Proof of Concept for an Enterprise Environmental Spatial System –
Spatial Knowledge and Integrated Environmental System (SKIES)

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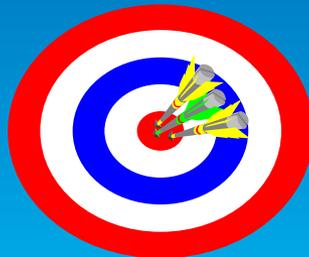
Policy Integration Branch, Policy Division

Alberta Environment and Sustainable Resource Development

Edmonton, Alberta

Canada

Purposes of Presentation

§ Share a vision

§ Exchange ideas & experiences

§ Explore collaboration opportunities

Outlines of Presentation

§   Introduction

§   Challenges

§   Vision

§   Benefits

§   Summary

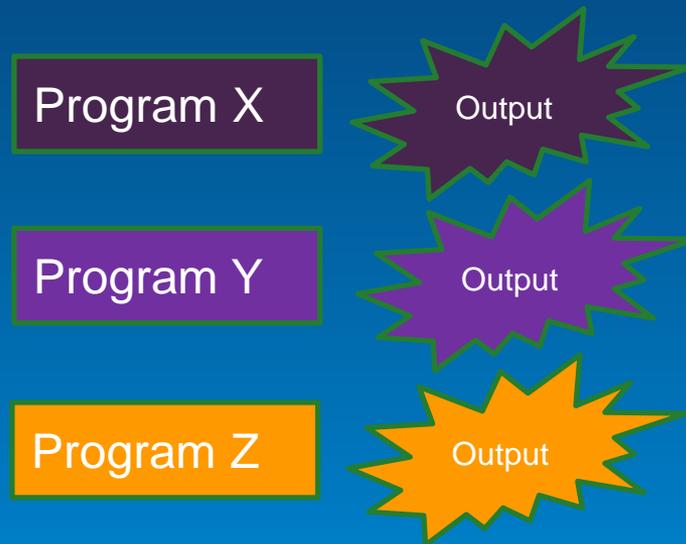# Outlines of Presentation

§ Introduction

§ Challenges
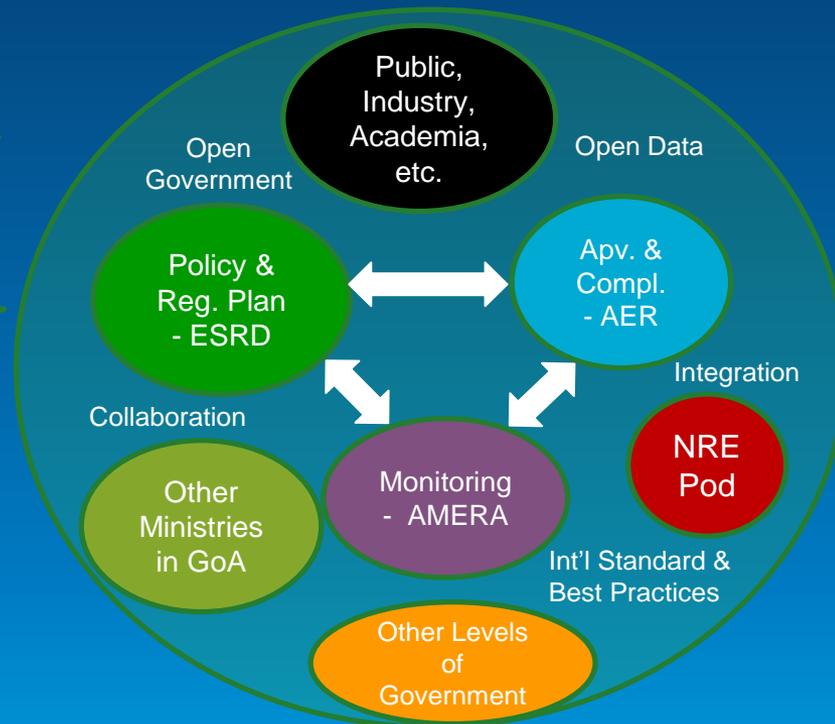
§ Vision

§ Benefits

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# Old Paradigm vs. New Reality in Government of Alberta (GoA)

The Old Paradigm

Program X — Output

Program Y — Output

Program Z — Output

Program-centric with little to no perceived requirement for coordination or alignment between programs or departments.

The New Reality

Public, Industry, Academia, etc.

Open Government

Open Data

Policy & Reg. Plan - ESRD

Apv. & Compl. - AER

Integration

Collaboration

Monitoring - AMERA

NRE Pod

Other Ministries in GoA

Int'l Standard & Best Practices

Other Levels of Government

A "System of Systems" delivering the outcomes of Integrated Resource Management (IRM) and Cumulative Effects Management (CEM).

Proof of Concept for an Enterprise Environmental Spatial System

* Modified based on ESRD draft informatics Program Governance (2013)

Integrated and Collaborative Approach –
To achieve desired environmental outcomes and sustainable development of natural resources
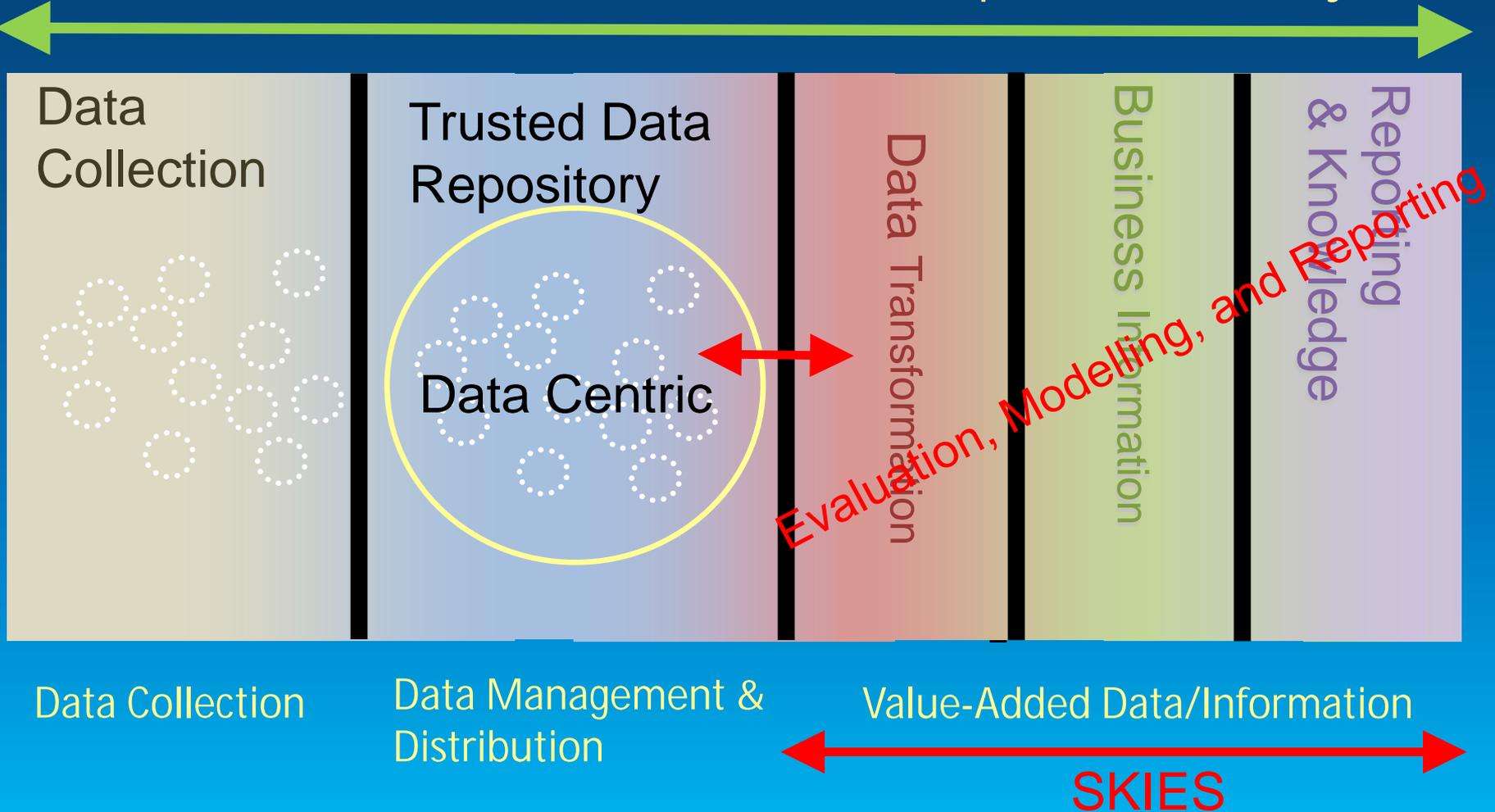
Water

IRM & CEMS

Air

Land

Bio-diversity
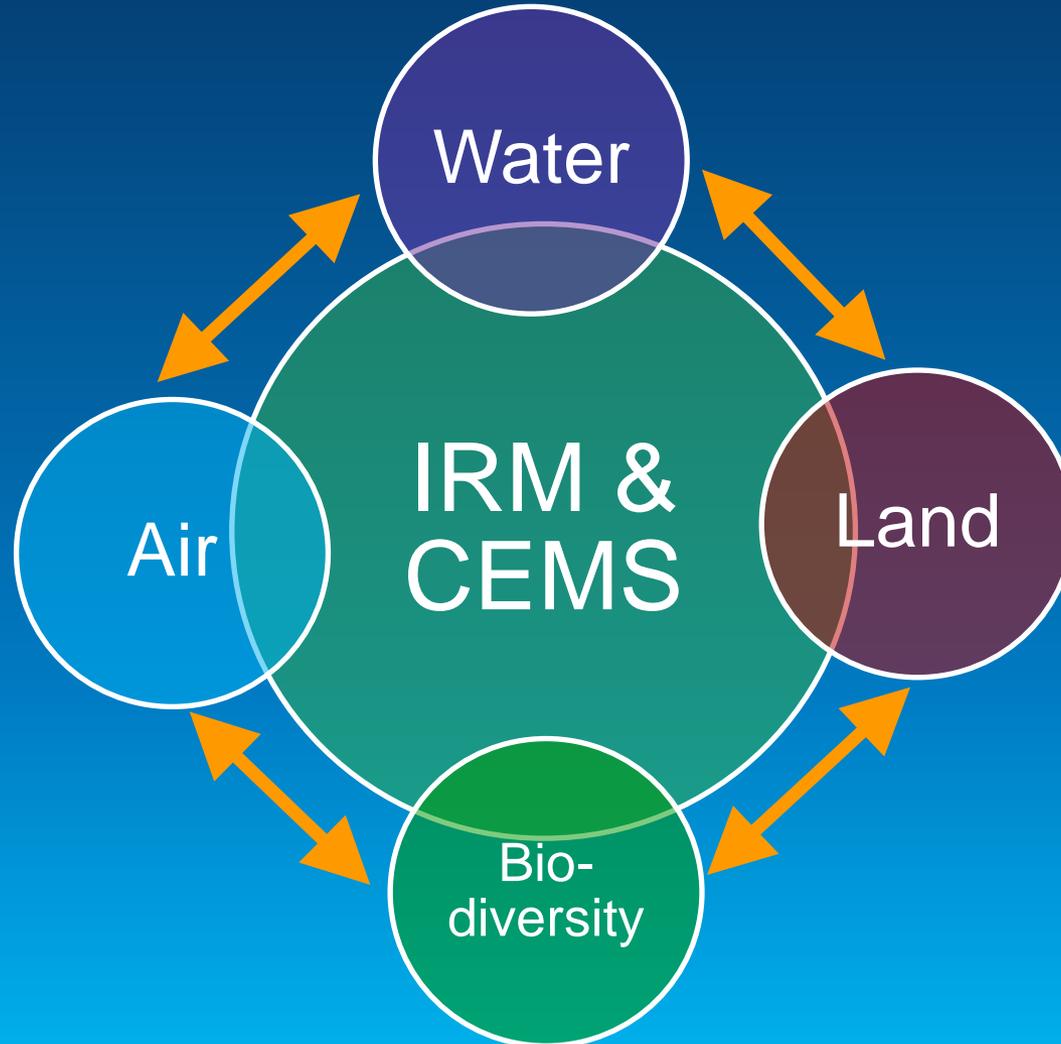
Data à Information à Knowledge

§ "We are drowning in data and thirsting for information" (John Naisbitt, Megatrends, 2000).

