Aquaculture zoning, site selection and area management under the ecosystem approach to aquaculture: A handbook
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Study Guide
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Abstract

This document provides the study guide for unit 3 in a Masters-level course in 'Planning and Managing the Use of Space for Aquaculture' made by the AquasSpace project. The main study material is part 1 of an FAO/World Bank handbook for the spatial management of aquaculture.

Contents

1 Study Guide

This text was written during the H2020 Aquaspace project (2015-2018, contract no. 633476) for a Masters-level course in 'Planning and Managing the Use of Space for Aquaculture'. The course consists of a number of units; this unit uses an FAO/World Bank handbook[1] to provide guidance for the implementation of spatial planning for aquaculture under the Ecosystem Approach to Aquaculture (EAA, introduced in unit 2).

The study material for this unit is contained in part 1 of the FAO handbook by Aguilar-Manjarrez et al. (2017), which should be read carefully. For convenience, this part of the handbook is provided on the AquaSpace website as a pdf, together with a set of slides containing the diagrams from the handbook. Hard copies of part 1, and pdf of the complete document, can be obtained from the FAO by following the links in the reference list.

Some of the SAQs in section 2 of this guide requires the student to obtain country-specific knowledge in order to answer self-assessment questions. Alternatively, a class teacher could prepare a lecture on this topic by assembling the relevant specific information. AquaSpace Case Study reports (Strand and Bergh, 2017) provide relevant information.

The learning outcomes for this unit are to be able to:

1. explain the main steps or components of spatial planning for aquaculture;
2. critically assess whether a planning process satisfies the requirements of the EAA;
3. give an example of the cultivation of an aquatic organism in the student's own country and show awareness of the public policy and legal framework, for zoning, siting and management, within which this cultivation takes place;
4. explain, in general terms, why a potential aquaculture zone is likely to be suitable for cultivation of a particular organism.

[1] For brevity, this will be referred to as 'FAO handbook'.

2 Commentary and Self-Assessment Questions

The SAQs that follow test your achievement of the learning outcomes and help you think actively about the matters described in the FAO handbook. In some cases (marked by (+)) you will need to draw on knowledge about aquaculture in your own country. The plus sign followed by a number (e.g. (+ 2)) is a reference to material in an earlier unit in this module. The sign (→) followed by a number (e.g. → 7) is a reference a later unit.

2.1 Introduction

This chapter in the handbook presents reasons for the spatial planning of aquaculture and the Ecosystem Approach to Aquaculture (EAA).

1. What are the principles of the EAA?

2. What risks or problems can be avoided, and what opportunities can be exploited, by spatial planning of aquaculture? Identify at least one problem and one opportunity in economic, environmental, and social categories, and (+2) suggest how each may contribute, positively or negatively, to an enterprise's economic, social and environmental *licences*.

2.2 Implementation

This chapter concerns the implementation, at national and lower levels of governance, of spatial management plans for aquaculture. It provides an outline, which is expanded in subsequent chapters of the handbook.

3. What are the four steps in the process for spatial planning and management of aquaculture?

4. What is meant by the 'executing entities' for each process step? (+) Who or what are they in your country?

2.3 Scoping

This chapter concerns the development of a country's national or regional policies relating to aquaculture "in the context of other sectors, policies and goals".

5. (+) Give an example of a law or regulation in your country that relates to aquaculture.

6. (+) Does your country have public policies relating to aquaculture? if yes, state an example policy.

7. Give several examples of types of stakeholders who should be consulted about national or regional spatial plans involving aquaculture.

8. (+) Give an example of an aquatic organism that is or could be cultivated in your country; what technology would be used and where might suitable conditions be found?

9. (+) What arguments could you make to investors to persuade them to invest in aquaculture in your country? (→ 5, *Aqua Investor Index* tool)

2.4 Zoning

This chapter deals with reasons for aquacultural zoning and mechanisms for setting up such zones, viewing the latter mainly as a function of public authorities.

10. Give at least one example from each category of economic, environmental and social factors (or opportunities) that could make a zone suitable for aquaculture.

11. Give at least one example from each category of economic, environmental and social factors (or risks) that could make a zone unsuitable for aquaculture.

12. What is the difference between environmental and social carrying capacity? (+2) How do these concepts relate to environmental and social licence?

13. Aquacultural zoning might be permissive (farming is allowed here) or exclusive (farming will be given priority here). Need aquaculture zones be exclusive to be effective?

14. (+2) Could zones be established and maintained other than by 'power steering' by government?

2.5 Site Selection

This chapter deals with the identification of a site for a specified aquacultural enterprise, such as a fish or shellfish farm.

15. What is the difference between identifying a zone for aquaculture and identifying a site for a farm?

16. Who 'owns' a site selection process? I.e. what kind of entity or organisation or person usually initiates it and what kind of entity can consent or forbid it? (+) Give an example of each for your own country.

17. Give several examples of economic, environmental and social factors that should be considered during site identification. (→ 5, *AquaSpace Tool*)

18. Give an example of a model that can be used to estimate whether a fish farm might cause eutrophication.

19. Give an example of a model that can be used to predict benthic impact from a fish farm.

20. Why do aquacultural sites need to be separated from each other and from other human activities? Give some examples of minimum separations, and (+ 2) relate these to the spatial scales of relevant environmental processes.

