# Research to Inform Policy and Decision-Making

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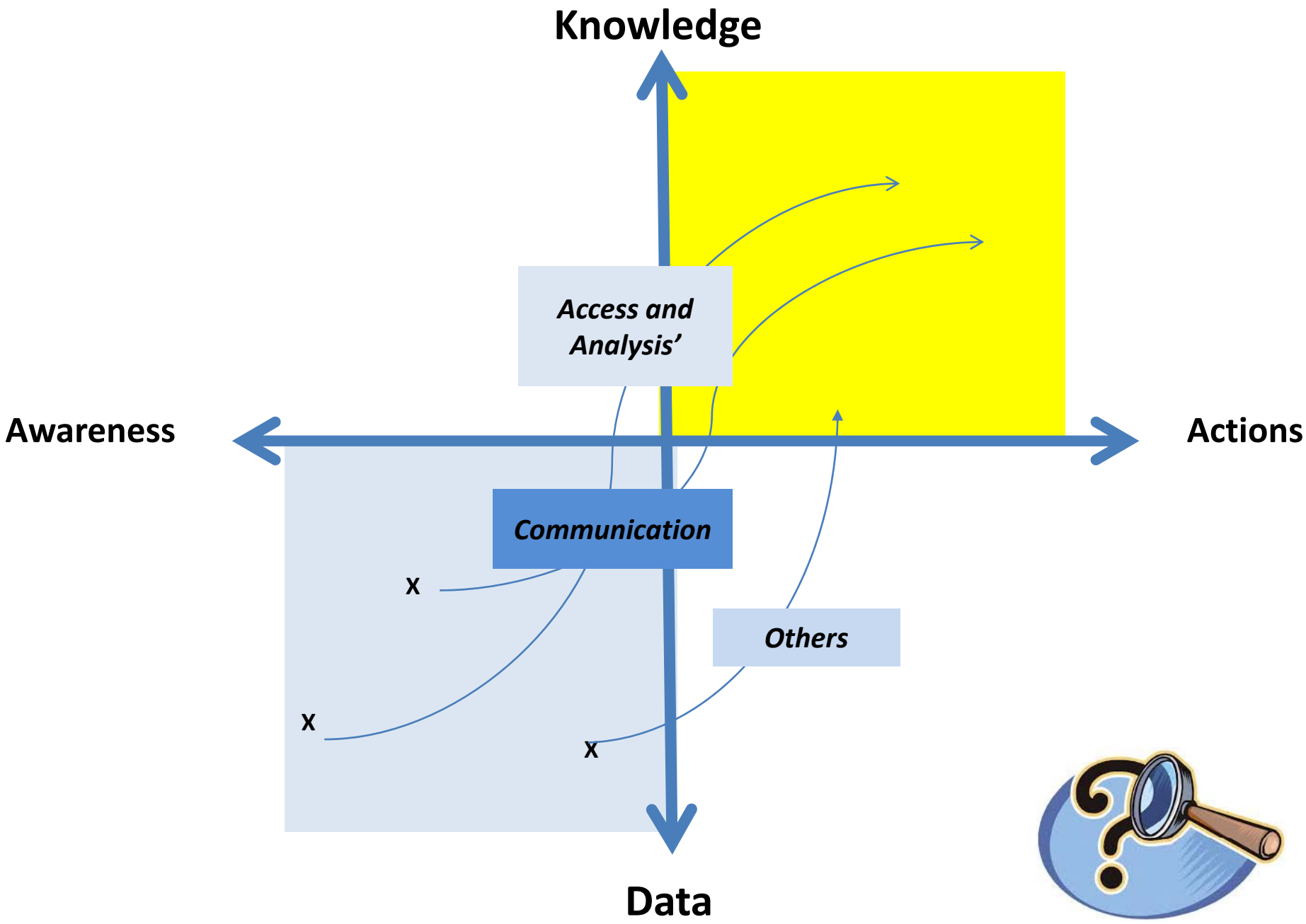
