# APPENDIX 9

## Cumulative Impact Assessment (CIA) and Rapid CIA(R-CIA) Operational Guidelines

*Environmental and Social Management Framework (ESMF) Appendix*

# Table of Contents

# 1. Introduction and purpose of the guidelines

The **Climate Resilience in Water Management Project** in Poland, implemented by the State Water Holding Polish Waters, comprises a complex set of structural and non-structural interventions across major river basins. Structural measures include the construction and rehabilitation of dry polders, multi-purpose retention reservoirs, and local flood defense networks. Non-structural measures involve nature-based solutions (NBS), forest retention, forecasting systems, and spatial transformation studies.

Because these Tasks interfere significantly with the water cycle and are often concentrated within the same watersheds, they are highly prone to generating **cumulative impacts**.

These **Operational Guidelines** serve as **Appendix 9** of the overarching **Environmental and Social Management Framework (ESMF)**. They provide a practical, standardized, and legally compliant framework for identifying when a subproject/Task requires a Cumulative Impact Assessment (CIA) or a Rapid Cumulative Impact Assessment (R-CIA).

# 2. Screening and triggering criteria: rapid CIA (R-CIA) vs. Full CIA

## 2.1 The Two-Tiered Assessment Approach

To ensure administrative efficiency and proportionality, the Project adopts a **two-tiered approach** to cumulative impacts:

1. **Rapid Cumulative Impact Assessment (R-CIA):** A simplified, primarily desk-based review. It relies on existing ESIAs, feasibility studies, regional resource plans, and available scientific literature. New primary field data is limited to critical gaps. R-CIA is the default instrument for tasks classified as *Substantial* or *Moderate* risk where cumulative interactions are anticipated but do not threaten regional thresholds.
2. **Full Cumulative Impact Assessment (Full CIA):** A highly comprehensive, multi-disciplinary, and future-oriented study. It involves complex mathematical modeling (e.g., 2D hydraulic models, climate-change runoff projections), extensive primary baseline field collection, and the definition of regional carrying capacities or ecological thresholds. Full CIA is triggered by *High-risk* tasks, large-scale multi-reservoir cascades, or when multiple complex stressors overlap in a highly degraded or extremely sensitive basin.

## 2.2 Screening and Triggering Matrix

The Project Implementation Unit (PIU) shall conduct cumulative impact screening during the **Task Screening Phase** (Phase 1 of the E&S risk management process). The PIU's E&S specialists shall use the matrix below to determine whether a Task requires a Full CIA, an R-CIA, or can be managed purely through standard ESIA/ESMP tools:

| Screening Indicator | Trigger for Full CIA | Trigger for R-CIA | No CIA Required |
|---|---|---|---|
| **Project Scale & Complexity** | Large-scale new reservoirs with permanent impoundment or multi-polder networks acting as a single hydraulic system | Dispersed small-scale dry polders or localized bank reinforcements. | Minor non-structural interventions, pilot floodproofing, or office-based software/regulatory tasks. |
| **Hydrological / Morphological Interference** | Permanent alteration of river flow regime, baseflow regulation, or major sediment transport barriers (e.g., dams on active sediment routes). | Temporary, occasional flood wave attenuation in dry polders with no baseflow alteration. | No in-channel works; surface runoff management using pure NBS. |
| **Overlap with Other Projects** | Multiple planned, under construction, or existing hydrotechnical structures (e.g., cascading HPPs, mining, or highway crossings) within the same river sub-basin. | 1–2 minor parallel projects planned within the spatial-temporal boundary; low regional development density. | No other known public or private developments planned or operating in the sub-basin. |
| **Biodiversity & Sensitivity of Receptors** | Overlap with, or direct impact on, Natura 2000 sites, critical habitats, or pathways of key migratory/endangered fish species (e.g., mountain mullet, trout). | Presence of modified or natural habitats of moderate sensitivity, buffer zones of Landscape Parks | Strictly highly-urbanized, modified landscapes with zero presence of sensitive ecological receptors. |
| **Social Sensitivity & Displacement** | Significant physical or economic resettlement. | Minor land acquisition, temporary construction-phase economic disruptions, or restricted access. | No land acquisition; works conducted strictly on existing public land. |
| **Pre-existing Basin Pressures** | Highly degraded surface water bodies or communities with deeply depleted adaptive capacity | Moderately pressured basin; some water quality/quantity stress but ecological indicators remain stable. | Pristine basin conditions with abundant ecological carrying capacity and high social resilience. |

