

GlobWetland Africa:

Towards Earth Observation based Wetland Monitoring in Africa



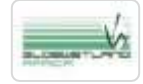
Why GlobWetland Africa?



- **African wetlands** are rich on biodiversity and an important resources for local livelihoods.
- African wetlands are **under immense pressure** from a young and growing population, widespread poverty, but strong economic growth.
- **Ramsar in Africa**
 - 370+ Ramsar sites (over 40% of the total areas of Ramsar sites)
 - 50 contracting Parties (30%)
 - Only 15 countries have achieved their wetland inventories



Why Earth Observation?



Earth Observation technology is an important tool for the **Multilateral Environment Agreements** (MAE) to support the Contracting Parties, and local, national and international bodies involved in the implementation of the Conventions:

- **Continuous data acquisition:** Earth Observation satellites allows continuous observation of the Earth surface and its changes on a regular basis
- **Historical archive:** The existing archives of Earth Observation data allows an historical view of environmental issues (40+ years)
- **Multi-scale capabilities:** The different Earth Observation satellite allows the observation of the Earth at global, regional, national and local scales
- **Multi-sensor information:** The synergic use of optical and radar systems allows different types of environmental parameters and processes to be observed and monitored

GlobWetland Africa in a nutshell



Objectives

- Exploit the **increasing capabilities of satellite observations** for wetlands inventory, assessment and monitoring.
- Develop a **“free of charge” and “open source” software toolbox** to better assess the state and change in wetlands.
- Access **“freely and openly available” satellite observations** from the most recent and innovative EO assets (mainly Sentinels of the European Copernicus Program and NASA/USGS Landsat 8).
- Enhance the **capacity of African stakeholders** to develop national and regional wetland observatories and fulfill their Ramsar commitments.

Project key facts

- 1.500.000 EUR budget
- 3 years duration (starting from Nov 2015)
- More than 25 African and international partners
- Provision of free of charge and open source EO toolbox
- 4 regional trainings (North, East, West and Central Africa)

GlobWetland Africa, an open-source EO toolbox for a wide range of wetland applications



Wetland inventory

identification and delineation of wetland areas over large river catchments, in support to national wetland inventorying campaigns;

Wetland habitats maps

for the assessment of the wetland status and for long-term change and trend analysis, inside and around Ramsar/wetland areas;

Water cycle regimes

for the analysis of the intra- and inter-annual variations of the water tables, inside and around Ramsar/wetland areas;

Water quality parameters

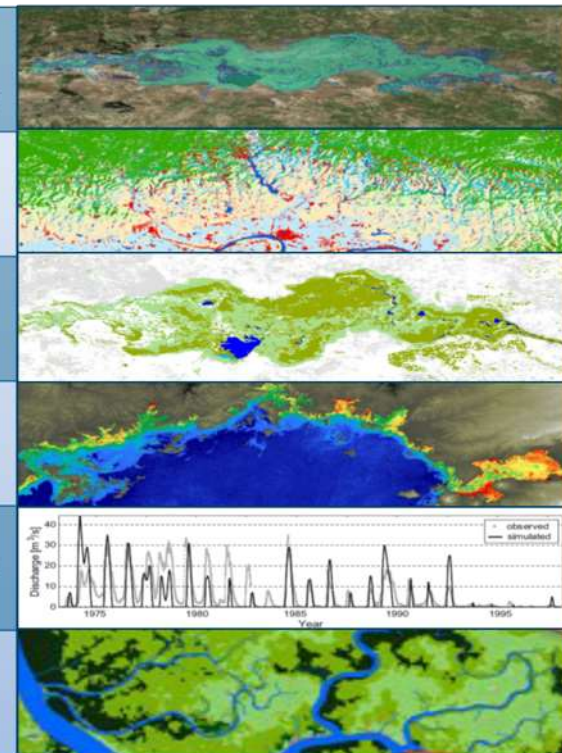
such as turbidity, suspended solids and chlorophyll concentration, for the monitoring of the aquatic contamination and physical disturbances of the wetland ecosystem;

River basin hydrology

for the modelling of the water balance and the impact of/on wetlands within river catchments;

Mangroves mapping

for the assessment of the status and trends of tropical mangroves.



