UC 2006 – Preconference Seminar

Geo-Project Planning

(Using ModelBuilder™)

Ready, aim ...

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August 2006

Contents

Definitions

The definition of environment …

Environment is the context for life.

physical systems
biological systems
social systems
value systems

Definitions

The definition of landscape …

Landscape is the planet's life-zone.

land + water
below + surface + above
physical + biological + social + values

Landscape Change Diagrams

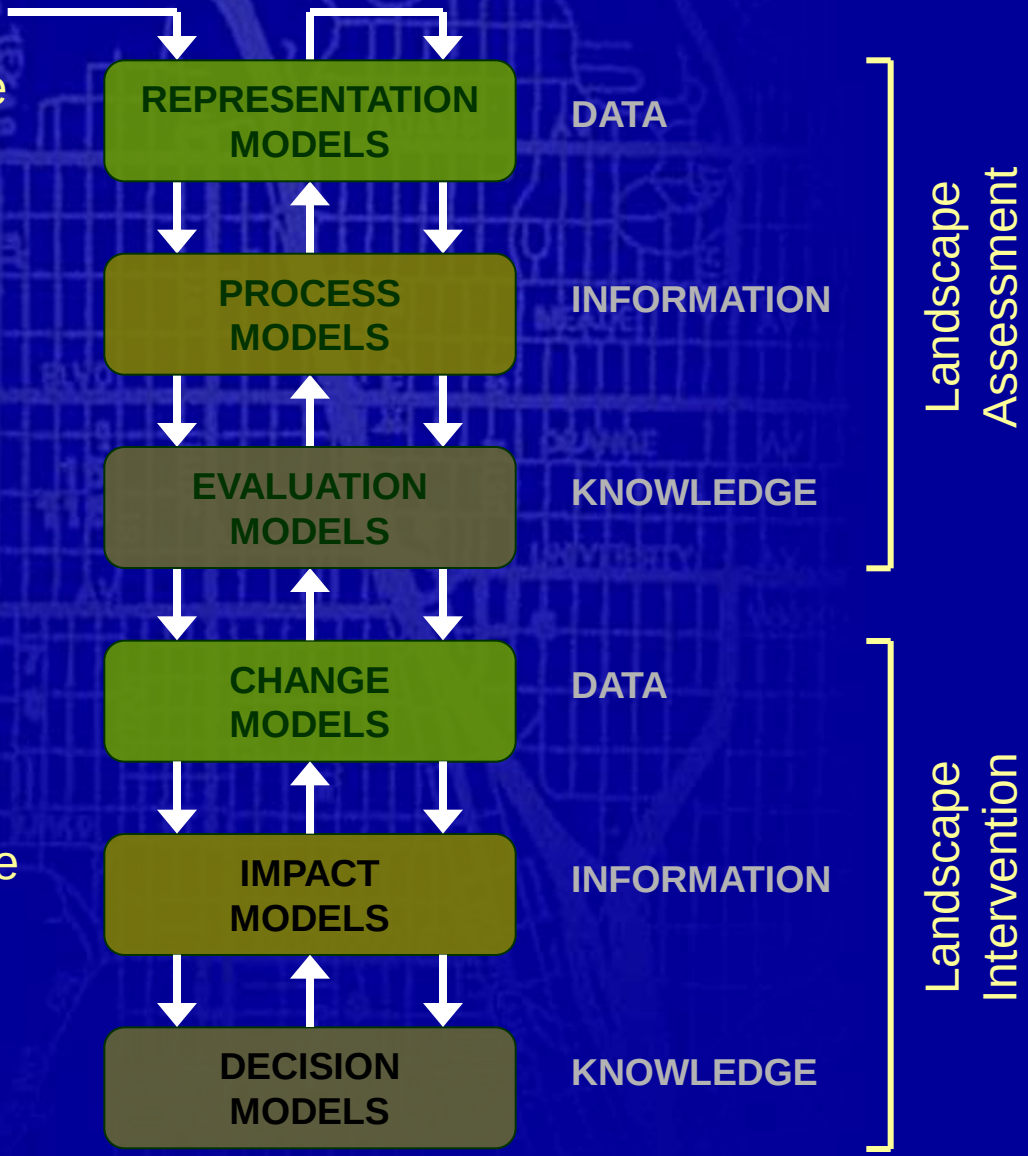
Landscape Change Model
(Concept Diagram)

Modeling Spatial Information
(Process Diagram)

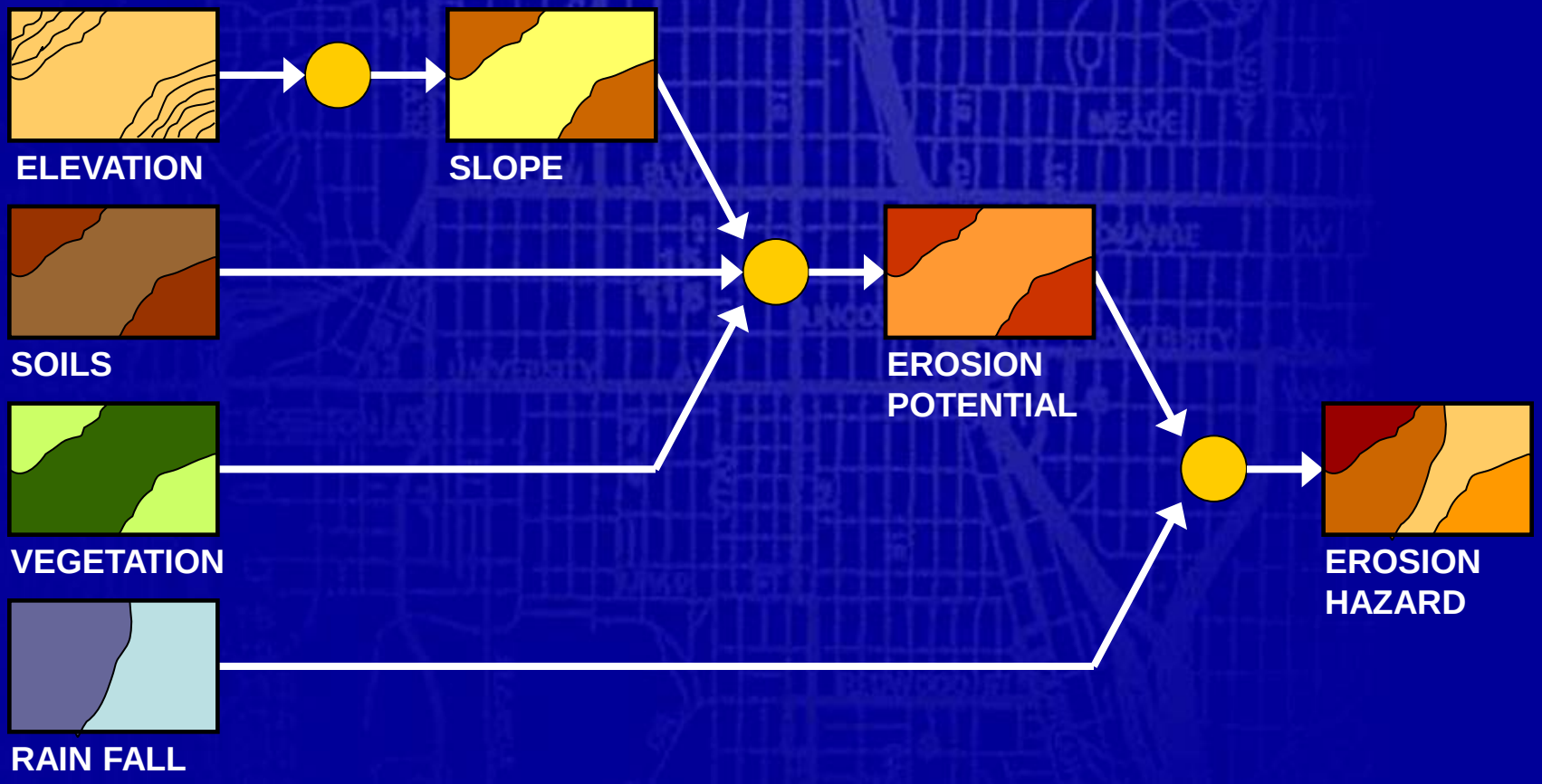
Mapping and Decision Diagram
(MAD Diagram)

Landscape Change Model by Carl Steinitz

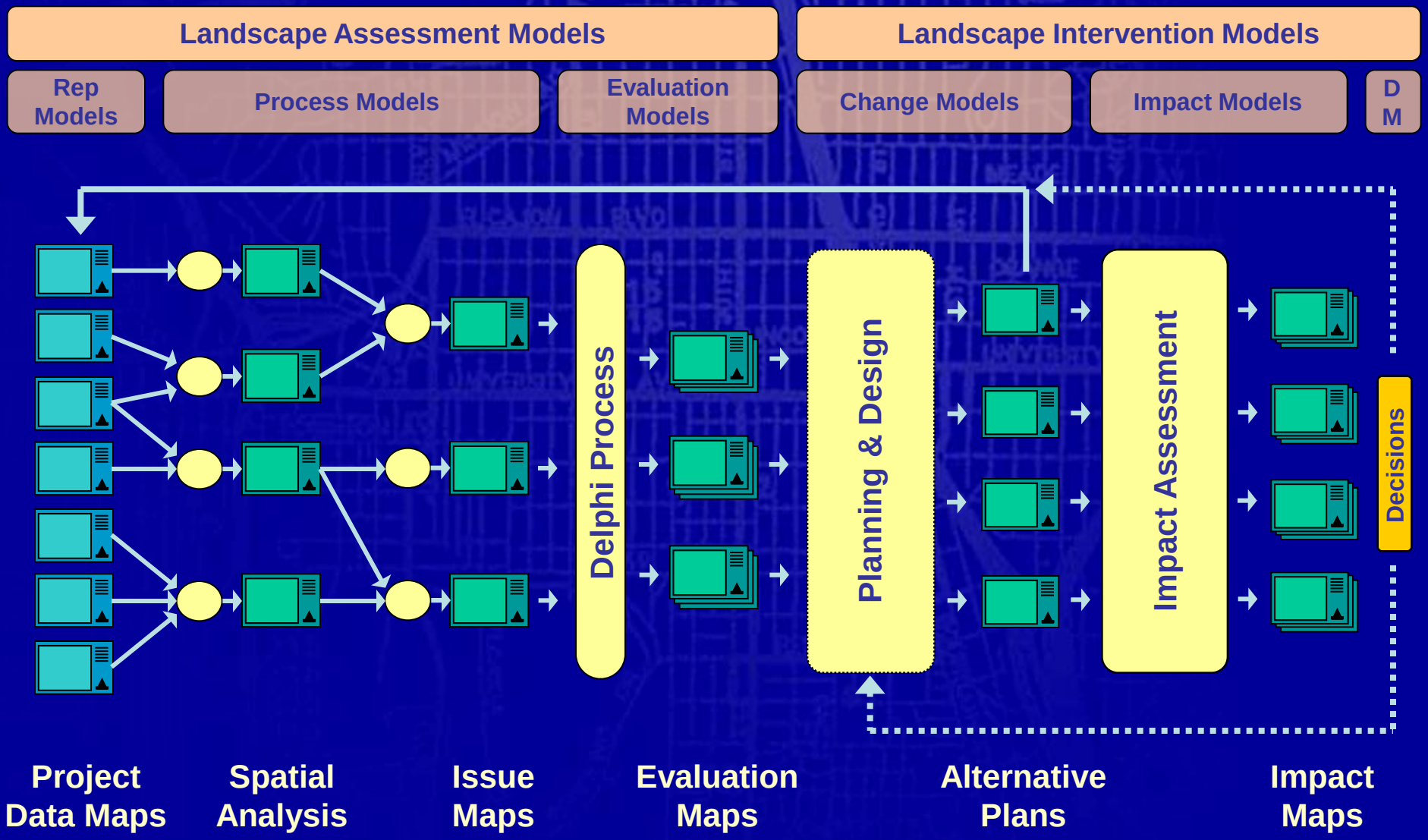
1. How should the landscape be described?
2. How does the landscape operate?
3. Is the landscape working well?
4. How might the landscape be altered?
5. What differences might the changes cause?
6. Should the landscape be changed?



