EUROPEAN SPACE AGENCY CONTRACT REPORT

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WASCIA – WATER STRESS AND CLIMATE INDICES FOR AFRICA

Policy Highlights

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CHANGE LOG

Reason for change	Issue	Revision	Date	Page(s) and Paragraph(s) affected
Initial version	1	0	06/09/2024	All
Comments from ESA	1	1	10/10/2024	• List of Figures, no figures message included • Section 2.1, reference to Table 2-1 improved

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1 INTRODUCTION

1.1 *PURPOSE OF DOCUMENT*

This document is D12 deliverable for the ESA Water Stress and Climate Indices for Africa (**WaSCIA**) project. It contains details of the Policy Highlights.

1.2 *CONTENTS OF DOCUMENT*

Following this introductory section, the document layout is as follows:

Section 2 presents how the Policy requirements have been addressed

Section 3 presents the Conclusions

1.3 *REFERENCES*

1.3.1 Applicable Documents

The following applicable documents are those referenced in the Contract or approved by the Agency. They are referenced in this document in the form [AD n.]:

AD	Title	Version / Date
AD 1.	Statement of Work - ESA Express Procurement [Plus] - [EXPRO+] - EO AFRICA - NATIONAL INCUBATORS EXPRO+	1.0 26/10/2021
AD 2.	KPT91865-AO11039-Proposal-EOAFRICA-R1r0.pdf	1.0 18/02/2022
AD 3.	WASCIA-KO-Minutes_1.0.pdf	1.0 07/10/2022

1.3.2 Reference Documents

The following reference documents are those referenced within this document. They are referenced in this document in the form [RD n.]. They are not applicable documents.

RD	Title / source	Version / Date
RD 1.	WaSCIA.TN.009_D4-PTM_R1r0	1.0 15/02/2023
RD 2.	WaSCIA.TN.019_D9-Processor_R1r1	1.1 19/12/2023

1.4 *ACRONYMS AND TERMS*

The following acronyms and terms are used in the document and have the identified meaning.

Acronym / Term	Definition
TPZ UK	Telespazio UK
WaSCIA	Water Stress and Climate Indices for Africa

2 ADDRESSING POLICY REQUIREMENTS

In the D4 deliverable, a thorough review of policy documents relevant to the ESA Water Stress and Climate Indices for Africa **(WaSCIA)** was conducted, identifying a total of 74 polices, and potential solutions. Here, we will demonstrate how these policy requirements were met during the project.

2.1 *POLICY TRACEABILITY MATRIX (PTM)*

The Policy Traceability Matrix (PTM) developed in D4 [RD 1], provided a traceable list of requirements chosen from the documents that were reviewed. Each requirement was given a unique identifier (**ID**) in the form of **Po-xx**, where xx is the number of the policy.

Table 2-1 provides an update of this PTM, with two 'solution' columns. One provides details on the approach we had planned to meet the policies at the start of the project, while the second shows the actual steps taken to address the policy requirement as part of the WaSCIA solution.

Table 2-1. Policy Traceability Matrix.

ID	Policy Description	Solution Planned to Meet Policy Requirement	✓ Solution Applied to Meet Policy Requirement
Po-001	Efficient utilization and management of water requires the full participation of all stakeholders. The Dublin Principle No. 2 underlines the importance of a participatory approach in water development and management, starting at the lowest appropriate level.	We will develop the portal with our African partners who will lead on making the portal available to those who need and will encourage participation.	✓ We actively engaged with Africa partners through development and deployment of products, leveraging their regional knowledge and expertise. ✓ We Tested the portal and tools with potential end-users to gather feedback.
Po-002	Improvement of rainfall and runoff catchment and storage, including river-head forest management.	Out of scope for this project, but the water stress product will contribute to better water management and decision making.	✓ As previously stated, this was out of scope. But the tools developed will provide users with vital information for water management and provide insight into the current situation as well as historical events to help inform and make better decisions.

Po-003	Promotion of alliances and partnerships between public and private research institutes, Civil society organizations (CSOs), universities and water-related industries to support the adaptation, transfer and application of new research.	WaSCIA consortium brings together industry with African public sector and academic organisations. The solution will be handed over to the African organisations to operate.	✓ Consistent communication and collaboration were maintained with our consortium, including African public sectors and academic organisations. ✓ This was achieved through monthly progress meetings, workshops, and publication developments.
Po-004	Effective and efficient knowledge sharing across the continent and globally.	WaSCIA service will enable data and knowledge sharing through dedicated in-country workshop to fulfil capacity building requirements.	✓ The WaSCIA product allows easy access to vital climate and EO data through WASDI, as well as providing tools to analyse the output, in the form of Jupyter Notebooks. ✓ This empowers users to both access and produce meaningful plots / analysis. ✓ Demonstrations of the tools are available through the project website. ✓ Workshops have been held to share knowledge of the product regionally. ✓ An open access publication is under review, which will provide global access to the projects underpinnings and use cases.