Inherits the **TIGER**
Water Observations
Information System



User driven development



- GW-A is a **user-driven project**, where the toolbox and products are developed and demonstrated in direct response to specific user needs.
- The **GW-A user group** encompasses major actors involved in the implementation of the Ramsar Convention in Africa.

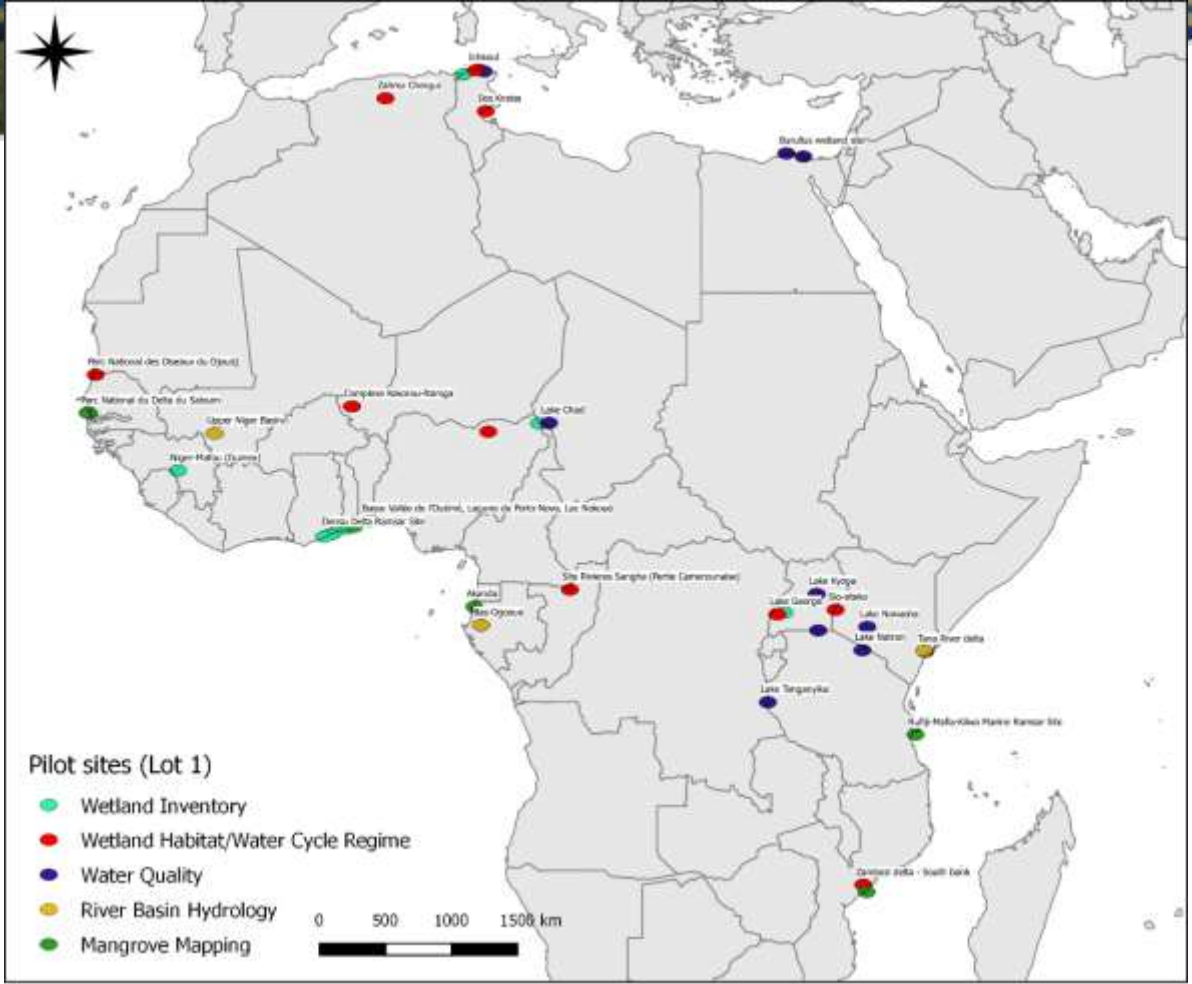




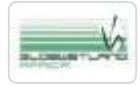
Proof-of-concept

Pilot sites (Lot 1)

