

An Interactive Learning Process for Estuary Management and Associated Sustainable Enterprise Development

1. An Introduction to an interactive learning process for estuaries use, management and enterprise development

An interactive learning process has been designed to help stakeholders develop a joint understanding of the role of estuaries in society, for the purposes of promoting cooperative use, management and sustainable enterprise development. The process uses ecosystem services as the common currency between science and society. Scientists speak about ecology and society speaks about services, and ecosystem services combines these two concepts. This process and the associated tools enable society and scientists to generate a common understanding of an estuary, which can then promote informed decisions on how to use the estuary sustainably and how to manage it. The process also includes tools that can help identify potential enterprises that could be developed sustainably on an estuary. This aspect specifically developed to help with the identification of development opportunities on the Eastern Cape coast.

Whilst ecosystem services is the common currency or the language of the learning process, the key mechanism used to develop a better understanding of the estuary and associated social system, is an ecosystem services supply and demand analysis. The analysis address questions like;

- Just what is the estuary capable of delivering?
- What services is it good at supplying, and what is it poor at supplying?
- Who uses these services?
- How important are these services in the lives of the users?

Unfortunately, few people recognize all the services estuaries deliver to them, as many are indirectly supplied. Much like staying at a bed and breakfast. While you pay for your bed and breakfast, you get clean room, hot water for the shower, clean towels, security, parking for the car, etc. But what does services does an estuary give you? This interactive process helps to identify what the estuary supplies and who does or who could be using the services.

Importantly, the process is an interactive social learning process, which builds on the wisdom, knowledge and experiences - of all the participants. The process does not require intensive data in order to make an analysis, but works better if participants have access to local detailed knowledge. It also works best with a diverse range of people - as people are the repositories of wisdom – of both supply capabilities and use of services. For example bait collectors know precisely just what the estuary does for them in terms of bait supply. Conversely, the narrower the range of participants, the more limited the learning process and the less credible the outcomes may be.

1.1 The tools used

The interactive learning process is based on a systems model which is simple enough for a group of stakeholders to populate, understand the workings thereof and to analyse the outcomes – in a one to two day session. The systems model is based on social-ecological systems thinking – whereby a natural asset, such as an estuary, is not seen as an independent ecological entity, but is seen to be interdependent with the associated society, where the social processes influence the ecological processes, and vice versa. The systems model uses ecosystem services as the common currency between society and ecology. The model assesses the supply of these ecosystem services – the ecological component, and then assesses the demand for these services – the social component. It then assesses supply and demand from various perspectives. The process uses a common language, which it develops in the first phase of the process. The process is conducted in a workshop setting, with a field visit and then structured discussions, providing the space for stakeholders to interact. Importantly, the process is driven by a facilitator who uses the systems model as a structuring framework for conducting a systemic and thorough dialogue on the system. The facilitator has an important role to play in eliciting knowledge from all participants, and in encouraging all participants to listen and learn from each other. Everyone is recognised as an expert of their own experiences of the system.

The model inputs are predominantly scores and basic available data which the facilitator has to get the stakeholders to agree to. A critical element of the process is to develop consensus on the scoring as this builds credibility of the process outcomes. Building consensus on the model inputs also encourages stakeholders to accommodate a range of perspectives and helps to build trust between the stakeholders – as they recognise that each person has something valuable to contribute. The model uses a simple scoring system that prevents lengthy detailed analysis. For example, is the habitat state in good, moderate or poor condition? Are there tens, or hundreds, or thousands or tens of thousands of users? Furthermore, the model uses a simple list of habitats, and a limited list of ecosystem services to limit the range of discussion and to ensure that within an 8 to 14 hour period, the analysis can be completed and outcomes generated. These habitats and services can be changed to suit the local context.

1.2 The Context of the learning process

The process recognises that there is substantial individual and institutional wisdom regarding estuary uses and functions. It also recognises that estuaries are complex social-ecological systems, with interdependent stakeholders who are linked through use of a common resource – the estuary. The process also recognises that there are multiple perspectives of the system and that there is significant uncertainty associated with the functioning of the system. Importantly, the process does not attempt generate high levels of detail, but rather generates enough understanding of the linkages between the social-ecological components, that can direct critical research, management and use.

