Table S1a. Reviewed hydrological regime alteration assessment methods adopted by the 32 EEA member countries and the cooperating countries and their main characteristics (IN: index based on flow indicators; D: descriptive; M: hydrological component only in relation to morphological alteration; Ql, Qualitative; Qn, Quantitative)

a/a	Country	Hydrological regime alteration assessment	Name	Acronym	Authority	Year	Method	quantity and dynamics of flow	connection to groundwaters	Related to EN 14614:2020	Related to EN 15843:2010	3rd RBMP update	Under development
1	Albania	No	-	-	-	-	-	-	-	-	-	-	-
2	Austria	Yes	Austrian Guidance on hydromorphological assessment of rivers	-	Bundesministeriums für Land- und Forstwirtschaft, Umwelt und Wasserwirtschaft (Federal Ministry of Agriculture, Forestry, Environment and Water Management of the Republic of Austria)	2015	IN	Qn	Qn	Yes	-	-	-
3	Belgium						-	-					
	Brussels	Yes	évaluation de la QUALité du milieu PHYsique des cours d'eau	QUALPHY	-	1996	D	Ql	Ql	-	-	-	Yes
	Flemish	Yes	meetnet Hydromorfologie	-	Flemish Environment Agency	-	M	Ql	-	-	-	-	-
	Walloon	Yes	évaluation de la QUALité du milieu PHYsique des cours d'eau (modified)	QUALPHY modified	-	2006	IN	Qn	Qn	Yes	-	-	-
4	Bosnia and Herzegovina	Yes	-	-	Federal Ministry of Environment and Tourism	2022	IN	Qn	-	Yes	Yes	-	-
5	Bulgaria	Yes	Flood Attenuation from Reservoirs and Lakes	FARL	Ministry of Environment and Water of Bulgaria	2023	D	Qn	-	Yes	Yes	Yes	Yes
6	Croatia	Yes	Methodology of monitoring and assessment of hydromorphological indicators	-	-	2016	IN	Qn	-	-	Yes	-	-
7	Cyprus	No	Integrated Pressure Index	IPI	Ministry of Agriculture, Rural Development and Environment, Water Development Department	2014	-	-	-	-	-	-	-
8	Czech Republic	Yes	Work procedure for the determination of significant	-	TG Masaryk Water Management Research Institute	2019	IN	Qn	-	Yes	Yes	Yes	-

a/a	Country	Hydrological regime alteration assessment	Name	Acronym	Authority	Year	Method	quantity and dynamics of flow	connection to groundwaters	Related to EN 14614:2020	Related to EN 15843:2010	3rd RBMP update	Under development
			effects on morphology and hydrological regime										
9	Denmark	No	Dansk fysisk indeks (Danish Physical Index)	DFI	Aarhen University	2016	-	-	-	-	-	-	Yes
10	Estonia	Yes	hüdromorfoloogilise seisundi hinnang-HÜMO hinnang	HYMO EST	Keskkonnaministeerium -KEM	2019	IN	Qn	-	-	Yes	Yes	-
11	Finland	Yes	HyMo method (Kevomu-menetelmä)	-	The Finnish Environment Institute-SYKE	2019	IN	Qn	-	-	-	-	Yes
12	France												
	metropolitan France	Yes	SYstème Relationnel d'Audit de l'Hydromorphologie des Cours d'Eau – Relational System of watercourse Hydromorphology Auditing	SYRAH-CE	Not available	2014	IN	Qn	Ql	-	-	-	-
	ultra-peripheral regions of France	Yes	Référentiel hydromorphologique ultra-marin/Overseas hydromorphological repository	RHUM	Not available	2014	IN	Qn	Ql	-	-	-	-
13	Germany	Yes	LAWA-Klassifizierung des Wasserhaushalts von Einzugsgebieten und Wasserkφrpern	-	Not available	2017	IN	Qn	Qn	-	-	-	-
14	Greece	Yes	Methodology for the determination and the assessment of hydromorphological alteration	-	Ministry of Environment and Energy-Special Secretariat for Water	2016	IN	Qn	-	-	-	-	Yes
15	Hungary	Yes	Assessment of the hydromorphological condition of watercourses and standing waters	-	General Directorate of Water Management of Hungary-Országos Vízügyi Főigazgatóság (OVF)	2021	IN	Qn	-	Yes	-	Yes	-
16	Iceland	Yes	Hydromorphological quality factors of streams and lakes	-	Icelandic Meteorological Office	2021	IN	Qn	-	-	-	-	Yes
17	Republic of Ireland	Yes	Morphological Quality Index-Ireland	MQI-Ireland	Environmental Protection Agency	-	M	Ql	-	-	-	Yes	Yes
18	Italy	Yes	Indice di Alterazione del Regime	IARI	Not available	2011	IN	Qn	-	-	-	-	-

