CREWS PROJECT STATUS REPORT
(July - December 2021)

1. Project title	Burkina Faso: Strengthening National Capacities for Early Warning System Service Delivery	**2. Project reference**	CREWS/CProj/03/Burkina
3. Lead Implementing Partner	WMO	**4. Regional/National Partners involved in the project**	ANAM (meteo), DEIE (hydro), INERA (agriculture), Météo-France, AGRHYMET, RCC Niamey, RTC Niamey, GISC Casablanca, AEMET/BSC, FURV, UNIFI + consultants
5. Project Duration/ Timeframe	Jan 2017 - Dec 2022	**6. Total Funding Approved by Steering Committee (in US dollars), including fees**	USD 2,192,650
7. Reporting focal point	Jean-Baptiste Migraine <jbmigraine@wmo.int>		
8. Project overview	Burkina Faso is a country in West Africa with a large portion of the workforce depending on rain-fed agriculture (about 30-35% of employment), and an urbanisation rate currently at 29% and rapidly growing. This country is characterized by an extreme climate variability that can produce both persistent dry spells and extreme rainfall events, combined with a rainy season that lasts for 3-4 months with specific convective precipitation patterns leading to flooding. Studies have shown an increase in both drought and flood events, in Burkina Faso, with increasingly serious consequences for the population, infrastructure, environment and the economic sector. The CREWS project in Burkina Faso, with a budget of US$2,192,200, is being implemented by WMO in partnership with Météo-France,		

	AGRHYMET, AEMET/BSC, FURV, UNIFI, INERA and the national meteorological service (ANAM), providing technical assistance in synergy with investments by WMO (USAID, GFCS), the World Bank (IDA, GCF, P164078 and P164345) and UNDP (GEF, SAPIC), as well as with the regional CREWS West Africa project (see comprehensive list of Projects in Burkina Faso). The project's objective is to improve hydrometeorological services for early warning on flood-related risks and risk information for agriculture, food security and anticipation of severe weather impacts. The main focus of the project is to build the capacity of the National Meteorological and Hydrological Services and to strengthen their cooperation with agriculture, food security, civil protection, humanitarian stakeholders and the media, to test seamless warning systems that deliver relevant information to end-users. This is being achieved through developing capabilities on data management, observation network monitoring and control, implementation of analysis, monitoring and forecast tools for weather and climate early warning, as well as strengthening the interface with information users in specific pilot sites. The project draws on advanced technical expertise from cooperating institutions to ensure access to relevant data, products, tools, training and equipment. The project builds upon the 3.6 million USD UNDP SAP-IC and 330k USD USAID GFCS projects; and is implemented in close coordination with the 31 million USD hydromet project, with an objective similar to CREWS. The total amount leveraged is 35 million (16x).
9. Progress summary	As of today, the project has successfully: - Assessed the baseline capacities for hydrometeorological forecasting and warning, with specific guidance about how to use investment resources made available to the country by The World Bank; - Provided enhanced agrometeorological warning services in 3 pilot zones, with socio-economic benefits demonstrated; - Developed the strategic plan of ANAM, adopted by its Board in 2020; - Registered the 242 automatic weather stations if the global observations' database OSCAR/Surface and solved the communication issues of 9 manual synoptic stations (out of a total of 10); - Trained ANAM forecasters and operational staff on numerical weather prediction interpretation, limited area modelling, crop modelling, flood modelling, sub-seasonal forecasting, sand and dust storm forecasting; to inform the future warning system with a seamless approach.

	Under the remaining period, the project is expected to
	- complete the remaining activities
	  - Flash Flood Guidance System, expected to be delivered (including trainings) and operational in 2022
	  - Calibration and training on AQUACROP irrigation decision support system (based upon pilot in Farako-Ba)
	  - Complete the support to ANAM to develop irrigation schemes and agricultural advisories for farmers at the dry season.
	- ensure provision of advisory services to ANAM and DEIE under the 33 million USD Hydromet investment. This has started in March 2021 following a high-level meeting (see MoU); the preparation of a contract for provision of reimbursable advisory services after the closing of the CREWS project was initiated in Dec 2021 (see mission report). Those advisory services currently focus on (i) public weather services, with the upgrade of the multimedia studio; (ii) MHEWS standard operating procedures, with identification of specific responsibilities for meteorological, hydrological, civil protection, food security and DRR national services in the warning systems; (iii) enhancing the observing and forecasting capacities, with the plan to run a limited area numerical weather prediction model from Ouagadougou soon; (iv) warning production, with the installation of a production room.

