

CHAPTER

11

Water Resources Management

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Recommendations to Improve the Quality of Spending



This chapter is part of the World Bank's 2020 Public Expenditure Review for Indonesia.

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Key Messages

- A** Indonesia has set output targets on the construction and rehabilitation of irrigation systems, and the construction of new dams to achieve its outcomes for food security.
- B** However, it is unlikely to meet its 2019 targets.
- C** Spending is focused in general too much on new construction, compared with operations and especially maintenance. This is especially a problem for district-level irrigation systems.
- D** Coordination and technical (terrain geography) problems are an obstacle to effectiveness.

Summary of Recommendations

IMPROVE OPERATION & MAINTENANCE (O&M)

- A** Create incentives for subnational governments (SNGs) to increase budget for O&M.
- B** Apply asset management/full lifecycle cost planning (medium term).
- C** Introduce SOE-public-partnerships (SPPs) to identify revenue mechanisms to provide alternative long-term financing mechanisms.
- D** Build capacity of technical staff in river basin organizations and in SNGs for O&M.
- E** Introduce clear service agreements describing the roles, responsibilities, rights and obligations of service providers, and the recipients of the service.

SCALE UP AND INSTITUTIONALIZE PARTICIPATORY IRRIGATION AT SUBNATIONAL LEVEL

- A** Ensure local commitment in rice-growing provinces and districts to support the agenda on food security.
- B** Strengthen the role of irrigation commission and water resource boards as local/multi-stakeholder platforms.
- C** Revise DAK to include the procurement of technical assistance.
- D** Improve clarity on the mechanism for irrigation scheme above 3,000 hectares (ha) under central government control.

IMPROVE CONVERGENCE IN PLANNING, BUDGETING, TARGETING AND RESULT MONITORING

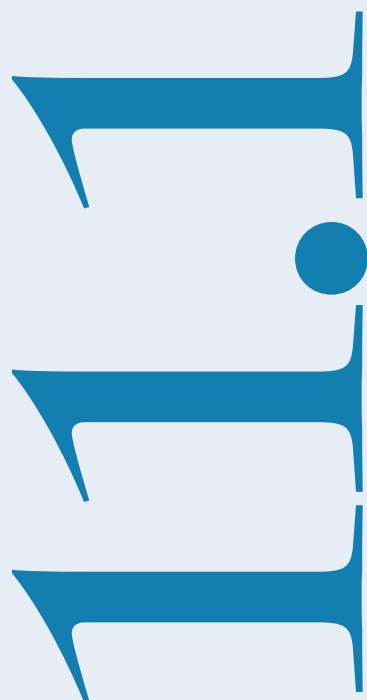
- A** Disseminate best practices on integrated sector planning and incentivizing coordination.
- B** Endorse an integrated, outcome-driven planning framework to enable stronger coordination and convergence of planning among related sectors.

Further key reading

"Indonesia Towards A Policy for Irrigation Management Modernization Country Assessment", World Bank, Ministry of Public Works and Housing, AusAID, November 2013 [link to be added]

"Maturity Matrices for Institutional Benchmarking of Dam Safety in Indonesia", World Bank, 2018. <https://openknowledge.worldbank.org/handle/10986/30067>

"Indonesia Country Water Assessment Report", ADB, 2016. <https://www.adb.org/documents/indonesia-country-water-assessment>



Context

Indonesia faces an extraordinary water management challenge. A vast archipelagic nation with 8,000 watersheds, 128 main river basins and over 5,700 rivers, water is generally abundant in Indonesia. However, demographic changes and urbanization are rapidly reducing water security. Per capita water availability is expected to remain ample overall in the longer term, but not in certain locations, especially on Java. The uneven distribution of the population across islands places more pressure on the Government of Indonesia (GoI) to improve the management of water resources across the country. Nearly 60 percent of the population lives on Java, the major center of economic activity, but the total water available in the island is only 4 percent, mainly due to the country's precipitation patterns.

Water resources management (WRM) is essential for Indonesia's economic growth and social development through its role in providing food security,²⁸³ water security and, indirectly, employment. While Indonesia is a water-rich country, significant spatial and seasonal variations in water availability influence the management of water resources and irrigation essential to agriculture. The resource allocation framework at the central level for water resources and irrigation is based on a unique combination of the island archipelago, the uneven population distribution, and the nation's precipitation patterns. Moreover, agriculture is the main source of employment in rural areas and employs nearly 40 million people, or about one-third of the labor force. Ensuring the availability of bulk

water for irrigation through water resources infrastructure, such as dams and reservoirs, is therefore a key element in ensuring national food security (Table 11.1), which is critical to shared prosperity.

Proper management of water resources is particularly important for rice production, which is by far the most important food crop grown in Indonesia.²⁸⁴ In 2011, Indonesia produced around 65 million metric tons, of which more than 95 percent was derived from irrigated rice fields.²⁸⁵ However, the costs of irrigated rice production in Indonesia are high, while farm household profits are low. The development of water infrastructure, especially for food security, to support growth is a priority of the current National Medium-Term Development Plan (RPJMN 2015-2019).

Efforts to achieve food security cascade from high-level policy directions to the creation of an enabling environment, including the provision of budget, infrastructure such as irrigation, dams, markets, reward and punishment mechanisms, knowledge-sharing, research and capacity building. It also requires the provision of supplies such as land tenure, seeds, fertilizer, equipment, loan or credit; and demand creation such as for safe and nutritious food, preference for local products and variety food; and to conduct good agriculture and aquaculture practices, etc. The multi-sector collaboration applied in Indonesia is presented in Figure 11.1. The Ministry of Public Works and Public Housing (MoPWH), the Ministry of Agriculture (MoA), the Ministry of Trade (MoT) and subnational governments (SNGs) all share

TABLE 11.1. Concept of irrigation policy to achieve food security

	Policy	Strategy	Target
Supply	Increase irrigation resilience	Construction of water storage including reservoirs, dams and pumps	Construction of 65 dams
Distribution	Increase irrigation infrastructure resilience	Rehabilitation of the existing irrigation network Construction of new irrigation network	Rehabilitation of 3 million ha New construction of 1 million ha
Accessibility	Increase performance of O&M	Provision of O&M workers, O&M mechanism, activating local wisdom	O&M central 3,417,201 ha O&M subnational 5,718,827 ha

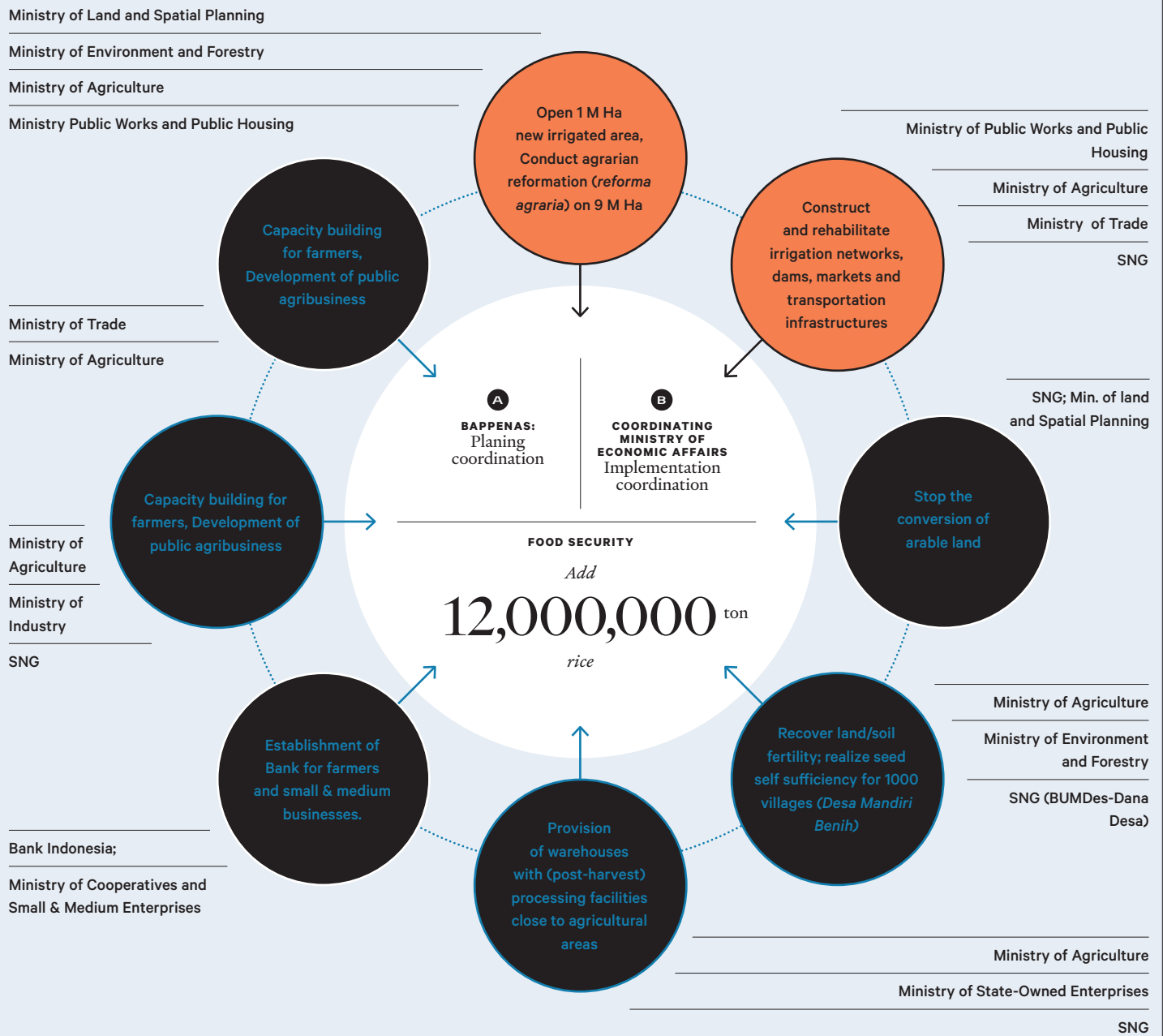
Source: Hadimoeliono, M.B. 2015. *Peningkatan ketahanan air sebagai dukungan terhadap pencapaian kedaulatan pangan* (translation: Increased water security as support for achieving food sovereignty).

