CReW+

Water Information Management System (WIMS) in six Caribbean countries

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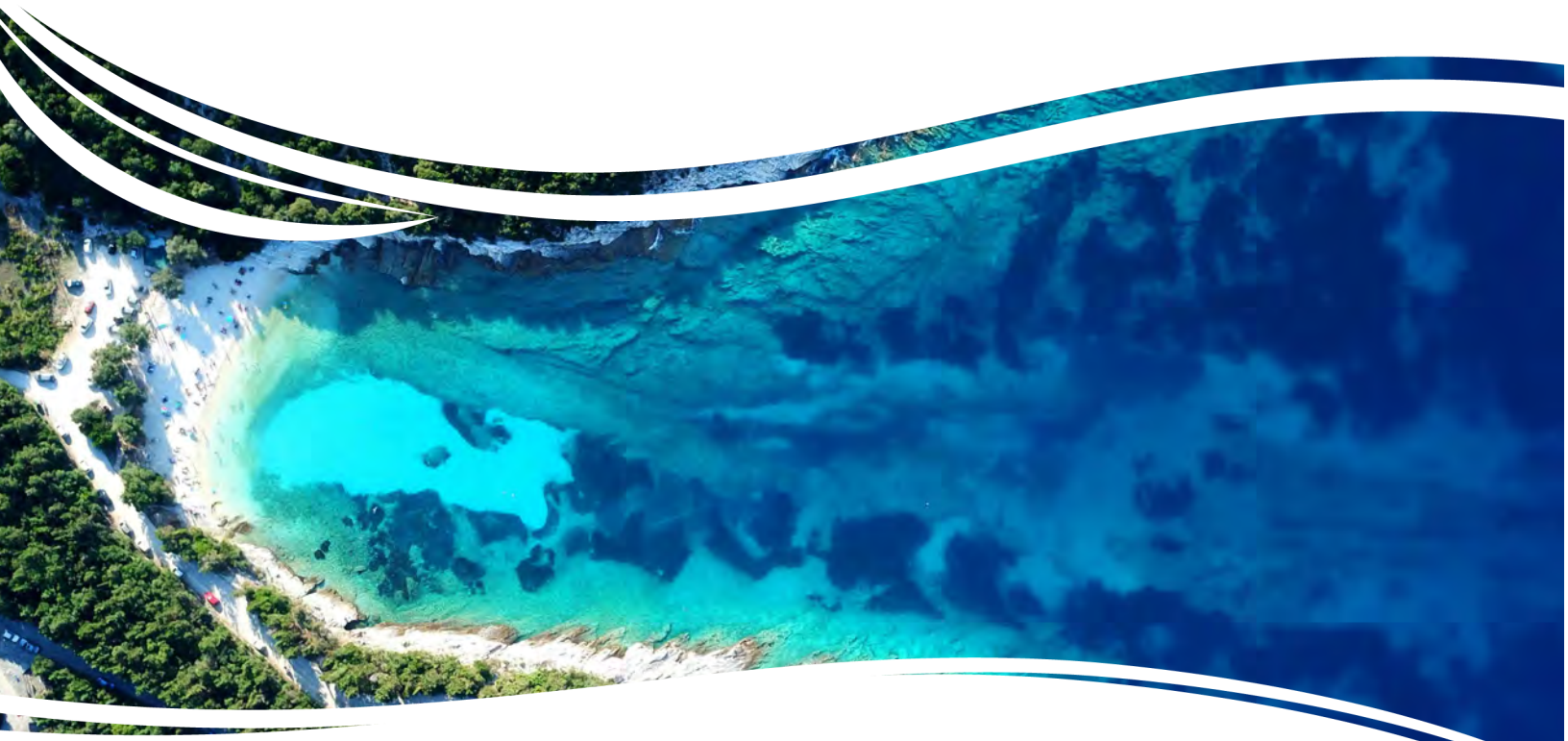

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The Water Information Management System (WIMS) in six Caribbean countries was spearheaded by the UNU Institute for Water, Environment and Health (UNU-INWEH) and financed by The Global Environment Facility (GEF) under the GEF CReW+ Project.

The GEF CReW+ is a partnership project funded by the Global Environment Facility (GEF) that is being co-implemented by the Inter-American Development Bank (IDB) and the United Nations Environment Programme (UNEP) in 18 countries of the Wider Caribbean Region (WCR).

This project builds upon its previous successful phase "The Caribbean Regional Fund for Wastewater Management (CReW)" project (2011-2017). CReW+ is being executed by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, the Organisation of the American States (OAS) and the Secretariat of the Cartagena Convention (CAR/RCU) on behalf of the IDB and UNEP respectively.

The 18 participating CReW+ countries (Barbados, Belize, Colombia, Costa Rica, Cuba, Dominican Republic, Grenada, Guatemala, Guyana, Honduras, Jamaica, Mexico, Panama, Saint Kitts and Nevis, Saint Lucia, St. Vincent and the Grenadines, Suriname and Trinidad and Tobago) vary geographically from large, continental countries to small island states, with significantly different political, linguistic and cultural contexts.

About the GEF: The Global Environment Facility (GEF) has provided $22 million in grants and blended finance and mobilised nearly $120 billion in co-financing for more than 5,200 projects and programmes. The GEF is the largest trust fund focused on enabling developing countries to invest in nature and supports the implementation of international conventions on biodiversity, climate change, chemicals and desertification. It brings together 184 governments, plus civil society, international organisations, the private sector and partners.

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1. GEF CReW+ Project

The GEF CReW+ is a partnership project funded by the Global Environment Facility (GEF) that is being co-implemented by the Inter-American Development Bank (IDB) and the United Nations Environment Programme (UNEP) in 18 countries of the Wider Caribbean Region (WCR). The concept was approved in November 2017 for an amount of 14,943,938 US$ by the GEF Trust Fund. The GEF CReW+ started 2020 with an inception phase.

This project builds upon its previous successful phase "The Caribbean Regional Fund for Wastewater Management (CReW)" project (2011-2017). CReW+ is being executed by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, the Organisation of the American States (OAS) and the Secretariat of the Cartagena Convention (CAR/RCU) on behalf of the IDB and UNEP respectively. The executing agencies are responsible for achieving its goals and outcomes, within the respective Technical Cooperation Agreements, and consistent with GEF, IDB and UNEP policies and procedures.

The eighteen participating CReW+ countries (Barbados, Belize, Colombia, Costa Rica, Cuba, Dominican Republic, Grenada, Guatemala, Guyana, Honduras, Jamaica, Mexico, Panama, Saint Kitts and Nevis, Saint Lucia, St. Vincent and the Grenadines, Suriname, Trinidad and Tobago) vary in size from large, continental countries to small island states, with significantly different political, linguistic and cultural contexts. The technical specialists from the implementing and executing agencies are coordinating with the

CReW+ focal points to support implementation of project activities.

About GEF: The Global Environment Facility (GEF) has provided $22 billion in grants and blended finance and mobilized nearly $120 billion in co-financing across more than 5,200 projects and programs. GEF is the largest trust fund focused on enabling developing countries to invest in nature and supports the implementation of international conventions on biodiversity, climate change, chemicals and desertification. It brings together 184 governments, as well as civil society, international organizations, the private sector and partners.

GEF CReW+ cooperates with national, regional, and local stakeholders on the range of innovative sanitation technologies and efforts to safeguard freshwater resources. This also includes consultation with the private sector.

At the institutional level, GEF CReW+ promotes the development of norms, strategies and policies concerning water resources and wastewater management. Aiming at long-term service provision for all, the project identifies sustainable finance mechanisms such as payment for ecosystem services, incentive creation and revolving funds. The technical activities of GEF CReW+ comprise design and construction of natural wastewater treatment plants and sanitary facilities, based on the results of country-specific assessments. Furthermore, knowledge management forms a crucial part of GEF CReW+, including the development of a communication strategy. The strategy includes comprehensive inventories of material on wastewater infrastructure, reuse, watershed protection and financing tools at the regional and national level.

The Wider Caribbean Region faces multiple challenges in the wastewater and sanitation service provision. About 70% of the region's population lacks access to safely management sanitation facilities and adequate hygiene services.

It is estimated that between 70% and 80 of domestic wastewater is discharged into the environment partially treated or untreated. Weak legislative, political, and

regulatory frameworks as well as the lack of financial resources to enable adequate levels of treatment further compound the problem. This causes severe pollution of groundwater, soil, watersheds and ultimately the Caribbean Sea resulting in significant environmental, economic and social impacts.

The GEF CReW+ project provides innovative and nature-based solutions to mitigate the effects of partially or untreated wastewater on the environment and public health.

Valuing water as a precious resource, the concept of Integrated Water and Wastewater Resources Management (IWWM) applied in the GEF CReW+ project is based on the four Rs of the circular economy approach: reduce, reuse, recycle, and recover. The project treats wastewater not as waste, but as a valuable resource with reuse potential in agriculture, industries and other commercial sectors. With regards to the environment, treating wastewater safely supports regional efforts for sustainable development by reducing pollution, safeguarding marine biodivesity and protecting human health. GEF CReW+ thus contributes directly to the achievement of the SDGs 3, 6, 11, 14 and 15.

2. UNU-INWEH and GEF CReW+

The United Nations University Institute for Water, Environment and Health (UNU-INWEH) implemented the Water Information Management System (WIMS) as a component of the CReW+ Project, funded by the Global Environment Facility (GEF) and focused on integrated water and wastewater management in the Wider Caribbean Region. Initially targeting six countries, the project aimed to enhance water data accessibility, sharing, and management to support national decisionmaking and reporting obligations.

Following consultations and requirement analysis, the project scope was adjusted based on partner interest, with implementation proceeding in four countries: Costa Rica, Jamaica, St Lucia, and Trinidad and Tobago. WIMS platforms, built on the open-source

GeoNode system, were tailored to national needs. Notably, this included developing a specialized field data verification application for Costa Rica and customizing the interface design based on feedback from Trinidad and Tobago.

A hybrid deployment strategy was adopted: systems for Jamaica, St Lucia, and Trinidad & Tobago were deployed on AWS cloud servers pending transfer to national resources, while Costa Rica's system was deployed on national servers. Capacity building was addressed through online demonstrations, targeted training sessions in Costa Rica, and a comprehensive self-paced online course hosted on the UNU platform. Key challenges included varying stakeholder engagement across countries, data standardization, technical capacity, and resource availability, which were mitigated through adaptive management, training, and tailored technical solutions.

Key deliverables included operational WIMS platforms in the four participating countries, the specialized field application for Costa Rica, a Data Governance Framework, and capacity-building resources. Project dissemination included submitting an abstract to the AGU 2024 meeting. Despite challenges and scope adjustments, the WIMS project successfully established platforms to improve water data management and decision-making capacity in the participating nations

3. Implementation of Activities

3.1. Executive Summary

The GEF CReW+ Project through UNU-INWEH provided support for regional activity in one component:

Component I. Institutional, policy, legislative and regulatory reforms for Integrated Water and Wastewater Management (IWWM). Provision of innovative small-scale, local, rural, peri-urban and community-based solutions for IWWM.

Outcome 1.2. Enhanced regional and national coordination, information exchange, science-based decisions, and reporting on relevant SDGs and MEAs, resulting from the use of national and regional platforms/databases for IWWM by national and regional institutions.

Output 1.2.1 New or updated national platforms/databases, supported by a regional platform for IWWM developed.

- Water Information Management System (WIMS) in six Caribbean countries

3.2. Execution of the activities

Water Information Management System (WIMS) in six Caribbean countries

Executing Agency: UNU-INWEH

This report provides of the WIMS implementation, highlighting key achievements, challenges, and recommendations for sustainability.

Project Objectives

1. Establish a WIMS platform in each of the six partner countries to:
    a. Provide real-time access to historical and current water-related data.
    b. Securely store and archive water-related data from multiple stakeholders.
    c. Enable interoperability with existing national and regional information systems.
    d. Ensure data quality through governance frameworks and standardized protocols.
    e. Support national, regional, and global reporting obligations (e.g., SDG 6 and SDG 14).
2. Develop a Data Governance Framework to ensure the quality, security, and ethical use of WIMS data.

Deliverables

- Operational WIMS platforms in selected countries.
- Data Governance Framework for managing data quality and security.
- Capacity-building programs for local stakeholders.

Stakeholder Engagement

The project identified and engaged key stakeholders across the participating countries. Preliminary lists identified core partner agencies responsible for water resource management, environmental protection, public utilities, meteorology, agriculture,

disaster management, and research within Costa Rica, Trinidad and Tobago, St. Vincent and the Grenadines, Jamaica, St. Lucia, and Grenada. These included government ministries (e.g., Ministry of Environment and Energy in Costa Rica, Ministry of Public Utilities in Trinidad & Tobago), water authorities (e.g., WASA in Trinidad & Tobago, Central Water and Sewerage Authority in St. Vincent), environmental agencies (e.g., NEPA in Jamaica, EMA in Trinidad & Tobago), meteorological services, and universities.

The consultation process varied by country:

- Costa Rica: Engaged actively with a responsive focal team, leading to agreed-upon needs that were proceeding to finalization. They have requested to develop a mobile and web based water source field data collection application and a customised WIMS for water resources data and document management
- Trinidad and Tobago: Was actively engaged with a responsive focal team, agreeing on the WIMS system framework and interface design. Feedback gathered focused on interface personalization, feature additions (logos, links, IT support, event banners, project/policy listings, public info sections), data access controls, and search/display functionalities
- St Lucia: An introductory meeting was held, initial requirements were received, and the country accepted a design based on feedback from Costa Rica and Trinidad & Tobago
- Grenada: An introductory meeting was conducted to initiate engagement. No feedback received on the requirement
- Jamaica & St Vincent and the Grenadines: An introductory meeting was conducted to initiate engagement. No feedback received on the requirement

Engagement activities involved gathering feedback on system design and functionality. For example, feedback from stakeholders in Trinidad and Tobago included requests for:

- Enhanced website aesthetics reflecting the Caribbean region.
- Addition of stakeholder logos and summaries of their contributions.
- Integration of features like IT assistance bots, FAQ sections, event banners, and listings of ongoing water projects and relevant studies/policies.

- Inclusion of a public-facing section with general water sector facts and a gallery.
- Development of tutorials and training materials.

Requirement Analysis

The requirement analysis phase focused on defining the specific functional and non-functional needs for the WIMS platform, tailored to national contexts while ensuring regional interoperability.

Costa Rica identified the two major needs:

- Developing a field data collection and verification application. This was not mentioned in original project proposal but later agreed to be included based on requirement from Costa Rica. This application required capabilities for offline data collection, location capture using multiple coordinate systems with automatic conversion, and data verification workflows.
- Specific data modules were defined, covering applicant details, water usage (commercial, industrial, tourism, aquaculture, agro-industrial, agricultural), and source information (location, flow rate). Enhancements to the map visualization system were requested, including improved user profile management (registration, session saving, password recovery.
- Customised WIMS for water resources data and document management.

Trinidad & Tobago highlighted requirements concerning data access control (specifying user permissions for viewing/downloading metadata, spatial data, maps, and hydro-meteorological data). Detailed specifications were requested for search options within data, document, and map explorers (by categories, keywords, data types, regions). Design preferences included options for heat maps, graduated colors, and buffer analysis in the map explorer. Requirements for the time series data explorer included search by text, parameter, station name, region, or data owner, and display options like maps of stations, lists, and charts (single or multiple stations).

Following the initial consultations and requirement analysis phase, a decision was made

based on partner interest to discontinue the WIMS implementation efforts in Grenada and St. Vincent and the Grenadines. Implementation for Jamaica and St Lucia was planned based on similar requirements from Trinidad and Tobago.

This collaborative approach ensured the WIMS platform was developed to meet specific national needs while facilitating broader regional data sharing and management goals.

System Development

The WIMS platforms were built using the open-source GeoNode geospatial data management system. GeoNode offers a robust foundation for managing and sharing spatial and non-spatial data, documents, and maps. Each WIMS instance includes:

- Data Management Module: For uploading, storing, and sharing geospatial and tabular data.
- Document Management Module: To handle relevant policy, regulatory, and technical documents.
- Map Explorer: Allows users to create and explore interactive maps using uploaded datasets.
- Timeseries Data Explorer: Enables visualization and analysis of temporal data, aiding trend analysis and informed decision-making.

The development process prioritized modularity and scalability to adapt to each country's data infrastructure and needs. WIMS was tailored to integrate with existing national information systems, ensuring interoperability. Training programs and online courses were developed tomsupport national stakeholders in using and maintaining WIMS, with a focus on data governance,mquality control, and effective information sharing.

Field Data Verification Application (Costa Rica):

Responding to specific requirements identified during consultations in Costa Rica, a dedicated Field Data Verification Application was developed. This involved creating:

- Android Mobile Application: An Android app designed for field personnel to review and inspect collected water source data against water use permit applications. Key development tasks included designing the Spanish user interface (approx. 6-8 screens), enabling data download via API based on file/process ID, allowing updates to usage information and GPS coordinates within the app, incorporating offline data collection with later synchronization, and producing a user guide.
- Web Application Backend: A supporting web application for data visualization and management. This involved setting up a server and database repository, developing an API for receiving data from the mobile app, enabling data synchronization, creating a web page for Browse uploaded data, ensuring a Spanish interface, providing user guides for both web and mobile components, and sharing the source code.

System Deployment

The deployment strategy for the Water Information Management System (WIMS) was adapted based on the infrastructure availability and preferences of the partner countries participating in the final implementation phase: Costa Rica, Jamaica, St Lucia, and Trinidad and Tobago.

- Cloud-Based Deployment (AWS): For Trinidad and Tobago, St Lucia, and Jamaica, the WIMS platforms were deployed on Amazon Web Services (AWS). This approach facilitated rapid deployment and ensured accessibility during the project phase. The objective for these deployments is a future transition; the systems are intended to be transferred to national computing resources once these are made available by the respective countries.
- National Server Deployment (Costa Rica): In Costa Rica, the WIMS components, including the Field Data Verification Application and the core WIMS data and document management system, were deployed directly onto servers provided by the country. This aligns with the national infrastructure and data management protocols.

Training & Capacity Building:

A key component of the WIMS project was building the capacity of national

stakeholders to effectively utilize and manage the system. A multi-faceted approach was adopted for training and capacity development:

- Online Demonstrations: Live online sessions were conducted to provide users with demonstrations on the practical use of the WIMS platform and its various functionalities.
- Targeted Training Sessions: Several dedicated training sessions were held specifically for stakeholders in Costa Rica, focusing on the newly developed Field Data Verification system to ensure its proper application and integration into their workflows.
- Self-Paced Online Course: A comprehensive, self-paced online course was designed and developed to offer flexible learning opportunities. This course is hosted on the UNU online learning platform (lc.unu.edu). The course covers essential aspects of WIMS, including:
    - System registration, login, and profile management.
    - Adding and managing various data types: base data (e.g., shapefiles), documents, remote services, and time series data (station and observation data).
    - Metadata editing and managing permissions [cite: training-outline.pdf].
    - Creating, exploring, and visualizing maps and data using filters, charts, tables, and data comparison tools.

Dissemination Activities

In addition to direct implementation and training, efforts were made to share the project's work with the wider scientific and technical community. An abstract detailing the Water Information Management System (WIMS) developed under the project was submitted for presentation at the American Geophysical Union (AGU) 2024 annual meeting. This activity aimed to disseminate the project's approach and findings to relevant experts and practitioners globally.

Challenges and Mitigation Strategies

The implementation of the WIMS project encountered several challenges common to multinational, technology-focused initiatives. Key challenges and the strategies

employed to mitigate them include:

Stakeholder Collaboration and Institutional Buy-in: Securing consistent engagement and long-term commitment from diverse institutional stakeholders across multiple countries proved challenging. While focal teams in countries like Costa Rica and Trinidad & Tobago were highly responsive, achieving uniform engagement and securing buy-in across all initially targeted countries varied. Ultimately, based on partner interest and likely linked to securing sustained commitment, the implementation scope was adjusted, and efforts were discontinued in Grenada and St. Vincent and the Grenadines.

Mitigation: Early and continuous engagement with stakeholders was prioritized to foster ownership and secure commitments. Regular consultations were held to align the WIMS development with national priorities.

Data Standardization: Integrating water and wastewater data from various national agencies, often maintained in different formats and standards, presented a significant hurdle. Harmonizing these diverse datasets for effective use within a common platform required considerable effort.

Mitigation: The project addressed this by promoting and adopting common metadata standards across the participating countries to facilitate data interoperability and quality control.

Technical Capacity: Ensuring that national agencies possessed the necessary technical expertise to operate, maintain, and sustain the WIMS platform beyond the project's lifespan was a key concern.

Mitigation: A comprehensive capacity development program was implemented, including live online demonstrations, targeted training sessions (especially for specialized components like Costa Rica's field application), and a detailed self-paced online course hosted on the UNU learning platform, covering all aspects of system

usage and administration.

Resource Availability: Differences in the availability of national resources, including dedicated personnel and computing infrastructure, posed a challenge for standardized deployment and longterm sustainability. The need for countries like Trinidad & Tobago, St Lucia, and Jamaica to eventually provide their own computing resources for hosting the AWS-deployed systems highlights this dependency.

Mitigation: A hybrid deployment approach was adopted. Where national servers were available (as in Costa Rica), the system was deployed locally. For others, AWS cloud infrastructure provided an interim solution, allowing platform deployment while giving countries time to plan for the allocation of national resources for eventual system handover and long-term maintenance.

3.3. Results

Activity - Water Information Management System (WIMS) in six Caribbean countriesTraining and Capacity Building under the CReW+ Project

Output 1.2.1 New or updated national platforms/databases, supported by a regional platform for IWWM developed.
• *Access to a comprehensive, self-paced online training course hosted on the UNU online learning platform (https://lc.unu.edu/courses/course-v1:UNU-INWEH+INWEH-28+2024-T2/about) covering system usage and administration.* • *Data Governance Framework (attached).* • *User manual for WIMS system (attached)*
Costa Rica: • *Deployed Systems (on National Servers):*   ○ *Field Data Verification Application (Mobile and Web components) tailored to national requirements*

○ *WIMS Data and Document Management System deployed in national server* ○ *User guide for field application (attached)* • *Capacity Development:* ○ *Targeted training sessions specifically focused on the Field Data Verification Application.*
System Deployed on AWS, pending transfer
Trinidad and Tobago: http://3.238.130.180:8000/
St Lucia: http://3.238.93.223:8000/

3.4. Lessons Learned

Varying stakeholder engagement across countries poses a challenge to uniform implementation and securing sustained commitment. Adjusting the scope based on partner interest and responsiveness can be necessary.

Partner engagement was challenging because UNU-INWEH, responsible for developing the WIMS, was not directly responsible for partner engagement.

Coordination from UNEP interfered due to staff turnover.

Country partner agencies were not clear about their mandate and requirements from the system.

Integrating data from various national agencies in different formats and standards is a significant hurdle. Harmonizing diverse datasets requires considerable effort.