Modeling Spatial Information



Mapping and Decision Diagram



The Components of a MAD Diagram

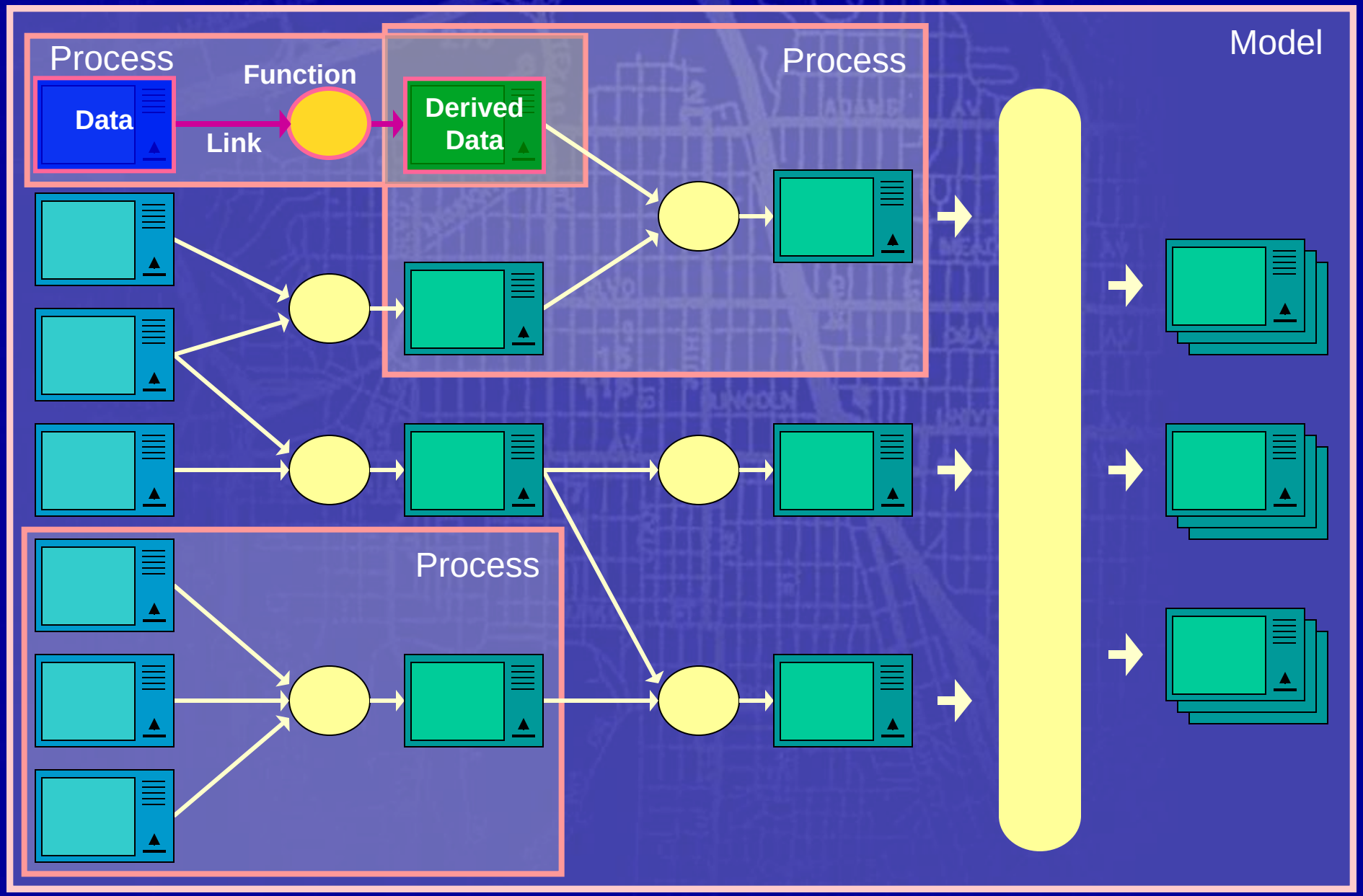
Semantic Structure

Sensitivity Analysis

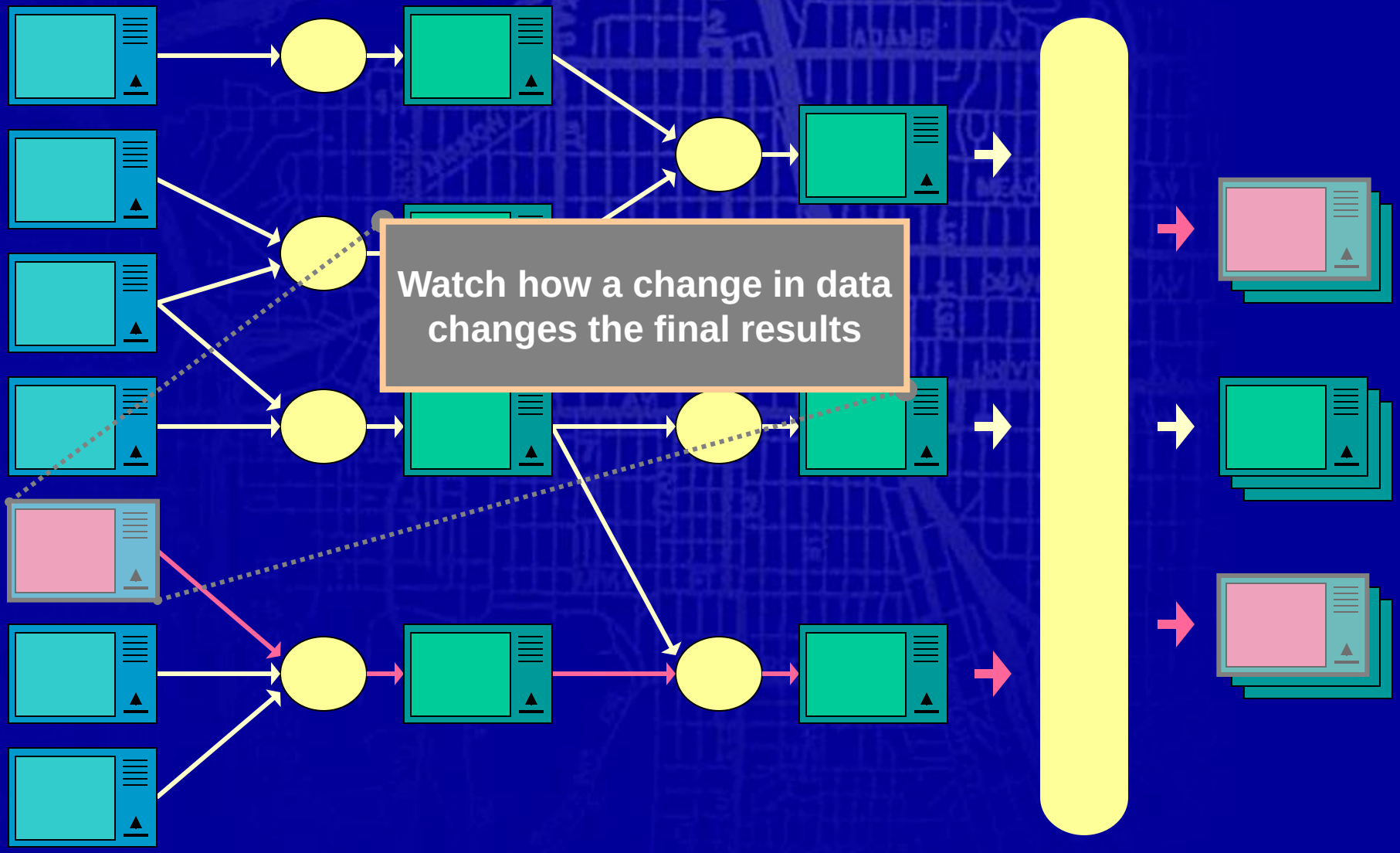
Regression Analysis

Benefit/Cost Analysis

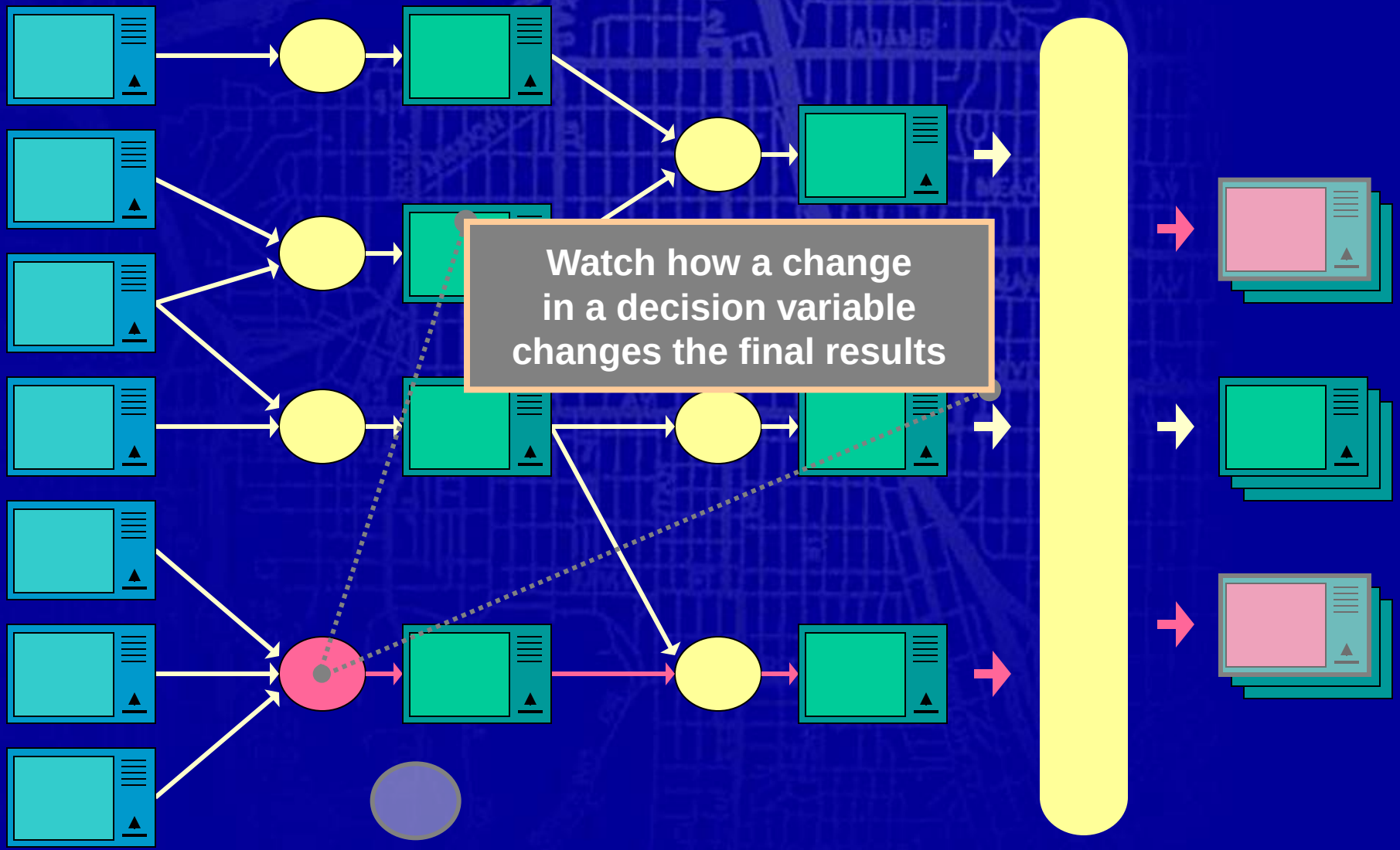
MAD Diagram – Semantic Structure



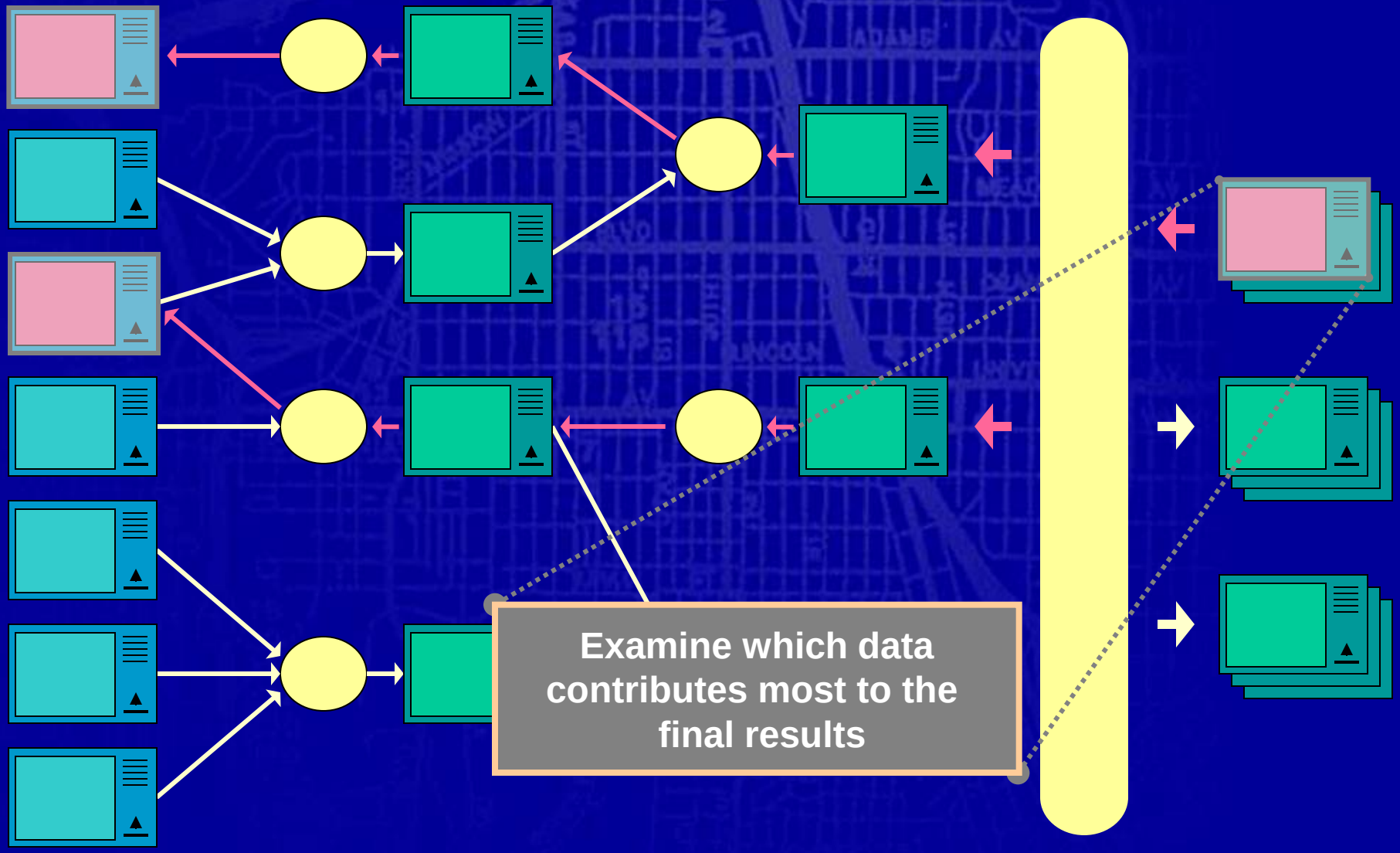
MAD Diagram – Sensitivity Analysis - Data



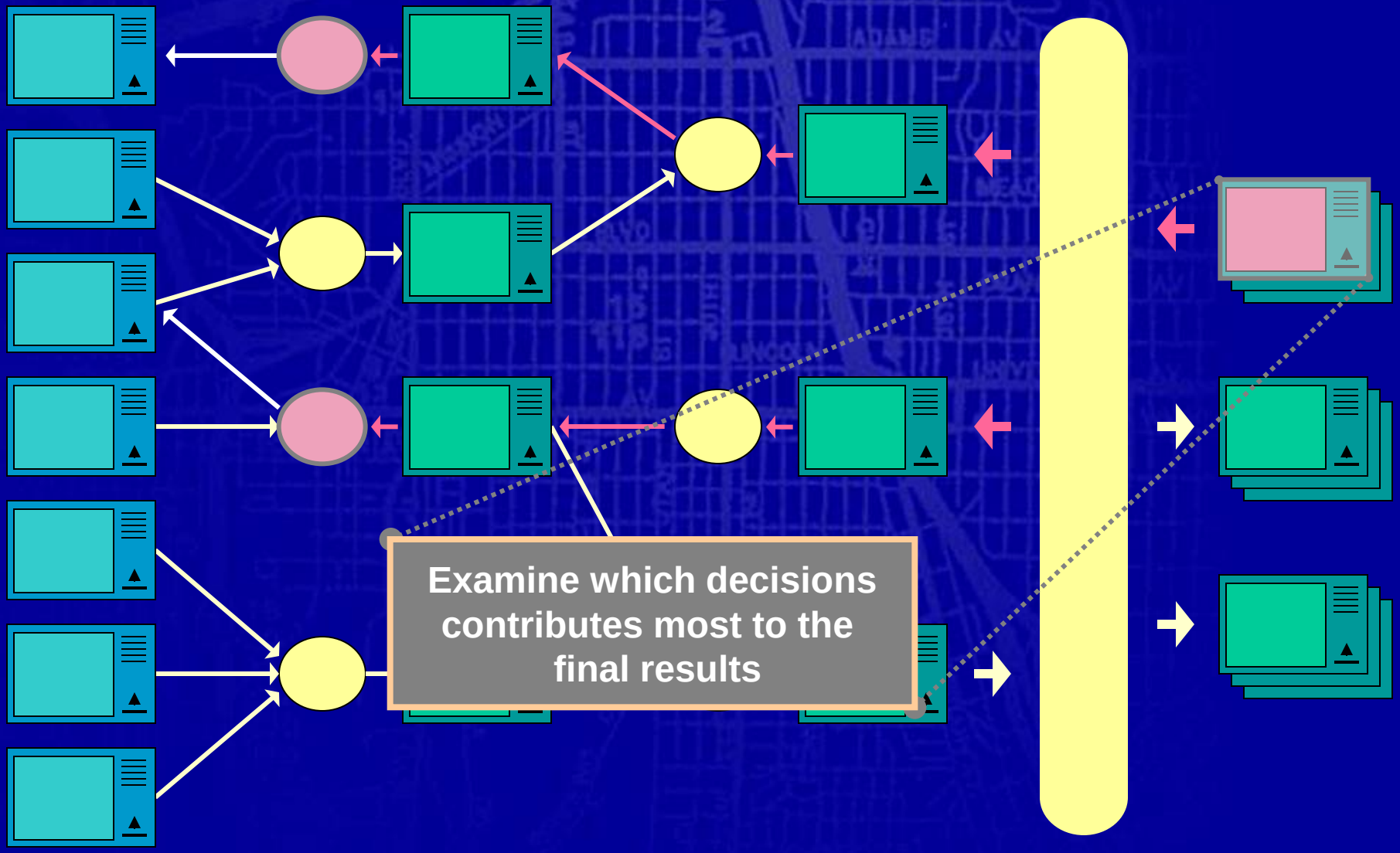
MAD Diagram – Sensitivity Analysis - Decisions



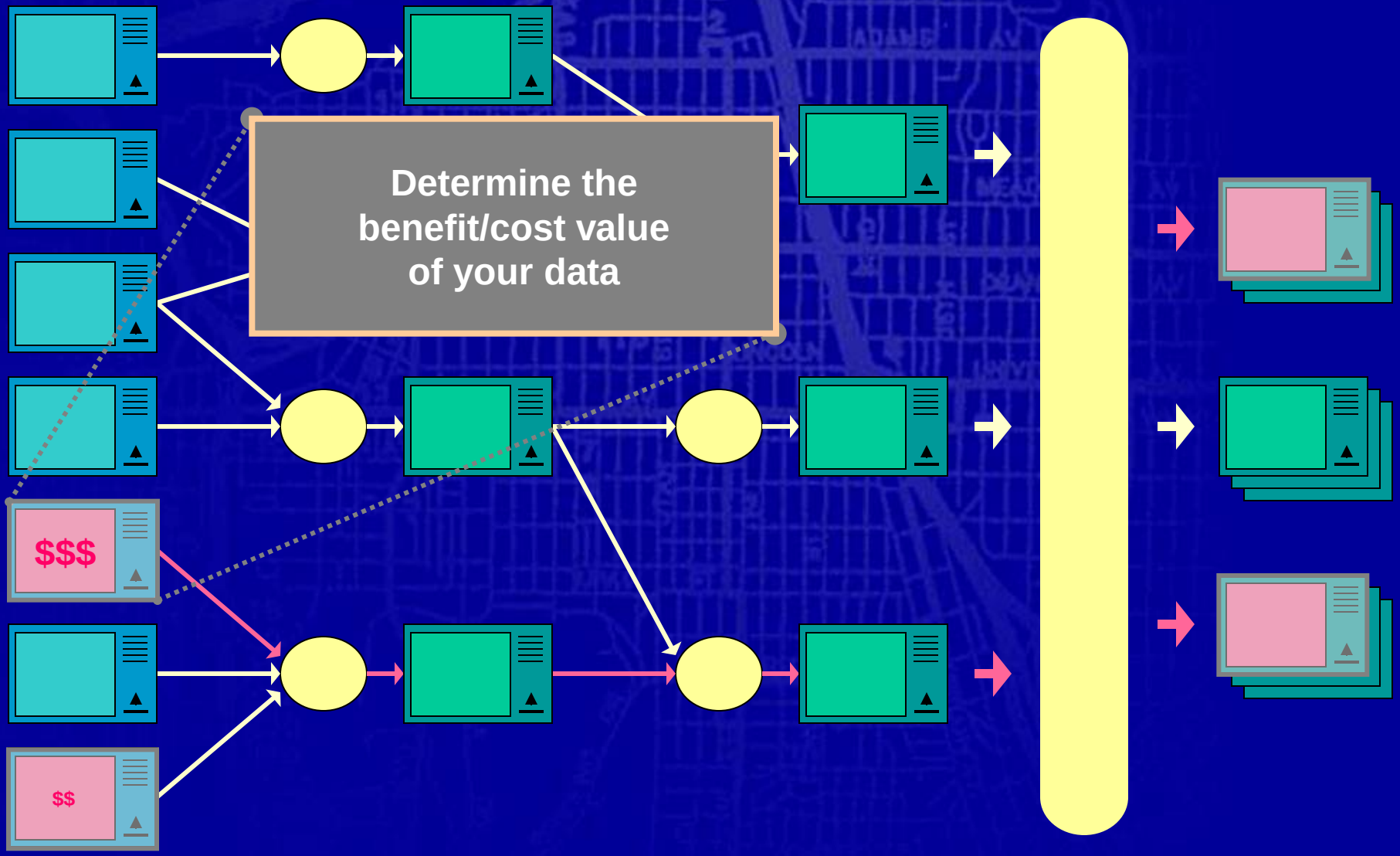
MAD Diagram – Regression Analysis - Data



MAD Diagram – Regression Analysis - Decisions



MAD Diagram – Benefit/Cost Analysis



Example - Mapping and Decision Diagram

Concept Diagram

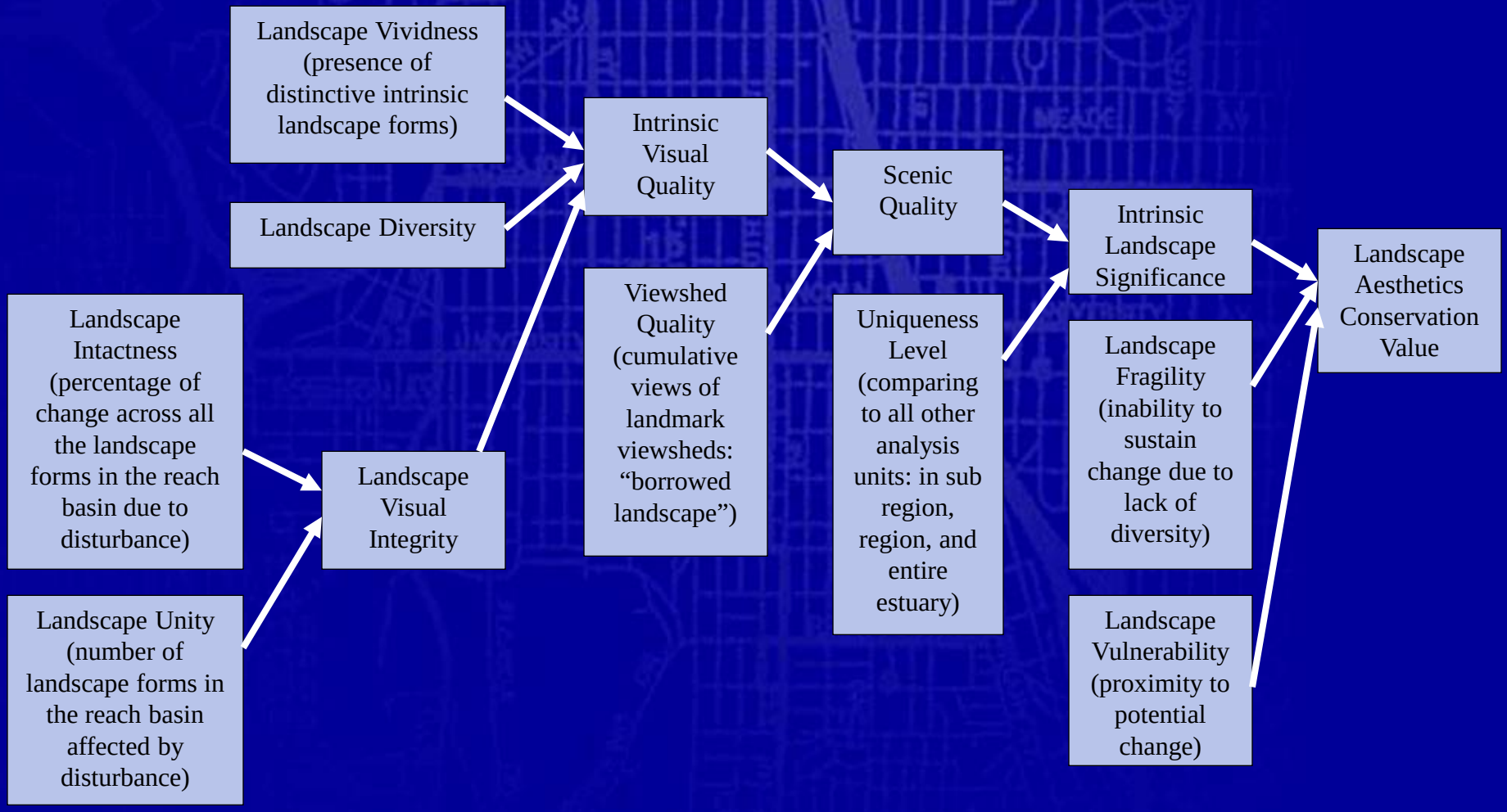
MAD Diagram

ModelBuilder Diagram

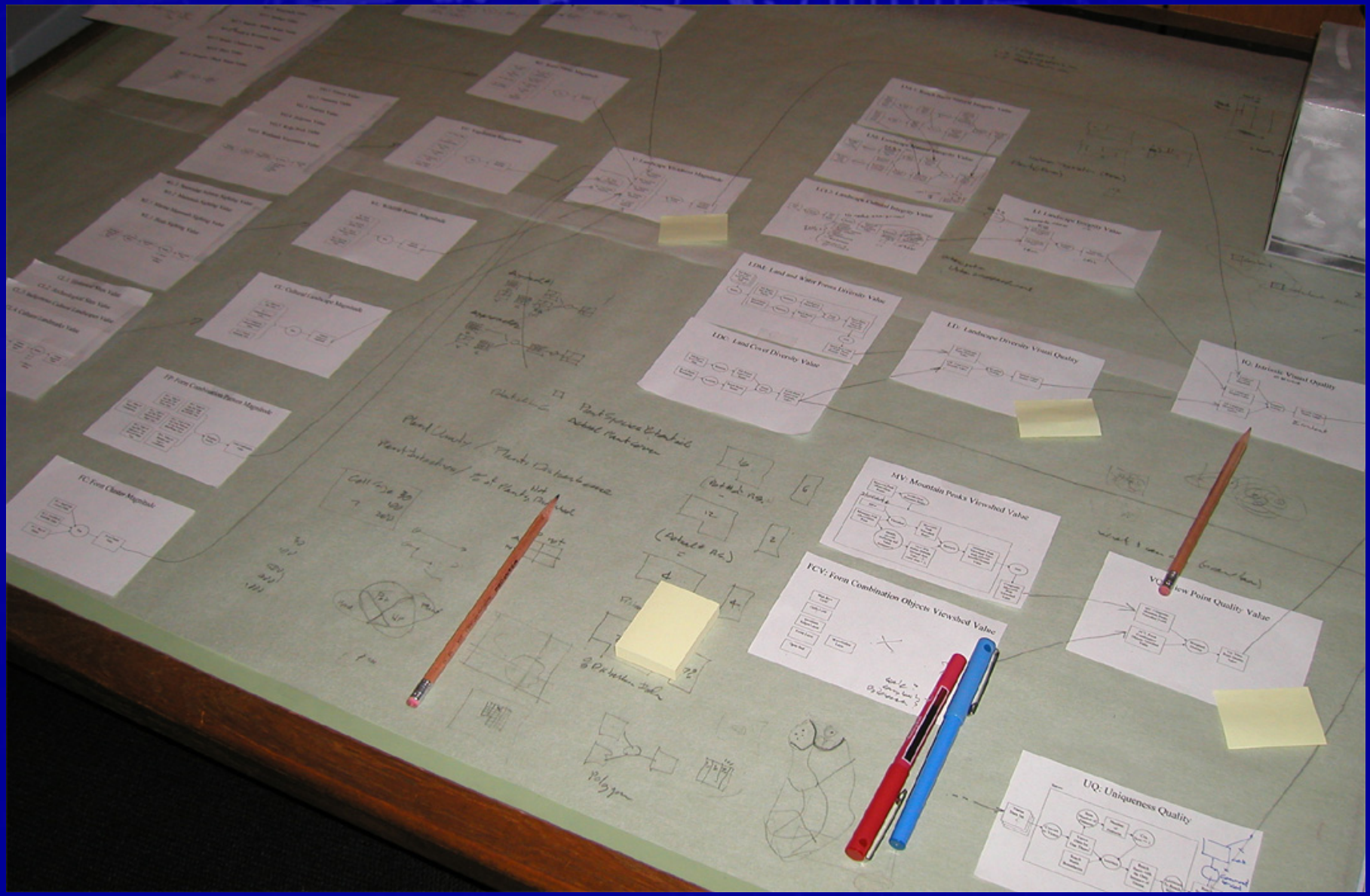
ModelBuilder Output

Concept Diagram

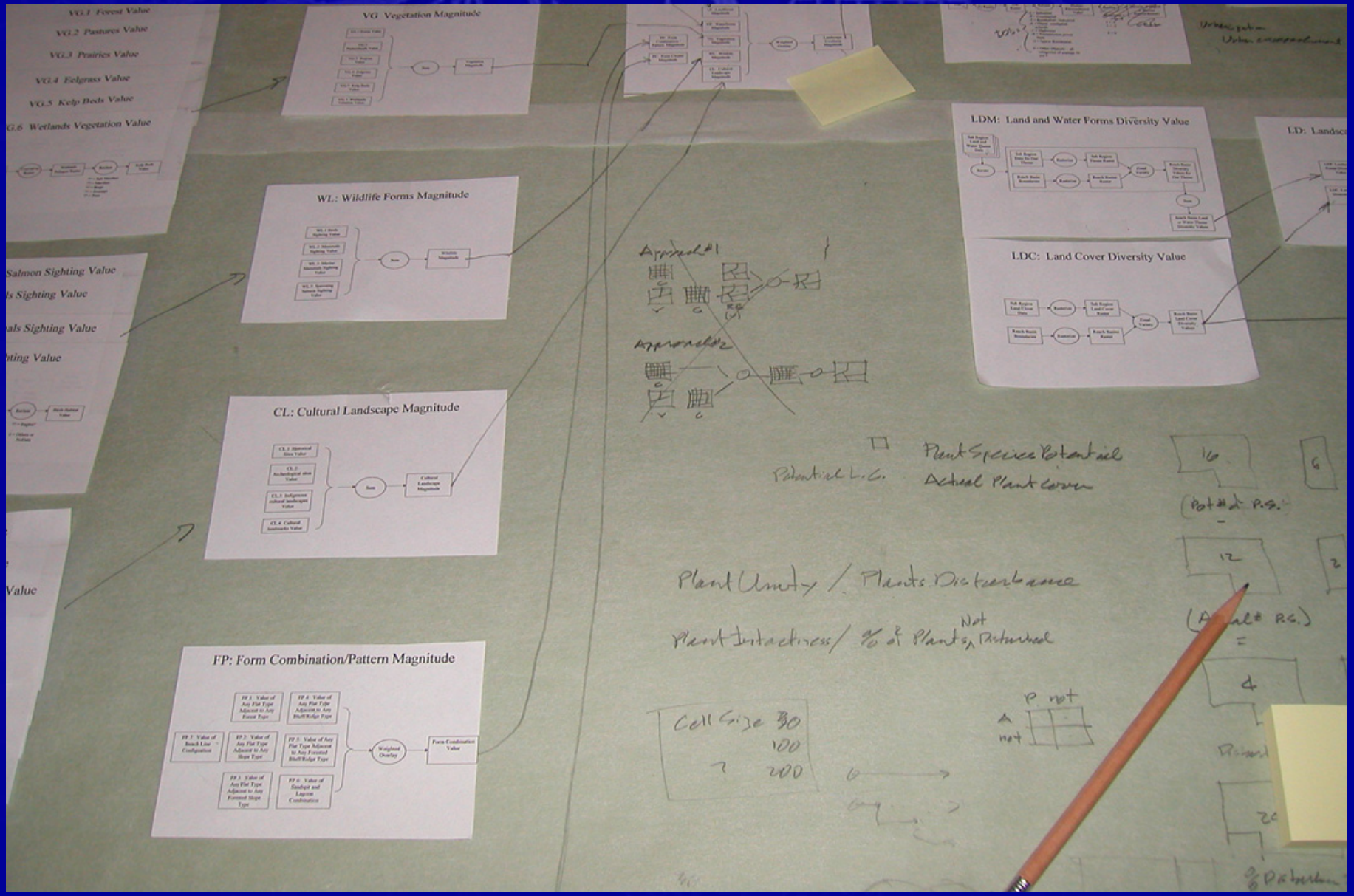
ILARIS Model – Assessing Landscape Quality



