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Short Note

Assessing the extent to which African wetland inventories can report to the global targets on biodiversity, including Goal A of the Global Biodiversity Framework

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Wetlands face global threats with estimates suggesting a loss ranging from 21% to 85% of their original extent. Africa's wetlands, covering about 4.4% of the continent, provide crucial services to millions of people and harbour significant biodiversity. This study assesses African countries' readiness for the Kunming–Montreal Global Biodiversity Framework (GBF) through wetland inventories. It examines the progress made under the Aichi Targets for 2020, revealing 39% of reporting African countries indicating being on track for Aichi Target 11. Subsequently, the study explores wetland inventorying trends from national reports made to the Ramsar Convention from COP07 (1999) to COP14 (2022), showcasing increased membership and progress in African countries. Notable patterns emerge, revealing challenges in maintaining accurate inventories. Despite varying responses, 67% of African countries reported having a comprehensive wetland inventory at one point in the past 23 years. However, the wetland inventories are out of date, and critical information is not easily accessible, hampering accurate reporting on the current state of wetlands, and hindering informed decision-making for conservation and protection initiatives. Global datasets have contributed to reporting on wetland ecosystems; however, biodiversity-focused wetland typology systems like the IUCN Global Ecosystem Typology are crucial for a comprehensive understanding of wetland ecosystems.

Keywords: Africa, biodiversity targets, Ramsar convention, wetland biodiversity, wetland inventories

Wetlands, widely described as "permanently or seasonally inundated freshwater habitats ranging from lakes and rivers to marshes, along with coastal and marine areas such as estuaries, lagoons, mangroves and reefs" (Ramsar Convention Secretariat 2018b, pg. 11), provide numerous services, such as preserving the quality of water, sequestering carbon, preventing floods, controlling erosion and providing wildlife habitats (MEA 2005; Mitsch and Gosselink, 2015). They are found on every continent, covering roughly 6% of the Earth's land surface and spanning diverse environments. Li et al. (2022) reported the extent of African wetlands in 2020 to be 1 342 500 km², comprising approximately 4.4% of Africa's total land area, with 97% of the wetlands in the tropics. Inland swamps are the most prevalent wetland type, followed by marshes and surface water, collectively accounting for 78.6% of the total wetland area (Li et al. 2022). Africa showcases high ecosystem diversity, encompassing approximately 83% of the functional groups found in terrestrial, freshwater and marine shelf ecosystems worldwide (Keith et al. 2024). In Africa, as elsewhere, wetlands are particularly valuable, providing critical ecosystem services to millions of people and harbouring significant biodiversity, with the services they provide far surpassing those of many terrestrial ecosystems (Rebelo et al. 2010; Hu et al. 2017; Ramsar Convention Secretariat 2018a).

Despite all their benefits, wetlands are amongst the most threatened ecosystems globally (Davidson 2014; Mitsch and Gosselink 2015; Ramsar Convention Secretariat 2018a). Historically, wetlands had little value and were drained or filled for other uses such as for agricultural purposes or urban areas (Darwall et al. 2009; Ramsar Convention on Wetlands 2016). An estimated loss ranging from 21 to 85% of their original extent has been reported globally (Hu et al. 2017; IPBES 2019; Ramsar Convention Secretariat 2021; Fluet-Chouinard et al. 2023), although reflecting variation in the geographic distribution and severity of their degradation. While wetland ecosystems are inherently dynamic through seasons, years and broader climatic cycles, anthropogenic pressures and the effects of climate change have accelerated the rate of change in their extent, resulting in quicker degradation and greater biodiversity losses compared to other ecosystems, especially because inland waters are positioned at the culmination points in the landscape (Dudgeon et al. 2006; Hu et al. 2017). In Africa, the decline of wetlands is attributed to increasing human populations, economic development and the impact of climate change (Davidson 2014).

