Assessment of Economic and Social Impact of Ecological Policies in Danube Delta

Trifon Belacurencu
Candidate Ph.D.
Academy of Economic Studies, Bucharest

Abstract. *Impact assessment is a component of ecological policies assessment in Danube Delta and represents a preventive measure to make sure the some criteria are met based on which the designed ecological policy is accepted or not, such as: economic efficiency, equity, stimulative feature, applicability. We will restrict our evaluation to* assessing the impact of the due on fish resource capitalization. *This option is also justified by the fact that in the Danube Delta the highest human pressure is exerted on fish resource.* The due *on fish resource is an* instrument *of ecological policy that influences the model of fish resource management. The five forms of impact of due on fish resource are underlined: alimentary discomfort, reduction in workers income in collecting activity, lifestyle change, fish resource protection, increase in workers income in specific fields, such as research, investments. Weighting coefficients of parameters for each of five forms of impact are calculated with Delphi method.*

Key words: resource; impact; due; frequency; weight.

Impact assessment is a component of ecological policies estimation in Danube Delta and represents a preventive measure to make sure the following criteria are met based on which the designed ecological policy is accepted or not:

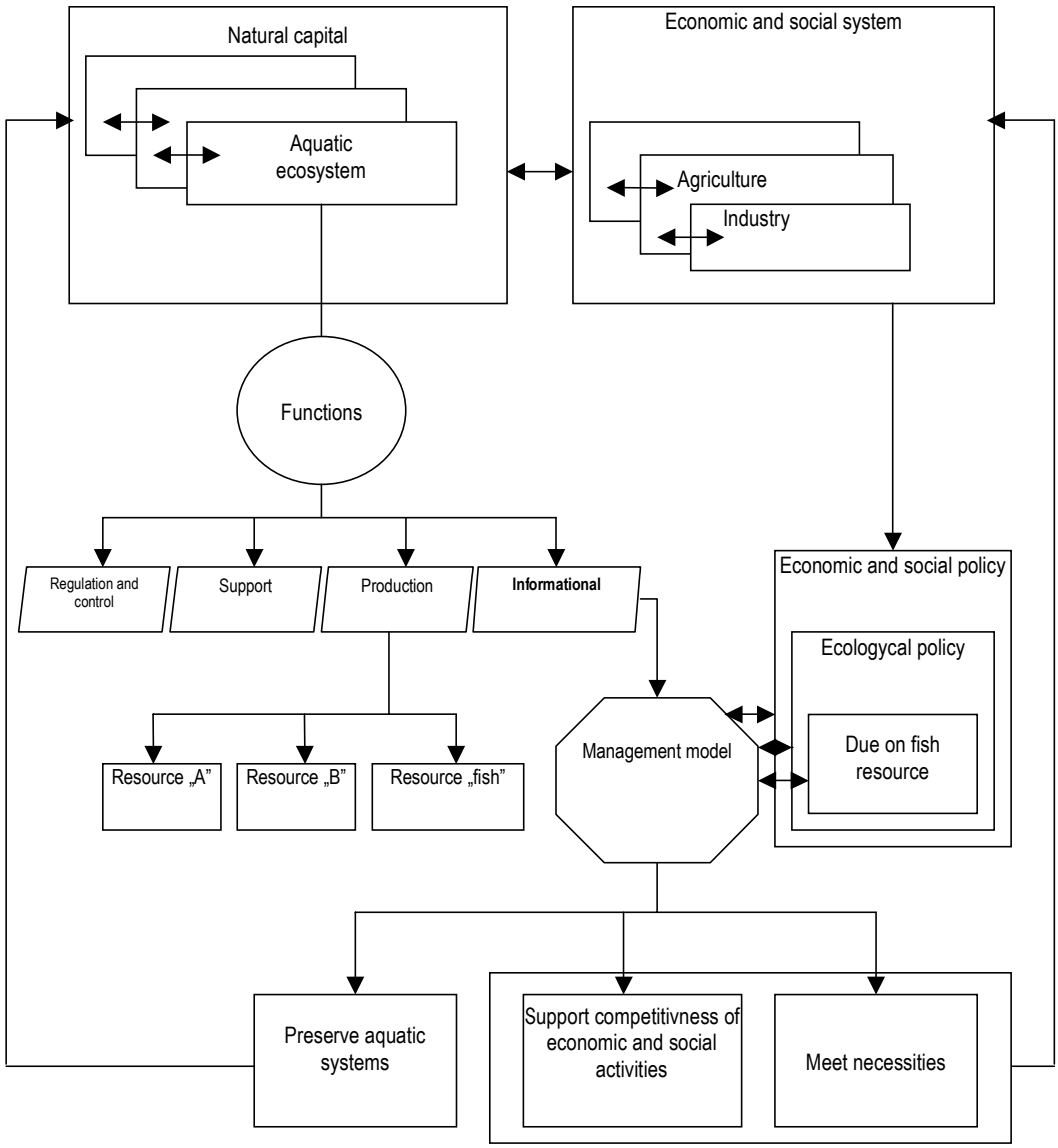
- economic efficiency,
- equity,
- stimulative feature,
- applicability.

