

 $\label{eq:Figure S1} Figure \ S1 \ Validation \ of \ reservoir \ storage \ reconstruction \ for \ Lake \ Aswan.$



Figure S2 Annual time series (dash line: significant trends) in combined global reservoir storage (blue line; unit corresponds to left axis), and in storage for Lake Kariba (purple line; unit corresponds to right axis), and Lake Aswan (red line; unit corresponds to right axis).



Figure S3 Trends in reservoir storage (second and fourth column; p<0.05; increasing: blue; no change: grey; decreasing: red; dot sizes correspond to storage capacity; light blue line: main river network; faded yellow shade: selected basins) and grid-based modelled streamflow (first and third column; colour correspond to per cent of linear change overall period) during 1984–2015.



Figure S4 Trends in reservoir storage (first column; p<0.05; increasing: blue; no change: grey; decreasing: red; dot sizes correspond to storage capacity; faded yellow shade: selected regions) and time series of annual average relative total storage volume (light blue shaded), and modelled streamflow (solid red line) indicated with a base period of 1984–1999 (second column).

Table S1 The list of original sources of gauging data (listed in ascending order of number of stations)

National and international sources	The number of	
National and international sources	gauging data	
The United States Geological Survey (USGS) National Water Information		
System (NWIS: <u>https://waterdata.usgs.gov/nwis</u>) and GAGES-II database	9180	
(Falcone (2011))		
The Global Runoff Data Centre (GRDC: <u>http://grdc.bafg.de</u> ; Lehner (2012))	4628	
The HidroWeb portal of the Brazilian Agência Nacional de Águas	2020	
(<u>http://www.snirh.gov.br/hidroweb</u>)	5029	
The European Water Archive (EWA) of EURO-FRIEND-Water	2260	
(<u>http://ne-friend.bafg.de</u>)		
Water Survey of Canada (WSC) National Water Data Archive (HYDAT;	1479	
https://www.canada.ca/en/environment-climate-change)		
The National Center for Atmospheric Research (Dai 2016)	925	
The Australian Bureau of Meteorology (BoM:	776	
http://www.bom.gov.au/waterdata; Zhang et al. (2013))		
The Chilean Center for Climate and Resilience Research (CR2:	521	
http://www.cr2.cl/recursos-y-publicaciones/bases-de-datos/datos-de-caudales)	531	

Table S2 Statistical models to estimate reservoir depth (D: average depth; A: observed extent; S_{100} : average slope around the reservoir).

Reservoir size class by maximum extent (km ²)	Statistical models
0.1-1	$\log_{10} (D) = 0.3826 + 0.1512 \times \log_{10} (A) + 0.4820 \times \log_{10} (S_{100})$
1-10	$\log_{10} (D) = 0.1801 + 0.2985 \times \log_{10}(A) + 0.8473 \times \log_{10} (S_{100})$
10-100	$\log_{10} (D) = 0.0379 + 0.2445 \times \log_{10}(A) + 1.1517 \times \log_{10} (S_{100})$
100-500	$\log_{10} (D) = 0.0123 + 0.2664 \times \log_{10} (A) + 1.1474 \times \log_{10} (S_{100})$

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