Committee H DAM SAFETY WORKSHOP – 2 – 4 pm Saturday May 28, 2022

Agenda Item 4

B2 DAM SAFETY - GOVERNANCE CONSIDERATIONS

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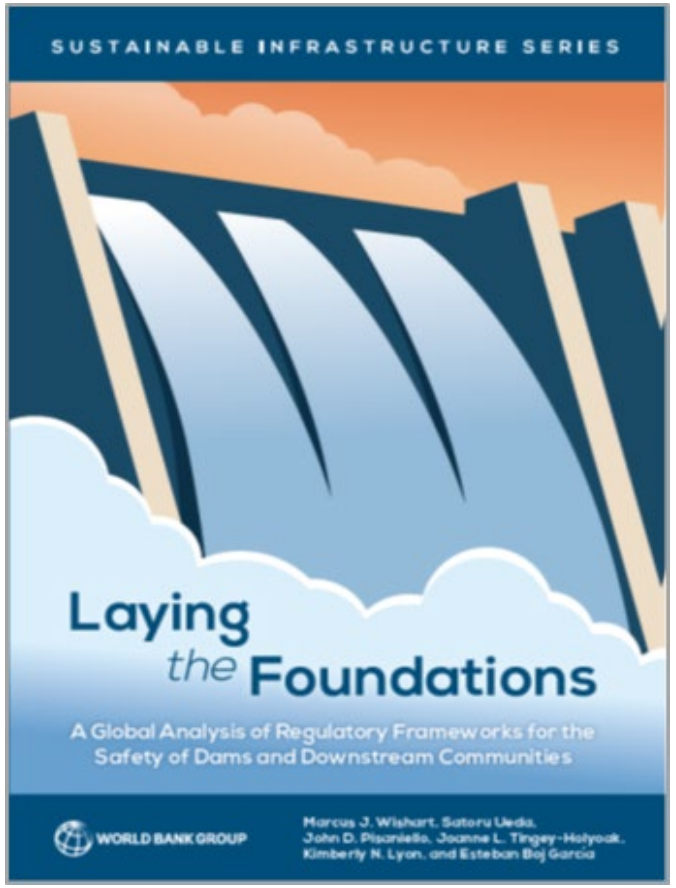
B2 - Dam Safety Governance Considerations <Key Features>

- This Bulletin is different from typical ICOLD Bulletins in that it does not address any technical or engineering aspects of dam safety.
- Its focus is entirely on explaining how to build an effective and efficient dam safety regulatory framework which not only fits the country/jurisdiction legal system but is also appropriate for the country/jurisdiction social and economic circumstances, cultural traditions and societal expectations.
- It explicitly recognizes the fact that there is not a single way to achieve such goal, and development of a single, prescriptive procedure would not meet all stated objectives.

B2: Dam Safety Governance Considerations <Bulletin Development Process>

- Relied extensively on the material collected and analyzed for the World Bank Study on Comparative Assessment of Legal and Institutional Frameworks for Dam Safety Assurance around the world.
- Its findings, conclusions and recommendations provided necessary input to the development of the guidance presented in this Bulletin.

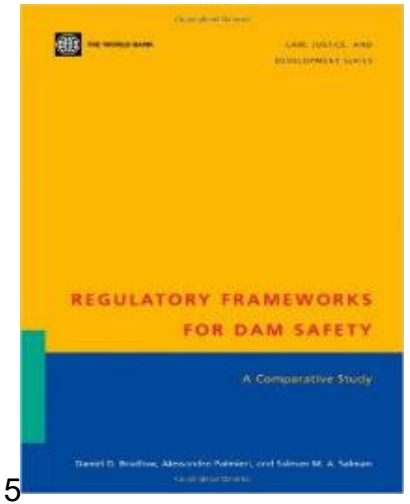


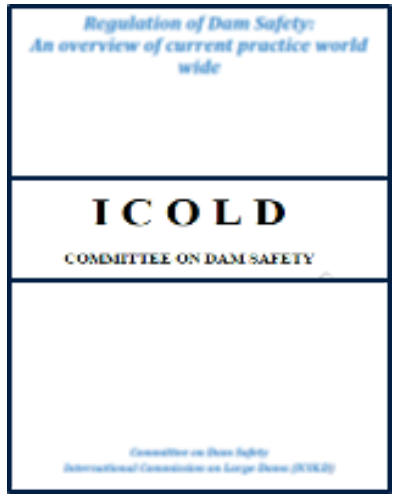
Background: A Global Analytics of Regulatory Framework for Safety of Dams and Downstream Communities

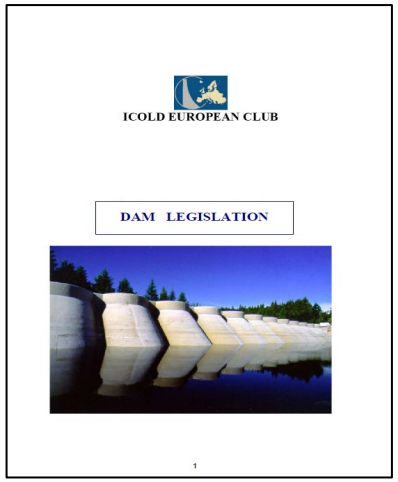
1. to provide a comprehensive set of country case studies with a balanced representation among a diverse set of countries with varying economic, political and cultural circumstances.
2. to carry out a comparative analysis of the legal, regulatory, and institutional metrics along with financial and operating model analysis to identify a continuum of elements of exemplary practice and precedents.
3. to recommend a set of legal, regulatory and institutional frameworks suitable for different country circumstances supported by a menu of different options.

Collaborative Effort that Builds on Previous Efforts

- Strong Foundations
  - WB Regulatory Frameworks for Dam Safety (2002)
  - ICOLD Bulletins
  - Technical Guidelines (USACE, FEMA, Canada, Australia, UNECE etc.)
  - Informs the Bank's Environment & Social Framework

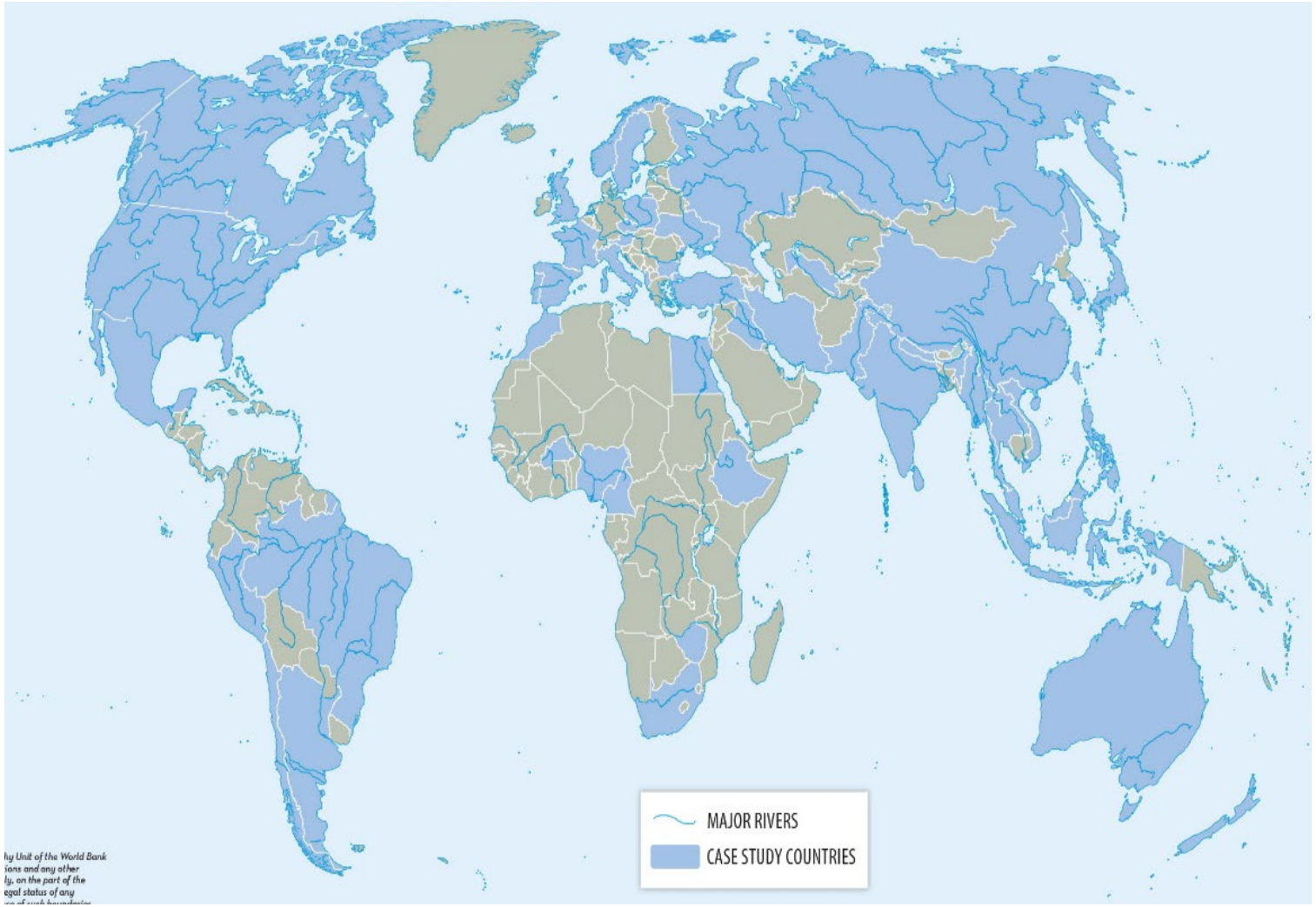






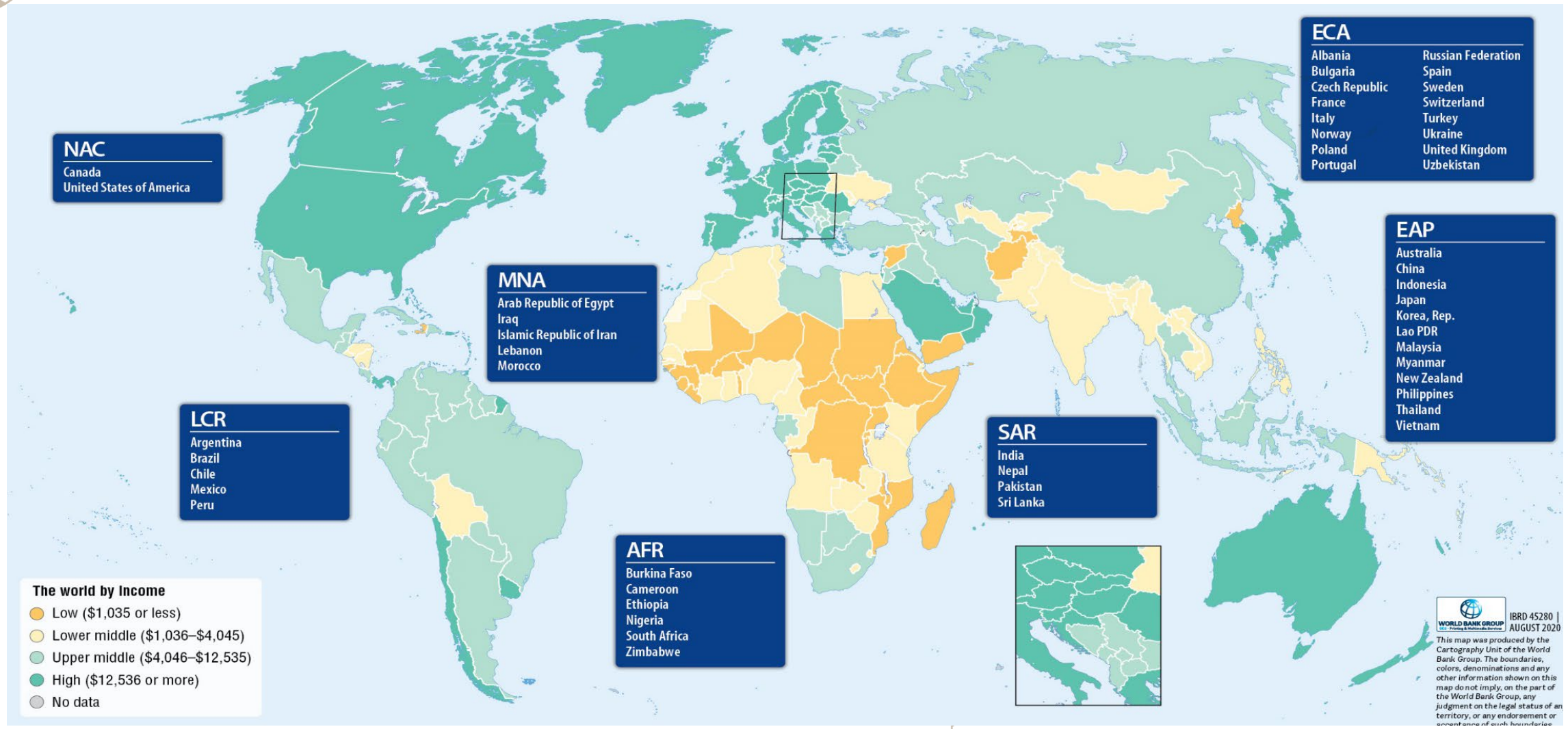
- Consultative Process
  - 6 Core Team Members
  - 3 External Advisers
  - 5 Internal Peer Reviewers
  - 7 External Peer Reviewers
  - 28 WB Contributors
  - 116 Country Contributors
  - EAP/SAR Consultations
  - AFR/MNA Consultations
  - ICOLD Committee on Dam Safety

