II INCA DAM SAFETY SEMINAR

NOVEMBER, 6th – 7th

HERNANDARIAS - PARAGUAY

Dam Safety from the World Bank Perspective

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USA

WORLD BANK GROUP
Water

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Contents

1. The Role of the World Bank Group

Our Mission

The World Bank Group is firmly committed to reaching our twin goals:

Eradicating extreme poverty Ensuring shared prosperity

The twin goals and the three ways to get there are collectively referred to as the "2x3" approach.
In close partnership with our member countries, we will achieve these goals in three ways:

1. By working to accelerate inclusive and sustainable economic growth
2. By helping countries invest more effectively in people
3. By fostering resilience to global shocks and threats

IBRD
The International Bank for Reconstruction and Development

IDA
The International Development Association

IFC
The International Finance Corporation

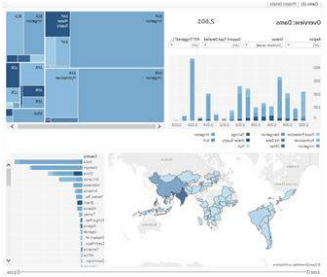
MIGA
The Multilateral Investment Guarantee Agency

ICSID
The International Centre for Settlement of Investment Disputes

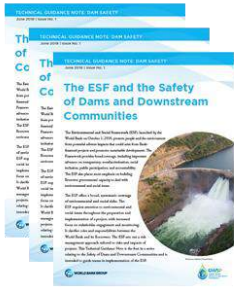
2. Overview of the Global Dam Safety Program

Global

Dams Portfolio Management & E-Library



Guidance Notes



Global Study

Partnerships & Training

iha international hydropower association

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GFDRR Global Facility for Disaster Reduction and Recovery

ICH harmonisation for better health

Regional & Country

Technical Support and Quality Assurance for:

- National Dam Safety Programs
- Stand-Alone Dam and Reservoir Projects
- Technical Assistance Advisory Services and Analytical Work

2. Good Practice / Technical Guidance Note on Risk-Informed Dam Safety

1. Risk-Informed Dam Safety Management
   a) Framework for risk-informed dam safety
   b) Application to Bank operations
   c) Compliance requirements (dam safety plans, independent review, etc.)
   d) Procedural aspects (key steps, timing, etc.)
2. Risk analysis and management tools
   a) Potential Failure Modes Analysis
   b) Portfolio Risk Assessment & Management with Risk Index
3. Hydrologic Risk Assessment
4. Seismic Risk Assessment
5. Geotechnical Risk Assessment
6. Management of Small Dams Safety
7. Management of Tailings Storage Facilities

Audience: Bank staff and Borrowers

2. Technical Support and Capacity Building - Demands and Opportunities

- **Advisory Services and Technical Assistance**
  - Global knowledge products
  - Regional & Country analyses
  - Just-in-Time support
- **Consultations and Network Development**
  - Expert review and advice
  - Global and regional conferences
  - Workshops
- **Training**
  - Short- and Long-term learning
  - Study tours and exchanges

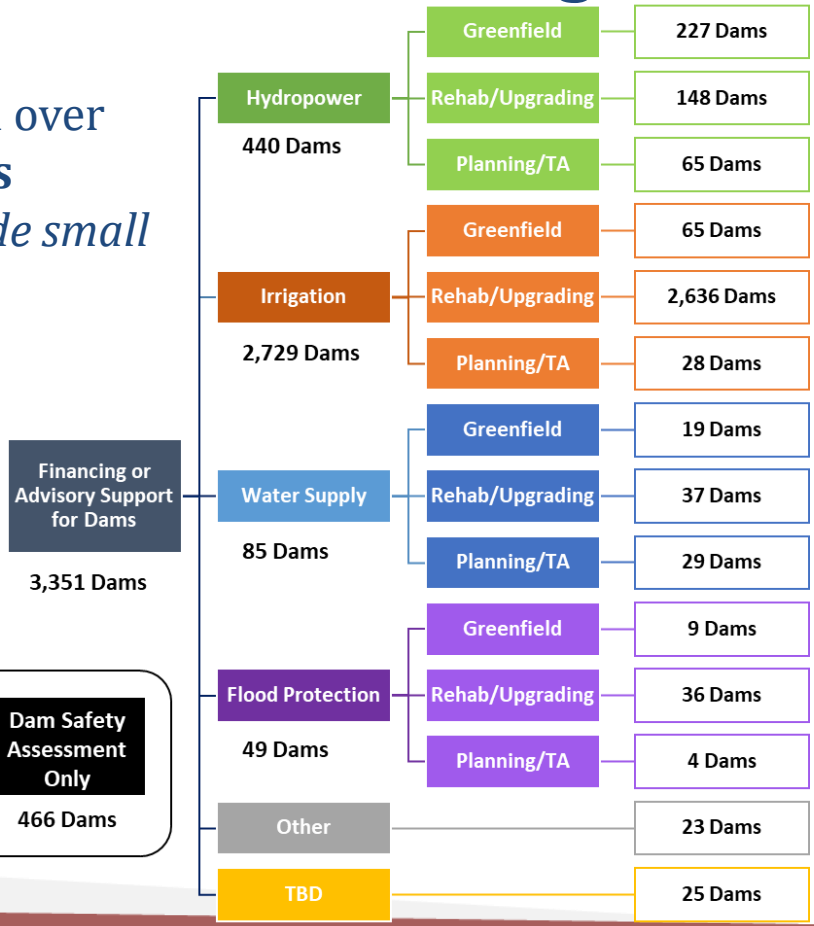
2. Technical Support and Capacity Building - Demands and Opportunities

