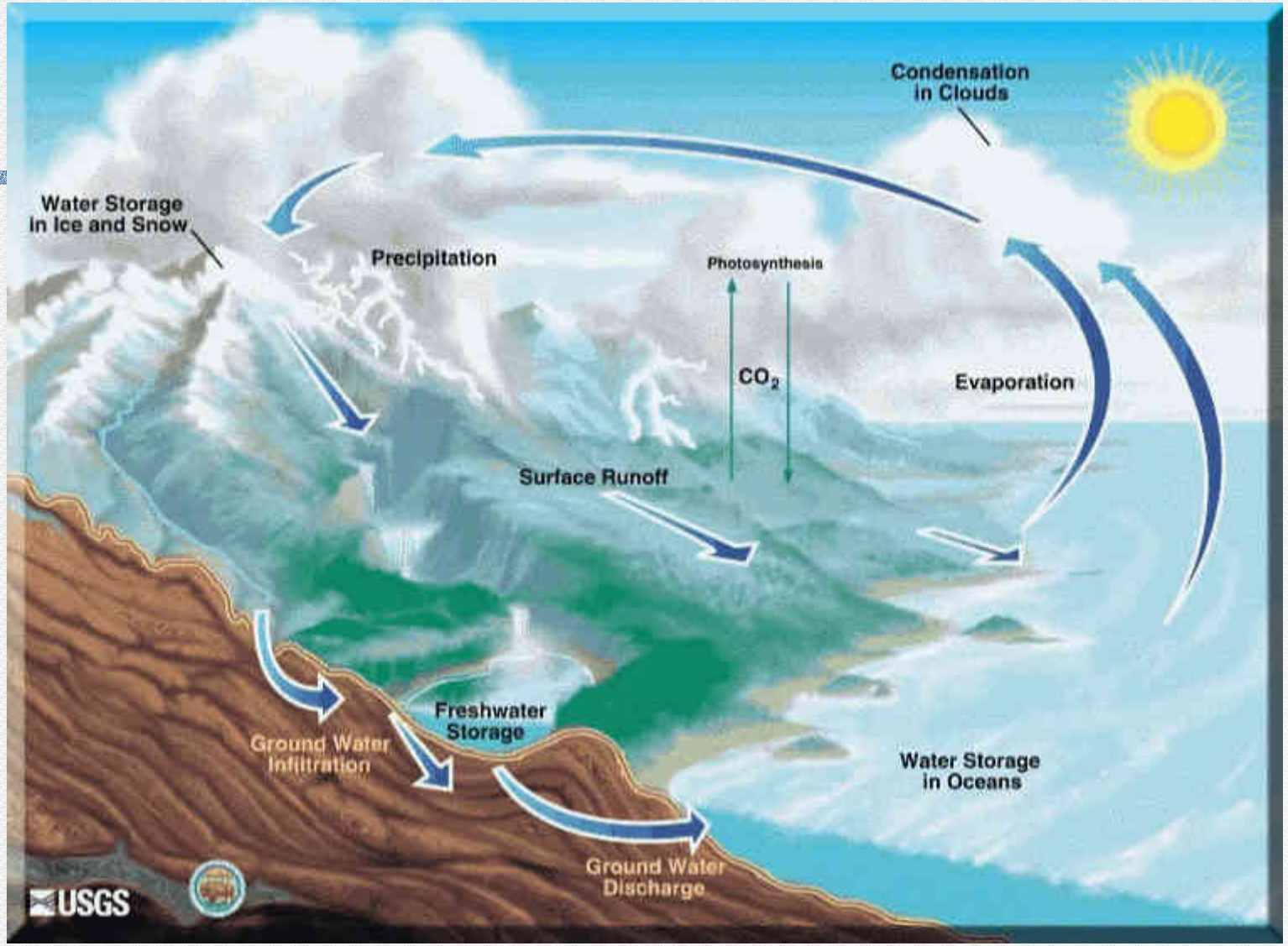
Ολοκληρωμένη Διαχείριση Υδατικών Πόρων IWRM

Χρίστος Α. Καραβίτης

Colorado State University

The Amount of Water on the Earth is Constant



Υδρολογικός Κύκλος

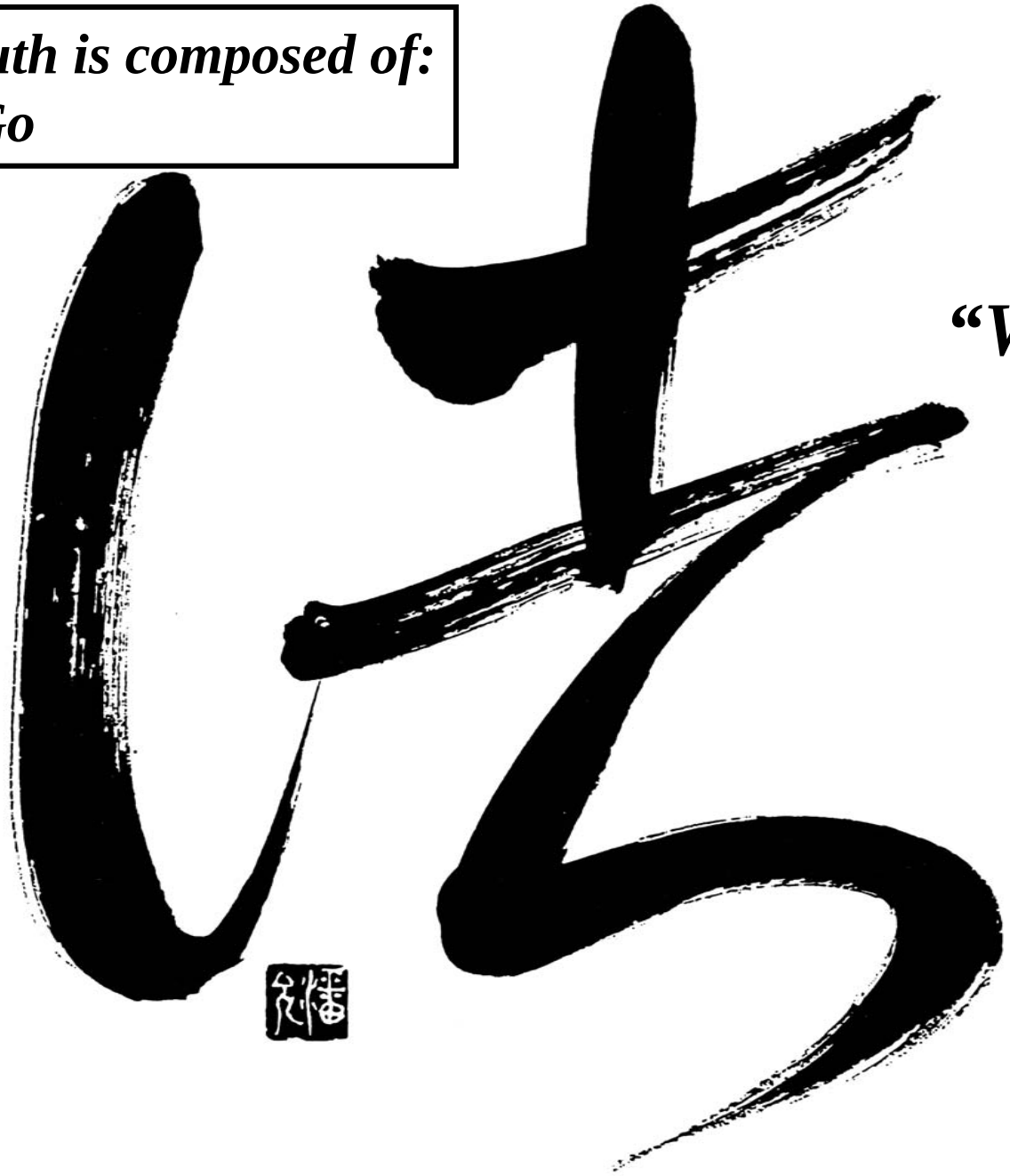
Παραδοσιακή Θεώρηση

"Παραδοσιακά, το νερό θεωρείτο ανεξάντλητος φυσικός πόρος, με ελάχιστες αναφορές στα κόστη, την ρύπανση, την ανάπτυξη των δυνατότητων αυτού του πόρου, τον έλεγχο των χρήσεων, η την μεταφορά του νερού."

"With low population density and plentiful water, streams and lake remained relatively clean. But with urbanization, surface waters started to become the receptacles of urban and industrial wastes."

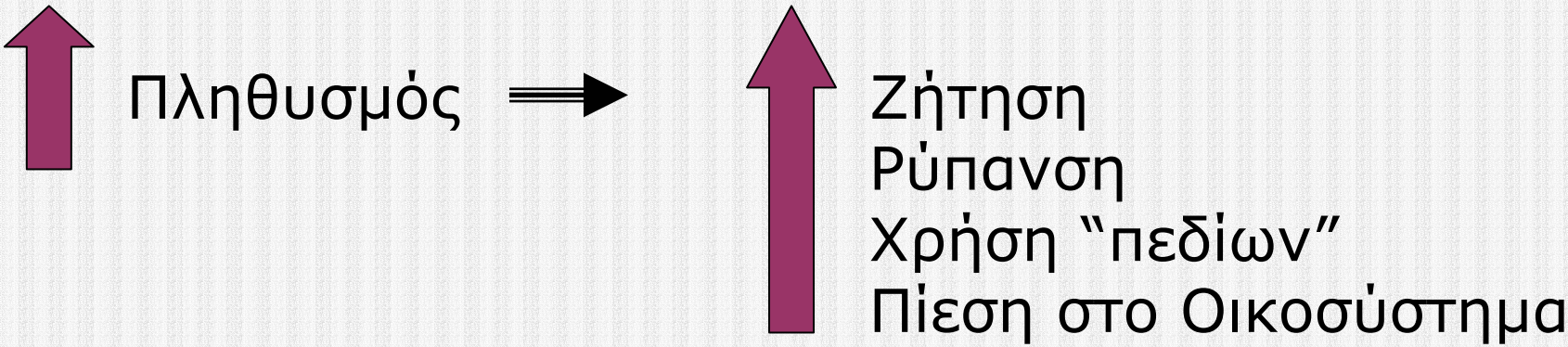
[Dzurik, 1990]

Ultimate Truth is composed of:
Water and Go



"Water Goes the Way it Goes"

Παραδοσιακή Θεώρηση

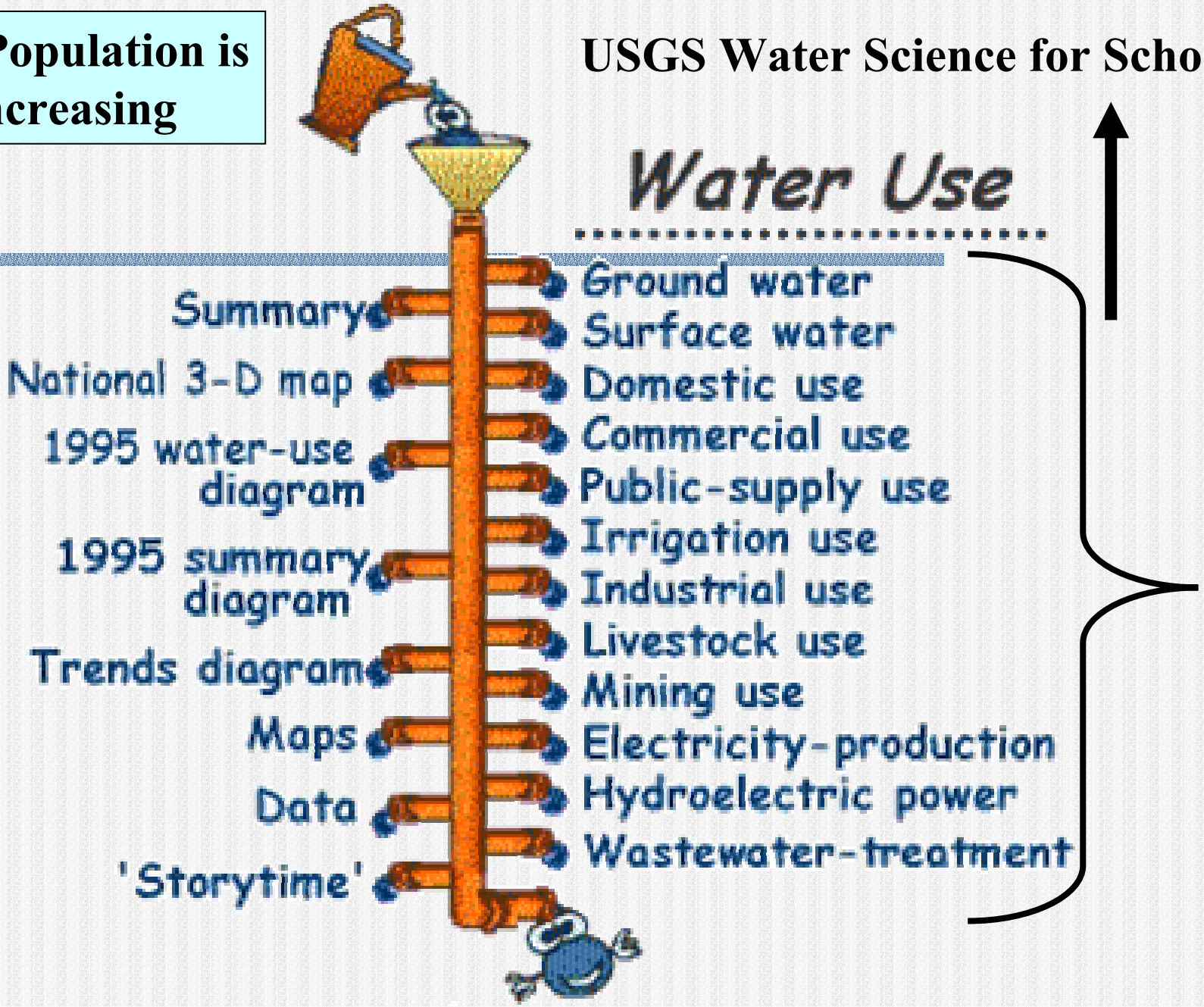


Κλασσικό Δίλημα:

Μεταφέρουμε τον Πληθυσμό κοντα στο νερό η μεταφέρουμε το νερό στον πληθυσμό?