Ensuring national agencies have the technical expertise to operate, maintain, and

sustain the platform beyond the project's lifespan is crucial.

Differences in the availability of national resources, including dedicated personnel and computing infrastructure, challenge standardized deployment and long-term sustainability.

Stakeholder Collaboration and Institutional Buy-in: Early and continuous engagement was prioritized to foster ownership and secure commitments. Regular consultations were held to align WIMS development with national priorities. This adaptive approach led to adjusting the implementation scope based on partner interest.

Data Standardization: The project promoted and adopted common metadata standards across participating countries to facilitate data interoperability and quality control. This addressed the hurdle of integrating data from various national agencies maintained in different formats.

Technical Capacity: A comprehensive capacity development program was implemented. This included live online demonstrations, targeted training sessions (particularly for specialized components like Costa Rica's field application), and a detailed self-paced online course covering system usage and administration. This aimed to ensure national agencies had the necessary expertise to operate and maintain the platform. The self-paced online course is hosted on the UNU online learning platform and covers essential aspects such as system registration, data management, metadata editing, managing permissions, and exploring/visualizing maps and data. Access to this course is available for all participating countries.

Resource Availability: A hybrid deployment approach was adopted to address differences in the availability of national resources. Where national servers were available, such as in Costa Rica, the system was deployed locally. For other countries, AWS cloud infrastructure provided an interim solution, allowing platform deployment while giving countries time to plan for the allocation of national resources for eventual

system handover and long-term maintenance.

3.5. Next Steps

The project methodology, based on the open-source GeoNode system and tailored to national needs, appears replicable in other countries or regions facing similar water information management challenges. The core components, including data management, document management, map explorer, and timeseries data explorer, provide a robust foundation. The ability to tailor the system and develop specialized applications, as seen with the field data verification application for Costa Rica, further supports its adaptability.

The WIMS project nurtured sustainability through a multi-faceted capacity building program and a flexible deployment strategy. Capacity building included online demonstrations, targeted training sessions, and a comprehensive selfpaced online course hosted on the UNU online learning platform. This aimed to equip national stakeholders with the necessary skills to effectively utilize and manage the system beyond the project's lifespan.

4. Focal point and national stakeholders

Name	Role in CReW+	Position and Organization	e-mail
Mr. Madani Kaveh		Division Director UNU-INWEH	madani@unu.edu
Mr. Matin Mir		Project Manager UNU-INWE	mir.matin@unu.eduprojects

Table 1. Focal points and national stakeholders

5. Project implementing structure

Agency	Position	Contact	e-mail
Inter-American Development Bank (IDB)	Lead Implementing Agency	Rodrigo Riquelme Water and Sanitation Lead Specialist, INE/WSA	rodrigor@iadb.org
United Nations Environment Programme (UNEP)	Implementing Agency	Isabelle Van der Beck GEF International Waters Task Manager Water and Sanitation Division Ecosystems Division, Marine and Coastal Infrastructure and Environment Ecosystems Branch	isabelle.vanderbeck@un.org
	Project Coordination Group (PCG)	Pedro Moreo Mir Regional Coordinator	pmoreo@oas.org

Agency	Position	Contact	e-mail
Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH	Executing Agency	Bärbel Schwaiger Programme Director Sanitation for Millions Division Environment, Climate and Infrastructure	baerbel.schwaiger@giz.de
Secretariat to the Cartagena Convention (CAR/RCU)	Executing Agency	Laverne Walker Programme Officer Pollution and Communications Sub-Programmes Cartagena Convention Secretariat Ecosystems Division	laverne.walker@un.org

Agency	Position	Contact	e-mail
Organisation of the American States (OAS)	Executing Agency	Andres Sanchez Water Program Specialist Secretaría Ejecutiva para el Desarrollo Integral (SEDI) Departamento de Desarrollo Sostenible (DDS) Sección de Gestión Integrada de Recursos Hídricos (GIRH)	asanchez@oas.org

Table 2. Implementing structure

6. Annexes

6.1. Water Resources Data Governance Framework for Caribbean Countries

Water Information Management System (WIMS) under the CReW+ Project

Water Resources Data Governance Framework for Caribbean Countries

United Nations University Institute for Water, Environment and Health (UNU-INWEH)

Chapter 1: Introduction

1.1 Introduction: Setting the Stage for Data-Driven Water Management

The Caribbean regions are vulnerable to the escalating impacts of climate change, manifesting as altered precipitation patterns, more frequent and intense extreme weather events, and rising sea levels, and floods all of which directly threaten the availability and quality of water [1]. Coupled with rising population densities and the substantial water demands of key economic sectors such as agriculture and tourism, the sustainable management of this precious resource has become paramount for the region's future [3]. For Caribbean Small Island Developing States (SIDS), effective water resources management is not merely an environmental concern but a fundamental prerequisite for socio-economic stability, public health, and overall environmental sustainability [1].

Data governance is a critical element for ensuring efficient management of water resources. Data governance can be defined as a comprehensive system encompassing the rules, roles, responsibilities, and processes that collectively ensure the quality, security, and usability of data within an organization or across a sector. While traditional approaches to water resources management have often focused heavily on physical infrastructure such as dams, pipelines, and treatment plants, there is a growing recognition that robust data governance is equally essential for informed decision-making and effective resource allocation in the modern era. Just as a well-managed network ensures the reliable delivery of potable water to communities, a robust data governance framework ensures that accurate and trustworthy water-related information is available to those who need it, when they need it.

Recognizing the critical need for improved water resources management in the Wider Caribbean Region (WCR), the Water Information Management System (WIMS) has been developed under the CReW+ Project. This initiative, implemented by the Inter-American Development Bank (IDB) and the United Nations Environment Programme (UNEP), aims to create an efficient, real-time, and secure water information management system tailored for each partner country. The United Nations University Institute for Water, Environment, and Health (UNU-INWEH) is leading the development and operationalization of WIMS in six Caribbean countries: Costa Rica, Grenada, Jamaica, Saint Lucia, St. Vincent and the Grenadines, and Trinidad and Tobago. WIMS is built on the GeoNode open-source geospatial data management platform, offering a flexible and robust solution for managing diverse data types, including spatial and aspatial data, documents, and time series data.

This report aims to address the pressing need for a tailored approach to water resources data governance in the Caribbean region, incorporating the utilization of systems like WIMS. Its primary objective is to provide a comprehensive and adaptable Water Resources Data Governance Framework specifically designed to address the unique challenges and contexts of Caribbean countries. This framework is intended to serve as a practical guide for water management agencies in the region as they embark on the crucial task of developing their own data governance policies and procedures, ultimately contributing to the sustainable and resilient management of their water resources, leveraging tools such as WIMS to enhance data access and sharing.

1.2 The Critical Role of Data Governance in Achieving Sustainable Water Resources Management in the Caribbean

Data governance serves as the bedrock for evidence-based decision-making across the entire spectrum of water resources management activities in the Caribbean. From the routine operational tasks of water utilities to the formulation of long-term strategic plans for national water security, the principles and practices of data governance are indispensable. By ensuring that water-related data is accurate, reliable, accessible, and timely, effective data governance empowers stakeholders to make informed choices that promote the sustainable use and protection of this vital resource. Systems like the Water Information Management System (WIMS) are crucial in providing the technological infrastructure to support these data governance objectives by ensuring real-time, secure access to water-related data while maintaining data quality and interoperability.

A well-defined framework establishes clear protocols for the systematic collection, storage, and analysis of crucial data on various aspects of the water cycle. This includes information on the availability of both surface water (rivers, lakes, reservoirs) and groundwater (aquifers), the quality of these water sources (physical, chemical, and biological parameters), the patterns of water use across different sectors (domestic, agriculture, industry, tourism), and prevailing hydrological conditions such as rainfall, evaporation, and streamflow.

Furthermore, robust data governance is essential for **enhanced planning and forecasting** in the water sector [1]. Accurate and comprehensive data underpins the development of reliable water balance assessments, which are crucial for understanding the overall availability of water resources within a given region. It also supports the creation of informed demand projections, allowing water management agencies to anticipate future water needs based on population growth, economic development, and other relevant factors. Moreover, in an era of increasing climate variability, sound data governance enables the development and refinement of climate change impact models, helping Caribbean nations to better understand and prepare for the potential effects of a changing climate on their water resources [1].

A well-implemented data governance framework fosters **increased transparency and accountability** in water resources management [3]. By making relevant water-related data accessible to a wide range of stakeholders, including government agencies, researchers, the public, and civil society organizations, it promotes trust in the management of this essential resource. Transparency in data collection, management, and decision-making processes enhances accountability and enables stakeholders to participate more meaningfully in water resources governance[3]. WIMS is designed to facilitate access to historical and current water data, promoting efficient data sharing among stakeholders and enhancing transparency. In essence, data governance, supported by systems like WIMS, is not merely a technical exercise but a crucial element in building a resilient, sustainable, and equitable water future for the Caribbean region.

1.3 Current Challenges in Managing Water Data Across the Caribbean Region

Despite the recognized importance of data in water resources management, Caribbean countries

currently face a multitude of interconnected challenges in effectively managing their water-related information. These challenges span various aspects of the data lifecycle, from initial collection to final dissemination and use, and often hinder the ability of water management agencies to make informed decisions and implement sustainable practices. The introduction of the Water Information Management System (WIMS) aims to address many of these challenges by providing a unified platform for data management and sharing.

One of the significant hurdle is the **lack of standardization** in data management practices across the region [1]. Different agencies within the same country, and certainly across different Caribbean nations, often employ disparate data collection methodologies, use varying data formats, and adhere to inconsistent quality control procedures [1]. This lack of uniformity creates significant obstacles to data integration, analysis, and comparison, hindering regional assessments and collaborative efforts in water resources management. The non-uniformity in data gathering and management limits the accuracy of climate projection models for the Caribbean [1]. WIMS is designed to ensure data interoperability by facilitating the storage, and sharing of data in standardized formats.

The problem of **fragmented data management** further compounds these challenges. In many Caribbean countries, water data collection and management responsibilities are distributed across numerous institutions, including meteorological services, ministries of agriculture, water utilities, and health ministries. Often, these entities operate in relative isolation, lacking effective mechanisms for data sharing, coordination, and collaboration. This compartmentalized approach leads to duplication of effort, inefficient resource utilization, and a limited overall understanding of the interconnectedness of water resources. The lack of appropriate facilities for collating, analyzing, and disseminating water data encourages this isolated approach. WIMS directly addresses this by providing a structured platform for managing and sharing data among different stakeholders, enhancing interoperability with existing national systems.

Furthermore, many water management agencies in the Caribbean grapple with **inadequate infrastructure and technology** for effective data management[2]. This includes limitations in hardware for data storage and processing, a lack of sophisticated software for data analysis and visualization, and insufficient network capabilities for data transmission and dissemination[2]. WIMS, built on the GeoNode platform, offers a robust and flexible solution for managing diverse data types, potentially alleviating some of these infrastructure limitations.

1.4 Regulatory and Policy Landscape for Water Data Governance

Establishing an effective Water Resources Data Governance Framework in the Caribbean, especially with the integration of the Water Information Management System (WIMS), requires a thorough understanding of the existing regulatory and policy landscape at the international, regional, and national levels. These frameworks provide the overarching context within which water data is collected, managed, shared, and utilized within WIMS and other systems.

1.4.1 International Frameworks and Commitments

At the international level, the **Sustainable Development Goals (SDGs)**, adopted by the United Nations in 2015, provide a comprehensive agenda for global sustainable development. **SDG 6**, specifically focused on "Clean Water and Sanitation," has direct relevance to water data governance. Several targets within SDG 6, such as target 6.3 on improving water quality, target 6.4 on increasing water-use efficiency, and target 6.5 on implementing integrated water resources management, necessitate the collection, analysis, and sharing of high-quality water data, which WIMS is designed to support. The indicators used to track progress towards these targets also rely heavily on robust data management systems. Effective water data governance in Caribbean countries, facilitated by tools like WIMS, is therefore crucial for monitoring their progress towards achieving SDG 6 and contributing to the global sustainable development agenda.

Furthermore, international best practices and guidelines in water data management, developed by organizations like the **World Meteorological Organization (WMO)** and the **International Hydrological Programme (IHP) of UNESCO**, offer valuable insights and standards that can inform the development of national data governance frameworks in the Caribbean and the utilization of systems like WIMS. While not explicitly detailed in the provided snippets, these organizations play a significant role in setting global standards for hydrological and meteorological data collection and management.

1.4.2 Regional Policies and Collaborative Initiatives

Within the Latin American and Caribbean region, several policies and collaborative initiatives aim to improve water governance and data management, which can be further enhanced by the use of WIMS. The **Regional Strategic Action Plan for the Water Sector in the Caribbean to Develop Resilience to the Impacts of Climate Change (RSAP)**, for example, explicitly recognizes the need for improved governance, data collection, and monitoring to enhance the resilience of the region's water sector to climate change[8]. WIMS directly supports these objectives by providing a platform for better data collection and sharing.

The **Caribbean Water and Wastewater Association (CWWA)** plays a vital role in fostering collaboration and knowledge sharing among water utilities and professionals in the region[10]. While not solely focused on data governance, the CWWA's efforts in promoting best practices and facilitating communication indirectly contribute to better data management across the Caribbean, which can be further strengthened by the adoption of WIMS[10].

1.4.3 Country-Specific Regulatory and Policy Overviews (Trinidad and Tobago, St. Lucia, St. Vincent and the Grenadines, Jamaica, Costa Rica, and Grenada)

Each of the six focus countries has its own unique regulatory and policy landscape concerning water resources management and data, which will influence the implementation and utilization of WIMS.

In **Trinidad and Tobago**, the primary legislation governing the water sector is the **Water and Sewerage Act (Chapter 54:40)**, which established the Water and Sewerage Authority (WASA)[9]. The **Environmental Management Act (Chapter 35:05)** and its subsidiary legislation, such as the **Water Pollution Rules,**

2019, also play a significant role in regulating water quality and discharges. Within WASA, the Water Resources Agency (WRA) is the main unit responsible for water resources management. Trinidad and Tobago also has a **National Water Resources Management Policy** aimed at effectively managing the country's water resources in an integrated and sustainable manner. However, there is a noted lack of a National Integrated Water Resources Management database and Information System[7], which WIMS could potentially address.

St. Lucia's water sector is primarily governed by the **Water and Sewerage Act 2004** and the **Water and Sewerage (Water Resource Management) Regulations**, which established the Water Resource Management Agency (WRMA). These regulations outline data collection and sharing requirements for the WRMA[11]. St. Lucia also has a **National Water Policy** that guides the sustainable use and development of the island's freshwater resources. The implementation of WIMS can support the WRMA's mandate for data management and coordination.

In **St. Vincent and the Grenadines**, key pieces of legislation include the **CWSA Act of 1991**, which puts all fresh water under the control of the CWSA, and the **Forestry Conservation Act of 1992**. The **National Parks, Rivers and Beaches Authority (NPRBA)** also plays a role in water quality monitoring.

Jamaica has a relatively well-established legal framework for water resources management, primarily through the **Water Resources Act, 1995**, which established the Water Resources Authority (WRA). The Act mandates the development of a **National Water Resources Master Plan** to guide the management of the country's water resources. Jamaica also has a web-based **Water Resources Information System (WRIS)** managed by the WRA, which serves as a central repository for water data. WIMS aims to enhance and potentially integrate with existing systems like WRIS to further improve data access and sharing. Furthermore, the **GOJ Open Data Policy** demonstrates a commitment to transparency and public access to government data, which could extend to water-related information managed in WIMS[6].

Costa Rica's water sector is governed by the **General Water Law (Law 276 of 1942)** and the law establishing the **Costa Rica Institute of Water and Sewerage (AyA) (Law 2726 of 1961)**. Various decrees related to water quality and wastewater management have also been enacted. The institutional framework for water management in Costa Rica has been characterized as fragmented, with multiple agencies involved.

Grenada recently passed the **Water Resources Management and Regulation Bill (2025)**, which aims to provide an institutional framework for the sustainable management of the country's water resources and establish a National Water Resources Management Unit. Grenada also has a **National Water Policy (2020)** and an **Integrated Water Resources Management Plan (2019)** that guide the country's approach to water resources management. The new legislation mandates the establishment of a public information system for water resources, which aligns with the objectives of WIMS.

Chapter 2: Developing a Water Resources Data Governance Framework

2.1 A Structured Process for Developing a Context-Specific Framework

The development of a robust and effective Water Resources Data Governance Framework for Caribbean countries, particularly one that incorporates the use of the Water Information Management System (WIMS), requires a structured and iterative process that takes into account the unique challenges, opportunities, and existing capacities within the region. This process should involve several key phases, ensuring that the resulting framework is context-specific, sustainable, and widely adopted by water management agencies and relevant stakeholders, with WIMS playing a central role in data management and sharing.

2.1.1 Comprehensive Assessment of Existing Data Management Practices and Infrastructure

The initial and arguably most critical step in developing a tailored data governance framework, especially one that will utilize WIMS, is to conduct a **comprehensive assessment of the current state of water data management** within each agency and country. This assessment should serve as a foundation for understanding the existing landscape, identifying gaps and weaknesses, and informing the design of the framework and how WIMS can best be integrated. It needs to encompass a thorough review of people, processes, and technology involved in managing water-related information, including the current capacity for utilizing a system like WIMS.

A crucial component of this assessment is a detailed **data inventory**. Agencies need to meticulously identify all water-related data that is currently being collected or could potentially be collected, considering how this data can be managed within WIMS. This includes specifying the types of data (e.g., hydrological data such as rainfall, streamflow, groundwater levels; meteorological data like temperature, evaporation; water quality data including physical, chemical, and biological parameters; water usage data by sector; and infrastructure data related to water supply and sanitation systems). The inventory should also document the sources of this data (e.g., automated monitoring stations, manual readings, laboratory analyses, remote sensing platforms, third-party providers), the frequency of data collection, the formats in which the data is stored (e.g., spreadsheets, databases, GIS files), and the specific departments or individuals responsible for its collection and initial management, and how these can be incorporated into WIMS.

Following the data inventory, it is essential to undertake **process mapping**. This involves visually documenting the existing data management workflows within each agency, from the initial point of data collection through to its storage, processing, analysis, dissemination, and eventual archiving or disposal, and how these processes can be streamlined or enhanced through WIMS. The mapping process should identify any manual steps involved, potential redundancies in data collection or storage, bottlenecks or inefficiencies in the data flow, and areas where data quality might be compromised. For instance, identifying agencies still relying heavily on manual data recording (as noted in St. Vincent and the Grenadines) is crucial for understanding how WIMS can facilitate a transition to more digital and integrated processes.

An **infrastructure evaluation** is also necessary[5]. This involves assessing the current hardware (e.g., servers, desktop computers, laptops, sensors, monitoring equipment), the software used for data management (e.g., database management systems, statistical analysis tools, Geographic Information Systems - GIS), and the underlying network capabilities (e.g., internet connectivity, local area networks, data transmission systems) in the context of their compatibility and potential integration with WIMS. The evaluation should determine the adequacy, reliability, security, and overall capacity of the existing infrastructure to support effective data management and the use of WIMS[5].

Furthermore, a **skills and capacity assessment** of the staff involved in water data management is critical[5]. This assessment should identify the current skills, knowledge, and expertise of personnel in areas such as hydrology, data science, information technology, GIS, and statistics, and their current ability to utilize data management systems. It should also pinpoint any training needs or skill gaps that may need to be addressed to effectively implement and sustain a data governance framework that includes WIMS[5].

The insights gained from this comprehensive assessment will provide a clear baseline understanding of the current state of water data management within each Caribbean country and its water management agencies, including their readiness for adopting a system like WIMS.

2.1.2 Engaging Key Stakeholders and Defining Agency Roles in Data Governance

The development and successful implementation of a Water Resources Data Governance Framework for Caribbean countries, especially one centered around the Water Information Management System (WIMS), necessitates a **participatory approach** that actively engages all relevant stakeholders from the very beginning. This inclusive approach is crucial for ensuring that the framework is relevant, widely accepted, and effectively implemented across the diverse water sector in the region, with stakeholders understanding their roles in contributing to and utilizing WIMS.

The first step in this phase is **stakeholder identification and mapping**. This involves identifying all individuals, groups, and organizations that have a vested interest in or can influence water resources management and data, including those who will be data providers to and users of WIMS. Key stakeholders include water management agencies and authorities, government ministries responsible for water, environment, agriculture, health, and planning [5], meteorological services and hydrological agencies [5], environmental protection agencies. Once identified, these stakeholders should be mapped according to their roles, responsibilities, interests, and potential contributions to water data governance and the WIMS. This mapping will provide a clear understanding of the data ecosystem and help identify potential areas of collaboration as well as potential conflicts or competing interests related to data sharing on WIMS.

Following stakeholder identification, it is essential to conduct **consultations and workshops**. These engagements provide a platform for gathering the perspectives of various stakeholders, understanding their specific data needs that WIMS should address, and soliciting their input on the development of the data governance framework and the implementation of WIMS. These consultations can take various

forms, including one-on-one meetings, focus group discussions, and larger stakeholder workshops. The goal is to ensure that the framework addresses the diverse needs of the water sector and benefits from the collective knowledge and experience of all relevant parties regarding data management and the potential of WIMS.

Based on the stakeholder mapping and the insights gained from the consultations, the next crucial step is **role and responsibility definition**[5]. This involves clearly defining the specific roles and responsibilities of each agency and stakeholder within the data governance framework, particularly in relation to the Water Information Management System (WIMS). It should explicitly specify who is accountable for various aspects of data management within WIMS, including data collection, quality control, data storage, data security, access management, and data sharing[5].

To ensure the ongoing oversight and effective implementation of the framework and the utilization of WIMS, it is also important to **establish appropriate governance structures**. This could involve the creation of a multi-stakeholder data governance committee or a dedicated working group with representatives from key stakeholder agencies who will oversee the management and use of WIMS. This committee would be responsible for overseeing the implementation of the framework, setting data policies and standards for WIMS, resolving data-related issues within the system, and promoting data sharing and collaboration across the water sector through WIMS.

2.1.3 Establishing Clear and Actionable Data Governance Policies and Procedures

Once the assessment is complete and key stakeholders have been engaged, the next phase involves establishing **clear and actionable data governance policies and procedures**[5], specifically addressing the management and utilization of the Water Information Management System (WIMS). These documented guidelines will provide the necessary structure and direction for water management agencies in the Caribbean to effectively manage their water-related data within WIMS and through other means. The policies should translate the overarching principles of data governance (transparency, accountability, security, integrity, sustainability, and compliance) into practical and implementable directives for the use of WIMS and related data management activities.

A foundational policy is a **Data Standards Policy**. This policy should specify the required formats for different types of water data (e.g., tabular, spatial, time-series) that will be stored and shared within WIMS, the standard units of measurement to be used, the minimum metadata requirements for all datasets (including data source, collection methodology, quality information, and limitations), and the overall quality standards that the data should meet within WIMS. Consideration should be given to adopting existing regional or international data standards where appropriate to enhance interoperability within WIMS and with other systems.