Comprehensive set of country case studies



- Ø cover nearly 70% of the total land area
- Ø roughly 80% of the world's population
- Ø all but one of the case studies are ICOLD Members (Laos pending)
- Ø represent half of the ICOLD Members
- Ø >95% of dams registered with ICOLD
- Ø ~85% of registered storage capacity

Range of economic, political and cultural circumstances



Country Case Study Template

1. Country Characteristics, including Dam Safety History & Regulatory Development
2. Legal Basis for Dam Safety Responsibility and Legislation
3. Governance, Empowerment & Institutional Arrangements
4. The Contents of the Regulatory Regime
5. Corporate Governance
6. Portfolio Risk Management
7. Operation and Maintenance
8. Dam Safety Review/Design
9. Emergency Preparedness Plans
10. Funding of the Regulatory Regime
11. Dams in Transboundary Basins

Bulletin B2 - Table of Contents

1. Introduction
2. Ground rules for developing appropriate dam safety governance and regulation
3. Legal foundations of dam safety
4. Institutional, financial and governance arrangements
5. Content of regulatory arrangements
6. Legal and regulatory arrangements for dams on transboundary rivers
7. General dam safety assurance framework (continuum)
8. Decision Support Tool - examples

Ground rules for developing appropriate dam safety governance and regulation

1. Considering severe dam failure consequences, dams require safety assurance regulatory framework in an appropriate manner for the economic, societal and cultural conditions of the jurisdiction.
2. Government is responsible for developing a regulatory framework, including enactment of dam safety legislation, to provide appropriate dam safety assurance to the public.
3. The actual level of dam safety assurance should consider the structural elements, country's policy environment, its ability to implement the regulatory framework.
4. The regulatory framework should be developed from a range of legal, institutional, technical and financial options appropriate to various jurisdictional circumstances with different portfolio characteristics, human and financial resources and population locations and growth.
5. Dam safety regulatory arrangements should be cost-effective. A judgment must be made on how far the risk reduction objectives are pursued and what cost is reasonable to bear.
6. Cost of regulation should be borne equitably with two models: i) the taxpayer via government that funds the regulator, or ii) the user, i.e., the institution being regulated funds the regulator.
7. Regulatory arrangements should be flexible ranging from self regulation to fully independent regulation depending on specific country characteristics.
8. The regulatory framework should evolve with changes in the portfolio and country conditions, providing a continuum of legal, institutional, technical and financial options reflecting their specific needs and requirements.

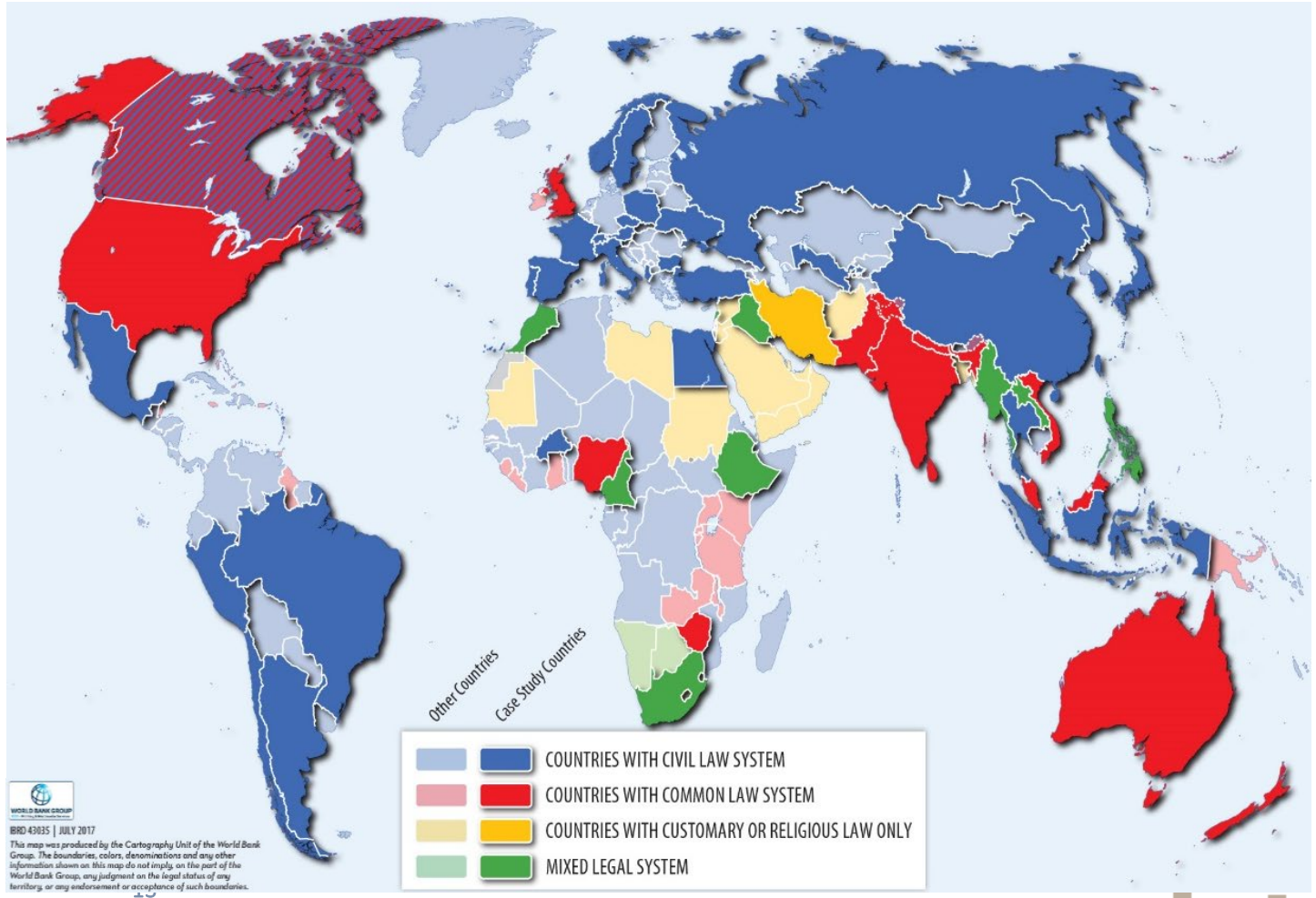
Chapter 3: Legal Foundations of Dam Safety

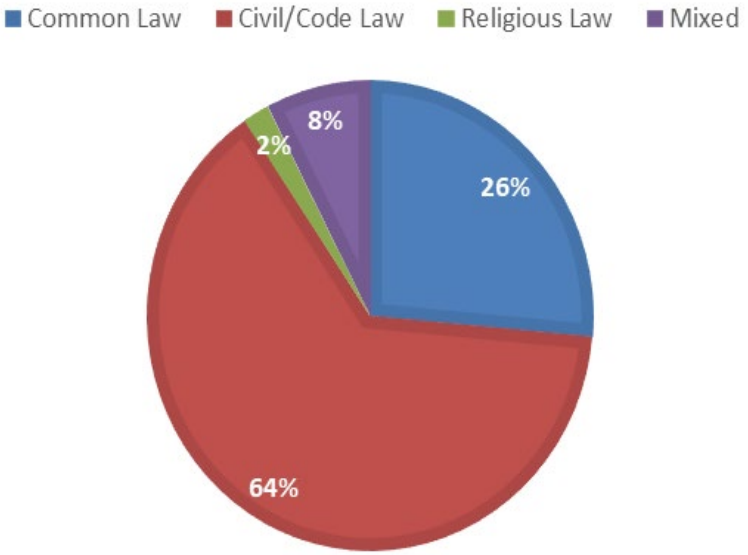
1. Types of legal systems
2. Law making and administration
3. Types of dam safety legislation
4. Dam safety regulation under enabling and dedicated legislation
5. Defining legal liability for dam safety assurance
6. Insuring against liability
7. Summary – legal foundation for dam safety

The Legal Framework for dam safety assurance serves to establish the minimum standards, as well as the roles and responsibilities, for ensuring the safe development and operation of dams

- Constitutional basis for law making (i.e. common or civil) and administration (i.e. federal/decentralized) provide definitive precursors within which the enabling legislative environment for dam safety assurance is formulated.
- Challenges to improving the legal and institutional framework for dam safety management varies depending on the type of legal system and its ability to establish and define roles and responsibilities for dam safety
- Legal framework defines the standard of care, the liability in case of dam failure and the criteria to use to distribute such responsibility among the stakeholders
- Legal framework sets the rules for coordination among dam owners/operators and regulators subjected to different jurisdictions.

The legal system of any country is shaped by its legal traditions and incorporates specific variations based on its particular geo-political history