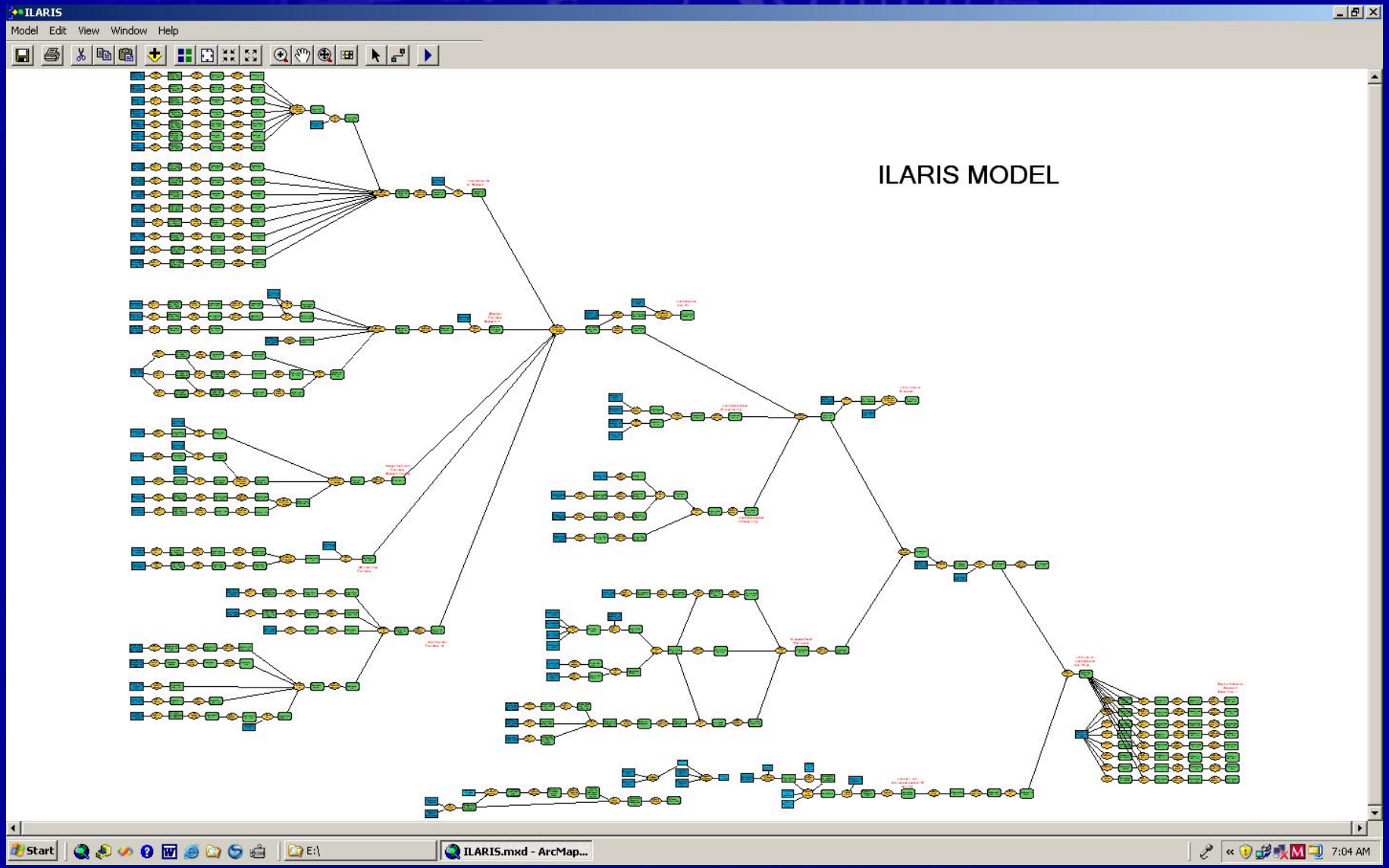
MAD Diagram


MV: Mountain Peaks Viewshed Value
FCV: Form Combination Objects Viewshed Value
UQ: Uniqueness Quality

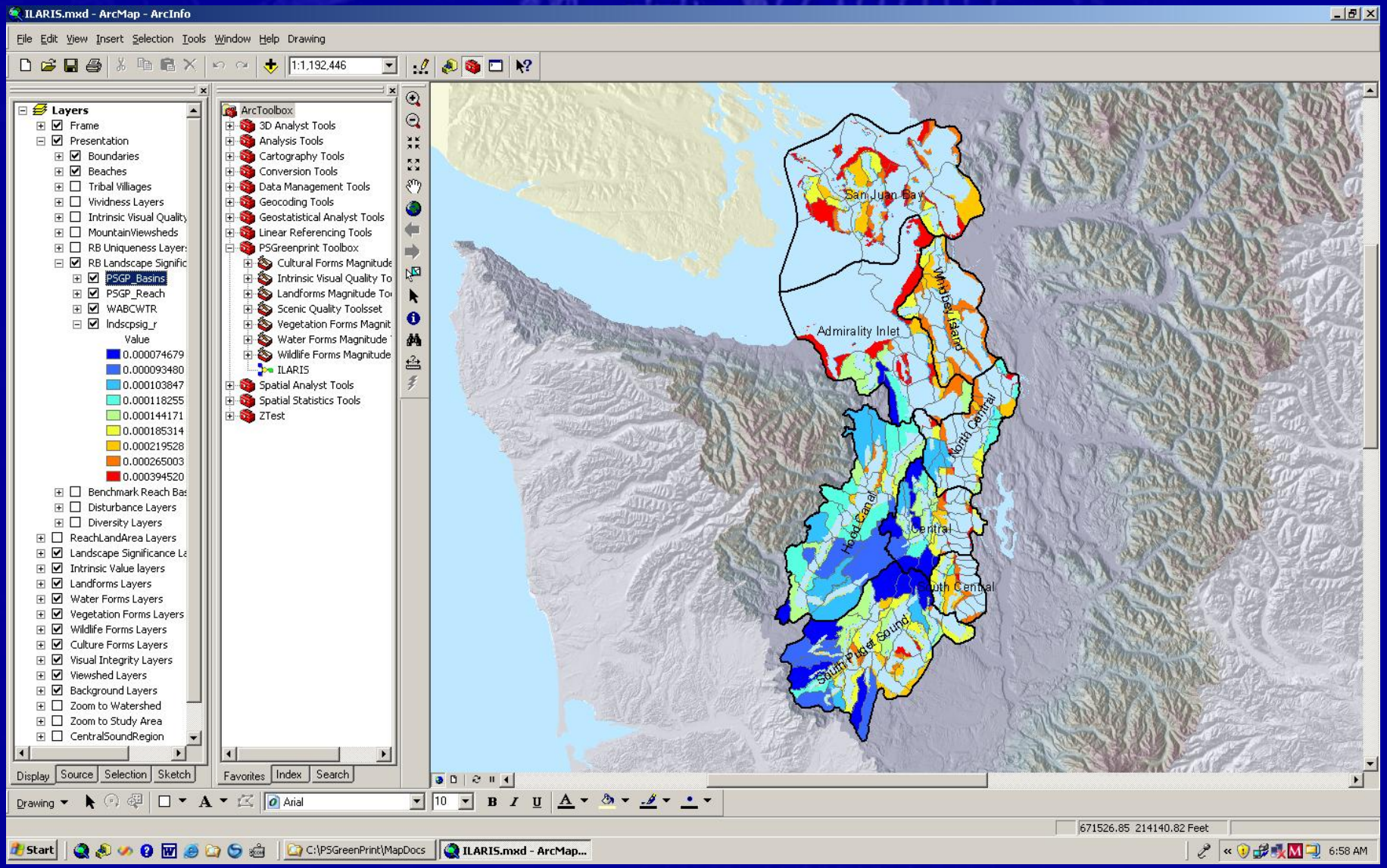
MAD Diagram


VG.1 Forest Value
VG.2 Pastures Value
VG.3 Prairies Value
VG.4 Eelgrass Value
VG.5 Kelp Beds Value
VG.6 Wetlands Vegetation Value
VG Vegetation Magnitude
WL: Wildlife Forms Magnitude
Salmon Sighting Value
Value
CL: Cultural Landscape Magnitude
FP: Form Combination/Pattern Magnitude
LDM: Land and Water Forms Diversity Value
LDC: Land Cover Diversity Value
Approach #1
Approach #2
Plant Species Potential
Potential L.C.
Actual Plant Cover
Plant Unity / Plants Disturbance
Plant Interactions / % of Plants Not Disturbed
Cell Size 50
100
200
P not
A
not