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While many wetland ecosystems on the continent remain under-evaluated, assessments have been conducted for some parts of the continents through the IUCN's Red List of Ecosystems (RLE; Bland et al. 2017). RLE assessments consider rates of changes in the extent of ecosystems, and whether they are range-restricted, faunal associations and future risks. South Africa's latest assessment of ecosystems in the National Biodiversity Assessment (NBA) of 2018, found that nearly half of the 1 021 ecosystem types of all realms evaluated in South Africa (estuarine, freshwater, marine and terrestrial) were deemed threatened (Skowno et al. 2019). Estuaries and inland wetlands showed the highest proportion of threatened types, with almost 80% of South Africa's 135 inland wetland ecosystem types categorised as threatened, encompassing nearly 88% of the country's estimated 2.6 million hectares of inland wetland area (van Deventer et al. 2019). Some wetland ecosystem functional groups in Africa were also suggested for the RLE, including for example, the subtropical-temperate coastal forested wetlands of South Africa which was suggested to be Critically Endangered owing to range restricted extents and continued deforestation for agriculture (van Deventer et al. 2021). Egypt's salt marshes around Lake Burullus were assessed as Critically Endangered, primarily due to urban expansion, land reclamation and farming (Ghoraba et al. 2021). In contrast, Mozambique's estuarine and freshwater wetlands were assessed as Least Concern compared to terrestrial ecosystem functional groups in a RLE assessment (Lötter et al. 2021). Listing of RLE will be used as indicator A1 under goal A of the Kunming-Montreal Global Biodiversity Framework (GBF) and will provide essential data for spatial planning to halt loss, restoration and protection, integral components of targets 1, 2 and 3 (Nicholson et al. 2024).

The GBF, endorsed at the 15th meeting of the Conference of the Parties (COP15) to the United Nations Convention on Biological Diversity (CBD) in November 2022, outlines four goals and 23 targets aimed at halting biodiversity loss and ensuring sustainable resource use by 2030 and beyond (Obura 2023). "Goal A" is particularly relevant to wetlands, emphasising the need to protect and restore these vital ecosystems by increasing the area of natural ecosystems by 2050. The first three targets of the GBF, addressing threats to biodiversity, also have direct relevance to wetlands (CBD 2022). Target 1 aims to ensure comprehensive biodiversity-inclusive spatial planning for all global land and sea areas, while Targets 2 and 3 require that 30% of degraded ecosystems are under restoration and 30% of ecosystem types are protected by 2030 in order to prevent biodiversity loss (CBD 2022). With these new goals and targets, there is hope that the GBF will be more successful, avoiding the challenges faced by the preceding Aichi Targets of 2020, which were intended to guide international biodiversity conservation efforts but were not fully realised between 2010 and 2020 (CBD 2020) due to a lack of regular monitoring and review of contributions. In addition to the CBD's efforts, monitoring of open water wetlands is reported under Sustainable Development Goal 6 (SDG6), specifically target 6.6 which focuses on protecting and restoring water-related ecosystems (Ramsar Convention Secretariat 2018b). The Ramsar Convention on Wetlands plays a pivotal role in guiding international collaboration for wetland conservation. Contracting parties commit to the wise use and sustainable management of wetlands, recognising wetlands' essential role in ecological balance and biodiversity, and parties submit national reports to the Ramsar Conference of Contracting Parties (hereon referred to as Ramsar COP). These reports provide essential information on the progress made by countries towards achieving the target, and highlight areas where additional efforts may be needed (Ramsar Convention Secretariat 2018b).

