



**TIDE Tool:
Conflict Matrix Management Tool -
User Guide**

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1. INTRODUCTION

1.1 General

One of the main research strands and deliverables within the TIDE project was the provision of a 'Toolbox' to assist integrated estuarine management in relation to a range of port development and flood risk protection scenarios and against a background of Natura 2000 compliance and enhancement.

One important tool within the 'Toolbox' approach which has been used to assist components of the 'Management Planning & Governance' strand in the TIDE project has been the development of *Conflict Matrices* for each estuary, and their subsequent analysis and integration.

These matrices have been developed to provide a tool to facilitate the integration of the requirements and operations of a range of users and uses within an estuary on a management zone basis, and to subsequently integrate these outcomes with other research strands such as management plan best practice, the development of the 'ecosystem services' approach, and the derivation of a series of defined mitigatory measures.

The individual estuary conflict matrices have been developed and subsequently populated using Regional Working Groups (RWGs) established for each estuary, with the composition of these groups being drawn from a range of 'experts' within each estuary representing the main areas of estuarine 'use'.

Effectively, this has included representatives from a number of organisations including those tasked with statutory nature conservation management and flood risk protection; the ports industry; navigation; and other important user groups including representation of the diverse recreational user community, fisheries, and the scientific community. However, the exact composition of the RWGs has varied on an individual estuary basis reflecting the main uses and issues of that particular estuary, and the management structures already in place.

For the TIDE estuaries, RWG composition was therefore not prescribed, but instead, required that there was sufficient representation within the group to address with 'expert knowledge', the main uses and issues within the estuary.

1.2 Research Aims

One of the main aims of TIDE has been to develop a holistic management planning approach for estuaries using a multi-manager sectoral framework. However, the intention was to provide assistance where possible to the operation of existing frameworks and organisations, developing an inclusive management system involving the expertise and understanding of stakeholder groups.

Effectively, TIDE aimed to assist in the development of a holistic management planning framework for estuaries building on existing structures and using a multi-manager sectoral framework.

Some research questions considered to be of relevance to estuarine management and integration include:

- What should be legitimate management priorities for estuaries and how we can better integrate these in Natura 2000 estuaries?

- Where are the main areas of spatial and sectoral ‘conflict’, and what methods can we employ to address these (e.g. which plans work)?
- How do we integrate traditional planning and assessment structures with developing ecosystem services requirements?

In order to address the above, it is necessary to understand:

- the management issues in estuaries (in this project the four TIDE estuaries);
- the methods used to deliver the management;
- the basis for management delivery;
- the efficacy of the management tools;
- the best tools/plans available to meet these needs;
- gaps in management.

In addressing these questions, a ‘conflict matrix’ approach was identified as being of value in conjunction with a review of the body of estuarine system legislation and organisational remit for management for the four TIDE estuaries. Further analysis has additionally been undertaken in relation to the content and efficacy of estuarine plans derived from this review, using a Strength, Weakness, Opportunity, Threat (SWOT) approach. This strand of the analysis is reported in Boyes *et al.* (2013), but with relevant outcomes integrated into the results of the conflict matrix analysis and conclusions (Cutts & Hemingway, 2013), the latter report supporting the Conflict Matrix tool addressed here (user guide and conflict matrix proforma).

1.3 Conflict Matrices

In order to effectively manage a dynamic estuarine system it is considered important to:

- Identify the users and uses of the system (both legal and illegal, desirable and undesirable).
- Identify *sectoral* areas that most require management (or improved management), e.g. contribute to the greatest level of user conflict in an estuary.
- Identify *spatial* areas that most require management (or improved management), e.g. feature the greatest level of user conflict in an estuary.
- Identify synergistic opportunities that can occur and how they might be expanded or better utilised.
- Identify areas where conflict levels are lower than expected (e.g. systems are in place that may be particularly good at managing multi-user issues), and vice versa (e.g. areas of unusually high conflict and potentially management failure).

The use of conflict matrices and subsequent outcome analyses allows the points identified

above to be at least partially characterised, particularly when integrated with other strands of governance information as described above.

1.4 Conflict Matrix Tool

As already described, the conflict matrices have been developed to assist the TIDE project, and in particular, aspects of estuarine governance and management. As such, a proforma conflict matrix is included within the TIDE Toolbox for use as an estuarine management tool by a range of practitioners who may use the Toolbox package. In addition to the conflict matrix proforma, the current user guide has been produced to describe the process involved in completing and deriving the outcomes from the matrix analysis.

2. CONFLICT MATRIX METHODOLOGY

2.1 Approach

As noted in Section 1.4, a proforma 'conflict matrix' and associated 'user guide' (current report) are provided within the TIDE Toolbox for use by estuarine managers and other practitioners.

Essentially, there are three main phases to the process:

- Completion of the conflict matrix spreadsheets through a Regional Working Group (RWG) that provides a sufficient breadth of 'expert knowledge' on the estuarine system to be able to populate the matrices, but that is comprised of a range of experts who can provide an unbiased input (e.g. representatives of the main user groups rather than just one or two sectors).
- Analysis of the derived matrices to identify key areas of sectoral and spatial user conflict, synergisms etc. as outlined in Section 1.3.
- Integration of the outcomes with other information on management systems for the estuary, e.g. availability and integration of sectoral plans, legal compliance requirements etc.