10. Project Performance

Interpretation of color coding		
	**High**	Good progress, on track in most or all aspects of delivery
	**Medium**	Moderate progress or on track in some aspects of delivery
	**Low**	Less than moderate or poor progress. Not on track in critical areas of its delivery. Requires remedial attention

	Rate of expenditure	Rate of delivery	Alignment of Objectives
Coding			
Narrative	The progress with expenditure is satisfactory, 77% of the total budget (USD 1,698,919).	The progress is satisfactory, and the independent review identifies a mix of activities delivered very efficiently (agrometeorological services at pilot sites, capacity development in numerical weather prediction, subseasonal forecasting and agrometeorology) as well as some delivered with delays (procurement of soil moisture sensors, sharing of observations in the WMO Information System, provision of flood forecasting guidance). Since March 2021, WMO is providing advisory services to the national meteorological and hydrological services in the context of the implementation of the 33 million USD Hydromet project.	The objectives of the program are consistent with (i) national policies and strategies, donor policies, and initiatives of other major donors; (ii) overall purpose and objectives defined during project formulation. The adopted approach, particularly for the capacity building of ANAM, has demonstrated to be well adapted to the context.

11. Risk Management Status

Risk Status	The risk remains moderate, as identified at the proposal stage. While ANAM demonstrated appropriate capacity for implementation, and a stable institutional context conducive to strategic planning and capacity development, there is a risk remaining of suboptimal use of resources within DEIE, and lack of staff, despite the 2 large investment projects supporting the institution (Hydromet 33 million USD

	and water resources and sanitation 250 million USD). In addition, the security risks in the country have deteriorated over the past 18 months, and French civil servants are no longer able to travel in Ouagadougou.
Measures to address	To cope with the limited capacity of DEIE to manage activities, (i) an amendment to the Letter of Agreement with ANAM was signed, allowing ANAM to implement activities in support of DEIE and (ii) a coordination meeting was held with the Hydromet project, to ensure rapid uptake of recommendations from the assessment of DEIE. In relation to the deteriorating security and COVID-19 situations, a number of trainings, missions and workshops have been relocated from Ouagadougou to Toulouse and Niamey, have been held online or have been postponed (FFGS step 3).

12. Contributions to CREWS National Outputs

CREWS National Output 1: National Meteorological and Hydrological Services' delivery improved, including the development of long-term service delivery strategies and development plans				
Project Outputs	**Overall Project Target**	**Progress by July 2021**	**Target for reporting period**	**Progress by Dec 2021**
1.1. Assessment of the observing network as an update of the SAP-IC midterm review report (2017), updating of the OSCAR/surface database and improvement of data sharing into the WMO Information System (WIS). Meteorological stations' metadata has been collected. 4 missions took place since 2018, the last one on 10-14 Feb 2020 (see report). Equipment was provided and training delivered to 10 observers operating the synoptic stations (see details under output 5). Since then, 10 stations out of 10 feed the WIS 8 times a day (compared to 1 previously). Additional guidance for developments to be performed by the end of 2023 under the 33 million USD Hydromet investment is available.	100%	100%	100%	100%
1.2. Assessment of the hydrological service's national capabilities as an update to Serge Pieyns' reports (2014; 2016; 2017; 2018) with specific focus on end-to-end flood forecasting and early warning and recommendations towards modernization using CREWS	100%	100%	100%	100%

