Deployment of SWAT-DEG as a Web Infrastructure Utilizing Cloud Computing for Stream Restoration

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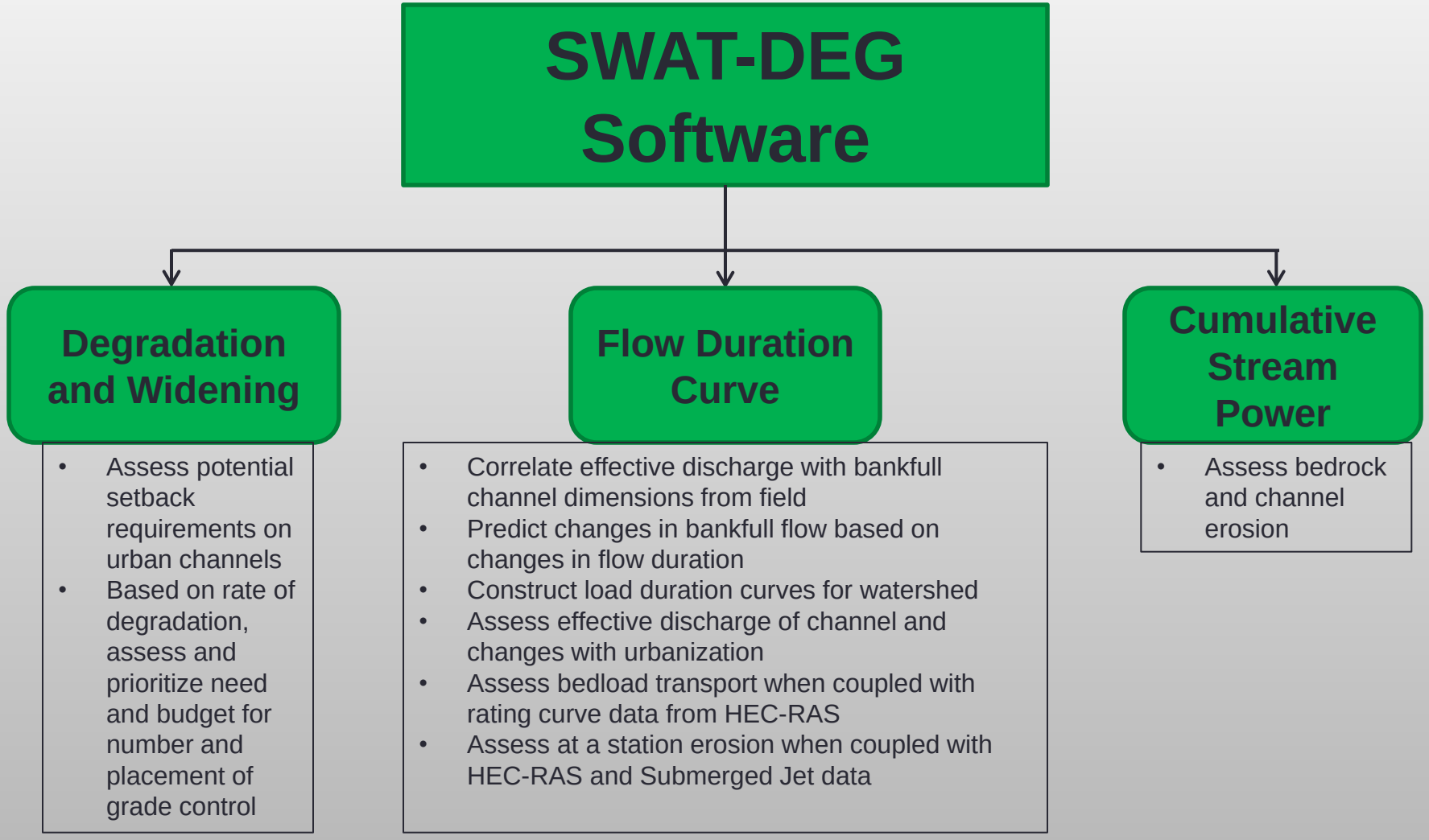
River Restoration

- Rapidly growing
  - Expenditures averaging > $1 billion a year
- National Database
  - Water Quality (27%)
  - Riparian Mangement (26.5%)
  - Bank Stabilitation (12%)
- Stakeholders

Model – SWAT-DEG

- SWAT-DEG
  - Degradation and Widening
  - Flow Duration Curve
  - Cumulative Stream Power
- Problems
  - Scalability
  - Accessibility

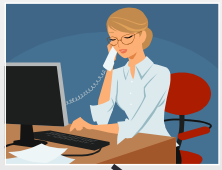
SWAT-DEG's output for stream assessment

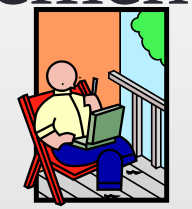


Accessibility

- Web Deployment:
  - Minimizes
    - Installation
    - Desktop software
  - Enables
    - Universal access
      - Devices
      - Location
    - Server based functions (eRAMS)
      - Access multiple models
    - Comprehensive approach
    - Interactive graphics