²⁸³ Food security is achieved when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs, customs and food preferences for an active and healthy life. Combined food security definition FAO.

²⁸⁴ The GoI has targeted an additional 12 million tons of rice to reach the food security objectives under RPJMN 2015-2019.

²⁸⁵ Indonesia Towards A Policy for Irrigation Management Modernization Country Assessment. World Bank, Ministry of Public Works and Housing, AusAID, November 2013.

FIGURE 11.1. Multi-sector collaboration to achieve food security in Indonesia



Note: BUMDes: village-owned enterprise. Source: Bappenas presentation at Musrenbang for Palu, December 2014. (Footnote 286)

responsibility with regards to water resource infrastructure, such as dams and irrigation, markets and transportation.

The GoI has adopted a well-defined sector plan for irrigation and water resources (Table 11.2). The GoI targets the production of additional 12 million metric tons of rice to reach the food security objectives under the RPJMN 2015-2019. Policy measures and priority investments in the

RPJMN 2015-2019 include: (i) the rehabilitation of 3.0 million ha of existing irrigation systems; (ii) the development of 1.0 million ha of new irrigation systems; (iii) the adoption of sustainable approaches for farming on rehabilitated upland areas; (iv) the development of farm roads; and (v) increased adoption of environmentally friendly technologies for food crops. The GoI is also investing in the construction of 65 new dams

under the *Nawacita* program to enhance water security for agriculture. Most of the irrigation schemes in Indonesia are run off the river systems and only about 11 percent of the total irrigation command areas are currently served by reservoirs. It is expected that the new dams will increase the share of command areas served by reservoirs to 19 percent by the end of this RPJMN.

286 Musyawarah Perencanaan dan Pembangunan (Community discussion on local development needs). <https://www.slideshare.net/liilikwbs/paparan-men-pnmusrenbangregionalpalusulawesi>

TABLE 11.2.

Concept of irrigation policy to achieve food security

Outcome	Intermediate outcomes	Outputs	Covered in chapter
Additional annual rice production: 12 million metric tons of rice	Improved irrigation efficiency and agricultural productivity ("more crop per drop").	Rehabilitation of 3.0 million ha of irrigation systems <ul style="list-style-type: none"> Baseline (2014): 0 Progress (2017): 1.1 million ha Target (2019): 3 million ha 	Yes
		Development of 1 million ha of new irrigation systems; <ul style="list-style-type: none"> Baseline (2014): 0 Progress (2017): 0.3 million ha Target (2019): 1 million ha 	Yes
		Adoption of sustainable approaches to farming on rehabilitated upland areas	
		Development of farm roads	
		Increased adoption of environmentally friendly technologies for food crops.	
		65 new dams constructed in the period 2015-23, of which 29 dams completed to enhance water security for agriculture in the period 2015-19 <ul style="list-style-type: none"> Baseline (2014): 0 Progress (2018): 12 completed out of 29 Target (2019): 29 completed 	Yes

Source: RPJMN, Renstra and e-Monitoring database (April 2017).

FIGURE 11.2.

Development of new irrigation area: progress to date and projection

Thousand ha

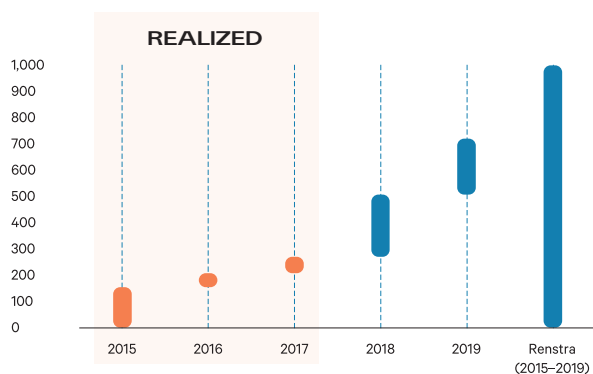
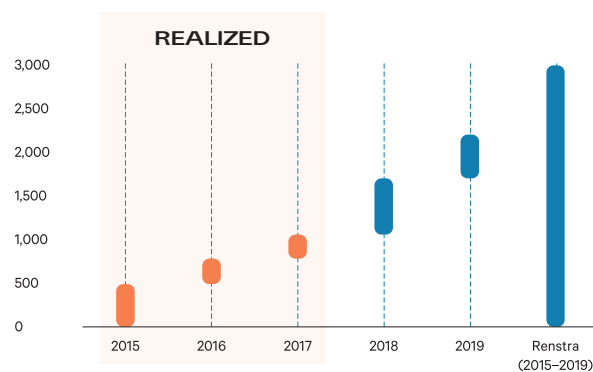


FIGURE 11.3.

Development of rehabilitated irrigation area: progress to date and projection

Thousand ha



Source: MoPWH Strategic Plan 2014-2019 (PUPR 2014-2019) and MoPWH e-Monitoring database (April 2017).

There has been progress toward the irrigation targets. As of 2017, about 287,490 ha, or 29 percent of the new irrigation targets of 1 million ha of the MoPWH strategic plan, had been completed (Figure 11.2), and about 1.1 million ha out of 3 million ha had been rehabilitated.

In order to achieve the broader vision of water security, food security and energy security, the GoI initiated an ambitious program of new dam construction

between 2014 and 2019. This includes 65 new dams, the majority of which are located in Java (24), followed by Sumatra (11), Sulawesi (9), East Nusa Tenggara (7), Kalimantan (5), West Nusa Tenggara (4), Bali (3) and Maluku (1) and Papua (1). The overall cost of this program is estimated at more than IDR 72 trillion (around US\$5.5 billion). Once completed, this will increase the total storage volume by 7 billion cubic meters and provide water for an estimated 484,781 ha

of irrigated land (Table 11.3). These 65 dams cover about 46 percent of the targeted increase in irrigation system area. There is also a program for 140 existing dams in Indonesia with the aim of: (i) increasing the safety and functionality with respect to bulk water supply of large MoPWH-owned reservoirs; and (ii) strengthening the safety and operational management policies, regulations, and administrative capacity of the MoPWH.²⁸⁷

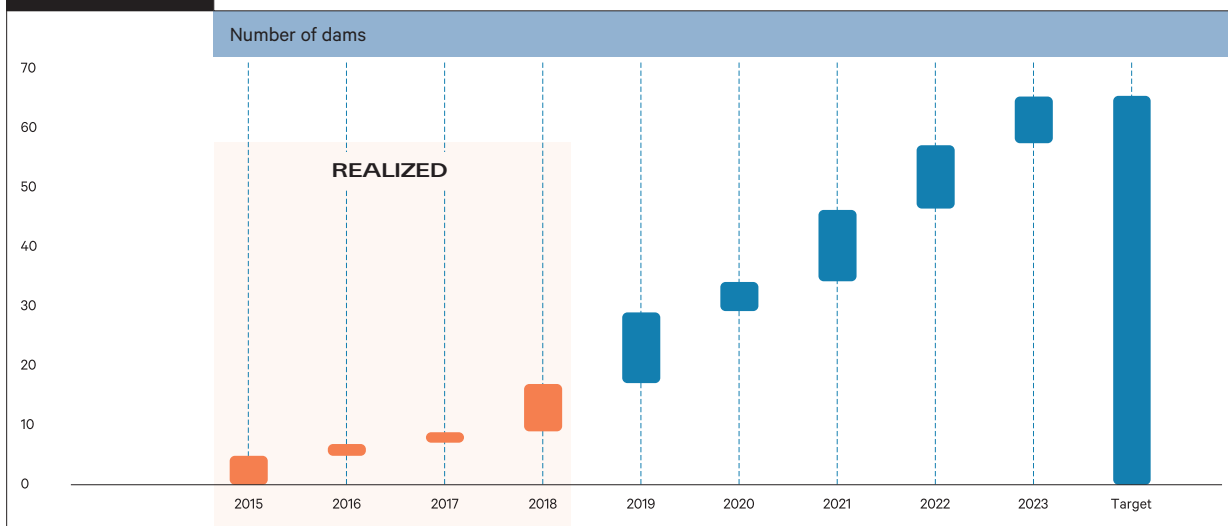
²⁸⁷ This is a World Bank-supported Dam Operational Improvement and Safety Project: <http://projects.worldbank.org/P096532/dam-operational-improvement-safety?lang=en>

TABLE 11.3. Overview of new dam development in Indonesia

Island	Number of dams	Total volume (1,000 m ³)	Irrigation area (ha)	Estimated (IDR trillion)	Estimated (US\$ million)
Sumatra	11	988,190	108,002	12	894
Java	24	2,668,220	221,641	25	1,929
Kalimantan	5	1,632,140	33,472	9	663
Bali	3	29,600	7,586	2	163
West Nusa Tenggara	4	99,920	12,134	2	171
East Nusa Tenggara	7	56,060	7,666	3	252
Sulawesi	9	1,474,030	91,380	13	968
Maluku	1	15,000	2,900	2	128
Papua	1	200,000		5	361
Total	65	7,163,160	484,781	72	5,529

Source: Database Pembangunan Bendungan DG Water Resources, MoPWH. <http://sda.pu.go.id/pusben/65bendungan.php>

FIGURE 11.4. New dam development: progress to date and projection



Source: Dam development and other water collection mechanism 2014-19 and policy direction 2020-24, presentation MoPWH.

