Climate-Change Problem Solving: Structured Approaches Based on Real-World Experiences

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Outline

- Model of knowledge system
- Structured problem solving
- How to express problem solving in information technology
- Concrete design example:
  - Development of quasi-controlled vocabulary
  - Narrative information
- Conclusions: Major Design Considerations

- Draw a single thread through a complex problem

Knowledge System

- Need to bring together disparate information and different points of view to develop strategies for applied problem solving
- Key to development of successful strategies: iterative process or co-development with information providers and information users

Cash et al: 2002
Lemos & Morehouse, 2005
Dilling & Lemos, 2011

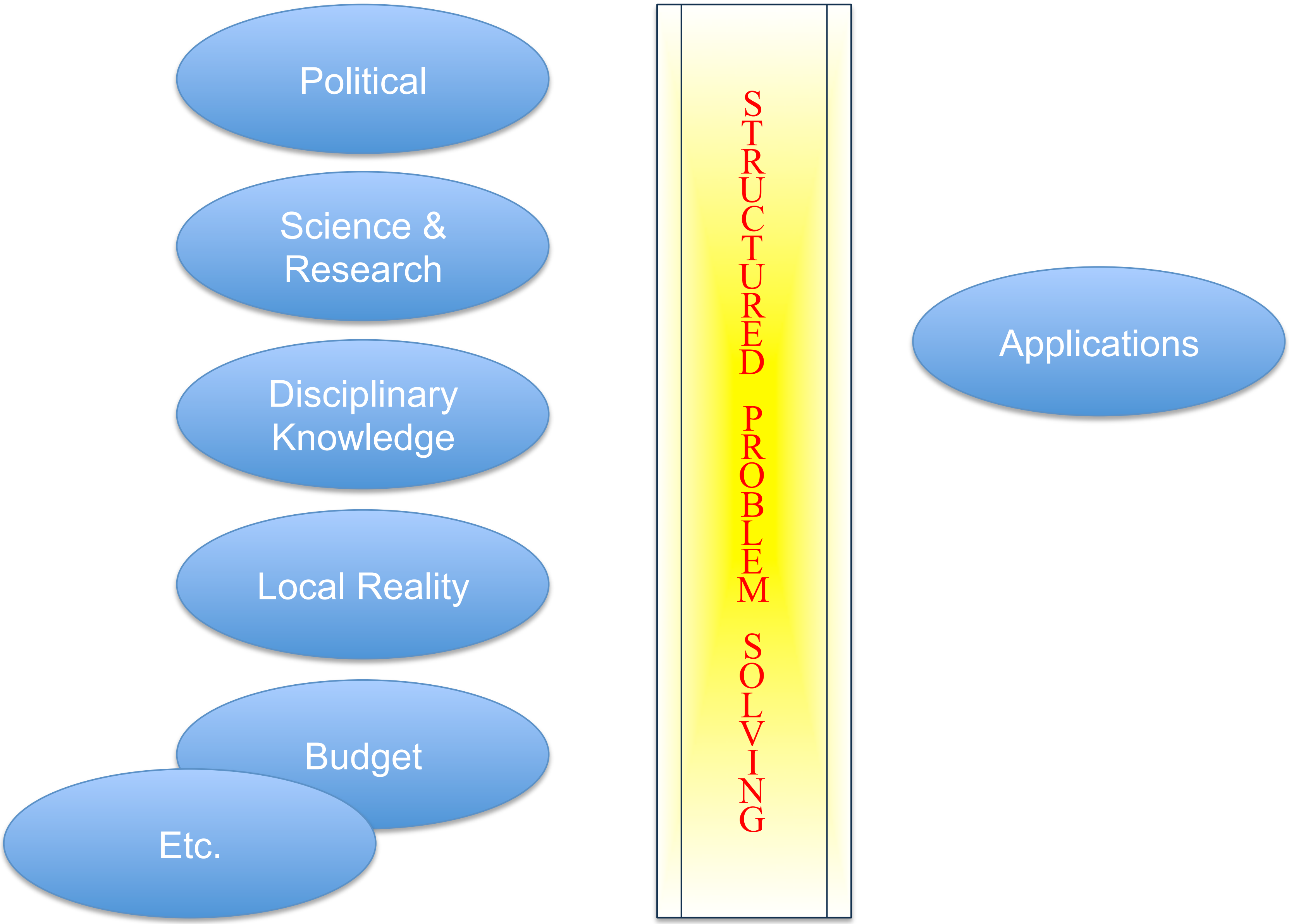
Knowledge System, Science Focused

- Two Points
  - This figure overstates the role of “science” in the knowledge systems
  - I choose not to draw a line between the two bubbles, as the relation between “science” and the application is not direct.