The matrices were developed based on an expectation of broad uses and users regularly encountered in north-west European estuaries (and certainly within the four TIDE estuaries). Whilst the categories of use are broad, sub-categories tighten the focus further to a sub-sector level of activity that might be addressed via a specific management plan or suite of measures in many instances. These are cross referenced to the TEEB categories (Jacobs *et al.*, 2013).

Within the TIDE project, analysis has been undertaken on methods for zonation within the estuaries in order to provide a basis for inter-estuarine comparison analyses and other management approaches (Geerts *et al.*, 2012). As such, each TIDE estuary has been divided into a series of zones with, where practicable, zonation based upon the salinity conditions of the estuary reach, but also reflecting broader estuarine management requirements where applicable. These zones/salinity divisions were then subsequently used within the conflict matrix completed for each respective estuary.

The Humber Estuary, used here as the example estuary for the conflict matrix user guide, has primarily been zoned based on an existing management framework operated in the estuary, but with salinity parameters allocated to the zones as a 'best fit', whilst the Elbe Estuary utilises a number of smaller existing management sub-zones within the broader salinity classification developed in TIDE.

Within the blank conflict matrix proforma (devised for an estuary with a division of up to 10 management zones/units), the zones chosen by the user for analysis of their particular estuary could be based on salinity, or alternatively, established or notional management areas which reflect different conditions either physically, socially, or environmentally.

The conflict matrix uses a series of basic numerical associations of estuarine use level and 'conflict' or 'synergism' between uses/users to derive a 'conflict score' between each use on an estuary.

Section 2.2 below details how the proforma conflict matrix should be populated (using the completed Humber Estuary conflict matrix as an example), and also describes the basic process used to ascribe the numerical associations (Section 2.3).

2.2 RWG Completion of the Conflict Matrix Proforma (Sheets 1 & 2)

Population of the conflict matrix proforma is detailed here using the Humber Estuary as an example (with associated screenshots from the completed conflict matrix for the estuary).

The blank proforma has been devised for an estuary with up to 10 zones/management units which should provide a sufficient number of zones for the majority of estuaries.

As described in Section 2.1, the Humber Estuary was primarily zoned based on an existing management framework operated in the estuary, but with salinity parameters allocated to the zones as a 'best fit'. Figure 1 and Table 1 provide further details in relation to the Humber divisions.