Taking into account the approach of this issue, we will restrict our evaluation to *assessing the impact of the due on fish resource capitalization*. This option is also justified by the fact that in the Danube Delta the highest human pressure is exerted on fish resource.

The general framework to identify, foresee, normalize, proper evaluate and communicate the impact of "due on fish resource capitalization" is the one establishing the relationship between the natural capital and socio-economic system (figure 1).

The due on fish resource is an instrument of ecological policy that influences the model of fish resource management so that it meets the requirements:

- preserve aquatic ecosystems,
- support competitiveness of economic and social activities,
- meet necessities.



Source: Negrei, C., Trică, C., *Economia și gestiunea resurselor de apă,* Editura ASE, 2005

Figure 1. *Determinant factors of fish resource management model*

Identification of "due" impact is based on the following *argument* (figure 2): establishing the "due" determines, on the one hand, *cost rise* in accessing fish resource, and on the other hand it determines the growth of *budgetary incomes*. Based on the possibilities of the entity that exploits the fish resource to "transfer" the due cost to final consumers, it could register a *rise of delivery price* of fish, or/and a shortcoming in its profitability. According to the rules of competition market, price rise will be reflected in a lower demand for fish, so that, finally, the resource *will be protected*, but against *affecting the alimentary "comfort"*.

The reduction in profitability will determine some measures in rationalizing the expenses of accessing fish resource which can lead to a reduction of employment in fishery (and not only) that will be reflected in income loss of workers, as well as in changing lifestyle (fishery in Danube Delta is more than an activity, is a state of mind).

The increase of revenues from the "due" represents an important premise for strengthening and increasing jobs in field research, as well as in specific investments, Reserve administration, due collection respectively for *increasing workers incomes*.

The contradictory impact of the "due" on workers income should not be analyzed just from a compensation perspective, because income lowering affects the poor categories, and it will give the ecological policy an *aggressive character*.

