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GUIDANCE DOCUMENT

DELINEATION OF SURFACE WATER BODIES, REFERENCE CONDITIONS AND CLASSIFICATION SYSTEMS IN GEORGIA

USAID GOVERNING FOR GROWTH (G4G) IN GEORGIA

29 FEBRUARY 2016

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ACRONYMS

AQEM	"The Development and Testing of an Integrated Assessment System for the Ecological Quality of Streams and Rivers throughout Europe using Benthic Macroinvertebrates" EU Project.
AWB	Artificial Water Body
CIS	Common Implementation Strategy
DEM	Digital Elevation Model
EPIRB	Environmental Protection of International River Basins Project
EQR	Ecological Quality Ratios
EU	European Union
G4G	Governing for Growth in Georgia
GEP	Good Ecological Potential
GES	Good Ecological Status
GIS	Geographic Information Systems
HMWB	Heavily Modified Water Body
ICPDR	International Commission for the Protection of the Danube River
MEP	Maximum Ecological Potential
NEA	National Environmental Agency of Georgia
NWP	National Water Partnership of Georgia
OECD	Organisation for Economic Cooperation and Development
RBD	River Basin District
RBMP	River Basin Management Plan
UNECE	United Nations Economic Commission for Europe
USAID	United States Agency for International Development
UWWT	Urban Waste Water Treatment
WB	Water Bodies
WFD	Water Framework Directive

CONTENTS

EXECUTIVE SUMMARY

To support implementation of the European Union (EU) Water Framework Directive (WFD), a strategy for implementation has been developed. Under this strategy, a set of Guidance Documents were prepared to support member states during the implementation process. Among them, Guidance Documents on identification of water bodies, typology, reference conditions and classification systems were prepared and published.

This Guidance Document contains the synthesis of the outputs from the Common Implementation Strategy (CIS) Guidance Documents. It is also built on the input and feedback from a wide range of experts and stakeholders from EU funded projects conducted in the Caucasus region. The Guidance Document reflects the current situation and conditions in Georgia regarding implementation of the EU WFD. The Guidance Document will support institutions and authorities in Georgia during the preparation of the "Characterization Phase," when River Basin Districts will be subdivided into smaller units called "water bodies." The Guidance Document is not a "cooking book," but gives a clear clue on the steps to be conducted during the first phase of preparation of River Basin Management Plans.

1 INTRODUCTION

1.1 PURPOSE OF THE GUIDANCE DOCUMENT

This Guidance Document is intended to make the complex structure of the WFD easier to understand for enforcement purposes across Georgia, to ensure a uniform approach to implementing the WFD and to avoid any duplication of effort. It is also expected for the Guidance Document to serve as an example for other countries in the Caucasus Region, especially since by providing advance information on the approaches being taken and the content of activities being pursued, it can help to stimulate Caucasus region discussion on the implementation of the Water Framework Directive.

This document seeks to make an important contribution to the unified understanding and implementation of the WFD in the field of surface water body identification, delineation, typology, reference conditions and classification systems.

1.2 SCOPE OF THE GUIDANCE DOCUMENT

The scope of this Guidance Document is based on the discussions with representatives of the Ministry of Environment and Natural Resources Protection (MENRP). It is divided into the following parts:

- Introduction;
- Legal aspects;
- Tasks to implement requirements defined in Article 5, Annex II and V of the Water Framework Directive. Namely, the following tasks are described in the Guidance Document:
    - Surface water identification, typology and delineation (including heavily modified water bodies and artificial water bodies);
    - Principles to establish reference conditions;
    - Principles of ecological status classification systems.

1.3 TO WHOM THE GUIDANCE DOCUMENT IS ADDRESSED

It is expected that a wide range of organisations, stakeholders and individuals will be included using this Guidance Document:

- MENRP;
- Monitoring Agencies (National Environmental Agency of Georgia (NEA), etc.);
- Managers in charge of developing river basin management plans;
- Researchers and consultants;
- The public and a wide range of stakeholders that have developed expertise in specific fields and are involved in water management.

2 LEGAL ASPECTS

It is important to take into account that implementation of Article 5, Annex II and V that is compliant with EU WFD needs to be integrated with river basin planning process, programmes of measures, impact assessment, and ongoing further characterisation as it is illustrated in Fig. 1.

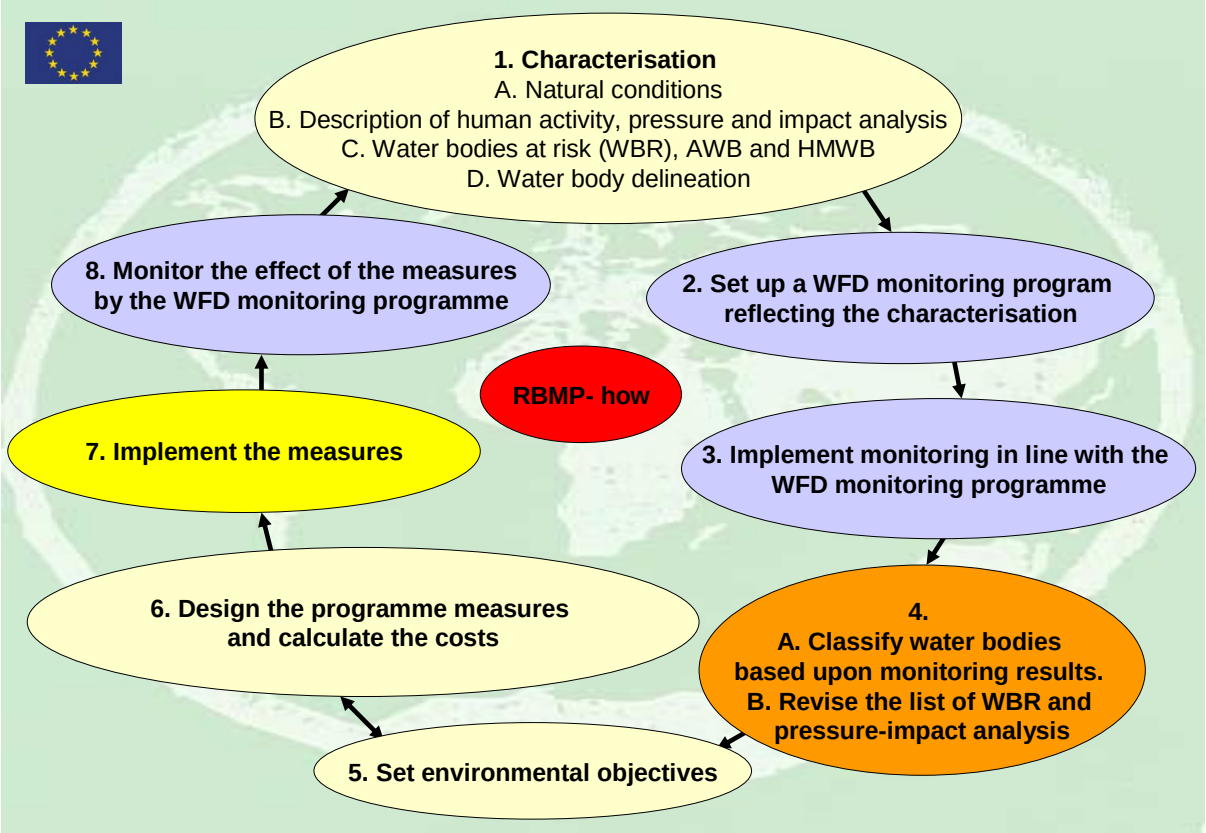

Figure 1: The Water Framework Directive Planning Cycle

2.1 THE WATER FRAMEWORK DIRECTIVE'S REQUIREMENTS

As part of the characterization process for water types in each River Basin District, Article 5 and Annex II of the Water Framework Directive require to undertake an analysis of its characteristics according to the technical specification outlined in Annex II. The initial definition and testing of the typology method for rivers, lakes, and transitional and coastal waters is therefore a priority task in the implementation of the Directive.

This Guidance Document is related and should be read in association with the following documents:

- *EU Directive 2000/60/EC establishing a framework for Community action in the field of water policy (Water Framework Directive);*
- *Guidance Document No 2 Identification of Water Bodies;*
- *Guidance Document No 9 Implementing the Geographical Information System Elements (GIS) of the Water Framework Directive;*
- *Guidance Document No 10 River and lakes – Typology, reference conditions and classification systems;*
- *Guidance document No 5 Transitional and Coastal Waters Typology, Reference Conditions and Classification Systems;*
- *Guidance on establishing reference conditions and ecological status class boundaries for inland surface waters (CIS WG 2.3 REFCOND, 2003).*

Furthermore, results and findings from the several EU funded Research and Development programme projects were used as well.

2.2 NATIONAL LEGISLATION

On the national level, the following documents were used during the development of the Guidance Document:

- *Draft Law of Georgia on Water Resources Management;*
- *Draft Governmental Decree on Approval of the Rules for Identifying Water Bodies and Establishing Boundaries;*
- *Draft Governmental Decree On Approval of the Boundaries of River Basin/River Basin District Territorial Entities of Integrated River Basin Management;*
- *Draft Governmental Decree on the Procedure of Elaboration, Review and Approval of River Basin Management Plans.*

3 DELINEATION AND TYPOLOGY OF SURFACE WATER BODIES

The following sections provide a systematic explanation of the steps to be taken with regard to surface waters as part of the inventory required under Article 3 and 5 and Annex II of the Water Framework Directive. In accordance with the technical specifications in Annex II of the WFD, the surface water bodies shall be grouped together into river basin districts, allocated to categories and differentiated according to type. The next step is to determine type-specific reference conditions for each water body as a basis for the assessment and classification procedure. A hierarchical approach for the identification of the surface water bodies in presented in Fig. 2.