ModelBuilder Diagram



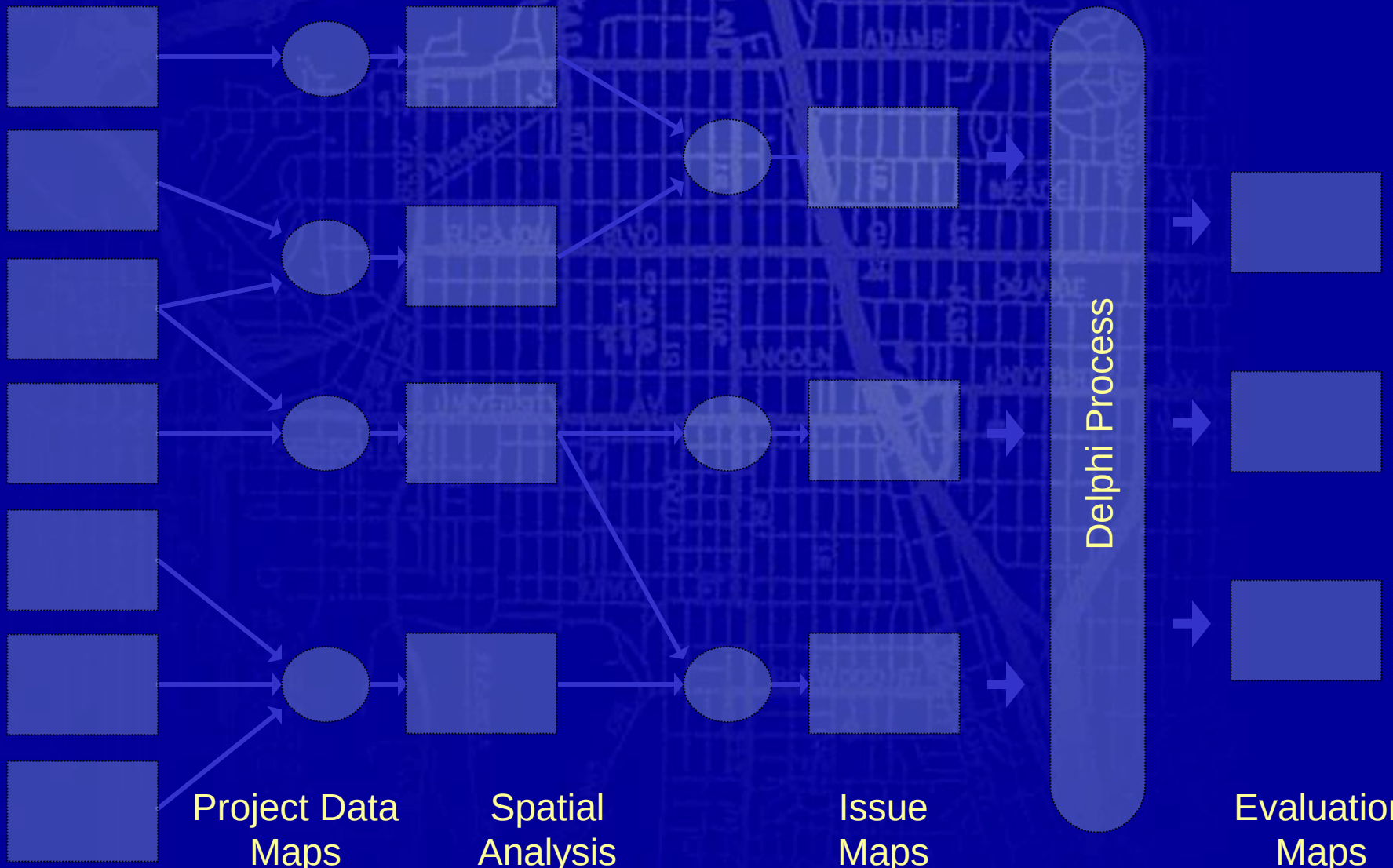
ModelBuilder Output



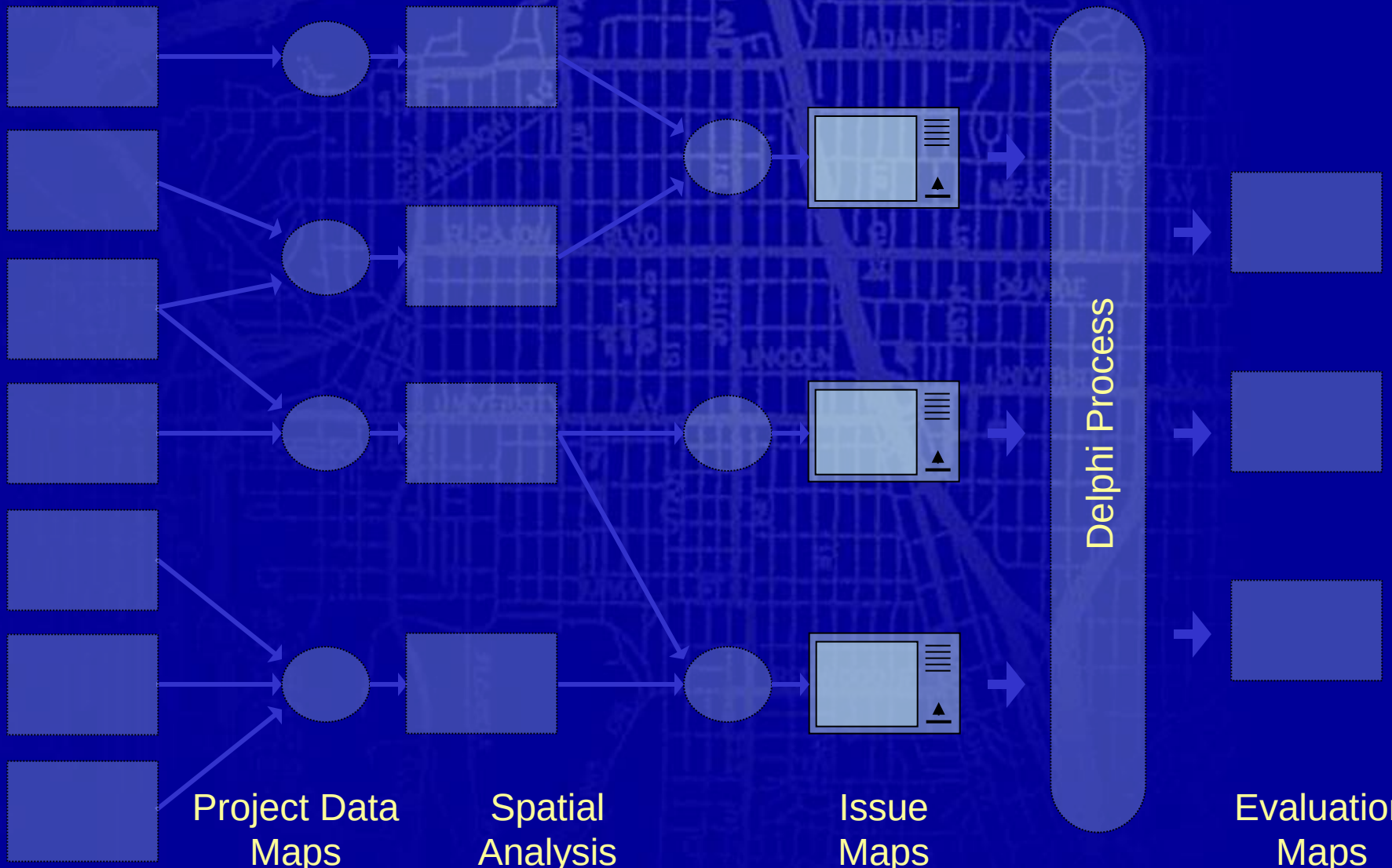
Landscape Significance – Entire Region

Landscape Assessment

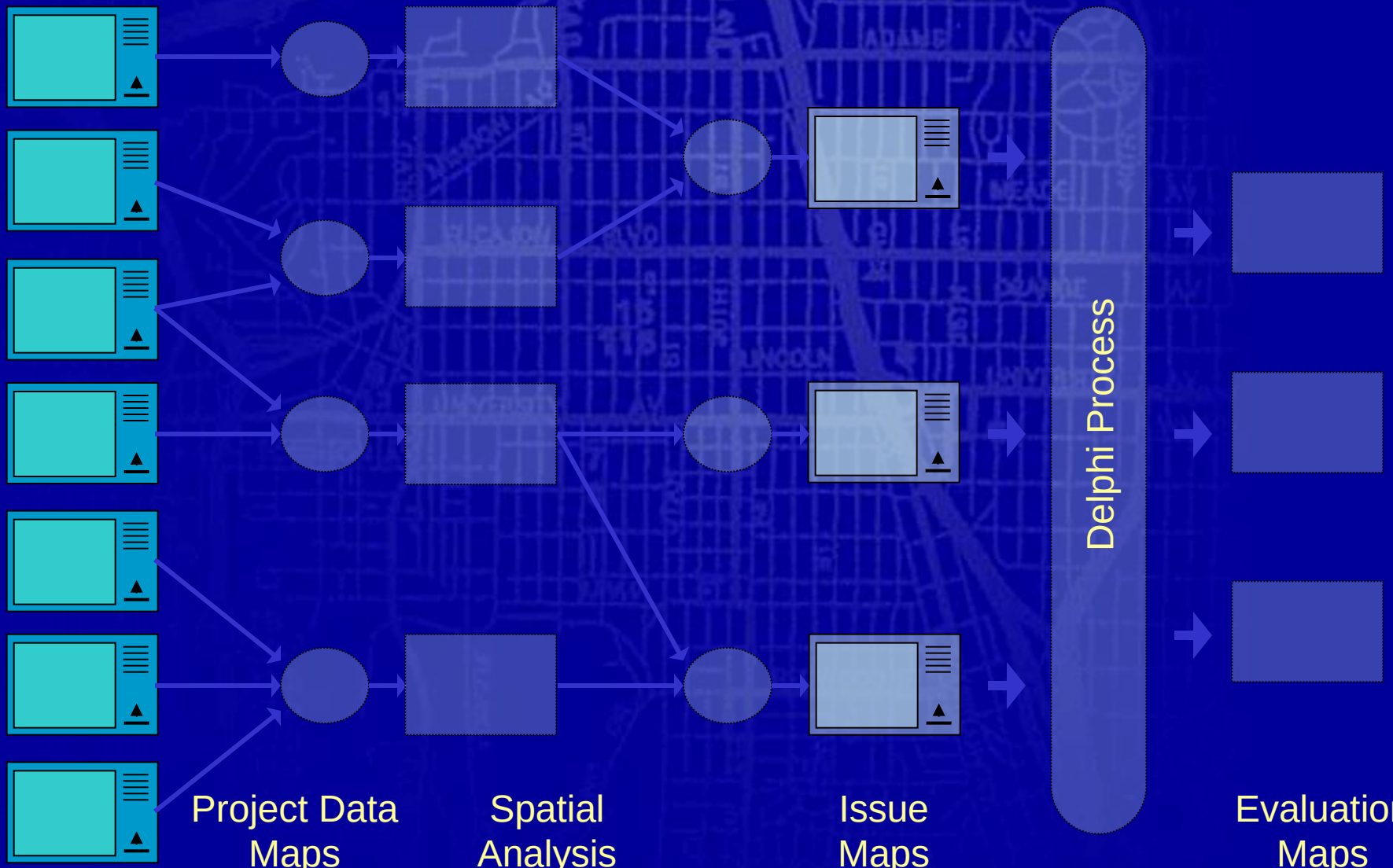
Landscape Assessment Model - Sequence



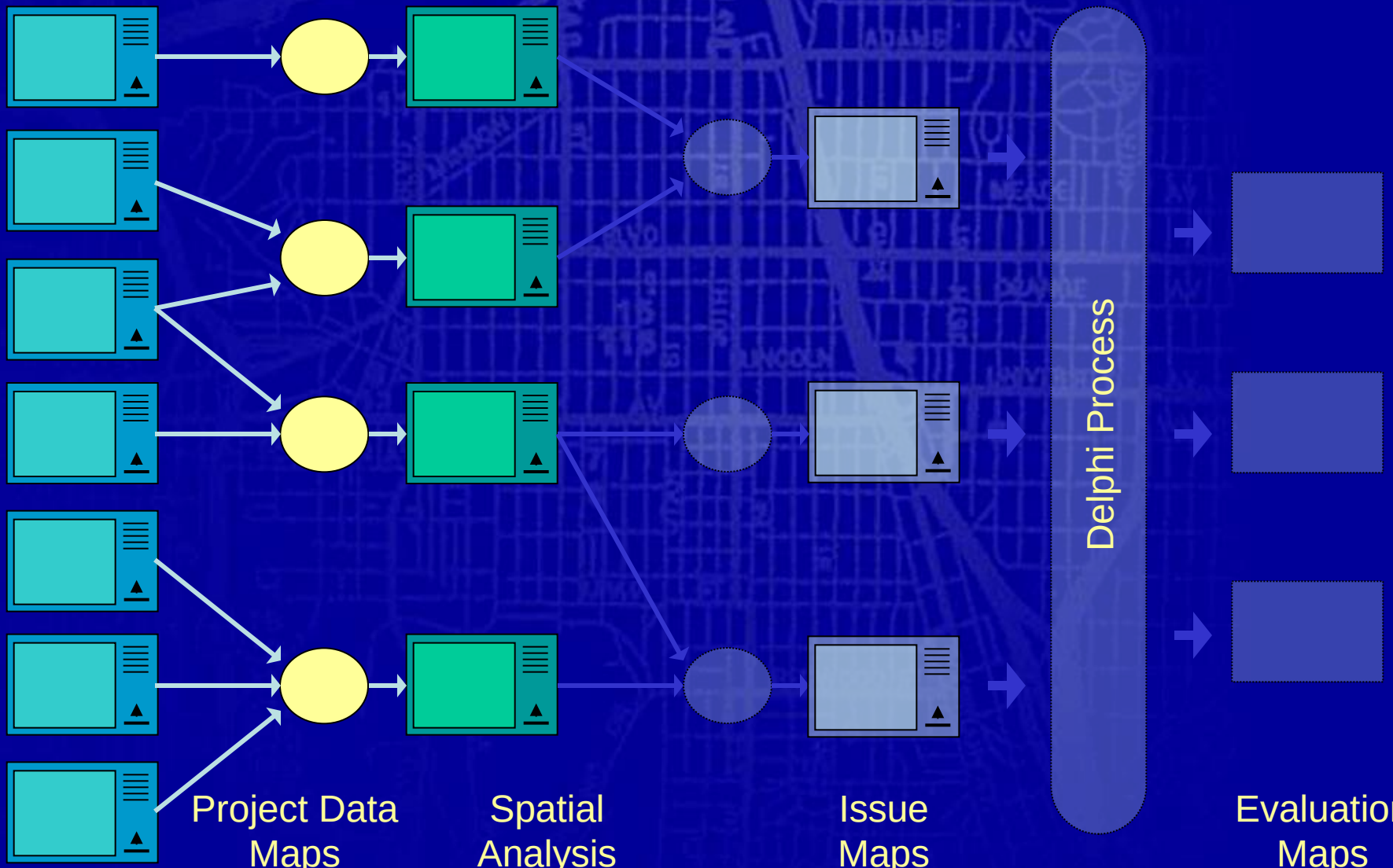
MAD Diagram – Issues of Concern



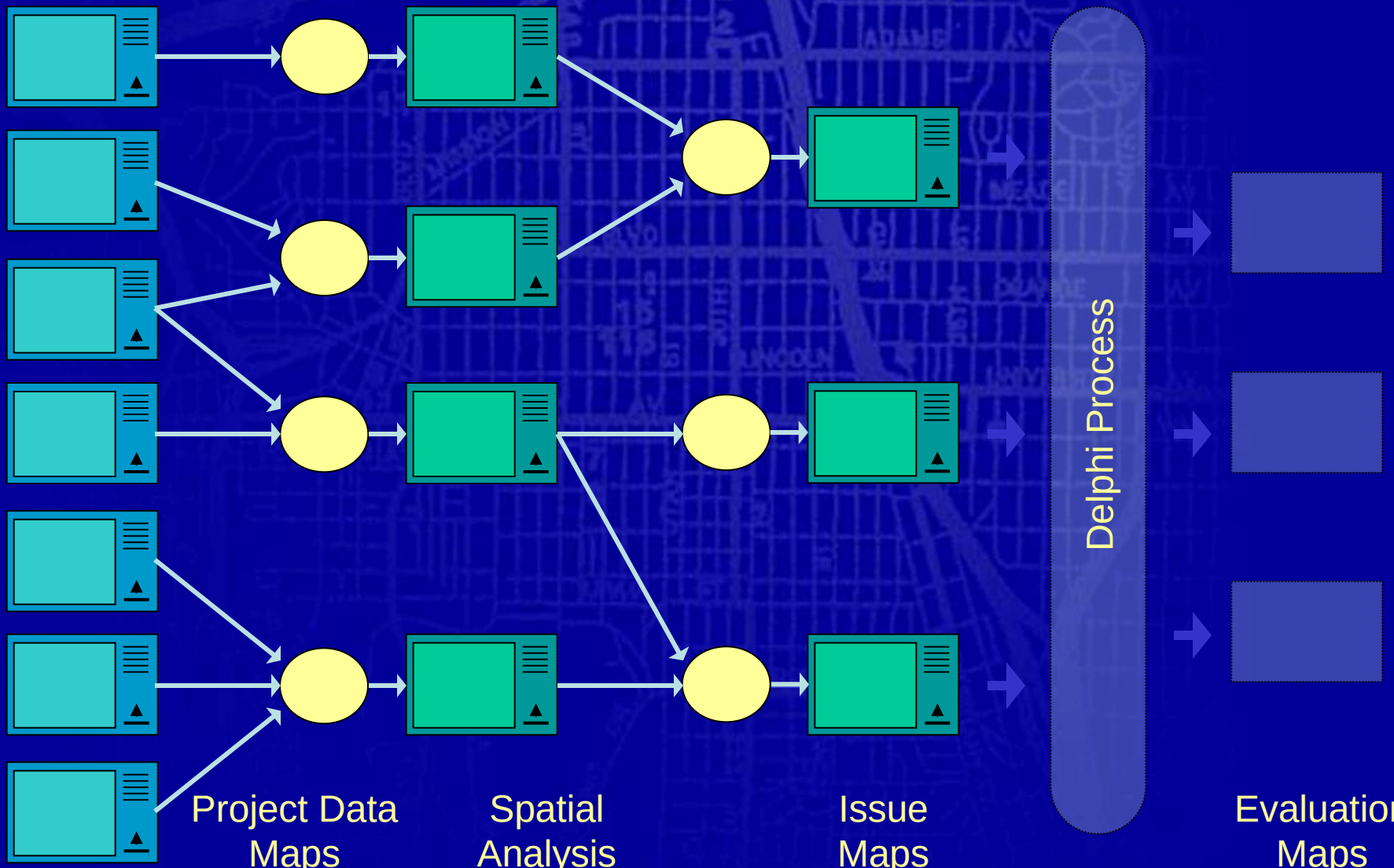
MAD Diagram – Spatial Data



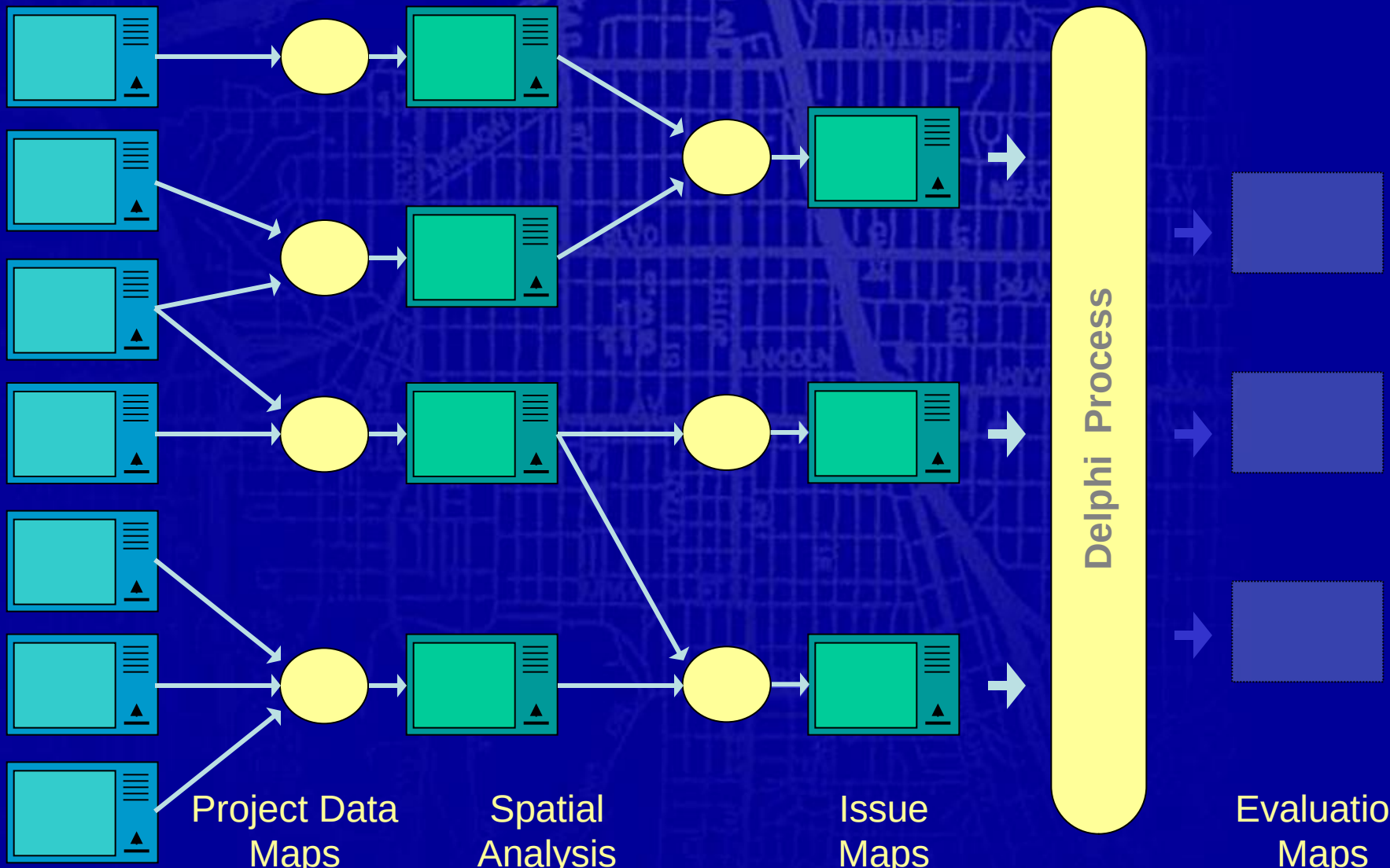
MAD Diagram – Spatial Analysis



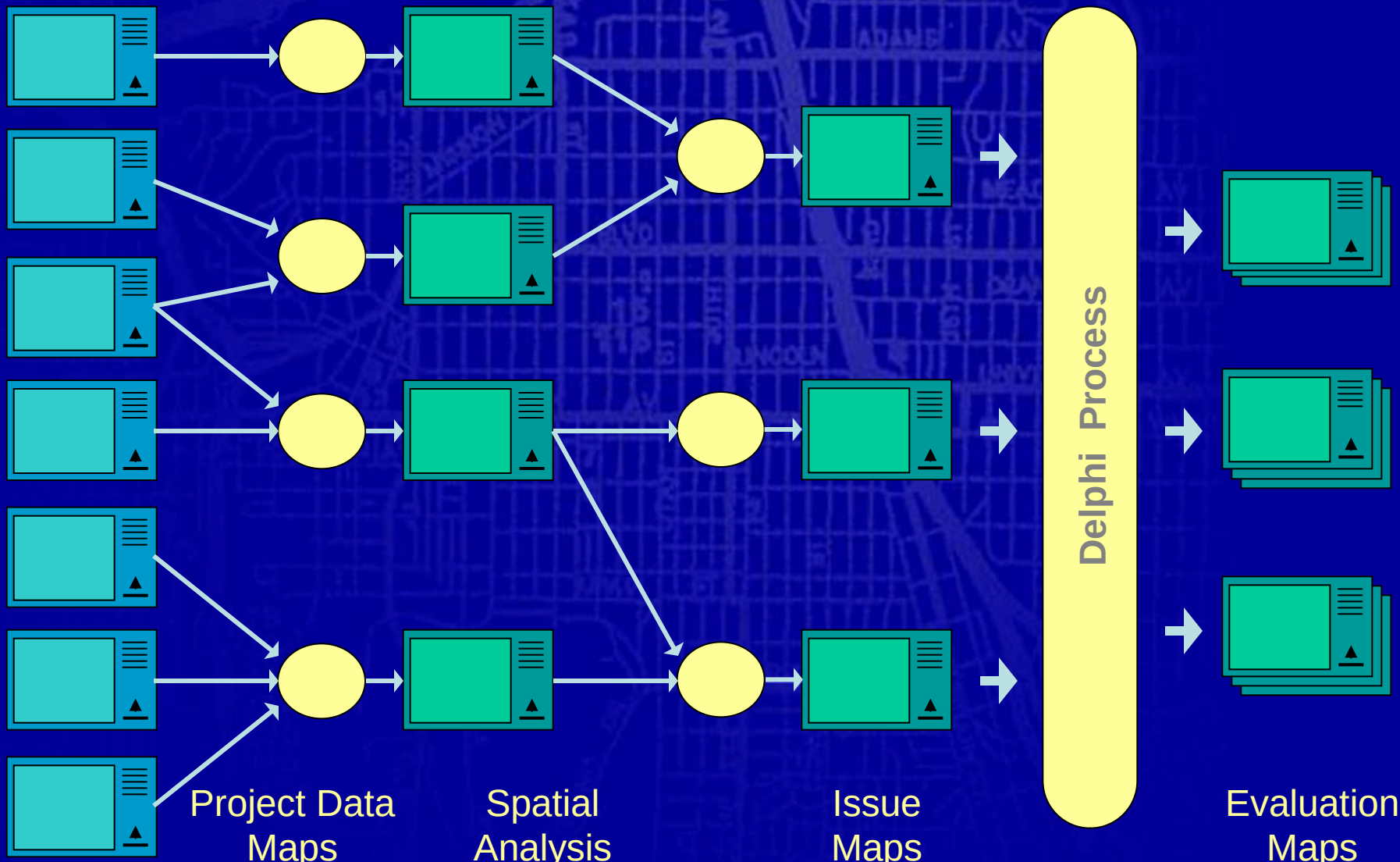
MAD Diagram – Issue Maps



MAD Diagram – Delphi Process



MAD Diagram – Evaluation Maps



Landscape Assessment

Project Definition

Issues of Concern

Spatial Data

Spatial Analysis

Issue Maps

Delphi Process

Evaluation Maps

Landscape Assessment

Project Definition

Focus
(primary / secondary objectives)

Extent
(geographic boundaries / active domains)

Deliverables
(primary / secondary products)

Issues of Concern

Definition of *issue* …

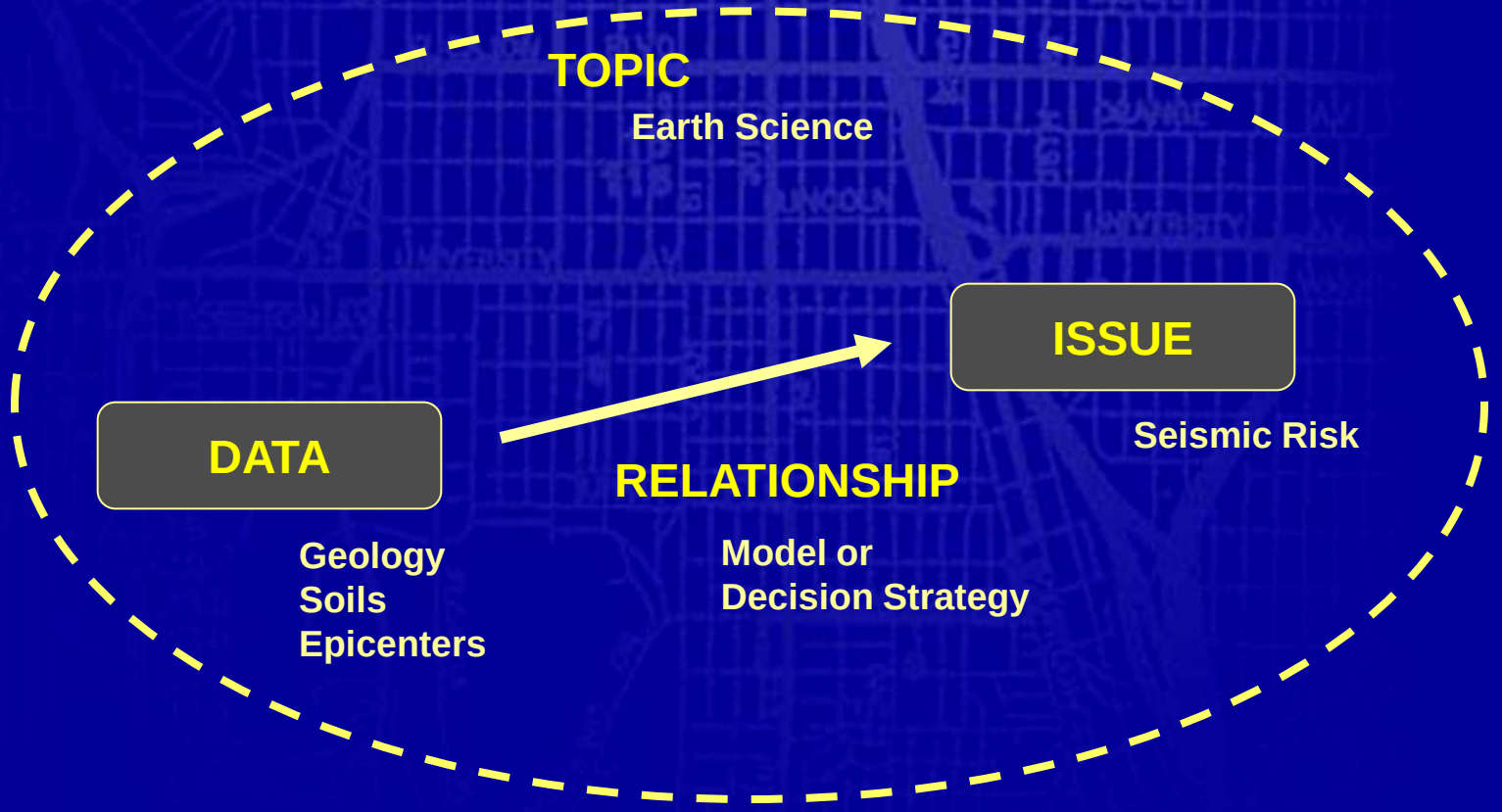
An *issue* is a concern that can be expressed as a scaled value.

Definition of *Spatial Issue* …

A *spatial issue* is an issue that can be mapped as a scaled value.

Landscape Assessment

Topics / Data / Issues



Landscape Assessment

Types of Issues

Physical
(terrain / earth / hydrology / climate)

Biological
(flora / fauna)

Social
(culture / demographics)

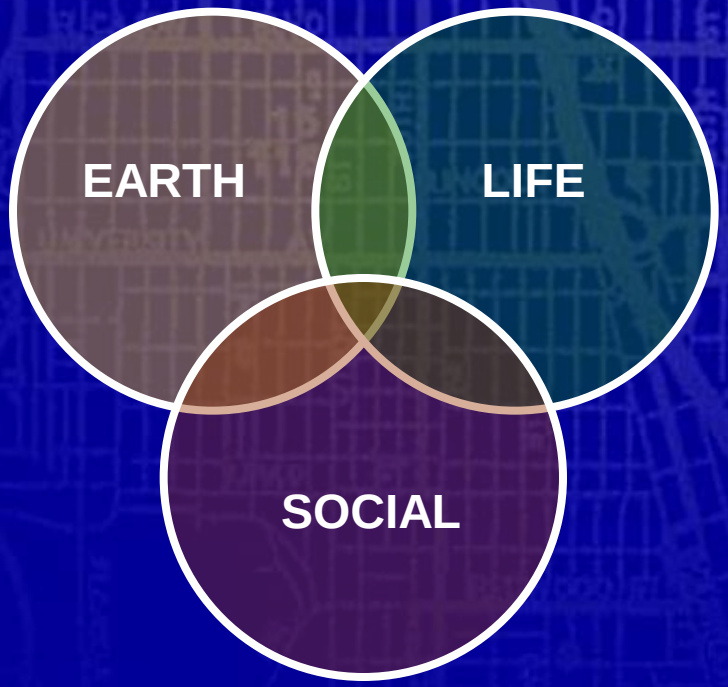
Economic
(economic costs / benefits)

Landscape Assessment

Listing Issues

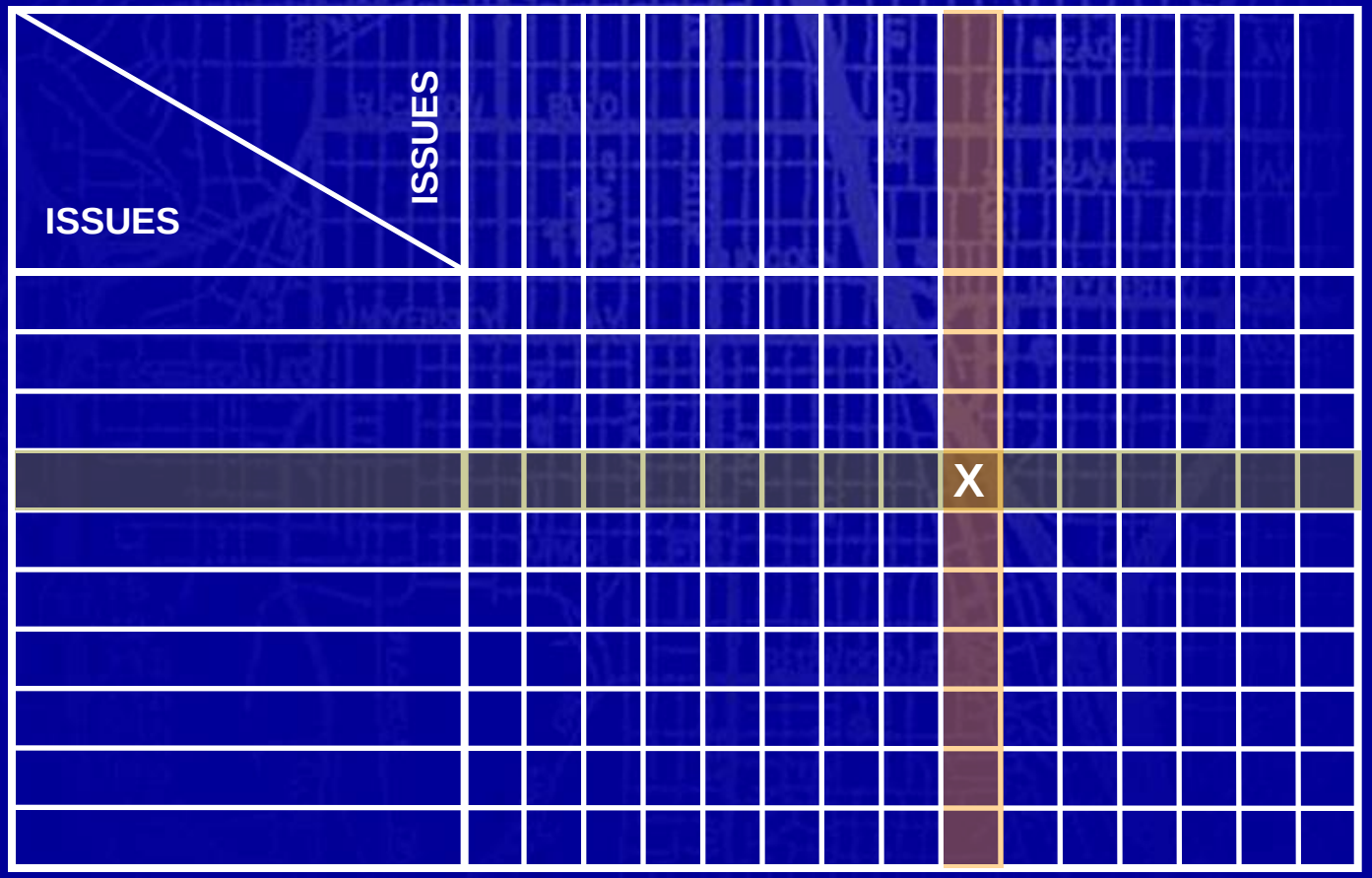
Potential Issue	Topic	Data	Issue	Spatial	Importance

