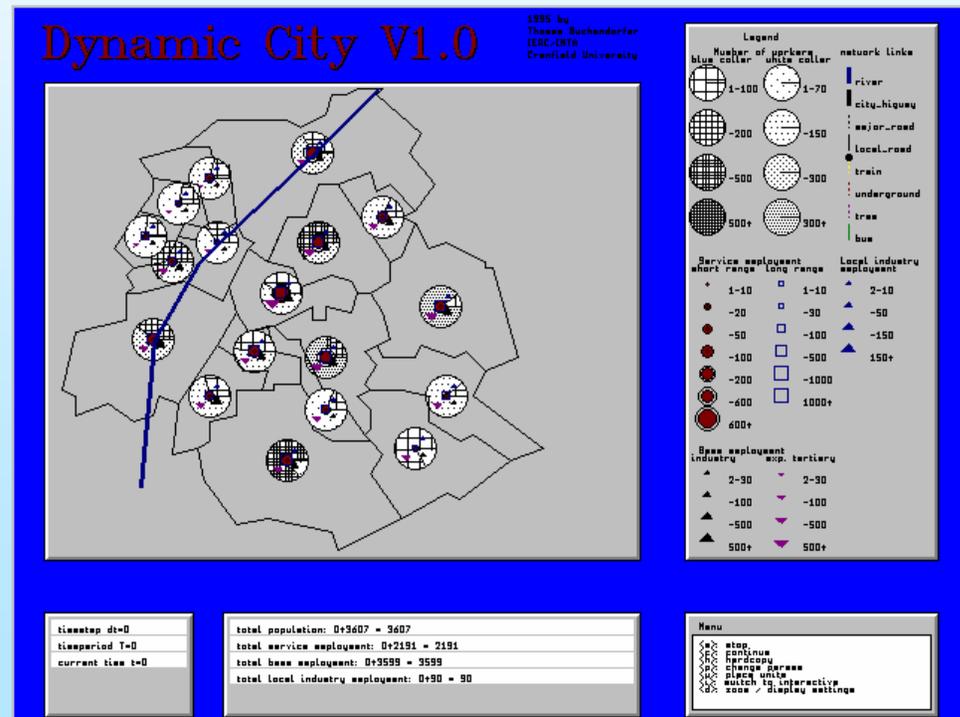# Brussaville - update by T.Buchendorfer

This dynamic, spatial model can be used to explore the long term consequences of possible developments, actions, policies and changing costs.

The Complexity of the urban system…..

Multiple Actors with multiple perspectives, time-scales, needs, locations, and abilities…