and GCF/IDA resources. The report has been developed between May and October 2019, delivered in November 2019 (see report). It provides specific guidance for developments to be performed by the end of 2023 under the 250 million USD water and sanitation program and the 33 million USD Hydromet investment.				
1.3. Assessment of agro-meteorological users' requirements with regards to climate warnings in 3 pilot areas (Niangoloko, Tenado, Titao) and detailed work plan for the CREWS agro-meteorological component. The first mission to evaluate requirements was held from 17-22 December 2017 (see reports). A detailed list of requirements has then been updated on an ongoing basis, based upon lessons learned as climate services have been provided to users over the 2018, 2019 and 2020 cropping seasons. Local representatives from the Ministry of agriculture were trained on how to respond to emerging needs expressed by vulnerable farmers (including women) through series of trainings (in the field, in Ouagadougou and in AGRHYMET), while ANAM progressively improved the agrometeorological bulletins.	100%	100%	100%	100%
1.4. Licence to access products and forecasts from the European Centre for Medium-Range Weather Forecasts (ECMWF). Licence procured on 31 October 2017 covering 100Go of daily downloads from November 2017 until October 2019. Since 2019, access to ECMWF datasets is provided by RSMC-Dakar under the SWFP project.	100%	100%	100%	100%
1.6. Development of an interface responding to the specific requirements of Burkina Faso as part of the West Africa Severe Weather Demonstration Project (SWFDP-West Africa). The RSMC Dakar password-protected website is available in both French and English languages. NWP products including EPSgrams from several contributing global NWP centres (e.g. Environment Canada, ECMWF, NOAA/NCEP, UKMO etc.) are available to NMHSs of West Africa including ANAM. RSMC Dakar also issues daily Regional Severe Weather Forecast Guidance product to the NMHSs through its web portal.	100%	100%	100%	100%
1.7. Calibration of a crop model (SARRA-H) for the agro-meteorological pilot zones, and setup of Aquacrop for irrigation decision support - A training workshop on CIRAD models	100%	90%	90%	90%

SARRA-H and SARRA-O was organized by AGRHYMET from 12 to 23 November 2018 with participants from Burkina Faso, Niger, Mali and Senegal (see report / folder). Since June 2020, INERA and UNIFI have calibrated and tested the Aquacrop model in the agrometeorological station of Farako Ba, using automatic soil moisture sensors (see report). Partnership agreements have been signed on 7 May 2020 with UNIFI and on 17 March 2020 with INERA for the setting-up of the tool. A training, report and research paper will be produced in Q2 2022 (summarizing two years of field experiments during the dry season).				
1.8. Development of priority agromet indices based on Land Data Assimilation Systems (LDAS). Météo-France developed indices and tested them in Burkina Faso in close coordination with ANAM. A workshop took place from 28-29 May 2019 on LDAS organized by Météo France in Ouagadougou (see report / folder). Following this training, additional indices of interest have been included in the tool: soil moisture, long dry sequences (+ 10 days to + 20 days), monitoring and forecasting of biomass and Leaf Area Index (LAI). The production of these indices will be continued with other CREWS projects starting in 2021.	100%	100%	100%	100%
1.9. Development of a Flash Flood Forecasting System (FFGS). The initial planning meeting took place from 25-28 June 2019 in Dakar (see report). HRC begun the implementation of the West Africa FFGS (WAFFGS) with requests for data from the countries of Burkina Faso, Mali and Niger, delineation of flash flood prone basins in the domain of the three countries, the establishment of secure FTP sites for downloading from countries, as well as from the ICON NWP from DWD and the H03B satellite precipitation product from EUMETSAT, and the opening of the instructional portal with online courses (in English and French) to support the Step 2 online e-course training on the FFGS. This training on fundamentals in hydrometeorology related to flash floods and an introduction to FGGS products was completed on April 2019, and allowed to train 13 staff from ANAM and DGRE-DEIE.	100%	75%	50%	75%

1.10. Sand and dust storm forecasting. An LoA with the Barcelona Supercomputing Center was signed in July 2018 to support the development of a Warning Advisory System for Sand and Dust Storm in Burkina Faso. The BF-SDS-WAS was launched in Oct 2018 and provides daily information to ANAM forecasters since then. This system will be expanded to 7 countries in Sahel, starting in 2021.	100%	100%	100%	100%
1.11. Supporting forecasting of severe weather events using the MISVA tool and weekly briefings. After 4 years of continued operation during the rainy season, supported by Météo France (research and operational teams together), an analysis of user feedback and requirements was performed, see report. Subsequently, the MISVA tool was further improved, see new version at https://misva.aeris-data.fr	100%	100%	95%	100%
1.12. Strategic plan for ANAM, as an update to the KPMG Modernization Plan (2014) and National Framework for Climate Services (2016). Météo-France hired WeatherForce to undertake this task, and the first consultation workshop was held in May 2019. A strategic plan was delivered in Nov 2019.	100%	100%	100%	100%
CONTRIBUTION TO CREWS VALUE PROPOSITION: MULTIPLIER - Country portfolios promote a favorable environment for, and leveraging of, effective additional financing. CREWS develops specific solutions in pilot areas related to agrometeorology and flood modelling. These will be scaled-up by the WB P164078 Climate Resilience (32 million USD) and P164345 Water Res. (300 million USD) projects, together with 21 projects contributing to GFCS, CREWS or Sendai priorities				

