Sustainability Based Guidance for a 'Decision Framework for Assessing Options for the Disposal and Treatment of Contaminated Dredged Material' in England and Wales

Chris Vivian **and Ruth Edwards, Cefas, UK**
Paul Bardos, r3 Environmental Technology Ltd, UK
Sabine E. Apitz, SEA Environmental Decisions Ltd, UK

Overview

- The project objective was to provide guidance to the UK Marine Management Organisation (MMO) for a draft tiered framework for use by applicants who have to select management alternatives for contaminated dredged sediments
- This project covered the early tiers – the identification of reasonable management alternatives – and the associated sustainability assessment
- This presentation will introduce the guidance on the early tiers and the sustainability assessment

Dredged Material Management

- Based on OSPAR and London Convention/Protocol Dredged Material guidance documents
- Sediment is considered a valuable resource, and as much as possible should be used beneficially
- If not useable, the goal is to cost-effectively and safely dispose at sea
- But, contaminants in sediments mean that not all sediments can be used or disposed of at sea
- In the short term, this means that there is a need to select and obtain permits for **alternative management approaches**
- In the longer term, **contaminant sources should be controlled** so that sediments can be re-used or disposed of without control

Addressing UK-specific priorities

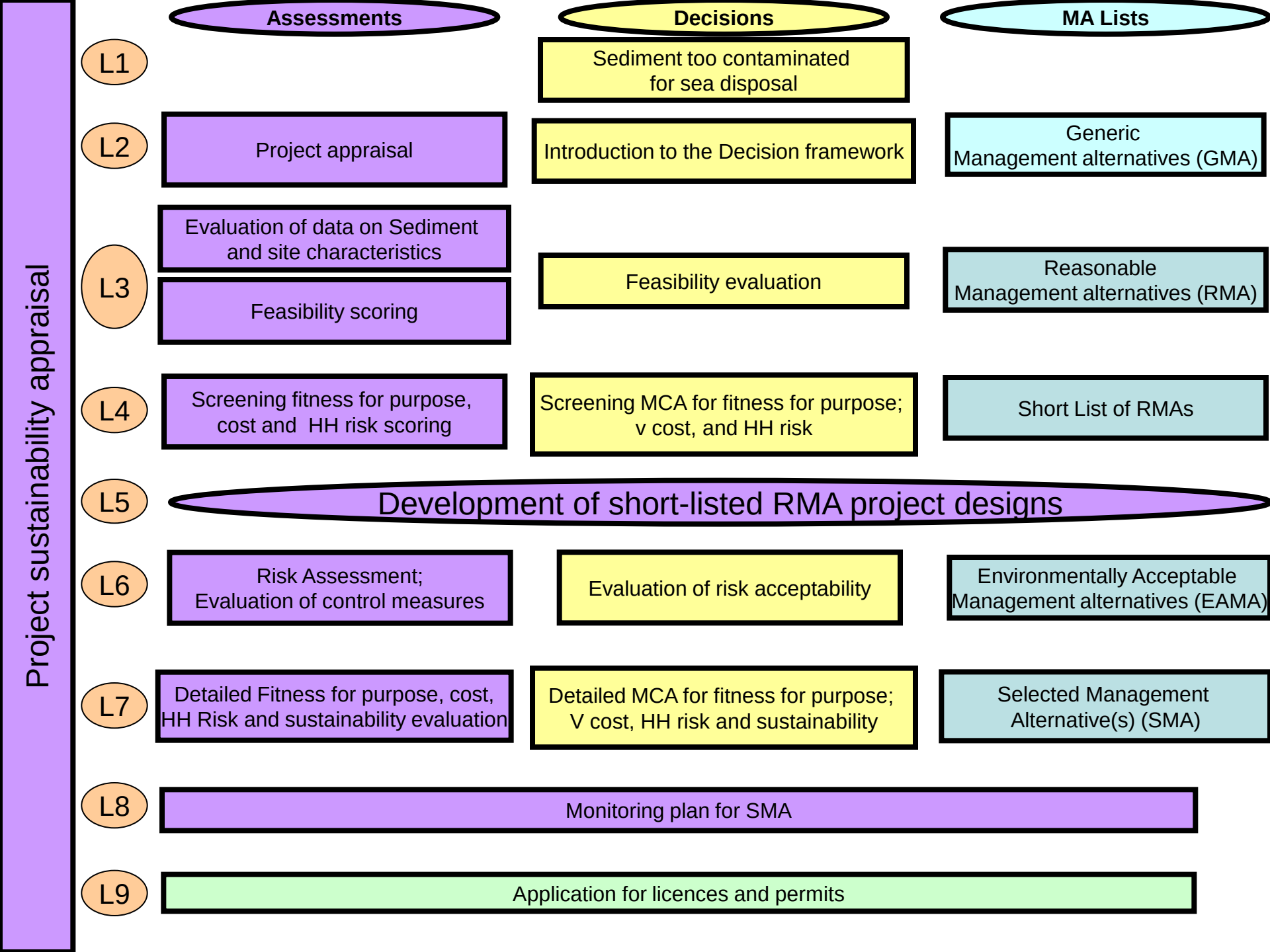
- The challenge is developing guidance and a framework which is not only technically correct, but which also focuses on UK-specific decision drivers
- MMO requirements
  - An initial screen to rule out “unreasonable options”
  - An MCA approach to ranking “effectiveness”
  - A separate ranking considering “effectiveness, cost and human health risk”
  - A later, detailed ranking of short-listed options
  - The development of monitoring strategies for selected option
- Criteria and indicators needed to be linked to these priorities