a/a	Country	Hydrological regime alteration assessment	Name	Acronym	Authority	Year	Method	quantity and dynamics of flow	connection to groundwaters	Related to EN 14614:2020	Related to EN 15843:2010	3rd RBMP update	Under development
			Idrologico/Hydrological Regime Alteration Index										
19	Kosovo	No	-	-	-	-	-	-		-	-	-	-
20	Latvia	Yes	Summary of methods for determining the significance of loads	-	LVĜMC-Latvian Environmental, Geological and Meteorological Centre	2021	IN	Qn	-	-	Yes	Yes	-
21	Liechtenstein	No	Management plan and program of measures according to the Water Framework Directive	-	Office for the Environment	2019	-	-		-	-	-	-
22	Lithuania	Yes	Upės Hidromorfologinis Indeksas-River Hydromorphological index	UHMI-RHMI	Ministry of the Environment of the Republic of Lithuania	2021	IN	Qn	-	Yes	-	Yes	-
23	Luxembourg	Yes	OWKwater balance	-	Administration de la gestion de l'eau (AGE)-Administration of the water management	2022	IN	Qn	Qn	-	-	Yes	-
24	Malta	No	-	-	-	-	-	-	-	-	-	-	-
25	Montenegro	Yes	-	-	Institute for Hydrometeorology and Seismology of Montenegro	2022	IN	Qn	-	Yes	Yes	-	-
26	Netherlands	Yes	Handbook of hydromorphology 2.0-Handboek hydromorfologie 2.0	-	-	2013	IN	Ql	Ql	-	-	-	-
27	North Macedonia	No	-	-	Ministry of Environment and Spatial Planning	2021	-	-	-	-	-	-	-
28	Norway	Yes	Proposal for a method for classifying hydromorphological conditions in Norwegian rivers-Forslag til metode for klassifisering av hydromorfologisk tilstand i norske elver	-	SINTEF	2018	IN	Qn	-	Yes	Yes	-	-
29	Poland	No	Hydromorfologicznego Indeksu Rzecznego-	HIR	-	2017	-	-	-	-	-	-	-

a/a	Country	Hydrological regime alteration assessment	Name	Acronym	Authority	Year	Method	quantity and dynamics of flow	connection to groundwaters	Related to EN 14614:2020	Related to EN 15843:2010	3rd RBMP update	Under development
			Hydromorphological Index for Rivers										
30	Portugal	No	River Habitat Survey/Hydromorphological Quality Index for Large Rivers	RHS/IQHGR	-	2003	-	-	-	-	-	-	-
31	Romania	Yes	Romanian Hydromorphological Assessment methodology	HYMO_RO	National Institute of Hydrology and Water Management (NIHWM)	2021	IN	Qn	Qn	Yes	-	Yes	-
32	Serbia	No	-	-	Environmental Protection Agency-Ministry of Environmental Protection of Serbia	-	-	-	-	-	-	-	-
33	Slovakia	Yes	Hodnotenie hydromorfologickej kvality tokov-Evaluation of the hydromorphological quality of streams	HYMOK	SHMÚ	2019	IN	Qn	-	Yes	Yes	-	Yes
34	Slovenia	No	Slovenian hydromorphological assessment methodology	SIHM	-	-	-	-	-	-	-	-	-
35	Spain	Yes	Protocol for the hydromorphological characterization of water bodies	-	Ministry for the Ecological Transition	2019	IN	Qn	Ql	-	-	Yes	-
36	Sweden	Yes	The Swedish Agency for Marine and Water Management regulations on classification and environmental quality standards regarding surface water	-	Swedish Agency for Marine and Water Management	2019	IN	Qn	-	-	-	-	-
37	Switzerland	Yes	"Hydrology – flow regime" module at level R (region)	HYDMOD-R	Federal Office for the Environment (OFEV)	2011	IN	Qn	-	-	-	-	-
38	Turkey	Yes	-	-	Ministry of Agriculture and Forestry	2023	IN	Qn	Ql	-	-	-	Yes

Table S1b. Reviewed hydrological regime alteration assessment methods adopted by the 32 EEA member countries and the cooperating countries and their main characteristics (ND: not determined; IN: index based on flow indicators; D: descriptive; M: hydrological component only in relation to morphological alteration; Ql, Qualitative; Qn, Quantitative; Component: 1: Average flows, 2: Low flows, 3: High flows; Indicators: see footnote; Indicator group: 1: Magnitude, 2: Frequency, 3: Duration, 4: Timing, 5: Rate of change; Pressures identified: 1: Flow diversion, 2: Abstractions, 3: Hydropeaking, 4: Channel interventions, 5: Large scale interventions; Biological element: 1: Ichthyofauna, 2: Macrozoobenthos/Benthic fauna, 3: Macrophytes)