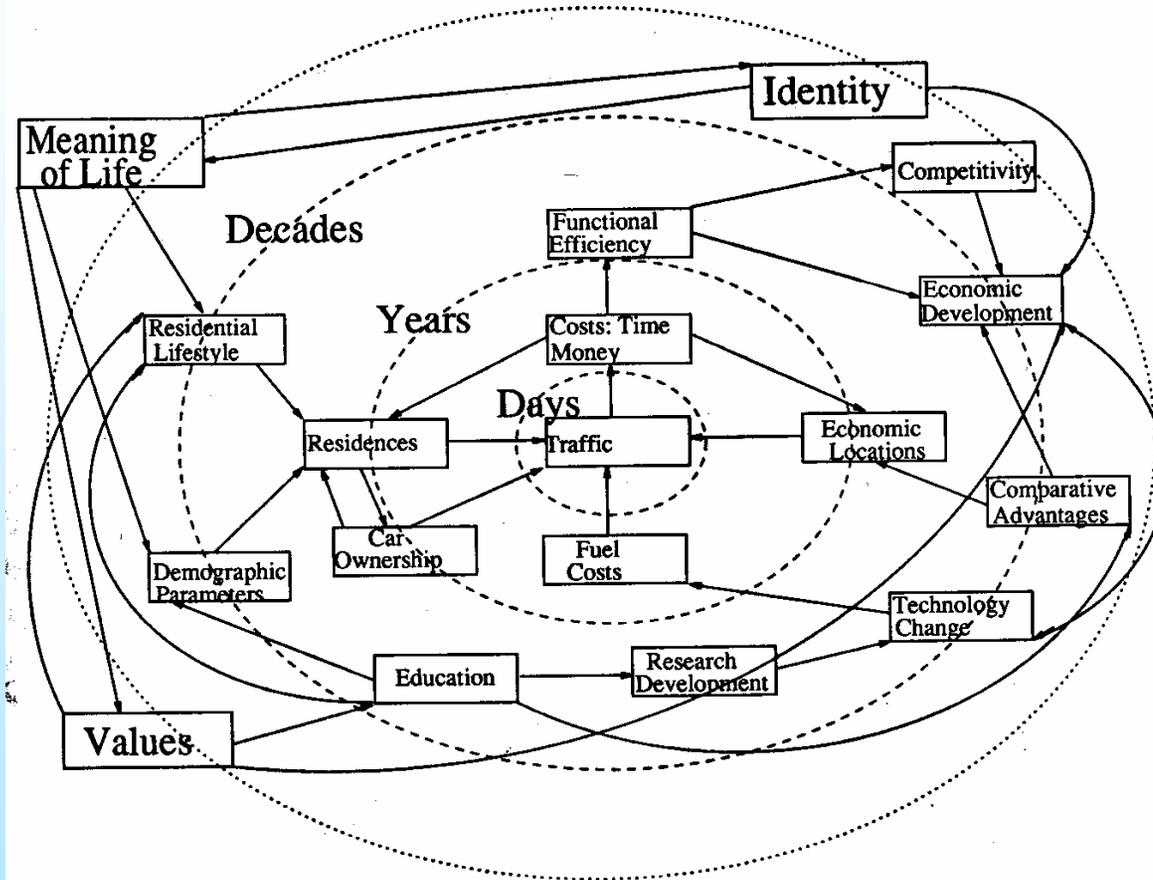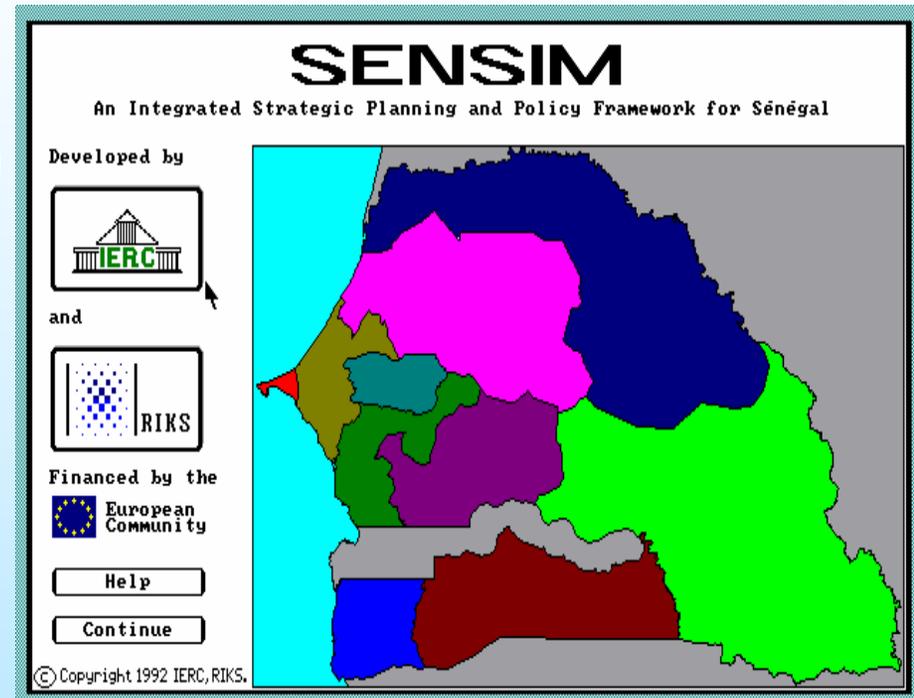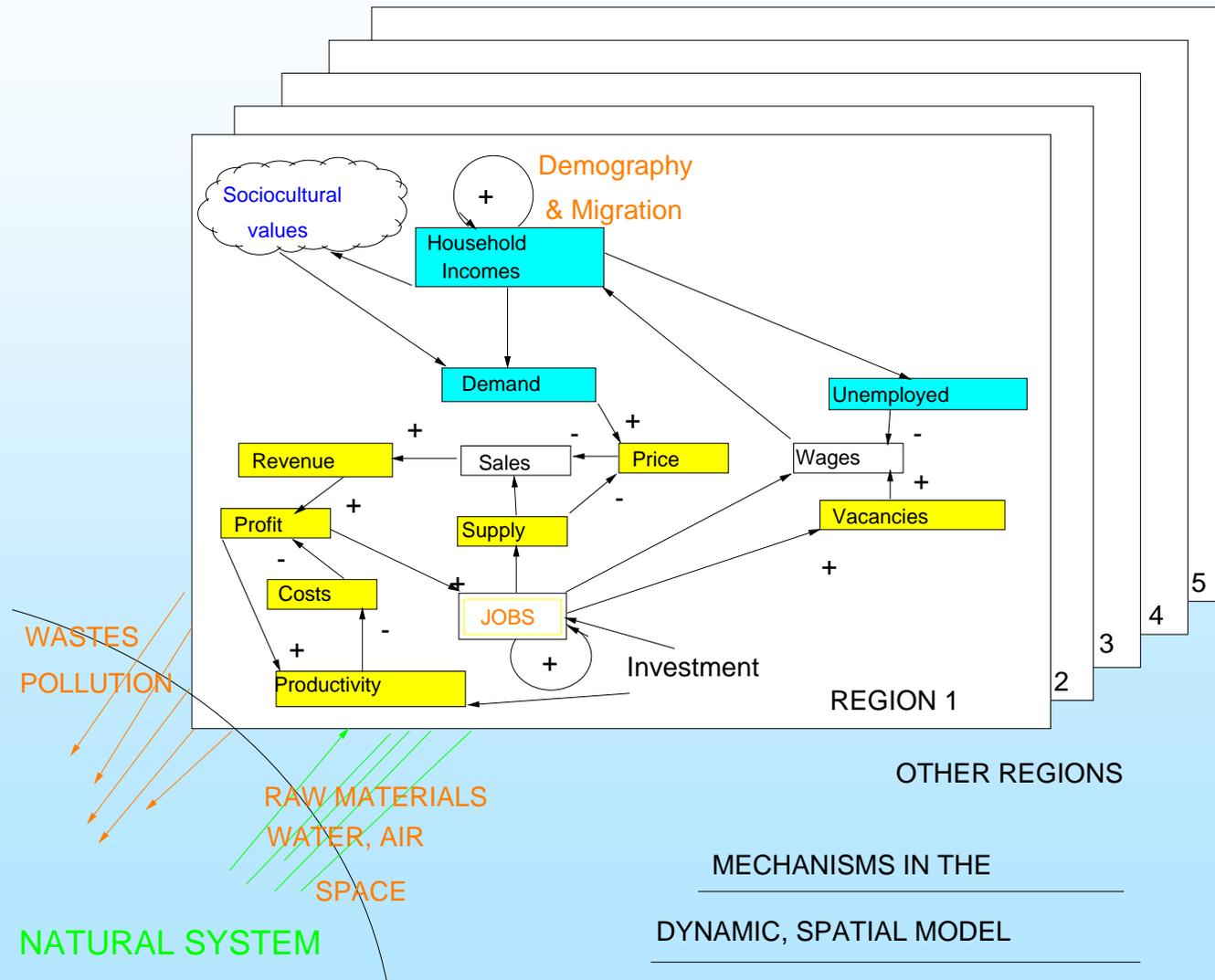**If "decision support" is to make better decisions, then for whom, in what way….**