CREWS Output 2: Risk Information to guide early warning systems and climate and weather service developed and accessible				
Project-specific Outputs	**Overall Project Target**	**Progress by July 2021**	**Target for reporting period**	**Progress by Dec 2021**

2.1. Identification of flood prone areas in a GIS portal. Under the Agreement with HRC, watersheds and flood-prone areas will be mapped based on combination of national and global datasets.	100%	50%	50%	50%
2.2. Enhanced drought risk assessment and drought monitoring. The development of crop calendars and a training on the use of R-INSTAT for monitoring of drought indices took place on 20-24 Feb 2020 (see report).	100%	100%	100%	100%
CONTRIBUTION TO CREWS VALUE PROPOSITION: UNIQUE - A financing mechanism that builds sustained institutional capacity driven by countries and supported by the expertise and specialist networks of its partners. CREWS supports the development of innovative sand and dust storm warning (with AEMET/BSC), flash flood guidance (with HRC), seamless forecasting under MISVA (with Météo France and RSMC Dakar), and agrometeorological services based on weather, sub-seasonal and seasonal prediction (with AGRHYMET, CIRAD, UNIFI, FURV, Météo-France). The national services (ANAM and DEIE) in Burkina Faso are leading these interactions.				

CREWS Output 3: Information and communication technology, including common alerting protocol, strengthened				
Project-specific Outputs	**Overall Project Target**	**Progress by July 2021**	**Target for reporting period**	**Progress by Dec 2021**
3.1. Setup of a data concentration and data management system. 12 PCs, 2 laptops, 1 server, 13 external disks and ten mobile broadband devices have been procured and received at ANAM. A training took place from 5-9 November 2018 before delivery of the equipment to the stations and Internet subscription for 30 months was done. The Climsoft software was installed on 10 PCs for the 10 synoptic stations in April 2019, and two rounds of training were conducted. As of Dec 2020, 9 synoptic stations out of 10 provide data through CLIMSOFT with a systematic approach. The last mission regarding data concentration was organized on 10-14 Feb 2020 (see report).	100%	100%	100%	100%
3.3. Procurement and installation of soil moisture sensors in pilot sites. Specifications on sites and sensors configuration have been identified, for measurements at 5 cm (surface	100%	90%	100%	95%

soil moisture) and 10 to 120 cm (soil moisture profile). Procurement is almost completed with additional communication equipment for validation site in Farako Bâ. Sensors were delivered in July 2020 and partially installed in October 2020. Installation is expected to be completed by October 2021. A partnership agreement with INERA was setup on 17 March 2020 in order to calibrate and demonstrate the potential use for drought warning and irrigation decision support. A new partnership agreement with INERA is being drafted and expected for approval in July 2020 to support ANAM on the validation and development of soil moisture monitoring products and irrigation advice for sensitive rainfed and irrigated crops.				
CONTRIBUTION TO CREWS VALUE PROPOSITION: PEOPLE-CENTERED - Local organizations are listened to and engaged so that investments are driven by the needs of end-users. 1,100 farmers in 3 pilot sites have been trained on the use of weather and climate forecasts, with local radio operators, to optimize field cropping calendars. The trainings have been specifically designed based on a diagnosis of how people access, process, and respond to information and warnings.				