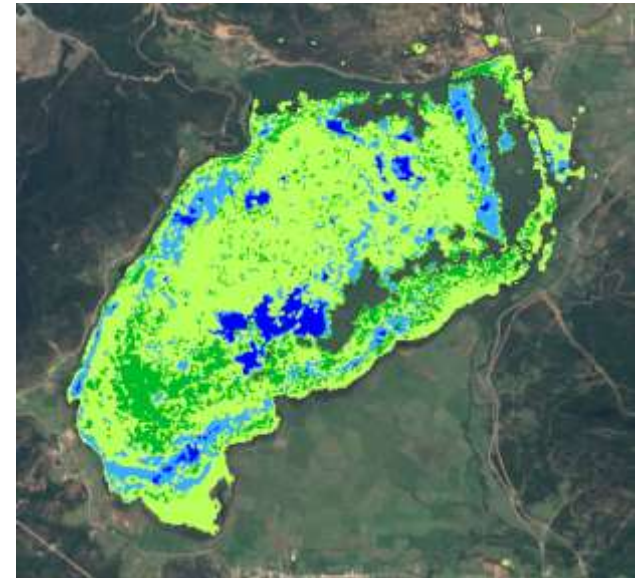
- Wetland Inventory
- Wetland Habitat/Water Cycle Regime
- Water Quality
- River Basin Hydrology
- Mangrove Mapping



Wetland Inventory

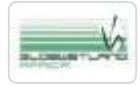


- Identification and **delineation of wetlands areas** as a support to wetland inventories.
- Serve the needs of national/sub-national agencies interested in exploring the possibilities to **reduce costs** associated to large-scale wetland inventorying campaigns.

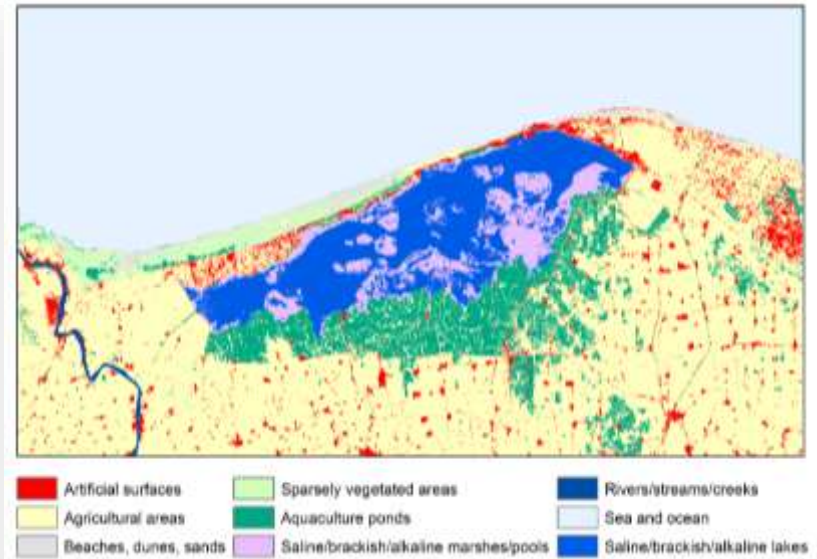


Wetland Inventory, Lake Tonga, Algeria

Wetland Habitat Mapping



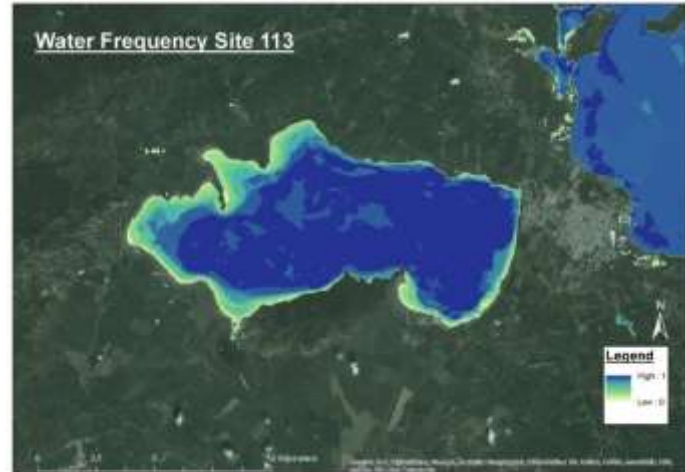
- Detailed **classification of Wetland Habitats** (through LC/LU), and of their changes
- Cover the **wetland area** but also the **surrounding** to identify threats
- Detect **changes of wetland habitats**, derive trends of wetland status, **assess threats** and **estimate impacts**
- **Standardized Land Cover / Habitat Classification scheme** incorporating the Ramsar wetlands typologies.