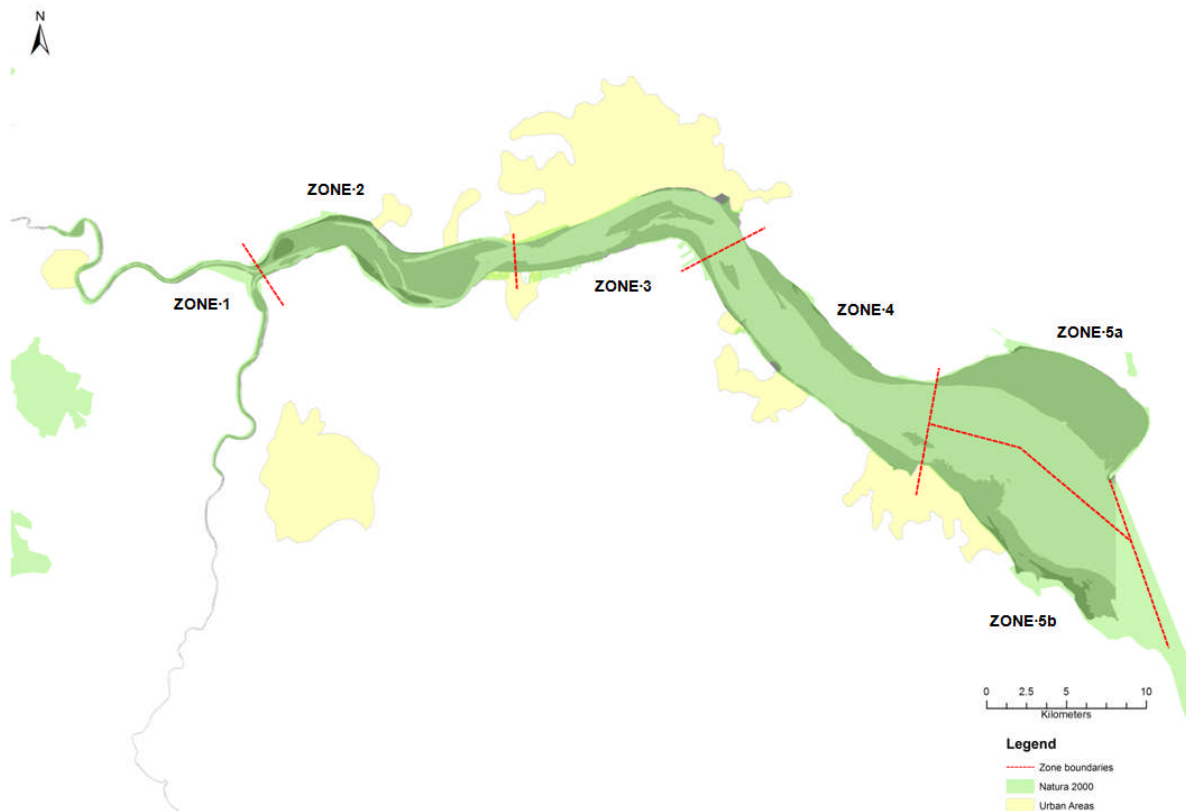


Figure 1: Zonation of the Humber Estuary, UK.

Table 1: Zonation of the Humber Estuary, UK.

Zone	Details (distances measured from limit of tidal influence - classed as 0 km)
Zone 1	Tidal Rivers (Limnetic/Oligohaline: 0 - 61 km)
Zone 2	Inner Estuary (Mesohaline: 61 - 90.5 km)
Zone 3	Middle Inner (Mesohaline: 90.5 - 114.8 km)
Zone 4	Middle Outer (Polyhaline: 114.8 - 143.8 km)
Zone 5a	Outer North (Polyhaline: 143.8 - 169 km)
Zone 5b	Outer South (Polyhaline: 143.8 - 169 km)

As already noted, the conflict matrix proforma should be completed by a Regional Working Group (RWG) established for the estuary, with the composition of the group being drawn from a range of 'experts' representing the main areas of estuarine 'use'

2.2.1 POPULATION OF 'ESTUARY ZONE USE' (SHEET 1)

The first sheet of the conflict matrix proforma (Estuary Zone Use) allows the quantification of each activity/management occurrence per estuarine zone.

The left hand columns detail individual estuarine uses/management tools, relevant associated TEEB categories (Jacobs *et al.*, 2013), and further information to assist with quantification and the subsequent scoring system.

For each 'Use/Management tool', a score for each estuarine zone ranging from **0** (not applicable or absent/very low) to **3** (high) should be entered into the orange coloured cells by the RWG as highlighted in Figure 2. **No other values than 0-3 should be entered onto this sheet.**

On completion of this first sheet, the RWG should subsequently move onto the population of Sheet 2 (Activity Conflict Assessment) of the conflict matrix proforma.

