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Assessing the Resurgent Irrigation Development Programm of the Philippines: Synthesis Report

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Assessing the Resurgent Irrigation Development Program of the Philippines: Synthesis Report

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Abstract

This paper synthesizes the results and findings of four component studies under the resurgent irrigation development assessment: the technical and institutional assessments of national and communal irrigation systems, the water resource assessment and the governance components. This synthesis is structured according to the research questions posed to the component studies along the project cycle. The first two components provided technical and institutional evaluations of selected NIS and CIS systems from Luzon to Mindanao from project identification, to preparation, appraisal, and selection, to project implementation, operations maintenance, and monitoring and evaluation. The water resources component assessed the irrigation service areas as originally planned or designed compared to the actual service areas with respect to water availability, land use (including flood vulnerability) and status of irrigation facilities. The governance component discussed and analyzed the governance mechanisms for the irrigation sector and the irrigation project from planning to monitoring and evaluation.

Keywords: technical and institutional assessments, irrigation management, water policy, water governance, national irrigation systems, communal irrigation systems

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Assessing the Resurgent Irrigation Development Program of the Philippines: Synthesis report

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1. Introduction

Irrigation sector development is a key policy instrument used in addressing rice crisis in the country. Calamities and El Nino effects, and high world prices affecting the rice sector triggered this policy stance. This heavy bias on irrigation investment as a tool for addressing food insufficiency has been the case not just in this present administration but even way before the National Irrigation Administration (NIA) was established. In the recent administration, there has been massive increases in funding for irrigation in 2017 and 2018. Appropriations for irrigation rose to Php 38.4 billion in 2017 and to Php 41.7 billion in 2018. These figures far exceed the Php 8 billion in 2008 and the Php 24.4 billion allocation in 2012.

In view of the importance of irrigation in terms of national budget allocation and its expected contributions to agriculture and addressing food concerns, this study on Assessing the Resurgent Irrigation Development Program examines the effectiveness and efficiency of the government's irrigation program. It focuses on the technical, physical, and institutional aspects of performance of both national (NIS) and communal irrigation systems (CIS), and selected case studies. Specifically, four component studies were conducted: (1)-(2) the technical and institutional assessments of the national irrigation systems (NIS) and communal irrigation system (CIS), (3) the water resource assessment, and (4) water resource governance. From here on, these four reports are referred as “component studies.”

This paper is largely a synthesis of results and findings of the four components but where necessary, enhanced by related studies and more recent findings. It is structured according to the research questions posed to these components along the project cycle. In addition, a discussion on the broader issues of irrigation governance is added. The first two components carried out technical and institutional evaluations of selected NIS and CIS systems in the context of a project cycle from identification; preparation, appraisal, and selection; project implementation; operations maintenance; and to monitoring and evaluation. The water resources component on the other hand, assessed the irrigation service areas as originally planned or designed compared to the actual service areas in relation to water availability, land use (including flood vulnerability) and status of irrigation facilities. Specifically, the study evaluated the ability (how much) of the water resources (water source), land resources (slope, soils and land use) as well irrigation facilities to irrigate so much area (hectares) through watershed and irrigation modeling and simulation. The governance component described and analyzed the governance mechanisms of the entire irrigation project cycle from planning to monitoring and evaluation. It drew on the findings from the other components within this

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project, while focusing on governance, particularly higher-level issues cutting across national and communal irrigation systems and also across the other water sector agencies.

2. Methodology and Data

The irrigation assessment study evaluated the effectiveness and efficiency of the government's irrigation program with focus on the technical, physical, and institutional aspects of performance of national irrigation systems (NIS) and communal irrigation systems (CIS). This synthesis report is organized around the research questions which the component studies were meant to answer. Below are the research questions at each stage of a project:

1. Project identification

- What is the appropriate methodology for approximating the irrigation potential of a large river basin?
- How can the present irrigation potential estimate/estimation process for the whole country be improved?
- What is the correct methodology for estimating the service area of an identified project, considering both engineering and economic constraints?

2. Project design and appraisal

- What is an appropriate design philosophy for new, restoration, and rehabilitation projects?
- How can project design benefit from high-resolution data (using GIS) and science-based information at the level of the basin and irrigation system?
- What are the implications of watershed status, and watershed management, for the design and management of irrigation systems?
- How capable is the project proponent in arriving at an appropriate, science-based, and economically viable design of an irrigation project? How can capacity be improved?
- How capable is the project decision-making system in conducting an independent appraisal of proposed irrigation projects? Is the system able to critically discriminate viable from non-viable projects? Why or why not? What are the points of weakness, and how can capacity be improved?
- How can design be improved through proper consultation with end users (farmers) and technical staff in charge of O&M? Or how intended/planned system management should be incorporated in system design so that it will be compatible with system management structure?
- How can the roles of DENR, DA, NIA, IAs, and LGU be delineated, and proper coordination between agencies ensured?

3. Project implementation and Procurement

- How capable are NIA, LGUs, and BSWM, in implementing irrigation projects?
- What is the proper delineation of roles across these agencies/units in the short, medium, and long term?

- Is the procurement process transparent and timely? How can timeliness and transparency in procurement be improved?
- Are construction/rehabilitation activities properly coordinated with farmers, and other stakeholders (e.g. LGUs, DENR, etc.) What is the appropriate role of farmers in project implementation?

4. System Management, Operations and Maintenance

- How will the free irrigation policy be implemented?
- What are the implications of the free irrigation policy?
- Will this represent a total reversal of irrigation management transfer (IMT)?
- Did the IMT program realize its intended outcomes and impacts?
- Is the IMT preparing farmers enough to take on the task of managing irrigation systems?
- What is the appropriate strategy for O&M of a given system? Will it vary by type and characteristics of the system?
- How can the problem of siltation and inadequate water supply be addressed?
- What O&M activities are within the technical capacity of the IA? If some are not, how can these be sustainably conducted?
- What is the appropriate costing of O&M?
- Is there institutional capacity for O&M on the part of NIA (for NIS), LGUs (hardly in management but by law should be in development); and IA both NIS & CIS)? How can capacity be improved?
- What is the appropriate cost recovery mechanism for O&M? How can this mechanism be established?
- What factors determine successful and sustainable conduct of O&M? How can cooperation and active participation of farmers be secured?
- How can the roles of NIA, IAs, and LGU be delineated, and proper coordination between agencies ensured?

5. Monitoring and evaluation

- What types of information should be regularly collected from NIS and CIS for proper monitoring and evaluation?
- How can a proper M&E system be institutionalized covering NIS and CIS?
- How can information be used for operations and planning of future projects?

6. Broader issues of irrigation governance

What reforms need to be pursued in terms of: water pricing, allocation of water rights, management of watersheds; investment allocation, finance of O&M, and subsidy arrangements; and organizational framework and set-up of NIS, CIS, and BSWM systems?

A. Coverage of Component Studies

This synthesis heavily draws from the key results of the technical and institutional assessments of the **39 national irrigation systems** (NISs) and **90 communal irrigation systems** (CISs), **two case studies** (Pampanga Delta River Irrigation System or PADRIS and Angat-Maasim River Irrigation System or AMRIS) for the water resource assessment, and the water resource governance.

The NIS and CIS components of this resurgence study carried out the following: (1) characterization of the current physical state of the system including its dams or headworks and various control structures; (2) system diagnosis and a more detailed assessment of design specifications and engineering performance indicators; (3) evaluation of operation and maintenance activities; (4) analysis of the nature and cost of repairs, restoration and rehabilitation; (5) assessment of the effectiveness of irrigators' associations; and (6) rapid appraisal of farmers' opinion about the quality of irrigation service and the reasons behind low ISF collection rates.

<u>NIS Cases</u>

The NIS cases were drawn from Luzon, Visayas and Mindanao. The selection of these NIS is based on location, size, performance (successful/non-successful), and irrigation technology (gravity vs pump). For each selected NIS case, the proponents interviewed the IMO, Division Manager (if within close proximity of the NIS site), NIS Manager, or any key personnel knowledgeable with the systems. All available technical references including feasibility studies, technical drawings, and network maps were obtained (hard and soft copy) from various offices of NIA. The authors reviewed and analyzed the maps in terms of technical specifications, canal layout, location and functions of irrigation structures, and irrigated and built-up areas.

The 22 cases in Luzon include 3 in Nueva Ecija, 3 in Tarlac, 1 in Pampanga, 1 in Bulacan, 2 in Ilocos Norte, 1 in Ilocos Sur, 2 in Pangasinan, 3 in Cagayan, 2 in Isabela, 1 in Camarines Sur, 1 in Occidental Mindoro, 1 in Quezon and 1 in Cavite. For Visayas, the 9 NIS cases were drawn from Capiz (1), Iloilo (3), Bohol (3), and Leyte (2). As to the sample from Mindanao, 3 cases were from Bukidnon, 1 in Davao del Sur, 2 in North Cotabato, and 2 in South Cotabato.

Table 1. NIS Cases from Luzon to Mindanao (2015 & 2018)

Island	Number of cases	NIS Cases
Luzon	22	PDRIS (Pampanga), TGIS and TASMORIS (Tarlac), UPRIIS (Nueva Ecija), AMRIS (Bulacan), Nueva Era RIS and Bonga Pump #2 PIS (Ilocos Norte), Banaoang PIS (Ilocos Sur), MARIIS (Isabela), Solana PIS (Cagayan), Visitacion RIS (Cagayan), Magapit PIS (Cagayan), Libmanan-Cabusao PIS (Camarines Sur), Ambayoan-Dipalo RIS (Pangasinan), Caguray RIS (Occidental Mindoro), Balayungan RIS (Cavite), Dumacaa RIS (Quezon)

Visayas	9	Mambusao RIS (Capiz), Jalaur-Suague RIS (Iloilo), Sibalom-Tigbauan RIS (Iloilo), Barotac Viejo RIS (Iloilo), Malinao RIS (Bohol), Capayas RIS (Bohol), Bayongan RIS (Bohol), Binahaan-Tibak RIS (Leyte), Daguitan-Guinarona-Marabong RIS (Leyte)
Mindanao	8	Manupali RIS (Bukidnon), Pulangui RIS (Bukidnon), Roxas-Kuya RIS (Bukidnon), Padada RIS (Davao del Sur), M'lang RIS (North Cotabato), Maridagao RIS (North Cotabato), Marbel #1 RIS (South Cotabato), Banga RIS (South Cotabato)

All the NIS covered were more than 25 years old except for Pampanga Delta RIS, Malinao NIS and MalMar, which were relatively recent.

CIS Cases

Cycle 1 involved the assessment of **66** communal irrigation systems (CIS) from 11 provinces in **Luzon**, while Cycle 2 covered **12** CIS from 4 provinces in the Visayas, and **12** CIS from 4 provinces in Mindanao. Provinces were selected based on the total firmed-up service area (FUSA) served by CIS, while the selection of sample CIS per province were based on size category of service areas: small (50 ha and below), medium (between 50 and 100 ha), and large (above 100 ha). The selected CIS were then characterized based on water source, type of extraction/distribution technology (gravity or pump), FUSA, operational status and cropping intensity.