While dam projects in Java, Sumatra and Sulawesi have been initiated and are underway, the construction of dams in Papua and Maluku has yet to commence (Figure 11.4). Implementation capacity in the extreme eastern parts of the country is complicated given the remoteness of the locations, the distance from the main economic centers of the country, and logistics constraints associated with construction in difficult terrain, hence implementation capacity of this con-

struction can be challenging.

The management of Indonesia's water resources sector faces increasingly complex long-term investment and management challenges. The GoI's strategy toward decentralization has adopted: (i) a basin-based integrated WRM approach; (ii) the improvement of governance for accountability; and (iii) effective service delivery of river and irrigation infrastructure, dam construction and other services.

However, fragmented mandates between the central government and SNGs, and between ministries, require strong coordination, incentives schemes, and more comprehensive regulations.

The irrigation sector has been subject to a transformation since the process of decentralization and democratization started in 1998. In 1998, the GoI assigned new authority and mandates (command areas) for the management and governance

of 7.4 million ha of government irrigation systems to national, provincial and district governments:

1. National irrigation systems account for 2,357,904 ha or 33 percent of the total in the country and each scheme is larger than 3,000 ha or crosses provincial borders. The jurisdiction and management responsibility of the national schemes is under the national River Basin Organizations (RBOs, see below) of the MoPWH. Operation and maintenance (O&M) is financed by the MoPWH.

2. Provincial irrigation systems account for 1,143,227 ha or 16 percent of the total schemes and have a size between 1,000 to 3,000 ha, or cross district boundaries. They fall under the jurisdiction of the provincial water resources service. O&M is financed from the provincial government's budget.

3. District irrigation schemes have a size of less than 1,000 ha. They account for 3,646,588 ha or 51 percent of the country's irrigation area. They are managed by the district agency responsible for water resources and irrigation. O&M is financed from district governments' budgets.

The management of irrigation systems in Indonesia is typically done in three tiers (Table 11.4). For National Irrigation Systems they are: (i) primary basin water supply systems managed by the 34 River Basin Organizations (RBOs) under the MoPWH and two River Basin Corporations (RBCs), namely Perum Jasa Tirta-1 and Perum Jasa Tirta-2²⁸⁸ under the Ministry of State-Owned Enterprise (MSOE); (ii) the secondary system managed by the provincial/district irrigation agencies; and (iii) the tertiary units are the responsibility of the farmers, organized in Water Users' Associations (WUAs), as well as their Federations (WUAFs). However, clear service agreements that describe the roles, responsibilities, rights and obligations of the service provider and the recipient of the service are absent. These would be: (i) between the RBO and provincial/ district irrigation agency; and (ii) between the provincial/ district irrigation agency and the WUAFs. The absence of these agreements makes the provision of services to the farmer unreliable. The situation is aggravated by shortages of field-level staff at all three levels, and a lack of systematic information on actual amounts of water needed, available, and allocated.

As part of its endeavors to improve cost recovery and to ensure the fiscal sustainability of river basin management systems, the GoI has established two self-financing state-owned enterprises, or River Basin Corporations, (PJT-1 Brantas and PJT-2 Jatiluhur), under the MSOE. These entities are responsible for the O&M of river and bulk water supply infrastructure, with funding derived from sales of raw water, hydropower, water quality laboratory fees, and recreation fees, etc. PJTs' O&M activities are considered successful with financial support derived from their own revenues. However, all infrastructure development and rehabilitation investments continue to be funded through the national budget via the MoPWH, and the 128 river basins have no revenue-generating capacity.

In addition, the GoI has adopted a policy of participatory irrigation management (PIM). In this system the participation of water users in all aspects of development and management of irrigation systems, and the establishment of Irrigation Commissions as multi-stakeholder coordination and decision-making platforms, became mandatory at each district and province. The introduction of this reform agenda has been rolled out over the country since 2004. Following its introduction, the harvested rice area grew from 11.9 million ha in 2004²⁸⁹ to 14.1 million ha in 2015. In the same period, production of dry husked rice increased from 54.1 million tons/ha to 75.4 million tons/ha, and average yields increased from 4.53 tons/ha to 5.34 tons/ha, or 18 percent over 12 years.²⁹⁰ These results were achieved due to the increased participation and commitment of subnational governments (SNGs) in the management of irrigation services. Until recently, the focus had been completely on provincial and district systems.

²⁸⁸ RBOs are government institutions that rely on government budget and not revenue generating entity. RBOs are established by and are responsible to all levels of government: central, province and districts, under supervision of the Ministry of Public Works and Housing. RBCs (PJT-1 and PJT-2) are SOEs, corporations under the Ministry of State-Owned Enterprises that manage water resources infrastructures (dams and irrigation networks) with revenue-generating capacity. The seven river basins covered by PJT-1 and PJT-2 are also the river basins under RBOs. The PJTs support some RBOs in the O&M of some river basins, especially dealing with hydropower dams.

²⁸⁹ 2004 was the start of the implementation of the irrigation sector reform and introduction of the participatory irrigation management policy with the promulgation of Law No. 7/2004 on Water.

²⁹⁰ Badan Pusat Statistik (BPS) 2018.

TABLE 11.4. The distribution of responsibilities for River Basin Organizations

Management responsibility	River Basin Organization	River basin
Central Government	34 (32%)	64 (50%)
Provincial Government	57 (54%)	52 (41%)
District/city Government	15 (14%)	12 (9%)
Total	106	128

Source: Permen PUPR No. 04/PRT/M/2015, <http://sda.pu.go.id>

TABLE 11.5. The distribution of responsibilities for River Basin Corporations

Management responsibility	River Basin Corporations	River basin
Perum Jasa Tirta-1 Brantas	1	5 (71%)
Perum Jasa Tirta-2 Jatiluhur	1	2 (29%)

Source: www.jasatirta1.co.id, www.jasatirta2.co.id

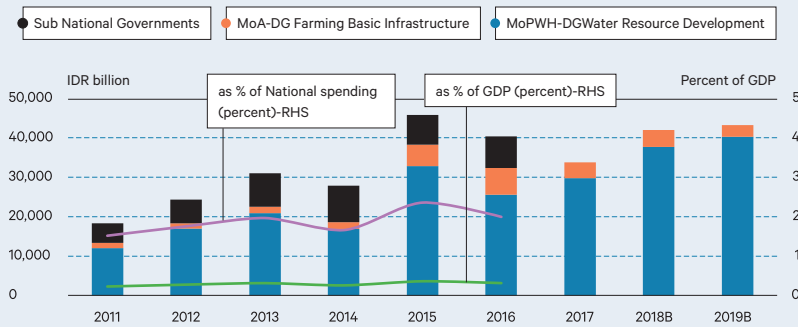


11.2

Assessing the Quality of Spending

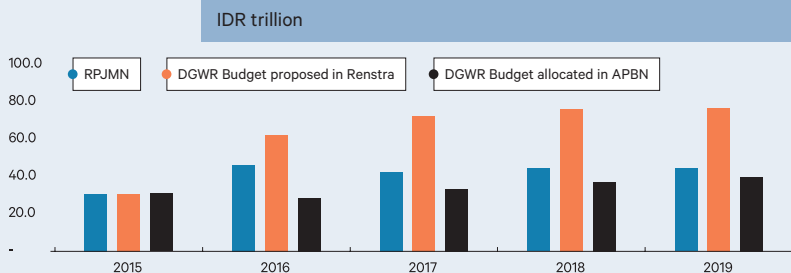
- A** Overall Trends: Is Spending Adequate?
- B** How Efficient Is Public Spending in the Sector?
- C** How Effective Is Public Spending in the Sector?

FIGURE 11.5. National spending on Water Resource Development, 2011-17



Note: Public expenditure on water resources comprises: (i) CG spending, including subsidies and interest payments, but excluding transfers; (ii) provincial-level spending; and (iii) district-level spending. Presented SNGs' spending in 2011-16 was estimated based on the ratio of SNG spending in water resources over infrastructure sector in 2007.
Source: World Bank staff calculations using Ministry of Finance data.

FIGURE 11.6. Comparison between DG Water Resources budget proposed in the Renstra versus budget allocated in APBN



Source: MoPWH data and Financial Note of MoF.