Po-005	The lack of adequate and reliable information or data and the failure to use available tools are major obstacles to enhancing water security in projects and programmes.	The WaSCIA service will provide high quality water stress and climate data information at a national level for Senegal, with the goal of extending to other African countries. The outputs of WaSCIA service will be provided along with quality information and validation reports to ensure reliability of the products.	✓ WaSCIA provides accurate reliable information that is well documented and covers Senegal. ✓ The tools developed have the potential to be scaled up and cover a greater area. ✓ Main outputs from the WaSCIA project are accessible through WASDI and the WaSCIA website, including data, analysis tools, user guides and instructional videos. ✓ These tools are well documented and provide clear instructions on their use, improving their reliability. ✓ The analysis tools are provided in a popular format (Jupyter Notebooks) which is open access and well documented.
Po-006	Reliable data to make evidence-based decisions on interventions within a water security framework.	The WaSCIA service will provide high quality water stress and climate data information at a national level for Senegal, with the goal of extending to other African countries.	✓ WaSCIA provides easy access to high quality climate and water stress data through the platform. This pre-processed for ease of use, and reduces computation costs for the user, making the data more accessible. ✓ The tools developed have the potential to be scaled up and cover a greater area.
Po-007	Agriculture is the largest water consumer in Africa, with an annual usage of about over 80 percent of its total exploited resources. The strategic use and management of water in agriculture is therefore key to both water and food security.	Water stress and climate information is a valuable input for crop monitoring, water management and therefore food and water security.	✓ We have demonstrated and developed use cases of this platform in relation to agriculture. This was achieved through our publication (in review) and through workshops. ✓ From the workshops overall, the applications were viewed as innovative and impactful, particularly for agriculture. Several respondents expressed appreciation for the WaSCIA project and its potential applications, particularly in agriculture and water resources management.

Po-008	Some of the water-related constraints on inland waterways include seasonal blockages caused by water weeds, and variable water levels that interrupts or reduce reliability of the service.	Not in the initial scope of the project but could possibly be an extension of it.	✓ This was not within scope for the project but could be investigated subject to a further service development activity
Po-009	Increasingly large amounts of water are being taken from the surface or aquifers for industrial purposes including manufacturing and extractive industries.	Not in the initial scope but water availability can be supported by WaSCIA water stress data.	✓ This was not within scope for the project but could be investigated subject to a further service development activity
Po-010	The Bank will support integrated disaster risk management and emergency response planning.	WaSCIA water stress and climate indices can support in-season drought monitoring, water availability, disease and areas exposed to wildfire risk.	✓ The tools and data provided through WaSCIA gives users access to several methods to support-drought monitoring, assess water availability and wildfire risk. ✓ These are provided though a carefully selected group of climate indices as well as the soil moisture product. ✓ The usefulness of this has been demonstrated through the development of use cases which have been tested by end users, and a publication (in review).

Po-011	Support of ecosystem-based climate adaption and disaster management measures including supporting more hydro-meteorological stations for the better understanding of disaster risks, predictions and early warning mechanisms.	WaSCIA climate indices can complement the observations at hydro-meteorological stations in remote areas. Also, the decision support tools developed for WaSCIA can be adapted for developing analytical threshold warning systems.	✓ The climate indices and soil moisture product developed through WaSCIA are well suited to be supplementary materials in climate adaptation and disaster management. ✓ The tools and data provide users with methods of monitoring both current a climatological state, with the opportunity to overlay these and identify abnormal conditions. ✓ The Threshold Warning tool is the best demonstration of this, providing users with a comprehensive analysis of a time period in comparison to the climatology, helping to identify abnormal conditions and the frequency of their occurrence. ✓ Furthermore, the Threshold Warning Notebook allows flexible definitions of the threshold, allowing expert users to define their own parameters through the 'absolute value' function. Changes can also be made to the percentiles considered to be the threshold in relation to the climatological data (default set to 90th and 10th percentile). ✓ Forms the foundation for a potential early warning tool.
Po-012	The major blockages to the development of effective response measures to the impact of climate change in the water-dependent sectors such as agriculture include the limited availability and integration of water resources databases and climate change models.	WaSCIA will integrate EO and long-term historical climate reanalysis datasets to develop indices relevant to agriculture and water sector. The underlying data and models will be available to users to use as the basis for the analysis of historical trends for climate change impact assessments.	✓ We created a database with 20 climate indices accessible to users. These provide a great source of easy to access climate data, suitable for use by sectors such as agriculture and water resources. ✓ This is due to their heavy focus on rainfall and temperature, key variables in these sectors. ✓ This provides historical data from 1981 – near real time data, as well as calculations for climatology (1991 – 2020).

