



# Digital Platforms and Indigenous Knowledge

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The Atlas of Living Australia and CSIRO acknowledge Australia's Traditional Owners and pays respect to the past and present Elders of the nation's Aboriginal and Torres Strait Islander communities. We honour and celebrate the spiritual, cultural and customary connections of Traditional Owners to country and the biodiversity that forms part of that country



The ALA is made possible by contributions from its many partners. It receives support through the Australian Government through the National Collaborative Research Infrastructure Strategy (NCRIS) and is hosted by CSIRO.

# OVERVIEW



Role of digital infrastructures in respecting and reflecting IK and ICIP:

## CONTEXT

Data ecosystems &  
information  
supply chain

prominence, control  
and access in the  
“ecosystem”

## APPROACH

Cultural integrity

integrity in  
the research method & engagement  
and digital representation

## TOOLS

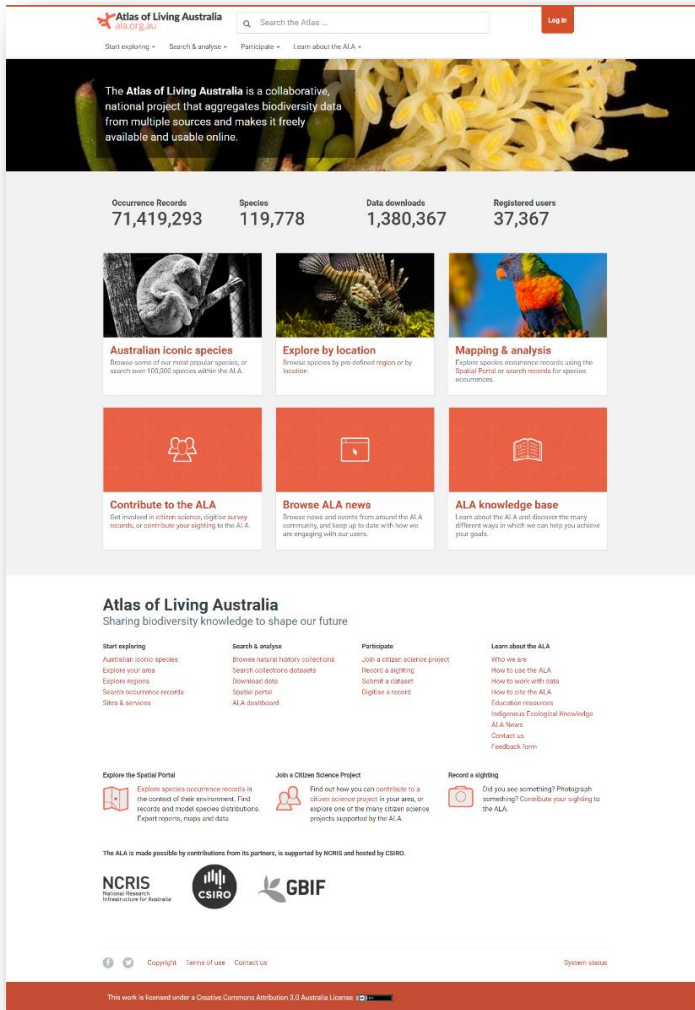
Digital governance

legal and alternative  
protection & identifying of  
rights and interests

# CONTEXT

- **the ALA as an example**
- **place in the information supply chain**

# CONTEXT – Atlas of Living Australia – national platform



➤ AUD \$55 million investment

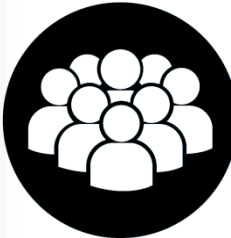
**NCRIS**  
National Research  
Infrastructure for Australia  
An Australian Government Initiative



over 10 years



The national and world-class biodiversity information infrastructure

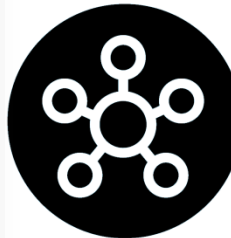


Partners – founding & beyond



Data types

- >121,000 species
- specimens
- occurrence
- images, sounds
- literature
- sequences
- more .....



National Research infrastructure

**NCRIS**  
National Research  
Infrastructure for Australia  
An Australian Government Initiative



Data Aggregation

- >85 million records
- >10,000 data sets
- 485 spatial layers
- >52,000 registered users
- >18 billion records downloaded from over 1.8 million events



Open data, open source,  
open access, open services,  
open infrastructure



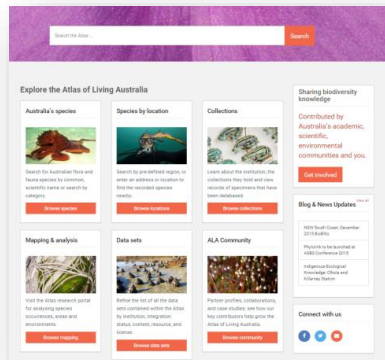
System

- data collection & aggregation
- data management
- data discovery
- data visualisation
- data analysis & reporting

# CONTEXT – ALA as an open infrastructure



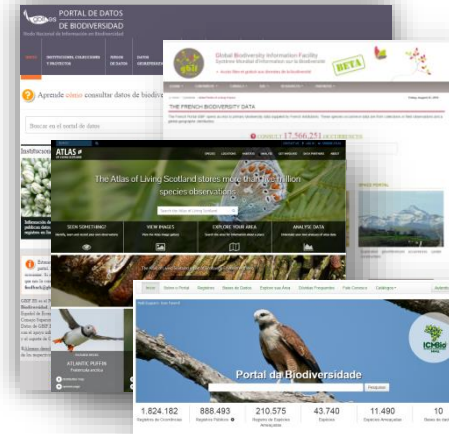
## ALA Portal



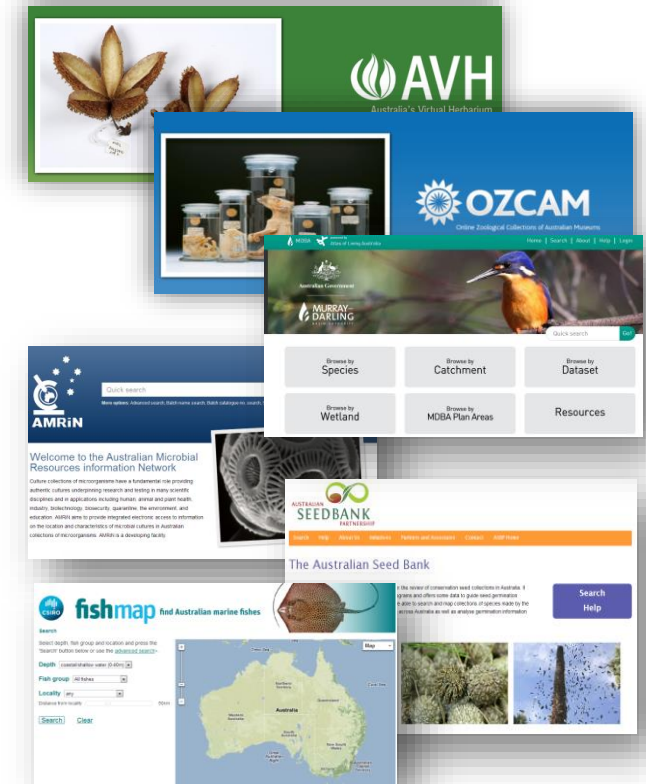
## Domain Instances (Aus)