A

Overall Trends: Is Spending Adequate?

Public spending on the water resources sector only accounts for 1.7 percent of total national spending and around 65 percent of this spending is undertaken by the central government (Figure 11.5). The bulk of spending is from DG Water Resources (DGWR) under the MoPWH. The MoA is the other ministry that has budget for water resources through its Directorate General of Farming Basic Infrastructure and provides support for rehabilitation and construction of irrigation facilities at the farmers' level (tertiary). It also acts as a facilitator and regulator in activities including coaching, facilitating, coordinating and M&E in all provinces. WUAs are engaged through the MoA to maintain tertiary irrigation networks through grants provided to the WUAs.

Despite significant increases in 2015,²⁹¹ central government spending on water resources remains well below the MoPWH's Strategic Plan (Renstra) target (Figure 11.6). After the energy subsidy reform freed up fiscal space, the infrastructure budget increased by 40 percent (see Overview chapter). This mainly benefited the MoPWH, and the DGWR's budget increased by 47 percent, along with the budgets of other departments, such as DG Highways (see National Roads chapter). This coincided with the start of the Nawacita dam construction program.

For irrigation development, the other funding channel is through Special Allocation Fund (DAK), which represents a significant proportion of the funds managed by SNGs. Starting in 2016, the DAK for irrigation was part of DAK *Penugasan*

²⁹¹ 2015 and 2016 budget increased by 63 percent compared with 2014.

(special allocation fund to achieve national priorities). Since then, the DAK allocation for irrigation increased significantly, from IDR 1.9 trillion in 2015 to average IDR 3.8 trillion in 2016-19, a 200 percent increase. DAK *Penugasan* is eligible only for provinces and districts determined by the central government (Bappenas and sectoral ministry), and local government requires the submission of proposals to qualify to receive DAK funds.

The DGWR provides technical data such as the unit cost and technical index (e.g., the condition of existing infrastructure, irrigation network maps, etc.) and, in a trilateral meeting, the MoF, Bappenas and the MoPWH will discuss allocations. This practice has improved the targeting mechanism thanks to the DAK Irrigation Guidelines 2019 and, on average, districts in paddy growing provinces will receive more DAK in 2019. Utilization of DAK is mainly for construction, rehabilitation and improvement of provinces' and districts' irrigation command areas. Meanwhile, O&M of the infrastructure has to be financed by SNGs. No funds from the DGWR are allocated to the WUAs.

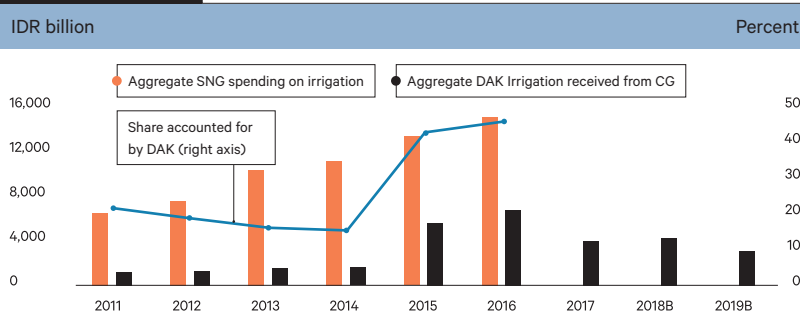
Under the DAK Irrigation Guidelines 2019, the eligibility criteria to receive DAK funds are based on Bappenas's locus/priority location to support the achievement of national development targets in the RPJMN and *Nawacita*. There are two criteria: (i) criteria for the construction of new irrigation networks, including: (a) to support food security: 15 provinces with the largest rice production²⁹² and 284 paddy growing centre districts;²⁹³ (b) lagging regions (President Regulation No. 131/2015); (c) island regions;²⁹⁴ and (d) poverty: districts with poverty rate above national average;²⁹⁵ and (ii) criteria for rehabilitation.²⁹⁶

The contribution of DAK Irrigation to SNG spending on irrigation in substantial. After 2015, when DAK Irrigation transfers increased significantly, the share in aggregate SNG spending on irrigation funded by DAK Irrigation increased from 15 percent in 2014 to 45 percent in 2016 (Figure 11.7).

The irrigation targets are unlikely to be met. In the absence of strong growth in the budget allocations of the DGWR

FIGURE 11.7.

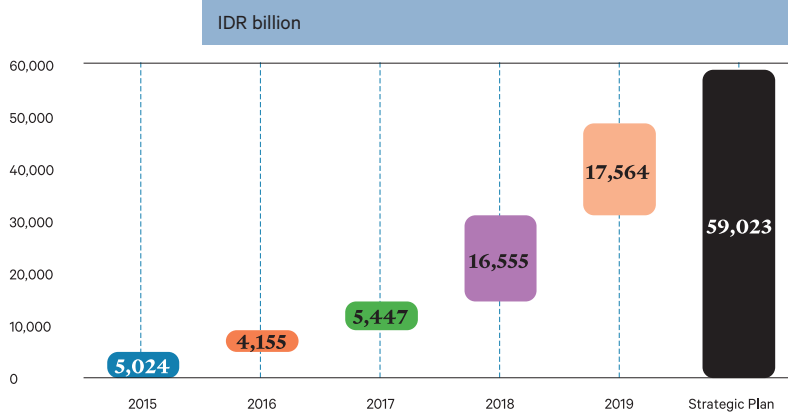
Total SNG spending on irrigation, and share accounted for by DAK Irrigation



Note: DAK Irrigation from CG fiscal data; data on total SNG spending on irrigation after 2016 are not available.
Source: World Bank staff calculation using MoF data.

FIGURE 11.8.

Budget allocation for development of new dams



Note: (i) budget between 2015 and 2017 are actual budget, (ii) budget of 2018 and 2019 are proposed budget by the MoPWH strategic plan, and (iii) the strategic plan budget is the required budget to realize the construction of 65 new dams.
Source: MoPWH.

for irrigation and dams, and assuming the budget share for irrigation remains similar to 2018 and 2019, it is estimated that only 68 percent of the new irrigation targets of 1 million ha in the MoPWH strategic plan will be met by 2019, through central government financing (Figure 11.6). While SNGs' contributions should also be considered, it is unclear if any measurement of new irrigation development through SNG financing is available (Figure 11.7).

Furthermore, targets for dams are also unlikely to be met. While the targeted spending on dams is a budget requirement of

IDR 59.0 trillion (roughly US\$4.5 billion) to construct 65 dams, to date, the total budget allocation has been equivalent to only about 50 percent (IDR 31.1 trillion) of the total required (Figure 11.8).

The GoI continues to look at development financing and foreign loans. The intention is more to work together with development partners to introduce new, alternative ideas and pilot innovations, and to leverage these to improve the outcomes of the APBN, such as through service agreements and converting RBOs into revenue-generating entities.

²⁹² According to BPS 2015 data.

²⁹³ Ministry of Agriculture Decree 2016.

²⁹⁴ President Regulation No. 78/2005 and President Decree No. 6/2017.

²⁹⁵ Above 10.64 percent, as measured in the Susenas 2017.

²⁹⁶ MPWH Regulation No. 14/2015 on Criteria and Determination of Irrigation Area Status.

B

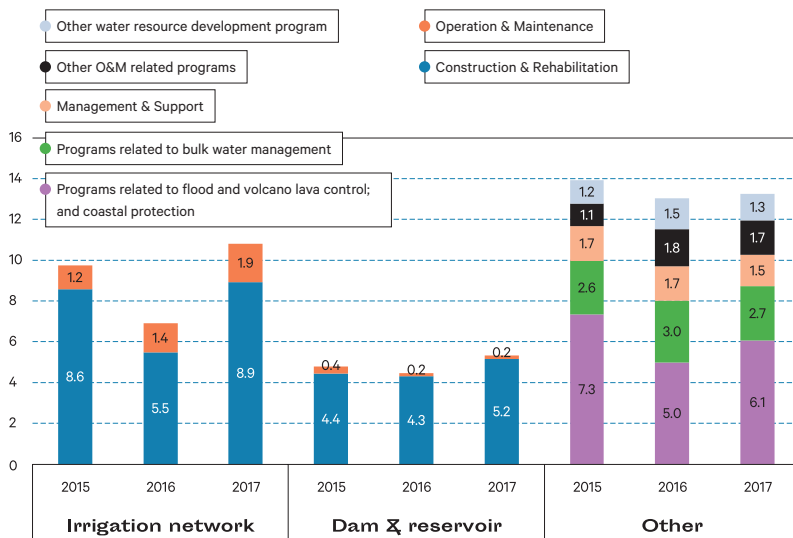
How Efficient Is Public Spending in the Sector?

B.1 Allocative efficiency (composition of spending)

FIGURE 11.9.

DGWR spending by activities, including construction and rehabilitation and O&M, 2015–17

IDR trillion



Source: World Bank staff calculations using MoF data.

Public spending on irrigation networks and dams consists of construction, rehabilitation and O&M, with the majority of spending on construction and rehabilitation for both irrigation and dams (Figure 11.9).