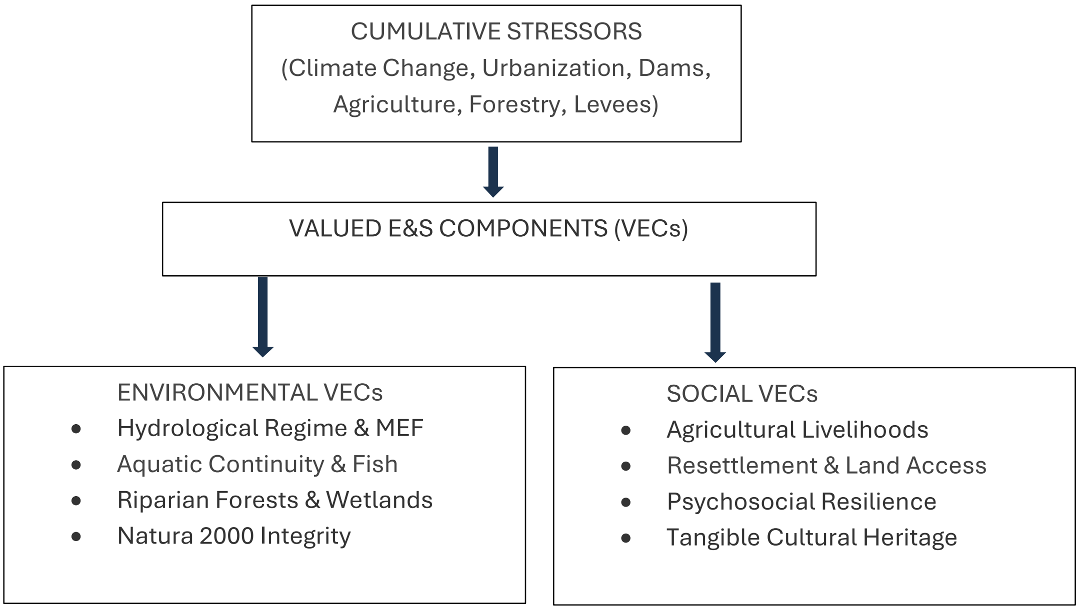
## 2.3 Methodological Comparison

| Aspect | R-CIA | Full CIA |
|---|---|---|
| **Core Objective** | Determine if the subproject's incremental contribution to cumulative impacts threatens VEC sustainability based on existing data. | Comprehensively model long-term VEC trends under multiple development scenarios and climate change to establish basin-wide carrying capacities. |
| **Data Requirements** | Strict desk review (*desk review*). Uses existing ESIAs, government reports, NGO data, and academic papers. High reliance on qualitative expert panels when data is thin. | High-intensity data collection. Requires new primary field surveys, multi-season monitoring, and hydrodynamic/hydrologic modeling. |
| **Spatial Boundary** | Limited to the immediate sub-catchment or hydraulic unit where project interactions are | Broad, regional landscape scale. |

| Aspect | R-CIA | Full CIA |
|---|---|---|
| | direct. | |
| **Temporal Boundary** | Subproject lifetime (construction + operation). | Extended timeline, integrating long-term national climate change scenarios up to 2100. |
| **Governance Structure** | Led by the PIU's E&S team in coordination with the Technical Assistance Consultant, with targeted stakeholder consultation. | Complex, multi-stakeholder steering committee involving PGW WP, RDOŚ, IMGW-PIB, local municipalities, and other active developers. |
| **Mitigation Focus** | Strict application of the mitigation hierarchy to avoid and minimize the project's own incremental contribution. | Shared regional management, collaborative monitoring networks, joint emergency response plans, and government-led policy recommendations. |

