



μ μ

μμ

:

:

μ

μ

μ

μ :

11

:

μ

μ

· , · · · ·

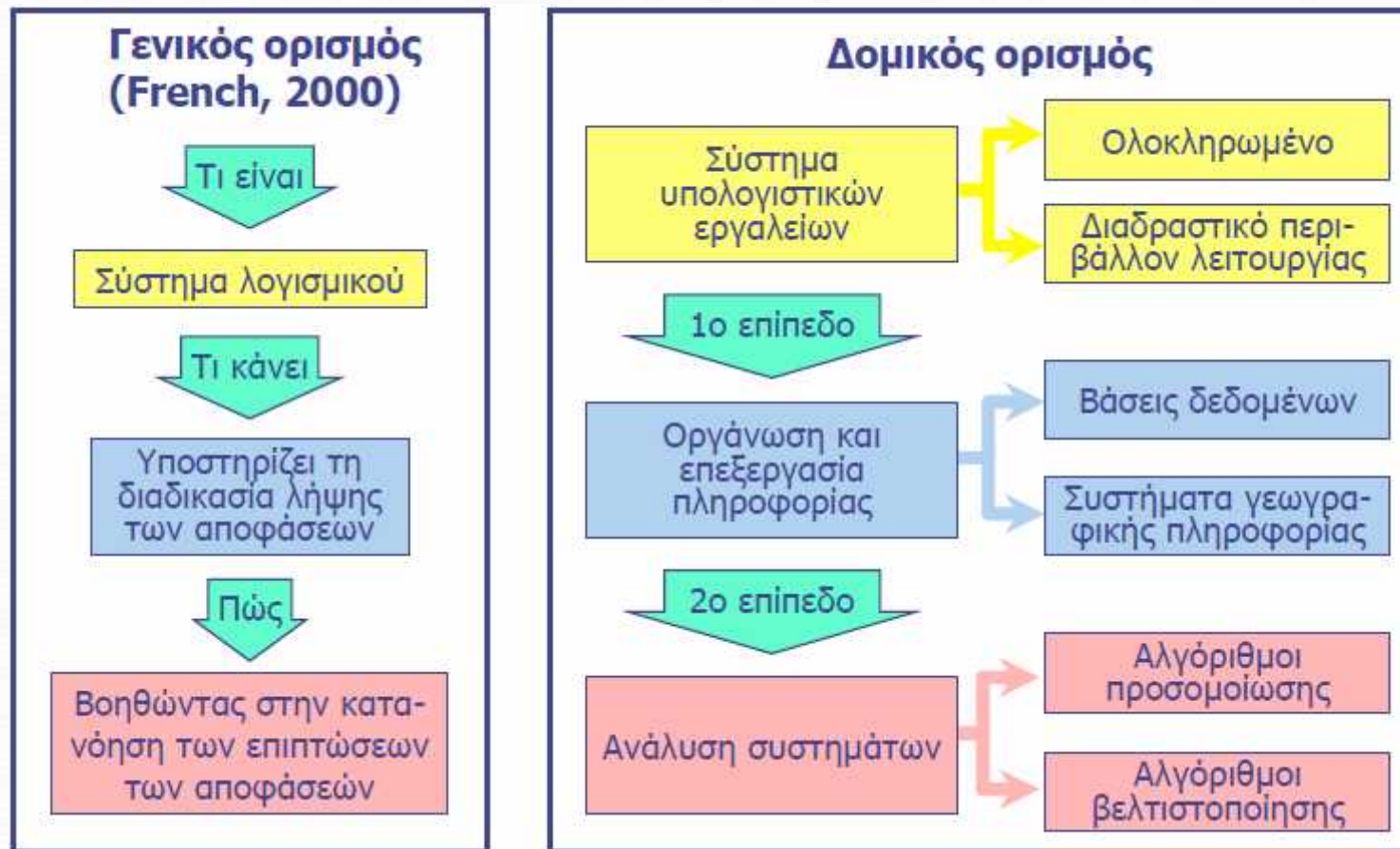