The Population is Increasing

USGS Water Science for Schools



Συστήματα Υδατικών Πόρων

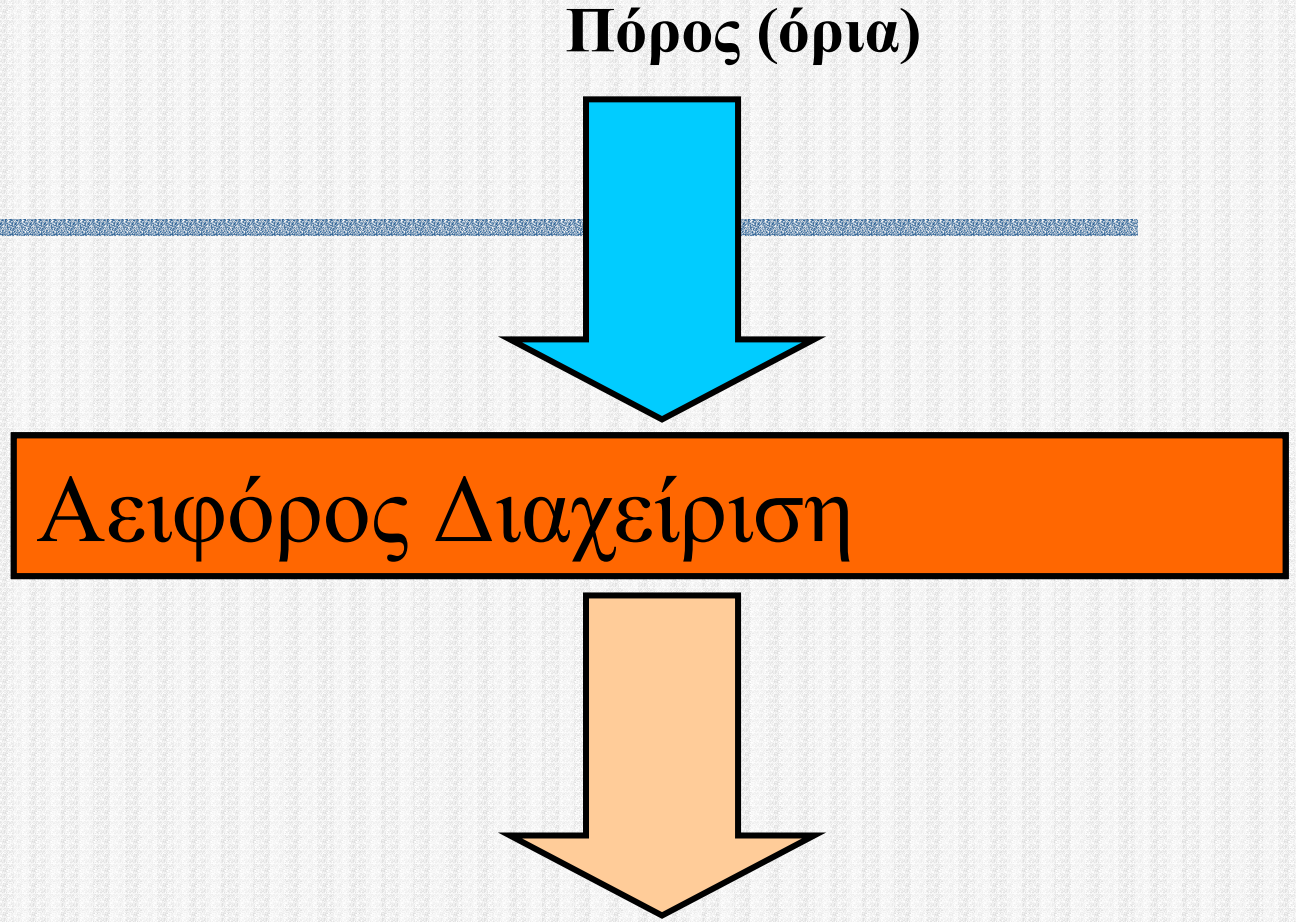
Ενας συνδυασμός εγκαταστάσεων ελέγχου και περιβαλλοντικών στοιχείων που συνεργάζονται για την επίτευξη διαχειριστικών σκοπών (Grigg)

Διαχείριση Υδατικών Πόρων

Διαχείριση Υδατικών Πόρων είναι η Εφαρμογή δομικών και μη δομικών μέτρων για τον έλεγχο των Φυσικών και Ανθρωπογενών Συστημάτων για κοινωφελείς σκοπούς, και την ταυτόχρονη προστασία του περιβάλλοντος.

Ολοκληρωμένη Διαχείριση Υδατικών Πόρων

Η ολοκληρωμένη διαχείριση Υδατικών Πόρων εξισορροπεί τις απόψεις και τους σκοπούς πολιτικών ομάδων, γεωγραφικών περιοχών, και τους στόχους της ανάπτυξης; και προστατεύει τους πόρους για.τα φυσικά και οικολογικά συστήματα


Πόρος (όρια)
Αειφόρος Διαχείριση
Απαιτήσεις (Αυξανόμενες)

Ολοκληρωμένη Διαχείριση Υδατικών Πόρων

- Πολιτική Θεώριση
- Γεωγραφική Θεώριση
- Θεώριση Λειτουργίας
- Περιβαλλοντική Θεώριση
- Θεώριση Ειδικότητας

Αειφόρος Ανάπτυξη

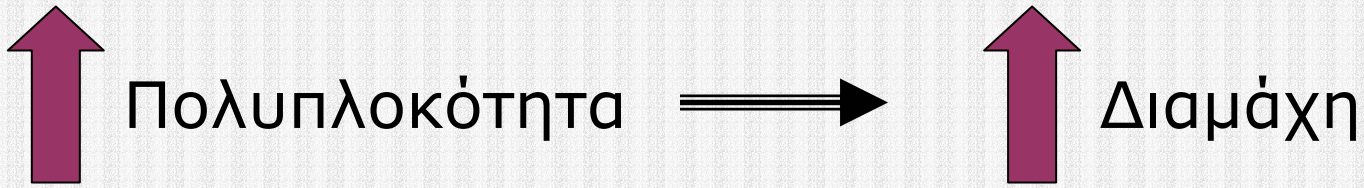
Η διαδικασία ανάπτυξης που εκπληρώνει τις ανάγκες του παρόντος χωρίς να διακινδυνεύει την δυνατότητα να ικανοποιηθούν και οι ανάγκες του μέλλοντος .

Αρχές:

1. Χρήση Πόρου (αποτελεσματικότητα, προστασία)
2. Περιβαλλοντική Ακεραιότητα και Ανάπλαση
3. Ελεχγος Ρύπανσης
4. Δικαιοσύνη και Συμμετοχή στην Λήψη των Αποφάσεων
5. Θεσμικές Αλλαγές

Πολυπλοκότητα (Complexity)

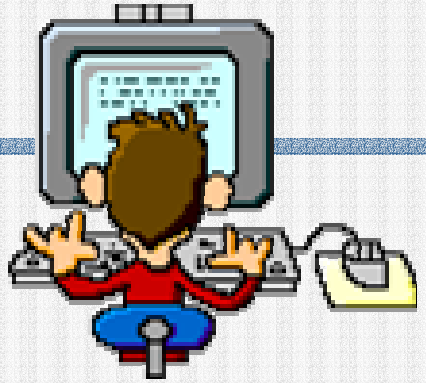
Η Πολυπλοκότητα μπορεί να προέλθει από το φυσικό, το λειτουργικό η το πολιτικό Σύστημα.



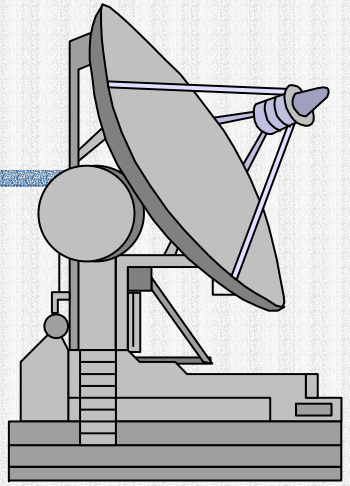
Six "C" Model

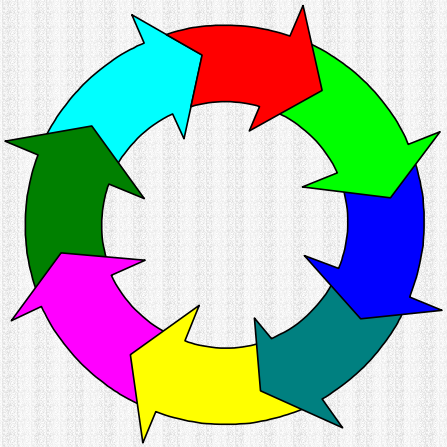
- Competence → Complexity
- Cooperation, Coordination, Communication → Conflict

Πληροφορική

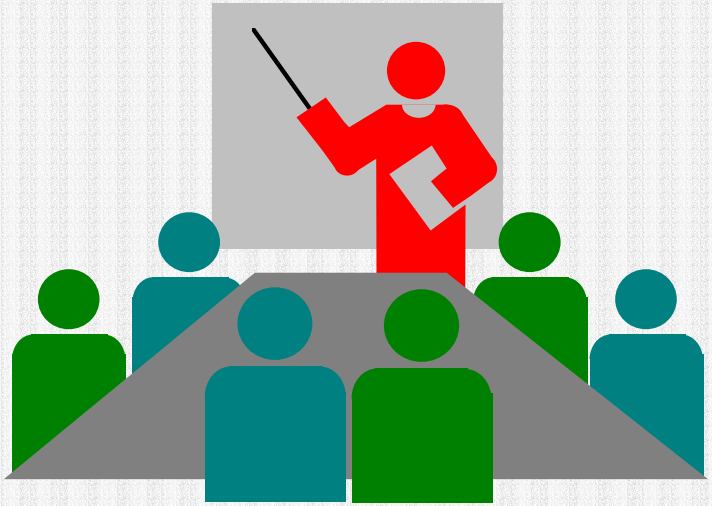


Επικοινωνίες

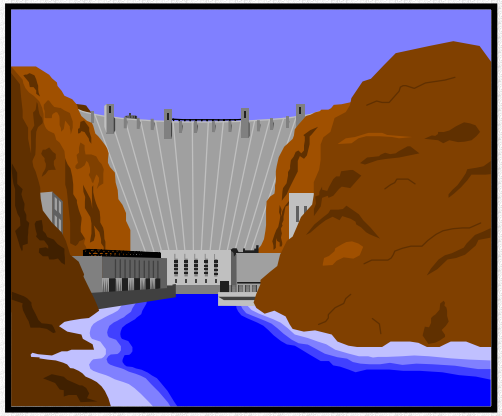




Λήπτες Αποφάσεων



Μηχανική



Μεταβαλλόμενες Προσεγγίσεις Διαχείρισης

1960	Μελέτες Σκοπιμότητας, Σχεδιασμός ειδημόνων, Κατεύθυνση Τάσεων
1970	Μελέτες Περιβαλλοντικών Επιπτώσεων, Δείκτες (Indicators)/Αρχές & Πρώτυπα, modeling/data
1980	Μελέτες ΑθροιστικώνΕπιπτώσεων (Cumulative Impact Assessment), Εμφαση Προβλεψης, Αρχή "User pays," "Polluter pays"
1990	Αειφορία, Equity/Efficiency/Effort, Σχεδιασμός Στόχων (Normative Planning)
2000	Παγκοσμιοποίηση, Integrated/Holistic/Comprehensive, "Co-evolution" Συν-εξέλιξη.