Table 2. CIS Cases from Luzon to Mindanao (2015 & 2018)

Island	Number of IAs	CIS Provinces/Irrigation Management Offices
Luzon	66	Bulacan-Aurora-Nueva Ecija, Pangasinan, Ilocos Norte, Pampanga-Bataan, Camarines Sur, Benguet, Nueva Vizcaya, Isabela, Cagayan-Batanes, Laguna, and Occidental Mindoro
Visayas	12	Leyte, Iloilo, Capiz, Bohol
Mindanao	12	North Cotabato, South Cotabato, Davao del Sur, Bukidnon

Governance Coverage

This component like the other two, was done in two cycles. Cycle 1 conducted in 2015 covered the seven regions of Luzon. Respondents were National Irrigation Administration (NIA) officers from the 7 Regional Irrigation Offices (RIO) and 14 Irrigation Management Offices (IMO), in 11 provinces. Cycle 2 covered NIS and CIS in eight (8) IMOs and 6 RIOs in the Visayas and Mindanao regions. The 8 selected Irrigation Management Offices (IMOs) visited for this study were from the eight Visayas and Mindanao provinces. Correspondingly, six Regional Irrigation Offices (RIOs) were supposed to be covered (Regions 6, 7, 8, 10, 11 and 12) but only four were actually visited. The CIS and NIS IA level governance data were delegated to the NIS and CIS technical teams. Also, data from Cycle 1 gathered for Luzon were integrated in the analysis.

Table 3. Governance coverage from Luzon to Mindanao (2015 & 2018)

Island	Number	Provinces
Luzon	7 RIO 14 IMO	Laguna, Ilocos Norte, Cagayan, Isabela, Nueva Vizcaya, Benguet, Pangasinan, Nueva Ecija, Pampanga, Camarines Sur, Occidental Mindoro
Visayas	2 RIOs 4 IMOs	Leyte, Bohol, Iloilo, Capiz
Mindanao	2 RIOs 4 IMOs	North Cotabato, South Cotabato, Davao del Sur, Bukidnon

B. Data Collection

As a background on the component studies, this section presents the data collection methodology.
Primary data were collected during technical field visits, and qualitative information gathered from key informant interviews (KIIs) for the institutional and governance aspects of irrigation service. Secondary data were collected from the different NIA offices such as NIA-Central, Regional, Irrigation Management Offices (IMOs), and the system offices of each selected NIS. Additional secondary data were gathered from other the government agencies. Relevant documents, appraisal, implementation/completion, project performance audit reports, annual/yearend reports, technical studies, policy notes, and river basin master plans were reviewed to characterize the current state and distribution of NIS and CIS and to evaluate trends and patterns of performance indicators. Specifically, secondary data/reports included the following:

- List of NIS/CIS under the IMOs and available data including functionality survey results;
- Technical data (i.e. physical state, service area, irrigation efficiency, source of water, access to and availability of water, year constructed and start of operations, construction cost, rehabilitation cost, other major investments, yield, cropping calendar, cropping intensity; rainfall and other climatic data;
- Status of IAs (i.e. profile/institutional report of IAs, source of funding, financial status/viability, program of works (POWs) for all available years, and national irrigation system performance (NISPER) and communal irrigation system performance (CISPER); and
- Assistance provided by NIA to CIS/IAs; assistance provided by other agencies to CIS/IAs.

For each selected NIS or CIS case, the proponents met with the IMO Division Managers, NIS Managers, and the system personnel. Where available, technical references including feasibility studies, technical drawings, network maps were obtained. A review and analysis of the maps, including technical specifications, canal layout, location and functions of irrigation structures, and irrigated and built-up areas were conducted.

Key informant interviews (KIIs) of NIS or CIS staff and IAs (e.g. IMO, System managers, IDOs/operations staff, and IA president/officer/member) were conducted. Information on socio-economic characteristics of farmer-members, institutional capacity of IA, problems and constraints in managing the NIS canals/laterals/CIS by the IAs were generated from the KIIs. The status and current conditions of the main canal, selected secondary, and tertiary canals were established through KIIs and ocular observations during the walk-throughs.

Walk-throughs and actual measurements were collected for a subset of the sample NIS and CIS to gauge the physical conditions of the systems (i.e. current vs. designed dam/reservoir capacity; length and efficiencies of lined vs. unlined canals; legal and illegal turnouts, including functionality; for pump systems: fully, partially operational, or non-operational pumps; among others). Depending on the size of the IS, one secondary lateral was selected: (a) near the dam or headgate, (b) in the middle, or (c) at the tail end of the system. If the NIS is relatively small, only one lateral near the headgate and one at the tail end were selected. These structures/facilities are photographed and geo-tagged for proper referencing. Conveyance losses were measured on selected main and lateral canals, and where applicable, compared for lined and unlined canals. For the CIS, at least two systems per IMO/province were selected for the walk-throughs: one lateral each near the headgate and at the tail end.

In addition, the governance study conducted KIIs in selected IMOs and RIOs and in national agencies such as the DA-BSWM, DENR-RBCO, DAR, DILG, NPC and NWRB. Focus group discussions were carried out at NIA Central Office and selected NEDA Regional Offices.

3. Project Identification

Finding the potential projects is the first stage in the cycle. Common sources would be the technical specialists at the national, regional, irrigation management and system offices, and local leaders. In the case of NIA, this is part of project preparation activities which it continuously undertakes in order to ensure a wider base for the selection of projects for implementation. Specifically, project preparation includes project identification, investigations, feasibility studies, plan formulation, project packaging, and detailed engineering.

Table 4 presents NIA's selection and prioritization of projects supposedly following the Agriculture and Fisheries Modernization Act (AFMA) provisions according to type of projects. These criteria must be reflective of the design philosophies that NIA adheres to. The current decision criteria for irrigation projects selection and prioritization in fact, include technical, economic, environmental/social and institutional considerations. Detailed guidance is provided as to how to go about the assessment of identified projects according to type. To what extent NIA applies these criteria in its selection and prioritization of projects is not apparent.

Table 4. Selection and prioritization criteria for NIP/NIS Rehabilitation, CIP/CIS Rehabilitation, Multipurpose Projects under AFMA (weights in %)

Categories (Main)/ (Sub)	NIP/ NIS New	NIS Rehab	CIP/ CIS New	CIS Rehab	Multi-Purpose
(1) Technical Feasibility	**33**	**25**	**25**	**25**	**28**
Project Components					*20*
Extent of area for rehabilitation				*25*	
Cropping Intensity			*20*		*8*
Water Supply		*15*			
Availability of Hydrologic data		*10*			
Water Resources	*15*				
Land Resources	*10*				
Type of Project	*8*		*5*		
(2) Agro-Institutional Feasibility		**50**	**40**	**45**	
Status of Farmers/ Status of IAs			*15*	*10*	
Right of Way			*10*		
Landholdings			*5*		
Type of Soil			*5*		
Status Amortization				*10*	
Willingness to Amortize additional cost				*10*	
Willingness to render equity				*10*	
Local Government Acceptance			*5*	*5*	
Percentage of present no. over target no. of beneficiaries		*5*			
With existing IAs		*10*			
Present performance level of IAs in their respective O&M responsibility area (1-10)		*10*			
Level of commitment of IAs to contribute to repairs and assume full responsibility of O&M on completion of rehab program		*25*			
(3) Socio-Economic and Financial Feasibility	**38**	**10**	**20**	**20**	**42**
Economic Internal Rate of Return	*10*	*10*	*10*	*10*	*15*
Level of Irrigation Development in the Region	*10*		*5*		*9*
Development Cost per Hectare	*8*		*5*	*10*	*8*
Per Capita Income in the Project Area	*5*				*5*
Population Density					*5*
Average Farm Size	*5*				
(4) Environmental and Other Factors	**29**	**15**	**15**	**10**	30
Watershed Conditions	9	*10*	*10*	*10*	10
Environmental Impact	5	*5*	*5*		5
Reservoir Resettlement					*10*
Endorsement by project beneficiaries/ Acceptability by proposed Beneficiaries	*5*				*5*
Availability of hydrologic data	*5*				
Availability of maps	*5*				
TOTAL	**100**	**100**	**100**	**100**	**100**

Source: Schema Konsult (2016)

Notes: Some of the sub-criteria appear to belong to other categories. For instance, type of soil, availability of hydrologic data, maps are more of technical factors. Endorsement by project beneficiaries would fit better under institutional feasibility.

On project identification, the study components sought to: (a) analyze the institutional capacity of the project proponent (selected NIS or CIS) in arriving at an appropriate, science-based, and economically viable **design** of an irrigation project; (b) describe the institutional capacity of the project decision-making system in conducting an independent and competent **appraisal** of proposed irrigation projects; and (c) recommend strategies for addressing **institutional**

capacity gaps, delineation of the roles of various stakeholders, and ensure proper coordination across agencies and meaningful consultations with end users.

A. Findings

Institutional capacity for project design and appraising proposed projects. With the E.O. 366 s. 2004 or the Rationalization Plan of NIA (RatPlan) implemented in 2008 and completed in 2012, NIA's staff was reduced from 11,451 authorized positions (1,021 in Central Office; 10,430 in the field offices) in June 1989 to 3,819 positions (392 in Central Office; 3,427 in field offices). And despite the increases in budgetary allocation in response to priority programs from just Php 12.8 billion in 2011, to Php 32.7 billion in 2016, Php38 billion in 2017, and Php 41.7 billion in 2018, the authorized positions remained as approved in the 2008-2012 RatPlan. The capacity to prepare pre-feasibility studies was among the capacities largely reduced. The restructuring resulting from the RatPlan reduced the capacities for project development especially at the Central Office. Aside from difficulty of finding new areas for development, NIA's capacity to carry out pre-feasibility studies must have declined with the retirement of many senior technical staff (Cablayan, et al. 2014; NIA 2018).

Given this gap between expectations and capacities, NIA has been proposing for a reorganization or organizational strengthening to address the dire staff shortage resulting from the RatPlan. This is evidenced by the organization strengthening proposal formulated by NIA which is yet to be approved by the Board. The NIA Board on the other hand, wants the National Irrigation Master Plan (NIMP) completed before approving the reorganization so that it will have to take into account the implementation of the Plan.

Need for increased coordination with Department of Agriculture (DA) and the Local Government Units (LGUs): With the rice tariffication law (R.A. 11203), more rice farms are expected to become less viable (Inocencio and Briones 2019). As an option, the implementing rules and regulation of the law has provisions for crop diversification which will increase attention to non-rice crops especially in the provinces deemed to be less viable and not priority for rice irrigation investment. When NIA was moved from DA and attached to the Office of the President, the collaboration with DA may have been weakened. Identification of irrigation projects had been largely an internal process within NIA with Central Office getting inputs from its regional offices in addition to the few initiatives coming from CO, many of which came from past proposals which never got funded.

The DA on the other hand has been facilitating the identification of priority commodities and infrastructure for all the provinces covered in the World Bank funded Philippine Rural Development Program (PRDP). The process of identification under this project appeared to very consultative and made use of all available data including suitability and vulnerability assessments.