a/a	Country	Temporal scale	Length (minimum)	River typology	Information source	Reference conditions estimation	Component	Indicator	Indicator group	Classification scheme	Pressures identified	Link to ecology	Biological element	Software Tool/Protocol
1	Albania	-	-	-	-	-	-	-	-	-	-	-	-	-
2	Austria	D, M, A	ND	Yes	1	ND	1, 2	Qm, Qal, Qdl	1	2-class	2, 3, 4	Yes	1	HyDaMS (not publicly available)
3	Belgium													
	Brussels	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-
	Flanders	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-
	Wallonia	ND	ND	ND	5	ND	ND	D	1	3-class/2-class	1, 2, 4	ND	ND	-
4	Bosnia and Herzegovina	H, D	ND	ND	1, 3, 4	ND	1	Qd, Qs	1	5-class	1, 2, 3, 4	ND	ND	-
5	Bulgaria	ND	ND	ND	ND	ND	ND	ND	ND	5-class	1, 3, 5	ND	ND	-
6	Croatia	H, D	ND	ND	1, 3, 4, 5	1	1, 2, 3	Qd, N%	1	5-class/3-class	1, 2, 3, 4, 5	ND	ND	-
7	Cyprus		-	-	-	-	-	-	-	-	-	-	-	-
8	Czech Republic	M	15y	ND	1, 2	3	1, 2, 3	Qa	1, 4, 5	5-class	1, 2, 3, 4	Yes	1, 2, 3	-
9	Denmark	-	-	-	-	-	-	-	-	-	-	-	-	-
10	Estonia	A	ND	ND	1, 4	ND	1	Qa	1	5-class	2, 5	ND	ND	-
11	Finland	D	10y	Yes	1	ND	1, 3	MQ, HQvrk-NQvrk, MHQ	1, 2, 4	5-class	2, 4, 5	Yes	1, 2	-
12	France													
	metropolitan France	D	ND	Yes	1, 3, 4	2	2, 3	ND	1	3-class low flow/4-class high flow	2, 5	ND	ND	AURAH-CE (AUdit RApide de l'Hydromorphologie des Cours d'Eau)
	overseas regions of France	D	ND	Yes	1, 3, 4	2	1, 2, 3	ND	1, 2, 3, 4	3-class	1, 2, 5	ND	ND	-
13	Germany	ND	ND	ND	1, 4	2	1, 2	Qa, Qal	1	5-class	1, 2, 3, 4, 5	ND	ND	-

a/a	Country	Temporal scale	Length (minimum)	River typology	Information source	Reference conditions estimation	Component	Indicator	Indicator group	Classification scheme	Pressures identified	Link to ecology	Biological element	Software Tool/Protocol
14	Greece	M	ND	ND	1	4	1, 2, 3	Qmm, Qmmax, Qmmin	1	5-class	1, 2, 4, 5	No	No	-
15	Hungary	M	30y	Yes	1	ND	1, 2, 3	Qaug80%, La, Ld	1, 3	5-class/3-class	1, 2, 3	Yes	1, 2	-
16	Iceland	H, D, W, A	10y	Yes	1, 2	1, 3, 5	1, 2, 3	Qam, Qwmls/Q95, Qwmlw/Q95, F2, F10, F33	1, 2	5-class	1, 3, 4	Yes	ND	COSH-Tool
17	Republic of Ireland	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
18	Italy	D, M	5y (current), 20y (natural flow)	ND	1, 2	1, 3	1, 2, 3	Q25, Q75	1, 2, 3, 4, 5	3-class	1, 2, 5	No	No	IHA
19	Kosovo	-	-	-	-	-	-	-	-	-	-	-	-	-
20	Latvia	ND	30y	ND	1	1, 5 (maps)	1, 2	ND	1	3-class	ND	No	No	-
21	Liechtenstein	-	-	-	-	-	-	-	-	-	-	-	-	-
22	Lithuania	ND	ND	ND	ND	ND	1, 2	ND	1	4-class	1, 2, 3, 4	No	No	-
23	Luxembourg	ND	ND	ND	1, 4	2	1, 2	Qa, Qal	1	5-class	1, 2, 3, 4, 5	No	No	HyMo2020 GIS Application
24	Malta	-	-	-	-	-	-	-	-	-	-	-	-	-
25	Montenegro	H, D	ND	ND	1, 3, 4	ND	1	Qd, Qs	1	5-class	1, 2, 3, 4	No	-	-
26	Netherlands	H	ND	Yes	1, 2, 4	ND	1	Qd	1, 2, 5	2-class/3-class/5-class	ND	No	No	-
27	North Macedonia	-	-	-	-	-	-	-	-	-	-	-	-	
28	Norway	H, D, W, A	20y (10 before-10 after regulation)	ND	1, 2	1, 3, 5	1, 2, 3	Qam, Qwmls/Q95, Qwmlw/Q95, F2, F10, F33	1, 2	5-class/3-class	1, 3, 4	Yes	ND	COSH-Tool
29	Poland	-	-	-	-	-	-	-	-	-	-	-	-	-
30	Portugal	-	-	-	-	-	-	-	-	-	-	-	-	-
31	Romania	A	1y, 6y	ND	1, 2	1, 4	1, 3	Qa, Qac, Qmc	1	5-class	1, 2, 3	Yes	ND	-