For this workbook, only put values in cells that are coloured as this cell.		TEEB Categories (Note - key associations listed)	Information to assist completion of the Activity Conflict Assessment (insert the Scores into the Appropriate Cells in Worksheet 2)	Information to assist completion of the Activity Significance Assessment (i.e. quantifying the presence of a particular use/management tool) in each high level estuarine/river zone (insert scores as a number (0, 1, 2 or 3) into the columns to the right)	HUMBER Estuary - Quantification of Activity/Management Occurrence (per Zone)					
Category	Uses / Management Tool				Zone 1 (Tidal Rivers)	Zone 2 (Inner Estuary)	Zone 3 (Middle Inner)	Zone 4 (Middle Outer)	Zone 5a (Outer North)	Zone 5b (Outer South)
Landscape	High value landscape feature	2.15, 3.1, 4.1, 4.2, 4.3, 4.4, 4.5	e.g. Area of Outstanding Natural Beauty (AONB)	Estimation of high value landscape features present within the zone as a % of each class. Score: 0 = Not applicable; 1 = Low (1-33%); 2 = Moderate (34-66%); 3 = High (66-100%)	0	0	1	0	1	0
Conservation	Protected area adjacent to system	3.1, 4.1, 4.2, 4.3, 4.4, 4.5	Areas of National/International importance, e.g. Special Protection Area (SPA), Special Area of Conservation (SAC), Site of Special Scientific Interest (SSSI), RAMSAR	Estimation of protected areas adjacent to the system as a % for each zone. Score: 0 = Not applicable; 1 = Low (1-33%); 2 = Moderate (34-66%); 3 = High (66-100%)	1	1	1	1	1	1
	Protected subtidal area	3.1, 4.1, 4.2, 4.3, 4.4, 4.5	Areas of National/International importance, e.g. Special Protection Area (SPA), Special Area of Conservation (SAC), Site of Special Scientific Interest (SSSI), RAMSAR	Estimation of protected areas adjacent to the system as a % for each zone. Score: 0 = Not applicable; 1 = Low (1-33%); 2 = Moderate (34-66%); 3 = High (66-100%)	1	3	3	3	3	3
Archaeology	Protected intertidal area	3.1, 4.1, 4.2, 4.3, 4.4, 4.5	Areas of National/International importance, e.g. Special Protection Area (SPA), Special Area of Conservation (SAC), Site of Special Scientific Interest (SSSI), RAMSAR	Estimation of protected areas adjacent to the system as a % for each zone. Score: 0 = Not applicable; 1 = Low (1-33%); 2 = Moderate (34-66%); 3 = High (66-100%)	1	3	3	3	3	3
	Archaeology/Historic protected site	4.1, 4.2, 4.3, 4.4, 4.5	Lists of protected sites may be found in registers/databases, e.g. Historic Environment Records (HERs) and Sites and Monuments Records (SMRs) in the UK	Estimate based on number of protected sites present in estuarine zone (consider in context of generic NW European estuary). Score: 0 = NA (absent/very low); 1 = Low; 2 = Moderate; 3 = High	1	2	1	2	1	1
Access & Disturbance	Recreational access on water	2.12, 3.1, 4.1, 4.2, 4.3, 4.4, 4.5	Activities such as sailing, jet skiing	Estimate based on activity level within estuarine zone. Score: 0 = NA (absent/very low); 1 = Low; 2 = Moderate; 3 = High	2	3	2	2	1	1
	Recreational access on the banks & intertidal	3.1, 4.1, 4.2, 4.3, 4.4, 4.5	Activities such as walking, dog walking, use of quad bikes, bird/seal watching, kite surfing, horse riding, cycling, fishing/golfing	Estimate based on activity level within estuarine zone. Score: 0 = NA (absent/very low); 1 = Low; 2 = Moderate; 3 = High	3	3	3	3	3	3
Flood/coast protection	Commercial	1.1, 1.2, 3.1, 4.1, 4.2, 4.3, 4.4, 4.5	Non-points activity within the estuary (intertidal/subtidal area), e.g. access for extractive activity	Estimate based on activity level within estuarine zone. Score: 0 = NA (absent/very low); 1 = Low; 2 = Moderate; 3 = High	0	0	1	1	1	1
	Defence sea-bank	2.1, 2.7, 2.8, 2.9, 2.14, 2.15, 2.19, 2.20, 3.1, 4.1, 4.2, 4.3, 4.4, 4.5	Managed re-alignment sites	Estimate within zone based on area of sea-bank sites & number of sea-bank sites (consider in context of generic NW European estuary). Score: 0 = NA (absent/very low); 1 = Low; 2 = Moderate; 3 = High	0	3	3	3	3	3
Navigation	Flood bank (e.g. gabion/wall)	1.7, 2.7, 2.11, 2.12, 2.14, 2.15, 2.16, 2.17	Flood bank dykes	Estimate of length of protected area within estuarine zone as a %. Score: 0 = Not applicable; 1 = Low (1-33%); 2 = Moderate (34-66%); 3 = High (66-100%)	3	3	3	3	3	3
	Channel stabilisation	1.7, 2.12, 2.15, 2.16, 2.19, 4.5	Channel stabilisation, e.g. training walls	Estimate of length within estuarine zone (consider in context of generic NW European estuary). Score: 0 = NA (absent/very low); 1 = Low; 2 = Moderate; 3 = High	2	1	0	0	0	0
	Capital Dredging	1.7, 1.8, 1.9, 2.12, 3.1, 4.5	Removal of material for capital works	Estimate of level of activity within estuarine zone (consider in context of generic NW European estuary). Score: 0 = NA (absent/very low); 1 = Low; 2 = Moderate; 3 = High	0	0	3	3	3	3
	Maintenance Dredging	1.7, 1.8, 1.9, 2.12, 3.1, 4.5	Removal of material for maintenance works	Estimate of level of activity within estuarine zone (consider in context of generic NW European estuary). Score: 0 = NA (absent/very low); 1 = Low; 2 = Moderate; 3 = High	0	0	2	3	3	2
	Vessel movement	1.7, 3.1, 4.2, 4.5	Naval movement on water body	Estimate of vessel movement activity within estuarine zone (consider in context of generic NW European estuary). Score: 0 = NA (absent/very low); 1 = Low; 2 = Moderate; 3 = High	2	3	3	3	3	3

Figure 2: Estuary Zone Use (Sheet 1) - Quantification of a particular activity taking place within each estuarine zone.

It should be noted that although the conflict matrix proforma has been devised for an estuary with up to 10 management/salinity zones, if a particular estuary being assessed has fewer than this, subsequent calculations within the proforma will not be affected. Any 'zone' columns not required for the assessment should simply be left blank on the first sheet and in turn, any associated sheets in the workbook for that particular zone will also remain blank.

2.2.2 POPULATION OF THE 'ACTIVITY CONFLICT ASSESSMENT' (SHEET 2)

The second sheet of the conflict matrix proforma (Activity Conflict Assessment) should again be completed by the Regional Working Group using 'expert judgement'.

This particular sheet addresses the effect of each individual use/management tool on another individual use/management tool.

Only the grey cells within the table should be populated as shown in Figure 3 and the sheet should be completed working across the table from left to right across each row in turn (impact of each use/management tool listed in column 2 on each use/management tool listed across row 2) as highlighted by Figure 4.