## International Instances



## Hubs



## One infrastructure - many systems

### Suite of Apps

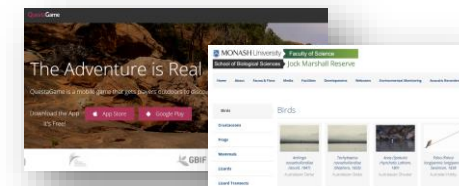
### Web Services

**METADATA:** ownership, location, collection method, permissions, quality control, data sensitivity

**DATA:** collections, field observations, images, literature, molecular data, expert knowledge

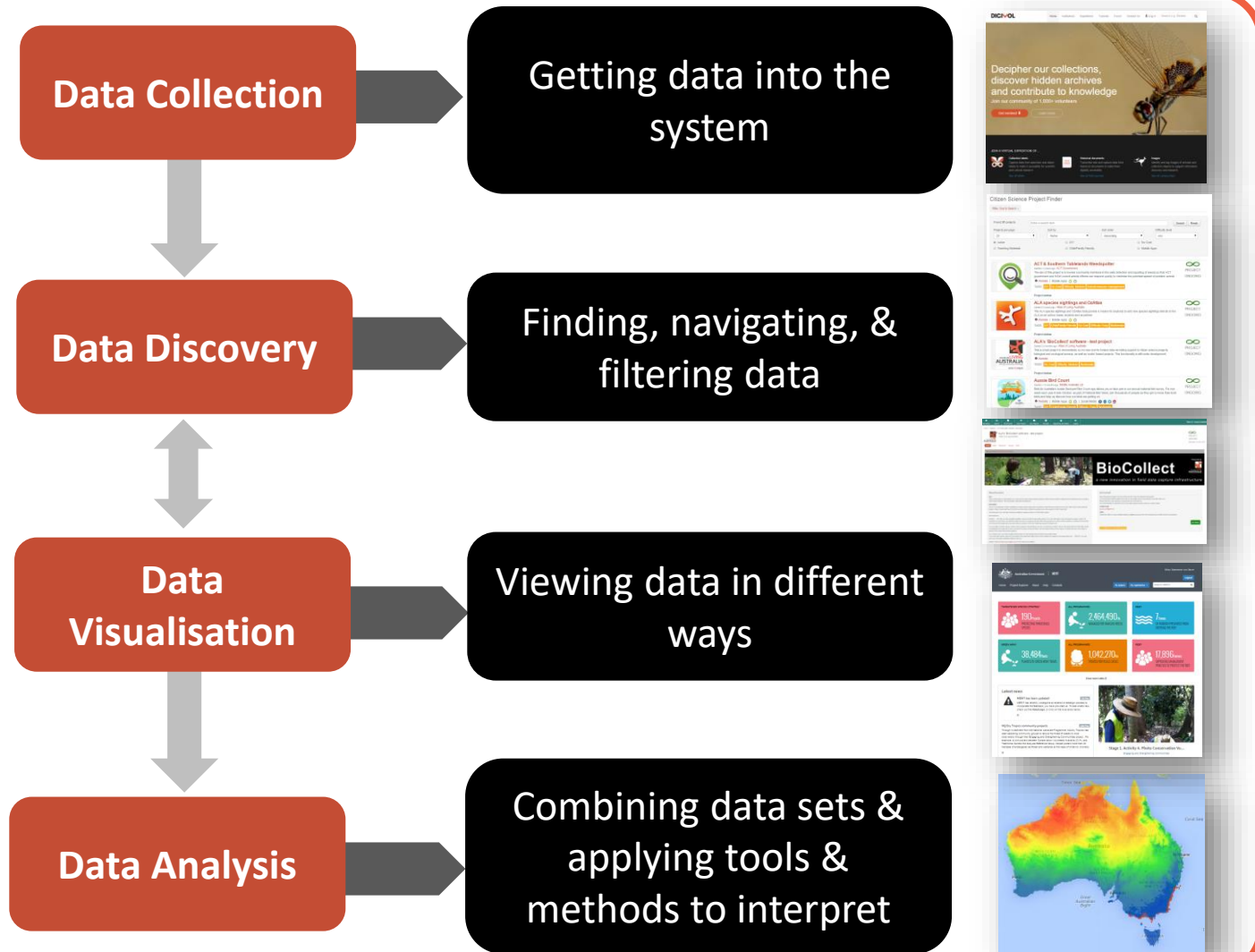


### Web Services



click on images to go through to site

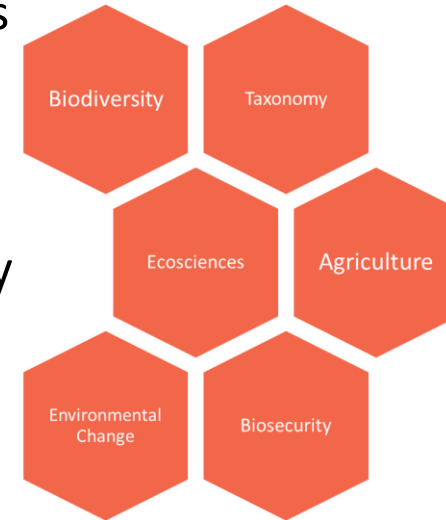
# CONTEXT – ALA providing tools for biodiversity



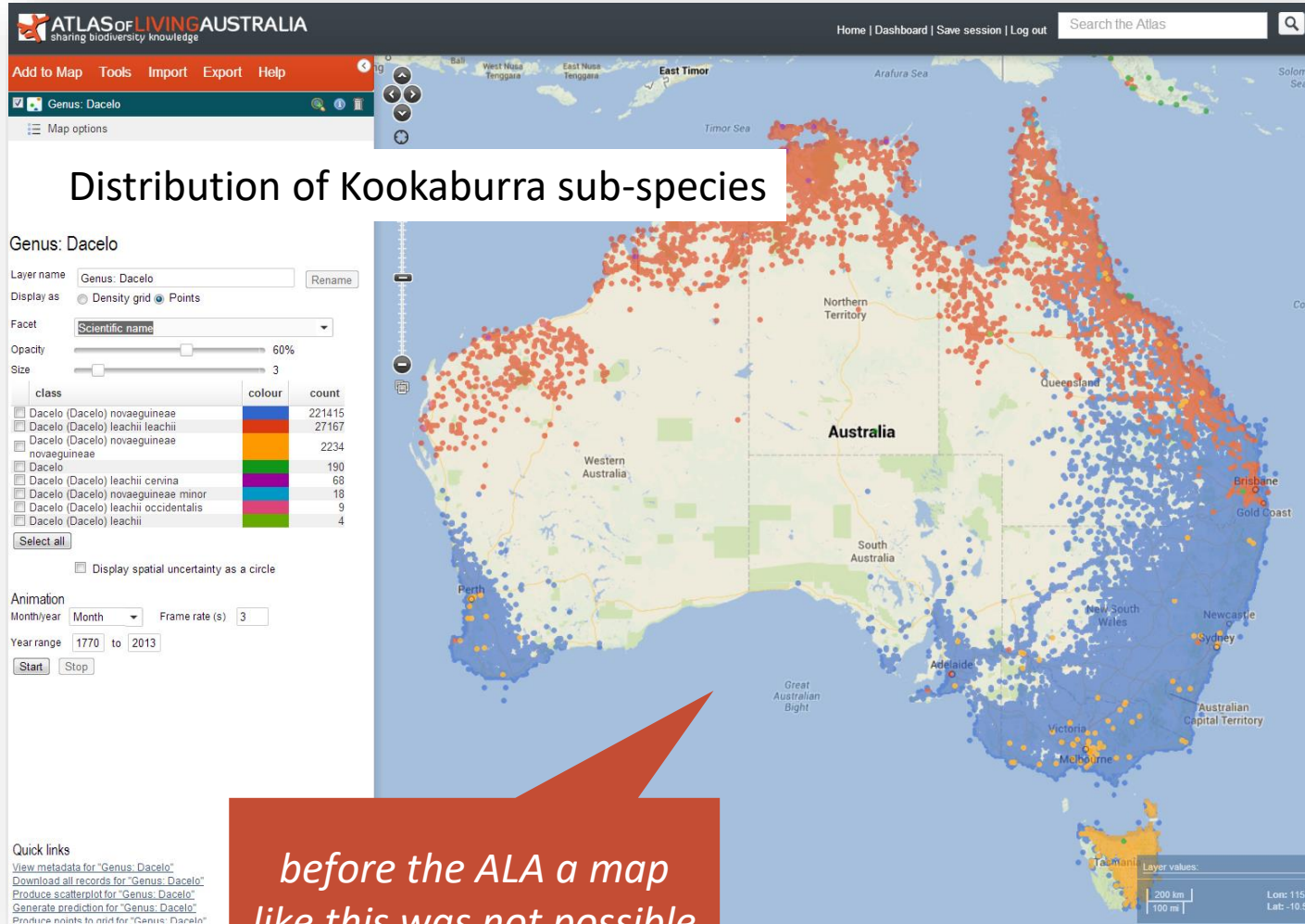
## ENABLING

- researchers
- government
- land/resource managers
- community
- industry to.....

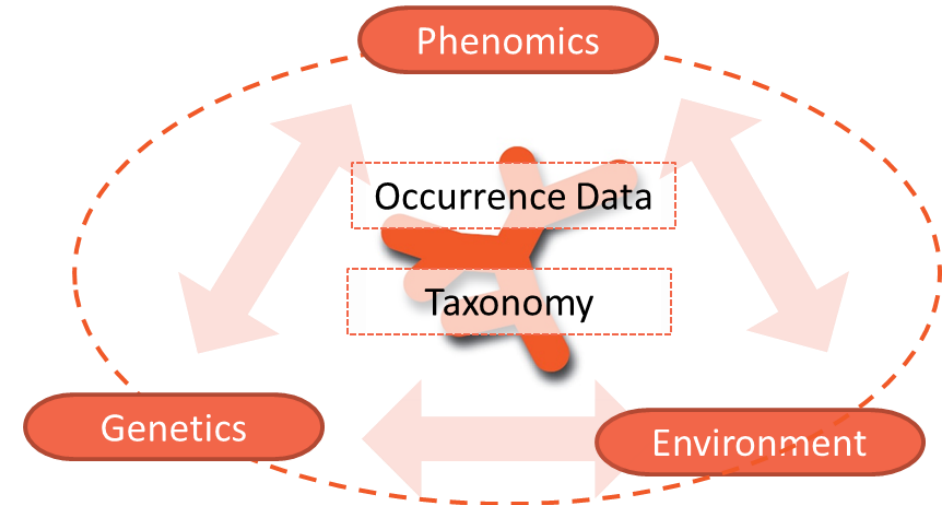
- **engage** with biodiversity
- **manage** biodiversity
- **report** on biodiversity
- understand **impact** on biodiversity