a/a	Country	Temporal scale	Length (minimum)	River typology	Information source	Reference conditions estimation	Component	Indicator	Indicator group	Classification scheme	Pressures identified	Link to ecology	Biological element	Software Tool/Protocol
32	Serbia	-	-	-	-	-	-	-	-	-	-	-	-	-
33	Slovakia	D, M	20y	Yes	1	1	1, 2, 3	Q5, Q10, Q20, Q50, Q355	1, 2, 3, 5	3-class	1, 2, 3, 4	No	No	-
34	Slovenia	-	-	-	-	-	-	-	-	-	-	-	-	-
35	Spain	M, A	Since 1980	Yes	1	1, 3	1, 2, 3	Qm, Qa, Qdmax, N	1, 2, 3, 4, 5	4-class	1, 2, 3, 4, 5	No	No	IAHRIS
36	Sweden	ND	ND	ND	ND	ND	1	Qsp, Qvd, Qdrch, WLdrch	1	5-class	ND	No	No	-
37	Switzerland	D, M, A	5-10y	ND	1, 4,	ND	1, 2, 3	Qm, Qa, Pk, Qdmax, Qd, Q347, Qdmax, Qdmin, etc	1, 2, 4, 5	5-class	ND	No	No	HYDMOD-FIT
38	Turkey	M, A	ND	ND	1, 4	ND	1	Qa, Qam, Da	1, 5	5-class	3, 4	No	No	-

Indicators:

Qm average monthly flow

Qa average annual flow

Qam median annual flow

Qal average annual low flow

Qd average daily flow

Qdl average daily low flow

Qdmax average daily maximum flow

Qdmin average daily minimum flow

Qmm median monthly flow

Qmmax maximum monthly flow

Qmmin minimum monthly flow

Qs average seasonal flow

Qwmls	7-day period with the lowest median water flow-summer
Qwmlw	7-day period with the lowest median water flow-winter
Q95	the level of flow at the point of measurement exceeded for 95% of the time over a ten year period
Qac	Average flow consumed
Qmc	Maximum captured flow
N	Number of times the maximum ordinary flood has been exceeded since October 1980
DM	Median flow
DCE	characteristic low flow
DCC	characteristic flood flow
N%	Percentage (%) of days in which the flow is different from the natural
MQ	Change in mean flow
HQvrk-NQvrk	Change in the daily variation of the flow
MHQ	Flood peaks transition or middle overflowgrowth
Qaug80%	80% of the average flow in August
La	average level of peaking
Ld	length of effect of peaking
F2	Flood of 2-year return period
F10	Flood of 10-year return period
F33	Flood of 33-year return period
Qsp	Specific flow effect
Qvd	Volume deviation
Qdrch	relative deviation rate of change of flow
WLdrch	rate of change of the water level
Pk	Parde coefficients

D_a	average water depth

Table S2a. Reviewed global hydrological regime alteration assessment methods (IN: index based on flow indicators; D: descriptive; M: hydrological component only in relation to morphological alteration; Ql, Qualitative; Qn, Quantitative)

a/a	Country	Name	Acronym	Authority	Year	Method	quantity and dynamics of flow
1	USA	Range of Variability Approach	RVA	US Nature Conservancy	1996	IN	Qn
2	Scotland	Dundee Hydrological Regime Alteration Method	DHRAM	Sniffer-Scotland & Northern Ireland Forum for Environmental Research	2000	IN	Qn
3	Spain	Index of Global Alteration	IGA	-	2010	IN	Qn
4	South Africa	Hydrological Driver Assessment Index	HAI	Department of Water and Sanitation, Republic of South Africa	2016	IN	Qn
5	Taiwan	Histogram Matching Approach	HMA	-	2008	IN	Qn
6	China	Histogram Comparison Approach	HCA	-	2017	IN	Qn
7	Finland	River Impact Index	RI	-	2014	IN	Qn
8	Australia	River Disturbance Index	RDI	-	2002	IN	Qn
9	Victoria, Australia	Index of Stream Condition	ISC	Centre for Environmental Applied Hydrology, University of Melbourne	1999	IN	Qn
10	Australia	Hydrological Disturbance Index	HDI	National Land and Water Resources Audit Office	2001	IN	Qn
11	Victoria, Australia	Flow Stress Ranking	FSR	Department of Sustainability and Environment	2005	IN	Qn
12	Murray-Darling Basin, Australia	Sustainable Rivers Hydrology Index	SR-HI	Murray-Darling Basin Commission	2004	IN	Qn
13	Tasmania, Australia	Hydrology Sub-Index Tasmanian River Condition Index	HSI-TRCI	NRM South	2009	IN	Qn
14	China	Chinese Hydrology and Water Resources Index	HD	-	2011	IN	Qn
15	China	Index of Flow Health	IFH	-	2012	IN	Qn
16	Italy	Index of Daily Hydrological Alteration	IDHA	-	2012	IN	Qn
17	China	Alteration of the HYT order	HYT	-	2015	IN	Qn
18	South Korea	Eco-index	-	-	2014	IN	Qn
19	Pan-European	Ecological Risk due to Flow Alteration	ERFA	-	2014	IN	Qn