μ

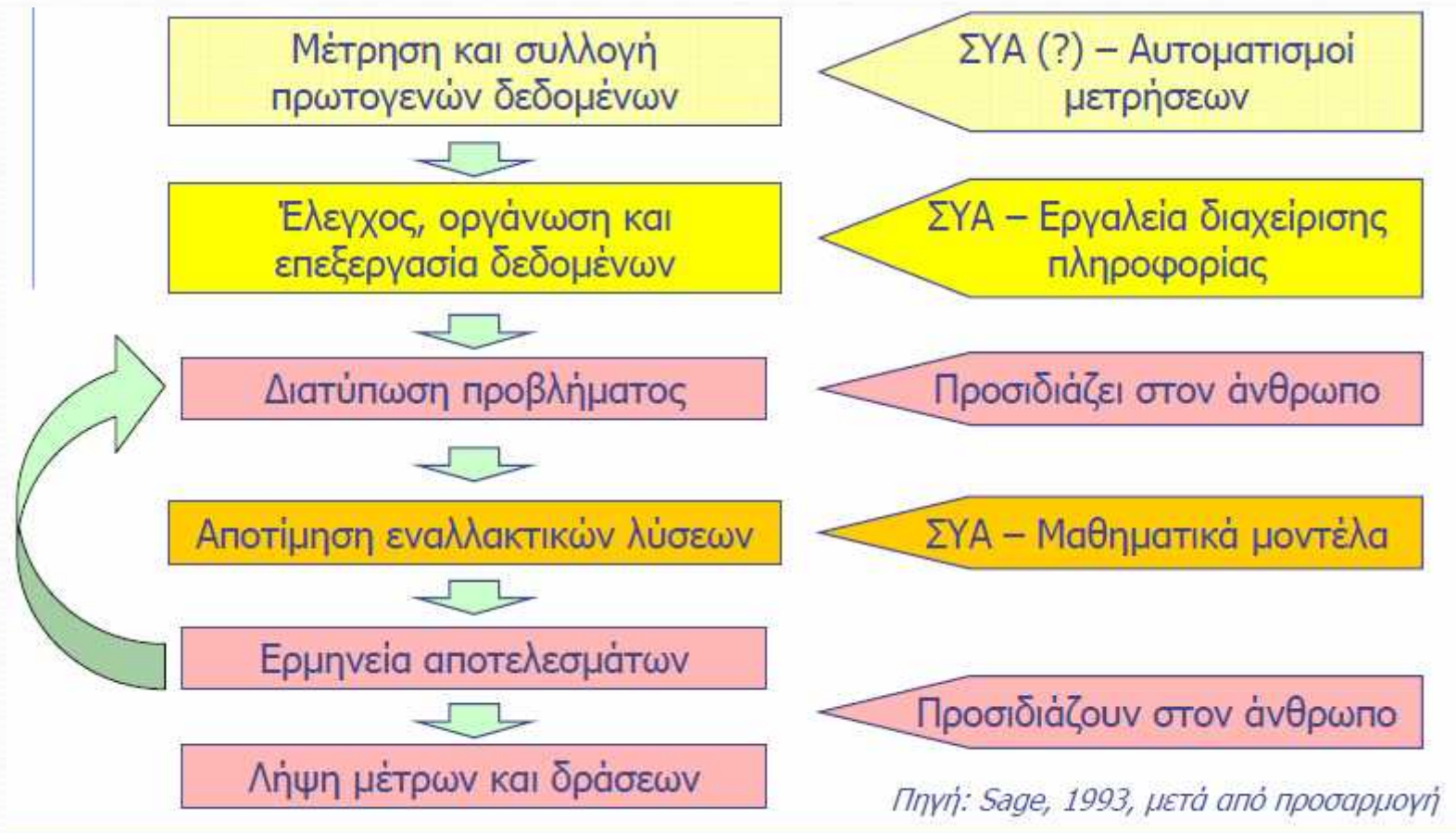
μ

,

:

➤ **μ μ**  
(decision support systems, )





