A framework for Communicating and Assessing Readiness Levels (**CARL**) for REDD+ methods and tools

CARL4REDD+

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Objectives of this morning session

- Present the rationale of the CARL framework
- Gain interest of R&D groups to report their research within this framework
- Refine the current version of the CARL framework

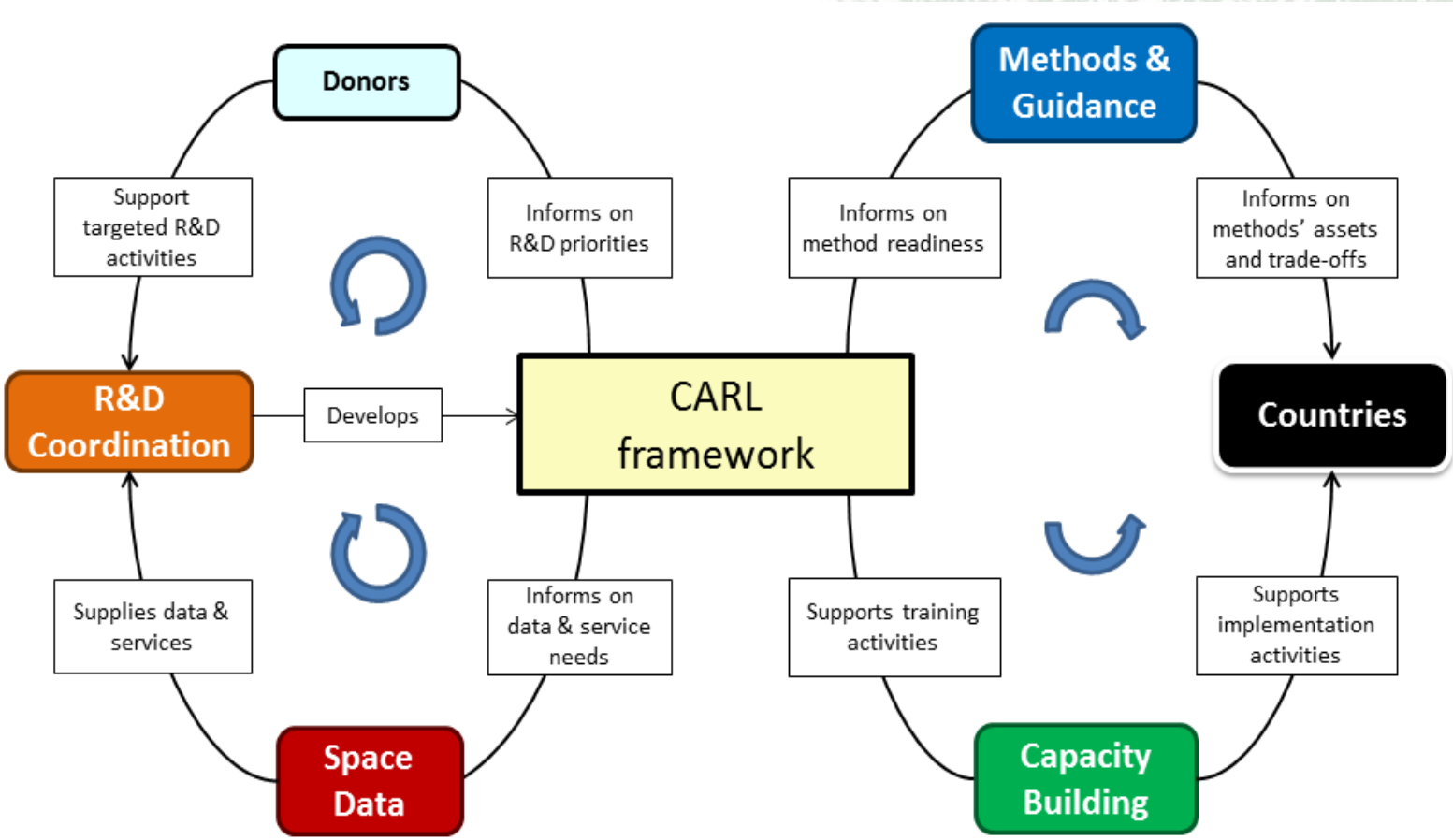
Background to CARL Framework

- Technical Readiness Levels (TRL) originally developed by NASA in 80s, and widely used and adapted as an indicator of the development status of technologies.
- GFOI aims to utilise the TRLs concept to assess and communicate operational status of technologies/ methods/ tools/ data sources related to REDD+ MRV.
- The proposed framework is called the Communication and Assessment of Readiness Levels (**CARL**).

Rationale of the CARL Framework

- A mechanism for researchers to manage/prioritise their R&D activity and communicate the contribution of their work to operational MRV.
- R&D Coordination component can encourage formulation of targeted research calls to meet specific R&D gaps and fund promising (early and mature stage) research.
- CARL framework would allow donor/partner agencies to prioritise investment in high priority R&D.
- Allow countries to choose appropriate technologies/ tools/ methods tailored to their needs.

