Securing Water for All

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The Decision Support System for Integrated Water Resources Management in the Citarum River Basin

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Jasa Tirta II Public Corporation

Outline

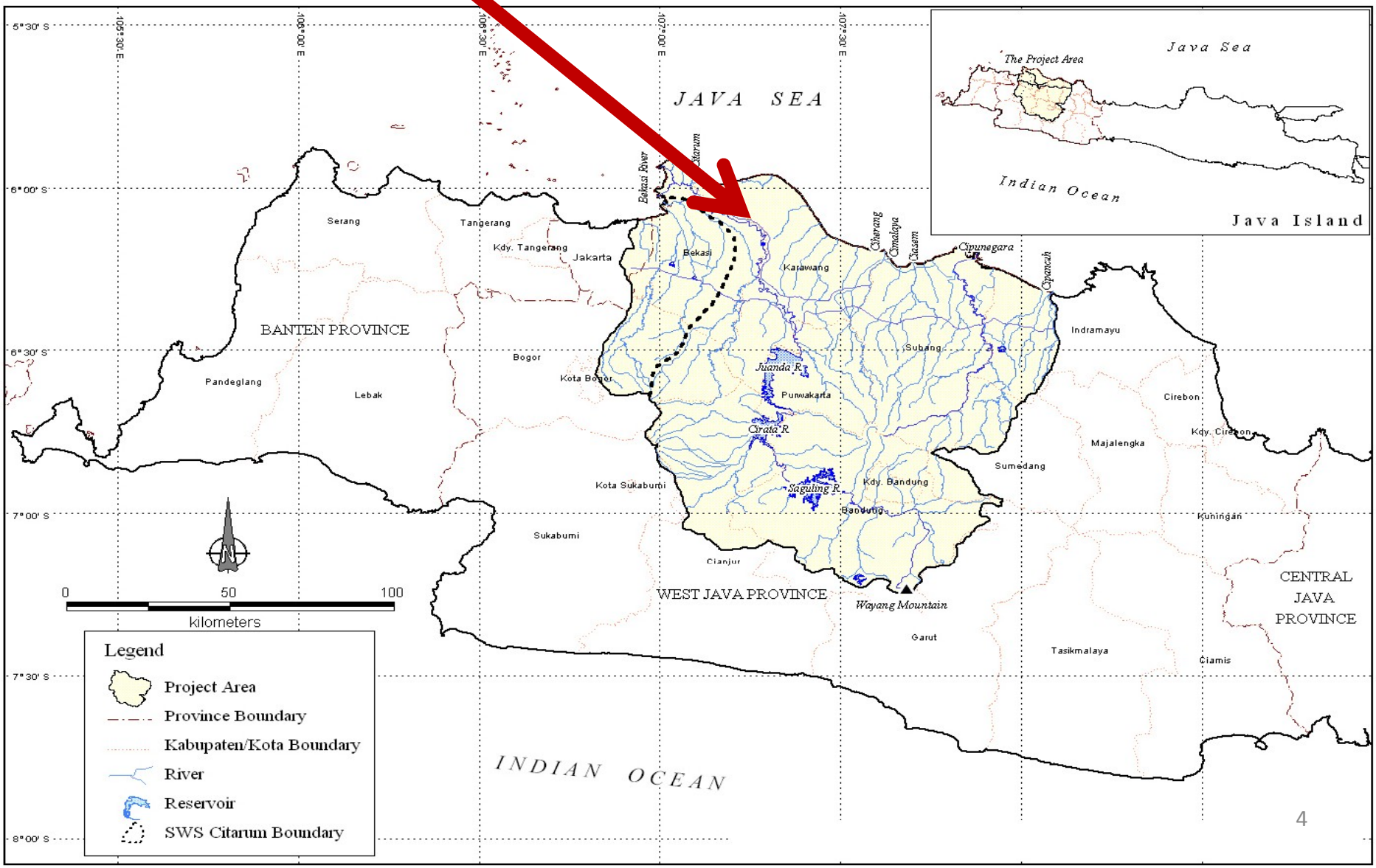
- Introduction
- Issues Challenges
- Challenges and Opportunities
- Water Operational in Citarum River Basin by PJT II
- Conclusion and Recommendation

BASIN

Introduction

- The water resources of the rivers systems in the Citarum River Basin (CRB) are critical to social and economic development of the country
- The system serves water for multiple uses, agricultural production through major irrigation systems, DMI water supplies, hydropower generation, and fisheries
- Information sharing is a basic principle of IWRM planning. Hence data, information and decision support are key components of the roadmap for IWRM in the CRB
- This information can be used to do research on catchment processes and demography; develop new technologies for water conservation and environmental protection; to develop and implement decision-support tools, including geographic information systems, hydrologic and hydraulic models and other analytical tools

Location of Citarum River Basin



Citarum River Basin Data

- Climate:
  - Wet and Dry seasons
  - Rainfall 2,382 mm/year, 132 rain days/year, rain intensity 18.1 mm/day
  - 80% falls in Nov-May
- Watershed
  - Basin: 6,600 km^2
  - Length: 270 km
  - Reservoirs: Saguling, Cirata and Jatiluhur

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Issues

1. The water resources information on the hydrological, hydro meteorological, and hydro-geological information, water resources and water resources infrastructure, water resources policies, water resources technology, the social economic and cultural activities of the community related to the waters sources of concern.

2. Design of gateway information technology infrastructure, which has interoperability capacity, for collaborating and sharing information from different protocols provided by various water resources data management centers.

3. Sustainability of budget resources and staffing system.

4. Level of human resources skill-set, especially managerial and technical skill.

Challenges and Opportunities

Citarum River, the biggest river in West Java Province, characterizes by three large dams formed a cascade system to serve multiple users and is considered as the most strategic river basin in Indonesia (13 district and 2 province).

Population over 2.5 million inhabitants is located in the immediate entrance of Citarum Upstream.

Citarum river water allocation for :

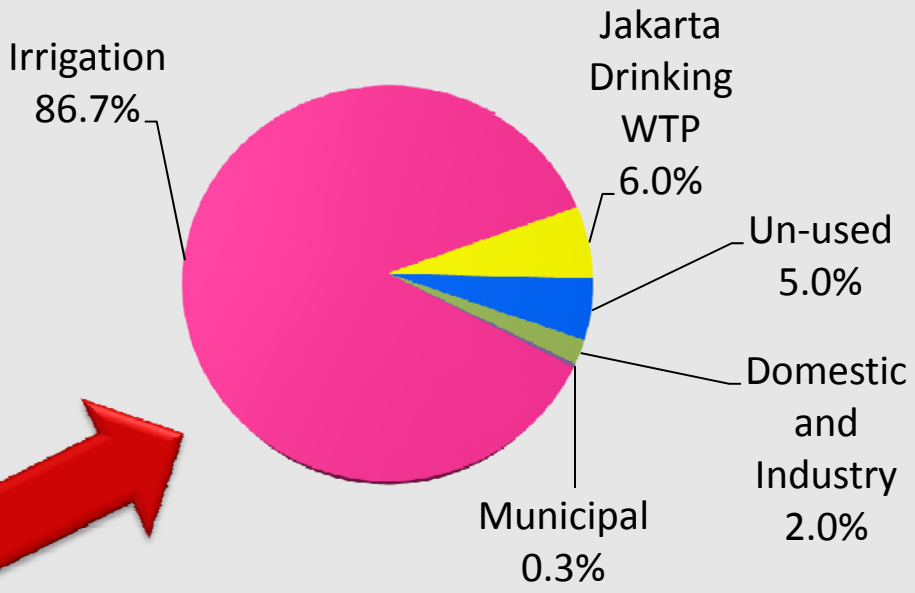
- 80% of raw water suppy of Jakarta is relied on CRB.
- 240,000 ha technically irrigated area
- DMI water requirements in 10 Kabupaten/Kota, Hydro-electric power plants (1800 MW in total).
- Flood control, etc.

For the implementing water operations, needs to be done water distribution, forecasts of water requirement, and water requirement regulation.

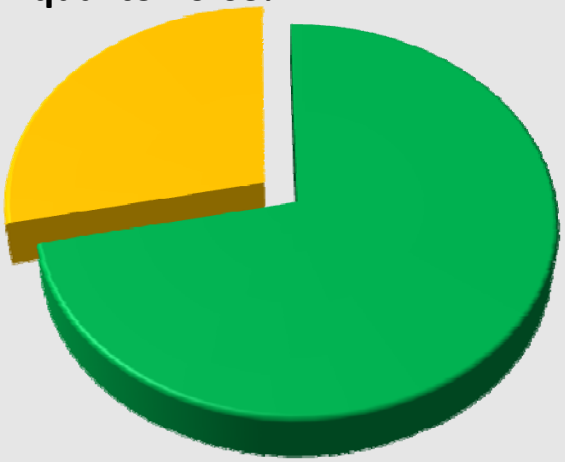
With the big system of water resources management we need the water operational with DSS.