re 12.3   The web of interactions traversing the spatial and temporal scales of a real system. The separation

Integrated Self-Organizing Models

- Models of the dynamic interaction of communication and spatial structure
- Can Explore different possible Urban Hierarchies, City Structures......

SENSIM

An Integrated Strategic Planning and Policy Framework for Sénégal

Developed by

IERC

and

RIKS

Financed by the

European Community

Help

Continue

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Inter-Regional Interactions

=== Guide to the model ===

Employment (or Filled Jobs)

The evolution in time of the employment in sector l and region i is described by the following expressions:

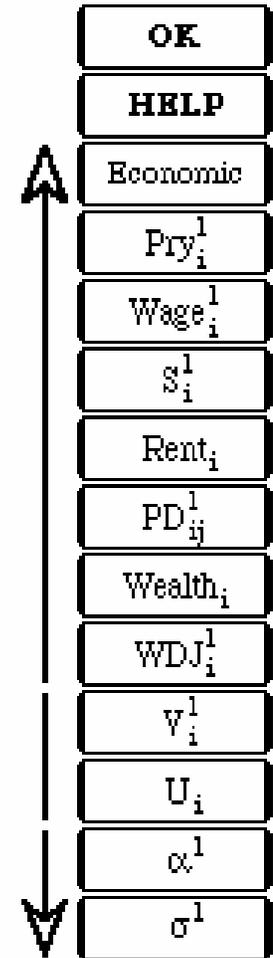IF $V_i^1 < 0$ THEN : $\quad \dfrac{\partial J_i^1}{\partial t} = \alpha^1 * V_i^1$

When hidden unemployment exists and the vacancies (V) are negative, jobs decrease in time proportionally to the existing vacancies at a rate (α) per year.
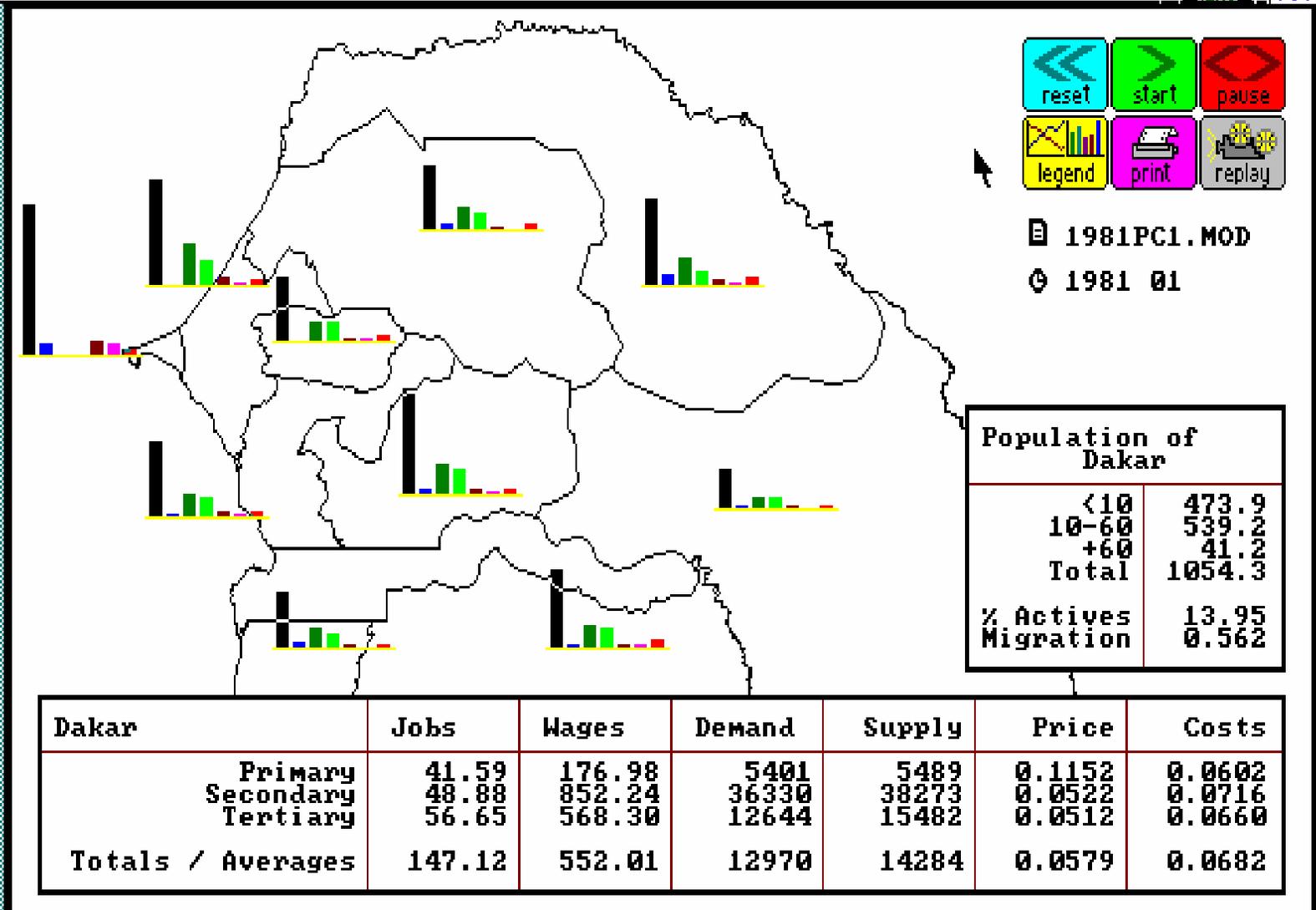
IF $V_i^1 > 0$ THEN : $\quad \dfrac{\partial J_i^1}{\partial t} = \sigma^1 * \dfrac{V_i^1 * U_i}{\sum\limits_k J_i^k}$