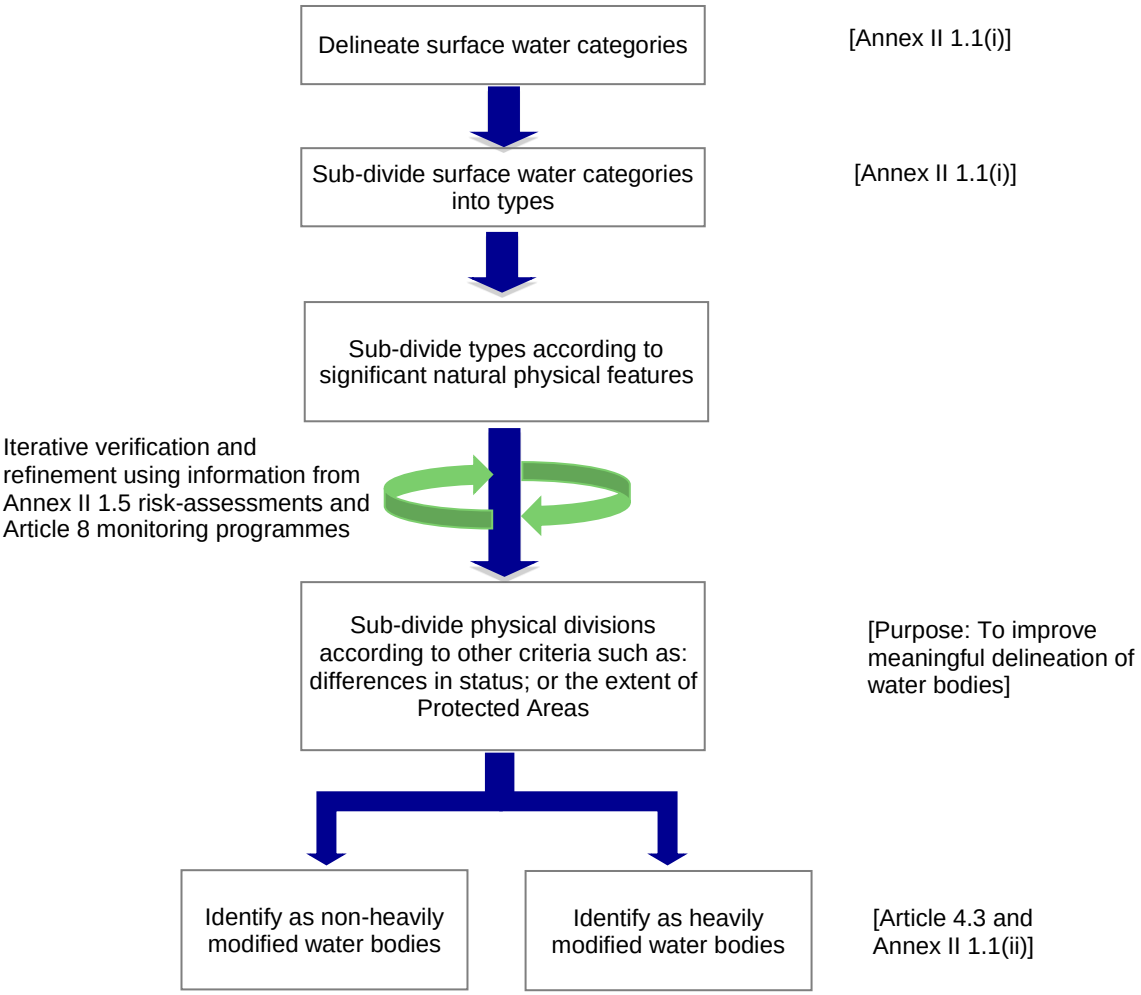

Figure 2: Summary of Suggested Hierarchical Approach to the Identification of Surface Water Bodies

The **first step** in delineating surface water bodies is to identify the boundaries of the surface water categories to ensure that water bodies do not cross the boundaries of surface water categories.

The **second step** in delineating surface water bodies is to identify the boundaries of the surface water types in each river basin district to ensure that water bodies do not cross the boundaries of surface water types.

The **third step** in delineating is to identify boundaries using distinct natural physical features that are likely to be significant in the context of aquatic ecosystem characteristics (e.g. geographical and/or hydromorphological features as largeness, the confluence of the rivers, permanent streams (well-watered regions) and temporary streams (drier regions), flow rates of the rivers, vertical stratification of lakes, water – sediment interchange,

surface water born types as glacier, precipitation, groundwater (salinity level)) and are consistent with both discrete and significant elements of surface water given in the Directive's definition.

Finally, the **fourth step** in identifying surface water bodies is to identify boundaries on the basis of other relevant criteria as status and/or pressure and impact assessment in order to ensure that water bodies are identified in a meaningful way.

3.1 IDENTIFICATION OF THE RIVER BASIN DISTRICTS

Before starting the delineation process of surface water bodies, it is necessary to assign all territorial catchment areas to their respective river basin district as required under Article 3 of the WFD. In Georgia, six river basin districts (see Fig. 2) are proposed to be delineated in the draft Governmental Decree. These river basin districts are as follows:

- *Alazani-Iori Basin District;*
- *Mtkvari Basin District;*
- *Khrami-Debed Basin District;*
- *Enguri-Rioni Basin District;*
- *Chorokhi-Kintrishi Basin District;*
- *Bzipi-Kodori Basin District*.

Within the river basin districts, consideration shall be given to those water bodies that count as discrete and significant elements of surface water in accordance with the definition given in Article 2 section 10 of the WFD. Further information on the designation of water bodies is provided in the CIS Guidance Document No. 2 entitled "Identification of water bodies."

A water body is a coherent sub-unit of a river basin district seeking to meet the environmental objectives of the WFD. Thus, a water body must be selected so that its status can be precisely defined and compared with the environmental objectives of the WFD. To this end, the size of the water body must be determined in such a way that it can achieve these goals in a consistent and effective manner.

The identification of water bodies is an iterative process. The verification and refinement of water body boundaries is still possible until the publication of the initial river basin management plan.

3.2 SECTIONING OF THE RIVER BASIN DISTRICTS

As proposed by the WFD, a proper typology has to be established based on the principal natural characteristics of surface water bodies. This is an important activity that serves as the basis for assessment of the ecological status and effective water management. The identification of river types, as relatively homogeneous hydrological and geological systems, implies the existence of linked biological communities. Therefore, river basin districts shall be subdivided into several sections taking into account the essential and the most significant both geographical and hydromorphological characteristics relevant for the aquatic community. It may be expected that Ecoregion 24, where territory of Georgia belongs will have in this context (natural variabilities) several sub-regions as for example:

- *Running waters in the Caucasus (very high altitude);*
- *Running waters in the pre-Caucasus foreland (high altitude);*
- *Central Uplands streams and rivers (mid altitude);*
- *Lowland rivers (low altitude).*

Note: Such sectioning of the river basin districts would also be reflected in the typology in altitude boundaries (see chapter 3.5 of this report).

3.3 DEMARCATION OF SURFACE WATER BODIES PRINCIPLES

A "surface water body," within the meaning of the WFD, is a discrete and significant element of a surface water body, e.g. a lake, a reservoir, a running water body, a river or canal, but also a part of a running water body, river or canal, as well as a transitional water or a strip of coastal water. The term "discrete" refers to the following conditions to be considered when demarcating water bodies:

- *No overlapping water bodies;*

- *Boundary at the transition between one water category (river, lake, transitional water, coastal water) and the next;*
- *Boundary at the transition from one water type to the next;*
- *Boundary where there are significant changes in physical (geographical and hydromorphological) characteristics;*
- *Boundary at the transitions between natural, possibly heavily modified, and artificial water (segment).*

In addition, locally acquired knowledge can be used to develop further criteria for demarcating surface water bodies, for example where very large segments of main rivers are still left after applying the above criteria.

- *Boundary if the status of significant water elements allocated to a water body under the above criteria has changed;*
- *Boundary at the transition from a protected to a largely unprotected area.*

Fragmentation of the river basin districts into surface water bodies (small coherent units) can be done based on the following criteria:

- Rivers 10 km^2;
- Lakes 0,5 km^2.

Regarding rivers, the length of river stream higher than 2 km can be used in the identification of the surface water bodies as identifier as well. All river streams with a length lower than 2 km will not be designated as a water body, except those that fulfil criteria as defined in chapter 3.6.5.

However, different size can be selected respecting the fact that a water body must be discrete and significant at the same time or small surface water bodies may be grouped later into large units (e.g. headwaters will be included into the downstream water bodies).

Note: The water network layer of the basic map, showing all the waters of the catchment areas larger than 10 km^2 and longer than 2 km (rivers) and lakes with surface are larger than 0,5 km^2*, will be prepared as result of this part of the WFD implementation.*

3.4 SURFACE WATER CATEGORIES

Reference to Water Framework Directive

Annex II No. 1.1 (ii) and No. 1.2

Technical background

A surface water body must not be split between different surface water categories (rivers, lakes, transitional waters and coastal waters). It must be of one category or another. The boundary of a water body may be established where two different categories “meet.“

In general, the following types of waters are to be included in this classification:

- *Rivers and streams with a catchment area of more than 10 km^2 and length larger than 2 km;*
- *Lakes with a surface area of more than 0.5 km^2;*
- *Transitional waters;*
- *Coastal waters up to a line of one nautical mile seawards from the baseline (with regard to chemical status, the territorial limits form the decisive boundary).*

In addition, the artificial waters shall be designated and a preliminary classification as heavily modified is to be made in accordance with requirements set up in chapter 3.7 below. The artificial and (initially) heavily modified water bodies will be then assigned to the natural water types most similar to them.

3.5 TYPOLOGY

Under Annex II, No. 1.1 (ii) of the WFD, a further differentiation of water body types is to be made within each surface water category. The water body types form the basis of the assessment of the ecological status of waters in accordance with biological communities specific to certain ecoregions.

3.5.1 TYPOLOGY OF RIVERS AND LAKES

The surface water bodies identified must be differentiated according to hydromorphological type. The types are defined in Annex II under "System A" or "System B." It is recommended to apply "System A" in Georgia that is the most straightforward and simplest to implement. On the other hand, one clear disadvantage of "System A" is that the classes established may not adequately partition the variability of the quality elements used, resulting in poor detection of ecological change. Given the inflexibility of "System A," most member states are likely to use "System B" as a basis for characterizing water body types. It is also anticipated that typology based on "System A" will be further developed, when the data become available, into a "System B" typology using mean slope, substrates and river discharge as optional descriptors for rivers.

The characteristics of natural rivers and lakes that can be used in deriving the basic typology in Georgia use the typing factors and ranges (where given) of "System A" of the WFD and are listed in Table 1.

