

***BURST Symposium on the Design of Urban Systems of the Future
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Built in Concrete?

Designing Sustainable Infrastructure for a Changing World

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the plan

the problem

uncertainty

new approaches

discussion



*“We can use projections or predictions
to plan our urban interventions
with only one certainty:
they are likely to be wrong in the far future”*

Chris Rogers

*“We can use projections or predictions
to plan our urban interventions
with only one certainty:
they are ~~likely~~ to be wrong in the far future”*
almost certain

Chris Rogers

the problem

- major urban infrastructure is planned **decades in advance** of its inauguration
- it is supposed to last **decades more**
- many **critical conditions** will have **changed** in the meantime

result

- infrastructure that is obsolete, redundant, ill-located, unfinished, **problematic...**

case in point

the California high-speed rail



<http://timelines.latimes.com/california-high-speed-rail-project/>

also

- freeways
- power plants
- underground
- airports
- redevelopment
- waterways
- ...

the story so far

1992 FRA lays groundwork for California corridor linking San Diego and Los Angeles with the Bay Area and Sacramento via the San Joaquin Valley

2000 USDOT clarifies that “the designated California corridor comprises the entire region lying between and among the extensive metropolitan areas of the San Francisco Bay, Sacramento, Los Angeles, and San Diego.”

2008 CA voters approve Proposition 1A (\$10 billion in bonds)

2009 FRA announces extension of CA High-speed Rail corridor to Las Vegas

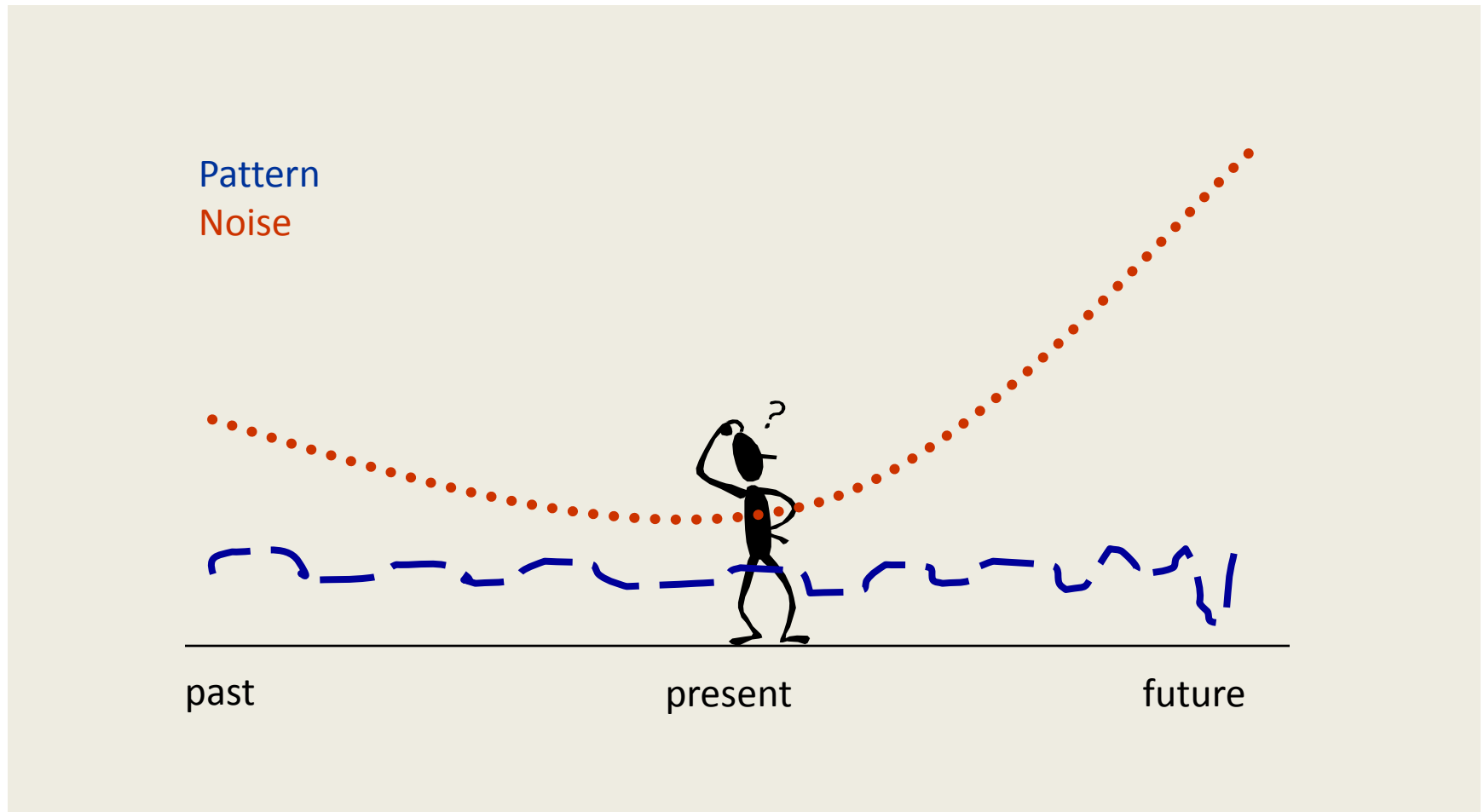
... and on it goes... to **2040**

<http://timelines.latimes.com/california-high-speed-rail-project/>

a ‘green’ infrastructure plan mired in budget and ridership uncertainties and controversy

signal and noise

uncertainty, prediction, and time



the certainty of uncertainty

-50 years

NOW

+50 years

cold war
nuclear energy
civil rights
fall of communism
rise of China
end of industrial era
knowledge society
environmentalism
little ice age
nuclear winter
global warming
AIDS, SARS, etc.
globalization
terrorism
global migrations
world recession
(re)turn to the city



the certainty of uncertainty (2)

-50 years

NOW

+50 years

computers
satellites
space missions
jet propulsion
supersonic flight
bullet trains
genetics
nanotechnology
biotechnology
electric cars
driverless cars
drones
GPS
sensor networks
cell/smart phones
big data
internet of things
green energy
green materials



Multiple **uncertainties** characterize the different kinds of events, changes, processes and actions that urban planning and policy must deal with

UE: uncertainties about events and changes in the external **e**nvironment ('**w**orld')

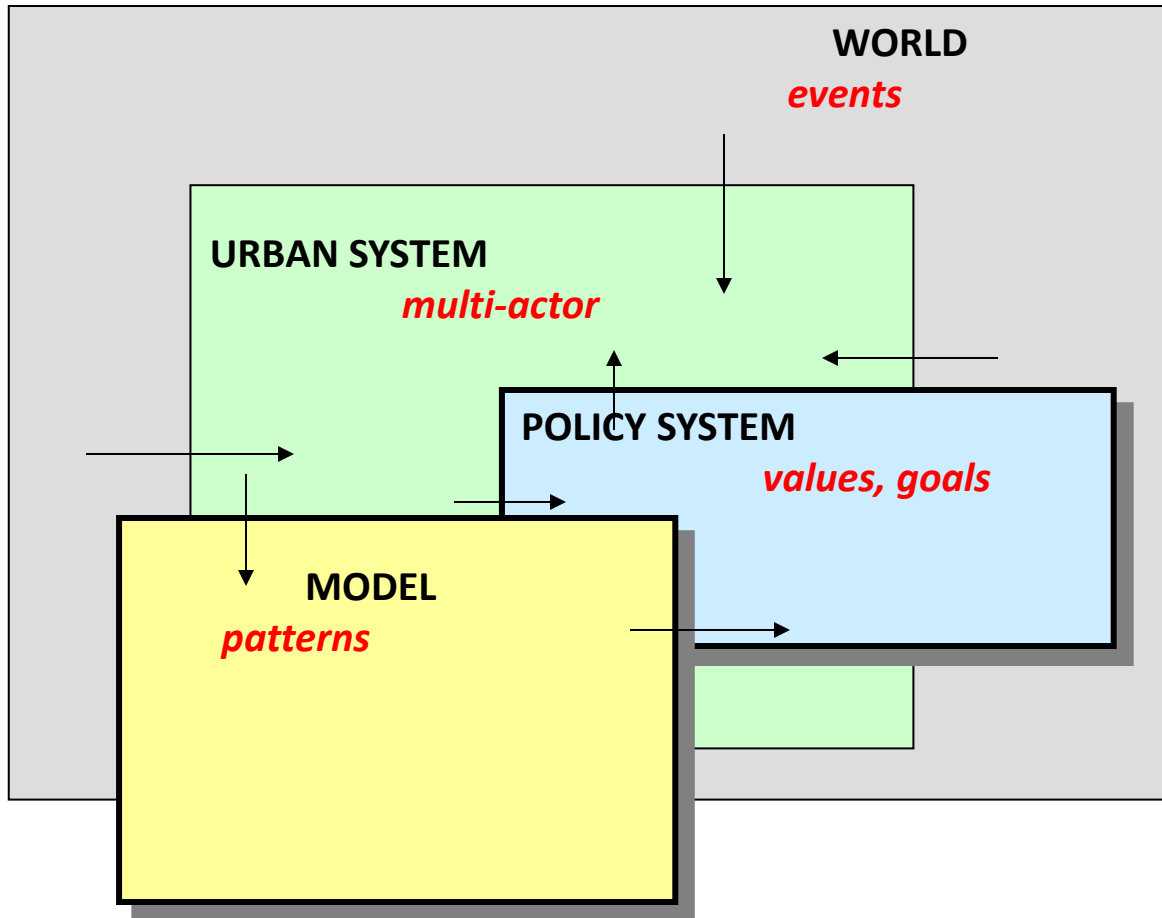
UR: uncertainties as to future actions in **r**elated fields of choice (**u**rban **s**ystem)