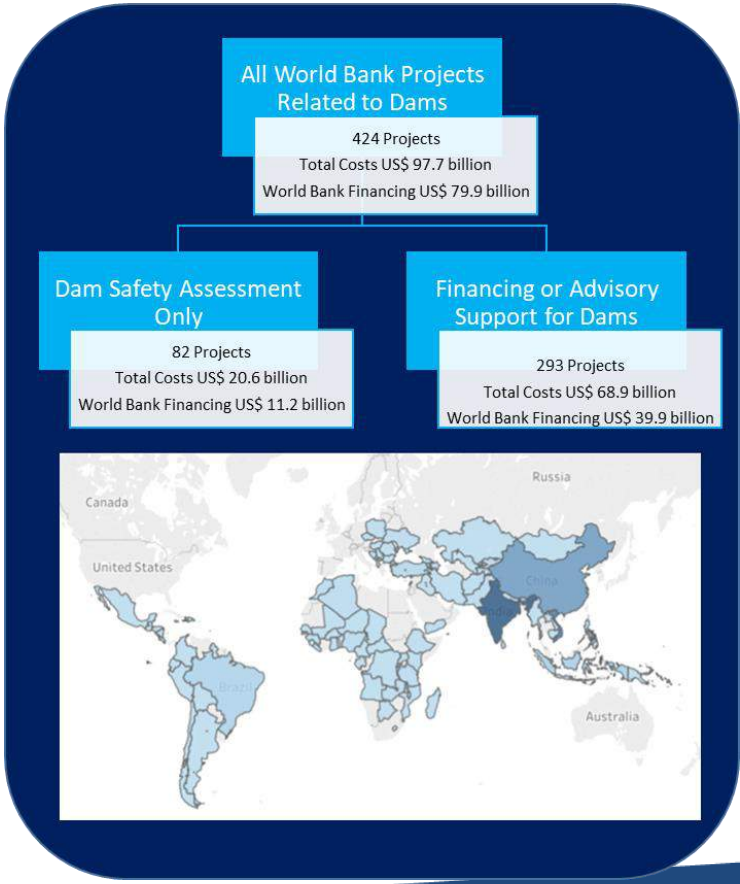
- **Knowledge products**
  - Knowledge notes
  - Guidance notes
- **eLearning**
  - Webinars
  - Self-paced courses
  - Open online courses
- **Interactive tools**
  - Online assessments
  - Global database development
  - Augmented/Virtual reality applications