In order to manage water resource infrastructure across the country, the DGWR relies on the river basin organizations (RBOs) and local offices, as the operational units for the development and O&M of dams and river infrastructure to deliver water resources development. These responsibilities are reflected in the budget allocations within the DGWR,

with the RBOs accounting for roughly 90 percent of the total budget. This is used to finance a wide range of activities relating to the development and management of water resources, including: technical assessments, water allocation, construction of new dams and irrigation systems, and the rehabilitation of existing dams and irrigation systems, as well as regular O&M of dams, irrigation schemes and river infrastructure. The remaining portion of the budget is allocated for among different directorates at the central and provincial (Dinas) levels, mainly to support the O&M of state-owned water infrastructure.²⁹⁷

Irrigation systems

There are many transfers for O&M across levels of government, so coordination between levels of government is important. The central level of government finances O&M through the national budget and utilizes transfers to the provincial irrigation services, which often delegate implementation to district-level agencies. At the provincial level, the water resources irrigation agencies fund O&M of the systems under their management through the provincial budget, with budget funds deriving from their own revenues and from the central government through TP-OP transfers²⁹⁸ (assistance task funding). At the district level, funding for O&M comes from district budgets.

O&M allocation by the central government is too low but has been getting closer to the estimated requirement of IDR 630,000 per ha. Under the new policies for rice self-sufficiency the allocations for O&M budget for the national irrigation system have been increased significantly to IDR 310,000/ha in 2015 and to IDR 500,000/ha in 2018, which is approaching the estimated amount needed for O&M of IDR 630,000/ha for systems to be in good condition.

The organizational structure of RBOs versus RBCs explains part of the reason for low O&M spending. The RBOs receive budget funding,²⁹⁹ and need to share it with 131 entities, and are not allowed to collect revenue. This constrains their budget for O&M. The two RBCs, on the other hand, are state-owned self-financed corporations, and are managed by a different ministry (MSOE) and, as mentioned above, collect revenue from funding derived from sales of raw water, hydropower, water quality laboratory fees, and recreation fees, etc. This means they have sufficient funds for O&M.

²⁹⁷ O&M of irrigation schemes > 3,000 ha, which are under the responsibility of the central government, but where O&M is transferred to the provinces, so that the central government transfers a certain amount of budget to the provincial level.

²⁹⁸ Tugas Pembantuan – Operasi dan Pemeliharaan (TP-OP) is an annual APBN allocation to the Provincial Service that manages irrigation systems.

²⁹⁹ From the central government budget (APBN) for command areas belonging to the central government, or province and district budgets (APBD) for command areas belonging to provinces and districts.

At the provincial level, however, the fiscal framework for river and irrigation infrastructure is constrained by inadequate financing, particularly for O&M. Irrigation spending is still focused on construction and rehabilitation, with relatively low allocations for O&M (TP-OP). The funds for TP-OP used for Operation, Routine Maintenance, Periodic Maintenance and others, such as AKNOP surveys and budget preparation, are presented in Table 11.6. Though the central government's guidance is to allocate budget evenly between the three expenditure items above, given the shortfall in budget, some provincial services give priority to meeting operation requirements first, i.e., getting the necessary field staff in place, hence causing neglect to maintenance of the infrastructure (Table 11.6).

At the district level, under-spending and a lack of attention to O&M have been highlighted as two of the main drivers behind the deterioration of irrigation infrastructure networks managed by districts. Moreover, the allocation and spending of these funds lack transparency.

Detailed O&M plans based on the allocations are not disclosed to water users. Moreover, the O&M budgets are still arbitrarily based on a flat rate per hectare, or an overall lump sum,³⁰⁰ rather than on the condition of infrastructure and thus the maintenance needs. As a result, 22 percent of all national schemes have different degrees of malfunction due to ineffective O&M and the degradation of infrastructure.

The condition of irrigation systems reflects the differences in adequacy of spending on O&M at different levels of government. Between 2010 and 2014 (latest actual data point available), the share of irrigation systems in good condition increased for those managed by the central government and provinces but decreased for those managed by districts (Figure 11.10).

Hence, to reach the target of 3 million ha of rehabilitated irrigation networks by 2019, a rapid acceleration is needed, since the 2014-19 target of 3 million ha is well above the 2010-14 target. Most of the damaged irrigation networks are in Java and Sumatra. This is mainly related to

the age and size of the irrigation networks on these islands. Older and larger networks demand greater financial resources for O&M, which are often inadequate or unavailable.

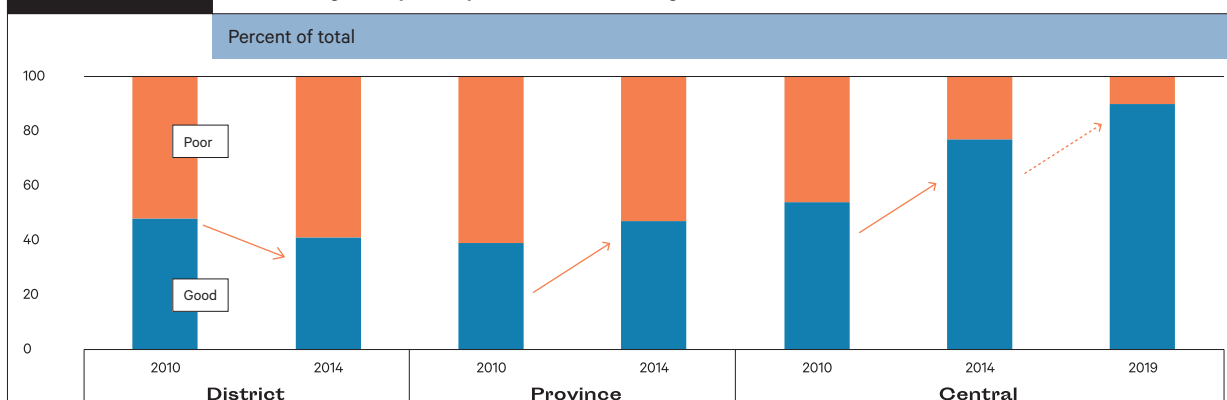
While farmers are officially not charged for irrigation services, in some cases they pay out of pocket to carry out repairs. The GoI policy is not to charge farmers for irrigation services in support of policies on food security and poverty alleviation. The operation, maintenance and management of the national irrigation schemes remain dependent on budget transfers from the GoI, as in almost all countries in the region. The GoI, instead, has adapted participatory irrigation to increase a sense of ownership among WUAFs and members in the irrigation facilities, in order to improve O&M practices and provide an opportunity to be involved in the implementation of schemes. In some cases, the WUAFs have initiated repairs at their own farmers' cost even in respect of the primary and secondary parts of the system, which by law is the responsibility of the SNG, as they cannot afford to wait for the districts to carry out repairs.

TABLE 11.6. Distribution of TP-OP allocations in percentages (2018, data from selected provincial agencies)

Province	Number of Systems	Area TPOP (ha)	Operation (%)	Routine Maintenance (%)	Periodic Maintenance (%)	Others (%)	Total %
West Java	17	399,963	-	-	-	-	-
Central Java	131	300,125	30.0	40.0	20.0	10.0	100.0
D.I. Yogyakarta	2	12,000	40.5	55.0	4.5	0.0	100.0
East Java	32	288,641	22.8	31.0	33.0	13.2	100.0

Source: AKNOP surveys (KPI that determines % of maintenance).

FIGURE 11.10. Share of irrigation system by condition and level of government



Note: 2019 is a target. 2014 is the latest actual data point available.

Source: Technical Audit, Badan Pengawasan Keuangan dan Pembangunan (BPKP, the government's internal audit agency), 2014

Dams

Due to spatial variations in Indonesia's geography, low unit costs for the construction of the dams should not be the only criterion, but it should also consider the needs for water supply, especially in the eastern region. Unit costs for construction vary greatly across Indonesia. This variation is mainly caused by: varied construction materials, transport, and labor costs (areas with poor accessibility are likely to have higher material prices), varied land acquisition costs, varied resettlement and compensation costs, and varied dam purposes (which influence the choice of technology to be used) (Figure 11.11)

Dam planning may not always be synchronized with the local spatial planning. For example, four out of 65 planned dams by the RPJMN will be located in Java and will be able to irrigate an additional 220,000 ha of new rice fields. However, it is unclear if the SNGs in Java plan agricultural growth of such magnitude.

Dam spending is also focused on the construction of the 65 new dams under

the *Nawacita*, at the expense of O&M. O&M through the MoPWH's RBOs for dams was only 3 percent of total spending in 2017, despite O&M being key for dam safety. Regular O&M (including thorough and consistent safety inspections) must be practiced throughout the lifetime of a dam. In addition to maintaining dam function, cost efficiency, and compliance with safety regulations, such habits can lead to the early detection of safety issues and the prevention of dam failure.

The development of new dams not only represents a substantial capital commitment from government resources but also has important long-term recurrent fiscal implications. The lack of secure and stable revenue streams associated with water services provided from the dams increases the reliance on government budget allocations. These are often competing against other demands and are considered variable allocations that are often subject to significant variability year on year.

The lack of predictable and sustained revenues for dam O&M can undermine long-term asset performance

and safety. Deferring O&M can also result in higher capital requirements by shifting the nature of the works from relatively simple O&M into larger rehabilitation requirements. This is reflected in the large number of dams identified for rehabilitation in the MoPWH's strategic plan (Figure 11.12).