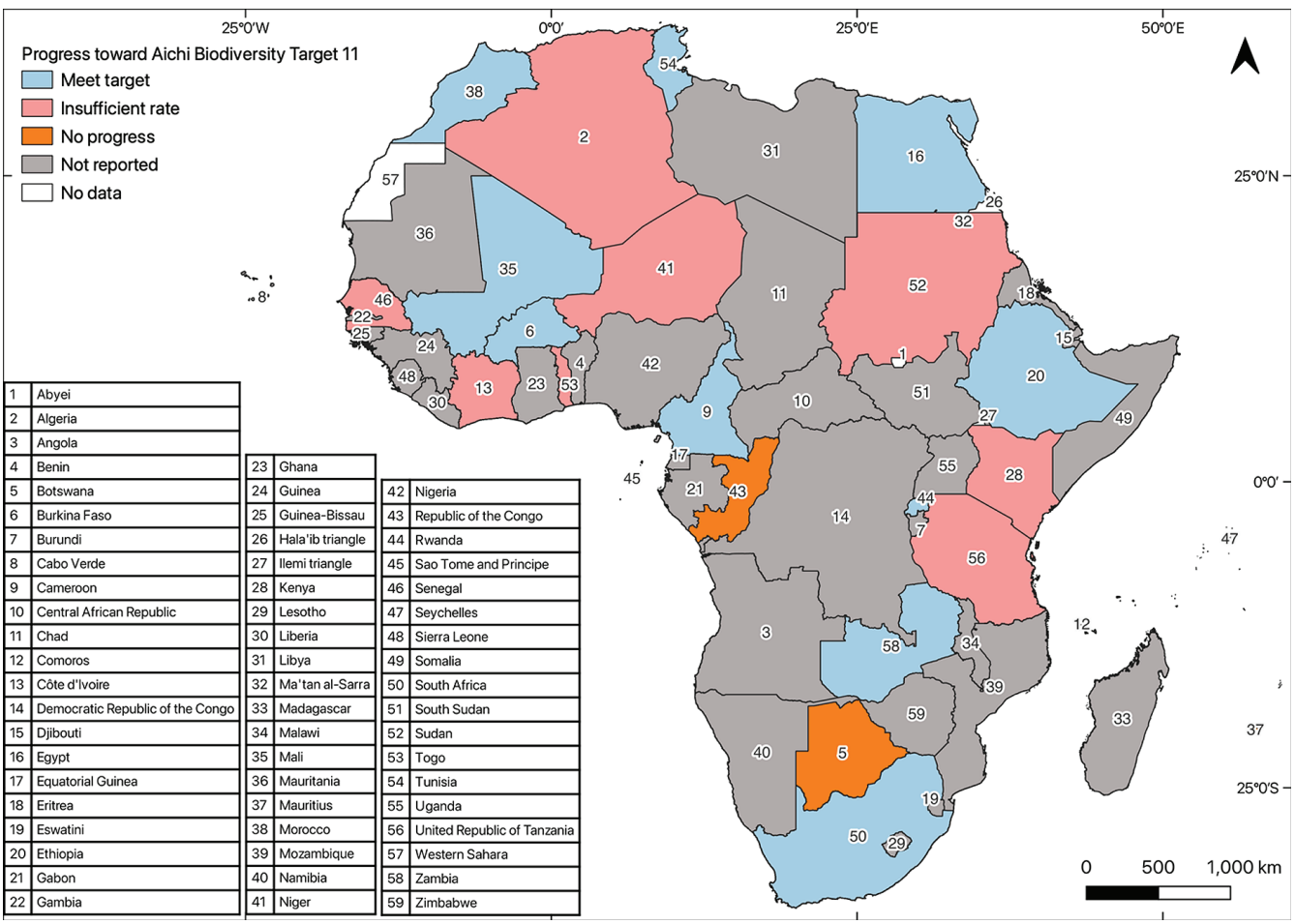
Integral to the GBF and SDG6 reporting are wetland inventories, as these play a critical GBF role in providing essential information on these ecosystems, aiding in their protection and restoration (Hu et al. 2017). This study assesses African countries' readiness and capacity to support the achievement of the GBF through comprehensive wetland inventories. To establish context, it is important to note that the GBF goals and targets have taken over the momentum from the Aichi Targets. Thus, the study begins with assessing the level of achievement of the Aichi Targets by reporting on the content of national reports submitted to the CBD on the achievement of Aichi Targets. The information gathered from the sixth national reports, presented to the CBD's 14th Conference of Parties (CBD COP14 in 2018) for the period 2014 to 2018, represented the concluding assessment of countries' progress towards Aichi Target 11 (conserve 17% of terrestrial and inland water areas by 2020). The data were obtained from the CBD website's Clearing-House Mechanism (CHM) tool, which can be found at http://www.cbd.int/reports/reports-map. Information on all 196 national reports submitted globally was extracted, as well as information as pertaining to the African continent.

Thereafter, this study examines and reports on the information contained within the national reports submitted to the Ramsar Convention, which is intended to be used to report on SDG 6.6.1a. This allowed an understanding of the current status of wetland status reporting efforts within African nations, giving insights into the preparedness of African countries to align with and implement the objectives of the GBF, particularly those related to wetlands. Additionally, the study examined the status of wetland inventory availability in 51 African Ramsar Convention contracting parties (excluding Eritrea, Ethiopia and Somalia) from Ramsar COP07 (1999) to Ramsar COP14 (2022). The statuses of inventories were classified as 'Yes' (existence of an inventory or updates), 'No' (absence), 'In-progress' (ongoing efforts, including partial inventories), 'Planned' (intentions) and 'No answer' (lack of information or national report). If a country reported having a wetland inventory to any Ramsar COP between 1999 and 2022, it was considered as having an inventory, regardless of its age; otherwise, the most recent response submitted to the latest Ramsar COP was considered definitive.