Methodology for estimating irrigation potential: A critical element in project identification is the availability of data particularly on irrigation potential. As reported in earlier studies, irrigation service areas were way below design areas (David and Inocencio 2012, Delos Reyes 2017). Designed service areas of NIA appear to fail to properly consider local actual land uses and the absence of updated local land use plans does not help. Estimated potential are already dated and did not account for expansion of residential, commercial and industrial uses of land.

Also, the estimates of NIA of its potential service areas did not consider the reduction in agriculture areas and the expansions of non-agricultural uses such as sub-divisions for residential and commercial uses.

The NIS and CIS studies found that to improve the present irrigation potential estimation process, use and updating of certain data would be required. These data include water supply, percolation and evapotranspiration, and projected land use changes.

According to the NIS Report, there is low irrigation potential of the available agricultural lands. The common constraints are slope, soil and productivity limitations. The governance study believes that the degradation of the watershed due to human activities and other factors is deemed to be one of the reasons for the unstable water supply for irrigation, which in turn will reduce irrigation potential. If validated, the above findings will mean that developing more new areas will increasingly become more difficult.

However, validation of irrigable potential will require more than what the component studies indicated. Specifically, the following will also be needed: (1) administrative boundary from the National Mapping and Resource Information Authority (NAMRIA) which would be available in its land cover data (latest available is for 2015) together with the slopes (usually for 0-3 and 3-8%) from its interferometric synthetic aperture radar (IfSAR); (2) the soil suitability from the Bureau of Soils and Water Management (BSWM). In fact, the national irrigation masterplan (NIMP) study commissioned by the National Economic and Development Authority (NEDA) in 2018 estimates potential irrigable area using the above but netting out the following (UPLBFI 2019): (1) all existing land uses and water bodies such as the road network from OpenStreetMap; (2) ancestral domain (or certificate of ancestral domain title or CADT) from the National Commission on Indigenous Peoples (NCIP); (3) protected areas from the Biodiversity Management Bureau (BMB); (4) inland water which includes rivers, streams and lakes from OpenStreetMap and land cover data; (5) built-up area also from the land cover data which can be updated through Google Earth; (6) forest and mangrove areas from land cover data; and (7) fault line maps from the Philippine Institute of Volcanology and Seismology (PHIVOLCS). The NIMP estimation procedure currently does not include projected land uses. This omission can be a serious limitation given the trends in land conversions especially in rapidly urbanizing provinces.

Additional parameters to consider in estimating irrigation potential: The GIS generated maps from the NIS Report show the location of field walkthroughs and measurements, erosion and ground water potential. The significance of mapping erosion potential in NIS sites lies on the fact that runoff and flooding of lowland/irrigated areas depends on the typology and characteristics of the watershed which surrounds the irrigation service areas. The upland watershed can be prone to erosion depending on the combined effects of vegetative cover (land use), soil characteristics (erodibility), slope (topography) and rainfall patterns (erosivity). These factors are used as inputs in the universal soil loss equation (USLE) to estimate soil loss and erosion potential of a watershed.[2] Many studies, validated by actual observations, have shown that eroded particles from upland areas are carried downstream areas and commonly cause siltation of water courses, irrigation canals and surface water systems. By mapping erosion potential, it is possible to assess which part of the watershed is prone to erosion, to propose appropriate land use planning and watershed management measures to protect the lowland areas from sedimentation and siltation, which are believed to cause reduced flow capacity of canals and poor water distribution. This consideration appears to be missing in identification of projects.

The Governance Report suggests that estimation of the irrigable land can benefit from data on water permits from the NWRB, and the effects of climate change support the estimation of how much additional areas can potentially be irrigated. Note that current estimates of irrigation potential only considered areas up to 3% slopes. In fact, in practice there are many irrigated systems which are already in the 8% slopes, according to the CIS study. If these uses are captured in the water rights granted, then these should be considered in the identification and development of new projects.

B. Recommendations

1. Build capacity for developing new projects

If NIA is to improve its performance in identifying and developing projects, it has to "rebuild" the capacity which has been largely diminished by the RatPlan and early retirement of many senior technical staff. As indicated in the Trends paper, the big gaps between planned vs. actual new areas irrigated could be partly attributed to the slower generation of pre-feasibility studies required in programming projects (UPLBFI 2019).

2. Increase coordination with the DA and LGUs

NIA should increase its collaboration with DA and the LGUs. The priority commodities and infrastructure identified by DA together with the LGUs and other government and non-government agencies through the PRDP project can provide guidance in identifying potential irrigation projects which are relevant to the provinces particularly in terms of commodities and locations to support. The irrigation potential which will be identified in the National Irrigation Master Plan for 2020-2030 together with the investment priorities formulated under PRDP can provide good starting points for NIA interventions.

3. Consider land conversion trends in estimation of irrigation potential while waiting for passage of Land Use Act

NIA should consider projected changes in land use and land conversions especially in larger projects. Trends in converting agricultural lands to industrial and residential uses must be considered in land suitability assessment and classification. Adjusting estimates of irrigation potential to anticipate land conversion will save the government millions or billions of pesos

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[2] USLE is a widely used mathematical model that describes soil erosion processes. It predicts the long-term average annual rate of erosion on a field slope based on rainfall pattern, soil type, topography, crop system and management practices (Hudson 1993).

in public funds invested in irrigation only to be converted to non-agriculture uses. Where irrigated lands are converted, the government should at least put in place a policy of recovering its investments.

4. Include the assessment of water supply sources in defining irrigation potential

The NIS and CIS reports recommended planning for the annual increase in irrigated areas should be based the dependable water supply of the rivers in the basin. The water balance analysis in the river basin master plans would be a good starting point in the estimation of water duties for new areas for irrigation development.[3] Improved data collection and management is required, given that data adequacy and quality were always found to be the constraints to proper estimation of irrigable areas. The formula to compute for water supply through time should be calibrated to account for climate change, land use, and land conversion.

To improve the present irrigation potential estimation process for the whole country, one recommendation is to update the water supply data that NWRB uses for water permitting and allocation, as well as the data on percolation and evapotranspiration. The formula used to compute for the water supply through time should also be calibrated to account for climate change effects.

4. Project Design and Appraisal

Project design preceeds project implementation. A well-developed design will lead to straightforward project implementation. A critical aspect of design is flexibility to allow for some adaptation, minimize undue delays and avoid cost overruns (World Bank 1981). Design failures come about apparently because ofinadequate stakeholder consultations and lack of funding leading for project appraisal activities.

The Resurgent Study components are intended to provide insights on eight areas pertaining to project design and appraisal: (1) differentiating the design philosophies for new, restoration, and rehabilitation projects; (2) demonstrating the project design benefits from high resolution data, like GIS, and science-based information at the level of the basin and irrigation systems; (3) identifying the implications of watershed status and watershed management for the design and management of irrigation systems; (4) measuring the capability of the project proponents at arriving at an appropriate, science-based, and economically viable design of an irrigation project; (5) measuring the capability of the project decision-making system in conducting and independent appraisal of proposed irrigation projects; (6) identifying the weaknesses for the improvement of project design and approval; (7) identifying how design can be improved through proper consultation with end users and technical staff in charge of O&M, with the incorporation of system management in system design to be made compatible with the system

[3] Water duty is a "measure of water which, by careful management and without wastage, is reasonably required to be applied to any given tract of land for such a period of time as may be adequate to produce therefrom a maximum amount of such crops as ordinarily are grown thereon" (Wescoat 2013 citing State of Colorado Supreme Court, 1954).

management structure; and (8) determining means to delineate and coordinate the roles of the DENR, DA, NIA, the IAs, and the LGUs. The discussion below highlights the key findings.

A. Findings

Project design benefits from high-resolution data (GIS) and science-based information: A key concern on project design has been the systematically lower service area relative to design area, indicating gross overestimate of potential irrigable area with urbanization trend not factored in, built-up areas not properly counted out, areas in higher elevation likely to be beyond reach of the system still counted in, flooded areas which cannot be served during wet seasons not counted out in service area. In addition, available estimates of potential irrigable area do not include potential of groundwater development, where the private sector investments have been significant since the 1990s.

The NIS report points to the benefits of high-resolution data using GIS and science-based information at the level of the basin and at irrigation system which includes mapping the location of structures, measurements, and spatial analysis of erosion, groundwater potential, and identification of flooded and elevated areas. These high resolution data and information can also enhance the targeting of interventions and programming areas for irrigation. However, this type of database will require intensive data gathering which will establish not only the land-based potential but also taking into account both surface and groundwater potential. The latter will include determining recharge rates of ground water as a function of rainfall, runoff, evapotranspiration, inflows/outflows and percolation and upward flux, among others.

Using GIS analysis, the NIS component found that significant proportions of NIS service areas are unsuitable to irrigated rice farming. The analysis points to the degraded states of the NIS watersheds, accounting in part for the heavy siltation in the systems. On the other hand, the groundwater maps show areas with high potential for groundwater resources to supplement inadequate water supplies from surface water.

Capability for science-based project design and appraisal: The implementation of less viable projects, design mistakes in irrigation projects could be partly attributed to weak capacities for design and appraisal. NIA is now more dependent on consultants for feasibility studies (FS). There appears to be reliance on proponent and donor design and assessment and insufficient independent checks in the project planning and appraisal[4]. Planning and design activities of the BSWM and the DAR projects partnering with the LGUs solicit technical inputs from NIA. Even for small projects, there are documents required, such as the certificate of non-coverage that must be requested from the DENR. NIA would usually hire external outfits, mostly from the academe, to aid in the putting together these inputs.

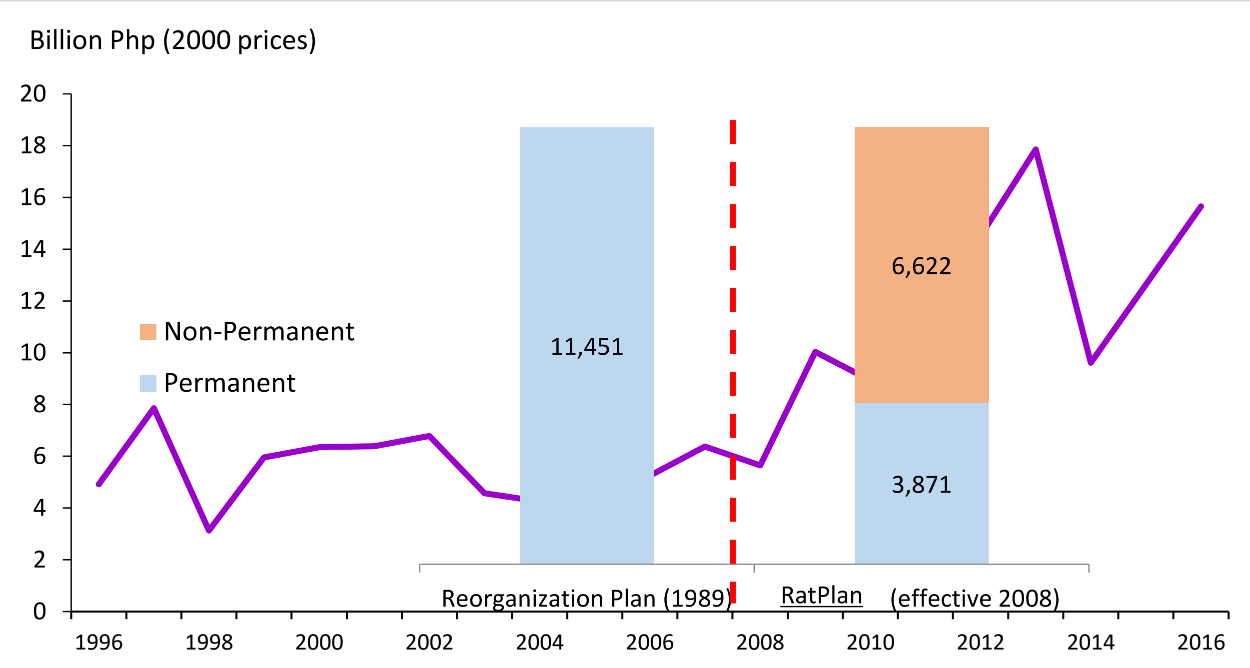
The increasing dependence on use of contractual arrangements for most of pre-feasibility and feasibility studies is indicative of inadequate capacities at relevant offices of NIA. Given this,

[4] The National Economic Development Authority (NEDA) has been funding more FS in the last few years and commissioning consulting firms, many of which are tapping experts from the academe.

project implementation and management of systems eventually also suffered because of the shortcomings in planning and design.