Po-013	Increased water security for Africa where transformed water assets as well as sanitation and hygiene improvements foster sustainable, green and inclusive socio-economic growth and development.	WaSCIA water stress and climate data can support drought monitoring, food security, and water security.	✓ Tools provided allow users to comprehensively assess water stress in near-real time, as well as assessing how indices have performed for similar periods historically through the Climate Indices app. ✓ The output from these tools can be used to inform decision making, relevant to socio-economic growth and development. ✓ Output will improve sectors such as agriculture and food security for the region.
Po-14	Going forward, the Bank will actively seek to use the transboundary nature of water to enhance regional integration and promote conflict resolution.	The WaSCIA service will provide high quality water stress and climate data information at a national level for Senegal, with the goal of extending to other African countries.	✓ Tools provided allow users to comprehensively assess water stress in near-real time, as well as assessing how indices have performed for similar periods historically through the Climate Indices app. ✓ WaSCIA provides easy access to high quality climate and water stress data through the platform. This pre-processed for ease of use, and reduces computation costs for the user, making the data more accessible. ✓ Tool is focused over Senegal, with potential to expand in future work.
Po-15	Integrated Water Resources Management (**IWRM**) principles should be used including: Water development and management should be based on a participatory approach, involving users, planners and policy-makers at all levels.	WaSCIA promotes the inclusion of users, planners and policy makers through workshops and webinars, in close collaboration with our African partners.	✓ We fostered a collaborative approach throughout the project ensuring users, and in country partners were actively involved in the development of a tool, tailoring to their needs. ✓ This will allow for more effective water development and management in the future, using these tools. ✓ A project extension may allow us to explore a wider availability of this tool, allowing for transboundary assessment and management.

Po-16	We will work to introduce water-specific insights – particularly on flood and drought management, a stated priority of most countries – into national dialogues on climate resilience-related development priorities. We will do so primarily through existing national processes as countries update their Nationally Determined Contributions under the Paris Agreement and develop, implement, and refine their National Adaptation Plans.	WaSCIA water stress and climate data can support drought monitoring and water availability. Flood management is out of scope at the moment but could be looked at in a project extension.	✓ The tools and data that we provide are an asset in drought monitoring and provide the users with information to make more informed decisions regarding water management. ✓ The tools could be used to help inform national processes, providing useful output and plots for reports.
Po-17	Improving transboundary water governance through advocating for reducing disaster risks through data sharing.	The WaSCIA service will provide high quality water stress and climate data information at a national level for Senegal, with the goal of extending to other African countries. Users will be able to search EO & climate data catalogues, import data, discover and run the available processors.	✓ Here we provide a platform for data sharing at a national level in Senegal providing access to EO & climate data catalogues, as well as allowing the import of data, discovery and running the available processors. ✓ This has the potential to be scaled up to a wider area of Africa, subject to a project extension.
Po-18	Integrated Water Resources Management (**IWRM**) at the local and regional levels and link those lessons to global insights. IWRM is a process that promotes the coordinated development and management of water, land, and related resources.	The WaSCIA service could support IWRMs at local and regional levels providing consistent data and insights. The service is supported by lessons learnt globally such as the models that are used.	✓ The WaSCIA service can support IWRM through data and tool provision at a national / regional - and for the soil moisture tool - local level over Senegal. ✓ We have provided access to 20 commonly used indices that can be compared to global insights / trends.

Po-19	There are a number of compounding issues that also have a significant impact on water resources in Africa. The most significant ones are: Inadequate public awareness and stakeholder involvement.	WaSCIA will encourage stakeholder involvement throughout the project and promote the project to the public through websites, publicly available webinars and promotional materials.	✓ We actively encouraged stakeholder and user involvement throughout the project through in country and online workshops. ✓ We took feedback from these to tailor and improve on our service, proving output with greater relevance. ✓ These workshops were published through our publicly accessible website, as well as advertised using banners at Cheikh Anta Diop University.
Po-20	The key technological factor is the existence of critical gaps in data (ground and surface water information and knowledge in the water sector).	The WaSCIA service will provide high quality water stress and climate data information at a national level. Workshops will fulfil capacity building requirements.	✓ Data provided through the WaSCIA service is high quality, easy to access and processed to provide users access to 20 pre-defined and calculated indices. ✓ This reduces the need for excessive processing by users, reducing their technological needs. ✓ We also provided user workshops demonstrating the use of the apps and their use cases. This helped to transfer knowledge and understanding of the product and its potential.
Po-21	The Internet is a major instrument for overcoming some of the technological constraints.	WaSCIA service shall be deployed on cloud infrastructure with sufficient storage and processing power for generating the outputs. Future project extension could look at accessibility through mobile applications, but not currently within project scope.	✓ The cloud infrastructure and WASDI platform provides the users with the compute power needed to produce output. This reduces the need for extensive technological infrastructure, making it accessible through a laptop with internet connection.
Po-22	A second factor is climate variability, which creates untenable risks in the absence of inter-country and inter-regional cooperation.	WaSCIA will provide high-quality climate indices weekly to help monitor the risk from climate variability.	✓ Both the Climate indices Notebook and Threshold Warning Notebook provide users with a way to assess climate variability, as well as identifying periods that exceed the standard climatology, adding further valuable information to their assessment of climate variability.