While acknowledging the progress made, it is important to remember that the Aichi Targets, while informative, have now been replaced by the GBF goals and targets. Thus, from information submitted to the most recent CBD COP, we gain valuable insights into the state of conservation efforts during the Aichi era, laying the groundwork for the transition to GBF goals. Among the 196 CBD parties worldwide, 53%

(103) submitted national reports for the 2014 to 2018 period, while 39% (40 countries) of the 103 reported being on track to meet Aichi Target 11 by 2020, while 9% (9 countries) exceeded these targets. Conversely, 5% (5 countries) made no progress, and 30% (31 countries) showed insufficient rate of progress to meet Aichi Target 11 by 2020. The remaining 17% (18 countries) did not report on progress toward achieving the target. At the continental level for Africa, 21 out of 54 countries (39%) submitted reports (Figure 1). Among these, 48% (10 of 21) were on track to meet the target, with 38% (8 of 21) indicating insufficient progress and 14% (3 of 21) no progress, respectively, to achieving Aichi Target 11 by 2020.

Figure 2 depicts the reported wetland inventory status for each country as reported to Ramsar COP07 (1999) to COP14 (2022). Trends in "Yes" responses, indicating the presence of wetland inventories, varied from 9% to 33% over consecutive Ramsar COP years (Figure 3). There was a 10% increase from COP07 (1999) to COP08 (2002), followed by stability from COP08 to COP09 (2005) (Figure 3). A modest 1% increase was observed from COP09 to COP10 (2008). The most substantial shift occurred from COP10 to COP11 with an 11% rise, reflecting a growing commitment to wetland inventory efforts. COP11 (2012) to COP12 (2015) continued this positive trend, showing a 2% increase. However, there was no change from COP12 to COP13, indicating a plateau in progress. From COP13 (2018) to COP14 (2022), there was a 5% decline, attributed to a decrease in the number of national reports submitted to the Ramsar Convention, falling from 47 in COP13 to 32 in COP14 (Figure 4). Nevertheless, the proportion of countries reporting national wetland inventories ("Yes" responses) increased over time, rising from 31% in COP09 to 47% in COP14, with a low of 27% in COP10. This aligns with the Secretary General's Report on the Convention's Implementation for COP14, reporting a modest improvement in Africa, with 45% of Parties completing inventories for COP14 (2022) compared to 35% for COP13 (2018). Figure 2 and Figure 4 further illustrate the steady growth in the number of African countries reporting national wetland inventories, contributing to an expansion in the total coverage of African wetland inventories. Notably, one of the significant trends that emerges from the data is the decrease in the number of countries that are not Ramsar signatories over the years (Figure 2 and Figure 3). In Ramsar COP07 (1999), 46% of African countries fell into this category, indicating limited engagement with the Ramsar Convention. However, this percentage consistently declined, demonstrating growing recognition of the Convention's importance. By Ramsar COP14 (2022), it had reduced to



1	Abyei	23	Ghana	42	Nigeria
2	Algeria	24	Guinea	43	Republic of the Congo
3	Angola	25	Guinea-Bissau	44	Rwanda
4	Benin	26	Hala'ib triangle	45	Sao Tome and Principe
5	Botswana	27	Ilemi triangle	46	Senegal
6	Burkina Faso	28	Kenya	47	Seychelles
7	Burundi	29	Lesotho	48	Sierra Leone
8	Cabo Verde	30	Liberia	49	Somalia
9	Cameroon	31	Libya	50	South Africa
10	Central African Republic	32	Ma'tan al-Sarra	51	South Sudan
11	Chad	33	Madagascar	52	Sudan
12	Comoros	34	Malawi	53	Togo
13	Côte d'Ivoire	35	Mali	54	Tunisia
14	Democratic Republic of the Congo	36	Mauritania	55	Uganda
15	Djibouti	37	Mauritius	56	United Republic of Tanzania
16	Egypt	38	Morocco	57	Western Sahara
17	Equatorial Guinea	39	Mozambique	58	Zambia
18	Eritrea	40	Namibia	59	Zimbabwe
19	Eswatini	41	Niger		
20	Ethiopia				
21	Gabon				
22	Gambia				

Figure 1: Progress towards achieving Aichi Biodiversity Target 11 of 2020 by all African countries