B.2

Technical efficiency in the use of budgeted resources

Compounding the issue of low budget allocations to the WRM sector, the realization rate (ratio of spending to budget allocated) is decreasing. Planning and implementation challenges, which involve assessments to update the data on the current status of infrastructure quality and the need for intensive consultations with various stakeholders on prioritization, have been constraining the development of new water infrastructure and have resulted in a low

FIGURE 11.11. Unit cost of dam and construction across Indonesia

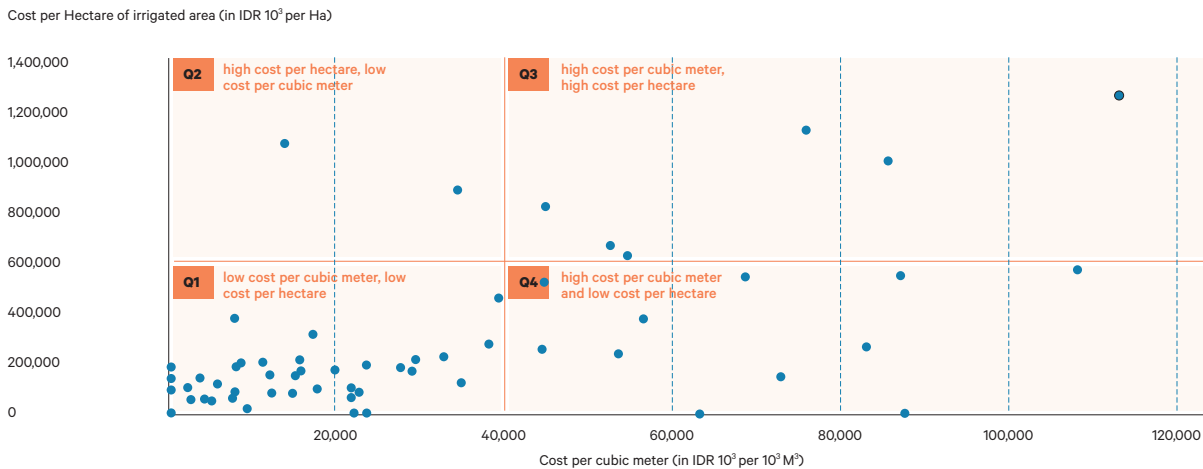
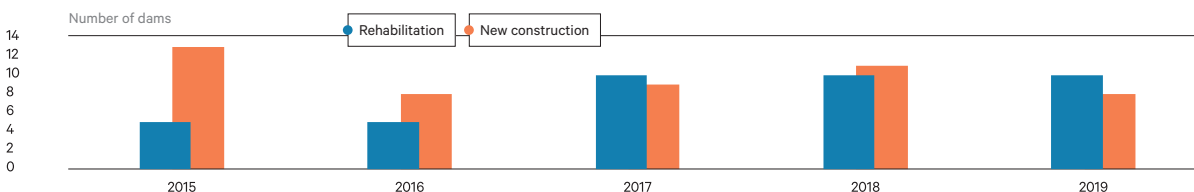


FIGURE 11.12. Dam construction and rehabilitation plan (according to MoPWH strategic plan 2014-19)



budget absorption rate by DGWR (Figure 11.13). As mentioned earlier in this chapter and in the Overview chapter, in 2015 budget allocations for the MoPWH increased by 59 percent compared with the 2014 budget, with all departments showing a lower execution rate in 2015 and 2016, although the DGWR's budget execution is structurally below other departments.

Some planning and implementation challenges result in low budget execution, constraining the development of new infrastructure:

Land acquisition. Both irrigation and dam construction involve significant land acquisitions, which in most cases require a long and iterative process to reach agreement among parties;

Coordination between multiple local governments in one service area. Construction of dams and national irrigation systems normally takes place across multiple local government jurisdictions, thus they are also affected by the readiness of local governments to collaborate on the specific water resources development agenda. In addition, water resources development generally receives low interest from local governments, especially

comparing irrigation infrastructure to roads (DG Highways/*Bina Marga*) and housing, water supply and sanitation (DG Human Settlement/*Cipta Karya*), which mostly create positive externalities;

Timing to minimize the interruption to farmers. The construction of water resources development has to adjust with the farmers' planting cycle agenda to minimize interruption of planting and crop production; and

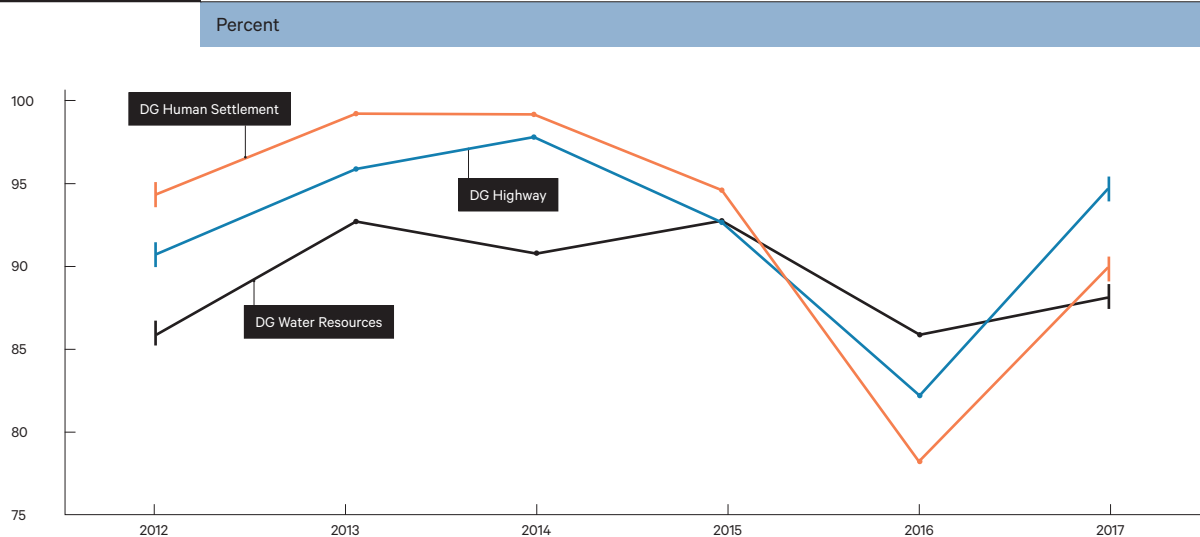
Climate-sensitive design and construction standards. Water resources infrastructure needs to be constructed according to high standards, not only to ensure durability and avoid leakage but also, and most importantly, to ensure human safety.

At the subnational level, DAK Irrigation implementation has increased, thanks to improvements to regulations. A study of a sample of provinces from the DAK infrastructure M&E report³⁰¹ suggests that execution rates were around 80 to 90 percent for 2018 in most districts. Thanks to Presidential Decree No. 70/2012 amending Presidential Regulation No. 54/2010 on Public Procurement, article 73(1), to accelerate the government procurement process,

the procurement unit (ULP) can announce the procurement process to the public based on the following conditions: (i) after enactment of the subnational budget (APBD) for goods and services procurement with the local budget financial source; and (ii) after the work plan and central government budget from ministry/institutions/agencies have been approved by the legislature (DPR). Hence, local governments have been able to announce the procurement process soon after the DAK Irrigation allocation has been approved and contract packages (URK)³⁰² have been developed.

Generally, the DAK Irrigation targeting to rice-producing provinces has improved, although there are some exceptions (Figure 11.14). Looking at the paddy production, it was found that DAK Irrigation in 2019 was allocated to provinces of the large beneficiaries of DAK on irrigation. These provinces matched with the locations of the large rice producers (Figure 11.5). This is an improvement on previous years, when other factors determined DAK allocations, and where, for example, in 2015, South Sumatra Province was the fifth-largest rice producer and was at the same time the fourth-smallest recipient of DAK Irrigation (out of 34 provinces).

FIGURE 11.13. Budget execution rate (ratio of spending to budget) among Directorates General of the MoPWH