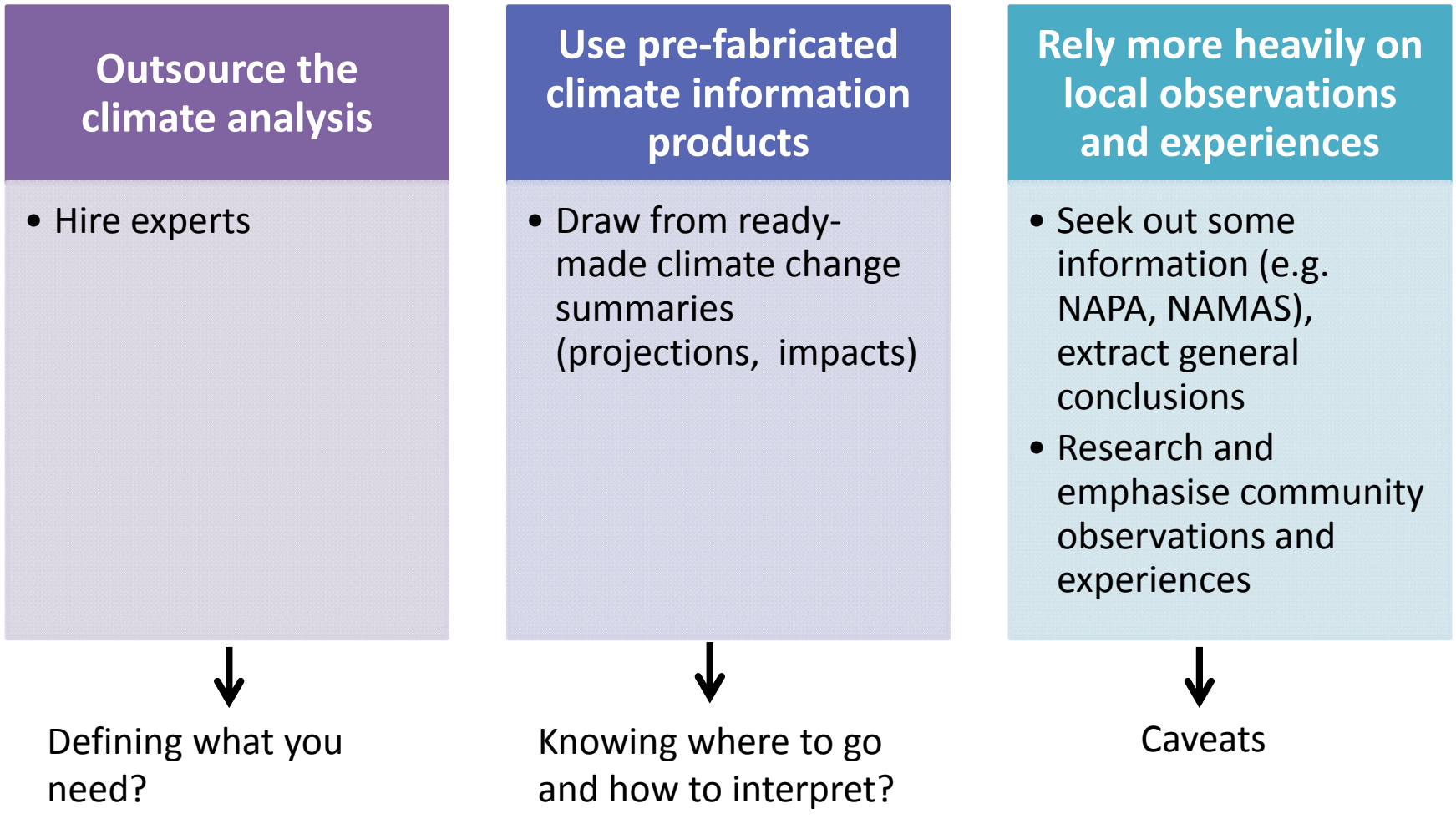
*To make informed decisions to respond to climate change on a sound, scientific, technical and socio-economic basis, need to know:*