Complementing the data standards policy is a **Data Quality Policy**. This policy should outline the specific procedures for ensuring the quality of water data throughout its lifecycle within WIMS. The policy should also clearly assign responsibility for ensuring data quality to specific roles, such as data stewards for data within WIMS.

A critical aspect of data governance, especially for a system like WIMS, is defining how data can be accessed and shared. A comprehensive **Data Access and Sharing Policy** is therefore essential. This policy should establish clear protocols for requesting and granting access to different types of water data within WIMS, define the various data access levels for different user groups (e.g., internal staff, researchers, the public), outline the terms and conditions under which data can be used (including any data licensing terms for data accessed through WIMS), and specify the procedures for data exchange between different agencies and stakeholders using WIMS and other methods. The policy should also address intellectual property rights related to water data, as highlighted in some regulations. WIMS itself is designed to facilitate data sharing while maintaining security.

To safeguard the integrity and confidentiality of water data within WIMS, a robust **Data Security Policy** must be developed. This policy should detail the technical and organizational measures that will be implemented to protect water data stored and transmitted through WIMS from unauthorized access, use, disclosure, disruption, modification, or destruction. This includes specifying requirements for access controls (e.g., user authentication, authorization within WIMS).

2.1.4 Strategies for Seamless Implementation and Integration into Existing Workflows

The successful adoption of a new Water Resources Data Governance Framework in the Caribbean, particularly one that relies on the Water Information Management System (WIMS), hinges on careful planning and the development of effective strategies for its **seamless implementation and integration** into the existing workflows of water management agencies [11].

Training and capacity building are absolutely essential for the successful implementation of a new data governance framework and the effective use of WIMS [5]. The online course on the use of WIMS would be effective for all the staff members who will be involved in using and managing water data within WIMS.

2.2 Essential Components of a Robust and Sustainable Data Governance Framework

A robust and sustainable Water Resources Data Governance Framework for Caribbean countries, especially one that incorporates the Water Information Management System (WIMS), should encompass several essential components that work together to ensure the effective management and utilization of water-related data within WIMS and through other means. These components address various aspects of the data lifecycle, from initial collection to long-term preservation and use within the context of WIMS.

2.2.1 Standardized Protocols for Data Collection, Validation, and Quality Assurance

To ensure the collection of high-quality, consistent, and comparable water data across the Caribbean region, particularly for data that will be managed within WIMS, the framework must establish **standardized protocols for data collection, validation, and quality assurance**. These protocols will provide clear guidelines for all agencies involved in collecting water-related information that will be uploaded and shared through WIMS.

Data Validation Procedures are crucial for identifying and correcting errors, outliers, and inconsistencies in the collected data before it is entered or uploaded into WIMS. These procedures should include both automated checks (e.g., range checks to ensure data falls within expected values, consistency checks to verify relationships between different parameters) and manual reviews of the data.

Establishing robust **Quality Assurance Processes** is equally important for data managed in WIMS. This involves implementing a system of quality control measures, such as regular data audits to assess the accuracy and completeness of the data. Assigning clear responsibility for data quality to designated personnel, such as data stewards for specific datasets within WIMS, is also essential.

The framework should mandate the use of **Metadata Standards**. Comprehensive metadata, which is "data about data," should be created for all datasets within WIMS. This includes information about the data source, the methodology used for collection, details about data quality, the units of measurement, the date and time of collection, the geographic location, and any limitations or known issues with the data. Standardized metadata within WIMS ensures that data can be properly understood, interpreted, and used effectively by different users over time. Accurate and reliable hydrological data are essential for informed decision-making[4]. WIMS facilitates the management and accessibility of metadata.

2.2.2 Effective Data Sharing Protocols and Interoperability Standards

To overcome the challenges of data fragmentation and promote collaboration in water resources management across the Caribbean, especially leveraging the capabilities of the Water Information Management System (WIMS), the data governance framework must establish **effective data sharing protocols and interoperability standards**. WIMS is specifically designed to facilitate data sharing and enhance interoperability.

Developing **formal data sharing agreements** between different agencies and stakeholders is crucial for the effective use of WIMS[10]. These agreements should clearly define the types of data that will be shared through WIMS, the frequency of sharing, the format in which the data will be provided (ensuring compatibility with WIMS), the terms and conditions of data use within WIMS, and the responsibilities of each participating party in contributing to and utilizing the system.

WIMS serves as a **data portal or platform**, significantly enhancing data accessibility. This online platform provides a central point of access for shared water data from the participating countries, offering users tools to search, view, and potentially download data.

The framework should also address **data licensing** for data shared through WIMS by defining clear terms under which the data can be used. This might involve specifying attribution requirements or restricting certain uses to protect data owners' rights. Consideration should be given to adopting open data licenses where appropriate to promote wider data utilization and innovation through WIMS[6].

2.2.3 Roles and Responsibilities (Data Owners, Stewards, Users)

A well-defined data governance framework clearly articulates the **roles and responsibilities** of individuals and entities involved in managing water data within WIMS and through other means[5]. This

ensures accountability and prevents confusion about who is responsible for specific tasks related to WIMS and the data it contains. Key roles typically include:

Data Owners are usually senior officials or departments within an agency who have overall responsibility for specific water datasets that are contributed to WIMS[5]. They define the data requirements for WIMS, determine who can access their data within WIMS, and are ultimately accountable for the accuracy and integrity of their data contributions to the system.

Data Stewards are individuals or teams within agencies who are responsible for the day-to-day management of specific datasets within WIMS[11]. Their responsibilities include ensuring data quality (through validation and cleaning before or during upload to WIMS), maintaining metadata within WIMS, implementing data standards for their data in WIMS, and serving as the primary point of contact for questions related to their data in the system.

Data Users are individuals or organizations who access and utilize water data from WIMS for various purposes, such as analysis, research, planning, or decision-making[5]. They are responsible for using the data appropriately and adhering to the data access policies and licensing terms defined for WIMS. This could include water resource planners, environmental consultants, researchers, and even the general public accessing data through WIMS.

2.2.4 Data Access Control and Privacy Considerations

The framework must carefully address **data access control and privacy considerations** to balance the need for data sharing with the protection of sensitive information and individual rights.

Implementing a **data classification system** can help categorize water data within WIMS based on its sensitivity and the potential impact of unauthorized disclosure. This classification will then inform the appropriate access control measures to be applied within WIMS.

Various **access control mechanisms** employed within WIMS, including user authentication (verifying the identity of users logging into WIMS) and authorization (determining what data and actions a user is permitted to access or perform within WIMS). Role-based access control, where permissions are assigned based on a user's role within their organization or their purpose for using WIMS, is a common and effective approach.

Chapter 3: Implementation Guide and Template

3.1 Step-by-Step Guide for Water Agencies

Implementing a Water Resources Data Governance is a significant undertaking that requires careful planning and execution. This step-by-step guide provides a roadmap for Caribbean water management agencies in the six participating countries to adopt and enforce such a framework, leveraging the capabilities of WIMS.

3.1.1 Phase 1: Assessment, Planning, and Stakeholder Consultation

The initial phase focuses on understanding the current state and laying the groundwork for the framework and the adoption of WIMS. Agencies should begin by conducting a **comprehensive assessment of their existing data management practices and infrastructure.** This involves taking stock of current data sources, workflows, technology, and human capacity, with a specific focus on how these can be integrated with WIMS.

Based on the assessment findings, agencies should then develop a **clear implementation plan** for both the data governance framework and the rollout of WIMS within their organization. This plan should define specific goals and objectives for data governance and WIMS utilization, establish a realistic timeline with key milestones for WIMS adoption, and outline the necessary resource requirements (financial, human, and technological) for WIMS implementation and ongoing use.

Simultaneously, it is crucial to **engage key stakeholders** throughout this phase. This involves identifying all relevant parties (government agencies, private sector, NGOs, etc.) and conducting consultations, workshops, and meetings to gather their input on the data governance framework and to introduce them to WIMS, understand their data needs that WIMS can address, and build consensus around the need for and the objectives of both the framework and WIMS.

3.1.2 Phase 2: Development of Data Governance Policies and Procedures

Building on the assessment and stakeholder consultations, the second phase involves the **development of the core data governance policies and procedures**, as described in Section 2.1.3. This includes creating detailed documentation for data standards, data quality assurance, data access and sharing protocols, data security measures, data retention policies, and compliance procedures, all with specific considerations for how these policies will apply to data managed within WIMS.

3.1.3 Phase 3: Technology and Infrastructure Setup and Training

The third phase focuses on ensuring access to the **technology and infrastructure** needed to support the data governance framework and the use of WIMS. This phase will involve setting installation of WIMS, setting up user accounts, defining user roles and permissions within WIMS, and potentially integrating existing data sources with WIMS. Agencies should ensure they have adequate internet connectivity to access and utilize WIMS effectively.

A critical component of this phase is providing **comprehensive training and capacity building programs**

for all staff members who will be involved in using and managing water data within WIMS. Training should cover the new policies, procedures for using WIMS (including data entry, data retrieval, visualization tools, etc.), and any related technologies. The online training course on WIMS could be used for conducting these training.

3.1.4 Phase 4: Enforcement, Monitoring, and Continuous Improvement

The final phase focuses on ensuring the **enforcement** of the data governance framework and the effective use of WIMS, and establishing mechanisms for **monitoring, evaluation, and continuous improvement**, as detailed in Section 3.3. This involves clearly defining accountability mechanisms for data management within WIMS, conducting regular audits of data quality and compliance with policies within WIMS, and establishing processes for addressing any violations or misuse of the system.

3.2 Customizable Data Governance Framework Template for Caribbean Water Agencies

The following table provides a customizable template for Caribbean water agencies in the six participating countries to use as a starting point for developing their own Water Resources Data Governance Framework, keeping in mind the utilization of the Water Information Management System (WIMS).

Key Governance Elements	Description and Best Practices	Agency Customization (Considering WIMS)
Data Collection Standards	Define standardized methodologies, and formats for collecting key water data (hydrological, meteorological, water quality, usage).	Specify the data parameters your agency collects, the standard operating procedures used, the types of equipment utilized, and any specific data formats adopted, ensuring compatibility with WIMS.
Data Quality Management	Establish procedures for data validation, error detection and correction, data cleaning, and regular quality audits. Assign responsibility for data quality to designated personnel (data stewards).	Outline your agency's specific data validation rules, error correction processes, data cleaning protocols, and the roles responsible for data quality, including procedures for ensuring data quality before and after uploading to WIMS.

Data Access and Sharing	Define protocols for requesting, accessing, and sharing water data, including access levels, licensing terms, and data exchange mechanisms between agencies.	Specify the different levels of data access within your agency and within WIMS, any data sharing agreements you have with other agencies that will utilize WIMS, and the licensing terms for your data in WIMS.
Data Security	Implement measures to protect data from unauthorized access, use, disclosure, disruption, modification, or destruction. Include access controls, encryption, backup and recovery, and incident response plans.	Detail the specific access control mechanisms in place for accessing WIMS, your agency's role for data contributed to WIMS
Metadata Standards	Mandate the creation of comprehensive metadata for all datasets, including information about the data source, collection methodology, quality, units, and limitations.	Specify the minimum metadata fields required for your agency's datasets in WIMS and the procedures for creating and maintaining metadata within the WIMS platform.
Roles and Responsibilities	Clearly define the roles of data owners, data stewards, data users, and any data governance bodies within your agency. Outline their specific tasks and accountabilities, particularly in relation to WIMS.	Identify the individuals or departments in your agency that will fulfill the roles of data owner, data steward, and data user for key datasets within WIMS. Outline their specific responsibilities related to contributing to and using WIMS.
Compliance	Outline procedures for	List the specific laws,

	ensuring compliance with all relevant international, regional, and national laws, regulations, policies, and standards related to water data management and protection, especially in the context of using WIMS.	regulations, and policies that your agency must comply with regarding water data management and how WIMS will help ensure this compliance.
Data Retention	Establish policies defining the retention periods for different types of water data and procedures for secure archiving and disposal, considering the capabilities of WIMS for data retention and potential archiving outside the system.	Specify the data retention periods for different categories of water data within your agency and within WIMS
Technology and Infrastructure	Outline the technology and infrastructure required to support the framework, including hosting and maintenance of WIMS	List the specific hardware, software, and network infrastructure that your agency will utilize to support the data governance framework and to access and use WIMS effectively.

Agencies should customize the third column of this table with details specific to their own organizational structure, existing systems, and unique needs, keeping in mind how WIMS will be integrated into their data management practices.

3.3 Monitoring, Evaluation, and Continuous Improvement

To ensure the long-term effectiveness and sustainability of the Water Resources Data Governance Framework and the successful utilization of the Water Information Management System (WIMS), Caribbean water agencies in the six participating countries must establish robust mechanisms for **monitoring, evaluation, and continuous improvement**.

3.3.1 Best Practices for Regular Updates and Adaptation

A data governance framework and the utilization of WIMS are not static; they should be regularly reviewed and updated to ensure continued relevance and effectiveness. Agencies should establish a

schedule for periodic reviews of the framework and its components, as well as the use of WIMS, at least annually or bi-annually.

The review process should actively **incorporate feedback from stakeholders** and draw upon lessons learned during the implementation and operational phases of both the framework and WIMS. This feedback can be gathered through surveys, workshops, and regular meetings with data owners, stewards, and users of WIMS.

The framework and the way WIMS is used should be **adapted as needed** to address new challenges, incorporate new features and functionalities of WIMS, and align with evolving regulatory requirements and best practices in data management and the use of such systems. Any updates or changes to the framework or the agency's approach to using WIMS should be clearly communicated to all relevant stakeholders to ensure continued understanding and compliance. This continuous improvement cycle is essential for maintaining a dynamic and effective Water Resources Data Governance Framework and maximizing the benefits of WIMS in the Caribbean.

3.4 Conclusion: Fostering a Culture of Data-Driven Water Resources Management in the Caribbean

In conclusion, the development and implementation of a robust Water Resources Data Governance Framework, which includes the strategic utilization of the Water Information Management System (WIMS), is of paramount importance for the six participating Caribbean countries seeking to achieve sustainable and resilient water resources management. This report has highlighted the critical role of data in informed decision-making, climate change adaptation, and progress towards international goals such as SDG 6. It has also unpacked the current challenges in managing water data across the region and outlined the essential principles and components of an effective data governance framework, emphasizing how WIMS can help address these challenges.

By prioritizing transparency, accountability, security, integrity, sustainability, and compliance in their data management practices, and by leveraging the capabilities of WIMS for data access and sharing, Caribbean water management agencies can build a foundation of trust and reliability in their water-related information. The step-by-step implementation guide and customizable template provided in this report offer practical guidance for agencies to develop their own context-specific data governance policies and procedures that incorporate the use of WIMS.

The benefits of adopting such a framework and utilizing WIMS are manifold, including improved monitoring and assessment of water resources, enhanced planning and forecasting capabilities, more efficient allocation of water among competing users, strengthened regulatory oversight, and increased transparency and accountability in the water sector. Ultimately, a robust Water Resources Data Governance Framework, supported by the effective use of WIMS, will foster a culture of data-driven decision-making, empowering Caribbean nations to safeguard their precious water resources for present and future generations.

It is therefore a call to action for Caribbean water agencies, policymakers, and all relevant stakeholders in the six participating countries to prioritize the full implementation of the Water Resources Data

Governance Framework and the effective adoption and utilization of the Water Information Management System (WIMS). By working collaboratively and embracing the principles and tools outlined in this report, the region can move towards a more water-secure and sustainable future.

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7. Degree of Integrated Water Resources Management Implementation – Trinidad and Tobago - CEPAL, accessed on March 18, 2025, https://www.cepal.org/sites/default/files/events/files/trinidad_and_tobago.pdf
8. The Caribbean has a plan for securing water resources in the face of climate change, accessed on March 18, 2025, https://blogs.iadb.org/agua/en/the-caribbean-has-a-plan-for-securing-water-resources-in-the-face-of-climate-change/
9. Water Resource Management - Ministry of Agriculture. Fisheries, Food Security and Rural Development, accessed on March 18, 2025, https://moaslu.govt.lc/water-resource-management/
10. IDB Pilots Innovative Data-Sharing Platform For Caribbean Water Utilities, accessed on March 18, 2025, https://www.ncbcapitalmarkets.com/research/latestnews/5224-idb-pilots-innovative-data-sharing-platform-for-caribbean-water-utilities
11. The OECD Water Governance Indicator Framework, accessed on March 18, 2025, https://www.oecd.org/en/data/insights/data-explainers/2024/06/oecd-water-governance-indicator-framework.html

6.2. Country Completion summary

Country	Activity 1 – Consultant and need assessment (problem analysis and solution design)	Activity 2 – WIMS design and launch (release integration and operationalization)	Activity 3 – Capacity Development (training and education)
Costa Rica	Series of online consultation conducted. In addition to WIMS, country requirements for a field data collection and verification system with mobile and web-based interface.	- Field Data Management Mobile and web application developed and installed in server provided by Costa Rica - WIMS customised and deployed in a server provided by Country partner	- Demonstration and virtual training conducted - Self paced online course developed and published
Trinidad and Tobago	Needs assessment conducted through virtual consultation and demonstration of the prototype	WIMS customised and deployed in a Amazon AWS server managed by UNU-INWEH	- Demonstration and virtual training conducted - Self paced online course developed and published
Saint Lucia	Needs assessment conducted through virtual consultation and demonstration of the prototype	WIMS customised and deployed in a Amazon AWS server managed by UNU-INWEH	- Demonstration and virtual training conducted - Self paced online course developed and published
Jamaica	One initial consultation organised. Same design as Trinidad and Tobago and Saint Lucia applied	WIMS customised and deployed in a Amazon AWS server managed by UNU-INWEH	- Demonstration and virtual training conducted - Self paced online course developed and published
Grenada	No interest received from country partners after initial meeting.	The same customisation of the WIMS system prepared but due to lack of interest from the country, the system was not deployed	- Self paced online course developed and published'
Saint Vincent and the Grenadines	No interest received from country partners after initial meeting	The same customisation of the WIMS system prepared but due to lack of interest from the country, the system was not deployed	- Self paced online course developed and published'

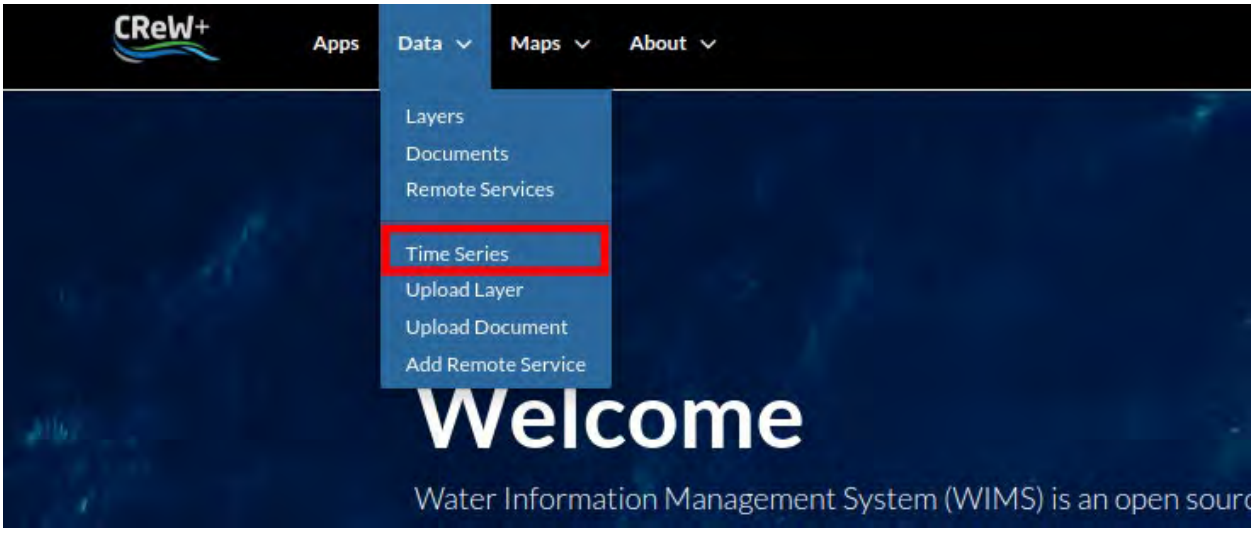
6.3. WIMS User Guide

WIMS User Guide

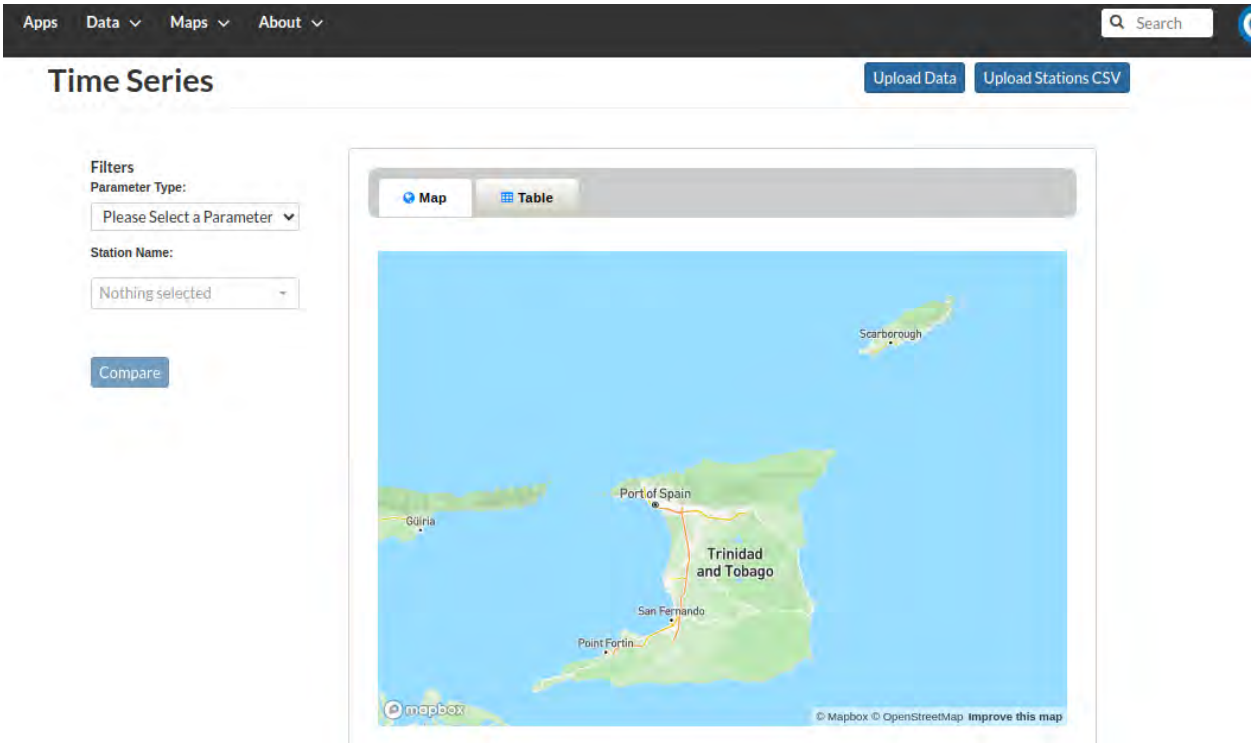
United Nations University Institute for Water, Environment and Health (UNU-INWEH)