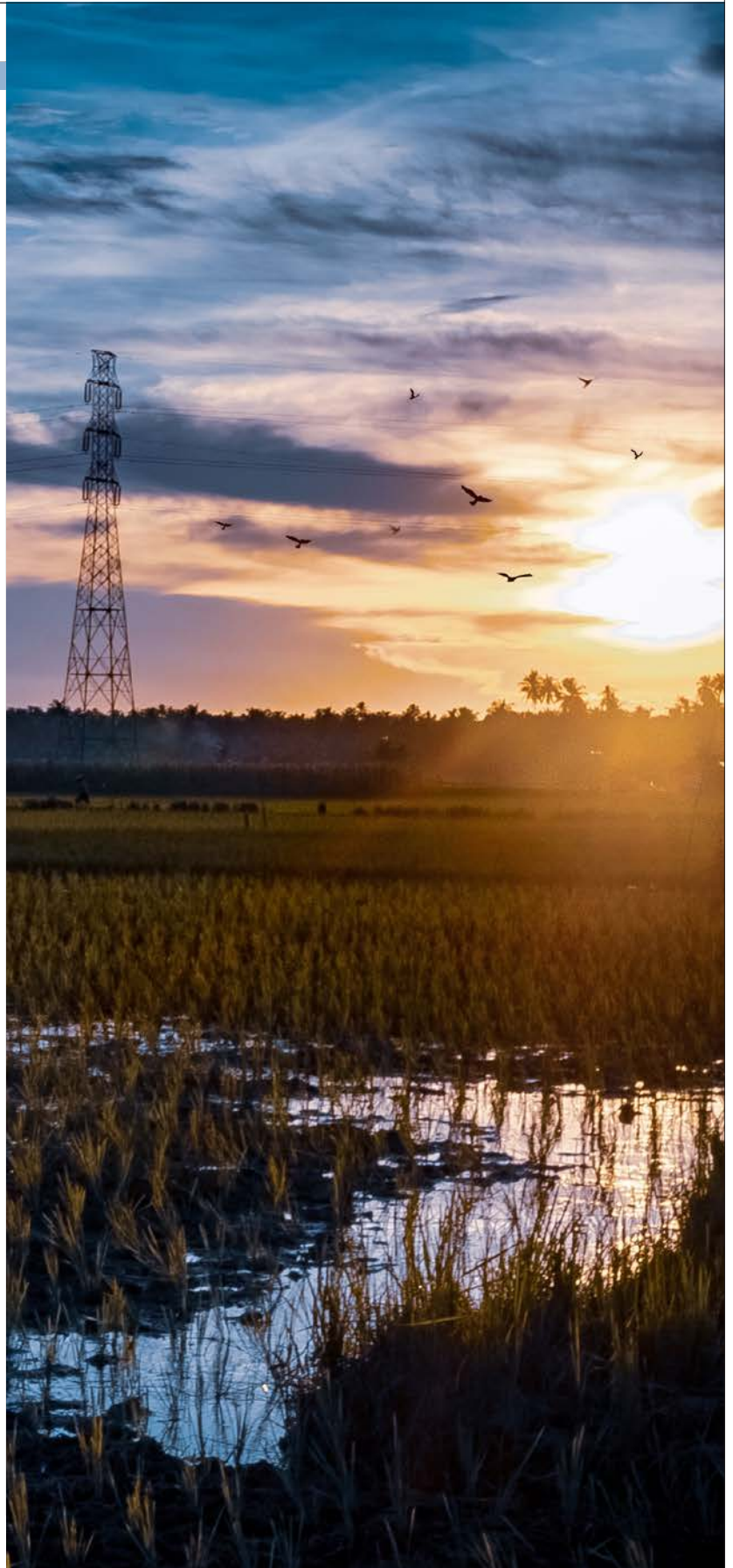
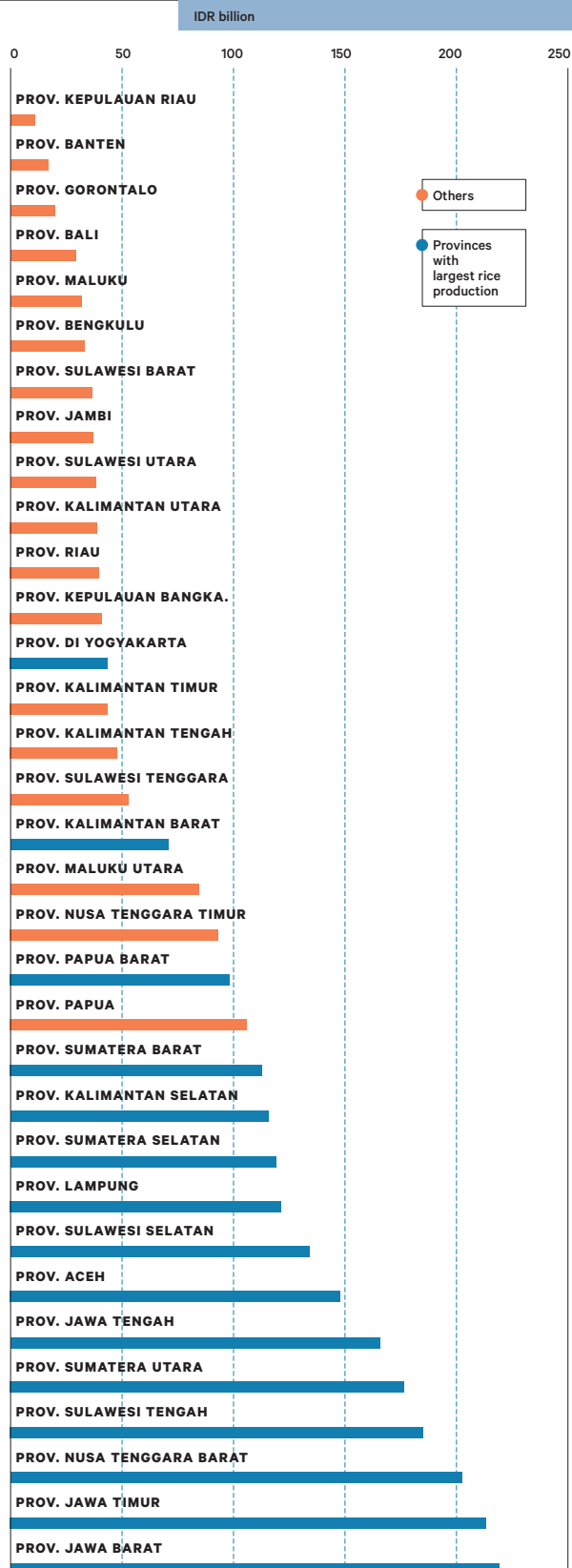
Source: State Government Annual Financial Report (*Laporan Keuangan Pemerintah Pusat*).

³⁰¹ e- money report. <http://103.11.135.34/dak2018.php>.

³⁰² *Usulan Rencana Kegiatan* (Activity Plan Proposal).

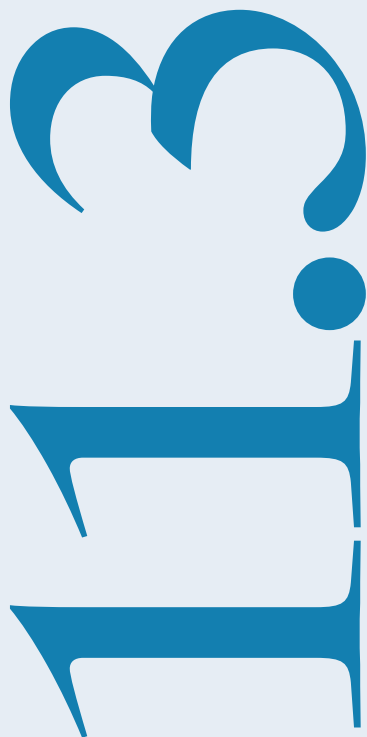
FIGURE 11.14.

DAK Irrigation allocation
across provinces, 2019



Note: The 15 provinces with the largest rice production are defined by BPS 2015 data.

Source: DG Fiscal Balance, Ministry of Finance. <http://www.djpk.kemenkeu.go.id/wp-content/uploads/2018/10/Rincian-Alokasi-DAK-Fisik-TA-2019-Upload-Final-Fix-31-Okt.pdf>



How Effective Is Public Spending in the Sector?

Construction challenges in remote areas. As mentioned earlier and shown in Figure 11.11, construction of dams in the extreme eastern parts of the country is complicated by the remoteness of the locations, the distance from the main economic centers of the country, and logistics constraints associated with construction in difficult terrain. Hence, implementation capacity of this construction can be challenging.

Despite a defined institutional and policy framework, the irrigation sector faces performance issues as a result of the absence of a functioning accountability system between the service providers and their clients, and between governments at different levels. For example, district governments are responsible for setting up and providing support to the WUAFs that manage tertiary networks in their command areas, regardless of whether the command area belongs to the district, the province, or is national. But in fact districts rarely provide

support if the command area of an irrigation scheme belongs to the provincial or central government. This also means that WUAFs, which are supposed to manage a province's or national command areas, will be neglected, while preventing the provincial and central government from supporting the WUAs.

There is a need for better regulations. Participatory irrigation has also given the farmers a voice in respect of regulatory development, through their representation in the Irrigation Commissions. However, implementation of the participatory principle in national schemes seems to be more problematic due to the fragmented mandate at the national level, whereas capacity building and development of WUAFs are the responsibility of local government. Also, the type of construction required for national schemes is generally more complicated and beyond the capacity of WUAFs. For participatory irrigation to be successful, the cooperation mechanism needs to be backed up by a clearer procurement policy that allows for WUAs to implement the smaller schemes.