1. **What is expected to change? [variable]**
2. **Where are the changes expected? [spatial scale]**
3. **When are the changes likely to take place? [temporal scale]**
4. **How (un)sure are we about these changes? [level of confidence]**


Knowledge
Access and Analysis'
Awareness
Actions
Communication
x
Others
x
x
Data

# Data/Information

| | |
|---|---|
| Knowledge Base | • Fragmented, Insufficient<br>• Poor public access<br>• Sources and conflicting messages: GCMs, RCMs, other downscaling |


Outsource the climate analysis
• Hire experts
Defining what you need?
Use pre-fabricated climate information products
• Draw from ready-made climate change summaries (projections, impacts)
Knowing where to go and how to interpret?
Rely more heavily on local observations and experiences
• Seek out some information (e.g. NAPA, NAMAS), extract general conclusions
• Research and emphasise community observations and experiences
Caveats

# What will change? [variable]

***Annual Temperature***
***Cardinal Months*** *(Jan, Apr, Jul, Oct)*
***Std Dev; CV; Skewness***
***Frost Days***
***Cold Spells***
***Heat Waves***

## *Temperature Analyses*

***Annual Rainfall***
***Cardinal Months***
***Std Dev; CV; Skewness***
***Seasonality and Concentration***
***Threshold Rainfalls Exceeded***
***Period with Raindays > Thresholds***
***Short and Long Duration Design P***
***Meteorological Droughts*** *(S, M, M, / A, M)*

## *Rainfall Analyses*

## *GCMs/RCMs/Statistically Downscaled Data*

| | |
|---|---|
| Present | 1971 - 90 |
| Intermediate | 2046 - 65 |
| Distant Future | 2081 - 00 |

## *Hydrological/ Ecological Analyses*

***Annual Runoff/Streamflow*** *(mean, 10th, 50th, 90th)*
***Cardinal Months*** *(Jan, Apr, Jul, Oct)*
***Std Dev; CV; Skewness; Kurtosis***
***Threshold Streamflows Exceeded***
***Soil Moisture***
***Peak Discharge***
***Sediment Yield***
***Hydrological Droughts*** *(Sev, Mod, Mld, / An, Mo)*
***Period with Streamflows > Thresholds***
***1 - 7 Day Design Stormflows*** *(2, 5, 10, 20, 50, 100 yr RP)*
***Indicators of Hydrological Alteration***
***Water Temperature***

## *AgriculturalAnalyses*

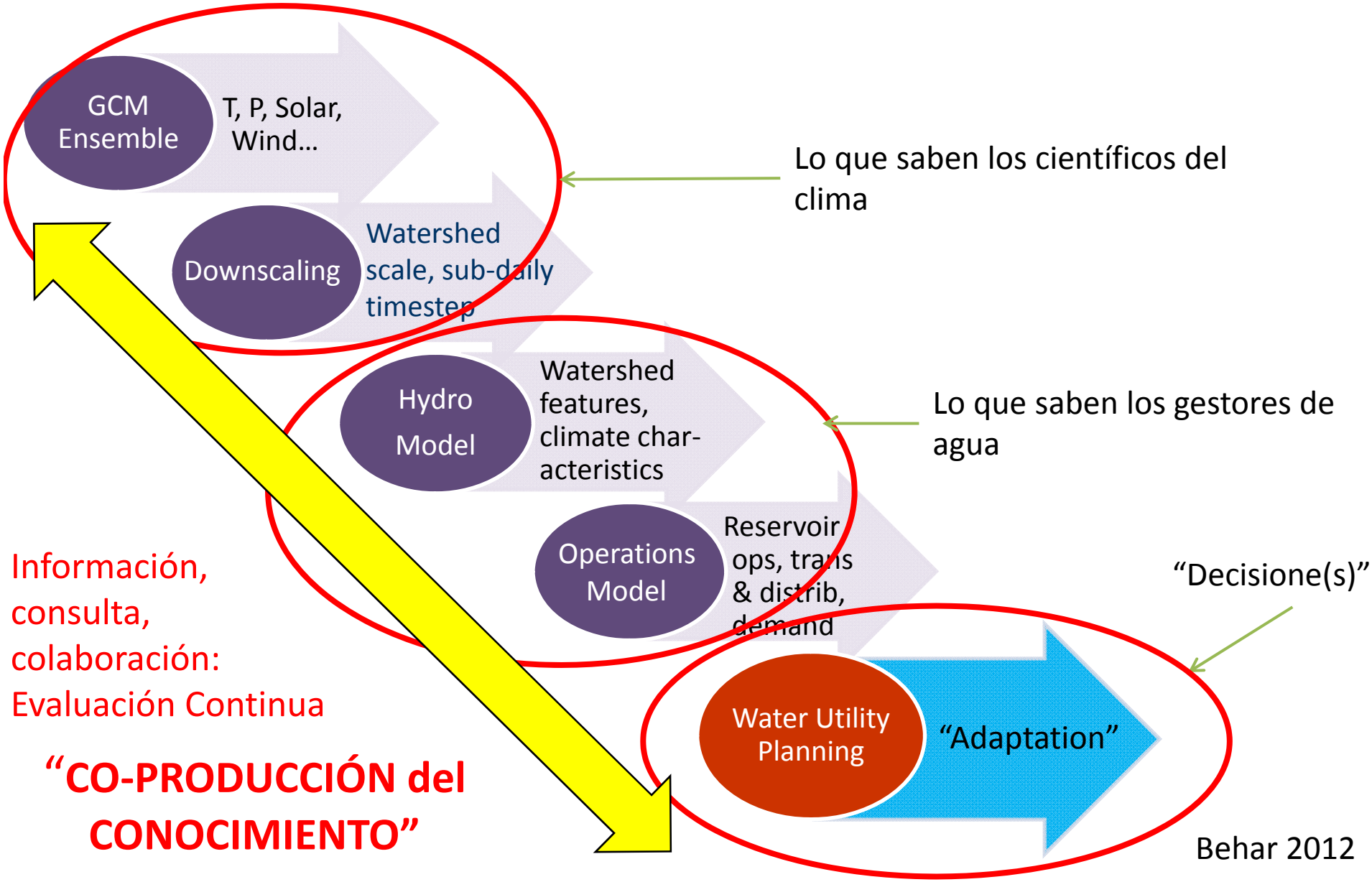
***2nd Order Analyses***
- ***Heat Units*** - ***Chill Units***