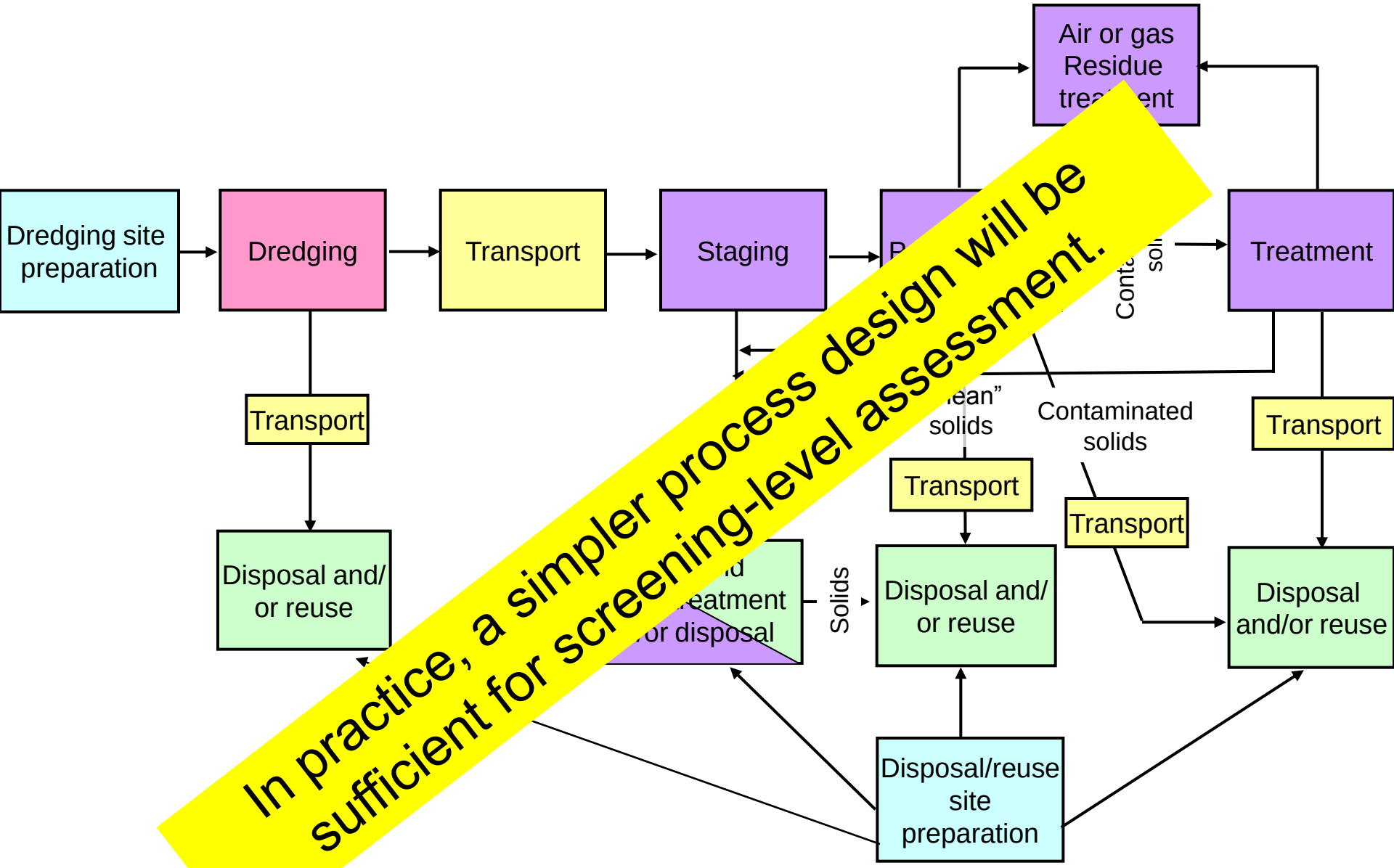
A range of Management Approaches (MAs) for Contaminated Dredged Material (CDM) should be evaluated in a comparative assessment