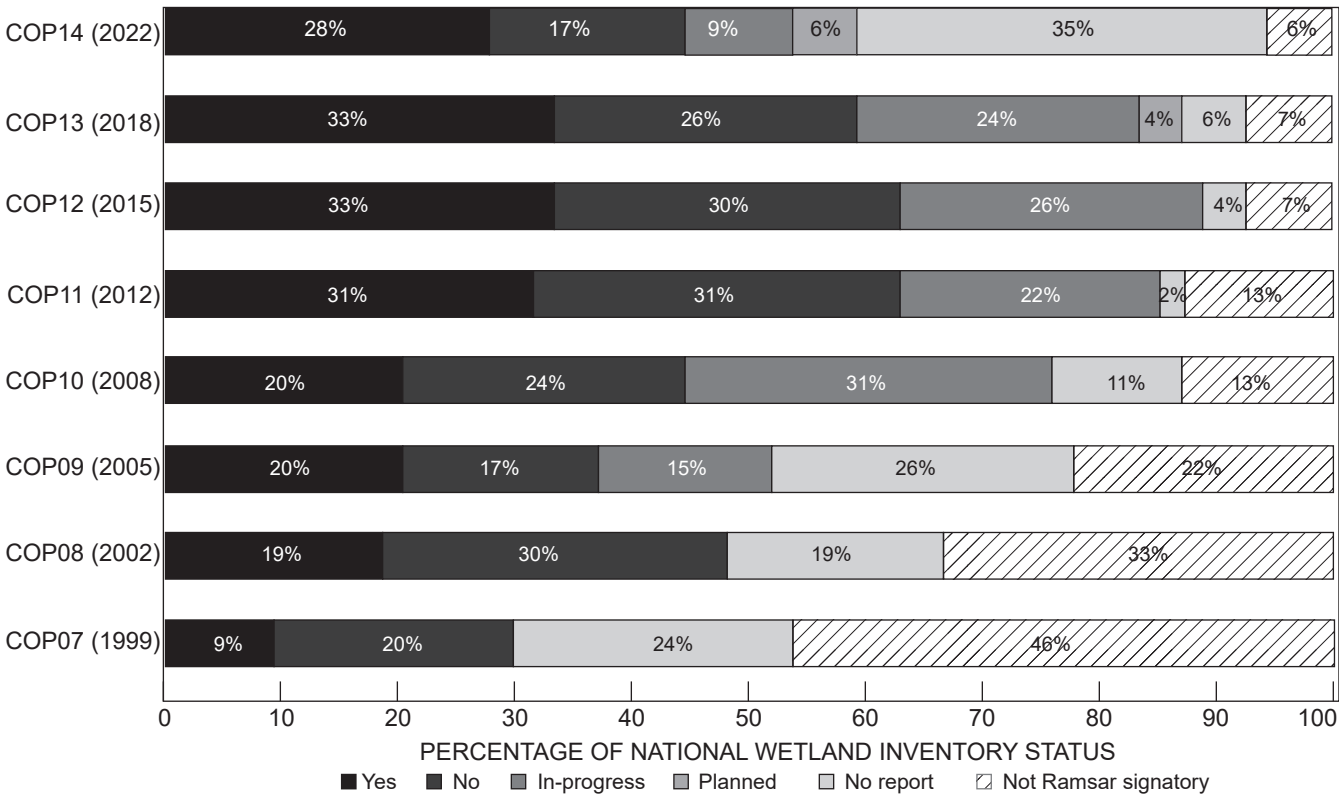


Figure 2: Change in status of African wetland inventories, Ramsar Conference of Contracting Parties COP07 (1999) to COP14 (2022)

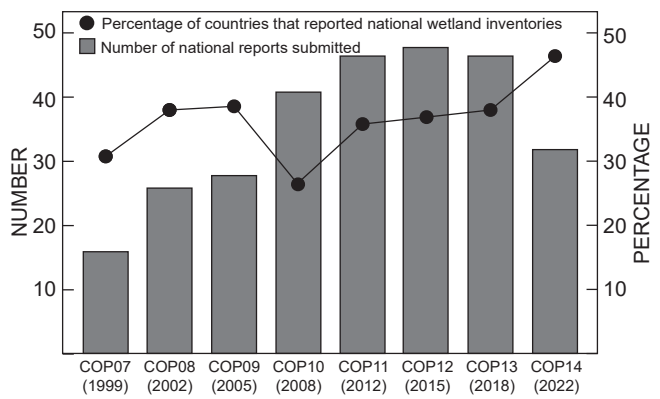


Figure 3: Temporal trends in wetland inventory reporting among 51 African Ramsar Convention Contracting Parties: national reports submitted to Ramsar Conference of Contracting Parties (COP) between COP07 (1999) and COP14 (2022)

just 6% of African countries, signifying a remarkable shift towards increased Ramsar membership and participation in wetland conservation efforts.

