GUIDANCE NOTE

IRRIGATION SUBSECTOR RISK ASSESSMENT

ASIAN DEVELOPMENT BANK

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Foreword

The *Guidance Note: Irrigation Subsector Risk Assessment* is part of a series of guidance notes for selected sectors and subsectors of the Asian Development Bank (ADB). A joint knowledge product of ADB's Governance and Water Communities of Practice, it offers a framework for mapping governance risks to inform the preparation of future country partnership strategies. Such a framework covers institutional aspects (policy, legal framework, and regulation); organizational aspects (planning, financial management, procurement, and human resources); and subsector operations.

This guidance note also supplements ADB's *Guidelines for Implementing the Second Governance and Anticorruption Action Plan*. The purpose of the Second Governance and Anticorruption Action Plan is to improve ADB's performance in implementing the governance and anticorruption policies in the sectors and subsectors in which ADB is active, and to design and deliver better-quality programs and projects.

A team from the Public Management, Governance, and Participation Division of the Regional and Sustainable Development Department initiated this guidance note. The team comprised Jessica Ludwig-Maaroof (public management specialist) and Brenda Katon (governance specialist, consultant). Josephine J. Aquino provided administrative support to the team. ADB staff members from the Water Community of Practice who were asked to review this guidance note included Arnaud Cauchois, Randall Jones, Thomas Panella, and Yasmin Siddiqi. Their contributions are truly appreciated.

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Abbreviations

ADB	–	Asian Development Bank
DMC	–	developing member country
GACAP II	–	Second Governance and Anticorruption Action Plan

The Guidance Note: Asian Development Bank Context

This guidance note recognizes the strategic importance that the Asian Development Bank (ADB) accords to irrigation. This is reflected in its Water Policy (2001); in the long-term strategic framework for 2008–2020, otherwise known as Strategy 2020; and in the Water Operational Plan 2011–2020. The Water Policy is premised on the need to formulate and implement integrated, cross-sectoral approaches to water management and development.[1] Pertinent policy pronouncements that are specific to irrigation underscore support for accountable service providers and for user participation, aligning the provision of services with user needs and ability to pay to improve cost recovery and sustainability, and tailoring institutional arrangements for water services management to local practices. Given the life-sustaining characteristics of water, participation is a key ingredient in water management and conservation and in harmonizing conflicting interests of water users.

Strategy 2020 identifies infrastructure as a core area of operations, where water resources management and the delivery of efficient and sustainable irrigation services are among the key elements. Infrastructure operations cover not only building physical assets but also improving the delivery of infrastructure services, mainly through capacity development and the promotion of institutional and policy reforms that enhance operational efficiencies and sustainability of infrastructure projects.[2]

In support of Strategy 2020, ADB's Water Operational Plan 2011–2020 seeks to improve efficient use of water and productivity in irrigated agriculture, among others. Growing more food with less water is a priority, making "more crop per drop" pivotal to the management of irrigation services. Part of the overall approach to agricultural water management is improving institutions and arrangements for irrigation service delivery. Given the emerging global premium on crops and the water–food–energy nexus, the Water Operational Plan regards inclusive and integrated decision making as crucial for achieving sustainable and equitable water security.[3]

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[1] Overall, ADB's Water Policy aims to (i) promote a national focus on water sector reform, (ii) foster the integrated management of water resources, (iii) improve and expand the delivery of water services, (iv) foster the conservation of water and increase system efficiencies, (v) promote regional cooperation and increase the mutually beneficial use of shared water resources within and between countries, (vi) facilitate the exchange of water sector information and experience, and (vii) improve governance. ADB. 2001. *Water for All: The Water Policy of the Asian Development Bank*. Manila. Available at www.adb.org/Documents/Policies/Water/water.pdf

[2] ADB. 2008. *The Long-Term Strategic Framework of the Asian Development Bank: 2008–2020*. Manila. Available at www.adb.org/Documents/Policies/Strategy2020/Strategy2020-print.pdf

[3] ADB. 2011. *Water Operational Plan 2011–2020*. Manila.

Objectives of the guidance note. This guidance note is meant for ADB staff involved in commissioning, undertaking, and/or reviewing governance risk assessments, as required under ADB's Second Governance and Anticorruption Action Plan (GACAP II), for ADB's priority sectors and subsectors.[4] Its target audience comprises both governance and irrigation subsector specialists. As such, it is structured in a way that allows governance specialists to comprehend the features of the irrigation subsector. It also aids irrigation subsector specialists to recognize areas that are vulnerable to governance risks.[5] This guidance note aims to explain key governance features of the irrigation subsector and identify entry points for mapping governance risks. It also helps inform the preparation of future country partnership strategies.[6]

Risk refers to the possibility of reduced development effectiveness—that the development objectives of developing member countries (DMCs) and ADB will not be met, or will be adversely affected by poor governance, weakly performing institutions, or vulnerability to corruption. GACAP II considers as priority areas those risks arising from public financial management, procurement, and corruption that affect development effectiveness. It recognizes, nonetheless, that the comprehensive subsector risks can be more complex and can go beyond these three priority areas. In this light, subsector diagnostics undertaken as part of economic and sector work must complement governance risk assessments to arrive at a more comprehensive risk analysis. This guidance note can be used as part of reference materials for the irrigation subsector.

Structure of the guidance note. Section II highlights the significance of irrigation and its challenges. Section III presents a descriptive overview of the key features of the irrigation subsector, mainly for governance specialists involved in risk assessments who may not be familiar with this subsector. Section IV outlines subsector risks that include GACAP II priorities of public financial management, procurement, and combating corruption. These priorities can be assessed within frameworks of (i) institutional features (policy, legal framework, and regulation); (ii) organizational aspects (planning, financial management, procurement, and human resources); and (iii) subsector operations, inclusive of surface irrigation and groundwater irrigation.

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[4] This guidance note supplements ADB. 2008. *Guidelines for Implementing ADB's Second Governance and Anticorruption Action Plan (GACAP II)*. Manila, which provide a risk management framework and map out the process for assessing, managing, and monitoring risks. It does not replace the guidelines. It is meant to help staff in tailoring the generic sector risk assessment terms of reference found in the GACAP II guidelines, and in considering risk vulnerabilities specific to the irrigation subsector. Available at www.adb.org/Documents/Guidelines/GACAP-II-Guidelines.pdf

[5] This guidance note is a joint undertaking of ADB's Governance and Water Communities of Practice.