WIMS User Guide

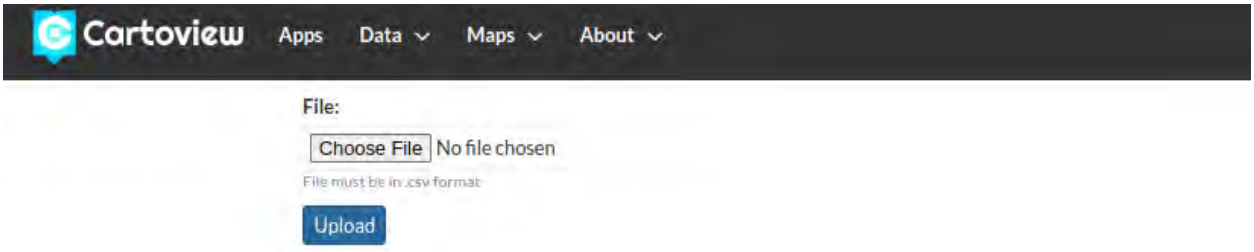
To use the system users need to login first. Then Under the Data in the tab we find Time Series:



Here is the overall look of the Time Series:



Above we can see two buttons for uploading Time Series Data and Station Data. When we click on one of them it shows:



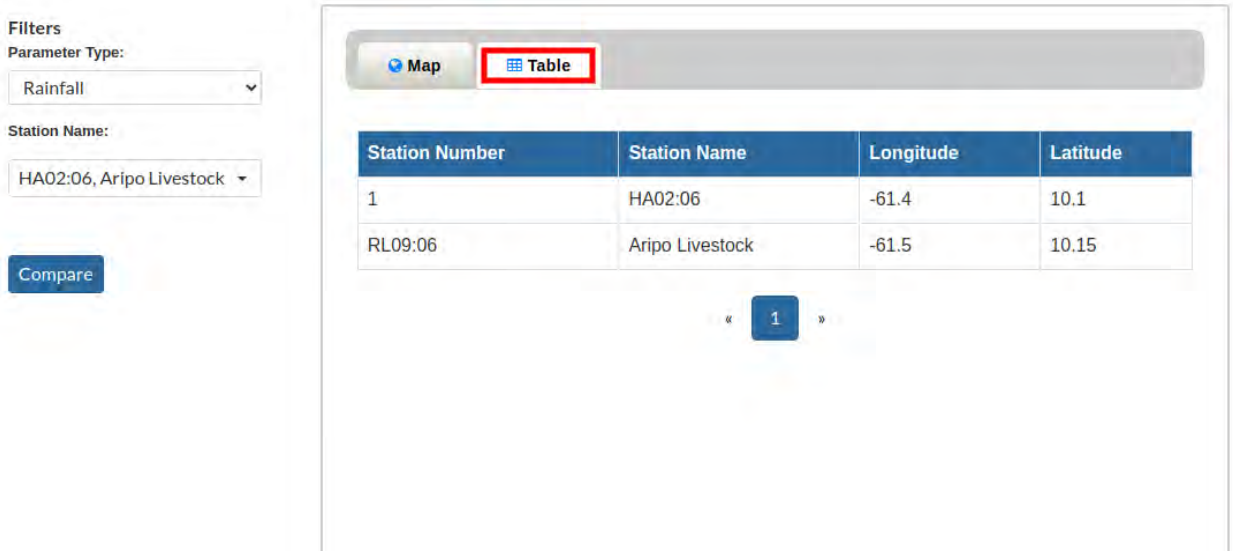
Here we upload the files in CSV format only. Sample data for the Time Series data is as follows **(remember to upload data in this format only especially the date and time format)**:

Index No	Station Name	Date	Time	Value	Parameter Type	Estimated	Unit	Sample ID	Lab ID	Chemical Name	Screen ID	Remarks
	HA02:06	1/1/1990	0:00	5.3	Rainfall							
	HA02:06	1/15/1990	0:00	10.7	Rainfall							
	HA02:06	1/30/1990	0:00	31.5	Rainfall							
	HA02:06	2/1/1990	0:00	0	Rainfall							
	HA02:06	2/15/1990	0:00	7.1	Rainfall							
	HA02:06	2/28/1990	0:00	21.3	Rainfall							
	HA02:06	3/1/1990	0:00	0	Rainfall							

Sample data for the Station is as follows:

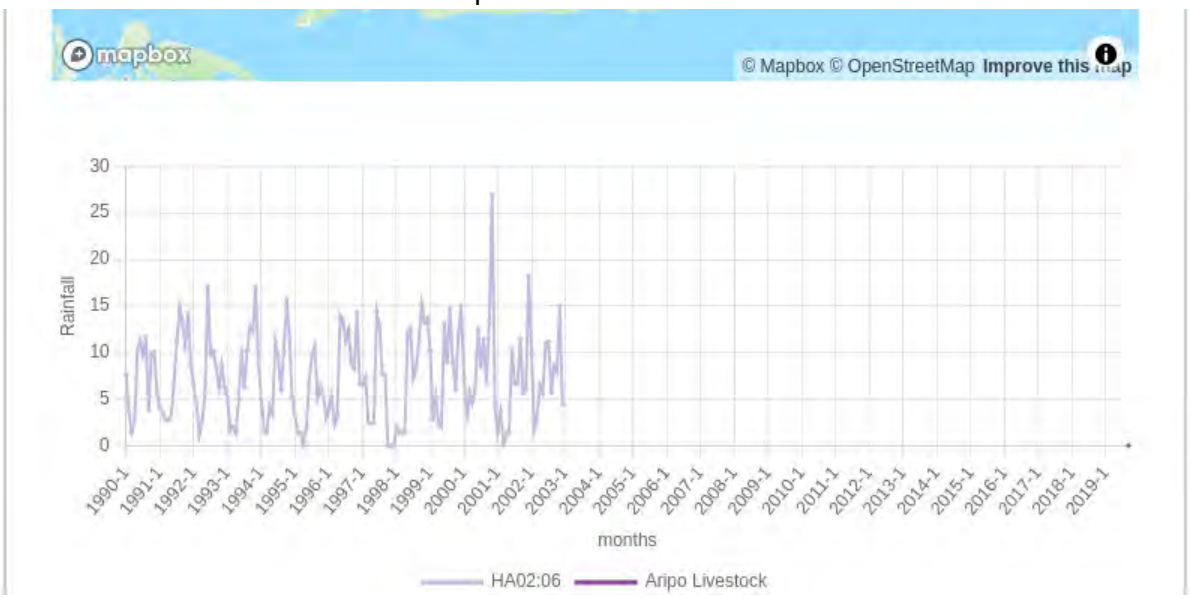
Index No	Station Name	X	Y	Zone	Elevation	TOC	Depth	Parameter Type	Hydrometric No	Hydrometric Name	Island	Watershed Name	Watershed Number	Watershed Area	Start of Records
1	HA02:06	-61.4	10.1		57.86044			Rainfall	9	Central West Coast	Trinidad	Rest West	37	54.76	
1041My	Mayaro 9	-61.55	10.2		59.86044			Water Quality	11	Central West Coast	Trinidad	Rest West	39	56.76	
1041My	Mayaro 10	-61.6	10.25		60.86044			Borehole Production	12	Central West Coast	Trinidad	Rest West	40	57.76	
TF09:20	Maraval	-61.65	10.3		61.86044			Streamflow Stage	13	Central West Coast	Trinidad	Rest West	41	58.76	
9:24	Centeno	-61.7	10.35		62.86044			Waterloss From Pan	14	Central West Coast	Trinidad	Rest West	42	59.76	
9.65	ECIAF	-61.75	10.4		63.86044			Waterloss From Pan	15	Central West Coast	Trinidad	Rest West	43	60.76	

Now below is the Station data table. When we upload the stations then it shows station data like this in the table tab:

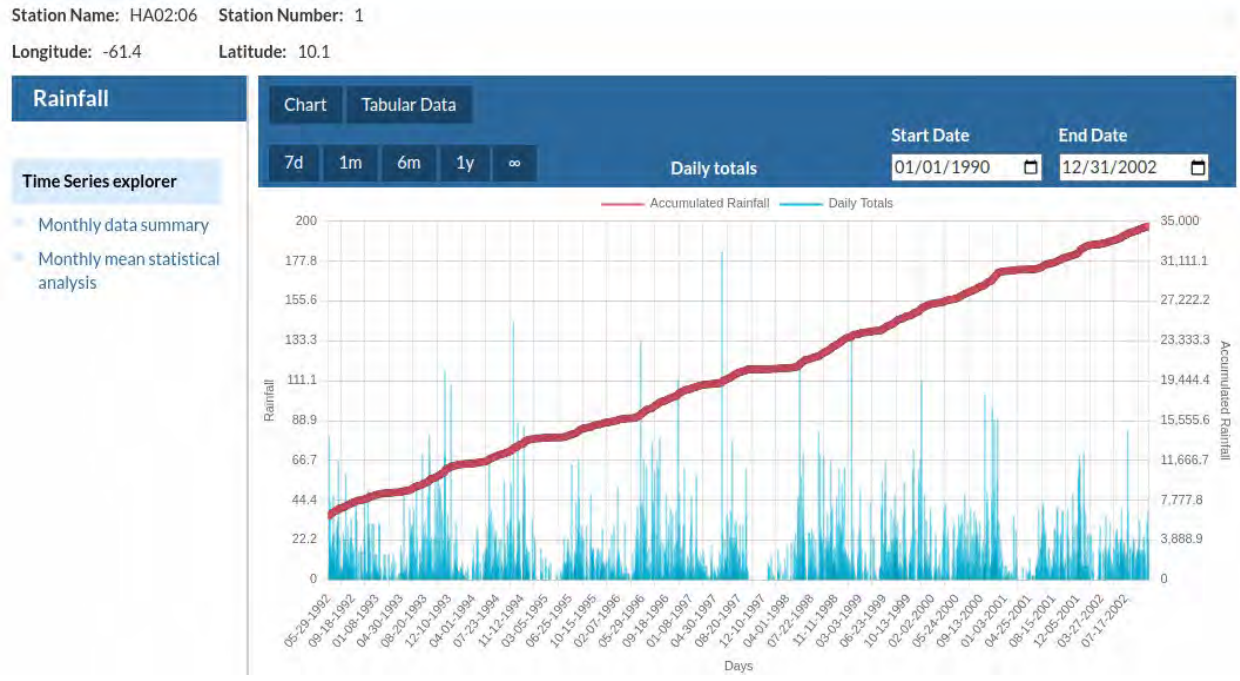


We can also compare station data for different stations by first selecting the parameter, then selecting the stations to compare and then clicking on compare:

And it will show the chart below the map:



Now heading back to the map. There are different points present on the map based on their latitudes and longitudes. When we click on a point on the map, It shows the Station details at the top, followed by the Time Series Graph in the center:



We can change the dates from the top to give it a date range. Moreover we can select the

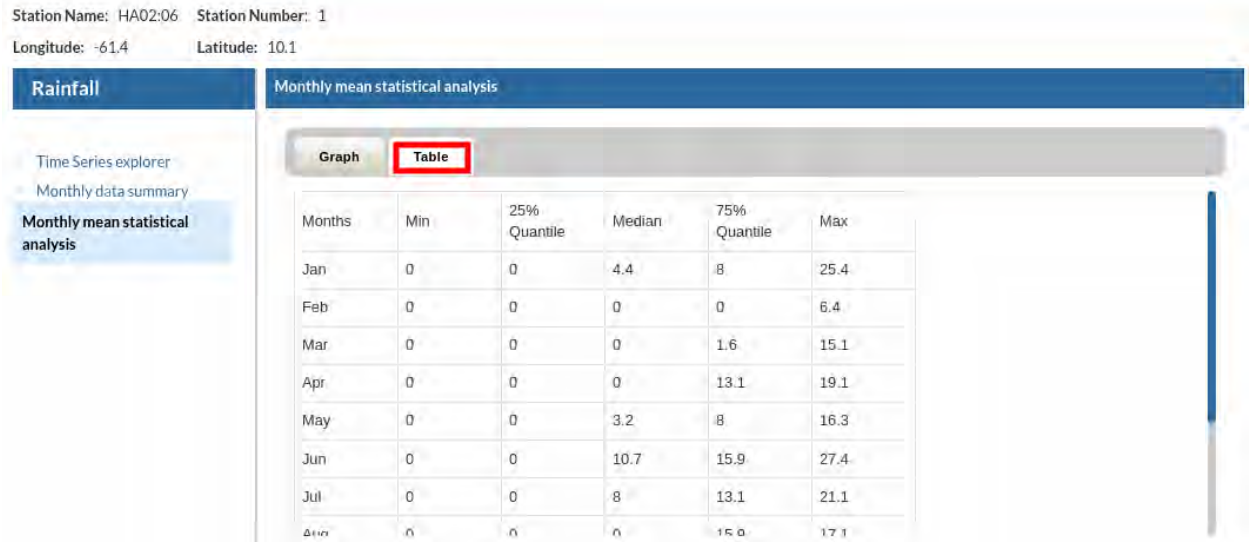
amount of data we want. For example we can select 1 day, 7 days, 1 month, 6 months, etc. The blue lines show the rainfall per day, and the pink line shows the accumulated rainfall over a certain period of time.

Now here is the monthly summary table which shows the rainfall data according to each month. We can select the year to get that year's data.

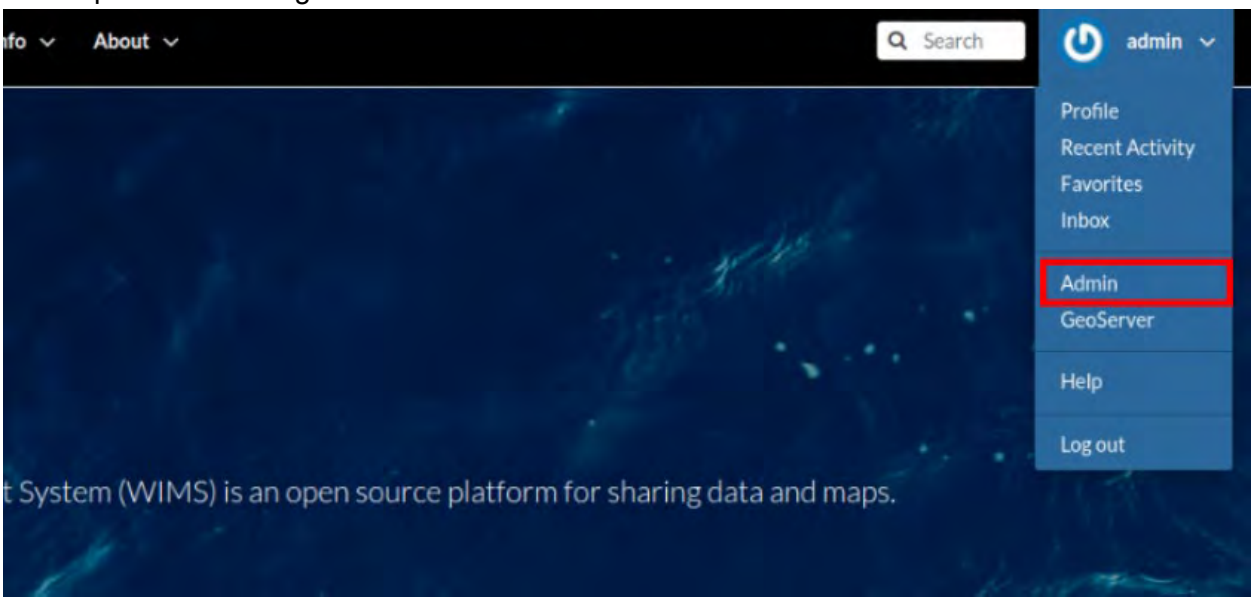
Day	Unit	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1		8.00	0.00	0.00	0.00	3.20	0.00	0.00	0.00	13.10	0.00	0.00	0.00
2		4.80	0.00	0.00	15.90	8.00	0.00	13.10	0.00	3.20	0.00	0.00	0.00
3		71.50	0.00	0.00	0.00	0.00	2.40	9.50	0.00	2.40	0.00	14.30	10.30
4		0.00	0.00	0.00	0.00	3.20	27.40	8.00	0.00	8.00	15.90	22.30	0.00
5		42.10	0.00	0.00	0.00	31.80	0.00	0.00	17.10	8.00	15.90	47.70	0.00
6		4.40	25.40	0.00	0.00	12.70	28.60	3.60	11.10	13.10	23.90	15.90	8.00
7		0.00	0.00	0.00	0.00	4.00	5.60	20.70	19.10	15.90	0.00	15.10	0.00
8		0.00	0.00	1.60	0.00	0.00	10.70	15.90	0.00	8.00	11.90	16.70	6.40

Another chart is the Monthly Mean Statistical Chart which is as follows:

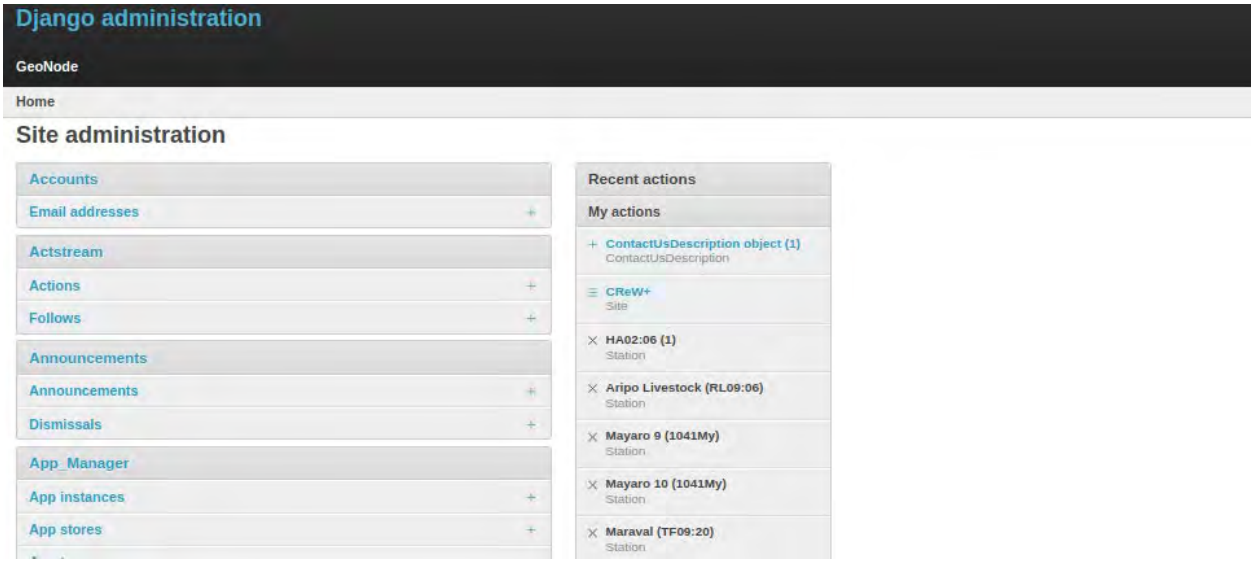
Below is a table showing the data of the Monthly Mean Statistical Analysis chart:



To see the uploaded data in the admin panel, we login as admin first. Then we click on Admin in the dropdown on the right:



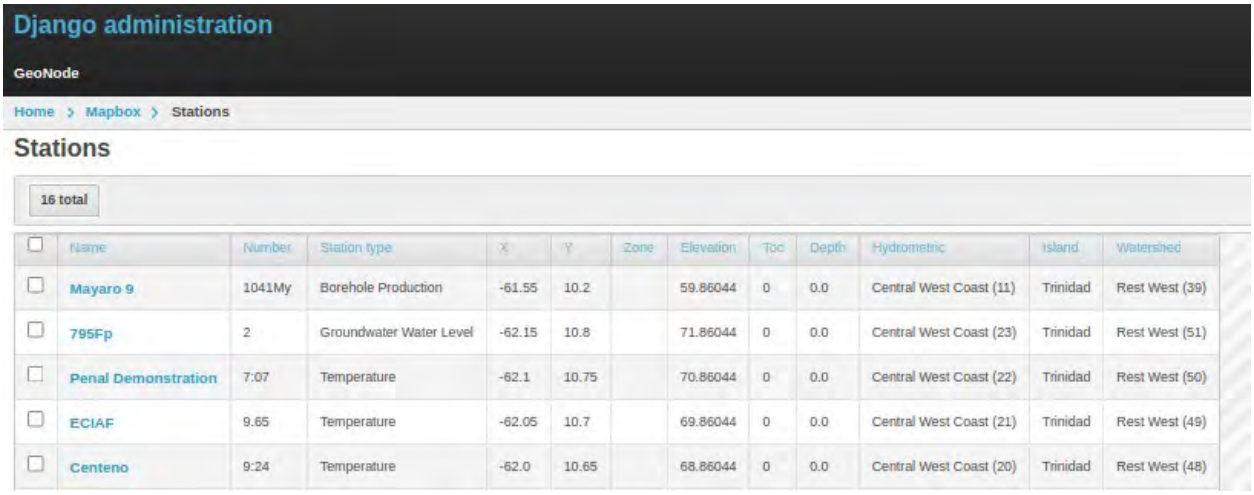
This is the admin panel:



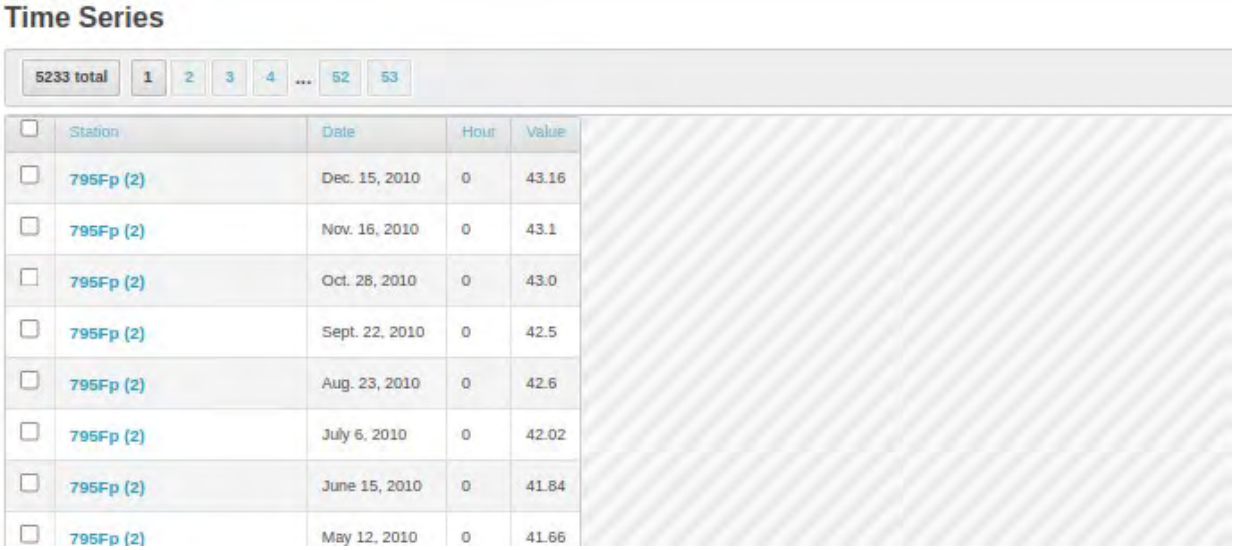
Then we scroll down until we find mapbox:

Here we can see Station and Time Series under Mapbox.