Table 1: "System A": Rivers and Lakes

Fixed Typology	RIVERS Descriptors	LAKES Descriptors
Ecoregion	24 (Caucasus)	24 (Caucasus)
Type	Altitude Typology • High: >1500 m • High-altitude: 801 to 1500 m • Mid-altitude: 501 to 800 m • Mid-altitude: 200 to 500 m • Lowland: <200 m	Altitude Typology • High: >800 m • Mid-altitude: 200 to 800 m • Lowland: <200 m
	Size Typology Based on Catchment Area • small: from 10 to 100 km2 • medium: >100 to 1 000 km^2 • large: >1 000 km^2	Size Typology Based on Surface Area • Small: from 0.5 to 1 km2 • Medium:1 to 10 km^2 • Large: >10 km^2
		Depth Typology Based on Mean Depth • <3 m • 3 to 15 m • >15 m
	Geology • Calcareous • Siliceous • Organic	Geology • Calcareous • Siliceous • Organic

Note: River water bodies with catchments less than 10 km2 and with length lower than 2 km will not be delineated as discrete water bodies. These generally comprise the 3rd order and some 4th order streams in the upper reaches of catchments. However, these river stretches are part of the catchment area of the next downstream river water body and in this way integrated into the Article 5 characterisation and risk assessment. Coastal streams with catchments less than 10 km2 will also not be delineated.

3.5.2 TYPOLOGY OF TRANSITIONAL WATERS AND COASTAL WATERS

The designation of transitional waters depends, in accordance with the definition given in the WFD, on three main criteria:

- *Geographical: the proximity to a river mouth;*
- *Chemical: the salt content derives from neighbouring coastal waters;*
- *Physical: the water dynamics largely correspond to those of running water.*

Transitional water of significant size within the meaning of the WFD only occur for the Chorokhi, Rioni and Enguri rivers that feed into the Black Sea. Other small rivers do not meet the physical criteria.

It is recommended to apply System A for typing both transitional and coastal water bodies in Georgia.

Table 2: "System A": Transitional and Coastal Waters

Fixed Typology	Transitional Waters Descriptors	Coastal Waters Descriptors
Ecoregion	Black Sea	Black Sea
Type	Based on Mean Annual Salinity in ‰ • <0,5: Freshwater • 0,5 to <5: Oligohaline • 5 to <18: Mesohaline • 18 to <30: Polyhaline • 30 to <40: Euhaline	Based on Mean Annual Salinity in ‰ • <0,5: Freshwater • 0,5 to <5: Oligohaline • 5 to <18: Mesohaline • 18 to <30: Polyhaline • 30 to <40: Euhaline
	Based on Mean Tidal Range • <2 m: Microtidal • 2 to 4 m: Mesotidal • >4 m: Macrotidal	Based on Mean Depth • Shallow Waters: <30 m • Intermediate: (30 to 200 m) • Deep: >200 m

Note: The basic GIS map with surface water body types for all surface water categories will be prepared during this activity.

3.6 OTHER CRITERIA FOR DELINEATING SURFACE WATER BODIES

The previous three steps differentiate surface water bodies into water categories: Rivers, lakes, transitional waters and coastal waters and subsequently these waters are then further subdivided depending on their type, based on natural factors such as altitude, longitude, geology and size that might influence ecological communities. This division forms the basic water bodies defined by the natural conditions. The next step is to use other considerations or parameters which will help to improve the delineation of meaningful water body boundaries. One requirement that is implicit in the Water Framework Directive is that the purpose of identifying "water bodies" is to enable the **status** of surface waters to be accurately described. Related to this requirement, there are considerations regarding **pressures** and **impacts**. Furthermore, different **uses** (e.g. drinking waters) and existing or new **protected areas** (e.g. Natura 2000 sites, see Fig. 4) may be used in the refinement of the "water body" identification. The subsequent subchapter focuses on aspects of status and/or pressure and protected areas.

3.6.1 STATUS CRITERIA

A discrete element of surface water should not contain significant elements of different status. A "water body" must be capable of being assigned to a single ecological status class with sufficient confidence and precision through the Water Framework Directive's monitoring programmes.

At the beginning, there will not be sufficient data and information to accurately define the status of surface waters available. Therefore, it is recommended to use both biological data and physico-chemical data from the national surface water monitoring programme and surveys to estimate the surface water quality status. Currently, a classification system based on water body status does not exist in Georgia. There are established Maximum Allowable Concentrations for certain physico-chemical parameters that did not allow for classification of surface waters into 5 classes. As an alternative, the classification schemes developed under the Environmental Protection of International River Basins (EPIRB) project can be used (*Ecological Status Classification Schemes, 2015)*. Those classification schemes were developed for three surface water type groups (Alpine Meadows type, Small Gravel Mountainous type and Middle Gravel mountainous type) and for the macroinvertebrates metrics, physico-chemical parameters and hydromorphological ones. In the water bodies where only physico-chemical data are available, classification scheme for physico-chemical parameters can be used to assign preliminary status classes to water bodies. In this case, expert judgement will be necessary to estimate the relationship between aquatic community and physico-chemical conditions (to distinguish between natural variations and anthropogenic impacts). Regarding the classification of lowland and large rivers, the Organisation for Economic Cooperation and Development (OECD) or International Commission for the Protection of the Danube River (ICPDR) classification system can be applied (only for physico-chemical parameters). However, NEA has already started to monitor more than 140 sampling sites and has ambition to extend the List of sampling sites where macroinvertebrates, physico-chemical parameters

and hydromorphology are monitored. Therefore, it would be possible to designate the ecological status to the water bodies, at least in the most impacted locations. For illustration of the subdivision water bodies based on status is shown on Fig. 3 below.

As understanding of status improves, the boundaries of surface water bodies can be adjusted till the first River Basin Management Plans are issued.

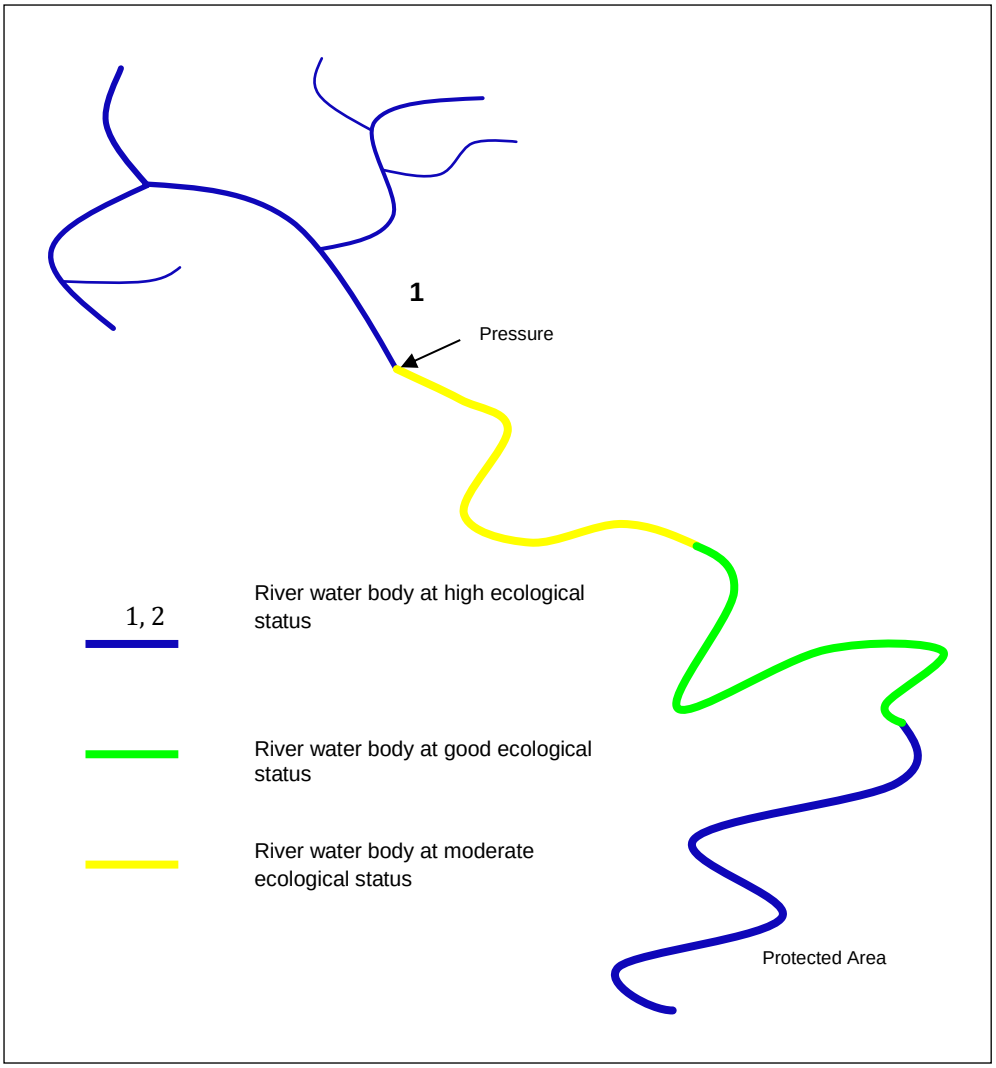

Figure 3: Status Differences within a River Reflected by Subdivision into 4 Water Bodies

3.6.2 PRESSURES AND IMPACTS CRITERIA

Based on the fact that information on the surface water status is not sufficient, it will be appropriate to use a *Pressure and Impact Analysis* as a surrogate for status. The implementation of a *Pressure and Impact Analysis* is requested by EU WFD Article 5 and Annex II and respectively requires to:

- Collect and maintain information on the type and magnitude of the significant pressures to which surface water and groundwater bodies in each River Basin District are liable to be subject;
- Carry out an assessment of the risk that these water bodies will fail to meet the Directive's environmental objectives.

In order to support experts to determine if water bodies are at risk to fail the environmental objectives, the IMPRESS Guidance Document No. 3 on the *Analysis of Pressures and Impacts* (2001) has been developed under the Common Implementation Strategy for the Water Framework Directive.

The (i) *Identification of Pressures* and the (ii) *Assessment of Impacts* is specifically addressed in the EU WFD Annex II (item 1.4. and 1.5) and consecutively follows-up previous implementation steps – that are listed below – as part of the basic characterization of river basin districts/river basins:

- Characterisation of surface water body types (Annex II/1.2);
- Ecoregions and surface water body types (Annex II/1.3);
- Establishment of type-specific reference conditions for surface water body types.