***3rd Order Analyses***
- ***Pests / Diseases***
- ***Crops - Agriculture***
- ***Crops - Pasture***
- ***Crops - Horticulture***
- ***Commercial Afforestation***
- ***Primary Production***
- ***Irrigation Requirements***

# Data/Information

| | |
|---|---|
| Knowledge Base | • Fragmented, Insufficient<br>• Poor public access<br>• Sources and conflicting messages: GCMs, RCMs, other downscaling |
| Analytical tools | • No modern shared tools for analyzing future investments<br>• Poor decision-support focus |

# Cadena de Modelos



# Matching scale of information to scales of intervention

- When are observable trends appropriate?
- What are the relevant data sources for obtaining these?
- When is a more precautionary approach warranted?
- How much flexibility is required in the intervention system?

# Data/Information

- What are adequate biophysical and socio-economic metrics and models to synthesize impacts across sectors and regions (including policy decisions)?
- How can we improve consistency between interacting climate and impact models?
- Tools to facilitate data access: what tools, approaches, methods are available? How do we judge their effectiveness/ validate them?
- Examples of tools used in case studies, best practices – How can we learn from user experiences? (Eg. IDF curves)
- Lessons from the field: metjhods, approaches to improve the use of climate information

# Comunication

## “Bridgers”

- Knowledge Brokers..
- Nuance vs. Naivete

## Challenges

- Communicating uncertainty
- If the formula for effective public communication requires simple, clear messages, repeated often by a variety of trusted sources…”, then..

# Communication, Con't

- Building capacity of briding institutions/ individuals – what kinds of investments in capacity are appropriate and what scale of decision-making is most important to target?
- How to achieve integration of climate information into various sectors without loosing the necessary detail?
- **Communicating climate risks to support decision making:** What do decision makers want and need to know and how best to understand and deliver information?
- Lessons from the field: metjhods, approaches to improve the communication and use of climate information

# Others

## Planning Instruments

- Climate-proofing
- Mainstreaming

## Others

- Costing?
- Role of the private sector
- Understanding the user base…
- Knowledge products?..

- Practical approaches to incorporating climate information in planning instruments..
- …