Classifying Spatial Issues



Landscape Assessment

Relating Issues



Example: Power Plant Siting Issues
(List of Spatial Issues)

Seismic Risk
Foundation Stability
Water Contamination Potential
Water Availability
Coastal Stability
Ecological Sensitivity
Social Sensitivity
Public Hazards

Landscape Assessment

Exercise 1

Project Definition

Spatial Issues

Project Data

Landscape Assessment

Spatial Data

Source Data
(available – maybe)

Project Data
(useable)

Derived Data
(purposeful)

Source Data vs. Project Data

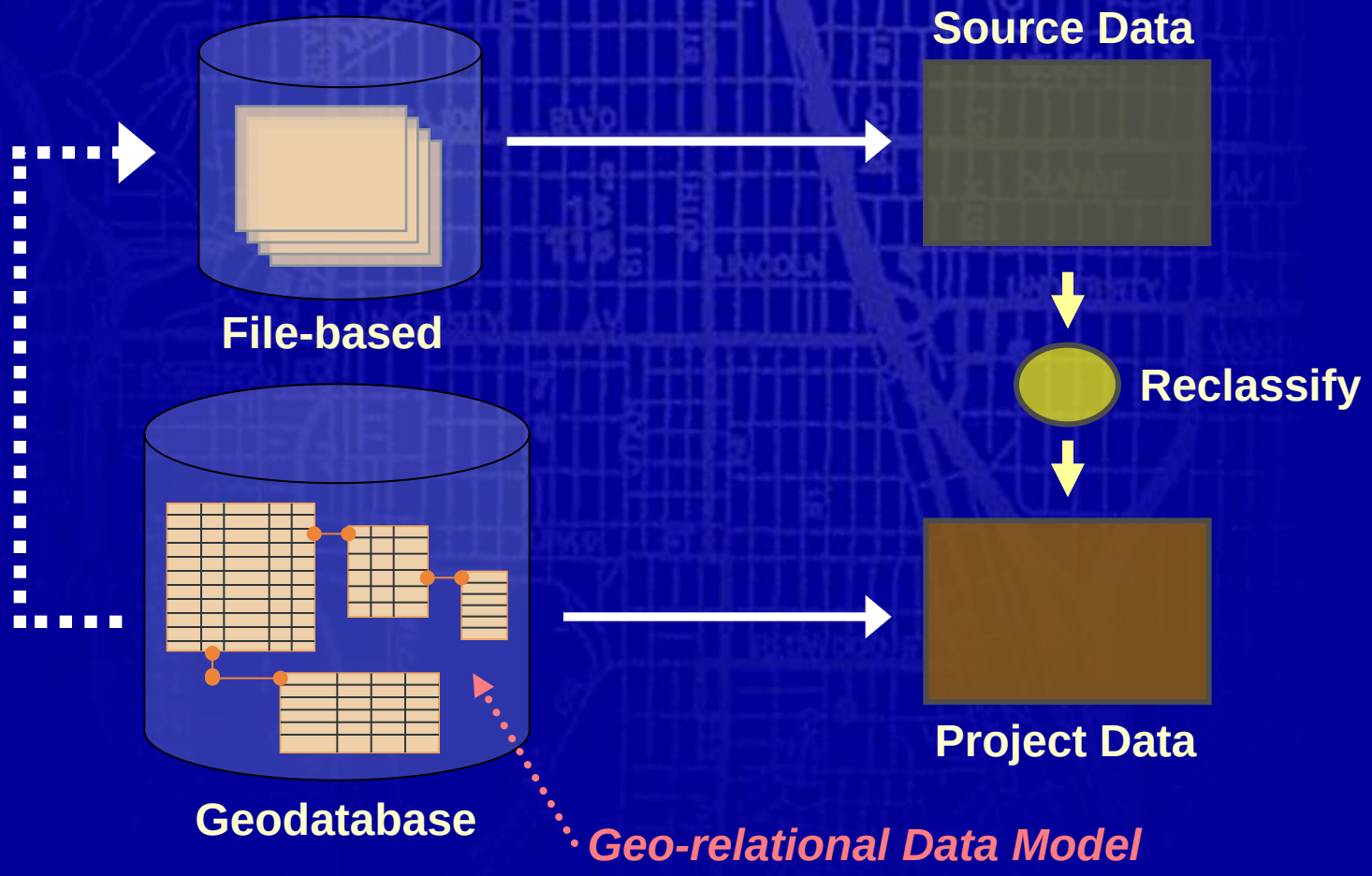
Scale
Extent
Projection
Classification
Accuracy
Resolution
Completeness
Age
Media/Format
Ownership
Accessibility

Project Base Map

Map Extent
Map Projection
Coordinate Systems
Scales
Nesting System
Geographic Features
Cartographic Design
Map Layout

Landscape Assessment

Spatial Database



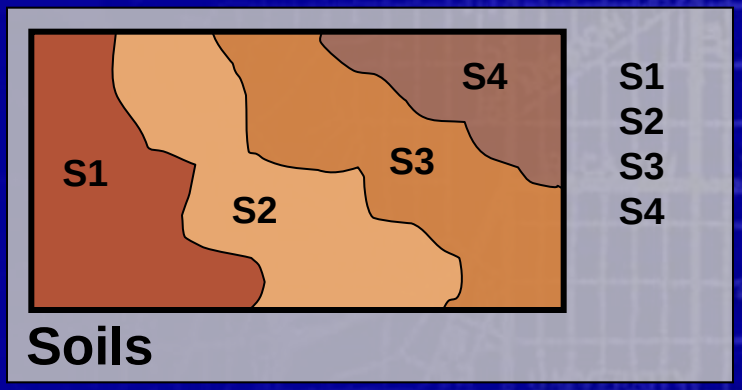
Landscape Assessment

Spatial Analysis

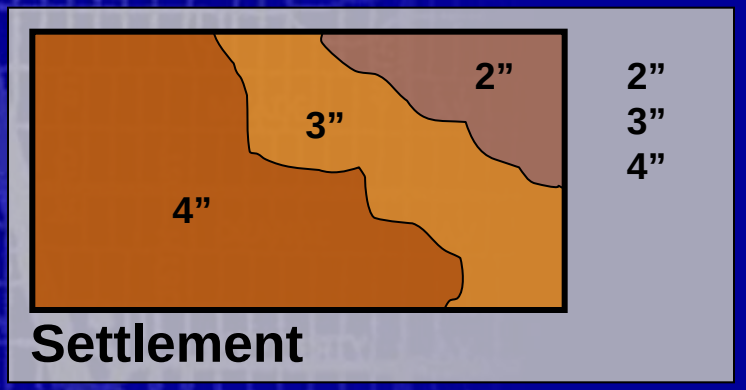
Functions
(Interpretation / Comparison / Overlay)

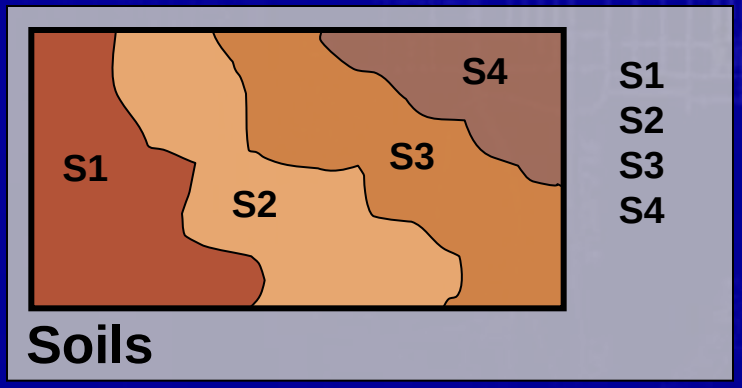
Value Scales
(Planning Values / Influence Ratios)

Interpretation

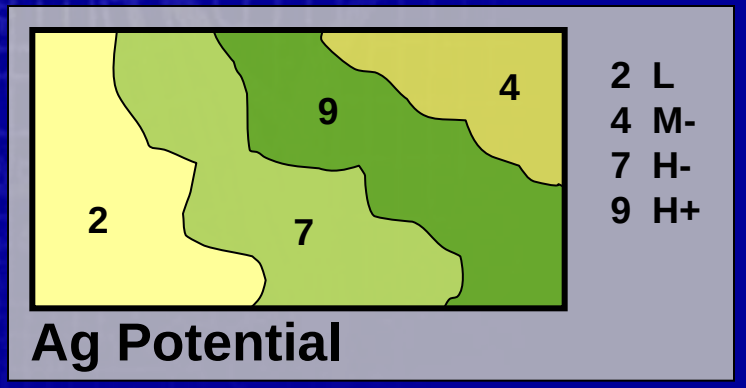


Soils	Set
S1	4”
S2	4”
S3	3”
S4	2”

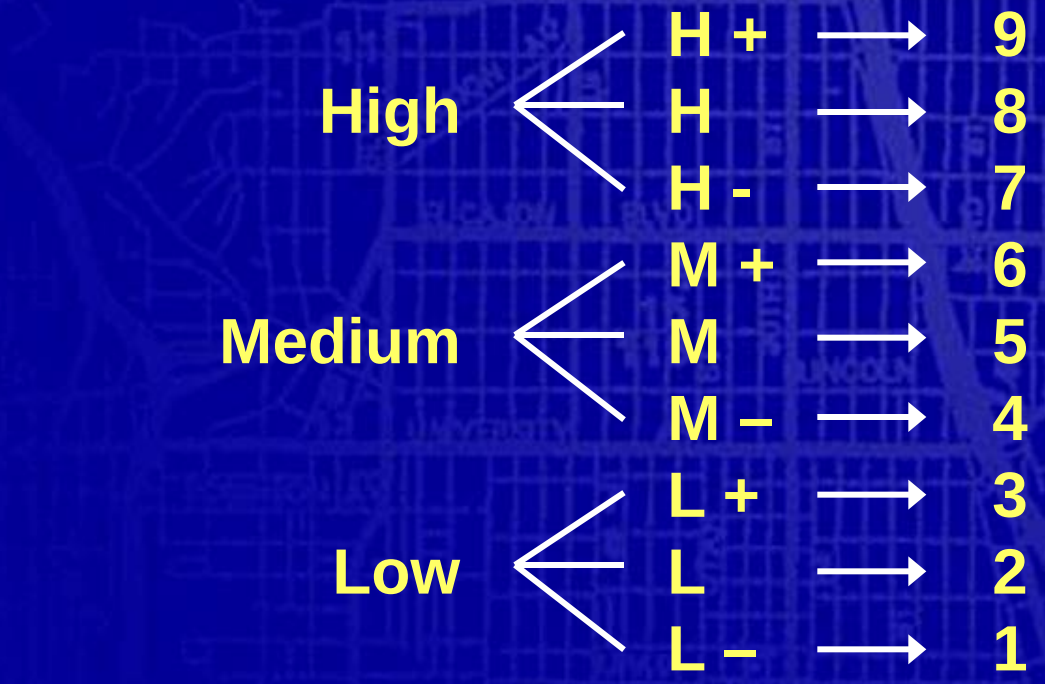




Soils	Ag
S1	2
S2	7
S3	9
S4	4

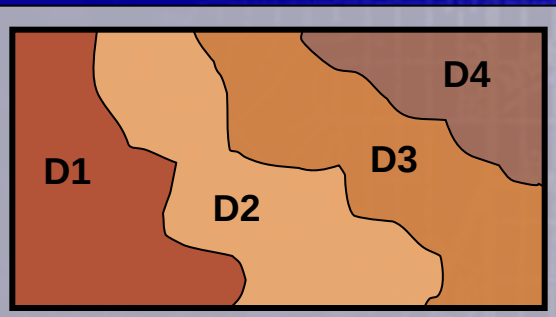


Planning Values (PVs)
(Interval Scale)



Restricted	R	0
Undetermined	U	U
No Comment	N	N

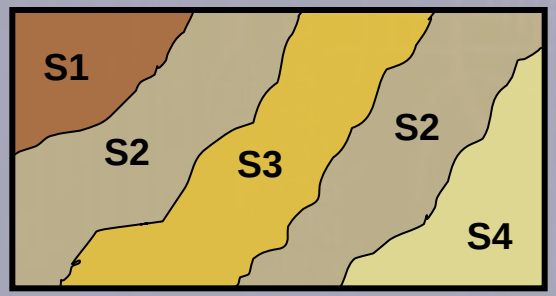
Comparison



D1
D2
D3
D4

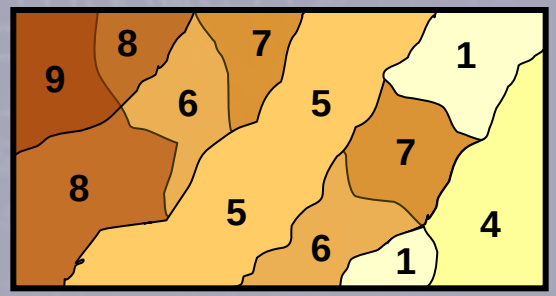
Dirt

	D1	D2	D3	D4
S1	9	8	4	3
S2	8	6	7	1
S3	5	5	5	5
S4	6	1	4	4



S1
S2
S3
S4

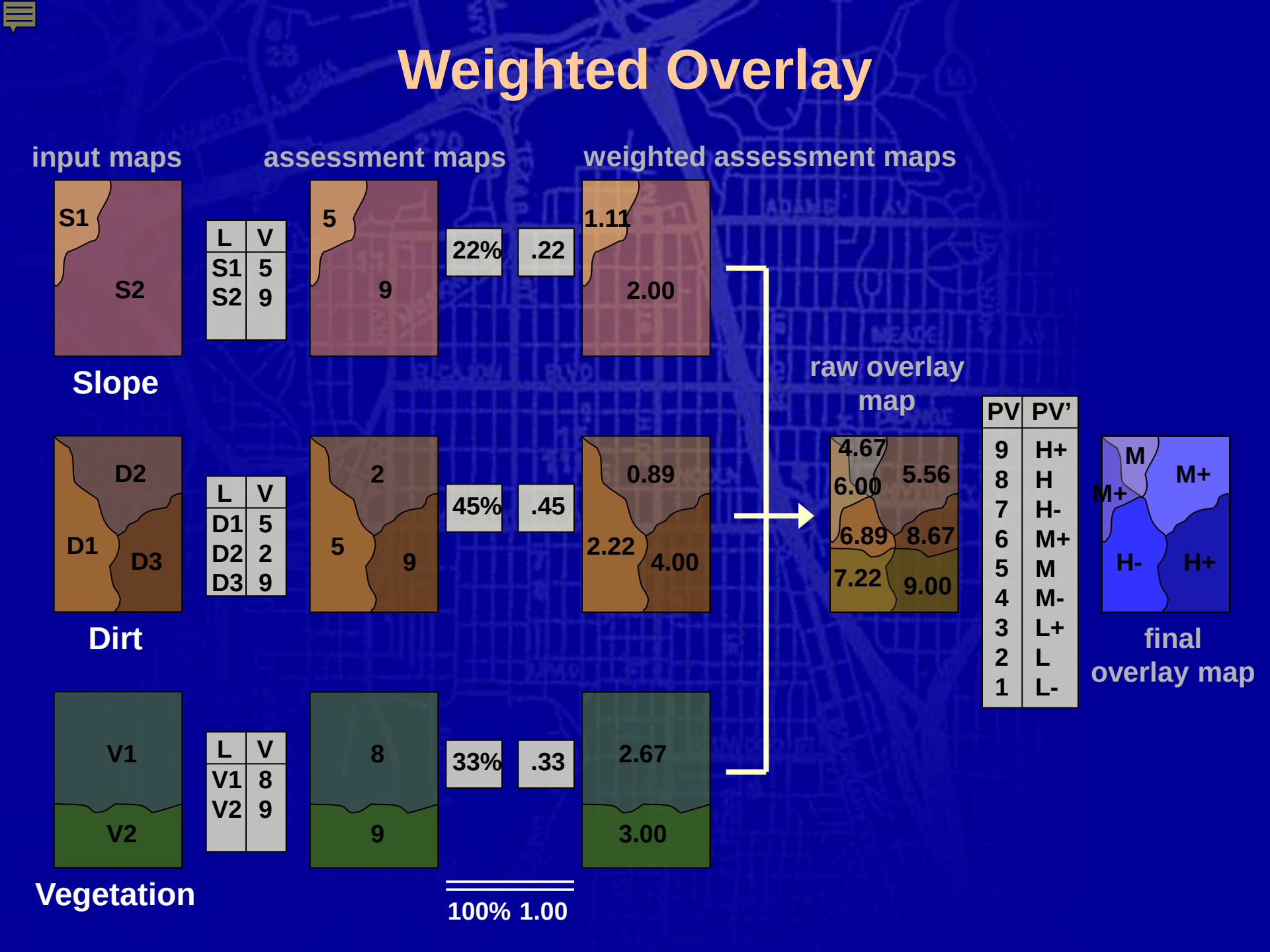
Slope



9 H+
8 H
7 H-
6 M+
5 M
4 M-
1 L-

Landslide Potential

Weighted Overlay



Importance Ratios (IRs) or Weights
(Ratio Scale)

Categories*	IR	NIR	IR	NIR	PV	NIR
Slope	1.8	0.15	15%	0.15	2	0.08
Hydro Hazards	2.0	0.16	25%	0.25	6	0.23
Eco Sensitivity	4.0	0.33	30%	0.30	9	0.35
Existing Use	3.5	0.28	20%	0.20	8	0.30
Ag Potential	1.0	0.08	10%	0.10	1	0.04
Totals	12.3	1.00	100%	1.00	26	1.00

* Example: Residential Suitability

Exercise 2

Mapping and Decision (MAD) Diagram

Group-Based Decisions

Types of Groups

The Delphi Process

Types of Groups

Interdisciplinary Teams

Interagency Committees

Citizen Participation Groups

Landscape Assessment

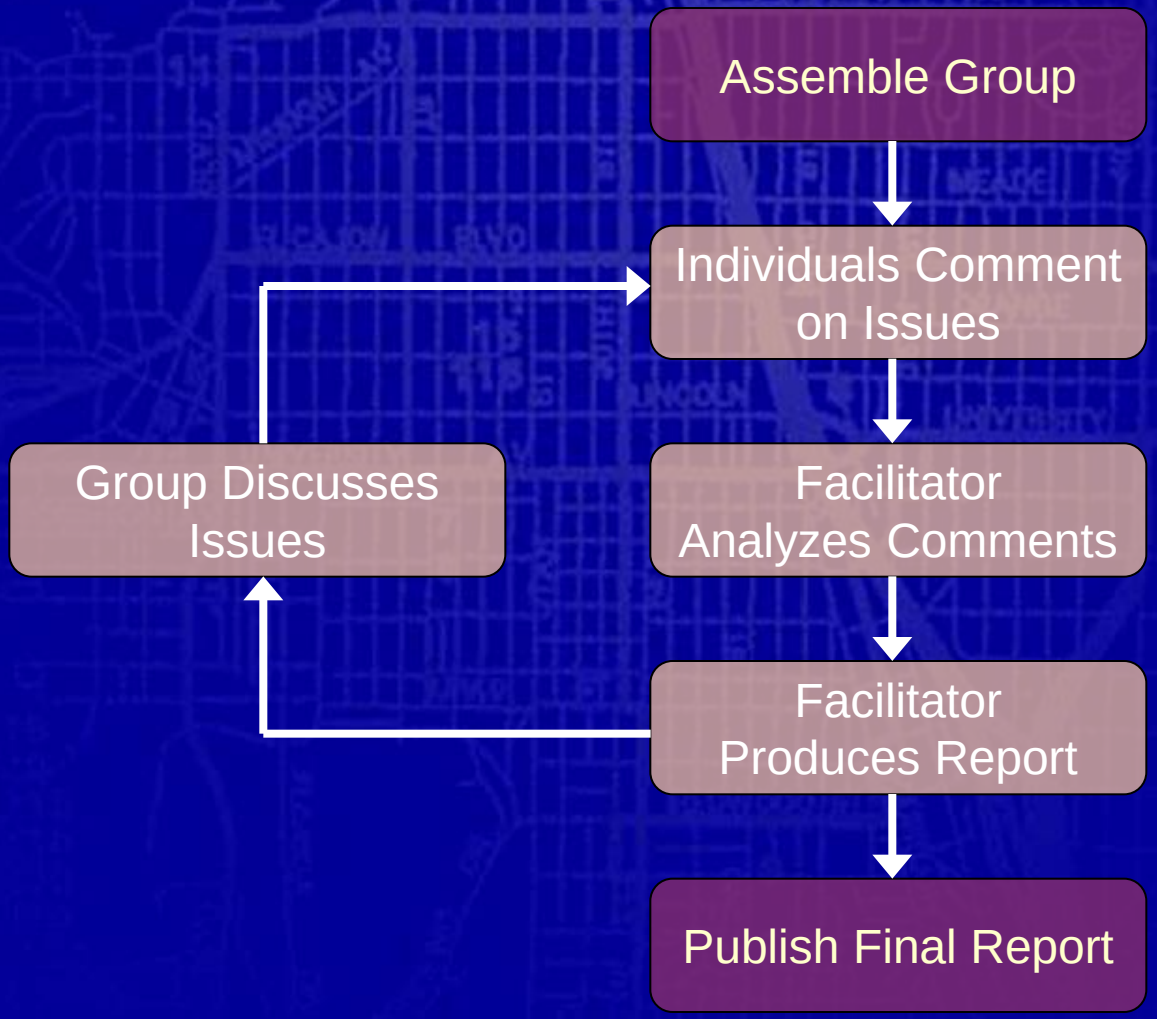
Delphi Process

Generic
(standard OR technique)

