitoring of first signs of danger, forecasting and timely evolution of warnings;
- **Component 3 - Dissemination and operational communication:** dissemination of clear and understandable warning messages, with prior preparation information;
- **Component 4 - Response formalized in an emergency plan,** reinforced by a set of operational procedures for rapid warning and intervention depending on the risk.

In order to achieve the results of component 2 "Design and implementation of a Multi-Risk Early Warning System (MR-EWS) drought, flood and bushfire" of the project, the tasks of the mission are built on the six (6) main components below.

3.1. Part 0 – Scoping and conduct of the mission

3.1.1. Start of the service

The service will begin with a start-up phase, for a good understanding of the context, issues and needs in which the activities will take place. It will be followed by an introduction of the team of experts to stakeholders and a consolidation of the framework for coordinating the delivery.

During this phase, the design office will in particular have to thoroughly analyse the ADAPT-WAP project document as well as all the preparatory studies[6] already developed during the project design phase, in order to establish a comprehensive inventory and draw the elements necessary for this consultation to be carried out.

[6] Report on the infrastructures and equipment necessary for the EWS to be acquired and set within the framework of the ADAPT-WAP project; Environmental and social impact study report of the 'integration of climate change adaptation measures in the consolidated management of the WAP trans-boundary complex Entente parks' project.

Then, the design office will have to convene a kick-off meeting with all (above mentioned) relevant stakeholders in collaboration with the OSS.

Finally, update the methodology submitted with the technical bid, based on the information made available during the start-up phase.

3.1.2. Expected deliverables

The deliverables associated with this start-up phase will be:

- **A framing note.** It will be drafted after the first remote meeting (videoconference or by phone) held with the PMU, and will include in particular the main adjustments to the methodology and organization of the mission decided during this meeting.

- **An inception report** including the minutes of all meetings conducted with national technical partners, regional level experts and other partners working on early warning systems in the region.

3.2. Part 1 - Preparation of preliminary studies for the implementation of the MR-EWS

3.2.1. Context and activities

Through this component, preliminary technical diagnoses will be carried out contributing to the development and operationalization of the MR-EWS prototype which will be defined and implemented for the WAP complex. As such, the design office will have to carry out four (04) preliminary diagnosis studies relating to the identification and assessment of the risks, hazards and dangers most often encountered and which will call on the MR-EWS in the WAP complex area.
In order to successfully carry out these studies, the design office will have to collect and systematically review documentary resources and relevant information / data in order to develop the necessary diagnoses, from the identification and mapping of risks, hazards and dangers to the analysis of related vulnerabilities and their forecast and management.

- **Study 1** - will be dedicated to the assessment, detailed analysis and mapping of areas vulnerable to climate risks (floods, drought, bush fires and related risks), focusing on hot spots (most vulnerable areas) in the WAP complex. This diagnosis will make it possible to define, on the one hand, the typology of risks and on the other hand to determine the monitoring parameters for each of the risks as well as their critical thresholds (floods, droughts, bush fires and related risks). The results of this diagnostic will be used later to develop the model and define the warning levels. This study must take into account the perception of the local riparian communities (including the gender) of the parks as to these risks and hazards. The preparatory studies carried out during the preliminary drafting phase of the project document, in particular, the "Analysis of the vulnerability of the WAP complex area population and ecosystems, facing the CC" report, could be used.

- **Study 2** - will focus on the situation of the hydro-meteorological monitoring and data collection network in the WAP complex. It will focus on the analysis of points of failure and the proposal of recommendations and concrete measures for the design and establishment of the hydro-meteorological and bushfire monitoring network, in particular, the system, strategies and appropriate actions related thereto. This study should provide a detailed mapping of data/information collection equipment, as well as the identification of additional equipment to be provided to cover the entire complex and meet the needs of the MR-EWS in in-situ monitoring data

- **Study 3 -** will focus on the development and operationalization of risk forecasting models related to floods, drought, bushfires and other risks in the WAP complex. This diagnosis must define, on the one hand, the type of risks, methods for calculating and forecasting the variables required for their monitoring, the validation and quality control procedures and, on the other hand, the thresholds and levels of warnings for every identified risk (floods, drought, bush fires and related risks). Finally, the study should provide approaches and strategies for merging the results and data with the previous study in order to strengthen the process of generating the indicators and information necessary for issuing warnings on the identified risks, as well as the dissemination of this information via the previously mentioned geospatial platform.

- **Study 4 -** will be dedicated to developing a standard procedure for using the collected information on the risks and dangers identified with a view to disseminating warnings for the benefit of vulnerable populations and authorities in charge of disaster risk management in the WAP complex. In this study, the design office or group of design offices will have to conduct an assessment of the operators to guarantee the commitment of all the partners and stakeholders at regional, national and local levels, which will lead to the establishment a Stakeholder Commitment Plan (SCP). This commitment plan will integrate operational measures so that all stakeholders benefit from a consistent and understandable level of information, especially vulnerable populations. Based on this SCP, the design office or group of design offices will carry out an analysis of the local governance structures and the current means of communication with a view to establishing a standard and fast message communication and dissemination procedure in case of disaster. The procedure must be supported by a network of operators structured in regional, national and local/community units associated with the different levels of the MR-EWS implementation. This network of operators must operate according to a participatory approach involving stakeholders at national and local level in the three (03) beneficiary countries of the project. The mission of each of these entities as well as its composition should be explained in this study.

Before carrying out these studies, the design office or group of design offices will have to produce and submit to the OSS technical notes describing the methodological approaches that will be adopted to carry out this part of the mission.

The design office will make sure to work hand in hand with another team of consultants appointed by the OSS to conduct the "Development of a plan to adapt the WAP complex to CC" study. Besides, it is worth noting that consultations and studies could be carried out in the beneficiary countries and will relate to:

- Developing transhumance corridors;
- Rehabilitating pathways; and
- Developing water points.

At the end of these four (04) studies, the design office will have to develop a prototype of the MR-EWS most suited to the climate, environmental and socio-economic context which currently prevails in the WAP complex. Part 2 provides more details on this subject.

3.2.2. Expected deliverables

By the end of the works on this first part, the deliverables to be submitted by the design office to the OSS are:

- **A concept note relating to each of the four (04) studies and** the methodologies for them to be conducted, the approaches that will be deployed for data collection, the tasks that will be carried out, the resulting deliverables (reports, multi-thematic database , maps, etc.). This note will be 10-page long maximum per study (annexes not included).

- **Four (04) detailed reports presenting the results of each of the studies,** transferred electronically, including: ***summaries of the main results (04), PPT presentations*** (in French)***, operational models for monitoring and forecasting risks (Study 3); multi-thematic databases (including maps of interest for the area) and the information collected as well as an annex[7] defining and giving details of the network of equipment to be deployed in the WAP complex (Study 4), a PEPP and a model of newsletters for the dissemination of messages and warning notices (Study 2).***

- **The facilitation report** of the restitution workshops of studies and explanation of the product results developed in collaboration with the regional project implementation unit.

3.3. Part 2 - Design of the MR-EWS prototype at technical and institutional level

3.3.1. Context and activities

Given the results and recommendations from the previously mentioned studies, the design office will have to design and validate a technical and institutional prototype of the MR-EWS. In this regard, the main activities to be carried out should focus on the following points.

a) Development and/or adoption of models and tools for simulation and forecasting of risks and warnings;
b) Development of a conceptual approach and a logical scheme for the MR-EWS operation at local, national and regional levels (institutional aspect);
c) IT development and implementation of the Information Circulation and Decision Support System on Multi-Risk Early Warnings.
d) Design and operationalization of the procedure for executing the emergency plan and simulation operations.