Water Resources Potential in Citarum River Basin

Total 12.95 Billion m^3/year
Citarum : 6.00 Bm^3/year
Other rivers : 6.95 Bm^3/year



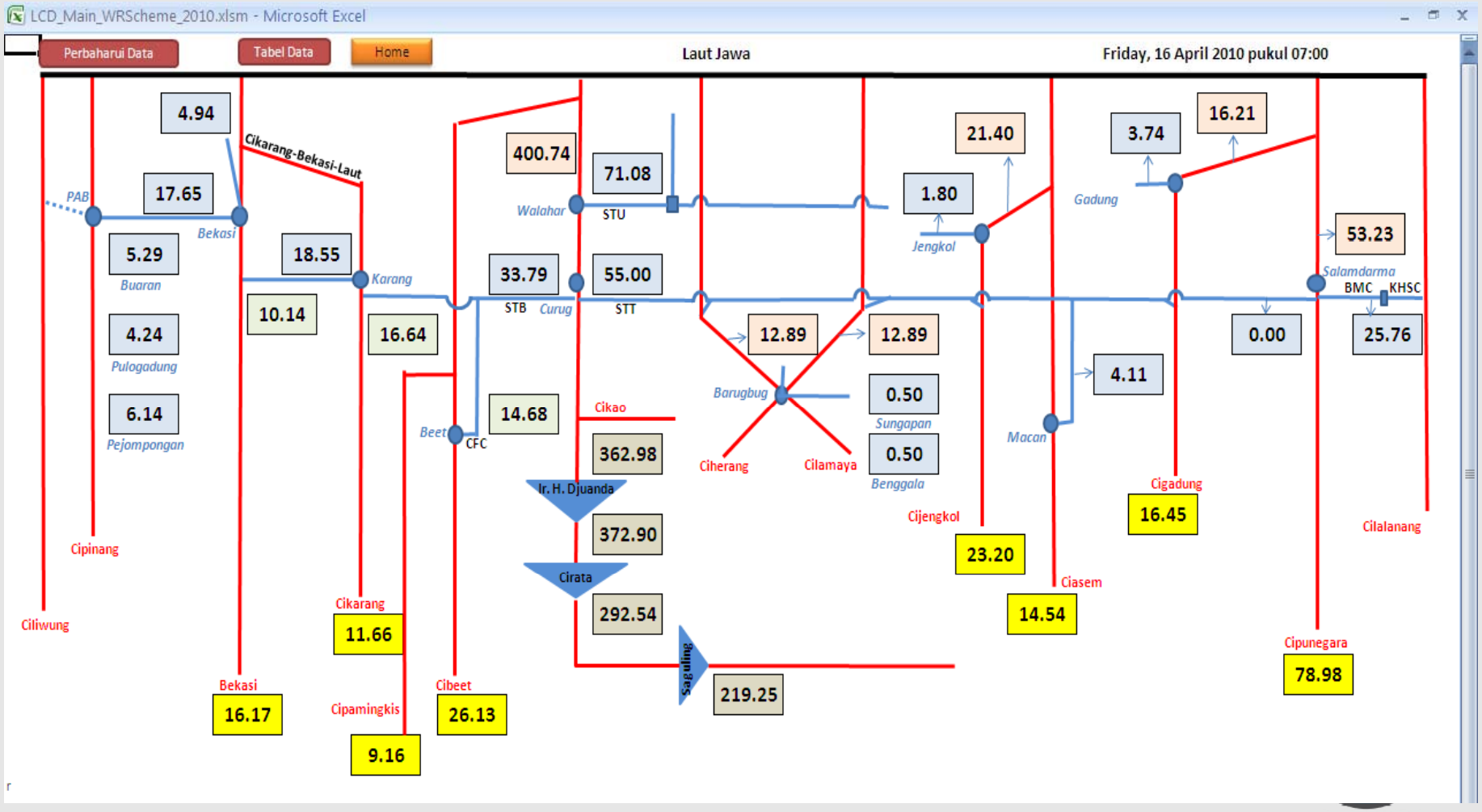
Unregulated 5.30 x 10^9 m^3/year
Equal to 40.03%



Regulated 7.65 x 10^9 m^3/year
Equal to 59.07%
From Citarum: 6.00 x 10^9 m^3/year (all utilized for HEPP)
From others: 1.65 x 10^9 m^3/year

BASIN

Scheme of Water Availability and Distribution



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Concept the DSS in Citarum River Basin

- Data and information are represented as foundation in decision making
- Required of fast, precise and accurate data
- Management of information and data is in line with development of technology
- It requires continuous operation, maintenance, and development and:
  - Competence of Human resource
  - Adequate of Infrastructure
  - Budget mobilization

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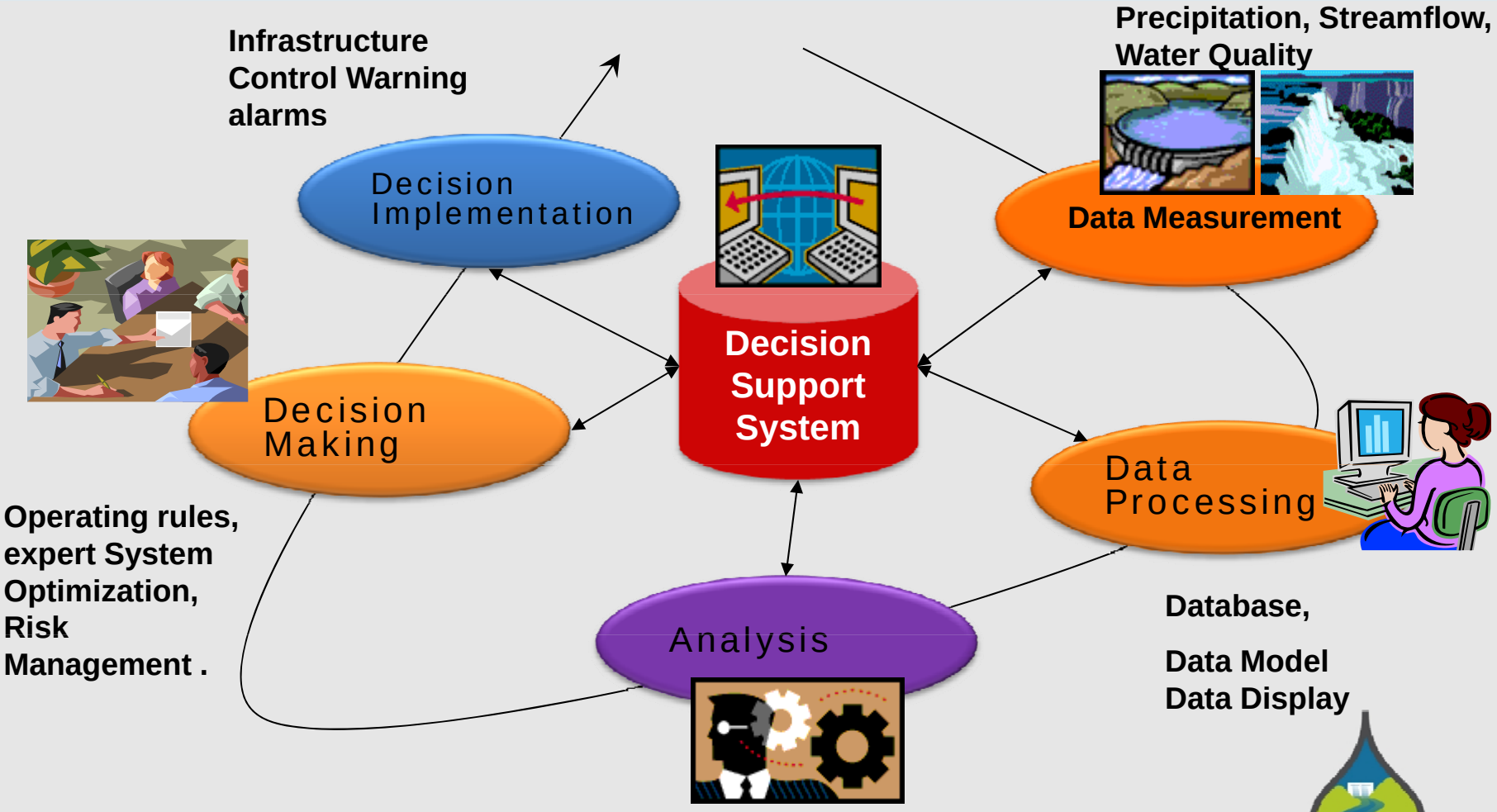
Decision Support System (DSS)

- **DSS is a system assisting executive on managing ssumptions, alternatives and opinions to a or some decision makers in making a decision which there are complex situations.**
- **DSS:**
  - Presenting various alternative with interest structure
  - Based various made moderate calculation and model presenting related/relevant among data
  - Presenting story; level of sensitivities of parameter