[6] One of the knowledge products that must be available at the time of country partnership strategy preparation is the risk assessment and risk management plan covering the governance priorities of public financial management, procurement, and combating corruption. Other knowledge products include (i) priority sector diagnostics and analysis, (ii) economic analysis, (iii) poverty analysis, (iv) gender analysis, (v) environment assessment, and (vi) private sector assessment. ADB. 2010. *Operations Manual: Operational Procedures for the Country Partnership Strategy*. Manila.

Irrigation: Significance and Challenges

Irrigation, as part of rural water supply, focuses on investments to improve livelihoods in rural communities. Agriculture uses about 70% of water consumed globally and 80% in Asia, mainly for irrigation. Irrigated farms account for 17% of the cultivated area in the developing world but produce 40% of the value of agricultural output.[7] Irrigation's role is strategic. It supplements rainfall where soil moisture is insufficient to reliably meet the needs of the crops and mitigates the water security risks from fluctuating rainfall. By providing a relatively predictable water supply, irrigation ensures crop production, provides a more even cash flow, and allows a stronger presence in markets.[8]

The future of agriculture, however, faces immense challenges. To feed a growing population and reduce hunger, more efficient use of water will be needed for agriculture. With rising incomes and urbanization, food habits are expected to move toward more nutritious and varied diets.[9] Growing a wide selection of crops to meet this demand implies that farmers need greater flexibility and reliability from their irrigation systems.[10] Erratic rainfall and seasonal differences in water availability can cause food shortages while floods and droughts can lead to food emergencies. Climate change can worsen the situation.

For irrigation, a major task is to adapt yesterday's irrigation systems to tomorrow's needs so it can respond to changing requirements (footnote 9). The recognition that water, food, and energy are interdependent has increasingly grown, along with the need to deal with climate change. Technological and managerial upgrading and a better integration of irrigation with agricultural production systems are needed to increase irrigation productivity. Traditionally, the irrigation subsector has been driven by investments in technological innovations and infrastructure development to increase water supply. Water management, however, is not only a technical issue. It is also a political and social issue. Given the complexity of water management and the multifunctional character of water for humans and the environment, a key challenge is to develop

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7 World Bank. 2007. *World Development Report 2008: Agriculture for Development*. Washington, DC. Available at www.worldbank.org/wdr2008

8 GTZ. 2010. *Pro-Poor Financial Services for Rural Water*. Eschborn. Available at www.gtz.de/water

9 David Molden, ed. 2007. *Water for Food, Water for Life: A Comprehensive Assessment of Water Management in Agriculture*. London: Earthscan.

10 Aditi Mukherji, Thierry Facon, Jacob J. Burke, Charlotte de Fraiture, Jean-Marc Faures, Blanka Fuleki, Mark Giordano, David J. Molden, and Tushaar Shah. 2009. *Revitalizing Asia's Irrigation: To Sustainably Meet Tomorrow's Food Needs*. Colombo: International Water Management Institute; Rome: Food and Agriculture Organization of the United Nations. www.adb.org/water/wfp/rural.asp

or strengthen existing institutions that are inclusive, responsive, and adaptive to changing social and hydrological conditions.[11] In this light, building the capacity to manage shifting demands of rural water resources in new ways is important, along with understanding the fundamental relationships between people, governing institutions, and the environment.[12]

[11] Hakan Tropp. 2007. Water Governance: Trends and Needs for New Capacity Development. *Water Policy* 9. Supplement 2:19–30.

[12] Stockholm International Water Institute. 2010. *Overarching Conclusions: The Water Quality Challenge—Prevention, Wise Use, and Abatement*. World Water Week in Stockholm, 5–11 September.

Key Features of the Irrigation Subsector

Irrigation systems in DMCs involve largely surface irrigation with an increasing utilization of groundwater. Surface irrigation refers to a broad class of irrigation methods in which water is distributed over the field by overland flow. Water is extracted from surface water bodies such as lakes, rivers, ponds, or reservoirs. Field slope and uniformity are important topographical factors in surface irrigation. The key components of surface irrigation systems include the following:[13]

(i) **Headworks**—consist of tapping the water resource (river, lake, stream, or diversion weir), sometimes storing it (dam or reservoir), and releasing it to meet the needs of users.

(ii) **Primary system**—consists of conveying water from headworks to distribution system (main canal or pipeline), and the accompanying structures and management rules.

(iii) **Secondary and tertiary channels**—consist of delivering water to farmers through channels (sometimes called laterals) based on water rights, water quotas, or other arrangements. This is typically done through gated structures that divert a regulated discharge from one canal level to the next lower level.

(iv) **On-farm water management**—refers to smaller field channels and associated structures that distribute the water to farmers' fields as well as the smaller drainage systems that take water from the field to prevent salinization and waterlogging.

(v) **System operation, maintenance, and rehabilitation**—include (a) water allocation management (assessing water demand and availability, managing water scarcity, and delivering the agreed water services in terms of quantity, timeliness, and quality); (b) water services (canal operation, water monitoring, operation of farm gates and hydraulic devices, billing and collecting service fees, and contract management); (c) system maintenance (preventive, reactive, and daily upkeep); and (d) rehabilitation (replacement/repair of structures, pumps and motors, control valves, gated outlets, and other facilities to restore system performance).

Groundwater irrigation systems, on the other hand, extract water from an aquifer located beneath the earth's surface. They provide farmers flexibility in applying the desired water quantity when needed. Their growth has been due to the increased availability of irrigation pump sets at affordable prices and to energy subsidies in certain DMCs. It has also been driven

[13] World Bank. 2007. Emerging Public–Private Partnerships in Irrigation Development and Management. *Water Sector Board Discussion Paper Series.* No. 10. Washington, DC. Available at http://water.worldbank.org/water/publications/emerging-public-private-partnerships-irrigation-development-and-management

by inadequate irrigation supplies from poorly maintained and deteriorating surface irrigation systems. Declining groundwater tables due to the unregulated use of groundwater, however, have raised sustainability concerns.[14] The lack of groundwater recharging and the non-conjunctive management of surface and groundwater resources can lead to aquifer depletion.