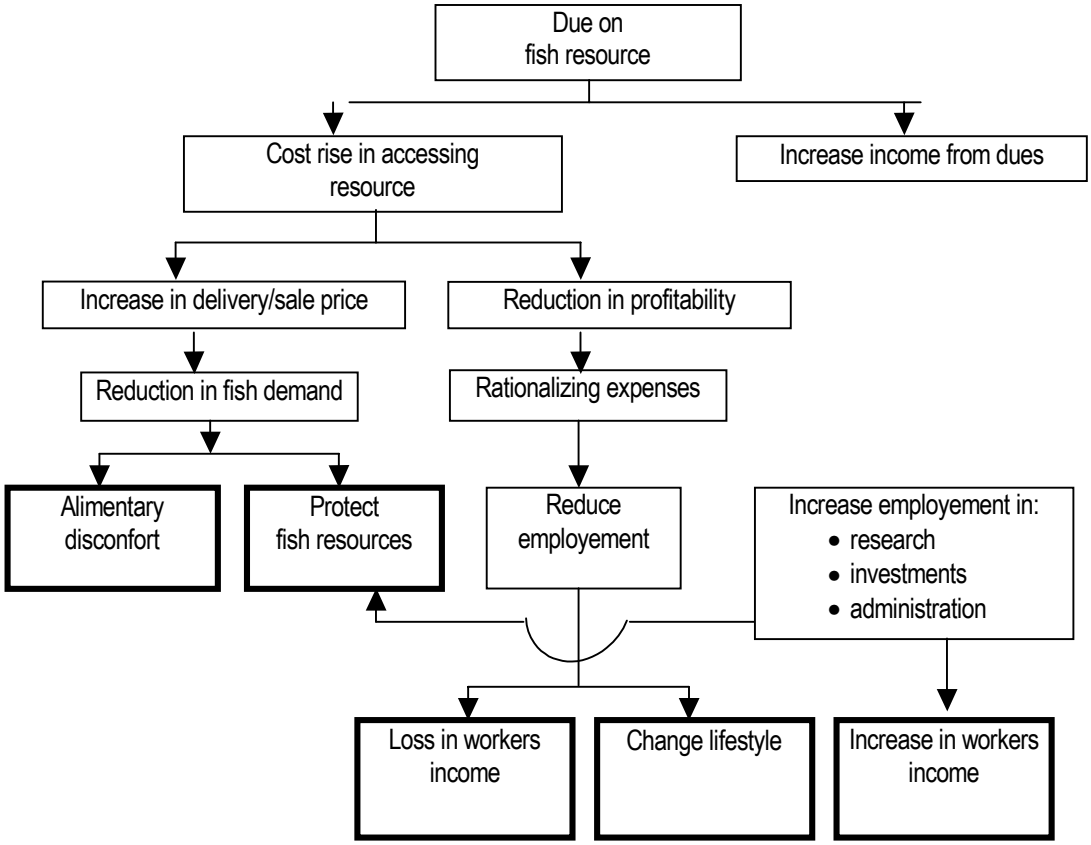


Figure 2. *Identification impacts of establishing dues on fish resources in Danube Delta*

Foreseeing impacts will have as starting point a series of functions (figures 3, 4) which connect the variables described above (figure 2).

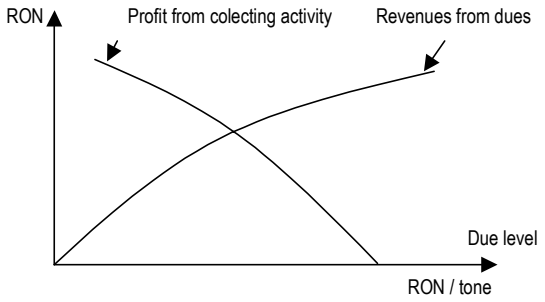


Figure 3. *Evolution of profit from collection activity and of revenues from dues, based on due level*

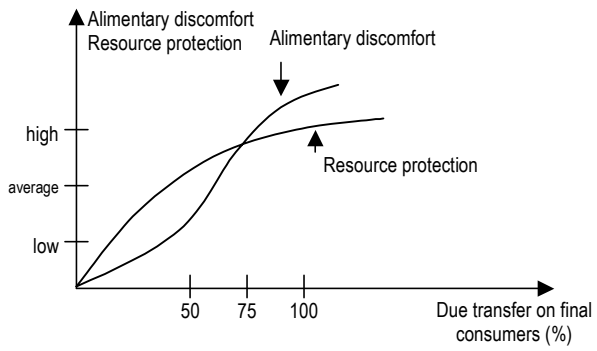


Figure 4. *Evolution of fish resource protection and of alimentary discomfort based of due transfer*

In Figure 4, five forms of impact of due on fish resource are underlined:

- alimentary discomfort,
- reduction in workers income in collecting activity,
- lifestyle change,
- fish resource protection,
- increase in workers income in specific fields, such as research, investments, etc.