CREWS Output 4: Preparedness and response plans with operational procedures that outline early warning dissemination processes strengthened and accessible				
Project-specific Outputs	**Overall Project Target**	**Progress by July 2021**	**Target for reporting period**	**Progress by Dec 2021**

CREWS Output 5: Knowledge products and awareness programmes on early warnings developed				
Project-specific Outputs	**Overall Project Target**	**Progress by July 2021**	**Target for reporting period**	**Progress by Dec 2021**
5.1. Roving seminars - Seminars involving local radio communicators and agricultural extension agents with regards to agrometeorological services are being held between 3 and 4 times per year at the pilot municipalities of Niangoloko, Tenado and Titao since April 2018; 1,101 farmers (501 women and 600 men) and 56 agricultural extension agent	100%	100%	100%	100%

and communicators were trained and are provided with enhanced agro-meteorological guidance.				
5.2. Project evaluation with knowledge on Burkina Faso early warning system relevance, effectiveness, efficiency, impact and sustainability - The report is available.	100%	100%	100%	100%
5.3. Gender-informed analysis of socio-economic benefits related to the delivery of enhanced products and services in pilot zones - An analysis has captured the benefits over the 2019 and 2020 rainy seasons for rain-fed crops, see report.	100%	100%	100%	100%
CONTRIBUTION TO CREWS VALUE PROPOSITION: PROMOTE COHERENCE - Programming considers existing projects and other international partner initiatives to ensure value-added to the national context and needs. With the 2014 DRM law yet to be endorsed, and not specifically addressing the institutional framework related to warning issuance and response, NMHSs are developing a standard operating procedure (including data exchange) to ensure a crosscutting approach to flood modelling and warning.				

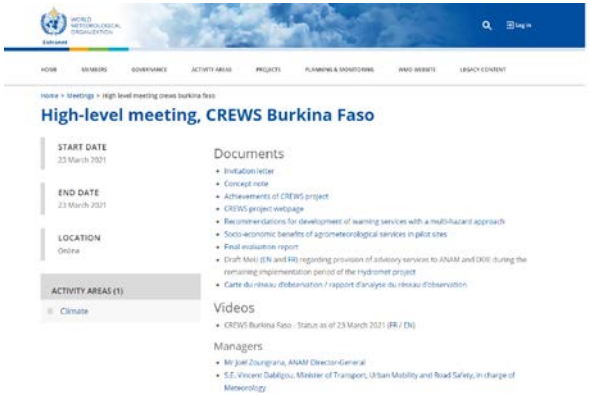
CREWS Output 6: Gender-sensitive training, capacity building programmes provided				
Project-specific Outputs	**Overall Project Target**	**Progress by July 2021**	**Target for reporting period**	**Progress by Dec 2021**
6.1. Training on sand and dust storm forecasting - provided to one ANAM forecaster in Cairo, 10-12 February 2018, see report.	100%	100%	100%	100%
6.2. Training on limited area modeling (LAM) numerical weather prediction (NWP) - Provided to two ANAM forecasters in Langen, 12-16 March 2018 and 8-12 April 2019, see reports: 2018 and 2019.	100%	100%	100%	100%
6.3. Development of numerical weather prediction capacities. Forecasters from ANAM have access to products from ECMWF (ecCharts) under a specific licence with ECMWF,	100%	100%	100%	100%

and from UKMO and NOAA/NCEP through SWFDP-West Africa. A licence agreement was signed between ANAM and DWD (Deutscher Wetterdienst) for the right to use the COSMO model software, and one ANAM staff member passed the Master in High Performance Computing between Sept 2018 and Oct 2019 in Trieste (Italy). Two staff members from ANAM (a forecaster and a public weather service expert) participated in a regional training workshop in Lomé, Togo from 20-30 Nov 2018. Two forecasters participated in a training at DWD on 8-12 April 2019 (see report). An in-country training on global NWP products interpretation and use in forecasting of severe and high impact weather took place in Ouagadougou from 2-4 May 2019 for operational forecasters. Lecturers came from Morocco, France, Senegal (RSMC Dakar) and WMO to contribute. Forecasters were also trained on the interpretation and use of Severe Weather Forecast Guidance product issued by RSMC Dakar on daily basis (see report / folder).				
6.4. Training of ANAM staff on the use of sub-seasonal and seasonal outlooks in agro-meteorological advisories. The training workshop was organised by Météo-France in Toulouse, with participation of Burkina Faso, Mali and Niger. See report / folder.	100%	100%	100%	100%
6.5. Training on dissemination and use of agromet products - Additional workshops were held in 2019 at the pilot sites (Titao, Tenado and Niangoloko) to disseminate the seasonal forecast, and train representatives, radio operators and extension agents from the agriculture decentralized services. In the 3 pilot sites, about 180 representatives and 1,100 farmers were trained on retrieving information and communicating it back to their community.	100%	100%	100%	100%
6.6. Training on Monitoring and forecast of IntraSeasonal Variability over Africa (MISVA) – A forecaster from ANAM was trained on subseasonal forecasting from 9 to 18 November, to take over gradually the provision of subseasonal forecasting guidance into MISVA. See report.	100%	0%	100%	100%