Wetland Habitat Map, Lake Burullus, Egypt

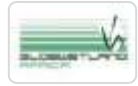
Inundation Regime

- Capture the **annual and seasonal variations** of the water table.
- Shows **minimum and maximum surface water extent** during hydrological year.
- Variations in **open water bodies** and **inundated vegetation**.
- To be generated yearly to characterise intra- and inter- variations of water regimes and identify **changes that affect the ecological character** of the wetlands.

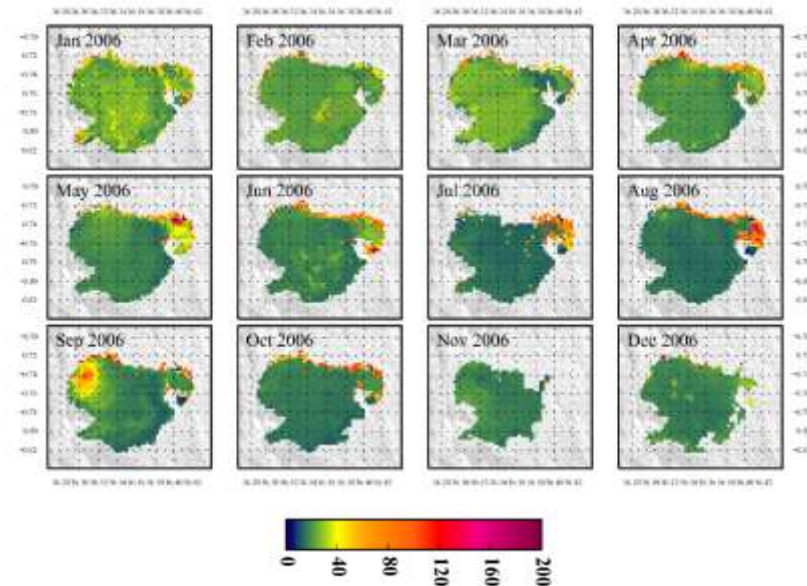


Water Extent, Water Frequency, Lake Ichkeul, Tunisia

Water Quality



- **Spatial and temporal assessment of Water Quality**
- Retrievals of total suspended **sediments** (TSM), **dissolved organic matters**, **chlorophyll** concentration, **cyanobacteria** blooms in absolute or relative terms
- Allow to monitor **wetland ecosystem contamination** (water body eutrophication due to excessive nutrients) from nearby agricultural activities and from urban / industrial waste discharge, and to estimate physical disturbances



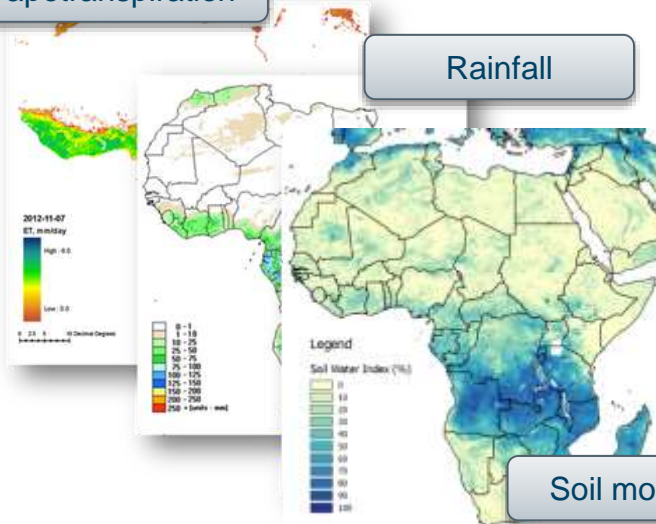
Chlorophyll concentration, Lake Naivasha, Kenya

River Basin Hydrology



- **Hydrological characterization** to assess the water conditions at a river basin level