[7]The equipment identified within the framework of this study will be the subject of Bidding Documents for their acquisition (Section 3).

The design office or group of design offices will have to mobilize the expertise necessary for carrying out these activities, to take into account the specificities of each country and to propose alignment approaches.

a) Development and/or adoption of models and tools for simulation and forecasting of risks and warnings

Based on the results of preliminary studies 1, 2 and 3, relating to the analysis of risks and their modelling, the analysis of areas vulnerable to climate risks and the situation of the monitoring network in the WAP complex, the design office or group of design offices will develop and/or adapt simulation models of the different risks that EWS will have to take into consideration.

- **Drought risks modelling**

The model dedicated to drought simulation should lead to the generation of a Drought Warning Index (DWI) specific to the WAP complex and its riparian areas in order to determine the areas that are vulnerable thereto[8].

This model should lead to spatiotemporal monitoring and analysis of drought over the different periods of possible occurrence of drought based on influencing factors, such as soil moisture, rainfall ..., since in tropical semi-arid areas, the possibility of drought occurrence depends mainly on rainfall. The rainfall indices (including for example the Standardized Precipitation Index, SPI) are thus crucial in this modelling.

Finally, the model must also ensure the classification of early warning signals and convert them into warning intervals. The figure below gives an example of determining the warning intervals from a DWI threshold comprising values ranging from 0 to 3 (*Lu et al 2020*).

Early warning signals	Green Light (G)	Blue Light (B)	Yellow Light (Y)	Orange Light (O)	Red Light (R)
Early Warning Indices Intervals	0 < IAS < 1	1<DAI<1,5	1,5<DAI<2	2<DAI<2,5	2,5<DAI<3
Warning levels	Normal state	Warning	Warning triggering	High warning	Serious warning

Figure 3: Determination of drought early warning intervals

- **Flood risk modelling**

The model dedicated to determine flood warnings aims to generate indices and indicators relating to imminent flooding cases in order to allow stakeholders to take action to reduce negative impacts.

This model must be able to provide real-time flood forecasting, by estimating the future situation of hydrological phenomena such as: flow rate, cumulative volume of water, level of floor, flood zones, average flow velocity at a particular geographic location or section of canal, etc.

The type of flood risk modelling approach should be based on choosing a model suitable for the context of the WAP complex. As a type of model, let us name:

- Data-driven models.

[8] As a reminder, the adverse impacts of the drought risks on livestock and animal production relate to: the degradation of pastures and corridors, the increase in transhumance and conflicts between farmers and breeders, aggravation of stress livestock water, decreased milk and meat production, social change.

- Conceptual (hydrological) models).

- Hydrological Operational Multipurpose System.

However, the choice of the appropriate model for flood forecasting in the WAP complex must be based on valid reasons and adequately explained.

Flood forecasting and warning should focus on communities and infrastructure in the WAP complex and surrounding cities (towns, villages, districts, etc.). The different sites of interest must therefore be given priority according to the risk level and the likely impact magnitude. Risk levels could be classified according to the possibility associated with particular trigger levels. As for the impact levels, they could be classified in terms of socio-economic costs and disturbances.

The figure below gives an example of the classification of risk areas.

Flood risk	Natural areas	Crop areas	Livestock areas/Pastures	Low density urban areas	High density urban areas
	Low	Medium	Medium	High	Very high
High	High/Low	High/Medium	High/Medium	High/High	High/Very high
Medium	Medium/Low	Medium/Medium	Medium/Medium	Medium/High	Medium/Very high
Low	Low/Low	Low/Medium	Low/Medium	Low/High	Low/Very High

Figure 4: Classification of flood impact zones

- **Bush fires risk modelling**

The model dedicated to bushfires should make it possible to detect the start or the occurrence of these bushfires in the WAP complex and its riparian areas. This model should also make it possible to simulate these fires in order to foresee their intensities and their spread speeds according to environmental factors such as the vegetation types and cover, topography (exposure and slope of the land), climate conditions (wind, temperature, rainfall, relative humidity, etc.), the intensity of combustion, the type of fuel, etc.

The simulation of fires can take into account and enhance the existing models:

- Statistic models
- Empirical models
- Semi empirical models
- Physical models

When designing the model, special attention should be paid to models that determine the simulation of the start and spread of fire, from an initiation point. The model should be able to calculate the position of these points and have them connected to form the new fire front.

It is highly recommended that the operation of each of these models (drought, flooding, bushfires and related risks) take into account input data prepared or developed under a GIS. The design office should consider the involvement and use of earth observation data (satellite imagery) and geospatial tools in the development of simulation and forecasting tools for risks and warnings.

b) Conceptual approach and operational logic diagram of the MR-EWS at national and regional levels

At the national level, this action will first consist in defining the vision and the implementation approach of the MR-EWS in each part of the complex located in the three (03) riparian countries, and then, in concretely translating this approach into a logical diagram illustrating the participation and the role of each entity at both national and local level.

The development of the MR-EWS prototype should take into account an implementation plan involving a network of operators made up of at least three (03) stakeholder groups:

- A National Early Warning Unit (NEWU) for each country, ensuring the coordination of the EWS at the national level;
- Local Early Warning Units (LEWUs), spread out throughout the part of the complex belonging to the countries and established in vulnerable areas;
- Community relays in each country, whose role is to support the activity of local branches.

These entities should be linked through a dynamic and effective communication network on risks and warnings; Figure 2 gives an illustration of the principle. They will also need to be given suitable and efficient means of transport allowing them to timely travel within the WAP complex in order to implement any emergency plans**.**

At the regional level, the design office should propose a consensual approach that aims to establish a Regional Early Warning Unit (REWU), linked to each of the three (03) National Units operating in the 03 countries and that should work hand in hand with them.

The Regional Unit will thus be the main interface of the MR-EWS of the WAP complex. It will fulfil three main functions:

- The connecting and relay point between the three (03) NEWUs established at the national level and the other EWSs in the West African sub-region and beyond;
- Supporting the implementation of NEWUs activities, by contributing to capacity building in the deployment of emergency plans;
- Supporting and strengthening institutional cooperation between the three countries for the adequate conduct of actions at both national and regional levels.

Figure 5 below illustrates the principle of MR-EWS interactions at national and regional levels. This diagram should be reviewed / improved by the design office according to the field reality.