Καθήκοντα Διαχείρισης

- Σχεδιασμός & Συντονισμός
- Οργάνωση
- Διαχείριση Λειτουργίας
- Κανονισμοί
- Επενδύσεις
- Ανάπτυξη Πολιτικής

Γνωστικά Πεδία Διαχείρισης

- Αρχές Διαχείρισης
- Περιβάλλον - Οικοσυστήματα
- Υποδομή
- Σχεδιασμός & Λήψη των Αποφάσεων
- Οργάνωση
- Ανάλυση Συστημάτων και decision support systems (DSS)
- Νομοθεσία Υδατικών Πόρων & Περιβάλλοντος
- Οικονομική Διαχείριση

Ολοκληρωμένο Πλαίσιο Διαχείρισης

- Ποτάμιας λεκάνης(river basin) focus
- Διαχείριση επιπτώσεων Ανάπτυξης & Λειτουργίας
- Συντονισμός Υπευθύνων τομέων
- Capacity building και συμμετοχή του κοινού
- Περιβαλλοντική Θεώριση
- Χρήση των μηχανισμών της Αγοράς για την κοστολόγηση

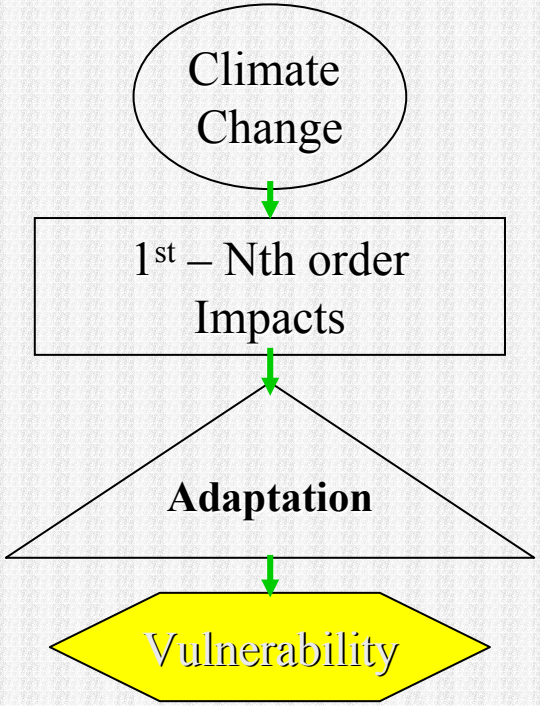
Αρχές Ολοκληρωμένης Διαχείρισης Υδατικών Πόρων

- Κοινωνικό αγαθό
- Εξαντλήσιμοι & έχουν τιμή
- Σε Ελειψη ικανοποιούνται πρωταρχικά οι κοινωνικές αναγκές

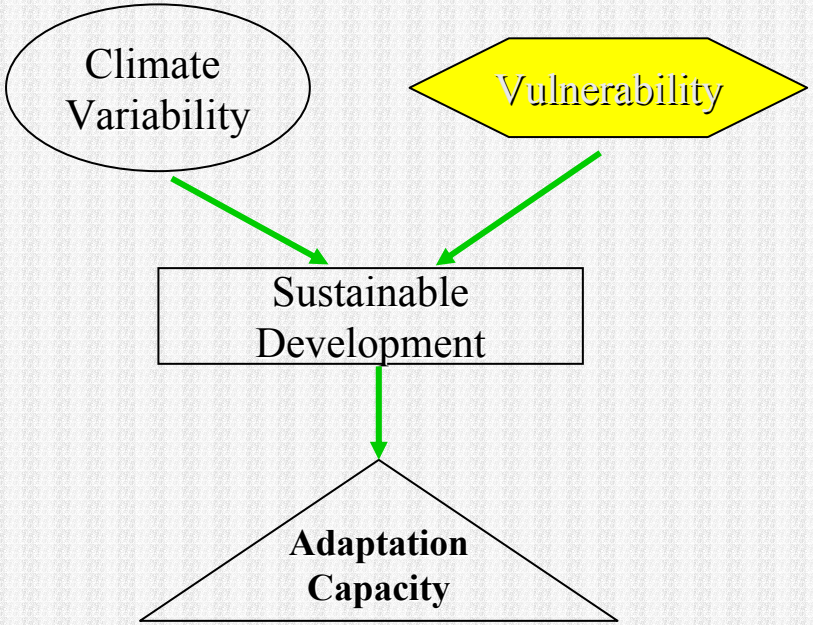
Αρχές Ολοκληρωμένης Διαχείρισης Υδατικών Πόρων

- Η Διαχείριση απευθύνεται σε πολλαπλούς χρήστες
- Η λεκάνη είναι η διαχειριστική μονάδα
- Η Διαχείριση πρέπει να Εμπλέκει Λήπτες αποφάσεων χρήστες και κοινό

Μεθοδολογικές Προσεγγίσεις Σχεδιασμού Προσαρμογής (Adaptation Planning)



Scenario-led



Vulnerability-first

Source: IPCC Dr. Thomas E. Downing (SEI)

Υπερ- Πλυπλοκότης (Complexification)

A. **Αντιλήψεων** = shifting paradigms/complexity/ chaos/heterarchization

B. **Μεθοδολογίας** = multi-/GIS, ES, AI, DSS/ systems/computational prowess

C. **Οργάνωσης** = participatory/anticipatory/ contingency emphasis

D. **Εφαρμογής** = new focus/areas of concern

Ερωτήσεις

Flood Management

Christos A. Karavitis
Colorado State University

Στρατηγικές Διαχείρισης Πλημμυρικών Πεδίων

- Τροποποίηση ανθεκτικότητας flood damage & disruption (Μη Δομικά - Non-structural)
- Τροποποίηση Πλημμύρας (Δομικά - Structural)
- Modify the impact of flooding on individuals and the community (Non-structural)
- Restore & preserve the natural & cultural resources of floodplains (Non-structural)

Τροποποίηση Ανθεκτικότητας

I. Κανονισμοί Πλημμυρικών πεδίων

- Περιφερειακοί κανονισμοί
- Τοπικοί κανονισμοί
  1. Zoning
  2. Subdivision regulations
  3. Building codes
  4. Sanitary & well codes
  5. Other regulatory tools

Τροποποίηση Ανθεκτικότητας

II. Development & redevelopment policies

- Design & location of services & utilities
- Land rights, acquisition and open space
- Redevelopment
- Permanent evacuation

Τροποποίηση Ανθεκτικότητας

III. Disaster preparedness
IV. Disaster assistance
V. Flood-proofing
VI. Flood forecasting, warning systems & emergency preparedness

Αντιμετώπιση Πλημμύρας

- Dams & reservoirs
- Dikes, levees & floodwalls
- Channel alterations
- High flow diversions (floodways)
- Land treatment measures
- On-site detention

Αντιμετώπιση Επιπτώσεων

- Information & education
- Flood insurance
- Tax adjustments
- Flood emergency measures
- Post-flood recovery

Αποκατάσταση Πόρων πλημμυρικών Πεδίων

I. Floodplain regulations

Same as for Modify Susceptibility

II. Development & redevelopment policies

Same as for Modify Susceptibility

III. Information & education

IV. Tax adjustments

V. Administrative measures

Federal Emergency Management Agency

LIBRARY

VIRTUAL LIBRARY & ELECTRONIC READING ROOM

Fact Sheet: Floods And Flash Floods

Mitigation pays. It includes any activities that prevent an emergency, reduce the chance of an emergency happening, or lessen the damaging effects of unavoidable emergencies. Investing in mitigation steps now such as constructing barriers such as levees and purchasing flood insurance will help reduce the amount of structural damage to your home and financial loss from building and crop damage should a flood or flash flood occur.

BEFORE

Find out if you live in a flood-prone area from your local emergency management office or Red Cross chapter.
Ask whether your property is above or below the flood stage water level andlearn about the history of flooding for your region.

Learn flood warning signs and your community alert signals.

Request information on preparing for floods and flash floods.

If you live in a frequently flooded area, stockpile emergency building

US Army Corps of Engineers 1993 FLOOD DAMAGES GIFS Page - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Search Favorites History

Address http://www.wes.army.mil/EL/flood/gifs.html Go Links

1993 Flood Damage Map GIFs

Welcome to our GIFs of maps of the damages from the 1993 flood of the Mississippi and Missouri Rivers and their tributaries! We have maps of the entire flooded area and maps of the individual states. In each series of maps, there are maps of acres flooded, commercial damages from flooding, emergency expenses associated with the flood, damages to public facilities, damages to residences, damages to transportation facilities, and damages to utilities. For both the region and each state, there is also a composite picture of all the other maps and their names. Descriptions of the damage categories are available at the damage table page.

Regional Maps

- Composite of All Regional Maps
- All Flooded Acres
- All Agricultural Damages
- All Commercial Damages
- All Emergency Costs
- All Public Facilities Damages
- All Residential Damages

Internet

National Warnings Area - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Search Favorites History

Address http://iwin.nws.noaa.gov/iwin/nationalwarnings.html Go Links

National Warnings Area

This page provides immediate access to all available warnings for the United States.
This page "REFRESHES" every 60 seconds to provide you the most current data.

Warning Catagories

Tornado	Hurricane	Severe Thunderstorm
Flash Flood	The National Oceanic and Atmospheric Administration	Flood
Winter Storm	Show All	Special Marine

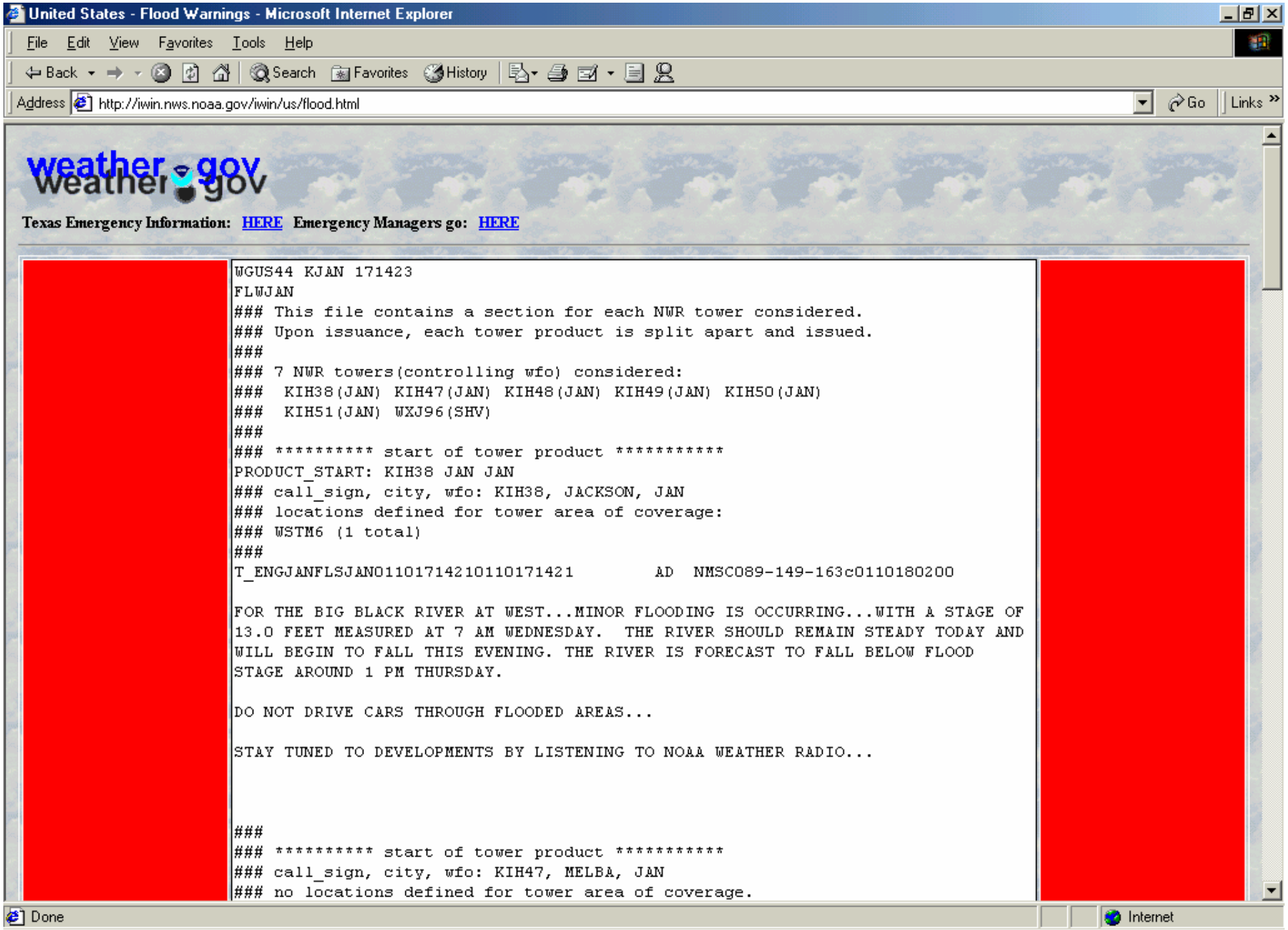
Additional Warning Catagories

Non Precipitation

Back to IWIN Main Level

If you would like to make some comments about this page please fill out our Survey Form

