NIH_ReSyP – A Reservoir Systems Package Developed at NIH

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Salient Features of NIH_ReSyP

- A number of programs developed for reservoir analysis problems merged to make ReSyP.
- Core in Fortran; forms and chores in Visual BASIC.
- Runs under Windows environment.
- Does not need any specific software or hardware.
- Provides a user-friendly environment.
- Results are presented in tabular and graphical form.
- Online Help is available.
- Results including graphs generated can be used in other applications by cut-copy-paste.
- Data can be prepared in MS-Excel and pasted in input forms or vice-versa.
Developed By:
Water Resources Systems Division
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Analysis Options Available in NIH ReSyP

- Reservoir capacity estimation using sequent-peak method
- Storage-Yield-Reliability analysis
- Hydropower analysis
- Operation analysis of a Multi-purpose Multi-reservoir system for conservation purposes
- Operation analysis of a Multi-purpose Multi-reservoir system for flood control
- Reservoir sedimentation analysis
- Probable inflow estimation
- Reservoir routing
- Estimation of trial Rule Curves for a reservoir
- Interpolation of elevation-area-capacity (EAC) table
- Reservoir inflow estimation using rate of rise method
Analysis Ladder for a Module of NIH_ReSyP

NIH Reservoir Systems Package (NIH_ReSyP)

Sequent-Peak Analysis
- Fill Data Form
- Analyze

Storage-Yield Analysis
- View Input/Output
- Help

Cap-Comp
- Cons-Oper
- Flood-Oper
- Res-Rout
- Hydro-Power
- Tainter-Gate-Oper
- E-A-C Interpolation
- Inflow-Estimation
- Help
- Exit

Graphs of last Analysis
- Tabular
- Using Excel
- Using MSChart

National Institute of Hydrology
उत्तराखंड जल विज्ञान संस्थान
आपी हिटा मयोमुख
Sample Input-Output of NIH_ReSyP

Sample Data Input Form

Sample Analysis Window

Sample Graphical Output

Sample Tabular Output
Operates a multi-reservoir system for D&I demands, irrigation, hydropower, and minimum flow requirements.

Any configuration of storage & diversion structures can be simulated.

Ten-daily or Monthly time steps can be used.

Interbasin water transfer can be simulated.

Rule-curves based operation is followed. ReSyP helps fine-tune operation policy of a reservoir system.

Reliabilities/resilience/vulnerability of structures are computed.

User-controlled detailed working table is generated for all dams/diversions.
Conservation Operation of a Multi-reservoir System

Rule-curve based operation

Input Data Form

Input data Form

Option for Graphical Output
Systems studied: Sabarmati, Machhu, Bargi, Vellar, Peninsular Part of River Interlinking Scheme, Ken-Betwa Interlinking project, ... 


Flood Operation of a Multi-reservoir System

- For operation analysis of a multi-reservoir system for flood control.
- Any configuration of storage & diversion structures can be simulated.
- Time steps – Multi-hours.
- For each structure, inflow hydrograph + flow from intermediate catchment is needed.
- Each reservoir is operated so that incoming flood is passed safely with least d/s flooding while ensuring safety of dam.
- Several methods are available for channel routing.
- User-controlled detailed working table is generated for all dams/ diversions.
Flood Operation of a Multi-reservoir System

Flood control operation

Input Data Form

Graphical Output
Capacity Computation Using Sequent Peak Method

Sequent Peak Algorithm

Input Data Form

Data Form for Tabular Data

Graphical Output
Firm Power Determination

- Maximum possible firm power depends upon the site conditions, hydrology of the area, type of load, and features of power plant.
- An optimization algorithm is used to determine firm power from a reservoir.
- SLOP is used for simulation of reservoir operation. Computations are repeated till convergence is attained.

Hydropower Simulation

- Knowing the given power demand, the reservoir simulation is carried out to find out power generation and reliabilities.
Sample Output file Generated

Reservoir Storage Required = 2812.22 M Cum, Number of Failures = 125
Reliability Achieved = .61

Reservoir Monthly Working Table

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<th>Month</th>
<th>Ini_Sto</th>
<th>Inflow</th>
<th>Demand</th>
<th>Release</th>
<th>Evap</th>
<th>End_Sto</th>
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Input Data Form

Sample Output file Generated

RULE CURVE DERIVATION FOR A RESERVOIR

Upper Rule Curve Levels (Jan...Dec)
416.59  413.70  411.26  408.55  406.02  422.76  422.76
422.76  422.76  422.76  420.97  419.17

Irrigation Rule Curve Levels (Jan...Dec)
416.59  413.70  411.26  408.55  406.02  415.81  418.13
420.44  422.76  422.76  420.97  419.17

Hydropower Rule Curve Levels (Jan...Dec)
413.66  412.57  411.26  408.55  406.02  403.55  407.93
412.31  416.69  418.50  416.54  415.22

Domestic Supply Rule Curve Levels (Jan...Dec)
403.76  403.79  403.82  403.78  403.68  403.55  403.58
403.61  403.64  403.67  403.70  403.73

Spill Zone
Full Supply Zone
Restricted Irrigation Zone
Domestic Supply Reserve Zone

Graphical Output
Reservoir Sedimentation Analysis

Empirical Area Reduction Method

Input Data Form

Tabular Output

Graphical Output
We present a package for various analyses pertaining to a (system of) reservoirs.

A Windows based GUI and input menu screens have been developed for easier use.

Tabular & graphical options with inter-portability of data from MS-Excel.

Software can be used to develop conservation and flood control policy for a system of reservoirs. It can also consider inter-basin water transfer.

Software is continuously up-dated with regular annual trainings and is nominally priced.

Looking for feedbacks to improve.
Hydrology and Water Resources Information System for India

www.nih.ernet.in/rbis/rbis
Note: For international / state boundaries and coastline, authoritative Survey of India maps may be referred to.