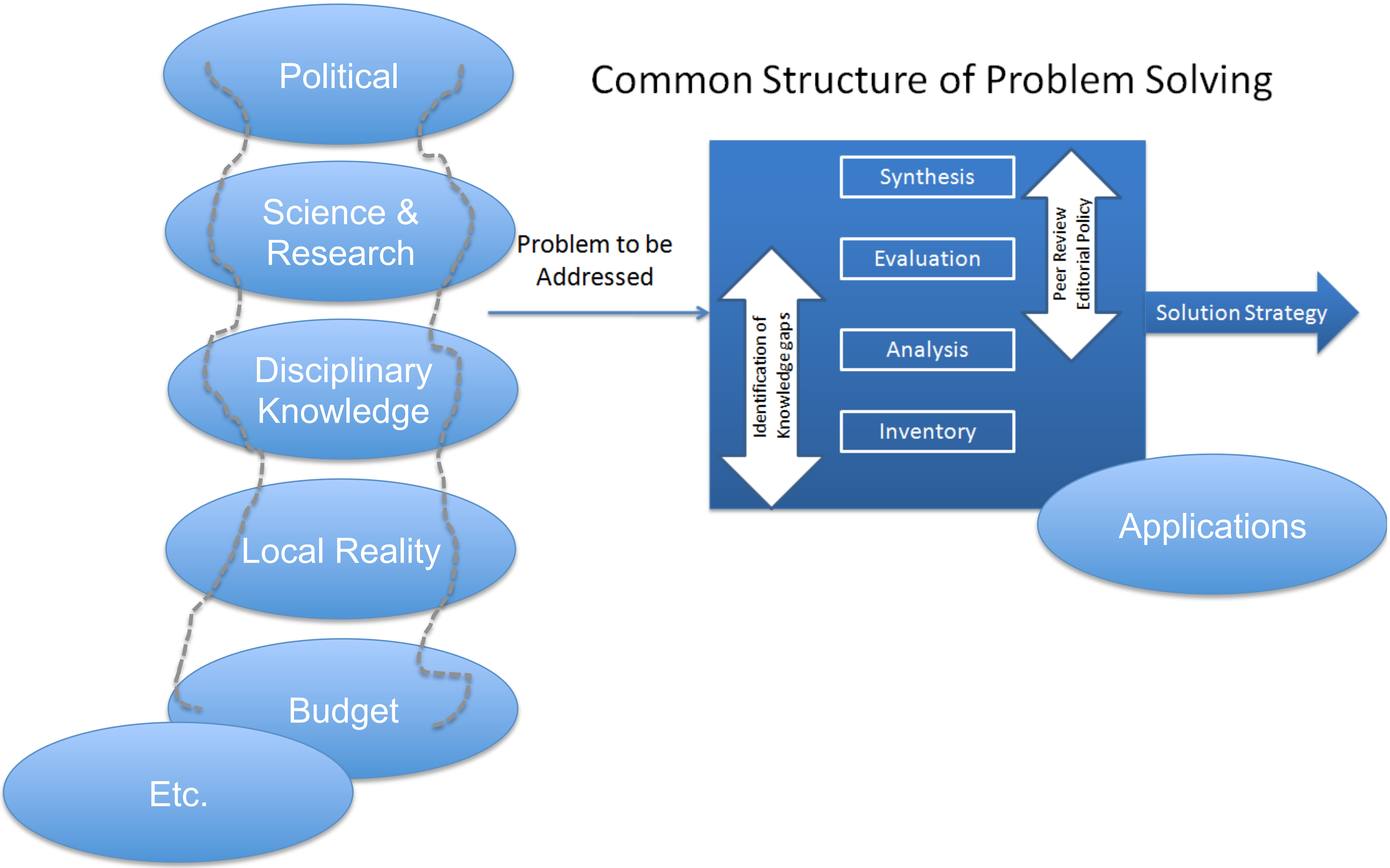
Heuristic Knowledge System

These elements sit in a complex and changing relationship within any specific application, as well as across multiple applications.

