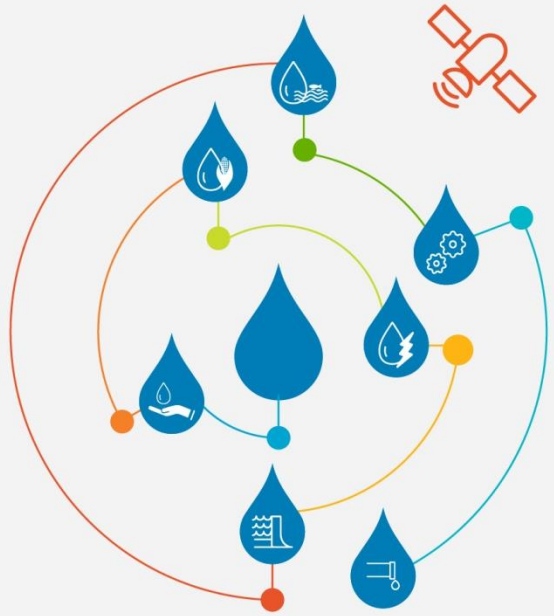
Why should irrigation managers worry about energy access & use?



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Background: Irrigation-Energy linkages

- Irrigation projects of the Asian Development Bank typically focus on modernization or rehabilitation
- Given growing water scarcity and competition for water resources, as well as cheaper technologies for pumping groundwater, many irrigation improvement projects are highly energy-intensive
- There can be trade-offs between increased water use efficiency or productivity and energy use efficiency
- If energy availability is not considered in modernization and rehabilitation projects, irrigation projects might perform below optimal levels

Energy Checklist for Irrigation Systems

- Focus on three areas:
  1) Energy access of the site in question
  2) Information on energy linkages to the specific irrigation project
  3) Environmental impacts like greenhouse gas emissions
- Implementation:
  1) Completed in Vietnamese Highlands
  2) Ongoing in Bangladesh PPP system

Checklist for energy uses in irrigation systems: Sample implementation: Krong Buk Ha reservoir (1/5): A—Energy access

No.	Category/Question	Yes/No	Remarks
1	Is the site connected to the electric grid?	YES	
1a	**IF NOT**, does it affect planned project performance?		
	IF YES, what are mitigation measures?		
2	Is electricity reliable in the dry and wet seasons?	YES	
2a	**IF NOT**, does lack of year-round availability affect proposed project performance?		
2b	**IF YES**, what are mitigation measures?		
3	Is electricity available 24 hours?	YES	
3a	**IF NOT,** does lack of year-round availability affect proposed project performance?		
3b	**IF YES**, what are mitigation measures?		
4	Is the electricity tariff subsidized?	YES	Across Viet Nam
4a	**IF YES**, is project viable if a full cost recovery tariff is applied?	Probably	
4b	**IF NOT**, what are mitigation measures?		

Checklist for energy uses in irrigation systems - Krong Buk Ha reservoir (2/5): B—Project description

	Category/Question	Yes/No	Remarks
5	Is this a multipurpose project	NO	
5a	**IF YES**, do you foresee competition for water or energy with other uses?		
5b	**IF YES**, what are mitigation measures?		
6	What is the source of irrigation water?		
6a	Groundwater	YES	Current use
6b	Water pumped from canals		
6c	Water pumped from a reservoir	YES	Switch from GW to reservoirs /surface water
6d	Water accessible without energy	NO	
6e	**IF** groundwater what is the average water table depth?	10-50m	
6f	**IF** groundwater, has the water table been declining over the last 10 years?	YES	
6g	**IF YES**, what are mitigation measures?		
6h	Will energy be needed to manage high water tables or polluted water?	NO	
6i	**IF YES**, what are mitigation measures?		
6j	..**IF** a centrally pumped system, is it possible that farmers continue to pump privately as well in the system?		Needs to be assessed
6k	**IF YES**, what are mitigation measures?		
6l	..**IF** water transfer to field requires energy, describe levels, tariffs, if any, and any cost implications for the project or end-user		Needs to be described

Checklist for energy uses in irrigation systems: Krong Buk Ha reservoir (3/5): B—Project description

No.	Category/Question	Yes/No	Remarks
7	.. **IF** this is a canal system (with or without pumping) is there a possibility to generate energy through turbining canals? IF YES, please describe	NO	
8	How is water applied on the farm?		
8a	Furrow		
8b	Sprinkler	YES	with the project
8c	Drip	YES	
8d	Flood		
8e	Other: _basin irrigation_____	YES	Switch from basin irrigation to HEI??
8f	**IF YES**, are all incremental energy needs in place or in reach at no or low incremental cost?		Probably yes
9	What other methods are envisioned to increase water and energy use efficiency?		
9a	Soil moisture sensors or similar	YES	with project
9b	Yield monitors		
9c	Wetting front detectors		
9d	On demand irrigation supply	YES	with project
9e	Other: _____		
9f	**IF YES**, are all incremental energy needs in place or in reach?	YES	

Checklist for energy uses in irrigation systems -Krong Buk Ha reservoir (4/5): B—Project description

No.	Category/Question	Yes/No	Remarks
10	Will the project likely lead to higher overall energy use in irrigated agriculture compared to the status quo (f. ex. more pumping, pressurized irrigation, more fertilizer, more pesticides, additional growing season, more mechanization, etc.)	YES	Due to area expansion
10a	**IF YES**, are there changes in the harvest index (for example from single to double cropping) and do these changes imply increased energy requirements?	NO	
10b	**IF YES**, are there changes in crops planted (for example, from rice to vegetables or perennial crops) and do these changes imply increased energy requirements?	NO	
10c	**IF YES**, are there increases in agrochemicals? (fertilizers or agrochemicals)	YES?	
10d	**IF YES**, are there changes in farm machinery use? (tractors, harvesters, etc.)	?	
10e	**IF YES**, are there changes in postharvest energy needs?	?	
10f	**IF YES**, other: _____		
10g	**IF YES**, are all incremental energy needs in place or in reach at no or low incremental cost?		
10h	**IF NO**, what are mitigation measures?		

Checklist for energy uses in irrigation systems -Krong Buk Ha reservoir (5/5): C—Environmental impacts

	Category/Question	Yes/No	Remarks
11	Have GHG emissions associated with changes in energy use been calculated?		
12	Are crop residues (rice husks, etc.) used for biogas?		
13	Has solar energy been considered?	NO	
14	If there is a grid connection, is it national or micro/local?	National	
15	Is the electricity grid part of a regional power pool?		
16	What is the share of renewable energy sources in electricity supply?	~30%	(Hydropower)
17	Have remediation measures been put in place for agricultural water pollution (which is energy-intensive to remediate)?		

Energy Checklist for Irrigation Projects

- Checklist provides guidance to project officers and other stakeholders on the various linkages between irrigation design/development and associated energy needs
- To be used at project design stage
- If medium or high risk of energy dependence is identified, a screening report would be developed
- Energy-irrigation indicators would be monitored during the project cycle
- Based on initial work in Bangladesh, energy access sheet (page 1) needs to be updated to include multiple sources of energy access for pumping (in particular solar and diesel)

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Next steps

- Application by additional irrigation officers at ADB and others (checklist can be downloaded at https://www.ifpri.org/sites/default/files/energy_checklist_for_irrigation_projects.pdf
- Online programming of the checklist so that it can be easily filled in
- Ex-post assessment if use of checklist improved design and performance of irrigation projects