Groundwater irrigation systems have several components: (i) wells; (ii) pumps to extract groundwater; (iii) prime movers, which refer to electric motors or diesel engines that drive the pumps; and (iv) a conveyance system, which includes lined channels, unlined earthen channels, and/or pipe systems that help convey the water from the well to the field.[15] Maintenance and repair of groundwater facilities are also important.

Institutional Features of the Subsector

Developing member country irrigation policy. The irrigation policies of ADB's DMCs are typically embedded in a blend of irrigation-specific policies and water policies. Examples of policies about irrigation include water use rights for surface water and groundwater, efficiency in the use of irrigation water, development of institutions for integrated planning processes, private sector participation in irrigation management, and intersectoral coordination for sustainable environmental management. Policies may also support decentralization of responsibility for irrigation to local governments, water management associations, and other user groups.

Legal framework and implementing rules. The legal framework for the irrigation subsector is often integrated into irrigation acts, water resources acts, water codes, and other related legislation. It deals with several aspects: (i) the subsector structure, organizational responsibilities, and related arrangements; (ii) water rights and allocation; (iii) water supply contracts; and (iv) water management to reduce the inefficient use of water, excessive water abstraction, and groundwater pumping. The legal framework tackles the administration of water resources through designated entities and establishes basic principles relating to the use, development, and protection of water resources. Details on how to enforce the legal framework are embodied in implementing rules.

Regulation. Water as a finite resource is subject to a regulatory framework. Regulation and control of irrigation systems include (i) water resource allocation; (ii) water resource utilization and monitoring (tracking the actual delivery of water against water rights and checking the withdrawal apparatus, such as hydraulic works, wells, and tube wells, and compliance with withdrawal permits where they exist); (iii) supervision of irrigation management; (iv) establishment of water tariff systems; and (v) promotion of sound water conservation and management practices. How to equitably and properly share water among users is a major challenge (footnote 13). Secure water rights and governance structures that ensure protection of these rights are vital for equitable and sustainable water use.

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[14] Shirish Sinha, Bharat Sharma, and Christopher Scott. 2006. Understanding the Water–Energy Nexus: Moving Beyond the Energy Debate. In *Groundwater Research and Management: Integrating Science into Management Decisions.* Bharat Sharma, Karen Villholth, and Kapil Sharma, eds. Groundwater Governance in Asia Series. Colombo: International Water Management Institute. Available at http://publications.iwmi.org/pdf/H039304.pdf

[15] Department for International Development of the United Kingdom. n.d. *Sustainable Groundwater Irrigation Technology within the Public and Private Sectors*. London.

Multi-stakeholder coordination. Broad-based networks are essential within and outside the irrigation subsector, given the multiple uses of water and its implications on well-being, livelihoods, food security, and environmental sustainability. Various water issues are interdependent, calling for collaborative action among stakeholders.

Organizational Features of the Subsector

Structure. Irrigation systems can fall into the following typology:[16]

(i) **Large-scale public irrigation systems in dry areas**—include most of the large schemes of Northern People's Republic of China, the dry part of the Indo-Gangetic Plain, Central Asia, and the Nepalese Terai. These are mostly run by public agencies and have been the focus of irrigation management transfer programs (i.e., shifting tertiary-level irrigation management functions from a public agency to a local or private sector entity like water user associations). Water delivery services are typically inflexible, and differences between the head and tail ends of the schemes are evident.

(ii) **Large-scale public paddy irrigation systems in humid areas**—typical of this type of systems are the large terrace systems of Southeast Asia or the tank and delta systems of East and South India and Sri Lanka. High rainfall environment and paddy cultivation are part of their unique features.

(iii) **Small- to medium-scale community-managed systems**—found in parts of Afghanistan, Pakistan, Indonesia, Nepal, the Philippines, the Lao People's Democratic Republic, and Northern Thailand. While this category covers a wide range of situations, it is marked by the small size of the systems, private or community investment, and management. Public sector involvement centers on rehabilitation, consolidation, or improvement.

(iv) **Farm-scale individually managed irrigation systems**—these systems are typically privately owned and are found in Bangladesh, India, and Pakistan. They rely on groundwater for irrigation and often face environmental and health-related problems (e.g., salinization, arsenic poisoning, and others).

(v) **Commercial privately managed irrigation systems**—these systems do not represent a large share of irrigated areas. They are governed by cultivators, employ paid staff, often use advanced technologies, and are responsive to international and local market opportunities (e.g., sugar cane and other crops).

Irrigation systems may also be classified in terms of the source of water—surface water and groundwater. In typical surface irrigation systems, the government constructs, owns, and manages the systems. In some cases, it delegates basic irrigation management functions to water managers. A surface irrigation system requires up-front organization and collective action. The substantial costs of building a diversion structure, a distribution system, and field outlets and channels are often beyond the capacity of a single person or family. Enforcing agreements concerning water allocation and system upkeep are crucial.

[16] Mark Svendsen and Hugh Turral. 2007. Reinventing Irrigation. In *Water for Food, Water for Life: A Comprehensive Assessment of Water Management in Agriculture*. David Molden, ed. London: Earthscan.

Groundwater irrigation, on the other hand, is predominantly a private sector activity. While the construction of wells and purchase of pumps is often subsidized, farmers operate and maintain the groundwater irrigation system themselves. For some farmers, groundwater may be the only source of irrigation water due to the topographic characteristics of the area. In other cases, farmers may be within the command area of an existing surface irrigation system but do not receive adequate water. The phenomenon of farmers investing in tube wells and pumps to obtain water from shallow and deep aquifers has given rise to atomistic irrigation.