When new jobs are available on the labor market and vacancies (V) are positive, jobs increase at a rate (σ) per year proportionally to the existing vacancies and the pressure on the labor market (this is the proportion of unemployed to employed people. The higher this proportion, the more pressure there is to take up an open position on the labor market.
To calculate the trend in the labor market, the number of jobs in a previous time step (t-1) are stored in the variable (OJ)
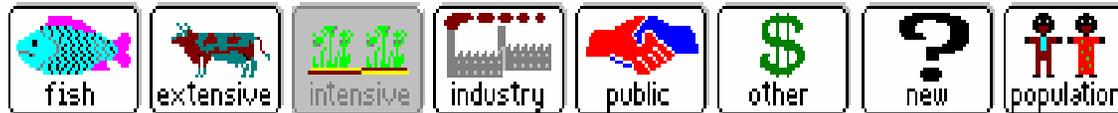
$OJ(t)_i^1 = J(t\text{-}1)_i^1$

OK

HELP

Economic

Pry_i^1

$Wage_i^1$

S_i^1

$Rent_i$

PD_{ij}^1

$Wealth_i$

WDJ_i^1

V_i^1

U_i

α^1

σ^1

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SENSIM   File   Region   Intervention   Presentation   Utilities

reset   start   pause

legend   print   replay

1981PC1.MOD

1981 01

Population of Dakar	
<10	473.9
10-60	539.2
+60	41.2
Total	1054.3
% Actives	13.95
Migration	0.562

Dakar	Jobs	Wages	Demand	Supply	Price	Costs
Primary	41.59	176.98	5401	5489	0.1152	0.0602
Secondary	48.88	852.24	36330	38273	0.0522	0.0716
Tertiary	56.65	568.30	12644	15482	0.0512	0.0660
Totals / Averages	147.12	552.01	12970	14284	0.0579	0.0682

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Saint Louis	1981 – 1	Intensive agriculture

