

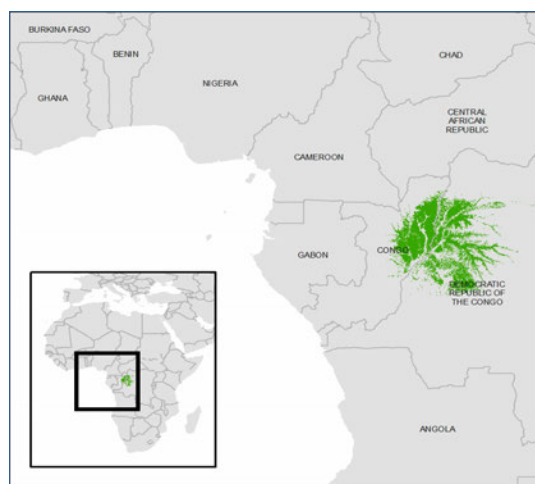
# Carbon, biodiversity and land-use in the Central Congo Basin Peatlands

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## KEY MESSAGES

- In January 2017, scientists announced new discoveries showing that the Central Congo Basin Peatlands form the largest area of peat swamp forest in the tropics. Estimates of soil organic carbon stocks in the Republic of Congo and Democratic Republic of Congo have radically increased as a result, to some 30 Gt. Degradation of these peat carbon stocks could have serious impacts on climate.
- Most of the area is covered by oil and gas concessions (for exploration and/or extraction), with smaller areas also covered by timber concessions and concessions for oil palm development or agricultural use. There is an associated risk of forest degradation, including from road development and woodfuel harvest.
- Concerns have been raised that the pattern of peatland drainage for oil palm plantations seen in Southeast Asia could also develop in the Central Congo Basin. While remote sensing provides good information about recent tree cover change in the area, less is understood about the potential scale of future land-use change and related risks.
- A Transboundary Ramsar Site was declared in June 2017, covering much of the Central Congo Basin Peatlands. The peat swamp forest ecosystem is in good condition due to its relative inaccessibility, and this new designation could provide a basis for its conservation and wise use consistent with the Ramsar Convention on wetlands.
- Further effective action to conserve and sustainably manage these peat swamp forests will also contribute to achieving the Sustainable Development Goals (as well as related national objectives):
  - Goal 13 on action to mitigate climate change, by keeping carbon stocks in the ground.
  - Goal 3 on health, by avoiding the serious air pollution problems observed in Southeast Asia when drained peatlands burn for months.
  - Goal 6 on clean water, through its target on protecting water-related ecosystems.
  - Goal 15 on life on land, by ensuring the conservation and wise use of this ecosystem and its threatened species.