3. WB Portfolio including Dams

Dams supported over the last **18 Years**

** Numbers include small dams*

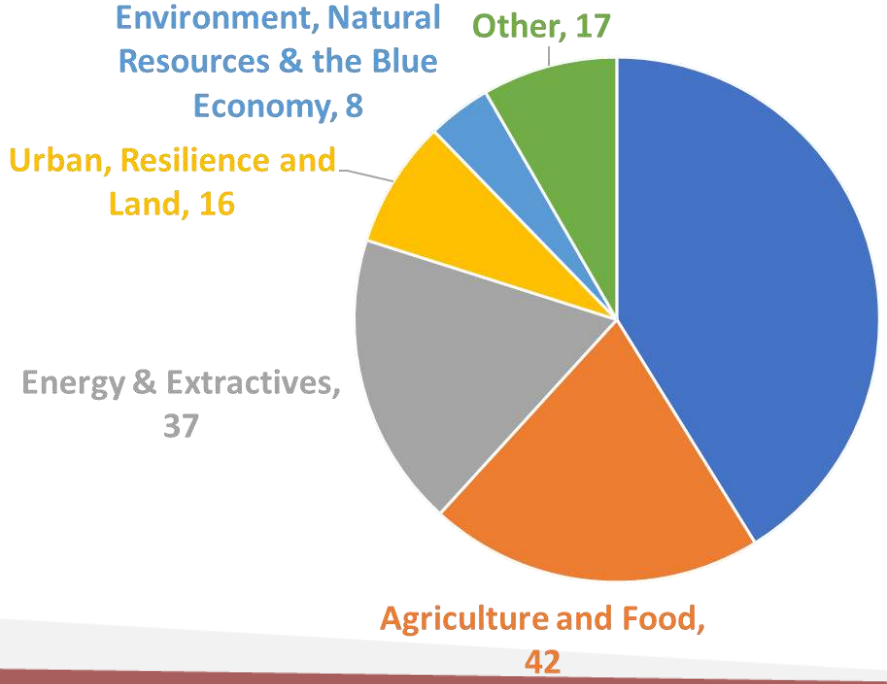




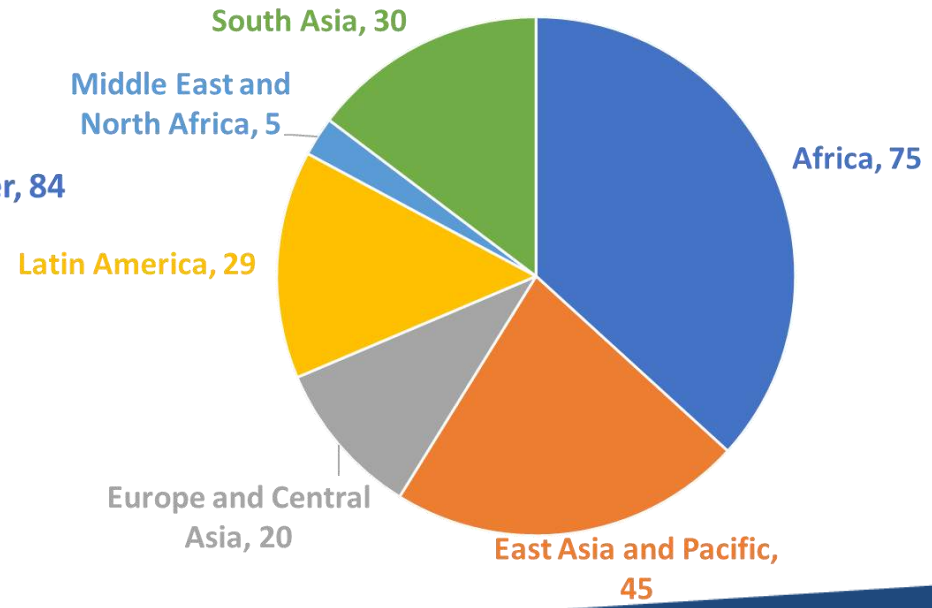
3. WB Portfolio including Dams

204 active and pipeline projects that have triggered WB safeguard policy OP 4.37 "Safety of Dams"

Projects per Global Practice



Projects per Region



3. WB Portfolio-New Dams Construction (Examples)

1. Hydropower Dams

- **Trung Son** (260 MW, Vietnam)
- **Dasu** (4,300 MW, Pakistan)
- **Lom Pangar** (30 MW + power generation increase of 9 downstream cascade plants, Cameroon)
- **Rusumo Falls** (80 MW, Rwanda, Burundi and Tanzania)

2. Multipurpose and Water Supply Dams

- **Wuxikou** (Flood control and hydropower, China)
- **Bisri** (Water supply for Beirut, Lebanon)
- **Mwache** (Water supply for Mombasa, Kenya)
- **Metolong** (Water supply for Maseru, Lesotho)

3. New Dams Design & EIA / RP Preparation

- **Upper Arun** (335 MW, Nepal)
- **Matenggeng pump storage** (1,000 MW, Indonesia)
- **Batoka Gorge** (2,400 MW, Zambia and Zimbabwe)

3. WB Portfolio-Rehabilitation/Upgrade (Examples)

Single / Multiple Dams - Targeted Refurbishment, Augmentation, and Safety Measures

e.g. **Kariba (Zambia/Zimbabwe), 7 Dnipro/ Dnister Rivers cascade dams (Ukraine), Nurek (Tajikistan), 3 Drin River cascade dams (Albania), Corumana (Mozambique), Tarbela (Pakistan),** etc.