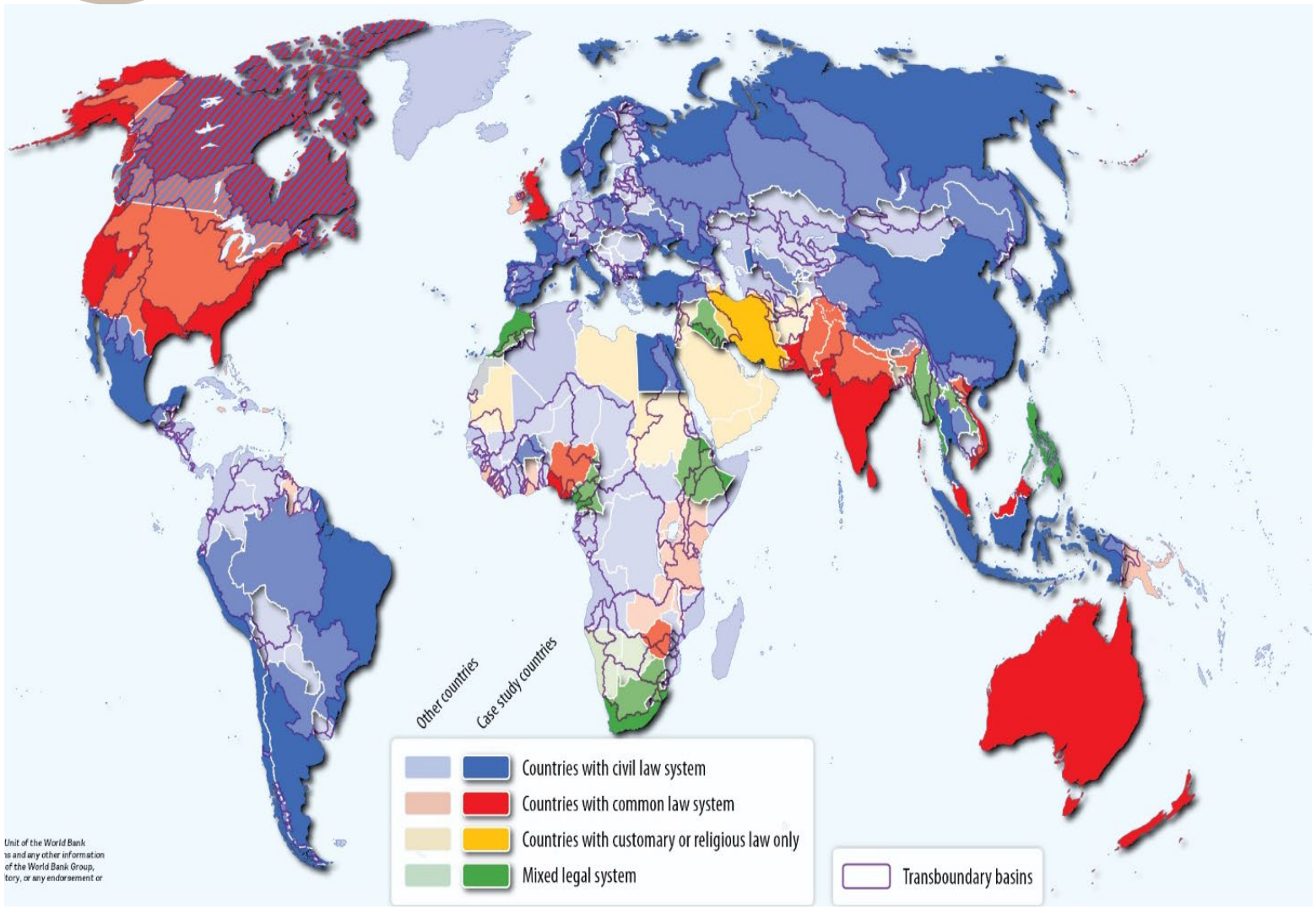


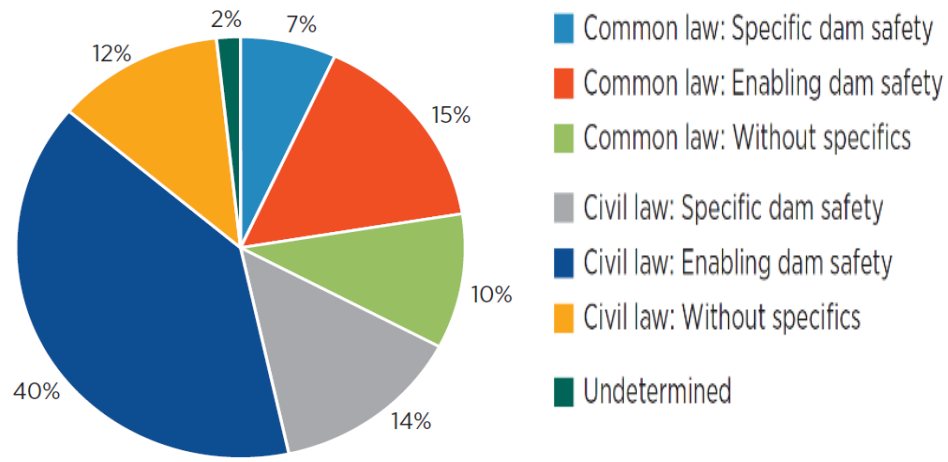


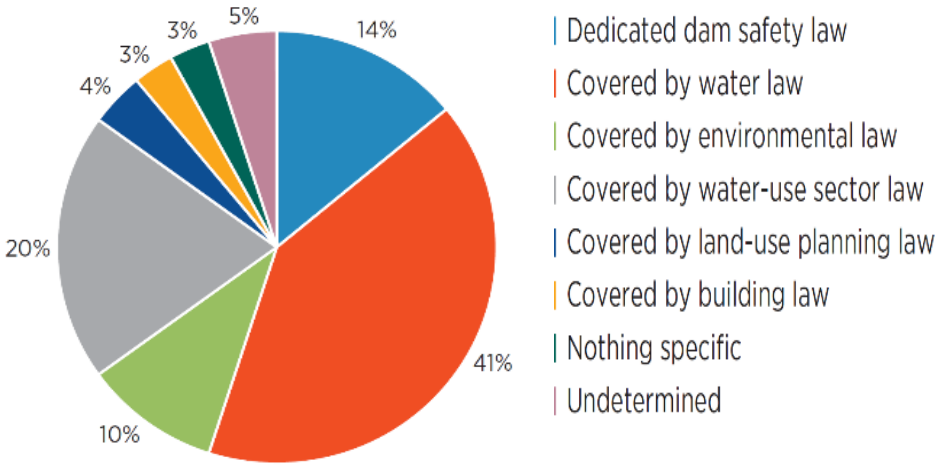
Civil Code *strictly and thoroughly prescribed in legislation/codes with no judicial precedent. Regulating dam safety must be done in a more prescriptive manner.*

Common Law *is based on judicial precedence that can only be over-ridden by statute law which is subject to judicial interpretation. Allows generic laws with reference to guidelines to set requisite standards.*

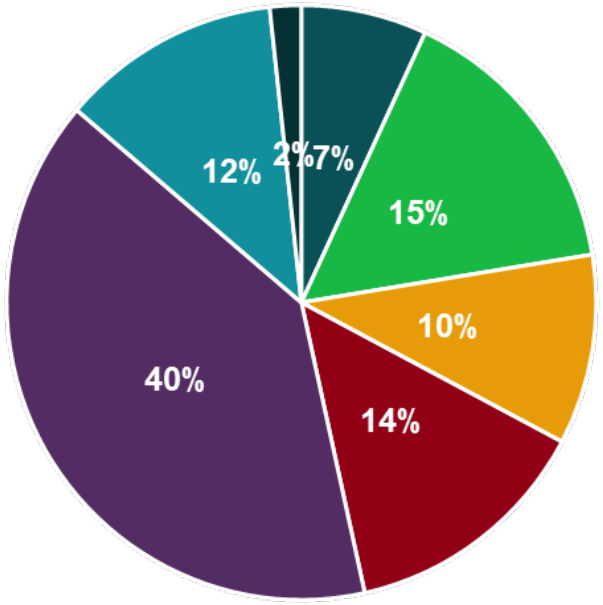
Legal Basis for Dam Safety Assurance

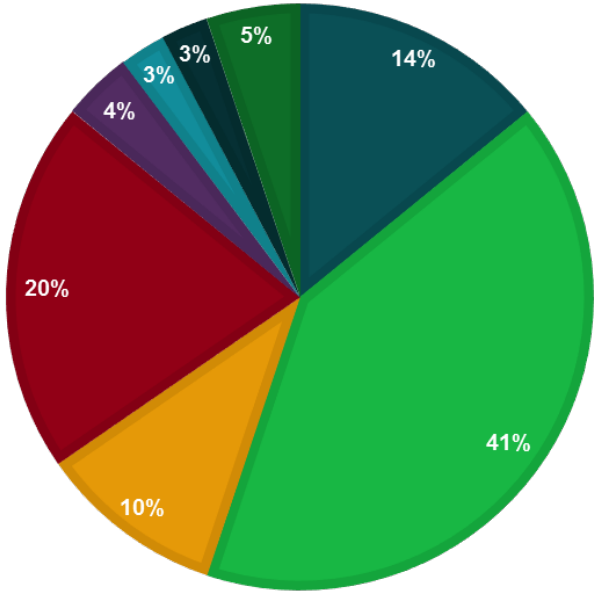






Legislative Provisions for Dam Safety



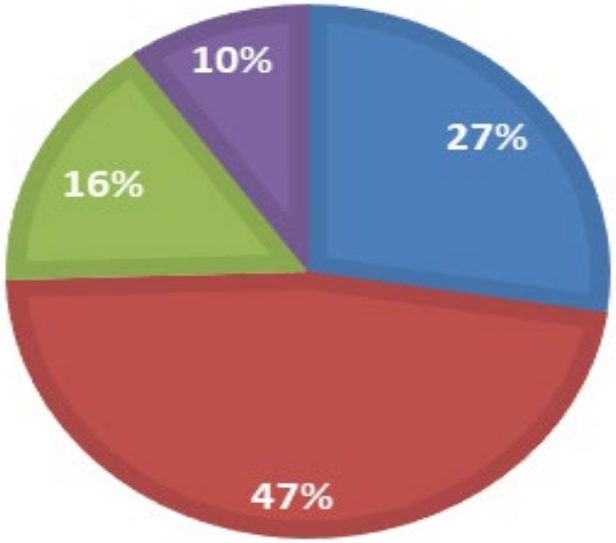


- Common Law: Dam Safety Specifics
- Common Law: Enabling Dam Safety
- Common Law: Without Specifics
- Civil Law: Dam Safety Specifics
- Civil Law: Enabling Dam Safety
- Civil Law: Without Specifics
- Undetermined

- Dedicated Dam Safety Law
- Covered by Water Laws
- Covered by Environment Laws
- Covered by Water Use Sector Laws
- Covered by Land Planning Laws
- Covered by Building Laws
- Nothing specifics
- TBD

- Dedicated dam safety legislation only observed in 21% of country case studies, including both common and civil law
- Dam safety provisions are typically contained within broader enabling laws, such as those for water, environment, energy etc.
- Enabling legislation can bind dam safety provisions to broader legal reforms and also make them more difficult to amend
- No specific dam safety provisions observed in a number of countries (22% of total)
- Legal provisions evolve with the country characteristics and depend on the size of the portfolio, distribution among the different sectors, and national income level

Law making and administration of dam safety assurance

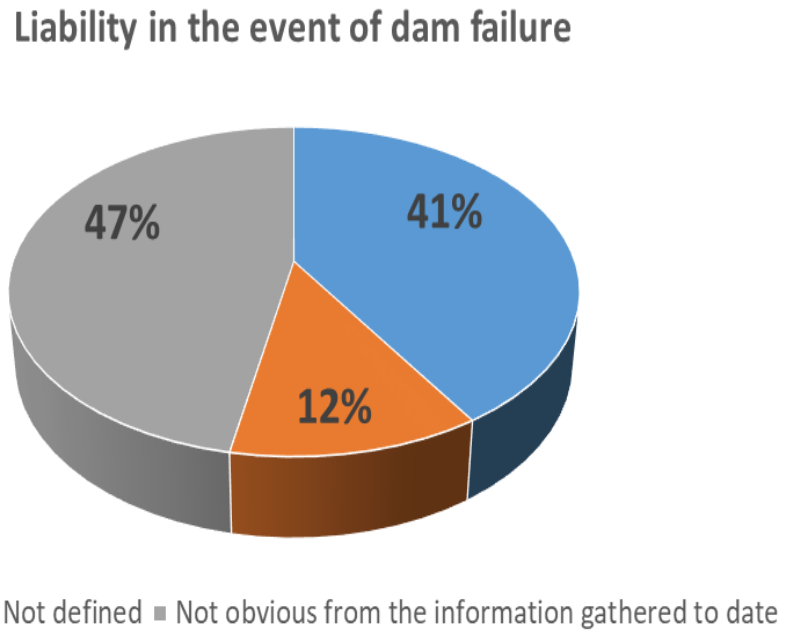


- National only law making and administration
- National only law making but administration can be delegated to lower regional entities
- Federal system where law making and administration possible at either federal or state/provincial level and federal laws can be made to bind states
- Federal system where law making and administration is possible at state/provincial level and federal involvement can be limited for guidance, incentives, etc.

- Majority of countries can administer laws nationally, with administration possible at either national or regional levels.
- Uniformity in dam safety provisions across a territory is easier, while delegating administrative responsibilities to regional entities
- Federal systems where national laws cannot bind the states can result in a lack of uniformity and transboundary challenges

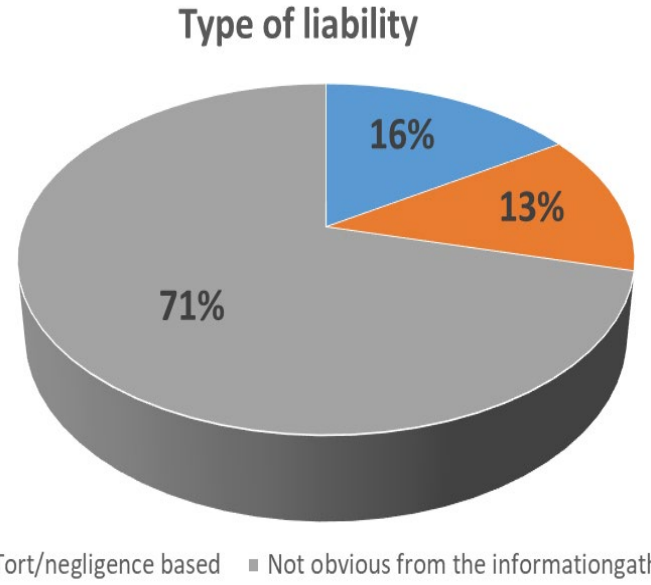
Incentive mechanisms can encourage states and improve uniformity

Responsibility and liability for dam safety are two distinct but strongly related elements



- Responsibility exists throughout the life of the dam, from the design stage until the decommissioning
- Liability only arises in the case of dam failure or mis-operation and when compensation is sought

- Responsibility for dam safety refers to the actions taken by the dam owner towards the care and consideration of the safety of the dam.
- Liability for dam safety refers to the legal obligation of the dam owner to compensate the victims for the personal and property damage caused by mis-operation of a dam or dam failure.



Key Messages from Legal Foundations Chapter

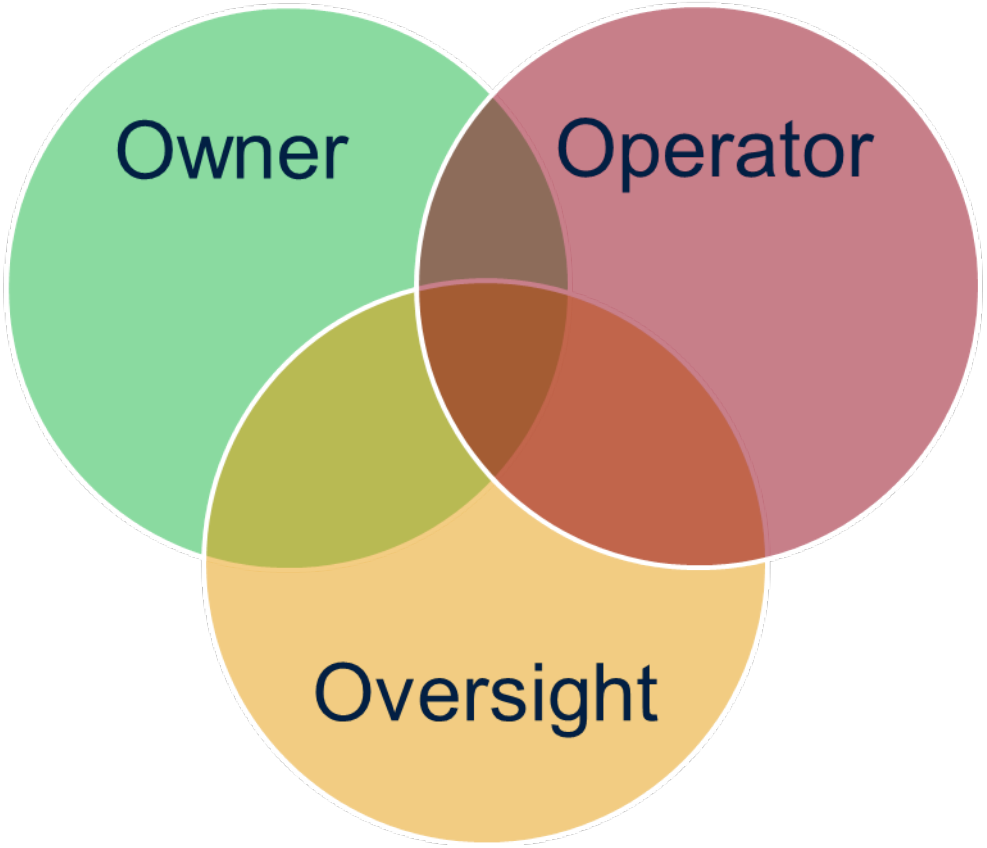
- Legal framework development with due recognition of the enabling environment
- Dam owner is primarily responsible and liable for dam safety in most jurisdictions, and responsibilities and potential liabilities should be clearly defined
- Regulator's role / responsibilities should be clear and activities publicly reported
- Required design standard and safety requirements / standard of care should be clearly stipulated so regulators can check the owner's compliance sufficiently.
- Continuum of legislative options to be evaluated within specific country context
- Enabling legislation provides a pragmatic approach to ensure basic dam safety provisions are incorporated, particularly for emerging portfolios
- Specific regulatory standards or guidelines under relevant laws provide a flexible mechanism to changing circumstances and avoids being held to broader reforms
- Many countries either have no legislative provisions or are in transition, highlighting the need for interim or transitional arrangements
- Non-legislative measures can be used to encourage uniform approaches, eg incentive mechanisms between federal, sub-national and potentially international jurisdictions