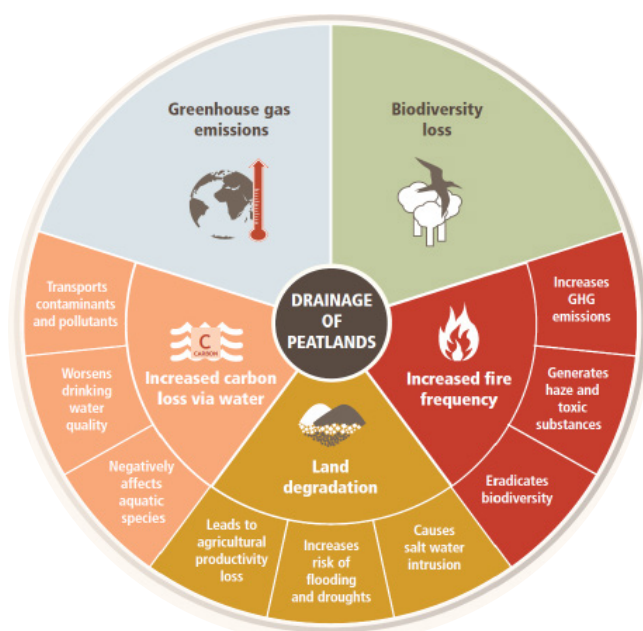


## The peatlands of the Congo Basin

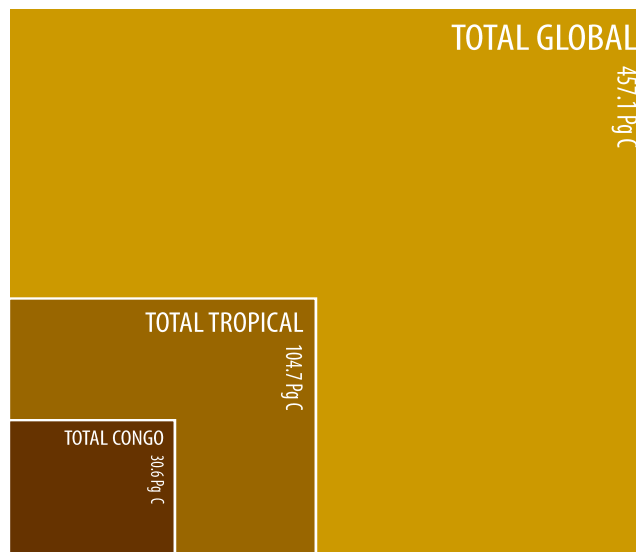
A large, carbon-rich and relatively undisturbed peatland area within the central Congo Basin has caught the world's attention, following the publication of a key Nature paper in January 2017 [1]. These peat swamp forests are located in the heart of Africa and are shared between the Republic of Congo and the Democratic Republic of Congo (Map 1). They cover 40% of the Cuvette Centrale depression, occupying land between tributaries of the Congo River. This is now thought to be the largest tropical peatland area in the world. The discovery of their extent and significant carbon stocks is especially relevant to climate change mitigation [2]–[4], but also to the Sustainable Development Goals on health, water and life on land. As a unique ecosystem hosting both threatened species and endemic species only found in the Congo Basin region, its conservation would contribute to achieving the Aichi Biodiversity Targets (Map 2).

Peat is compressed, partly decayed organic matter under waterlogged conditions that prevent its full decomposition [5], [6]. Peatlands store about one-third of all soil carbon, despite covering only 3% of Earth's land area [7], [8]. They occur primarily within the tropics, the sub-arctic and boreal regions, and can host forests, grasslands, marshes and shrublands [3], [4]. Around 15% of global peatlands have already been disturbed (and/or drained) by agriculture, forestry, peat extraction and/or infrastructure development [4], [9].

The large-scale drainage of peatlands accounts for more than 3% of all greenhouse gas emissions [4]. When peatland are drained, the decomposition of organic matter resumes in peatlands releasing greenhouse gas emissions for decades or more (Figure 1) [9]. Drained tropical peatlands are also very vulnerable to fire, which can continue underground for months and contributes to haze with severe implications for air quality and human health, as well as to climate change [10]. The peatlands of the Central Congo Basin are waterlogged swamp forests, which have remained largely



**Figure 1.** Environmental and social impacts of peatland drainage © FAO 2017



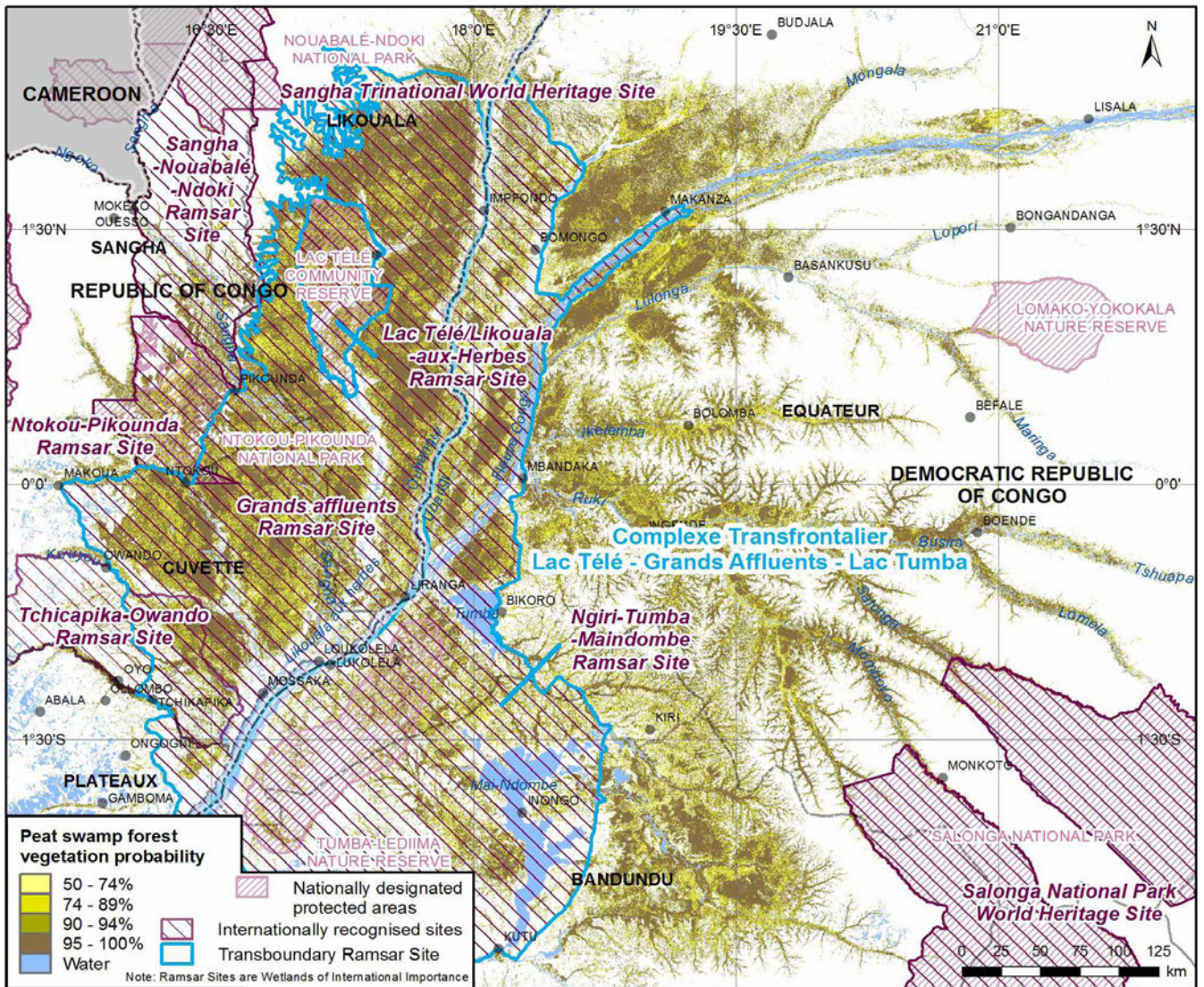
**Figure 2.** Soil organic carbon stocks estimates in Central Congo Basin, Tropical and Global peatlands [1-3].