Internet


United States - Flood Warnings - Microsoft Internet Explorer
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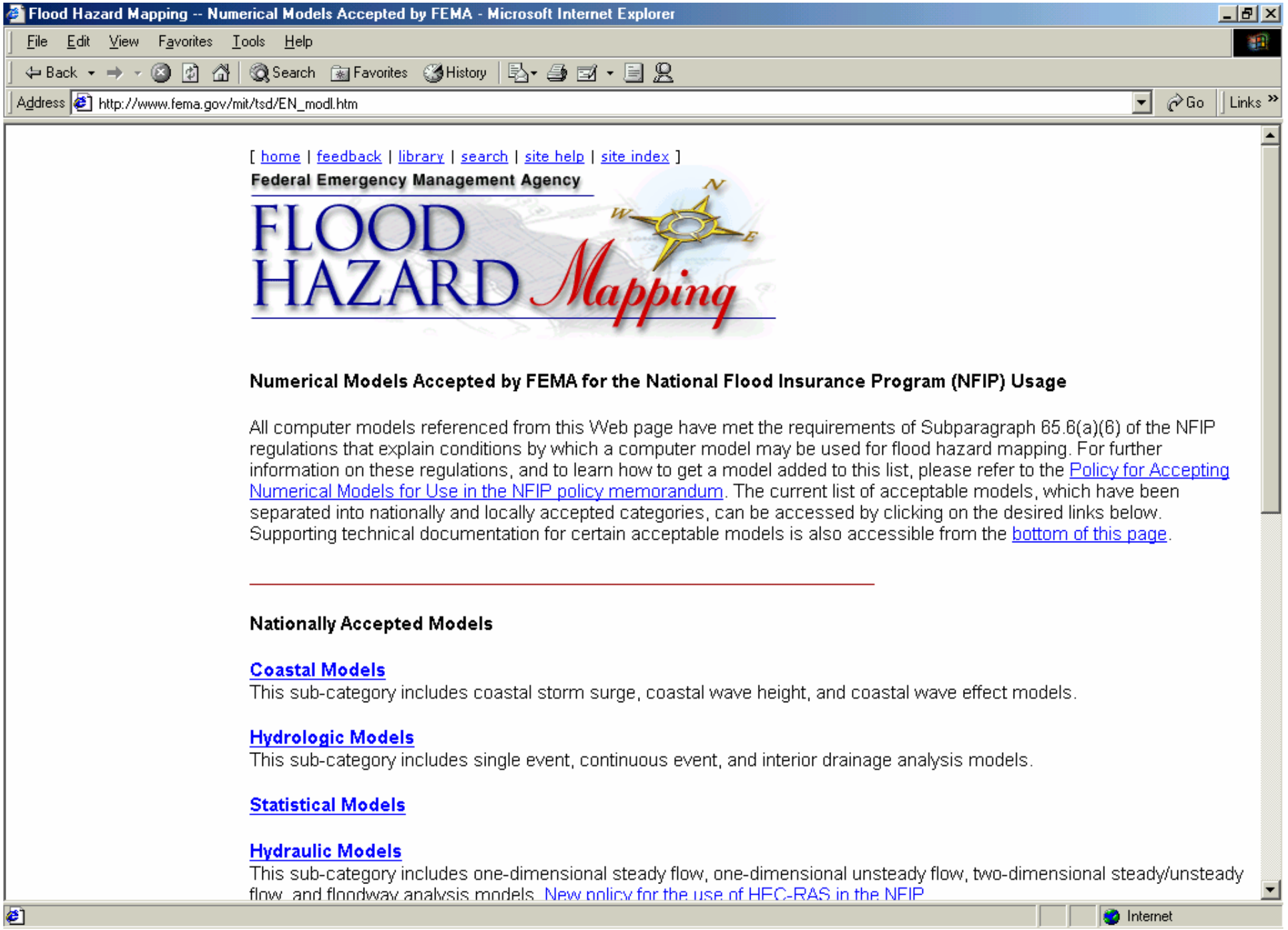
Address http://iwin.nws.noaa.gov/iwin/us/flood.html
Go Links
weather.gov
Texas Emergency Information: HERE Emergency Managers go: HERE
WGUS44 KJAN 171423
FLWJAN
This file contains a section for each NWR tower considered.
Upon issuance, each tower product is split apart and issued.
###
7 NWR towers(controlling wfo) considered:
KIH38(JAN) KIH47(JAN) KIH48(JAN) KIH49(JAN) KIH50(JAN)
KIH51(JAN) WXJ96(SHV)
###
********** start of tower product **********
PRODUCT_START: KIH38 JAN JAN
call_sign, city, wfo: KIH38, JACKSON, JAN
locations defined for tower area of coverage:
WSTM6 (1 total)
###
T_ENGJANFLSJAN0110171421 0110171421 AD NMSC089-149-163c0110180200
FOR THE BIG BLACK RIVER AT WEST...MINOR FLOODING IS OCCURRING...WITH A STAGE OF
13.0 FEET MEASURED AT 7 AM WEDNESDAY. THE RIVER SHOULD REMAIN STEADY TODAY AND
WILL BEGIN TO FALL THIS EVENING. THE RIVER IS FORECAST TO FALL BELOW FLOOD
STAGE AROUND 1 PM THURSDAY.
DO NOT DRIVE CARS THROUGH FLOODED AREAS...
STAY TUNED TO DEVELOPMENTS BY LISTENING TO NOAA WEATHER RADIO...
###
********** start of tower product **********
call_sign, city, wfo: KIH47, MELBA, JAN
no locations defined for tower area of coverage.
Done
Internet


Flood Hazard Mapping -- Numerical Models Accepted by FEMA - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites History
Address http://www.fema.gov/mit/tsd/EN_modl.htm
Go Links
[home | feedback | library | search | site help | site index]
Federal Emergency Management Agency
FLOOD HAZARD Mapping
Numerical Models Accepted by FEMA for the National Flood Insurance Program (NFIP) Usage
All computer models referenced from this Web page have met the requirements of Subparagraph 65.6(a)(6) of the NFIP regulations that explain conditions by which a computer model may be used for flood hazard mapping. For further information on these regulations, and to learn how to get a model added to this list, please refer to the Policy for Accepting Numerical Models for Use in the NFIP policy memorandum. The current list of acceptable models, which have been separated into nationally and locally accepted categories, can be accessed by clicking on the desired links below. Supporting technical documentation for certain acceptable models is also accessible from the bottom of this page.
Nationally Accepted Models
Coastal Models
This sub-category includes coastal storm surge, coastal wave height, and coastal wave effect models.
Hydrologic Models
This sub-category includes single event, continuous event, and interior drainage analysis models.
Statistical Models
Hydraulic Models
This sub-category includes one-dimensional steady flow, one-dimensional unsteady flow, two-dimensional steady/unsteady flow, and floodway analysis models. New policy for the use of HEC-RAS in the NFIP
Internet

Federal Emergency Management Agency

FLOOD HAZARD Mapping

Hydraulic Models Accepted by FEMA for NFIP Usage

(Nationally Accepted Models - shown in descending order of approximate usage)
Effective: September 30, 2001

TYPE	PROGRAM	DEVELOPED BY	AVAILABLE FROM	COMMENTS
Hydraulic Models: Determination of Water-Surface Elevations for Riverine Analysis				
One-dimensional Steady Flow Models	HEC-RAS 2.2 (September 1998)	U.S. Army Corps of Engineers	Water Resources Support Center Corps of Engineers Hydrologic Engineering Center (HEC) 609 Second Street Davis, CA 95616-4687 http://www.hec.usace.army.mil/	A HEC-2 file can be imported into HEC-RAS; the user must change the conveyance computations in HEC-RAS and make the necessary modifications to the bridge modeling before running HEC-RAS to duplicate the results obtained using HEC-2. The use of HEC-RAS for restudying a stream previously studied using HEC-2 is encouraged, as long as one of the following conditions is met: 1) the entire stream is rerun using HEC-RAS; or 2) the stream reach remodeled using HEC-RAS is hydraulically independent from the rest of the stream. The WSPRO bridge analysis is recommended for constricted floodplains under subcritical flow conditions. In addition, HEC-RAS version 2.2 that performs the steady flow water-surface profile calculations (SNET) has been updated to version 2.2.1; it should be used for NFIP studies.
	HEC-RAS 3.0	U.S. Army Corps of Engineers	Water Resources Support Center Corps of Engineers Hydrologic Engineering Center 609 Second Street Davis, CA 95616-4687	Under rare circumstances, for bridges with low flow, and weir flow on the overbanks, HEC-RAS 3.0 may not be able to balance the flow using weir flow equation and low flow bridge analysis methods. HEC-RAS 3.0 will then use the energy method, and the computed energy grade elevations and water-surface elevations may be on the high side.
	HEC-2 4.6.2[2]	US Army Corps of	Water Resources Support Center[2]	Includes culvert analysis and floodway options.

Flash Flood Forecasting

U.S. National Report to IUGG, 1991-1994
Rev. Geophys. Vol. 33 Suppl., © 1995 American Geophysical Union

USGS
science for a changing world

Updating Flood Inundation Maps Efficiently:

Building on Existing Hydraulic Information and Modern Elevation Data with a GIS

By Joseph L. Jones, Tana L. Haluska, Alex K. Williamson, and Martha L. Erwin

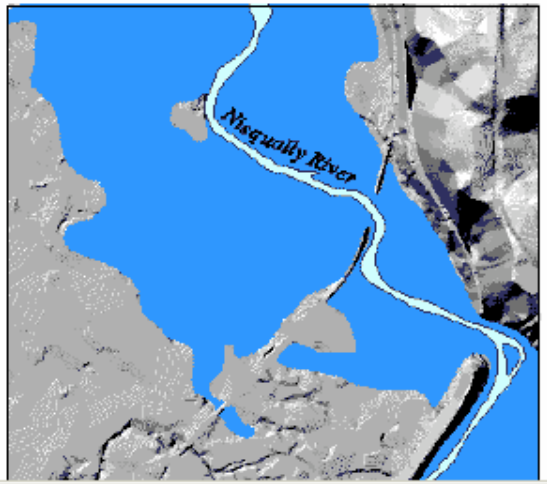
U.S. Geological Survey Open-File Report 98-200

Download this report (Microsoft Word '97 or Adobe Acrobat PDF)

Existing flood maps (around 1980)

- Based on flood probability estimates that, in many cases, are now out-of-date
- Hand-drawn on paper maps that had limited vertical accuracy or could not be easily matched to "real-world" geographical coordinates
- Based on elevation data that, in many cases, have been or will be superseded by more accurate data