- Electrical- Mechanical system refurbishment, upgrade and augmentation
- Instrumentation upgrade
- Spillway, outlet works, stilling basin, etc.

National Dam Safety and Rehabilitation

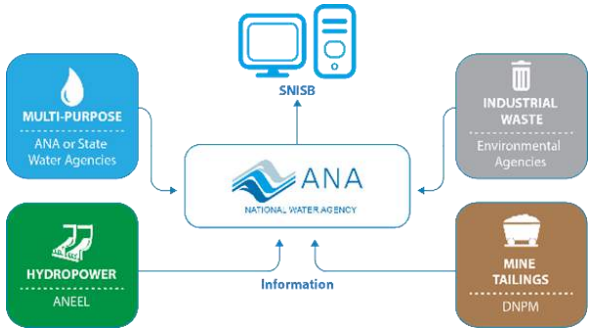
e.g. **India, Indonesia, Sri Lanka, Armenia, Vietnam,** etc.

- Inventory of existing dams and risk / hazard classification
- Rehabilitation / upgrade of priority existing dams
- Advanced hydro-meteorological monitoring, flood forecasting system and optimized reservoir operation procedure
- Emergency Preparedness Plan and downstream warning systems

3. WB Portfolio - Dam Safety Technical Support under lending operations and standalone programs (examples)

- **Brazil, India, Nepal, Laos, Ethiopia, etc.**

  - Institutional & Regulatory Framework Review
  - Dams classification
  - Design of national database system for dam safety
  - Manuals/guidelines for regulators and owners
  - Technical and management workshops



- **Eastern Nile (Ethiopia, Sudan and South Sudan)**

  - Review of countries' dam safety guidelines
  - Discussion on possible joint dam safety framework
  - Capacity building including technical workshops on Possible Failure Mode Analysis (PFMA)

4. WB Dam Safety - Application of OP4.37 and ESF/ESS4

Old projects
(before October 1, 2018)

- OP4.37

Operational Manual

OP 4.37 - Safety of Dams

These policies were prepared for use by World Bank staff and are not necessarily a complete treatment of the subject.

OP 4.37
October, 2001

Note: OP/BP 4.37, *Safety of Dams* were revised on April 2013 to take into account the recommendations in *"Investment Lending Reform: Modernizing and Consolidating Operational Policies and Procedures"* (R2012-0204 [IDA/R2012-0248]), which were approved by the Executive Directors on October 25, 2012. As a result of these recommendations, OP/ BP 10.00, *Investment Project Financing*, have been revised, among other things, to incorporate OP/BP 13.05, *Supervision*, (which have consequently been retired). OP/BP 4.37 have consequently been updated to reflect these changes. Other Bank policies that may apply to projects that involve dams include the following: OP/ BP 4.01, *Environmental Assessment*; OP/ BP 4.04, *Natural Habitats*; OP/ BP 4.10, *Indigenous Peoples*; OP/ BP 4.11, *Physical Cultural Resources*; OP/ BP 4.12, *Involuntary Resettlement*; and OP/ BP 7.50, *Projects on International Waterways*.

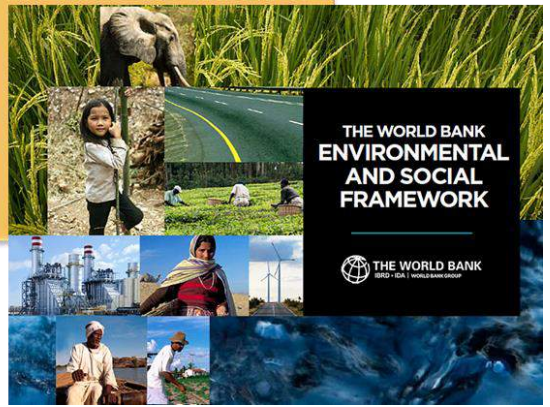
Questions on dam safety should be addressed to the Safeguard Policies Helpdesk in OPCS (Safeguards@worldbank.org.)