ACTIVITY CONFLICT ASSESSMENT (the effect of a particular use or management tool on another use or management tool)	Category	Landscape	Conservation			Archaeology	Access (e.g. Disturbance)			Flood/coast protection		Navigation			Ports & Harbours			
			Leave column blank	High value landscape feature	Protected area adjacent to system		Protected subtidal area	Protected intertidal area	Recreational access on water	Recreational access on the banks & intertidal	Commercial	Defence set-back	Flood bank (dyke/gabion/wall)	Channel stabilisation	Capital dredging	Maintenance dredging	Vessel movement	Port land claim (intertidal/subtidal)
Leave row blank																		
Landscape	High value landscape feature		1	0	1	0	0	0	0	-1	-1	0	0	0	0	-1	0	0
Conservation	Protected area adjacent to system	1		1	2	0	-1	-1	-1	-1	0	0	-1	0	0	-2	-2	-2
	Protected subtidal area	0	1		1	1	0	0	-1	1	0	-2	-2	-2	-1	-2	-1	-2
	Protected intertidal area	1	1	2		1	-1	-2	-2	-2	-1	-2	-2	-1	0	-2	-2	-2
Archaeology	Archaeology/History protected site	0	0	0	0		0	0	-1	-1	0	-1	-2	0	0	-1	-1	-1
Access (e.g. Disturbance)	Recreational access on water	0	0	-1	-1	0		0	0	0	0	0	0	0	-1	0	0	0
	Recreational access on the banks & intertidal	0	-1	-1	-2	0		0	0	-1	0	0	0	0	0	0	-1	0
	Commercial	0	-1	-1	-1	0		0	0	0	0	0	0	0	0	0	0	0
Flood/Coast protection	Defence set-back	-1	1	2	2	-1	0	-1	-1		1	-1	0	-1	0	0	0	-1
	Flood bank (dyke/gabion/wall)	-1	-1	-2	-2	0	0	2	1	0		-1	0	0	0	0	1	0

Figure 3: Estuary Activity Conflict Assessment (Sheet 3).

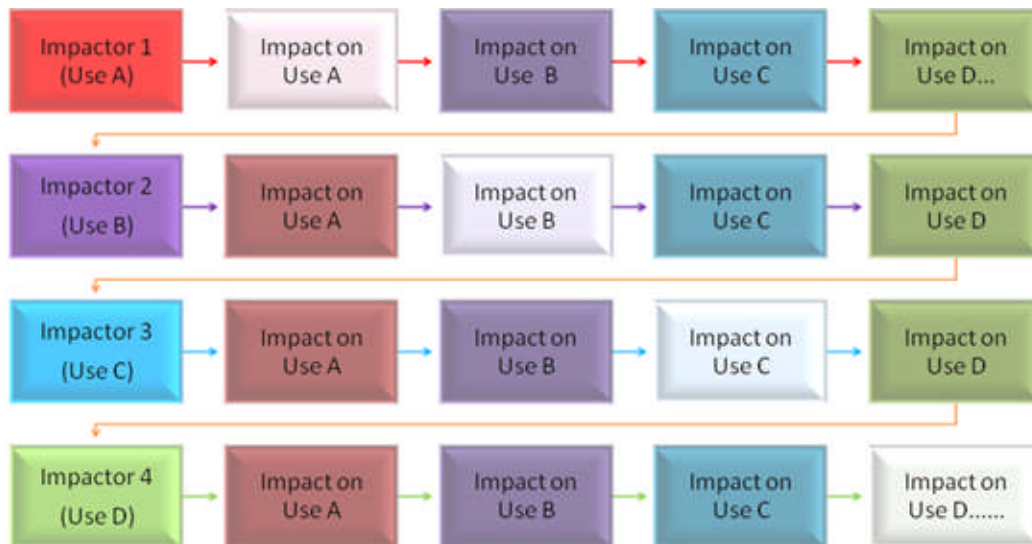


Figure 4: Sequence of completion for the Activity Conflict Assessment.

It should be noted that all interaction scores within the table require completion as the severity of conflict between uses are not always directly reciprocal.

After an agreement has been reached by the RWG on each level of impact, the scores ranging from +2 (positive high) to -2 (negative low) should be entered within each cell as per the 'Generic Sensitivity for Conflict' key shown below (Figure 5). The cell will then change to the corresponding colour as per the key. **No other values than -2 to +2 should be entered in this sheet.**

Generic Sensitivity for Conflict	
Positive High (+2)	Positive Low (+1)
	Zero (0)
Negative Low (-1)	Negative High (-2)

Figure 5: Key to the 'Generic sensitivity for conflict'.

Only Sheets 1 and 2 of the conflict matrix proforma should be manually populated by the Regional Working Group. All the remaining sheets will be automatically completed.

2.3 Automatic Completion of the Conflict Matrix Proforma (Sheets 3-22)

After manually populating Sheet 1 (Estuary Zone Use) and Sheet 2 (Activity Conflict Assessment) within the conflict matrix proforma, the remaining sheets of the excel workbook will be automatically completed using a series of formulae. Other than the name of the estuary being assessed (which should be entered into the pale yellow cell), **no additional input is required on these sheets.**

For each estuarine zone quantified as per Sheet 1, two further corresponding sheets for each zone will be automatically completed in the latter part of the workbook - one for the 'Quantification of Activity/Management Occurrence per Zone' (the 'Activity Extent'), and a second for 'Actual Conflict Level Assessment per Zone' (the 'Conflict Score').