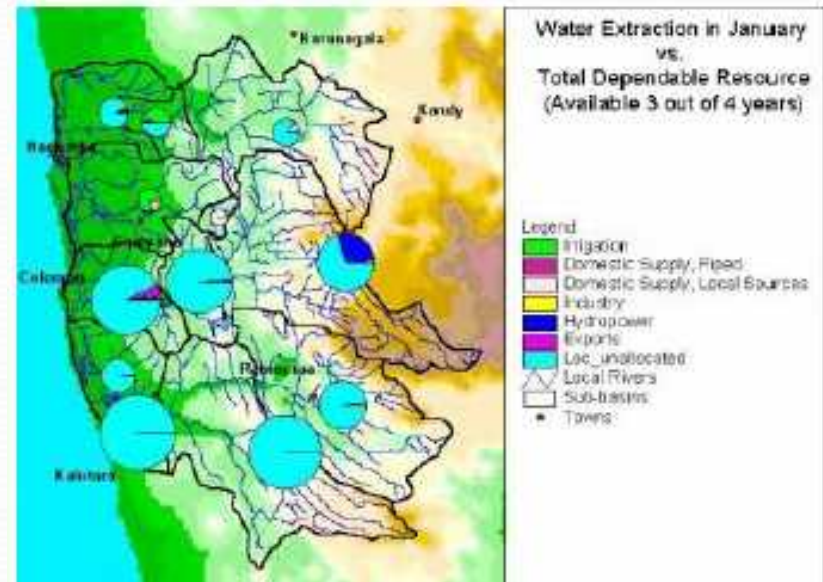
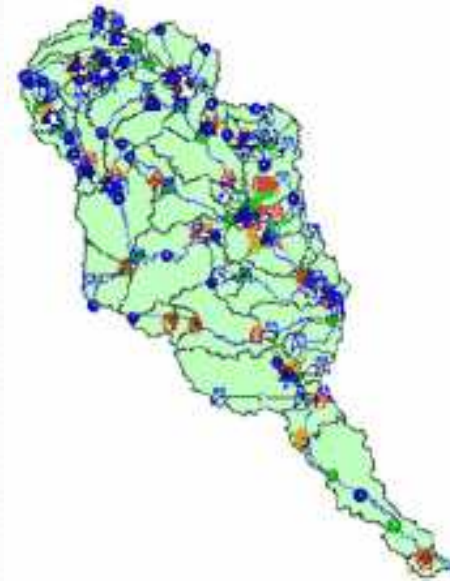




- $\mu - \mu$  :
- $\mu$
- $\mu$
- $\mu$  :
- $(\mu - \mu)$
- $(\mu - \mu)$
- $\mu$  :
- $\mu$
- $\mu$
- $\mu$
- $\mu$  :
- $\mu$
- $\mu$
- $\mu$

# ➤ μ MIKE-BASIN (DHI Software)

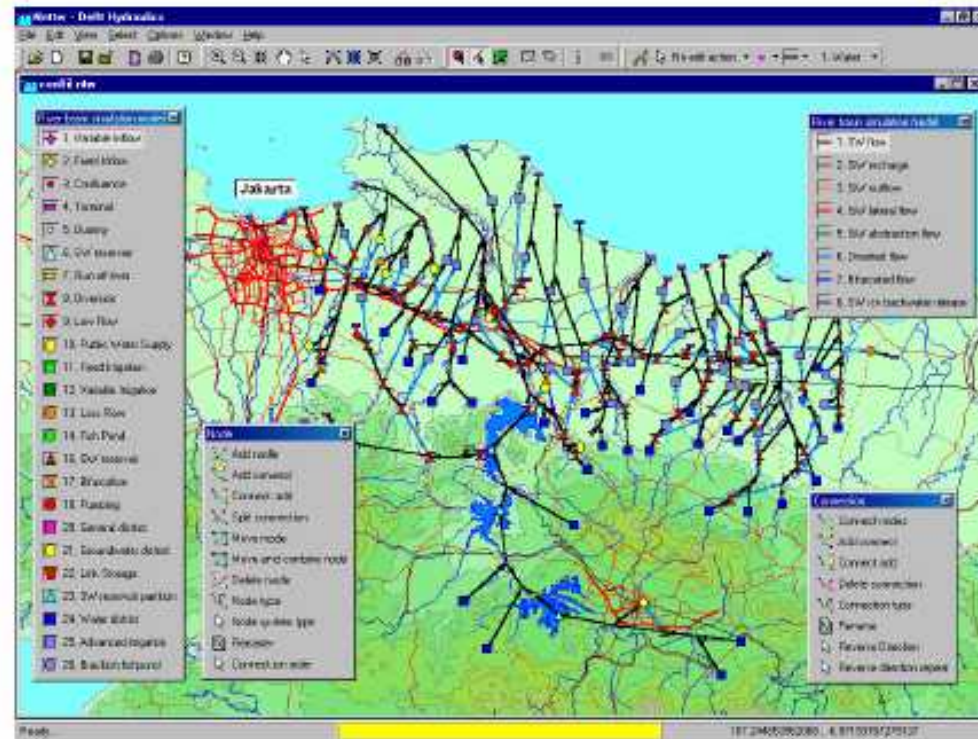
- ArcGIS, μ
- μ μ ,
- μ .
- μμ
- , μ
- μ μ
- Visual Basic.
- μ μ
- (solver) Excel,
- μ μ μ ,
- μ μ .