Revised April 2013

1. For the life of any dam, the owner[1] is responsible for ensuring that appropriate measures are taken and sufficient resources provided for the safety of the dam, irrespective of its funding sources or construction status. Because there are serious consequences if a dam does not function properly or fails, the Bank[2] is concerned about the safety of new dams it finances and existing dams on which a Bank-financed project is directly dependent.

New projects
(after October 1, 2018)

- ESF/ESS4



4. Dam Safety Under the ESF/ESS4 – Community Health & Safe

The **Environmental and Social Framework** (ESF), which has become effective since October 2018, is intended to enable the World Bank and Borrowers **to better manage environmental and social risks of projects and to improve development outcomes**.

The ESF provides a systematic coverage of environmental and social risks and sets out a **risk management approach tailored to risk and impacts of projects**.

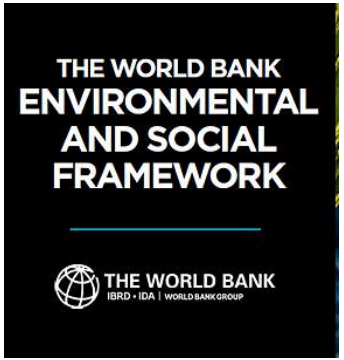
The ESF consists of:

- the World Bank's Vision for Sustainable Development
- the World Bank's Environmental and Social Policy for Investment Project Financing (IPF), which sets out the requirements that apply to the Bank
- the **10 Environmental and Social Standards (ESS)**, which set out the requirements that apply to Borrowers.

4. Dam Safety Under the ESF/ESS4 – Community Health & Safe

ESS4: Community Health and Safety addresses the health, safety, and security risks and **impacts on project-affected communities** and the corresponding responsibility of Borrowers to avoid or minimize such risks and impacts, with **particular attention to people who, because of their particular circumstances, may be vulnerable**.

This includes specific provision related to the Safety of Dams, replacing OP/BP 4.37 (ESS4-Annex 1).



4. OP/BP 4.37 vs ESF/ESS4

Major modifications:

- lowering the threshold for large dams with a reservoir capacity greater than 3 million m3 from 10 m to 5 m in height;
- the inclusion of all other dams regardless of size or retention capacity (referred to as “small dams”) that could cause safety risks; and,
- the introduction of a proportional **risk-informed approach** to the application of the dam safety requirements, **proportional to dam’s size, complexity and potential risk**.

4. WB Dam Safety Policy(OP4.37, ESF/ESS4)

Dam Safety management - Basic Concept

- Stems from the concern over the serious consequences if a dam does not function properly or fails
- Refers to the factors that influence the safe operation of the structure of the dam and the appurtenant structures:
  - adequacy of design and construction
  - regular surveillance and inspections
  - adequacy of operation and maintenance
  - plans for dealing with emergencies

4. WB Dam Safety Policy(OP4.37, ESF/ESS4)

WB Safeguards Requirements

- The WB distinguishes between **small and large dams** as per the ICOLD definition
- For large dams, but also for small dams that could cause safety risks, the WB requires
  - 3a. reviews by an **Independent Panel of Experts** of the investigation, design, construction and start-up phases
  - 3b. preparation and implementation of detailed **Dam Safety Plans**
  - 3c. **prequalification of bidders** during procurement and bid tendering
  - 3d. **periodic safety inspections** of the dam after completion

Composition and Purpose of Panel of Experts

- Consists of three or more experts, appointed by the borrower and acceptable to the Bank
- Contracted by the Borrower, following advice and review by the Bank
- Meets regularly and issues recommendations, from investigation until start-up phase

4. Dam Safety Report – 4 Dam Safety Plans

ESS4 Annex 1: C. Dam Safety Report (derived from BP4.37)

1. **Construction Supervision and Quality Assurance Plan**
   - Organization (Key parties roles and responsibilities)
   - Quality control measures
   - Health and safety management, etc.
2. **Instrumentation Plan**
   - List of monitoring equipment (type, number, location)
   - Technical specification of monitoring equipment
   - Data acquisition, analysis, reporting, and storage system

4. Dam Safety Report – 4 Dam Safety Plans

ESS4 Annex 1: C. Dam Safety Report (derived from BP4.37)