# CONTEXT – ‘big data’ analytics & ‘linked’ data



*before the ALA a map like this was not possible*



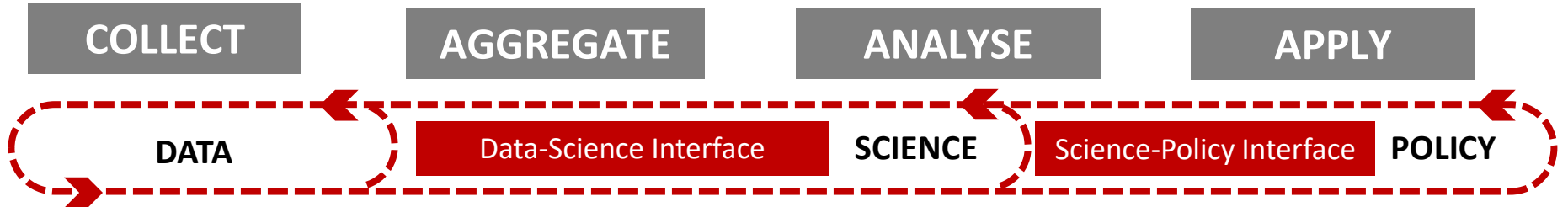
*Mobilised and linked genomic, environment and phenomics data*

# CONTEXT – information supply chain



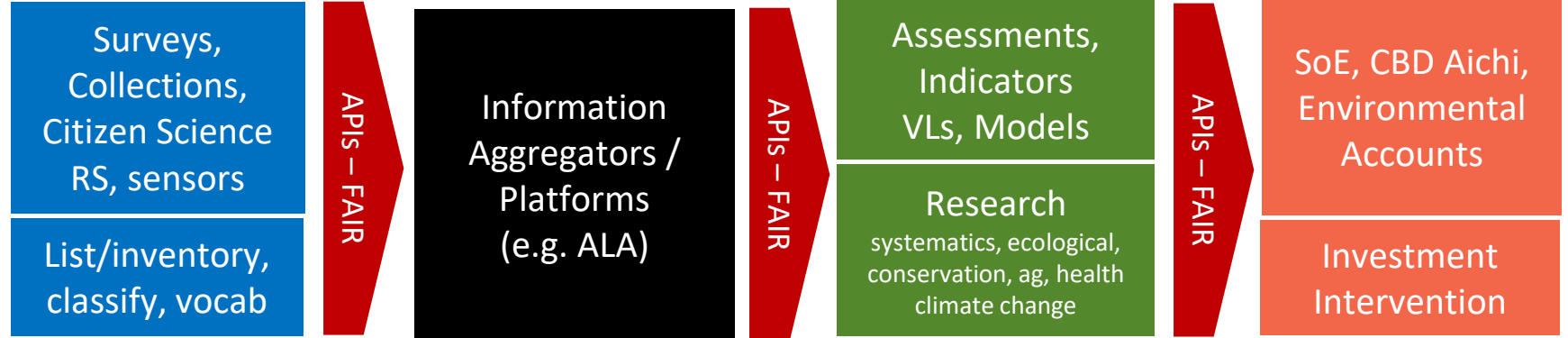
Looking at information / data as part of a “supply chain” to improve the seamless flow of information and therefore deliver strategic outcomes and impact

*flow and feedback*



*different:*

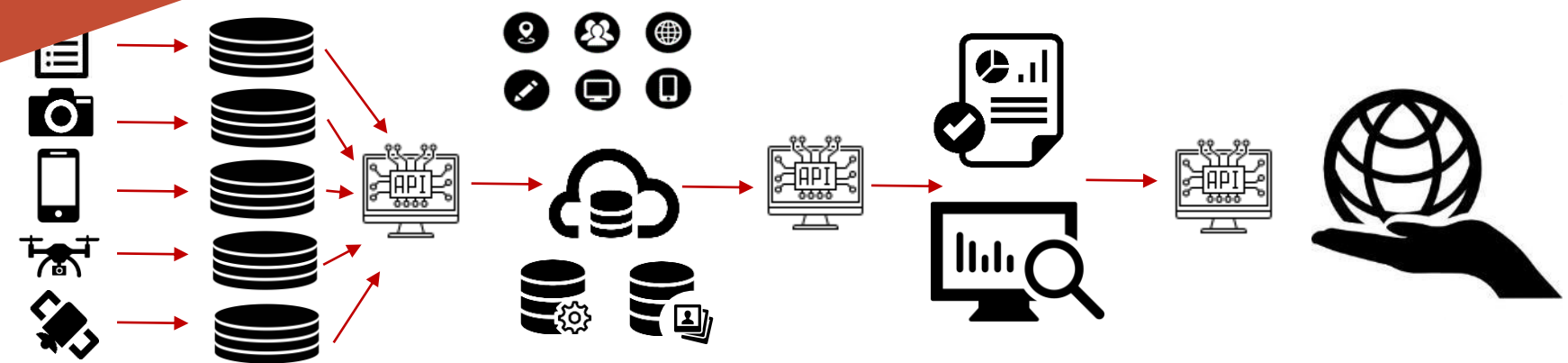
- actors
- drivers
- costs/value
- platforms



Impact – social, environmental, economic

*social architecture*

- *social* - privacy, attitudes, incentives..
- *institutional* – legal, policy, standards...
- *economic* – value of data, business models

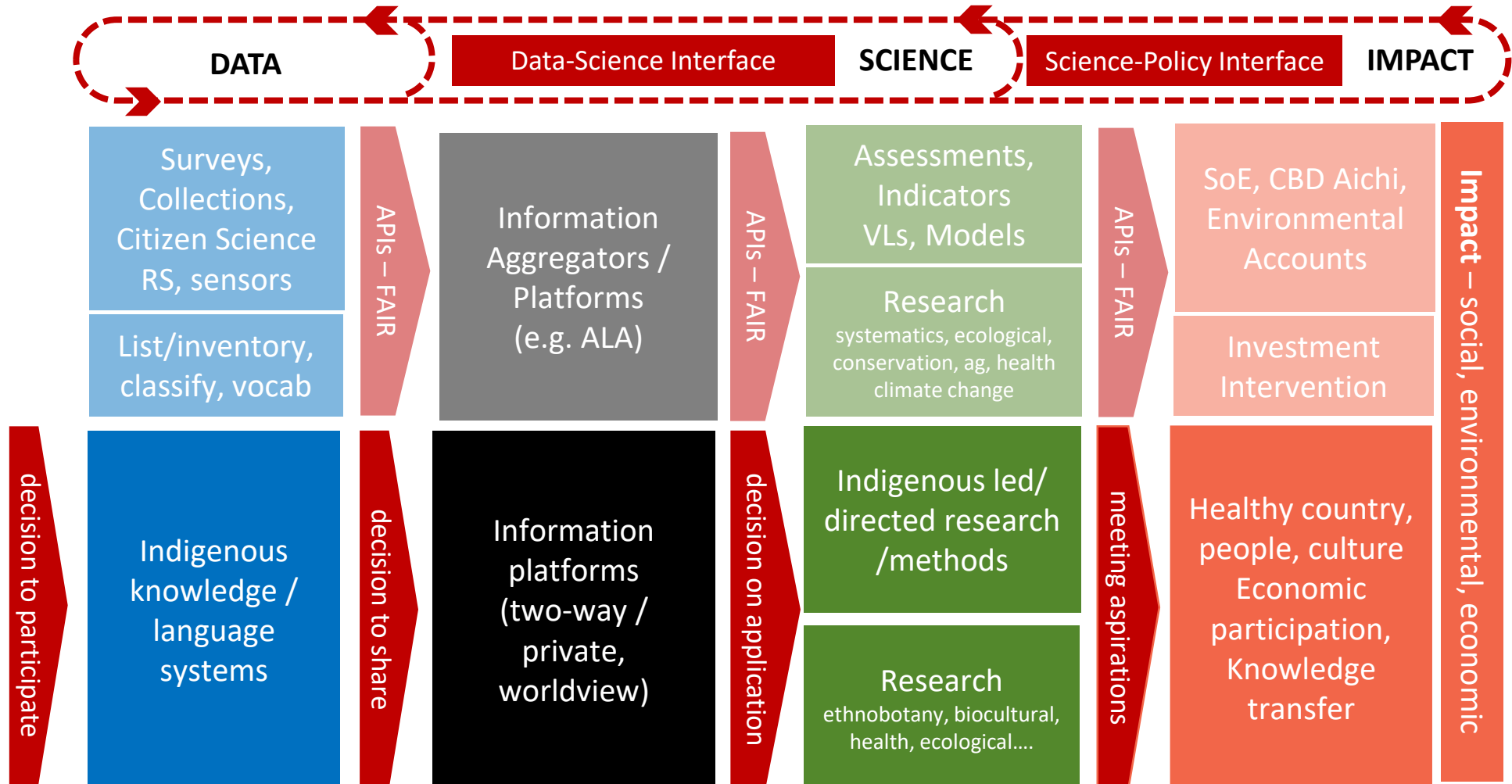




# CONTEXT – information supply chain



If, and how Indigenous knowledge and approaches might fit into the supply chain?