CONTRIBUTION TO CREWS VALUE PROPOSITION: GENDER-SENSITIVE - CREWS recognizes women's empowerment as fundamental for building resilience, and that gender influences the way people access, process, and respond to information and warnings.

User requirements in pilot sites have been collected in a gender-disaggregated manner, and the analysis of socio-economic benefits of agro-meteorological and other warning services in these pilot sites were conducted in 2019 with a particular focus on specific vulnerability patterns, including those of women.

13. Visibility products



[High-level meeting, March 2021]

VIDEO: CREWS Burkina Faso – March 2021

PRESENTATION

VIDEO: LDAS training workshop , 28-30 May 2019

VIDEO: Seasonal, sub-seasonal and severe weather forecasting workshop, 13-17 May 2019

From Research to Operation - Presentation of the Burkina Faso SDS WAS, March 2019

14. Key supporting documents

List and annex to the report any documents providing details on project activities such as reports of training sessions, summaries of high-level discussions etc.

242 weather stations in Burkina Faso have been added to WMO's OSCAR/Surface repository of metadata on observing networks. Sharing this data with the rest of the world will contribute to more accurate forecasting globally.

Proposal for implementing an irrigation support system – works are ongoing in the pilot site of Farako-Ba in Burkina Faso, with UNIFI, ANAM and INERA. A training, report and research paper will be produced in Q2 2022 (summarizing two years of field experiments during the dry season).

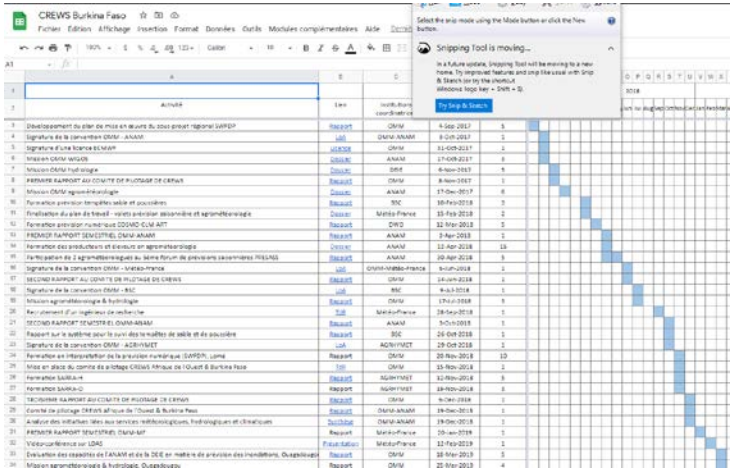
Strengthening Climate Resilience in Burkina Faso (Hydromet) – Project Page ; Project Document ; Procurement Plan

Agreement signed between WMO and MTMUSR

Agreement signed between WMO and The World Bank

Work plan for an irrigation support system (ANAM / UNIFI / INERA)

15. Project History



See PROJECT MANAGEMENT SPREADSHEET with timeline, contacts, budget, list of synergistic projects and links to deliverables

