National Geospatial Data Asset Baseline Maturity Assessment
for the Federal Geographic Data Committee

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Abstract

*The Federal Geographic Data Committee (FGDC) is **designing a portfolio management process** for 193 geospatial datasets contained within the 16 topical National Spatial Data Infrastructure themes managed under OMB Circular A-16 "Coordination of Geographic Information and Related Spatial Data Activities." The 193 datasets are designated as **National Geospatial Data Assets (NGDA) because of their significance** in implementing to the missions of multiple levels of government, partners and stakeholders. As a starting point, the data managers of these NGDAs will **conduct a baseline maturity assessment** of the dataset(s) for which they are responsible.*

*The maturity is **measured against benchmarks** related to each of the seven stages of the data lifecycle management framework promulgated within the OMB Circular A-16 Supplemental Guidance issued by OMB in November 2010. This framework was developed by the interagency Lifecycle Management Work Group (LMWG), consisting of 16 Federal agencies, under the 2004 Presidential Initiative the Geospatial Line of Business, using OMB Circular A-130" Management of Federal Information Resources" as guidance. **The seven lifecycle stages are: Define, Inventory/Evaluate, Obtain, Access, Maintain, Use/Evaluate, and Archive.** This paper will focus on the Lifecycle Baseline Maturity Assessment, and efforts to integration the FGDC approach with other data maturity assessments.*

What is the FGDC?

The FGDC is an **interagency committee that promotes the coordinated development, use, sharing, and dissemination of geospatial data on a national basis**. This nationwide publishing effort is known as the **National Spatial Data Infrastructure (NSDI)**. The NSDI is a physical, organizational, and virtual network designed to enable the development and sharing of this nation's digital geographic information resources. FGDC activities are administered through the FGDC Secretariat, hosted by the U.S. Geological Survey. More at: https://www.fgdc.gov/

The Office of Management and Budget **(OMB)** Circular A-16 revised in 2002 "*provides direction for federal agencies that produce, maintain or use spatial data either directly or indirectly in fulfillment of their mission*" and establishes the FGDC. More at: http://www.whitehouse.gov/omb/circulars_a016_rev/ The **A-16 Supplemental Guidance issued in 2010** identifies the need for geospatial data-management, "*constant renewal, information quality, and information management challenges*" using a portfolio-centric model. More at: http://www.whitehouse.gov/sites/default/files/omb/memoranda/2011/m11-03.pdf The "*Supplemental Guidance document further defines and clarifies selected elements of OMB Circular A-16 to facilitate the adoption and implementation of a coordinated and effective Federal geospatial asset management capability*" and establishes the portfolio management phase including assessing the state and maturity of each NGDA Dataset within the portfolio. The current plan published here: http://www.fgdc.gov/policyandplanning/a-16/ngda-management-plan

Why a Lifecycle format? The Geospatial Lines of Business (GeoLoB) Presidential Initiative in 2004 brought together 25 Federal Agencies into 6 working groups to develop blueprints, modernization efforts, establish the National Geospatial Advisory Committee, etc. using 6 working groups. The Lifecycle Management Work Group developed the A-16 Supplemental Guidance using the requirements and capabilities "life cycle" elements defined in OMB Circular A-130. This effort now supports the GeoPlatform (https://geoplatform.gov) providing shared and trusted geospatial data, services and applications. Reports on the process will be produced, assessments conducted, and modifications made as deemed necessary.

Other Maturity Assessment Methods/Models

Maturity – having attained a final or desired state, attained a stable growth rate, full development. Assessments have been developed to determine maturity for multiple elements: completeness, data records, system, stewardship, data quality, data usability, currentness, timeliness, accessibility, etc.
- **Capability Maturity Model Integration (CMMI)** - http://en.wikipedia.org/wiki/Capability_Maturity_Model_Integration
- **AGU Data Maturity Model** - http://onlinelibrary.wiley.com/doi/10.1029/2012EO440006/pdf
- **CORE-CLIMAX – Climate Data Record Assessment** - http://wacmos.itc.nl/sites/coreclimax.itc.nl/files/documents/Workshops/WS1/Core-Climax_CDR_Assessment_Instruction_Manual.pdf
- **Unified Framework of Measuring Stewardship Maturity for NOAA Digital Climate Environmental Geospatial Data Products** – Ge Peng and Jeffrey L. Privette
- **Utah Automated Geographic Reference Center (AGRC)** - http://gis.utah.gov/give-it-a-try-one-page-gis-data-maturity-assessment/

NGDA Dataset Management Lifecycle

Business Requirement drives management practices at every lifecycle stage with feedback informing the process with quality assurance/quality control processes at every stage. The development of the lifecycle includes current federal requirements and policies included for every stage and, in some cases, specific to a lifecycle stage.

