Australian Government
National Land & Water Resources Audit

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Fundamental Data required to support National Monitoring and Evaluation indicator reporting

The National Land & Water Resources Audit has further developed a set of natural resource condition indicators as part of the agreed National NRM Monitoring and Evaluation Framework. The indicators are associated with a range of fundamental data and information needs, that are needed to monitor and report on the health of Australia's natural resources.

The National Land & Water Resources Audit (the Audit) provides data, information and nationwide assessments of Australia's land, water and biological resources to support sustainable development.

The Audit was tasked to develop a set of indicators under the National NRM Monitoring & Evaluation Framework (NM&EF) and the NRM Monitoring, Evaluation, Reporting and Implementation Framework.

The Audit — supported by multi-jurisdictional, theme base National Coordination Committees (NCCs) — provided scientific and technical input for the development and testing of indicators for a number of themes, including:

- Soil Condition
- Land Salinity
- Water Quality
- Inland Acquatic Ecosysytems
- Native Vegetation
- Native Species and Communities
- Invasive Species
- Estuarine, Coastal and Marine Habitats
- Social and Economic.

Natural Resource Management (NRM) is complex. Different components of NRM (science, policy, planning, decision-making, monitoring, assessment and evaluation of programs) all have slightly varying data needs, although there are potentially many overlaps and possibilities for efficiencies through collaborative investments.

What is fundamental data?

Fundamental data is defined as:

"data and information that is essential to support a required business process"

For the Audit the particular business process is reporting against agreed National NRM Monitoring and Evaluation indicators.

The Audit compiled the following list of fundamental data which is required to support the development of baselines and for future monitoring and reporting on the health of Australia's natural resources.

The Audit provides data, information and nationwide assessments of Australia's land, water and biological resources to support sustainable development

Fundamental Data required to support National

This list is arranged under:

- ISO 19115 (Geographic information - Metadata) Topic Category, (eg. Biota), then
- Topic, (eg. Aquatic fauna) then
- Sup-topic (eg. Extent, distribution and abundance...) and specific attributes associated with it.

Biota

Aquatic fauna

- Extent, distribution and abundance of aquatic fauna, including:
  - fish, macro-invertebrates, phytoplankton, diatoms
  - -threatened, endangered or protected species
  - estuarine and marine species
- Threats and pressures, including:
  - recreational and commercial fisheries, fish kills

Terrestrial fauna

- Extent, distribution and abundance of terrestrial fauna species, communities and habitats including for:
  - mammals, birds, reptiles, frogs, insects
- Biodiversity management practices and plans
- Threats and pressures, including:
  - microbiological risks

Vegetation

- Extent and distribution of native vegetation including:
  - all native vegetation
  - pre-1750 vegetation types
  - current vegetation types
  - riverine, wetland and coastal vegetation
- Condition of native vegetation including:
  - modification from benchmark, resilience for recovery, timeframe of modification and attributes of structure and floristics

Geoscientific information

Geoscience

- Geology related attributes (unspecified), but including:
  - lime quality, salt sources

Elevation

Elevation

- Digital elevation models, topography and landform attributes

Climate, Meteorology, Atmosphere

Climate

- Climate attributes (unspecified), including:
  - rainfall total, distribution and intensity
  - evaporation, wind, visibility
  - air temperature

Environment

Soils and landscape

- Extent and distribution of soil types, including:
  - all soil types
  - acid sulphate soils
  - acid and alkaline soils
- Soil properties, including:
  - pH, carbon content, nutrients, salt stores
  - texture, porosity, depth and cation exchange capacity
  - surface roughness and particle sizes
  - erodability and erosivity
  - soil moisture and temperature
- Geomophological attributes, including:
  - landforms and drainage lines
- Extent and distribution of wind and water erosion
- Location soil conservation structures
- Land cover including:
  - native, non-native and non vegetation
  - annual and perennial % ground cover and extent

Dryland salinity

- Location and extent of dryland salinity, including:
  - outbreaks and intensity
  - discharge zones
  - areas of hazard

Oceans

Coast and marine

- Coastal, estuarine and marine habitat extent, distribution and condition attributes, including:
  - coast and beach type, beach stability
  - estuary type, geomorphology, area, depth, volume, perimeter, length, inlet morphology, entrance, tides, flushing
  - seagrass, epiphyte coverage, macroalgae
  - coral reef, rock, sediment
  - mangroves, saltmarsh,
- Oceanography, including:
  - tides, waves, currents, sediment transport, temperature, bathymetry
- Threats and pressures, including:
  - foreshore structures, marinas, moorings, aquaculture, urbanisation
  - dredging, artificial entrance opening
  - toxicants, litter, shipping activity
  - catchment disturbance (streams and estuaries)

Monitoring and Evaluation indicator reporting

Inland Waters

Groundwater

- Groundwater fluctuations and trends, including:
  - water quality, pH, EC (salinity), depth
- Groundwater Flow Systems
- Baseflow salinity and volumes
- Groundwater sampling and pumping details