Capability of the project decision-making system in conducting an independent appraisal of proposed irrigation projects: With the NIA Rationalization Plan (RatPlan) which was implemented from 2008 to 2013, NIA's capacity in conducting independent project development and appraisal had been substantially reduced. The plantilla positions were literally cut in half. With the reduced staff, the irrigation management transfer (IMT) was supposed to increase the roles of irrigators' associations (IAs) to fill the gap. However, with the renewed food self sufficiency/food security program of government, NIA was tasked to develop even more irrigated areas with the massive increases in its budgetary allocations. The increase in budget entails additional work responsibilities for NIA. As shown in Figure 1 with the sharply increased allocation since 2009, given the reduced capacities, NIA had to rely even more on job orders, consultants and contracted out work (Cablayan, et al. 2014, Ponce, et al. 2019).

Figure 1. Public Expenditures for Irrigation, 1996-2016 (2000 prices) & Number of NIA Positions Before and During RatPlan



Source: Ponce, et al. (2019)

Table 5 shows that the agency has not recovered from the reduction of its plantilla positions since it was rationalized in 2008. To cope with increased volume of work, NIA has employed non-plantilla positions such as casuals, job-orders, cost of service (COS), which affects both the quality of work and stability of the work-force. Non-plantilla personnel transfer to more stable jobs in other government agencies such as Department of Public Works and Highways (DPWH) that offer better salaries and benefits.

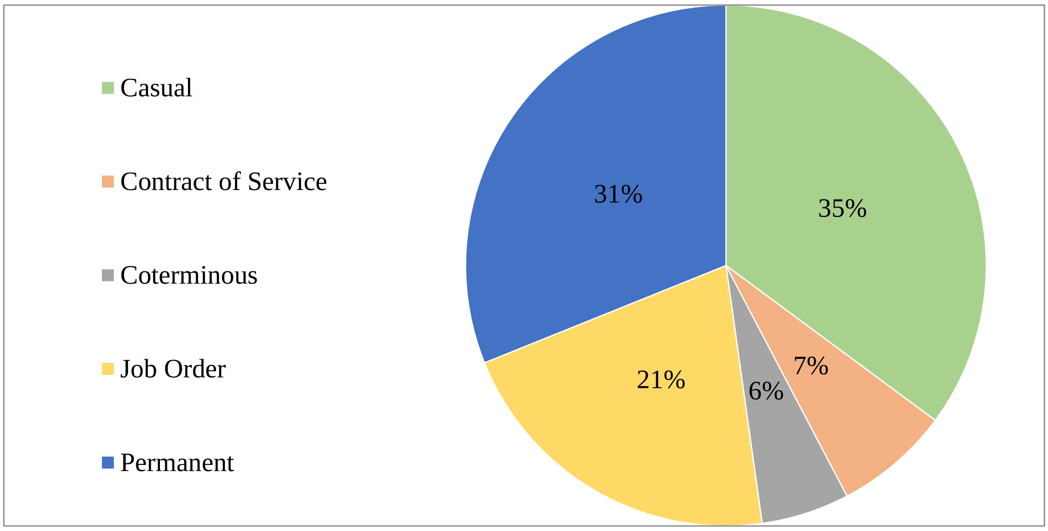
Table 5. Number of Positions by Office/Unit in NIA and by Type of Engagement Before and During RatPlan

Organizational Unit	Reorganization Plan (1989)	RATPLAN (Effective 2008)	% Reduction
Central Office	1,021	412	60%
Regional Irrigation Office	1,439	728	49%
Integrated Irrigation System Office (UPRIIS)	2,202	473	59%
Integrated Irrigation System Office (MRIIS)		430	
Irrigation Management Office	1,568	1,828	-17%
National Irrigation Systems Office	5,221		100%
Total	**11,451**	**3,871**	**66%**
Additional Complement			
Casual Positions	-	3,311	-
Contract of Service	-	792	-
Job Order	-	2,519	-
Overall Total	**11,451**	**10,493**	**8%**

Source: Ponce, et al. (2019)

The extent of the problem is shown in Figure 2 with the large job-orders and casuals, and high turn-over rate of non-plantilla positions. **The b**ulk of NIA personnel has no security of tenure as over 50% of NIA personnel consist of casuals and job-orders. Out of the 12,455 NIA employees as of November 2018, about 35% casual and 21% are job order positions. Permanent positions only represent one-third of total.

Figure 2. Distribution of NIA Manpower as of November 2018



Source: Ponce, et al. (2019)

Weaknesses and need for improvement in project design and appraisal: Formal appraisal of proposed irrigation projects is mostly done for big projects as stated in the governance report. The funding agency like the World Bank (WB) or Asian Development Bank (ADB) will create an appraisal team mostly of hydrologist and engineers; and the appraisal will be mostly technical in nature and will be usually assisted by NIA in the field. However, as shown in Table 6, project preparation activities within NIA appeared to have been given little attention even before the RatPlan implementation. One sign of improvement however can be seen in the 2018 figures with much increased allocation and relatively higher percentages of completed FS and DE. But relative to the magnitudes of projects, even a 2% allocation may seem small if we consider the critical role of getting the designs right as among the first few steps in successfully implementing projects.

Table 6. Status of Project Preparation Activities: Feasibility Studies/Detailed Engineering (FSDE) for Irrigation Projects

Year	2018	2017	2013	2012	2008	2007
FSDE Obligation (Php Mn)	927	415	283	336	31	32
Total Obligation (Php Mn)	41,160	48,710	31,309	24,218	8,327	8,745
As % of total	2.25	0.85	0.90	1.39	0.37	0.37
Completed FS *	191	172	91	3	2	8
Completed DE *	164	111		0	3	0
Completed as % of target FS	70	74	31	11	13	53
Completed as % of target DE	54	47		0	21	0

* Figures in 2013 are combined feasibility studies (FS) and detailed engineering (DE).
** FS for 2007-08, 2012 includes pre-FS/Project Identification
Sources: NIA Year End Reports, 2007-08, 2012-13, 2017-18

Related to this concern, there is the issue of time lag between FS and implementation with FS already 10 years old by the time the project get funded (Moya 2014). Also noted by Moya was that engineers know how to design well but seemingly not why, thus the need for peer-reviewed or third-party reviewers. According to Moya, engineers usually veer toward the tried-and-tested rather than the search-for-a-better-way approach.

Design improvement through proper consultation with end users and O&M technical staff: A key aspect of design is achieving operational flexibility with the incorporation of system management in system design to be compatible with system management structure. As earlier reported in Moya (2014), there is apparently little interaction happening between the design and implementation, and the operations units of NIA. Upon project completion, the system is turned over to the operations staff. Apparently, there is often little or no design inputs from operations and maintenance (O&M) personnel, more so from farmers. The purpose of such would have been to provide more operational flexibility especially to downstream users. In constructing farm water facilities, the main and lateral canal water elevations (hydraulic working head) are determined and firmed up first. Then, the micro topography of the area is carefully considered by involving the farmers as they have intimate knowledge of their areas.

This disconnect between the design and construction teams, and the system operations units appears to be still the case.

Delineation and coordination of roles of DENR, DA-BSWM, NIA, IAs/SWISAs, and LGUs: There are several government agencies tasked with the provision of support services to irrigated agriculture. Rola, et al (2019) identified at least 13 such agencies. These are line agencies, bureaus and offices, government corporations, an investment coordination committee, and a water resources board with inter-agency memberships, and inter-agency committees created for the purpose of orchestrating the participation of all the concerned agencies. Inter-agency bodies often include representatives from non-government and people's organizations. Inter-agency cooperation at the planning stage is supposed to strengthen support services to the farmer and promote agricultural production. These various bodies are meant to address institutional and inter-agency constraints affecting provision of irrigation services. Ideally, inter-agency cooperation and coordination with the objective of improving support to farmers and irrigators associations and make the best use of the irrigated water provided.

Collaboration takes different forms. Currently, there is a Memorandum of Agreement (MOA) between the Forest Management Bureau (FMB) of the Department of Environment and Natural Resources (DENR) and the NIA as regard reforestation and protection of watersheds affecting irrigated areas. On paper, the FMB is supposed to ensure the protection of the water sources for NIA. NIA on its own, carries out annual tree planting activities. Given the continuing degradation of major watersheds affecting irrigated areas, the current arrangement and corresponding efforts are clearly not enough or the reforestation/conservation coverage appears limited in relation to the areas covered by NIA.

On coordination between NIA and Bureau of Soils and Water Management (BSWM) of the Department of Agriculture (DA), the first is tasked with development of larger systems while the latter, together with the local government units (LGUs), and the Department of Agrarian Reform (DAR) build smaller systems. On paper, it appears that each has well defined scope. NIA is supposed to service only areas with 200 hectares (of contiguous land) and above while below this cut off, should be the responsibility of the DA-BSWM. In practice, whereas BSWM used to develop only sources of water (small farm reservoir or SFR, small diversion dams with height of 3m and below, small water impounding projects or SWIP), with the transfer of NIA supervision to the Office of the President in 2014, DA has broadened the tasks of BSWM to also include organization of small water irrigation systems associations (SWISAs) and distribution systems. NIA, on the other hand, in times El Nino, NIA had distributed pumps to farmers.

By the Local Government Code and the AFMA, the M/P LGUs have been made responsible for development and funding of inter-barangay and inter-municipal irrigation systems. However, there is little evidence that the LGUs are able to step up and perform their mandate due to limited resources and technical capacities.

The irrigators associations (IAs) or SWISAs coordinate with NIA and BSWM, respectively, in terms of operation and maintenance of systems. In certain irrigation projects (e.g. the Southern Philippines Irrigation Sector Project or SPISP), they had been more actively engaged from project identification and planning to construction and O&M but this arrangement is not yet applied to all projects.