1982 map

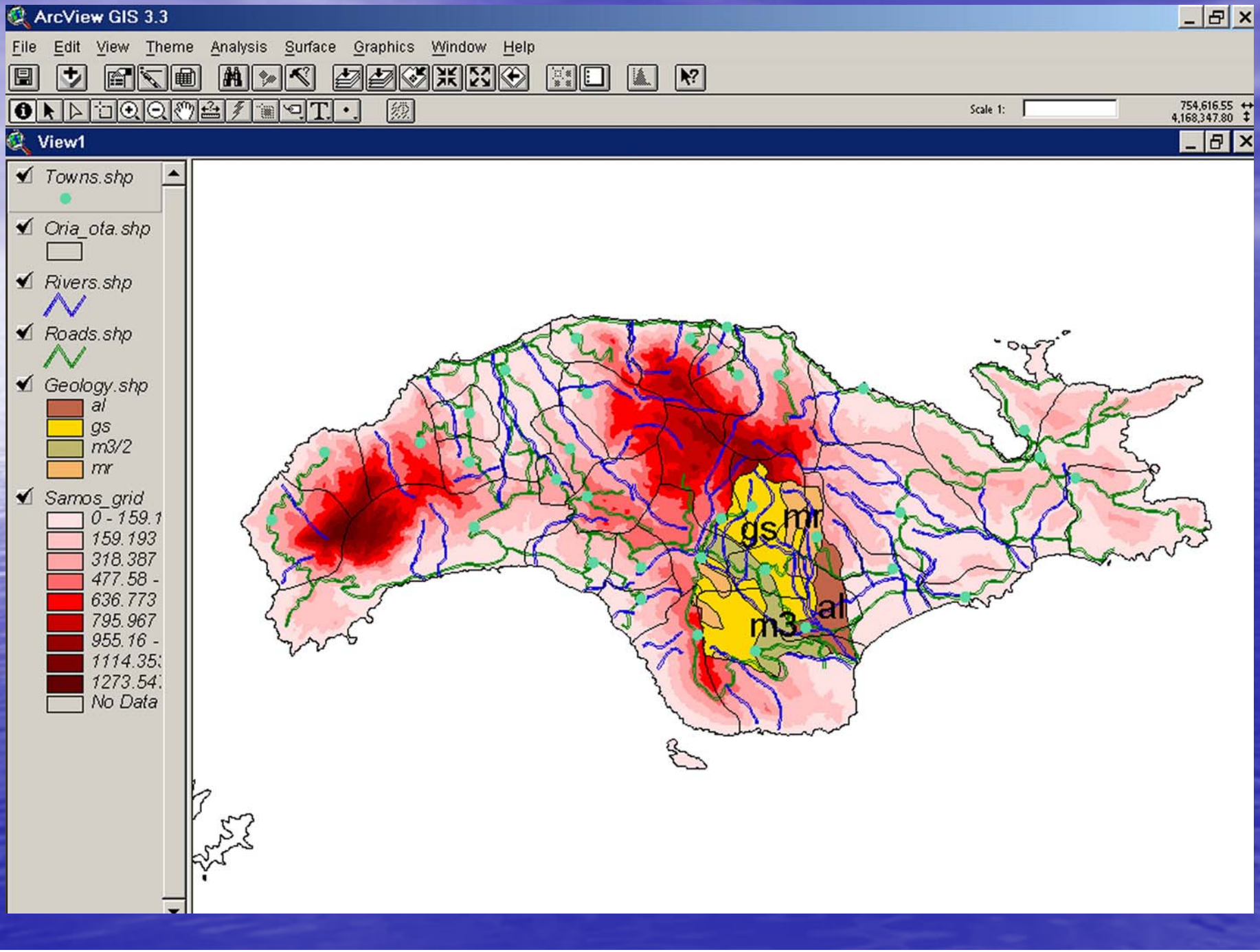



8.7.2002 14:53


HOTEL
ΚΗΦΙΣΟΣ
8. 7. 2002 14:54


SUBARU
8.7.2002 14:56


8.7.2002 14:57


ArcView GIS 3.3
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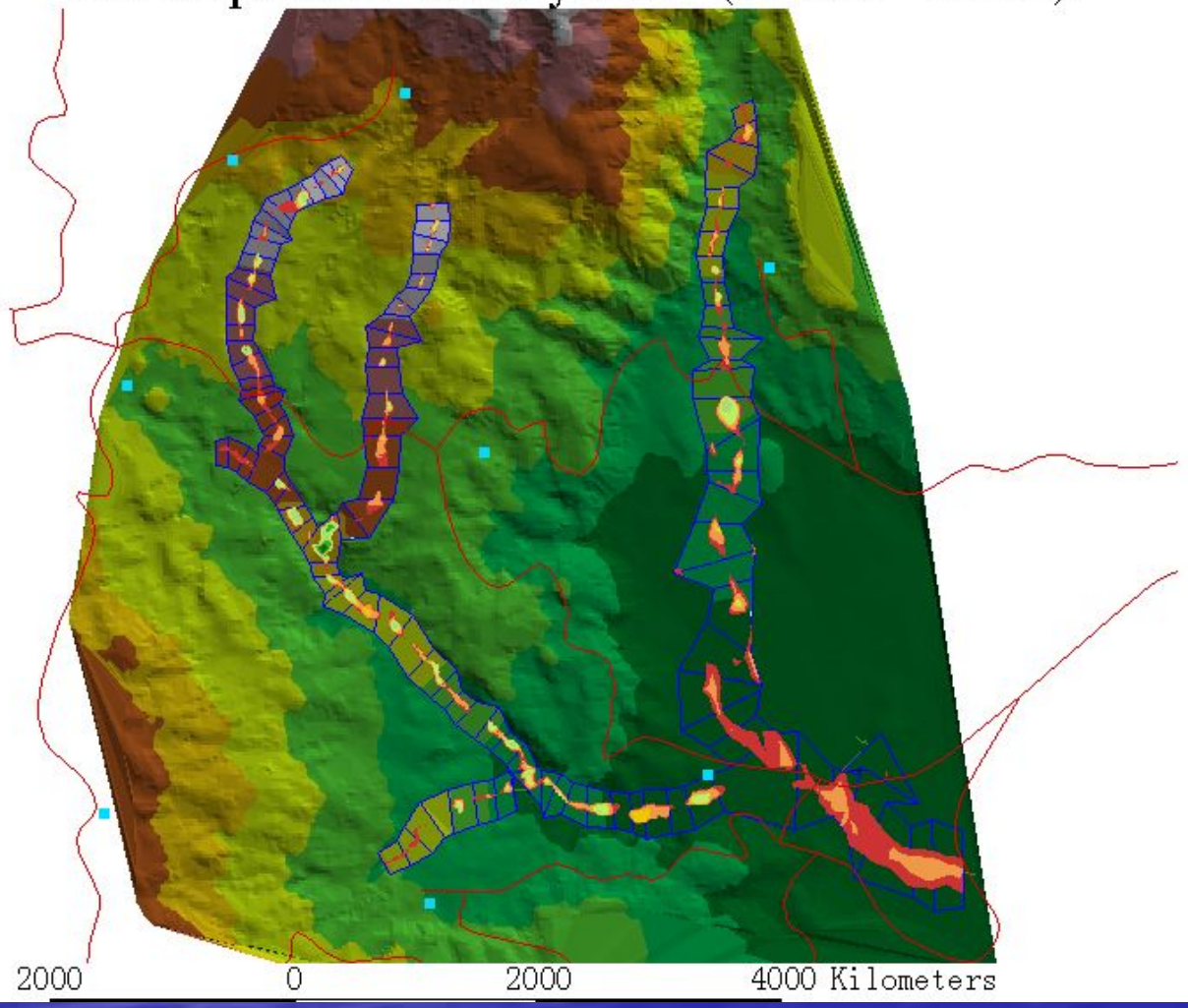
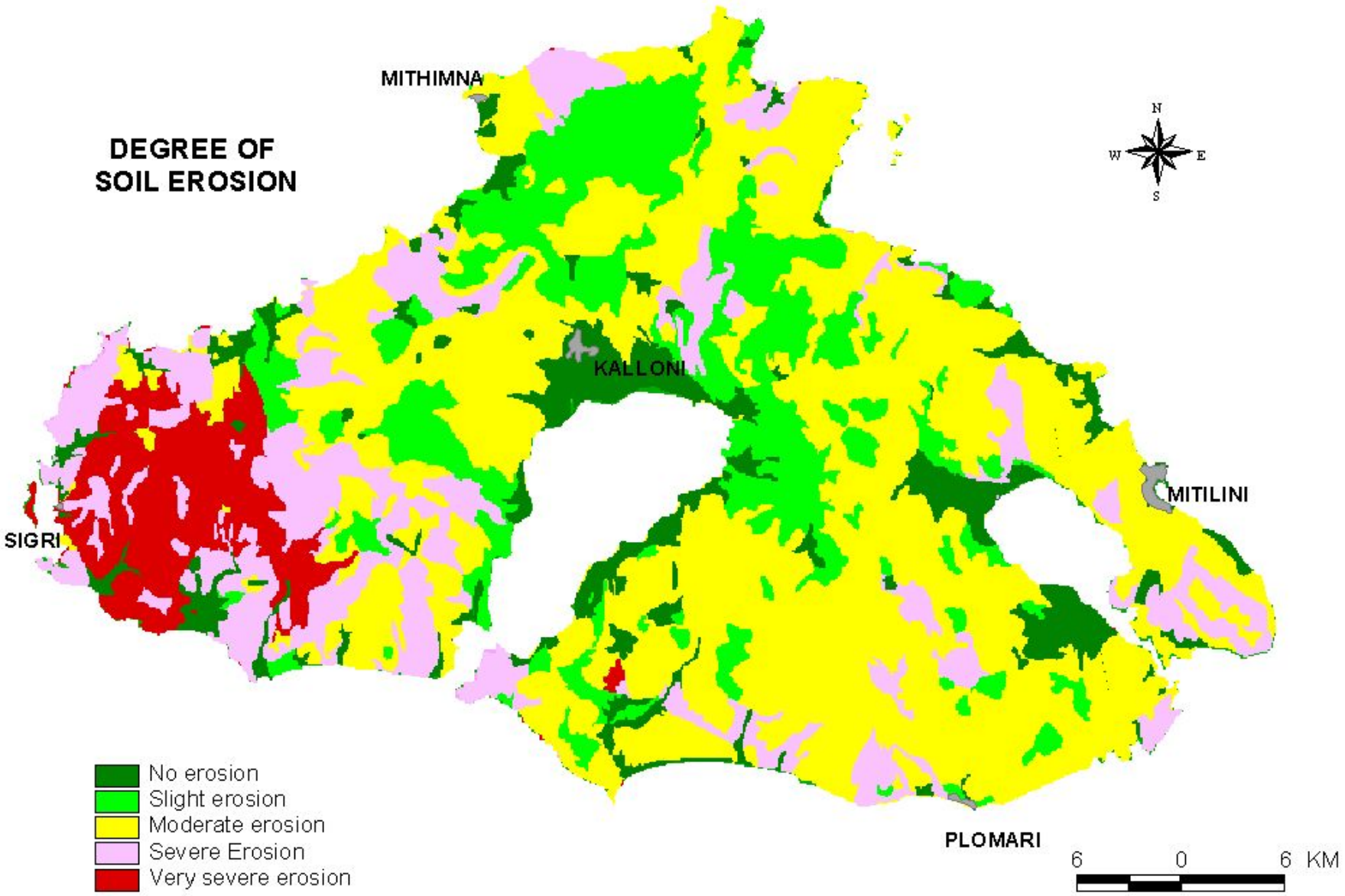
Scale 1:
754,616.55
4,168,347.80
View1
Towns.shp
Oria_ota.shp
Rivers.shp
Roads.shp
Geology.shp
al
gs
m3/2
mr
Samos_grid
0 - 159.1
159.193
318.387
477.58 -
636.773
795.967
955.16 -
1114.35
1273.54
No Data
gs
mr
al
m3

Floodplain analysis (after fire)



Towns.shp
Roads.shp
GD post
0 - 1
1 - 2.5
2.5 - 3
3 - 6
6 - 11.468
11.468 - 13.761
13.761 - 16.055
16.055 - 18.348
18.348 - 20.642
No Data
BP post
BP preaver
BP predry
Export_xs.shp
Export_SN.shp
Imvr
Breaklines
Hard
Soft
Elevation Range
1024.574 - 1152.62
896.528 - 1024.574
768.482 - 896.528
640.436 - 768.482
512.39 - 640.436
384.344 - 512.39
256.298 - 384.344
128.252 - 256.298
0.206 - 128.252

N
W
E
S


DEGREE OF
SOIL EROSION
MITHIMNA
KALLONI
MITILINI
SIGRI
PLOMARI
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W
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No erosion
Slight erosion
Moderate erosion
Severe Erosion
Very severe erosion
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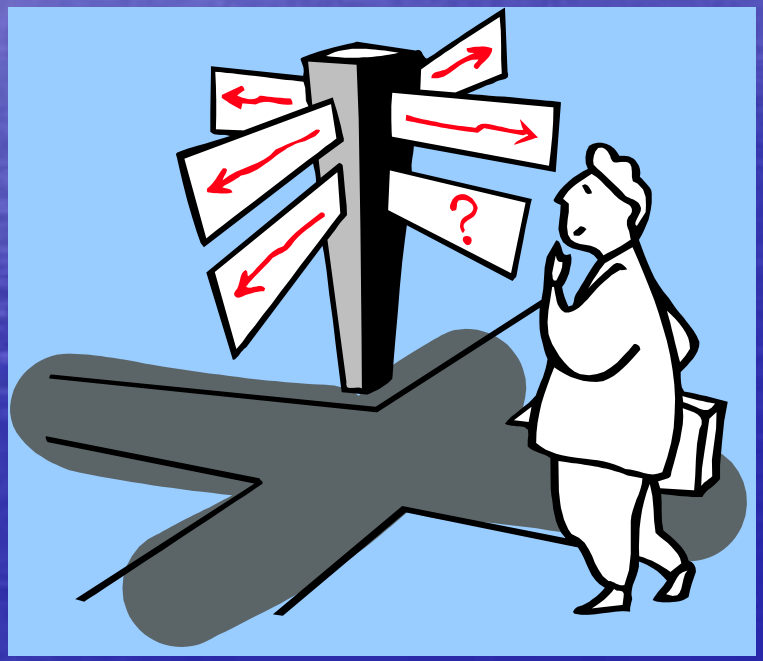
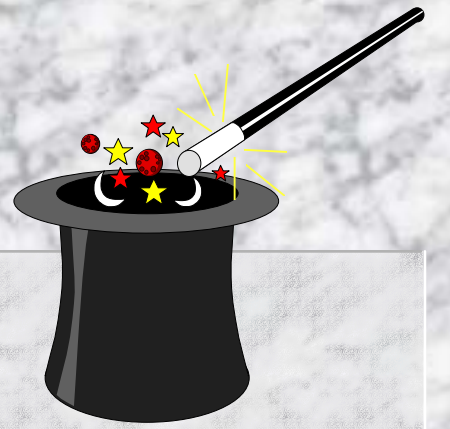
Questions?





ΟΛΟΚΛΗΡΩΜΕΝΗ ΔΙΑΧΕΙΡΙΣΗ ΛΕΙΨΥΔΡΙΩΝ

Christos A. Karavitis, Colorado State University, Fort Collins, CO

National Drought Mitigation Center - Microsoft Internet Explorer

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National Drought Mitigation Center
University of Nebraska–Lincoln

The National Drought Mitigation Center helps people and institutions develop and implement measures to reduce societal vulnerability to drought. The NDMC, based at the University of Nebraska-Lincoln, stresses preparation and risk management rather than crisis management.

- Quick Info for Media
- U.S. Drought Monitor
- Interim National Drought Council


Drought Watch
SPI maps & current conditions


Drought Science
definitions, indices, etc.