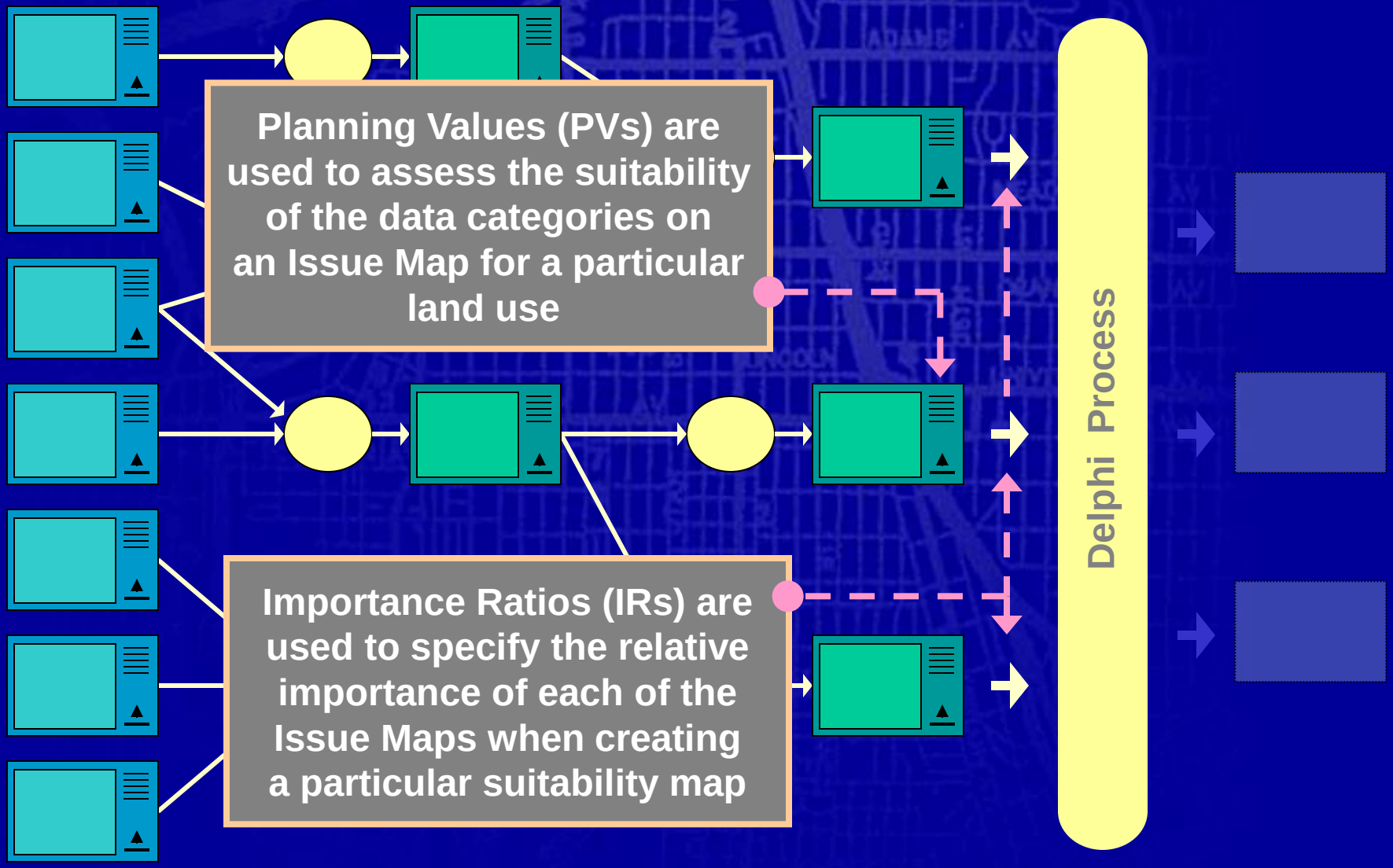
Planning
(PVs and IRs)

Participants
(team members / stakeholders / citizens)

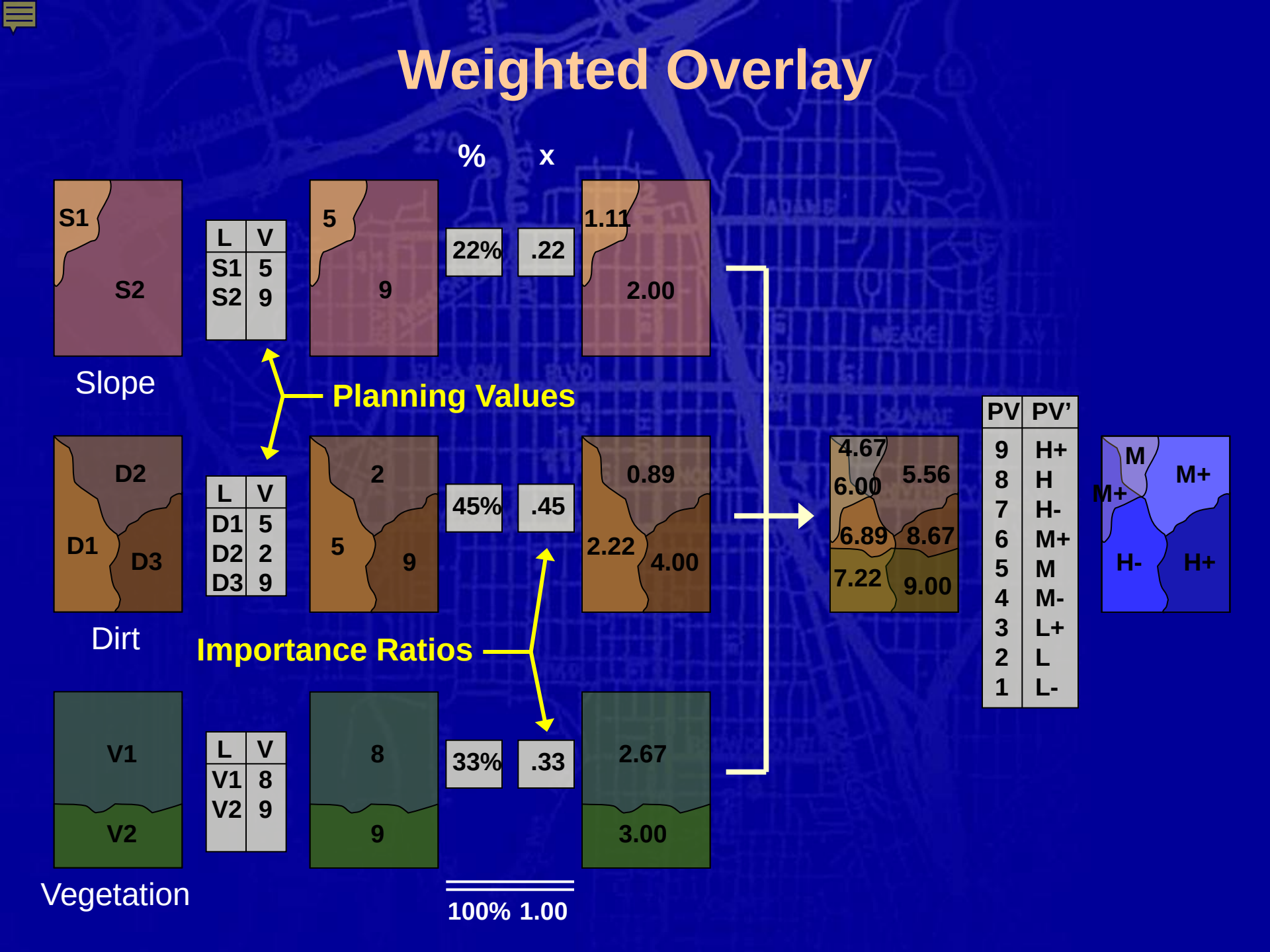
Delphi Process - Generic



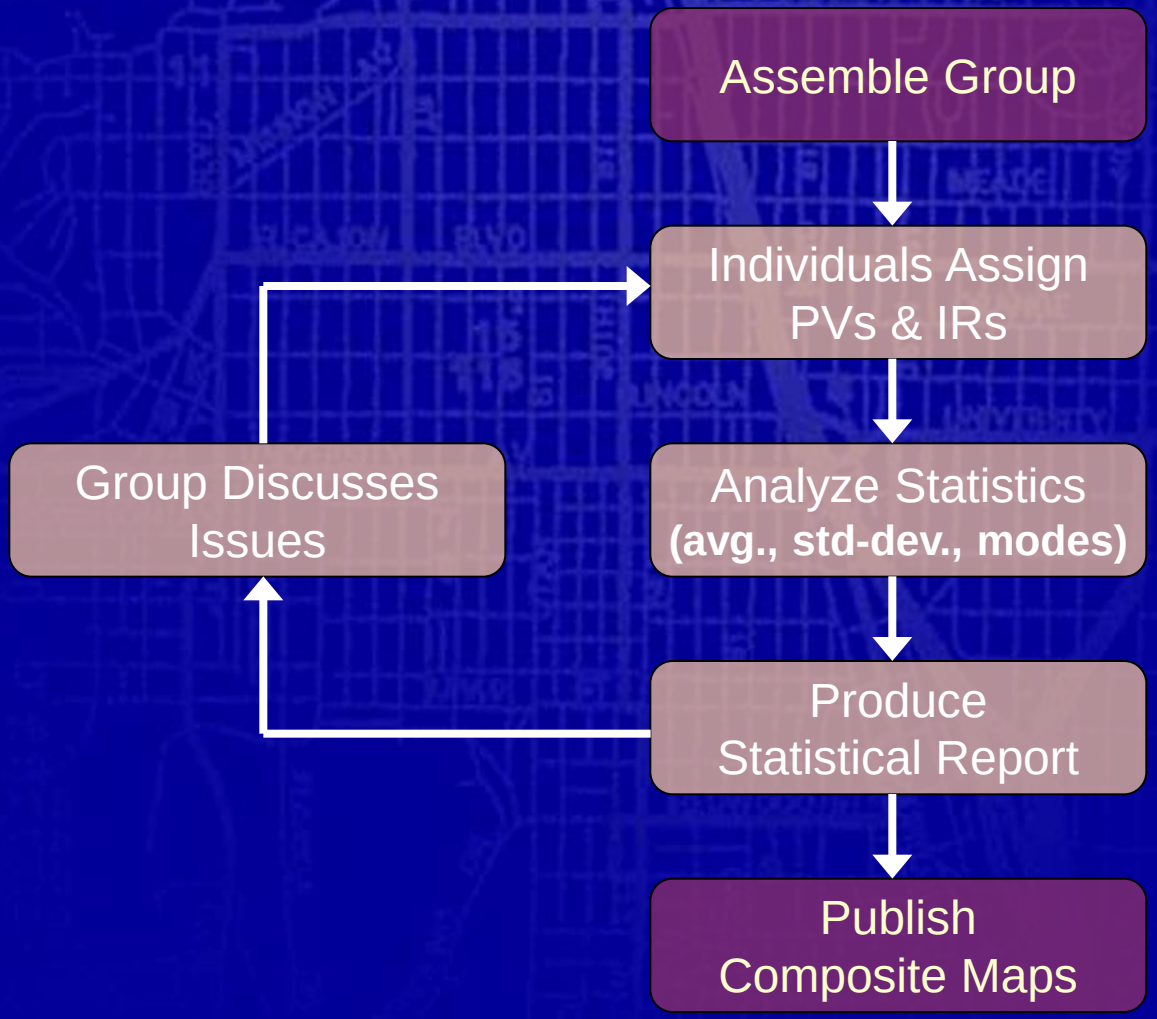
Delphi Process – PVs & IRs



Weighted Overlay



Delphi Process – PVs and IRs



Delphi Process – Participant's Input Form

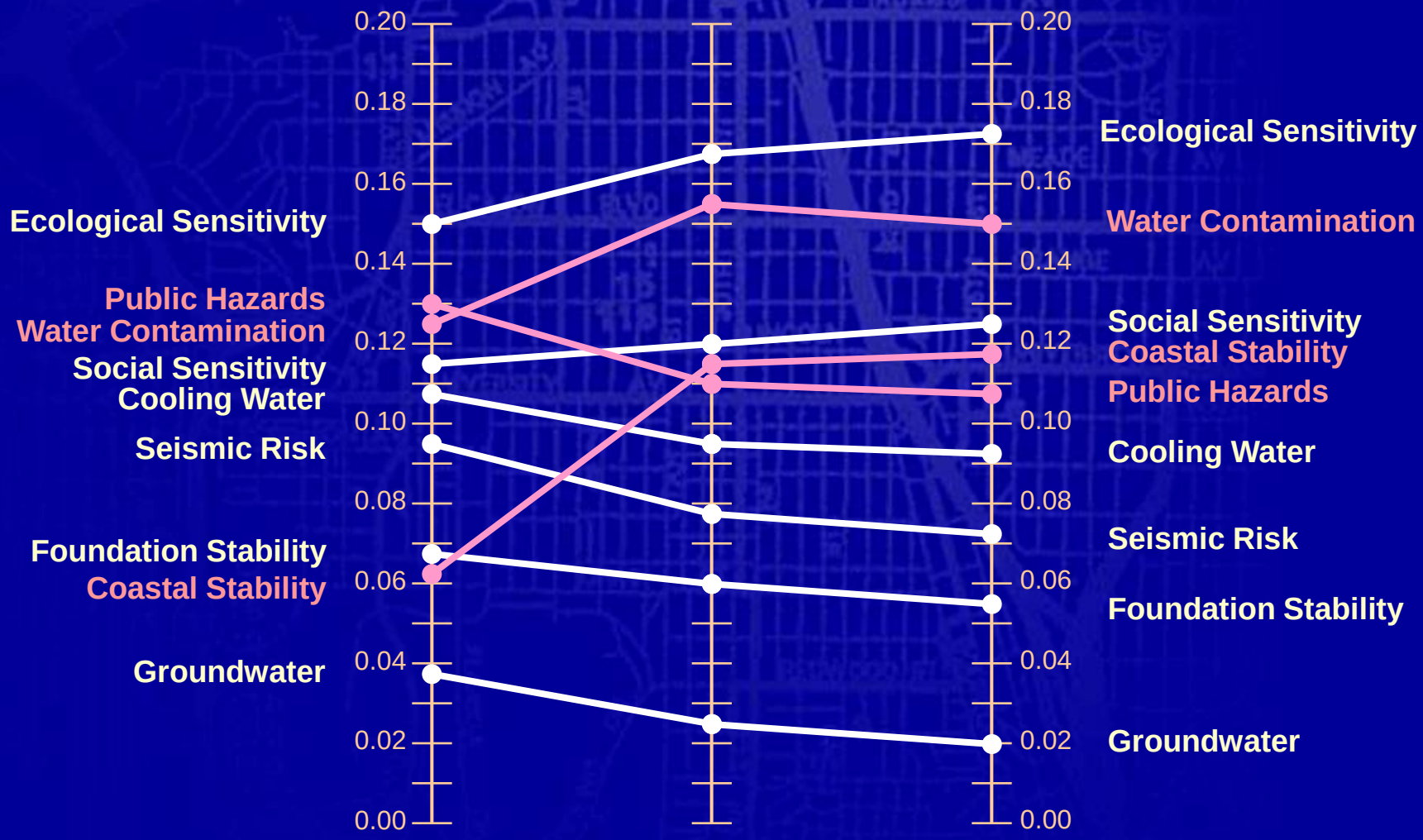
Land Uses / Issues	Residential Suitability		Commercial Suitability		Open Space Suitability	
	yours	group	yours	group	yours	group
Fnd Stability	13 %		32 %		0 %	
high	H +		H +			
medium	H +		M			
low	L		L -			
Eco Sensitivity	26 %		16 %		67 %	
high	L -		R		H +	
medium	M		L		H +	
low	H +		H +		L -	

Delphi Process – Participant's Report

Land Uses / Issues	Residential Suitability			Commercial Suitability			Open Space Suitability		
	yours		group	yours		group	yours		group
Fnd Stability	13 %		12 %	32 %		18 %	0 %		7 %
high	H +	9	8.7	H +	9	8.6			8.5
medium	H +	9	5.1	M	5	8.4			8.2
low	L	2	1.3	L -	1	2.3			8.7
Eco Sensitivity	26 %		29 %	16 %		35 %	67 %		41 %
high	L -	1	1.1	R	0	1.6	H +	9	8.8
medium	M	5	6.7	L	2	4.7	H +	9	5.3
low	H +	9	8.9	H +	9	8.8	L -	1	3.6

Delphi Process – Changing IRs

(Example: Sensitivity to Siting a Nuclear Power Plant)



The Delphi Process
(considerations)

Selecting the Participants

Recording the Opinions

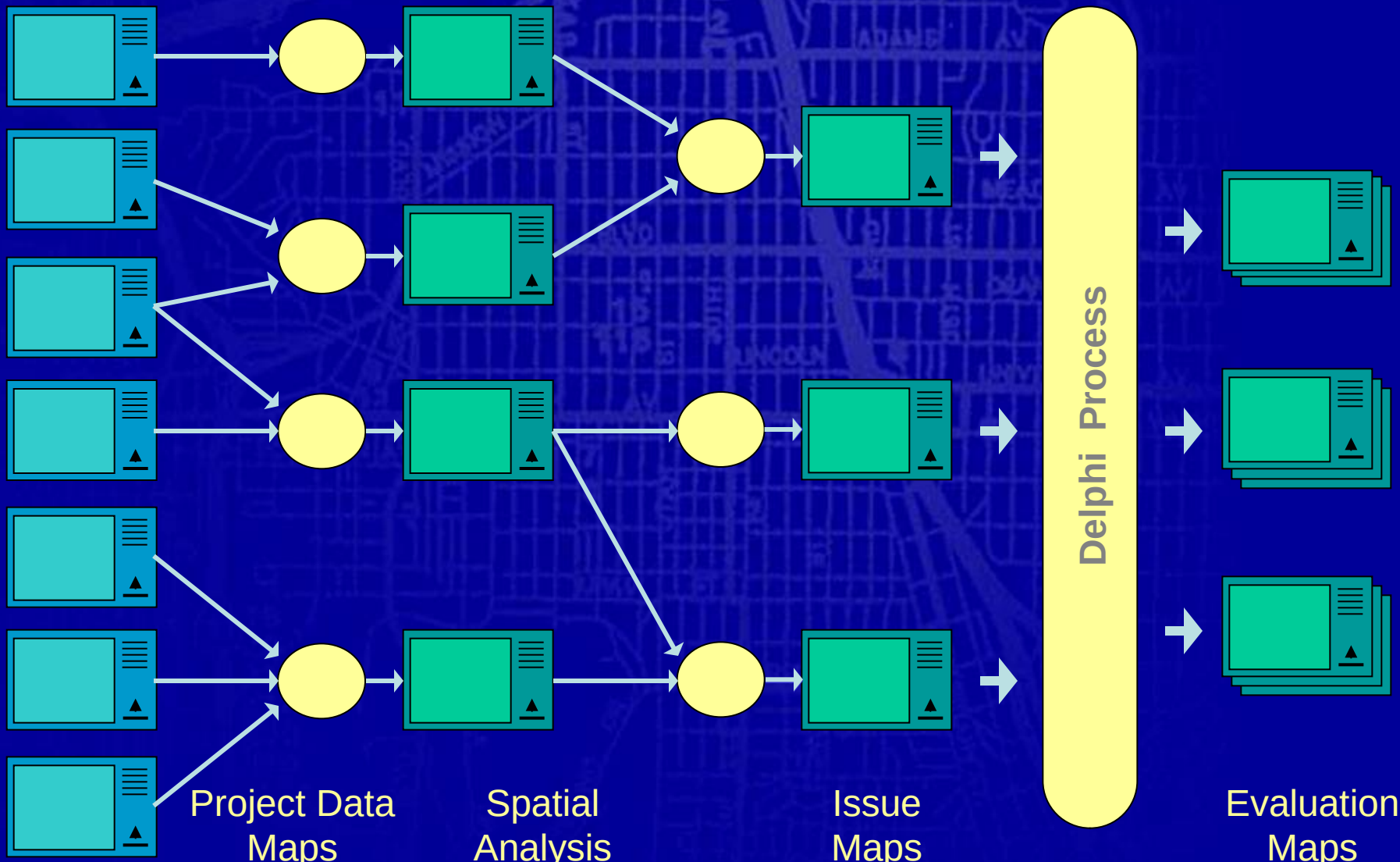
Analyzing the Input

Discussing Differences

Exercise 3

Delphi Process

MAD Diagram – Evaluation Maps



Types of Evaluation Maps

Sensitivity
(environmental)

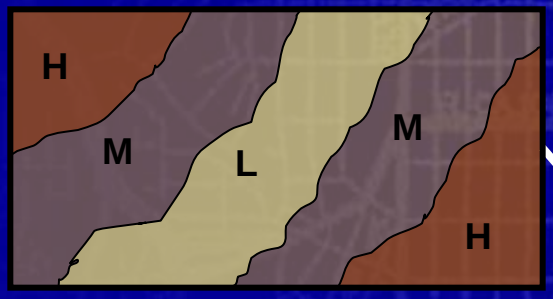
Pressure
(development)

Suitability
(land use)

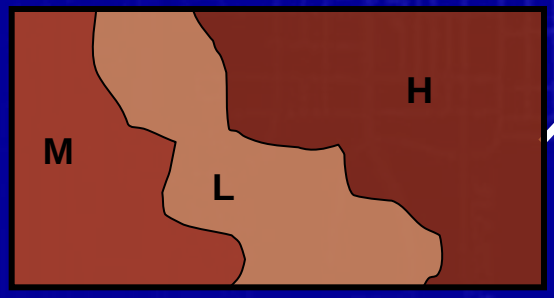
Capacity
(activity)