B. Recommendations

1. Improve irrigation system designs

Considering the physical factors which influence the design of the system as a whole, such as reservoir capacity, design cropping pattern, and size of service area, must be first considered. Operational factors including the allocation and scheduling of water deliveries to the cultivators and their implications in design of the canal conveyance and distribution system must be given significant weight.

Luyon (2019) suggests that irrigation system design should consider the ability to irrigate small patches of lands (including flat lands on higher elevations) with limited sources of water; farmer empowerment or farmers getting higher degree of control over the management of irrigation water (or operational flexibility); higher water use efficiency (lower conveyance losses because farm is near the source); and possibly, flexibility for crop diversification.

Additional emerging irrigation design philosophies include environment-friendly, participatory (stakeholder) particularly for communal and small NIS, and resilient irrigation systems (Moya 2019). The old irrigation design philosophy on "design for management," is yet to be fully subscribed to.

The NIS and CIS studies reiterate that design should be based on technical soundness and economic viability of the proposed new or restore/rehabilitation project. In addition, projects constructed or improved should be designed with a view to likely developments (agricultural, climate changes, urbanization) over the next one or two decades, or should be capable of adaptation to such developments. It also suggested to account for factors outside of the direct control of irrigation systems such as flooding problems caused by constriction of waterways, rapid denudation of watersheds which accelerate the rate of flooding and siltation within the systems and reduce available water supply political pressures impinging on the choice of irrigation projects and contractors.

2. Promote good watershed management and conduct environmental assessments

The NIS study reiterates that good watershed management and environmental studies are needed to prevent or minimize siltation problems in water courses, and improve the discharge capacity of water distribution canal and water intake into NIS diversion dams. Such practices and study results should then be considered in engineering design and feasibility studies of irrigation projects. However, the control of the watershed of irrigation systems should be transferred first to NIA, as it is currently under the jurisdiction of the Department of Environment and Natural Resources (DENR).

The NIS component recommends that NIA also conducts a better assessment of the state of the watersheds for each NIS project and properly factor the results in the system design and O&M. As watershed management is already part of the NIA's charter, to do so will require allocation of substantial resources and not just simple coordination with the DENR.

Adoption of an integrated watershed management (IWM) is also suggested in order to achieve the following objectives: (1) to control damaging runoff and degradation to conserve soil and water; (2) to protect and conserve the watershed for more efficient and sustained production; (3) to protect and enhance the water resource originating from the watershed; (4) to control soil erosion in the watershed and reduce the effect of sedimentation in downstream areas, including water courses and canals; (5) to moderate the floods peaks in downstream areas; and (6) to increase infiltration of rainwater and improve soil and ground water recharge, wherever applicable.

3. Opt for multipurpose projects

The governance study recommends that NIA should pursue multipurpose projects with hydropower and/or domestic water supply to increase the benefits and make projects (more) viable. Giving a percentage of income to the host communities of the dams and structures will engage the local people to protect these structures and extend the economic viability of the irrigation system.

Such multipurpose projects must engage experts who can do sectoral assessments. Optimizing incomes from the projects benefits NIA by providing revenues from generating power and addressing long-term water supply concerns in municipalities and cities downstream through the bulk water supply.

4. Clearly define/delineate roles and responsibilities

The governance study recommends a memorandum of agreement (MOA) specifying the roles and responsibilities of each agency and mechanics to improve the coordination among the agencies involved. NIA together with local and national agencies can converge on specific projects where a single, integrated rolling plan that would account for the dynamic nature of human, physical and institutional players can be implemented.

Aside from linking with FMB, NIA should engage with the River Basin Control Office (RBCO), DENR to validate irrigation plans. Specifically, at the regional level, characterization of the critical watersheds should input in the designs of irrigation systems.

In addition, NIA can actively engage with LGUs and other provincial stakeholders through the Philippine Rural Development Project (PRDP) platform where provincial development councils generate priority projects to which NIA can validate and align its identified and designed projects.

5. Project Implementation and Procurement

Once projects are initially appraised and designed, implementation can follow if the project is deemed to be economically viable. In the implementation phase some departures from original project design may be necessary given new information from the ground. In general, such discrepancies should be avoided by preparing better and more realistic project plans.

Gittinger (1981) citing Olivares (1978) on his review of agricultural projects indicated that the that the most common implementation problems have to do with: “(1) inappropriate technology; (2) inadequate support systems and infrastructure; (3) failure to appreciate the social environment; (4) administrative problems, including those of the project itself and of the overall administration within the country; and (5) the policy environment, of which the most important aspect is producer price policy.” In the case of NIA, most of these reasons can easily apply. For one, the introduction of diesel-fueled pump systems for deepwells when price of fuel is rising instead of gravity-run diversion systems can cause lukewarm reception among intended beneficiaries. Also, the implementation of system design which does not match the institutions on the ground, indicates failure to consider social environment. Administrative effectiveness during implementation can be affected by constraints from various fronts from bidding failures for lack of qualified contractors/consultants firms or absence of bidders, to right of way acquisitions, to timing of releases of funding, to seeking approvals and resistance by affected communities.

A. Findings

Under this section, the four components are tasked to identify the implementation capability of NIA, the LGUs, and BSWM; to delineate the roles of NIA, LGUs, and BSWM in the short, medium, and long terms; assess the transparency and timeliness of the procurement process; and to identify means to facilitate the coordination of the construction and rehabilitation activities with stakeholders and the role of farmers in the project implementation.

Implementation capability of NIA, BSWM and LGUs: Implementation of irrigation projects is done mainly by NIA and DA-BSWM. NIA has the technical capacity to implement projects while DAR and the LGUs rely on the technical expertise of NIA and BSWM.

For small-scale irrigation projects (SSIPs), BSWM is supposed to provide technical assistance which includes capability building to RFOs, LGUs and farmers’ associations (SWISAs).[5] The DA regional offices that implement BSWM projects set them up for bidding or they enter MOAs with LGUs. The LGUs provide engineers and DA monitors the progress of the implementation. For DAR projects, the MOA identifies the recipients of the irrigation project. DAR engineers monitor the implementation of the construction of DAR projects.

Given the heavy demands on NIA with the much increased budgetary allocation, its technical staff is now largely made up of non-plantilla positions (Figure 2).

[5] SSIPs include small water impounding projects (SWIP), diversion/check dams (DD), small farm reservoir (SFR), shallow tubewell (STW), pump irrigation system for open source (PISOS), spring development, and alternative prime movers for pump irrigation systems.

Roles of NIA, LGUs, and BSWM: The NIS and CIS studies indicate that NIA is the primary agency in both irrigation development and institutional development, i.e., capacity building of IAs and LGUs which manage the systems. The BSWM is largely responsible for small scale irrigation projects (SSIPs) in coordination with other government agencies, especially on groundwater management. The IAs, with their experience and support from NIA and other agencies, have the institutional capacity which need to be continuously updated and upgraded through training and networking.

Table 7 gives the project management activities and the responsible units within NIA. Three key offices are responsible for project preparations and constructions. It is possible that the structure for DA-BSWM would be simpler given the type and size of projects.

Table 7. Irrigation project management activities of NIA and responsible units

Activity	Responsible Units
I. PROJECT PREPARATION	
A. Project Planning	
• Project identification	
• Project Investigation/Validation	
• Project Design Studies	
• Plan Formulation	
• Feasibility Report	
• Project Authorization	
B. Project Detailed Engineering Design	
• Preparation of conceptual designs	
• Determination of project feasibility	-CO-Engineering Department
Considering:	
- Surveys and mapping	-RIO-Engineering & Operations Division
- Hydrology	
- Geology	-IMO-Engineering Section
- Agronomy	
- Irrigation	
- Drainage	
- Economic	
- Watershed Management and Environmental Study	
C. Project Procurement	
• Program of Works (POW)	
• Project Procurement Management Plan (PPMP)	
• Annual Procurement Plan (APP)	
II. PROJECT CONSTRUCTION	
• Construction Planning and Scheduling	-CO-Engineering Department
• Contract Administration	
• Project Evaluation and Monitoring	-RIO-Engineering & Operations Division
(Construction Management Division follows the IRR of RA 9184, Commission on Audit (COA) and Office policies and Foreign Financing Procurement guidelines)	-IMO-Engineering Section
III. NIS OPERATIONS & MAINTENANCE	

Activity	Responsible Units
• Water Delivery • Irrigation Service Fees Collection • Repair and Improvement - Irrigation Facilities - Drainage Facilities - O&M Equipment	-CO-System Management Division under the Operations Department -CO-Irrigation Engineering Center (IEC) under the Operations Department -CO-Equipment Management Division (EMD) under the Operations Department -RIO-Engineering & Operations Division -IMO-Operation & Maintenance Section
IV. INSTITUTIONAL DEVELOPMENT PROGRAM	
• Organization of IAs • Capacity building of IAs	-Institutional Development Division (IDD) under the Operations Department but with supervision from the Engineering office on oversight functions on irrigation projects.

Source: Rola, et al (2019) which drew from NIA QMS Manual (March 2018).
Notes: CO is Central Office, RIO is Regional Irrigation Office, IMO is Irrigation Management Office.

Procurement process transparency and timeliness: The governance study finds that problems in procurement, apart from the weather, delays in budget releases and the legal procurement process tend to delay construction. Despite these, more than half of the respondent farmers who have been active in the implementation of new projects, reported timely implementation (from the formation of their respective IAs to construction).

NIA oversees procurement through the necessary bidding process, which is delegated to RIOs and IMOs depending on the size of the projects. Standard bids and awards committee (BAC) procedure is followed in the procurement. The reports identified failure in the bidding as the cause in implementation delays.

Coordination of construction/rehabilitation activities with stakeholders and the role of farmers in project implementation: The role of farmers in project implementation is limited to the clearance of the right of way, participation and membership in IAs, provision of manpower, and other relevant forms of assistance. They actively participate in the implementation of new projects, in part due to NIA and the contractors drawing them in as project labor workers and for their indigenous/local knowledge especially on the construction and rehabilitation locations.

B. Recommendations

1. Increase capacities to implement projects

As NIA is the organization that regularly implements irrigation projects, the governance report recommends to beef up its technical capacities to ensure that it would be able to address the demands of the collaborating agencies on technical assistance. With the formulation of a national irrigation master plan with even higher targets for new irrigated and rehabilitated areas, plantilla technical positions need to be created.

2. Improve procurement and better understand the bottlenecks in implementation

Governance component recommends revisiting of the procurement law because instead of facilitating, it is impeding efficient processes, and causing delays in project implementation. Other than this, there is no systematic study that clearly establish the most common problems in implementation and causes of delays. While some projects may have mentioned the weather, politics/corruption, right of way problems, a better understanding of the bottlenecks will help in formulating effective solutions. Technical changes maybe necessary during project implementation. Project implementation must be flexible. Changes in policy environment may also require corresponding adjustments in project implementation..