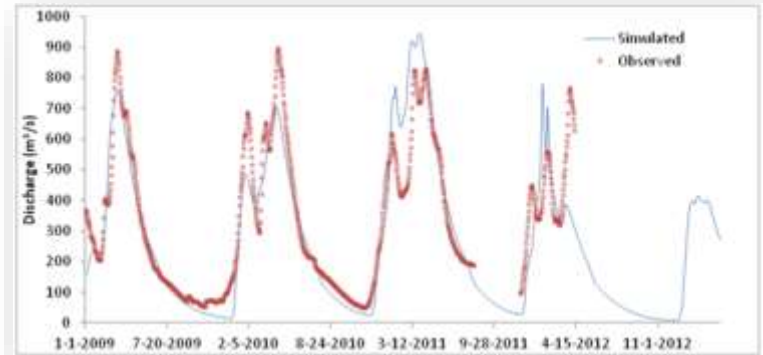
Evapotranspiration



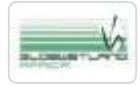
Rainfall

Soil moisture

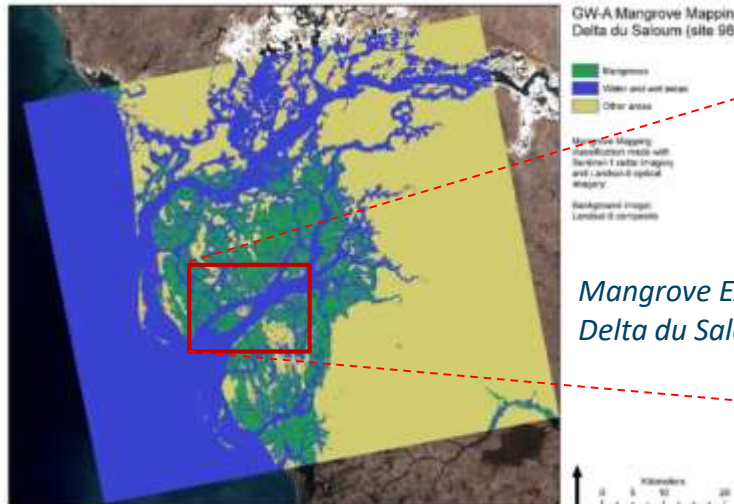
- **Hydrological modeling** to assess **impact of human activity** and **adverse effects of climate changes** on wetlands



Mangroves mapping



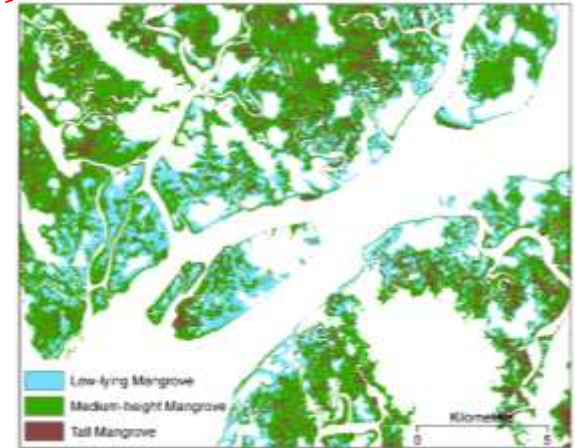
Mangrove Inventory



*Mangrove Extent
Delta du Saloum, Senegal*

Delineation of mangrove forests to support inventory, monitoring and assessment of mangroves