Po-23	The major environmental factor is climate variability (spatial and temporal) leading to drought, desertification, floods and other natural disasters. A second factor is environmental degradation from domestic, industrial and agricultural waste. A third factor is failure to allocate adequate water resources to sustain life-supporting ecosystems, both terrestrial and aquatic. Addressing these factors at the national and international level is absolutely critical for Africa's sustainable social and economic development. If they are not addressed, the prognosis is dire.	The WaSCIA service will provide high quality water stress and climate data information at a national level for Senegal, with the goal of extending it internationally to other African countries. This will help address the climate variability factor at the required level.	✓ The WaSCIA service provides users with the ability to assess the climate variability for 20 climate indices for the whole of Senegal. This service will also aid users in addressing water resource issues, by assessing the provided climate indices and soil moisture tool in near real time, highlighting when intervention might be needed.
Po-24	Unfortunately, Africa does not have an adequate number of highly motivated and highly skilled water professionals who can deal effectively with the complex issues of water scarcity, climate variability and joint management of international waters.	Through providing free high-quality water stress and climate indices data, and by providing workshops to encourage the use, WaSCIA will hopefully help in the upskilling of professionals in the water field.	✓ The WaSCIA project delivered workshops that gave participants a full overview of the tools and methods needed to use our service. This improved their skills in water stress management and climate variability analysis. These workshops were very successful and participants we highly motivated and demonstrated a clear desire for us to continue to develop the project and involve them in this. ✓ The workshops also encouraged collaboration and working in groups of individuals from different industries, helping cross pollination of ideas and increasing their understanding of water scarcity and climate variability by looking at it from a different perspective.

Po-25	Responding to immediate water problems; meeting urgent water needs. There is an inter-dependency between water and economic development.	WaSCIA provides weekly water stress and climate indices. The underlying daily climate information can also be provided (up to 5 days delay from present time).	✓ The WaSCIA service provides success to climate indices up to near real time (5 days from present). This allows for continuous monitoring of key variables over time as well as comparison to climatology, helping identify events that fall outside of the norm. ✓ Access to these tools will allow users to respond to urgent water needs and assess the ongoing situation.
Po-26	Create an enabling environment for international cooperation.	WaSCIA will promote cooperation between African countries through the development and continued use of the WaSCIA service. Though, the start of the service will initially focus on Senegal, this will extend. User engagement has already been across potential users across west Africa.	✓ Throughout the WaSCIA project there was active participation between European and African institutes. ✓ Collaboration was key in the development of the tools, with our partners in Africa providing valuable local knowledge to tailor the tool. ✓ Additionally, the international collaboration was vital in the success of the in-person workshop held in Senegal, as well as in the creation of the project publication (in review) which used a worked example of how users might use the tool.
Po-27	Manage watersheds and flood plains to safeguard lives, land and water resources.	Not initially in the scope for the complete management of watersheds. Nevertheless, water stress indices can assist monitoring of water resources.	✓ There was no scope in this project to directly address this demand. ✓ The service we do offer however, does help manage / monitor water resources, just not in relation to watersheds and flood plains.
Po-28	Continued improvement of databases and information sharing on land and water.	The underlying WaSCIA data will be made available to users via the cloud storage. Users can synchronise this with their own databases if desired.	✓ Data provided through the WaSCIA service via a cloud platform named WASDI. This provides access to all WaSCIA datasets in an easy to access format, improving on existing water databases. ✓ The tools for processing the provided data allows for efficient analysis. This analysis can be shared expanding on current methods of information sharing.

Po-29	Improving water wisdom: Raising awareness on water-management issues.	WaSCIA through user engagement via its platform, web pages and workshops will raise awareness of underlying water-management issues that may relate to water stress and climate indices.	✓ WaSCIA provides open public access to tools used in the project through the website, as well as embedded videos that demonstrate their use. ✓ The workshops held online and in person increase the reach and impact of the tool, allowing a wide range of users to understand how to use the tools and improve on their current available water-management tools. ✓ Extensive engagement and publicly available documentation and tools provide greater awareness and understanding of water stress, as well as methods for analysing it.
Po-30	Improving water wisdom: Establishing a sustainable system for data collection, management, and dissemination, including standardization and harmonization of data.	WaSCIA will provide water stress and climate indices to users. As more users across Africa uses the data then the more likely that this data will become the standard format for these indices. This will be encouraged through the free use of the platform, promotion and education. Data format will be agreed beforehand but likely to be in standard GIS formats such as Esri Shapefile, NetCDF and GeoTIFF. Data will be validated with in-situ observations, the ideal form of which should also be decided within the project.	✓ The tools we have developed use standards GIS format as outputs. ✓ We have demonstrated these to users, highlighting how to use them through workshop and webinars. ✓ We have also developed a pair of Jupyter Notebook scripts to help in the exploitation of the outputs. ✓ These are open access codes; therefore, the users can read, understand, adapt and reuse the code for other applications.
Po-31	Improving water wisdom: Conducting research and development on water-resources issues.	As part of the development of WaSCIA, workshops and continued research will mould the service to assist in the monitoring of water resources issues	✓ WaSCIA held a number of workshops, including members from a variety of institutes and sectors. This allowed for the cross pollination of ideas and aided in our tool's development. ✓ The discussions / research conducted at the final workshop has greatly improved on our understanding of water issues in the region, and that of the users.
Po-32	Improving water wisdom: Facilitating access to knowledge and information centres and services such as the Internet.	The WaSCIA platform will be free to users, providing easy access to its data and knowledge.	✓ WaSCIA provides easy access to pre-processed data that would otherwise be computationally expensive to attain. ✓ The ease of access and tools provided mean that users can conduct meaningful research into water stress in Senegal, with just an internet connection.