# 3. Valued environmental and social components (VEC)

For a CIA to be effective, its scope must be focused on **Valued Environmental and Social Components (VECs)**—the sensitive environmental and social receptors that are the ultimate recipients of cumulative stress. In flood protection works in Poland, the following VECs must be prioritized:



## 3.1 Environmental VECs

1. **Hydrological Regime and Natural Flow Variability (ESS1, ESS6):**
    - *Definition:* The preservation of natural quantity, quality, seasonal variability, and predictability of flows.
    - *Cumulative Stressors:* Cascading reservoirs, multiple agricultural water withdrawals, urban runoff.
    - *Significance:* Crucial for maintaining river morphology, diluting pollutants, and supporting downstream groundwater recharge.
2. **Aquatic Continuity and Migratory Fish Populations (ESS6):**
    - *Definition:* The ability of catadromous and anadromous fish species (e.g., mountain mullet, trout, eel) to migrate between feeding, growing, and spawning grounds.
    - *Cumulative Stressors:* Cumulative barrier effects from multiple physical dams, weirs, and lateral dry polder dikes.
    - *Significance:* Cascading projects without fish passes or ecological flows can completely collapse regional fish populations.
3. **Riparian Forest and Wetland Ecosystem Integrity (ESS6):**
    - *Definition:* Natural alluvial communities (e.g., Natura 2000 priority habitats *Alno-Padion*, *Salicetum albae*) and active floodplains.
    - *Cumulative Stressors:* Cumulative river channel straightening, construction of longitudinal embankments, lowering of local water tables.
    - *Significance:* Loss of these ecosystems severely degrades natural retention, nutrient cycling, and local microclimate regulation.
4. **Protected Areas and Natura 2000 Site Integrity (ESS6):**
    - *Definition:* Legally protected areas, such as Special Protection Areas (SPAs) for birds and Special Areas of Conservation (SACs) for habitats.
    - *Cumulative Stressors:* Small, incremental, fragmented habitat losses across multiple distinct subprojects.
    - *Significance:* A series of "individually minor but collectively significant" habitat conversions can violate the conservation objectives of entire Natura 2000 networks.

## 3.2 Social VECs

1. **Agricultural Livelihoods and Soil Usability (ESS5):**
    - *Definition:* The economic viability of smallholder and commercial farming within river valleys and polder basins.

- *Cumulative Stressors:* Transition to flood-compatible agricultural land use, cumulative loss of arable lands, and soil erosion.
- *Significance:* While farming is permitted within dry polders under operational restrictions, cumulative, unpredictable flooding during growing seasons can permanently destroy local agricultural livelihoods.

2. **Resettlement and Land Tenure Security (ESS5):**
   - *Definition:* The physical and economic displacement of households and businesses, and their ability to restore livelihoods.
   - *Cumulative Stressors:* Overlapping land acquisition footprints from flood protection, road development, and energy infrastructure in the same commune.
   - *Significance:* Generates regional land scarcity, inflates property prices, and limits the availability of suitable replacement land.
3. **Post-Disaster Community Psychosocial Resilience (ESS1):**
   - *Definition:* The mental health, safety, and adaptive capacity of local populations.
   - *Cumulative Stressors:* Successive major flood events (e.g., the 1997, 2010, and 2024 floods in Poland) combined with the stress of long-term planning uncertainty and resettlement.
   - *Significance:* Highly relevant in mountainous areas like the Biała Lądecka catchment. Uncoordinated public consultations or unmanaged construction nuisances can trigger severe community trauma and deep resistance.
4. **Cultural Landscape and Tangible Heritage (ESS8):**
   - *Definition:* Preserved historic urban/spa layouts, archaeological sites, and locally valued community heritage (e.g., roadside shrines and crosses).
   - *Cumulative Stressors:* Construction-phase excavation, physical relocation of historic structures, and visual degradation of the landscape.
   - *Significance:* Shrines and crosses represent vital spiritual and social anchors for Polish rural communities. Their cumulative uncoordinated removal can poses a substantial social risk, potentially eroding community trust, triggering local opposition.