➤ μ RIBASIM (Delft Hydraulics)

- μ , μ μ μ μ μ .
- μ μ μ HYMOS ,
- μ μ μ (SACRAMENTO)
- μ μ (DELWAQ).

- μ μ .
- μ μ , -
- μ μ , μ
- μ .
- μ μ .





μ

# WEAP (Stockholm Environment Institute)



μ

,

μ

μ

.



μ

,

μ

,

(what if-)

.

μ

μ

μ

μ

.



μ

,

.



,

,

,

μ

,

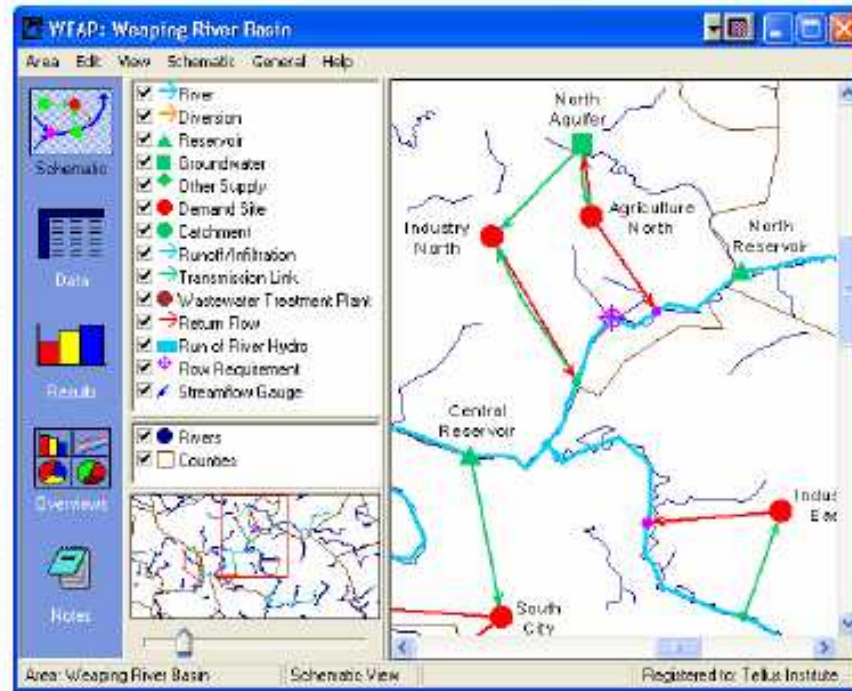
,

μ

μ

,

...









$\mu$   $\mu$   $\mu$   $:$



$\mu$  ;



$\mu$   $\mu$   $\mu$   $\mu$

$\mu$

, :

-

$\mu$  ( )

-

$\mu$

.

-

$\mu$  .