§ 80% of all data contains some reference to geography (Franklin and Hane, 1992).

§ Use a GIS to manage, visualize, explore, synthesize, and analyze the spatial data; and turn data into information into knowledge.

§ Put the right data/information/knowledge, in the right format, in the right hands, at the right time - Informatics.

Enterprise Data Management System (EDMS) & SKIES

EDMS: Governance, Standards, Processes, Open, and Security

Data Collection

Trusted Data Repository

Data Centric

Data Transformation

Business Information

Reporting & Knowledge

Evaluation, Modelling, and Reporting

Data Collection

Data Management & Distribution

Value-Added Data/Information

SKIES

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Challenges in Environmental Evaluation, Modelling & Reporting (EMR)

1. Data Availability

2. Access to Authoritative Data Sources

3. Data Preparation

4. Integration with GIS

5. Information/Knowledge Sharing
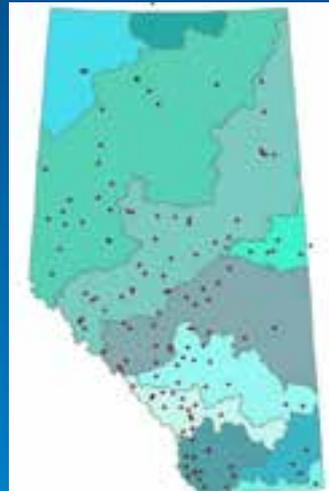
6. Fragmented Silos
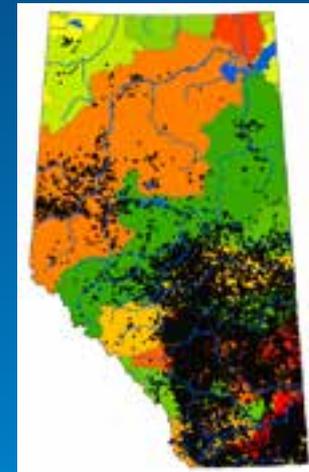
Challenge #1: Data Availability

Data are often unavailable or insufficient for the area of interest. We simply cannot afford to monitor everything in everywhere. For example:
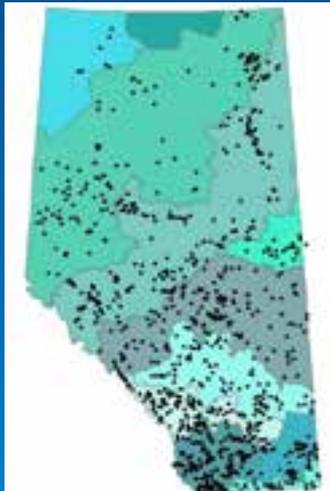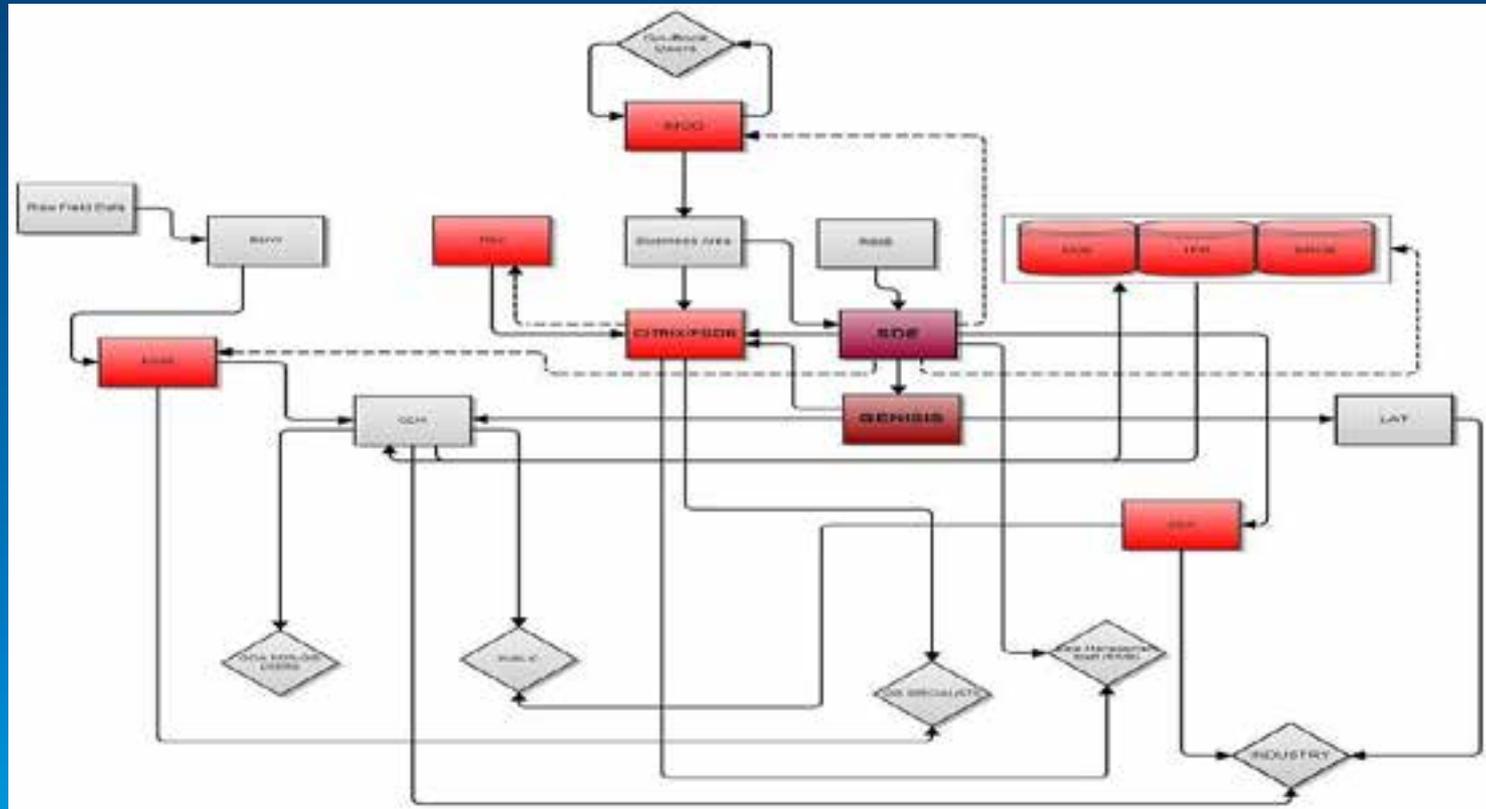

1,100 Hydrometric Stations

140 'Suitable' Hydrometric Stations

Water Management 'Challenge'

Need for environmental modelling to answer "What If?" questions.

Challenge #2: Access to Authoritative Data Sources

Need for accessing internal & external authoritative data sources.

Challenge #3: Data Preparation

60 - 80% of the time spent on data analytics projects is spent preparing the data for analysis, which often is:

- § Repetitive
- § Time consuming
- § Laborious
- § Costly
- § Error prone

Need for automation of data preparation.

Challenge #4: Integration with GIS

§   There are trends in interfacing GIS with predictive water resource models. However, neither technology was initially developed to interact with the other (Martin et al., 2005).

§   Lack of integration between spatial and temporal data/information.

GIS

Environmental Tools & Modelling
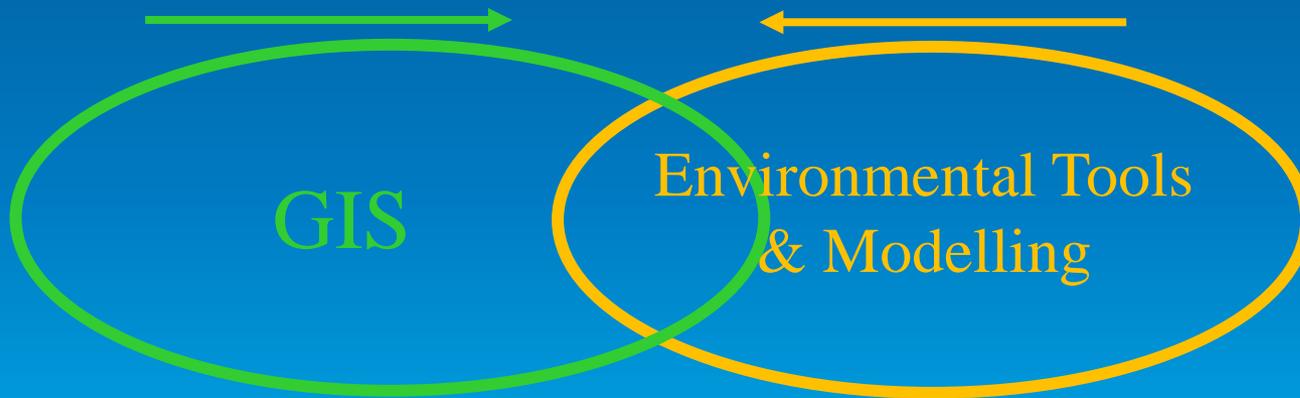
Need for a GIS framework to support environmental analytical tools & modelling.