As diagrammed in the following graphic the lifecycle stages are a cyclic process and change based on business requirements. The Lifecycle Stages include: Define (also referred to as planning), Inventory/Evaluate, Obtain, Access, Maintain, Use/Evaluate, and Archive.
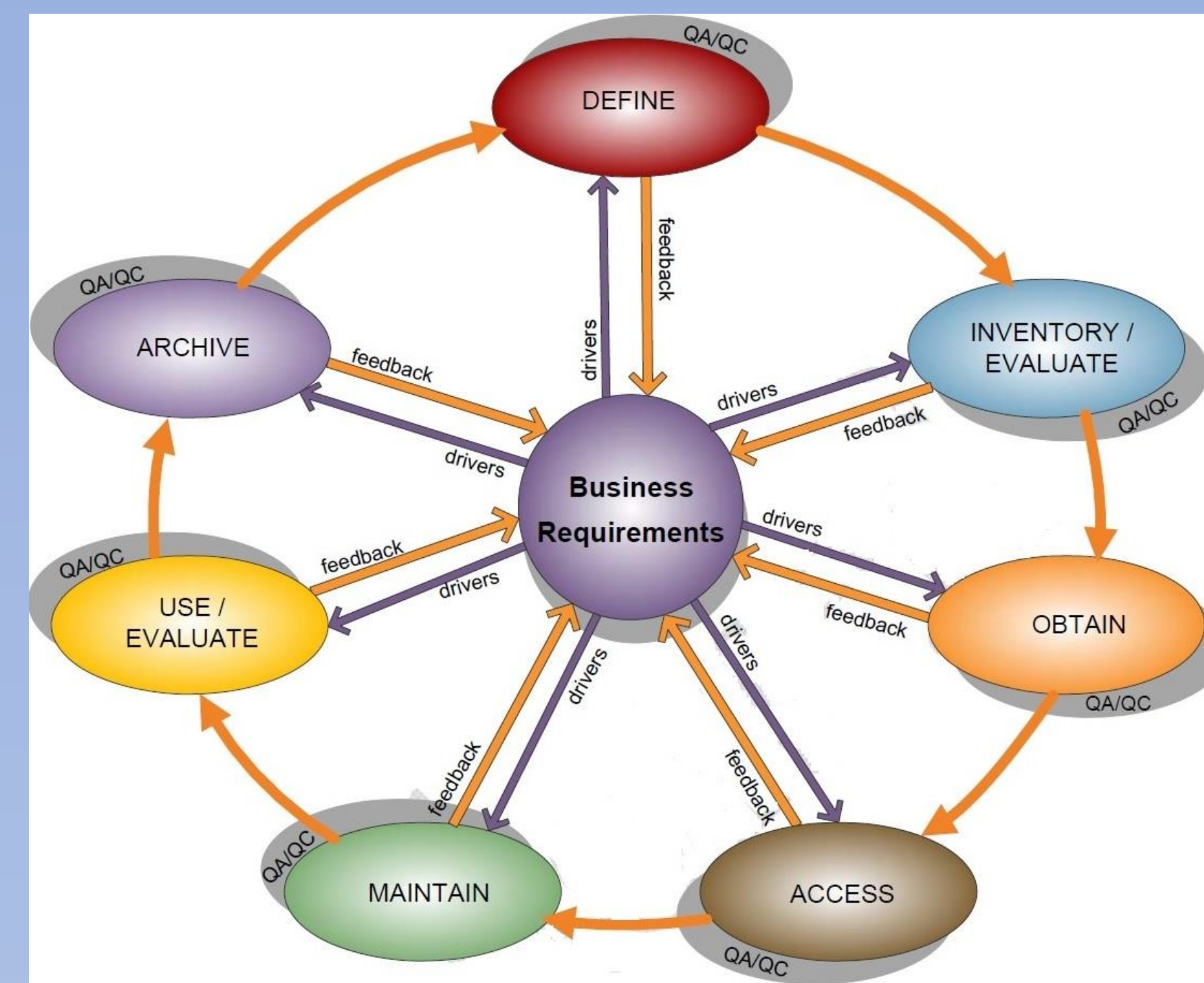
- **Stage 1 Define:** Characterization of data requirements based upon business-driven user needs.
- **Stage 2 Inventory/Evaluate:** The creation and publication of a detailed list of data assets and data gaps (both internal and external) as they relate to business-driven user needs.
- **Stage 3 Obtain:** Identify the mechanism(s) for the collection, purchase, conversion, transformation, sharing, exchanging, or creation of geospatial data that were selected to meet the business needs
- **Stage 4 Access:** Making data produced known and retrievable to the community through documentation and discovery mechanisms so the users can meet their business requirements.
- **Stage 5 Maintain:** Ongoing processes and procedures for data operation and maintenance to ensure that the data continue to meet business requirements.
- **Stage 6 Use/Evaluate:** The ongoing assessment, validation, and potential enhancement of data to meet user needs and business requirements.
- **Stage 7 Archive:** Required retention of data and the data's retirement into long-term storage.