Overview of Decision Support System in Citarum River Basin



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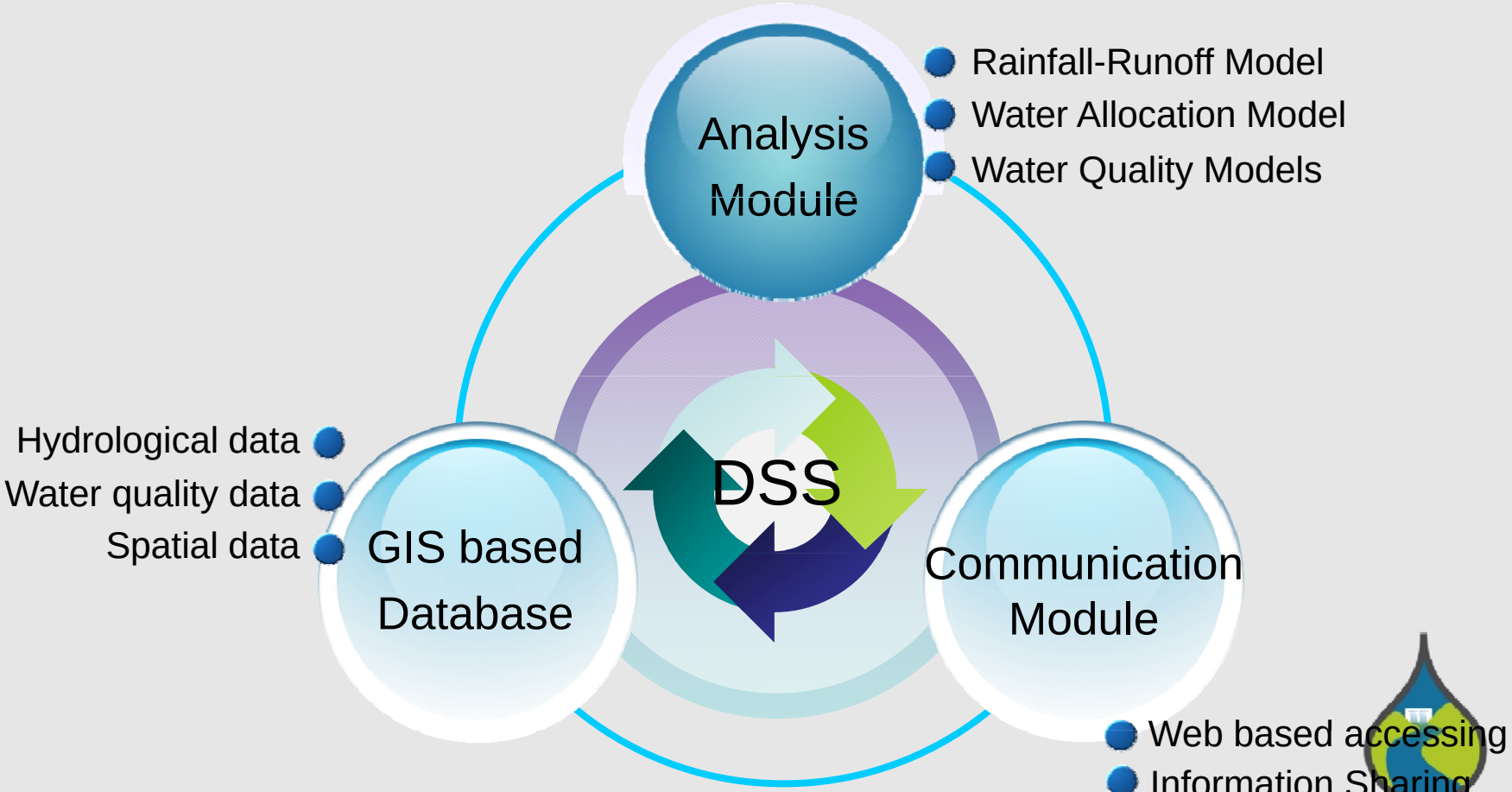
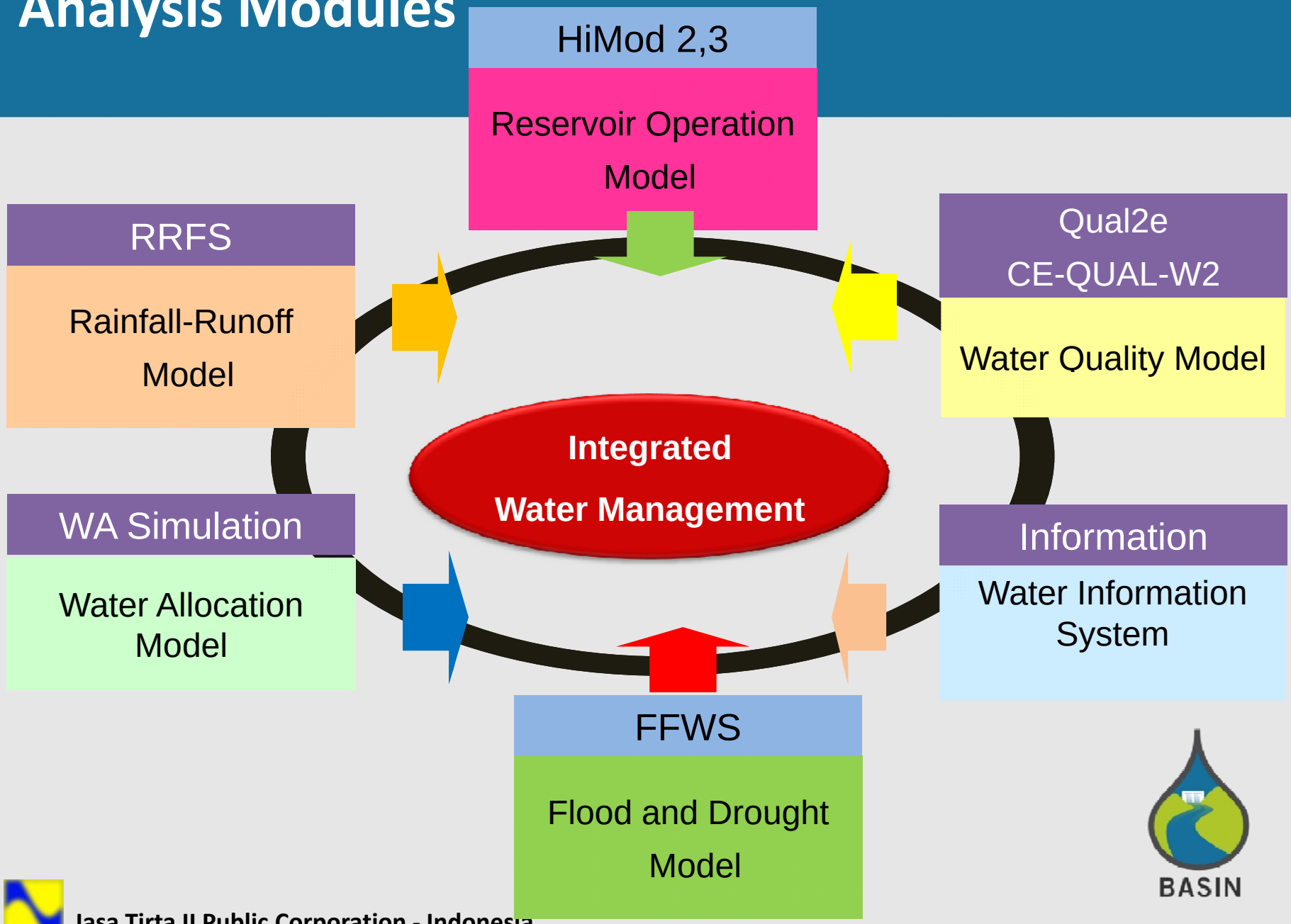
Overview of DSS in Citarum River Basin



Analysis Modules



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Database Structure

- **Database structure for Rainfall-Runoff Modeling**
  - The database structure and data requirement for Rainfall-Runoff modeling is the essential required data are rainfall, temperature, dam release, water demand, and water level (stream flow) data.
- **Database structure for Water Allocation Model**
  - The required database structure and datasets for water allocation model will depend upon the detail of watershed to be managed. At the minimum, control, discharge and flow data for all the reservoirs as well as predicted water demand for agriculture and urban consumption is required.
- **Database structure for Water Quality Modeling**
  - The required database structure and datasets for water quality modeling make the QUAL 2E PLUS model will be used for stream water quality modeling. The model will require flow data as well as field water quality data, withdrawal data, and point and non-point pollutant sources data.