Challenge #5: Is information and/or knowledge generated from someone readily available & accessible to others?
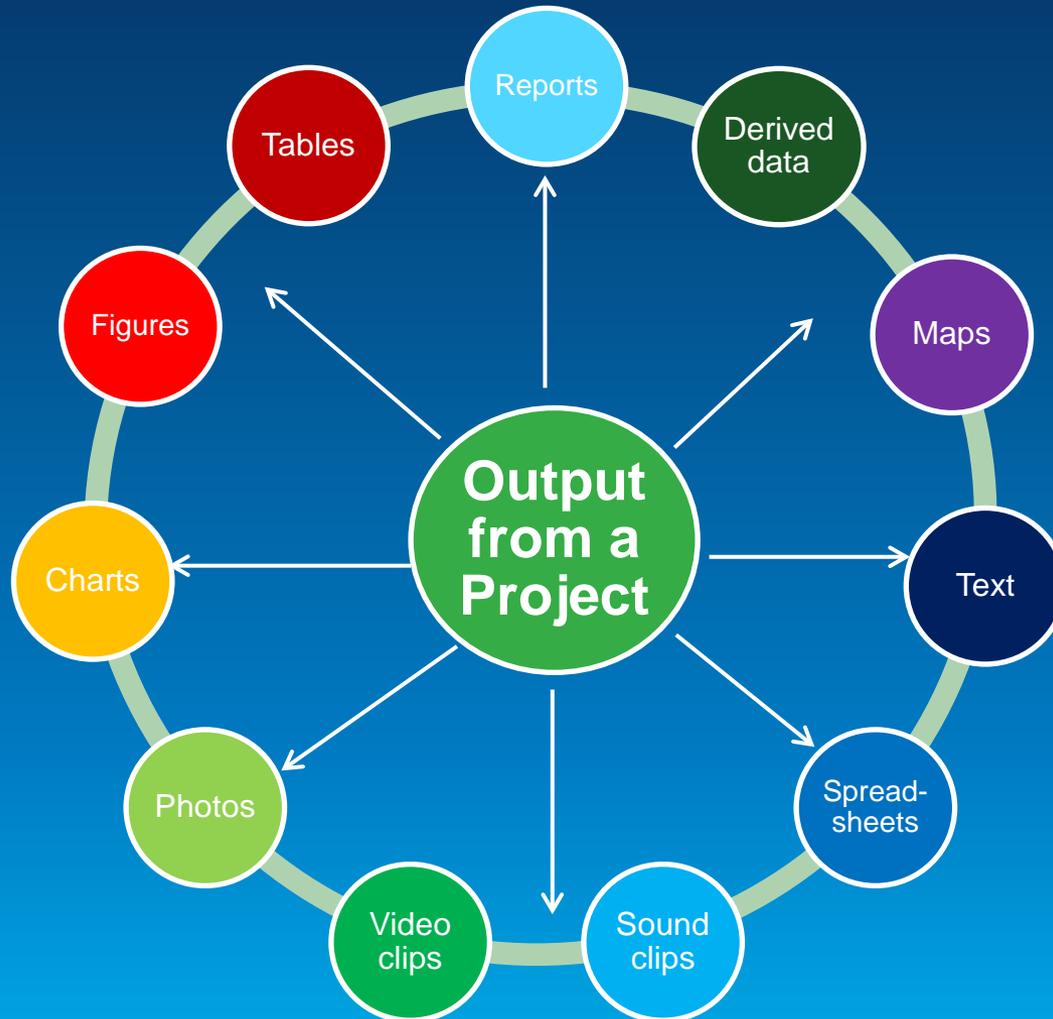
Need for Information Management & Knowledge Management.

Challenge #6: Fragmented Silos
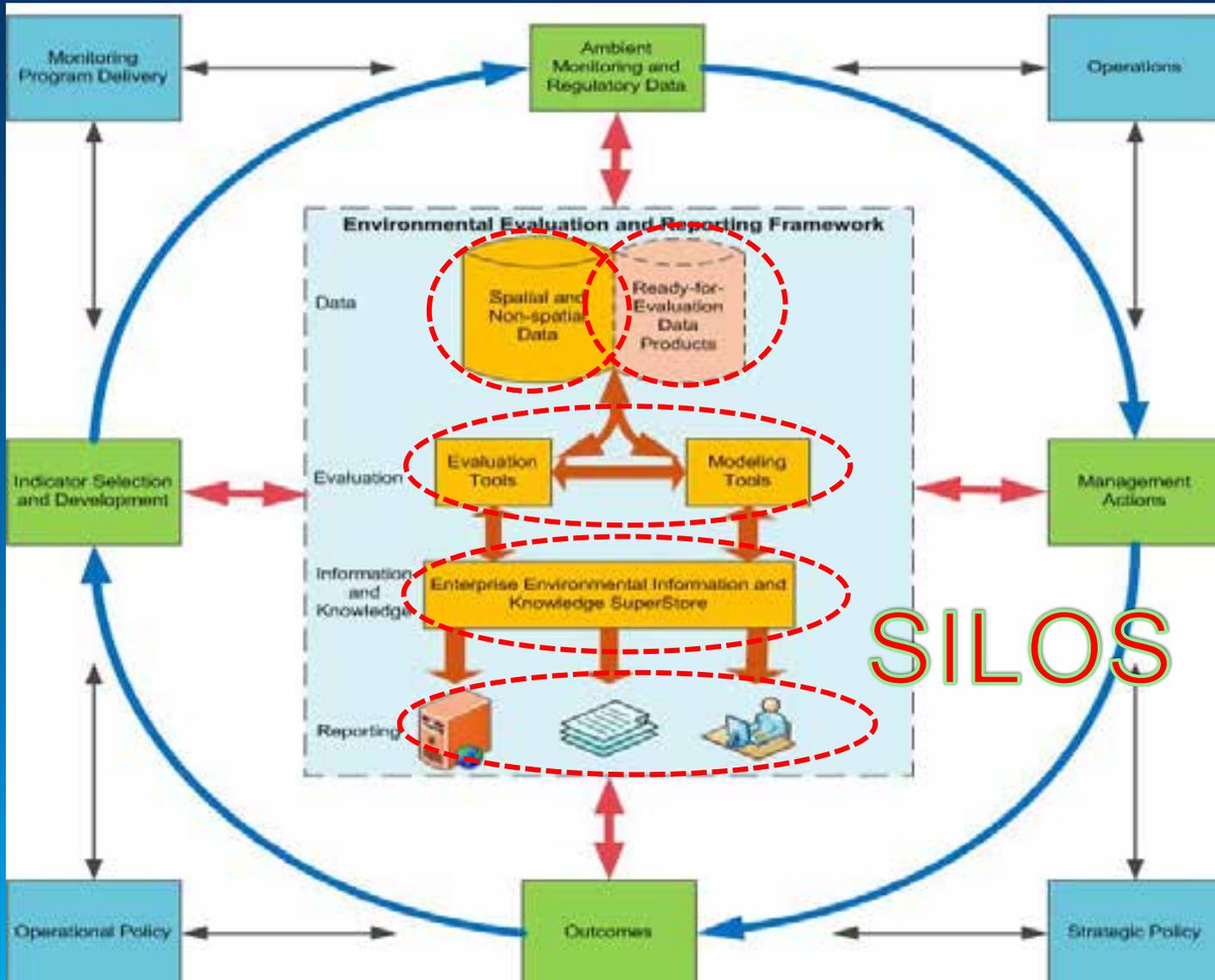
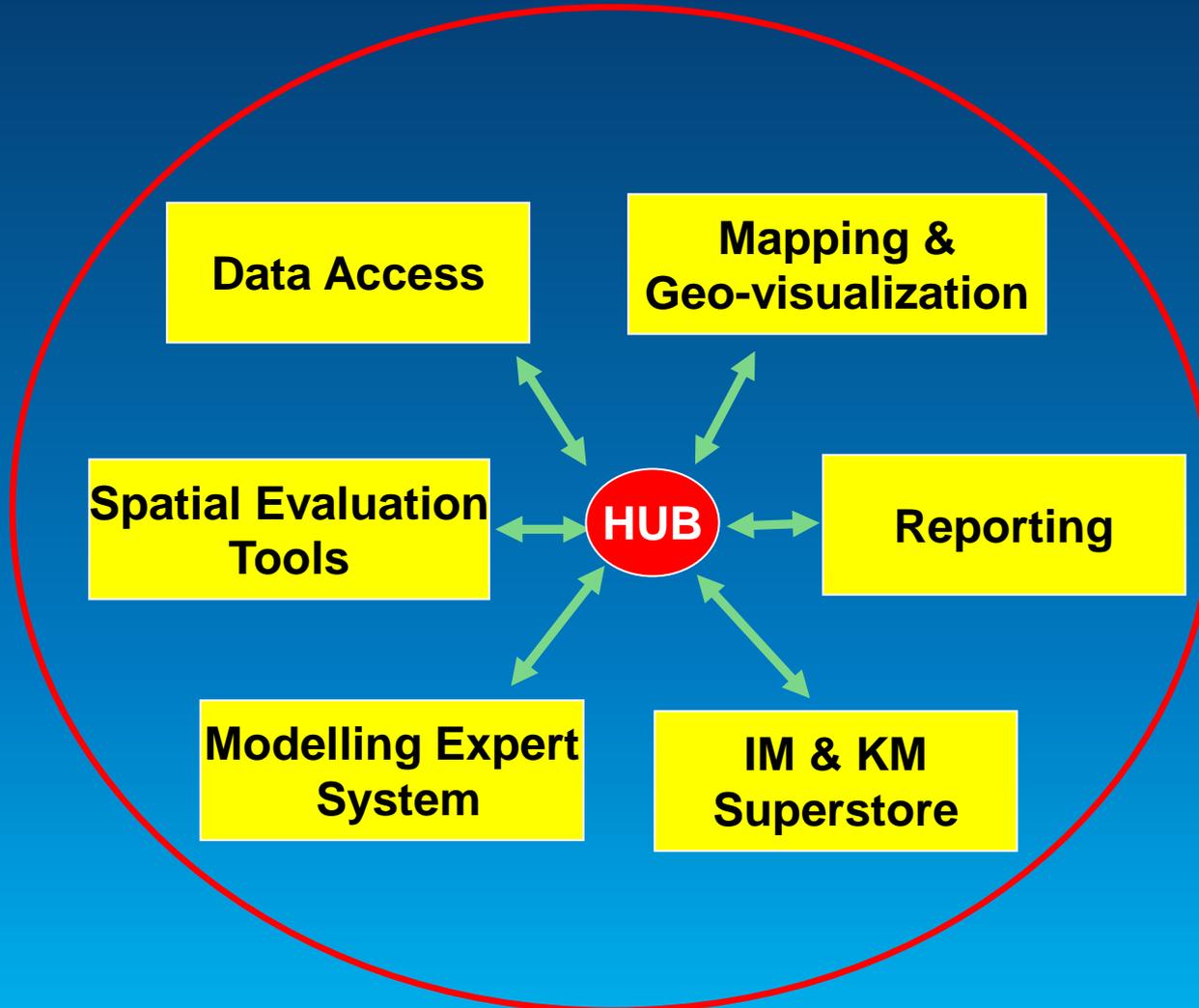# Outlines of Presentation