When we click on stations we see the data like below:



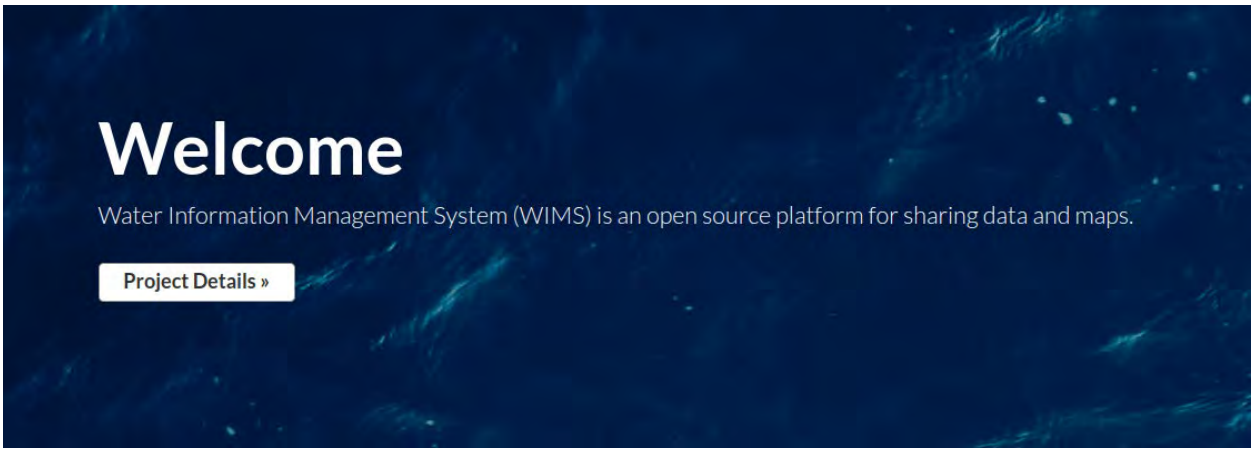
And when we click on Time Series we can see data like below:



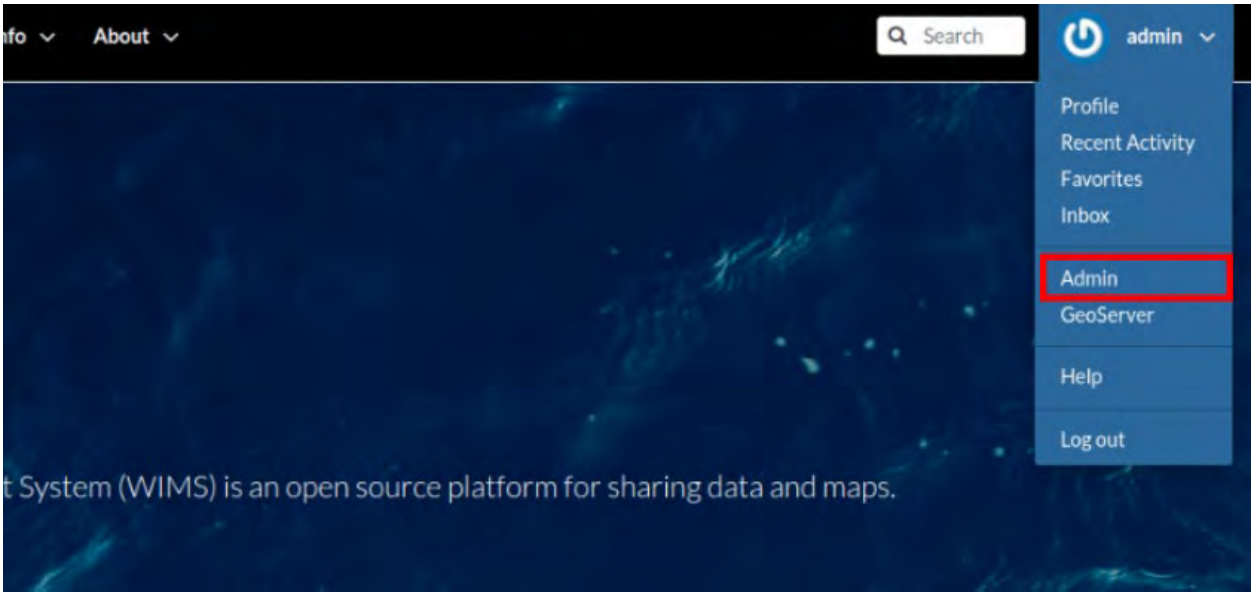
For the dynamic changes of the five webpages:

Homepage:

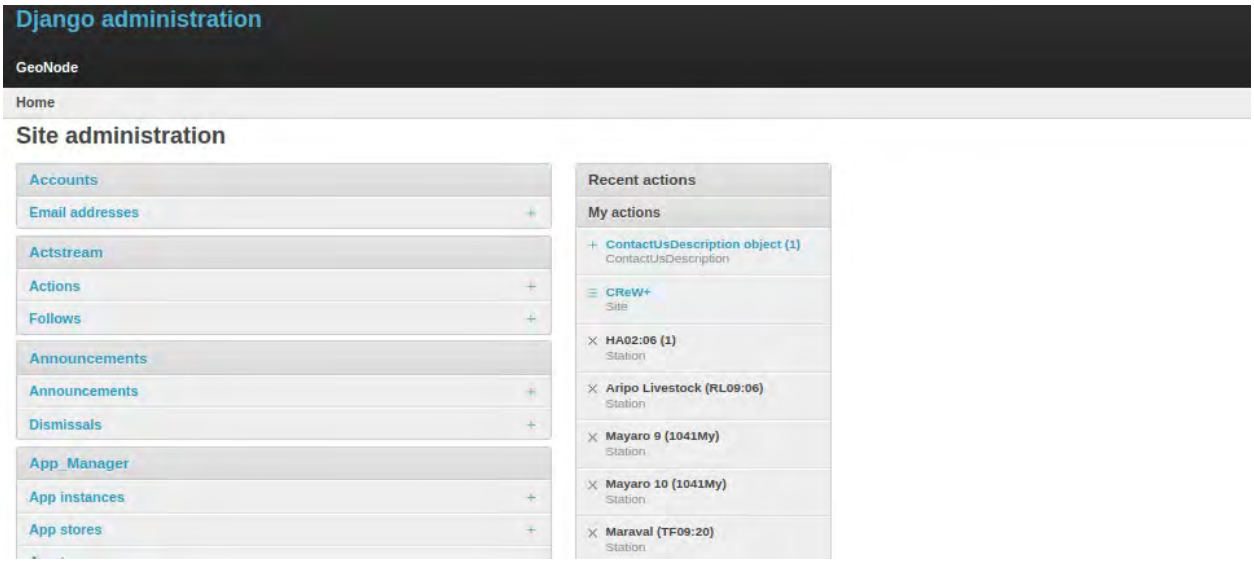
Steps to Follow:



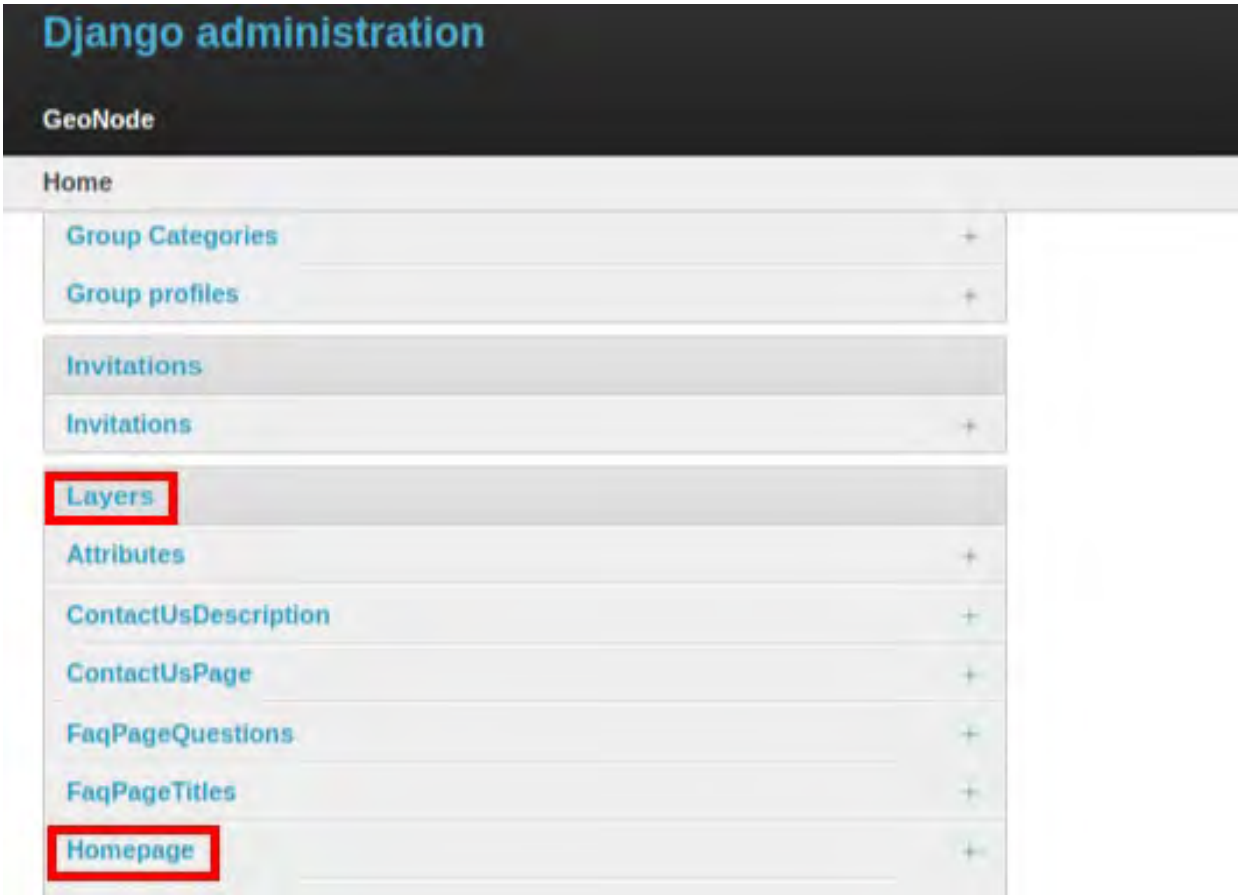
For changing the Homepage title, description and button link, first Sign In as Admin. Then click on the top left button to open a dropdown:



Then click on Admin to open the admin panel.

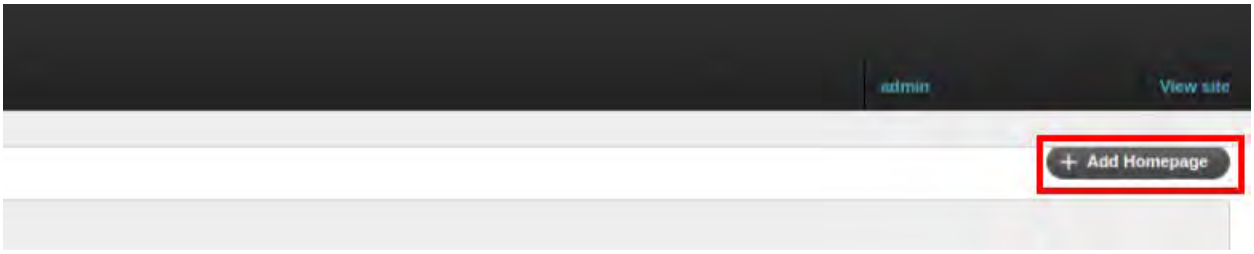


Above is the admin panel.
Then scroll down till you find “Layers”.

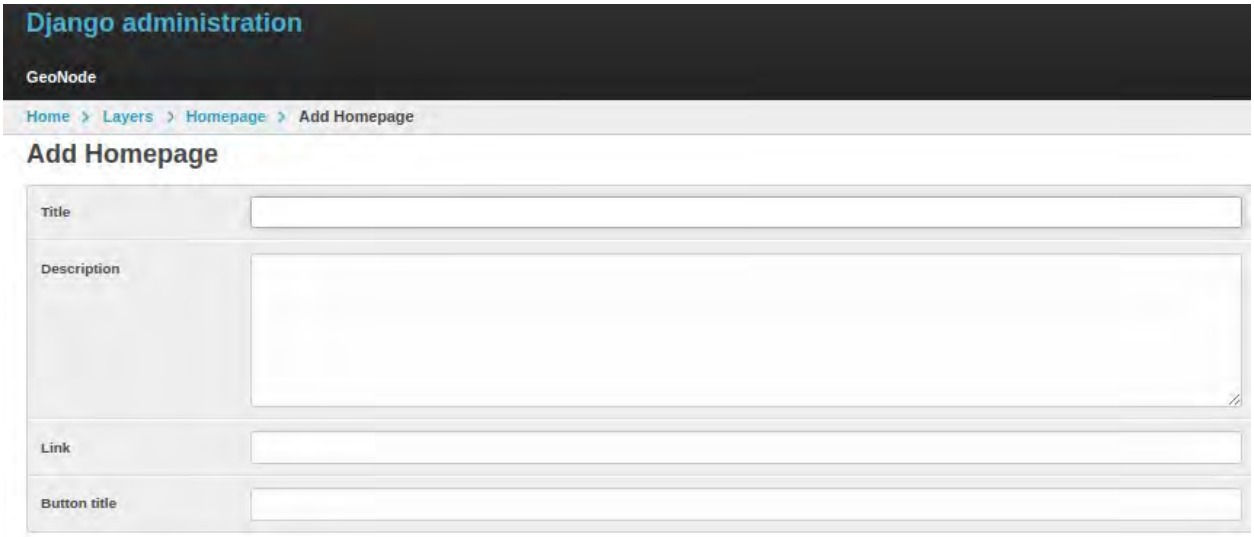


Under the “Layers” we can find “Homepage”. Click on Homepage.

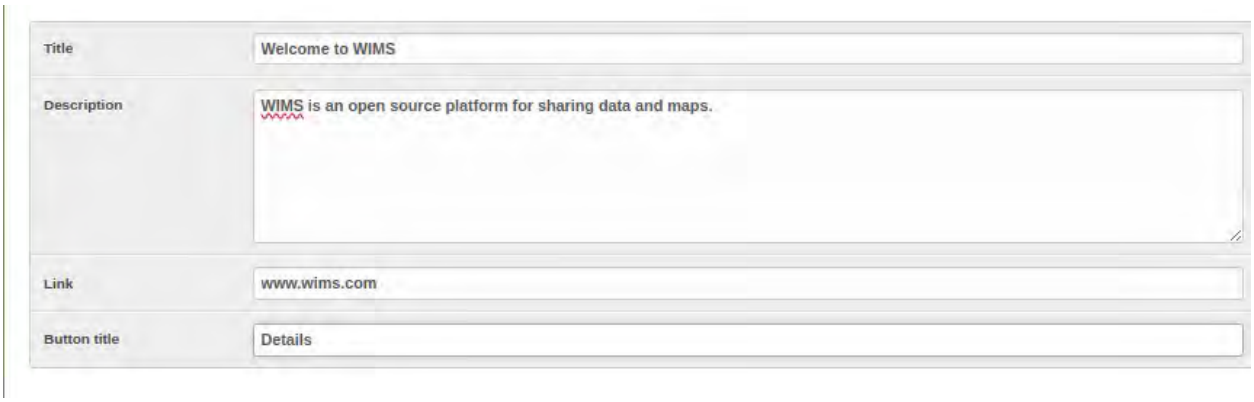
Then click on “Add Homepage” on the right side of the page.



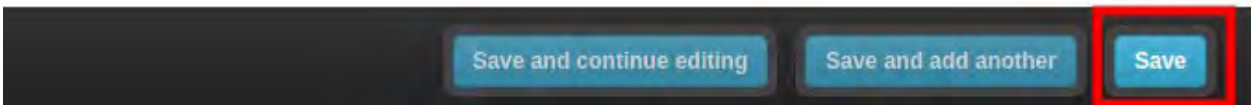
Below you can see the Title of the page, Description, Button Link and Button Title.



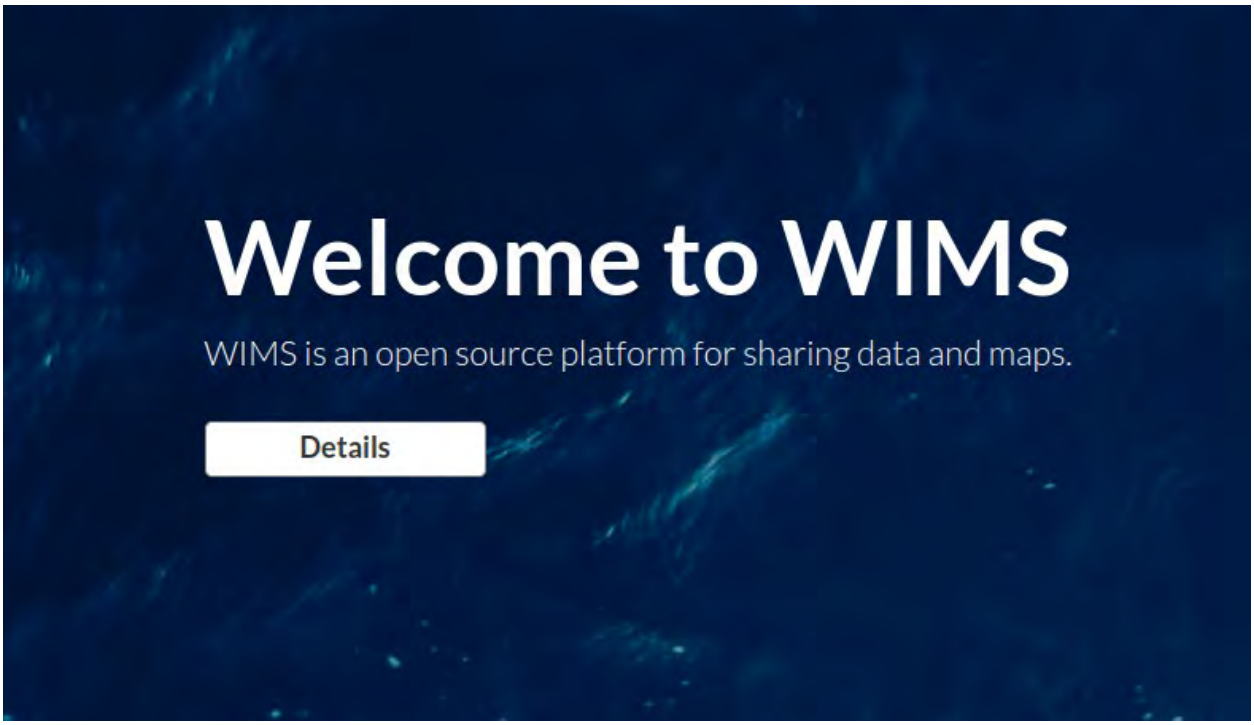
So we change these to:



Then click on save button below the page:

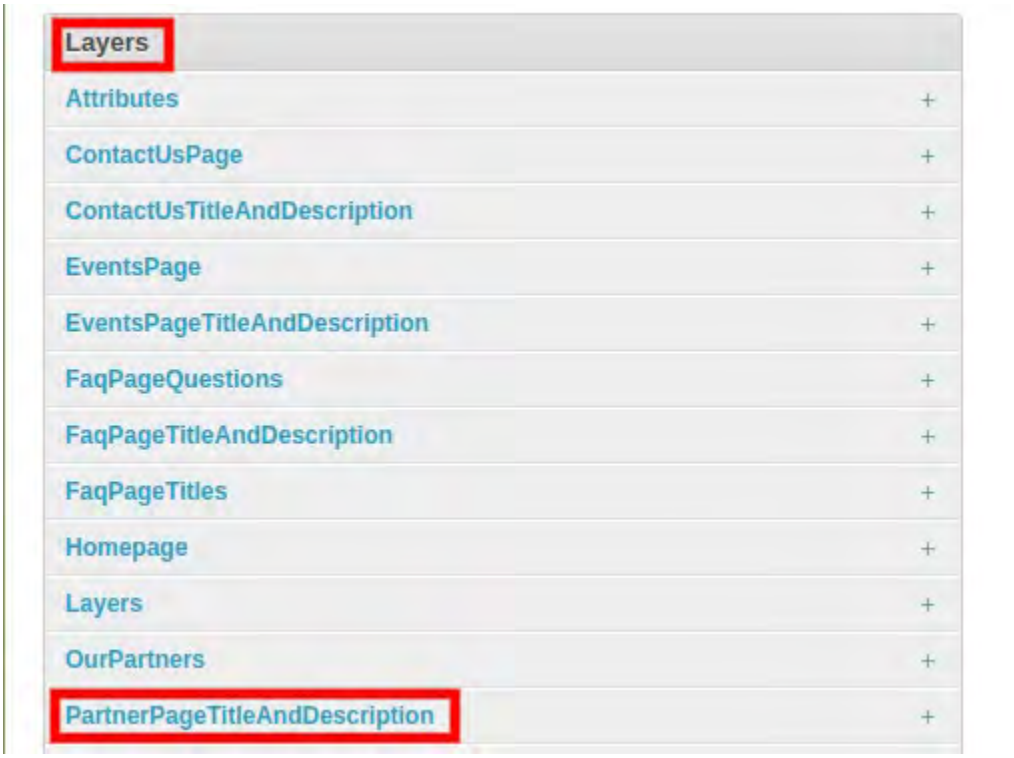


And we can see the changes:

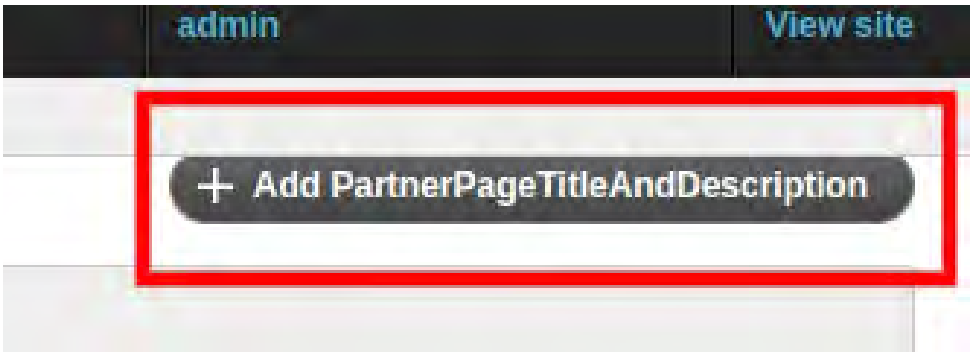


Partner Page Title and Description:

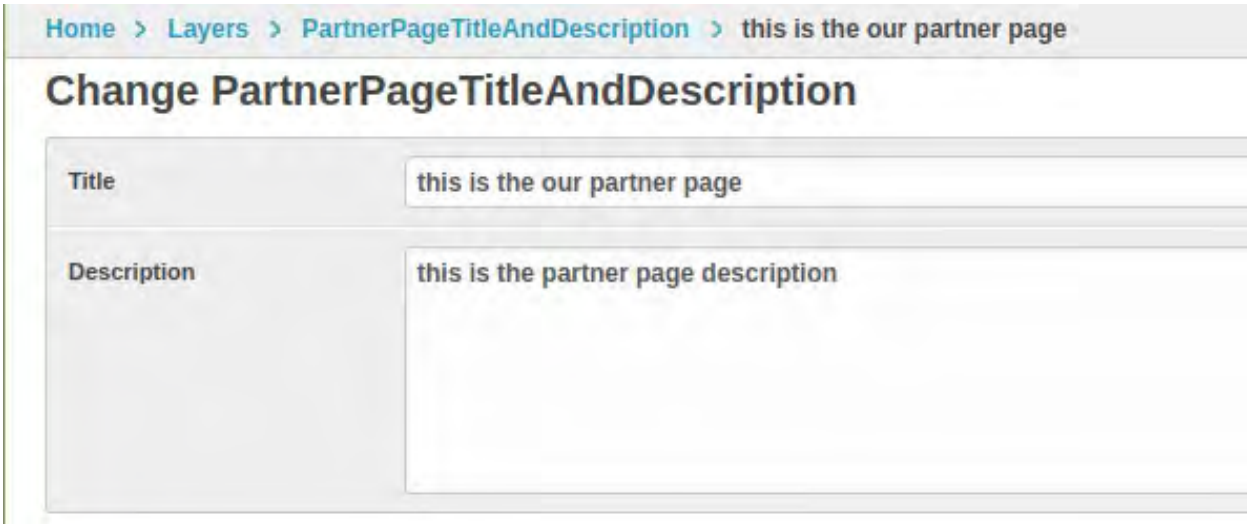
For changing the Partner Page Title and Description, we will go to PartnerPageTitleAndDescription section under Layers.