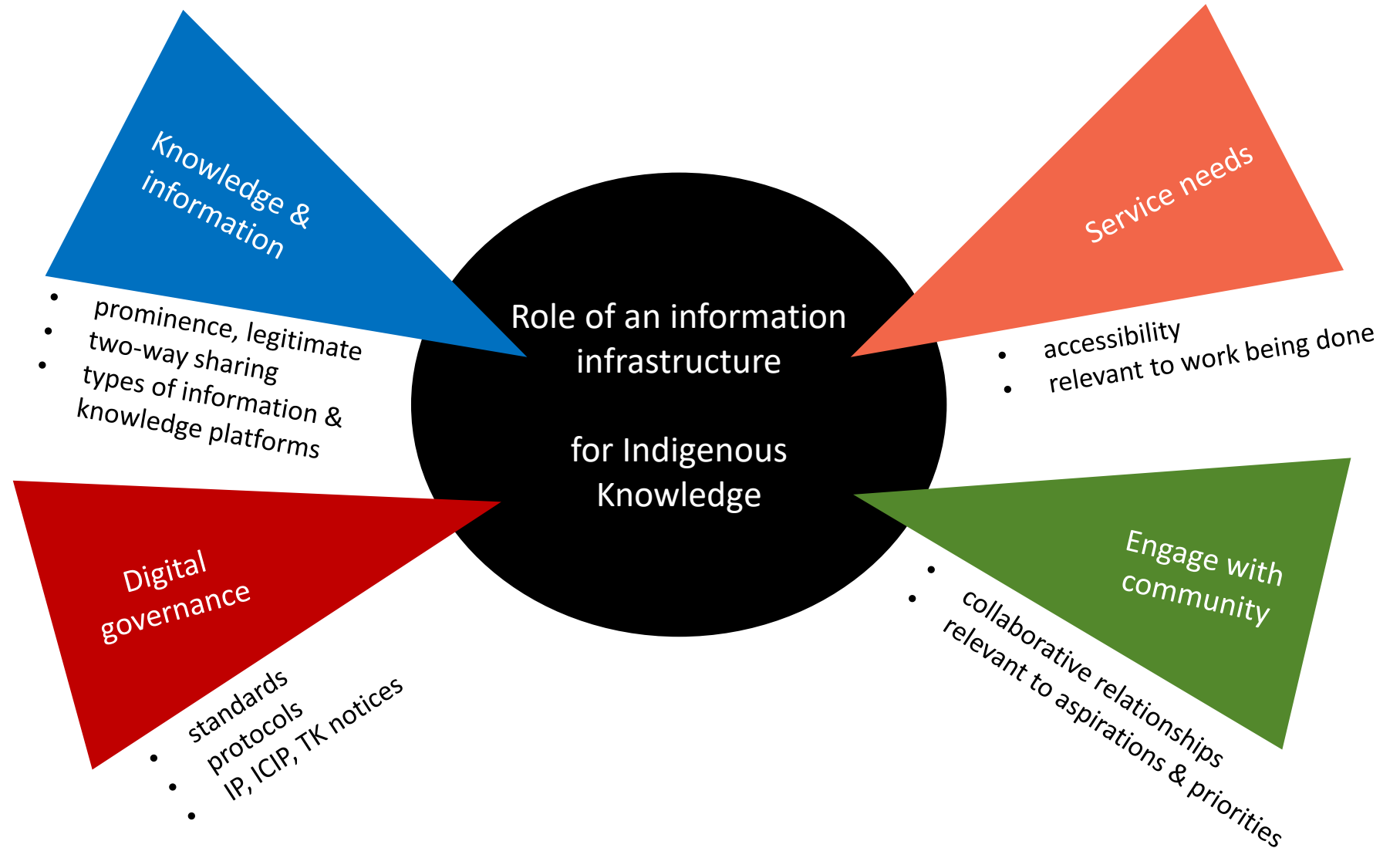


- C.A.R.E**
- *Collective Benefit*
  - *Authority to Control*
  - *Responsibility*
  - *Ethics*

# CONTEXT – responsibility of an infrastructure



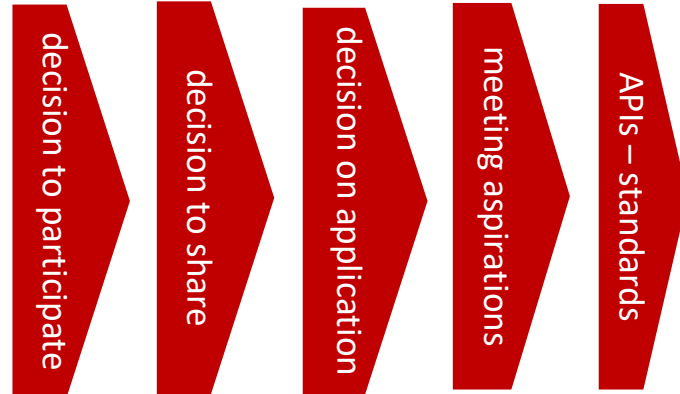
- IEK as a **legitimate body of knowledge** about Australian biodiversity
- **Avoid the perpetuation of colonialism** in the emergence & convergence of digital platforms
- **Responsibility** to address these issues as a national infrastructure



# CONTEXT – ALA IEK intent and workplan




Indigenous ecological knowledge

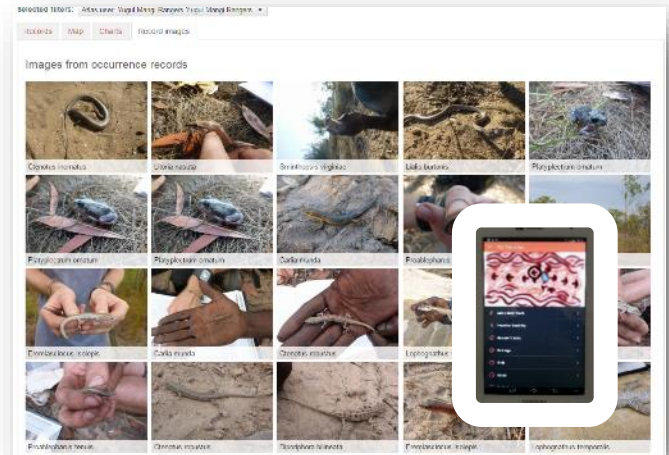


Information platforms  
(two-way/private)

- Yugul Mangi two-way project
- Kamilaroi language names
- Tracks App – CLC
- BioCollect

- Olkola: decision & risk matrix
- Traditional Knowledge Labels
- ICIP principles/protocols
- Language, spatial layers/place

- Prototype information platforms:
- Seasonal calendar
  - Profiles - cross-cultural collections



# CONTEXT – “deep time”



species *Genyornis*

ALA oldest record of  
Emu (record 1770,  
image 1974)

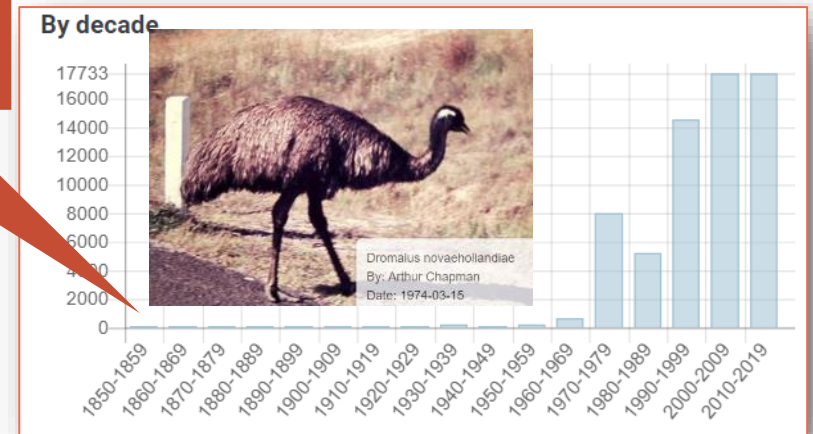
a species “record” from  
~40,000 years ago

28,000-40,000 years (Arnhem Land) ©Ben Gunn



“birth of humanity”  
record (Europe) only  
17,000 years ago

17,000 years (Cave of Lascaux)



240 years (Emu – ALA records)

# CONTEXT – language as a backbone



- The Species Pages give an overview of all the different types of information available in the ALA about a species. Names form the backbone of how ALA works.

Atlas of Living Australia  
ala.org.au

Search the Atlas ...

My profile

Start exploring Search & analyse Participate Learn about the ALA

Home > Australia's Species > Dioscorea: Yam

Plantae / Charophyta / Equisetopsida / Magnoliidae / Liliaceae / Dioscoreales / Dioscoreaceae / Dioscorea

**Dioscorea L.** JSON

**Yam**  
genus Accepted Name authority: APC

Overview Gallery Names Classification Records Literature Sequences Data Partners

Occurrence records map (6,821 records)

Online Resources

- ALA occurrences
- GBIF
- Encyclopaedia of Life
- Biodiversity Heritage Library
- Google search
- Google scholar

Record a sighting  
Submit a photo  
Receive alerts when new records are added

Datasets  
30 datasets have provided data to the ALA for this genus.

**Dioscorea L.**

**Yam**  
genus Accepted Name authority: APC

Overview Gallery Names Classification Records Literature Sequences Data Partners

**Names and sources**

Accepted Name  
Dioscorea L.

Synonym  
Tamus L. synonym  
Dioscorea sect. Opsophyton Ulline heterotypic nom. illeg.

Common Name  
Yam

Language names  
Uhi Maori  
Uwhi Maori  
Uwhikāho Maori

Species names – scientific names

Species names – common names

Language names – Maori names

We are exploring how and where we can show Indigenous language names in the ALA

Common Name	Source
Australian Bustard preferred	• AFD
Wild Turkey	• AFD
Plain Turkey	
Jurlaka Warlpiri traditional knowledge TKS TKF Spring	
Majiyampa Warlpiri traditional knowledge WLA plural	
Some remarks here	
Wardilyka Warlpiri traditional knowledge TK A leg	• The Tracks A
Parrurka Warlpiri traditional knowledge Australia male	• The Tracks A

Mock-up

Are there ways to protect ICIP in language?