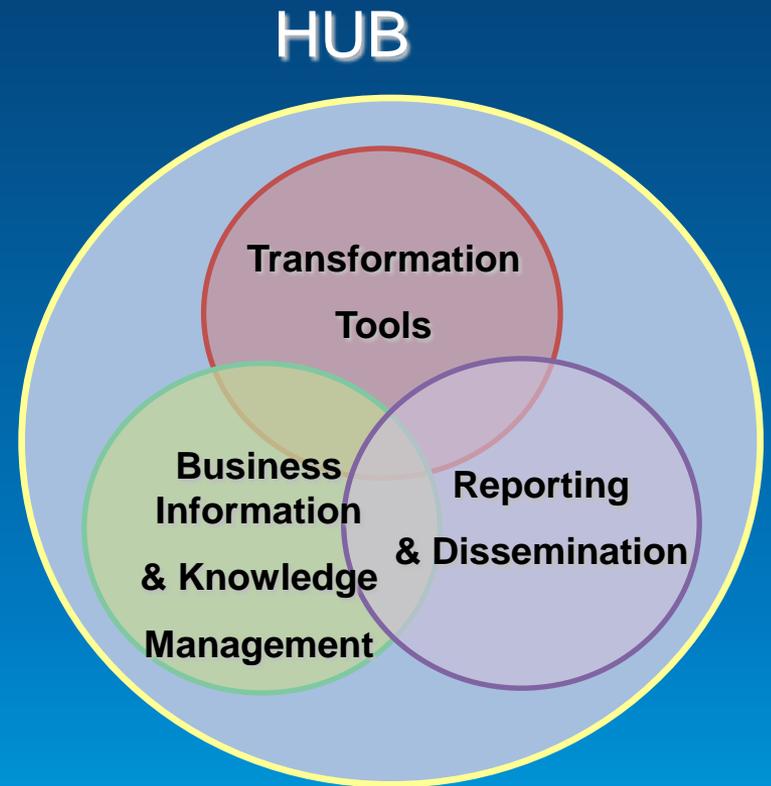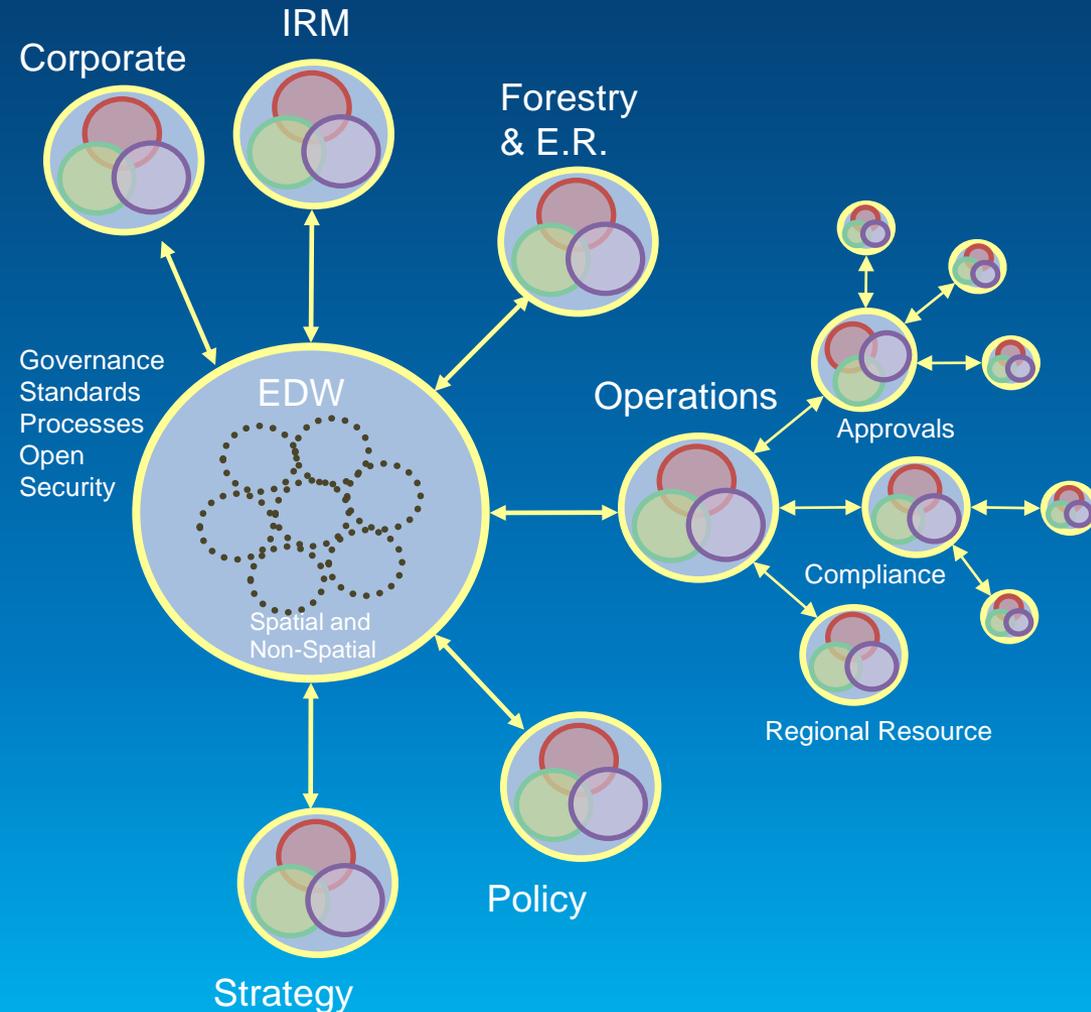§ Introduction

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Vision of SKIES

HUB of SKIES

Proof of Concept for an Enterprise Environmental Spatial System

Centralized Computing **Centre** for Evaluation, Modelling and Reporting

Data Collection Systems
• Monitoring Standards
• Data Collection Process & Standards
• Data Quality Standards
• Data Storage & Retrieval Standards

Non-Spatial Data

EMS

Ground Water

Flood Hazard Mapping

Air Quality

Water Use

EDW

WISKI

Water Quality

Naturalized Flows

(WSC) Climate

(WSC) HYDAT

Spatial Data

Streams & Monitoring
Drainage Areas
Hydrography
Channels
Surface Terrain
Rainfall & Snow
Imagery

Land Cover/Use

Soil

Geology

Remote Sensing

Enterprise Data warehouse

Data Processing

GeoDiscover & Layer Manager

Centralized Science & Modelling Computing Centre

READY TO GO

Processed Data Warehouse
(to assist with - Analysis, Evaluation, Modelling)

ESRD/GOA –
internal/external
web sites & Portals
(e.g. Oil Sands, SSRB etc)

Dedicated Network

Modelling & Analysis Tools (network licensed) - Pre-installed

Dedicated Server:
Modelling archives

Reporting & Web Publishing

• • •

ESRD. Statistician

Analytical Chemist

Central Modelling Office

Land Specialist

Air Specialists

Evaluation Specialists

Data Mining Specialists

Reporting Specialists

Hydrologists

SW Allocation

SW Quality

GW

Air Quality

Land

Riparian & Biodiversity

GIS

Generate Information & Knowledge

ESRD Communities – Scientists, Modellers, Data Analysts, Data Evaluators, GIS Users etc.