Chapter 4: Institutional, Financial and Governance Arrangements for Dam Safety

1. Roles and responsibilities
2. Oversight
3. Role of the regulatory authority
4. Institutional systems
5. Financing dam safety assurance
6. Summary – Institutional, financial and governance arrangements for dam safety

The legal framework gives rise to institutions responsible for ownership, operation and oversight of elements for dam safety assurance

- Range of different institutional functions (owners, operators, oversight)
- Range of different models of ownership (public, semi-public, or private)
- Range of different institutional forms (dedicated, sectoral, mixed)
- Range of administrative levels (national/centralized or regional/decentralized)
- Range of different levels of institutional independence (independent to self-regulation)
- Institutional capacity critical to ensuring dam safety (financial, human, technical, etc.)

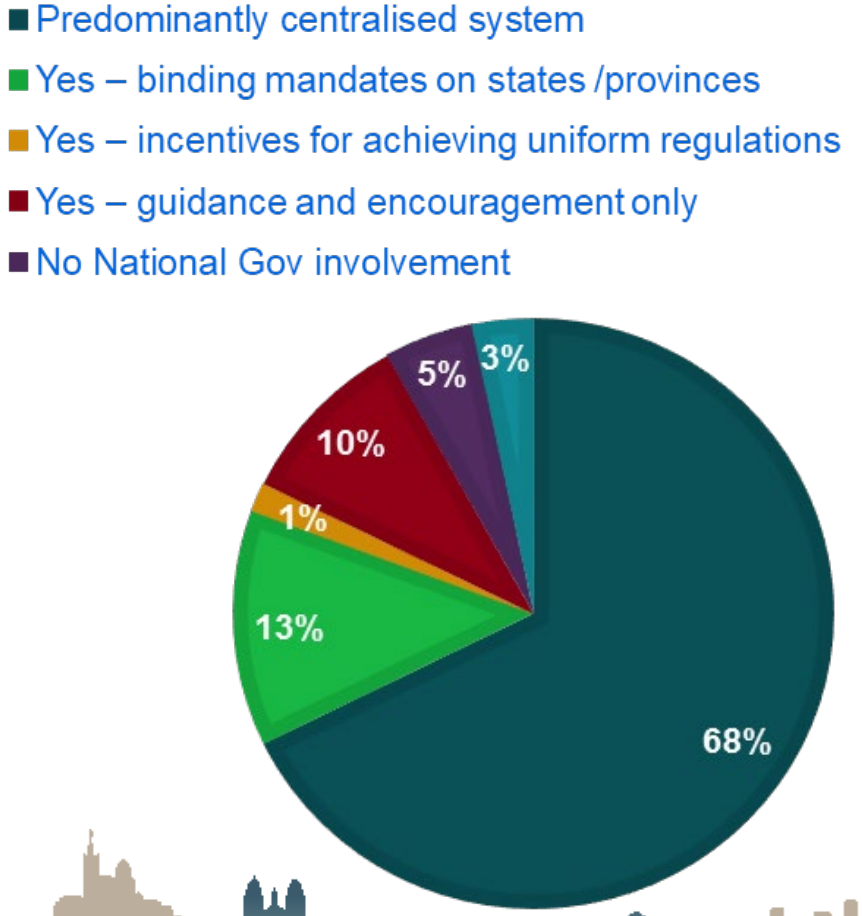


Institutional & Governance Arrangements

Analytical Findings: Administrative Arrangements for Dam Safety

- Majority of country case studies have established centralized regulatory systems
- Sub-national authorities typically have to adhere to the same regulatory regime, although often delegated authority to regulate smaller dams with lower safety / hazard requirements.
- Delegated authority can be legally binding, although instances of management through incentives, to ensure consistency with the national framework.
- Federal systems where the national government is limited to providing guidance and technical to sub-national government requires incentive mechanisms to ensure consistency and avoid transboundary complications

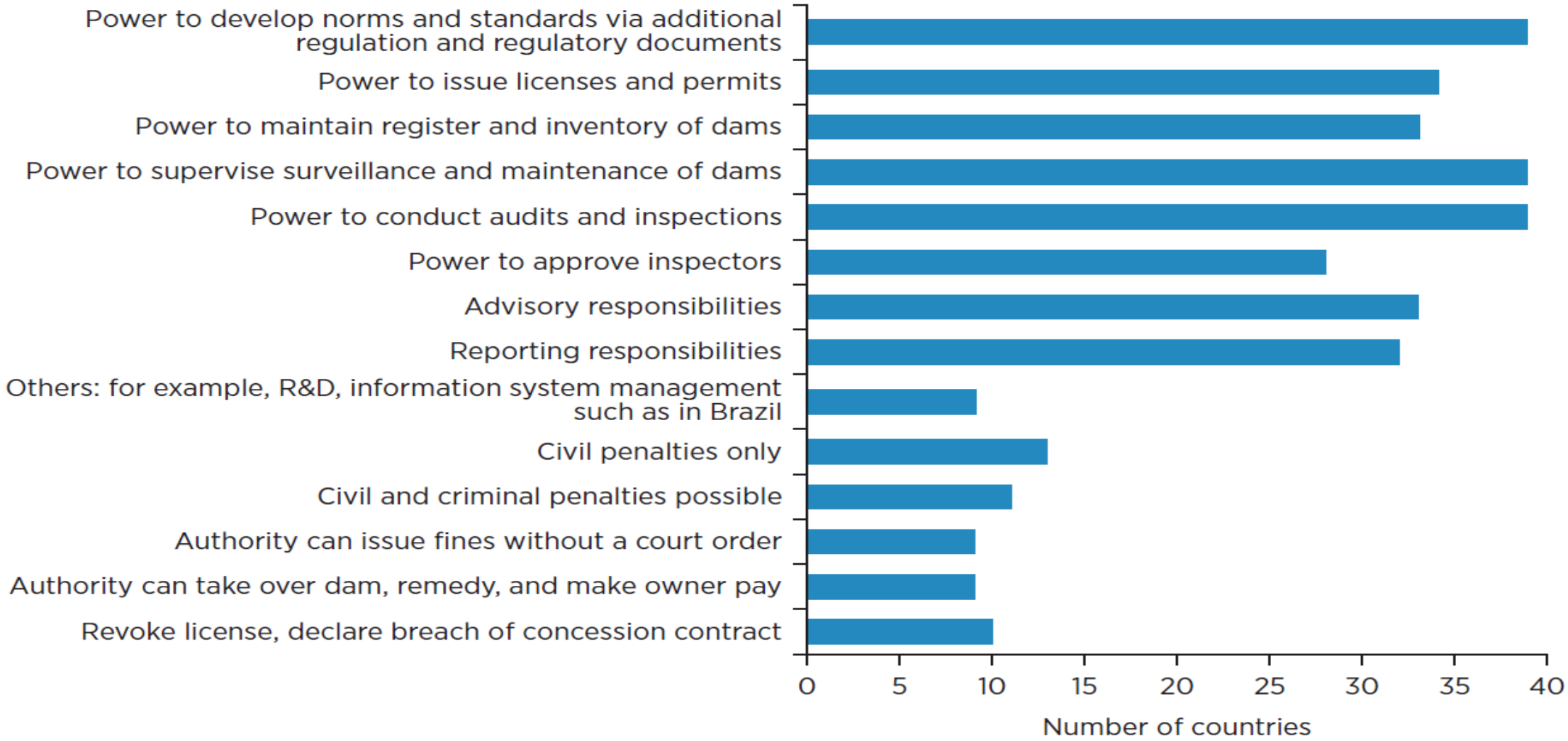
THE RELATIONSHIP BETWEEN FEDERAL/NATIONAL GOVERNMENTS AND STATE/LOCAL GOVERNMENTS



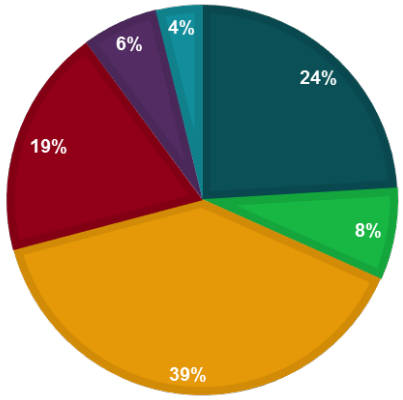
A Continuum of Regulator Type

Role	Compliance audit	Quality assurance	Direct inspection/ assessment
Function	**Random quality assurance audits only** Otherwise just rubber-stamping reports and certifications provided by owners' engineers in a predominantly hands-off function	**Allover assurance, check all information/reports provided by owners' engineers for every dam** May also do the hazard classification (i.e., more hands-on)	**Performs periodic dam safety inspections and assessments** Highly hands-on function
Capacity	**Low** need for capacity/expertise in authority	**Medium** need for capacity/expertise in authority	**High** need for capacity/expertise in authority
Liability	Accepting **no** liability Authority makes no decisions related to the safety of the dam	Accepting **some** potential liability	Accepting **extensive** potential liability

Specific Roles and Powers of Dam Safety Regulators

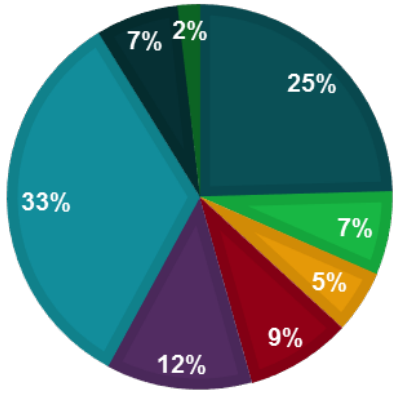


Institutional & Governance Arrangements
Analytical Findings: Independence and Type of Regulatory Bodies



INDEPENDENT REVIEW MECHANISMS

- Independent dam safety authority
- Self-Regulation with independent review mechanism
- Self-Regulation with specific codes/guidelines
- Mixed Independent and Self-Regulation by Sectors
- No clear dam safety regulation
- TBD



INSTITUTIONAL ARRANGEMENT OF REGULATORS

- Cross-Sector led by Water/WR
- Cross-Sector led by Environment/ NR
- Cross-Sector led by Agriculture
- Cross-Sector led by Energy
- Cross Sector led by Infrastructure
- Sectoral Parallel
- Separate Arrangement

- Independent dam safety authorities which do not own any dams are not universal and predominantly located in high income countries.
- Mixed regulatory systems in which regulators own some types of dams, resulting in self-regulation of those dams, whilst independently regulate other types/sectors of dams, are common across income groups.
- Out of those mixed system countries, some countries have developed mechanisms to minimize potential conflict of interests, while others rely on clear separation between the regulation branch and infrastructure branch or independent review committees.
- Self-regulation with specific codes and guidelines is predominantly observed in middle income and common law countries and provides sufficient regulation when coupled with “independent” review and inspection mechanisms.
- Self-regulation in the absence of any enabling legislation, technical guidance or monitoring and reporting requirements highlights significant gaps and poses substantial risks
- Majority of country case studies have incorporated dam safety provisions into cross sectoral regulatory systems.
- Many countries have developed differentiated sectoral regulations in parallel, with some having delegated responsibility to regional authorities or county councils.