Risk
(event)

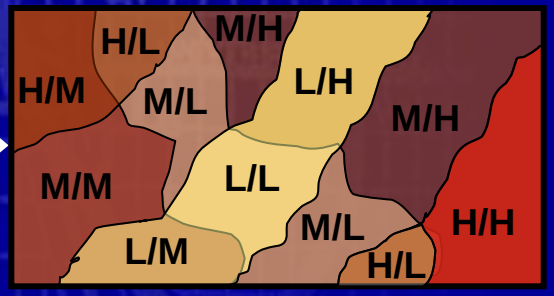
Comparing Evaluation Maps



Environmental Sensitivity



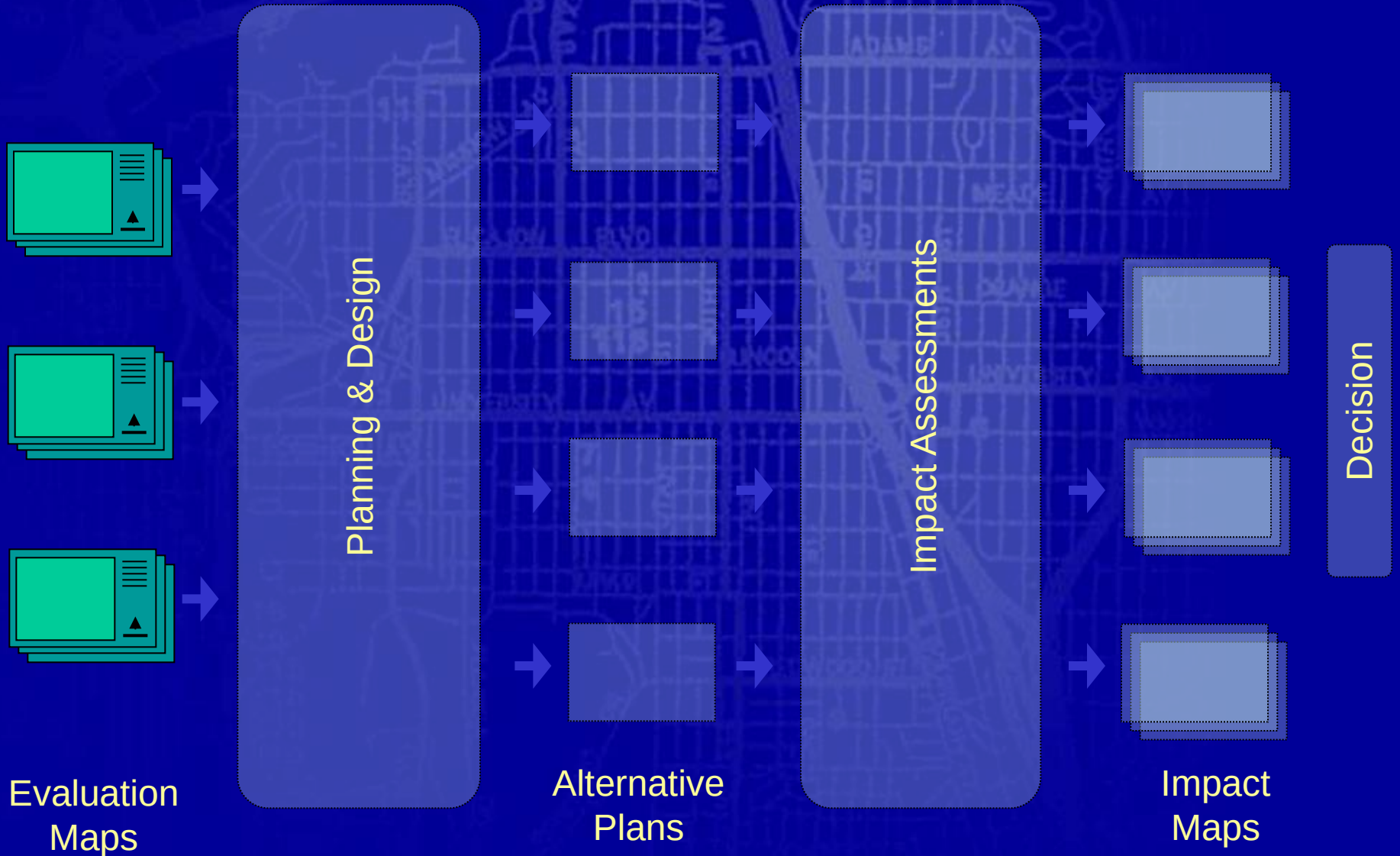
Development Pressure



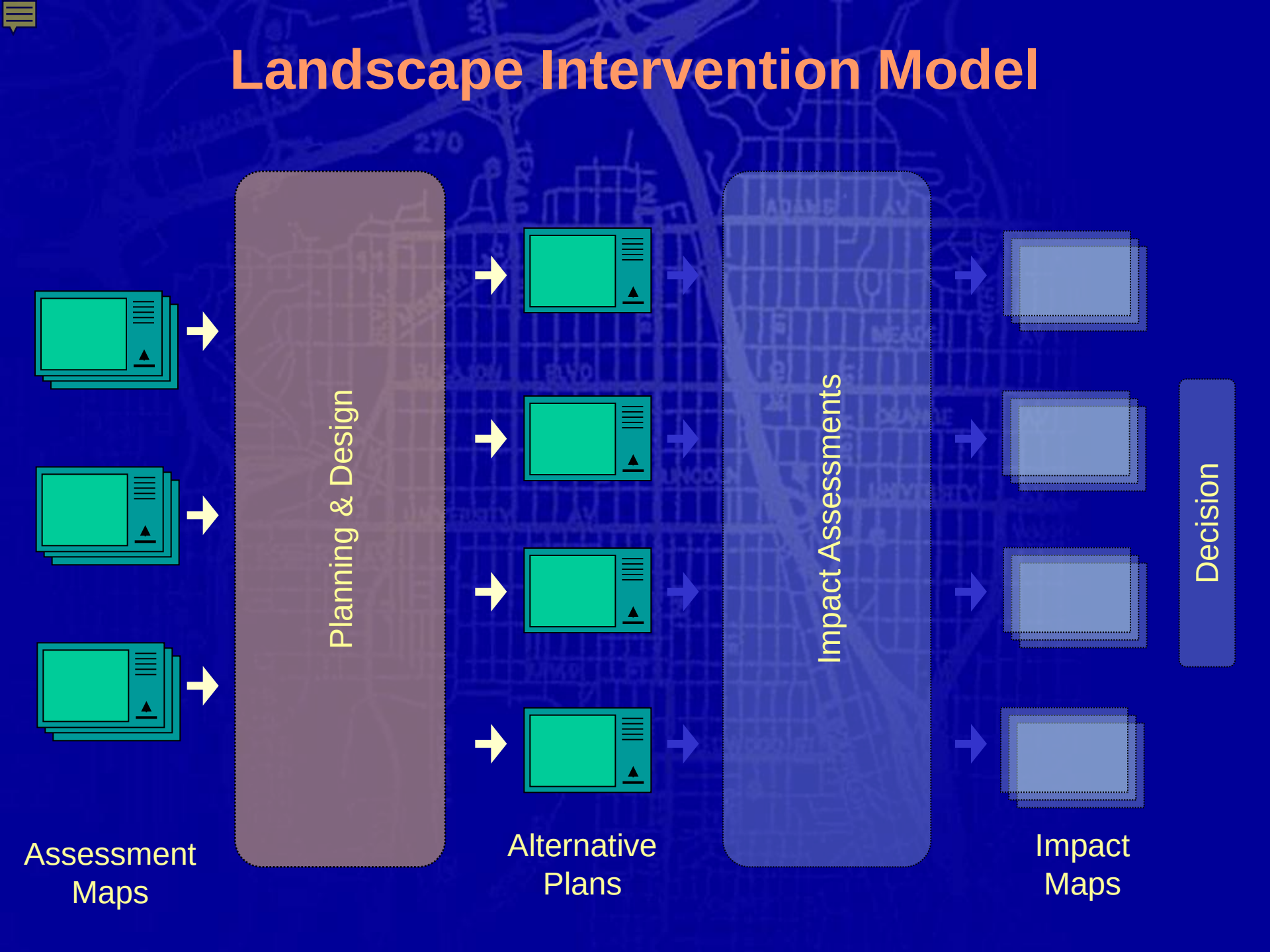
Sensitivity / Pressure

Landscape Intervention

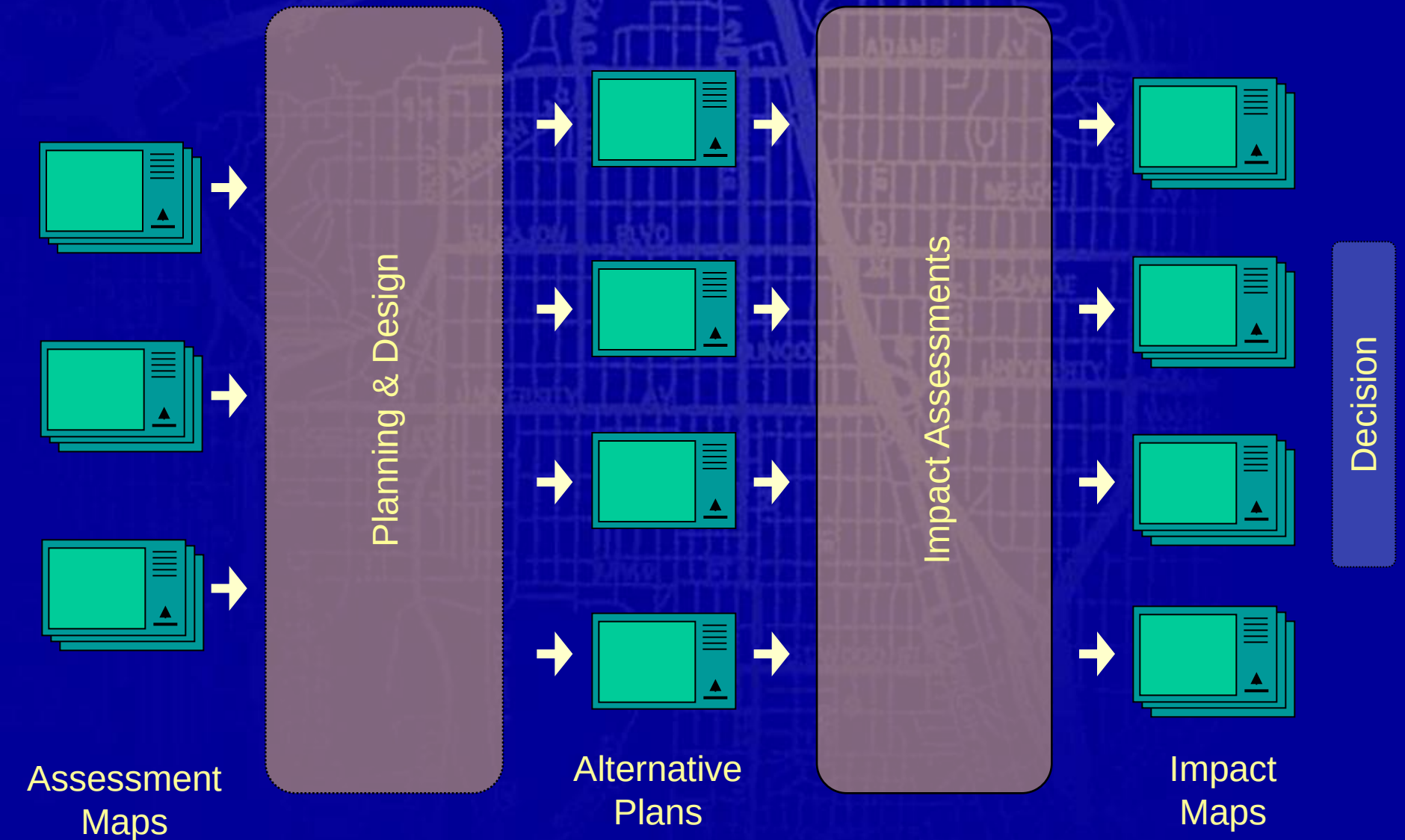
Landscape Intervention Model



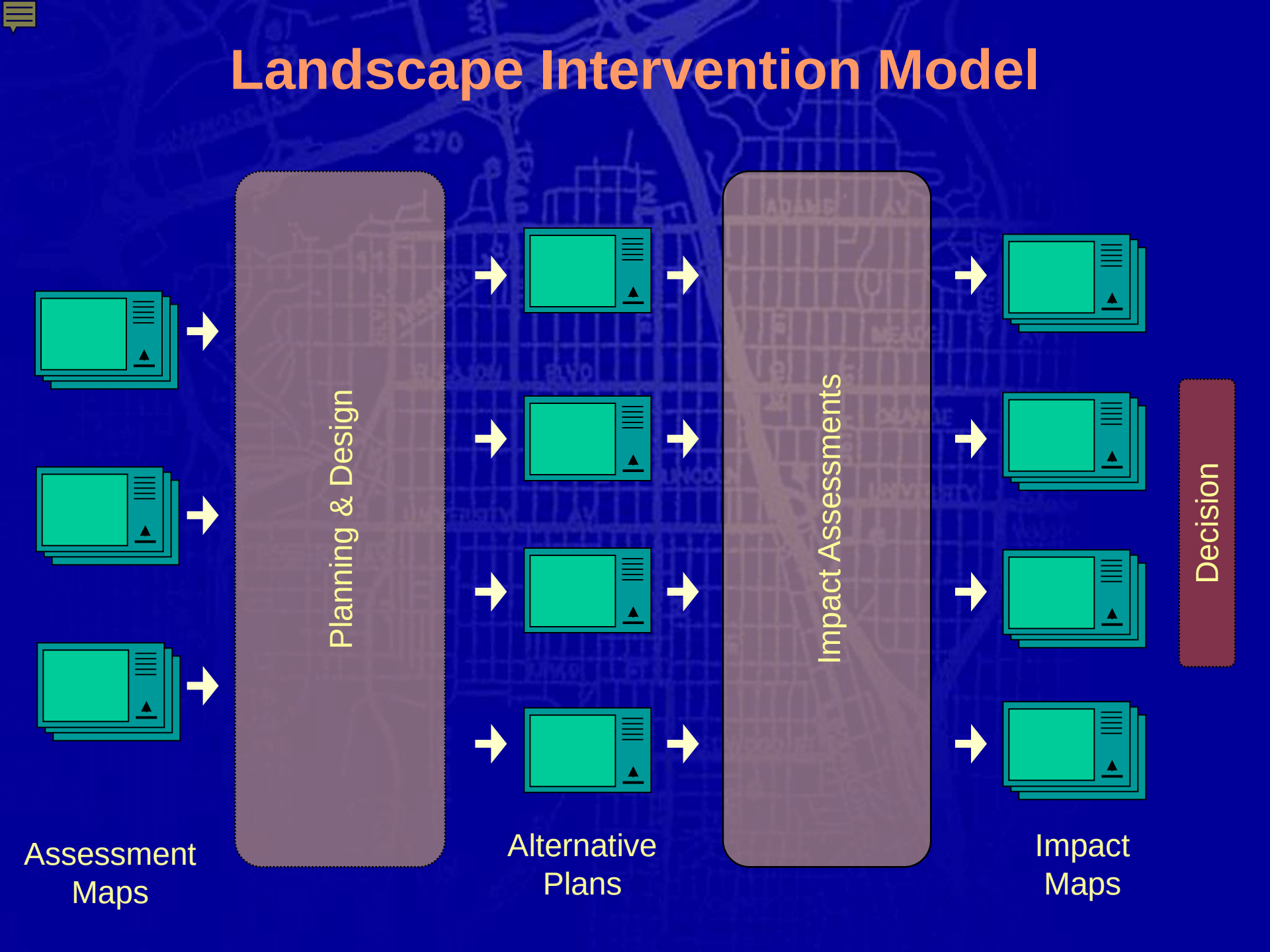
Landscape Intervention Model



Landscape Intervention Model



Landscape Intervention Model



Landscape Intervention

Urban Growth

Alternate Land Use Plans

Impact Assessments

Decision Support

Landscape Intervention

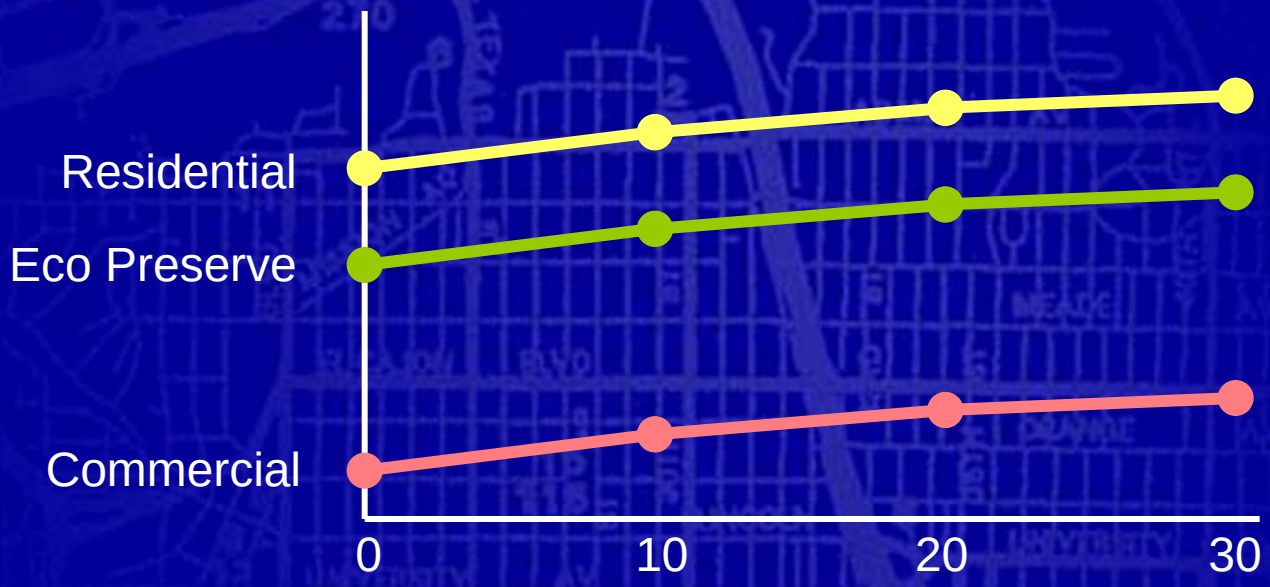
Urban Growth

Demographic Projections
(for various cohorts)

Socioeconomic Projections
(for various sectors)

Land Use Projections
(for each type of land use)

Land Use Projections



Land Use	10 years	20 years	30 years
Commercial	2,000	4,000	5,000
Residential	500,000	900,000	1,200,000
Eco Preserve	200,000	400,000	500,000

Landscape Intervention

Alternate Land Use Plans

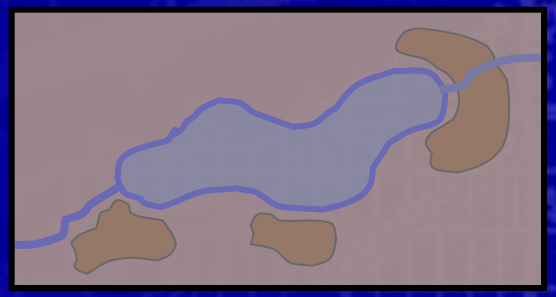
Land Use Assessment Maps
(for each land use)

Morphological Analysis
(the search for form)

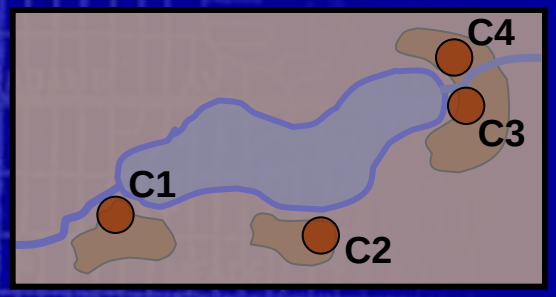
Adjacency Considerations
(near and far)

Concept Variations
(exploring possibilities)