# 4. The six-step process for implementing CIA/R-CIA

Whether conducting an R-CIA or a Full CIA, the PIU and its consultants shall follow this structured **six-step iterative process**:

**STEP 1: Define Spatial and Temporal Boundaries**

- **Select VECs (e.g., Hydrology, Fish, Livelihoods)**

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**STEP 2: Identify Other Activities & External Stressors**

- **Climate Change, Urbanization, Mining, etc.**

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**STEP 3: Establish Baseline Status of selected VECs**

- **Analyze historical trends and resilience**

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**STEP 4: Assess Cumulative Impacts on VECs**

- **Compare Future Baseline vs. Project Scenario**

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**STEP 5: Assess Significance of Cumulative Impacts**

- **Evaluate against carrying capacities/thresholds**

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**STEP 6: Design & Implement Cumulative Management Plans**

- **Mitigation hierarchy & Adaptive Management Triggers**

## 4.1 Step 1: Define Spatial and Temporal Boundaries (Scoping Phase I)

The spatial and temporal horizons of a CIA/R-CIA must reflect the scale of the VECs, not the administrative borders of the project footprint.

**Spatial Boundary Guidelines:**

- *Biophysical VECs:* Must encompass the entire relevant hydrologic management unit. For river flow, sediment, and fish migration, the boundary is the **watershed scale**.
- *Social VECs:* Must cover the labor market area, the resettlement reception zones, or the boundaries of the affected municipalities.
- *Delineation Rationale:* The boundary is expanded to the point where the VEC is no longer significantly affected, or where the project's incremental contribution becomes scientifically undetectable.

**Temporal Boundary Guidelines:**

- Must cover the entire life cycle of the hydrotechnical infrastructure (typically **50 to 100 years** for dams and polders).
- Must integrate future climate change projection horizons (specifically the **2050 and 2100** national climate models).
- Must look backward to establish a historical baseline (e.g., pre-1997 or pre-2024 flood conditions) to prevent the "shifting baseline syndrome".

## 4.2 Step 2: Identify Other Activities and External Drivers (Scoping Phase II)

The assessment must identify all human activities and natural drivers whose influences overlap with the project's spatial and temporal boundaries.

**Other Human Developments:**

- *Existing:* Operating wastewater plants, mines (causing hydromorphological pressures), forest logging roads.
- *Planned/Reasonably Foreseeable:* Planned highway crossings, upcoming commercial or residential expansions, municipal zoning plans, and other flood control tasks under the ESMF.

**Natural and External Drivers:**

- *Climate Change:* Increased frequency and intensity of torrential rainfall, sudden flash floods, and prolonged agricultural droughts.

- *Upstream Land Use:* Deforestation, agricultural land drainage, and soil compaction on steep mountain slopes, which accelerate runoff velocity and increase sediment loads.

## 4.3 Step 3: Establish Baseline Status of selected VECs

This step defines the current condition, vulnerability, and resilience of each VEC.

**Required Baseline Indicators:**

- *Water Quality & Ecology:* Biological indices (phytobenthos, macrophytes, ichthyofauna), chemical status (e.g., benzo(a)pyrene levels), and status ratings of Surface Water Bodies (SWBs) and Groundwater Bodies (GWBs).
- *Sociodemographic Profile:* Age structure (e.g., aging and feminization of old age in rural/spa gminas), household income levels, and numbers of flood-displaced persons.