Sheets 3-12 of the proforma/workbook provide the *Quantification of Activity/Management Occurrence per Zone* (Activity Extent) for Zones 1 to 10 respectively, and Sheets 13-22 provide the *Actual Conflict Level Assessment per Zone* (Conflict Score) for Zones 1 to 10 respectively.

Figure 6 illustrates the quantification of activity/management occurrence (activity extent) for Zone 1 of the Humber Estuary (as automatically completed).

Category		Row will auto insert score from Matrix Information Sheet	Score (e.g. 0-3)	Landscape	Conservation			Archaeology	Access (e.g. Disturbance)			Flood/coast protection	
Category	High value landscape feature		Protected area adjacent to system	Protected subtidal area	Protected intertidal area	Archaeology/History protected site	Recreational access on water	Recreational access on the banks & intertidal	Commercial	Defence set-back	Flood bank (dyke/gabion/wall)		
HUMBER ESTUARY (Zone 1): Quantification of Activity/Management Occurrence per zone (all these cells are completed automatically from columns F-K in Sheet 1 so DO NOT populate)		Row will auto insert score from Matrix Information Sheet	Score (e.g. 0-3)	0	1	1	1	1	2	3	0	0	3
Landscape	High value landscape feature	0		1	1	1	1	2	3	0	0	3	
Conservation	Protected area adjacent to system	1	1		2	2	2	3	4	1	1	4	
	Protected subtidal area	1	1	2		2	2	3	4	1	1	4	
	Protected intertidal area	1	1	2	2		2	3	4	1	1	4	
Archaeology	Archaeology/History protected site	1	1	2	2	2		3	4	1	1	4	
Access (e.g. Disturbance)	Recreational access on water	2	2	3	3	3	3		5	2	2	5	
	Recreational access on the banks & intertidal	3	3	4	4	4	4	5		3	3	6	
	Commercial	0	0	1	1	1	1	2	3		0	3	

KEY:

Quantification of Combined Activity/Management Occurrence	
Zero (0)	Low (1 to 2)
Moderate (3 to 4)	High (5 to 6)

Figure 6: Quantification of activity/management occurrence for Zone 1 of the Humber Estuary (Sheet 3).

Figure 7 illustrates the actual conflict level assessment (conflict score) for Zone 1 of the Humber Estuary (as automatically completed).

Category	Category	Leave column blank	Landscape	Conservation			Archaeology	Access (e.g. Disturbance)			Flood/coast protection	
			High value landscape feature	Protected area adjacent to system	Protected subtidal area	Protected intertidal area	Archaeology/History protected site	Recreational access on water	Recreational access on the banks & intertidal	Commercial	Defence set-back	Flood bank (dyke/gabion/wall)
	HUMBER ESTUARY (Zone 1): Actual Conflict Level Assessment per zone (all these cells are completed automatically so DO NOT populate)											
	Leave row blank											
Landscape	High value landscape feature			0	0	0	0	0	0	0	0	0
Conservation	Protected area adjacent to system		0		2	4	0	-3	-4	0	0	0
	Protected subtidal area		0	2		2	2	0	0	0	0	0
	Protected intertidal area		0	2	4		2	-3	-8	0	0	-4
Archaeology	Archaeology/History protected site		0	0	0	0		0	0	0	0	0
Access (e.g. Disturbance)	Recreational access on water		0	0	-3	-3	0		0	0	0	0
	Recreational access on the banks & intertidal		0	-4	-4	-8	0	0		0	0	0
	Commercial		0	0	0	0	0	0	0		0	0

KEY:

Actual Conflict Level Assessment (Combination of Sensitivity & Significance)	
Negative Very High (-10 to -12)	Negative High (-7 to -9)
Negative Moderate (-4 to -6)	Negative Low (-1 to -3)
Zero (0)	
Positive Low (1 to 3)	Positive Moderate (4 to 6)
Positive High (7 to 9)	Positive Very High (10 to 12)

Figure 7: Actual conflict level assessment for Zone 1 of the Humber Estuary (Sheet 13).

2.3.1 QUANTIFICATION OF ACTIVITY/MANAGEMENT OCCURRENCE PER ZONE (SHEETS 3-12)

Figure 8 provides further information on how the activity/management occurrence per zone (provided by Sheets 3-12 for estuarine zones 1-10 respectively) is automatically quantified using Zone 1 of the Humber Estuary as an example.