The wetland inventorying efforts among the 51 African member countries reveal four main patterns of inconsistency, as depicted in Figure 2. These patterns underscore the dynamic nature of wetland inventorying and the challenges faced by nations in maintaining accurate and up-to-date inventories. Firstly, some countries, including Benin, Burkina Faso, Côte d'Ivoire, Djibouti, Morocco and Zambia, initially reported "Yes" in their wetland inventories but later shifted to indicating "No". This suggests potential difficulties in maintaining or updating their inventories, pointing to shifts in priorities over time. Secondly, a fluctuating pattern is observed in several countries such as Burkina Faso, Nigeria, Togo and Tanzania. These nations alternated between "In-progress" and "No" responses across different Ramsar COP reports, without resulting in a finalised wetland inventory. This pattern may indicate uncertainties or variations in their efforts to establish and maintain wetland inventories. Thirdly, there is a noticeable trend of countries shifting from an initial "Yes" response to other categories like "In-progress" or "Planned." Burkina Faso, Côte d'Ivoire, Equatorial Guinea and Togo exemplify this shift, suggesting changes in their approach to wetland inventory management or alterations in data collection methods. Lastly, certain countries including Madagascar, Seychelles, Togo and Zambia reported "No" or "In-progress" responses with variations across different Ramsar COP reports. This reflects ongoing changes in wetland inventory efforts, challenges in data reporting or shifting national priorities. These inconsistencies also highlight the evolving methods and standards in wetland inventorying over time, posing significant challenges for countries in keeping up with the latest developments and methodologies.

Given these varying responses to the Ramsar Convention, 34 of the 51 African member countries, or 67%, have reported to at least one of the Ramsar COP between 1999