Environmental Risk Assessment and Management System





eRAMS.com

My Account

- Share Documents
- Store GIS Layers
- Upload Documents
- Upload Pictures
- Upload Videos
- Download
- Manage Projects

GIS/Analysis

- Manipulate Layers
- Online GIS Functions
- Models tied with GIS
- View Built in Layers
  - NHD Layers
  - Google like map
  - Ownership map

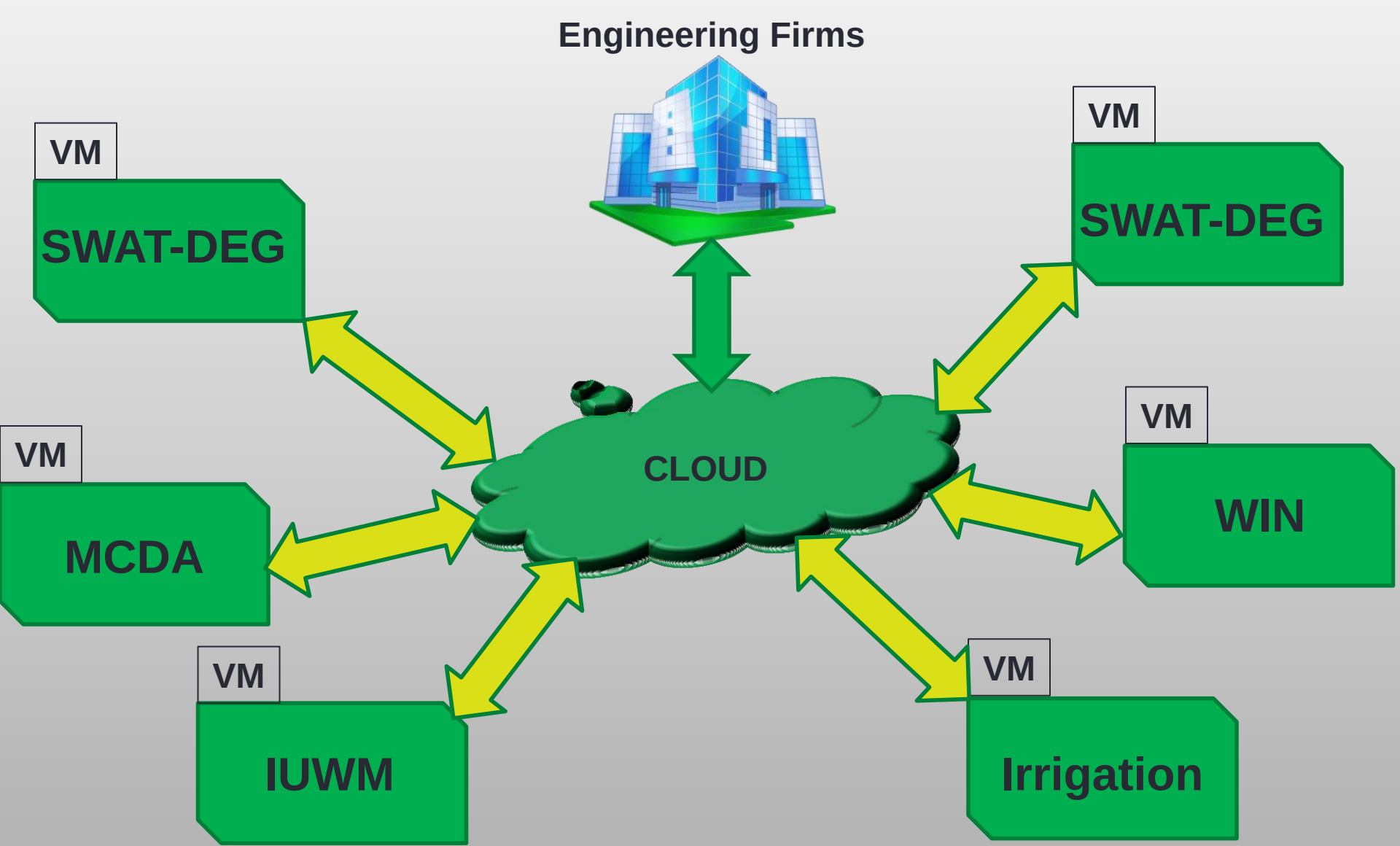
Tools

- MCDA
- HRU Delineation
- Irrigation
- Load Duration Curve
- Water Innovation Network
- Integrated Urban Water Management
- Data Downloads
- SWAT Conservation Plan