Farmers using groundwater typically do not organize or enforce collective agreements on water allocation and system maintenance. Some farmers may form partnerships to raise the capital necessary to build a well. Groundwater irrigators, however, face an information-poor environment. On their own, they cannot easily determine the number of other pumpers, the capacities of their wells, how much water they are taking, and the effects of their pumping on the overall productivity of the groundwater basin. In this situation, developing reliable sources of groundwater information on the part of the government is crucial to guide and implement informed options. Solutions that slow declines in water tables or that stop the intrusion of salt water into a basin, for example, require that groundwater users accept limits on wells and pumping, and adopt activities that reduce water consumption. More importantly, a continuing capacity to match new rules to new circumstances is fundamental.[17]

Planning. In general, planning for irrigation is anchored in policy and strategy documents for water and agriculture, and takes place within broader planning processes of relevant state planning and infrastructure departments. For a resource as strategically sensitive as water, stakeholder involvement in planning and decision making is vital. Basic to planning are (i) a situation analysis involving a review of hydrological aspects, water demand and supply, and institutional arrangements for water resources management; (ii) goals, strategies, roles, and mechanisms, including water vision statements, medium- and long-term goals, and strategies to address key issues; (iii) financing aspects; and (iv) implementation arrangements, including intersectoral coordination. Identifying immediate and longer-term actions helps set priorities and makes planning more realistic.[18]

Management of irrigation systems. Irrigation management comprises three interconnected elements: (i) the water used in irrigation; (ii) the physical infrastructure that controls that water; and (iii) the organizations, both system-level and farm-level, that are needed to operate, maintain, and manage the infrastructure. Such organizations (public or user-established) are responsible for decision making, resource mobilization and management, communication and coordination, and conflict resolution. Irrigation subsystems are linked together physically and functionally. Thus, understanding irrigation management calls for an analysis of the water used in irrigation, the social structures that control that water, and organizational interactions at the system and farm levels.

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[17] Edella Schlager. 2007. Community Management of Groundwater. In *The Agricultural Groundwater Revolution*. Mark Giordano and Karen G. Villholth, eds. Colombo: International Water Management Institute. Available at www.iwmi.cgiar.org/publications/CABI_Publications/CA_CABI_Series/Ground_Water/protected/Giordano_1845931726-Chapter7.pdf

[18] Global Water Partnership. 2008. *Planning for a Water Secure Future*. Stockholm. Available at http://www.gwp.org/Global/The%20Challenge/Resource%20material/Planning_Water_Secure_Future_Brochure_Dec_2008.pdf?

Due to diverse subsystems, which are influenced by human and farming systems as well as by the limitations of water resources and those of the physical system itself, management of irrigation systems can be complex. In general, issues that affect irrigation systems include deteriorated infrastructure, mismanagement of the system by farmers and/or government, insufficient capacity building, poor recovery of operation and maintenance costs, extraction of rents for service delivery, conflicts in water allocation, and unsustainable water management practices.

Financial management. Traditionally, the financial management of government-administered irrigation systems is input-driven and based on budget allocations that are not related to the long-term cost of sustainable service provision. This leads to inadequate levels of maintenance and investment in infrastructure. Moreover, the budget allocation is often determined annually based on maintenance costs rather than on the life cycle cost of the infrastructure.

Reliable and sustainable provision of irrigation services have budgets that are based on short- and long-term needs to deliver the agreed level of service. Irrigation systems that are managed by service-oriented and accountable organizations are likely to be more sustainable over the long term. Financial management needs to identify resources for sustainable service delivery. In this context, asset management is an essential tool in providing information on the cost of service provision for different time horizons, which is directly related to the level of service provided, and on expected maintenance and investment costs.

Costs associated with service provision can be recovered from water users and/or from government contributions to help sustain public irrigation systems. Irrigation fees (service delivery charges) can be levied on farmers, taking into account government policies, regulations, and procedures. Fees can be based on (i) flat rates, where the total cost is divided on a per capita or per hectare basis; and (ii) the level of consumption of the services by the individual clients.[19] Often, flat rates per area are applied because most irrigation lacks volumetric measurement, and they also generate a relatively stable income and call for less administration and monitoring on the part of the irrigation administrator.

Public procurement. Construction or civil works is a major aspect of irrigation development and/or improvement. Where the irrigation system is government-operated, the typical procurement mode is that of a construction contract. The government engages a contractor to build, upgrade, or rehabilitate the irrigation system. Though not as common, where the private sector is engaged to operate and maintain the system (e.g., management or concession contract), a separate procurement mode is applicable. The procurement contract defines responsibilities for asset maintenance and system operations over a specific period.

Procurement processes in irrigation involve public entities (e.g., national and local political officials, directors, engineers, operations staff, project managers, and procurement officers) and private entities (e.g., construction firms and suppliers of goods and services). External entities, such as media and nongovernment organizations, can also be involved to boost transparency and integrity of the procurement process. Procurement is subject to the requirements of government

[19] Paul J. M. van Hofwegen. 2000. *Incentives for Financing the Maintenance of Irrigation and Drainage Systems*. Eschborn: GTZ.

and development partners. Basic principles are transparent procurement, competitiveness, efficiency, and award of contracts that represent the best value-for-money.

Information system. An information system supports relevant and timely decision making in the irrigation subsector and helps manage subsector outcomes. As such, activities associated with collecting, processing, storing, and disseminating information are important. As a minimum, the information system for surface irrigation covers the following areas:

(i) **Physical infrastructure**—includes an asset inventory of the irrigation network, drainage network, roads, and other related facilities.

(ii) **Irrigation system management**—covers crop water requirements, irrigation water supply and demand, water distribution schedule, and actual water delivery.

(iii) **Financial systems**—include accounting and budgeting, water fees, billing, and collection.

(iv) **Human resource development**—includes employee records; skills inventory; job description database; and staffing per department, function, activity, and expertise.

Human resources. Achieving the subsector's goals calls for capacity development that is aligned with short-term and long-term needs. Weak technical and managerial capacity hampers translation of decisions into effective management actions and delivery of envisaged development outcomes. Decentralization may place many local governments and local water providers in charge of service delivery, but they may not have the capacity to step up to their role. Ignoring local capacity and readiness for their role can invite inefficiency and corruption.

Stakeholders

The stakeholders in the irrigation subsector are diverse. These include (i) the government (e.g., policy makers, regulators, planners, irrigation department staff, project managers, etc.); (ii) owners and cultivators of irrigated land; (iii) suppliers of inputs, services, and funds; (iv) water management associations; (v) other groups who are affected by irrigation water management (e.g., households, power, and industry); and (vi) nongovernment organizations and environmental interest groups. Table 1 presents some examples of the roles of key stakeholders in the irrigation subsector, and is not meant to be exhaustive.