UV: uncertainties as to appropriate **v**alue judgments (**p**lanning & **p**olicy **s**ystem)

(Friend and Jessop, 1969)

UM: uncertainties regarding the reliability of the **m**odel(s) used

So little certainty, so much noise...



There are many kinds of uncertainty

some are manageable

'deep uncertainty' is the most difficult challenge

Location	Level			Nature	
	Statistical uncertainty	Scenario uncertainty	Recognized ignorance	Epistemic	Variability
World					
Stakeholders					
Values					
Model					

adapted from Walker et al. 2003
and Friend & Jessop 1969

What to do?...

- work with uncertainty
- the RAND corporation has some interesting answers:

Assumption-based planning (ABP)

keep checking your assumptions as you go
take strategic action as needed

Robust adaptive planning (RAP)

plan paths that keep your options open
test them against myriad scenarios

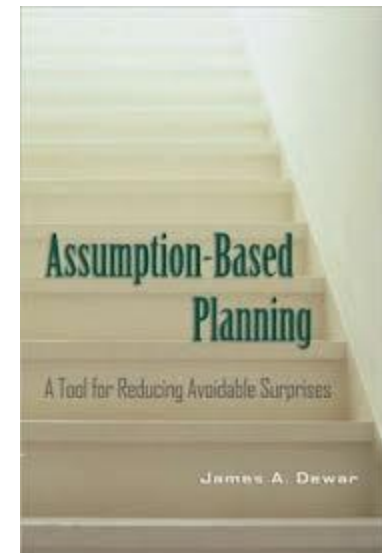
steps: *Assumption Based Planning*
*a planning tool for very uncertain times**