Po-33	Improving water wisdom: Mainstreaming gender and youth concerns in all activities.	The WaSCIA team is composed of different genders and ethnicities and the strength of diversity in our team will be clear during our workshops and other promotional material. Young users will also be encouraged.	✓ The WaSCIA team was composed of different genders and ethnicities and the strength of diversity in the team was demonstrated during our workshops and other promotional material. ✓ The WaSCIA app is useable and accessible to all ages, with clear to follow instructions and demonstrations.
Po-34	Adopting the river basin as the unit for water-resources management; Strengthening river-basin and aquifer management.	Not within scope of WaSCIA project.	✓ This was not in the scope of the project.
Po-35	Managing climate variability and change, including drought, desertification and floods.	Drought indices will be provided by WaSCIA as a core component. Other indices such as surface wetness indicators, and precipitation will also be provided.	✓ WaSCIA gives users access to vital climate indices for users to assess. ✓ We provide users with methods and tools to compare these to climatology, as well as identify abnormal values that exceed the norm, helping them understand and manage climate variability and drought.
Po-36	Developing effective systems and capacity for research and development in water and for the collection, assessment, and dissemination of data and information on water resources.	The WaSCIA project will develop a platform for the collection and processing of data that will be used to create water stress and climate indices. The platform will enable users to assess and interrogate the data.	✓ The WaSCIA project built on a cloud platform that stores and provides easy access. ✓ This data alongside the tools provides ample capacity for research and development of water stress, particularly drought monitoring. ✓ The output can be used in research and in the assessment of water stress, as demonstrated by our publication (in review). ✓ The WaSCIA website provides a starting point for the dissemination of information, and is populated with information on the tools, their use, and news about the project.

Po-37	The consequences of the deterioration of water quality include eutrophication and the proliferation of invasive aquatic plants. Eutrophication is a factor mainly in lakes.	Not currently in scope but future extensions could look at monitoring of water quality in lakes, particularly signs of eutrophication and evasive plants.	✓ This was out of scope for this project.
Po-38	A key limitation at national, sub regional and continental level is the paucity of data on water resources. This limitation is linked to inadequate human capacity for the collection, assessment and dissemination of data on water resources for developing, planning and implementing projects.	WaSCIA will provide high-quality reliable weekly water stress indices data and provide workshops on how to evaluate this data.	✓ WaSCIA provides easy to access data, reducing the limitation linked to the capacity for data collection. ✓ Additionally, through the provision of tools and detailed instructions, users have the capacity to conduct assessments of this data themselves, helping them develop, plan and implement this information into regional projects.
Po-39	Africa's agriculture will be modern and productive, using science, technology, innovation and indigenous knowledge.	WaSCIA high-quality water stress and climate indices data can support decision making in regard to agriculture.	✓ The data and tools provided through WaSCIA are tailored to monitor and assess water stress in Senegal. This is a key component in agricultural practices; therefore, this tool will benefit this sector and aid in its development.
Po-40	An Africa whose development is people-driven, relying on the potential of African people.	The WaSCIA project will not only involve African stakeholders but will actively encourage their participation and assistance throughout the project length.	✓ There was active collaboration between European, UK and African partners, with further engagement from African users. ✓ The feedback and active input received from Africa users has helped in the development of the WaSCIA service ✓ The collaboration with the partners was also fundamental in the development of the WaSCIA services as well as organisation of workshops and input into publications and project documents.