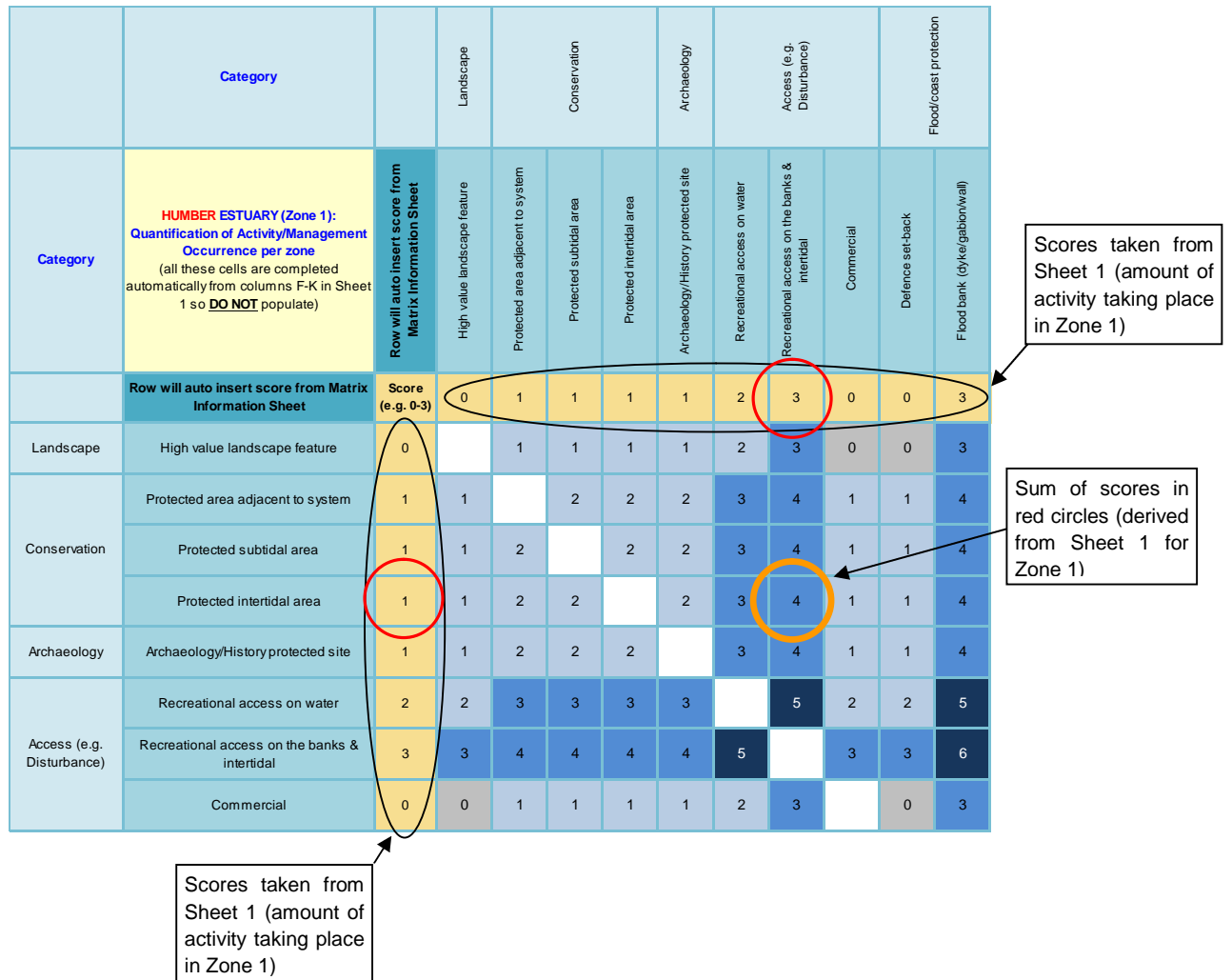


Figure 8: Calculation of the activity/management occurrence (activity extent) in Zone 1 of the Humber Estuary (Sheet 3).

2.3.2 ACTUAL CONFLICT LEVEL ASSESSMENT PER ZONE (SHEETS 13-22)

Figure 9 provides further information on how the actual conflict level assessment per zone (provided by Sheets 13-22 for estuarine zones 1-10 respectively) is automatically calculated using Zone 1 of the Humber Estuary as an example.

Category	Category	Leave column blank	Landscape	Conservation			Archaeology	Access (e.g. Disturbance)			Flood/coast protection
			High value landscape feature	Protected area adjacent to system	Protected subtidal area	Protected intertidal area	Archaeology/History protected site	Recreational access on water	Recreational access on the banks & intertidal	Commercial	Defence set-back
	HUMBER ESTUARY (Zone 1): Actual Conflict Level Assessment per zone (all these cells are completed automatically so DO NOT populate)										
	Leave row blank										
Landscape	High value landscape feature			0	0	0	0	0	0	0	0
Conservation	Protected area adjacent to system		0		2	4	0	-3	-4	0	0
	Protected subtidal area		0	2		2	2	0	0	0	0
	Protected intertidal area		0	2	4		2	-3	-8	0	-4
Archaeology	Archaeology/History protected site		0	0	0	0		0	0	0	0
Access (e.g. Disturbance)	Recreational access on water		0	0	-3	-3	0		0	0	0
	Recreational access on the banks & intertidal		0	-4	-4	-8	0	0		0	0
	Commercial		0	0	0	0	0	0		0	0