Stakeholder analysis is fundamental in understanding subsector governance. The management of irrigation systems is partly shaped by political democratization, which redefines the relationship between the state and the citizenry and has a bearing on the conditions of access to resources.[20] Defining water rights, setting priorities, and enforcing regulations at the sector and local water user levels affect stakeholder relationships in water resources management.

Stakeholder analysis, moreover, is vital for understanding how and why relationships have changed over time, how existing alliances affect policy processes, and how potential niches

[20] Randolph Barker and Francois Molle. 2004. *Irrigation Management in Rice-Based Cropping Systems: Issues and Challenges in Southeast Asia*. Bangkok and Colombo. Available at www.agnet.org/library/eb/543/

Table 1 **Examples of the Roles of Key Stakeholders in the Irrigation Subsector**

Stakeholder	Illustrative Roles
Government	• Provide the policy, legal, and regulatory framework for the irrigation subsector • Establish effective water rights systems and enforce related policies and legislation • Determine water allocations for the head of each system • Issue permits for water use and impose limits on water extraction • Prepare and implement plans for sustainable basin-level management • Approve projects for developing and managing irrigation systems • Help build the capacity of irrigation water management associations to operate and maintain irrigation systems • Resolve conflicts among water users • Collect irrigation service charge
Owners and cultivators of irrigated land	• Engage in crop production to meet the needs of the household and of the market • Manage the system from tertiary to field level • Pay irrigation service charge
Suppliers of equipment and services (e.g., suppliers of pipes, pumps, and related equipment; providers of construction and repair services; and providers of consulting services)	• Provide technical and production support to irrigation systems
Providers of development assistance to the subsector	• Provide financial and technical assistance for developing, rehabilitating, and modernizing the irrigation subsector • Help build the capacity of water users for sustainable water management
Irrigation water management associations	• Mobilize the active participation of water users • Comply with water-related rules • Help maintain irrigation systems • Pay fees for the use of surface irrigation water • Coordinate irrigation and agriculture-related services with relevant groups
Other groups affected by irrigation water management (households, power, industry, and others)	• Participate in issues arising from water management • Contribute to basin water management • Exercise the right to obtain their share of water supply for their needs
Nongovernment organizations	• Catalyze the process of developing local organizations for managing irrigation systems and the environment
Environmental groups	• Advocate sustainable environmental management practices • Participate in dialogues and interactive discussions on the environment and help promote informed choices

Sources: ADB. Various years. *Report and Recommendation of the President*. Various irrigation projects. Manila; Asian Productivity Organization. 2004. *Linking Main System Management for Improved Irrigation Management*. Tokyo. Available at www.apo-tokyo.org/projreps_acd/05_AG-GE-SEM-08.pdf

for engagement across organizations and sectors can be pursued.[21] It can help identify affected groups and look into their position vis-à-vis policy changes, the extent of their influence, the likelihood of their participation in supporting change, and alternative ways to overcome risks. Dealing with concerns such as sustainability, management efficiency, cost sharing, water rights, and integrated water resources management requires a reexamination of stakeholder roles in relation to changing challenges and situations.

[21] For further details on stakeholder analysis, please see (i) Joy Moncrieffe and Cecilia Lutrell. 2005. *An Analytical Framework for Understanding the Political Economy of Sectors and Policy Arenas*. London: Overseas Development Institute. Available at www.odi.org.uk/resources/download/2989.pdf; and (ii) World Bank. 2009. *Problem-Driven Governance and Political Economy Analysis*. Washington, DC. Available at http://go.worldbank.org/SGO4LFRSS0

Governance Risks

Understanding the risk environment and identifying risks. The irrigation subsector is vulnerable to risks due to several factors: (i) capital intensity and opportunities for large-scale procurement, particularly in surface irrigation; (ii) poor regulation; (iii) weak business processes and control systems; (iv) interface between the public and private sectors; (v) lack of capacity for managing shifting water resources, given uncertain water levels and climate change; (vi) fragmented water institutions; and (vii) political interference. Vulnerabilities exist in policy making, regulation, organizational arrangements, and subsector operations. Reducing risks from poor governance and institutional weaknesses requires an understanding of where they occur and what arrangements sustain them. Familiarity with specific dynamics affecting governance arrangements in the subsector is vital. In addition, assessing which systems and stakeholders can be strengthened to create an effective, systemic movement toward accountability and integrity in the subsector is fundamental.

Subsector-level governance risks, for example, can arise from out-of-date and inconsistent policies that hasten water depletion and degradation. Nontransparent policy decisions can lead to inappropriate investment priorities that favor selected political and business groups. Political interference can be significant because water-related policy, planning, and budgeting decisions directly impact livelihoods and basic human needs. In many DMCs, the rural population is the main voting block and therefore intrinsically linked to issues related to irrigation.

In groundwater irrigation, which is financed largely by farmers and other private sector players, corruption may be seen in bribes for the issuance of permits to drill a well or release additional water at outlet. Weak regulation can lead to rapidly falling groundwater levels and dwindling supplies for smaller farmers who cannot compete in the pumping race. Excessive groundwater use without regard for equity and sustainability is a failure of accountable governance, with grave consequences for secure livelihoods and the environment.[22]

As part of the high-risk infrastructure sector, irrigation exhibits resource allocation and procurement procedures that provide opportunities for rent-seeking. At the government agency level, risks may stem from the absence of appropriate business processes and mechanisms that can help increase efficiency and reduce discretion (e.g., information technology, automated planning, and financial tools and applications). In addition, failure on the part of the procuring entity to monitor project progress and/or to mobilize independent external organizations to assist in monitoring contract implementation can add to governance risks.