intact, with limited accessibility [1]. Although relatively undisturbed at present, these ecosystems may in future face similar threats to those reported now in Southeast Asia and across the tropics [11], [12]. Expansion of the road network over the past 15 years has increased access to previously remote locations (Map 3). Concessions for logging, mining and oil and gas exploration/exploitation together cover most of the region (Maps 3 and 4). As global food demand increases, agricultural expansion may also promote deforestation, peatland drainage and overall ecosystem degradation. Furthermore, some regional climate projections forecast reduced annual rainfall and stronger dry seasons, which could also facilitate peatland drainage [1].

Calls have already been made for the protection of the Central Congo Basin Peatlands whilst supporting national development needs [1]. The Republic of Congo recognized the role of peatland carbon stocks in the country's forest reference emission level for REDD+ [15]. Its Intended Nationally Determined Contribution under the climate change convention references a Permanent Forest Domain, in which land-use change would be illegal [29]. This includes a conservation forest category, in addition to the protected areas designated for biodiversity conservation [30]. This already represents a substantial commitment to protect the area.

The Republic of Congo is also considering the expansion of the *Lac Télé* Community Reserve to protect further areas of swamp forest (Map 1) [1]. The draft of its National REDD+ Strategy aims to ensure that agro-industrial concessions are not granted near wetlands or forests with high biodiversity value. REDD+ could be a potential tool to promote the conservation of the Congo peatlands. It was devised by the United Nations Framework Convention on Climate Change (UNFCCC), to support developing countries to reduce emissions from deforestation and forest degradation whilst ensuring the sustainable management of forest ecosystems and the conservation and enhancement of forest carbon stocks. The Convention's safeguards for REDD+ expect that its implementation delivers social and environmental benefits beyond climate change mitigation.

## Map 1. Peatland extent, carbon content and protection status



According to the UK-Congolese team working on the Cuvette Centrale region, this is the most extensive tropical peatland complex worldwide, five times larger than previously estimated [1]. Initial estimates indicate an area of about 145,500 km<sup>2</sup>, corresponding to 4% of the entire Congo Basin (Map 1) [1]. These estimates, however, require further ground-truthing as they rely on peat-vegetation associations and remote sensing products [1]. If validated, these findings could make the Democratic Republic of Congo the country with the second largest peatland extent (90,800 km<sup>2</sup>) in the tropics (after Indonesia), followed by the Republic of Congo (54,700 km<sup>2</sup>) [1]. The median peat depth is 2 metres (with a maximum of 5.9 metres), shallower than many other tropical peatlands, but with a higher carbon density in each handful of peat [1]. The Congo peat swamp forests store almost 30% of all the soil organic carbon found within tropical peatlands (about 30 billion tonnes of carbon), and about 5% of that estimated to be stored in peatlands across the world (Figure 2) [1]. Their carbon stocks are also estimated to be as high as those in the entire above- and below-ground forest biomass of the two countries [1] (Figure 3).

The two countries agreed in June 2017 to cooperate in the sustainable management of three Ramsar sites that together occupy 45% of the peatland area, by formally declaring them as a single transboundary site, Complexe Transfrontalier lac Télé - Grands Affluents - Lac Tumba. Only 7% of the peatland region is covered by designated protected areas at the national level, so this transboundary site provides a good framework for conservation and wise use of the area consistent with the Ramsar Convention on wetlands.