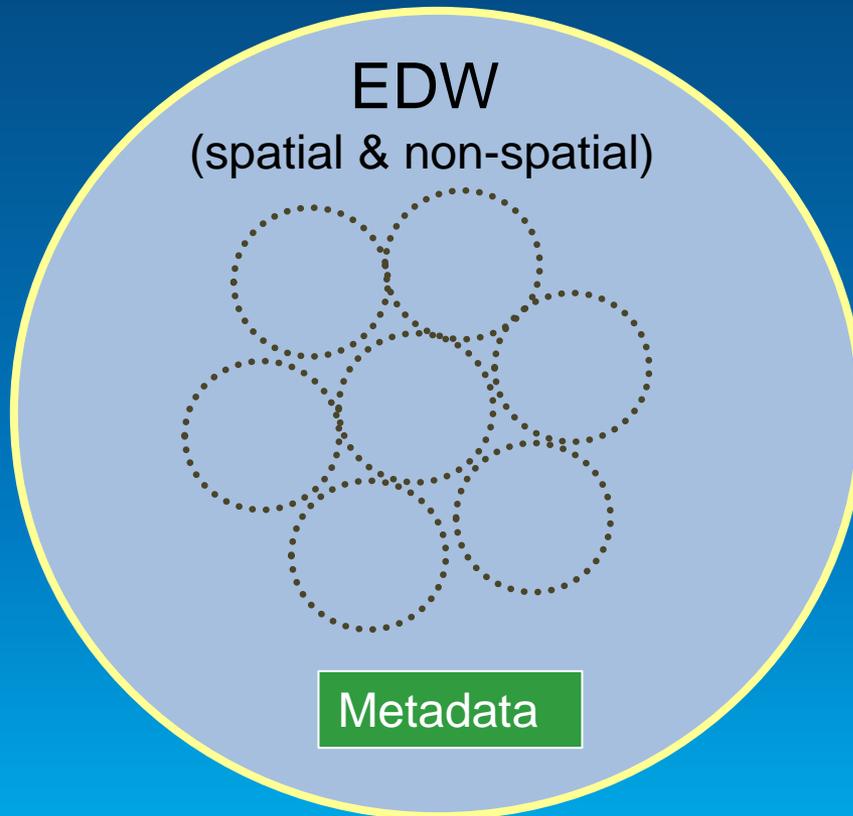# ArcHydro as a Ready-To-Go Data Framework for Water Resource-Related Tools and Models
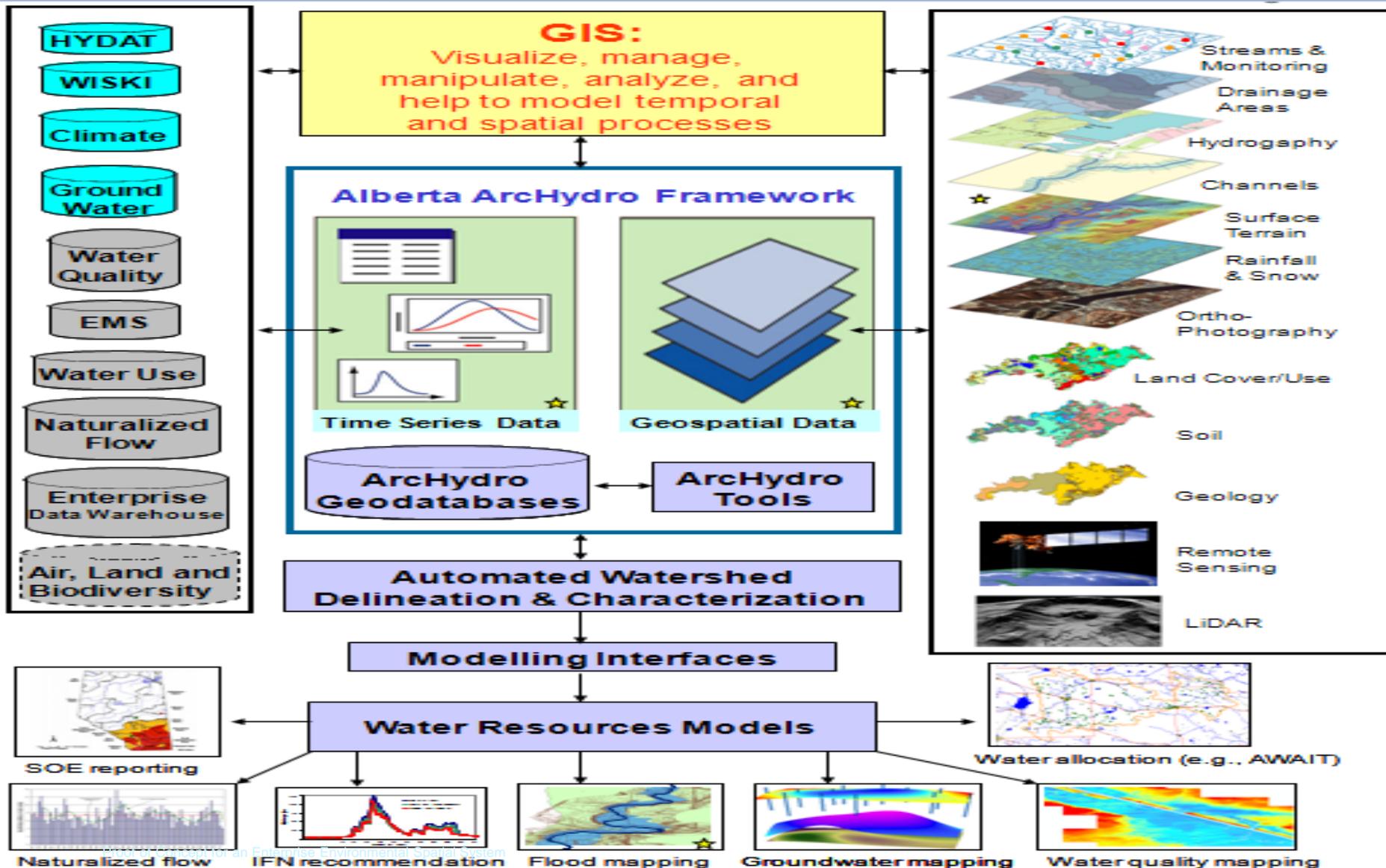
Vision: Data Access
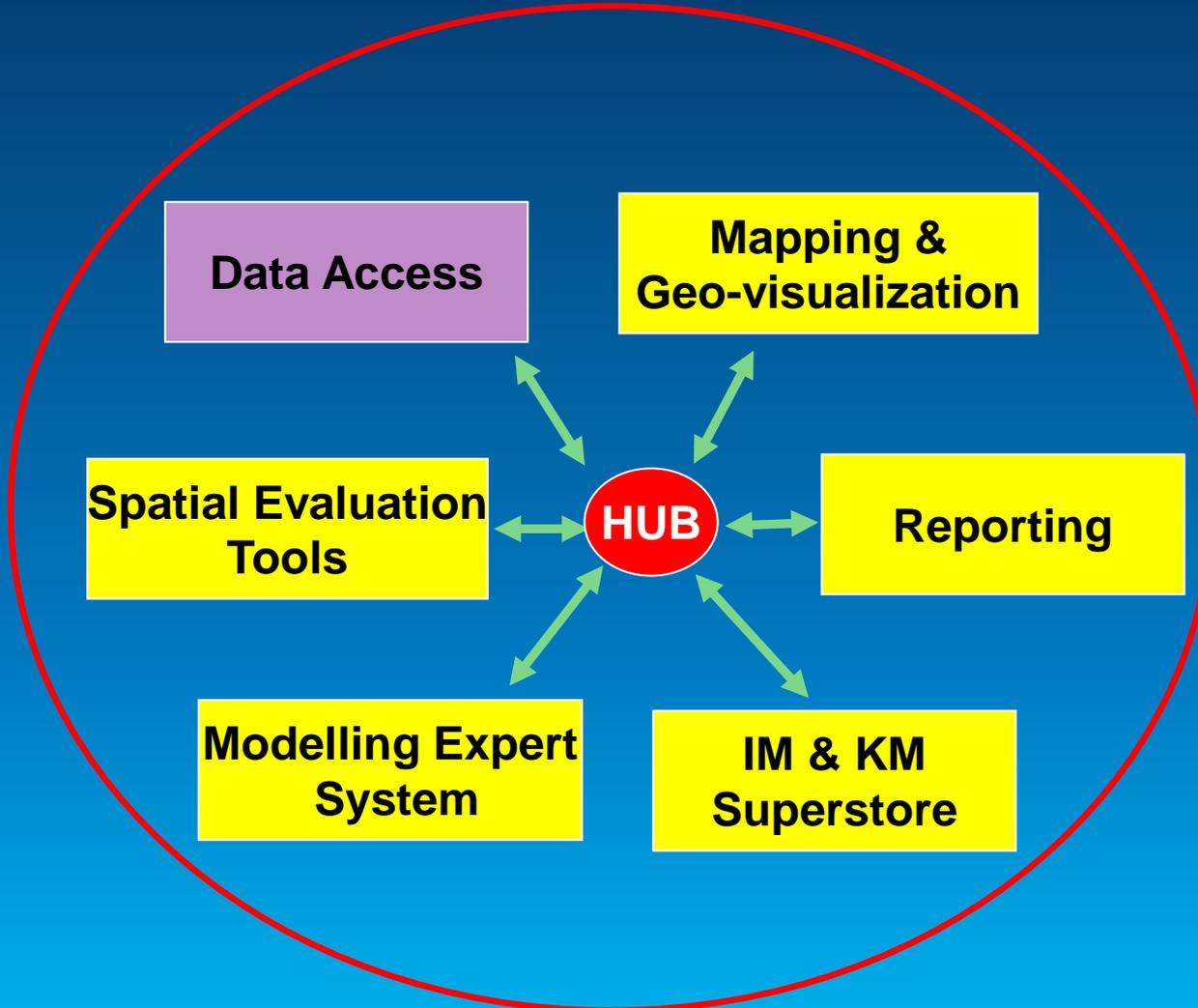
Data Access:
Access spatial and non-spatial data from multiple internal and external authoritative sources
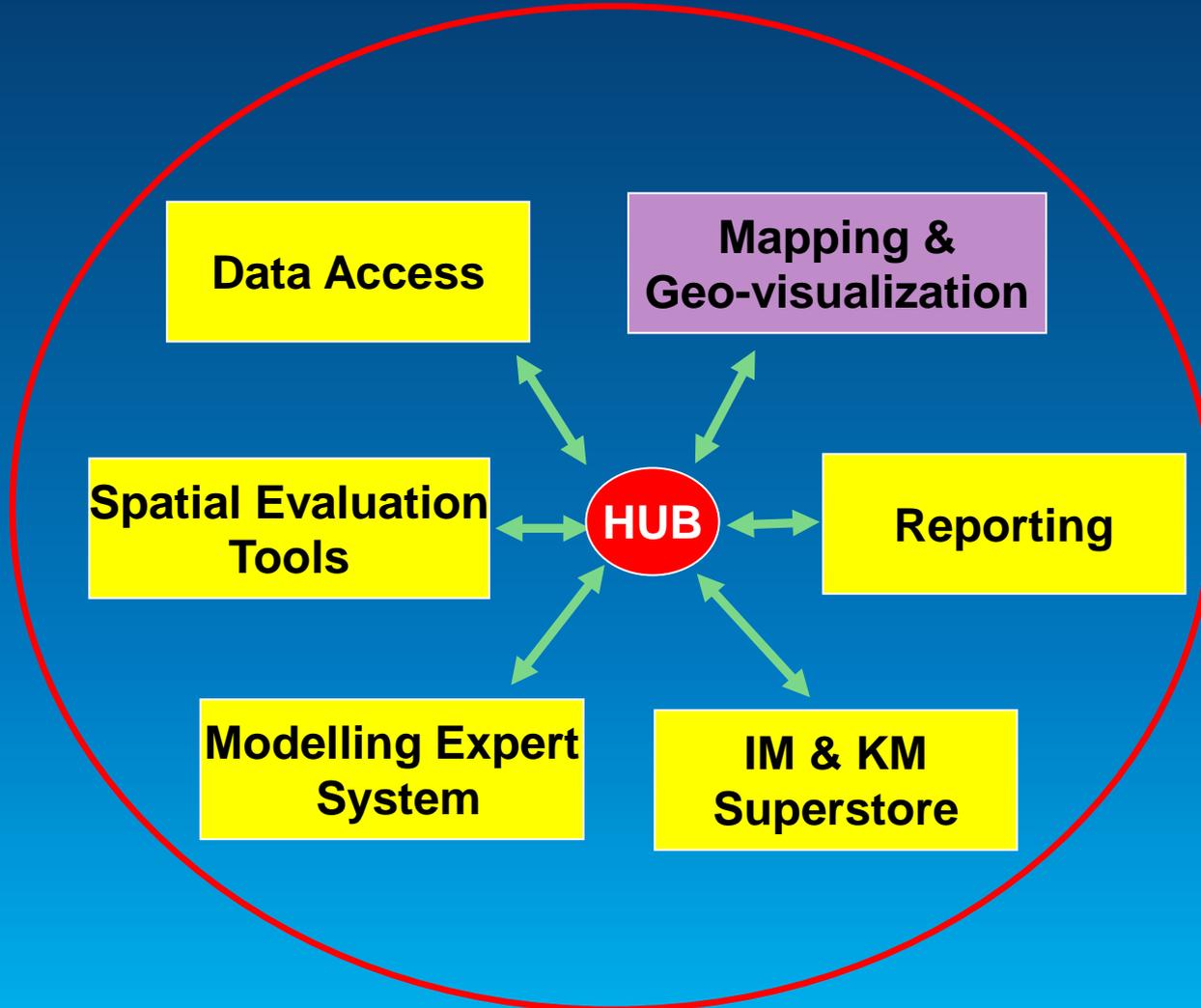
Data Centric

Value-Added Information & Knowledge

EDW
(spatial & non-spatial)

