IWRM-Indonesia Fact Sheet

Optimization of the Bribin Water Distribution System

General Data

Working task:	Optimization of a regional water distribution system
Location:	Bribin water distribution system, Region of Gunung Sewu, Kabupaten Gunung Kidul, Province of Yogyakarta Special Region, Indonesia
Operator:	Gunung Kidul Water Authority (PDAM Gunung Kidul)

Technical Data

Distribution system	Bribin water distribution system	
Water production	Bribin-Weir:	- Energy: electricity
		- Max. capacity: 55 lt/s
		- Potential operation: 11 h/d
	Bribin-Sindon:	- Energy: hydro power
		- Max. capacity: 62 lt/s
		- Potential operation: 24 h/d
Connected population:	~ 80.000 Inhabitants (Status May 2015)	
Coverage area:	~ 250 km^2	
Main line system	- Length: ~31 km mains	
	- Elevated storage tanks: 7	
	- Pump stations at water production: 2 (see water production)	
	- Booster pump stations including tanks: 5	
Supply system	- Length: ~163 km supply pipes	
	- Supply zones: 7	

1 Objective

In the karst region Gunung Sewu large, wide spread water distribution systems are necessary to supply the population due to the little number of accesses to the karst water resources and the population distribution. Moreover, the hilly topography results in a comparatively high energy demand for water pumping and distribution. The Bribin water distribution system (Bribin WDS) is one of eleven of such systems supplying the Gunung Sewu region (see Fig. 1). In addition to the high energy demand the current Bribin WDS faces several severe deficiencies such as high water losses (> 50% of system input), regular supply interruptions and uneven supply of the population. Hence, there is a great need for optimization of the Bribin WDS. Consequently, the objectives to develop an approach for system optimization and a subsequent pilot implementation are:

- Data collection, hydraulic modeling and deficiency analysis.
- Development of a supply strategy for an evenly distribution of the limited water resources.
- Development of a concept to restructure existing water distribution systems to increase energy efficiency.
- Development of a tool for system monitoring and control to support the implementation of the operation strategy.
- Pilot implementation of the approach at the Bribin WDS including integration of the newly built adapted hydropowered underground pump station at Gua Bribin-Sindon.

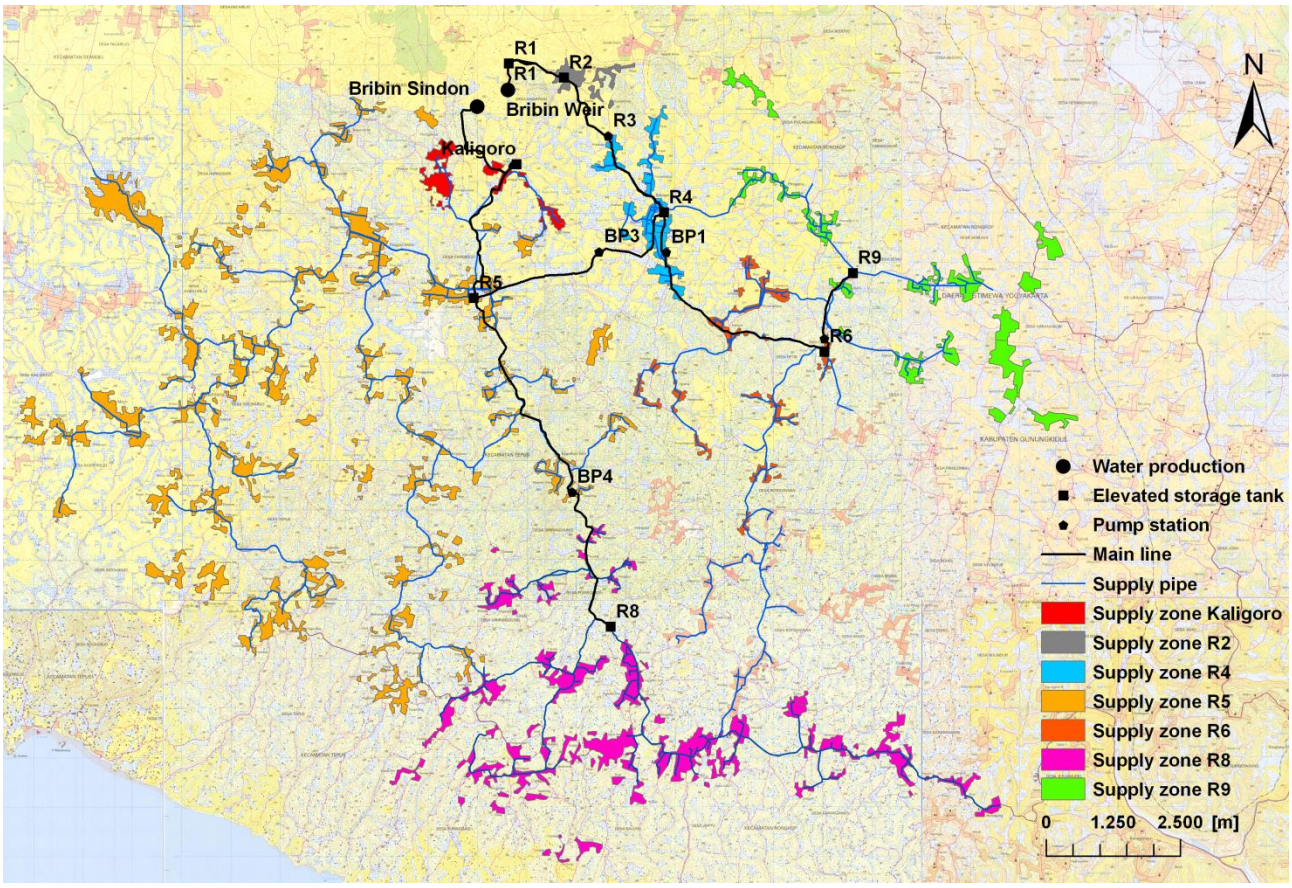

Fig.1. The Bribin water distribution system

2 Approach

Based on the objectives described above, the optimization approach has three main components, which are:

1. Adapted supply strategy: The classical demand driven supply strategy (the water demanded is supplied) is replaced by a system input-oriented strategy (the water available is supplied) in order to provide for a continuous and even supply. The daily water production is distributed to the elevated storage tanks proportionally to the population of the supply zones connected to the tanks. Only the specific water volume available at a tank at a certain day is feed into the corresponding supply network, the consumption is controlled. A monitoring system supports the application of the supply strategy (see point 3).
2. Optimized system concept: The energy efficiency is increased by exploiting existing potential energy through a network restructuring. In addition the system component capacities are optimized, water losses are reduced and the hydropower driven water pumping station Bribin-Sindon is integrated. For the main line system hydraulically discrete sections are defined. Elevated storage tanks are the connection points of the supply zone networks and the main line system (see Fig. 2).
3. Monitoring and control system: An adapted system to monitor water levels and discharges as well as valve and pump settings supports the application of the supply strategy (see point 1).

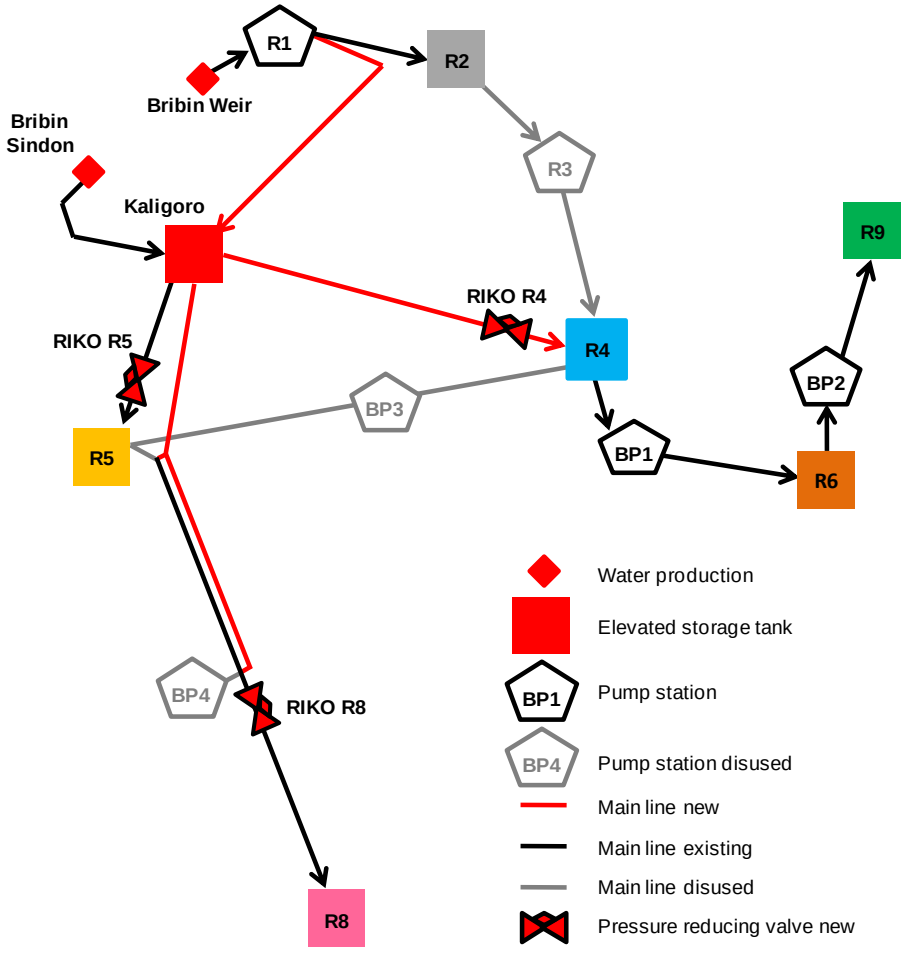

*Fig.2. Bribin WDS (*top*) and implemented optimization concept of the main line system (*bottom*)*

3 Implementation and Results

The optimization approach was applied for the Bribin WDS and a pre-design with technical specifications for the implementation of the approach was developed in coordination with the Indonesian partners. With the restructured system the specific demand for external energy could be reduced from approx. 2.4 kWh/m³ to approx. 0.4 kWh/m³. Within the IWRM-Indonesia project the implementation of the lots comprising the sections Bribin Sindon/R1 to Kaligoro to R5/R8/R4 have been carried out (see Fig. 2 and 3). This part of the main line system covers approx. 84% of the supply area. The measures include the installation of approx. 17 km of new main lines, three pressure reducing valves and water hammer security devices (see Fig. 3). The local operators from PDAM were trained during the joint commissioning of the section Kaligoro to R4 (see Fig. 3).

(a) Elevated storage tank

(b) Pump station (now disused)

(c) Leakage

(d) Implementation: Installation of main line

(e) Implementation: installation of control devices

(f) Commissioning and capacity development

Fig. 3. Pictures impression of the implementation

4 Project Partners

Karlsruhe Institute of Technology

IDS GmbH

Ministry of Public Works and Public Housing

Province of Yogyakarta Special Region

National Nuclear Energy Agency

Local Government of Gunung Kidul Regency

Water Authority (PDAM) Gunung Kidul

Bestindo Putra Mandiri Ltd

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