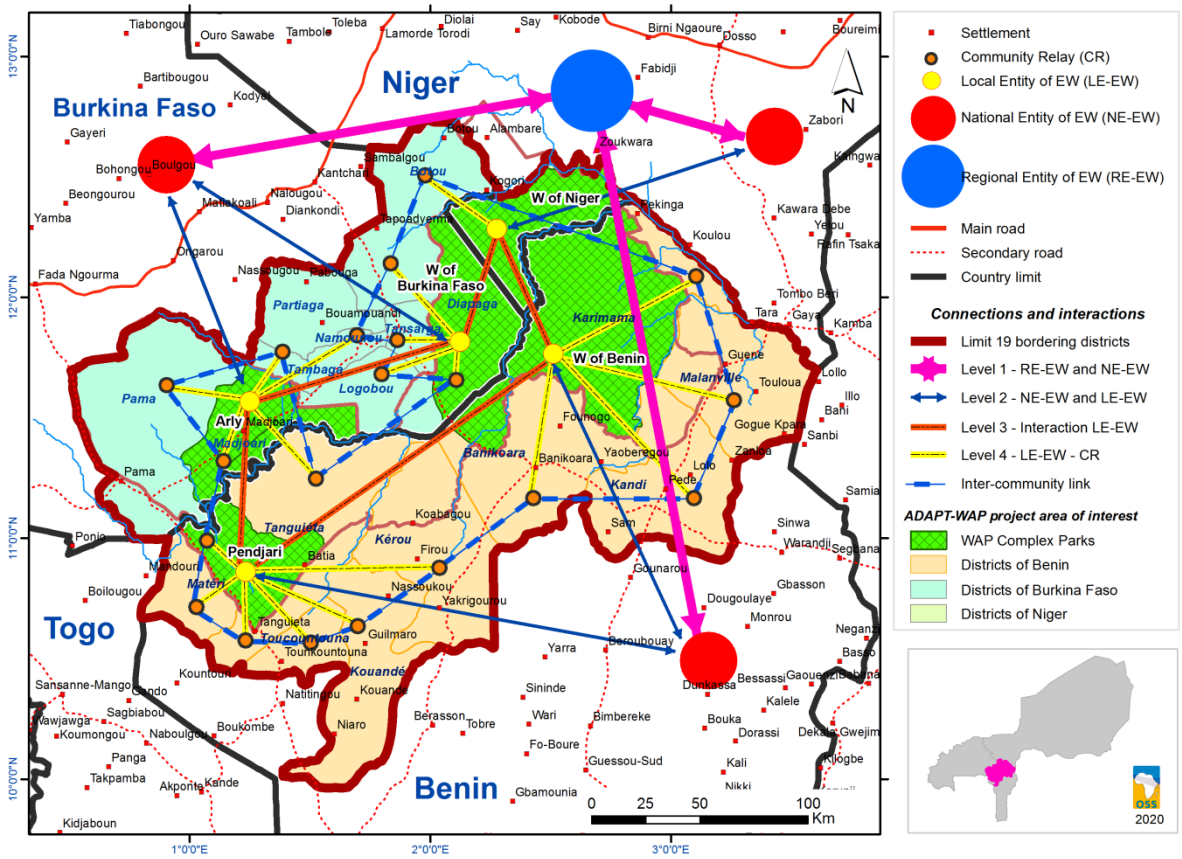

Figure 5: Illustration of the principle of connection and interaction between the MR-EWS Units

Globally speaking, and in relation to the concepts and operating principles of the above mentioned national and regional levels, the design office must propose and describe:

- **A general conceptual diagram** characterizing the overall functioning of the MR-EWS **(local, national, regional level).** This diagram should highlight all the components to be integrated in the system;
- An operational plan defining the operating principle of MR-EWS at **national and local** level, with a detailed description of the components and the role of each operator;

The Figure below provides a general overview of an available conceptual approach for the MR-EWS to help design the two schemes. These diagrams must be exhaustive, ranging from the environmental monitoring process to that of stakeholder feedback. In this regard, the design office can get inspired by the works of Didier et al (2019) on "early warning systems for natural and environmental hazards (Open via this link: https://www.erudit.org/fr/revues/rseau/2017-v30-n2-rseau03369/1042922ar/).

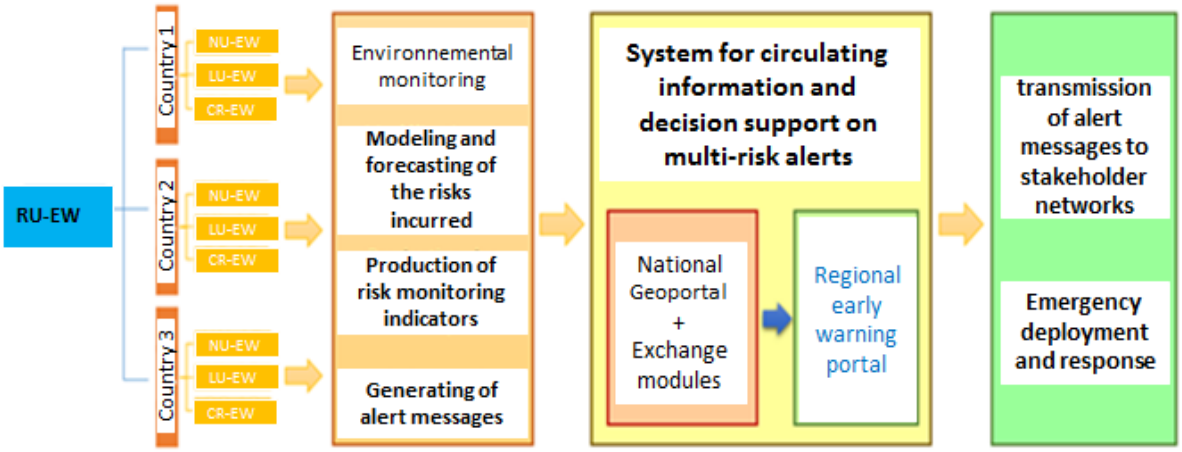

Figure 6: Overview of the general conceptual approach for the MR-EWS

c) IT development and implementation of the multi-risk forecasting and warning system

In order to lay the foundations for the establishment of the Information Circulation and Decision Support System, the design office will have to ensure the IT design, development and implementation of the related platform. The design office will therefore have to proceed with the development, establishment, setting and start-up of all the components of the regional platform and a common IT interface for data collection and real-time centralization, development, processing, interpretation, visualization, warning, release and dissemination of information through servers (one regional server and 3 national servers) dedicated to the MR-EWS.

The design office will therefore be responsible for producing the conceptual model, developing and implementing an operational system fitted with the tools, functions and necessary requests allowing:

- The collection (in real time and continuously) from multi-risk databases fed in real time and continuously by measuring instruments deployed in the field and by the information resources available in the 3 countries.
- The storage and processing of multi-thematic and multi-risk databases, as well as the necessary forecasts, analyses and modelling.

The steps to be considered by the design office for the implementation of this Information Circulation and Decision Support System are:

- The development of the conceptual model of the databases and system: the design office will have to develop and deploy the following needs:
  - *A tool for collecting data on risks in real time from the different databases linked to the measuring instruments and equipment deployed within the framework of the project.*
  - *A tool for pre-processing and processing data on risks and producing the necessary indicators.*
  - *A tool for forecasting and foreseeing risks and dangers.*
  - *A warning tool generated and disseminated efficiently and beforehand and in a format that is adapted to the user needs.*
  - *Warning, broadcasting and visualization tools (2D and 3D).*
  - *An object-guided model ("Unified Modelling Language" (UML) from the documents and requirements provided and perform a UML class diagram.*

- Development, preparation and implementation of the multi-risk database (drought, floods and bushfires): at this level, the design office is expected to generate the multi-risk database from the conceptual model produced. This is a translation and optimization of the UML model.

- Development and implementation of the Information Circulation and Decision Support System: the design office in charge of:
    - *Collecting multi-risk databases generated in real time and continuously by measuring instruments deployed in the field.*
    - *The collection and centralization of other information resources available in the 3 countries and at the regional level which would be useful for the production of indicators and information related to risks and warnings.*
    - *Storing and processing BD data on these risks and warnings.*
    - *Simulating and forecasting risks and warnings and foreseeing emergencies and possible impacts.*
    - *Analysis, modelling, cross-referencing, consultation, manipulation, security and dissemination of data and information on the risks (droughts, floods and bush fires, etc.).*

As for the regional platform which will constitute the main interface of the MR-EWS, it should be developed as a functional website. The design office must at least:

- Define the site tree structure;
- Define the domain name of the site by checking its availability, as well as for geoportals and mapping servers;
- Define the intranet site plan and browsing design.
- Propose 3 graphic charters;
- Propose a name to the intranet site;
- Develop the site according to the design and functionalities requested;
- Detail and comment on source codes and programs developed;
- Supply the geographic database with structured data;
- Ensure the proper functioning of the site;
- Ensure the security of the geographic database after it has been fed.