a/a	Country	Name	Acronym	Authority	Year	Method	quantity and dynamics of flow
20	-	River Regulation Index	RRI	-	2014	IN	Qn
21	USA	Hydroecological Integrity Assessment Process	HIP	USGS	2006	IN	Qn
22	USA	Effective Degree of Regulation	EDOR	-	2017	IN	Qn
23	England & Wales	The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015	-	Environment Agency	2015	IN	Qn
24	North Ireland	The Water Framework Directive (Classification, Priority Substances and Shellfish Waters) Regulations (Northern Ireland) 2015	-	Department of the Environment (Northern Ireland)	2015	IN	Qn
25	Scotland	The Scotland River Basin District (Standards) Directions 2014	-	Scottish Environment Protection Agency	2014	IN	Qn
26	-	Hydro-Morphological Quality Index	HMQI	-	2016	IN	Qn/Ql
27	United Kingdom	Lotic-invertebrate Index for Flow Evaluation	LIFE	-	1999	IN	Qn
28	Canada	Canadian Ecological Flow Index	CEFI	-	2011	IN	Qn
29	Greece	Hellenic Flow Index	ELF	-	2020	IN	Qn
30	USA	Flow duration curves	FDC	-	2007	IN	Ql
31	USA	Hydrologic Condition Assessment	HCA	-	2000	IN	Ql
32	Canada	Flow Duration Curve Index	FDCI	-	2013	IN	Qn
33	Southern California, USA	Hydrologic Alteration Index	HAI	-	2017	IN	Qn
34	EU	Hydrological status	HS	-	2011	IN	Qn
35	Mexico	Mexican standard-Hydrologic alteration indexes	HAI	-	2012	IN	Qn
36	-	Hydropeaking	HP	-	2014	IN	Qn
37	Turkey	Hydrology sub-index	HI	-	2021	IN	Qn
38	-	Dynamic Flow Alteration Indices	DFAI	-	2022	IN	Qn

Table S2b. Reviewed global hydrological regime alteration assessment methods (ND: not determined; Component: 1: Average flows, 2: Low flows, 3: High flows; Indicator group: 1: Magnitude, 2: Frequency, 3: Duration, 4: Timing, 5: Rate of change; Pressures identified: 1: Flow diversion, 2: Abstractions, 3: Hydropeaking, 4: Channel interventions, 5: Large scale interventions; Biological element: 1: Ichthyofauna, 2: Macrozoobenthos/Benthic fauna, 3: Macrophytes)

a/a	Acronym	Temporal scale	Length (minimum)	River typology	Information source	Reference conditions estimation	Classification scheme	Component	Indicator	Indicator group	Pressures identified	Link to ecology	Biological element	Tool
1	RVA	D	20y	No	1, 2	1, 2, 3, 4, 5	3-class	1, 2, 3	32 Q parameters	1, 2, 3, 4, 5	ND	No	No	IHA
2	DHRAM	D	20y	No	1, 2	1, 3	5-class	1, 2, 3	32 Q parameters	1, 2, 3, 4, 5	ND	No	No	IHA
3	IGA	D, M	15y	No	1, 2	1, 3	5-class	1, 2, 3	32 Q parameters, 21 indexes	1, 2, 3, 4, 5	ND	No	No	IAHRIS
4	HAI	D, M	ND	No	1, 2	1, 3	6-class	1, 2, 3	70% percentile, ratio from the max to min mean baseflow month	1, 2, 3, 4, 5	ND	No	No	
5	HMA	D, M	20y	No	1, 2	1, 3	2-class	1, 2, 3	32 Q parameters	1, 2, 3, 4, 5	ND	No	No	
6	HCA	D, M	20y	No	1, 2	1, 3	ND	1, 2, 3	32 Q parameters	1, 2, 3, 4, 5	ND	No	No	
7	RI	M	ND	No	ND	ND	5-class	1	MIF (Magnitude Impact Factor), TIF (Timing Impact Factor) and VIF (Variation Impact Factor)	1, 4, 5	ND	No	No	
8	RDI	ND	ND	No	4	ND	8-class	ND	ND	ND	ND	No	No	GIS
9	ISC	M	5y minimum	No	1, 2	2, 3	5-class	ND	Amended Annual Proportional Flow Deviation; Daily flow variation due to change of catchment permeability; Daily flow variation due to peaking hydroelectricity generation	ND	1, 3, 5	Yes	2	
10	HDI	M	ND	No	1, 2	1, 2	5-class	1, 2, 3	mean annual flow index, flow duration curve difference index, seasonal amplitude index (SA), seasonal period index (SP)	1, 4, 5	1, 2	No	No	
11	FSR	D, M	15y minimum	No	1, 2, 3, 4, 5	2, 3	ND	1, 2, 3	Low Flow Index, High Flow Index, Proportion of Zero Flow Index, Seasonal Period Index	1, 4	ND	No	No	