6. System Management, Operations and Maintenance

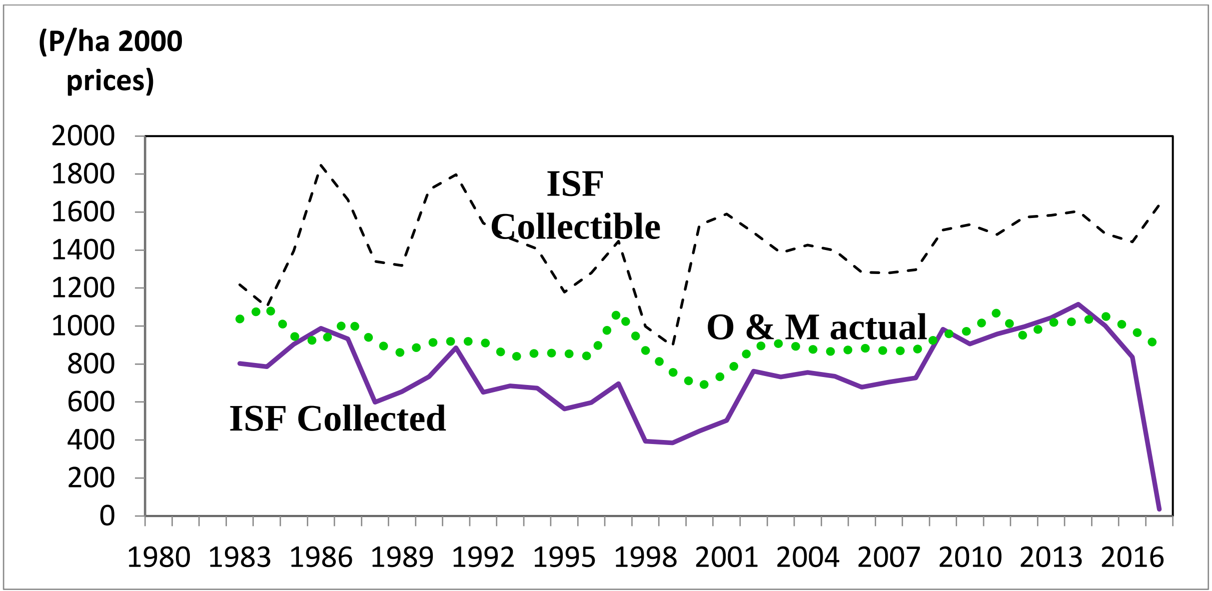
The four study components were supposed to indicate: (a) how the free irrigation policy will be implemented and its implications, including that on the irrigation management transfer (IMT); (b) identify the outcomes and impacts of the IMT program; (c) determine the O&M strategy for any given system; and (d) identify the factors for successful and sustainable conduct of O&M.

A. Findings

Increasing degradation & poor system performance: The two component studies by Clemente, et al (2019) and Luyon, et al (2019) confirmed earlier findings on O&M by various studies (Moya 2018, David and Inocencio 2014, Inocencio, David and Briones, 2014, David (2009), Masicat, de Vera and Pingali 1990). These studies highlighted the relatively poor states of existing irrigation systems due to inadequate O&M and rehabilitation. They cited increasing degradation of irrigation infrastructure, control structures in need of rehabilitation/improvement, canals needing de-silting or reshaping or heightening of embankments. A good part of the service roads need rehabilitation. Specifically, David (2009) indicated that the deterioration rate in gravity irrigation systems was about 70,000 has/year in the total NIS and CIS service areas in the pre-AFMA years (1992–1996). This rate increased to close to 134,000 has/year in the post-AFMA years of 1998–2004 (David 2003, 2008, 2009). Rehabilitation efforts per year from 1995 to 2005, averaged 124,597 hectares which falls short of rate of deterioration. Ella (2015) confirmed the above and indicated that the net increase in total irrigated areas from 1985 to 2014 was only 294,939 hectares or just 10,170 hectares per year. The sum of new areas generated and areas restored minus actual irrigated areas for the same period showed total areas which deteriorated to be about 355,026 hectares or 71,005 hectares per year.

Factors contributing to poor O&M & Implications of FISA: A key concern is the lack of funds to do proper O&M and rehabilitation to arrest, if not slow down the deterioration even before the free irrigation act. The internally generated funds of NIA mostly composed of ISF, were insufficient such that the national government had to subsidize O&M of national systems (Figure 3). The collection rate was way below 100%, and yet NIA could not exclude from its service farmers who did not pay the irrigation service fees (ISF).

Figure 3. Trends in the actual cost of O&M of firmed-up service areas, ISF Collected of NIS, 1983-2016



Source: Inocencio and Briones (2019)

Aside from inadequate funds, Moya (2018) has raised an equally important concern – how is the O&M/rehabilitation fund spent. He noted that despite the varied rehabilitation and maintenance works needed, NIA's rehabilitation projects in the cases documented by Delos Reyes (2014 and 2017) were largely spent on canal lining at about 80% of total project cost. Moya also raised that issue of the need to modernize systems and strengthen system resilience. Irrigation modernization entails upgrading of both technical and social components of existing systems. This direction will require higher investments in the updating and upgrading of both hardware/technical and software/social components of irrigation systems (Moya 2018).

Implementation and Implications of FISA: With the passage of RA 10969 or the free irrigation service act (FISA), all farmers with landholdings of eight hectares and below are exempted from paying irrigation service fees (ISF) for water derived from national irrigation systems and communal irrigation systems (CIS).[6] This effectively puts back in the hands of the national government the bulk of the NIS and CIS O&M burden, which has in fact been already devolved to some NIS (through Models 3 and 4) and all CIS-IAs prior to FISA.

The FISA effectively reverses the IMT process of devolving more responsibilities to IAs and reducing those of NIA in operating, managing maintaining systems. NIA however, came up with a "modified" IMT which essentially collapses all the four models into a one type of contract.

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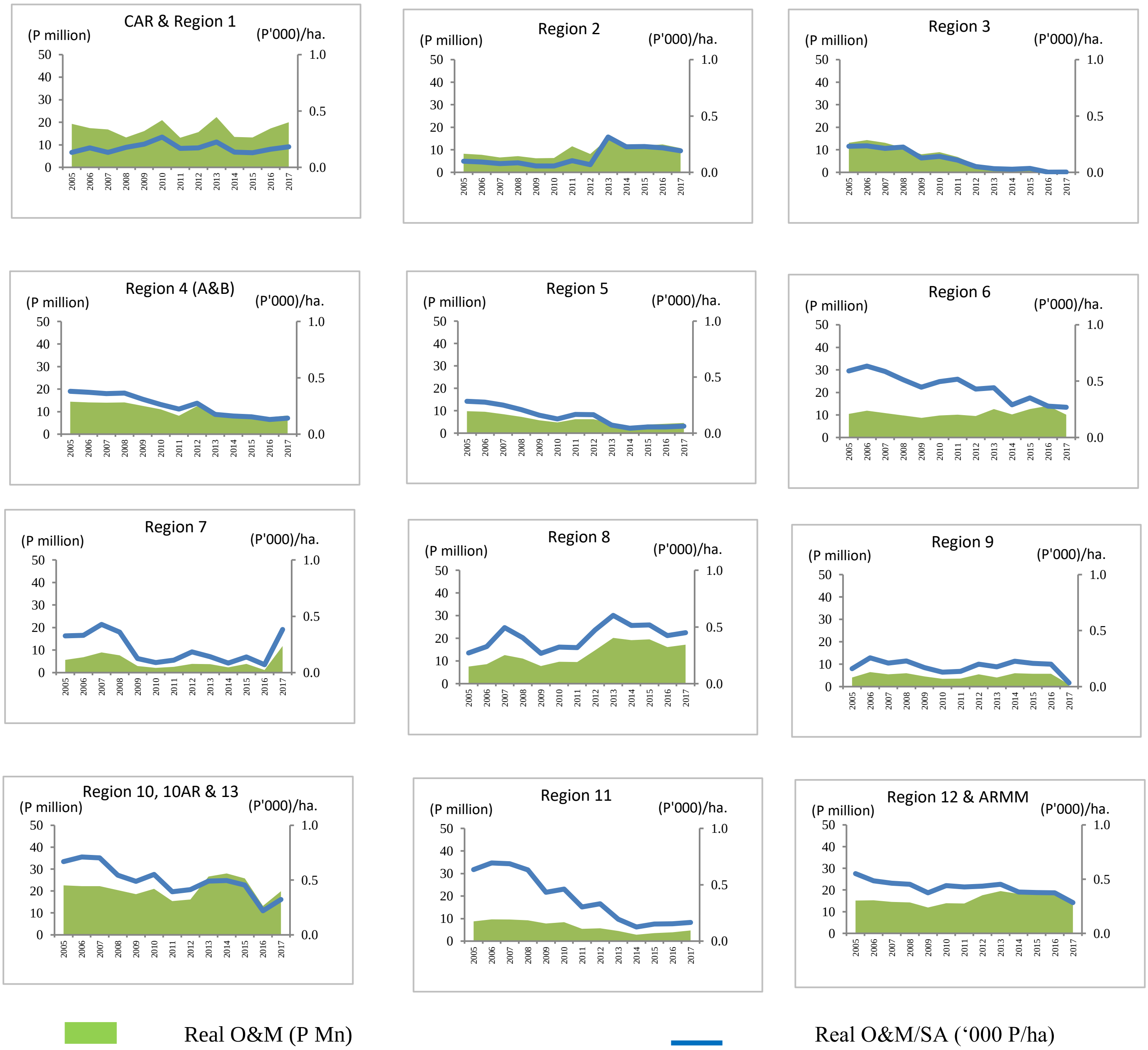
[6] FISA was implemented starting mid 2017 for NIS while for CIS, implementation began in the last quarter of 2018. The implementing rules and regulations (IRR) had been finalized in December 2018.

Figure 4. NIS Real O&M Expenditures and O&M per ha (2000 prices), 1990-2017

Source: Inocencio and Briones (2019)

Figure 5. CIS Real O&M Expenditures and O&M per ha (2000 prices), 2005-2017



Source: Inocencio and Briones (2019)

The incentive mechanism imbedded in the original IMT program with the four different models taking into account capacity and performance is gone as all IAs/ISCs are offered the same operation and maintenance subsidy per ha and per 3.5 km (unlined) or 7 km of (lined) canal. While in the "modified" IMT the annual functionality survey is still done, the results are meant to determine what interventions and assistance to provide the IAs and ISCs (irrigation service cooperatives).[7] In addition, the modified contract includes a provision for IMT performance evaluation to be conducted by both NIA and the IA/ISC. At first glance, this part provides some "disincentive" for extremely poor performance which can lead to suspension of contract and provision of subsidy. However, if we note that NIA's takeover of management of irrigation

[7] Another use of the annual functionality survey is as basis for awards and incentives for annual search for Regional and National Outstanding IAs/ISCs in NIS and CIS systems.

O&M and hiring of "contract of services" will in fact just free the IAs/ISCs of the responsibility and financial burden of topping up the inadequate O&M subsidy. The irrigation service will not be necessarily suspended and the erring IAs/ISCs can still benefit from the free irrigation service. In this sense, this supposed disincentive can potentially serve as an incentive for the IAs/ISCs to perform poorly.