,  $\mu$   $\mu$



$\mu$  :

-

$\mu$   $\mu$  ( )

$\mu$  ;

-

$\mu$

$\mu$

( , , ) ;

-

$\mu$  ;

-

$\mu$

;

-

$\mu$

$\mu$  ;

-

;



μ

□ 1989-1991:

μ

( MS-DOS)

. μ

μ

-

μ

μ

μ

.

□ 1993-1995:

μ

μ

( Windows

95/UNIX).

μ

μ

μ

μ

μ

.

□ 1997-1999:

μ

( Delphi),

μ

μ

μ

(

Access).

μ

μ

-

.

μ

.

□ 1999-2003:

.

( μμ

μ

, μ

μμ

μ

).

μ

μ

.

□ 2003-2007:

μ

μ

μ

,

μ

.





μ

μ



μ

μ

μ



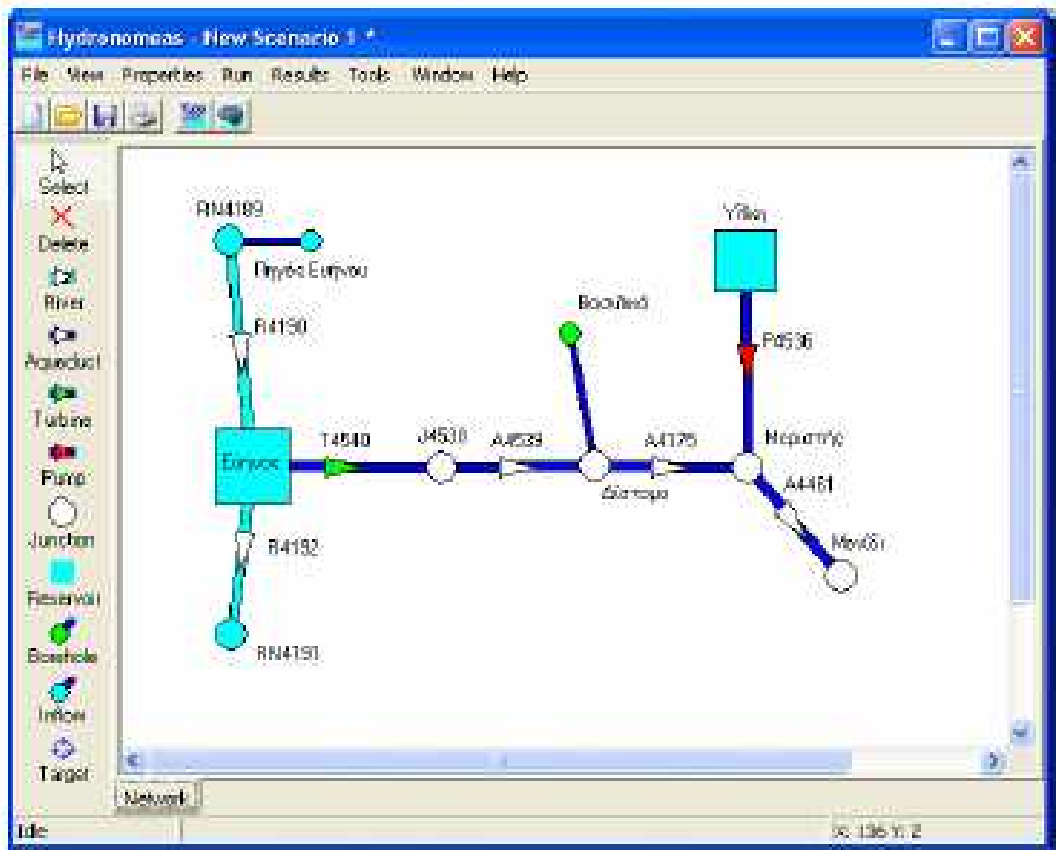
μ

μ

μ

μ

μ



(...)

)μ

μ

μ

μ

,

.