a/a	Acronym	Temporal scale	Length (minimum)	River typology	Information source	Reference conditions estimation	Classification scheme	Component	Indicator	Indicator group	Pressures identified	Link to ecology	Biological element	Tool
12	SR-HI	M	15y	No	1, 2	3	5-class	1, 2, 3	High-Flow Events, HFE, Low- and Zero-Flow Events, LZFE, Variability, V, Seasonality, S, Gross Volume, GV	1, 4, 5	ND	No	No	
13	HSI-TRCI	D	15y minimum	No	1, 2	3	5-class	1, 2, 3	Mean Annual Flow Index (MAF), Flow Duration index (FD), Variation Index (CV), Seasonal Amplitude Index (SA), Seasonal Period Index (SP), High Flow Index (HF), High Flow Spells Index (HFS), Low Flow Index (LF), Low Flow Spells Index (LFS), Proportion of Zero, Flows Index (PZ), Overbank Flows Index (OF), Overbank Spells Index (OFS)	1, 2, 3, 4, 5	ND	No	No	
14	HD	D, M	ND	No	1, 2	3	8-class	1, 2	Amended Annual Proportion of Flow Deviation indicator (AAPFD)	1	ND	No	No	
15	IFH	D, M	10y	No	1, 2	3	5-class	1, 2, 3	High Flow (HF), Low Flow (LF), Highest Monthly (HM), Lowest Monthly (LM), Persistently Higher (PH), Persistently Lower (PL), Persistently Very Low (PVL), Seasonality Flow Shift (SFS) and Flood Flow Interval (FFI).	1, 2, 3, 4, 5	ND	No	No	Software Flow Health v3.0.0
16	IDHA	D	ND	No	1, 2	3	ND	1	Qd	1	ND	No	No	
17	HYT	D	ND	No	1, 2	3	ND	1, 2, 3	32 Q parameters	1, 2, 3, 4, 5	ND	No	No	IHA
18	-	D	ND	No	ND	ND	3-class	1, 2, 3	32 Q parameters	1, 2, 3, 4, 5	ND	No	No	IHA
19	ERFA	D	ND	No	ND	ND	4-class	1, 2, 3	32 Q parameters	1, 2, 3, 4, 5	ND	No	No	IHA

a/a	Acronym	Temporal scale	Length (minimum)	River typology	Information source	Reference conditions estimation	Classification scheme	Component	Indicator	Indicator group	Pressures identified	Link to ecology	Biological element	Tool
20	RRI	ND	ND	No	ND	ND	ND	ND	storage volume of any reservoir upstream of river reach, the total number of reservoirs upstream of river reach and the natural average discharge volume per year at river reach	ND	1, 2	No	No	-
21	HIP	D	10-25y	Yes	1, 2	1, 3	ND	1, 2, 3	171 indices	1, 2, 3, 4, 5	ND	No	No	HIT, NATHAT, NJSCT, NJHAT
22	EDOR	ND	ND	No	ND	ND	ND	ND	Reservoir storage capacities and annual discharge (measured or estimated) Reservoir operation (volume of water released and stored)	ND	ND	No	No	
23	-	D, M	10y	No	1	ND	2-class	2	Q95	1	2, 5	No	No	No
24	-	D	ND	Yes	1	ND	4-class	1, 2, 3	Q95, Q70, Q60	1	ND	No	No	No
25	-	D	ND	Yes	1	ND	4-class	1, 2, 3	Q95, Q70, Q60	1	ND	Yes	1	No
26	HMQI	D, M	ND	No	ND	ND	5-class	1, 2	Q1.5-Q10	ND	1, 3, 4	No	No	
27	LIFE	D	ND	No	1	ND	ND	ND	macroinvertebrate abundance	ND	ND	Yes	2	
28	CEFI	ND	ND	No	1	ND	ND	ND	macroinvertebrate Relative frequency, Relative abundance, Current velocity optimum value, Indicator weight score	ND	ND	Yes	2	
29	ELF	ND	ND	No	1	ND	5-class	ND	macroinvertebrate Relative richness, Relative abundance	ND	ND	Yes	2	
30	FDC	D	ND	No	1	ND	8-class	ND	ND	ND	ND	No	No	
31	HCA	D	ND	No	1, 4, 5	ND	ND	ND	ND	ND	5	No	No	
32	FDCI	H, D	20y	No	1, 2	1, 3	3-class	1, 2, 3	Qmm, Q95	1, 2, 3, 4, 5	ND	No	No	SAAS v.4.1