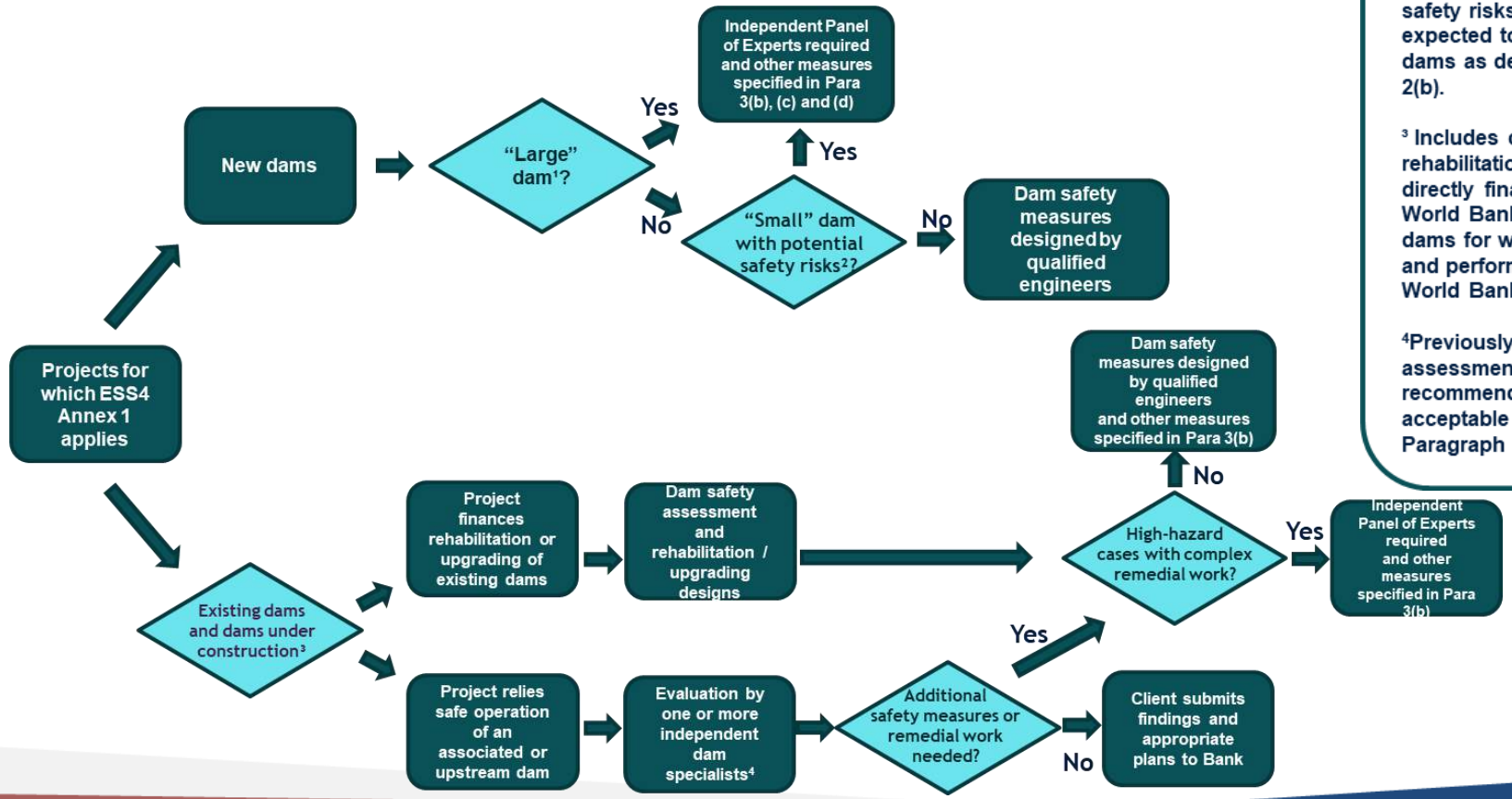
3. Operation and Maintenance Plan

- Organization/staffing
- Operation & Maintenance procedure
- Reservoir operation procedure
- Surveillance and inspection procedure, etc.

4. Emergency Preparedness Plan

- Responsibilities demarcation
- Emergency identification, evaluation and classification
- Notification /warning procedures and preventive /emergency actions
- Inundation maps and tables, etc.

4. ESS4 – Annex 1. Safety of Dams



[1] "Large" dams are defined in Paragraph 2 (a).

[2] "Small dams" with potential safety risks or that are expected to become large dams as defined in Paragraph 2(b).

[3] Includes dams for which rehabilitation works are being directly financed through World Bank projects as well as dams for which their safety and performance are critical to World Bank financed projects.

[4] Previously prepared assessment or recommendations may be acceptable as laid out in Paragraph 10.

Thank you for your attention…

Felipe Lazaro, senior dam specialist

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