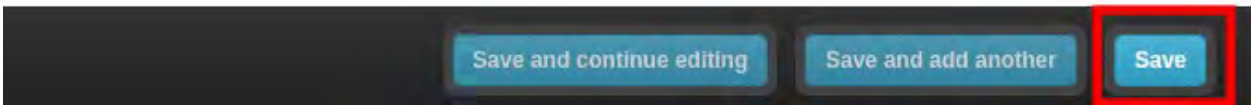
Then click on Add PartnerPageTitleAndDescription on the right side of the page:



Then add the relevant title and description.

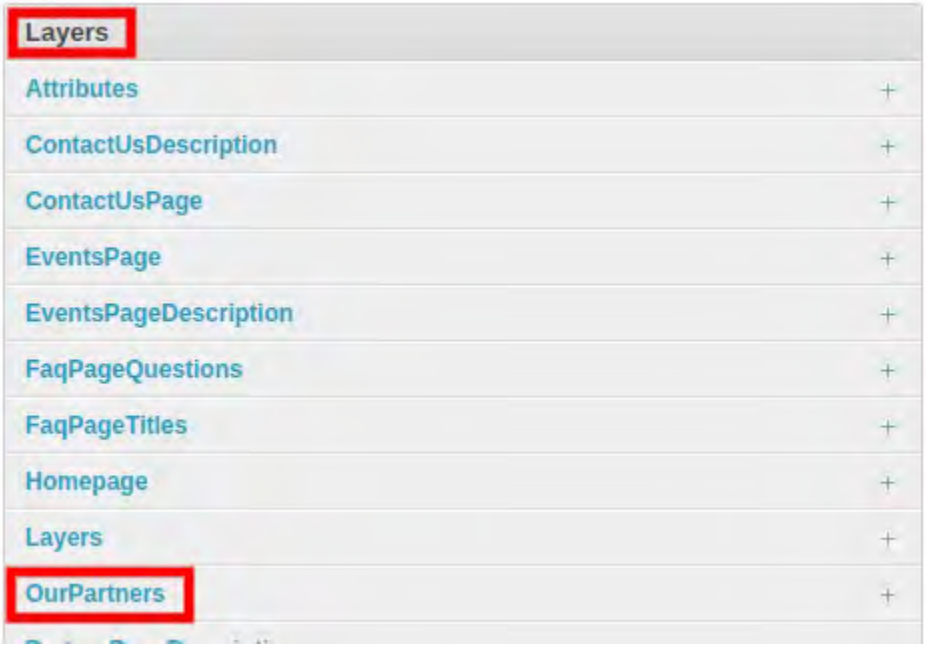


And click on save:

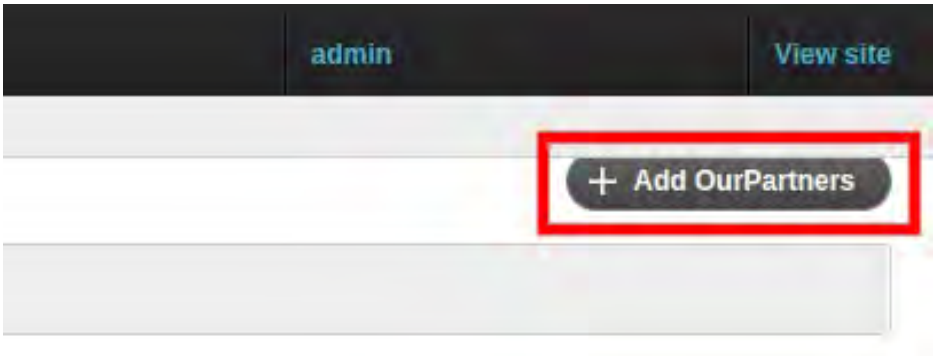


Contributing Partners and Our Partners:

For changing the Contributing Partners on the Homepage, we will change Our Partners Page section. Because both Partners are the same hence we will use the single place to change Our Partners and Contributing Partners on the Homepage.
In the Admin panel, under Layers, click on OurPartners.

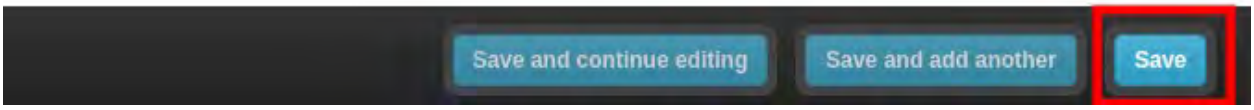


Then click on Add OurPartners on the right of the page:



Choose the logo and fill in the relevant information. And don't forget to put http:// before the website name in the link. For example http://www.ema.com is a valid website name but www.ema.com is not.

Then click on save below:

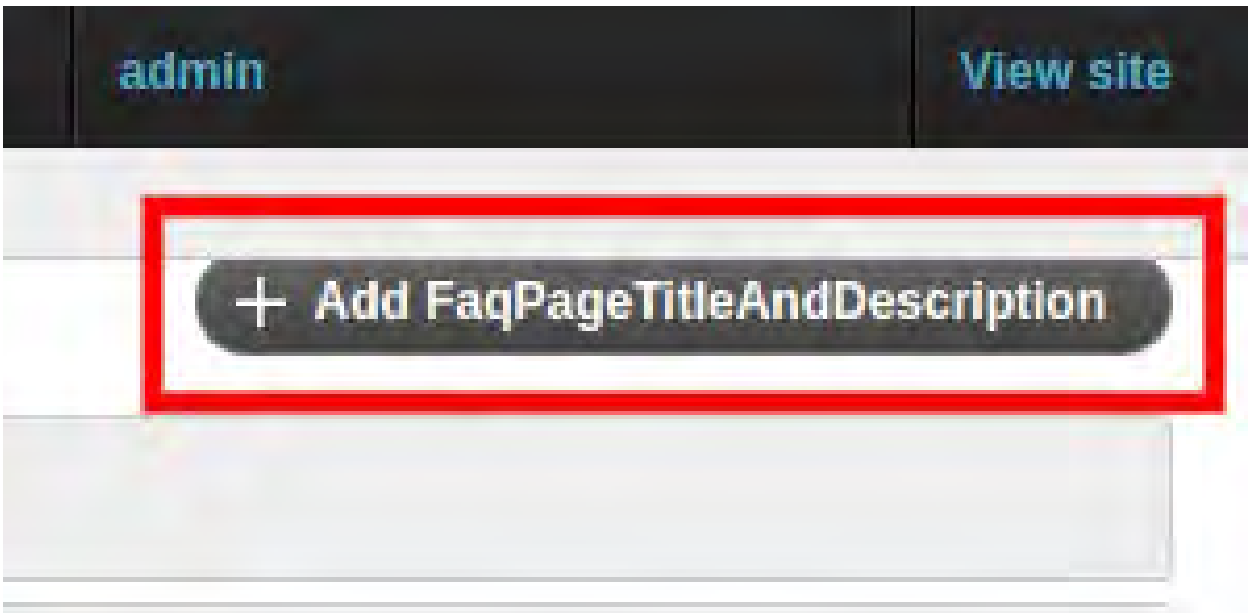


And we will see the partners in the Our Partners section and Contributing Partners on the homepage.

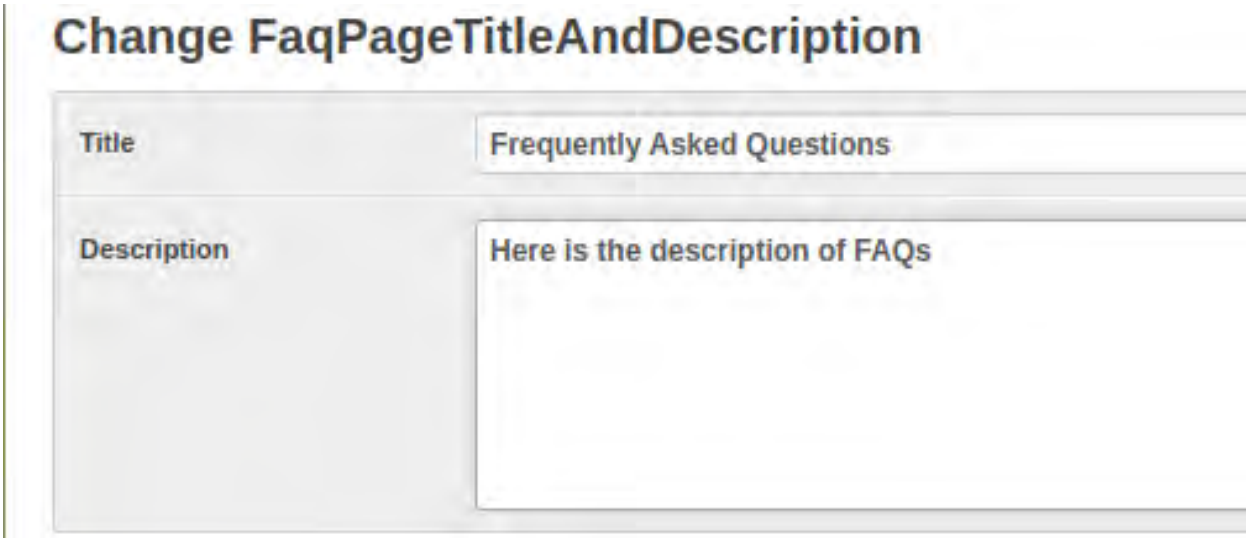
FAQ Page Title and Description:

For changing the FAQ page title and description, we click on FaqPageTitleAndDescription under Layers:

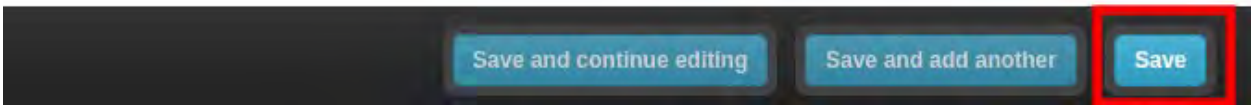
Then we click on Add FaqPageTitleAndDescription on the right side of the page:



Then fill in the relevant title and description:

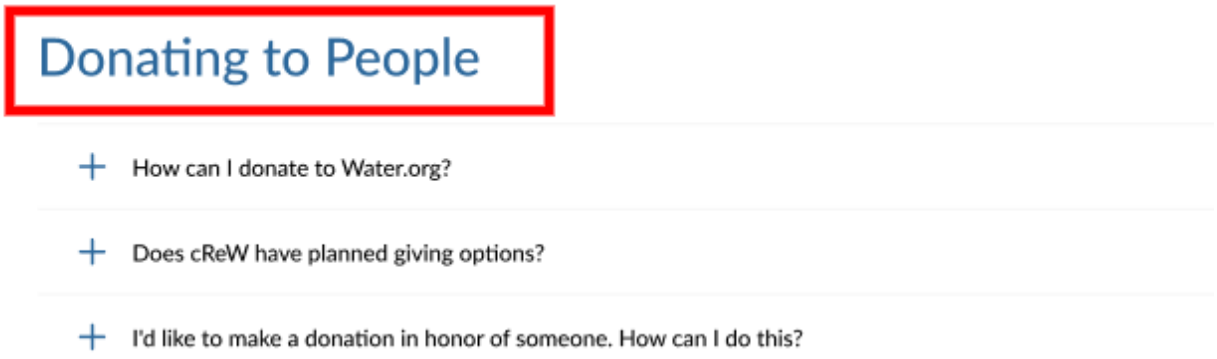


And then click on save below:



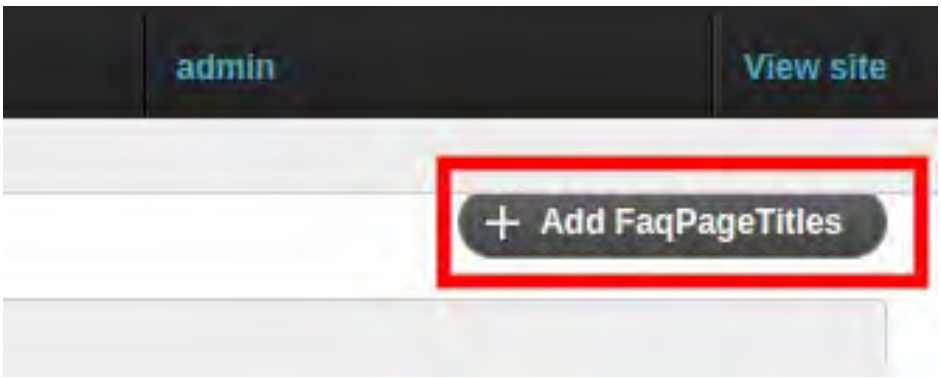
FAQ Page:

For adding the FAQ Page title like the one below:



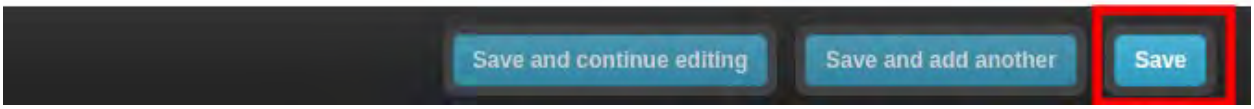
We would click on FaqPageTitles in the Layers section:

Then click on Add FaqPageTitles:

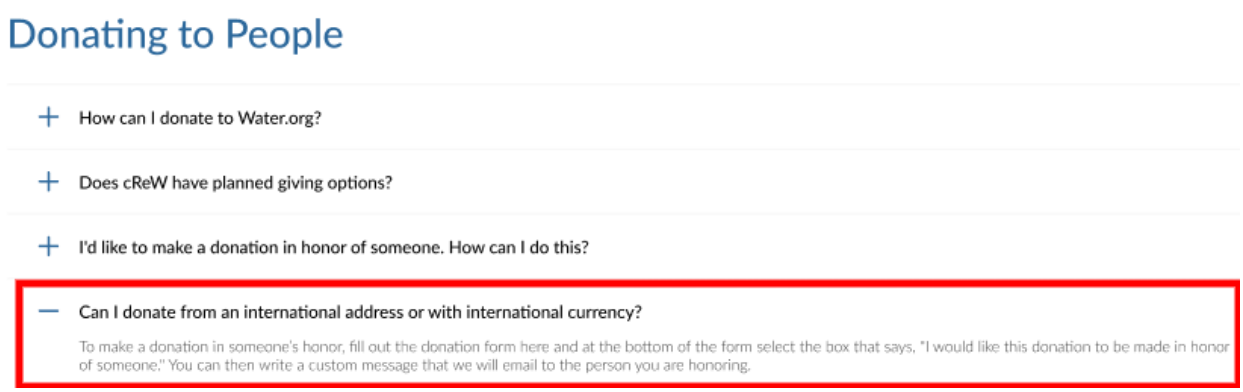


Then add the title:

And click on save below.

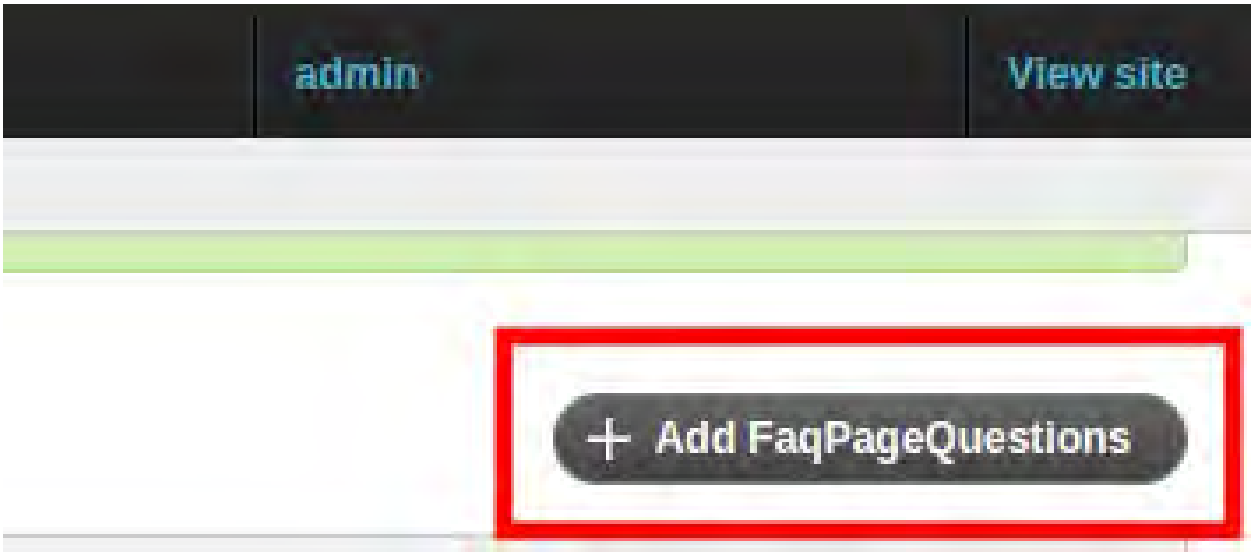


For adding the Question and Answer like the one below:



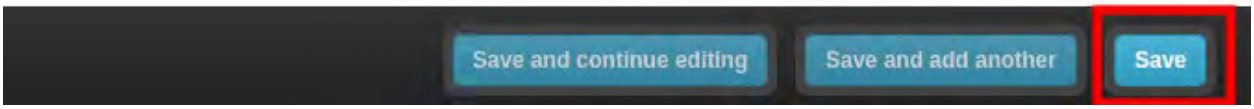
Click on FaqPageQuestions under the Layers section:

Then click on Add FaqPageQuestions:



Fill out the question and answer and choose the title under which the question is going to be:

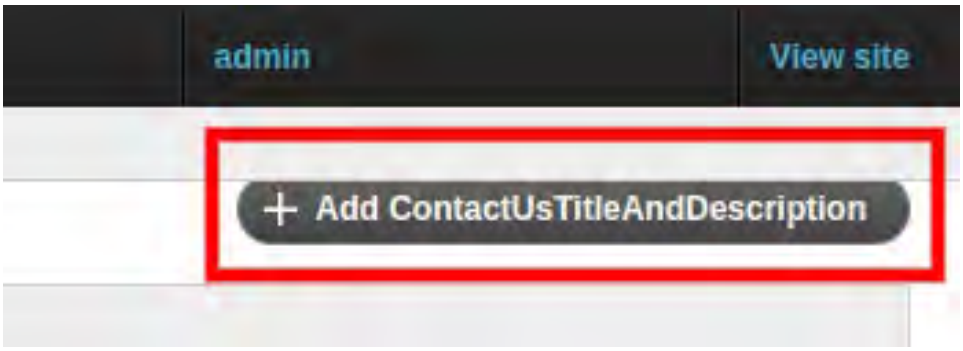
Then click on save below:



Contact Us Title and Description:

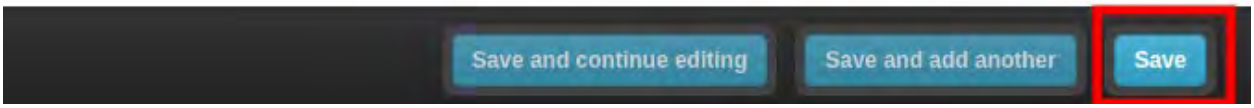
For changing the Contact Us title and description, we go to ContactUsTitleAndDescription in the Layers section:

Then click on Add ContactUsTitleAndDescription on the right side of the page:

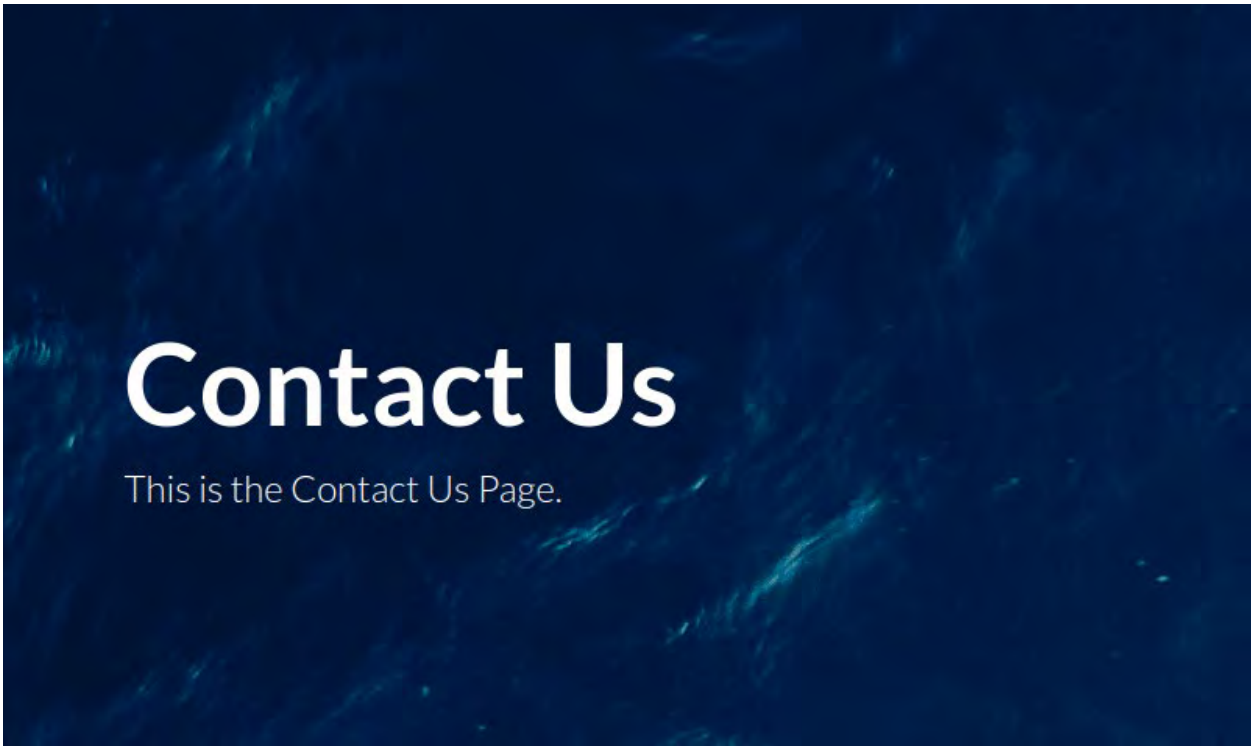


Then put in the relevant description:

And click on save below:



And we can see the title and description on the Contact Us page:



Contact Us Messages:

To see the messages received through filling the Contact Us details by the users, we would go into the ContactUsPage in the Layers section:

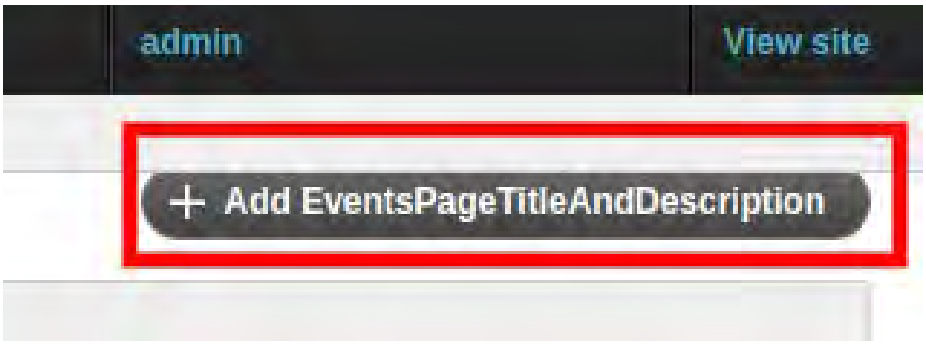
And there we click on any one message:

And we can see the message there:

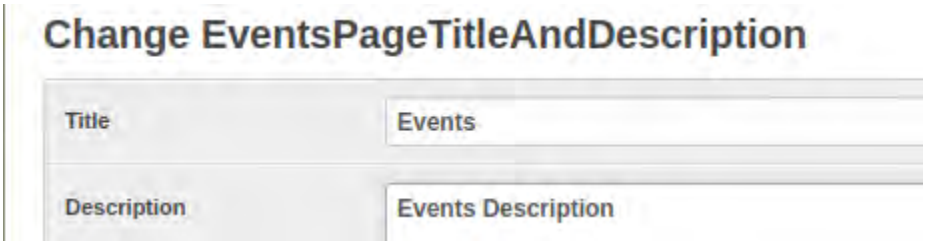
Events Page Title and Description:

To change the Events page title and description, we will go to the EventsPageTitleAndDescription in the Layers section:

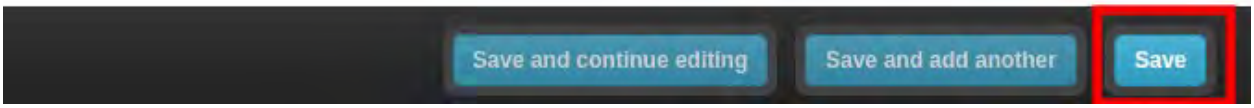
Then click on Add EventsPageTitleAndDescription on the right side of the page:



Then enter the relevant description:



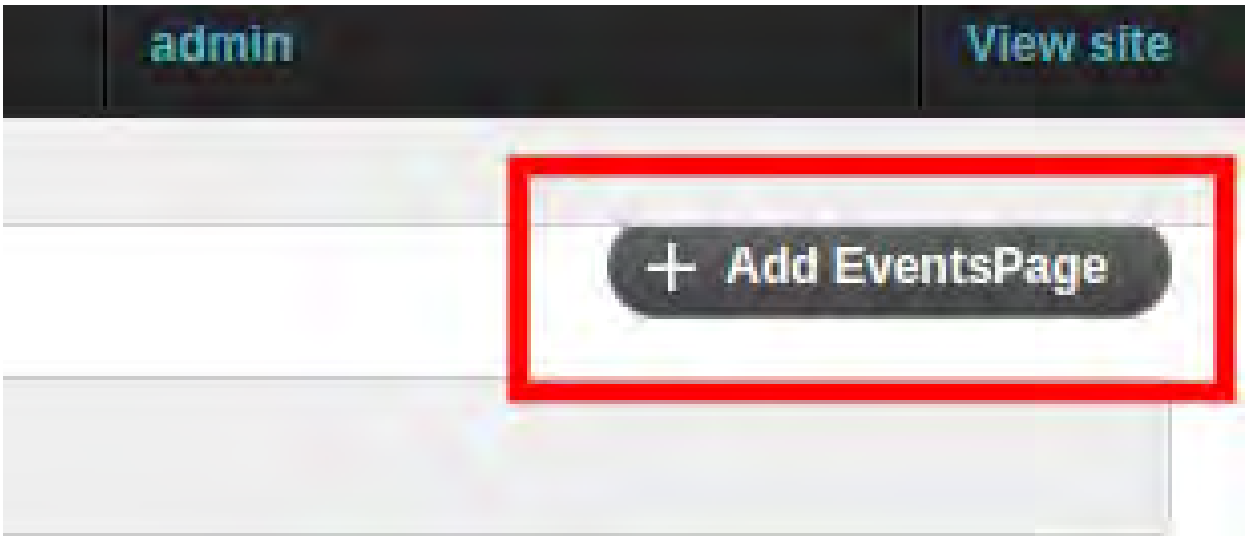
And click on Save below:



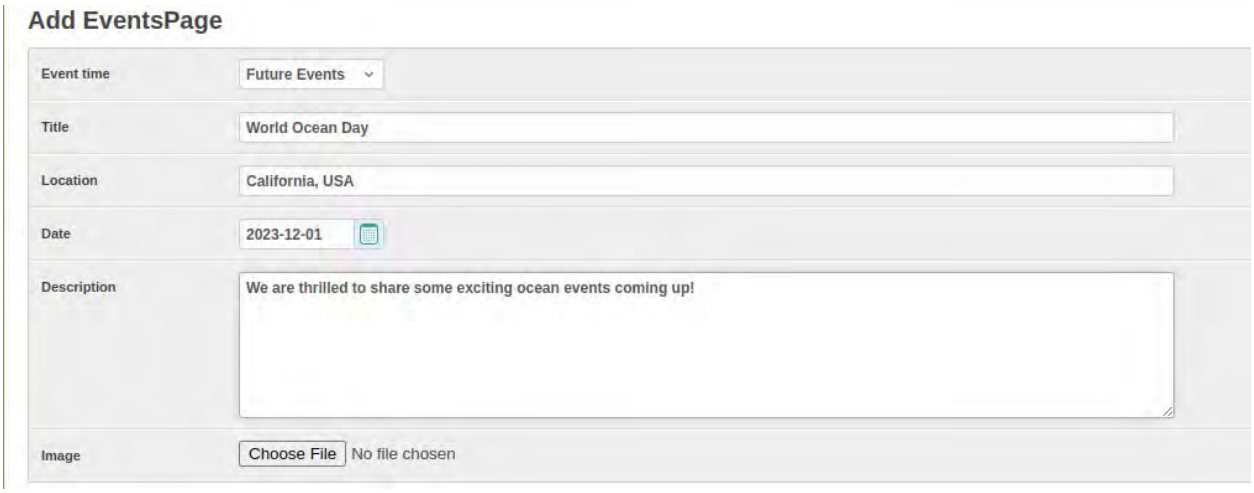
Event Details:

To add the Events details, click on EventsPage in the Layers section:

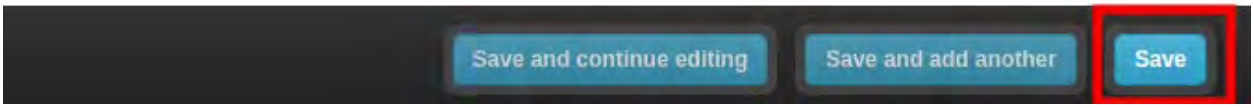
Then click on AddEventsPage:



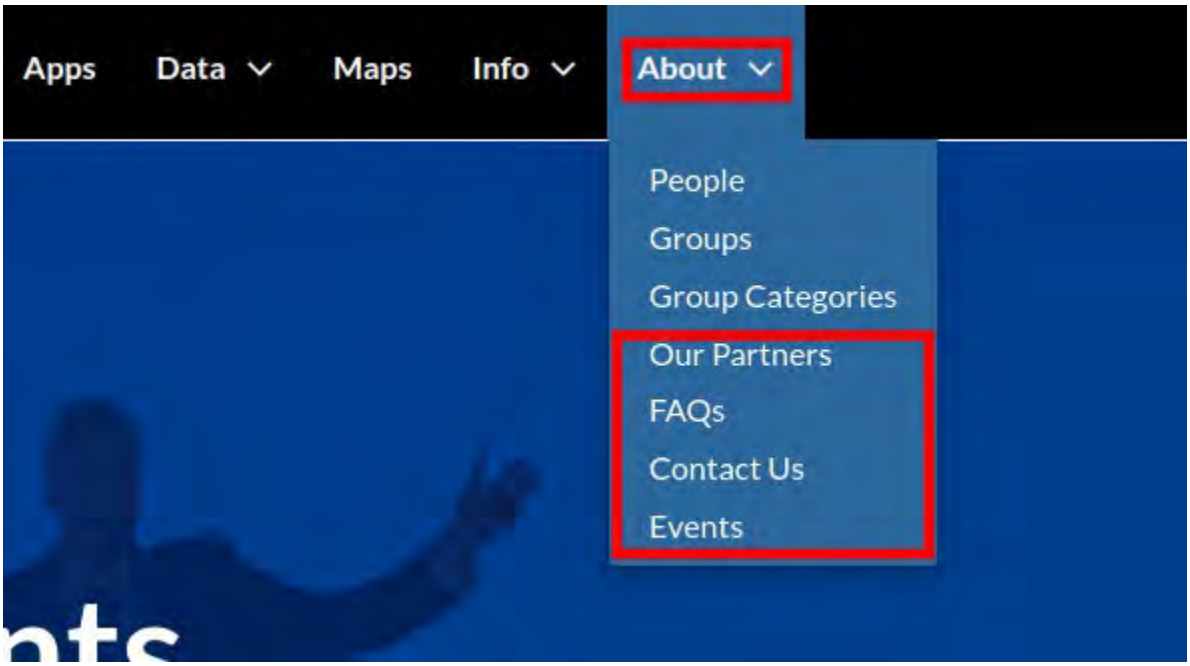
Choose the Event time whether it is a future event or a past event. Then fill in the relevant details of the event and choose the image of the event:



Then click on save below:



All the pages are available in the About dropdown on the tab:



6.4 WIMS Application manual (spanish)

Guía del usuario de CAMPO

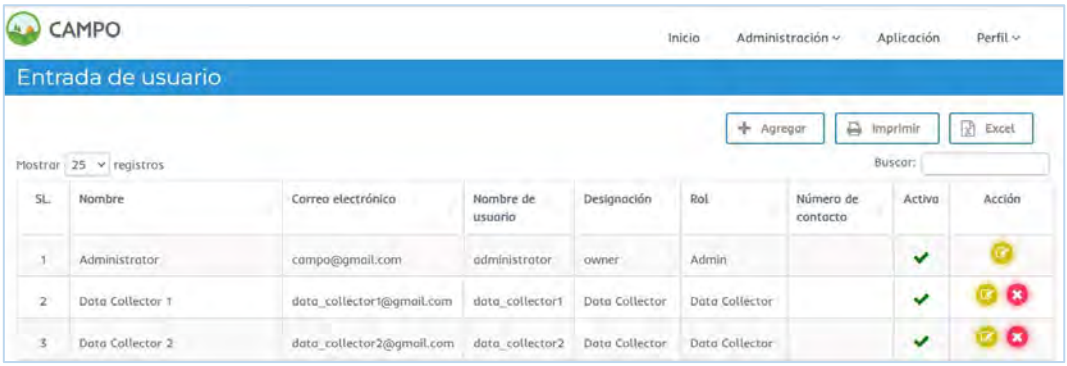
United Nations University Institute for Water, Environment and Health (UNU-INWEH)

Tabla de contenido

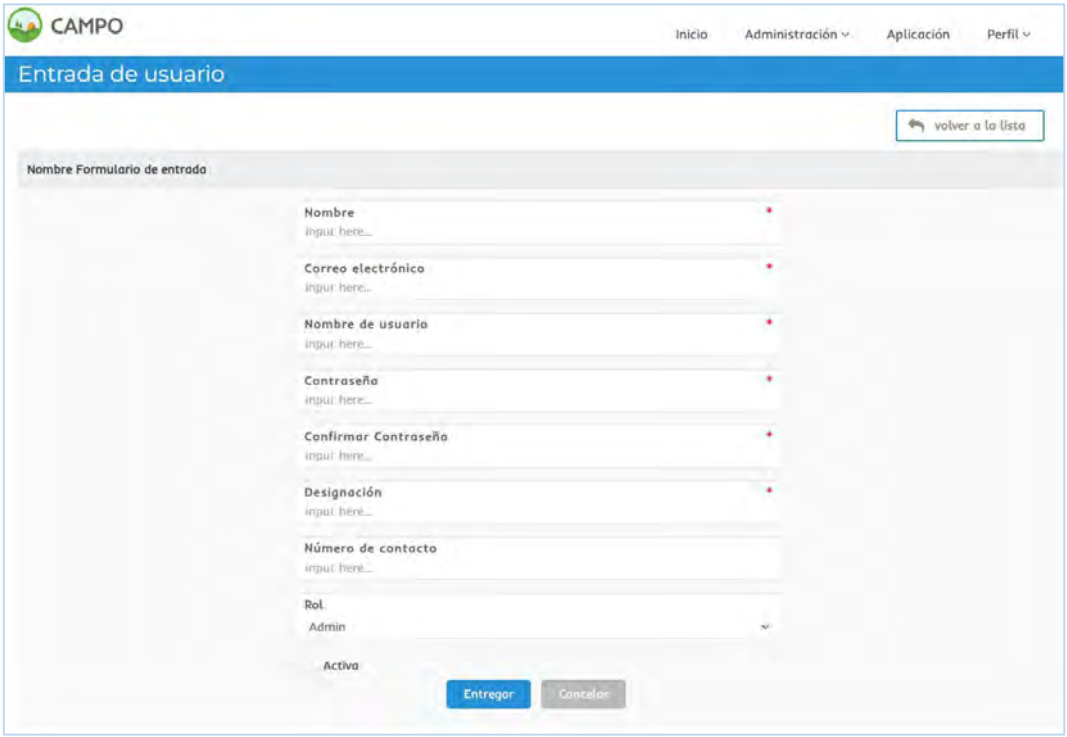
Cómo crear un usuario para la APLICACIÓN CAMPO

La aplicación requeriría que un usuario válido ingrese datos. El siguiente proceso explica cómo crear un usuario:

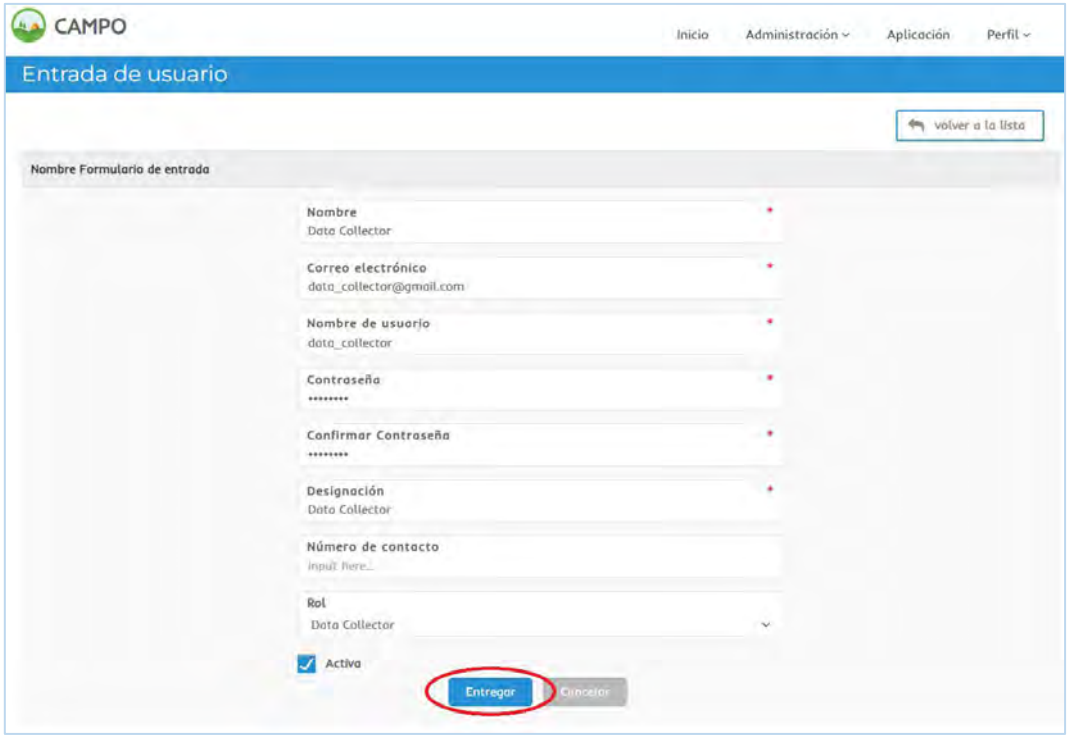
- Navegar https://campo.da.go.cr/ inicie sesión con la siguiente credencial de administrador:
  - **nombre de usuario**: administrador
  - **Contraseña**: zEHfEWxbK@$N!XBZJ7UA*a#yJj5
- Vaya a Administración > Usuaria > Entrada de usuario y se mostrará la siguiente página de entrada de usuario.



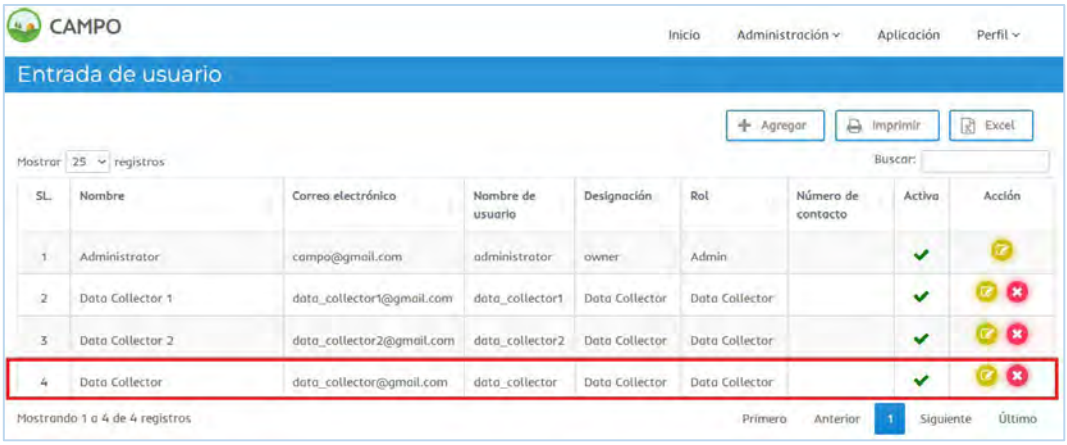
- Ahora haga clic en el botón (+) Agregar y se abrirá el siguiente formulario de entrada de usuario.



- Ahora ingrese los siguientes campos de datos:
    - **Nombre:**Introduzca el nombre de usuario. Este es un campo obligatorio.
    - **Correo electrónico:**Introduzca la dirección de correo electrónico del usuario. Este es un campo obligatorio.
    - **Nombre de usuario:**Ingrese el nombre de inicio de sesión del usuario (por ejemplo, data_collector). Este es un campo obligatorio.
    - **Contraseña:**Introduce la contraseña. Este es un campo obligatorio.
    - **Confirmar Contraseña:**Ingrese la misma contraseña nuevamente. Este es un campo obligatorio.
    - **Designación:**Ingrese la designación. Este es un campo obligatorio.
    - **Número de contacto:**Ingrese el número de contacto. Este no es un campo obligatorio.
    - **rol:**Seleccione la función del recopilador de datos en la lista desplegable. Este es un campo obligatorio.
    - **Activa:**Verifique el activo.



- Después de completar todos los datos de los campos, presione el botón Entregar. El nuevo usuario se mostrará en la lista de usuarios y este usuario puede ingresar datos en la aplicación CAMPO.