# APPROACH

**cultural integrity in:**

- **the research method and engagement**
- **the representation of knowledge systems**

# APPROACH - Cultural Integrity



## Research method & engagement

- Ethical engagement
  - Trust, of individual and institution
- Decision-making
  - Governance
  - Information access to make informed decisions: Data sharing; ownership; control; access; permissions



## Representation of knowledge

- Indigenous Ecological Knowledge
  - Relational, networked
  - (Far) More than species and taxonomy (e.g. songlines; connectedness to place)
  - Huge opportunity, but ontological divide





*There is a small group of us older people still trying to follow the way of the ancestors. We are worried about what young kids are thinking. Kids today are moving with time too fast...too quickly. We need to get all these things documented and kept archived and when the little kids are older they can go back to those things...and know two ways. When they are going to school they are learning 'that' way, and when they are here with us they are learning 'our' way – Patricia Marrfurra McTaggart, Ngan'gi Elder*





McTaggart, Patricia Marrfurra ; Yawulminy, Molly ; Ariuu, Catherine; Daning, Dorothy ; Kamarrama, Kitty ; Warwul, Mercia; Woodward, Emma. Ngan'gi Seasons, Nauiyu – Daly River, Northern Territory, Australia. Darwin. 2009. CSIRO Sustainable Ecosystems

The bark of **Elu** (Mal), **Kerewey** (Mat)  
*Buchanania obovata* is used in a  
preparation for the treatment of skin  
sores and fungal infections.

# MalakMalak and Matngala plant knowledge

DALY RIVER, NORTHERN TERRITORY, AUSTRALIA



**Arimada** – Early rains begin. The north-west sea breeze, Nol, begins to blow.

**Palaty** (Mal) **Kuri** (Mat)  
*Dioscorea bulbifera*. This yam is ready to collect in the wet season. It takes lengthy preparation, soaking in running water and roasting, to make it safe to eat.

**Wulingum** (Mal) **Pindalany** (Mat)  
*Planchonia careya* fruit ready for eating.

**Mungam** *Grewia retusifolia*. Fruit are eaten when they turn brown. The leaves and roots are boiled in water and used to treat diarrhoea.

**Ariwarik** – The monsoon time.

**Munnenput** (Mal) **Matyamaya** (Mat)  
*Flueggea virosa*

**Mungam** *Grewia retusifolia*

**Palaty** (Mal) **Kuri** (Mat)  
*Dioscorea bulbifera*. This yam is ready to dig up when the 'cheeky yam grasshopper' called **Palaty** (Mal) sings out to let you know.

**Din'girri** (Mal), **Bunggarra** (Mat)  
*Syzygium eucalyptoides* produces a sweet fruit, and flowers that attract bees and sugarbag (native bee-hives).

**Diririkwak** – Late wet season when the rains are stopping.

**Nging** *Antidesma ghesaembilla*

**Diririkwak** – Late wet season when the rains are stopping.

**Nimir** (Mal) **Tyambor** (Mat)  
*Dioscorea transversa*. The 'long yam' is highly sought after, often found in jungle patches and dug up during **Kaleykaley**.

**The leaves and pods of Darik** *Acacia auncilliformis* may be rubbed in water to produce a soapy lather for washing. The lather can also be used as a fish poison to stun fish in small pools.

**Wulingum** (Mal) **Pindalany** (Mat)  
*Planchonia careya*. This plant is spiritually and culturally important to MalakMalak and Matngala people.

**Mer** (Mal) **Meriki** (Mat)  
*Brachychiton megaphyllus* pods are burnt before the seeds inside are eaten.

**Punggulerrp** – The wind from the south east, **Dangiti**, begins and the stems of the spear grass dry out and burning can begin.

**Kaleykaley** – The refreshing wind called **Kaleykaley** begins to blow.

**Muntyalk** (Mal) **Keter** (Mat) *Nymphaea macrosperma* has large seed heads that can be roasted or eaten raw. In the past the seeds were collected, dried and kept wrapped in Paperbark in preparation for the wet season when food was short.

**Mer** (Mal) **Meriki** (Mat)  
*Brachychiton megaphyllus* pods are burnt before the seeds inside are eaten.

**Pinyyakper** *Morinda citrifolia* can be chewed to treat colds and flu.

**Yyety** *Cochlospermum fraseri*. The flowers signal that freshwater crocodile eggs are ready to be collected and eaten.

**Yilik** (Mal) **Mirang** (Mat)  
*Nelumbo nucifera*. The seeds are called **Numuru** (Mal) or **Miyangmiyang** (Mat) and can be stored for when food is scarce during the wet season.

**Aridangit** – Early to mid dry season when it can get cold at night-time.

**Muntyalk** (Mal) **Keter** (Mat)  
*Nymphaea macrosperma*

**Bemburrtiyak** *Syzygium suborbiculare*

**Elu** (Mal) **Kerewey** (Mat)  
*Terminalia ferdinandiana*

**Muram muram** (Mal) **Tyangatya** (Mat)  
*Pandanus spiralis*

**Ali** (Mal) **Warwi** (Mat)  
*Ficus racemosa*

**Wom** (Mal) **Bon** (Mat)  
*Vitex glabrata*

**Pulu** (Mal) **Tyerrak** (Mat)  
*Brachystemna globiflorum*

**Elu** (Mal) **Kerewey** (Mat)  
*Buchanania obovata*

**Elu** (Mal) **Kerewey** (Mat)  
*Buchanania obovata*

**Yyety** *Cochlospermum fraseri*. The flowers signal that freshwater crocodile eggs are ready to be collected and eaten.

**Menytyil** (Mal), **Menyyer** (Mat)  
*Barringtonia acutangula* leaves and bark are used as a fish poison, **Taratywolil**, and also to heal skin sores.

**Lemberrengety** (Mal) **Ngarangga** (Mat)  
*Flacourtia territorialis*. A favoured sweet fruit that is eaten when red brown.

**Pundumirri** – Late dry season when it is humid and hot.



# APPROACH - Seasonal calendars

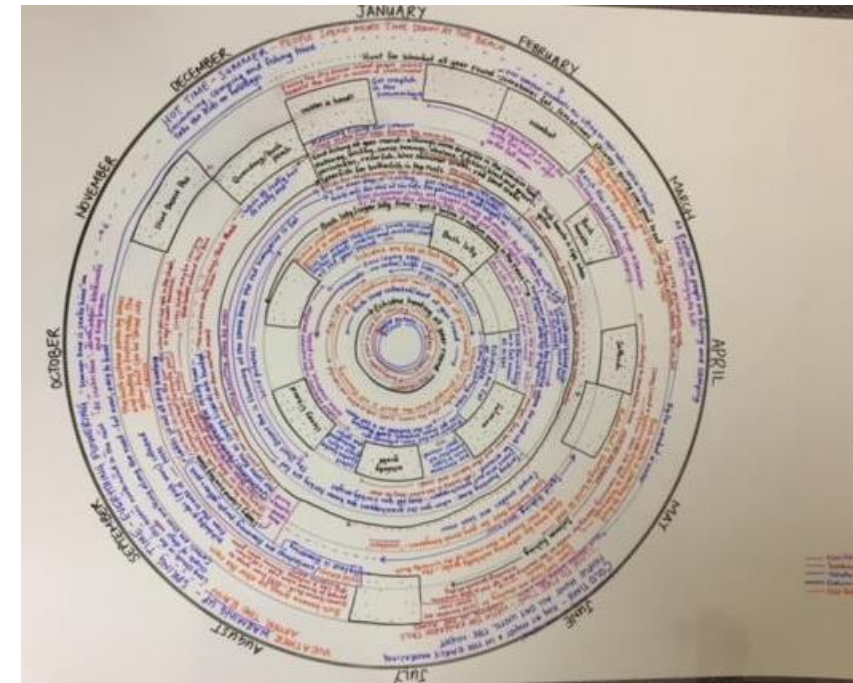


## Seasonal calendars as a tool for communicating IEK

- An intergenerational knowledge sharing tool
- A tool for clearly articulating connection place and value related to attachment
- Facilitates public engagement & appreciation
- Broader promotion of IK system complexity
- Community pride in displaying IEK for others to appreciate