21. What matters should concern the public authorities when issuing licences (also called authorisations, permits or consents) for fish farm development at a particular site?

22. Give an example of problems due to inadequate licensing (+ 1: Buschmann et al. (2009)).

23. How might spatial planning process, and the application of the EAA, resolve actual or potential conflicts between two proposals to develope a particular site (a) for the same type of aquaculture, (b) for different types of

aquaculture, (c) for aquaculture and another type of human activity, such as tourism ? (→ 5, *AquaSpace Tool*)

2.6 Management Areas

This chapter deals with the management of groups of neighbouring farms. The processes involved in collective management relate to farms in existence, whereas those involved in aquacultural zoning can take place before farm development. Additionally, the distinction (see unit 2) is between a process directed by the public authorities (i.e. involving 'power-steering') and a collective process involving co-operation amongst farm operators who are neighbours.

24. What is an AMA? What functions can an AMA serve?

25. How might an AMA be set up? What organisational entities and groups of people should be included or consulted when an AMA is set up and when it is in operation? (→ 9)

26. Give an example of how an AMA can improve biosecurity. (→ 7)

27. Describe the use of Remote Sensing (also called Earth Observation) in managing aquaculture in these areas. (→ 6)

28. What is the role of adaptive management in AMA? Explain in the context of a specific AMA function, such as biosecurity or eutrophication prevention.

Several of the issues examined in this chapter are beyond the scope of the AquaSpace project except insofar as they were amenable to the tools developed or tested during AquaSpace. They are

IMTA, *Integrated MultiTropic Aquaculture*, the co-culture of different species either within the same farm or the same water-body (Ferreira et al., 2015; Granada et al., 2016); both aquacultural regions in AquaSpace's case study in China (Strand and Bergh, 2017) involved multi-enterprise IMTA and showed that the producers are aware of the need for spatial planning to co-ordinate use of ecosystem services;

Models for carrying capacity are the subject of studies carried out by the EU H2020 Tapas project, which is closely related to AquaSpace;

Risks from HABs – i.e. from *Harmful Algal Blooms* – were investigated by the EU FP7 ASIMUTH programme; some outputs from this programme are available from the Library/Other documents page on the AquaSpace web site;

Public management of water bodies is carried out in EU countries under member state transpositions of the Water Framework Directive, and such water bodies are an appropriate size for collective environmental management[2] - for example, a group of enterprises can agree to share a safe nutrient loading, or can co-operate in

[2] See *Scale* appendix in unit 2.

IMTA to ameliorate effects of excess nutrients.

3 Discussion and further study

To sum up, the spatial planning of aquaculture is a function of societal governance[3] on all three levels:[4]

constitutional level at which general rules are decided, such as those in the EU MSPFD or WFD, or UNCLOS, or the principles of the EA and EAA; these provide the framework within which the next level functions insofar as a nation state has signed up to appropriate treaties or decision makers are influenced by the principles;

collective-choice level at which policies (including regulations) are decided at nation-state or sub-state level: this is the level of the **scoping** step, and the involvement of stakeholders is part of the collective, deliberative, element, as might be the involvement of elected representatives in legislatures;

operational level at which rules are put into practice, with the consequence that peoples' actions directly affect biophysical conditions; **site selection** and the operation of **management areas** take place at this level and can

[3] As explained in unit 2, *governance* is defined as "the steering and ruling of society and the ways in which citizens and groups articulate their interests, mediate their differences, and exercise their legal rights and obligations". This definition is broader than that of *government* which operates through power-steering. It allows also for *collective arrangements* and money-steering through *markets*.

[4] The titles for the levels of governance are taken from figure 2.3 in Ostrom (2005), where they are used to qualify *(action) situations*.

involve a combination of institutional (rule-driven) action, deliberative social action, and individual agency; **zoning** might function at this level or be an aspect of policy-making at the collective-choice level.

The details of what happens at each level are of course highly specific to culture and governance and will differ between countries. It is for this reason that some SAQs have asked for information about conditions in a student's own country. And thus there is scope for much **further study** of some of these details. A good place to start would be with one of the ten **case studies in annex 5 to the FAO handbook** (included in the full report: see Aguilar-Manjarrez et al. (2017) in reference list for link). Although AquaSpace had non-European partners, it was necessarily Europe-focussed. The FAO case studies redress the global balance.

Within Europe, the AquaSpace Scotland (Argyll) and Italy (Adriatic) case studies provide an informative comparison. In Argyll, salmon farming is the dominant type of aquaculture, and most farms are owned by one of a few large, internationally-controlled, companies. In the Adriatic, shellfish farming is dominant, carried out by many small companies, some of which collaborate as part of co-operatives. Relevant sections of AquaSpace D4.2 (Strand and Bergh, 2017) give more information, and the Library/Video page of the AquaSpace website includes short videos about these two case studies.

4 Exercise

In the form of an essay (1000 words), or a set of 5 slides, or an A4 table,

- Critically and briefly analyse the extent to which a country's aquaculture plan implements the principles of the EAA at *Collective-Choice* and *Operational* levels of governance.

Sources of information include the case studies in annex 5 of Aguilar-Manjarrez et al. (2017), AquaSpace case studies in Strand and Bergh (2017), and investigations made in answering the SAQs in this unit.

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