1.3 The outcomes of the process

The interactive learning integrates the different mental models of individuals into a common mental model of the social-ecological system. This process of social learning builds social capital – the basis for cooperative management. It also serves to grow a community of practice – a group of stakeholders who in working together, develop greater skills in managing complex social-ecological

systems. By providing a mechanism to combine the wisdom of diverse individuals, new knowledge is co-generated which can be considered more neutral, and form the basis planning future action.

Whilst the interactive process builds social capital, the systems model is able to:

- Identify ecosystem services supplied,
- Identify ecosystem services demanded, and
- Identify the current roles of the estuary in society

through the ecosystem supply and demand analysis component. Once this has been done, there are additional spreadsheet tools that help the stakeholders to:

- Identify the desired and conflicting roles.

An additional series of spreadsheets have been developed to support decision making regarding the selection of enterprises for possible development in association with estuaries. These spreadsheet tools are able to ;

- Identify estuary based enterprise development opportunities
- Identify priority enterprise risks (but only in relation to social-ecological systems and not the economic system)
- Identify actions to address priority risks.

2 An outline of the interactive learning process

There are two parts to this process. The first part focuses on generating a common understanding of the estuary social-ecological system, and can inform management, use and enterprise development. This initial phase is relevant to a broad stakeholder group interested in the estuary.

The second part of the process focuses specifically on enterprise development in association with estuaries, and will only be relevant to those people interested in establishing enterprises.

2.1 Developing a common understating of the estuary system

The process needs to take place in a workshop setting, preferably close to the estuary. A range of stakeholders need to be invited to the workshop that represent ;

- estuary users (including recreation users, local residents, businesses with interests associated with the estuary, municipal engineering staff),
- estuary managers (including national, provincial and municipal conservation officials, civic organisations, and other concerned groups),
- other interested parties, such as researchers and knowledgeable residents, and
- associated marine and freshwater managers.

The process is best conducted over two days to allow for ample discussion.

The process needs to be facilitated by a skilled facilitator, who is able to generate credibility in the process and outcomes, by ensuring that everyone gets heard, and by generating consensus in the scoring.

2.1.1 Developing a common language

The first step in the process is to develop a common language between all the participants. In essence, the social learning process takes all the individual participants' mental pictures of the estuary social-ecological system, and builds a greater common mental picture of the system. Critical to building such a common vision is to share a common language during the process. This common language is created by having a discussion on the concepts of ecosystem services, and by having a field visit to the estuary itself to identify the estuary habitats, their condition and the users. Once this is done, the group then returns to the workshop venue to continue with a focused discussion.

2.1.2 Discussing the concept of ecosystem services

A guide to estuary ecosystem services has been prepared that can help to inform the discussion on services. The discussion needs to show what range of services the estuary provides, and who is likely to be using these services.

2.1.3 Estuary field visit to generate a common language

All the participants need to experience the estuary assets. They should all see the assets to be discussed, and especially listen to each other's perceptions of the quality of the assets. People need to talk about their knowledge and experiences. The field visit is time for promoting a common understanding of the estuary in question.

An important discussion on site is to set the boundaries of the ecosystem for analysis. This includes;

- Where does the estuary start upstream and finish in the sea?
- How high does the estuary extend above the high-tide mark?
- Where does the estuary floodplain start and end?

The participants should leave the field visit with clear picture of the components, linkages and boundaries of the estuary.

2.2 Identify the services supplied

Once a common understanding of estuary and ecosystem services has been developed by the group, it is then time to use the model supplied to direct the interactive learning process. The model is an interactive Excel spreadsheet, that allows the users to define the key variables, and then allows the users to then analyze the estuary ecosystem services supply and demand.

The steps in the process are outlined in excel. Go to the Excel spreadsheet, open the first tab (services assessment), and follow the steps. Note that there are several tabs.