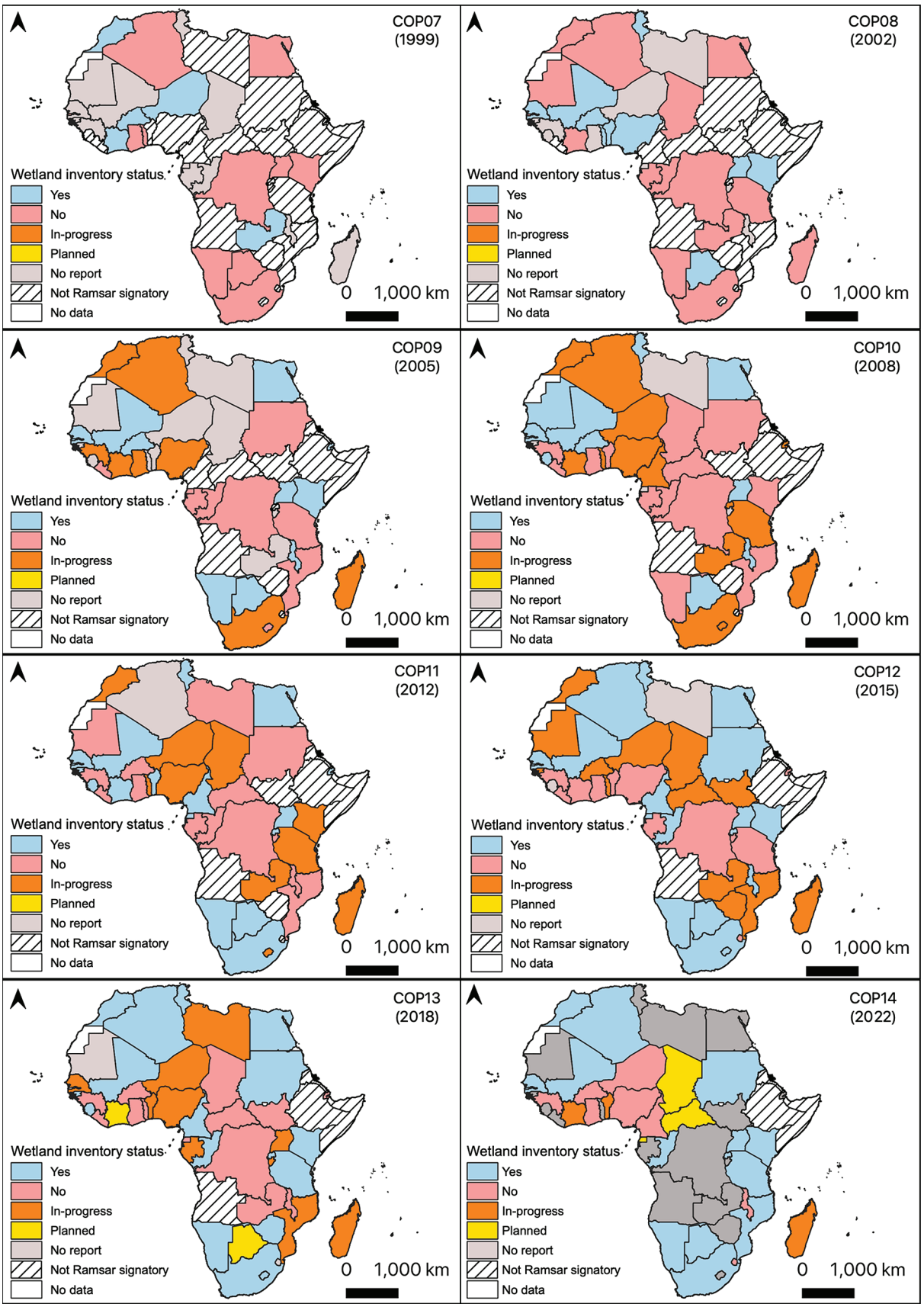


Figure 4: Number of national reports submitted to Ramsar Conference of Contracting Parties (COP) and the percentage of countries that reported national wetland inventories between COP07 (1999) to COP14 (2022)

and 2022 that they have a comprehensive wetland inventory (Figure 5). Parties are advised to report wetland extents, categorised into marine/coastal, inland and human-made wetlands, with a minimum requirement of providing the total area for each of these three categories. The majority of the countries, however, did not provide information about the wetland types and extent and only 29% (15) of countries reported the year their wetland inventory was created or updated. Furthermore, there are some discrepancies in the countries that reported extents, with countries such as Egypt, Uganda and Zimbabwe only reporting total extents without specifying wetland types, with figures of 3 834 km^2, 26 000 km^2 and 1 200 km^2, respectively. Additionally, discrepancies are evident in reports from countries like Gambia which, despite not reporting a wetland inventory, provided wetland extents of 1 505 km^2 marine/coastal, 654 km^2 inland and only 1 km^2 of human-made wetlands. Further inconsistencies are observed in reports from Mozambique and Rwanda with combined extents of 892 km^2 and 2.8 km^2 across the three categories. These discrepancies highlight the need for a comprehensive assessment of the validity and reliability of the reported numbers. Moreover, the inconsistencies observed in some countries' reported extents raise questions about the reliability of the values provided by other countries that appear to have reported valid figures. Furthermore, only eight (16%), which are Algeria, Morocco, Mozambique, the Republic of the Congo, Rwanda, South Africa, Sudan and Uganda, reported a national wetland inventory created or updated in the last decade (2013−2022). These findings are consistent with those of Steinbach et al. (2021) who stated that many African countries have national datasets on wetlands. However, the currency of these datasets is compromised owing to the non-reproducibility of the methods used to generate them, most notably the reliance on manual digitisation techniques. It is clear that over the last 23 years, reporting practices have continued to depict incomplete extents of wetlands across the African continent, posing a significant challenge for effective planning, monitoring and reporting initiatives. The analysis underscores the crucial role of Ramsar reporting in monitoring and safeguarding the ecological character of wetlands. However, it also highlights a glaring oversight in the enforcement of completeness and quality standards for reported data. The evident inconsistencies and gaps in reporting practices across African member countries emphasise the urgent need for robust mechanisms to ensure standardised and reliable reporting. Without such measures, Ramsar reporting