The need for Baseline Data and an O&M system: To address the O&M issues in national irrigation systems, a 4-year project was implemented from 2013-2017 through the NIA-JICA Cooperation Project 3 (TCP3) to adopt an improved operations and maintenance system in national irrigation systems (NIA 2017a). This project involved reviewing existing O&M management methods, practices and monitoring systems, and proposing methods and strategic plans for an improved O&M system. In addition, this project included piloting an O&M system with baseline data collection to initially populate the system. During the baseline survey in the project, some of the common issues found were: 1) outdated basic information on farmers and their farm lands, 2) discrepancies in data of NIA and the actual farms, 3) lost data due to flood, fire and other reasons, 4) unrepaired damages of irrigation facilities, 5) many illegal turnouts, 6) inequitable water distribution and downstream farms not getting water, and 7) several canals not constructed according to design resulting in operational difficulties.

Under the TCP3, the Farmland GIS (FGIS) with an integrated database of farmland information using satellite images was generated for a total of 10 pilot NIS. The basic problem encountered in this project was the collection of data and submission by the regional offices. Prompt and correct data submission holds the key to the success of Farmland GIS. Among the Phase 2 project sites, only 3 out of 8 had completed data validation in two years. Of the Phase 3 project sites, there were turnout service area groups (TSAGs) which did not submit the needed data to the FGIS Consultant. With all the failures and shortcomings in gathering information, TCP3 recommended that data collection for the NIS systems be continued and that NIA should do some validation even after the completion of the JICA project. One suspected cause of delay in the submission of parcellary data was the large number of farmers to get information from or the numerous parcellary data to be collected. Given the shortage of manpower in each NIA regional office, collection of data for FGIS was not priority.

Outcomes and Impacts of the IMT Program: Before the FISA, the IMT program had four models described in Table 8. Cablayan, et al. (2014) indicated that while the IAs have been organized in almost the entirety of existing national irrigation systems, at the time of the study, less than 80% had contracts under the "new" IMT policy: 40% with Model 1 contracts, 30% with Model 2, 2% with Model 3, and 1% with Model 4. With fewer NIA personnel at the system level, IAs had to be strengthened to readily accept more responsibilities in the O&M of systems. But IAs with Model 1 or Type 1/Type 2 contracts were reluctant to convert to Model 2 contract for fear that they will not be able to achieve the higher ISF collection targets set by NIA and end up with zero share in the collection. In Model 1 contract, they had guaranteed compensation for clearing canals and possible share from ISF collection if the base collection efficiency is surpassed. There were also officers of IAs who simply did not want to accept responsibility for collecting irrigation fees, which was an IA responsibility in Model 2 or higher level contract.

Table 8. Basic responsibilities of NIA and IAs under Various Models of IMT Contracts

IMT Contract	NIA Responsibility	IA Responsibility

Model 1	Management of the entire system but transferred specific operation and maintenance (O&M) responsibilities to the IAs	a) Maintenance of canals (portion of main canals, laterals and other irrigation facilities and structures within the coverage of the IA service area); b) operation activities such as discharge monitoring and preparation of list of irrigated and planted area; and c) distribution of irrigation service fee (ISF) bills and campaign for payment. Depending on the capacity and willingness of the IA, ISF collection was an added responsibility of the IA especially in NISs that had very limited NIA Staff under the NIA rationalized structure.
Model 2	Management of the main system, from the headworks to the head gates of lateral canals	Management, operation and maintenance of the laterals, sub-laterals, and terminal facilities. ISF collection.
Model 3	Management of the headworks and portion of main canal up to the junction of the first lateral canal headgate	Management, operation and maintenance of the rest of the system from the junction of the first lateral canal headgate down to the farm level facilities. This was an expanded form of Model 2.
Model 4	Monitoring, evaluation and technical assistance of the IA	Full management, operation and maintenance of the entire system including the headworks.

Source: NIA Policy on Irrigation Management Transfer, Second Edition-April 2011.

Cablayan, et al. identified three major challenges to the IMT program as implemented at that time: (1) defective irrigation facilities; (2) weak financial positions of IAs; and (3) contradicting policies on IA sharing. The IAs were dissatisfied with their contracts due to NIA’s failure to honor its commitment to complete repair and maintenance of facilities agreed upon during contract negotiation and inadequate support to improve O&M, during water shortage and calamities. Defective irrigation facilities (like turnouts without gates, illegal turnouts, etc.) were key causes of water not reaching downstream areas. IAs covering small areas like 100 hectares or less have lower potential income from ISF share.

After the passage of the free irrigation act, the four irrigation management transfer (IMT) models no longer apply. First, between models 1 and 2, the ISF collection was the key difference. With generally free irrigation, there is no of very limited ISF to collect. Models 3 and 4 which devolved even greater O&M and management responsibilities to the IAs also no longer hold with NIA effectively taking back the responsibility with the free irrigation service to all. Thus, under FISA, the four models have been collapsed into just one “modified IMT” with the full responsibility for management and funding fully back to NIA and all the IAs getting the same contract to do O&M and operation. The idea of giving farmers or irrigators associations bigger roles and more responsibilities in the operation and management of national systems was meant to address the sustainability concerns given limited funds for O&M and the much reduced staff complement of NIA with the rationalization. However, with the free irrigation, the inherent incentive imbedded in the different models for IAs to participate and contribute more towards managing and sustaining systems may have been diminished.

B. Recommendations:

Given the findings on O&M, three recommendations come out from the component studies and earlier assessments and projects: establishment of an asset management plan, baseline data, and determination of appropriate funding. These recommendations are in fact very much linked to each other. The asset management plan will require credible and validated baseline data on irrigation assets. With the first and second recommendations in place, the determination of appropriate funding can follow.

1. Adoption of Asset Management Method for all systems

This recommendation is not new. Earlier JICA (TCP3, TCP2) and WB studies have already been pushing for this. Given problem of performance and sustainability, it is imperative to implement a sustainable and cost-effective Asset Management Plan (AMP). This AMP will enable NIA to utilize and maintain the condition of its assets in the best possible way – keeping the systems at good operating standard, and providing levels of services which are consistent with cost-effectiveness and sustainability objectives.

The AMP is management method that considers financial, economic, social and engineering condition to maintain the function of irrigation in most cost-effective manner. It combines the entire lifecycle (design, construction, operating, maintaining, repairing, modifying, replacing and disposal) of respective irrigation facilities. The asset management method will be advantageous as it will reduce the life cycle cost of irrigation systems and reduce the risks of suspension of water supply or damages caused by sudden and unexpected accidents.

The asset management activities will include conduct of soundness diagnosis of irrigation followed by the formulation of long term maintenance plans for each irrigation system based on the results of diagnosis. Under TCP3, some NIA staff in the 10 pilot NIS have already been trained on irrigation system maintenance and management. The participants studied the methodology of soundness diagnosis of irrigation facilities and crafting of long term maintenance plan. This initiative can use the TCP3 Maintenance Manual for irrigation systems which includes the methods for carrying out the diagnosis and planning for long-term maintenance of irrigation facilities. The best part is that the FGIS established under TCP3 has a module on Asset Management. With the soundness diagnosis, the irrigation facilities which will require follow-up observation will be identified.

Resources will need to be allocated for this to institutionalized at NIA and scaled-up to include the rest of the NIS and over time, can also be adopted for CIS.

2. Continuous Capacity Building and Establishment the Baseline Data

In order to institutionalize the first recommendation, more NIA staff will have to be capacitated. In addition to the TCP3 pilot sites, the key NIA personnel for facility maintenance at each of the irrigation systems will have to be trained on maintenance method of irrigation facilities using Asset Management.
In order for the asset management method to work, baseline data on the state of the systems will have to be established and then regularly updated. The Asset Management module in Farmland GIS will provide information on the soundness of each facility visually and will make it possible to easily view detailed diagnosis results.

3. Determination of Appropriate O&M Funds

Given the findings on poor states of many systems, NIA will need to allocate realistic resources for O&M and formulate effective policies and incentive systems, so as not to defer O&M until the problem becomes a major rehabilitation project. Additionally, canal lining, while effective in reducing water losses, should be evaluated to confirm its long-term efficiency in comparison to unlined canals.

With the use of asset management method, it is possible to come up with the appropriate estimates of fund requirements for O&M of systems.

7. Project Monitoring and Evaluation (M&E)

Project monitoring is part of implementation especially when huge investments are involved. This activity includes tracking of implementation performance from inputs to outputs as part of the project management. Usually, a project is evaluated at halfway through completion and at completion. The monitoring and assessment would cover adherence to design, budget and timelines.

Project ***evaluation*** follows project completion and intended to assess project outcomes and impacts. . Evaluations can provide useful insights for future similar projects. Not all projects are evaluated. The World Bank and Asian Development Bank carry out evaluation several years after project completion and especially when follow up projects are planned.

For M&E, the four study components were supposed to carry out the following: (1) identify the types of information to be regularly collected from the NIS and CIS for proper monitoring and evaluation; (2) develop the means to institutionalize a proper monitoring and evaluation system covering both NIS and CIS; and (3) demonstrate how information can be used for operations and planning of future projects.

A. Findings

Types of Information to be Regularly Collected from NIS and CIS for Proper Monitoring and Evaluation: Water flow is a basic measure critical to system management. However, in the cases in the NIS report, it was found that this information could not be obtained due to the non-operational check gauges. Water quality on the other hand, is characterized by indicators under the environmental aspect that include dissolved oxygen (DO), pH and electrical conductivity, which is related to salinity level.

On the environmental aspect focusing on water quality, pH levels on the alkaline side (> 7) which can be attributed to excess sodium and can lead to a sodicity problem in the future and pose a serious problem in water quality, especially if combined with high salinity levels. Another water quality indicator which affects photosynthesis and biomass production is DO. The DO level and pH of the water in a rice field are positively correlated; both are low when respiration dominates and, depending on the alkalinity or buffering capacity of the body of water, the diurnal variations can range from zero DO to super-saturation and from acid to highly basic (pH>9.5) waters during times of algal blooms (Roger, 1996).

The results of the NIS Study confirm the studies that have shown a reduction in rice yield due to water pollution. Low performing systems reflect low water quality in terms of one or two of the water quality parameters. However, there are other factors that can cause low yields, apart from poor water quality, such as lack of inputs (fertilizer and water) and crop and soil management.

Irrigation service is found to be adversely affected by institutional and organizational issues such as illegal settlers, dumping of garbage, and illegal pumping, as per the NIS report. Other problems identified included water delivery scheduling and distribution issues and conflicts among users, especially when upstream members block the path of water, which reduces the water supply for the downstream part. Another issue is the resistance of farmers to change and adopt new technologies. Many farmers prefer traditional methods and refuse to follow the crop calendar. In some cases, informal settlers along the canals pose problems due to their disposal of solid waste.