- There is not one correct answer, just an attempt to quantify and balance risks, benefits and objectives
  - All options have risks
  - All approaches and models must address uncertainty
  - Option selection involves trade-offs; these should be explicit
- Comparative approaches must combine disparate lines of evidence and decision criteria into transparent frameworks

Approach

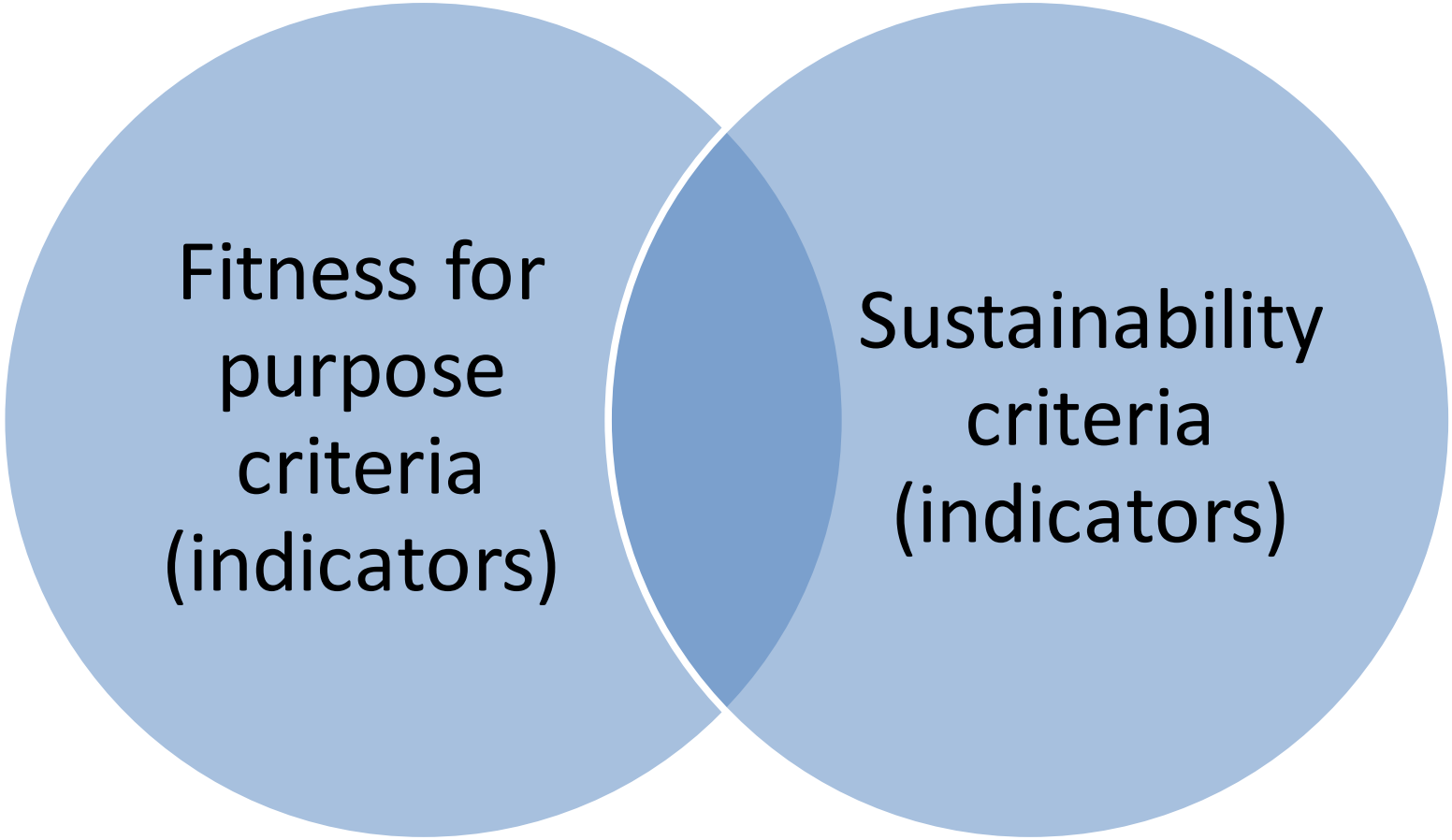
- A DM decision process involves a number of assessments and decisions, of differing complexity
- The challenge is to avoid the expense of detailed evaluation of inappropriate options, whilst ensuring that potentially appropriate options are not eliminated too early
- The framework developed is tiered to minimize costs and improve efficiency.
  - Designed to specify an appropriate minimum level of information required for each level of decision-making
  - Applies qualitative criteria to screen out the majority of options that may not be reasonable, cost-effective or feasible
  - Uncertainties are defined in each tier
  - More detailed assessments are applied to reduce the uncertainties and better characterize risks, costs and trade-offs for remaining options.
  - This optimises decision-making effort and use of available information resources