Corruption is a key challenge in the irrigation subsector. In surface irrigation systems, corrupt practices can be seen in the construction of large irrigation infrastructure or contracting of

[22] Transparency International. 2008. *Global Corruption Report: Corruption in the Water Sector.* Cambridge. Available at http://www.transparency.org/whatwedo/pub/global_corruption_report_2008_corruption_in_the_water_sector

maintenance work (e.g., desilting of canals). Corruption is linked to the award of contracts to favored contractors. Technical and commercial requirements may be tailored to accommodate a particular bidder, invitations to bid may not be published, confidentiality of suppliers' offers may be breached, and the bidding process and contract execution may not be transparent. Very short deadlines may be imposed to make it difficult for bidders who have no prior knowledge of the contract. Collusion with favored contractors to inflate the costs to make room for subsequent kickbacks can occur. Contractors or suppliers may try to cover the costs of corruption by providing substandard materials or workmanship, and/or bribe inspectors to obtain false certifications of quality and delivery. In turn, these can lead to poorly functioning irrigation systems and failure to service farmers that need these systems most. Weak supervision, absence of third-party monitoring, and lax quality control enable contractors to get away with such corrupt practices.

Signs that bribes and kickbacks are being offered include unexplained delays that may indicate that the procuring official is discreetly negotiating with each of the bidders outside the formal procurement process, bidding irregularities in favor of a small group of contractors, or unjustified sole-source awards. Vulnerabilities can arise from the following situations: (i) the failure to adopt public bidding as a general rule; (ii) even though public bidding is complied with, the turnout of bidders is generally low; (iii) only a few bidders from a particular area participate (this happens when each company takes turns to be the winning bidder); (iv) a very short bid evaluation period, which can occur when a bidder has been preselected and the procuring entity is merely going through the formalities; and (v) poor records management (i.e., missing documents on bidder information, bid evaluation results, awards, and contracts).

In relation to bid rigging, warning signs include the following: (i) some suppliers unexpectedly withdraw from the tender; (ii) each company seems to take turns being the winning bidder; (iii) two or more businesses submit a joint bid even though at least one of them could have bid on its own; (iv) the winning bidder repeatedly subcontracts work to unsuccessful bidders; (v) the winning bidder does not accept the contract and is later found to be a subcontractor; (vi) competitors hold meetings before the tender deadline; (vii) bid documents submitted by different companies contain less detail than would be necessary; (viii) competitors submit identical tenders or the prices submitted by bidders increase in regular increments; and (ix) there are significant reductions from past price levels after a new supplier bids (e.g., the new supplier may have disrupted an existing bidding cartel). Contractor collusion is often indicated by persistently high bid prices; relatively few bidders; and the same bidders, with losing bidders becoming subcontractors.[23]

At the farm level, surface irrigation farmers may compete to obtain as much water as possible when water is scarce and resort to corruption to obtain more than one's fair share. Better-off farmers may bribe irrigation officials and managers in return for an assured water supply during the entire growing season. Unofficial payments may also be made when tail-end users run out of water at the end of the season. Bribes tend to be high when uncertainty is high. Ill-conceived responses to water scarcity can undermine longer-term policy objectives and reduce flexibility to manage risks.[24]

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[23] Organisation for Economic Co-operation and Development. 2008. *Guidelines for Fighting Bid Rigging in Public Procurement*. Paris. Available at www.oecd.org/dataoecd/27/19/42851044.pdf

[24] Stuart Orr, Anton Cartwright, and Dave Tickner. 2009. *Understanding Water Risks: A Primer on the Consequences of Water Scarcity for Government and Business*. Water Security Series 4. Surrey: World Wide Fund for Nature. Available at www.wwf.org.uk/what_we_do/safeguarding_the_natural_world/rivers_and_lakes/publications/?2842/Understandingwater_risks

In relation to irrigation system maintenance, poorly constructed or substandard irrigation systems increase the need for maintenance and rehabilitation. Insufficient funding for irrigation system maintenance (as a percentage of requirements) leads to deterioration and lack of sustainability of the irrigation network. Low collection ratios can indicate weak capacity, or reluctance to adopt efficient financial management systems, or it may be associated with corruption (e.g., misreporting fees collected or failure to *enforce* collection in return for side payments from irrigation farmers).

Mapping governance risks. Table 2 provides examples of governance risks, along with capacity development risks, which can serve as entry points for risk mapping. Some of these risks may occur in the specific DMC subsector being assessed; others may not. The risks are meant to be illustrative and are not exhaustive. This guidance note excludes risk management measures because such measures need to be based on context-specific situations. When preparing an irrigation subsector risk assessment in accordance with GACAP II to inform a new country partnership strategy, the governance risk assessment and risk management plan will follow the GACAP II guidelines.

Table 2 **Irrigation Subsector—Examples of Governance and Capacity Development Risks**

Dimension	Illustrative Risks	Coverage		
		Cross-cutting	Surface Irrigation	Ground-water Irrigation
1. Institutional Risks				
1.1 Policy	Out-of-date, incoherent, and inconsistent water policies can impede efforts to improve the governance of water resources.	x		
	Limited conduct of policy dialogues can weaken support for improvements in the irrigation subsector.	x		
	Where policy transparency is absent, vested political and economic interests can influence the direction of policy priorities to obtain returns for themselves and/or their associates. This can lead to unsound investments in the irrigation subsector.	x		
	Lack of policies for the conjunctive management of groundwater and surface water can compromise investments in the irrigation subsector.	x		
	Lack of capacity for improving governance of the irrigation subsector can impair the sustainability of investments.	x		
	Inappropriate policies for energy tariffs can lead to the wasteful use of groundwater for irrigation.			x

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Table 2 *continued*

Dimension	Illustrative Risks	Coverage		
		Cross-cutting	Surface Irrigation	Ground-water Irrigation
1.2 Legal framework	Lack of well-defined and equitable water rights can make disadvantaged groups vulnerable to unpredictable water supply and create opportunities for corruption.	x		
	The absence of a legal framework for managing contracts for surface irrigation facilities, along with ill-defined responsibilities and risk-sharing arrangements, can pose corruption risks.		x	
1.3 Regulation	Using bribes and political patronage to obtain permits for pumping water can lead to the indiscriminate and inequitable use of groundwater for irrigation.			x
	Nonenforcement of regulations on the choice of sites for irrigation wells based on hydro-ecological characteristics can lead to groundwater mismanagement.			x
	Lack of capacity to implement regulations on well spacing based on aquifer properties can compromise the reliability of water supply for groundwater irrigation systems.			x
	Lack of capacity to enforce water rights and responsibilities can undermine equitable access to water supply.	x		
	Lack of transparency in apportioning water supply to meet competing uses during water shortages can open up opportunities for water users to bribe officials in return for an assured water supply.		x	
1.4 Multi-stakeholder coordination	Lack of capacity for building a multi-stakeholder platform can hamper strategic decision making and good water governance.	x		
	Lack of government capacity to enter into partnerships with the private sector and civil society can undermine sustainable water management and subsector investments.	x		
	Uncoordinated development assistance can impede the adoption of sustainable management practices.		x	x