What's New
news & site updates


Climatology
maps, charts, graphs


Impacts
effects of various droughts


NDMC
publications, about us


Drought Links
web resources


Mitigation
easing impacts


Network
drought planners nationwide


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with Excite


Methodologies
build a drought plan


Why Plan?
intro for newcomers

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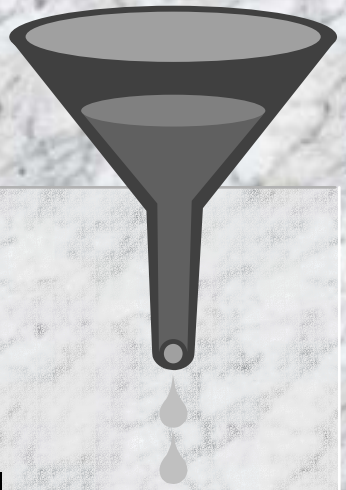
Internet

Λειψυδρία



- Η κατάσταση δυσμενών και εκτεταμένων υδρολογικών, περιβαλλοντικών, κοινωνικών και οικονομικών επιπτώσεων εξ αιτίας μικροτέρων των συνήθως αναμενομένων ποσοτήτων ύδατος (Karavitis, C.A., 1992)
- Προσφορά ελαττούται η/και η ζήτηση αυξάνει.

Drought Indices

by Dr. Michael J. Hayes
Climate Impacts Specialist, National Drought Mitigation Center

Introduction

Drought indices assimilate thousands of bits of data on rainfall, snowpack, streamflow and other water supply indicators into a comprehensible big picture. A drought index value is typically a single number, far more useful than raw data for decision making.

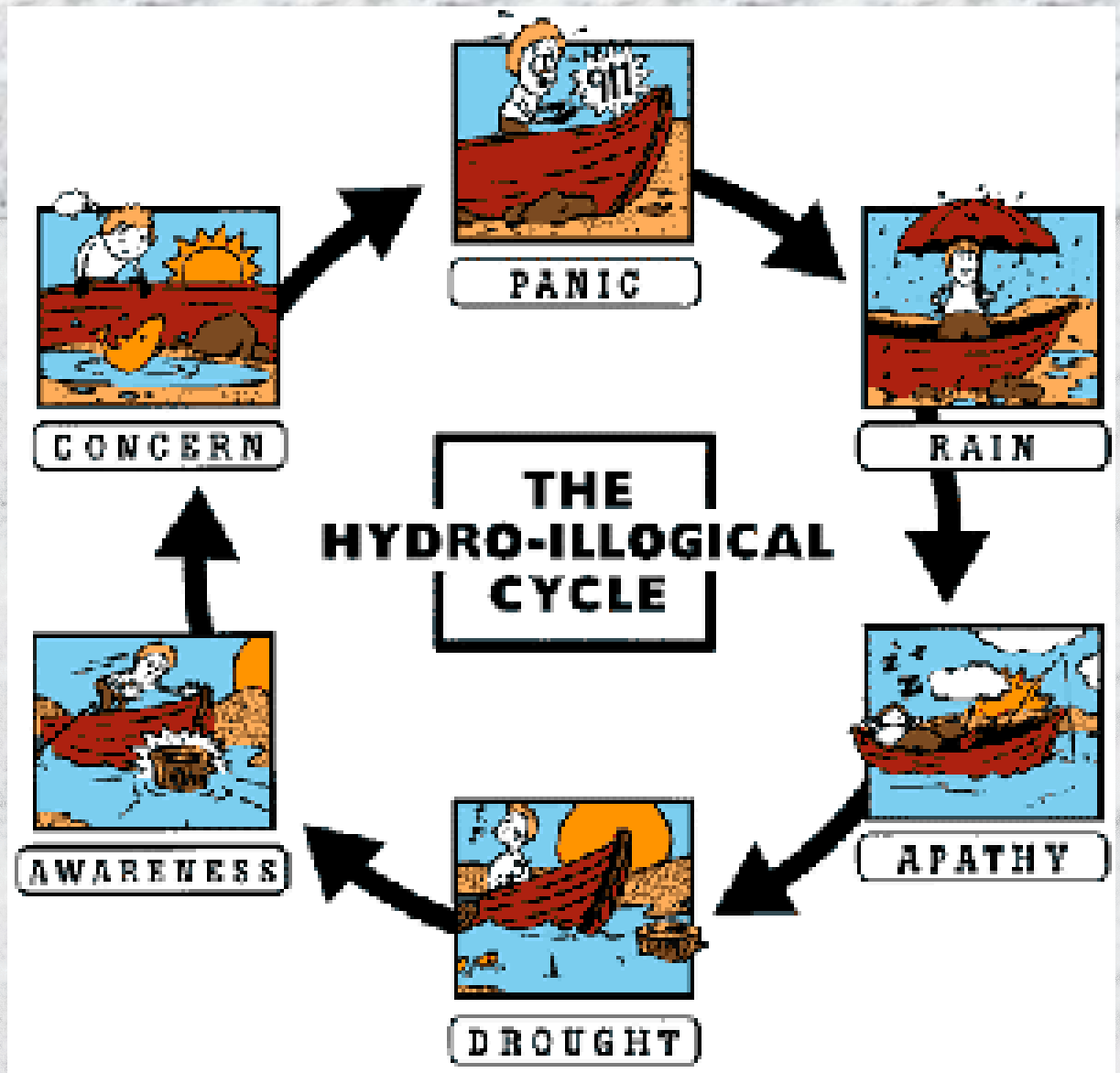
There are several indices that measure how much precipitation for a given period of time has deviated from historically established norms. Although none of the major indices is inherently superior to the rest in all circumstances, some indices are better suited than others for certain uses. For example, the Palmer Drought Severity Index has been widely used by the U.S. Department of Agriculture to determine when to grant emergency drought assistance, but the

Εισαγωγή

- Γιατί χρειάζονται οι στρατηγικές αντιμετώπισης των λειψυδριών?
- Διαδικασίες Εκτάκτου Ανάγκης Αντιμετώπισης Φυσικών Κινδύνων.
- Πρωτόκολλα για την Εξέλιξη και τις Διαδικασίες.

Προβλήματα

- Σημαντική Δυναμική για Συγκρούσεις.
- Η διαχείριση ασκείται από πολλούς φορείς (Τοπικούς, Περιφερειακούς, Εθνικούς).
- Πολλές Ομάδες Επιρροής Αποφάσεων.
- Δύσκολες Αποφάσεις Αλληλο-παραχωρήσεων (Trade-off).
- Η Διαχείριση Πληροφοριών (Information Management) είναι κρίσιμη.
- Δύσκολος Καθορισμός των Λειψειδριών