The WFD requires information to be collected and maintained on the type and magnitude of significant anthropogenic pressures, and indicates a broad categorisation of the pressures into:

- Point source pollution;
- Diffuse source pollution;
- Morphological alterations;
- Effects of modifying the flow regime through abstraction or regulation.

There are several guidelines and methods available to conduct the Pressure and Impact Analysis. However, for the purposes of this Guidance Document it is highly recommended to use the "*Guidance Document Addressing HydroMorphology and Physico-Chemistry for a Pressure-Impact Analysis/Risk Assessment According to the EU WFD"* that has been developed under the EPIRB project. This Guidance Document was already applied in the Adjaristkali/Chorokhi pilot river basin. The Guidance Document of EPIRB concentrates to:

- *Describe the basic principles of a Pressure and Impact Analysis according to the EU WFD;*
- *Concentrate on the river water bodies and outline a specific approach, indicators and criteria to analyse pressures and impacts to be integral part of the River Basin Management Plans (RBMP);*
- *Criteria of the approach to analyse significant pressures and impacts are focused on:*

  (i) Hydromorphology:

  Interruption of river and habitat continuity;
  Hydrological alterations;
  Modification of river morphology.

  (ii) General physico-chemistry considering point and diffuse pollution sources:

  Pressure indicators for pollution from municipal wastewater sources and industrial wastewater sources;
  Pressure indicators for diffuse agricultural pollution sources (both plant production and animal breeding).

- *Link the Pressure and Impact Analysis through criteria to a risk assessment in order to estimate if river water bodies are at risk to fail the EU WFD objectives;*
- *Design the approach in a concise way focusing on key indicators and criteria using available data and information in the Caucasus region;*
- *Findings and results from the previous projects are involved, and;*
- *Ensure easy and combined implementation through desk work that may be supplemented for improvement by field assessments after surveys and monitoring.*

The advantage to use this Guidance Document is that experts from National Environmental Agency were trained on using this method and it is prepared in user-friendly manner.

3.6.3 PROTECTED AREAS

Article 6 of the Water Framework Directive (2000/60/EC), requires each Member State to establish a "register or registers of all areas lying within each river basin district which have been designated as requiring special protection under specific Community legislation for the protection of their surface water and groundwater or for the conservation of habitats and species directly depending on water" (Article 6.1, 2000/60/EC).

The Register of Protected Areas in Georgian Territory will be elaborated and based upon existing national and EU legislation regarding the protection of waters for ecological, recreational and socio-economic purposes. The Register will be prepared in two formats – an MS Access database and a Geographical Information System (GIS). The geographical features within the Register will be based upon a standard, national GIS

feature dataset and coding system and as such, each of the GIS datasets within the Register should be fully integrated within the national GIS database.

Areas designated for the abstraction of water intended for human consumption

The protected area for drinking waters is represented by the water body from which the water is abstracted and the associated drinking water abstraction point. The entire water body is to be used to represent the protected area (groundwater, lake or river).

Note: Where water is abstracted from a river or lake that was not initially selected as a water body (i.e. 1st or 2nd order rivers or lakes smaller than 50 hectares) the water is then designated as a protected area and the 1st or 2nd order stream or small lake is reclassified as a water body.

Areas designated for the protection of economically significant aquatic species (fish, shellfish)

The protected areas for economically significant aquatic species will be prepared and listed as production areas for shellfish.

Areas designated as recreational and bathing waters

Bathing waters will be included within the Register as recreational waters. Protected areas for bathing waters should be included in the Bathing Waters Regulation that will be prepared later after identification of the lengths of beaches by respective authority.

Nutrient sensitive areas

The nutrient sensitive areas included within the Register are those waters defined in the Urban Waste Water Treatment (UWWT) directive. The water body containing the sensitive area is used to represent the nutrient sensitive area.

Areas designation for the protection of habitats (including birds)

The Specific Areas of Conservations that contain water dependent species and habitats will be included within the Register. In some cases, the actual extent of water dependent habitats and species within certain protected area is unclear and in this case, the entire Specific Area of Conservation will be included within the Register.

The areas designated as protected areas will be illustrated in the GIS map and will be part of the Register of Protected Areas.

3.6.4 WETLANDS

Interaction between groundwater and wetlands and dependent terrestrial ecosystems is complex and not well understood. This, together with the limited amount of data available to support the delineation process means that it will be necessary to focus on the expert judgment approach. When wetlands are delineated, it would be useful to plan to improve this understanding by conducting surveys and studies.

In the current situation in Georgia, where data is limited, terrestrial ecosystems dependent upon groundwater will be identified using information from geology, hydrogeology and vegetative communities. It is also recommended to use information from the EU Habitat Directive and EU Natural database.

3.6.5 SMALL ELEMENTS OF SURFACE WATER

The CIS Horizontal Guidance on Water Bodies establishes a common framework for the identification of small surface water bodies. The identification of minor elements of surface water, such as headwaters, small standing waters, and artificial drainage ditches as separate water bodies would cause significant logistical difficulties, and stretch the resources available to improve more significant elements of surface water. A balance is needed which takes account of the position expressed in the Horizontal Guidance on Water Bodies that the purposes of the EU Water Framework Directive apply to all surface waters but which also ensures that the management process is not overloaded and disabled by the creation of large numbers of very small management units.

It suggests that the extent of sub-division of the surface water bodies is a matter for member states to decide based on the characteristics of each River Basin District and the need to reconcile the objective of adequately describing water status with the risk of fragmenting surface waters into unmanageable numbers of water bodies.

Therefore, it would be necessary to define criteria that small elements of surface water can be identified as a separate water body. Where a small element of surface water is not identified as a water body on the basis of the relevant size thresholds set out in chapter 3.3 and if small elements of surface water, which would otherwise simply be included in a larger surface water body, may be identified as separate surface water bodies if deemed appropriate in the context of the criteria set out below. The small elements of surface water will be identified as a water body:

- Where the element of surface water is used, or intended to be used, for the abstraction of water intended for human consumption, it will be identified as water bodies;
- The achievement of any standards and objectives for Protected Areas identified under Directive 79/409/EEC and Directive 91/271/EEC (for illustration see Fig. 4);
- The achievement of the standards and objectives for small elements surface waters depend on the maintenance or improvement of the status of the element of surface water, and the element is thus of ecological significance within the river basin district;
- It is determined within the river basin management planning process that the maintenance or improvement of the status of the element of surface water is important to the achievement of national or international biodiversity targets;
- The small element of surface water is of such significance in the river basin district that impacts on it are liable to result in a failure to achieve the objectives for a body, or bodies, of water in the river basin district;
- The element of surface water is designated as:
  Sensitive area, or part of such an area, under the Urban Waste Water Treatment Directive or the Nitrates Directive, a bathing water under the Bathing Waters Directive, an area for the protection of economically significant aquatic species under the Shellfish Waters Directive or the Freshwater Fish Waters Directive.

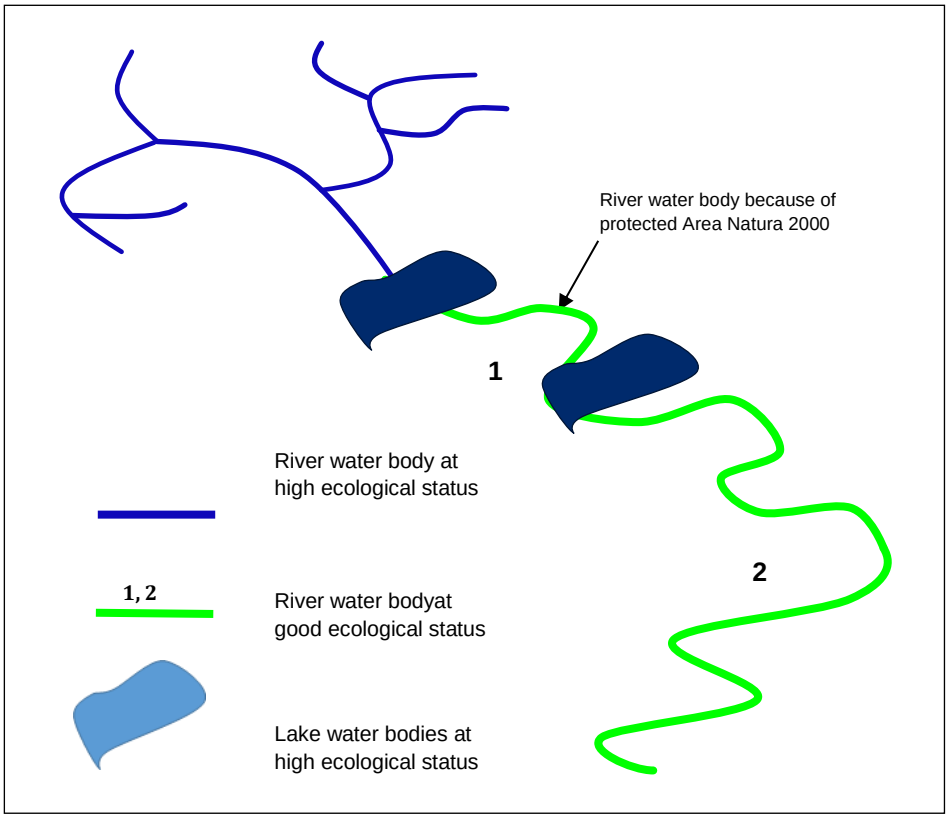

Figure 4: Small Element of Surface Water Identified as Water Body Due to its Significance to Achieve the Objectives of a Natura 2000 site

3.7 IDENTIFICATION OF ARTIFICIAL AND HEAVILY MODIFIED WATER BODIES

Reference to the Water Framework Directive

Article 2(8), (10), Article 4 (1 a iii), (3) and Annex V nos. 1, 2, 3, Article 5 (1) and Annex II.