A description of the process is outlined below for further clarification. **IMPORTANT - COPY THE SOFTWARE AND STORE A UNUSED VERSION**

The model inputs are generally scores. This means that the actual score has little meaning, but the relative score is important. The model colours the scores from high (green), to moderate (yellow), to low (red). Importantly, the workshop needs to focus on the order of ranking and colours to provide useful insights.

2.2.1 Determining habitat functionality

The group needs to determine how functional the estuary is. This is critical for understanding the level of services supplied. We need to know just how big the services factory is, what is its condition and how well it is linked into other critical components.

Firstly, confirm that the estuary habitat types reflected are correct. There may be some differences in tropical and temperate estuaries, e.g. the presence or absence of mangroves.

We do this by firstly scoring the condition. See the spreadsheet for the details. Then you need to score the size, by inserting the hectares of each specific habitat type. Lastly you need to score the landscape context. How well is the estuary linked to associated rivers, and ocean, and to other estuaries? While condition and size are the key determinants of service levels, the landscape context is less important and so is only weighted at 10% of the other two scores in the functionality calculation.

This functionality score becomes the driver of the services supply level.

2.2.2 Identifying services supplied

The next step is to identify the services which the estuary supplies. The model is pre-loaded with a list of key estuary ecosystem services. These can be changed but you cannot add more to the list.

Discuss the range of ecosystem services supplied as a group and agree on the final list and wording to be used. The model is set up to use a fixed number of services. Keeping the list short is also important to keep the learning process concise and manageable. Only change the services on the first page. The model automatically updates changes these on the subsequent pages.

2.2.3 Determining relative services supply levels

Now for interesting part. The relative capability of each habitat type to supply services needs to be scored. This step will generate a lot of heated debate and the process will need to be closely managed. Here the matrix of services and habitats needs to be filled in. Each intersecting cell needs to be scored, which needs a discussion and an agreement.

VERY IMPORTANT - the supply capability needs to be scored for pristine conditions and NOT for current conditions. The functionality score accounts for current condition.

Completing the matrix is time consuming and hard work, but critical. The process is usually characterized by robust debate with strong facilitation and chairmanship required. Discussion needs to be kept short and concise.

Again, the scores in the matrix have been pre-loaded based on several rounds of testing. The scores should be used as a basis for the discussion, and need to be adjusted by your team.

The service supply capability score is then multiplied by the functionality score, to give a relative service supply level for each discrete habitat type. The service levels for each habitat type are then summed to provide a score for each service for the whole estuary.

2.3 Identify the demand for estuary services

In these next steps we identify the demand for each of the ecosystem services supplied. We assess the demand for services from the perspective of four different user groups. These include;

- on site users (people living adjacent to the estuary or within the local municipality),
- downstream users (people who use the services supplied by the ocean which are linked to the estuary),
- provincial users, and
- national and international users.

2.3.1 Estimating the number of users

This step needs you to score the magnitude of use for each discrete service. How many people use the service supplied by the estuary? Importantly, the model only allows you to score orders of magnitude estimates – in multiples of ten. This prevents prolonged detailed discussions, which have limited value in this assessment. The important issue is whether there are tens, hundreds, thousands or tens of thousands, or hundreds of thousands of users.

2.3.2 Their dependence on the service

In understanding demand, it is also critical to identify the relative dependence of the users on accessing the services supplied. Each service user group will have a different level of dependence on access to the service. A large number of users with many alternative access options, is very different to a large group of people, whose livelihoods depend entirely on the service available. Greater dependence would mean greater societal importance and value.

2.4 Identifying the roles of the estuary

What the estuary can produce, and how these services are used, defines the estuary's role in society. In order to get a sense of the role of the estuary, two tables are generated. Firstly, the relative demand between services by different user groups is determined. Secondly, the total importance of services is determined by combining both demand and supply.

2.4.1 Rank the services used based on numbers of users

The next step in the assessment is to rank each of the user groups according to the number of users. An excel macro is used to do this ranking. Make sure have enabled the macro capability. Follow the instructions on Tab 2 (sort) of the spreadsheet.