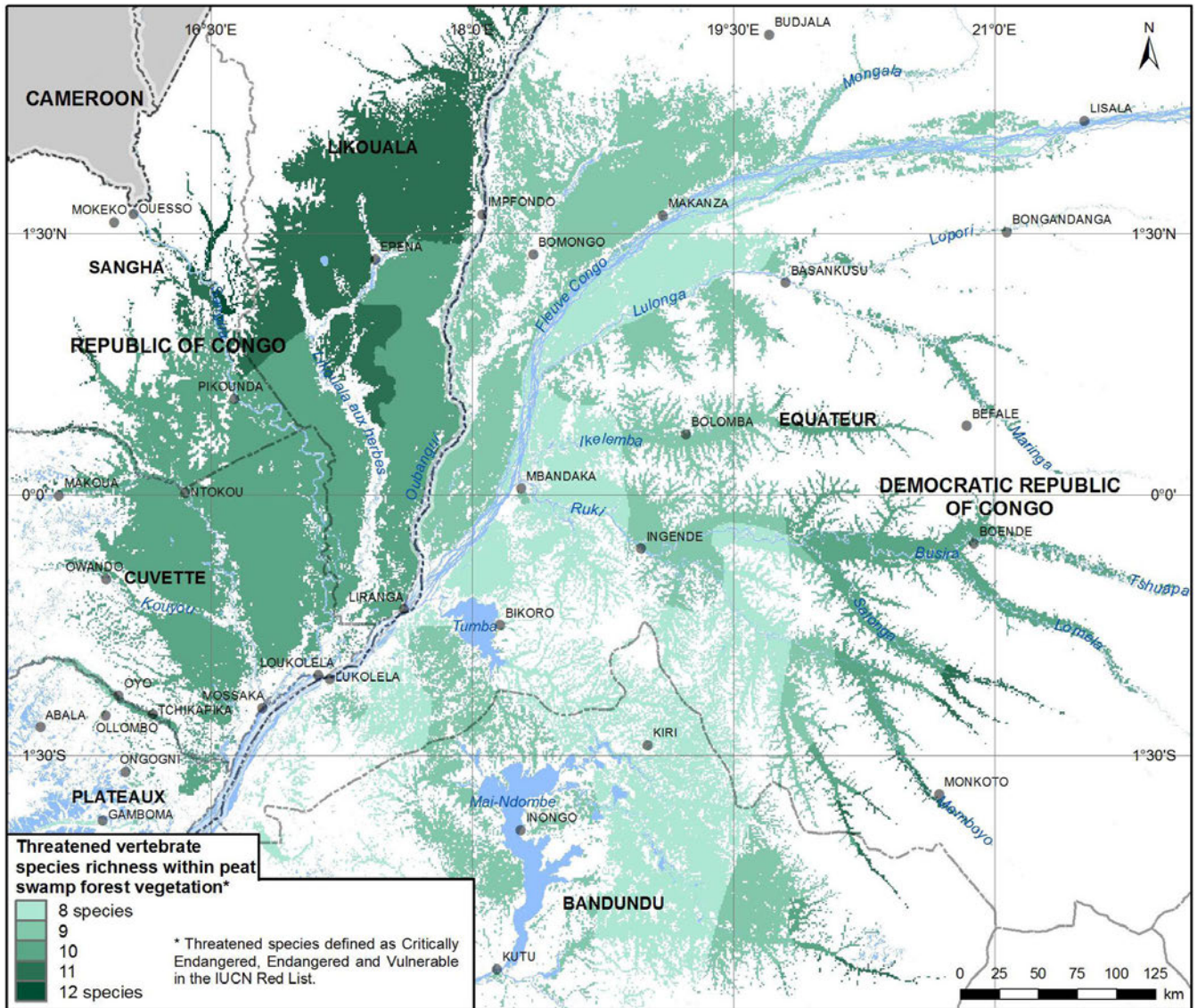
**Figure 3.** Carbon stock estimates for peat and above- and below-ground woody biomass across the Republic of Congo and the Democratic Republic of Congo [1], [30].

### Map 1 data sources:

**Peat swamp forest vegetation:** Dargie GC, Lewis SL, Lawson IT, Mitchard ETA, Page SE, Bocko YE, Ifo SA. 2017. Age, extent and carbon storage of the central Congo Basin peatland complex. *Nature* 542:86–90. Map data available from [www.afrifron.org/en/peatland](http://www.afrifron.org/en/peatland).

**Protected areas:** IUCN and UNEP-WCMC. 2017. The World Database on Protected Areas (WDPA). Public release July 2017. Cambridge, UK. Available at: [www.protectedplanet.net](http://www.protectedplanet.net). Please note: some Ramsar site boundaries have been digitized by UNEP-WCMC.