Technical background

Article 4 (3) of the WFD prescribes that the designation of an artificial or heavily modified water body is presented and justified in the management plan required under Article 13 of the WFD. The final designation of these heavily modified water bodies must be carried out till the first River basin Management Plan and reviewed every 6 years. The provisional identification as “heavily modified” is undertaken where necessary for those bodies of water which are not expected to achieve Good Ecological Status (GES) due to hydromorphological interventions and are, in their physical character, heavily modified. Under Article 2 (8) of the WFD an "artificial water body" means a body of surface water created by human activity. This means that a surface water body was created at a site where no water body previously existed. An artificial water body has, moreover, been created neither by the direct physical alteration of an existing water body nor by its repositioning or levelling. Where an existing water body has been altered or relocated (i.e. to a site that had previously been dry land), it should be classified, if appropriate, as heavily modified and not as artificial. The same applies to water bodies that have been assigned to another category as a result of physical alterations. Such water bodies (e.g. impounded lakes crated from a river by damming) are to be classified as heavily modified water bodies and not as artificial water bodies. The category of artificial bodies of surface water includes, for instance:

- Canals built for the purposes of navigation, for hydropower uses and for irrigation and drainage, which meet the above conditions;
- Lakes formed in pits, quarries and open-cast mines, ponds;
- Impounded reservoirs and artificial storage basins fed by transferred water;
- Docks.

These surface waters can be designated as artificial water bodies, but they do not have to be so designated. Under certain conditions they may also be classified as natural water bodies (e.g. old lakes formed in mining landscapes. Artificial bodies of surface water are, however, certainly not natural waters that have been modified by hydro-engineering measures.

Activities to be conducted

The artificial or heavily modified bodies of surface water are to be established in accordance with the criteria via a series of steps as follows:

- Survey to identify water bodies (*The literature review will be done to identify the scope and applicability of literature and guidance currently available in relation to the designation of Heavily Modified Water Body (HMWB) and Artificial Water Body (AWB) and extract the most useful information from that available for the development of the Georgia approach.);*
- Designating bodies of surface water created by human activity as artificial waters;
- “Screening” – exclusion of water bodies without hyromorphological alterations from the further process of designation (*All data should gather preliminary information on all cases identified under Article 5.);*
- Establishing water bodies with significant hydromorphological alterations and description of these significant alterations;
- Preliminary classification as “heavily modified” if water bodies have been significantly altered in character in the form of physical changes resulting from human interventions;
- Designating heavily modified or artificial bodies of surface water in the first River Basin management plan and review every six years *(The task includes an appraisal of consistency in reporting of water bodies with high level of hydromorphological alterations and canals across River Basin Districts (RBD), the inclusion of summit points as HMWB and AWB boundaries, and refining their delineation in the national GIS layer).*

Examples of the potential HMWB and AWB are presented in Table 3.

Table 3: Potential HMWB represented by Article 5

Category	Modification	Specified Use
River	Artificial Bed	Flood Protection
		Protection of Wider Environment from Contaminated Sediment
	Impoundment	Drinking Water Supply
		Hydro Power Generation
		Hydro Power Generation and Drinking Water Supply
	Tidal Barrage	Flood Protection
Lake	Abstraction	Drinking Water Supply
	Impoundment	Drinking Water Supply
		Hydro Power Generation
Transitional	Flood Defence Works	Flood Protection
	Impoundment	Public Transport Infrastructure
	Port and Related Activities	Ports
Coastal	Port and Related Activities	Ports

Table 4 Potential AWB represented by Article 5

Description	Specified Use
Canals	Irrigation, Hydro Power Generation
Reservoir	Flood Protection, Drinking Water, Irrigation, etc.

Step wise approach to designate the HMWB is presented in the scheme below (based on UKTAG GD):

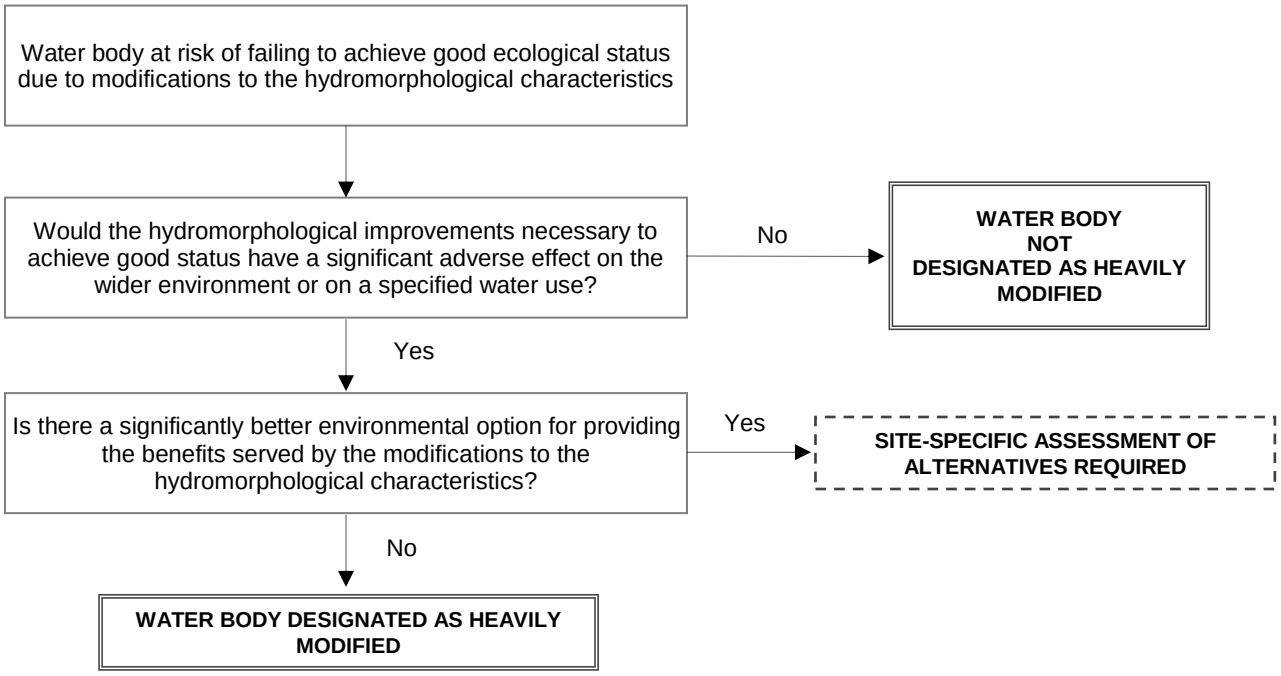

Figure 5: Scheme to Designate HMWB (Based on UKTAG GD)

3.8 CODING OF THE DELINEATED SURFACE WATER BODIES

There are several systems to make coding of the delineated surface water bodies. However, it is recommended to use the international hydrological coding system, known as the Hack's main streams or Gravelius order that ranks streams based on a hierarchy of tributaries. Such coding system was already applied in Georgia in the Chorokhi/Adjaritskali river basin (EPIRB project, 2013). It is recommended to add into this system two letters to represent the name of Georgia and one letter representative of the river basin district.

After such amendments, each delineated water body in the river basin district will obtain a unique identifier using the following format:

GEVXxxYZZ, where:

GE – is international code of Georgia;
V – is the first letter of the river basin district;
Xxx are the first 3 letters of the river name;
Y is the order of the river:

- 0 – Order of the main river that is flowing to the sea;
- 1 – Order of its tributary;
- 2 – Order of tributary of the 1-st order river;
- 3 – Order of tributary of the 2-nd order river.

ZZ is the consecutive number of water bodies on the river of given order.

For example: the identifier for the second water body on Akavreta River in GECAka202.

Furthermore, identified surface water bodies types should be coded as well. The following coding system for rivers can be used in Georgia:

ABxCDE, where:

A – is the first letter of Ecoregion (C in case of Georgia);
Bx – are the first two letters of the sub-region;
C – is a class of altitude descriptor:

1 – <200 m;
2 – from 200 to 500 m;
3 – from 501 to 800 m;
4 – from 801 to 1500 m;
5 – >1500 m.

D – is a class of catchment area descriptor:

S – Small;
M – Medium;
L – Large.

E – is a class of geology descriptor:

C – Calcareous;
S – Siliceous;
O – Organic.

For example: the code of water body type CCa5SS means river water body type in Ecoregion 24, sub-region Caucasus streams, altitude higher than 1500 m, with small catchment area and with prevailing siliceous geology.

Similar coding system can be developed for lakes, transitional and coastal waters in Georgia.

3.8.1 CONSTRUCTION OF RIVER TYPOLOGY MAPS

The construction of the typology maps will be carried out using ArcGIS and ArcHydro (Geographical Information Systems). The following data inputs are required:

- *Digital Elevation Model (DEM) with resolution 30x30 m;*
- *Solid geology dataset 1:250,000 (if not available smaller scale can be used in short-term with expert judgement to justify the positional accuracy), to characterize dominant geology for the water bodies;*
- *Flow accumulation grid map;*
- *Base rivers dataset produced by NEA of Georgia for river network at a scale of 1:50,000.*

The typology map will be produced using an automated GIS method. This approach will allow to identify the individual water bodies for Georgia based on river confluences (as example see Fig. 6).