Po-41	Consolidate the modernisation of African agriculture and agro-businesses, through scaled up value addition and productivity, including expanding the introduction of modern agricultural systems, technology, practices and training.	WaSCIA high-quality water stress and climate indices data can support decision making in regard to agriculture.	✓ The tools and data developed through WaSCIA will be beneficial in decision making processes in the agricultural industry. ✓ We have worked closely with our partners in Africa to ensure that the climate indices and water stress methods are suited to the region, to provide the most reliable output possible. ✓ This high-quality information that has been adapted for the region, will provide users with more information on soil moisture and water stress, allowing them to improve their practices using this technology.
Po-42	The private sector will work closely with public, education and research, societal, funding and national and international development agencies to facilitate technology transfer, collaborate in commercializing and exploiting research and innovation and support building the necessary capacities and technical competencies required to achieve the objectives of the Strategy.	The WaSCIA project actively looked to involve both the private sector with various public sector bodies, particularly in Africa, to ensure not only a project team of many capabilities and experiences, but also a wide range of users who we want to be involved throughout the project length.	✓ The WaSCIA project ensured to include partners and users from a variety of academic and institutional backgrounds. In our final workshop we had users from 14 different entities, belonging to a variety of sectors. ✓ Their feedback and input has been extremely valuable in the development and progress of the project. ✓ The workshops and partnerships formed will ensure that the users and partners have the capacity to use these tools after the project's completion.
Po-43	The wide-scale affordability of new technologies will be one important factor for minimizing the digital divide.	WaSCIA platform will be open source and the underlying data are free of charge. The only cost is the deployment cloud infrastructure which is low cost.	✓ The tools developed in the project are currently deployed in WASDI, a paid subscription with a free trial available. However, the tools have been designed to be easily moved out from this platform and deployed in any other infrastructure with similar characteristics. ✓ The migration into an environment with free access and use is considered as a project extension.

Po-44	Shifts in patterns of land use and how we manage our global food systems are also needed to reduce carbon emissions: agriculture, deforestation and wetlands development contribute 23% of all human-caused greenhouse gases.	Land use monitoring is not in the scope of the project but could be considered in future iterations.	✓ Land use monitoring was out of scope for this project. ✓ There were active discussions on the incorporation of land type into the soil moisture product at the final workshop. ✓ The further developments discussed in these workshops could be implemented through an extension of the current project.
Po-45	Establish communities of practice for the sharing of experience and best practices, as well as the definition of user needs.	WaSCIA platform will enable data and knowledge sharing. Workshops will fulfil capacity building requirements. User needs will be compiled and reviewed throughout the project to ensure we are developing a long lasting and meaningful service.	✓ The workshops held both online and in-person, provided excellent opportunities for capacity building, demonstrating to users the use of the tool. ✓ It also provided an excellent chance for feedback on the products usefulness, and ways we could adapt it to improve user experience and tailor to tools to better reach their requirements. ✓ This was followed throughout the project and the updates implemented following feedback from the December webinars and July workshop. ✓ The workshop, held in person in Dakar in July, also allowed several participants from different entities to meet each other creating an environment for sharing and discussing on common needs.
Po-46	Space-derived products and services used for decision-making and addressing economic, political, social and environmental challenges.	WaSCIA water stress and climate data can support drought monitoring, food security, water availability, disease and areas exposed to wildfire.	✓ The WaSCIA services provides of both climate and soil moisture data, with a means to analyse it. The output of which can be applied to many of these areas, including drought monitoring, food security, water availability, and areas exposed to wildfire risk. ✓ These can be inferred through the indices provided and used to better assess the risks.

Po-47	Addressing user needs – harnessing the potential of space science and technology to address Africa's socio-economic opportunities and challenges.	User engagement throughout the agile development process will help to tailor the solution to the user needs. We will continue to probe the users' needs to ensure that what we are providing will help address Africa's socio-economic challenges.	✓ The Agile development implemented throughout the project meant that we were able to adapt the tools based on feedback collected at workshops. This provides users with tools better suited to meet their needs. ✓ This tailored input can be used to help our African partners and users address socio-economic challenges. ✓ One way this could be achieved, is through improvements to agriculture that can be achieved through the use of this tool.
Po-48	Strengthening research, development and innovation in the continent by increasing the number of services and products using African capacities.	The WaSCIA platform will be a brand-new service that will support research and development in water, climate and environmental fields. New data products of climate and water stress indices, plus the underlying data will be available to the users. The service will be developed with African's to eventually be passed to Africa for continued management and development.	✓ The WaSCIA service provides a brand-new service for the region that can support research and development in the region, particularly in respect to water stress. ✓ With the valuable input from our Africa partners, we have been able to adapt indices and provide output that will best aid this research and development.
Po-49	International partnerships should be encouraged to address any remaining gaps and pursue new learning opportunities through active participation in global space initiatives.	WaSCIA is an international partnership between Europe and Africa, to build a platform for monitoring indices water stress and climate.	✓ This project was part of an international collaboration, between Europe and Africa with active collaboration between the groups to provide the best output.
Po-50	Climate EO data – 5 to 20m resolution, daily.	WaSCIA plans to provide weekly climate and water stress indices data. It is not in the scope to provide Climate EO data at this resolution. Climate indices 9 km resolution.	✓ The climate indices provided for the project at a 9 km resolution at daily time steps, aggregated to weekly, monthly and annual outputs. ✓ It was not in the scope of the project to provide a higher resolution than this.
Po-51	Water EO data – 50cm > 30m, seasonal.	WaSCIA plans to provide weekly climate and water stress indices data. Water stress data 30 m resolution.	✓ WaSCIA provided soil moisture data at a weekly time step @ 20 m resolution.
Po-52	Agriculture EO data – 2.5m > 30m, daily.	Not within initial scope but could be provided after consultation with end users e.g. NDVI.	✓ NDVI was not in scope for this project but could be investigated in future service development.