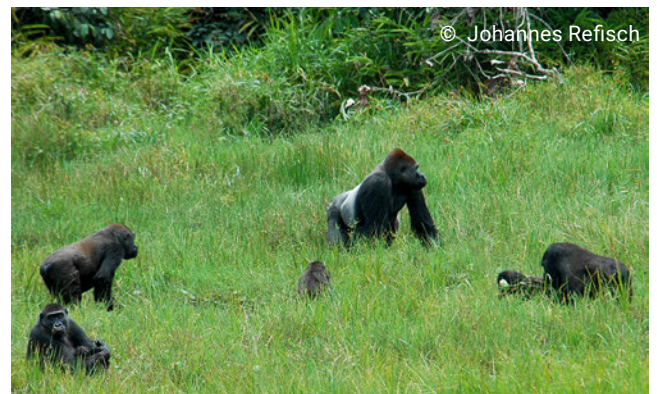
**Map 2. Richness of threatened vertebrates within the Central Congo Basin Peatlands**



The Central Congo Basin Peatlands are home to 14 species threatened at the global level, as well as to 10 prioritised nationally and/or regionally [20], [21]. For example, these include three of the four African ape species. To the east of the Congo river, bonobos (*Pan paniscus*) live in the peat swamp forests, while to the west, western lowland gorillas (*Gorilla gorilla gorilla*) can be found [22]. Chimpanzees (*Pan troglodytes*) are found in the north of the Central Congo Basin peatlands [22]. Swamp forest provides them with useful food resources, with both gorillas and bonobos enjoying aquatic herbs. Map 2 shows the known richness of threatened vertebrates across the Congo peatlands. A total of 5 areas have been identified as key for biodiversity conservation within this region (Map 2).

All the African apes are protected by the Kinshasa Declaration on Great Apes as well as under national law [23]. At a regional scale,

the COMIFAC Convergence Plan, in its “Axis of intervention for the conservation and enhancement of biodiversity” emphasizes the importance of the conservation of large mammals and other threatened species of fauna and flora [24].