The -8 here in the 'Conflict Score' sheet (**Sheet 13**) for Zone 1 of the Humber Estuary (protected intertidal area on recreational access) is calculated as follows:

The quantification of an activity/management occurrence as calculated from **Sheet 3** for Zone 1 of the Humber (protected intertidal area on recreational access) which was given a score of **4 (A)** (shown by the orange circle in Figure 8)

The estuary 'activity conflict assessment' score from **Sheet 2** completed for the Humber Estuary (protected intertidal area on recreational access) which is given a score of **-2 (B)** (shown by the purple circle in Figure 10)

Score here in **Sheet 13** for Zone 1 of the Humber is therefore derived from **A x B**

$$4 \times -2 = -8$$

Note – if either score **A** (from Sheet 3 in the case of Zone 1) or score **B** (from Sheet 2) is '0', then the number will also be '0' here

Score in Sheet 14 (Level of conflict in Zone 2) would be derived from Score in Sheet 4 (quantification of activity for Zone 2) x score in Sheet 2 (activity conflict assessment for the estuary being assessed)

Figure 9: Calculation of the actual conflict level assessment (conflict score) in Zone 1 of the Humber Estuary (Sheet 13).

ACTIVITY CONFLICT ASSESSMENT (the effect of a particular use or management tool on another use or management tool)	Category	Landscape	Conservation			Archaeology	Access (e.g. Disturbance)			Flood/coast protection	
			High value landscape feature	Protected area adjacent to system	Protected subtidal area		Protected intertidal area	Recreational access on water	Recreational access on the banks & intertidal	Commercial	Defence set-back
HUMBER Estuary Activity Conflict Assessment Uses/Management Tools (what is the effect of each use/management tool listed in the rows below on each use/management tool listed in the columns to the right, e.g. reading across the table, what is the effect of dredging (channel deepening/berth heads) on high value landscape features, protected subtidal areas etc.?)	Leave column blank										
Leave row blank											
Landscape	High value landscape feature		1	0	1	0	0	0	0	-1	-1
Conservation	Protected area adjacent to system	1		1	2	0	-1	-1	-1	-1	0
	Protected subtidal area	0	1		1	1	0	0	-1	1	0
	Protected intertidal area	1	1	2		1	-1	-2	-2	-2	-1
Archaeology	Archaeology/History protected site	0	0	0	0		0	0	-1	-1	0
Access (e.g. Disturbance)	Recreational access on water	0	0	-1	-1	0		0	0	0	0
	Recreational access on the banks & intertidal	0	-1	-1	-2	0	0		0	-1	0
	Commercial	0	-1	-1	-1	0	0	0		0	0

Figure 10: Activity Conflict Assessment for the Humber Estuary (Sheet 2).

3. ANALYSIS & INTERPRETATION

During the completion of the conflict matrices via the RWG, it may be of value to identify the background of RWG members in order to compensate for any bias in composition (e.g. weighting scores may be biased towards a specific topic area such as conservation or navigation, if membership of the RWG is skewed). To assist this process it might be of use to ask individual RWG members to indicate which high level services they consider most import within an estuarine system (e.g. as suggested in Figure 11).

Regional Working Group Conflict Matrix Composition and Concerns						
Estuary	Humber	Importance of Use				Total
RWG Member	Organisation Remit (Port/Industry, Environment, Academic)	Transport & Accessibility	Flood Protection and Capacity	Ecological Function and Diversity	Recreation and Social Use	
e.g. P Smith	Port Authority	2	1	2	0	5
						0
						0
						0
						0
						0
						0
						0
						0
						0
						0
						0
						0
						0
						0
						0
						0
		0	0	0	0	0

Only fill in the cells in green. Scoring should be based on 0 for no or little importance, 1 for moderate importance and 2 for high importance.

Figure 11: Example RWG Management Priority Questionnaire.

On completion of the conflict matrix process, the final Activity Conflict Assessment sheets will provide information on the main areas of conflict and synergisms on a management zone basis. These data will assist in the identification of the main areas requiring management whilst individual user interaction scores are also provided to assist in the targeting of management actions.

In addition to the establishment of a broad conflict typology for the estuary as a whole, the conflict level information should provide an indication of sectoral and spatial management pinch-points, e.g. severe conflicts between two users may only occur in one zone within the estuary. This should assist in the focus of future management actions as it may reflect either resource constraints and increased competition, or effective/ineffective management practices within specific zones.

However, when analysing the outcomes from the conflict characterisation and assessment process, it is important to bear the zone length variations in mind. For instance, a series of high conflict scenarios within a long estuary zone may be more of a management priority than those from a relatively short reach. However, it is also noted that this analysis considers only zone length rather than area, and other spatial considerations may therefore also require consideration in some circumstances.

Finally, in addition to assisting managers in identifying areas of management deficiency (and in the case of synergisms), opportunity, the technique allows for both the building (or strengthening) of a management forum through the establishment of a Regional Working Group, and as a transparent basis to future management actions and an associated tool to assist in stakeholder engagement.

4. REFERENCES

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