Po-53	Developing adequate skills and expertise in Earth observation applications and usage.	WaSCIA platform will enable data and knowledge sharing. Workshops will fulfil capacity building requirements.	✓ The workshops provided users / attendees with the knowledge needed to use this service for their own. ✓ The website also provides information and users guides making it more accessible to a wider audience.
Po-54	Fostering knowledge sharing among African experts, users and stakeholders.	WaSCIA platform will enable data and knowledge sharing. Workshops will fulfil capacity building requirements.	✓ Collaboration and workshops provided great knowledge sharing opportunities between project representatives, regional experts, and end-users. ✓ This knowledge sharing was two-fold, with us being able to depart our knowledge of the tool on to regional experts and users, and them providing knowledge on regional discrepancies that should be accounted for in the tools through their local knowledge.
Po-55	Developing Earth observation services and products using web-based and other appropriate technologies in order to meet user needs.	WaSCIA will develop a web-based UI to meet our user needs.	✓ The WaSCIA service provides a publicly available a web-based interface through WASDI. This provides the users with access to data and links them to the Jupyter Notebooks that they can use to analyse the data in a way that meets their needs.
Po-56	Fostering stakeholder engagement to ensure the generation of the relevant services and products that maximise the benefits of Earth observation applications.	User engagement throughout the agile development process will help to tailor the solution to the user needs.	✓ Agile development through the process mean we were able to receive feedback from African partners and users, adapting the tool to better meet their needs.
Po-57	Raising awareness among the public, users, and policy and decision makers.	Workshops and project website will help raise awareness of the project.	✓ The workshops and public website provide the project with adequate advertisement. ✓ Banners displayed at the University of Dakar during the workshop also further advertised and raised awareness of the project and the issues of water stress.

Po-58	Develop a data-sharing policy that ensures affordable and equitable access to spatial data and information.	WaSCIA platform will be open source and the underlying data are free of charge. The only cost is the deployment cloud infrastructure which is low cost.	✓ The tools developed in the project are currently deployed in WASDI, a paid subscription with a free trial available. However, the tools have been designed to be easily moved out from this platform and deployed in any other infrastructure with similar characteristics. ✓ The migration into an environment with free access and use is considered as a project extension.
Po-59	Develop timely access to the right data sets in accordance with user needs.	WaSCIA provides weekly water stress and climate indices. The underlying daily climate information can also be provided (up to 5 days delay from present time).	✓ WaSCIA provides weekly water stress and climate indices. The underlying daily climate information can also be provided (up to 5 days delay from present time). ✓ We also provide access to a weekly water stress indices dating back to 2016. ✓ This has been shown to meet the users' needs through the workshops.
Po-60	Develop the provision of appropriate services and products that respond to all user needs.	User engagement throughout the agile development process will help to tailor the solution to the user needs.	✓ Agile development through the process mean we were able to receive feedback from African partners and users, adapting the tool to better meet their needs.
Po-61	Develop robust processing capabilities to ensure that timely access to the requisite services and products are available to end users.	WaSCIA service will take advantage of the WASDI platform features which includes enhanced web-based interfaces that allow seamless integration of tools and workflows.	✓ The WaSCIA service uses the WASDI platform, providing instant access to the data provided through the service. ✓ The WASDI platform features include enhanced web-based interfaces that allow seamless integration of tools and workflows, meeting the needs of the end users.

Po-62	Ensure that all levels of governments are able to access space and ground-based data through a centralised portal.	WaSCIA service will provide access to different types of users, from scientists and researchers to government decision makers can benefit from the service and obtain the information they need at requested granularity.	✓ By using the WASDI cloud platform and providing Jupyter Notebooks through the publicly available WaSCIA website, we allow access to all that require it including all levels of governance. ✓ This open access is available for 3 months followed by a need for a subscription to the WASDI platform. ✓ The WaSCIA tools have been designed to be easily migrated to another platform of free access and use with similar features than WASDI. This migration will be considered in a project extension.
Po-63	Provide geospatial and scientific data for education, and research and development.	The WaSCIA service will provide high quality water stress and climate data information at a national level for Senegal, with the goal of extending to other African countries.	✓ The data and output produced by the WaSCIA tools provide users with a variety of potential data visualisations over Senegal. ✓ The WaSCIA Notebooks allow different geospatial regions to be selected and analysed over Senegal. ✓ The high-quality data available is suitable for all, scientific, educational, research and developmental purposes.
Po-64	Provide geospatial data for commercial exploitation at a minimal cost.	The underlying datasets and indices will be made available to users free of charge. ESA encourages commercial exploitation of publicly available data/services developed through EO-Africa program.	✓ The underlying datasets and indices to users are free of charge for the first three months, followed by a subscription fee linked to the platform where the tools have been deployed. ✓ The migration of the WaSCIA tools into a free to access platform is considered as a project extension.
Po-65	Ensure availability and sustainable management of water and sanitation for all.	WaSCIA provides weekly water stress and climate indices which can used as part of the management of water resources. The platform will be free to use.	✓ The data and output provide water stress and climate indices at weekly intervals. This information is easily accessible and publicly available. ✓ This is free for the first 3 months followed by a subscription fee due to WASDI policy. ✓ The WaSCIA tools were designed to be platform agnostic. The migration of the tools into a free to access platform is considered as a project extension.