Metadata

Transformation Tools

Business Information & Knowledge Management
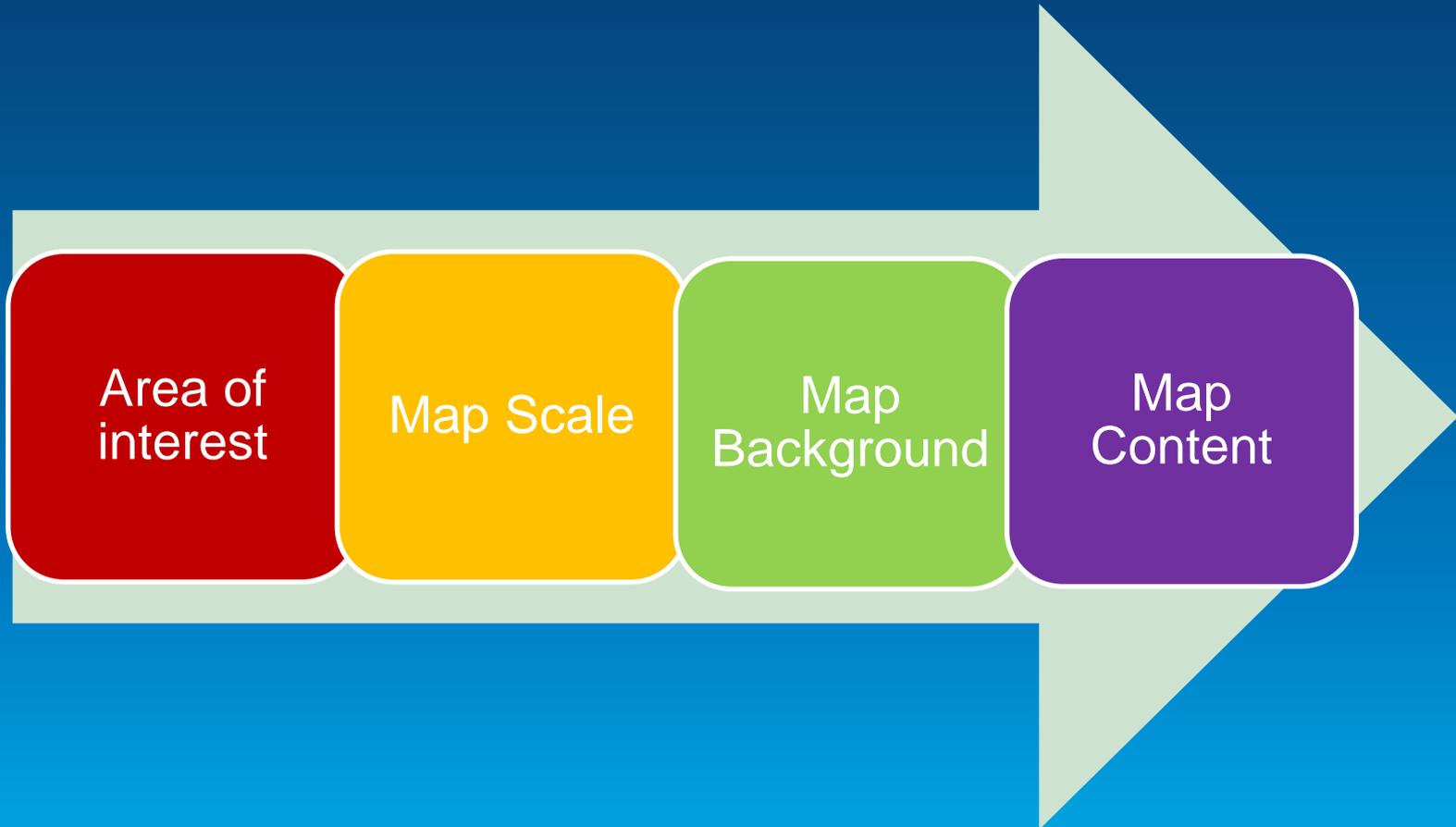
Reporting & Dissemination
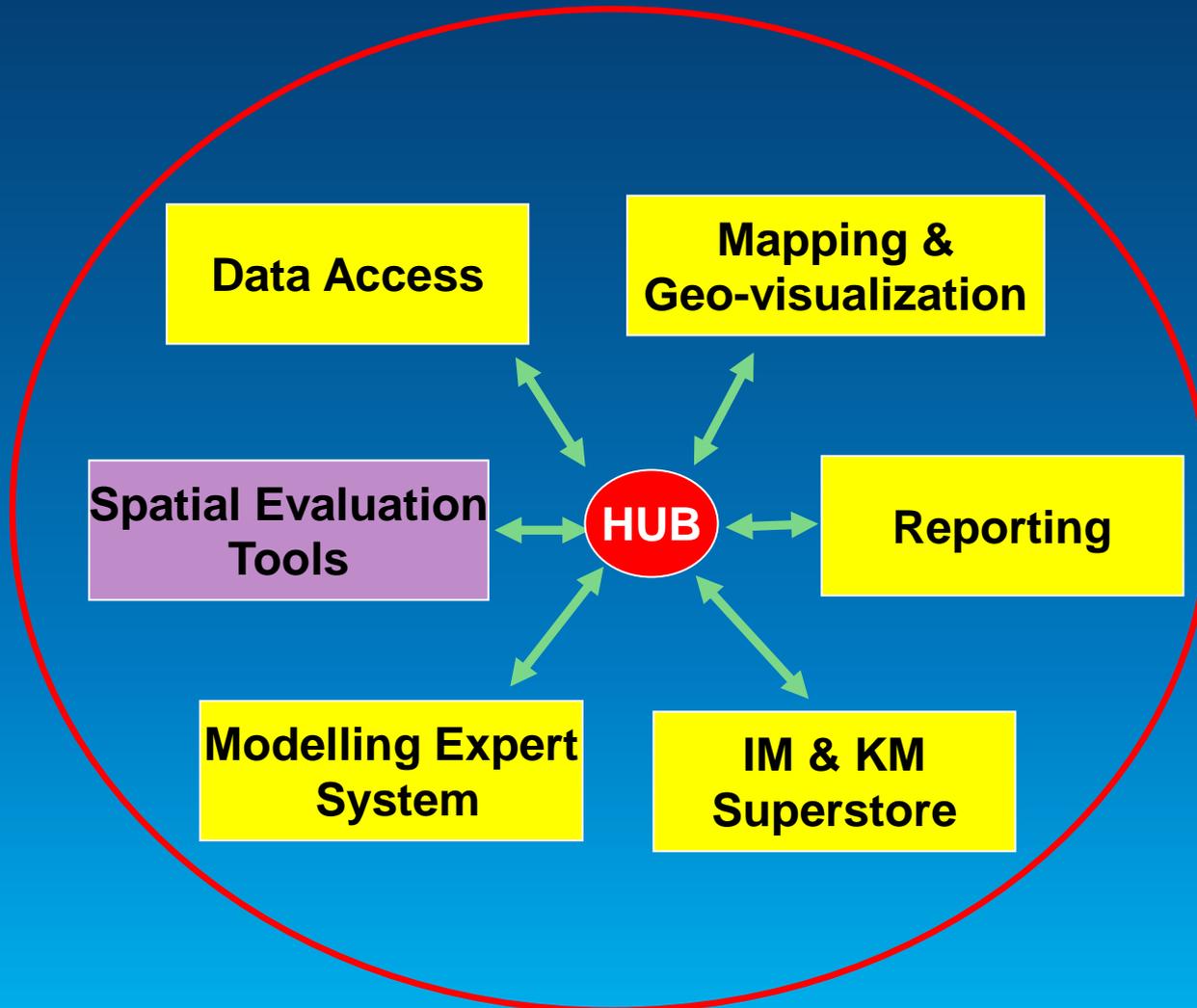
Vision: Mapping & Geo-Visualization

Mapping and Geo-visualization:
Automate processes to build standardized map templates and various thematic maps, and to share/search/retrieve map products

Area of interest → Map Scale → Map Background → Map Content

Vision: Spatial Evaluation Tools

# Spatial Evaluation Tools:
Facilitate to easily share/find/access spatial environmental evaluation applications and tools

- § Business-oriented spatial evaluation applications:
  - § Water Act Approvals - e.g., AWAIT
  - § Regulatory Tools – e.g., MIKISEW
  - § Wetland Policy - e.g., WESTPAB
  - § Others

- § A suite of generic spatial tools:
  - § ZoomToTown Tool
  - § PlaceName Tool
  - § Others

Vision: Modelling Expert System

Data Access

Mapping & Geo-visualization

Spatial Evaluation Tools

HUB

Reporting

Modelling Expert System

IM & KM Superstore
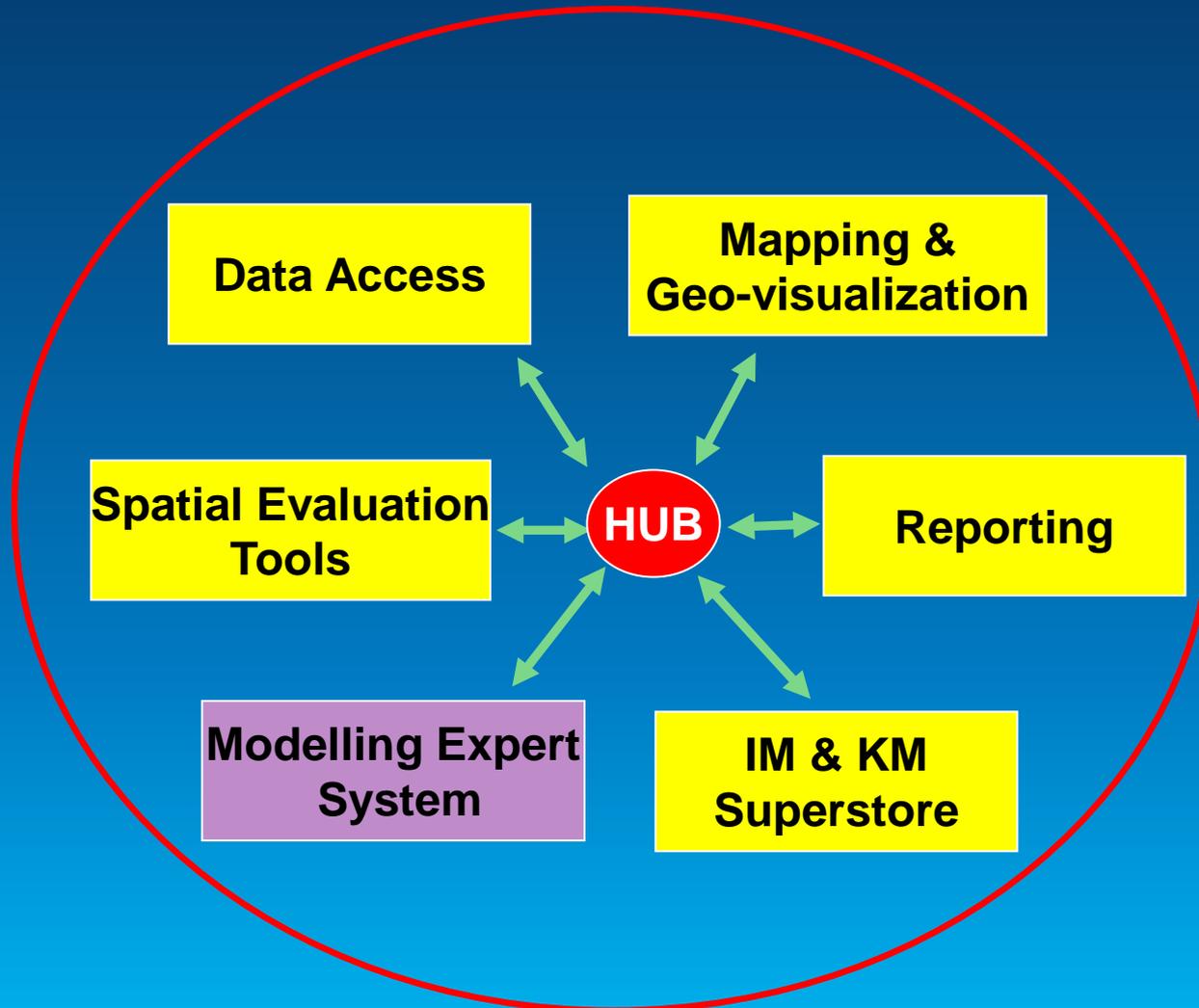
Modelling Expert System (MES):