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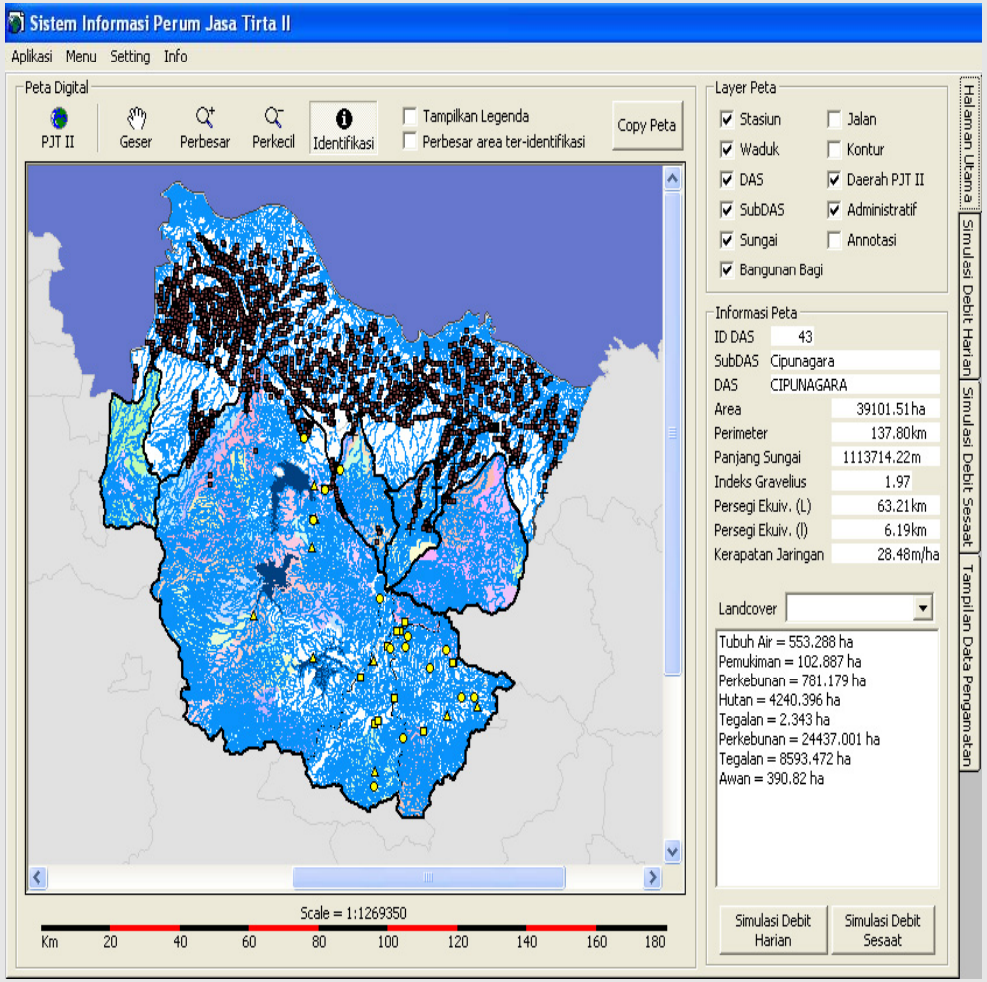
Configuration of GIS based system

- The database will utilize oracle for database support, ESRI software for geospatial data storage and management and be editable through web browser or Arc Editor depending on user licenses.
- The other sub-system support the regulatory activities of the area, including the discharge licensing system and compliance monitoring system.
- A such, the database would serve not just as a data processing and storage system, but more importantly as a management and decision-making support.
- The database system should be designed to facilitate access to socio-economic information via meta-databases.

Display of DSS for IWRM in Citarum River Basin



1. SPATIAL DATA

- River Basin and Sub of Citarum River Basin and some of Ciliwung-Cisadane River Basin
- Map of Land use
- Hydrological Network
- Infrastructures of Water Resource

2. TABULAR DATA

- Flow in Hydrometri Post
- Flow in ware
- Rainfall
- Climate
- Management of Reservoir Cascade of Citarum
- Water Quality
- Measurement of sedimentation at Ir. H. Djuanda Reservoir

3. MODEL

- Simulation of instantaneous flow
- Simulation of daily flow
- Simulation of sediment transport
- etc

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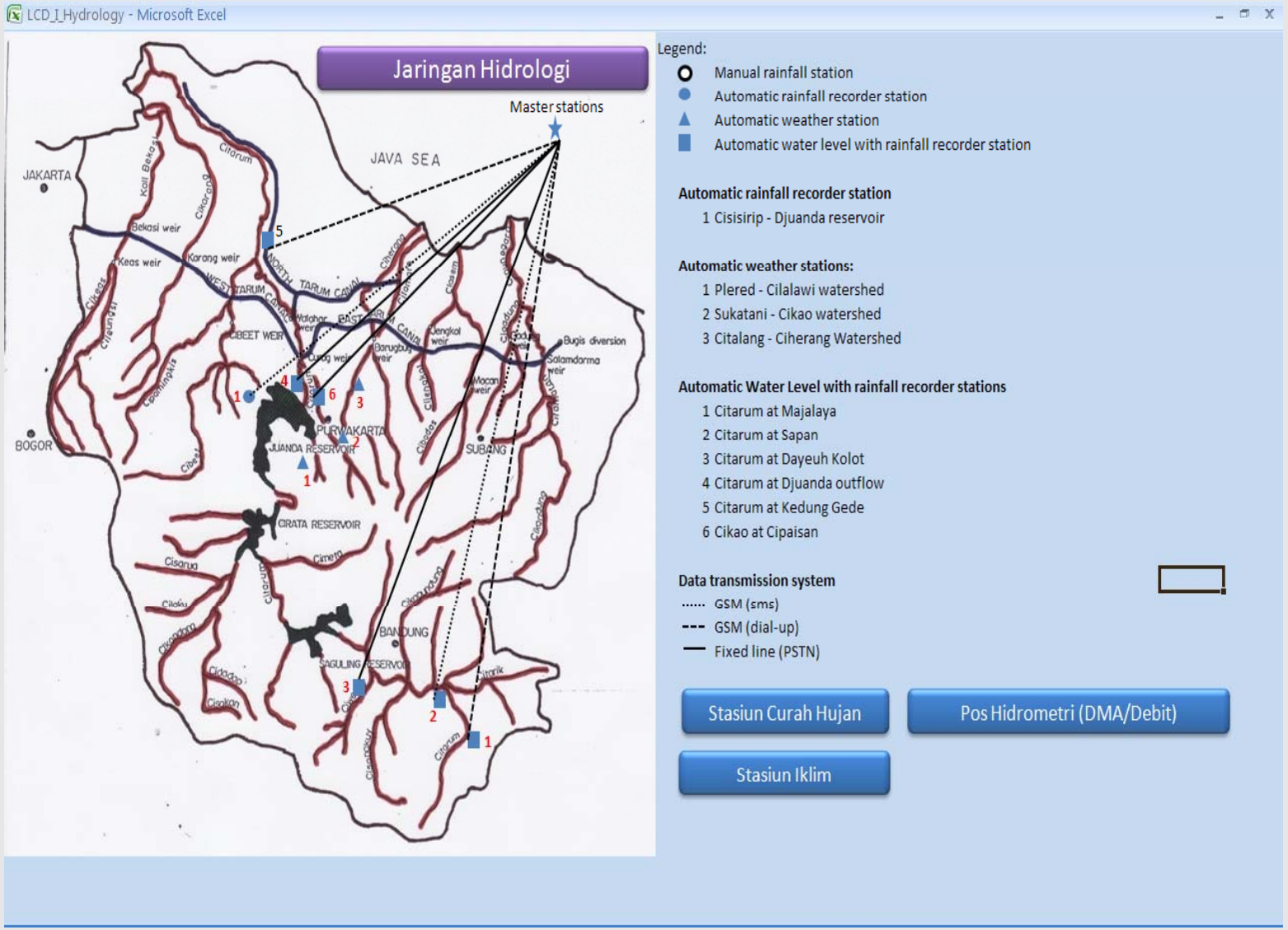
Hydrological Network