**Available Data Sources to Leverage:**

- *National Monitoring:* Chief Inspectorate for Environmental Protection (**GIOŚ**) water quality databases.
- *Hydroclimatic Data:* Institute of Meteorology and Water Management (**IMGW-PIB**) historical flow and climate projection registries.
- *Biodiversity Registries:* Global Biodiversity Information Facility (**GBIF**), Integrated Biodiversity Assessment Tool (**IBAT**), and Natura 2000 Standard Data Forms (SDFs).
- *Social Registries:* Central Statistical Office (**GUS**) municipal demography databases.

## 4.4 Step 4: Assess Cumulative Impacts on VECs

Rather than measuring the stress added by the project, this step estimates the **total resulting condition of the VEC** under the combined load of all stressors.

**The Future Analytical Baseline:**

Future Baseline = {Past/Current Trends} +{Other Planned Projects} + {Climate Change Drivers}

**The Project Scenario:**

{Project Scenario} = {Future Baseline} + {The Proposed Subproject (with mitigation)

**Project Incremental Contribution:**

{Incremental Contribution} = {Project Scenario} - {Future Baseline}

**Interaction Analysis:**

- *Additive:* Equal to the sum of individual effects (e.g., cumulative land acquisition across multiple projects).
- *Synergistic:* Combined effect is greater than the sum (e.g., climate-induced low-flows combined with reservoir impoundment causing severe downstream oxygen depletion).

- *Antagonistic:* Effects counteract (e.g., upstream forest retention counteracting urban runoff peaks).

## 4.5 Step 5: Assess Significance of Cumulative Impacts

The significance of cumulative impacts must be evaluated against **ecological and social thresholds** (limits of acceptable change).

**Threshold Definition:**

- *Hydrological Thresholds:* Minimum Environmental Flow (MEF).
- *Social Thresholds:* Carrying capacity for land acquisition in a single municipality. A significant threshold is crossed if land loss forces systemic agricultural collapse or induces irreversible community out-migration.

**Precautionary Principle application:**

- Where precise ecological thresholds are scientifically uncertain, the assessment must adopt a highly conservative approach, proposing tighter safety margins, larger downstream releases, and robust buffers.

## 4.6 Step 6: Management of Cumulative Impacts – Design and Implementation

The final step translates the assessment findings into actionable, costed, and contractually binding management plans.

**Mitigation Hierarchy Application (ESS1):**

- *Avoidance:* Re-engineering layouts to prevent VEC overlap. For example, optimizing polder boundaries to avoid physically relocating critical regional employers or historic monuments.
- *Minimization:* Operating reservoirs as a single coordinated system to optimize downstream flow and sediment patterns.
- *Offsetting:* Not applicable for a single project to offset regional cumulative impacts. However, collaborative, regional offset strategies (such as coordinated basin-wide watershed reforestation) may be proposed.

**Adaptive Management Setup:**

- A rigorous, structured mechanism to modify project operations in real-time based on VEC monitoring results. It requires the definition of **indicator-based triggers**.

# 5. Adaptive management protocols and decision triggers

To manage uncertainties associated with climate change, cumulative interactions, and ecological responses, all Tasks subject to a CIA/R-CIA must implement a formal **Adaptive Management Protocol**.

## 5.1 Standard Operating Procedure (SOP) for Adaptive Management

1. **Continuous Monitoring:** The Contractor and Contract Engineer collect real-time data on designated VEC indicators (e.g., flow volume, dissolved oxygen, fish pass passage rates).
2. **Trigger Exceedance:** If a VEC indicator crosses a predefined **Trigger Threshold**, the Contract Engineer must immediately notify the PIU.
3. **Root-Cause Assessment:** Within 72 hours the PIU, supported by the Technical Assistance Consultant, shall convene to determine if the exceedance is project-induced or driven by external factors.
4. **Action Plan Development:** If the subproject is a material contributor, the PIU shall approve a **Corrective Action Plan**.
5. **Implementation & Verification:** The Contractor executes the corrective measures. The Contract Engineer verifies their effectiveness and formally closes the non-compliance case once VEC indicators return to acceptable levels.