## Limitations to static calendar form

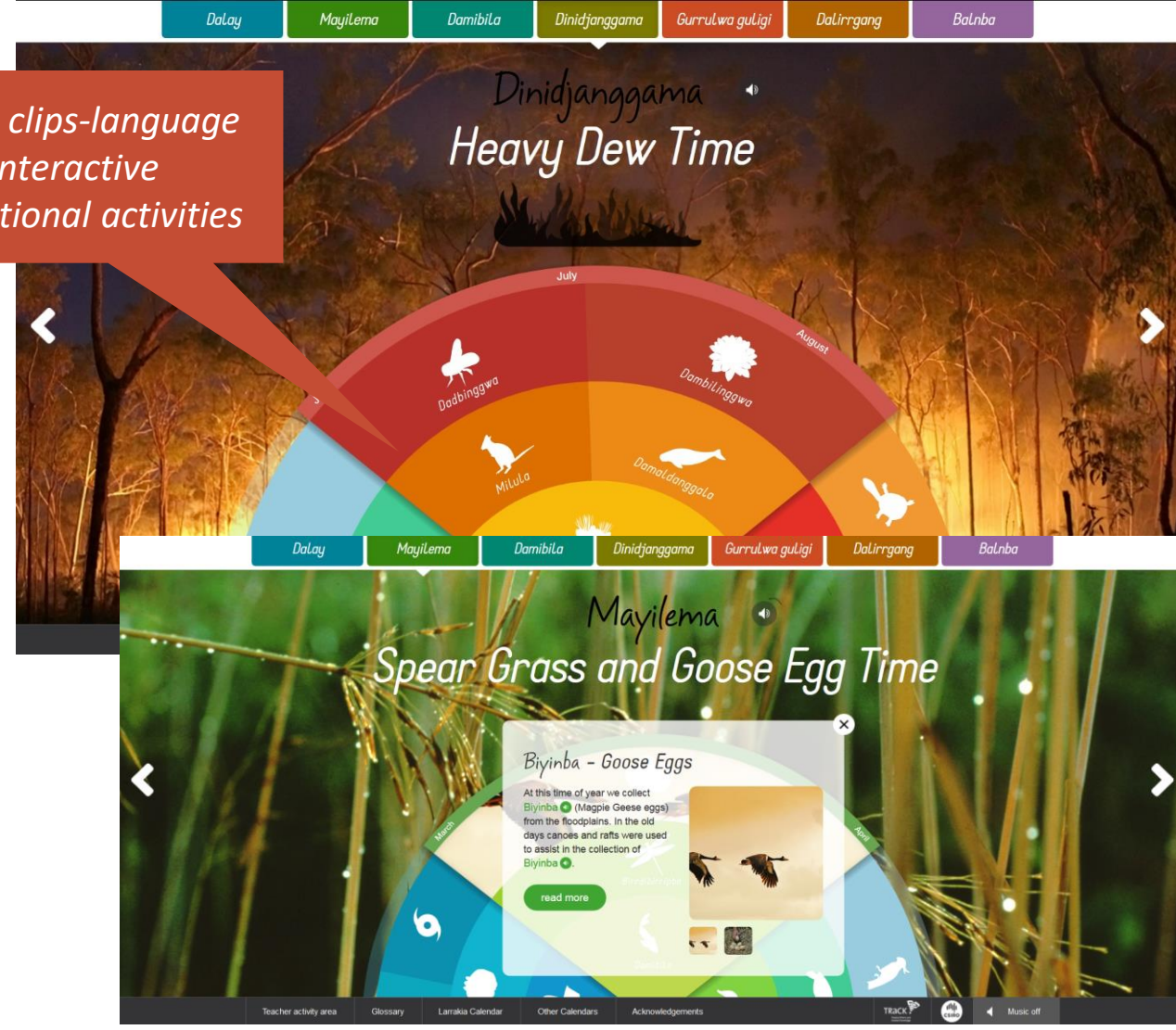
- Content limited by space on the paper
  - It may be inferred all known knowledge is included
  - Limits to build place-based context
- Static nature infers static, unchanging nature of IEK
- Limits to engaging youth



# APPROACH – Indigenous-led digital version



Audio clips-language  
Interactive  
Educational activities



Williams, Lorraine ; Williams, Judith ; Ogden, Maureen ; Risk, Keith ; Risk, Anne; Woodward, Emma. Gulumoerrgin Seasons (calendar): Larrakia, Darwin - Northern Territory. Darwin: CSIRO Ecosystem Sciences; 2012.

<http://Larrakia.csiro.au>

## Trust at the individual level

- Ethical engagement: relationships; participatory/engaged research methods; Indigenous-initiated and led; time-sensitive; FPIC; partnership.

## Trust at the institutional level

- Cultural, or social license; ability of the institution to respond to Indigenous values and needs from the data infrastructure
- Cultural competence; commitment

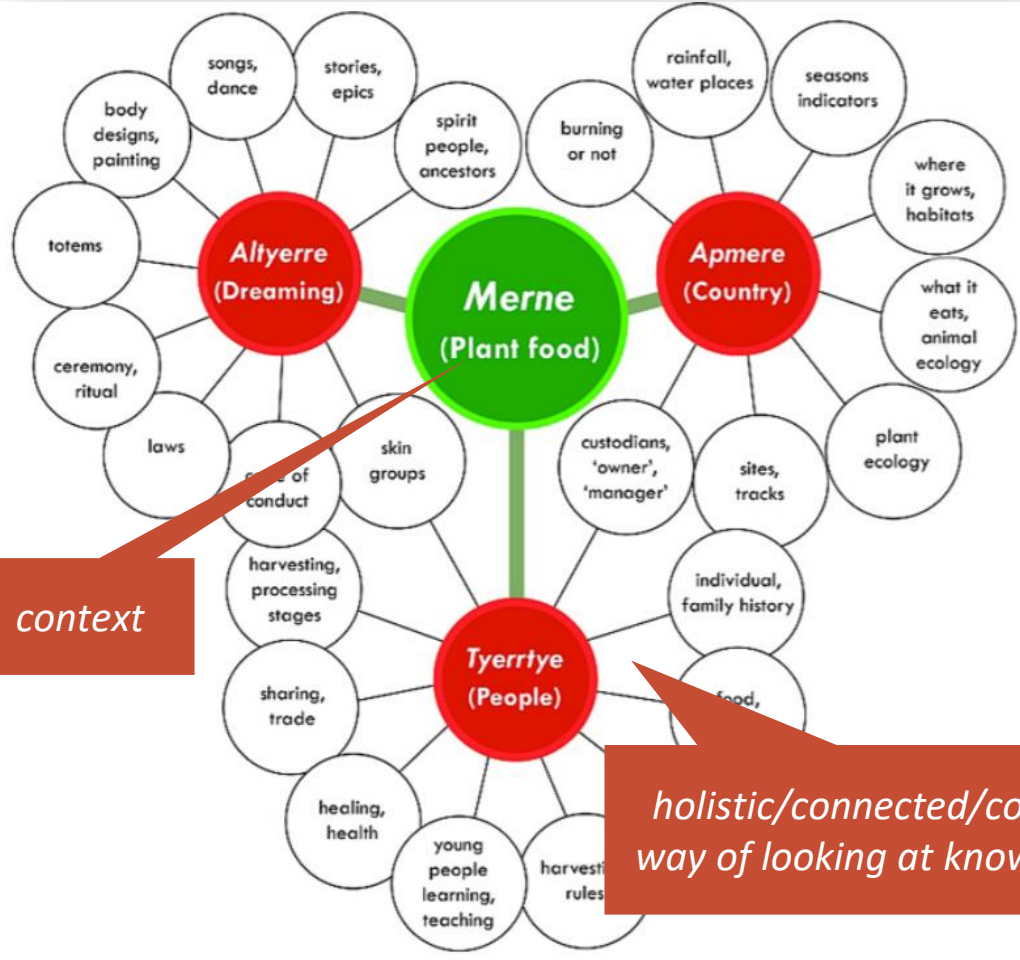
## Governance

- Supporting informed decision-making
- Supplying information: Implications of data sharing/exposure
- Spectrum of data sharing: Retaining ownership; control; access
- Secret/sacred knowledge? Knowledge of commercial interest?
- Access and permissions: Who gets to access what; multi-tiered access?

## Indigenous Ecological Knowledge

- Systems understanding; highly relational
- Complex understanding or relationships between plants, animals, people, ancestors, weather, hydrology, Country ('environmental' and 'metaphysical' aspects intertwined)
- Requires new approach to representing knowledge that is non-taxonomic; not shoe-horning into current platforms

# Worldview & knowledge systems



context

holistic/connected/context way of looking at knowledge

## Yam

genus Accepted Name authority: APC

Overview Gallery Names Classification Records Literature Sequences Data Partners

### Classification

kingdom **Plantae**  
phylum **Charophyta**  
class **Equisetopsida**  
subclass **Magnoliidae**  
superorder **Liliana**  
order **Dioscoreales**  
family **Dioscoreaceae**  
genus **Dioscorea**  
species **Dioscorea alata L.**

linear/taxonomic way of looking at species

seasonal calendars representation of a knowledge system





# APPROACH - Seasonal calendars



## Enacting and teaching IEK – Ngan'gikurrungurr people, Daly River



# APPROACH - Challenges



- ICIP considerations in sharing knowledge
  - Lack of Guidelines; need for practical advice
- Platform useability – digital literacy constraints
- Ontological challenges
  - Main structure of ALA is taxonomic based; significant ontological shift
  - Need to invest in understanding multiple forms/systems of IEK representation to build understanding of data infrastructure requirements
- Ethical obligation – ongoing support; legacy issues?
  - Personal; Institutional