## Concept of Operations / Portfolio Management
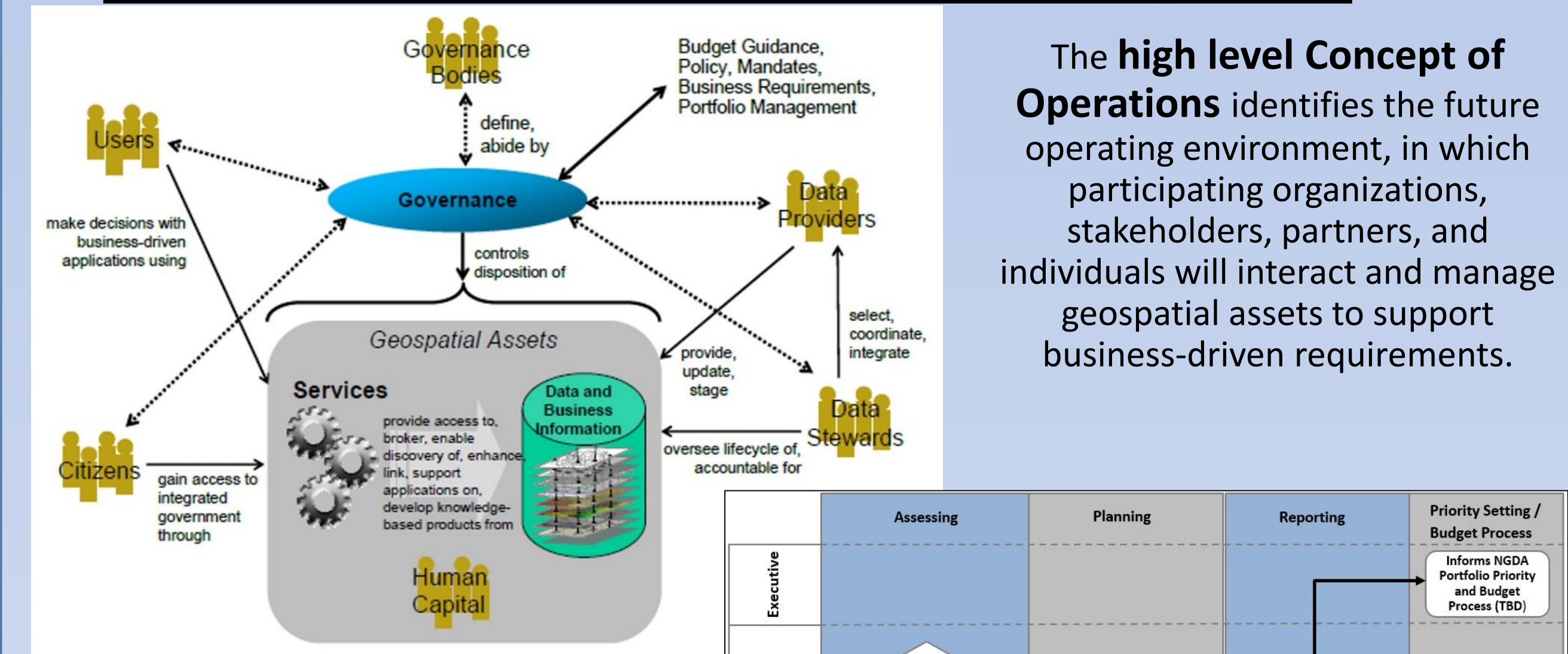
The **high level Concept of Operations** identifies the future operating environment, in which participating organizations, stakeholders, partners, and individuals will interact and manage geospatial assets to support business-driven requirements.