Heuristic Knowledge System



Common Structure of Problem Solving



Definitions: Structured Problem-solving

- **Inventory** is the collection of the necessary information to address the problem.
- **Analysis** is the consideration of the nature of the information: deconstruction - breaking down the information, identifying relationships, determination of information gaps …
- **Evaluation** is the determination of the quality and value of the information: accuracy, relevancy, defensibility, validation …
- **Synthesis** is the fitting together of the information resulting from the above problem solving processes to address a specific problem: reconstruction, integration, creation of new knowledge

How to support this in IT?

- Inventory is easy to conceive as a database with a content management system
  - How to extend this to support
    - Analysis
    - Evaluation
    - Synthesis

Capture Expertise of People Solving the Problem

- Tag information (range of descriptors)
- Translate information across disciplinary boundaries
- Tailor information to be relevant to specific application
- Describe uncertainty
- Provide judgment on usability of information
- → Knowledge applied to real problems

Focus on those directly vested in problem solving.

The way we have chosen to pursue this (GLISAclimate.org)

- Faceted Search
- Blog
- Wiki

Drupal: Open Source Content Management

Apache Solr: Open Source Search

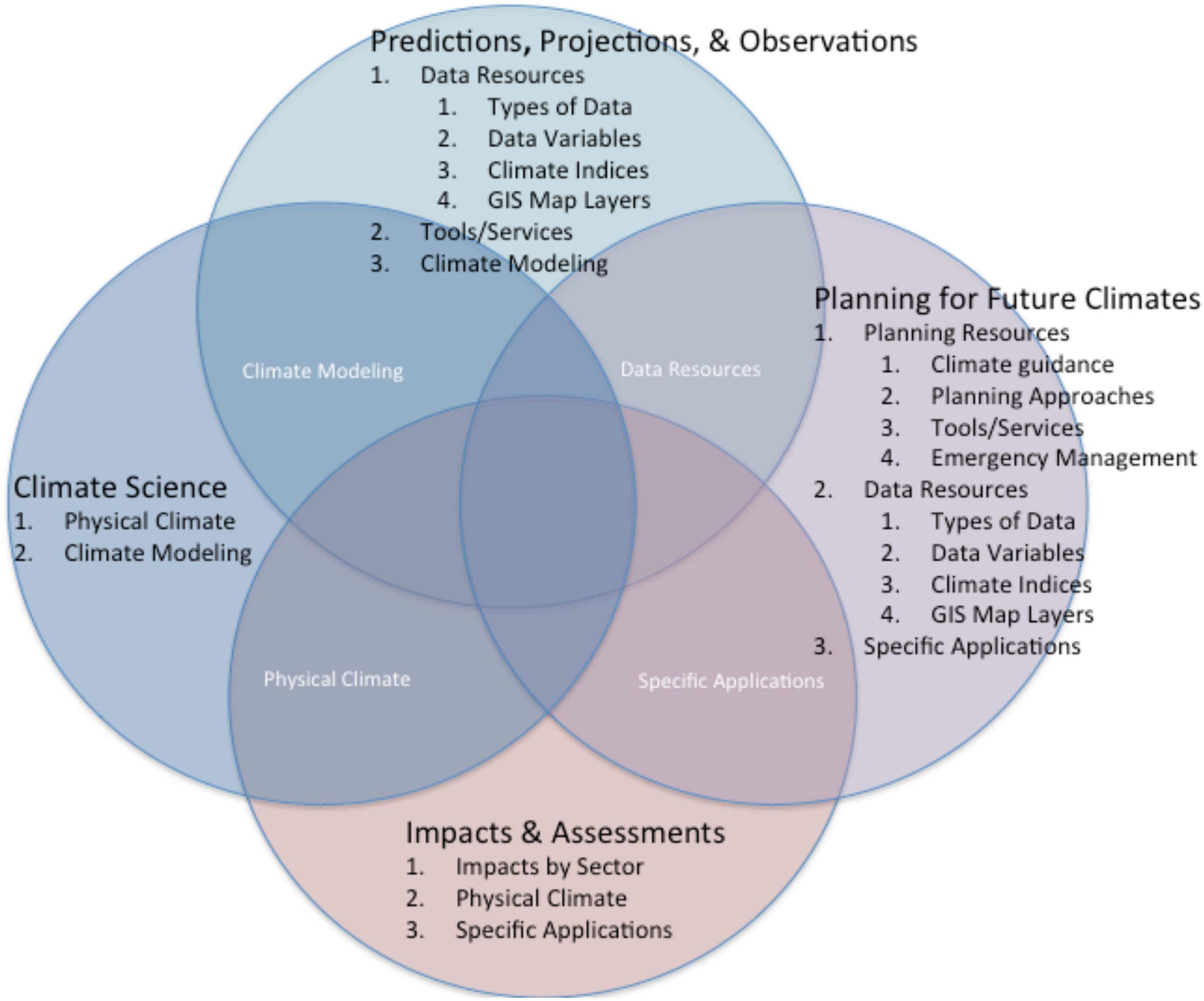
Vocabulary for Faceted Search

- Controlled or defined vocabulary
- User provided vocabulary

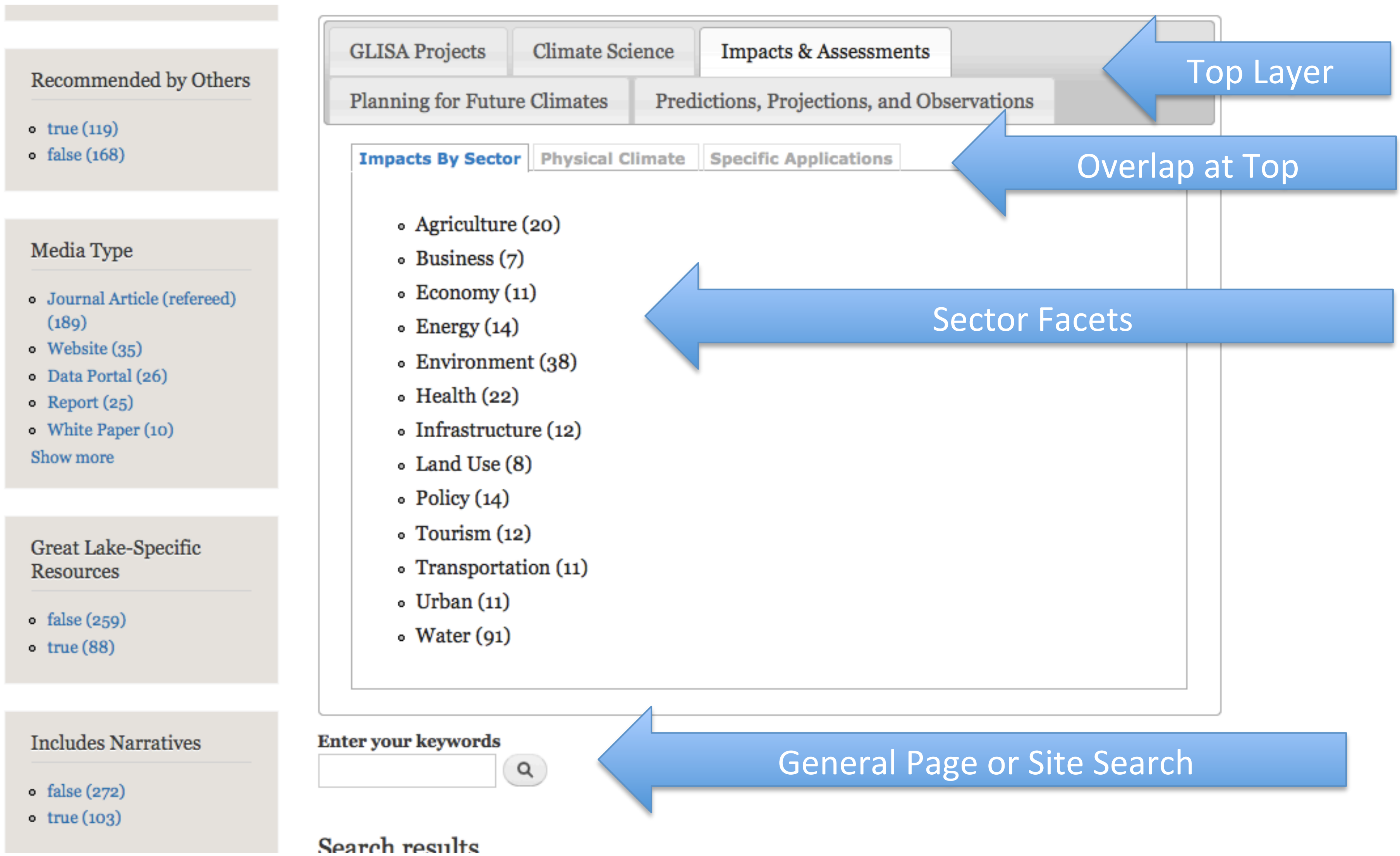
We have chosen a design of quasi-controlled vocabulary.