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Table 2 *continued*

Dimension	Illustrative Risks	Coverage		
		Cross-cutting	Surface Irrigation	Ground-water Irrigation
2. Organizational Risks				
2.1 Planning	Lack of a reliable database on water resources can hamper planning.	x		
	Fragmented sector and/or subsector planning can lead to inappropriate plans for the irrigation subsector.	x		
	Lack of capacity for strategic planning, transparency, and informed participation by relevant stakeholders can weaken responsiveness of irrigation plans.	x		
	Lack of capacity for preparing risk management plans can undermine achievement of envisaged subsector outcomes.	x		
2.2 Financial management	Corruption and rent-seeking can lead to lower returns on irrigation investments.	x		
	Inadequate financial management capacity can impair optimal resource uses.	x		
	The mismatch between planned funding requirements, budgetary allocations, and actual fund releases can lead to significant delays in implementing projects for the irrigation subsector.	x		
	Inadequate revenue streams to cover operations and maintenance costs can lead to poor service quality and undermine new investments.	x		
	Weak internal controls on revenue and expenditure management can lead to diversion of funds to unauthorized uses, mismanagement, and abuse.	x		
	Weak accounting systems and record-keeping practices can hamper provision of timely and adequate information on revenue streams and expenditure flows.	x		
	Incomplete recording of transactions due to technical weaknesses and/or disregard for comprehensiveness and accuracy can obscure fraudulent activity, impede auditing, and restrict management control.	x		

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Table 2 *continued*

Dimension	Illustrative Risks	Coverage		
		Cross-cutting	Surface Irrigation	Ground-water Irrigation
2.3 Public procurement				
(i) Procurement planning	The lack of procurement professionals and competent engineers can lead to loose contracts for surface irrigation, legal disputes, and nondelivery of services.		x	
	Technical specifications suit favored contractors, precluding competitive procurement.		x	
	Large irrigation projects present opportunities for large-scale procurement, which can create vulnerability to leakages when transparent procurement processes are not used.		x	
(ii) Advertising	Limiting the dissemination of information on procurement opportunities to well-connected firms can compromise procurement based on best-value or expertise. It can also provide a cover for corrupt practices.		x	
(iii) Prequalification and bid submission	Lack of due diligence and eligibility checks during prequalification can allow unsuitable contractors to bid, compromising best-value-for-money procurement.		x	
	Insufficiently specified bid documents allow low-cost contractors to bid despite lack of experience, capital, and equipment, which compromises best-value-for-money procurement.		x	
	Favored contractors are tipped off to permit the submission of an alternate bid. This provides an undue advantage to favored bidders.		x	
	Unexplained delays in the procurement process can allow secret late bids or enable procurement officials to negotiate with each bidder outside the formal procurement process in order to extract bribes.		x	
	Noncompetitive and nontransparent bidding can raise procurement costs.		x	

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Table 2 *continued*

Dimension	Illustrative Risks	Coverage		
		Cross-cutting	Surface Irrigation	Ground-water Irrigation
(iv) Bid evaluation	Disqualification of bidders and/or selection of high-priced bidders without sufficient justification can pose corruption risks.		x	
	Preselection of the winning bidder leads to a short bid evaluation period, compromising the integrity of the procurement process.		x	
(v) Award of contract	The absence of coherent guidelines for awarding contracts can lead to inconsistent procurement practices as well as to disputes.		x	
	Procurement officials award contracts to favored contractors and collude with contractors to inflate the contract price so kickbacks can be funded, which compromises quality of works and/or services.		x	
(vi) Contract management	Increasing the price of the contract, or changing the specifications after the contract has been awarded, can provide opportunities for kickbacks, particularly where a mechanism for a transparent contract review is not in place, or is not enforced.		x	
	Large contracts with service providers in an environment characterized by weak watchdog institutions can provide opportunities to decision makers to make illegal gains.		x	
	Inadequate oversight of contracts for the construction of irrigation systems and lack of functionality checks can lead to substandard services and facilities, which subvert sound resource uses.		x	
	Falsification of inspection certificates and quality tests can pose risks from corruption and undermine functionality of the irrigation infrastructure.		x	
	Contractors bribe officials to cover up low-quality work, which leads to poorly functioning irrigation systems and uncertain water flows.		x	
	Poor records management (i.e., missing bid evaluation results, awards, contracts, and other documents) can provide a cover for corrupt practices.		x	

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Table 2 *continued*

Dimension	Illustrative Risks	Coverage		
		Cross-cutting	Surface Irrigation	Ground-water Irrigation
(vii) Procurement process management	Inadequate procurement expertise and knowledge of applicable procedures and regulations can lengthen the procurement process.		x	
	Lack of streamlined procurement processes can obstruct timely project implementation.		x	
2.4 Information system	Lack of expertise in implementing and upgrading information systems can hamper opportunities for timely and informed decision making.	x		
	Irregular monitoring of water conditions can impede sustainable water management.	x		
	In multi-reservoir systems with irrigation, hydroelectric, and flood control functions, nontransparent information on water distribution can open up opportunities for rent-seeking and corruption.		x	
	Non-incorporation of groundwater assessment into a wider process of data collection and information sharing can hinder development of alternative management options.			x
2.5 Human resources	Limited expertise in strategic planning, contract administration, and asset management undermines subsector operations.	x		
	Conflict of interest with regard to staff appointments, especially senior-level appointments with decision-making authority for the subsector, can interfere in the performance of staff duties and lead to actions that favor certain contractors and political patrons.	x		
	Nepotism and corruption allow promotion of unqualified personnel, which can compromise responsive service delivery.	x		
	Officials post compliant employees in lucrative posts, in return for a share in illegal side payments and bribes.	x		