Once the foundational elements are in place for full Portfolio Management implementation, cyclic assessments, annual planning, reporting, and prioritization and budgeting can begin. Each Portfolio Management stage (Assessing, Planning, Reporting, and Prioritizing/Budgeting) described below starts with establishing a process or methodology which will ultimately recur on a set cycle.

The NDGA Management Plan: http://www.fgdc.gov/policyandplanning/a-16/ngda-management-plan
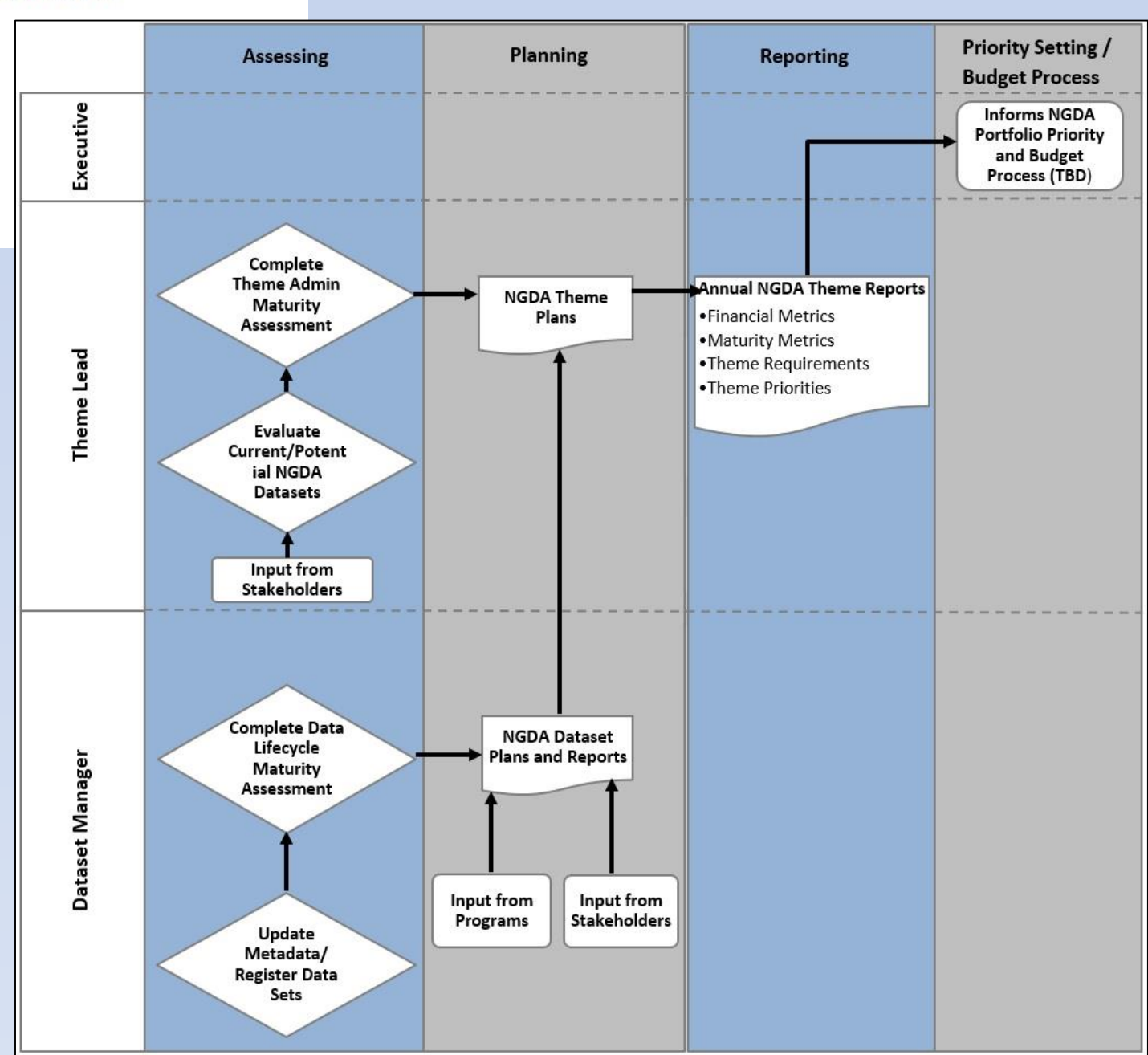
NGDA Lifecycle Maturity Assessment Tool

A tool comprised of **19 questions about benchmark activities** within each lifecycle stage has been developed for Dataset Managers to complete an assessment of the dataset managed. **Each question includes clarifying statements** or actions that may be used to accomplish the benchmark activities the question includes, **metrics** from "no" indicating no activity to a metric representing full maturity for the question, and a **Justification Comment** space for the Dataset Manager to provide documentation supporting the metric selected.