Project sustainability appraisal
Assessments
Decisions
MA Lists
L1
Sediment too contaminated for sea disposal
L2
Project appraisal
Introduction to the Decision framework
Generic Management alternatives (GMA)
L3
Evaluation of data on Sediment and site characteristics
Feasibility scoring
Feasibility evaluation
Reasonable Management alternatives (RMA)
L4
Screening fitness for purpose, cost and HH risk scoring
Screening MCA for fitness for purpose; v cost, and HH risk
Short List of RMAs
L5
Development of short-listed RMA project designs
L6
Risk Assessment; Evaluation of control measures
Evaluation of risk acceptability
Environmentally Acceptable Management alternatives (EAMA)
L7
Detailed Fitness for purpose, cost, HH Risk and sustainability evaluation
Detailed MCA for fitness for purpose; V cost, HH risk and sustainability
Selected Management Alternative(s) (SMA)
L8
Monitoring plan for SMA
L9
Application for licences and permits



Generic flow chart illustrating potential steps involved in the dredging and management of CDM. Not all MAs will have all steps, but the specific steps involved will have implications for risk, cost, space requirements and throughput.

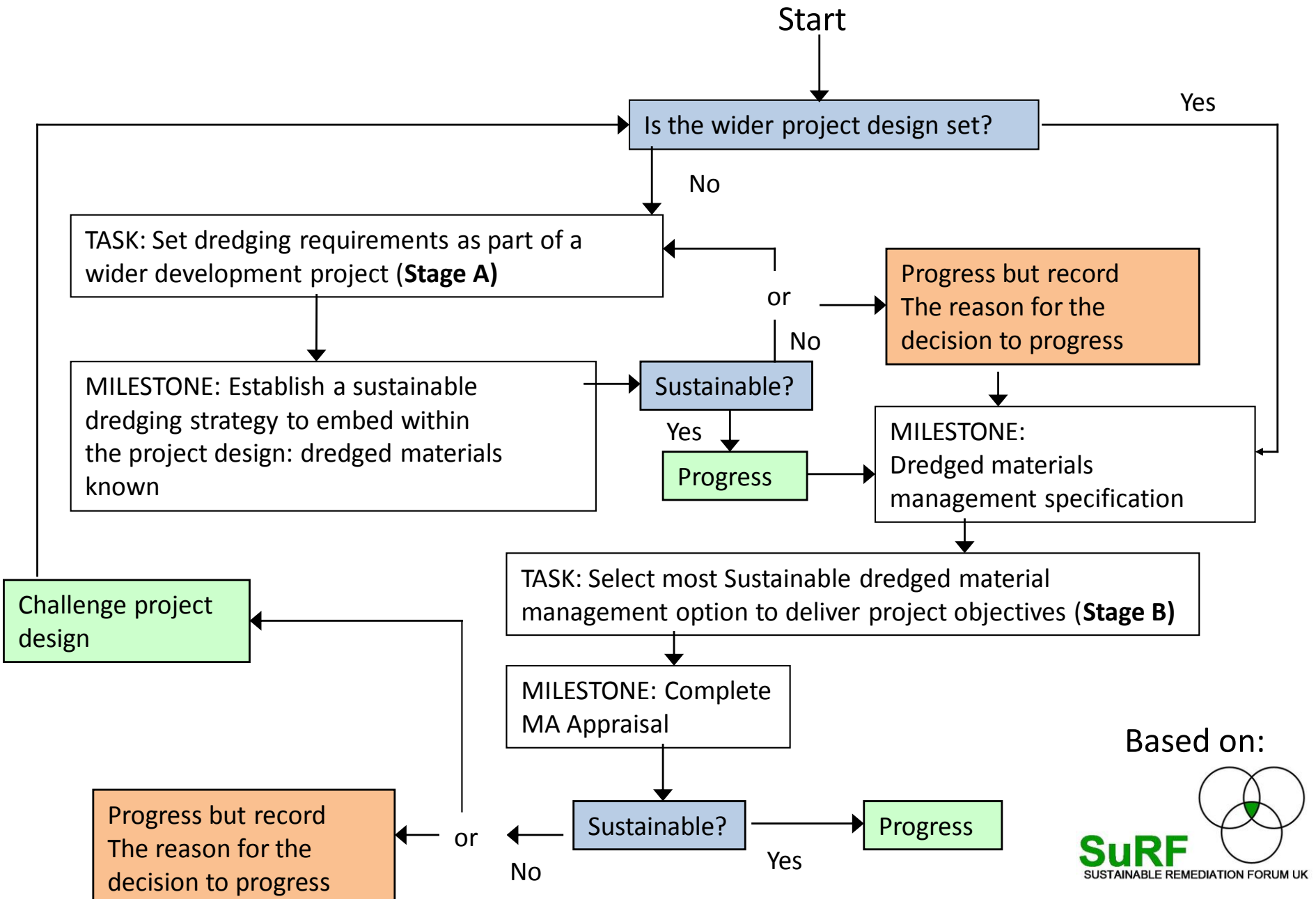
Criteria in decision making encompasses fitness for purpose (will a dredged material management option adequately fulfill the *technical* requirements for it) and sustainability criteria. These overlap but are not exactly the same, and may be best managed as separate decision elements



Sustainability Assessment in Framework Tiers/Levels

Level	Sustainability assessment activity	Notes
Levels 1 -3	Development of GMAs	Refining MAs based on sustainability considerations. Collating information.
Level 4	Evaluation of GMAs	*Qualitative* sustainability assessment (participatory approach suggested)
Ultimately at the close of Level 4, a qualitative view of sustainability, and any uncertainties associated with it, is *summarised* as an initial basis for decision making across the GMAs being scrutinised.		
Level 5	(Further) Development of short-listed RMAs	Refining RMAs based on sustainability considerations. Collating detailed information for subsequent evaluation.
Levels 6-7	Evaluation of RMA project designs	More detailed analysis. This might encompass improving the evidence base for sustainability criteria where there is uncertainty and/or controversy during initial qualitative assessment; or developing a cost benefit analysis or some other quantitative tool using the framework for sustainability assessment developed by the qualitative stage.
Level 8	Evaluation of SMA	Agreement of a verification scheme and monitoring plan