identify

1. important assumptions
2. assumption vulnerabilities

define

3. signposts
4. shaping actions
5. hedging actions



*James A. Dewar, Carl H. Builder, William M. Hix, Morlie Levin

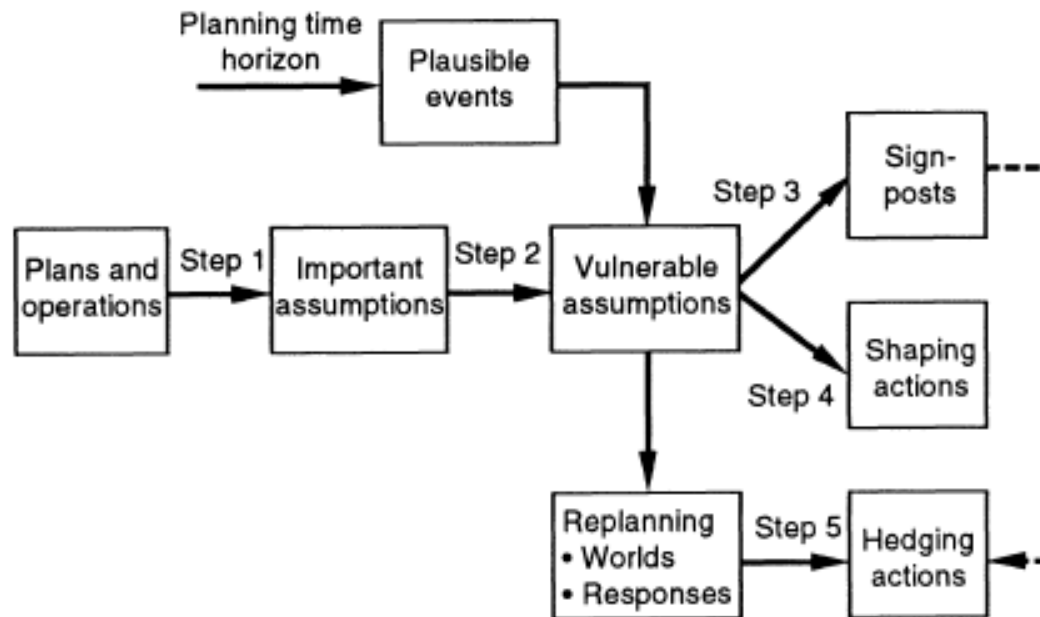


Figure 7.1—ABP Steps and Logical Dependence

discussion

- non-predictive modeling
 - compare and contrast
 - scenarios \leftrightarrow ABP, RAP
- sustainable infrastructure
 - extending ABP
 - GIS
 - Big Data



Scenarios, ABP, and RAP

scenarios: pros and cons

intuitive

why *these* 4? (or 3, or 5)

too structured

better for focused problems

Shell Oil vs Dutch government

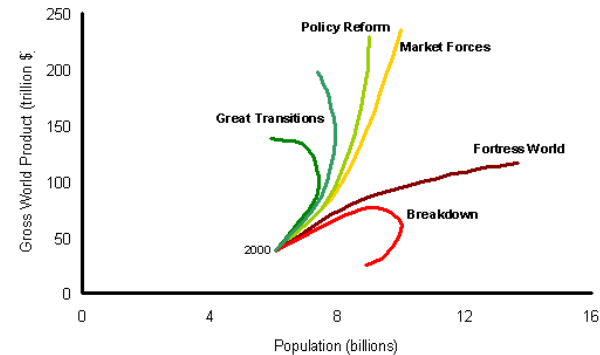
ABP and RAP

untried

RAP is too complex

complementary!

ABP and RAP both use scenarios



<https://encrypted-tbn3.gstatic.com/images?q=tbn:ANd9GcRI4dGKGEM0turn0JmZ-8nuW4CVam1z00G2IWamKOMbQkEszlaA>

...for a research agenda?

ABP for **spatial** infrastructure planning

integrate with GIS

develop visualizations

involve stakeholders

...for a research agenda?

ABP for **spatial** infrastructure planning

integrate with GIS

develop visualizations

involve stakeholders

ABP Big Data and ABP

crowdsourcing

anticipate 'signposts'

construct 'hedging' scenarios

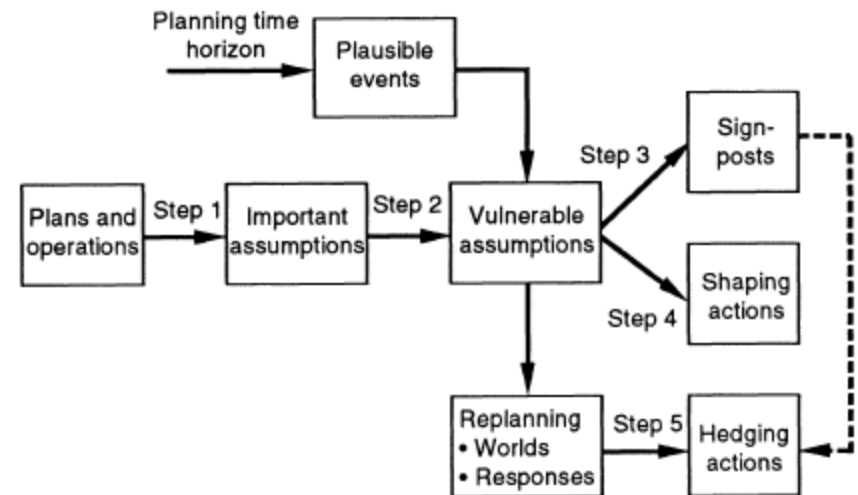


Figure 7.1—ABP Steps and Logical Dependence

The End



which way?