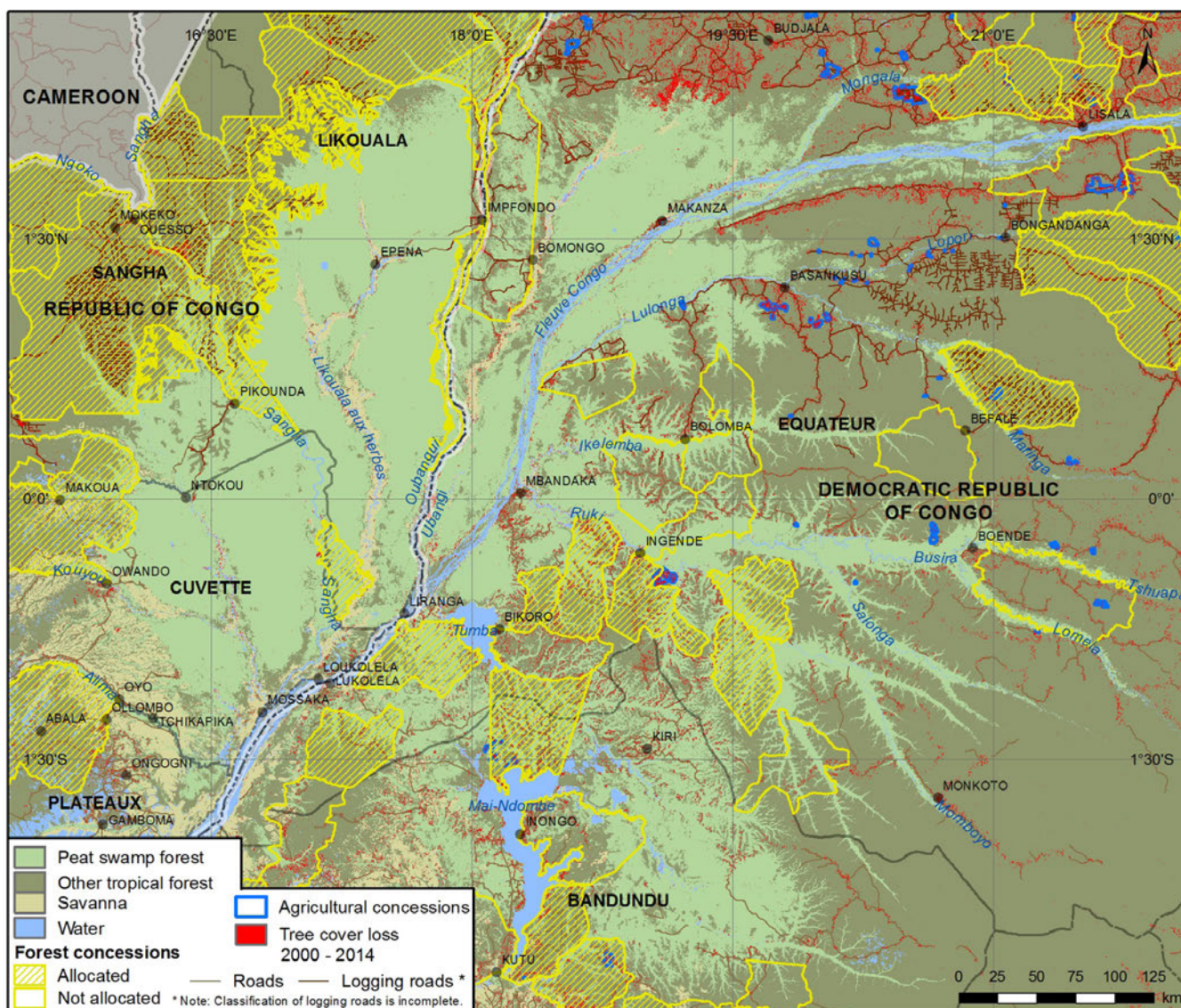


**Map 2 data sources:**

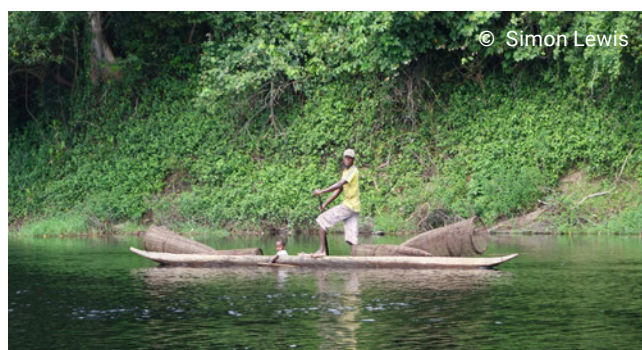
**Peat swamp forest vegetation:** Dargie GC, Lewis SL, Lawson IT, Mitchard ETA, Page SE, Bocko YE, Ifo SA. 2017. Age, extent and carbon storage of the central Congo Basin peatland complex. *Nature* 542:86–90. Map data available from [www.afrifron.org/en/peatland](http://www.afrifron.org/en/peatland).

**Threatened vertebrate species richness:** IUCN 2015. The IUCN Red List of Threatened Species. Version 2015.1. <http://www.iucnredlist.org>. Downloaded on 23/2/17.

**Map 3. Forest concessions across the Central Congo Basin peatlands, showing tree cover loss along logging roads and elsewhere**



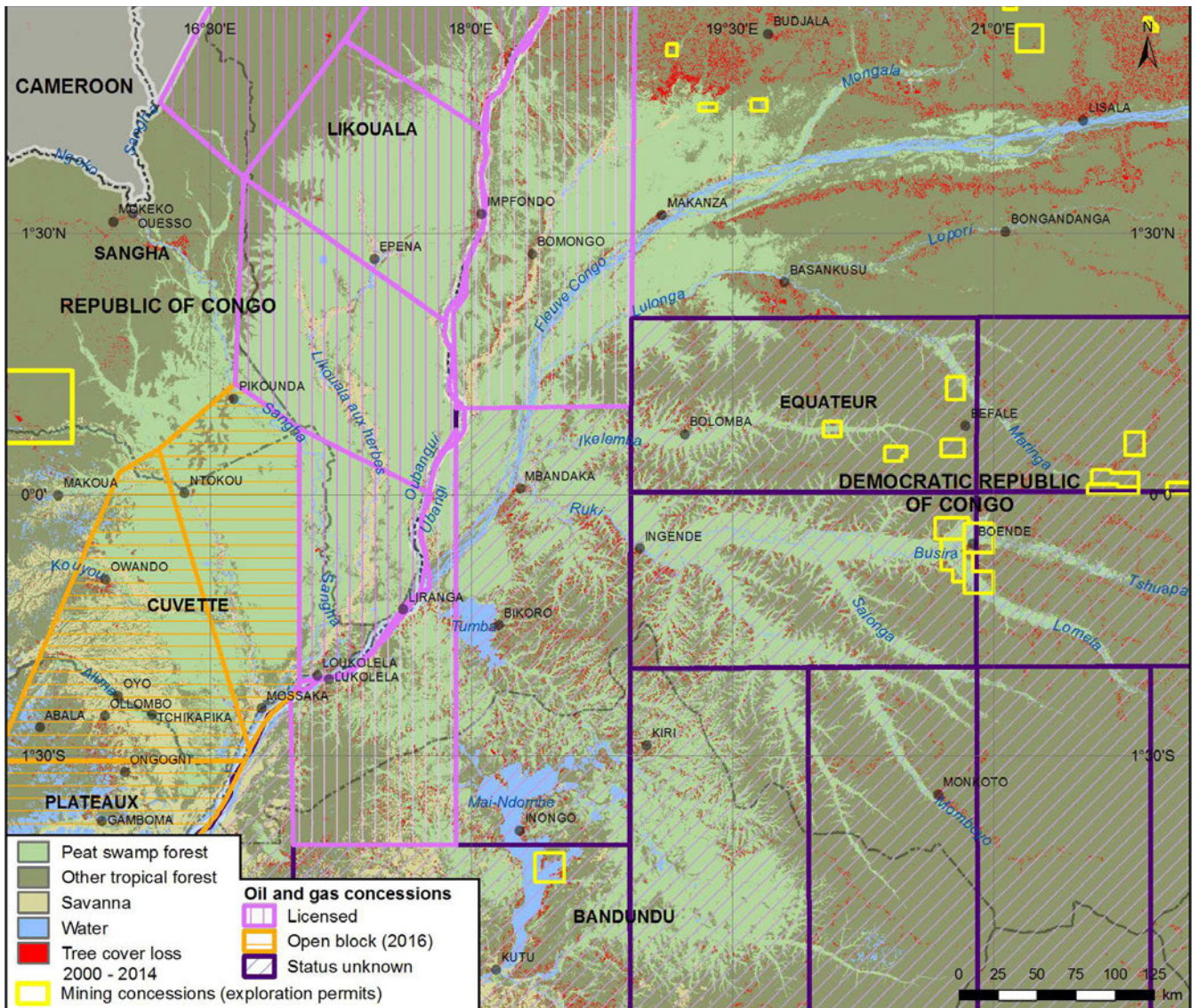
Most of the Central Congo Basin Peatlands are relatively undisturbed, but over the past ten years, tree cover has been lost at the edge of the peatlands and along logging roads (Map 3). This has been mainly within the Democratic Republic of Congo, where reports indicate that slash-and-burn agriculture has been the main driver of this change [16]–[18]. A considerable number of roads have also been opened within this period (Map 3). This may facilitate access to previously remote peat swamp forests. About 28,956 km<sup>2</sup> (20%) of peatlands are within forest concessions, and approximately 53% of these are thought to be already allocated to operators [25].