Slow Annual Growth and Focus on New investment. The annual growth of new irrigated seems to go on a slow pace despite the huge investments introduced for development projects. This may be in part, as found by the governance report, due to the low irrigation potential of the available agricultural lands for expansion which is commonly constrained by slope, soil and productivity limitations. So, proper land suitability assessment and classification may be needed to enhance the expansion and growth rate of new irrigation areas. Moreover, land conversion to give way for industrial and residential area expansion seem to be having priority from developers.

The preference of focusing on new projects instead of rehabilitating inefficient systems is another concern. This may be due in part to lack of budget to finish incomplete projects or that the opening new projects with new budget is more feasible. This may also be due to constraints in rehabilitation of old projects, making it more expensive.

Institutionalizing an M&E System for NIS and CIS: According to the governance report, the NIS IA participation in monitoring and evaluation is high. Monitoring is done manually by staff gauge, monitored by NIA and ocular inspection. Most NIS IAs have an existing monitoring system for flow rates. Water flow is a basic measure critical to system management. However, this information could not be obtained due to the non-operational check gauges.

NIA and the IAs oversee the flow rates and when defects in the system are found, they are reported to NIA through a system of reporting problems in the flow rates and other issues to the NIA/NIS IA management. Follow up actions and interventions are sometimes done in a timely manner. IA members also monitor the service area regularly, with the data collected being reported to the IMO to form the basis for the next season's decisions on water allocation.

According to the governance study, given that the technical capacity to undertake more modern and rigorous methodologies of analysis and design, as found by the governance report, e.g., GIS analysis, mathematical modeling and simulations, are now available in the country, they can be used by the NIA and other agencies. GIS analysis is useful in mapping the location of structures, measurements; spatial analysis of erosion, groundwater potential, flooding; distribution of IA performance; and in targeting interventions and programming areas for irrigation.

Use of Information for Operations and Planning of Future Projects: This part is quite linked to the Asset Management method which requires baseline data and regular monitoring. Also, the NIS study finds that the GIS tool has many uses including mapping of locations of irrigation facilities and structures, measurements, and analyzing soil erosions, determining groundwater potential, assessing impacts of flooding, monitoring of IA performance, enhanced targeting of interventions, and programming areas for intervention.

B. Recommendations

1. Use of Technology in M&E and Data to Collect

The governance study recommends to have integrated ground water and surface water maps and to gather data on evapotranspiration and percolation rates. To account for climate change, projections on water supply are also needed.

The NIS report recommends information on the following measures be gathered regularly for proper monitoring and evaluation: water flow and water quality. It also recommends for NIA to have a regular monitor the structures so repair or replacement, of damaged or non-functional devices are done in a timely manner. It suggests the use of the performance index: a function of the relative contribution of key factors, so management measures that improve the performance of those not performing well can be formulated by looking at the key factors causing the poor performance of a system. Regarding the misdeclaration of service areas, the report recommends the mapping of boundaries be performed to identify the areas and verify the justification of each IA to ensure that no double declaration of areas occur for subsidy allocation.

Water quality should also be checked seasonally and should be part of monitoring and evaluation programs of NIA to become a basis for policy formulation. This is to avoid water quality deterioration in the future which could affect yield (Clemente, et al 2019). The NIS report recommended that NIA should conduct a regular monitoring of structures to ensure that timely repair or replacement, of damaged or non-functional devices is done on schedule. The monitoring of flow rates can be performed by NIA and IAs while the monitoring of service areas can be done by the IAs.

The governance report recommended that modern and rigorous methodologies of analysis and design should be used given the increased technical capacity of NIA. The GIS maps, for instance, should be used to show the performance distribution throughout the Philippines. This is aimed to demonstrate the spatial distribution of irrigation performance among the different NIS and show how well each IAs are performing in a given area.

The CIS study recommends that assessment of water supply sources and water delivery performance be done. For the latter, it was suggested that the basis for the assessment be based on flexibility, reliability and equitability. Flexibility refers to the ability of the CIS to deviate from an established irrigation schedule. Most of the interviewed IAs have defined schedules for water releases especially during the dry season when water is limiting but are rather flexible during the wet season when water is more than enough. Some IAs have strict rules and penalties for non-compliance or water stealing. Flexibility in larger IS may be limited by the lack of control structures to divide or divert flows between zones. Reliability is an expression of confidence by the irrigation system to deliver water as promised (Murray-Rust and Snellen, 1993). It is also the degree to which the irrigation system conforms to prior expectations of its users (Rao, 1993). It should be noted that reliability is based on an expected or promised water delivery. Some farmers are resigned to the fact that water is scarce during a certain dry period and they would not receive water, so they usually find other water sources like STWs or LLPs. The almost uniform rainfall distribution in Mindanao and the reliable water sources in both Visayas and Mindanao are plus factors. Equitability, or equity, is the spatial uniformity of the ratio of the delivered amount to the required amount (Molden and Gates, 1990). It is also an expression of the share for each individual or group that is considered fair by all system members (Murray-Rust and Snellen, 1993). The possible biases of the interviewees must be considered in this measure.

2. Promote use of modelling in system water allocation management

The water resources component suggests to; (a) develop a hydrologic/hydraulic-based model of the watershed, reservoir operations and irrigation distribution systems associated to the systems; (b) conduct model simulations to determine the actual irrigated areas according to the existing and other what-if scenarios of the water and land resources, as well as configuration and dimension of the irrigation facilities; (c) assess the ability and reliability of the irrigation systems to actually irrigate said area or hectarage relative to its original design service area; and (d) assess the design irrigation service areas as originally planned compared to the actual service areas in relation to water availability, land use (including flood vulnerability) and status of irrigation facilities by evaluating the capacity (how much) of the water resources (water source), land resources (slope, soils and land use) and irrigation facilities to irrigate the area (hectares) through watershed and irrigation modeling and simulation.

8. Broader Issues of Irrigation Governance

In practice, political pressures, rent-seeking, and corruption perpetuate technical and economic inefficiencies in the irrigation and water sector (Wade 1982, Repetto 1986, Araral 2005, Huppert 2013). Hupert notes that "local as well as international professionals on different levels in the water sector are caught in multifaceted conflicts between formal objectives and hidden interests—and often tend to resort to rent-seeking behavior themselves." These professionals are in the bureaucracy, foreign lending agencies, consulting firms, and even local and international academic institutions dependent on the irrigation agencies and international donors for funding. In the Philippines, politicians interfere in project selection, construction, rehabilitation, distribution of water, and staff appointments and promotions (Rola, et al 2019). This interference may reflect both concerns for constituents and self-interest given that many of these politicians are themselves landowners and contractors.

The objectives of the teams under this topic is to identify, in broad terms, the reforms needed in cross-sectoral areas such as: water pricing, allocation of water rights, finance of O&M, and the organizational framework for national and communal systems.

A. Findings

The components identified several objectives under this section: identifying the issues in water pricing and water rights allocation; in watershed management; in investment allocation, O&M finance, and subsidy arrangements; and in the organizational framework and set-up of NIS, CIS, and BSWM systems.

Water pricing, water rights allocation: Currently, as per the governance report, there is no raw water pricing mechanism in the Philippines. It still follows the philosophy that water is a human right as per the Universal Declaration of Human Rights. Despite this, it has increasingly become an economic good, while in the irrigation sector, water has become a political good. There is a need to study water rights allocation, how the NWRB can be effective in its water permitting, given the inadequacy of the data that it is accessible to; who can host the data and should have one set of experts on water from the government side. Right now, technical experts are scattered in all the agencies and money is spent for cross validation within government.

Watershed management: Watersheds protect the fresh water supply, but the amount of water produced in a watershed is affected by soil, climate, forest cover, land use and land use practices. The main challenge in the protection of the watershed, as found in the governance report, is the dynamics and the level of collaboration among the various agencies that deal with the environment and land use. Interagency collaboration involves various national government agencies such as the DENR, and the DA, while multi-sectorial collaboration involves national government agencies, LGUs and local communities, youths, among others.

Policies and programs that are designed to maintain the healthy watersheds will be in the form of protection and conservation of water (Cruz 2018). The major reasons why these environmental policies have had limited positive impacts on water are due to asynchrony and disunity of policies, ineffective policy implementation, and inadequate infusion of science in policy formulation.

Investment allocation, O&M finance, and subsidy arrangements: Currently, as per the NIS report, it is not clear how irrigation projects (new vs rehabilitation, large vs small) are identified and prioritized. According to the NIA respondents, 75% of the budget should be for rehabilitation, but this is not based on any systematic evaluation. While the O&M is now covered by the GAA, there are feedbacks from IAs that the allocation is not enough. In terms of subsidy arrangements, both NIS and CIS IAs have full subsidies, with no accounting for its sustainability.

While NIA's proposed budget is crafted from the bottom up and with the participation of the various actors within the sector across the vertical chain, the decision on which to prioritize is still with the Central Office and then the budget department. While Congress makes the final decision on which to eventually fund.

The NIS report identified issues on the policy on allocating commensurate resources for O&M, the need for better tools in planning/programming to improve interventions, the need for intervention/action on watershed degradation that affect the quantity of water and deterioration of system efficiency, and the need for improvements in O&M, capacity for IAs, among others.

Organizational framework and set-up of NIS, CIS, and BSWM systems: The delineation of functions between NIA and BSWM appeared to be clear since the latter's function had been expanded in early 1990s to include water resources. There was no overlapping of function. However, with the transfer of NIA to the Office of the President, the DA has made the BSWM its de facto irrigation service provider. Whereas before the transfer of NIA, BSWM was limited to assisting farmers in developing water sources, it has now also involved itself in mobilizing small water irrigation system associations (SWISAs) to manage the systems it developed.

Also complicating the structure is the change in the CIS management and operation and maintenance. Before the FISA, the completed systems were fully turned over to IAs for them to manage and operate. With the free irrigation, NIA will now need to monitor the CIS. Given their number, NIA will need to populate and strengthen its IMOs in order to fulfil this function.

B. Recommendation

1. A reliable and updated database

The governance study recommends that with respect to water pricing and water rights allocation, a reliable and up-to-date database on water supply and demand be established to improve allocation of water rights. More studies should be done on the productivity of water across different uses to obtain the water price estimate.

2. Forging a shared vision

An important measure in watershed management recommended by the governance report is to forge a shared vision, goals and objectives that can motivate the government agencies and other sectors to work together, to pool and share resources, to synergize, and to agree on strategic directions for watershed management. Building high levels of trust and commitment amongst the various government agencies is another measure that can make collaboration effective.

Other important measures that can promote successful collaboration include agreement on a clear guideline for sharing knowledge, information and other resources, distributing leadership, and sharing accountability.

The governance report found that, to come up with an organizational framework that is acceptable to the stakeholders, further collaboration of the representative agencies is required.

3. Strengthen enforcement

Other recommendations include: (a) enforcement of regular monitoring and proper implementation of policies related to illegal activities that affect irrigation system functionality (e.g. illegal settlers, illegal turn-outs, pumping, and waste disposal; (b) ensuring policies allocate appropriate resources for O&M; (c) to make use of better tools in planning/programming, especially to improve interventions; (d) more proactive stance in addressing watershed degradation directly affecting irrigation systems; and (e) continue to improve O&M capacities of NIA and IAs, etc.

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