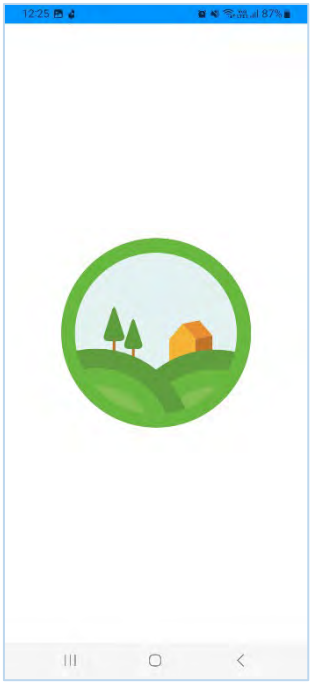


APLICACIÓN CAMPO

Mahmudul Islam (Consultor) desarrolló una aplicación de Android que se utilizará para la entrada de datos y la carga sincronizada para respaldar el portal web. https://campo.da.go.cr/ .La aplicación de Android está diseñada para ejecutarse en cualquier dispositivo móvil o tableta compatible con Android. Después del inicio de sesión inicial, la aplicación de Android permitirá que el personal de la instalación ingrese datos completos sin conexión y los cargue cuando haya Internet disponible. Los datos se cargarán directamente en la web de CAMPO. https://campo.da.go.cr/

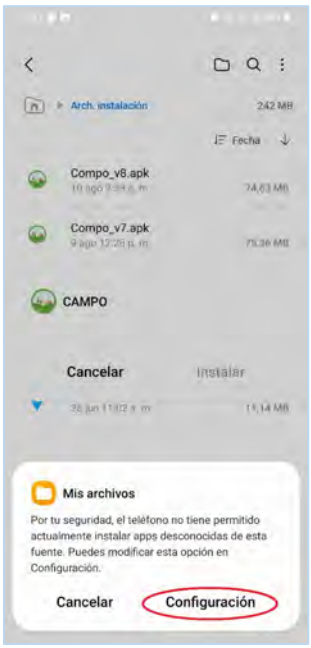
Está entregando la primera versión de la aplicación que está disponible aquí:
https://drive.google.com/drive/folders/1Zzy2yO4vS9MRlCQjrtrIC7U9lixo7yiw?usp=sharing

La aplicación debe descargarse en un móvil o tableta Android compatible e instalarse. Una vez que se apruebe la solicitud y la versión final esté lista, estará disponible a través de Google Play Store.

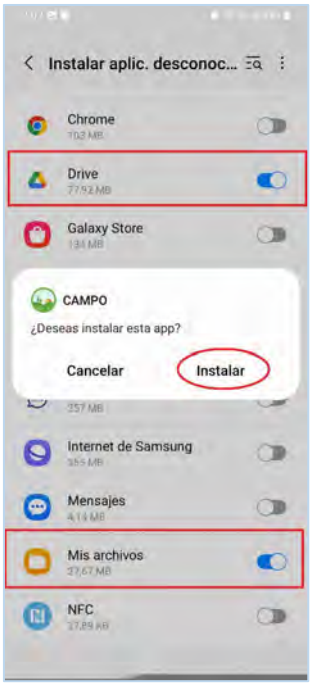


Instalación e inicio de sesión de la aplicación CAMPO

- Cuando instale esta aplicación, aparecerá una ventana emergente solicitando permiso para instalar aplicaciones de una fuente desconocida (Nota: el proceso de permiso puede variar según el dispositivo. Si se ha otorgado permiso previamente, la ventana emergente no aparecerá y el proceso de instalación Comenzará)

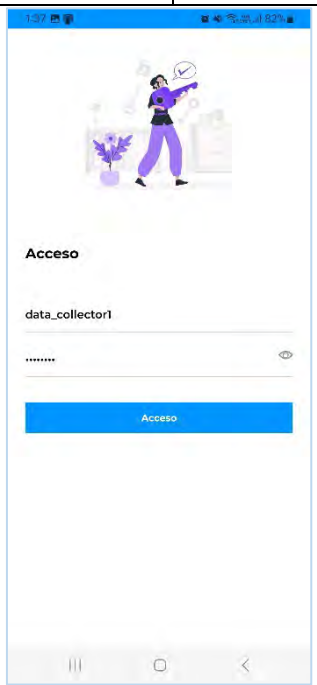


- Toque 'Configuración' y seleccione la fuente desde la que desea permitir la instalación de aplicaciones, como Drive o Mis archivos. Luego, mueva el interruptor junto a "Permitir desde esta fuente" para otorgar permiso y toque Instalar -



- Ahora abra la aplicación CAMPO e inicie sesión con su nuevo usuario creado o la siguiente identificación de usuario y contraseña predeterminadas:

SL	ID de usuario	Contraseña
1	recopilador_datos1	21254565

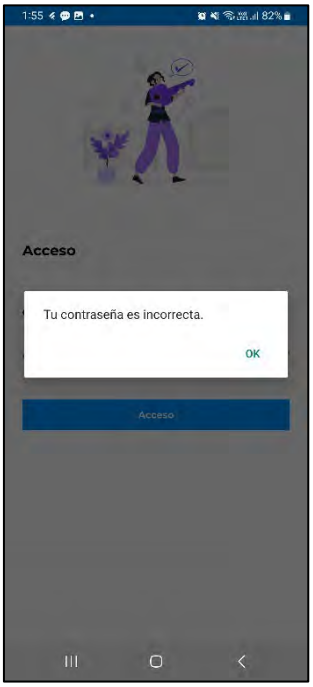


- Haga clic en el botón Acceso para acceder a la aplicación.

***Nota 1.**: Si el usuario ingresa una identificación de usuario incorrecta, se mostrará el siguiente mensaje de error:*

"Su identificación de inicio de sesión de usuario es incorrecta" -

***Nota 2.**: Si el usuario ingresa una contraseña incorrecta, se mostrará el siguiente mensaje de error: "Su contraseña es incorrecta."-*



***Nota 3.**: Si el ID de usuario y la contraseña están en blanco, se mostrará el siguiente mensaje de error: "Ingrese el ID de usuario y la contraseña".*

Descargar aplicación

- Después de iniciar sesión en la aplicación CAMPO, aparecerá la siguiente pantalla:

- Haga clic en el botón “Descargar aplicación” de la pantalla de inicio, esto nos llevará al menú “Idantidad” -

- El ingreso de datos de Idantidad permitirá al usuario actualizar/rellenar los siguientes campos –
  - **tipo de gestión**: Seleccione tipo de gestión de la lista desplegable. Este archivado es obligatorio.
  - **Número de gestión:**Este archivado es obligatorio.
  - **Nombre Solicitante**: Este archivo es obligatorio.
  - **Teléfono:**Este archivado es obligatorio.
  - **Teléfono:**Este archivo no es obligatorio.
  - **UBICACIÓN:**Este archivado es obligatorio.

- Una vez que haya terminado de completar el formulario, encontrará el botón "Guarder" en la parte inferior de la página, en el que debe hacer clic para que se guarden los valores.

- **Nota:***: Si el Número de gestión ingresado ya existe en otra aplicación de su dispositivo, mostrará el siguiente mensaje de error duplicado:*

- Ahora haga clic en el botón “Siguente”, esto nos llevará al menú “fuentes de auga” con Agregar (+) en la parte inferior derecha de la pantalla (ver imagen a continuación)-

- Después de hacer clic en el botón (+), se abrirá la siguiente pantalla:

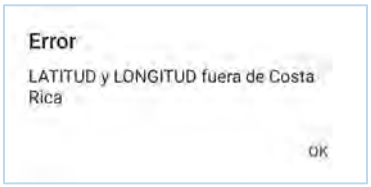
- Para ingresar datos de UBICACIÓN LATITUD y UBICACIÓN LONGITUD toque el ícono de ubicación-

- Se abrirá la siguiente ventana emergente y seleccione la opción "Mientras la aplicación está en uso" o "Solo esta vez" para elegir los datos de su ubicación actual.

- Esto completará los datos de latitud y longitud.

- También rellenas los datos de UBICACIÓN LATITUD y UBICACIÓN LONGITUD manualmente.

NÓTESE BIEN.*: Si UBICACIÓN LATITUD y UBICACIÓN LONGITUD más allá del cuadro delimitador de Costa Rica y presiona el botón Ahorrar o Siguente, mostrará el siguiente mensaje de error –*

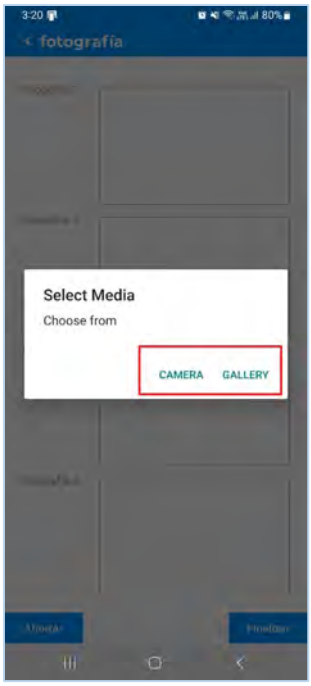


- Ahora ingrese los siguientes datos de campos:
  - **TIPO DE FUENTE:**Seleccione un Tipo de Fuente de la lista desplegable. Este archivado es obligatorio.
  - **CAUDAL**: Este archivo no es obligatorio.
  - **ACOMPANA MIENTO1**: Este archivo no es obligatorio.
  - **ACOMPANA MIENTO2:**Este archivo no es obligatorio.

- Una vez que haya terminado de completar el formulario, encontrará el botón "Siguente" en la parte inferior de la página, toque el botón que nos llevará a la siguiente página "OBSERVACIONES".

- El usuario puede ingresar cinco OBSERVACIONES desde esta página. Haga clic en el botón "Siguente" en la parte inferior de la página, que nos llevará a la siguiente página de "fotografía".

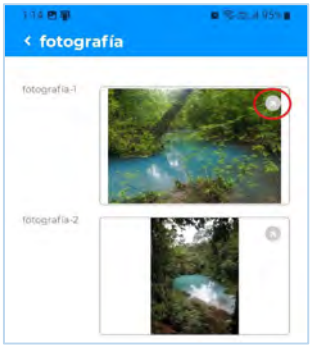
- Al hacer clic en una de las áreas del cuadro, aparecerá el siguiente cuadro emergente con dos opciones CÁMARA y GALERÍA. Puede capturar imágenes usando la cámara del teléfono seleccionando la opción CÁMARA y también puede importar imágenes desde la galería del teléfono usando la opción GALERÍA.



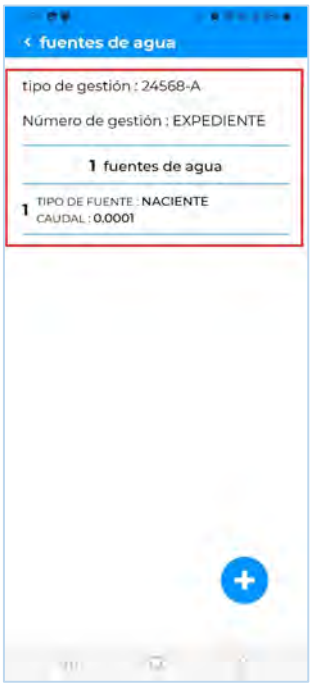
- Al capturar o seleccionar una imagen, se mostrará junto al nombre de la fotografía.

- Para importar otra imagen, haga clic en otra área del cuadro al lado del nombre de la fotografía.

Nota: El usuario puede anular la selección de la imagen haciendo clic en el botón (X) en la esquina superior de las imágenes.



- Cuando termine de importar imágenes haga clic en el botón “Finalizar”. Después de eso se muestra la lista ingresada de “fuented de agua”.



- El usuario puede agregar otros datos fuented de agua en esta aplicación usando el botón Agregar (+) en la parte inferior derecha de la pantalla.

- El usuario puede volver a la página ANTERIOR o de inicio haciendo clic en el botón Atrás (<) al lado del título de la página superior.

Editar

- El usuario puede editar la aplicación ingresada y los datos de fuente de agua desde este menú.

- Haga clic en el botón Editar. Esto mostrará la lista de aplicaciones ingresadas con el botón editar y eliminar.

***Nota**: Si hace clic en el* 🗑 *La aplicación del botón de eliminación se eliminará con los datos fuente de agua.*

- Clickea en el 📝 botón de edición para editar la aplicación y los datos fuented de agua-

- Puede actualizar los datos de la aplicación aquí y hacer clic en el botón Seguirnte, esto mostrará los datos de fuente de agua.

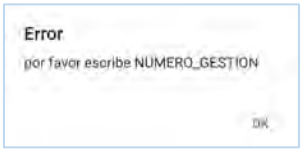
- Para editar/eliminar datos, vaya al deslizamiento izquierdo de fuented de agua en la lista de fuented de agua, luego aparecerá el siguiente botón de editar y eliminar:

***Nota**: Si hace clic en el* *El botón de eliminación con fuente de agua se eliminará.*

- Clickea en el botón editar para actualizar datos fuented de agua-

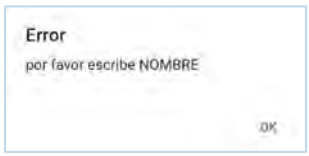
- Después de actualizar los datos, haga clic en el botón Guarder para actualizar los datos y haga clic en el botón Siguente para ir a la página siguiente y actualizar otra información.

NÓTESE BIEN. 1*: Si Número de gestión dejó los datos en blanco y presiona el botón Siguente, se mostrará el siguiente mensaje de error –*

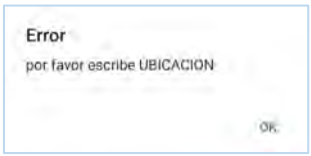


NÓTESE BIEN. 2*: Si tipo de gestión presentó los datos en blanco y presiona el botón Seguirnte, se mostrará el siguiente mensaje de error –*

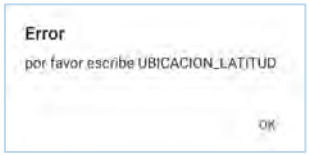
NÓTESE BIEN. 3*: Si Nombre presentó los datos en blanco y presiona el botón Seguirnte, se mostrará el siguiente mensaje de error:*



NÓTESE BIEN. 4*: Si UBICACIÓN dejó los datos en blanco y presiona el botón Seguirnte, entonces mostrará el siguiente mensaje de error –*



NÓTESE BIEN. 5*: Si UBICACIÓN dejó los datos en blanco y presiona el botón Seguirnte, entonces mostrará el siguiente mensaje de error –*



Sincronizar

- Ir al menú sincronizar. El usuario puede volver a la página ANTERIOR haciendo clic en el botón Atrás (<) al lado del título de la página superior.

- Ir al menú sincronizar.

- La siguiente página de sincronización mostrará cuántos informes están esperando para sincronizarse.

- Pulsa en el botón Sincroniza ahora para Sincronizar datos en la web. Después de sincronizar correctamente los datos con la web, se muestra el siguiente historial de sincronización y un mensaje de éxito:

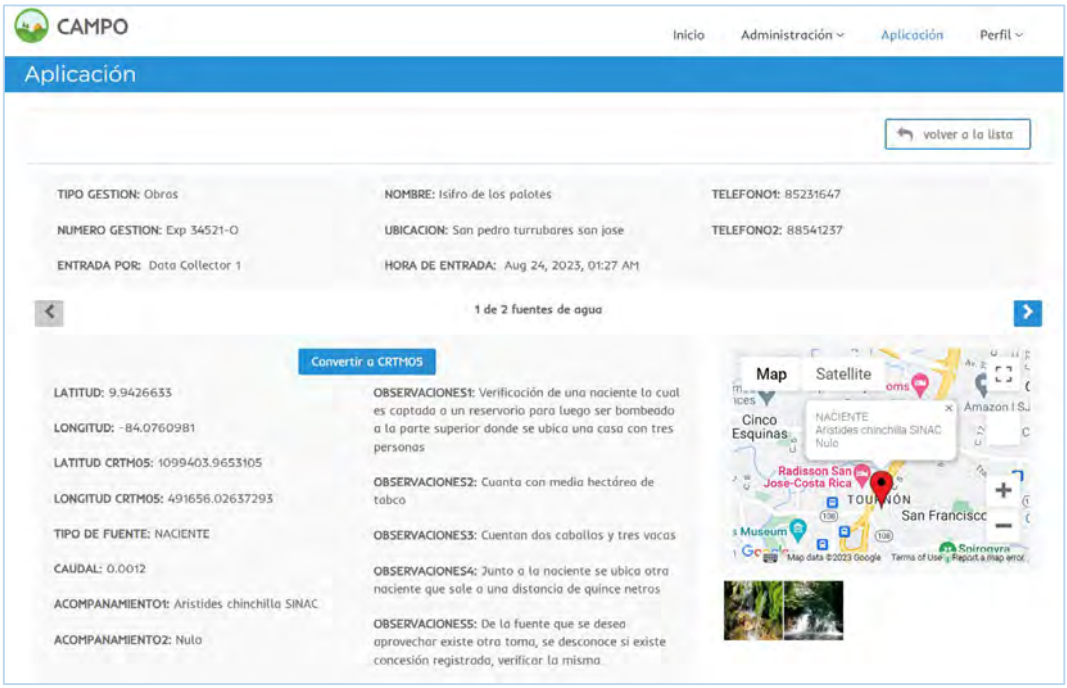
- Haga clic en el botón Cerrar para cerrar la ventana emergente. Se mostrará la siguiente pantalla con el estado de sincronización.

Nota:: *Si las aplicaciones ingresadas Número de gestión coinciden con la aplicación ya sincronizada en la web, se mostrará el siguiente mensaje de error:*

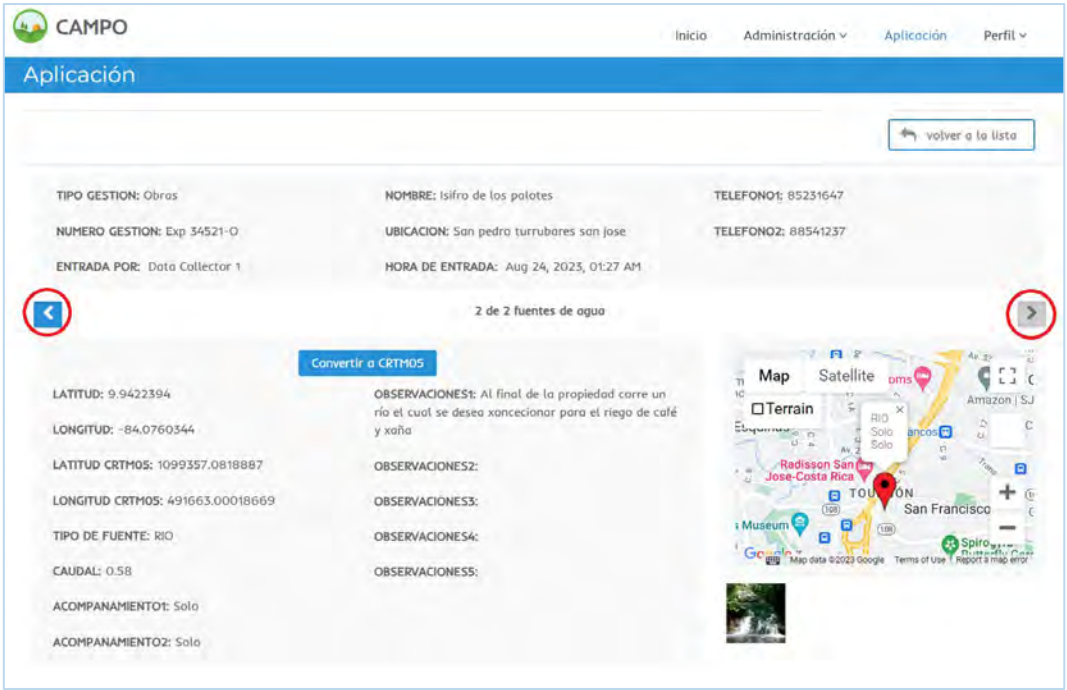
- **Carga de datos en la web**: Después de sincronizar correctamente los datos de la aplicación, los datos de la aplicación se mostrarán en la página web.
    - Navegar https://campo.da.go.cr/ .
    - Inicie sesión en el sistema con la identificación de usuario y la contraseña mencionadas anteriormente.
    - Vaya al menú Aplicación.

- Aparecerá la lista de aplicaciones y el usuario podrá buscar la aplicación siguiendo los criterios de filtro.
    - **Numerosas Gestiones:**Seleccione Numero Gestion de la lista desplegable.
    - **Fecha de inicio:**Seleccione la fecha de inicio para buscar la solicitud.
    - **Fecha final:**Seleccione la fecha de finalización para buscar la solicitud.
    - **Lista de usuarios:**Seleccione un usuario específico del menú desplegable.
    - **UBICACIÓN:**Escriba UBICACION en el cuadro de texto y presione Entrar para buscar la aplicación.

- Haga clic en los detalles botón de la columna de acciones y ver el detalle fuentes de agua data –

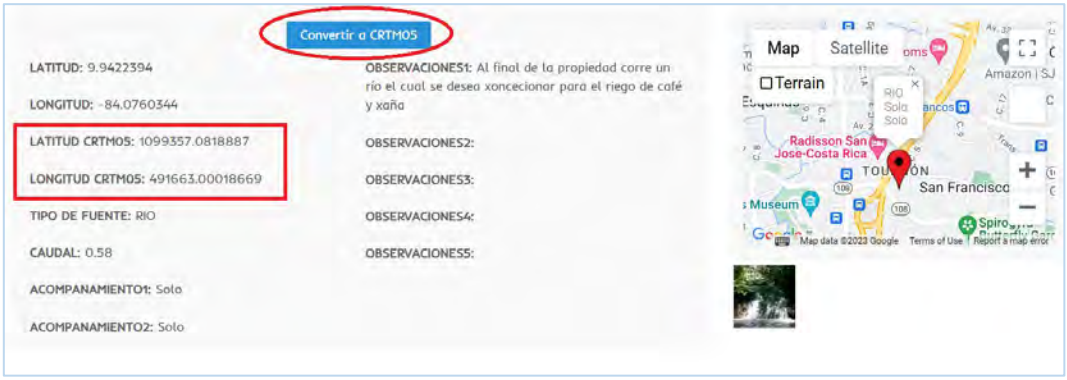


- Si hay varios datos de fuentes de agua disponibles en esta aplicación, el usuario puede ver otros datos de fuentes de agua haciendo clic en el botón SIGUIENTE (>) del lado derecho.



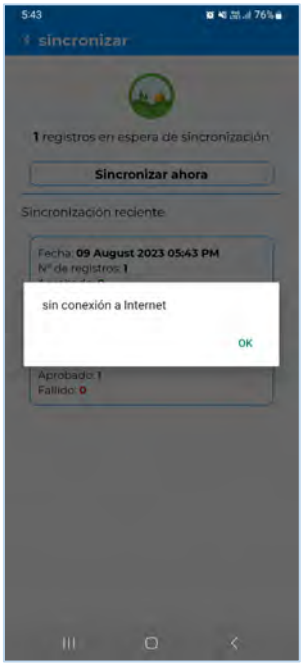
- Haga clic en el botón ANTERIOR (<) del lado izquierdo para ver los datos anteriores de fuentes de agua.

- Convierta LATTITUD y LONGITUD a CRTMO5, presione el botón Convertir a CRTMO5.



***NÓTESE BIEN.**: Si la conexión a Internet no está disponible al iniciar sesión, se mostrará el siguiente mensaje de error:*

***NÓTESE BIEN.**: Si la conexión a Internet no está disponible cuando Sincronizar ahora, mostrará el siguiente mensaje de error:*



***NÓTESE BIEN.**: El botón Editar no está disponible para datos sincronizados –*

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