# City of Cusco

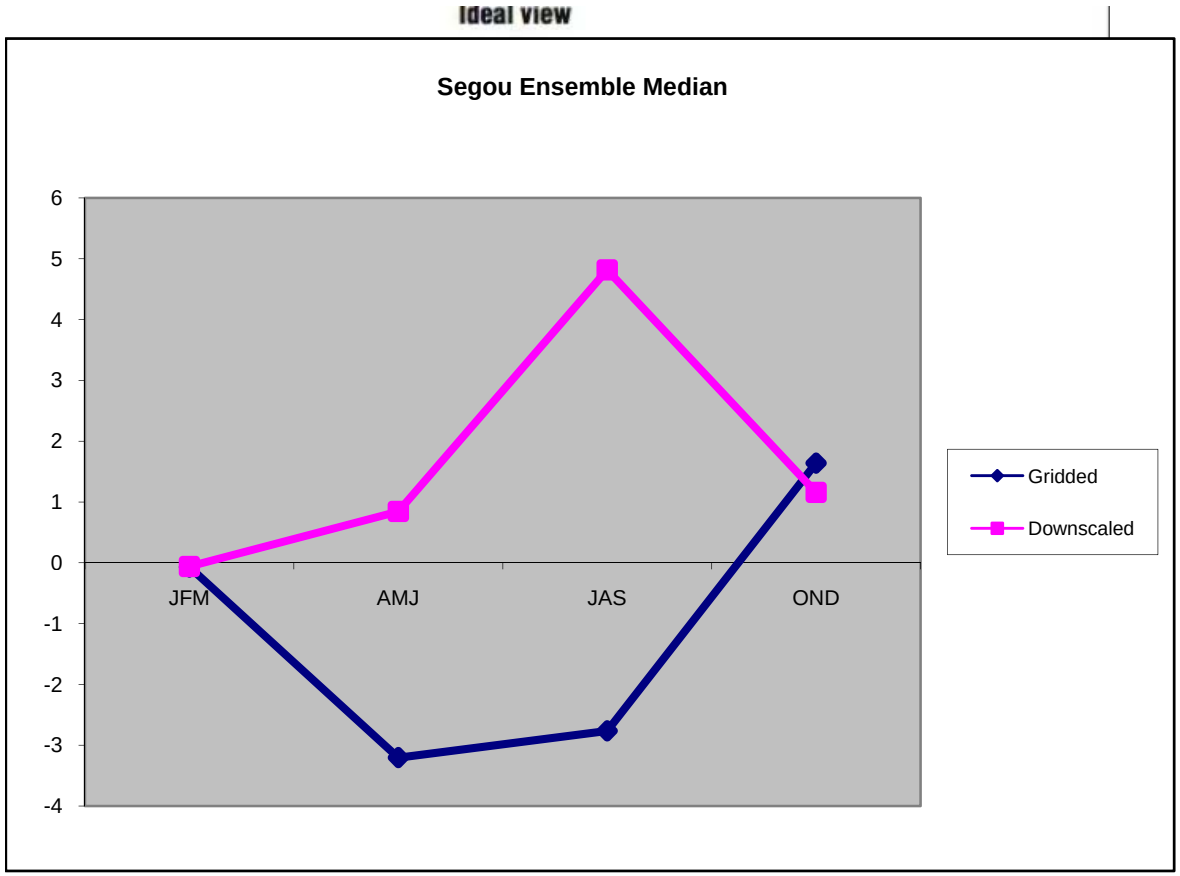
## *Examples of real decisions to be made…*

- How/Where to improve Hydropower generation?
- How to supply water for increasing domestic/urban uses?
- How to better operate existing water infrastructure?
- How to improve resilience to floods?
- How to cope with droughts?
- How to better resolve water conflicts?

…all these decisions are sensitive to climate. the “answers” require a careful consideration of climate variability and climate change.

Harsh

# Que (in)certidumbre tenemos sobre estos cambios?

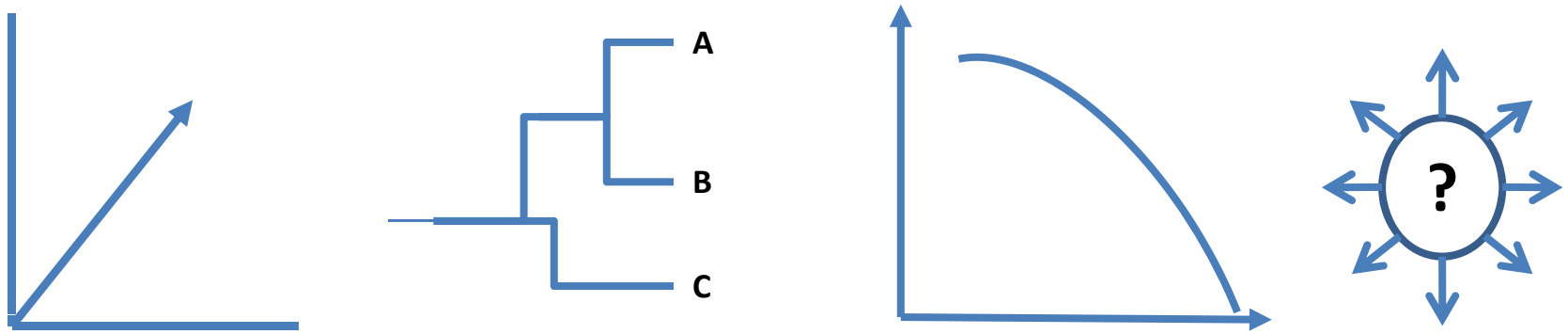



- Sensibilizacion sobre el cambio climatico - incluyendo peligros de utilizar una sola fuente de información
- Postular preguntas correctas (ingenuidad vs matiz)
- Coincidencia de horizontes de planificación a la información potencialmente útil
- "Good Enough" información
- ¿Por qué downscale?