The regional platform should make it possible to carry out the following operations (non-exhaustive list):

- Interactive visualization and spatial analysis;
- Generation of thematic maps and reports;
- Generation of monitoring and inventory reports (forms);
- Updates ;
- Management of procedures, functions, applications (customized tools and buttons, interfaces etc.);
- Editing of maps and personalized reports.
- Document download and printing.
- Etc.

As for the security of the platform dedicated to MR-EWS, the design office is expected to:

- Define the applications and security measures for the system;
- Define the methods of access for users of the system;
- Define security of data and source codes of different applications and services.

Figure 4 below gives an illustration of the platform dedicated to this multi-risk warning and forecasting system.

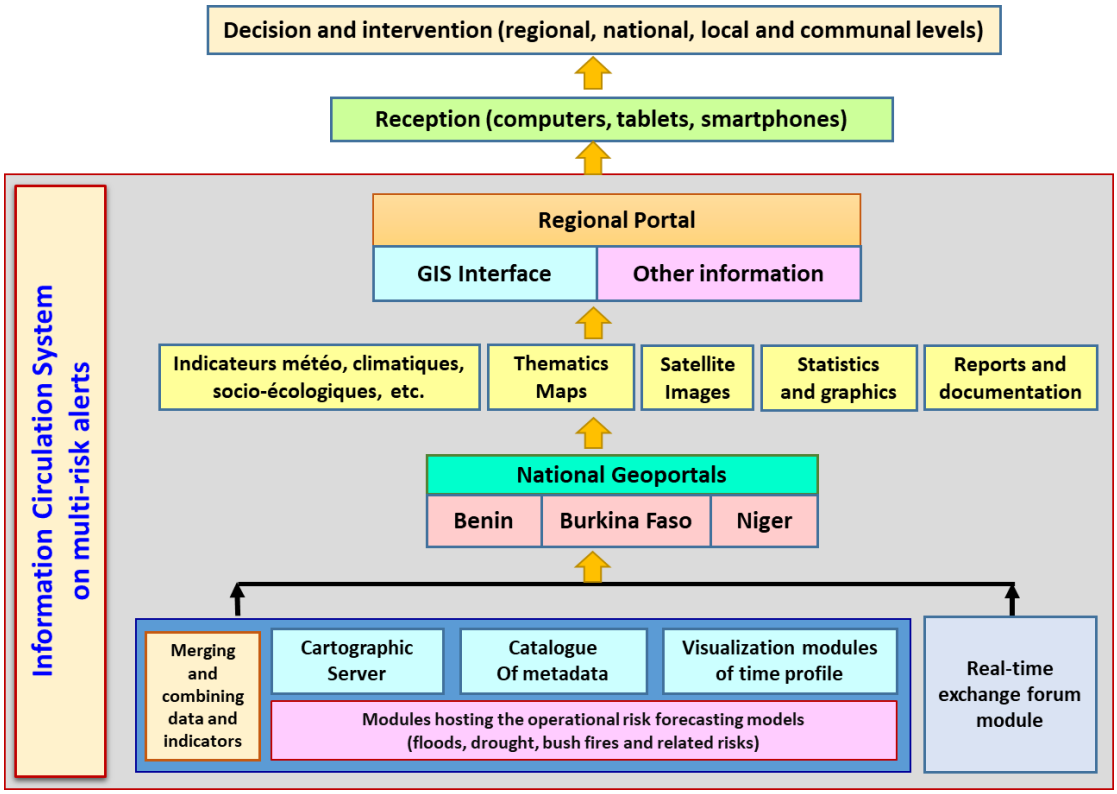

Figure 7 : Illustration of the platform dedicated to the information circulation system on multi-risk warnings.

d) Design and operationalization of the procedure for executing the emergency plan and simulation operations

The objective sought by setting up this MR-EWS is to improve the responsiveness of stakeholders to local and regional hazards and to ready them to better react to natural disasters (floods, drought, bush fires, etc.). The MR-EWS should be based on a **relief mechanism, the establishment and ownership of which** would make it possible to prevent disasters, extreme events or risks, and therefore reduce the negative impacts of natural disasters on ecosystems and local populations.

The emergency plan must be translated into an emergency plan, the actual deployment of which must be evaluated and mastered following the launch of a warning within the framework of an MR-EWS. In addition to the launch test, time steps should be defined for backup simulations. This will allow the different stakeholders to develop certain reflexes. This emergency plan is in fact an operational manual for disaster impact management in the three countries. Its command is a crucial condition for the resilience and adaptation of communities. Given its importance, it is therefore necessary that the technical and material capacities (vehicles, fire engines, bicycles, motorcycles, canoes and inflatable boats) of the various users (management units, three-part units and representatives of the population ...) be strengthened so that they can take ownership and control the execution of this plan.

The design office will thus be responsible for:

- **Proposing operational emergency plans,** with clear and fluid action plans integrating national and regional systems and making it possible to deal with disasters and dangers related to floods, drought and bushfires. Emergency plans should include a community management mechanism involving forecasting and warning units as well as the WAP local population, taking into account the gender-related specificities in order to reach every component of the population (women, young people). , etc…); detail the roles and responsibilities (theoretical and practical) of every stakeholder.

- **Develop the operational manual dedicated to the emergency disaster management plan including** well-tested and proven evacuation strategies. The manual will have to mention the behaviours to adopt in order to reduce risks and protect one's health, know the available evacuation routes and safe areas and have a clear idea of the most effective measures to avoid damage and material loss.

- **Develop communication media** open to communities and provide awareness and information sessions for the benefit of local populations (in the 22 neighbouring towns).

- **Develop a clear action plan** to ensure the conduct of three simulation operations.

3.3.2. Expected deliverables

At the end of this second part related works, the design office will have to provide the OSS with the following products:

- A report detailing the models and tools for simulation and forecasting risks and warnings;
- **A concept note** for the development and operationalization of the platform constituting the Information Circulation System on multi-risk warnings;
- **Reports describing the MR-EWS prototype** to be implemented in the WAP complex, **the list** of equipment to be made available for the intervention teams, the protocol for integrating the conventional information circulation and transmission channels for the MR-EWS, the establishment and sustainability of ICDSS, and the implementation of the regional web portal, national geoportals and related modules;
- **Comprehensive guides or handbooks** describing the establishment of the MR-EWS facilitation and management units (regional, national and local EW units), the operational management of disaster impacts, including evacuation strategies (emergency plans) and operational management of the three simulation operations;
- **A regional web portal** for sharing EW information within the WAP complex area;
- **Training modules and kits** for the benefit of the different categories of operators involved in early warning, so that they master the use of the tools and products developed.

3.4. Part 3 - Preparation of Tender Documents (TDs) for the acquisition of the equipment necessary for the implementation of the MR-EWS.

3.4.1. Context and activities

As part of the establishment of the different components of the MR-EWS, a variety of equipment should be acquired and deployed in the WAP complex and in the three (03) beneficiary countries. For this reason, a detailed Tender File (TF) should be prepared for the acquisition of said equipment.

The design office will have to proceed with the development of this TF and will have to:

- Identify and define the characteristics of each item of equipment that will be necessary for the establishment and operationalization of the MR-EWS.
- Develop a comprehensive Tender File (TF) for the acquisition of said equipment.

This equipment would include, inter alia, monitoring equipment that would allow the establishment of national environmental monitoring systems for areas vulnerable to climate risks in order to make monitoring hubs (one at the regional level, three at the national level supported by local branches). The equipment will also relate to computer equipment, tools for disseminating warning messages to the populations.

It is worth noting that the design office or group of design offices will have to, as the MR-EWS is conceptualized, define the equipment requirements necessary for its deployment and start-up. This consultation also provides for the organization of simulation operations which requires the prior provision of EWS equipment.