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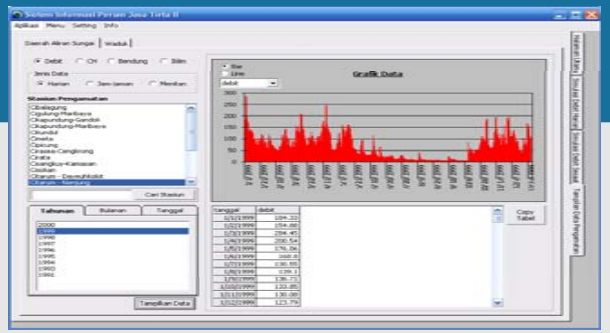
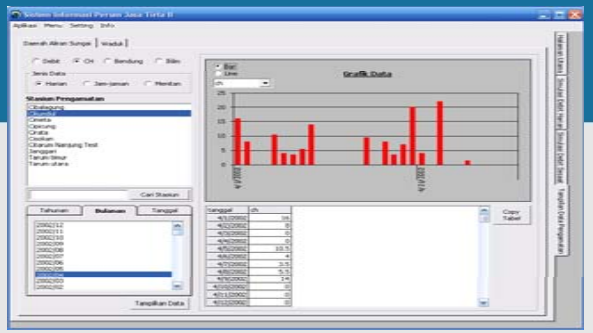
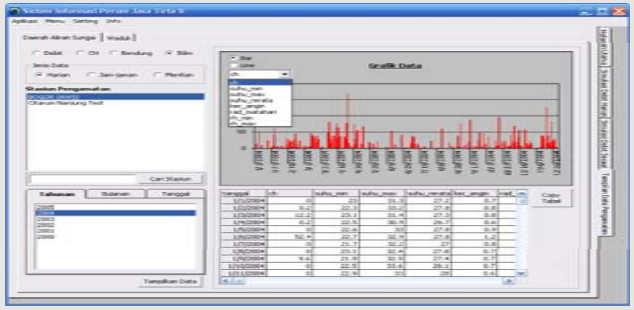
Tabular data Information in the DSS