Framework for CDM Management Sustainability Assessment



Sustainability Assessment Indicators - Environmental

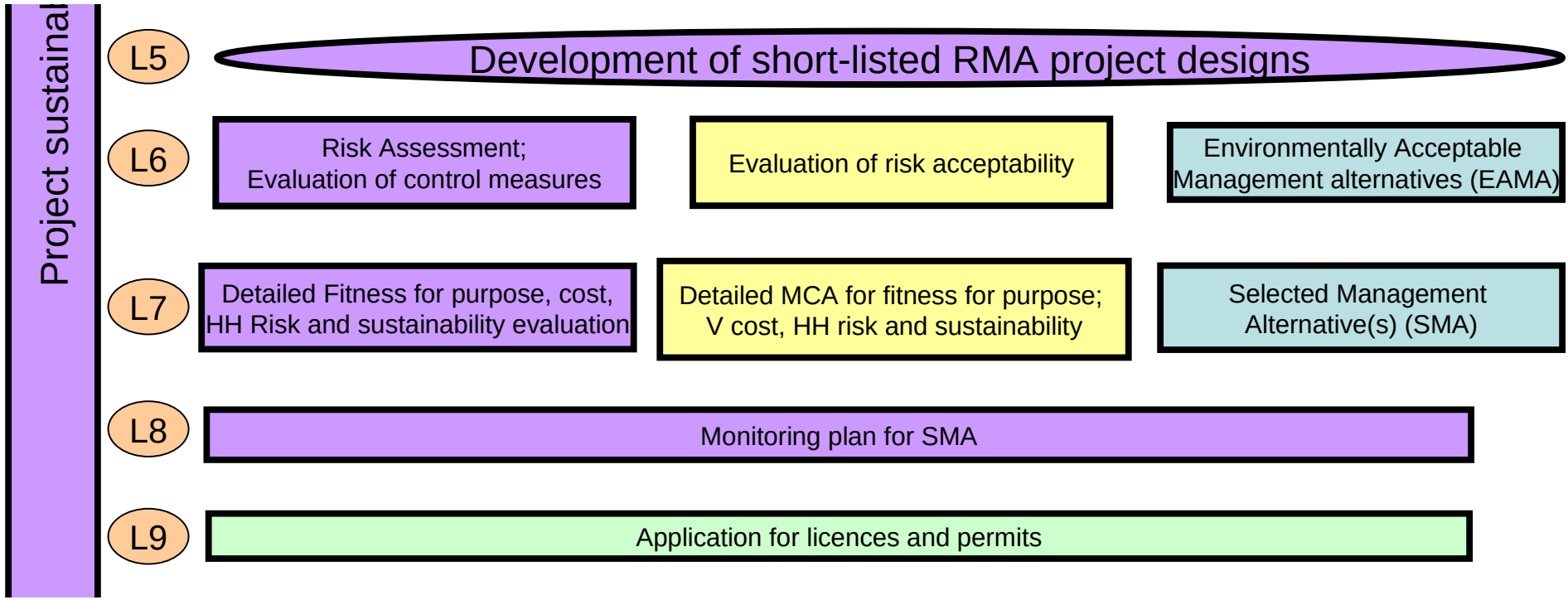
ELEMENT	CATEGORY	ISSUES THAT INDICATORS MIGHT NEED TO BE CONSIDERED
Environmental 1	**Impacts on air**	Emissions that may affect climate change or air quality, such as greenhouse gases (e.g. CO2, CH4, N2O), NOX, SOX, particulates (especially PM5 and PM10), O3, VOCs, ozone-depleting substances, etc. *(Note: Does not include any odorous effects, bioaerosols, allergens or dust, as these are included in 'Social 3: Impacts on neighbourhoods or regions'.)*
Environmental 2	**Impacts on sediment, soil, porewater and ground conditions**	Changes in physical, chemical, biological sediment or soil condition that affects the functions or services provided by sediments and soils. May include sediment/soil quality (chemistry), water filtration and purification processes, contaminant attenuation, sediment/soil structure and/or organic matter content or quality; soil/sediment, coastal and/or wetland erosion and stability, geotechnical properties, compaction and other damage to structure affecting stability, drainage, or provision of another ecosystem good or service. Impacts on geological SSSIs and geoparks.
Environmental 3	**Impacts on groundwater and surface waters**	Release of contaminants (including nutrients), dissolved organic carbon or silt/particulates, affecting suitability of water for potable or other uses, water body status (under WFD) and other legislative water quality objectives, biological function (aquatic ecosystems) and chemical function, mobilisation of dissolved substances. Effects of water abstraction included, such as lowering river levels or water tables or potential acidification. *(Note: Does not include any water abstraction use or disposal issues, as this is covered in 'Environmental 5: Use of natural resources and generation of wastes'.)*