Tool Format – the following question is an example of how the questions are formatted – the tool will be integrated into the GeoPlatform.gov interface for easy access and updating:

> **Question 1:   General Question - Is there a recurring process to obtain funding for all lifecycle stages?**
> **Clarifying statement** – examples actions may include: identifying existing sources of funding (i.e. – local, agency, interagency, etc.) identifying supporting staff (i.e. – contracting officer, contracting officers representative, etc.) funding requests updated and submitted annually or tied to dataset scheduled, and coordinating with supporting offices including, but not limited to, information technology, records management, data centers, including archiving and ultimate disposition, etc.
> **Metrics** –
> ☐ No
> ☐ Funding is from local offices, budgeting effort minimal, staffing minimal
> ☐ Funding is planned at agency level, supporting staff assigned, but funding is not recurring, some lifecycle stages are supported.
> ☐ Funding support exists but is not adequate to meet known requirements, most lifecycle stages are supported.
> ☐ Funding support is part of agency budget on a recurring basis, funding is consistent and tied to business processes, and supports **all lifecycle stages**
> **Justification Comment** – Dataset Manager required to provide documentation supporting metric selected.

All of the questions included in the NGDA Lifecycle Maturity Assessment Tool:
General Questions –
- Question 1 – Is there a recurring process to obtain funding for all lifecycle stages?
- Question 2 - Is there a process in place to ensure that open government and transparency guidelines are followed in all lifecycle stages for this dataset?
- Questions 3 - Are there processes and tools in place so that staff are sufficiently knowledgeable to ensure a continuity of the dataset for all stages of the lifecycle, especially during staffing transitions?

Stage 1 Define/Plan –
- Question 4 – Are user and business requirements defined and formalized?
- Question 5 – How are partners/stakeholders involved in the requirements collection process?
- Question 6 – Is there a quality assurance process for the dataset?
- Question 7 – Is there a process to evaluate the sensitivity, privacy, and confidentiality of this dataset?
- Question 8 – Are defined data standards used in collecting, processing and/or rendering the data?

Stage 2 Inventory/Evaluate:
- Question 9 – Is there a process for determining if data necessary to meet requirements already exist from other sources (either within or outside of the agency) before collecting or acquiring new data?
- Stage 3 Obtain:
- Question 10 – Is there a process for obtaining data in relation to this dataset?
- Question 11 – Is the metadata in a FGDC endorsed geospatial metadata standard?
- Question 12 – How complete is the geographic coverage as defined in the requirements for the dataset?

Stage 4 Access:
- Question 13 – Is there a process for providing users access to the data in an open digital machine readable format?

Stage 5 – Maintain:
- Question 14 – Is there a maintenance process for updating and storing the dataset?
- Question 15 – Is there an error correction process as part of dataset maintenance?

Stage 6 – Use/Evaluate:
- Question 16 – Is there a process to determine if the dataset meets user needs?
- Question 17 – Is there a process to provide users information on how to access and properly use the dataset?
- Question 18 – Are the business processes and management practices assessed to meet changing technology?

Stage 7 – Archive
- Question 19 – Is there an archiving process for the dataset?

Calculating Maturity

The maturity metrics are designed to include a range of activities associated with the question, from no activity to significant activity. Values are applied and the result is a maturity assessment for the question. Each question has anywhere from 3-5 metrics. These are broken out into percentages in the following table.

Number of metrics for Assessment Question	Metrics Applied
3	0%, 50%, 100%
4	0%, 33%, 66%, 100%
5	0%, 25%, 50%, 75%, 100%
NA	Question not included.

The dataset will be assigned a maturity for each question and these will be rolled up into a maturity for each lifecycle stage.