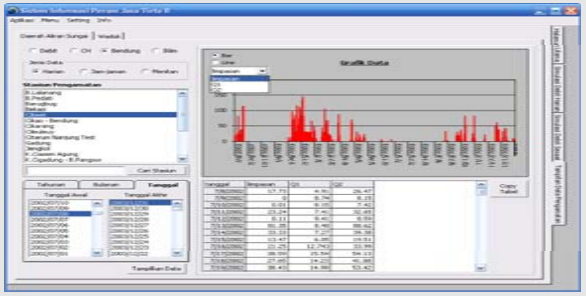
a. Discharge Data Observations



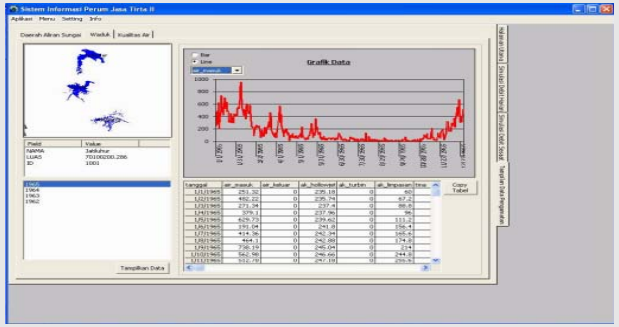
b. Rainfall Data Observations



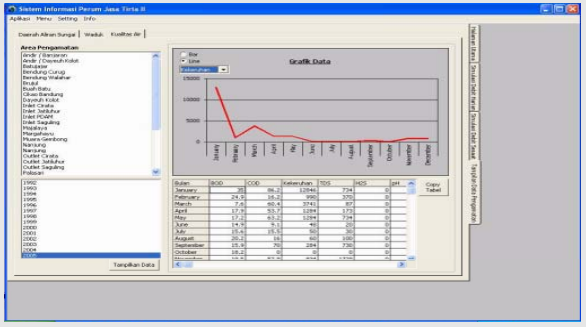
c. Weir Discharge Data



d. Climate Data Observations



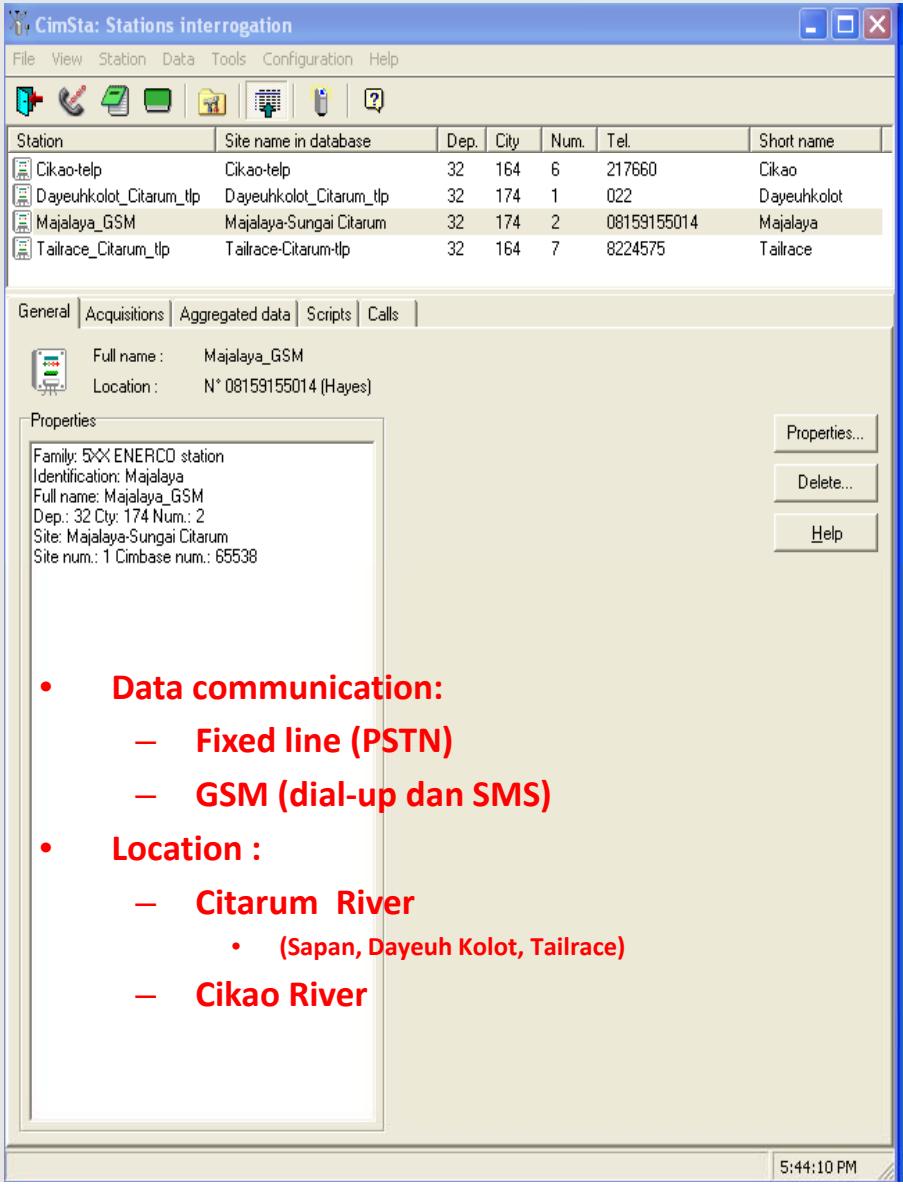
e. Water Level Dam Data



d. Water Quality Data

BASIN

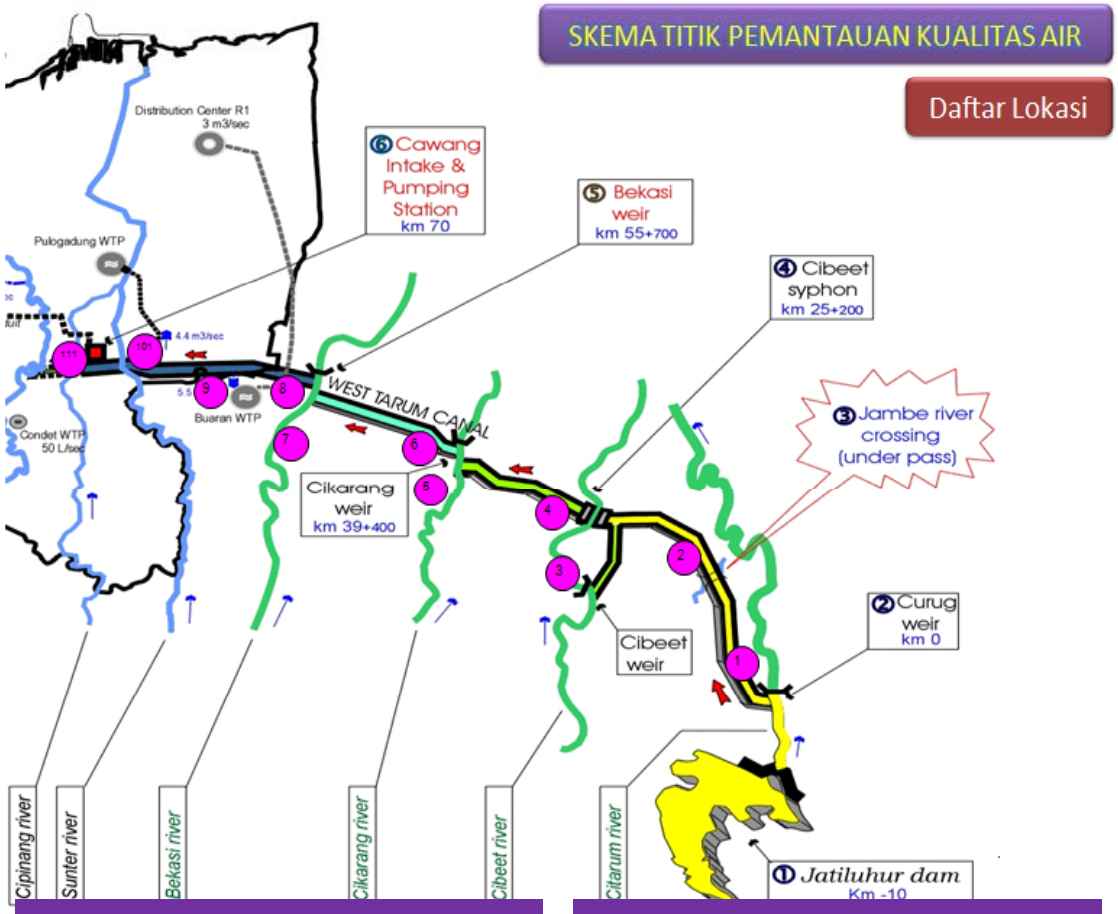
Telemetry System



- **Data communication:**
  - **Fixed line (PSTN)**
  - **GSM (dial-up dan SMS)**
- **Location :**
  - **Citarum River**
    - **(Sapan, Dayeuh Kolot, Tailrace)**
  - **Cikao River**

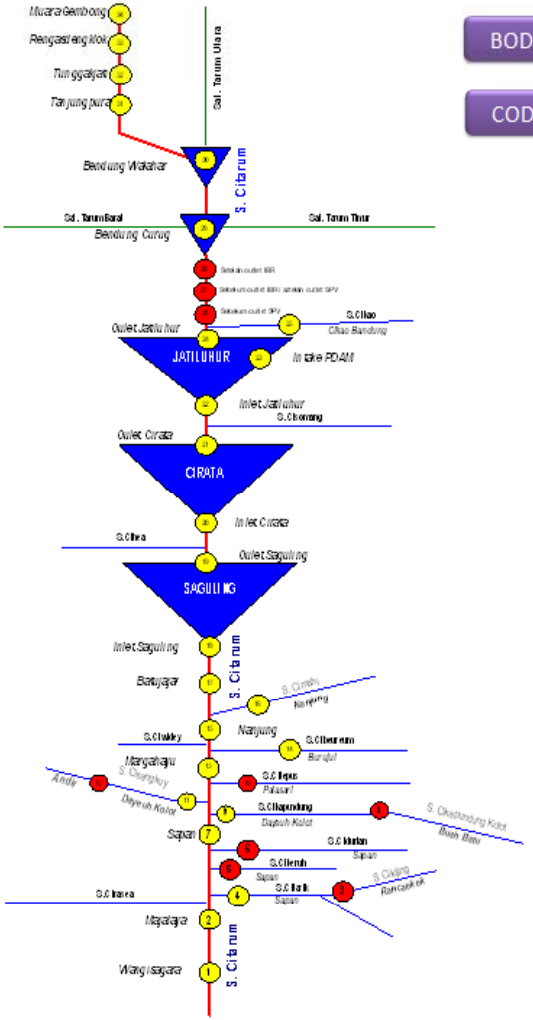
Water Quality Monitoring Point

Tampilan WQS [Compatibility Mode] - Microsoft Excel



Condition of Water Quality Monitoring Point – Citarum

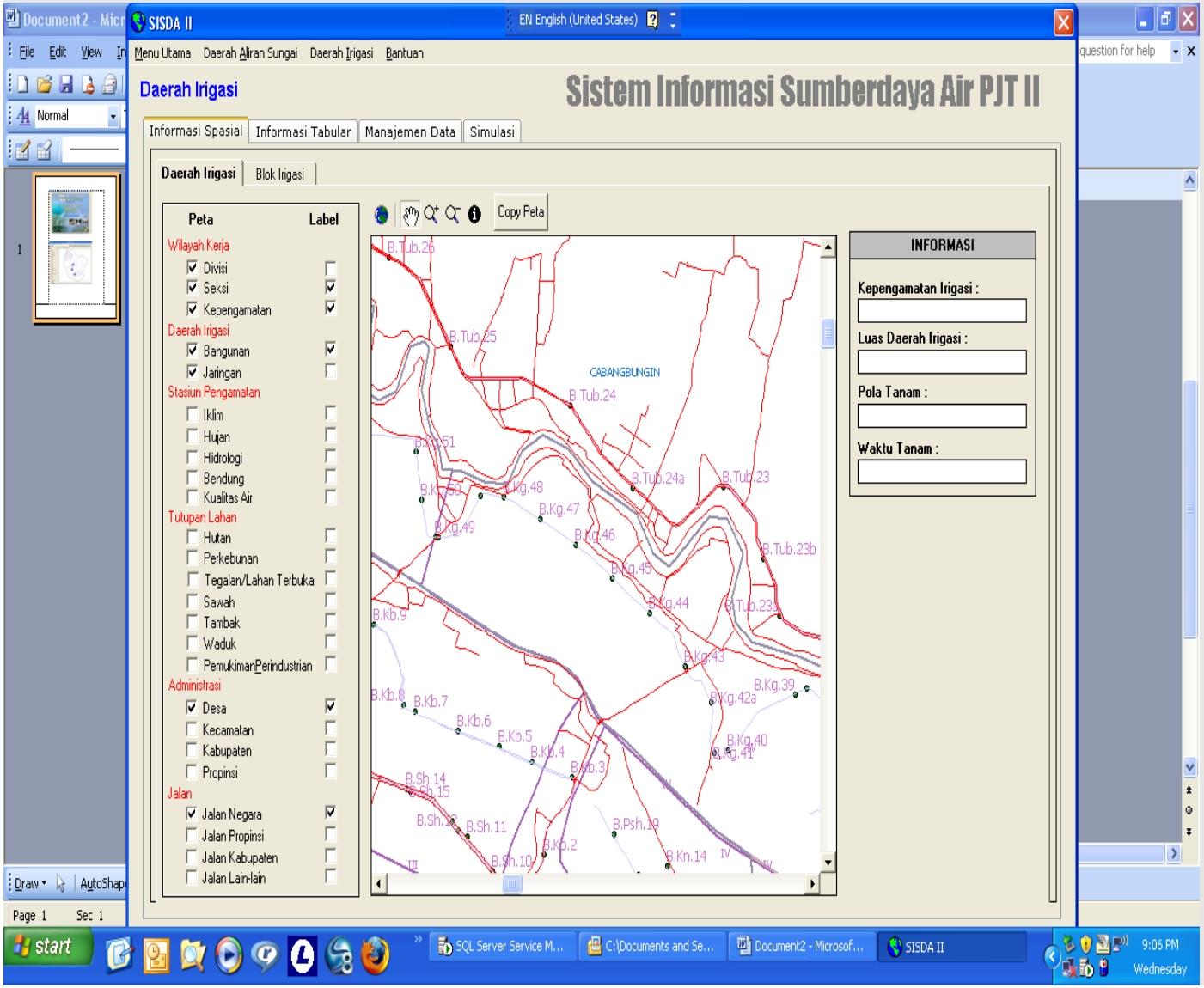
Kondisi Titik Pemantauan Kualitas Air Ruas S.Citarum