53.840	Jobs
0.010	Vacancies
473.810	Wages
0.136	Price of goods
6000.00	Productivity
6000.00	Base productivity
55.000	Available area
0.000	Rate of change of available space
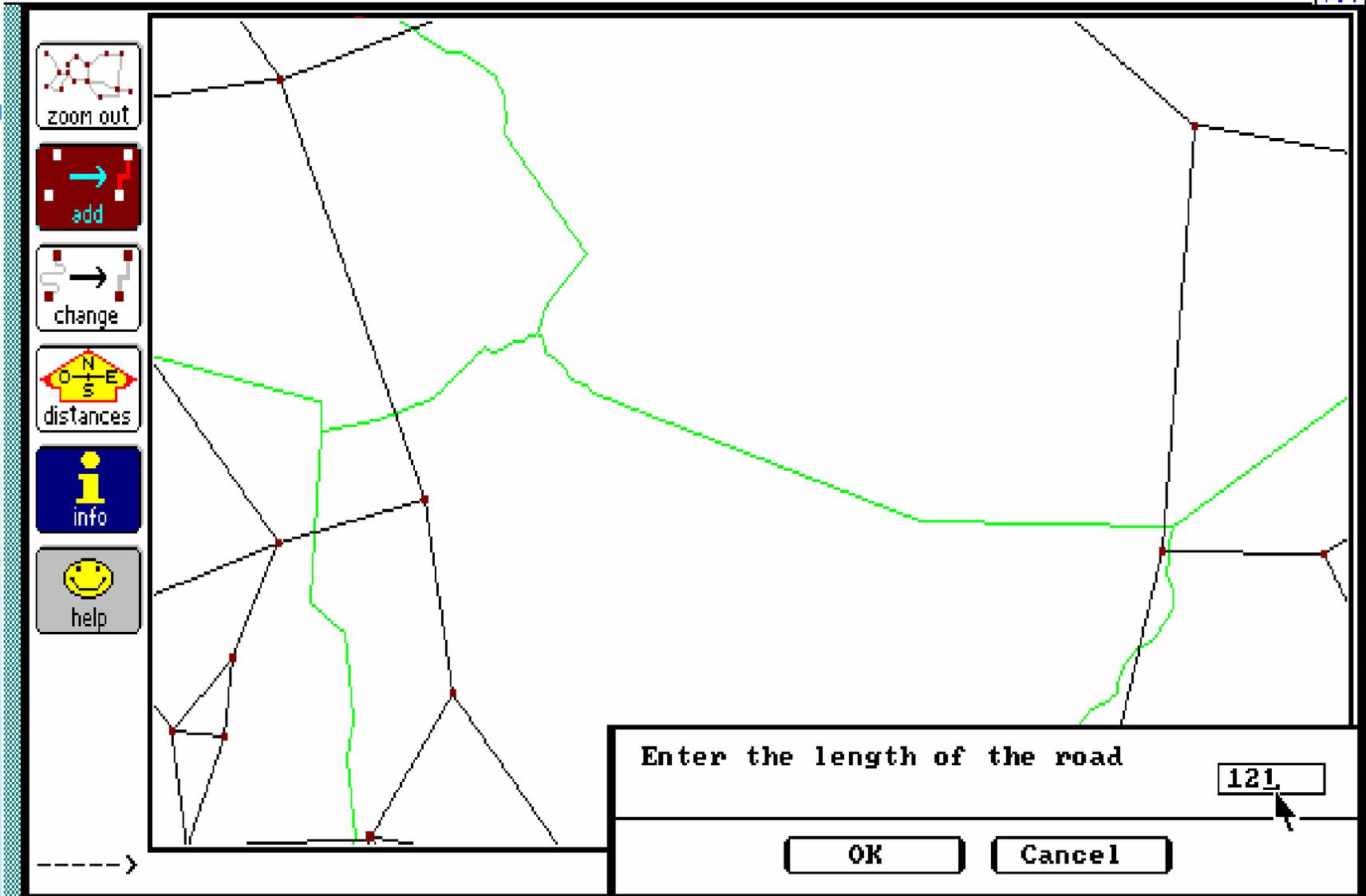
fish   extensive   intensive   industry   public   other   new   population

Ready   Help   Undo

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Development Policy Exploration

- Model permits the complex impacts of a policy or decision to be explored.
- Firstly, the immediate impacts on the environment
- and also the longer term induced effects can be estimated
- "Senegal River Basin Development".....

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Transport Project in West Bengal

- Idea to Improve Transportation Infrastructure

- Improve roads, build bridges, container depots…

- Normal analysis local cost/benefit

- Need regional trade, and spatial effects

- Poverty Impact assessment

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Effects on Jobs of Transport Improvements

- Decision based on "link" cost benefits….