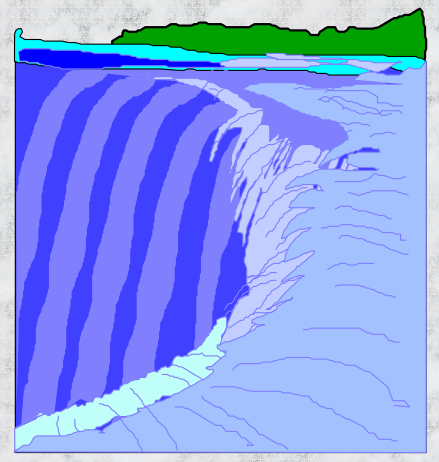

THE
HYDRO-ILLOGICAL
CYCLE
PANIC
RAIN
APATHY
DROUGHT
AWARENESS
CONCERN

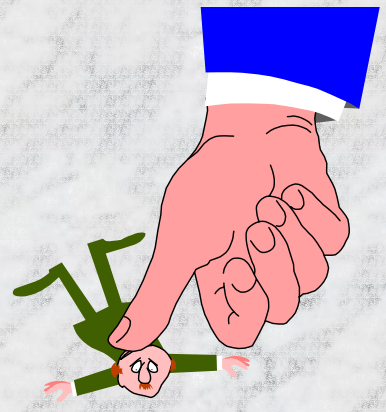
NDMC

Επιλογές Διαχείρισης

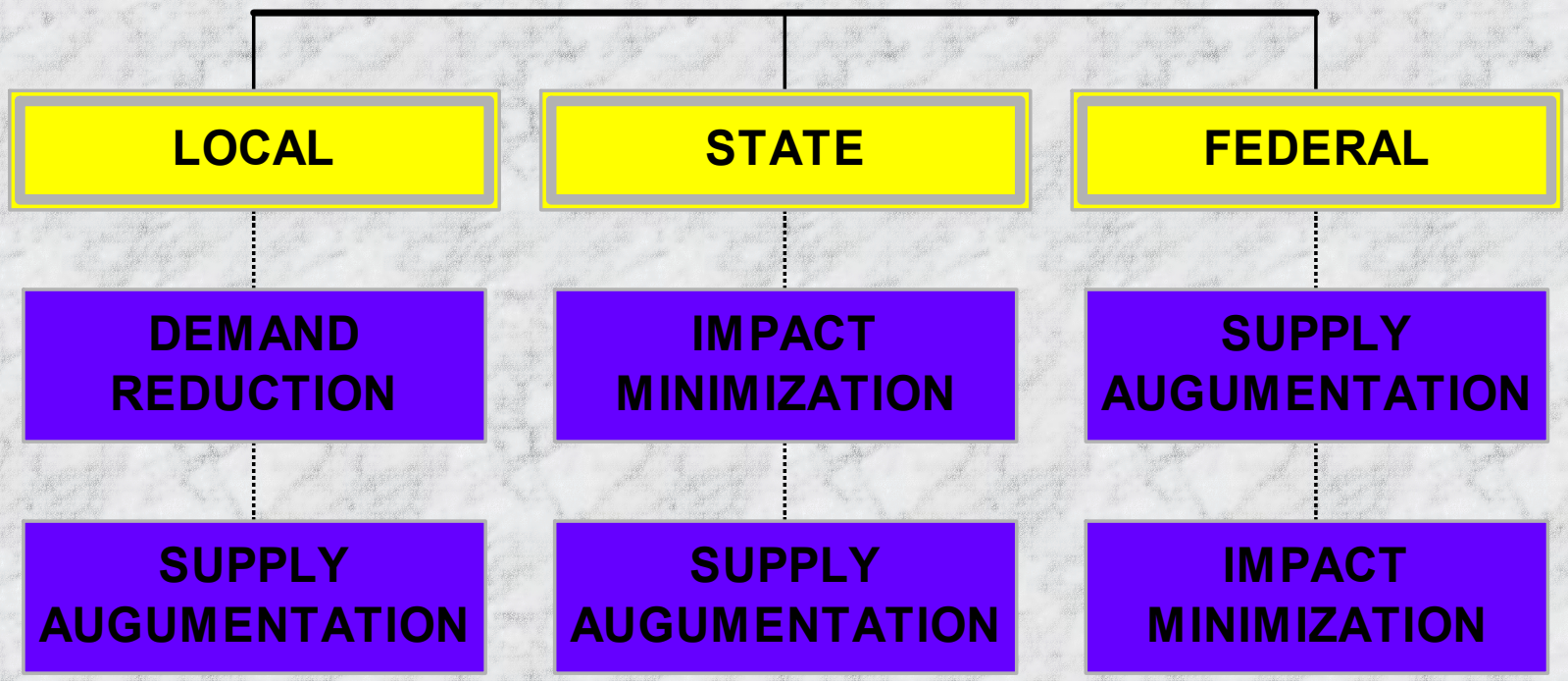
TACTICAL STRATEGIES/ MANAGEMENT OPTIONS

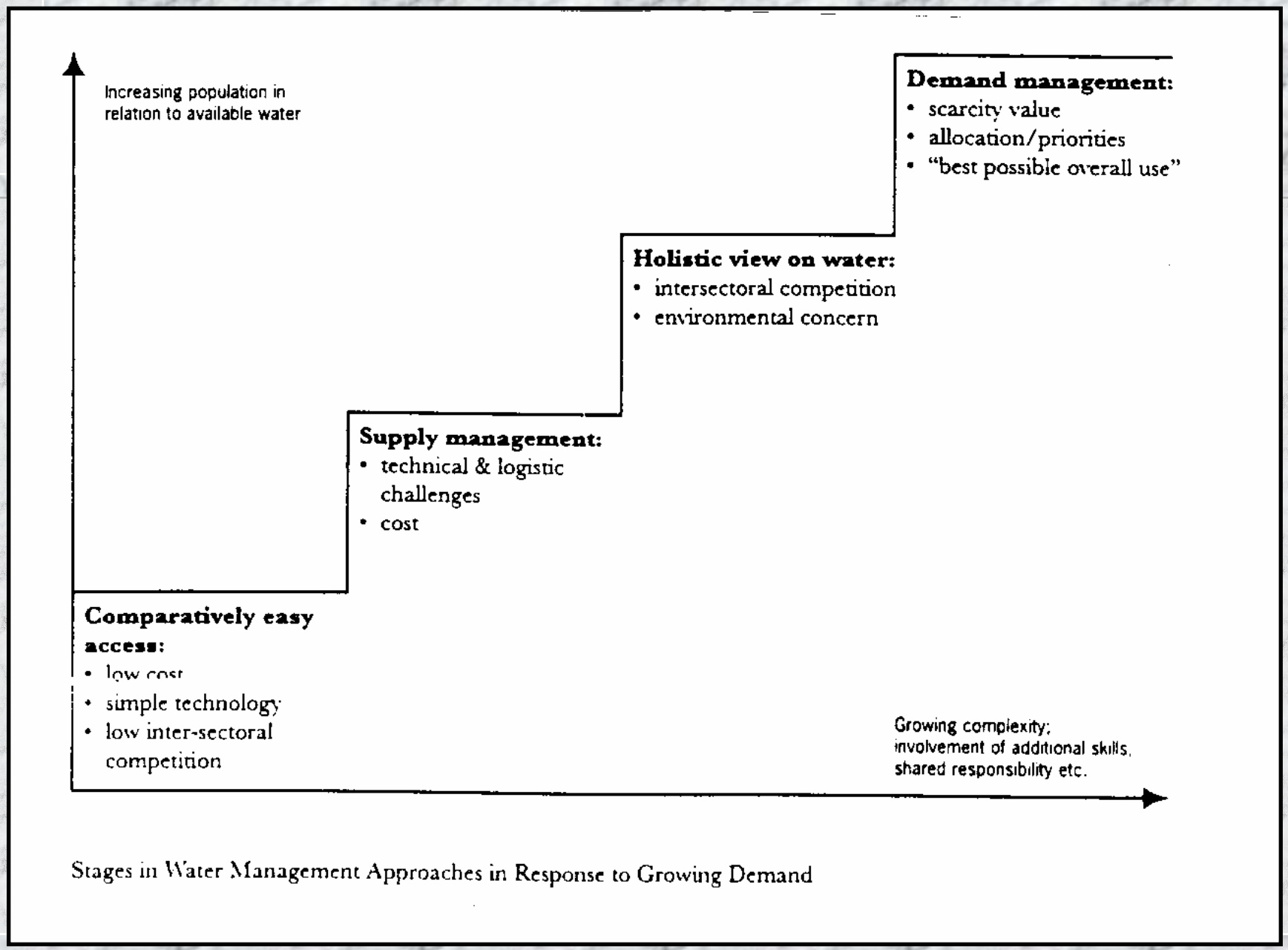
- **SUPPLY AUGMENTATION**
- **DEMAND REDUCTION**
- **IMPACT MINIMIZATION**





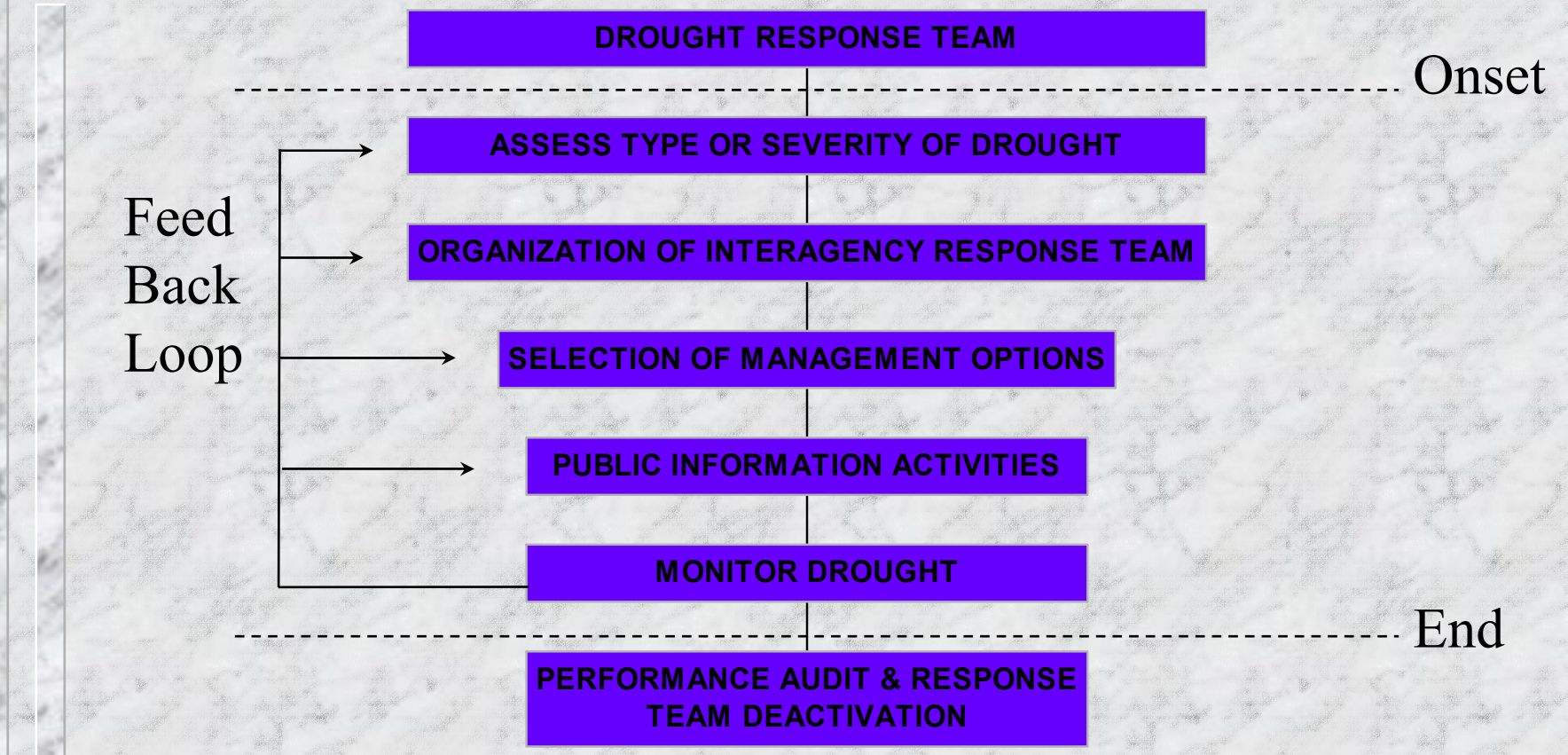
Επιλογές Διαχείρισης



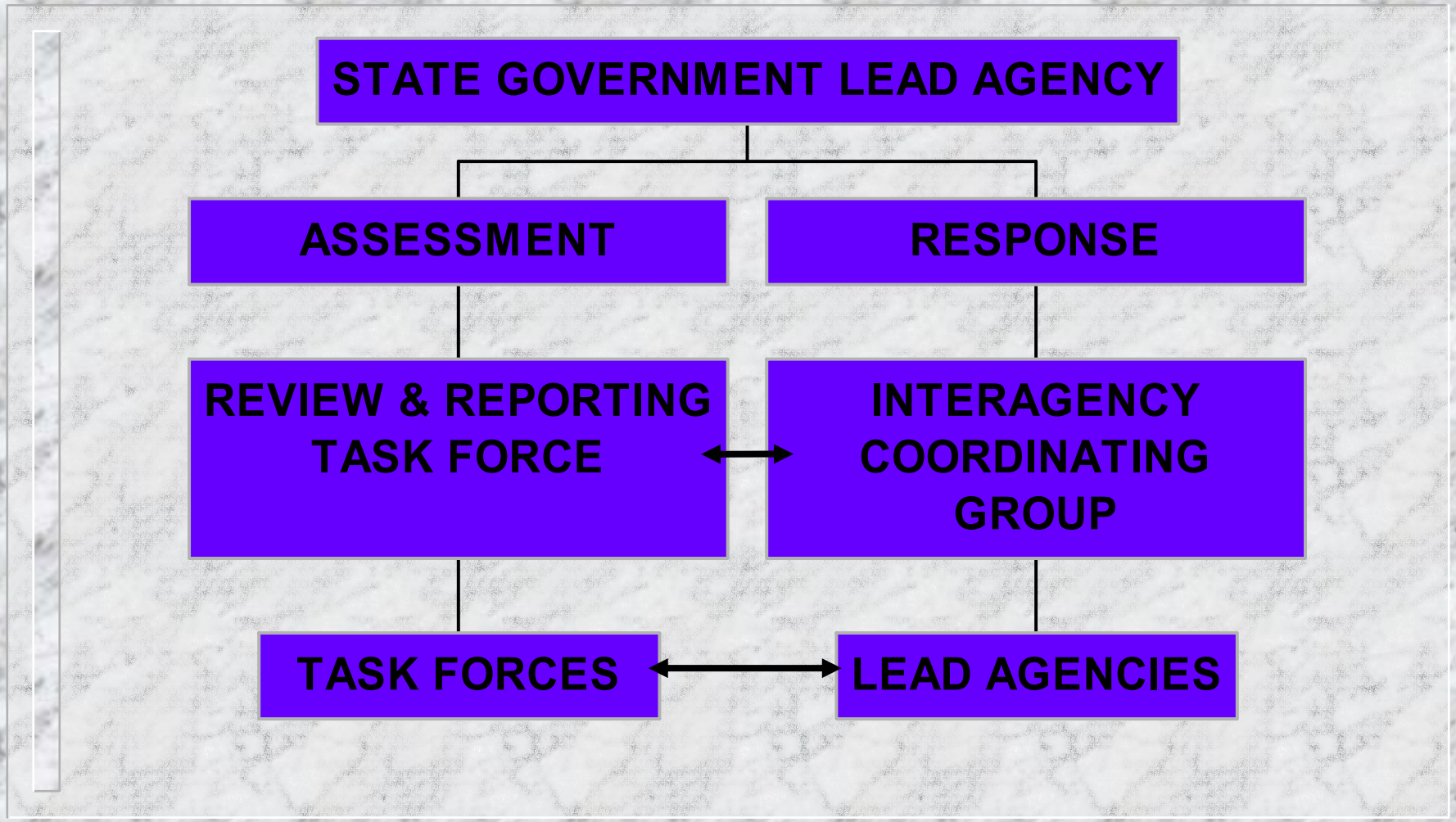


Stages in Water Management Approaches in Response to Growing Demand

Διαδικασία διαχείρισης Λειψυδριών



Οργανισμός Αντιμετώπισης Ξηρασιών



Προτόκολο Αντιμετώπισης

- Διαδικασία ορισμού αρμοδιοτήτων σε τοπικό, Περιφερειακό και Εθνικό επίπεδο.
- Οργανισμός αντιμετώπισης με αναγνωρισμένη ηγεσία
- Αποδεκτές διαδικασίες αξιολόγισης και επιλογών αντιμετώπισης.
- Αποδεκτές διαδικασίες διαχείρισης πληροφοριών και ελέγχου (Information Management and Performance Audits)

Updated: February 23, 2001

The Basics of Drought Planning: A 10-Step Process

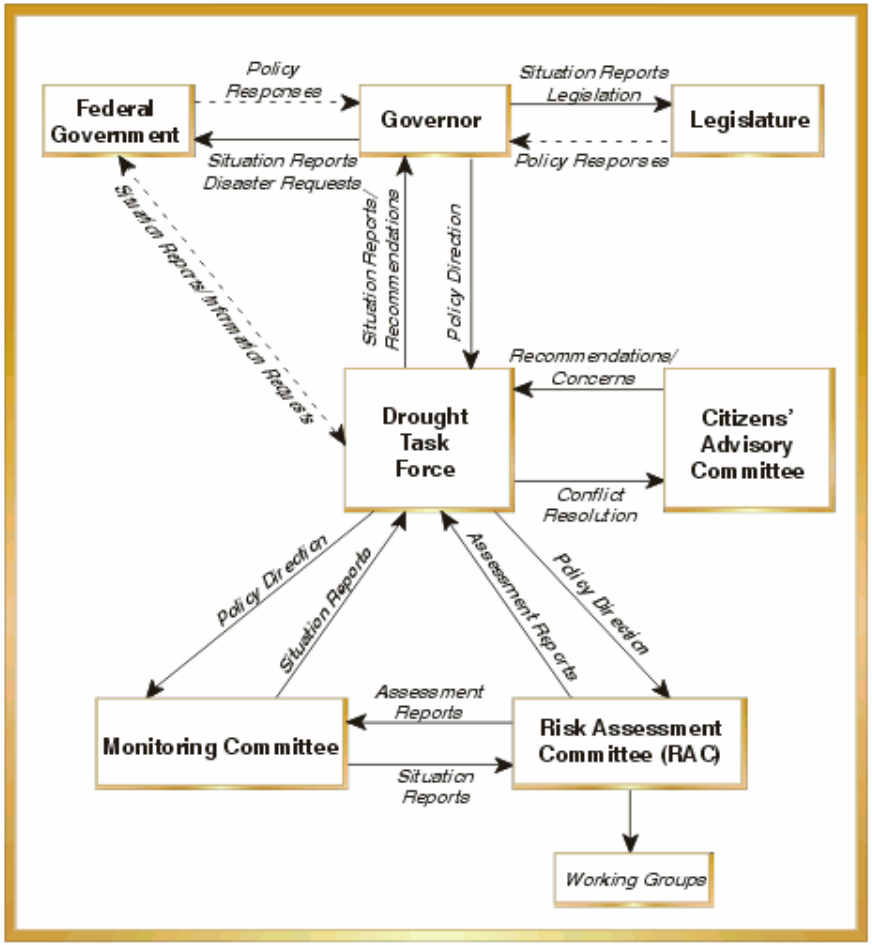
One of the biggest challenges in successful drought planning is getting all the right groups of people to communicate effectively with one another.