Environmental 4	**Impacts on ecology**	Direct consequences for flora, fauna and food chains, especially protected species, biodiversity and impacts on SSSIs. Introduction of alien species. Significant changes in ecological community structure or function. Loss of habitat. Impacts of light, noise and vibration on ecology. Use of decontamination equipment or disposal sites or operations that affect fauna (e.g. affecting bird or bat flight, or animal migration, etc; environmental windows). Impacts on fish or marine mammals. *(Note: Does not include effects on soil and aquatic ecosystems, which are covered in 'Environmental 2: Impacts on soil and ground conditions' and 'Environmental 3: Impacts on water', whilst impacts of light, noise and vibration on humans are covered in 'Social 3: Impacts on neighbourhoods and regions'.)*
Environmental 5	**Use of natural resources and generation of wastes**	Consequences for land and water resources, use of primary resources and substitution of primary resources within the project or external to it, including raw and recycled aggregates. Use of energy/fuels taking into account their type/origin and the possibility of generating renewable energy by the project. Handling of materials on-site, off-site and waste disposal resources. Water abstraction, use and disposal.
Environmental 6	**Intrusiveness**	Impacts on flooding or increase risk of flooding, coastal erosion; alteration of landforms that affect environment, (e.g. a "natural" view). *(Note: Does not include effects on built environment and protection of archaeological resources, which are covered in 'Social 3: Impacts on neighbourhoods or regions', whilst affects on ecology are covered in 'Environmental 4: Impacts on ecology'.)*