According to the experience it has in setting up EWS, the design office or group of design offices will have to propose the characteristics of the relevant and efficient equipment for the effective operationalization of the complex area MR-EWS.

3.4.2. *Deliverables*

The design office will have to provide the OSS with:

- **An exhaustive version of the TF** relating to all the equipment to be acquired for the operationalization of the MR-EWS in each of the 3 countries and in the Regional Early Warning Unit.
- A summary note on the selection and award criteria for tenders during a call for tender's procedure.

3.5. Part 4 - Deployment of the MR-EWS in the field

3.5.1. Context and activities

Following the validation of the technical and institutional MR-EWS prototype and the exhaustive inventory of the equipment necessary for its implementation, the design office will deploy the MR-EWS in the field (in countries and in the WAP complex area).

Once the equipment has been acquired and in connection with the deployment of MR-EWS in the field the design office will focus on five (05) main aspects:

- The establishment, connection and parameter setting (unit setting, function settings, etc.) of tools and materials, according to the diagrams initially proposed / validated during additional studies, the plan and mapping of their spatial distribution of this equipment;
- The definition and formalization of the network of operators (regional, national, local units, community relays, etc.) will be in charge of animating and managing the MR-EWS and who will take action at different levels.
- Capacity building of technical teams (from 03 countries) responsible for environmental monitoring and the production of indicators and warning messages: training on:
    - *Data processing (climate variables, vulnerabilities, socio-economic data).*
    - *The generation of the appropriate parameters for the monitoring and forecasting of risks, the production of indicators / information on forecasts and warnings and their transfer to other members of the network of operators involved in the MR-EWS, starting with the Information Circulation System technical teams.*
    - *The conduct of emergency plan through carrying out simulation operations (consisting of simulation exercises of disaster management).*

- Capacity building of the technical teams (from the 03 countries) in charge of managing the **Information Circulation System** linked to the MR-EWS: training relating to the supply and administration of web portals, geoportals, and media communication modules, etc. These teams must be connected to effective channels for disseminating and transferring information to the network of operators (Media, social network, mobile phone, etc.)**.**

- Training (theoretical aspects) of local operators and community relays in the WAP complex area: training on detecting the first signs of risks, reporting information to local authorities and animation of plans for emergency.

3.5.2. Deliverables

At the end of component 4 related works, the design office will have to provide the OSS with the following products:

- **Report on the establishment and operationalization of IT equipment** (computers processing units, servers, software, etc.), as well as **the observation equipment setting** (hydrological, meteorological, piezometers stations (with reference to their specificities, identification, number, model, geographic location, measurement and remote transmission parameters, etc.) ;
- **Report on the formalization and establishment** of the network of the main operators of the MR-EWS (regional unit, national and local units, community relays, etc.) who will be responsible for facilitating and managing the MR-EWS as well as the measures to be taken for their sustainability;
- Reports relating to the different training workshops for the benefit of management units and EWS relays in the three (03 countries) for the benefit of:

3.6. Part 5 - EWS operationalization and sustainability

3.6.1. Context and activities

At the end of the MR-EWS on-field deployment process, it will be up to the design office or group of design offices to check its operationality and then to propose the mechanisms for its sustainability.

To this end, the design office or group of design offices will:

- Make an exhaustive test of all the adopted hardware and human devices, from the establishment and networking of equipment and systems for the production and circulation of information on early warnings, to the management units and community relays, in order to ensure the effective operation.
- Use indicators on forecasts and risks for the production of warning messages and disseminate these warning messages to the different levels of intervention.
- Practically execute the emergency plan to be adopted (with regard to each of the identified risks: drought, flood, bush fires, etc.) in the event of a disaster, by carrying out simulation operations which represent practical exercises simulation of full-scale disaster management in countries. These simulation operations must be based on the procedures described in part 2 and which would have been validated by the stakeholders.
- Validate the sustainability measures set forth in component 4, in order to ensure the sustainability and empowerment of the MR-EWS by national institutions.

3.6.2. Deliverables

At the end of this last work, the design office will have to provide the OSS with the following products:

- **Connection and operation reports** for the entire system (equipment, regional web portals and national geoportals, reception structures, operators' network, etc.) along with the simplified procedures relating to each of the risks, their identification as well as the protocols to be implemented for the management of the related disasters' impacts;
- A validation report on the protocol and the measures that should lead to the sustainability of the system through the empowerment of national institutions
- A practical implementation report for simulation operations carried out with national partners including the main recommendations.

For all of the above-mentioned components, the design office or group of design offices should refer to Annex 4 for more details on deliverables.

4. QUALIFICATIONS, EVALUATION CRITERIA AND SUBMISSION OF BIDS

The consultation duration is 280 days spread over twenty-four (24) months on average from its signature. The total volume of services to be mobilized for the accomplishment of the mission is estimated at approximately 350 man-days, including support staff. The number of man-days proposed, its consistency with the proposed methodology and the intervention schedule of the different experts will be one of the key criteria that will be taken into account during the examination of the technical bids.

4.1. Qualifications

The design office will have to provide the following profiles for this service:

4.1.1. Key experts

A PhD and/or masters level specialist in hydrometeorology, climate change/scenario development, natural risk management or similar fields of study, lead officer. Qualifications and experience:

- At least 15 years of general work experience.
- At least 10 years of specific experience in modelling hydro-meteorological hazards, drought, flood and fire risks (meteorological and climatological factors, fire regimes and behaviours, geographic and anthropogenic factors).
- At least 10 years of proven experience in the design and development of multi-hazard early warning systems and disaster contingency plans, including disaster impact management and evacuation strategies.
- Good knowledge of the typology of central and de-concentrated State institutions, decentralized institutions and civil society as well as professional organizations and socio-professional categories to be involved in the establishment of an early warning system .
- Very good knowledge of new/recent technologies and application of information in the context of multi-hazard early warning systems.

- Good working experience in countries bordering the WAP complex, in particular on issues related to the preservation of national parks.
- Experience on community management mechanisms including knowledge of the study area would be a great asset.
- Experience in the management and monitoring of projects (adaptation and/or mitigation) would be an asset.
- Good knowledge of the procedures of funding partners such as the Adaptation Fund, GCF, World Bank, GEF and IFAD ... would be an asset.
- Great writing capacity in French.
- Able to work within a team, communicate and provide leadership.
- Knowledge of gender would be an asset

- **Environmental specialist in disaster management, or other closely related sectors.**
  - PhD and/or Masters level in environment specialized in natural risk and disaster management, ecology or other sectors closely linked to any other related field, with a minimum of ten (10) years of experience in carrying out disaster risk reduction missions, particularly floods, droughts, bush fires.
  - At least ten (10) years of professional experience in areas relevant to the consultation, especially with regard to decentralized early warning tools and their linkage with national and local EWS.
  - Proven knowledge in the development and management of early warning systems, experience in the Sahel regions and knowledge of the institutional contexts of the relevant countries (Benin, Burkina Faso and Niger) would be great assets.
  - Demonstrated skills in polls/surveys and in qualitative and quantitative data analysis.
  - Good command of classical international languages (French and English).
  - Knowledge of other local languages used in localities bordering the complex would be appreciated.
  - Previous experience with results-based monitoring and evaluation methodologies.

- **Geographer, specialist in GIS, disaster management or environmental engineering.**
  - PhD and/or Masters level in geography, environmental engineering or any other related field, with a minimum of ten (10) years of experience in carrying out disaster risk reduction missions, in particular floods, drought, fire bush.
  - At least 10 years of experience in early warning and/or in carrying out disaster risk reduction missions, in particular floods, drought, bush fires.
  - Experience in EWS setting up and operating in the Sahel region would be an asset.
  - Proven experience in mapping, geographic information systems (GIS) and remote sensing.
  - Experience in developing training guidelines and manuals.
  - Communication experience.
  - Gender knowledge would be an asset.