a/a	Acronym	Temporal scale	Length (minimum)	River typology	Information source	Reference conditions estimation	Classification scheme	Component	Indicator	Indicator group	Pressures identified	Link to ecology	Biological element	Tool
33	HAI	H, D	5y	Yes	1, 2	2	4-class	1, 2, 3	39 flow metrics	1, 2, 3, 4, 5	ND	No	No	
34	HS	M	5y	Yes	1, 2	1, 3	4-class	1, 2	Flow permanence, or Mf, Pool permanence, or Mp , Dry channel permanence, or Md , Six-month predictability of zero flow periods, or Sd6, Summer-winter seasonality, or Sws, Equinox-solstice seasonality, or ESs	1, 2, 3, 4	ND	No	No	
35	HAI	D	20y	No	1	1	2-class	1	monthly and annual percentiles 10 and 90	1	1, 2, 3	No	No	
36	HP	H	ND	No	1	ND	3-class	1	HP1, HP2	1, 5	3	No	No	
37	HI	M	3y	No	1	ND	4-class	1	Froude number (Fr)	1, 5	ND	No	No	
38	DFAI	ND	ND	No	ND	ND	ND	1	ND	1, 4	1, 3	No	No	

Table S3. Reviewed global hydrological regime alteration assessment methods-Number of primary reference citations

a/a	Methodology	Acronym	Scopus	Web of Science	Google Scholar	ResearchGate	Journal metrics	Median	Year	Reference
1	Range of Variability Approach	RVA	475	396	759	257	380	396	1998	[94]
2	Dundee Hydrological Regime Alteration Method	DHRAM	88	79	154	115	78	88	2005	[101]
3	Index of Global Alteration	IGA	26	24	37	39	26	26	2012	[103]
4	Hydrological Driver Assessment Index	HAI	-	-	7	11	-	9	2007	[105]
5	Histogram Matching Approach	HMA	75	72	97	93	70	75	2008	[106]
6	Histogram Comparison Approach	HCA	11	12	12	13	11	12	2017	[107]
7	River Impact Index	RI	53	48	71	62	53	53	2014	[108]
8	River Disturbance Index	RDI	105	101	187	158	105	105	2002	[109]
9	Index of Stream Condition	ISC	243	170	462	328	256	256	1999	[111]
10	Hydrological Disturbance Index	HDI	62	55	87	87	52	62	2007	[113]
11	Flow Stress Ranking	FSR	2	-	4	3	-	3	2011	[115]
12	Sustainable Rivers Hydrology Index	SR-HI	46	2	164	45	-	46	2008	[116]
13	Hydrology Sub-Index Tasmanian River Condition Index	HSI-TRCI	10	-	10	-	-	10	2009	[117]
14	Chinese Hydrology and Water Resources Index	HD	4	-	7	-	-	6	2011	[118]
15	Index of Flow Health	IFH	5	-	14	-	-	10	2012	[119]
16	Index of Daily Hydrological Alteration	IDHA	33	30	40	36	33	33	2012	[120]
17	Alteration of the HYT (hydrologic year types) order	HYT	28	26	31	32	24	28	2015	[121]
18	Eco-index	-	20	17	26	23	17	20	2014	[122]
19	Ecological Risk due to Flow Alteration	ERFA	72	65	100	95	69	72	2014	[100]
20	River Regulation Index	RRI	90	88	130	116	90	90	2014	[123]
21	Hydroecological Integrity Assessment Process	HIP	79	-	162	98	-	98	2006	[125]
22	Effective Degree of Regulation	EDOR	183	162	251	218	183	183	2017	[126]
23	The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015	-	13	-	10	-	-	12	2015	[128]
24	The Water Framework Directive (Classification, Priority Substances and	-	1	-	-	-	-	1	2015	[129]

a/a	Methodology	Acronym	Scopus	Web of Science	Google Scholar	ResearchGate	Journal metrics	Median	Year	Reference
	Shellfish Waters) Regulations (Northern Ireland) 2015									
25	The Scotland River Basin District (Standards) Directions 2014	-	5	-	11	-	-	8	2014	[130]
26	Hydro-Morphological Quality Index	HMQI	42	-	67	30	-	42	2016	[131]
27	Lotic-invertebrate Index for Flow Evaluation	LIFE	241	235	417	274	215	241	1999	[136]
28	Canadian Ecological Flow Index	CEFI	50	49	89	62	43	50	2011	[133]
29	Hellenic Flow Index	ELF	11	10	17	17	11	11	2020	[135]
30	Flow duration curves	FDC	385	350	684	562	329	385	1994	[138]
31	Hydrologic Condition Assessment	HCA	-	3	16	-	-	10	2000	[139]
32	Flow Duration Curve Index	FDCI	-	-	10	-	-	10	2013	[141]
33	Hydrologic Alteration Index	HAI	25	22	34	29	18	25	2018	[143]
34	Hydrological status	HS	96	93	143	133	84	96	2012	[144]
35	Mexican standard-Hydrologic alteration indexes	HAI	10	9	11	15	10	10	2020	[146]
36	Hydropeaking	HP	45	42	59	60	43	45	2015	[149]
37	Hydrology sub-index	HI	2	2	8	3	2	2	2021	[150]
38	Dynamic Flow Alteration Indices	DFAI	1	2	4	5	2	396	1998	[151]