Recommendations to Improve the Quality of Spending

Given the crucial importance in water systems, the quasi-public-good nature of the investment, and Indonesia's water needs, the irrigation sector needs greater resources to develop an adequate and timely supply of water to rural areas all year round. While there are efficiency gains to improving current spending patterns, greater investment overall is also needed to address Indonesia's dam and irrigation needs. Below are the main recommendations for improving the quality of spending:

A

Scope of Analysis

This analysis focuses on the public expenditure on water resources for food security at the national level spent by the MoPWH and its agencies. It does not include:

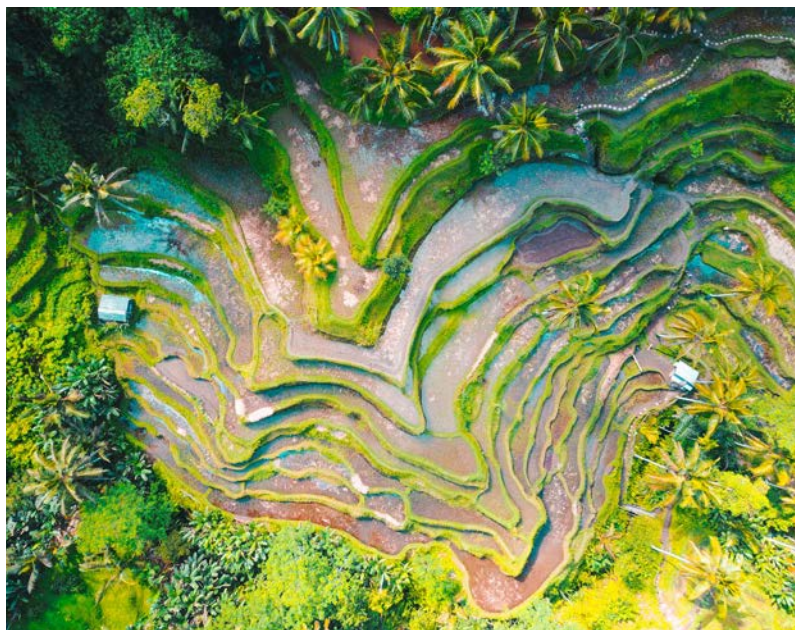
1. Spending on the subnational level; analysis was infeasible due to limited data availability;
2. Spending by the Ministry of Agriculture (MoA) on the maintenance of tertiary irrigation channels, as the size of the expenditure is relatively small, and the responsibility for the maintenance of tertiary canals will soon be transferred to the MoPWH (awaiting the finalization of a presidential decree); and
3. MoPWH expenditure on the provision of social assistance for WUAs to maintain their tertiary canals; analysis was unfeasible due to limited data availability.

B

Improved Operation & Maintenance

Infrastructure development target needs to consider institutional capacity and the implementation of asset management to ensure effectiveness and sustainability of services. This review found that O&M spending on dams and irrigation is insufficient. The review therefore recommends allocating more resources to O&M for irrigation and dams, which will reduce the need for rehabilitation in the future and ensure dam safety. Several initiatives could be recommended as follows:

1. **Create incentives for SNGs to increase the budget for O&M.** In addition, to address the deteriorating quality of the irrigation network, provinces and districts need to allocate more resources to O&M and assume a portion of the rehabilitation cost (according to local fiscal capacity). Local governments have little incentive to adequately invest or even increase their O&M budgets, because they do not bear the cost of the central



government's rehabilitation grants. The cost of rehabilitating the provincial and district networks should be shared between central and local governments according to fiscal capacity. This would create an incentive to maintain the network, because it is significantly cheaper to fund regular maintenance operations than to support rehabilitation projects. Central government could also introduce performance-based transfers by making district and provincial irrigation asset management plans, proof of adequate O&M allocation, and achievement of performance targets conditions for receiving central government financial support.

2. Apply asset management/full lifecycle cost planning (medium term). The assessment found that ambitious construction targets are an additional burden on budgets and institutional capacity. For example, the budget prepared for new dam construction does not include costs of additional human resources required to operate and manage such facilities. The review suggests developing medium- and long-term plans for O&M based on an asset management system, instead of annual or ad-hoc practices. New investment should incorporate medium- and long-term needs for O&M. It is suggested that budget increases for capital spending should be complemented by targeted and well-timed institutional capacity programs, and investment planning should look at longer-term, full lifecycle cost planning.

3. Introduce SOE-Public-Partnership (SPP) to identify revenue mechanisms to provide alternative long-term financing mechanisms. To cope with higher needs

for O&M in the future, while RBOs cannot generate their own revenue from users, the review recommends that RBOs consider the possibility of converting RBOs into revenue-receiving entities, such as BLU³⁰³, and the possibility of introducing SPPs based on PJT management contracts of irrigation services in other basins.

4. Build the capacity of technical staff in RBOs and in SNGs for O&M. A significant increase in new water resource investment will require improved human resources capacity. In the central government, it is vital that the DGWR in the MoPWH develops a capacity-building program that links with long-term sector objectives. To develop the capacity, learning centers should be revitalized to include water resources capacity-building programs. Cooperation between RBOs and these centers should be strengthened. For the SNGs, a capacity-building program should be developed by SNGs in cooperation with RBOs to increase WUA/WUAFs' capability for O&M.

5. Introduce clear service agreements describing the roles, responsibilities, rights and obligations of the service provider and the recipients of the service. These service agreements would be between: (i) the RBO and provincial/district irrigation agency; and (ii) the provincial/district irrigation agency and the WUAFs. These agreements would make the provision of services to farmers more reliable. This should be accompanied by hiring sufficient field-level staff at all three levels, and the provision of systematic information on actual amounts of water needed, available, and allocated.

C

Scaling-up & institutionalization of participatory irrigation at the subnational level (coordination CG-SNG)

Reforms to delegate irrigation management to the subnational level and to adopt participatory irrigation through the involvement of various stakeholders, especially WUAs, need to be implemented consistently. In addition, participatory irrigation has been proven to be effective in increasing O&M practice, better water distribution among users, and increasing farmers' involvement in decision-making processes. Further enhancements of these approaches should be undertaken through various initiatives, such as:

1. Ensure local commitment in rice-growing provinces and districts to support the agenda on food security. Central government has identified a focus on provinces and districts that have high rice production rates and should include these as eligible criteria to receive DAK Penugasan. Central government should ensure that these SNGs include food security and participatory irrigation in their medium-term development plans. This is important to ensure that local resources are allocated to the sector and performance is measured by local parliaments. The MoHA could be assigned this task.

2. Strengthen the role of the Irrigation Commissions and water resource boards as local/multi-stakeholder platforms. The roles and responsibilities of WUAs, especially on O&M aspects, could gradually be increased. Accordingly, Irrigation Commissions and water resource boards need to be strengthened as multi-stakeholder platforms that provide guidance to local governments

³⁰³ Badan Layanan Umum or General Service Body is a Gol institution that provides goods or services to community. This is a non-profit-oriented body rather than one that can increase efficiency and productivity.

D

Convergence in Planning, Budgeting, Targeting and Result Monitoring (PFM)

on the sector development agenda. This has already been included as aspects to be considered for local government planning in WRM (Public Works Affairs) as per MoHA regulation (Permendagri) No. 22/2018.

3. Revise DAK to include procurement of technical assistance. The transfer of funds from the central government should provide a menu to procure technical assistance and capacity-building support. These will include the provision of facilitator for WUAs to support them to develop a work program, to ensure alignment between their workplan and the district work plan, and to provide necessary skills, including organizational development, simple financial management, and O&M of infrastructure. Revision of DAK could be considered to accommodate this suggestion.

4. Improve clarity on the mechanism for irrigation scheme above 3,000 ha under central government control. Additional technical guidance and clearer agreement between central government with district governments that have a mandate to set up and support WUAs in those area is recommended. Currently, district governments do not provide any support to farmers who fall under central government irrigation schemes. Despite this, by regulation, the central government has no financing mechanism to support farmers with regards to O&M of the tertiary networks.

The objective of the sector is still focused on outputs (e.g., number of dams and irrigation networks built), and not on the outcomes. It is suggested to realign the sector objective to focus on outcomes, such as improved irrigation efficiency and agricultural productivity (“more crop per drop”).

While WRM is only one of the many other factors that contribute to achieving food security, support is necessary at every level to reach the optimum outcomes: (i) water storage development and management to ensure water availability; (ii) irrigation networks management; (iii) development of paddy fields and ensuring land conversion; (iv) WUA establishment; and (v) post-production support. Therefore, clear coordination mechanisms need to be established both horizontally (among sectors both in central and subnational levels) and vertically (between central and subnational levels). This concept has been practiced and proven feasible on a project scale under the Water Resources and Irrigation Sector Management Program 2 (WISMP-2) project.³⁰⁴ The scale-up of implementation of these approaches could be done through various initiatives, such as:

1. Disseminating best practices on integrated sector planning and incentivizing coordination. The integrated sector planning requires stronger coordination

and convergence planning among related sectors through an integrated results framework. The WISMP-2 project applied a performance-based program to incentivize coordination and requires each institution to work together for the same goal to improve agricultural productivity. The participating Dinas³⁰⁵ in the participating districts confirmed that this system helped them to plan and implement the program accurately and has been replicated for non-WISMP-2 projects in about 70 percent of districts. Wider dissemination of this evidence and best practice should be endorsed.

2. Endorsing an integrated, outcome-driven planning framework to enable stronger coordination and convergence of planning among related sectors. This could be implemented by introducing guidelines describing each ministry’s role in improving the quality of planning and budgeting processes, as well as sector coordination toward broader outcomes. The key ministries are the MoPWH in charge for infrastructure development, the MoA in charge of crop production and post-production, and the MoHA in charge of developing local government capacity. The guidelines can also be considered a DAK requirement to improve the effectiveness of the funds. Bappenas should lead the development of the guidelines, while the MoF should lead the review process of DAK proposals.

³⁰⁴ Water Resources and Irrigation Sector Management Program-2 (2011-18), funded by the World Bank.

³⁰⁵ These are the equivalent of ministries at the subnational level: Dinas Public Works, Dinas Agriculture, and the Local Planning Agency (Bappeda).