- Co-developed with initial users
- Limit terms to promote usability
    - Especially at the top, first levels

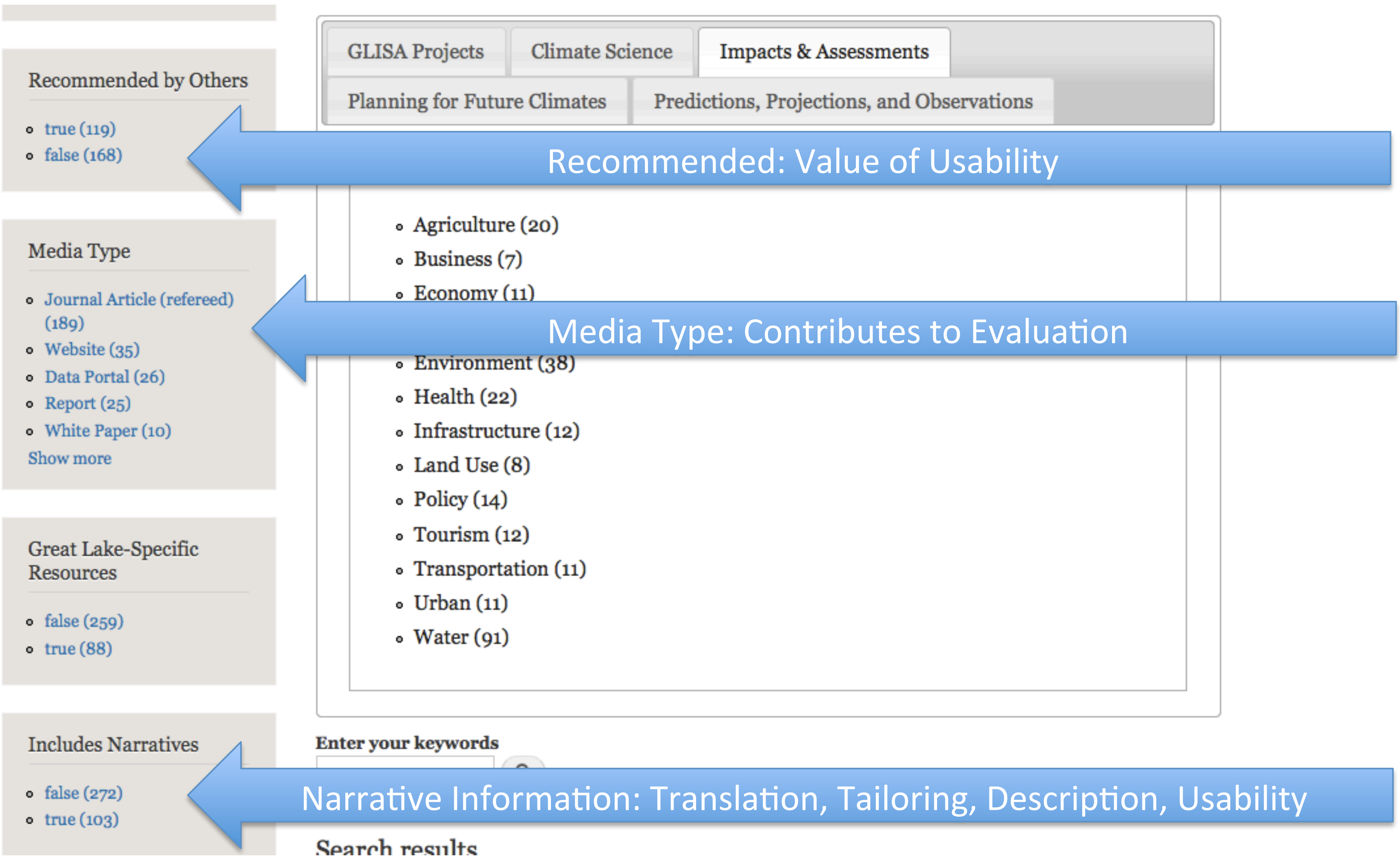
Development of Controlled Vocabulary



Search: GLISAclimate.org



Support Co-development: GLISAclimate.org



Conclusion: Major Design Considerations (http://www.glisaclimate.org)

- Support iterative co-development
  - Focus on those actively engaged in process
- Information is not hierarchical
  - “Science” only part of knowledge base
- Fundamental elements of problem solving
  - Inventory, Analysis, Evaluation, Synthesis
- Quasi-controlled vocabulary
  - Classification, usability
- Free-form narrative information and tags
  - Analysis, Evaluation, Synthesis
  - Iterative Co-development