Po-66	By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world.	Drought indices will be provided by WaSCIA as a core component. Other indices such as surface wetness indicators, and precipitation will also be provided.	✓ The WaSCIA service provides users with a means to analyse and monitor a number of drought related climate indices as well as soil moisture. These indices will be able to assist users combat a number of these issues and help achieve a degradation-neutral Senegal.
Po-67	By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality.	WaSCIA high-quality water stress and climate indices data can support decision making in respect to agriculture.	✓ The WaSCIA service provides users with a wide range of indices and analysis methods to inform agricultural practices. ✓ This information can be key in forming resilience to climate change, drought and abnormal conditions that fall outside of the climatological norm for the region.
Po-68	Strengthening EO data access and sharing practices and policies in promoting intra-African collaborative actions.	WaSCIA service shall enable users to search EO & climate data catalogues, import data, discover and run the available processors. All underlying data will be available and free-to-use for WaSCIA users.	✓ The WASDI platform provides users access to high quality, pre-processed data that would otherwise require computational expense that might not be achievable. ✓ We also provide free and open access to the project website which has extensive documentation and information as well as access to the Jupyter Notebooks that can be shared to users.
Po-69	Conduct capacity development on Earth Observation for integrated decision-making.	Capacity development will be undertaken with training for the WaSCIA end users through in-country outreach workshops and online webinars	✓ We have conducted two webinars and a workshop in person. ✓ These activities provided training and demonstrations surrounding the use of the EO based tool, as well as highlighting its use in decision making, providing participants with the skills to conduct such analysis by themselves in decision making tasks.

Po-70	Strengthen awareness and outreach of Earth Observation among stakeholders including the private sector, policy makers and the general public.	Workshops and project website will help raise awareness of the project.	✓ The webinars and workshop for this project were advertised through both our website, and by our African partners, who provided in country information dissemination. ✓ For the workshop in Dakar (Jul 2024), we had 20 participants from 14 differing institutes covering a variety of sectors.
Po-71	Building on the existing expertise – GMES & Africa places emphasis on the utilization of existing capacities, as it seeks to strengthen additional specialized skills through training.	Similarly, WaSCIA platform is built on existing cloud architecture and models. The programme will strengthen skills with users through workshops and user guides.	✓ The WaSCIA platform used the pre-existing WASDI cloud architecture to disseminate the data to users, utilising existing capacities. ✓ The project also strengthened socialised skills through the provision of training at designated workshops, providing users with the skills to use the tolls themselves.
Po-72	In order to enforce value addition to products and most importantly to create an innovative medium of reaching end-users, EO and ICT should be integrated and considered part of the service delivery cycle.	WaSCIA will be deployed on the WASDI platform. It shall enable users to search EO & climate data catalogues, import data, discover and run the available processors.	✓ WaSCIA was deployed on the WASDI cloud architecture, allowing access to EO and climate data catalogues, as well as pre-processed data that provides users with pre-calculated climate indices for Senegal.
Po-73	Institutions are strongly encouraged to make use of the free and openly available software instead of purchasing other expensive licenses.	WaSCIA platform will be open source and the underlying data are free of charge. The only cost is the deployment cloud infrastructure which is low cost.	✓ The underlying data used for the service is available free of charge. WASDI, which provides the platform from which the pre-processed data is available, has a free 3-month trial, after which there will be a subscription charge. ✓ The migration of the tools to a free to use platform. This would require a project extension.
Po-74	Inspire a sense of ownership to the African public.	WaSCIA will be developed alongside African partners and will be passed on them for continued support and development at the end of the project. It will be very much an African owned resource and should be promoted as so.	✓ Our work alongside our Africa partners has provided them with the skills and understanding to take on this service following the projects end. This will make this an African owned and run project, providing the Africa public with the best possible service.

3 CONCLUSIONS

As evidenced in Table 2-1, the WaSCIA project has successfully addressed a vast majority of the 74 policies identified in the origin PTM. This has been achieved through the development of the cloud-based platform outlined in D9 [RD 2], providing users with easy access to climate and water stress data. The WaSCIA project has not only focused on the provision of this data, but also a means to analyse it (through a series of Jupyter Notebooks), and capacity building. Capacity building and sharing of information are pivotal to a majority of the policies listed. Workshops, webinars and public outputs have helped WaSCIA to achieve this, providing knowledge sharing and demonstrating how these can be used to strengthen services in the region.

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