Maturity	Aggregated Value	Visualization
No Activity	0-0.99%	
Early maturity	1-33.9%	
Mid-level maturity	34-66.9%	
More mature	67-100%	

The following figure is an example of how the maturity for each dataset could be displayed on the GeoPlatform.gov for the Dataset Managers, Theme Managers, and FGDC Management.
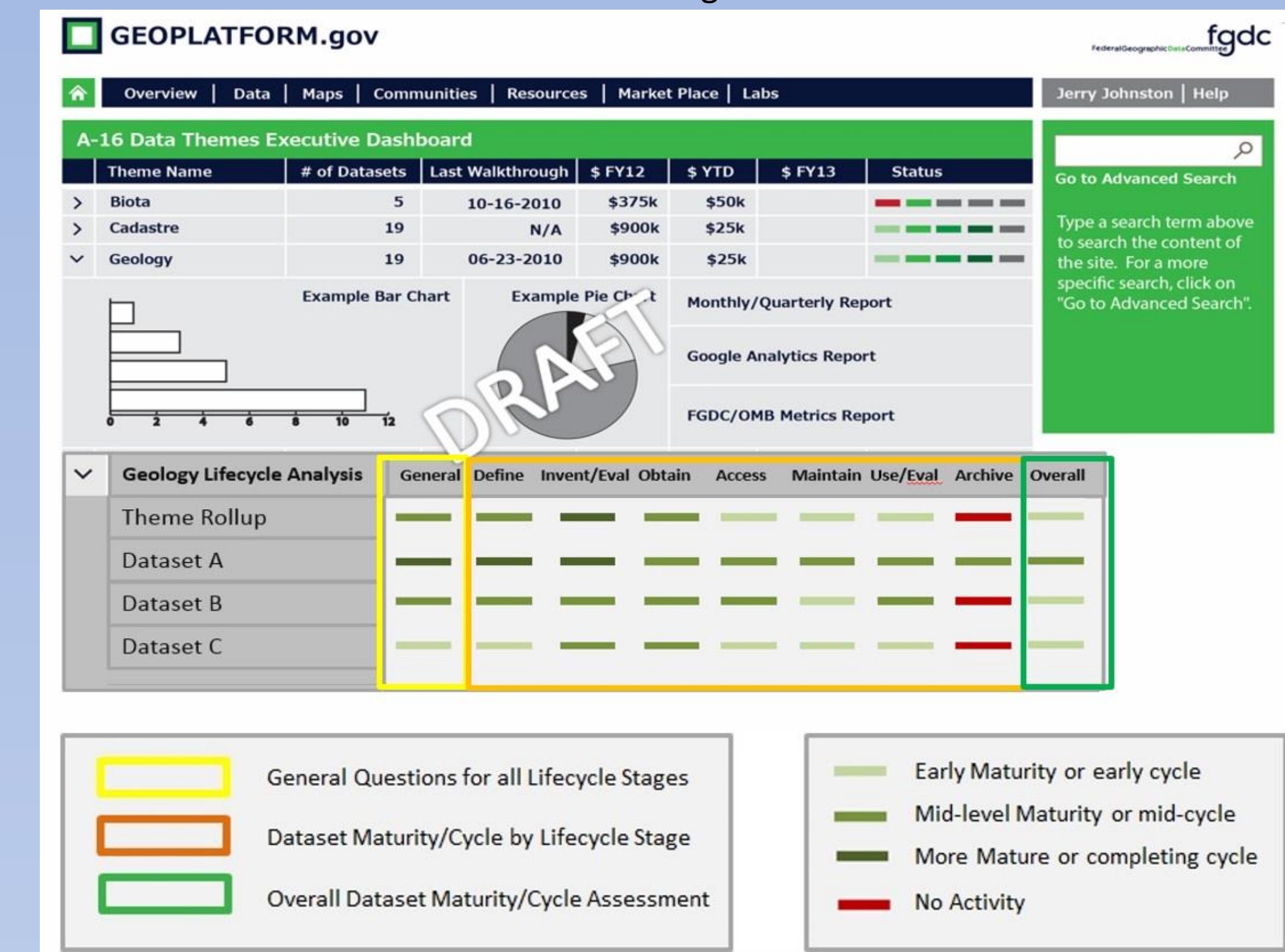
Expectations/Outcomes

Provide users with curated datasets
- Increased transparency
- Greater customer confidence – reliable and timely
- Ability to gage readiness for use – services and applications.

Provide dataset owners a road map
- Identification of strengths and gaps to help set priorities
- Tools for executive managers and champions for acquiring resources.

NSDI Communities / FGDC Steering Committee more informed decisions
- Consistent approach for communicating dataset and theme maturity
- Tool within and across themes for identifying and targeting joint opportunities
- Allows more holistic assessment when setting government priorities
- Enables assessment of when the NSDI is mature
- Enhances ability to answer queries from OMB, Congress, etc. on status of NSDI

ACKNOWLEDGEMENTS