- **IT Engineer/developer**
  - Engineer and/or Master level in computer science, computer analysis and development or any other related field, with a minimum of ten (10) years of experience in the development of digital products, custom software and easy-to-use software interface 'use.
  - Experience in leading multiplatform projects, from their design to their monitoring,
  - Experience in developing training guidelines and manuals.
  - Experience in teamwork and communication.
  - Experience in EWS setting up and operating in the Sahel region would be an asset.
  - Gender knowledge would be an asset.

4.1.2. Support experts

- Sociologist
- Communication expert
- Rural engineering expert
- Agroecology expert
- Procurement expert
- A remote transmission specialist

4.2. Evaluation criteria

The successful tenderer will be selected by the OSS tender evaluation committee based on:

- A clear and relevant methodological note (not more than 20 pages, see details below);
- The required team of experts presented;
- The financial bid.

The following criteria will be applied to select the economically most advantageous bid.

Criteria	Points	%
A. Technical bid		**70%**
A.1. Sub-criterion 1: Global approach for the performance of the service	***25***	
A.1.1. Methodological note for the performance of the service	10	
A.1.2. Understanding of needs	5	
A.1.3. References of the office for the performance of similar activities	5	
A.1.4. Timeline for the performance of the service	5	
A.2. Sub-criterion 2: Quality of the team of experts	***75***	
A.2.1. An international expert, specialist in hydrometeorology, climate change, natural risk management or similar fields of study, lead officer	15	
A.2.2. An environment Expert, specialized in disaster management, or other closely related sectors	10	
A.2.3. A geographer, specialist in GIS and remote sensing, disaster management or environmental engineering	10	
A.2.4. An IT engineer / developer	10	
A.2.5. A support expert as a sociologist	5	
A.2.6. A communication support expert	5	
A.2.7. A rural engineering support expert	5	
A.2.8. An agroecology expert	5	
A.2.9. A procurement expert	5	
A.2.10. A remote transmission specialist	5	
Total	**100**	
B. Financial bid		**30%**

4.2.1. Additional considerations

A statement of availability and exclusivity must be signed and annexed to the bid for each expert presented. If an expert is involved in several parts of the ToRs, the tenderer must present a table summarizing the mobilization of the expert on the different missions and their schedule compatibility.

4.3. Submission of bids

Applicants are expected to submit their applications which must include, an administrative file, a technical bid and a financial bid. Financial and technical bids must be kept separate.

4.3.1. Administrative file details

In addition to the technical and financial bids, the design office or group of design offices will have to provide the following administrative documents:

- The certificate relating to the tax situation provided for by the legislation in force,
- A certificate of non-bankruptcy, legal redress or any other equivalent document, provided for by the law of the country of origin for bidders who are not residents of Tunisia,
- A copy of the trade register for resident bidders or any other equivalent document provided for by the law of the country of origin, for bidders not resident in Tunisia,
- A sworn statement duly completed and signed in accordance with the form in Annex 5.1.
- A referring sheet duly completed and signed in accordance with the form in Annex 5.2.

If the tenderer happens to be a group comprising more than one design office, the two documents below are also required, namely:

- Group agreement duly signed by the bidding design offices.
- Power of attorney from the office designated to act and sign on behalf of the group.

4.3.2. Details of the technical bid:

The design office must provide a soft copy of the technical bid including:

- A methodological note that exhaustively describes the methodological approach that will be adopted to carry out the mission;
- A detailed presentation of the data collection approaches and tools that will be adopted.
- A presentation of the key points for the success of the service.
- A brief note on the relevant experiences and references of the office for achievements similar to the tasks requested, focused on the African context.
- A timetable defining the deadlines and steps necessary for the conduct of the entire mission and the submission of the different deliverables.
- The detailed Curriculum Vitae (CV) of each of the experts, clearly highlighting the missions carried out in connection with the consultation as well as the copies of certificates resulting from similar services. Use the standard OSS model, downloadable from the following link: **[OSS CV Model].**

Finally, based on its experience, the design office will have to outline the strategies and key points that it believes are necessary for the proper conduct of the service and for the success of the assignment. It will also have to mention the possible assumptions and risks which it could face, and consequently, the strategies to use for the success of the mission.

4.4. Details of the financial bid

The financial bid must be presented in American dollars (USD), detailing the travel fees and other expenses, as mentioned in the table below.

Component of the financial bid	Unit (M/d)	Amount (US$)
Expert 1 : Specialist in hydrometeorology, climate change/scenario development, natural risk management or similar disciplines, lead partner		
Duration of the intervention / effort (M / day)		
Estimated effort (M / day)		
Other expenses		
Subtotal expert 1		
Expert 2 : Environmental expert, specializing in disaster management, or other closely related sectors		
Duration of the intervention / effort (M / day)		
Estimated effort (M / day)		
Other expenses		
Subtotal expert 2		
Expert 3 : Geographer, specialist in environmental sciences, disaster management or environmental engineering		
Duration of the intervention / effort (M / day)		
Estimated effort (M / day)		
Other expenses		
Subtotal expert 3		
Expert 4 : IT Engineer / Developer		
Duration of the intervention / effort (M / day)		
Estimated effort (M / day)		
Other expenses		
Subtotal expert 4		
Support experts		
A sociologist expert		
A communication expert		
A rural engineering expert		
An agroecology expert		
A procurement expert		
A remote transmission specialist		
GENERAL TOTAL		

5. PAYMENT SCHEDULE

The OSS will proceed to the payment of the fees, to the account specified by the design office in American dollars (USD), after receipt and final validation of all requested products.

The payment schedule will be defined before the contract is signed and should be progressive depending on the delivery of the expected deliverables. The total amount of this service is limited and includes all the expenses necessary to carry out the work, including travel expenses and daily allowances. No additional funding is available beyond the budget once established.

The payment will be made as follows:

Main actions	Number of days	Payment percentage	Year percentage
Year 2020 - 2021			
Part 0 - Proposal of the scoping note and finetuned methodology for the conduct of the mission	20	0	45
Part 1 - Preparation of preliminary studies for the implementation of the MR-EWS	60	10	
Part 2 - Design of the MR-EWS prototype at technical and institutional level	70	25	
Part 3 - Preparation of Tender Documents (TDs)	30	10	
Year 2021 - 2022			
Part 4 - Deployment of the MR-EWS in the field	40	25	55
Part 5 - Operationalization and sustainability of the MR-EWS	60	30	
Total	**280**	**100**	**100**

6. DEADLINE AND PLACE FOR SUBMISSION OF APPLICATIONS

Bids (technical and financial in two different files) must be received by the OSS no later than Sunday **October 18, 2020 at 11.59 p.m. Tunis time or 10.59 p.m. GMT**. Mention to be made in the subject line: «Call for applications for the recruitment of a design office for the «**Design of a Multi-Risk Early Warning System (drought, floods and bushfires) in the WAP complex area** [**[AO/OSS/ADAPT-WAP_SAP/260820-26]** ».