Some Key Findings - Governance and Institutional Arrangements for Dam Safety Assurance

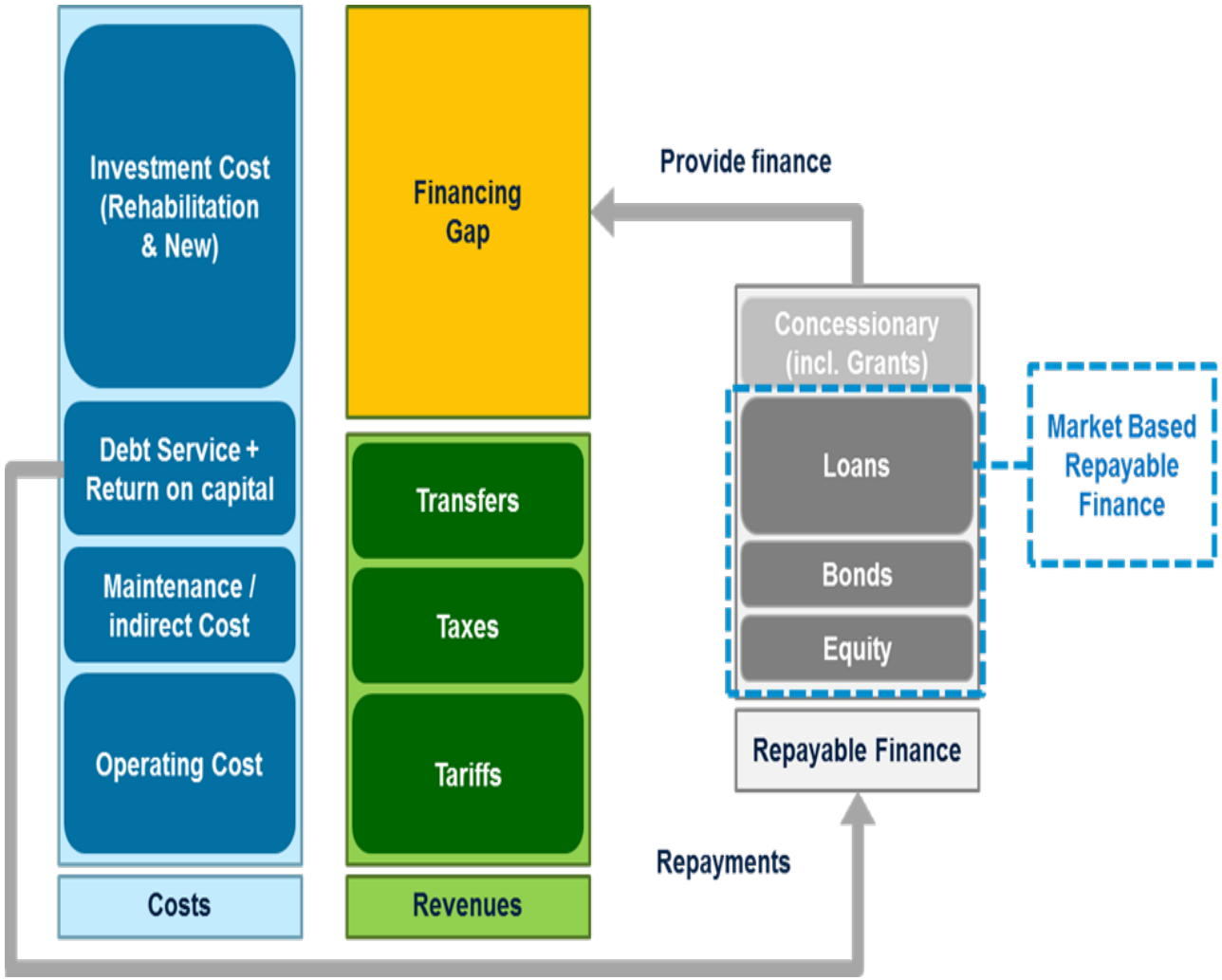
- **Typical issues**
  - No independence of dam safety authority/regulator (ie regulator also owns dams) to ensure proper accountability
  - Multiple authorities and complicated institutional framework for dam safety is problematic (i) horizontal (multiple ministries), (ii) vertical (national, local)
  - Regulator is too hands on. Hands-on or mixed roles creates potential liability issues with the authority having responsibility to determine dam safety issues rather than assess independent reports commissioned by owner. This also has implications for necessary funding and capacity of the regulator

- **Good practices**
  - Independent dam safety authority to limit potential conflict of interest, eg South Korea, Australia/NSW
  - Regulation is best developed/handled at central level to ensure uniformity, but administration may need to be taken to the provincial/regional level when large numbers of dams involved to ensure implementation, eg India, New Zealand, UK
  - More hands-on role for regulator requires more funding and capacity, and in countries where the portfolio of regulated dams is small this is more manageable than in countries with large numbers of regulated dams so a less hands-on and more compliance-audit (rubber stamping) role would be more suitable, eg Australia/Vic

Conclusions & Key Messages

- Dam owners or operator should be clearly responsible for safety of the dam and appurtenant structures, as well as ensuring the dam is operated safely.
- Oversight mechanisms independent from ownership that help to ensure proper accountability is critical, and imperative to establish clear demarcation between regulator vs dam design/operation unit preferably using an independent commission, etc.
- Regulatory mechanisms need to be aligned to size and complexity of portfolio, financial / human capacity as well as within legal regime
- Regulation developed/executed at central level improves uniformity, integrates transboundary considerations (sub-national and international)
- Administration may need to be taken to the provincial/regional level, particularly when large numbers of dams involved to ensure implementation, where incentive mechanisms can be used to align states responsibilities/action
- Multiple authorities can create a complicated institutional framework, particularly as portfolio increases and issues around coordination and competing uses of water can become more complex
- Irrespective of institutional mechanism the roles and responsibilities need to be clearly defined for both the Owner or Operator and the Government/Regulator in the relevant laws and statutes

Funding & Financing Options for Dam Safety Assurance



Three options for raising funds

- Tariff (i.e. user-pays, service fees)
- Taxes (i.e. government)
- Transfer (i.e. grants)

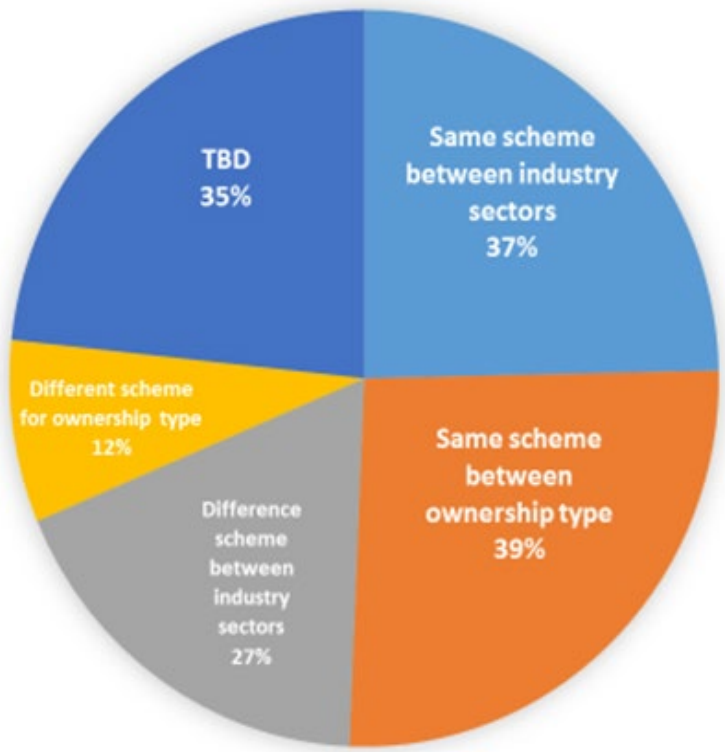
Roles & Responsibilities

1. Owners
2. Operators
3. Oversight

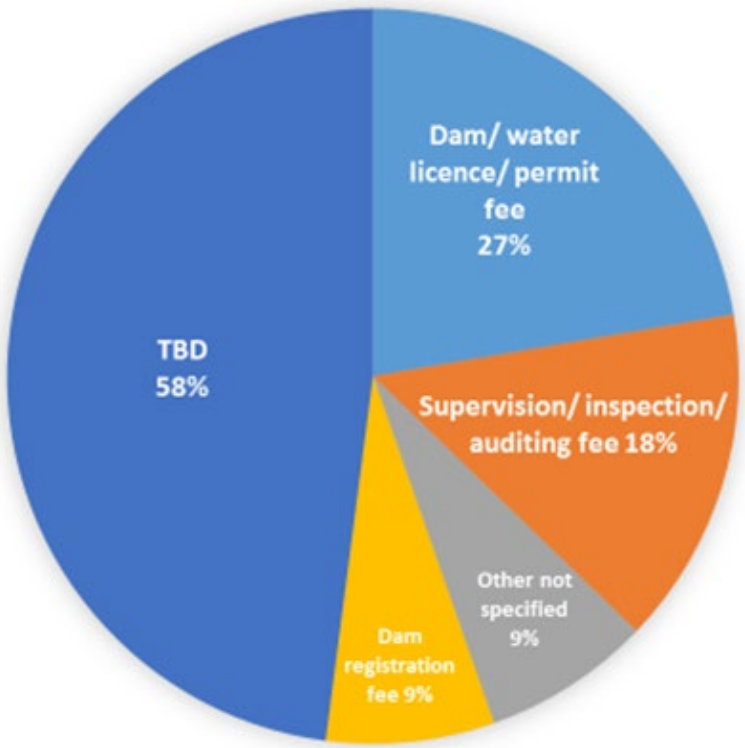
Sector dependent revenue streams

- Hydro
- Supply
- Irrigation
- Others….

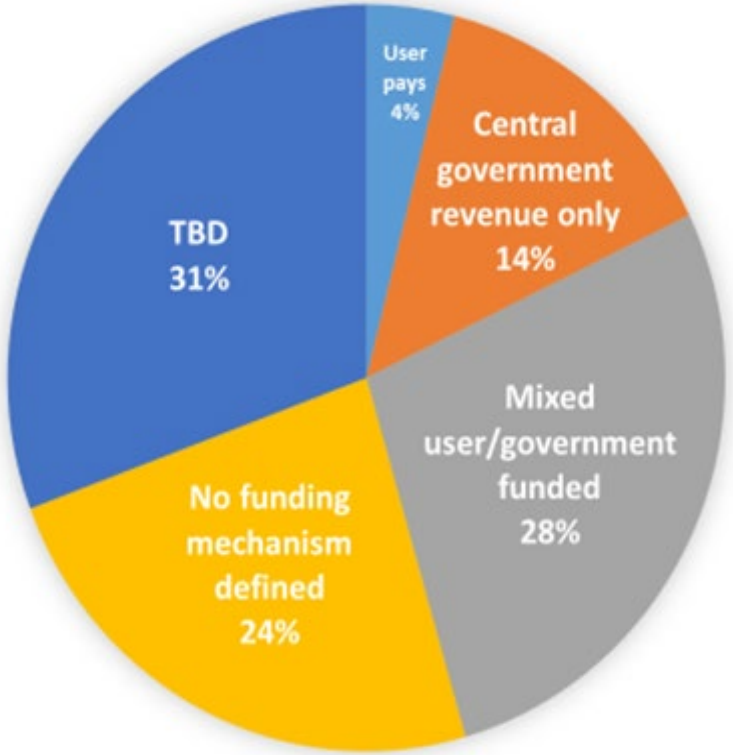
Funding Mechanisms for Dam Safety Assurance and Regulation



Funding mechanisms for regulatory regime



Types of user-pays systems



Regulatory funding sources

Funding Mechanisms for Dam Safety Assurance
Funding – a universal challenge

- Although data is limited,
  - 14 percent of country cases demonstrated or had evidence that their dam safety regulation and assurance programs are well-funded.
  - 20 percent of country cases demonstrated or had evidence that their dam safety management and assurance is generally accepted to be underfunded
- Ownership structures can create barriers to investment in dam safety assurance, requiring regulatory provisions, but these need to consider the financial implications for operators
- Portfolio approaches can assist in prioritizing investments among competing demands
- Minimum guaranteed revenue requirements through public transfers coupled with tariff mechanisms to leverage user based revenue streams and services can enhance financing
- Financial mechanisms can be used to provide incentives for improving compliance and dam safety assurance

Chapter 5: Content of Regulatory Arrangements

1. Dams subject to regulation
2. Classification
3. Dam classification and design standards
4. Requirements
5. Legal status of regulatory documents
6. Education and training
7. Enforcement and dispute resolution
8. Summary - Content of regulatory arrangements

Contents of Regulatory Regime

- **The contents of the regulatory regime** including specific roles, powers and responsibilities of the regulator, as well as the responsibilities of the dam owner and any other parties involved.
- **Dams capturing criteria and classification system** covering various types, such as dam's dimension-based, hazard/consequence-based, combined, etc.
- **The design standards** mandated for design of new dams or review of existing dams and **dam safety requirements** (surveillance, inspection, etc.) **linked with the classification system.**
- **Technical archiving and record-keeping of key documents as well as the owner's education** are for ensuring awareness of responsibilities, liabilities, legal states of guidelines, etc.
- **Enforcement** through penalties, remedies, and arbitration provide a critical element for dam safety assurance scheme.

Dams Capturing, Classification, and Design Standard

- The dams subject to the dam safety laws and regulations can be defined by their size, geometry, consequence or combination of these. For setting the thresholds, it is important to carefully consider the available resources and capacity of the regulators.
- Dam's classification system is useful and widely used in proportioning dam safety mandates and regulatory requirements, such as design standards, inspection frequency, etc. including the following approaches.
  - Hazard-potential based classification is effective for defining safety standards/requirements as per downstream hazard/consequence, in particular for countries with vast lands and lower population density where high dams could be less hazardous.
  - Geometry and type-based classification is used in more densely populated countries where it may be politically sensitive to introduce different safety requirements depending on downstream hazard class and/or almost all dams could be categorized as high hazard.
  - Combined approach. Quite a large number of countries use a combined system (size, type and hazard potential), which seem to be practical for countries with a large portfolio of dams.
- The design standards and dam safety requirements as per the classification system should be developed for each country based on its socio-economic condition, available resources, capacity, etc.