# APPROACH - Opportunities



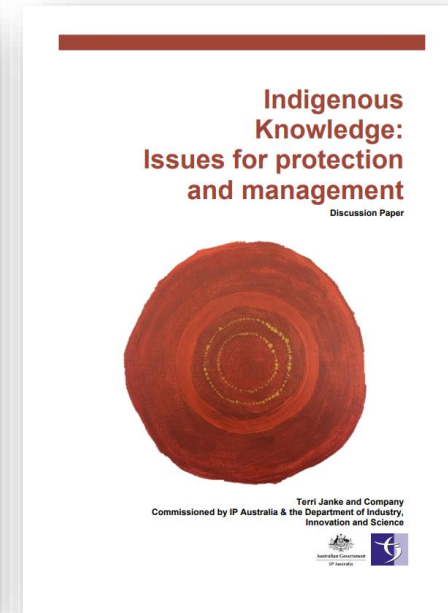
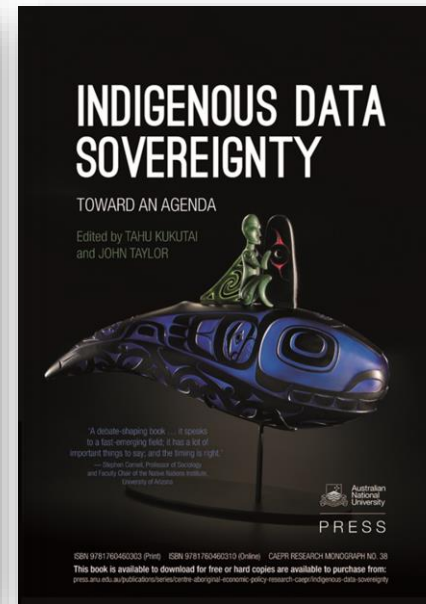
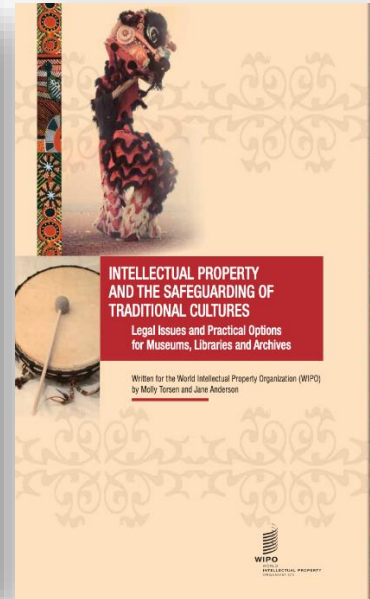
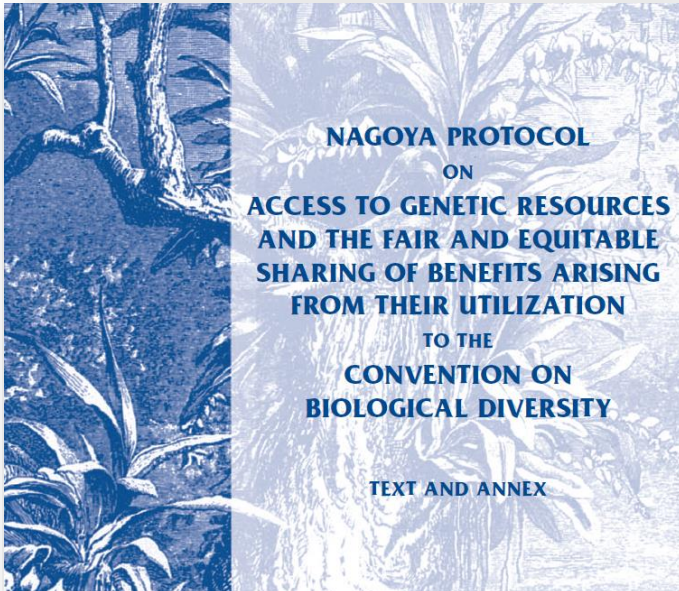
- Indigenous–led digital architecture for IEK
  - Limitless opportunities to demonstrate connectivity between species
  - Knowledge systems represented with cultural integrity
  - IEK connected with representations of people and Country
- Indigenous-created IEK content and management
- Opportunity created
  - for safe keeping of IEK, in forms that will engage other language group members
  - for increased respect and recognition for IEK as contribution to Australian biodiversity

# TOOLS

**Digital governance through:**

- **protocols**
- **practical tools embedded in platforms**

# TOOLS – legal and policy context



What digital **tools** and **practical** mechanisms exist to support the principles coming out of these contexts?



Australian Government  
Australian Bureau of Statistics  
Australian Taxation Office  
Department of Education and Training  
Department of Health  
Department of Human Services  
Department of Social Services

MULTI-AGENCY **DATA INTEGRATION** PROJECT

# TOOLS – digital governance and ICIP protocols



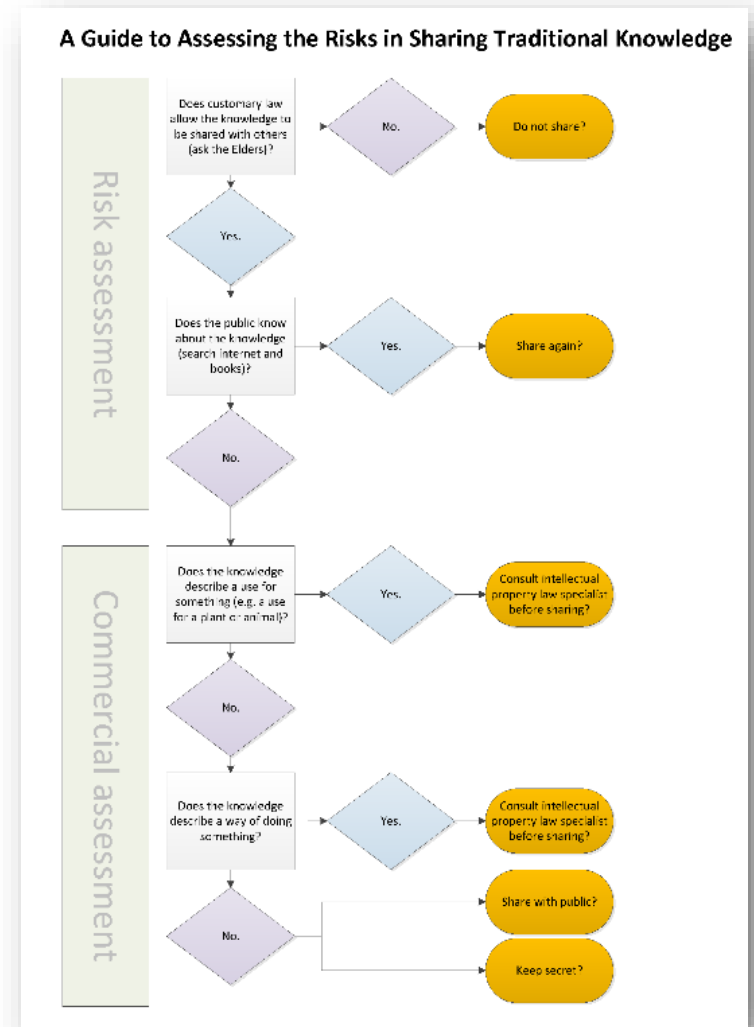
- Indigenous Knowledge Protocols
  - Indigenous Cultural & Intellectual Property (ICIP)
  - worked with Terri Janke & Co
- Approach
  - how to embed in a “open” platform & approach
  - transparency and frameworks for practical pathways & understanding for users
    - e.g. options, visual narrative, ● ● ●
  - the digital, administrative, legal, and contractual responses
    - e.g. website terms & conditions, training, contract terms, workflow



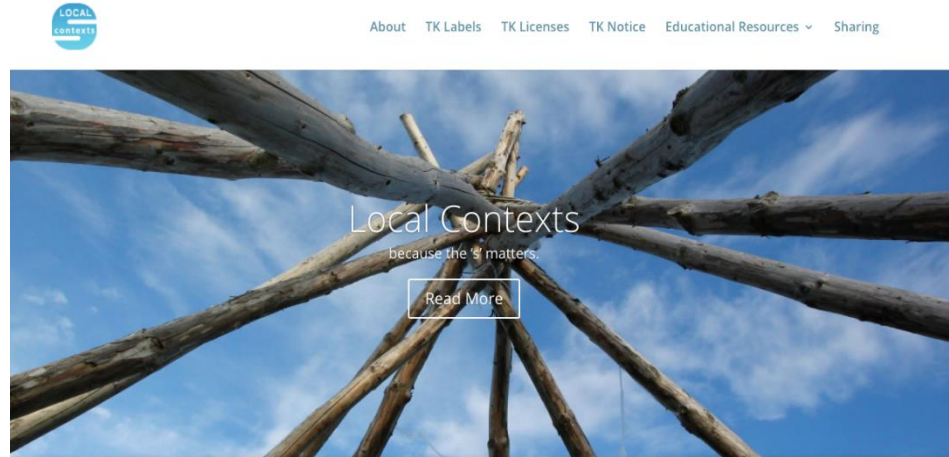
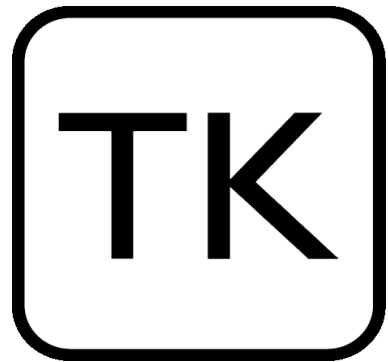
# TOOLS – decision to share & risk



- Work of Olkola & CSIRO
  - completed, needs translation into digital context
  - Profiles to be added - noting contractual limitations
- Decisions to share
  - two-way sharing
  - consent through collaborative decision making
  - operating in western legal framework
- Risks and benefits
  - what are the implications of sharing and sharing in different ways?
  - balancing risk and benefit



# TOOLS – normative approaches & frameworks



**TK LABEL HUB** ABOUT COMMUNITIES

Sharing TK Labels

- 1. Create a community page**  
Create a community profile with a name, description, and featured image. You can also add and manage members in your community account.
- 2. Select and adapt TK Labels**  
Choose from 13 TK Labels, and adapt them with your own cultural names, descriptions, and language.
- 3. Engage with cultural institutions**  
Establish new relationships of reciprocity, and form partnerships with libraries, archives, museums and universities.
- 4. Share and implement TK Labels**  
Share your unique community adapted TK Labels with cultural institutions for implementation in their digital systems.