- μ ( )

- μ μ

- μ μ



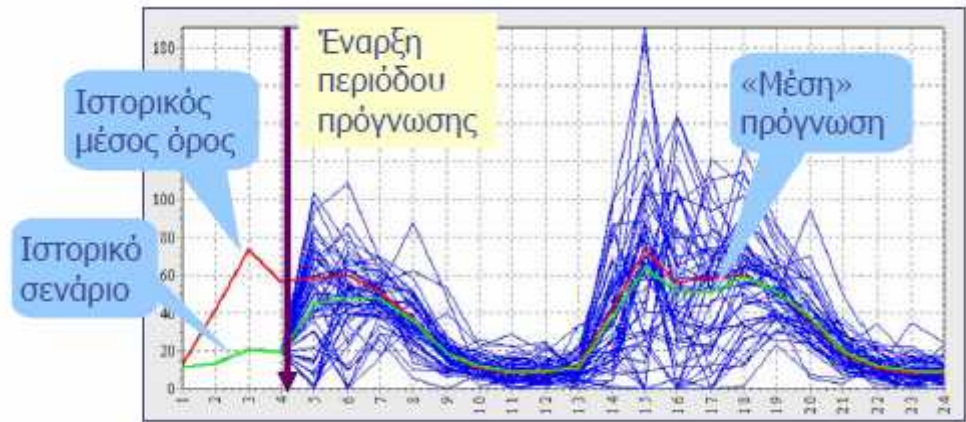
- μ μ μ (= μ μ μ), μ μ

- μ μ μ

- μ μ μ

μ

Η χρήση των συνθετικών χρονοσειρών επιτρέπει την ποσοτικοποίηση της αβεβαιότητας, με αποτίμηση όλων των δεδομένων εξόδου του μοντέλου με όρους πιθανοτήτων.





μ

μ



μ

:

-

μ

,

(

μ

μ

)

-

μ

.

-

μ

μ

μ

μ

μ

μ

μ

μ

.

-

μ

μ

μ

μ

μ

μ

.

-

.



μ

μ

:

-

μ

μ

(

μ

μ

)

-

(1

10)

.

-

μ

μ

μ

μ

(μ

)

μ

μ

,

μ

.

μ

μ

.





μ

μ

:

μ

μ

μ

, μ

μ

μ

μ

μ

μ

μ

μ

μ

, μ

μ

μ

μ

μ

μ

μ

μ

μ

μ

μ

:

μ

μ

(=

μ /

).

μ

μ

:

μ

μ

,

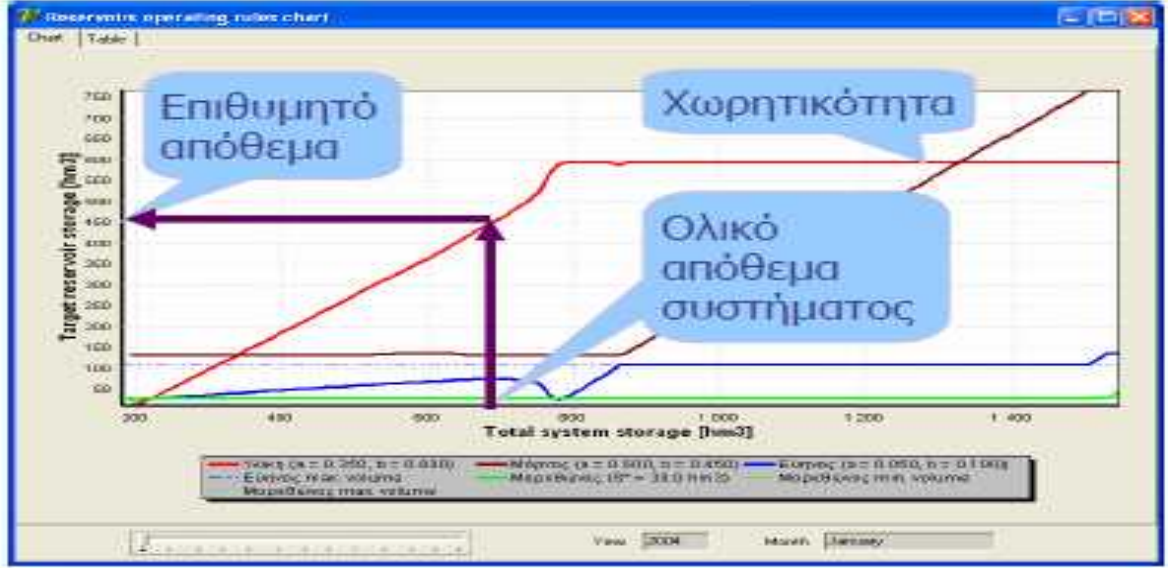
μ

(

),

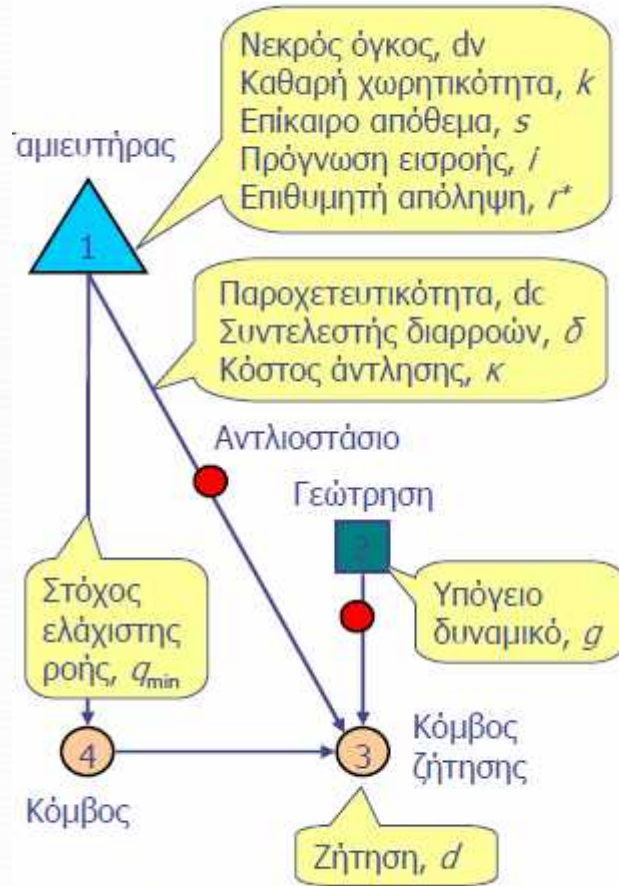
μ

.