- *Each polygon represents a stretch between river confluences obtained from an area accumulation grid. This grid showed where the physical change on the river network, which corresponded to "System A" typology size parameters (as example see Fig. 7).*
- *The stretches will be typed with the attributes of mean catchment altitude, dominant geology and catchment size.*

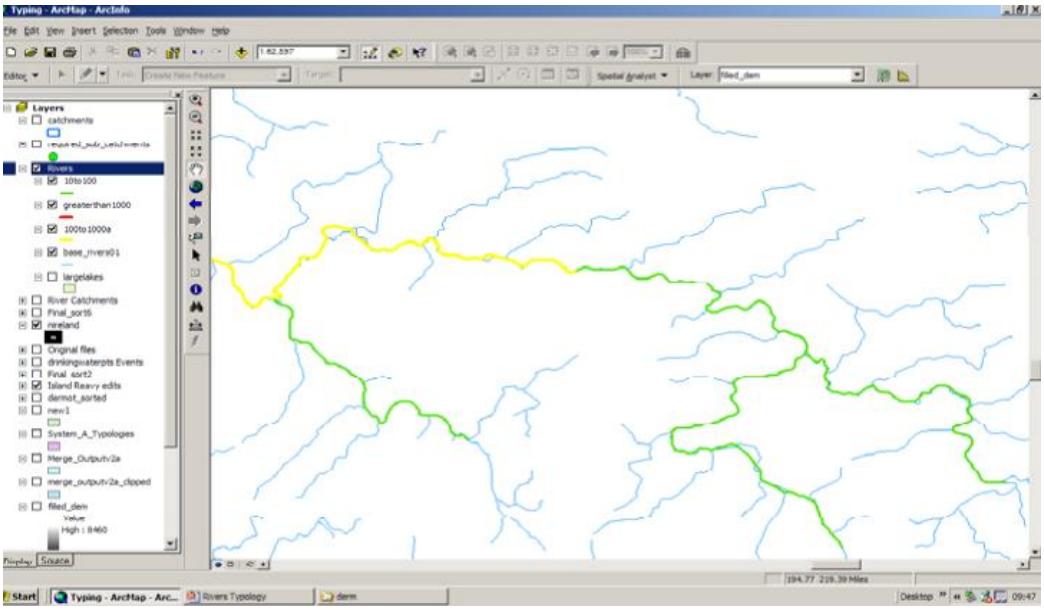

Figure 6: Area Accumulation Grid Showing Where Physical Changes Corresponding to WFD "System A" Catchment Size Occur

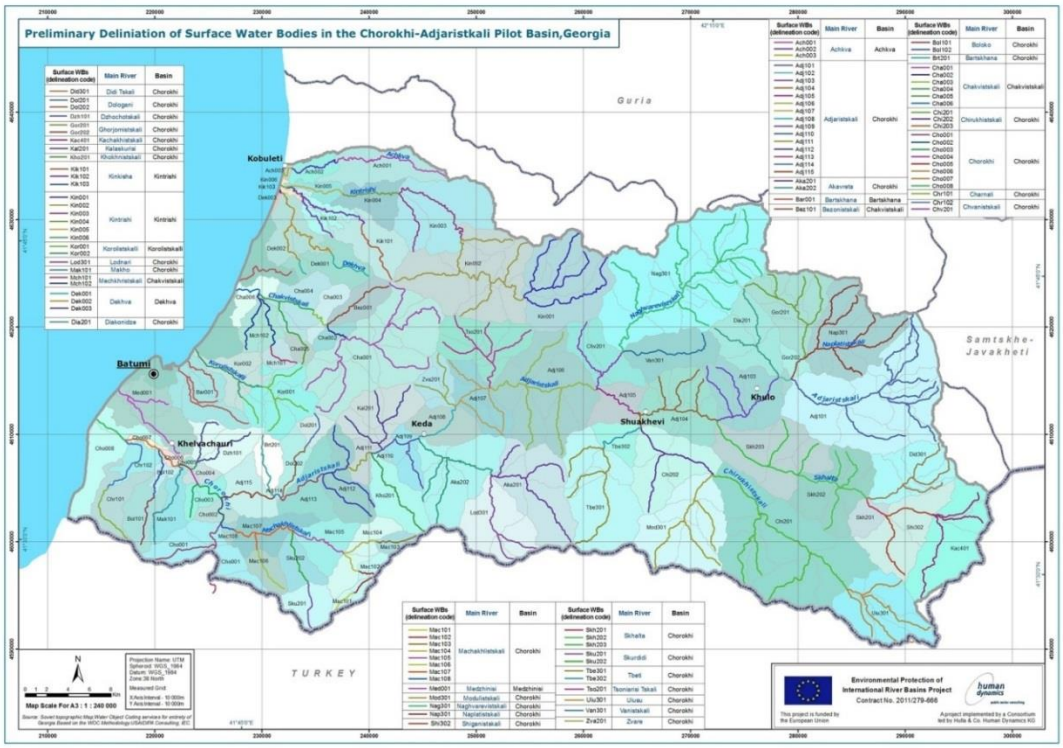

Figure 7: Surface Water Bodies in Chorokhi-Adjaristskali Pilot Basin (from EPIRB Project, 2013)

Aggregation can be applied for different purposes; for the management, the monitoring or the reporting of water bodies. It is necessary to apply aggregation on the basis of clear criteria and a transparent process. The criteria for aggregation will be different for various purposes. A few points would be mentioned regarding aggregation:

- It is necessary to clarify the definition of aggregation and to distinguish it from merging; aggregation means grouping into one unit separate identified water bodies while merging means combining into a single water body unidentified units of water.
- Aggregation is useful for pressure and impact assessment, monitoring, management and reporting, and it is a useful tool for managing and/or reporting very small surface water bodies.
- Merging is also useful under the following criteria: Contiguous, type, pressure, state/impact, quality objectives, sensitivity, etc.
- When aggregation is applied, it is important to mention/report the reason for this aggregation (i.e. aggregation for monitoring, management purposes or else).

The Water Framework Directive's requirement that water bodies contain "significant" elements indicates that a fine breakdown into small areas would be inappropriate and can lead to a large administrative burden. On the other hand, cruder breakdown into large areas would lead to worries about incorrect classification. The CIS guidelines emphasise that within water bodies, no major difference should occur with respect to the status of its water elements. So if, in a particular surface water body, elements with good status and moderate status were classified as "good" overall, there would appear to be no reason for measures to upgrade the "moderate" element. Where dense data is available for the water body and allows very detailed findings (e.g. for the systematic mapping of river morphology using the on-site method), appropriate transparent aggregation rules should be derived.

The activities carried out during the delineation of the surface water bodies and implementation of the WFD will result in the elaboration of the List of Surface Water Bodies for each river basin district that will be binding for activities in development of the River Basin Management Plans. For example, the following information and data can be included in the List of Surface Water Bodies as it is presented in Tab. 5 below (GIS coordinates can be added as well).

Table 5: List of the Surface Water Bodies

No.	River basin district	*Name of WB*	*WB code*	*WB type*	*r.k. from*	*r.k. to*	*Length (km)*	*Character*
1	*Khrami*	*Mashavera*	*GEKMas301*	*CUp4SS*	*2,7*	*10,7*	*8*	*Natural*
…	*…*							*HMWB*
…	*…*							*AWB*

Note: The final GIS map of the delineated surface water bodies will be a product in this stage of the delineation process. This GIS map will be used in the establishment of the type specific reference conditions, development of the classification of the ecological status (or potential) of the surface waters and the River Basin Management Plans. Furthermore, GIS Maps should be in format compatible with EU Guidance Document 9 where coding system is defined to unify the GIS mainly for reporting purposes.

4 NEEDS FOR INFRASTRUCTURE

An important part of the implementation of this Guidance Document is an infrastructure at the national level consisting of:

- Expertise;
- Databases;
- Assessment methods, models and other tools;
- Organizational structure.

It is expected that existing infrastructure of the institutes and organizations working in the water resources management field will be completed by a group of experts covering classification, ecological, chemical, hydrological, and statistical expertise as well as expertise on modelling, GIS and databases.

Databases are needed for the identification of relevant water bodies, characterization of relevant pressures and ecological status, and subsequently for unconstrained implementation not only this Guidance Document but also the WFD. State variables would be those required in the Directive for characterization and classification of water bodies (Annex II and V), plus optional variables suggested in the directive. Pressure variables would include measures of land-use, point source, diffuse sources, hydromorphological alterations, etc.

Assessment methods, models and other tools should include (i) models for determining point source and diffuse loadings of nutrients, metals and other substances, (ii) methods for determining biological state variables, and (iii) GIS applications.

The *organizational structure* will vary depending on the circumstances in Georgia, and in many cases it will require a great effort of coordination among responsible authorities and stakeholders.

5 PRINCIPLES FOR REFERENCE CONDITIONS ESTABLISHMENT FOR SURFACE WATER BODIES

The definition of reference condition should be as precise as possible and should follow the terms of the Directive, containing the basic requirement that "the values of biological, hydromorphological and physico-chemical quality elements should correspond to totally, or nearly totally undisturbed conditions" (Wallin et al, 2002).

Reference to Water Framework Directive:

Annex II No. 1.3

Annex V No. 1.2

Technical background

The Water Framework Directive in Annex II No. 1.3 states that the reference conditions are to be defined for all types of surface waters in line with the normative definition of high ecological status pursuant to Annex V, 1.2 of the WFD.

The basis for the identification of reference conditions is given in Annex II, 1.3 in the Directive. Without any specific ranking of the methods the main options for establishing reference conditions are:

Spatially based reference conditions using data from monitoring sites;

Reference conditions based on predictive modelling;

Temporally based reference conditions using either historical data or paleoreconstruction or a combination of both;

A combination of the above approaches;

Where it is not possible to use these methods, reference conditions can be established with expert judgement.

The reference sites must be carefully selected, because they will be used as "controls," against which other sites or entire rivers will be evaluated. A basic requirement is that they are minimally impaired (the accepted level of impairment depends on the adopted definition of reference conditions). Another requirement is that they are representative of the region and type of water bodies under consideration and display the natural ranges of the biological variation.

In practice, it is usual to define a priority-quantitative exclusion criteria with regard to specific types of impacts. Some of them are as follows*: Absence of wastewater discharge, absence of dams, flow and velocity of water being unaffected by water abstraction, lack of point pollution sources, unaltered land-use patterns due to settlements and agriculture activities, recreation*. Central to this practice is that sites not satisfying the predetermined criteria are excluded before the initiation of the field surveys.

Prior to process of the reference conditions establishment, one would respond on the several questions (Owen, 2002):

- Is a more precise or a more practical definition of reference conditions required?
- What is meant by "minimally disturbed" condition?
- What are the limits of an acceptable degree of slight change within reference condition?
- What benchmark should be used to determine undisturbed condition?
- Does any modification of a water body disqualify it as being in reference?
- How much natural variation can be accommodated within waterbody types?
- How can natural variation and anthropogenic impact be differentiated?
- How to segregate impacted from non-impacted sites?

With these in mind, the following methodological plan would be adopted for the establishment of the type specific reference conditions:

- Set criteria for impairment on the basis of stressors affecting the hydromorphological and physicochemical quality elements supporting the biological communities. It is suggested provisionally to use the AQEM criteria (see Annex 1 of this Guidance Document).
- Investigate from the maps and data sets and during the screening process, if there are sites satisfying these criteria in the river districts.

- If yes, and the sites are representative, spatial methods will be used.
- If no, alternative methods will be used. These may involve the selection of the excellent conditions method, models and data from similar watersheds (way of analogy).