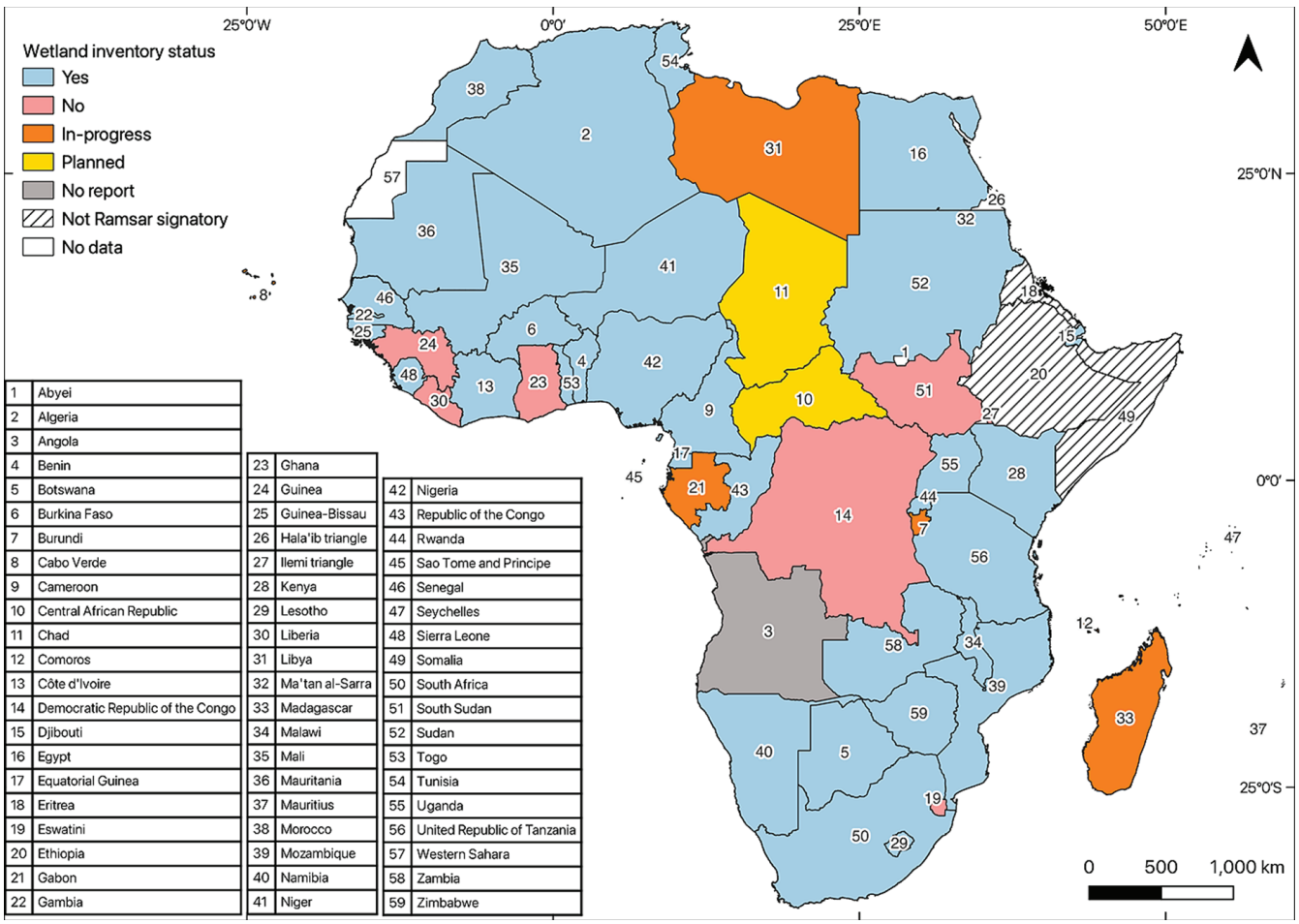


Figure 5: Consolidated wetland inventory statuses of African nations based on 51 of the Ramsar Conference of Contracting Parties (COP) national reports assessed between COP07 (1999) and COP14 (2022)

risks losing its effectiveness in accurately assessing and preserving wetland ecosystems.

Remote sensing can play a pivotal role in addressing these shortcomings, using freely available space-borne satellite images from the Landsat and Sentinel series of sensors. It provides detailed and frequent information that is consistent across administrative boundaries, thereby supporting wetland management and conservation across the continent (Rebelo et al. 2009; Amler et al. 2015). For example, Global datasets available and used for GBF and SDG reporting, such as the Global Surface Water Product (Pekel et al. 2016) and the Global Mangrove Watch (Bunting et al. 2022), contributed to the global reporting of changes in lacustrine and mangrove wetland extent, respectively. In a recent development, Li et al. (2022) utilised multiple spectral and geo-ecological features to map African wetland types at ecosystem functional group level of the IUCN's global ecosystem types, for the year 2020. However, despite the valuable information provided by these datasets regarding wetland extents and, at times, types, their classifications may not always be sufficient. For example, the Global Surface Water Product represents only 13% of the extent of wetlands mapped in South Africa's National Wetland Map 5 (van Deventer 2021), yet the representativity of biodiversity types by the products remains to be assessed.

Wetland classifications that specifically address the significance of wetlands for biodiversity are necessary and to support initiatives aimed at preventing and reversing biodiversity loss, typology systems summarising wetland ecosystems into ecologically defined categories have been developed (Jupke et al. 2022). The IUCN Global Ecosystem Typology, a systematic typology that captures the diversity of both ecosystem function and biodiversity, has been introduced. This hierarchical categorisation system defines ecosystems at their highest levels based on convergent ecological activities, and further distinguishes ecosystems at lower levels through contrasting groupings of species engaged in those functions (Keith et al. 2022). This approach underscores the importance of a comprehensive and systematic framework to enhance our understanding of wetland ecosystems and support effective conservation efforts.

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