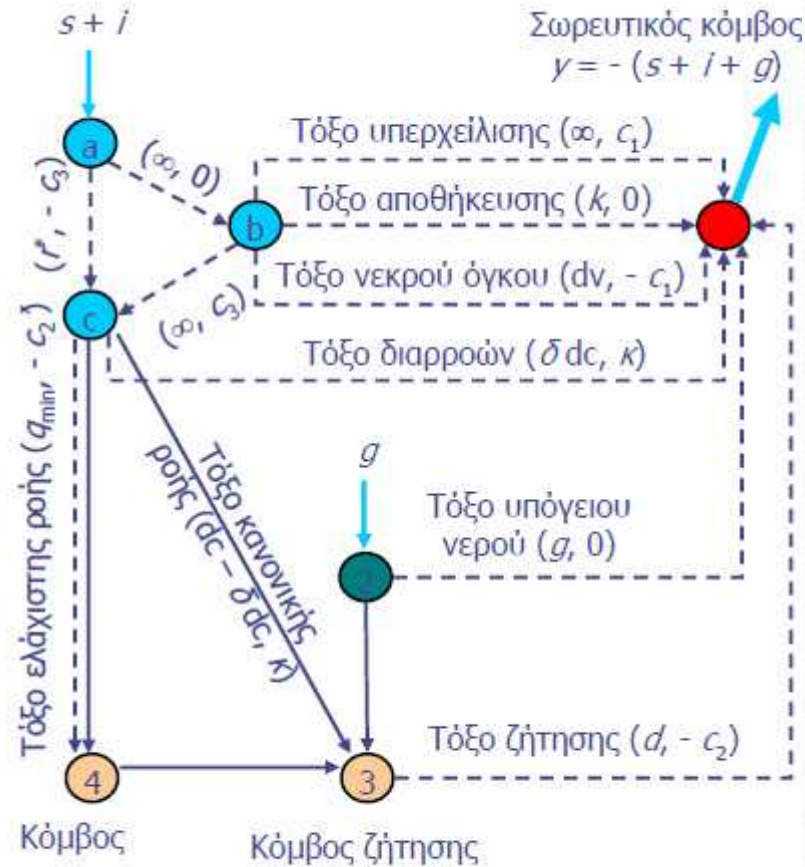




# μ μ μ



Συνιστώσες πραγματικού συστήματος



Συνιστώσες μοντέλου διγράφου





μ

μ : μ , μ

, .

:

- μ μ .

- μ μ .

- μ μ μμ .

μ :

- μ , .

- μ / .

:

- μ .

- μ .

- μ .

μ μ μ μ ( μ ),

μ μ μ μ

μ μ .



$\mu$



$\mu$  :

-

$\mu$

.

-

$\mu$

.

-

$\mu$

.

-

$\mu$

(  $\mu$

$\mu$

$\mu$

,

).

-

-

-

$\mu$

.

$\mu$

,

(

,

,

$\mu$

,

).

-

$\mu$

,

$\mu$

.



$\mu$  :

-  $\mu$

$\mu$

.

-

$\mu$

(

).

-

$\mu\mu$

$\mu$

(

$\mu$

$\mu$

).


-

( . . .

).




- μ « » μ μ μ ,
- μ μ .
- μ μ μ .
- μ μ μ .
- μ , - - , .
- μ .
- μ μ μ .
- μ μ μ μ μ
- μ , μ , , ) .
- μ μ μ μ

- 
- French, S., Decision Analysis and Decision Support Systems, 3rd draft edition, 2000.
  - Sage, A. P., Associates systems for decision support, Information and Decision Technologies, 19, 165-184, 1993.
  - Watkins, D. W., and D. C. McKinney, Recent developments associated with decision support systems in water resources, U.S. National Report to International Union of Geodesy and Geophysics 1991-1994, Reviews of Geophysics, Vol. 33 Supplement 1995, American Geophysical Union, 1995.

- <http://www.dhigroup.com/Software/WaterResources/MIKEBASIN.aspx>
- <http://www.wldelft.nl/soft/ribasim/int/index.html>
- <http://www.weap21.org/>
- <http://modsim.engr.colostate.edu/>
- <http://www.odysseusproject.gr/>



- 
- μ                    μ
- Efstratiadis, A., D. Koutsoyiannis, and D. Xenos, Minimising water cost in the water resource management of Athens, *Urban Water Journal*, 1(1), 3-15, 2004.
  - Koutsoyiannis, D., and A. Economou, Evaluation of the parameterization-simulation-optimization approach for the control of reservoir systems, *Water Resources Research*, 39(6), 1170, 1-17, 2003.
  - Koutsoyiannis, D., G. Karavokiros, A. Efstratiadis, N. Mamassis, A. Koukouvinos, and A. Christofides, A decision support system for the management of the water resource system of Athens, *Physics and Chemistry of the Earth*, 28(14-15), 599-609, 2003.
  - Koutsoyiannis, D., A. Efstratiadis, and G. Karavokiros, A decision support tool for the management of multi-reservoir systems, *Journal of the American Water Resources Association*, 38(4), 945-958, 2002.
  - Koutsoyiannis, D., A generalized mathematical framework for stochastic simulation and forecast of hydrologic time series, *Water Resources Research*, 36(6), 1519-1533, 2000.
  - Koutsoyiannis, D., Coupling stochastic models of different time scales, *Water Resources Research*, 37(2), 379-392, 2001.
  - Koutsoyiannis, D., Reliability concepts in reservoir design, *The Encyclopedia of Water*, edited by J. H. Lehr, New York, 2004a.
  - Koutsoyiannis, D., Stochastic simulation of hydrosystems, *The Encyclopedia of Water*, edited by J. H. Lehr, New York, 2004b.
  - Nalbantis, I., and D. Koutsoyiannis, A parametric rule for planning and management