5.1 REFERENCE CONDITIONS FOR RIVERS

Reference conditions for the river types in Georgia will be described for the macrophyte assemblages, macroinvertebrates, fish, and physico-chemical conditions that would be expected to occur in natural or nearly natural conditions (flow regime and morphological conditions). **Spatially based reference conditions approach, modelling methods and borrowing values from other countries (by a way of conclusion by analogy) will be applied in combination with expert judgement.**

Reference condition descriptions will be established using exclusion criteria and available monitoring data. Georgia has developed a quite large surface water monitoring network and National Environmental Agency has already started with monitoring of the macroinvertebrates as well. Both physico-chemical data and biological data on macroinvertebrates (or other biological quality elements, if available for example from the research projects and surveys conducted by Universities and Academy of Science Institutes) will be used.

When sites showing only minor disturbance exist, they will be used to define reference conditions for the identified types. The advantage of the site-specific spatial method is that reference conditions can be measured directly in an area. Another advantage is that natural variability can be accommodated in reference (see two photos from the Khrami River basin for illustration). A disadvantage is the high sampling cost, especially when high natural variability must be accounted for by increasing the number of surveyed reference sites. When high natural variability is present, high sampling frequencies are also needed during the monitoring operations to permit distinction from human impacts. Nonetheless, spatially based biological surveys provide the best current information for determining reference conditions values and subsequently the class boundaries of metrics.

The river types showing disturbances will have reference conditions derived using condition-based approaches in combination of expert judgement. The so called “excellent conditions” technique in which reference values of the chosen metrics (usually the highest scores) are determined from an entire population of sites can be applied. There are several variations of this technique, e.g. the reference values may be taken from the least impacted sites, from sites determined subjectively (e.g. inclusion of certain habitat types), from sites presenting the highest values of given metrics (species richness, abundance of intolerant species, etc.) or according to statistical design. In the latter case, for example, the determination is usually made in the following way:

- *A representative sample of sites is taken from the entire population of sites;*
- *The population distribution of each metric is determined;*
- *The 95th percentile of each metric is taken as its reference value.*

A central assumption of the “excellent conditions” approach is that at least some sites in the area are relatively unimpaired, which will be reflected in the highest scores of the individual metrics.

Another approach to establish the reference condition values, when the site specific spatial method is not possible to be used, is prediction of expected reference conditions, using models. This method is particularly useful when the human impacts are so intense and widespread that reference sites satisfying the criteria for minimal impairment do not exist or cannot be found.

The modelling approach requires adequate and suitable local data for the development of functional relationships between human impacts and ecosystem responses. Provided that such data exist or can be obtained, a pressure-response relationship can be established for a metric under impacted conditions.

Multiple regression models are constructed to predict metric values from environmental variables including typology factors and those indicative of human activity or disturbance:

Metric value = *f* (typology factors, disturbance (urban area, agricultural area))

However, when catchment areas are so strongly affected by anthropogenic activities that are undisturbed or best-available sites, satisfying a pre-set criterion of acceptable impairment, cannot be identified, the determination of reference conditions value for given metrics is still possible by extrapolation of measurements from other similar watersheds (borrowing reference conditions by analogy). However, the method is sensitive to assumptions about the generality of these relationships. It also requires knowledge of the mechanisms structuring natural communities.

Expert judgement is a relatively inexpensive technique, and has the potential to integrate a broad range of relevant information. The method is particularly useful in significantly disturbed areas, as is the case of heavily modified bodies, where no suitable reference sites can be identified. However, the method suffers from subjectivity errors and inability to arrive at quantitative and standardised procedures. Expert judgement is also essential even when spatial or modelling methods have been adopted, some kind of expert consensus is often required, for instance in evaluating data quality when the objectives and survey methods have changed over time or when extrapolating results from laboratory experiments to the field.

Note: To establish reference condition values for river water body types, it is recommended to use approach developed under the EPIRB project (Ecological Status Classification Schemes, 2015). On the other hand there are available different tools and methods to establish reference conditions values as they are presented in:

Guidance Document No 10 River and lakes – Typology, reference conditions and classification systems.

Guidance document No 5 Transitional and Coastal Waters Typology, Reference Conditions and Classification Systems.

Guidance on establishing reference conditions and ecological status class boundaries for inland surface waters (CIS WG 2.3 REFCOND, 2003).

5.2 REFERENCE CONDITIONS FOR LAKES

Reference conditions for lake types in Georgia will be describe for the macrophyte assemblages, invertebrate fauna, phytobenthos, phytoplankton and fish that would be expected to occur in natural or nearly natural conditions. Monitoring of the lakes in Georgian territory is very limited and mainly data from the research projects and surveys can be used in the process of setting the reference conditions. Reference conditions for Georgian lake types will be derived using all available data, in combination with expert judgement to fill the gaps in the data.

5.3 TRANSITIONAL AND COASTAL WATERS

In fact, it is not possible to represent the diverse array of habitats within a coastal or transitional water with one physical type due to the complex mosaic of marine habitats. Since typology is the basis of defining reference conditions and the upper anchor for high status and classification, the consequence of adopting these types is that reference conditions will cover a wide range of habitats within each type. Due to this fact and to overcome this difficulty, habitat specific reference conditions within broader physical types defined under the WFD Annex II factors should be agreed in Georgia. On the other hand experience from Bulgaria and Romania can be borrowed to establish habitat specific reference conditions allows the development of appropriate reference conditions for each quality element within each type.

Note: After selection of the suitable indicators (metrics) sensitive on the different pressures for each biological quality elements, the variation within type and variations between different water bodies status will be studied. Furthermore, seasonality should be indicated for the selected metrics and water body types (Ecological Status Classification Schemes, 2015).

6 PRINCIPLES FOR DEVELOPMENT OF ECOLOGICAL STATUS CLASSIFICATION SYSTEMS

The Water Framework Directive defines, both in general and in very detailed terms, ecological status in the high, good and moderate classes for each of the ecological quality element for each of the surface water categories. It indicates the biological, hydromorphological parameters and the physico-chemical parameters and other specific pollutants required in the overall ecological assessment. These definitions - the so called normative definitions - form the basis for the classification of surface waters. When implementing WFD, it is required to develop classification systems capable of distinguishing between the five ecological status classes - high, good, moderate, poor and bad - for each of the biological quality elements (macroinvertebrates, macrophytes, fish fauna, phytobenthos and phytoplankton (for lakes). Of particular importance is being able to distinguish between high, good and moderate status.

The WFD further specifies that the quality elements to be used for the classification of heavily modified and artificial water bodies are those relevant to whichever of the four surface water categories (river, lake, transitional or coastal) the heavily modified or artificial water body most closely resembles.

6.1 ENVIRONMENTAL QUALITY RATIO

An assessment of the biological quality elements must be taken into account when assigning water bodies to any of the ecological status or ecological potential classes (Figures 5 and 6). The status of each of the biological elements for natural water bodies is determined by measuring the extent of the deviation, if any, of the observed condition from the reference condition established for that water body. Reference conditions are the conditions established for the biological elements in the absence of pollution or disturbance. For HMWBs and AWBs the value corresponding to reference condition are referred to as the Maximum Ecological Potential (MEP) and reflect as far as possible, considering the hydromorphological and associated physico-chemical conditions, the reference conditions of the closest comparable normal surface waterbody type.

The results of the biological monitoring systems will be expressed numerically as Ecological Quality Ratios (EQR) in the range between 1 (high status) and 0 (bad status). The EQR scale for the monitoring system for each surface water category is divided into the five classes by assigning a numerical value to each of the boundaries between the classes (see Figure 5). The values for the boundary between the classes of high and good status, and between good and moderate status are being established through the EU supported inter-calibration exercise. This exercise will further ensure comparability of the results of the biological monitoring across member states for the high, good and moderate status. Georgia will take part in such comparison when establish classification system for the ecological status of surface waters.

Note: It is proposed to apply the approach developed under EU EPIRB project for establishing boundaries between ecological status classes. High and Good boundary will be used as 25 % tile of the reference conditions data and Lower anchor is used the worst value measured for given metrics. Other boundaries between classes of EQR are subdivided equally.

6.2 THE USE OF HYDROMORPHOLOGICAL QUALITY ELEMENTS

An assessment of the hydromorphological quality elements must be considered only when assigning water bodies to the high ecological status class and the maximum ecological potential class (Figures 8 and 9) (i.e. for distinguishing between high ecological status or maximum ecological potential and good ecological status/potential). For the other status/potential classes, the hydromorphological elements are required to have “conditions consistent with the achievement of the values specified for the biological quality elements.” Thus, the assignment of water bodies to the good, moderate, poor or bad ecological status/ecological potential classes may be made on the basis of the monitoring results for the biological quality elements and also, in the case of the good ecological status/potential the physico-chemical quality elements. This is because if the biological quality element values relevant to good, moderate, poor or bad status/potential are achieved, then by definition the condition of the hydromorphological quality elements must be consistent with that achievement and would not affect the classification of ecological status/potential.

6.3 THE USE OF GENERAL CONDITION (PHYSICO-CHEMICAL) QUALITY ELEMENTS

An assessment of the of the General Condition (physico-chemical) quality elements must be taken into account when assigning water bodies to the high and good ecological status classes and to the maximum and Good Ecological Potential (GEP) classes (i.e. when distinguishing between high status/maximum ecological potential and good ecological status/potential as well as between good and moderate ecological status/potential). For the other status/potential classes the physico-chemical elements are required to have "conditions consistent with the achievement of the values specified for the biological quality elements." Hence, the assignment of water bodies to moderate, poor or bad ecological status/ecological potential may be made on the basis of the monitoring results for the biological quality elements. This is because if the biological quality element values relevant to moderate, poor or bad status/potential are achieved, then by definition the condition of the physico-chemical quality elements must be consistent with that achievement and would not affect the classification of ecological status/potential.