Dams Classification System among the Case Study Countries & Jurisdictions

Type of Dam Classification System by Income Level

Income Level	Size only	Hazard only	Combined size and hazard	Others (risk, condition, safety level)	None exists	Undetermined
High	3	8	3	1	3	1
Upper Middle	0	1	7	2	7	0
Lower Middle	1	3	4	1	6	0
Low	1	0	1	0	2	0
Totals	5	12	15	4	18	1

Type of Dam Classification System by Legal System

Legal System	Size only	Hazard only	Combined size and hazard	Others (risk, condition, safety level)	None exists	Undetermined
Common Law	2	5	1	0	4	0
Civil Law	3	6	13	3	9	1
Religious Law	0	0	0	0	1	0
Mixed	0	1	1	1	4	0
Totals	5	12	15	4	18	1

Dam Safety Requirements

- Surveillance requirements include instrumentation monitoring, inspection, checking, testing, etc. with required level of qualification, scope and timing.
- Minimum requirements for surveillance and dam safety review are defined by classification under statutes or by empowered regulatory authorities.
- Operation and maintenance requirements including procedures for monitoring instruments, reservoir operation & d/s warning, reporting to the regulator.
- Dam safety file include as-built drawings/ construction records, surveillance /safety reviews, O&M Plan incl. reservoir operation, and emergency preparedness plan.
- Risk analyses and assessment for higher risk category dams are becoming part of dam safety regulations in various forms including PRM mandates.
- The preparation and implementation of the Emergency Preparedness Plan has become dam safety requirements in many counties with varying degree of mandatory provisions.

Risk-Informed Approaches and Portfolio Risk Assessment in the Case Study Countries & Jurisdictions

Status of Risk-Informed Approaches to Dam Safety Management

Legal System	Mandated	Allowed/Applied	Not recognized	Undetermined
Common Law	3	4	5	1
Civil Law	3	14	2	10
Religious Law	0	1	0	0
Mixed	1	1	4	2
Totals	7	20	11	13

Status of Portfolio Risk Management

Income Level	Mandated	Allowed or Applied	Under discussion/ being tested	No evidence of been considered	Undetermined
High	1	11	2	0	4
Upper middle	0	8	1	1	5
Lower middle	0	6	1	4	5
Low	0	1	0	2	0
Totals	1	26	4	7	14

Emergency Preparedness Plan among the Case Study Countries & Jurisdictions

Case Study Countries and Jurisdictions that Mandate EPPs

Income Level	Mandatory	Not mandated, voluntary	Undetermined
High income	17	1	2
Upper Middle Income	6	5	2
Lower Middle Income	4	6	4
Low Income	0	4	0
Totals	27	16	8

Some Characteristics of EPP Mandates among Case Study Countries and Jurisdictions

Income Level	EPPs mandated for specific classes of regulated dams	Mandated EPPs sophistication varies for different dams/classes	Mandated EPPs require multi-institutional coordination	Mandated EPPs require information dissemination and awareness raising for downstream communities	Mandated EPPs have other specific requirements (e.g. mock drills, brochures)
High	17	6	14	14	10
Upper Middle	6	3	3	2	2
Lower Middle	4	0	4	3	1
Low	0	0	0	0	0
Totals	27	9	21	19	13

Legal Status of Regulatory Documents

- Legal status of regulatory documents differ from country to country including:
  - Guidelines mandated in the legislation to set the standard
  - Guidelines developed by the regulatory authority with its mandated power
  - Guidelines widely accepted as the norm to set the standard to determine liability in common law system
  - Guidelines that are not mandatory but serve as good references
  - Deferring to the national / international guidelines proposed by professional entities
- In countries where most dam construction led by private sector; formal establishment of guidelines is strongly recommended to ensure that regulators can require developers to comply with the established standards.

Enforcement / Dispute Resolution and Education / Training

- The enforcement of regulatory requirements is critical with some remedial measures, such as license suspension, penalties, and requiring owners to use independent inspectors.
- Some countries have included arbitration and mediation provisions in regulations for dispute resolution between regulator and owners.
- It is important to discuss funding arrangements for ensuring the capacity of regulators who will enforce the regulatory dam safety provisions.
- Education and training is an important part of dam safety assurance to ensure the competence of regulatory officials, as well as owners and operator's staff.

Summary – Content of Regulatory Arrangements

- The dam safety regulator should be given clear mandates and enforcing capacity to fulfill its regulatory function vis-à-vis dam owners, reflecting each country's characteristic and the nature of the portfolio.
- The key elements and provisions that should be covered by the regulatory scheme include the following:
  - Capture of regulated dams and dam’s classification system
  - Dam safety design standards and safety requirements incl. surveillance and safety review
  - Operation & maintenance plan including reservoir operation, warning and equipment testing
  - Emergency preparedness or contingency plans
  - Record keeping requirements
  - Legal status of guidelines and standards
  - Enforcement and dispute resolution
  - Education and training

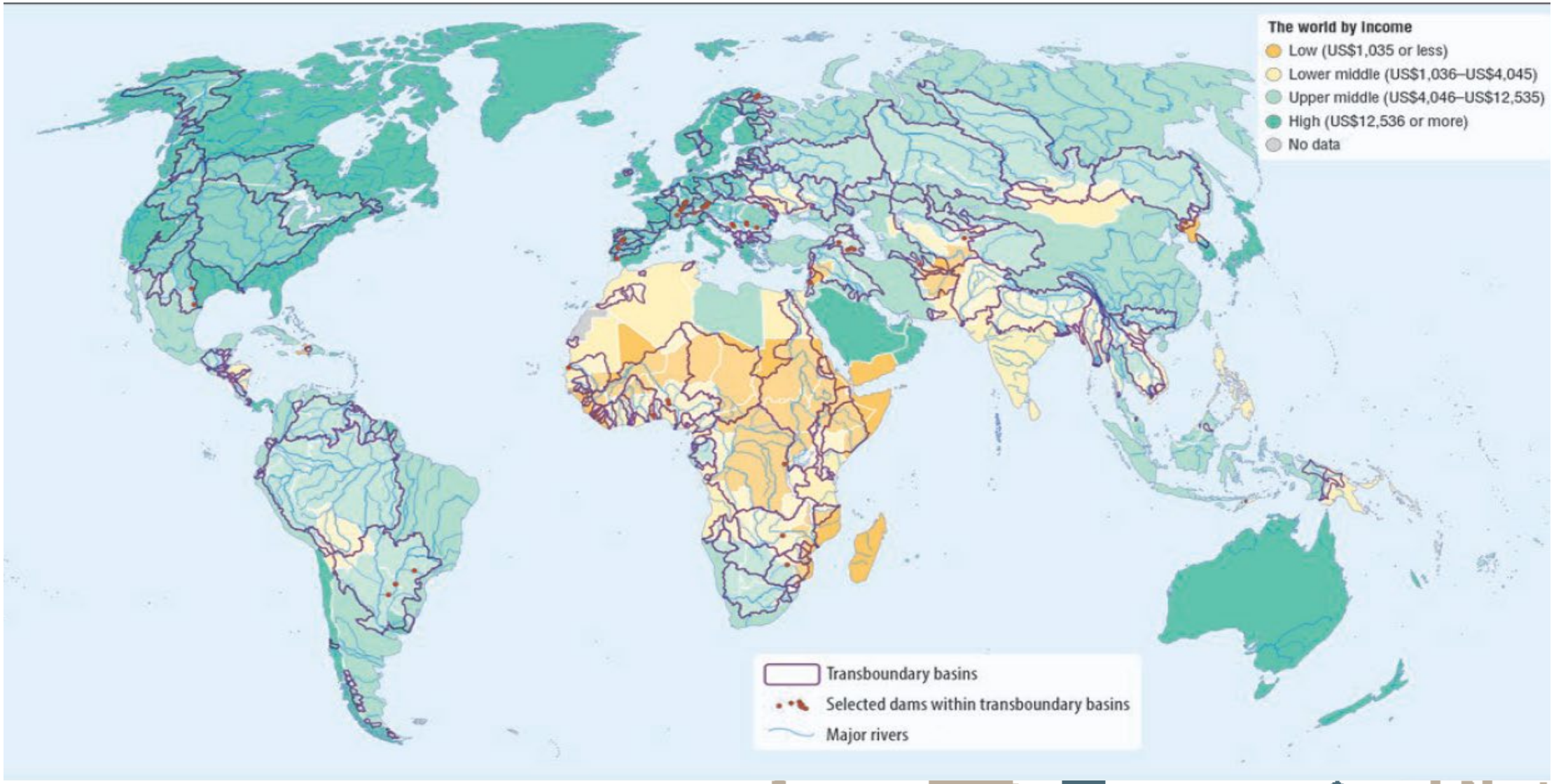
Chapter 6: Legal and regulatory arrangements for dams on transboundary rivers: Settings Context & Rationale

- 151 countries and 2.8 billion people share 286 transboundary river basins
- Internationally shared transboundary river basins or sub-national jurisdictions create complex interdependencies
- Unique considerations relating to dam safety:
  - different, and sometimes conflicting, legal regimes
  - historical considerations informed cultural and geo-political differences
  - socio-economic and bio-geographical characteristics
  - enabling institutional arrangements, and
- Case study countries cover 208 of the 286 transboundary river basins
- More than 126 of these transboundary river basins have dams located within them

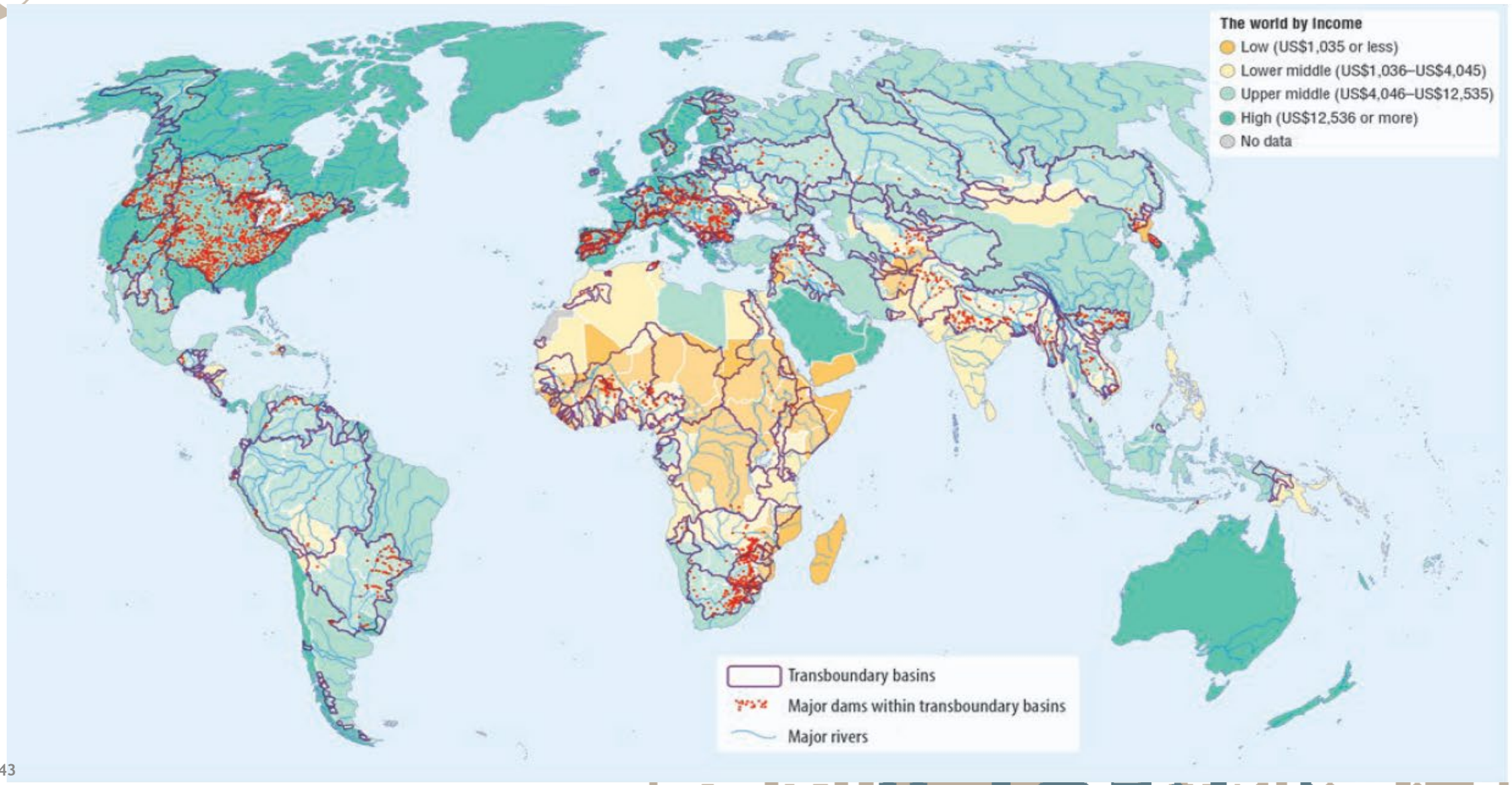
Transboundary Basin and Dams

Region	Total number of dams	Transboundary dams	Dams located in transboundary basins
East Asia and Pacific	29,588	2	127
Europe and Central Asia	7,113	42	772
Latin America and the Caribbean	2,633	4	151
Middle East and North Africa	1,507	1	59
North America	10,435	2	1,212
South Asia	5,381	0	120
Sub-Saharan Africa	1,861	8	483
Total	**58,518**	**59**	**2,924**