Email address: procurement@oss.org.tn

7. ANNEXES

ANNEX 1 - DISTRIBUTION OF THE 22 TOWNS OF THE ADAPT-WAP PROJECT "AREA" ACCORDING TO THE 3 COUNTRIES

N°	Pays	Réserves	Communes riveraines du complexe
1	Bénin	RBTW	Kandi
2			Karimama
3			Malanville
4			Banikoara
5		Pendjari	Kérou
6			Matéri
7			Tanguiéta
8	Burkina	RBTW	Botou
9			Diapaga
10			Logobou
11			Tansarga
12		Arly	Fada N'Gourma
13			Kompienga
14			Madjoari
15			Patiaga
16			Namounou
17			Matiakoali
18			Pama
19			Tambaga
20	Niger	RBTW	Tamou
21			Kirtachi
22			Falmey

ANNEX 2 - SPECIFICITIES OF THE INFORMATION CIRCULATION AND DECISION-SUPPORT SYSTEM (ICDSS)

The ICDSS brings together all the components, tools and modules that will be combined to develop a geospatial and multi-scale information system (local, national, regional and international scales) that can secure timely communication and dissemination of information to stakeholders (technical services, crisis unit and communication unit, etc.).

The design office or group of design offices will have to develop the ICDSS and have it operationalized, which will constitute the basic platform for the transfer of information on risks and for the dissemination of warning messages as well as opinions and advices. The ICDSS is highly important to provide the basic structure for the establishment of the communication device and network covering all levels (community, local, national, regional and international).

Two types of devices will be deployed in the implementation of this MR-EWS:

(i) Tools for spatial-temporal monitoring and dissemination of information on risks and hazards

Knowledge and monitoring of risk are the basic element for assessing hazards and the vulnerability of communities. Within the framework of the ADAPT-WAP project, the actions to be carried out to ensure this follow-up ("pre-disaster" actions) consist of additional studies to identify parameters and indicators on hazards (e.g. intensity, frequency, probability and spatial distribution) and on the vulnerability of communities. The results must be disseminated and open via:

- Interactive decision support tools, including geoportals that will enable the use of geospatial biophysical information and indicators, ready-to-use satellite imagery resources, etc.).
- Reports, maps for risks and their intensity, etc.

(ii) Risk and warning simulation and forecasting tools

These tools aim to develop operational models for forecasting the risks incurred in the WAP complex (**floods, drought, bushfires and related risks**). These models must be converted into computer modules developed based on the parameters that were used in the risk modelling processes.

The design office or group of design offices must therefore design these computer modules in order to be able to set up simulation and forecasting tools for risks and warnings, which are aggregated to the ICDSS, with the main tasks of:

- Interactively and automatically generating the indicators and information necessary to determine thresholds and warning levels for each of the types of risks identified.
- Ensuring the dissemination of these indicators/information via the regional portal dedicated to MR-EWS and their transfer to the network of operators (see illustration of the principle in Figure 4).

(iii) Tools for sharing and transferring information on multi-risk warning

These tools can bring together the main elements below:

- Conventional media (radio, local television and Internet) which are nowadays important allies of the MR-EWS (Didier et al 2019).

- Social media (Twitter, Facebook, Instagram, Whatsapp…) which are useful in both disaster and post-disaster mode.
- Mobile phones and android apps, allowing the dissemination of text, voice and image messages able of individually reaching a large number of residents in vulnerable areas.
- The pictograms a.
- Informal tools (word of mouth, village griots using drums, etc.).

The design office or group of design offices must provide operational systems and tools to ensure a perfect flow of information under the MR-EWS.

ANNEX 3 - LINKS WITH OTHER STUDIES

The design office should consult or refer to a number of studies carried out under the project but also to strategic documents on climate change and adaptation at the national and regional level. These include:

- Preparatory studies carried out when developing the project as follows:
    - Analysis and assessment report of the population and ecosystems' vulnerability to climate change - April 2018;
    - Environmental and social impact study of the 'integration of climate change adaptation measures in the consolidated management of the WAP trans-boundary complex' project - April 2018;
    - Environmental and social impact study report of the 'integration of climate change adaptation measures in the consolidated management of the WAP trans-boundary complex' project - April 2018;
    - Report on the infrastructure and equipment necessary for the EWS to be acquired and set as part of the ADAPT-WAP project - April 2018.
- The ongoing study establishing the baseline situation for the ADAPT-WAP - 2020 project;
- National adaptation plans of the affected countries, if applicable;
- National Adaptation Action Plans (NAAPs) of the affected countries.

ANNEX 4 - DELIVERABLES DETAILS

Part	Expected deliverables	Description
Part 0 - Proposal of the methodology for conducting the mission.	Scoping note	- Summary of adjustments made to the methodology and organization of the mission based on the initial technical bid; - Exhaustive version of the methodology with a timetable defining the deadlines and steps necessary for the conduct of the entire mission and the submission of the different deliverables. - Inception report version.
	Detailed working methodology taking into account the adjustments and recommendations made.	
	Inception report.	
Part 1 - Preparation of preliminary studies for the implementation of MR-EWS.	Four (04) concept notes on each of the four (04) diagnostic studies.	*These reports must describe the approaches to be deployed for data collection, the tasks to be performed as well as the related intermediate products: reports, multi-thematic database, maps, risk forecasting models, etc.* *These studies should collect information on all aspects of disaster and hazard risk; including their detection, mapping at an appropriate scale, monitoring, analysis, forecasting and management. Summaries must be 10 page-long maximum.*
	Four (04) detailed reports presenting the results of each of the four (04) diagnostic studies, including: Four (04) summary reports on each of the studies Multi-thematic database grouping the information collected during the development of the four (04) studies Mapping of areas vulnerable to identified risks and different topics of interest in the WAP complex area Operational models for monitoring and forecasting risks. Model of reports used to disseminate warning messages at national and regional level.	
	Report defining the network of equipment to be acquired and the plan according to which this network must be deployed in the WAP complex.	This report must be consistent with the content and requirements of the Call for Tender File to be prepared by the design office (see details in section 3). It must contain the diagrams and maps of the equipment distribution plan.
	The facilitation report of the study restitution workshops and explanation of the results of the products developed in collaboration with the regional project implementation unit.	
	Minutes of consultation and discussion meetings relating to this Component-1.	

Part	Expected deliverables	Description
Part 2 - Design of the MR-EWS prototype at the technical and institutional level.	A report detailing the models and tools for simulating and forecasting risks and warnings.	*The report will focus on validated models for forecasting floods, drought, bushfires and related risks.*
	Technical concept note for the development and operationalization of the platform constituting the Information Circulation and Decision Support System (ICDSS)	*This technical note should give details of the methodology that will be adopted for the IT development and deployment of this Platform which will constitute the ICDSS. It must present the architecture of the platform, explain each of its components and their functionalities, knowing that the emphasis should be placed on Open Sources approaches and solutions (OGC, ISO 19115 / ISO 19139). -*
	Report describing the MR-EWS prototype to be implemented in the WAP complex.	*This report must cover the following aspects (non-restrictive):* • ***The conceptual approach**, architectures and logic diagrams of operation of MR-EWS at national / local and regional levels. At this level, details must be provided on aspects relating to: (i) **The network of operators** who will take action at the local/community levels bordering the WAP complex, national (entities / units / early warning branches); with an accurate indication of the role of each of the stakeholder groups. (ii) **The procedures** that will be deployed to ensure the connection of these operators to the communication network to be set up.* ***The network of operators** and institutions to be established at the different levels of the system in the three (03) countries.*
	Guide for the establishment of the animation and management units of the MR-EWS.	-
	Posters describing the main conceptual and operating diagrams of the MR-EWS.	○ *The general conceptual diagram characterizing the overall operating of the MR-EWS and highlighting all its components.* ○ *The national and local conceptual diagram illustrating the operating principle of MR-EWS and the role of each operator.* ○ *The merging diagram of the two above mentioned diagrams highlighting their combination-*
	Regional web portal for sharing EW information within the WAP complex area. This portal must be fitted with geospatial decision-support platforms (one in each country).	*The work related to the establishment of the regional portal depends on the validation of the terms of the above mentioned concept note and which relates to it. The portal must be equipped with:* *• Three (03) geoportals (one in each country to be developed separately). These geoportals will be the tools for environmental and climate risk monitoring, and must be equipped with a map server and modules for interactive visualization of historical data series and monitoring of key spatial indicators. They must also promote the results of work related to modelling flood, drought, fire and related risks forecasts, identified in the WAP complex by the additional studies mentioned in Part-1.* *• An exchange module linking the network of operators in order to stimulate exchanges between stakeholders on key issues related to risks and warnings.* *A module ensuring the rapid circulation of information to the different relays at national and local levels*
	Modules and training kits to build capacities and ensure good command of tools and products adapted to the different categories of operators working on early warning	• *Training on data processing (climate variables, vulnerabilities, and socio-economic data), the generation of adequate parameters for monitoring and forecasting risks, and the production of indicators/information on forecasts and warnings, their transfer to other members of the network working on the MR-EWS.*