After being ranked according to the importance of demand, it is now possible to compare the relative demand between services and service users. This helps to inform the process of identifying the current, desired and possible conflicting roles which the estuary may play, which helps direct both use and management of the estuary.

It is useful to discuss the outcomes of the ranking process (on Tab sort) in some detail as it shows the different roles played by the estuary at local, catchment and provincial and national levels.

2.4.2 Rank the total importance of the services

Go to the third tab (summary) and follow the instructions. An excel macro will rank the list of services according to the greatest importance. This score is the product of the supply score multiplied by the demand score. The services with greatest supply capacity and greatest demand will score the highest, while low supply and low demand services will score the lowest. This summary table is an important look-up table for assessing or determining the desired roles and possible conflicting roles which the estuary performs.

2.5 By assessing the relative importance and demand, identify roles of the estuary

Go to the fourth Tab (roles identification). The current role is generated automatically. At this point in the process the assessment of services supply and demand has generated a common understanding of the status quo. However, the next steps start to assess possible desired futures and possible conflicting uses. These two elements are critical in shaping the future use and management of the estuary.

Follow the instructions on the fourth Tab. Consider the tables on Tab 2 and 3, and then insert notes on the desired roles and the conflicting roles identified.

At this point the workshop concludes its function of developing a common understanding of the social-ecological system, and the knowledge generated can then be used in further processes – such as developing a vision and associated management strategy.

3 Assessing the Estuary based enterprises

Should the stakeholders wish to develop possible enterprises in association with the estuary, then consider the Tabs 5 (enterprise opportunities), 6 (enterprise risk assessment) and 7 (priority risks). This part of the tool is specifically designed to address opportunities and risks associated with developing enterprises on or adjacent to an estuary. These tools should be used in a second more focussed workshop.

Estuaries, with their wide range of high value ecosystem services, are recognised as sites for potential enterprises development. A series of spreadsheets have been developed to support decision making in this regard, especially in terms of promoting sustainable enterprise development in association with estuaries. The tools focus on sustainability issues in relation to the estuary and the management thereof and do not focus on business practice.

These spreadsheets should be used in a workshop setting with knowledgeable stakeholders, and may include potential business developers, local communities, resource managers and government official promoting economic development.

3.1 Identify enterprise opportunities

Select Tab 5 (enterprise opportunities) and follow the instructions provided. In order to identify sustainable enterprise opportunities, you need to consider the current, desired and conflicting roles identified. The tables provide the space for making observations. The group needs to assess the previous tabs, and to have a structured discussion around these roles. The matrix provided also helps to highlight possible sustainability issues.

Different types of service use and possible estuary management categories have been listed to assist in identifying possible opportunities. It may also be useful to note the possible conflicting opportunities, as this help to identify some critical risks that may face the development of enterprises.

From this list desired enterprises, you need to select one enterprise for risk analysis.

3.2 Enterprise risk assessment

Estuaries and other natural assets are generally common property resources with a particular set of management challenges. Importantly, in such systems one user group has ability to influence other user group's wellbeing or use of services, through changing the estuary condition or service levels supplied by an estuary. This implies an enterprise may not have control over the supply of ecosystem services which could be their core business. Furthermore, estuaries are naturally systems with high variability, also influencing enterprise sustainability.

In order to assess the risks facing possible enterprises in estuarine systems, a risk assessment tool has been prepared. See Tab 6 (enterprise risk assessment).

3.2.1 Score the severity and likelihood of risks

Go to Tab 6. A list of questions are provided that need to be addressed and scored by the workshop participants. These questions relate to different aspects of natural resources management in common property or open access ownership institutions. Once they have been scored in terms of severity and likelihood, then proceed to Tab 7.

3.2.2 Rank the priority risks and identify mitigating actions

On this sheet, an excel macro has been set up to rank the risks according to the magnitude of risk identified on the previous sheet. Once ranked, the priority risks should be assessed, and mitigating actions need to be identified and noted. If the severe risks cannot be mitigated, then the proposed enterprise has a strong possibility of future failure.

These mitigation actions would need to form part of the enterprise's future business plan.