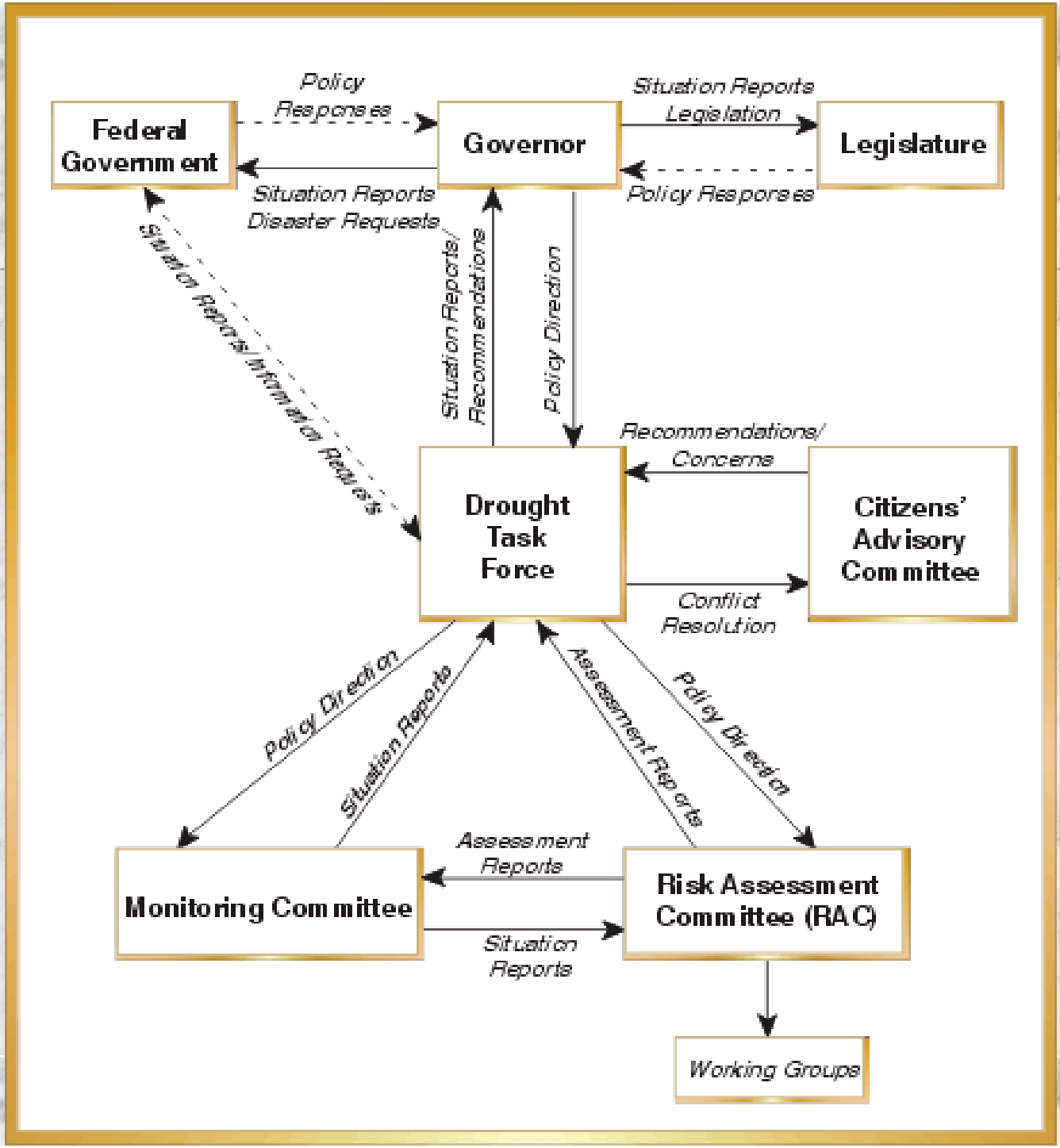
Three main groups need to be involved:

- **climatologists and others**, who monitor how much water is available now and in the foreseeable future. (Monitoring Committee)
- **natural resource managers** and others who determine how lack of water is affecting various interests, such as agriculture, recreation, municipal supplies, etc. (Risk Assessment Committee)
- high-level **decision makers**, often elected and appointed officials, who have the authority to act on information they receive about water availability and drought's effects. (Drought Task Force)

Getting these three groups functioning is the core of a successful drought plan, which is step 5 in a general 10-step process that can be tailored to the needs of an individual region, state or country:

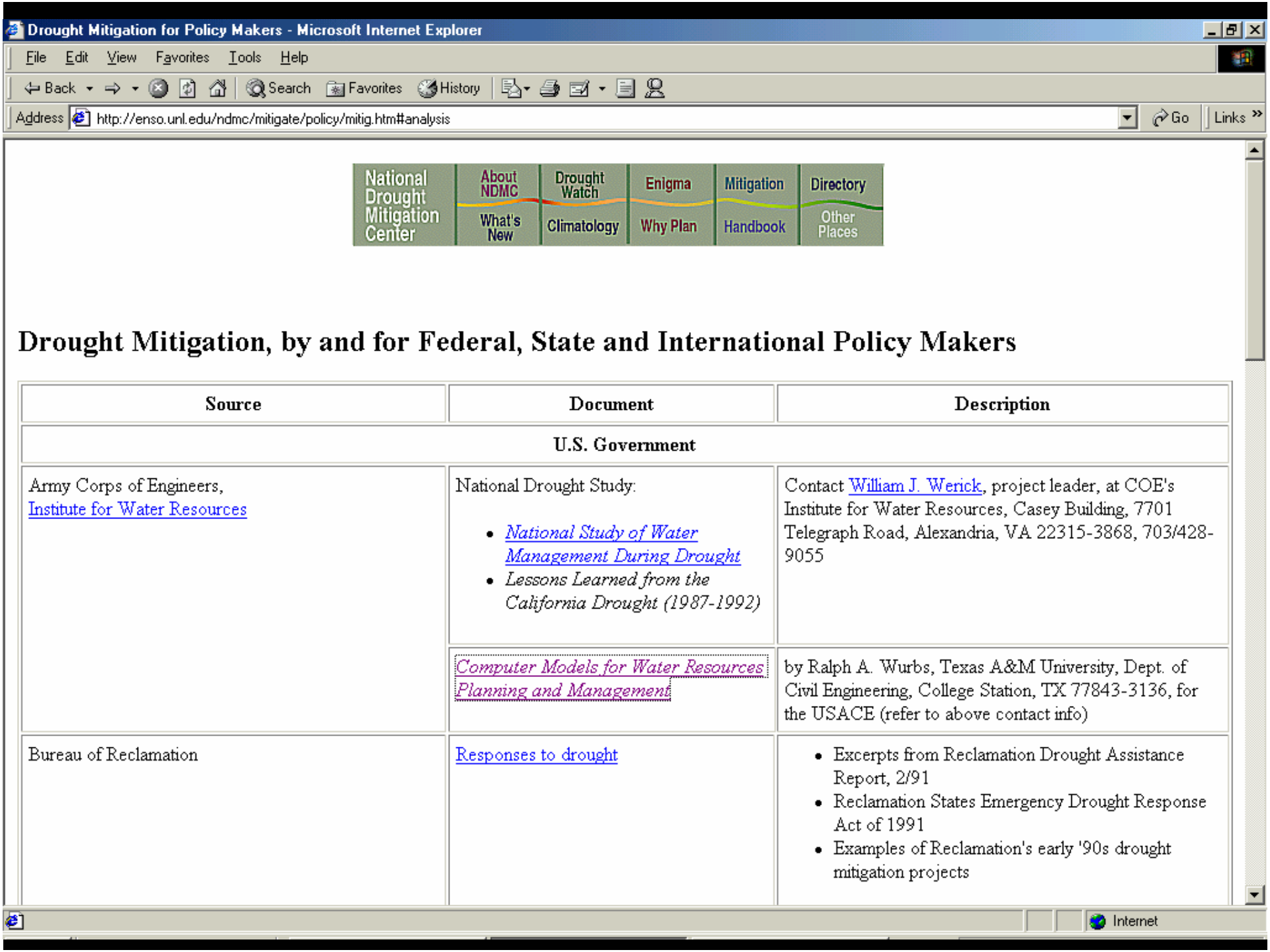
1. Appoint a Drought Task Force
2. Define the Purpose and Objectives of the Drought Plan
3. Seek Stakeholder Participation and Resolve Conflict
4. Inventory Resources and Identify Groups at Risk
5. Develop Organizational Structure and Prepare Drought Plan
6. Integrate Science and Policy, Close Institutional Gaps
7. Publicize the Proposed Plan, Solicit Reaction
8. Implement the Plan




Federal Government
Policy Responses
Governor
Situation Reports Legislation
Legislature
Situation Reports Disaster Requests
Policy Responses
Situation Reports/ Recommendations
Policy Direction
Situation reports/ Information requests
Drought Task Force
Recommendations/ Concerns
Citizens' Advisory Committee
Conflict Resolution
Policy Direction
Situation Reports
Assessment Reports
Policy Direction
Monitoring Committee
Assessment Reports
Risk Assessment Committee (RAC)
Situation Reports
Working Groups

NDMC General 10-step Process

1. Appoint a Drought Task Force
2. Define the Purpose and Objectives of the Drought Plan
3. Seek Stakeholder Participation and Resolve Conflict
4. Inventory Resources and Identify Groups at Risk
5. Develop Organizational Structure and Prepare Drought Plan
6. Integrate Science and Policy, Close Institutional Gaps
7. Publicize the Proposed Plan, Solicit Reaction
8. Implement the Plan
9. Develop Education Programs
10. Post-Drought Evaluation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Source
Document
Description
U.S. Government
Army Corps of Engineers, Institute for Water Resources
National Drought Study:
National Study of Water Management During Drought
Lessons Learned from the California Drought (1987-1992)
Contact William J. Werick, project leader, at COE's Institute for Water Resources, Casey Building, 7701 Telegraph Road, Alexandria, VA 22315-3868, 703/428-9055
Computer Models for Water Resources Planning and Management
by Ralph A. Wurbs, Texas A&M University, Dept. of Civil Engineering, College Station, TX 77843-3136, for the USACE (refer to above contact info)
Bureau of Reclamation
Responses to drought
Excerpts from Reclamation Drought Assistance Report, 2/91
Reclamation States Emergency Drought Response Act of 1991
Examples of Reclamation's early '90s drought mitigation projects
Internet

Updated: April 6, 2001

Why Plan for Drought?

Drought is inevitable, a normal part of virtually every climate on the planet, even rainy ones.

The impacts of drought hit hardest when people place too high a demand on the water supply. Unrealistic expectations often contribute to overestimating the water supply. We can mitigate drought by carefully balancing demand with supply.

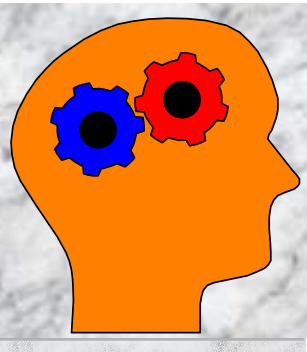
It is urgent that we act. More people need more water. As the human population grows, so does the amount of water that humans will need, for drinking, for growing food and for many other uses. It appears that our vulnerability to drought and water shortage is increasing along with our population. Every region of the United States has its own stresses on water supply.

Planning for drought is essential but it doesn't come naturally. Obstacles abound:

- No single definition of drought works in all regions.
- People aren't rational. We automatically swing into action when crisis strikes, freely funnelling time and money into alleviating suffering and property damage. This is crisis management. But once the crisis is over, it seems like too much trouble to invest the time and resources in planning that could ease the effects of the next drought. This is called the hydro-illogical cycle.
- Responsibility is divided among many governmental jurisdictions.
- The United States lacks a unified philosophy for managing natural resources, including water. A positive side to the drought of 1996 in the southwestern U.S. is that it has yielded a crop of policy initiatives.
- Historic responses to drought have been ad hoc, with special commissions and interagency groups created in response to specific droughts.
- Policies such as disaster relief and outdated water allocation practices may actually deter good long-term natural resource management.

But there are good reasons to plan for drought -- that is, to practice risk management rather than crisis management:

Προτάσεις



- Καλώς Δομημένες Στρατηγικές Αντιμετώπισης *αλλά* ευπροσάρμοστες
- Εφαρμογή "Ασκήσεων Λειψυδρίας"
- Ελεγχος συμπεριφοράς
- Συχνή αναπροσαρμογή του σχέδιου αντιμετώπισης

Μέλη Οργανισμού αντιμετώπισης

- Must Have the Required Time
- Must Have the Required Resources
- Must Have the Authority to Commit Their Agencies

Συμπεράσματα

- Σχέδιο Αντιμετώπισης Λειψυδριών, Nationally and Internationally
- Σχέδιο Πρόληψης Λειψυδριών - Drought Contingency Plans
- Διεθνής ανταλλαγή πληροφοριών - Share Information and Experiences
- Συμμετοχή Κοινού

Questions