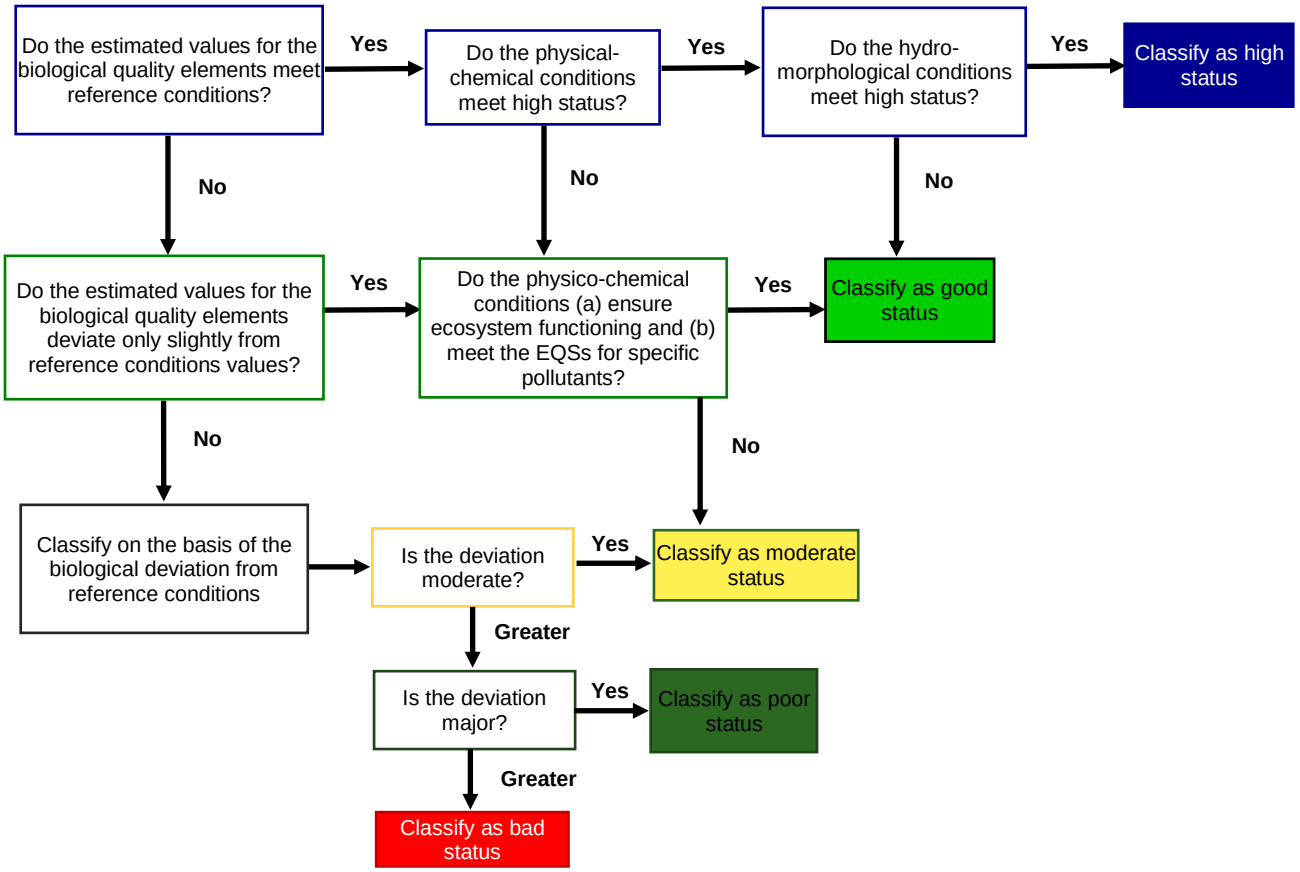

Figure 8: The Procedure for Assigning Ecological Status to a Natural Surface Waterbody According to the Definitions of High, Good, Moderate, Poor and Bad Status in the WFD

A similar approach (Fig. 6) is recommended for the classification of the ecological status of AWBs and HMWBs. The *Maximum Ecological Potential* of AWBs and HMWBs, corresponds to the reference condition of natural waterbodies and should be similar, in so far as possible, to the biological conditions associated with the closest comparable natural water body type at reference conditions, given the MEP hydromorphological and associated physico-chemical conditions.

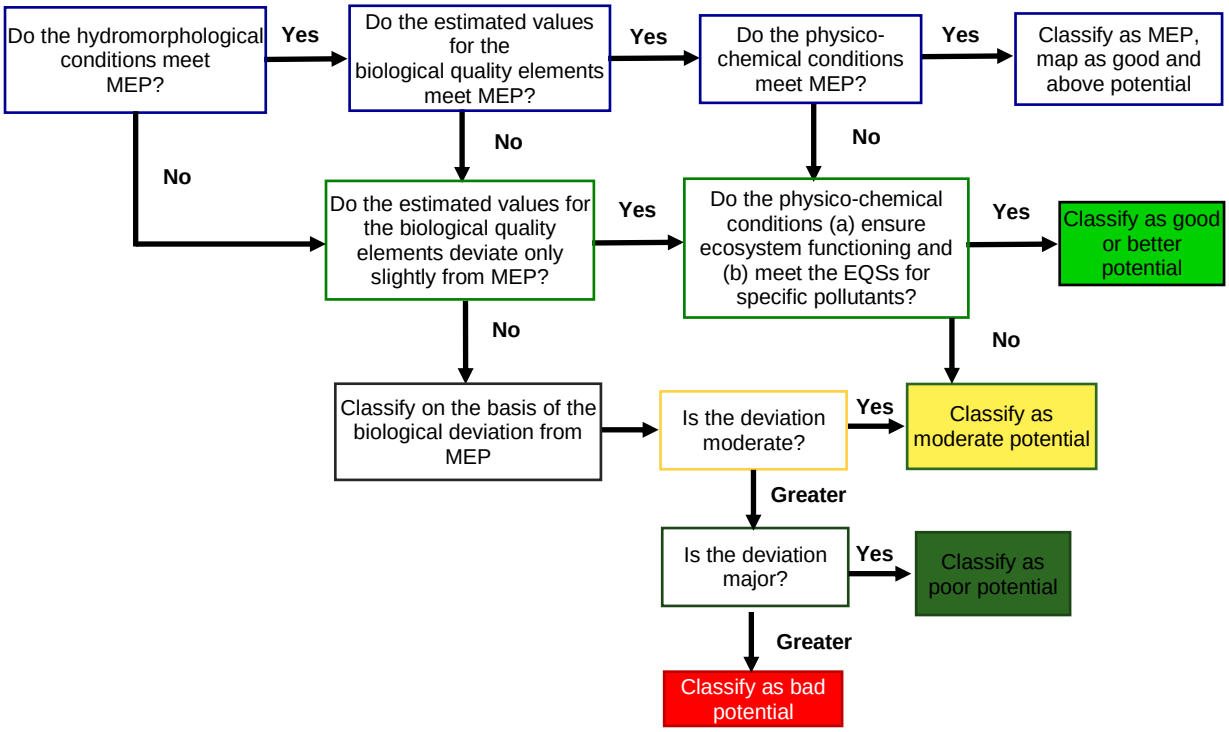

Figure 9: The Procedure for Assigning Ecological Status to an AWB and HMWB According to the Definitions of Good and Above Potential, Moderate, Poor and Bad Potential in the WFD

Note: To develop the Ecological Status Classification Systems for river water body types, it is recommended to use approach developed under the EPIRB project (Ecological Status Classification Schemes, 2015).

7 CONCLUSIONS

Typology must be able to answer the different objectives of the identification of the water bodies. Concerning the description of ecosystems, a simple and transparent typology allows the most common possible repository for comparison.

Another important issue is the size of the water bodies, and notably temptation to regroup heterogeneous ecosystems in the same water body to make management easier. It would be important to define reasons for aggregation and grouping of water bodies.

For the surface water bodies, the main issues seem to be the designation of the water body as natural water or not. It will affect the later decision and also Programme of Measures in the River Basin Management Plans. Therefore, transparent and fully covered by evidence delineation of the surface water bodies should be conducted.

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ANNEX 1: THE AQEM LIST OF CRITERIA FOR REFERENCE CONDITIONS

Basic statements

- The reference condition must be politically palatable and reasonable.
- The reference condition for a general type of water body should represent large numbers of defined populations of water bodies.
- A reference site, or process for determining it, must represent important aspects of 'natural' conditions.
- The reference conditions must reflect minimal anthropogenic disturbance.
- Whenever possible, states should share reference condition information when they share interstate or boundary water bodies.

Land use practices in the catchment area

- In most countries there is anthropogenic influence within the catchment area. Therefore, the degree of urbanisation, agriculture and silviculture should be as low as possible for the reference site. No absolute minimum or maximum values have been set for the reference condition (e.g. % arable land use, % native forest); instead the least influenced site with the most natural vegetation is to be chosen.

River channel and habitats

- The reference site floodplain must not be cultivated. If possible, it should be covered with natural climax vegetation or unmanaged forest, respectively.
- Coarse woody debris must not be removed (minimum demand: presence of coarse woody debris).
- Stream bottoms and stream margins must not be fixed.
- No migration barriers (effecting the bedload transport and/or the biota of the sampling site).
- Only moderate influence due to flood protection measures.

Riparian vegetation and floodplain

- Riparian vegetation and floodplains must still exist, making lateral connectivity possible. Example: riparian buffer zone greater or equal 3 x channel width (depending on the stream type).

Hydrological conditions and regulation

- No alterations of the natural hydrograph and discharge regime.
- No or minor upstream impoundment, reservoirs, weirs and reservoirs retaining sediments must be present (no recognisable effect on the biota of the sampling site).
- No hydrological alterations such as water diversion, abstraction or pulse releases.

Physical and chemical conditions

- No known point sources of pollution affecting the site.
- No known point sources of eutrophication affecting the site.
- No known or expected diffuse inputs.
- Near to natural background levels describing the baseload of a specific catchment area.
- No sign of acidification.
- No liming activities.
- No known impairments due to physical conditions, especially the thermal conditions must be close to natural conditions.
- No known local impairments due to chemical conditions, especially no known point sources of significant pollution, taking into account the dilution capacity of the water body.
- No known point sources of nutrients.
- No sign of salinity. - No known or expected diffuse inputs. Minimum: near to natural background levels describing the baseload of a specific catchment area.

Biological conditions

- No significant impairment of the indigenous biota by introduction of fish, Crustacea, mussels or any other kind of plants and animals.

- No significant impairment of the indigenous biota by fish farming.
- No significant impairment by invasive plant or animal species (Neophyta, Neozoa).

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