Rationale of CARL Framework



The CARL framework

CARL		Definition	Supporting information	Practicalities
1	Research	Basic principles observed and technology concept formulated.	Lowest level of readiness. Scientific research begins to be translated into applied research and development (R&D).	Applications are speculative, and there may be no proof or detailed analysis to support the assumptions. Published research exists that identifies the principles that underlie the technology. Promising case studies exist.
2		Analytical and experimental function (calibration) and/or proof of concept (validation).	Active R&D is initiated. This includes analytical and laboratory studies to measure parameters of interest.	Method still needs to be tested as repeatable or applicable in the REDD+ MRV context. Validation data may not be available.
3	Pre-operational	Demonstration in small-scale environment.	The basic technological components are integrated with reasonably realistic supporting elements so they can be tested in a small-scale environment.	End-to-end processing demonstrated. Data processing methods have been documented in peer review publications. Methods have been assessed for applicability in different forest monitoring contexts.
4		Demonstration in a larger-scale environment.	Representative model or prototype method (near the desired performance), which is well beyond that of level 3, is tested in a larger-scale environment.	Processing workflows and methods demonstrated in large scale processing systems or national programs. Basic data may not necessarily yet be available for routine monitoring.
5	Operational	Demonstration in an operational environment (national level).	Represents the end of true method development. Technology/method has been proven to work in its final form. Application of the technology/method in its final form with at least one MRV cycle completed.	Product/technology/method fits within a context or system, optimised to meet monitoring requirements with documented uncertainties. Processing workflows and methods are robust and repeatable. Methods are demonstrated to be applicable in forest monitoring contexts. Documented peer reviewed guidance is available. Core data is available for monitoring at relevant spatial and temporal resolutions, and scales. Includes a clear pathway for continuous improvement.
6		Actual technology proven through successful use in operational environments.	Application of the technology/method in its final form with at least two MRV cycle completed.	Method implemented in country(ies) as part of national environmental and forest monitoring programs. TTE Technical Assessment or Technical Analysis process, or equivalent, completed successfully. Advantages and trade-offs of the method are well documented, notably in terms of adequacy, technical complexity, performance, and costs. Includes a clear pathway for continuous improvement.

The CARL framework: guidance

CARL	Methods	Availability of Data	Application Scale
1	Pioneering and R&D development of new methods	Data acquisition concept is developed	Work mostly done in research environment
2	Method is demonstrated and validated and scientifically published	Experimental data for small-scale R&D are available	Work mostly done in research environment
3	Prototype is available and used by different experts, sources of uncertainties are known and can be quantified	Experimental data for small-scale R&D are available	Work mostly done in research environment
4	Prototype is available and used by different experts, sources of uncertainties are known and can be quantified	Data is available for large area/national demonstrations in different tropical country conditions	Training materials/tutorials and guidance documents developed and tested in countries
5	Method is available to be implemented by countries. (Meets TACCC criteria*.	Data are acquired in consistent and sustainable manner for routine national monitoring	Active implementation and capacity in mandated country monitoring organizations
6	Method is available to be implemented by countries. Meets TACCC criteria*.	Data are acquired in consistent and sustainable manner for routine national monitoring	Data/method used in reporting by countries

*Transparency, Accuracy, Consistency and Completeness. Comparability remains for UNFCCC reporting but is not included in REDD+ technical assessments

CARL framework: assets and limits

Advantages and strengths:

- establishes common understanding of technology/ method status,
- Informs on continuous improvement planning, prioritising R&D activities,
- makes decisions concerning transition of technology,
- prioritising content of capacity building activities,
- making decisions concerning technology funding, and
- assessing risk of adoption.

Limitations and external considerations:

- readiness does not necessarily fit with appropriateness/ maturity,
- CARL do not cater for unique national circumstances,
- assessed technologies/methods may not consider entire operational context of a complete MRV system, only components that may form a part of the system

Case Study

Forest Structural Classification and Above Ground Biomass Estimation for Australia

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CARL Framework Implementation

CARL framework

- CARL Level 4 - Pre-operational
- Table 1:
  - Demonstration in a larger-scale environment.
  - Representative model or prototype method (near the desired performance), which is well beyond that of level 3, is tested in a larger-scale environment.
  - End-to-end processing demonstrated.
  - Data processing methods have been (partially documented) in peer review publications (*submission for December 2016*).
  - Methods have NOT been assessed for applicability in different forest monitoring contexts.
- Table 2
  - Prototype is available and used by different (1-2) experts, sources of uncertainties are known and can be quantified.
  - Data are available for large area/national demonstrations in different tropical country conditions
  - Work mostly done in research environment
  - Training materials/tutorials and guidance documents NOT YET developed NOR tested in countries

CARL Framework Implementation

- Contribution to CARL
  - Provides national methods for:
    - Quantifying vegetation height and cover
    - Generating open data bases of structural measures and biomass.
    - Discriminating and mapping relative stages of degradation and regeneration.
- CARL Framework (Version 1) Feedback
  - Assets
    - Capacity to understand/undertake programming in development or implement programed software.
    - Capacity to integrate data from different sources
    - Understanding of the information content of different data sources
    - A strong and understandable validation dataset to quantify uncertainty.
  - Limitations
    - Historical data (e.g., ICESAT)
    - Relatively complex algorithms in combination.
  - Suggested modifications
    - Methods that work well in some countries (e.g., Australia), including non-tropical, but not applied yet to tropical countries.