Hydrology

- Hydrologic features, including:
  - rivers, streams waterbodies, wetlands and estuaries
  - river basins, catchments and sub-catchments
  - river and floodplain structures eg dams, weirs, levees
- Hydrologic attributes, including:
  - flow, run-off, flooding, sediment loads
- Water management attributes, including:
  - irrigation use

Water quality

- Water quality attributes, including:
  - nutrient loads, nitrogen and phosphorus level
  - electrical conductivity, major ions, pH
  - turbidity
  - dissolved and biological oxygen
  - chlorophyll concentration, algal blooms

Wetlands

- Extent and distribution of wetlands, including:
  - regionally significant, Directory of Important, Ramsar, and pre-European wetlands
- Wetland type
- Wetland condition attributes (unspecified), including:
  - inundation depth
- Wetland conservation status, including
  - management and environmental context

Society

Land managers' capacity

- Aspirations
- Capacity
- Management practices
- Rural livelihood context
- Outcomes of improved NRM

Regional organisations capacity

- Capacity
- Engagement
- Partnerships
- Recognition

Community

- Vitality
- Viability
- Health
- Cultural and historic assets

Boundaries

Regions and boundaries

- Biophysical boundaries, including:
  - river basins and catchments
  - Interim Biogeographical Regionalisation of Australia (IBRA) regions and sub-regions
  - Integrated Marine and Coastal Regionalisation of Australia (IMCRA) regions
- Management and administrative boundaries, including:
  - states and territories
  - Natural Resource Management regions
  - Ramsar wetland administrative boundaries

Planning and Cadastre

Land administration and use

- Land tenure
- Land ownership
- Land use including historic use and change
- Land management practices

Farming

Agriculture

- Distribution and extent of agricultural industries (footprints)
- Crop yields

Pests

- Occurrence, distribution, abundance and trend of invasive animals including:
  - terrestrial and aquatic species
  - estuarine and marine species
- Damage and level of impact caused by invasive animals

Weeds

- Occurrence, distribution, abundance of nominated weed species including:
  - Weeds of National Significance (WoNS)
  - other agreed species
  - coastal, estuarine and marine species

Economy

Economy and infrastructure

- Location of infrastructure, roads etc
- Population and Agricultural census and related survey statistics
- Agricultural economic attributes, including:
  - lime sales

Fundamental data and information supporting the NM&EF indicators have been classified as:

- **protocol – the actual measure of an indicator**
- **critical – contextual data required for interpretation of an indicator measure**
- **useful – contextual information which may assist in further analysis of results**.

Individual data or attributes may fall into one or more categories when considered across the full range of indicators. For example the 'extent of all native vegetation' is a protocol measure, but may also provide critical context to the measurement of the 'extent of priority types of vegetation'. Vegetation extent and distribution is also useful when considering cause and effect of 'water quality' indicator measurements.

The data listed may be required against one specific indicator or may have been identified for a number of indicators. The frequency or commonality of need is not a good measure of data's fundamentality. Fundamental data is that which is essential and is considered a "must have" if the particular indicator is to be utilised.

Fundamental data represented in this list is therefore that which has been identified as a protocol measure or as critical contextual data. Data that have been noted as only useful across the range of indicators has not been included, although such data may be fundamental to other components of the NRM process. A full list of all data identified throughout Audit processes can be found in supporting documents.

Baselines, time slices and temporal trends in the data are also important for monitoring.

Data were classified (where possible) using emerging national and international naming conventions, such as the ISO 19115 standard Topic Categories and the European GEMET Thesaurus (http://www.eionet.europa.eu/gemet).

Where these have not been suitable, particularly at lower levels of data attributes, commonly used Australian nomenclature has been adopted.

This list of fundamental data provided is incomplete due to the ongoing nature of indicator development and the difficulty for some themes to be explicit about the data needs.

Data are also identified at different levels across the themes and indicators, making it difficult to provide a comprehensive statement of need. We must to be able to get more specific about the required data — not just identifying soils, water and vegetation data for example, but being clear about the specific attributes and characteristics needed.

We must improve our understanding of data needs if strategic investment is to ensure that the required data is available. Data users must have an answer to the question 'what data do you need' and ask providers to supply specific information, rather than asking data providers 'what data do you have'; suggesting that they supply access to everything.

The Audit's fundamental data project attempted to develop a list of authoritative custodians for each of the data elements at national, state/territory and regional levels. However, this proved difficult (see *First draft national report on fundamental data for NRM*, the Beaten Track Group 2008). Custodianship needs to be clearly defined, agreed and resourced to ensure ongoing collection, management and dissemination of data assets.

Supporting documents

- Australian Natural Resources Information 2002, NLWRA.

- Assessment of data requirements and availability to address natural resource condition and trend indicators, 2004. The Beaten Track Group for NLWRA.

- Draft national list of key data supporting natural resource management, 2005. The Beaten Track Group for NLWRA.

- Information for sustainability – a statement of intent 2007. NLWRA and ANZLIC the spatial information council.

- Status of information for reporting against indicators under the National NRM Monitoring & Evaluation Framework. A series of theme booklets produced by the NLWRA 2008.

- First draft national report on fundamental data for NRM, 2008. The Beaten Track Group for NLWRA.

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