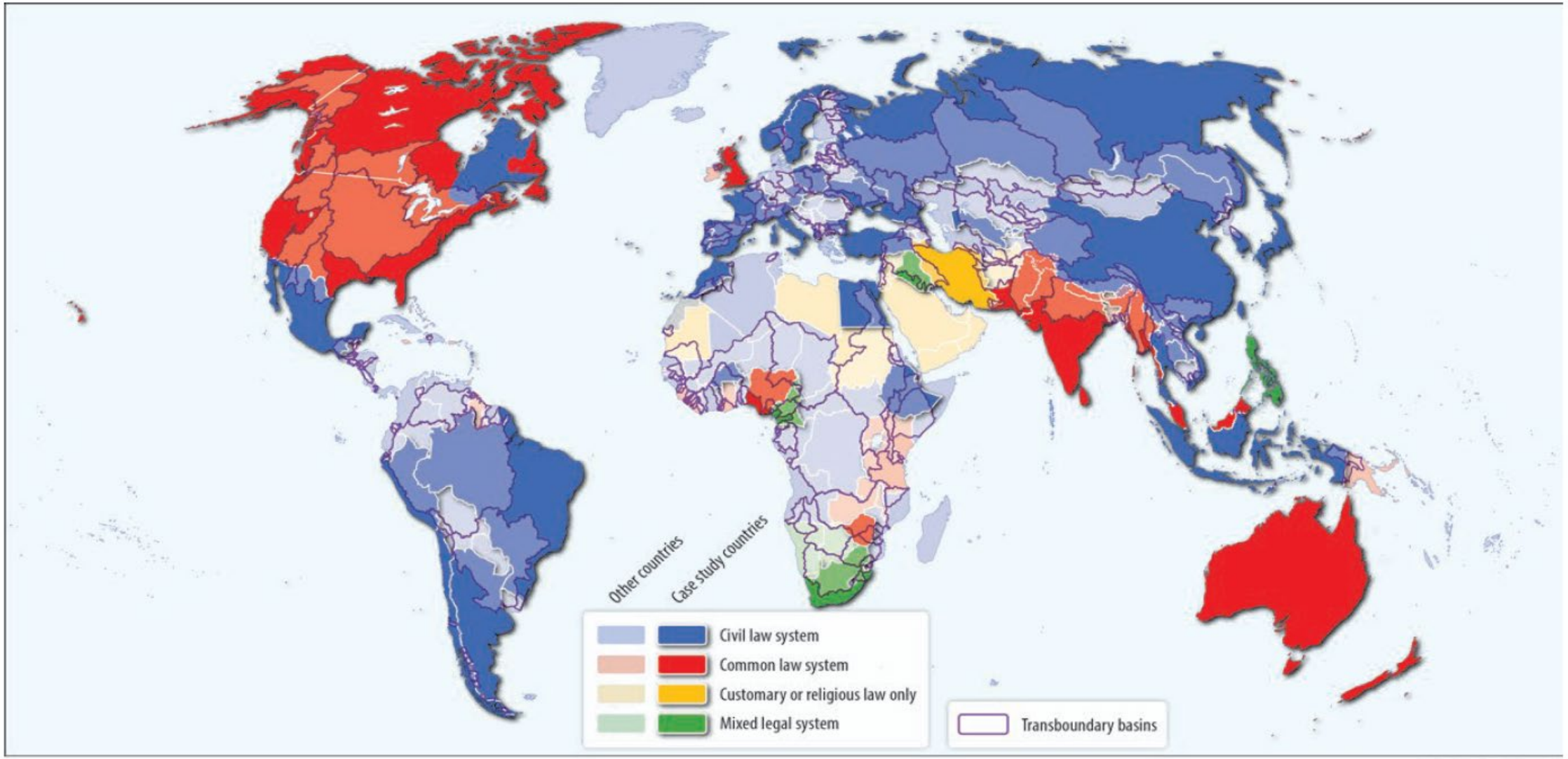
Global map indicating transboundary basins and dams with abutments located in more than one country



Global map indicating transboundary basins and dams located in transboundary basins



Global map indicating transboundary basins shared by riparian states with different legal systems



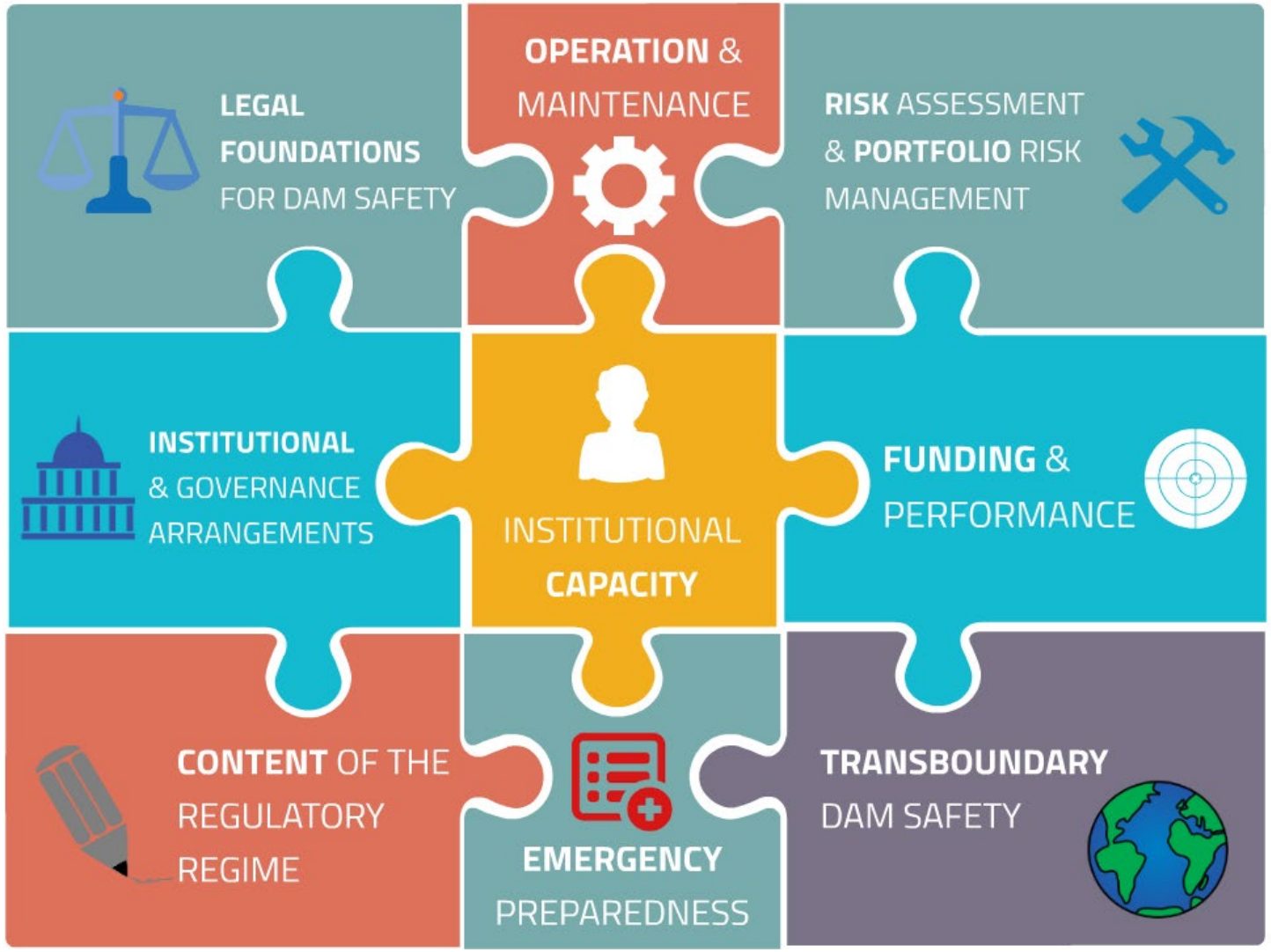
Transboundary Dam Safety Considerations

- A minimum level of coordination is required to ensure the safety of dams and downstream communities
- Dams attributed with international character need to be properly captured by the dam safety assurance regime
- Evaluate the degree of equivalence among the legal regimes and ensure a minimum level of assurance across the basin
- Address inconsistencies between the legal frameworks by subjecting transboundary infrastructure to a unique set of dam safety requirements
- Measures to facilitate the exchange of information relating to operations, improve coordination around emergency preparedness
- Base internationally recognized principles, such as the obligation to do no harm and ensure equitable and reasonable use

Chapter 7: General dam safety assurance framework

1. A continuum – defining the regulatory mix for dam safety
2. Characteristics informing a continuum for dam safety
3. Legal and institutional options along a continuum for dam safety
4. Technical considerations along a continuum for dam safety
5. Financial considerations along a continuum for dam safety
6. Compliance enforcement of the dam safety assurance policy mix
7. Summary - Bringing Minimum and Maximum Dam Safety Assurance Elements into a Continuum

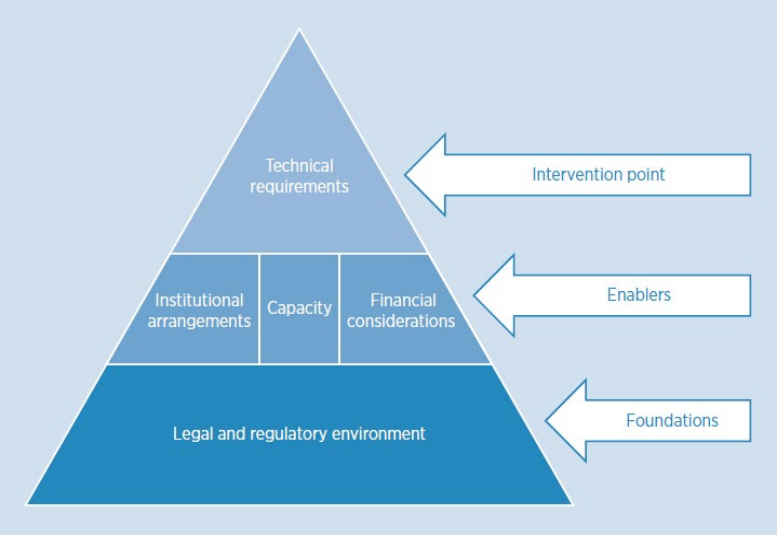
Chapter 7 built upon Global Study overall finding



A suitable dam safety regulatory framework is akin to putting together the pieces of a jigsaw puzzle, and the pieces can vary (considerably) for different jurisdictions

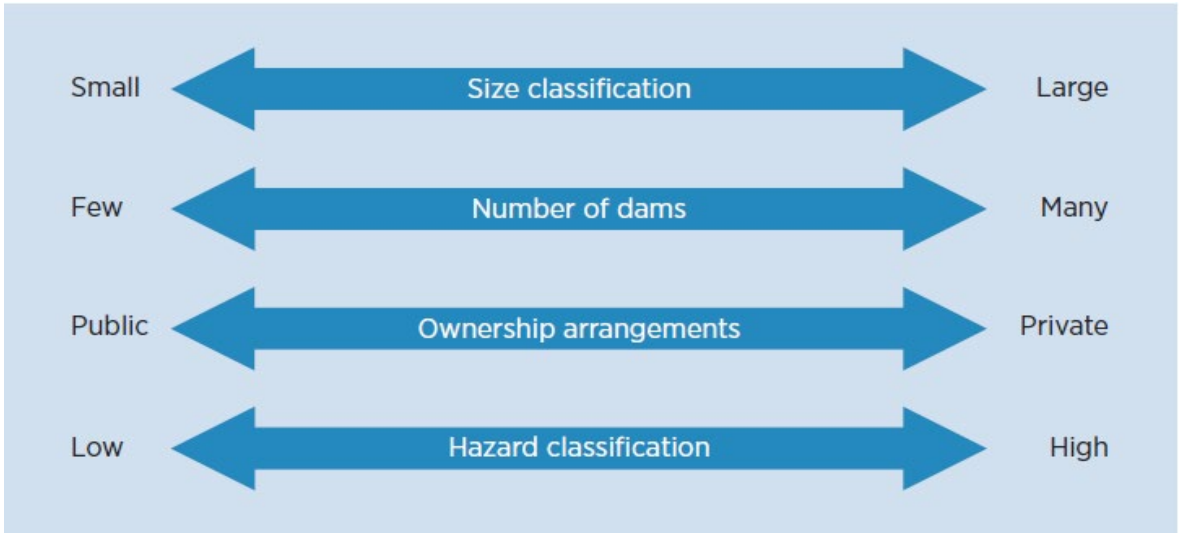
Key Elements and Determinants Informing Regulatory Frameworks for Dam Safety

The foundation for effective dam safety assurance is an appropriate and well-designed regulatory framework that captures the **legal, institutional, technical, and financial** elements within the reality of a particular jurisdiction.