# Which decision support tool

•Depends on type of answer

• Amount, quality of available information, goal



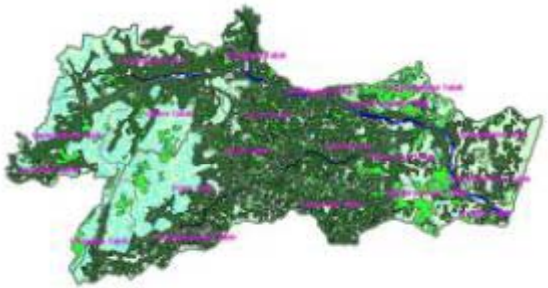

•A process – “adapting well, not well adapted”

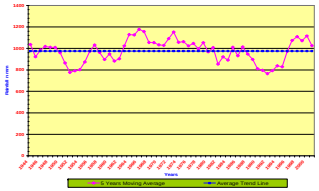
- Planning areas – areas in which a government or community manages, plans or makes policy affecting the services and activities associated with built, natural and human systems.

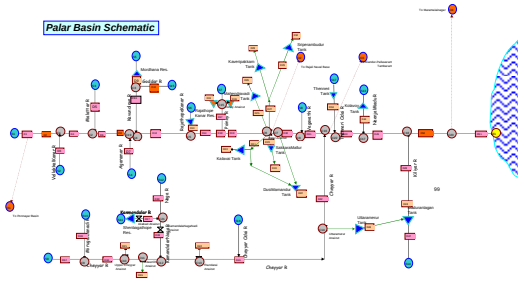
| 1. Sectors | 2. Planning Areas | 3. Current and Expected Stresses to Systems in This Planning Area |
|---|---|---|
| Hydrology and water resources | Water supply management | Low water supply during hot, dry summers; managing drought *(current and expected)* |
| | | Poor water quality during flood events *(current and expected)* |
| | | Poor water quality during summer *(current and expected)* |
| | | Aging infrastructure and lack of funding for system upgrades *(current and expected)* |
| | | Meeting increased demand from population growth *(expected)* |
| Infrastructure | Stormwater management | Combined sewer overflows (CSOs) during heavy rainstorms *(current and expected)* |
| | | Lack of funding for system upgrades *(current and expected)* |
| Transportation | Road operations and maintenance | Road buckling during heat waves *(current and expected)* |
| | | Winter road maintenance (snow/ice removal) *(current and expected)* |
| | | Managing brush fires along roadways *(current and expected)* |
| | | Erosion around bridge footings *(current and expected)* |