Mangrove Characterization



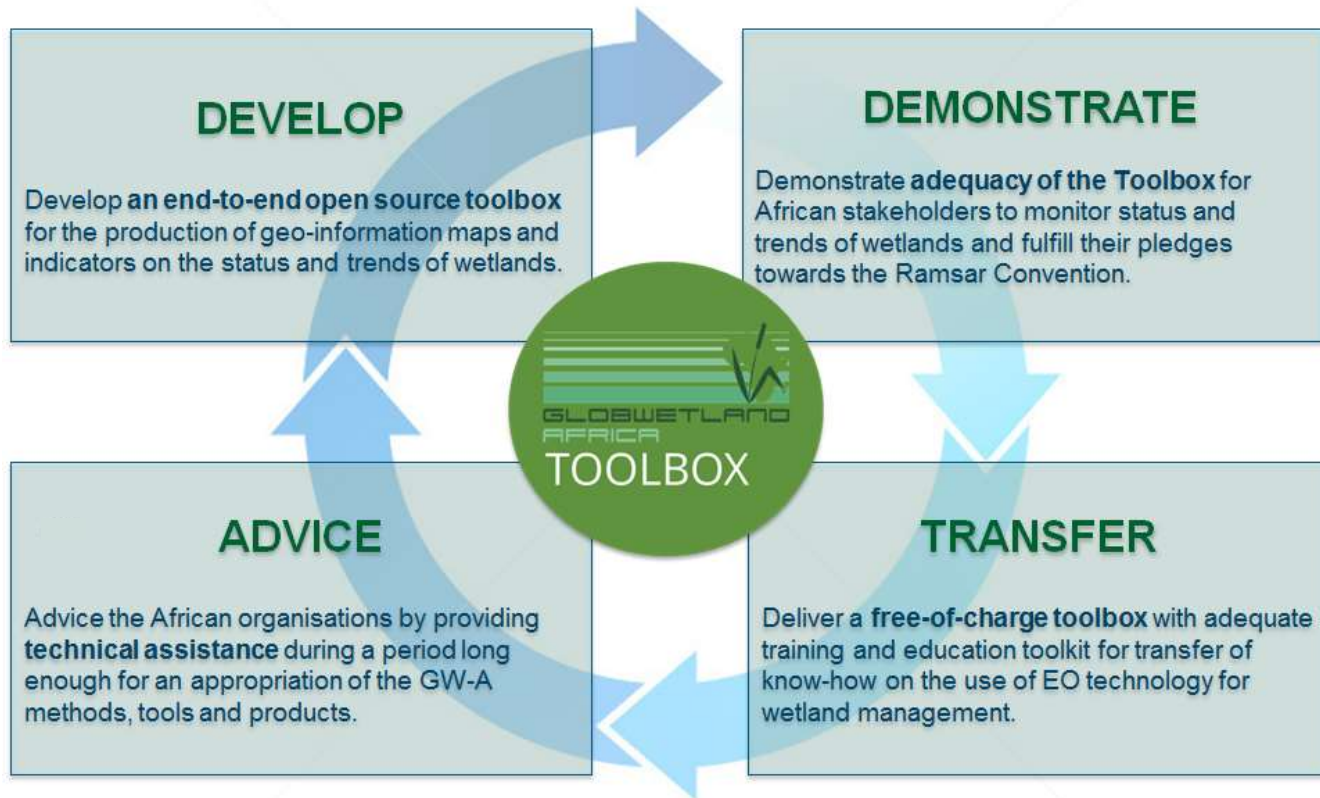
Characterization of mangroves into **communities** (species composition) and/or **structures** (high and low biomass)

GW-A toolbox key features



- **Free and open source** → *cost and license free*
- **Easy to operate** → *wizard based processing*
- **User Friendliness** → *Easy to use for non-experts*
but comprehensive enough to satisfy advanced users
- **Free to transfer and modify**
Adaptable to evolving user requirements
Can be integrated into IT infrastructures (cloud-computing platforms)
- **Open and Inclusive** → *stimulate development community*

Implementation approach



GW-A products vs Ramsar strategic objectives and UN SDG targets



GW-A main products	Contribution to Ramsar Strategic Plan Key Result Areas	Ramsar 2021 targets	SDG Targets
Wetland Inventory	Wetland distribution and status data and information available.	Targets 5, 8, 9, 13	SDG Target 6.6
Wetland Habitat Mapping	Wetland observing system(s) reporting on changes in wetland status .	Targets 1,5,7,11	SDG Target 6.6 SDG Target 15.1
Water Cycle Regime	Managing wetlands as natural water infrastructure integral to water resource management at the scale of river basins.	Targets 6,12	SDG Target 6.6 SDG Target 12.2
Water Quality	By 2020, pollution, including excess nutrients , has been brought to levels that are not detrimental to ecosystem function and biodiversity.	Targets 2,4	SDG Target 6.3 SDG Target 12.4
River Basin Hydrology	Effectiveness of cooperative management in place for shared wetland systems (for example, in shared river basins and coastal zones).	Targets 2, 9, 14, 17	SDG Target 6.5
Mangrove Mapping	National Wetland Policy and instruments fully in place alongside and integrated with ... coastal and marine resource management plans.	Targets 8, 11, 14	SDG Target 6.6 SDG Target 14.2 SDG Target 15.1



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