**Map 3 data sources:**

**Peat swamp forest and other vegetation:** Dargie GC, Lewis SL, Lawson IT, Mitchard ETA, Page SE, Bocko YE, Ifo SA. 2017. Age, extent and carbon storage of the central Congo Basin peatland complex. *Nature* 542:86–90. Map data available from [www.afritrn.org/en/peatland](http://www.afritrn.org/en/peatland). **Tree cover loss:** Hansen, MC., Potapov, PV., Moore, R., Hancher, M., Turubanova, SA., Tyukavina, A., Thau, D., Stehman, SV., Goetz, SJ., Loveland, TR., Kommareddy, A., Egorov, A., Chini, L., Justice, CO, and Townshend, JRG. 2013. High-Resolution Global Maps of 21st-Century Forest Cover Change. *Science* 342 (15 November): 850–53. Data available on-line from: <http://earthenginepartners.appspot.com/science-2013-global-forest>. **Roads:** WRI. 2009. Interactive Forest Atlas Version 1.0 for Congo; DIAF, DGF and WRI. 2013. Interactive Forest Atlas Version 1.0 for Democratic Republic of Congo. **Logging Roads:** OpenStreetMap with contributions from the Logging Road Initiative. n.d. Congo Basin logging roads. Accessed through Global Forest Watch on 24/02/17. [www.globalforestwatch.org](http://www.globalforestwatch.org). **Forest concessions:** World Resources Institute. n.d. Logging. Accessed through Global Forest Watch on 16/11/17. [www.globalforestwatch.org](http://www.globalforestwatch.org). **Agricultural concessions:** DIAF/WRI. 2017. Agricultural concessions. Created based on the FACET data, ‘cartes territoriales’ and a repertory of plantations. Layer in the process of being validated. Accessed through Moabi DRC on <https://mapforenvironment.org/layer/info/80/DRC-Agriculture-Concessions#5.67/-1.263/19.467> on 03/03/17.

**Map 4. Mining permits and oil and gas concessions in peat swamp forest**



Oil and gas concessions cover the Central Congo Basin Peatlands almost in its entirety (Map 4). Licenses have already been granted across 30% of the area (Republic of Congo 31,288 km<sup>2</sup>, Democratic Republic of Congo 12,990 km<sup>2</sup>), while 13% appears to be still open for bidding [26], [27]. The status of 44% of the oil and gas concessions in the Democratic Republic of Congo was unknown at the time of writing this briefing. Only those peat swamp forests at the north of the Equateur province in the Democratic Republic of Congo, and some areas within the Sangha province in the Republic of Congo are not subject to oil and gas concessions (Map 4). Mining concessions only cover a small area within the Central Congo Basin peatlands. Whilst peat is occasionally used in some countries for fuel or even in power plants [13],[14], this is not usually seen in the lowland tropics. This practice is not recommended

as peat has a high greenhouse gas emission intensity and slow renewal rates [31].