- Project proposal approved by CREWS Steering Committee (Feb 2017)
- Partnership agreement with Météo France - MISVA (report Dec 2020)
- Partnership agreement with ANAM (report Oct 2020)
- Partnership agreement with UNIFI (report Dec 2020)
- Partnership agreement with FURV (report March 2020)
- Partnership agreement with AGRHYMET (report Dec 2018)
- Partnership agreement with INERA (report Dec 2020)
- Training on Numerical Weather Prediction for warning of severe weather events, Ouagadougou, May 2019
- Training on seasonal and subseasonal forecasting for warning of climate extremes, Toulouse, May 2019
- Training on land data assimilation for crop monitoring and food security warning, Niamey, May 2019
- Training on crop calendars and R-Instat for crop monitoring and food security warning, Feb 2020
- Concept note for decision-support and warning of irrigated schemes, Feb 2020
- Flash Flood Guidance System inception workshop, Dakar, June 2019
- Assessment of flood forecasting capacities for flood warning, Nov 2019

- **High-level meeting 23 March 2021** (see webpage);

- **Project evaluation** (see report);

- **Evaluation of socio-economic benefits** in pilot sites (see report);

- **Partnership agreements** were signed between WMO and

    - Burkina Faso Meteorological Service (ANAM) on 3 Oct 2017, amended on 28 Feb 2020, for an amount of US$484,637;
    - Météo-France on 24 May 2018, for an amount of US$310,000 to support (i) use of seasonal and sub-seasonal forecasts in agrometeorological services; (ii) use of remote sensing (including Land Data Assimilation Systems - LDAS) in agrometeorological services and (iii) strategic planning within ANAM;
    - AEMET / Barcelona Supercomputing Center (BSC) in July 2018, for an amount of US$10,000, for provision of Warning advisories on Sand and Dust Storm in Burkina Faso;

- AGRHYMET in Oct 2018, for an amount of US$42,000 for provision of training on operational use of CIRAD SARRA models in support of agricultural meteorology;
- UNIFI to improve irrigation scheduling, assess biomass and yield responses using crop water productivity models (AquaCrop)
- INERA in March 2020, to test and calibrate the irrigation decision support tool in pilot fields AquaCrop model and demonstrate the potential use of soil moisture sensors for drought warning and irrigation decision support.
- Specifications for soil moisture sensors configuration have been finalized, for measurements at 5,10,15, 25,30,40, 50,60,70,80,90 and 100 cm. The contract has been awarded to OTT Hydrometry and the equipment has been delivered in June 2020. Soil moisture sensors have been installed in October 2020 in support of AquaCrop model calibration and to provide information for soil moisture products at country level.

- **Numerical weather prediction and severe weather forecasting:**
  - A licence was purchased for providing access to graphical products from the European Centre for Medium-Range Weather Forecasts (ECMWF) for 2018-2019;
  - A training on sand and dust storm was provided to one ANAM forecaster (Cairo, 10-12 February 2018);
  - A training on numerical weather prediction and climate simulations was provided to two ANAM forecasters (Langen, 12-16 March 2018 and 8-12 April 2019, see report);
  - The Burkina Faso "Warning Advisory System for Sand and Dust Storm" was launched in Oct 2018 and was presented at the UN Sand and Dust Storms Scoping Meeting in Geneva, 15-16 April 2019;
  - A training on global NWP products interpretation and use in forecasting of severe and high impact weather was provided in Ouagadougou (2-4 May 2019, see report);
  - A 1-year Master training on high performance computing (HPC) operation and maintenance was delivered to 1 ANAM staff at International Centre for Theoretical Physics (ICTP) in Trieste, Italy.

- **Observing network and climate data management**

- In April 2019, 10 synoptic stations were equipped with CLIMSOFT climate data management system (CDMS), with hardware and software purchased earlier by the project, to allow for enhanced quality and timeliness of data concentration in ANAM headquarters. As of Dec 2020, 9 stations out of 10 are using CLIMSOFT operationally;
- A second assessment of observing networks and data concentration processes was undertaken on 23-28 Feb 2020 (see report), providing guidance for investments to be performed by the end of 2023;
- In June 2021, 250 stations are being added to the OSCAR/Surface database, in order to fully describe the observing network metadata, according to the WMO Integrated Global Observing System (WIGOS) regulations and guidance, which will also allow for additional international exchange of data from those stations to take place.