- Distribution of ADDITIONAL jobs in agriculture, Industry and services

- Transport improvement produces 100,000 extra jobs, with various distributions depending on chance and government
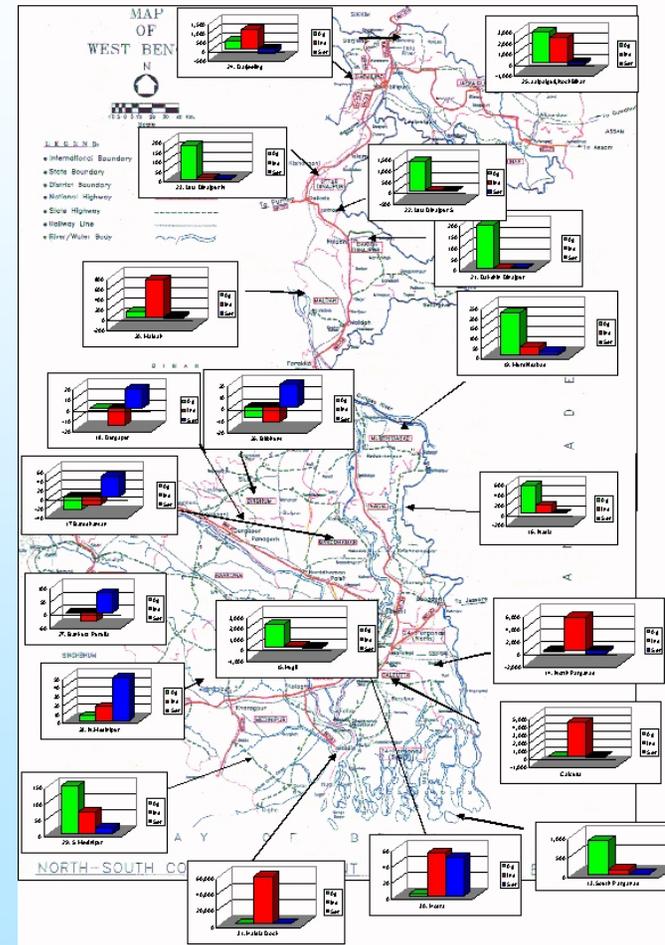
Distribution of Consumer Surplus….

- Shows estimated effects on poor, medium and rich populations

- Demonstrates the spreading effects, shows induced effects of projects

- Can suggest planning actions…..
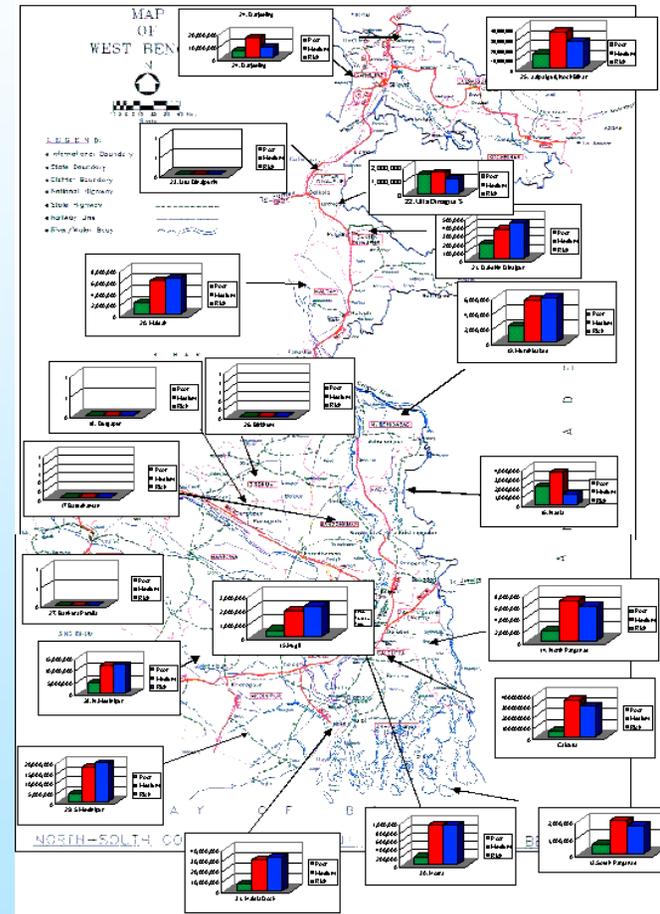
Cases I:

- DOT, USA, American cities, co-evolution of transportation and urban form (not used)(Could have helped)

- Belgium- Spatial evolution of population, jobs, of energy use, transportation….. (not used)(Gov)

- Senegal. Model for development policy exploration. Spatial evolution of population, jobs, natural resources, ….(not used)(EU)(Could have helped)

- Canadian Fisheries. Model of the evolution over time of the fisheries, under different policy options.(not used)(Gov)(could have helped)

Cases II-

- Brussels - Model allowing policy exploration of multiple consequences of different policies, decisions etc. (not used)(Gov)

- Argolid, Greece. Integrated model allowing exploration of impacts of agricultural policy, price support, technology subsidies etc. (not used yet..)(EU)(political complexity)

- Marina Baixa, Spain - Integrated model linking soils, slopes, crops, rainfall, water requirements, tourism and urbanisation. (not used yet..)(EU)(Hidden motivations…)

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Cases III -

- Schiphol Airport. Report on the possible validity of assumptions used for study….(used)(Gov)(Hidden assumptions)

- International Bank - Model showing complex spatial, economic and social impacts of large infrastructure project… (Used, but….)(Gov + Priv)(Hidden assumptions)

Why have we mostly failed?

- Because of "disciplines". Models that are used tend to be economic, agronomic, hydrological, ….but mainly economic (Experts !!?)

- these are catastrophically "incomplete" in that they tend to ignore both time, and also the multiple consequences in the many domains (social, technological, psychological, medical,…) that are not included

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Why have we mostly failed?

- Because Institutions do not understand the role or limitations of models, or indeed of Science in Policy Making

- Because they are looking for "certainty" in a "Forecast and Plan" cognitive time warp (Science = certainty…)

- Because we were developing a "new paradigm" - a thankless task….

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Different Choices:

- Transims: Generate traffic flows, and "transportation demand". Do not consider the impact of any decision taken on the distribution of activities, residents, flows, land-use……..

- Make simplifying assumptions about the response of jobs, and residents to a change in transportation
  - suppose equilibrium - no real-time simulation)
  - Spatial Interaction models: Average behaviours of typical sectors and populations

Different Choices:

- Simulating differential equations, with spatial interactions and feedbacks - Self-organising spatial structures (Allen, 1977 - until now)

- Including the housing and built spaces, in a spatial dynamic (Michael Wegener, …..)

- Using "local" interactions inside a spatial interaction model (Engelen and White).(Continuation of Allen type models….)

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So, models allow us to learn….

- The point about "simulations" is not that they predict the future.

- They allow us to know whether our present understanding is consistent with reality thus far…

- They allow us to interact with reality and to develop a representation of that reality based on assumptions that at least are neither inconsistent with each other, nor with the way things seem to be…..

- They can therefore allow us to make "policy explorations" into possible futures…...

They also tell us about learning...

- We can make Complex Adaptive models that allow us to compare policies that affect adaptation and learning….

- This means that we can start to "understand" not what future will occur, but how a system may be able to respond to change, or to create it

- The "building" of a simulation model, based on complex systems ideas, therefore is important in learning about the way the system learns

Conclusions-1

- Simulation models should be used in policy making, but not as "forecasting" tools

- They should be used to "learn about" and "understand" the situation, and to explore some of the possible futures

- Different attractors give different "regimes" of operation, these offer qualitatively different futures…

- Complex systems models can indicate the real "ignorance" that we have about what might happen. They may indicate "risks" and "uncertainties".

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Conclusions 2-

- Simulation models should be built together with the stakeholders. This allows reflection on the appropriate "selection" criteria for policies…

- They should make the assumptions clear, and also admit that JUDGEMENT will be required….

- They can possibly expand option space and provide information for compromise and agreement

- **They can help us do a little better than we have before, and that can't be bad.**