**Map 4 data sources:**

**Peat swamp forest and other vegetation:** Dargie GC, Lewis SL, Lawson IT, Mitchard ETA, Page SE, Bocko YE, Ifo SA. 2017. Age, extent and carbon storage of the central Congo Basin peatland complex. *Nature* 542:86–90. Map data available from [www.afritrn.org/en/peatland](http://www.afritrn.org/en/peatland). **Tree cover loss:** Hansen, MC., Potapov, PV., Moore, R., Hancher, M., Turubanova, SA., Tyukavina, A., Thau, D., Stehman, SV., Goetz, SJ., Loveland, TR., Kommareddy, A., Egorov, A., Chini, L., Justice, CO, and Townshend, JRG. 2013. High-Resolution Global Maps of 21st-Century Forest Cover Change. *Science* 342 (15 November): 850–53. Data available on-line from: <http://earthenginepartners.appspot.com/science-2013-global-forest>. **Oil and gas concessions:** Democratic Republic of the Congo: OpenOil Repository contributors. 2014, "Main Page," OpenOil Repository, [http://repository.openoil.net/w/index.php?title=Main\\_Page](http://repository.openoil.net/w/index.php?title=Main_Page) old id=5258, accessed 27/2/17; Congo: Le Ministère des Hydrocarbures and Société Nationale des Pétroles du Congo. 2016. Congo License Round 2016, Cuvette Basin. [http://media.wix.com/ugd/f80303\\_f4533124bd6d41d09f368f3c67a8c661.pdf](http://media.wix.com/ugd/f80303_f4533124bd6d41d09f368f3c67a8c661.pdf). Accessed 01/8/17. **Mining concessions:** World Resources Institute. n.d. Accessed through Global Forest Watch on 24/02/17. [www.globalforestwatch.org](http://www.globalforestwatch.org) (source date unknown).

## Proposed next steps for analysis

The emphasis of next steps in this briefing note is only on further research and analysis. A dialogue with the Governments and relevant stakeholders will be initiated by UN Environment and the partners to the Global Peatlands Initiative to discuss and develop a roadmap for policy action.

### Ecosystem services

- The current estimate of carbon stocks in the peatland has a high degree of uncertainty attached to it, as for all tropical peatlands. Further field samples (located using the peatland probability in Map 1) to confirm the presence of peat soils, and assess their depth and carbon density, would help to narrow the range.
- To better understand the impact of potential peatland drainage on ecosystem services in the region, it would be useful to develop scenarios of the effects on hydrology, erosion risk, water quality, fire risks and regional climate for this part of the world. Amongst others this might build on the Waterworld model, which estimates the effects of changes in tree cover (rather than in soil moisture holding capacity).

### Biodiversity protection

- The protected area maps for the Democratic Republic of Congo are not as up-to-date as those from Republic of Congo, and capacity building in this area may be desirable.
- If new protected areas are considered as a management response, it may be useful to draw on and update existing gap analyses, such as those developed by the PARAP project for Democratic Republic of Congo.

### Drivers of change

- To better understand the scale of the risk of peatland drainage in this region, a range of research could be carried out. Surveys interviewing concession holders in the region would improve information on market access for palm oil producers and likelihood that they invest in land drainage. Improved maps of suitability for oil palm development, taking the new understanding of peatland distribution into account would help to identify the scale of the theoretical risk. This information could feed into integrated assessment models of land use change that also consider anticipated global demand for products

### Responses

- An assessment of options for protection and sustainable use of the Central Congo Basin peatland region, could inform future policy decisions for government and other stakeholders. This could be underpinned by community surveys to understand the ways in which local people manage peatlands at present, and identify local development priorities and any barriers to conservation.
- A decision support system providing interactive access to the maps presented in this report (and more) could further inform decisions on where to locate new management interventions.

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**The UN-REDD Programme** is the United Nations Collaborative initiative on Reducing Emissions from Deforestation and forest Degradation (REDD) in developing countries. The Programme was launched in September 2008 to assist developing countries to prepare and implement national REDD+ strategies, and builds on the convening power and expertise of the Food and Agriculture Organization of the United Nations (FAO), the United Nations Development Programme (UNDP) and UN Environment.

The **UN Environment World Conservation Monitoring Centre** (UNEP-WCMC) is the specialist biodiversity assessment centre of UN Environment, the world's foremost intergovernmental environmental organisation. The Centre has been in operation for over 35 years, combining scientific research with practical policy advice.

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