Establish an integrated environmental modelling framework in support of the regional plan initiatives and Cumulative Effects Management System

Develop a framework for all environmental modelling activities in four media

Modelling Tools Catalogue

Meta-data Catalogue of Monitoring Networks

Centralized Modelling Repository System

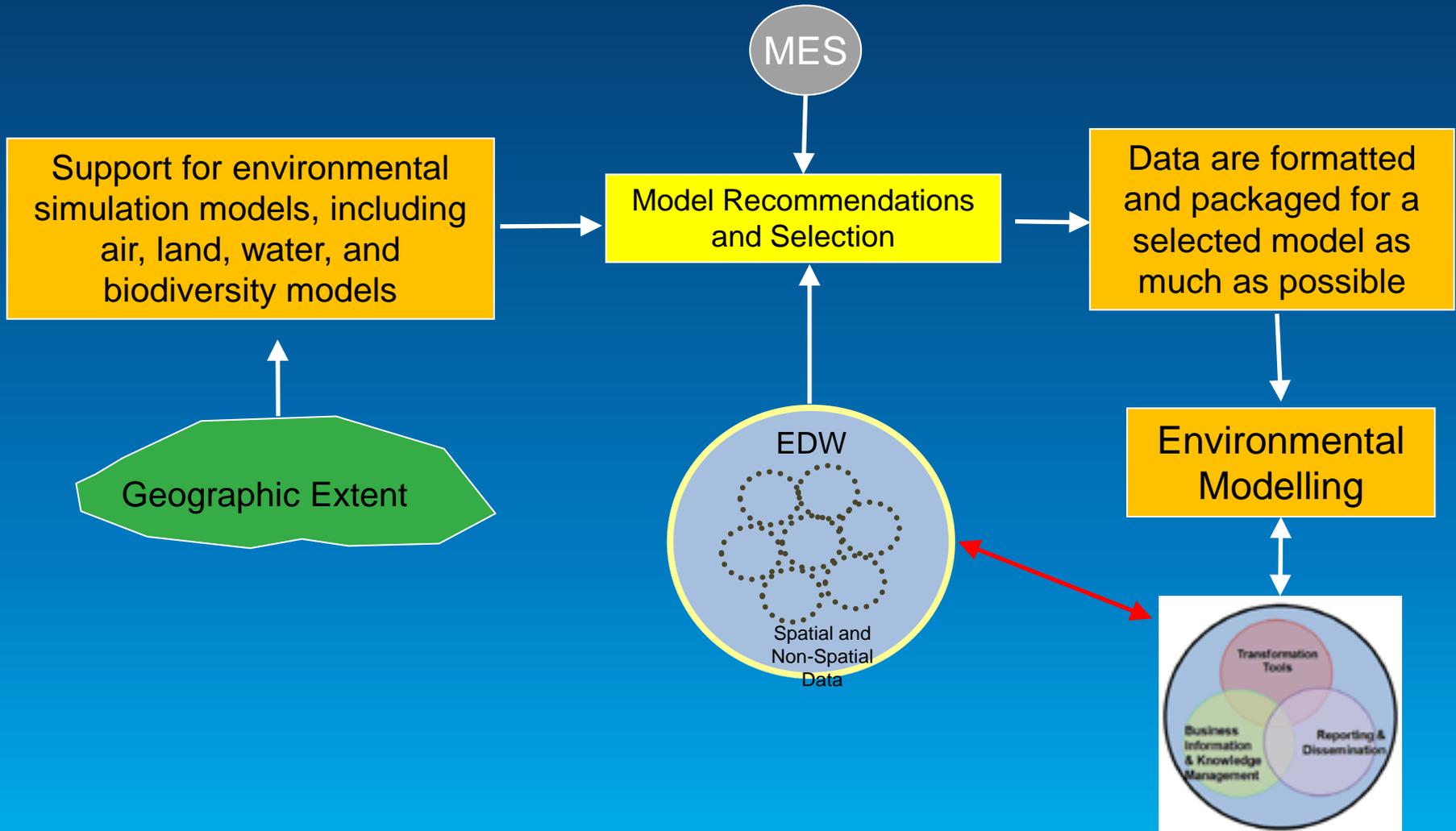Evaluate modelling tools across media (water, land, air, and biodiversity)

Inventory modelling projects and monitoring network meta-data

Develop the modelling expert system

Phase 1

Phase 2

Support Environmental Simulation Models

MES

Support for environmental simulation models, including air, land, water, and biodiversity models

Model Recommendations and Selection

Data are formatted and packaged for a selected model as much as possible

Geographic Extent

EDW

Spatial and Non-Spatial Data
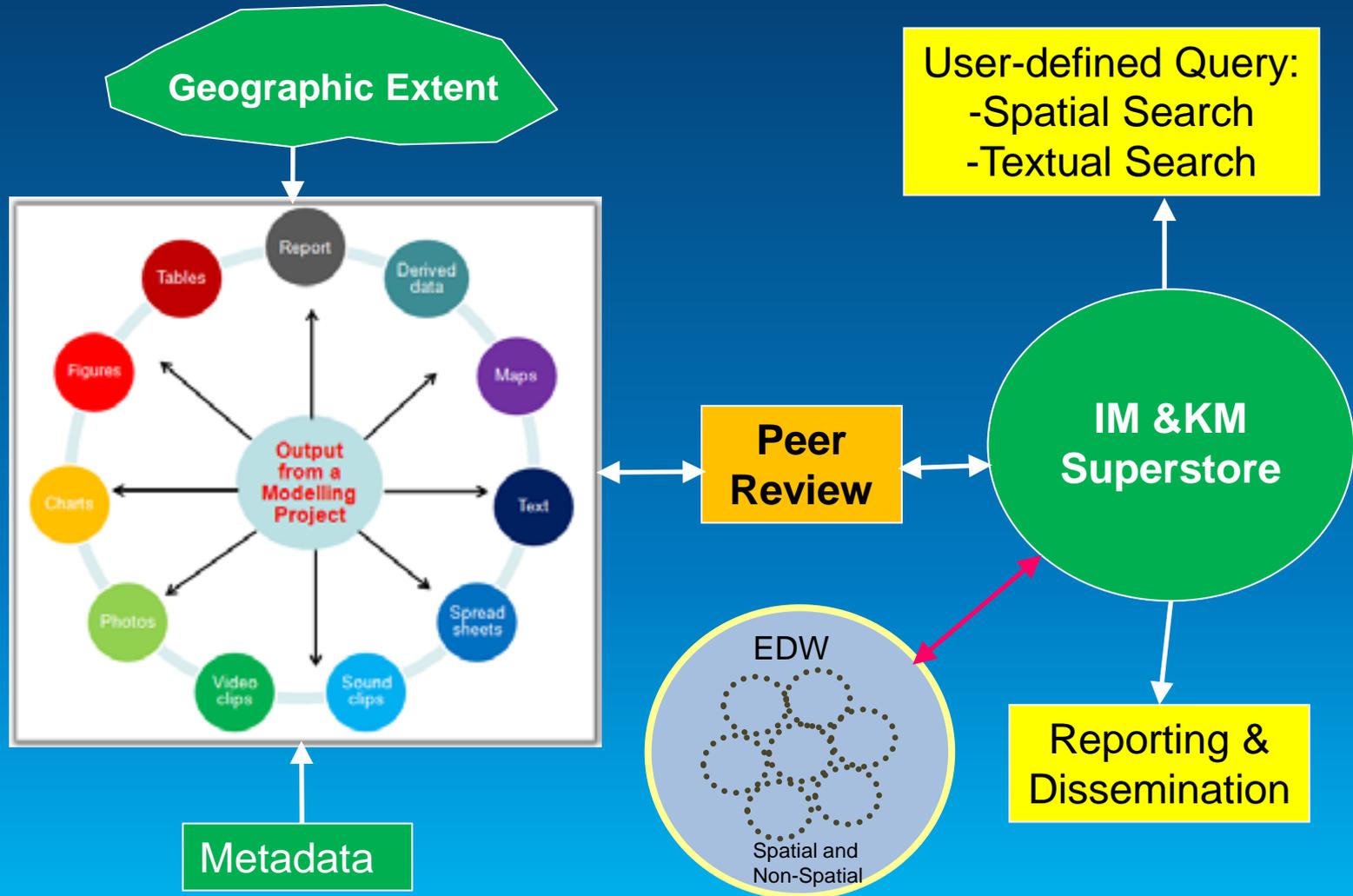
Environmental Modelling
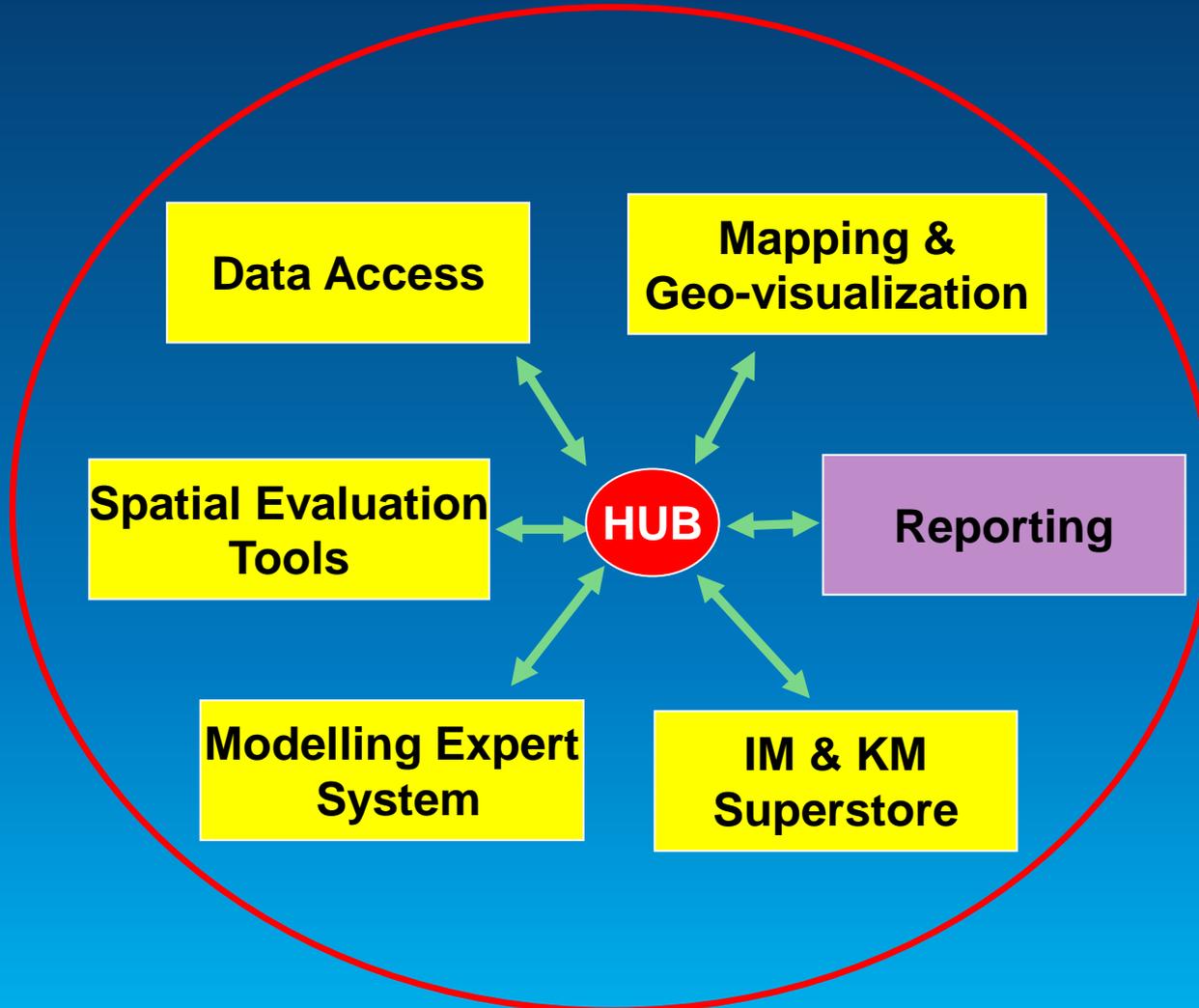
Vision: IM & KM Superstore
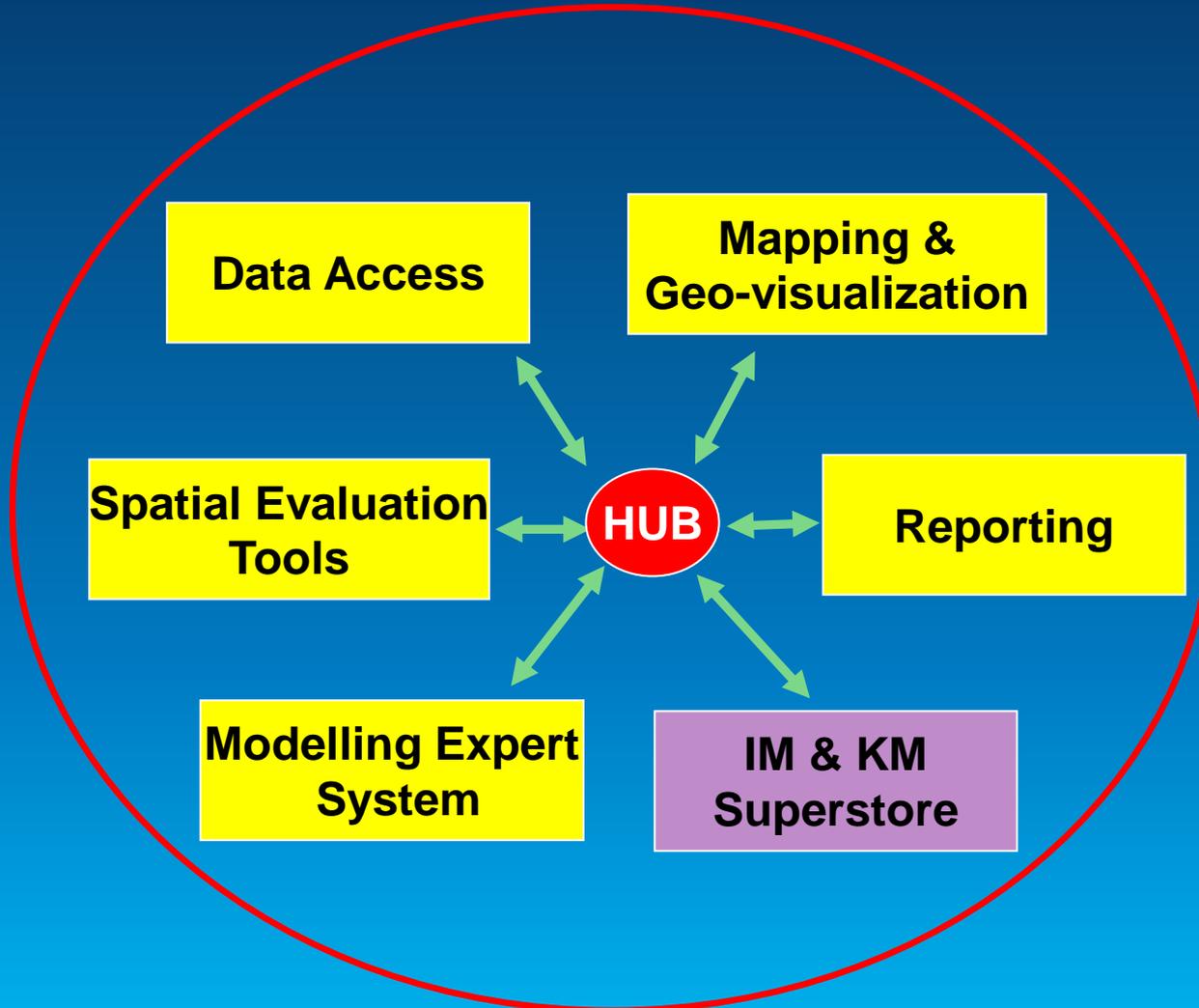
IM & KM Superstore:

Set up a spatially-publishable (including a peer review process), -searchable, -retrievable, and -downloadable information and knowledge management superstore (derived data, maps, text, reports, spreadsheets, graphics, pictures, audio & video clips, etc.)

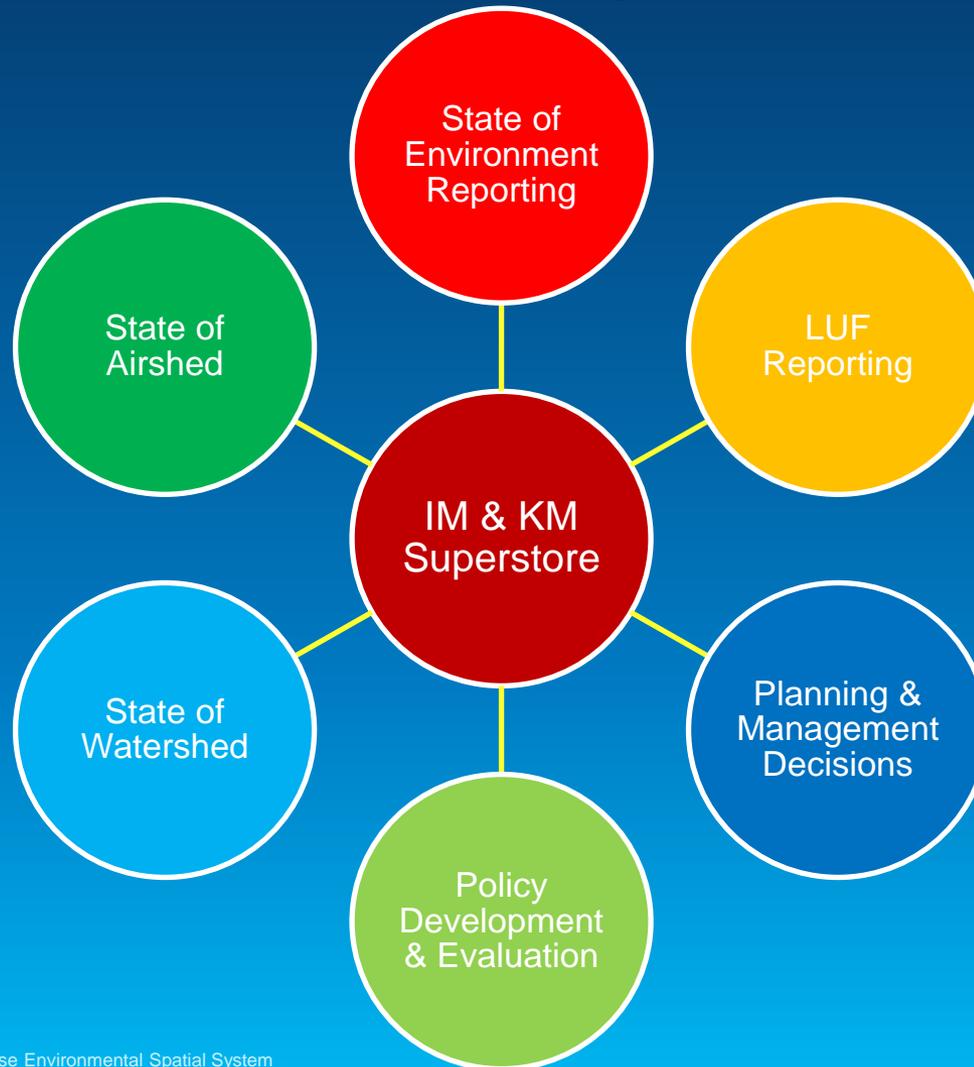**Geographic Extent**

User-defined Query:
-Spatial Search
-Textual Search

Peer Review

IM &KM Superstore

EDW

Spatial and Non-Spatial

Metadata

Reporting & Dissemination

Vision: Reporting

Reporting:

Create a spatial-enabled, open and transparent reporting system for publishing relevant environmental conditions of Alberta in a credible, open, transparent, sharable, and timely manner

- State of Environment Reporting
- LUF Reporting
- IM & KM Superstore
- State of Airshed
- State of Watershed
- Policy Development & Evaluation
- Planning & Management Decisions

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Benefits

§ Support business processes and management activities in the context of Cumulative Effects Management System and Integrated Resource Management.

§ Facilitate creation of scientifically rigorous and defensible data, information and knowledge, i.e., putting the right data/information/knowledge, in the right format, in the right hands, at the right time.

§ Align with government's open and transparent data/information policy.

§ Integrate various GIS functions with business areas.

§ Achieve the goal of enterprise GIS.

Outlines of Presentation
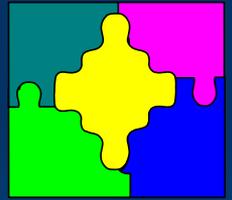
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Summary

§ We have a vision to create a world-class Spatial Knowledge and Integrated Environmental System (SKIES) for Alberta.

§ SKIES will help to achieve desired environmental outcomes and sustainable development of natural resources.

§ We are excited and passionate to do the right thing, and we will strive to do it right through a journey of learning.

§ We need your feedback, support and engagement. By working together, we can make a difference!

Thank You!

Q&A, Comments and Discussions

"A journey of a thousand miles begins with a single step. Just do it!"