Condition of Water Quality Monitoring Point – West Tarum Canal

Kondisi Titik Pemantauan Kualitas Air Ruas STB

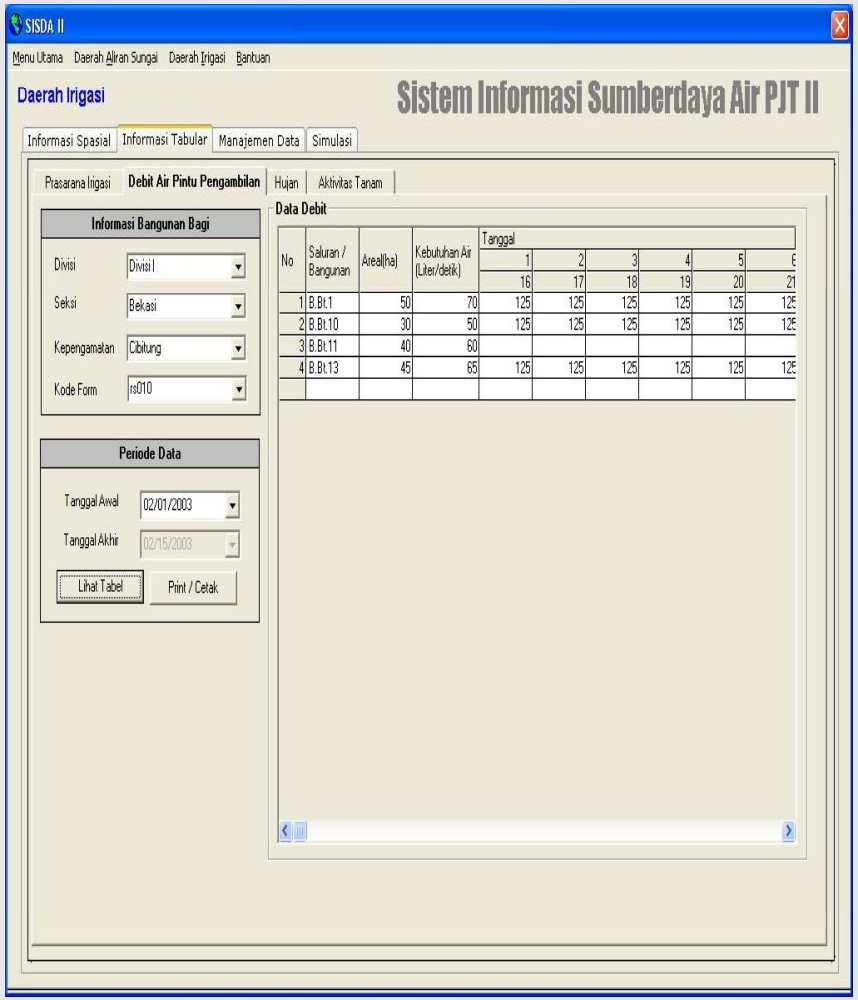
Irrigation Area Spatial Information

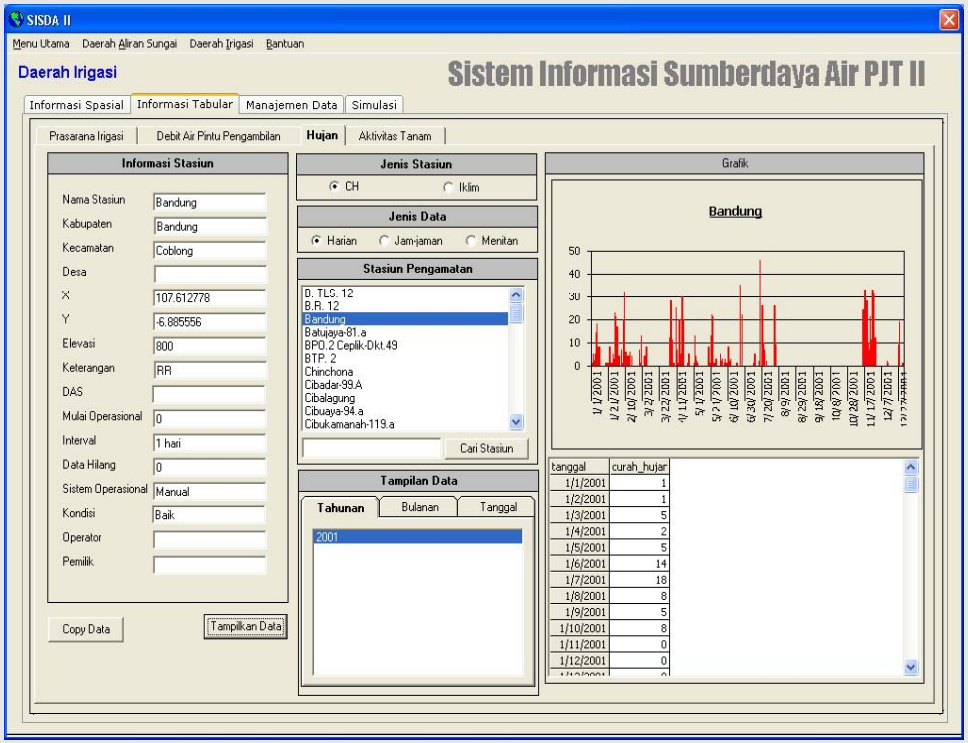


- Irrigation infrastructure
- Irrigation network
- Paddy Field
- Division
- River
- Administrative area
- Rainfall station

BASIN

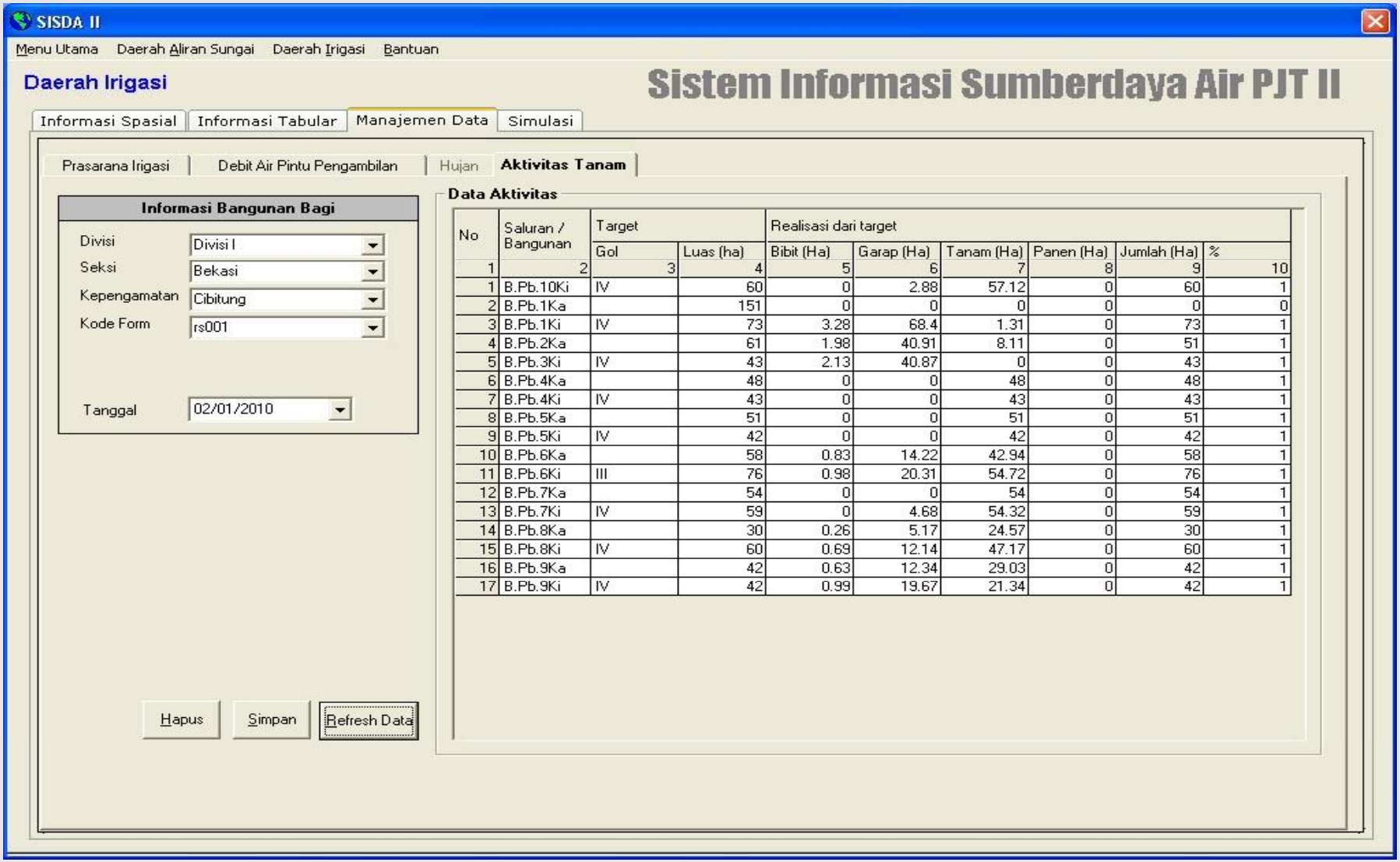
Hydrology and Meteorological Data Tabular Information