- **Seasonal and sub-seasonal forecasting:**
  - A training workshop was organised in Toulouse from 13 to 17 May 2019 (see report); One technician from ANAM stayed in Toulouse during 1-month for co-production of products using the IRI Climate Data Tool such as (i) high quality checks on the dataset: outliers; threshold, internal consistency, spatial coherence; (ii) interpolation of weekly rainfall data; (iii) correcting estimated rainfall data from CHIRPS with historical in-situ observation data; (iv) zoning of rainfall: automatic classification method using K-means; (iv) analysis of rainfall patterns;
  - The results obtained for the 2019 season are very positive and the improvement in the scientific and technical knowledge of ANAM staff is confirmed, as well as the improvement of the methodology associated with the operational practices implemented through MISVA (Monitoring of IntraSeasonal Variability over Africa) training and briefings. What is particularly interesting is also the regional approach and the south-south collaboration between the weather services of the different countries.

- **Agrometeorology:**
  - Assessments of user requirements with regards to agrometeorological services was performed for the pilot municipalities of Niangoloko, Tenado and Titao in Dec 2017, and series of Roving Seminars were held with the agro-meteorologists, radio operators, extension agents (from the agriculture Ministry), local authorities and farmers following this, to support farmers' adaptation to the dynamics of the rainy season, anticipate crop yields, and improve the service over time; an evaluation on the benefits from improved agromet services at pilot sites was conducted over the 2019-2020 seasons (see 2019 and 2020 reports);
  - a training on SARRA-H and SARRA-O took place in Ouagadougou from 12 to 23 Nov 2018 (see report);

- a training on and data assimilation system (LDAS) took place in AGRHYMET (Niamey, 28-29 May 2019), with staff from ANAM and from the Ministry of Agriculture (see report);
- A training on crop calendars and R-Instat for crop monitoring and food security warning was organized on 10-14 Feb (see report);
- The enhanced agro-meteorological services to the pilot sites have been operational in the 3 pilot sites since 2018, and the surveys carried out in 2019 and 2020 show that on average the 86% of pilot farmers receive regular and understandable weather and climate information from May to October and that about 80% of end-users use them for the conduct of agro-sylvo-pastoral operations.
- Five soil moisture probes (10-120 cm) EnviroPro Lite, three soil moisture probes (10-80 cm) EnviroPro Lite and a Hydra Probe II SDI-12 soil moisture sensor were purchased and delivered to Burkina Faso in first half of 2020. In October 2020, two probes (10-120 cm) were installed in Niangoloko and Somgande and a third probe plus the Hydra Probe were installed in Farako Bâ at INERA agricultural research site. The three probes (10-80 cm) are expected to be installed in Farako Bâ (INERA site) once the additional communication equipment being purchased will arrive. INERA site is hosting crop models and irrigation schemes validation and calibration activities. The two additional 10-120 cm probes will be installed near Titao and Tenado.

- **Hydrology:**
  - the first FFGS planning meeting was organized in Dakar on 25-27 June 2019 (see report)
  - HRC begun the implementation of the West Africa FFGS (WAFFGS) with requests for data from the countries of Burkina Faso, Mali and Niger, delineation of flash flood prone basins in the domain of the three countries, the establishment of secure FTP sites for downloading hydrometeorological historical data from countries, as well as the ICON NWP from DWD and the H03B satellite precipitation product from EUMETSAT, and the opening of the instructional portal with online courses (in English and French) to support the Step 2 online e-course training on the FFGS. This training on fundamentals in hydrometeorology related to flash floods and an introduction to FGGS products was completed on April 2019, allowed to train 13 staff from ANAM and DGRE-DEIE.
  - an integrated assessment of the flood forecasting and warning capacities in Burkina Faso was delivered on 7-8 Oct 2019 (see report); the validation workshop with national stakeholders (ANAM, DEIE, DGPCI, SAP, SONABEL) and project teams (Hydromet, Volta) analyzed the opportunities of a national joint flood forecasting unit.

- In addition, Burkina-Faso participated in a number of **crosscutting initiatives** to strengthen sub-regional cooperation:

- ECOWAS Hydromet Forum (Abidjan, 19-21 Sept 2018), in sessions related to the development of a CREWS Community of practice in West Africa and to the CREWS West Africa project;
- 2nd International Multi-Hazard Early Warning Conference, Geneva, 13-14 May 2019 and in the Global Platform 2019, 14-17 May 2019;
- Global FFGS workshop, Antalya, Turkey, 2-8 Nov 2019.