Scalability

- Cloud deployment:
  - eRAMS utilizes the Cloud Services Innovation Platform (CSIP)
    - Scalable cluster of computers create a computing resource
    - Automated deployment of models
  - Minimizes:
    - Model runtime
  - Enables:
    - Parallel computing
    - Multiple model runs
    - Automated distribution of inputs

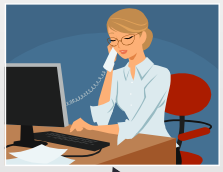
Cloud Computing



Future SWAT-DEG

- Uncertainty analysis
  - Monte Carlo Sampling Method
- Multiple runs
- Loading tests
  - Bottlenecks

Placing models into the Web Cloud



User Defined Database

eRAMS.com

Public Database

CSIP

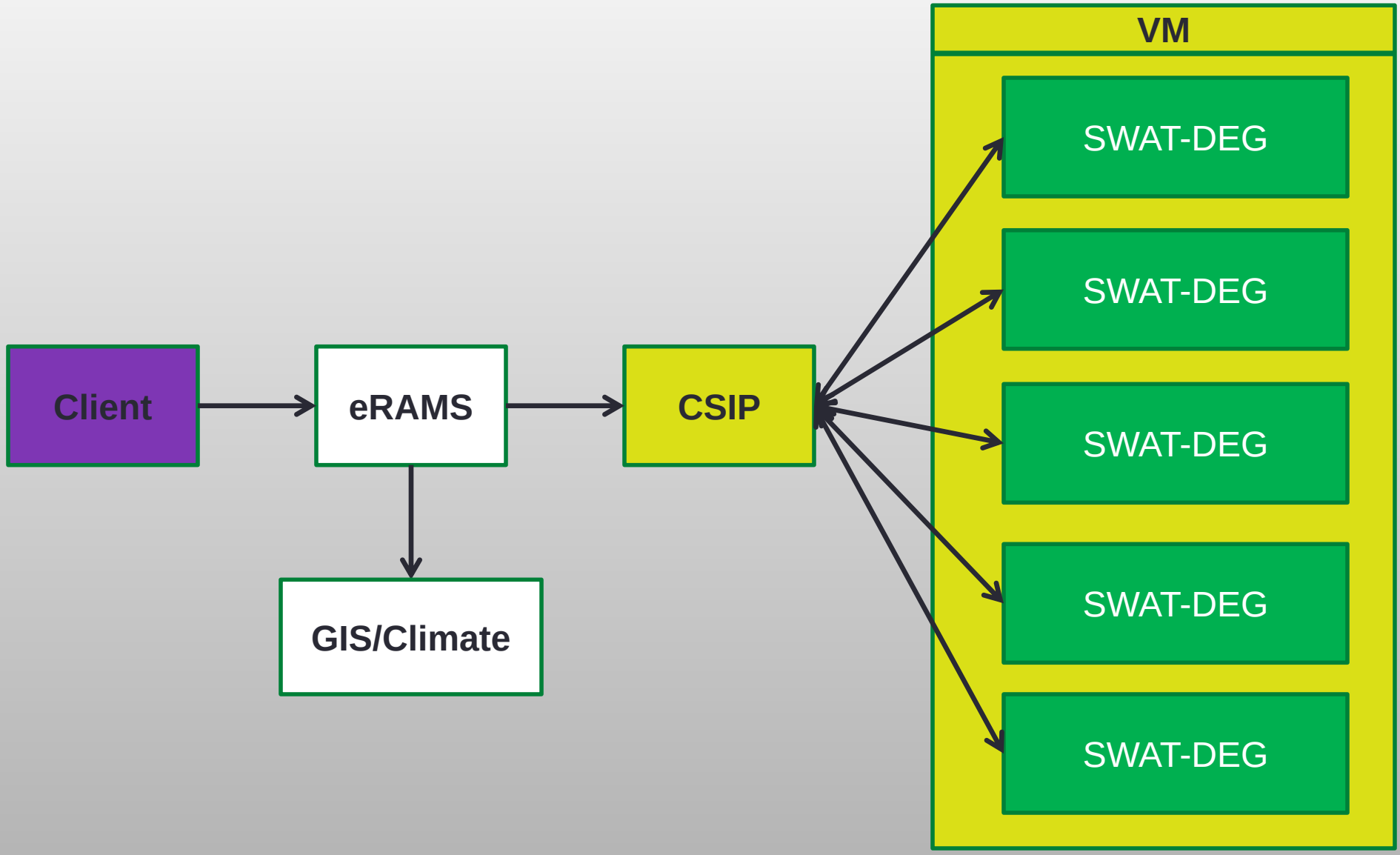
VM_n

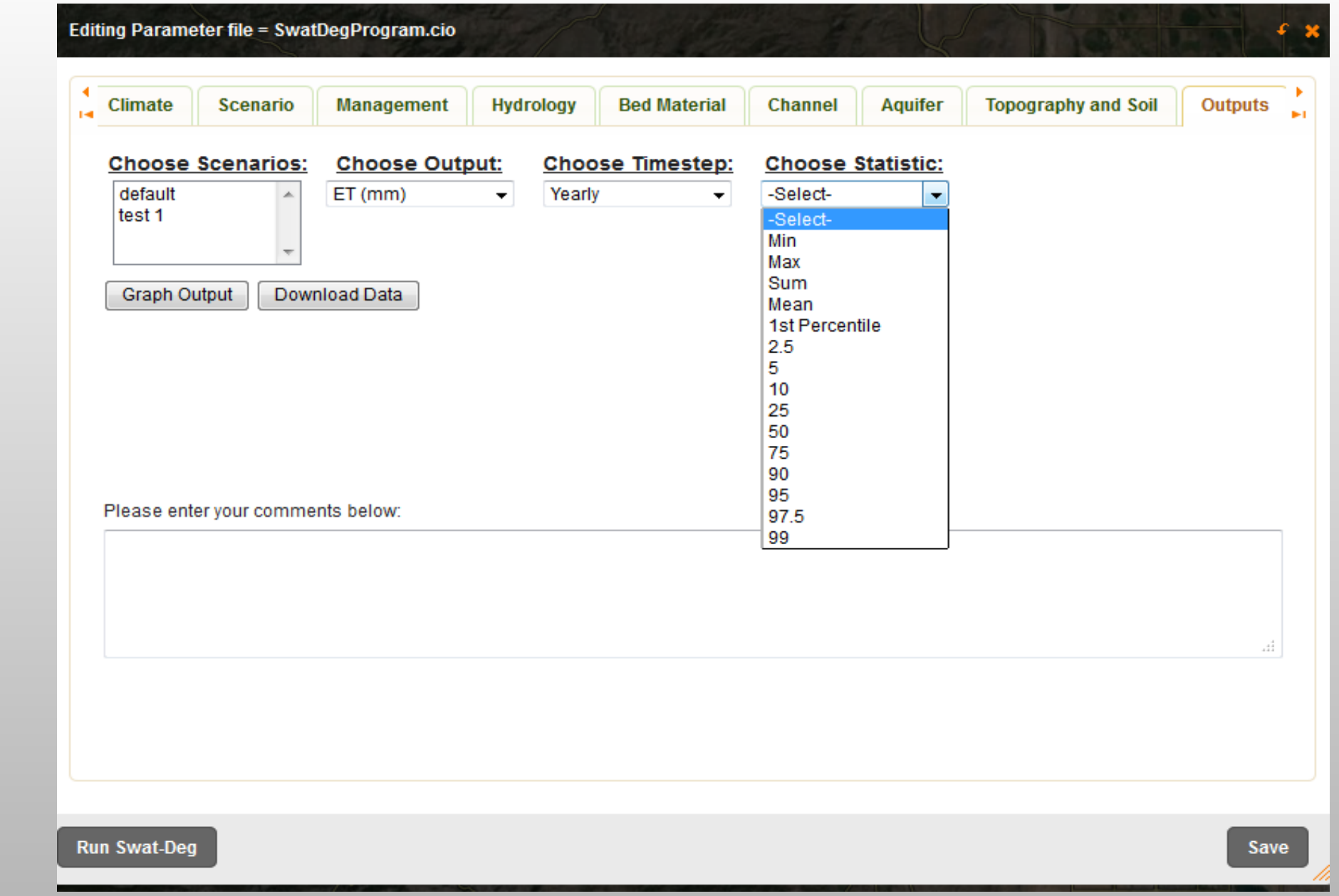
VM_1

VM_0

SWAT-DEG

Infrastructure of SWAT-DEG

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Climate
Scenario
Management
Hydrology
Bed Material
Channel
Aquifer
Topography and Soil
Outputs
Choose Scenarios:
default
test 1
Choose Output:
ET (mm)
Choose Timestep:
Yearly
Choose Statistic:
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-Select-
Min
Max
Sum
Mean
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2.5
5
10
25
50
75
90
95
97.5
99
Graph Output
Download Data
Please enter your comments below:
Run Swat-Deg
Save

Conclusions

- SWAT-DEG
  - channel stability evaluation
- Internet
  - Location independent
  - Multiple models (eRAMS)
- Cloud
  - Maximize CPU resources
  - Maximize user efficiency

Questions ???

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References

- Lloyd, W., O. David, J. Lyon, K.W. Rojas, J.C. Ascough II, T.R. Green, J.R. Carlson. 2012. “The Cloud Services Innovation Platform-Enabling Service-Based Environmental Modelling Using Infrastructure-as-a-Service Cloud Computing.” International Environmental Modelling and Software Society.