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Table 2 *continued*

Dimension	Illustrative Risks	Coverage		
		Cross-cutting	Surface Irrigation	Ground-water Irrigation
3. Subsector Operations				
3.1 Surface irrigation				
(i) Headworks	Poor water reservoir management leads to unreliable water supply, which can provide opportunities for corruption.		x	
(ii) Primary system	Kickbacks from the construction of irrigation canals and pipelines can pose risks from substandard quality of works.		x	
(iii) Secondary and tertiary channels	Preferential treatment of farmers, in return for side payments, leads to inequitable access to irrigation water supply.		x	
(iv) On-farm water management	Lack of capacity for managing on-farm irrigation systems can impair the efficient use of resources.		x	
(v) System operation, maintenance, and rehabilitation	Irrigation farmers bribe officials or ditch riders who operate farm gates, in exchange for opening gates for longer hours than intended. This leads to inequitable irrigation water distribution to farmers.		x	
	Farmers in the upper reaches of the irrigation system engage in extralegal transactions with irrigation agency officials to obtain water in excess of their legal quotas. This practice discriminates against farmers at the tail end of canals and undermines equitable water supply.		x	
	Water shortages caused by drought can motivate officials to extract side payments (e.g., cash or harvested crop) from farmers who would like to have water for the entire growing season.		x	
	When charges are based on the surface area irrigated, field-level officials can resort to charging for the full area but record only part of it in the official records. Such fraud can go undetected when the government does not have the capacity to audit collection officials.		x	
	Unpredictable and insufficient budgets for maintenance and rehabilitation compromise sustainability of irrigation systems.		x	

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Table 2 *continued*

Dimension	Illustrative Risks	Coverage		
		Cross-cutting	Surface Irrigation	Ground-water Irrigation
	Nonpayment by farmers of irrigation fees hampers the operation and maintenance of surface irrigation systems.		x	
	Lack of capacity of water user associations to progressively take over the responsibility for operation and maintenance can lead to a deteriorating irrigation system performance.		x	
	Poor system maintenance practices lead to silted-up canals, broken equipment, and other related problems, resulting in costly repairs.		x	
	Lack of capacity to develop institutional arrangements that integrate the accountability and responsibilities of government bureaucracies with those of local water users can undermine sustainable irrigation systems.		x	
3.2 Groundwater Irrigation	Lack of capacity for minimizing the excessive use of groundwater (a common property resource) can compromise the sustainability of groundwater irrigation investments and lead to conflicts among water users.			x
	Weak capacity for integrating science into management decisions can hasten the deterioration of groundwater systems.			x
	Poorly maintained groundwater irrigation systems can undermine efficient use of resources.			x

Sources: ADB Guidance Note Preparation Team: Irrigation Subsector; Global Water Partnership. 2008. *Planning for a Water Secure Future*. Stockholm; Stuart Orr, Anton Cartwright, and Dave Tickner. 2009. Understanding Water Risks: A Primer on the Consequences of Water Scarcity for Government and Business. *Water Security Series 4*. Surrey: World Wide Fund for Nature. Available at www.wwf.org.uk/what_we_do/safeguarding_the_natural_world/rivers_and_lakes/publications/?2842/Understanding_water_risks; Transparency International. 2008. *Global Corruption Report: Corruption in the Water Sector.* Cambridge. Available at www.transparency.org/publications/gcr; Water Integrity Network. 2008. *Advocating for Integrity in the Water Sector*. Berlin. Available at www.waterintegritynetwork.net

Glossary

Atomistic irrigation	Type of irrigation that allows farmers to tap directly into groundwater.
Bid rigging	Competing firms in a bidding process secretly conspire to raise prices or lower the quality of goods and services.
Bribe	Advance payment to an official or staff member in return for a promise to act in a certain way, such as awarding a supply contract to a particular firm.
Capacity development	The process of unleashing, strengthening, and maintaining capacity over time. Capacity refers to the ability of people, organizations, and society to manage their affairs.
Collection ratio	Total revenue collected as a percentage of total revenue billed.
Competitive bidding	A selection process based on open and transparent advertisement of an item or service, which ensures that the best bidder wins according to qualifications, value, and other objective criteria.
Conflict of interest	Any situation in which a party has interests that could improperly influence that party's performance of official duties or responsibilities, contractual obligations, or compliance with applicable laws and regulations.
Conjunctive water management	The coordinated management of surface water and groundwater to meet water needs.
Corrupt practice	The offering, giving, receiving, or soliciting, directly or indirectly, anything of value to improperly influence the actions of another party.
Corruption	The abuse of public or private office for personal gain. Involves behavior on the part of officials in the public and private sectors, in which they improperly and unlawfully enrich themselves and/or those close to them, or induce others to do so, by misusing the position in which they are placed.
Cost recovery	Getting back the cost of providing water supply services through fees or other explicit transfers of funds.
Financial management	A conglomeration of processes including accounting, financial reporting, internal controls, and audit.
Governance	The manner in which power is exercised in the management of a country's economic and social resources for development. It is synonymous with sound development management.

Institutions	Formal and informal rules that govern behavior and shape interactions of groups and organizations. Associated with policy, legal, and regulatory frameworks.
Organization	An entity that consists of structures, systems, and procedures and that is oriented to the pursuit of specified objectives.
Policy	A statement of a set of goals. A declaration of what is to be achieved.
Procurement	The process through which suppliers of goods and services are selected and contracted.
Stakeholder	An individual, community, group, or organization with an interest in the outcome of an activity or intervention.
Water allocation	A process whereby an available water resource is distributed to legitimate claimants, and the resulting water rights are granted, transferred, reviewed, and adapted.
Water right	The formal or informal entitlement that confers on the holder the right to withdraw water.

Guidance Note

Irrigation Subsector Risk Assessment

The irrigation subsector is vulnerable to a broad range of risks that can threaten development effectiveness. Risks can arise from several factors: capital intensity and opportunities for large-scale procurement, particularly in surface irrigation; poor regulation; weak business processes and control systems; lack of capacity to manage shifting water resources, given uncertain water levels and climate change; fragmented water institutions; and political interference. Governance risk vulnerabilities can cut across policy formulation, regulation, planning, financial management, procurement, and subsector operations. This guidance note aims to explain key features of the irrigation subsector and identify entry points for mapping governance risks.

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