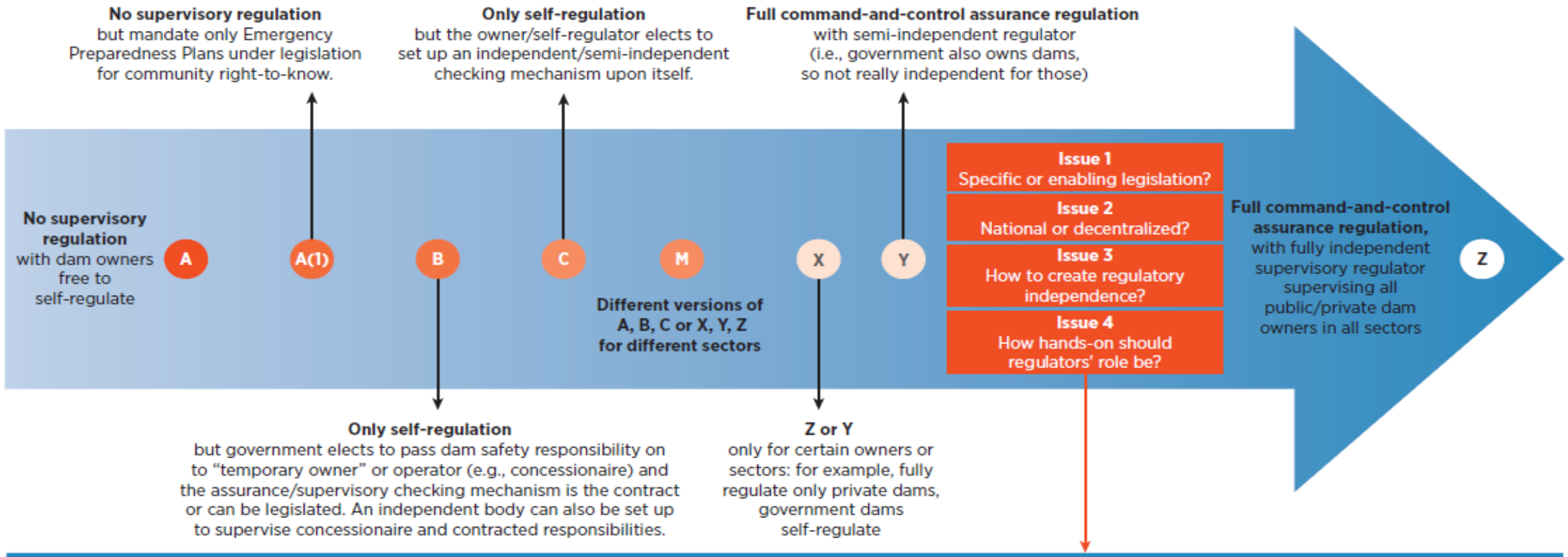
Elements of a dam safety assurance system

Portfolio determinants that should shape the dam safety system



While the type of legal system and administration that is constitutionally possible will define *how* the regulatory environment can be implemented, the type of **ownership** and the **size of a country's portfolio** of dams, **their geometric dimensions** and **hazard potential** will guide the main features of a suitable regime.

A Continuum from Minimum to Maximum Assurance

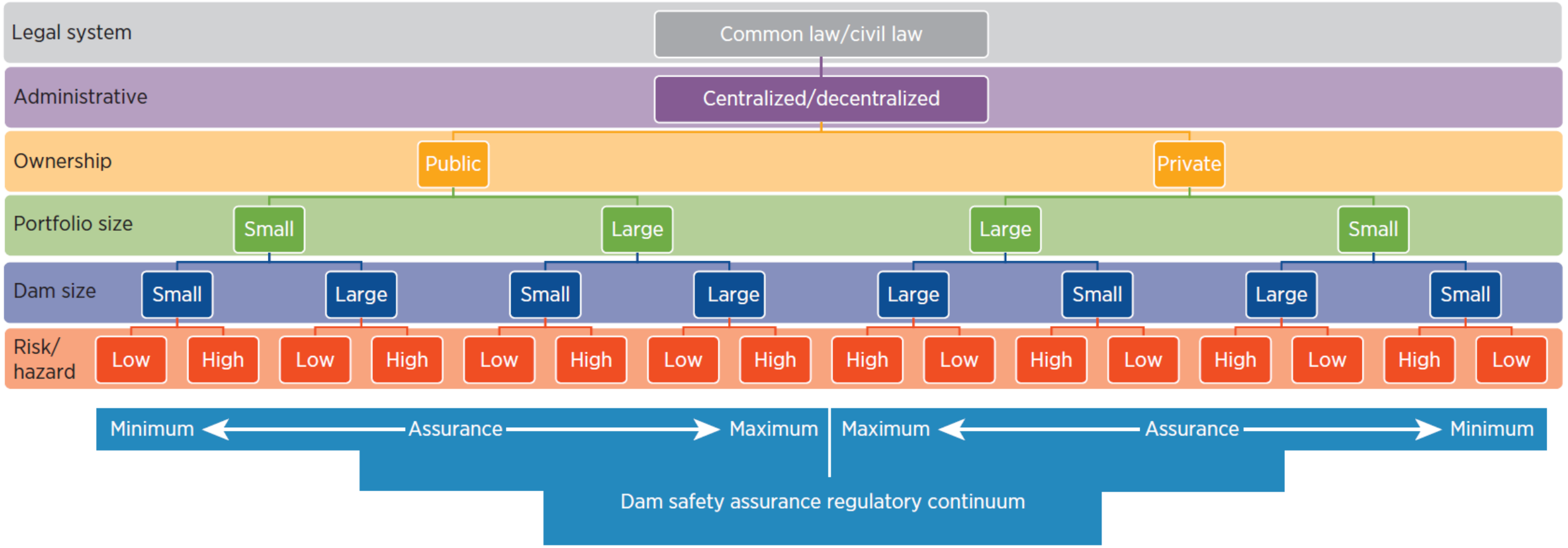


Role	Compliance audit	Quality assurance	Direct inspection/assessment
Function	**Random quality assurance audits only** Otherwise just rubber-stamping reports and certifications provided by owners' engineers in a predominantly hands-off function	**Allover assurance, check all information/reports provided by owners' engineers for every dam** May also do the hazard classification (i.e., more hands-on)	**Performs periodic dam safety inspections and assessments** Highly hands-on function
Capacity	**Low** need for capacity/expertise in authority	**Medium** need for capacity/expertise in authority	**High** need for capacity/expertise in authority
Liability	Accepting **no** liability Authority makes no decisions related to the safety of the dam	Accepting **some** potential liability	Accepting **extensive** potential liability

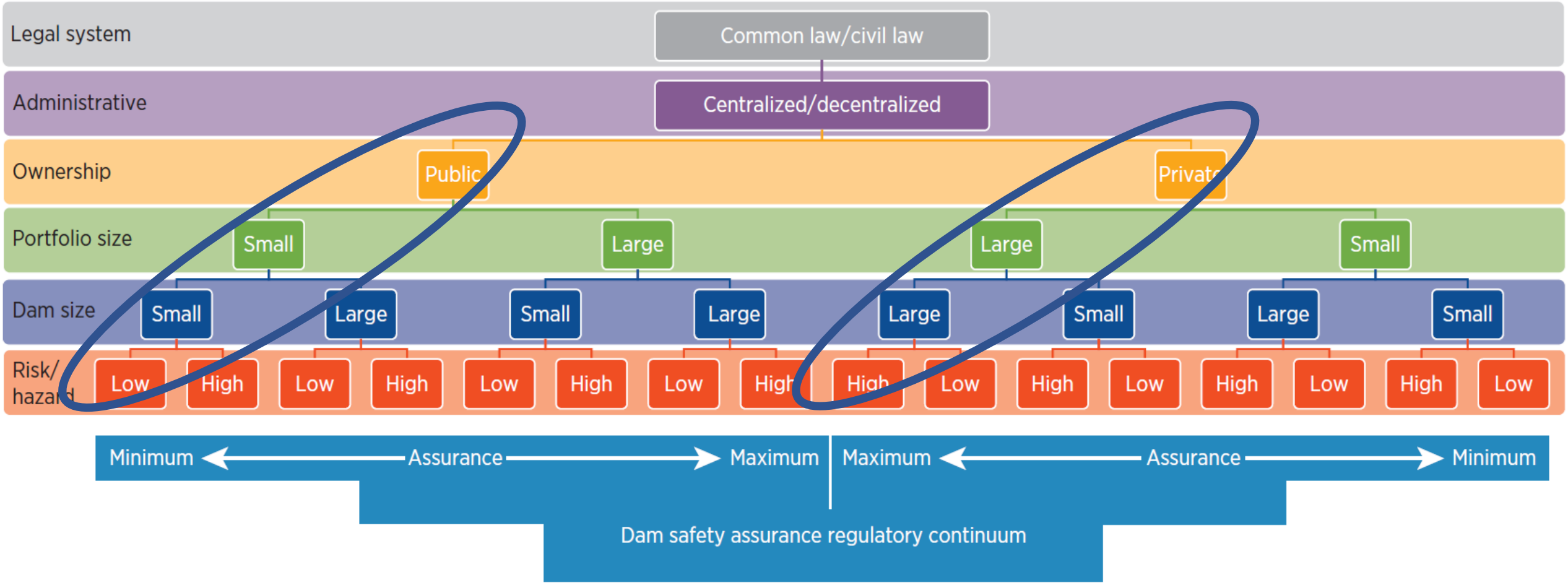
Chapter 8: Decision Support Tool - Regulatory Frameworks for Dam Safety

The regulatory framework should be **fit-for-purpose**.

Depending on the country and portfolio characteristics, a **continuum of options** can be derived.



Using the Decision Support Tool: Examples from the Extreme Ends of the Continuum



Using the Decision Support Tool: Examples from the Extreme Ends of the Continuum

- **Publicly Owned, Small Portfolio of Small Dams that are Largely Low Risk/Hazard**

Simplify requirements to reduce high transaction costs.

Legal

Self regulation. No need for dedicated legislation, but responsibility/liability should be clear.

Institutional

Dedicated unit/authority unnecessary. Regulator should at least provide dam owners with appropriate education and training.

Technical

An inventory of dams and a checklist of minimum requirements (design and review standards, inspections, O&M, instrumentation, EPP, public safety).

Financial

Minimal resources are needed to maintain these simple institutional arrangements.

- **Privately Owned, Large Portfolio of Large Dams that are Largely High Risk/Hazard**

Greater level of oversight → Maximum end of the continuum.

Need legislation on dam safety (can be under sectoral legislation). Clearly articulated, uniform laws and regulations.

Fully independent, apex regulator is ideal. Fully empowered to develop standards, issue licenses/permits and supervise maintenance and surveillance of dams.

Comprehensive and elaborate dam safety review system. Own national guidelines and standards. Frequent and intensive inspections. EPP and instrumentation requirements commensurate with hazard/risk.

Adequate funding for dam safety oversight commensurate with scope of responsibilities. Fee collection and penalties. Provisions for insurance may be appropriate.

Concluding remarks

- The Bulletin deliberately avoids being too prescriptive or giving specific recommendations, instead providing a continuum of options and examples that are applicable/ adaptable to varying physical, legal, political, and socio-economic circumstances of different countries/jurisdictions.
- It provides an appropriate level of generic prescription regarding the necessary elements that make up the two ends of the spectrum between the minimum and maximum assurance, and the indicative circumstantial criteria that could be considered down the decision path for selecting a suitable position along that spectrum.
- It is also illustrated with examples of possible combinations of circumstances.
- Therefore, variety of options ranging from self-regulation to a full government command-and-control framework are presented and explained.

Thank You

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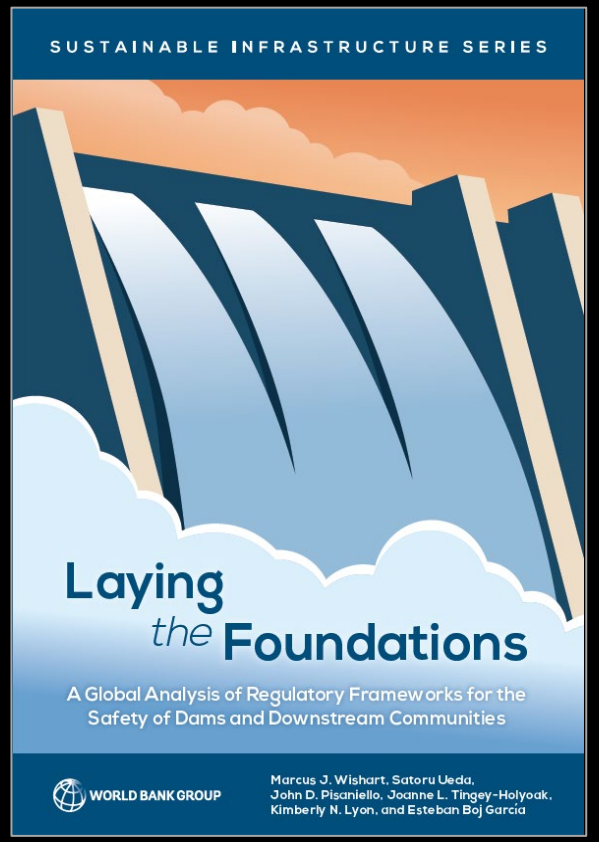

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