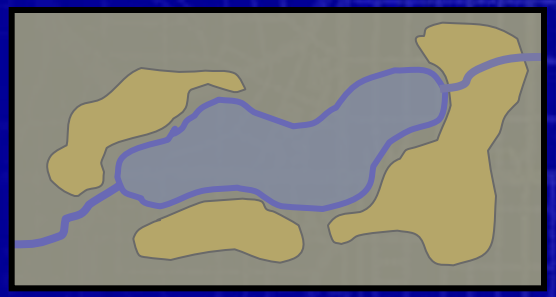
Land Use Allocation



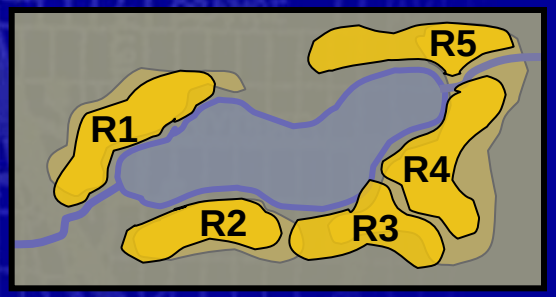
Commercial Suitability



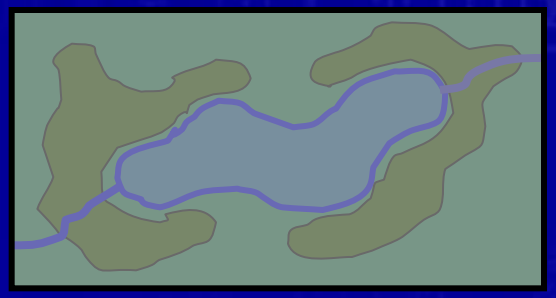
Commercial Center



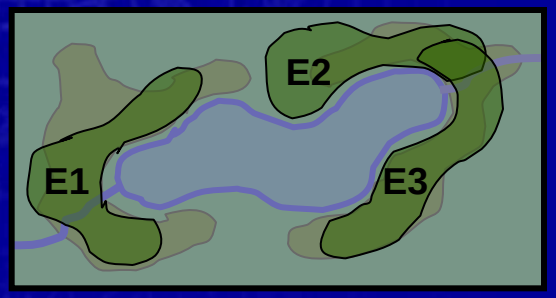
Residential Suitability



Residential Area

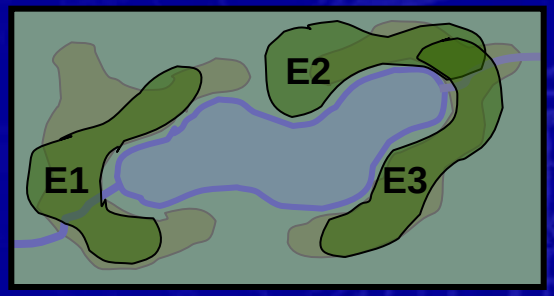


Eco Preserve Suitability



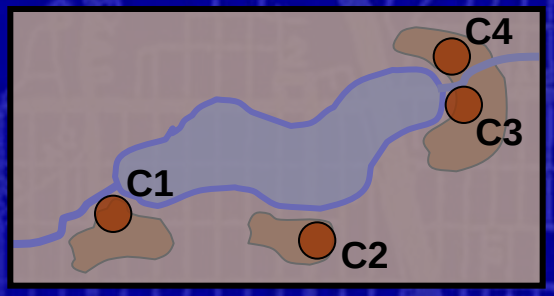
Eco Preserve

Morphological Analysis

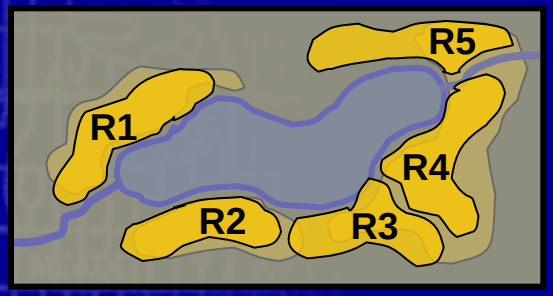


Eco Preserve

	C1	C2	C3	C4
E1	N	Y	Y	Y
E2	Y	Y	Y	N
E3	Y	N	N	N



Commercial Center



Residential Area

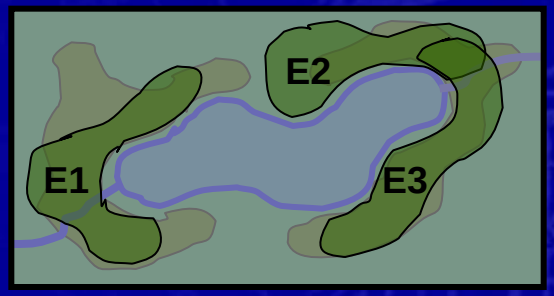
	R1	R2	R3	R4	R5
E1 + C2	N	Y	N	Y	Y
E1 + C3	N	Y	Y	N	Y
E1 + C4	N	Y	Y	Y	N
E2 + C1	Y	Y	Y	Y	N
E2 + C2	Y	Y	N	Y	N
E2 + C3	Y	Y	Y	N	N
E3 + C1	Y	Y	N	N	N

etc

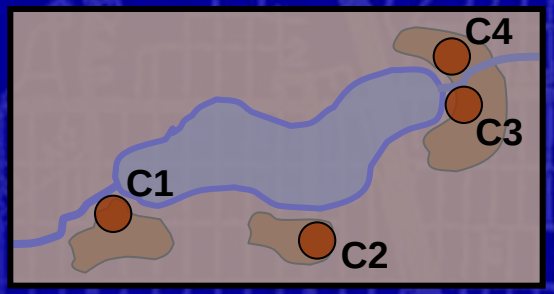
Adjacency Considerations

Land Use	Commercial	Residential	Eco Preserve
Commercial		NEAR	FAR
Residential	NEAR		
Eco Preserve	FAR		

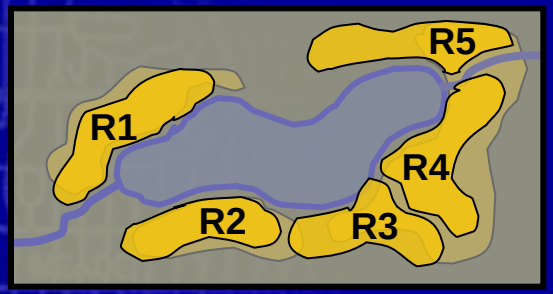
Morphological + Adjacency



Eco Preserve



Commercial Center



Residential Area

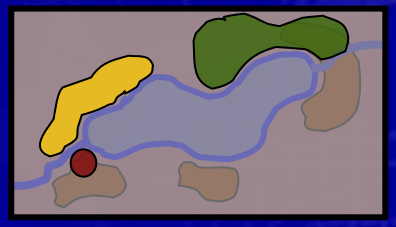
	C1	C2	C3	C4
E1	N	Y	Y	Y
E2	Y	Y	Y	N
E3	Y	N	N	N

	R1	R2	R3	R4	R5
E1 + C2	N	Y	N	Y	Y
E1 + C3	N	Y	Y	N	Y
E1 + C4	N	Y	Y	Y	N
E2 + C1	Y	Y	Y	Y	N
E2 + C2	Y	Y	N	Y	N
E2 + C3	Y	Y	Y	N	N
E3 + C1	Y	Y	N	N	N

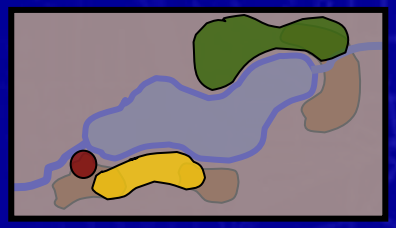
etc

Possible Variations

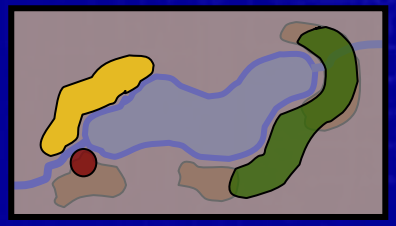
Commercial 1



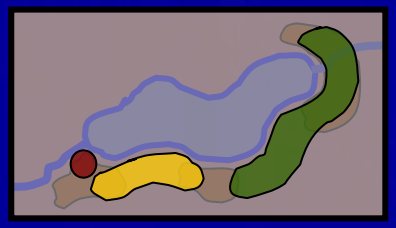
E2 + C1 + R1



E2 + C1 + R2

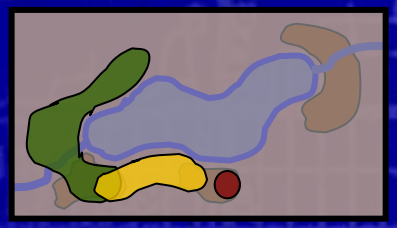


E3 + C1 + R1

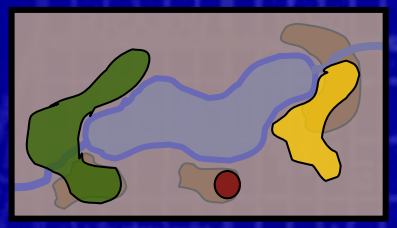


E3 + C1 + R2

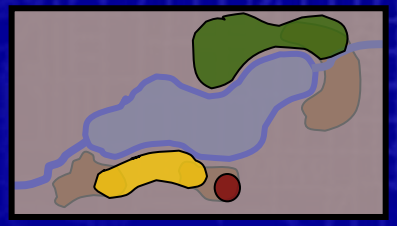
Commercial 2



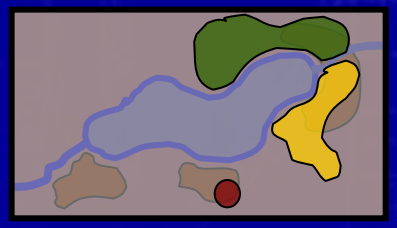
E1 + C2 + R2



E1 + C2 + R4

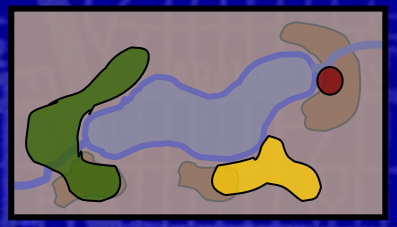


E2 + C2 + R2

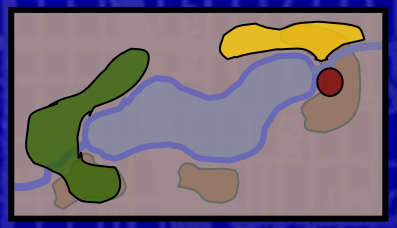


E2 + C2 + R4

Commercial 3

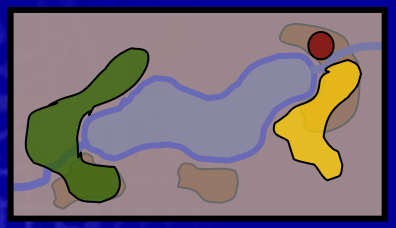


E1 + C3 + R3



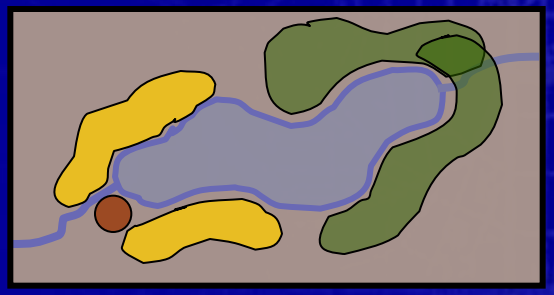
E1 + C3 + R5

Commercial 4

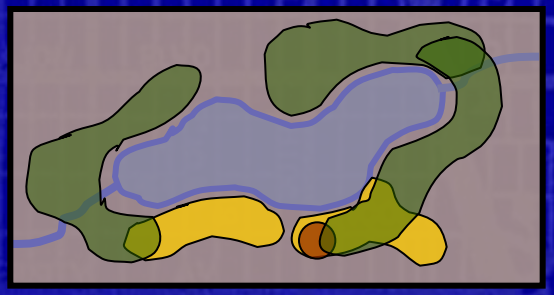


E1 + C4 + R4

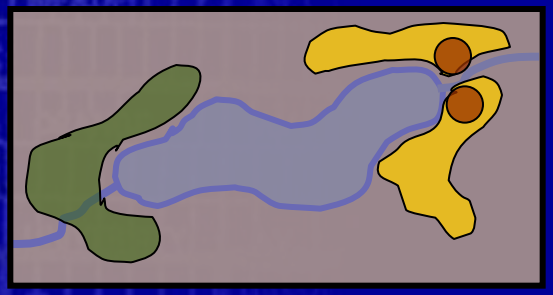
Basic Alternative Plans and their Variations



Alternative 1

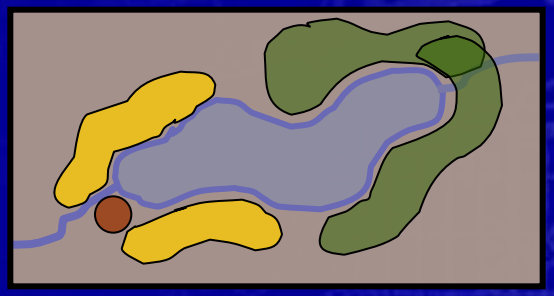


Alternative 2

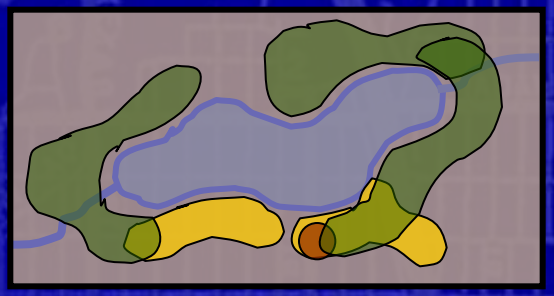


Alternative 3

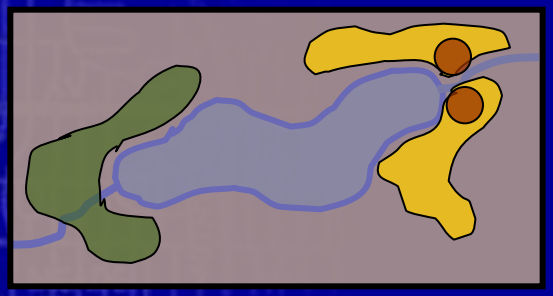
Evaluate Alternatives



Alternative 1



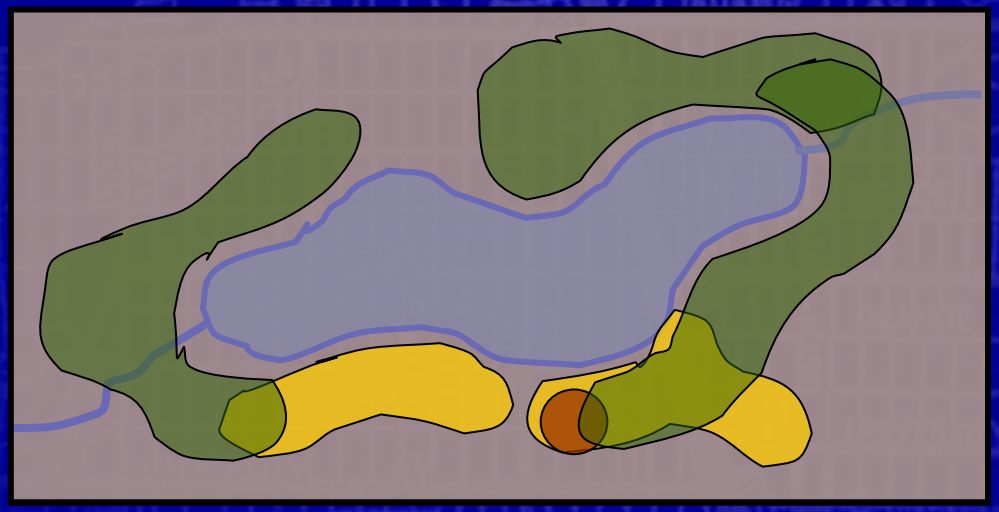
Alternative 2



Alternative 3

Evaluation Criteria	IR	Alternative 1		Alternative 2		Alternative 3	
Ecological Values	0.40	9	3.6	7	2.8	5	2.0
Urban Values	0.10	9	0.9	6	0.6	9	0.9
Social Values	0.10	8	0.8	8	0.8	8	0.8
Aesthetic Values	0.15	8	1.2	9	1.4	5	0.8
Economic Values	0.25	9	2.2	5	1.2	2	0.5
Total	1.00		8.7		6.8		5.0

Final Land Use Plan



Final plan is the conclusion of a logical process

All possible solutions considered

Optimum solution(s) identified

Provides a trace of the design process

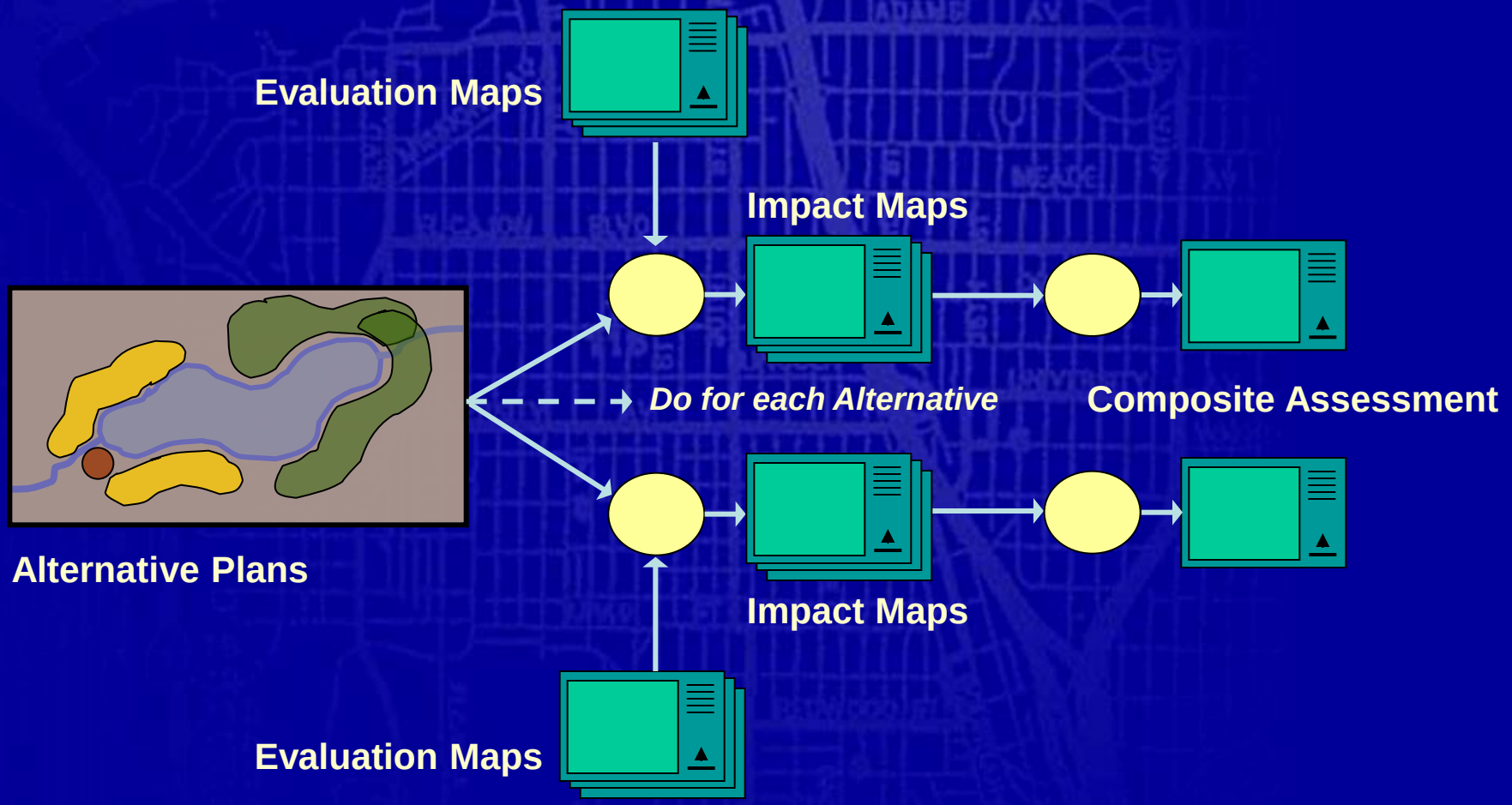
Landscape Intervention

Impact Assessments

Assess Impacts
(physical, biological, social and economic)

Evaluate Alternatives
(systematic assessment)

Assess Impacts



Landscape Intervention

Decision Support

... for staff, stakeholders and politicians

Policy Options

(what if)

Land Use Scenarios

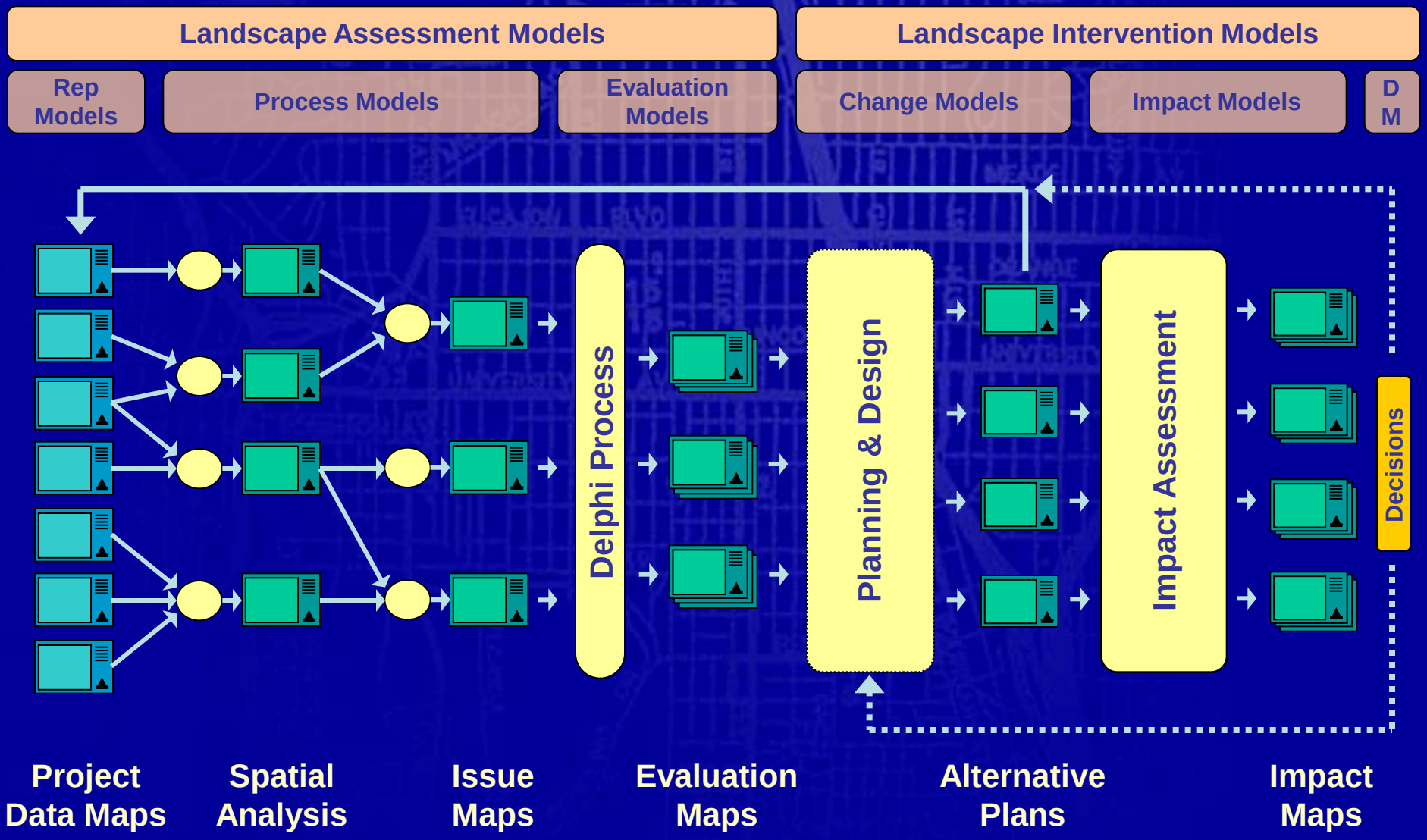
(opportunities and benefits)

Impact Assessments

(near and long term impacts)

Concluding Remarks

Landscape Change (MAD Diagram)



Benefits of going MAD

Framework for Integral Planning
(Comprehensive / Holistic / Systems)

Facilitates Communication
(Interagency / Interdisciplinary)

Delineates Project Workflow
(Spatial Data / Spatial Analysis / Project Management)

Saves Time and Money
(Project Tasks / Resource Allocation / Benefit-Costs)

Provides a Trace of the Decision Process
(Clarity / Accountability / Quality)

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