**TE MANA RARAUNGA**  
Māori Data Sovereignty Network

Concept	Characteristic	Assessment Question	High	Med	Low
Tapu	Level of sensitivity	"How sensitive is the data?"	Red	Yellow	Green
Noa	Level of accessibility	"How accessible should this data be?"	Green	Yellow	Red
Tika	Level of value	"How does the use of this data add value to the community?"	Green	Yellow	Red
Pono	Level of trust	"Will the community support this use of the data?"	Green	Yellow	Red
Mauri	Level of originality	"How unique is the data?"	Red	Yellow	Green
Wairua	Nature of the application	"Is the data being used in the same spirit as its original purpose?"	Green	Yellow	Red
Whakapapa	Level of relationship	"Does the user have an existing relationship with the data?"	Green	Yellow	Red
Pukenga	Level of expertise	"Does the user have the expertise and experience to use data in a culturally appropriate manner?"	Green	Yellow	Red
Kaitiaki	Level of authority	"Will the data be protected from inappropriate use?"	Green	Yellow	Red
Wananga	Level of responsibility	"Does the institution have the necessary infrastructure to ensure the use of the data in a culturally appropriate and ethical manner?"	Green	Yellow	Red

**Stats NZ** Tāwhiriwhiri

## IDI TIKANGA FRAMEWORK

<b>Safe people</b> Researchers can be trusted to use data appropriately	<b>Pūkenga</b> Researchers have experience researching Te Ao Māori topics	<b>Whakapapa</b> Researchers have existing relationships with the communities the data comes from (2pts)	<b>Scores /4</b> Pūkenga = X/2 Whakapapa = X/2
<b>Safe Projects</b> The project has a statistical purpose and is in the public interest	<b>Pono</b> Level of accountability to community of research is explained (3pts)	<b>Tika</b> Use of data will add value to Māori and improve outcomes for Māori and NZ (3pts)	<b>Scores /6</b> Pono = X/3 Tika = X/3
<b>Safe Settings</b> Ensuring the data is secure and preventing unauthorised access to the data	<b>Kaitiaki</b> Decision-makers of the project are identified and Māori are involved in decision-making (5pts)	<b>Wānanga</b> Institutions have established systems, policies and procedures to ensure data is used in culturally appropriate and ethical ways (5pts)	<b>Scores /10</b> Kaitiaki = X/5 Wānanga = X/5
<b>Safe Data</b> Personal information is not identified	<b>Wairua</b> Māori community objectives align with project research objectives (5pts)	<b>Mauri</b> Level of transformation of the data from its original collection purpose is explained (5pts)	<b>Scores /10</b> Wairua = X/5 Mauri = X/5
<b>Safe Output</b> Stats NZ results do not contain identifying results. Outputs must be confidentialised.	<b>Noa</b> Accessibility of data and awareness of the impact on Māori (5pts)	<b>Tapu</b> Sensitivities in the use of data are identified including privacy issues for individuals and communities (5pts)	<b>Scores /10</b> Noa = X/5 Tapu = X/5



# TOOLS – Traditional knowledge labels



How to **embed** ICIP principles and protocols in a digital platform – e.g. metadata

**supporting** the recognition & visibility of Indigenous ecological knowledge through the **co-development** of knowledge labels

**ensuring** more equitable and culturally respectful terms for the sharing of IEK



TK Family (TK F)



TK Seasonal (TK S)



TK Outreach (TK O)



TK Verified (TK V)



TK Attribution (TK A)



TK Community use Only (TK CO)



TK Secret / Sacred (TK SS)



TK Women General (TK WG)



TK Women Restricted (TK WR)



TK Men General (TK MG)



TK Men Restricted (TK MR)



TK Non-Commercial (TK NC)



TK Commercial (TK C)



TK Community Voice (TK CV)



TK Culturally Sensitive (TK CS)



## Traditional Knowledge Label: Outreach

**S'IWES** (literally education, teachings)

This website is intended to share who we are as Sq'ewlets people, and particularly to educate. The outreach label means 'educating' and 'teaching' in our language, s'iwes. We ask that outsiders respect our culture by not using the content out of context. If you use content on this website, please be respectful. We also encourage you to contact our Band to learn more about us and to create opportunities to learn more about us and our culture and history.



The free, mobile, and open source platform built with indigenous communities to manage and share digital cultural heritage.

Mukurtu (MOOK-oo-too) is a grassroots project aiming to empower communities to manage, share, and exchange their digital heritage in culturally relevant and ethically-minded ways. We are committed to maintaining an open, community-driven approach to Mukurtu's continued development. Our first priority is to help build a platform that fosters relationships of respect and trust.

Jane Anderson – Local Contexts / NYU  
Kim Christen – Local Contexts/Mukurtu

# TOOLS – Biocultural labels



## • Developing biocultural labels

- puts data in **context**
- makes **visible provenance** and the ethics/consents in collection
- sets out **mutually agreed** terms
- identifies possibilities for **benefit-sharing**
- **clarifies** data availability and future use
- **connects** data to people, to environments and to relationships over time

Jane Anderson – Local Contexts / NYU  
Maui Hudson – University of Waikato



for example:

- attribution
- open to commercialisation
- verified
- open to collaboration
- multiple communities

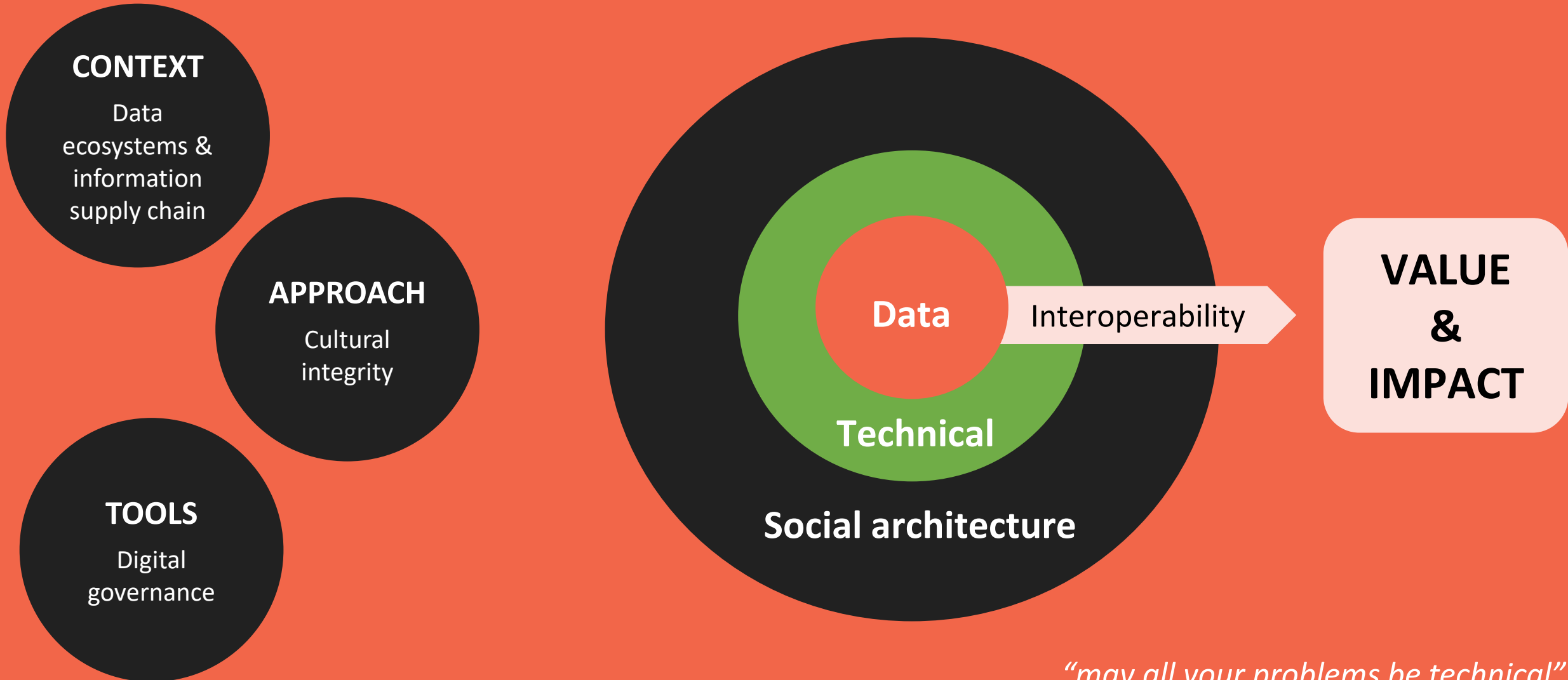


for example:

- Indigenous origin notice
- TK notice
- open to collaborate
- attribution incomplete
- Nagoya compliance

Nagoya Expectations	Biocultural Label
Prior Informed Consent	Consent
Mutually Agreed Terms	Community support, Attribution, Open to Commercialisation, Verified
Certified Compliance	<i>Nagoya Compliant</i>

# So much more to do & work together



*“may all your problems be technical”*



# Thank you

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