Example of Assessment Outcome at end of Level 4 – MAs 5-7 would be short-listed for further assessment

Option	Feasibility	Effectiveness	Cost and Benefits	Human health	Sustainability	Short-listed
1	M		M	M	M	No
2	H	M	M	M	M	No
3	H		M	M	M	No
4	H		M	M	M	No
5	H	H	H	H	M	Yes
6	H	H	H	H	M	Yes
7	H	H	M	M	M	Yes

Colours are scores; letters are level of certainty

Higher tiers of assessment require detailed project designs

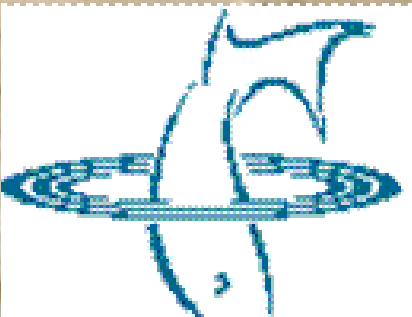


- Project designs are developed for short-listed RMAs so that project-specific costs and risks can be evaluated
- These are subjected to more quantitative MCA
- Selected Management Alternative (SMA) informs monitoring plan and applications

Conclusions

- A tiered approach with uncertainty assessment seeks to minimise unnecessary assessments
- Examination of all criteria seeks to avoid premature elimination of sustainable options
- Early tiers can use generic scoring tables, but site- or project-specific information can be applied where available
- In many cases, early scoring will be rapid, using expert knowledge
  - The process can then document decision basis and ensure that all parameters have been considered

- For more information:
  - Chris Vivian (chris.vivian@cefas.co.uk)
  - Paul Bardos (paul@r3environmental.co.uk)
  - Sabine E. Apitz (drsea@cvrl.org)
  - Draft tiered framework at: http://archive.defra.gov.uk/corporate/consult/ports-marinas/summary-responses.pdf
- This project was funded by the UK Department for Environment, Food and Rural Affairs



Cefas