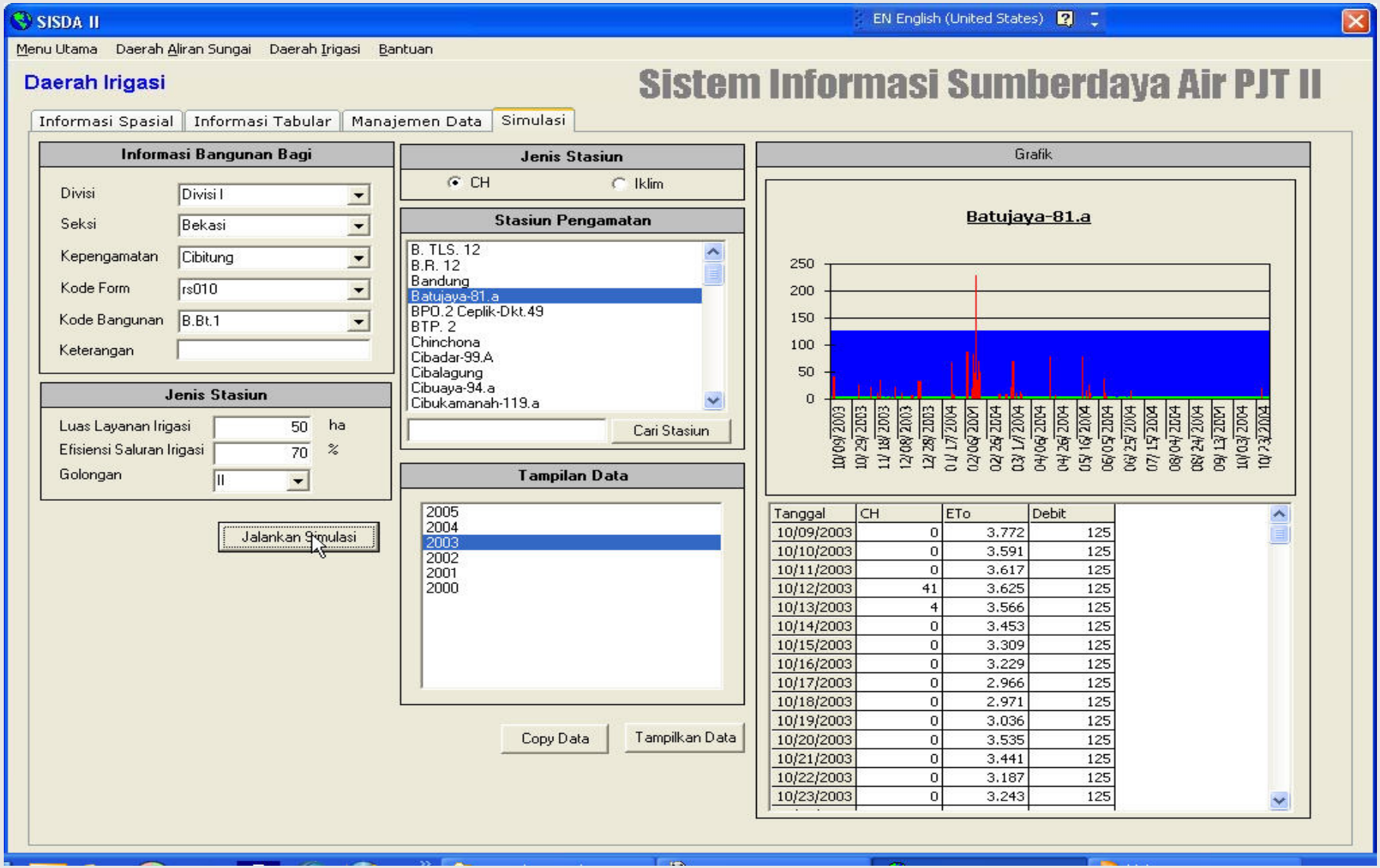
BASIN

Paddy Cropping activity (Tabular Information)

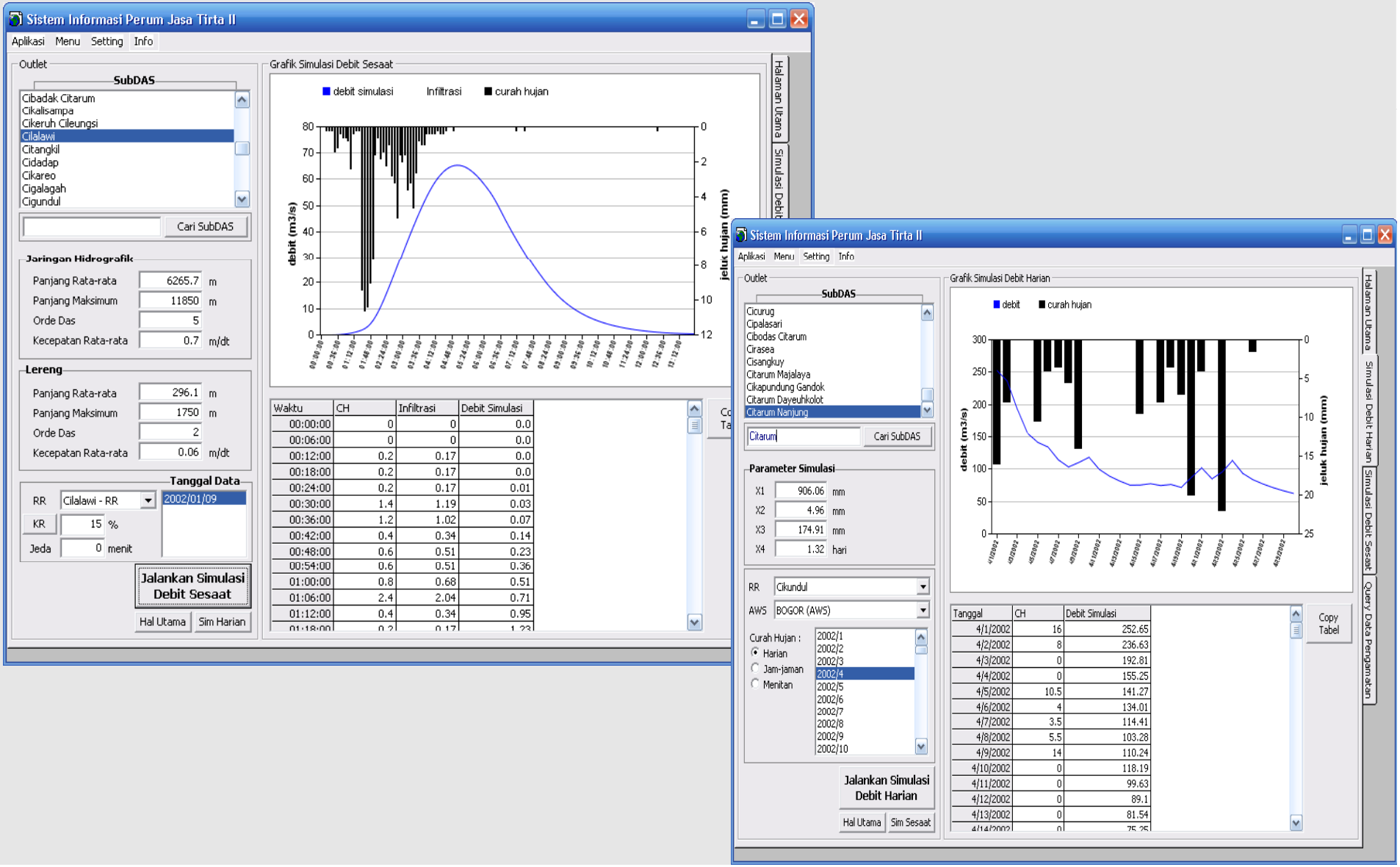


No	Saluran / Bangunan	Target		Realisasi dari target					
		Gol	Luas (ha)	Bibit (Ha)	Garap (Ha)	Tanam (Ha)	Panen (Ha)	Jumlah (Ha)	%
1	2	3	4	5	6	7	8	9	10
1	B.Pb.10Ki	IV	60	0	2.88	57.12	0	60	1
2	B.Pb.1Ka		151	0	0	0	0	0	0
3	B.Pb.1Ki	IV	73	3.28	68.4	1.31	0	73	1
4	B.Pb.2Ka		61	1.98	40.91	8.11	0	51	1
5	B.Pb.3Ki	IV	43	2.13	40.87	0	0	43	1
6	B.Pb.4Ka		48	0	0	48	0	48	1
7	B.Pb.4Ki	IV	43	0	0	43	0	43	1
8	B.Pb.5Ka		51	0	0	51	0	51	1
9	B.Pb.5Ki	IV	42	0	0	42	0	42	1
10	B.Pb.6Ka		58	0.83	14.22	42.94	0	58	1
11	B.Pb.6Ki	III	76	0.98	20.31	54.72	0	76	1
12	B.Pb.7Ka		54	0	0	54	0	54	1
13	B.Pb.7Ki	IV	59	0	4.68	54.32	0	59	1
14	B.Pb.8Ka		30	0.26	5.17	24.57	0	30	1
15	B.Pb.8Ki	IV	60	0.69	12.14	47.17	0	60	1
16	B.Pb.9Ka		42	0.63	12.34	29.03	0	42	1
17	B.Pb.9Ki	IV	42	0.99	19.67	21.34	0	42	1

Simulation of Irrigation water balance



Simulation Model
(Daily and Instantaneous Discharge)



Conclusion and Recommendation

- The water resources of the rivers systems in the Citarum River Basin (CRB) are critical to social and economic development of the country.
- Information sharing is a basic principle IWRM planning and data, information, and decision support are key components to the roadmap for IWRM in the Citarum River Basin.
- DSS of CRB is proved to be useful and needed in managing water resources.
- Addition of automatic precipitation station to integrate with hydrometric stations.
- Development of model and scenarios
- Data catalogue, custodian, sharing information and accessibility which related to water resource among institutions

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Thank you

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