Table S4a. Software tools used in hydrological regime alteration studies

a/a	Name	Acronym	Country	Developer	Method associated	Related to WFD
01	Indicators of Hydrologic Alteration	IHA	USA	The Nature Conservancy (TNC)	RVA	No
02	Indicators of Hydrologic Alteration in RIverS	IAHRIS	Spain	Spanish Ministry of the Environment/ Polytechnic University of Madrid	IGA	Yes
03	Hydrologic Index Tool	HIT	USA	USGS	HIP	No
04	National Hydrologic Assessment Tool	NATHAT				
05	Flow Health	FH	China	International WaterCentre, Fluvial Systems Pty and Yorb Pty Ltd	IFH	No
06	River Analysis Package	RAP	Australia	eWater CRC	FDC	No
07	Streamflow Analysis and Assessment Software	SAAS	Canada	Ministry of Natural Resources and Forestry of Canada	FDCI	No
08	Temporary Rivers Ecological and Hydrological Status	TREHS	Europe	IDAEA-CSIC	HS	Yes
09	Hydrology – flow regime module-FIT	HYDMOD-FIT	Switzerland	Federal Office for the Environment (BAFU/OFEV)	HYDMOD	No
10	Computational Tool for the Characterization of Rapid Fluctuations in Flow and Stage	COSH-Tool	Norway	SINTEF Energy	hydropeaking	No
11	Indicators of Short-Term Hydrological Alteration	InSTHAn	Spain	Universidad Politécnica de Madrid, Umeå University	hydropeaking	No
12	-	GeoTools	USA	Engineering Research Center, Colorado State University	-	No
13	hydrologic alteration and environmental flow assessment	Hydra-Eflow	Mexico	Instituto Interamericano de Tecnología y Ciencias del Agua; Institut national de recherche pour l'agriculture, l'alimentation et l'environnement	IAHRIS/IGA or Mexican standard Hydrologic alteration indexes/HAI	No

Table S4b. Software tools used in hydrological regime alteration studies (continued)

a/a	Acronym	Latest Version	Free/Open source	Operating system/ programming language (when available)	Site	Reference
01	IHA	7.1	Yes (agreement prior to downloading to the terms and conditions of a license agreement)	Windows executable; R; Python	https://www.conservationgateway.org/ConservationPractices/Freshwater/EnvironmentalFlows/MethodsandTools/IndicatorsofhydrologicAlteration/Pages/indicators-hydrologic-alt.aspx	[94,152,153,156]
02	IAHRIS	3.0	Yes	Windows executable	http://www2.montes.upm.es/dptos/digfa/	[104]
03	HIT	1.4	Yes	Windows executable; R; Matlab	https://www.sciencebase.gov/catalog/item/5387735ee4b0aa26cd7b5461	[22,125,154,155]
04	NATHAT	3.4				
05	FH	3.0	Yes	Windows executable	https://www.watercentre.org/resources/flow-health-hydrology-assessment-tool/	[119]
06	RAP	3.0.8	Yes (registration required)	Windows executable	https://toolkit.ewater.org.au/Tools/RAP	[157]
07	SAAS	4.1	Yes (password send after personal communication)	Windows executable	https://people.trentu.ca/~rmetcalfe/SAAS.html	[140]
08	TREHS	-	Yes (email required)	Windows executable	http://www.lifetrivers.eu/products/trehs-software/	[158,159]
09	HYDMOD-FIT	1.1.0.1	Yes	Windows executable; .NET Framework; Microsoft Office	https://modul-stufen-konzept.ch/en/hydrology/	[89]
10	COSH-Tool	2016	Yes (after agreement with SINTEF Energy Research)	Windows executable/Python	https://www.fithydro.wiki/index.php/COSH-tool	[160]
11	InSTHAn	-	No	Windows executable, Linux, Macintosh/Matlab	-	[161]
12	GeoTools	4.0	Yes	Windows executable/ Microsoft Office/Visual Basic	http://www.engr.colostate.edu/~bbledsoe/GeoTool/	[162]

13	Hydra-Eflow	1.0	Yes	Windows executable/ Matlab Runtime	https://drive.google.com/drive/folders/1nmbrRRH-YUaYN-XgjRbqE9730-gKebIH	[163]