# Tools are Evolving…

Analytical Tools



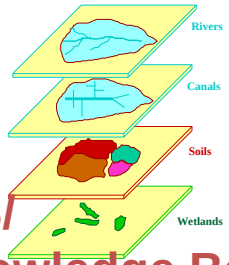


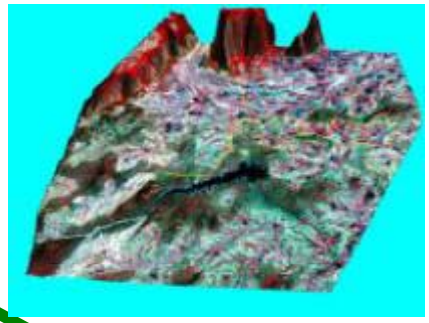

Spatial & Non-Spatial Analyses

Models/Decision Support Systems

The Internet

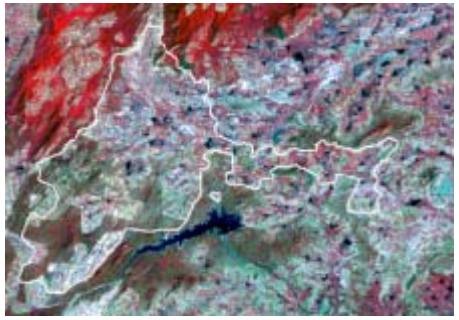



GIS/
Knowledge Base



Datasets

Knowledge Base



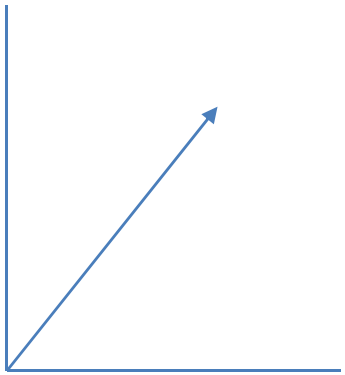
Remote Sensing

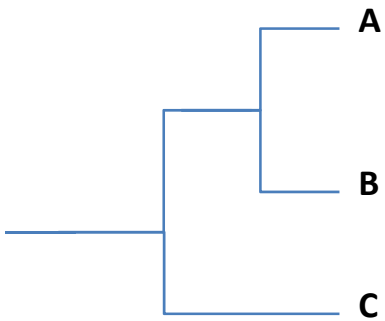
GPS

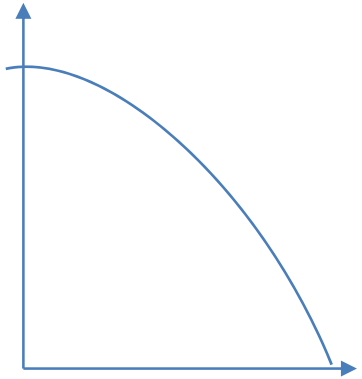
Surveys &
Stakeholder Views

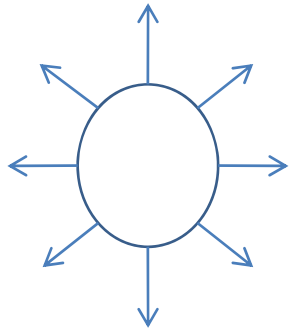
Maps/Attribute Data

1. How do we overcome the challenge of providing increasingly specialized scientific information to communities that approach problems “holistically and often intuitively”?





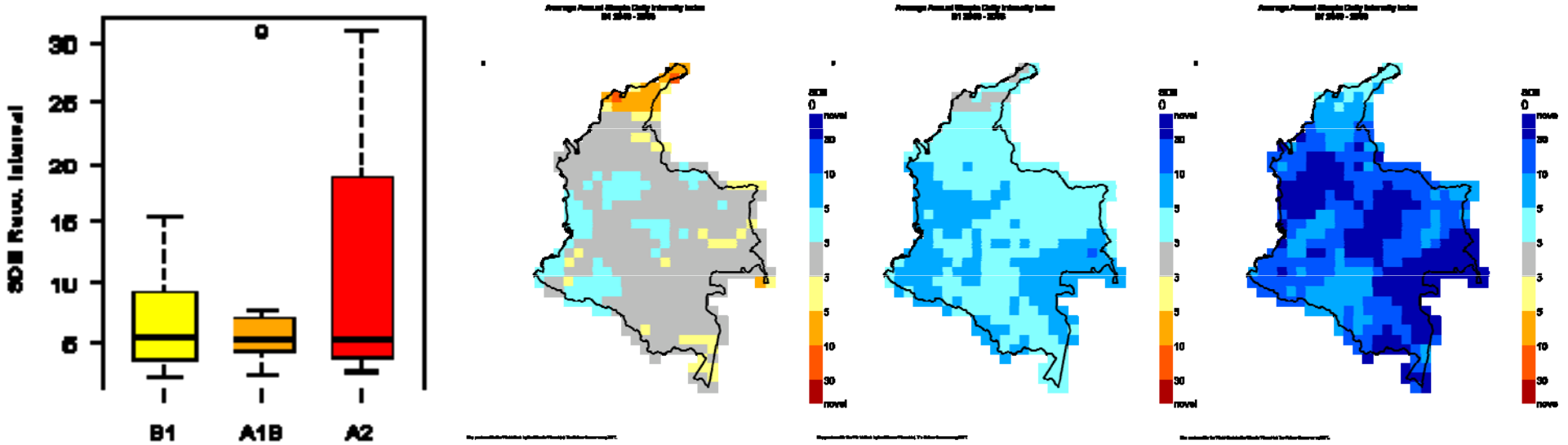





# Desafíos

- Limitaciones en nuestros modelos y *metodos*

***Projected changes in Annual rainfall by 2065 from 3 models***




***proyecciones difieren según el modelo***