Part	Expected deliverables	Description
		• *Training on supplying and managing web portals, geoportals, and media communication modules, etc.* • *Training on the detection of the first signs of risks, and the reporting of information on warnings to local authorities.* *Theoretical training on the implementation of emergency plans through the conduct of simulation operations (consisting of simulation exercises in disaster management).*
	A report outlining the protocol for integrating traditional channels of dissemination and transfer of information in the context of the MR-EWS.	
	ICDSS implementation and sustainability report, describing the adequate implementation of the regional portal, national geoportals and related modules.	This report must explain the proper implementation of the entire ICDSS by the bureau (the regional portal, the 03 national geoportals, the map server, etc.); and must describe the maintenance and sustainability procedures.
	An operational manual for disaster impact management, including evacuation strategies (emergency plans).	
	Supports de communication (audiovisuelle, spot de sensibilisation, etc.) accessibles aux communautés.	These communication supports should make it possible to convey information on the MR-EWS and to help raise the awareness of local populations in the 22 cities (see list in Annex-2).
	An operational guide for the conduct of the three simulation operations.	This guide should focus on practical case exercises in simulation and disaster management.
Part 3 - Preparation of tender documents (TDs) for the acquisition of the equipment necessary for the implementation of the MR-EWS.	Comprehensive version of the Tender Document (TD) relating to each of the 3 countries and dealing with all the equipment identified.	*For information purposes, this TF could be inspired by the sections below:* - Field monitoring equipment (weather station, piezometers, etc.), with clear information on their series, numbers, models, geographical position of establishment, measurement parameters, etc.). - Office equipment (servers, processing units, software, GPS, etc.), ensuring their quality and their ability to manage the flow of activity and services that will be incurred. - Disaster management equipment (pick-up, motorcycles, canoes, inflatable boats and specific accessories). - Warning message dissemination tools and material (markers, flags, sirens, indications, loudspeakers, telephone, radios, etc.). - Materials necessary for the rehabilitation of reception units (offices and other premises).
	A summary note on the selection and award criteria for tenders during a call for tender's procedure.	This note should provide guidance to the file evaluation committee during the tender procedure for the acquisition of equipment.

Part	Expected deliverables	Description
Part 4 - Deployment of the MR-EWS in the field	The report on the establishment and operationalization of IT equipment (computers/processing units, servers, software, etc.), as well as the configuration of observation equipment (hydrological, meteorological stations, piezometers (with reference to their specificities, identification, number, model, geographical location, measurement and remote transmission parameters). This report must include in annex the report of receipt and perfect operation of the equipment by the authorities of the beneficiary countries	This report must include in annex the report of receipt and perfect operation of the equipment by the authorities of the beneficiary countries
	Report on the formalization and establishment of the network of the main operators of the MR-EWS (regional unit, national, local units, community relays, etc.) who will be responsible for facilitating and managing the MR-EWS.	*This report should provide details on the validated texts for the creation of the different units (regional, national, local including community relays) and including the location, the tasks of the members of said management units, the network of operators who will take action in the different MR-EWS levels, equipment allocations, the mechanism for sustainability and continuous capacity building, etc.*
	Reports relating to the different training workshops for the EWS management and relay units in the three (03 countries).	This training should focus on the following groups of operators: The technical teams who will be in charge of data processing for the production of indicators and forecasting and early warning information [Training on data processing (climate variables, vulnerabilities, socio-economic data), generation of parameters adequate for monitoring and forecasting risks, producing indicators/information on forecasts and warnings, their transfer to other members of the network working on the MR-EWS, in particular the technical teams in charge of the Information Circulation System.]. The technical teams who will be responsible for managing the Information Circulation System linked to the MR-EWS [Training relating to the supply and management of web portals, geoportals, and communication modules with media, etc.]. EW Local Units and community relays [Training on the detection of the first signs of risks, and reporting of information on warnings to local authorities]. All stakeholders in the MR-EWS [Theoretical training on the implementation of emergency plans through the conduct of simulation operations (consisting of simulation exercises of disaster management)]. Gender should be represented in the management units and community relays.
	Report describing the protocol and the measures that should lead to the sustainability of the system by empowering national institutions.	This report should focus on the self-management of the system by relevant countries and communities with inherent resources.
Part 5 - EWS operationalization and sustainability	The connection and operation report of the entire system (equipment, regional web portals and national geoportals, reception structures, network of operators, etc.)	*The report should have in annex the simplified procedures relating to each risk, their identification as well as the protocols to be implemented for the management of the impacts of the related disasters.*

Part	Expected deliverables	Description
	A validation report of the protocol and the measures that should lead to the sustainability of the system through the empowerment of national institutions.	*The report emphasizing the self-management of the system by the countries and communities involved, which inherently should self-generate the resources for financing the MR-EWS at the end of the project-*
	A practical implementation report of simulation operations carried out with national partners including the main recommendations.	

ANNEX 5 - SWORN STATEMENT FORM AND REFERENCING SHEET

Annex 5.1: Model of the sworn statement

Sworn Statement

Subject of the Call for tenders: ……..

I, the undersigned (full name): .....
Nationality: ……

Acting as: ……
Company name:……

Address: .....
Registered in the trade register under number.....on .....at.....
Tax identification number:……..

- **Solemnly declare :**

1- Never having been in compulsory liquidation and never having been the subject of any legal proceedings for any reason whatsoever;
2- Undertake not to engage, myself or a third party, to practices that may be qualified as embezzlement, fraud or corruption in the different procedures for the award, management and execution of this contract;
3- Commit myself, should my bid be selected, to observe the OSS current procedures and the obligation of confidentiality and professional secrecy for all the facts and/or information that I may have to know;

- **Guarantee** the accuracy of the information contained in this sworn statement and in the documents provided in my bid.
- **Declare** that I am not related to any person receiving any remuneration from the OSS.
- **Acknowledge** having read that any inaccuracy or fallacy and any breach that may be registered in the content of my bid as well as non-compliance with the conditions of participation, are grounds for rejecting my application.

Made at ..... on .....

Signature and stamp of the legal representative of the design office or group of design offices.

ANNEX 5.2 - REFERENCING SHEET

Referencing sheet

DETAILS OF THE DESIGN OFFICE		
Company Name :		
Legal form: Tax ID number: Date of registration: Place of registration:	Tax registration number: Date of registration in the trade register:	
Full name and nationality of the Legal representative:	Position :	E-mail:
Full name and nationality of the Contact person:	Position :	E-mail :
Legal address in the country of activity:		
Zip Code :	City:	Country:
Phone :	Fax :	

THANK YOU FOR RETURNING THIS DOCUMENT DULY COMPLETED AND SIGNED BY THE LEGAL REPRESENTATIVE OF THE DESIGN OFFICE OR THE GROUP OF DESIGN OFFICES.