To evaluate the impacts we will limit the study to establishing their importance, which will allow us to find the acceptability level for the dues and/or to order different possibilities of the project; we underline, in this respect, the necessity to differentiate the variants based on:

- Level of transferring the due to final consumers;
- Economic and ecological value of different species of fish;
- Population dynamics of different species of fish.

Establishing the importance of each mentioned impact will be based on the following parameters (Negrei, 1999, p. 211):

Quantitative and qualitative level of environmental impact parameters

No	parameter	Symbol	Qualitative level	Quantitative level
	Content	C	Advantage	1
			Damage	-1
	Intensity	I	Low	1
			Average	2
			High	3
	Extension (area of manifestation)	E	Punctual	1
			Semi-diffuse	2
			diffuse	3
	Producing moment	M	Immediately	3
			Mid term	2
			Long term	1
	Duration	P	Temporary	1
			Permanent	3
	Reversibility	R	Impossible	4
			Long term	3
			Mid term	2
			Short term	1
	Flexibility (adherence to corrective measure)	F	In design phase	1
			In implementation phase	2
			In operation phase	3
			Absent	4

The "*Scale*" used to express quantitative the impact is aleatory and does not allow its conversion in measurable units, but only setting these impacts in order, which is very important in alternative selection process (establishing impact values is a an expensive action and that's why it will be bade only for the chosen alternative).

After establishing the weighting coefficient for each of the seven parameters, we can calculate the importance of impact using the formula:

$$Z(x,y) = C(i \times I + e \times E + m \times M + p \times P + r \times R + f \times F),$$

In which:

Z(x,y) = importance of impact of x and y co-ordinate,

i, e, m, p, r, f = weighting coefficients of impact parameters.

Weighting coefficients of parameters for each of five forms of impact are calculated with *Delphy method* (by consulting specialists from analyzed fields), using one of the following technics:

- ordering by means of ranks,
- classification by means of a proportion scale,
- comparison in pairs.

The importance of global impact (Z) of "due on fish resource" will be calculated *using the relation*:

$$\sum_{i=1}^{5} \alpha_i \times z_i$$

in which a = impact importance coefficient "i" ,established using comparison in pairs technics.

Classification by means of a proportion scale (usually with values from 1 to 10) is based also on the criterion of weighting each parameter, but respecting the following algorithm:

- Each element is appreciated by each expert with a number of points between 1 and 10

Number of points given to each element (or expressing parameter of it)

Parameters "j"	Members of expert team "i"			
	1	2 ……..	i	…….. m
1				
2				
.				
.				
.				
j			a_{ij}	
.				
.				
n				
$\sum_{i=1}^{m} a_{ij}$				

a_{ij} = number of points given by the expert "i" to parameter "j".

- The weight of points, for each parameter, in the total number of points given by an expert to the "n" parameters

$$V_{ij} = \frac{a_{ij}}{\sum_{j=1}^{n} a_{ij}}$$

The weight of points for each parameter in the total number given by each expert

Parameters "j"	Members of expert team "i"			
	1	2 ……..	i	…….. m
1				
2				
.				
.				
.				
j			V_{ij}	
.				
.				
n				

Parameters "j"Members of expert team "i"

- Calculation of the average weight of each element, taking into account everybody appreciation.

$$\overline{V_j} = \frac{\sum_{i=1}^{m} V_{ij}}{\sum_{j=1}^{n}\sum_{i=1}^{m} V_{ij}}$$

Comparing by pairs implies that each member of expert team to establish the priority of one element (parameter) compared with the other elements under evaluation.

Priority given to an element compared with each of the other element:

Parameters "j"	Members of expert team "i"									
	1		…		i		…		n	
	1 2…j…1…n			1 2 …j…	1	n		1 2 …j…1…n		
1										
2										
.										
.										
.										
j					a_{i1} or a_{ij}					
.										
.										
.										
n										

Data from the above table are used in the following algorithm:

- calculating the preference frequency for each element, against the comparison element.

Preference frequency for an element

Parameters "j"	Members of expert team "i"			
	1 2 ……..		i	i…….. m
1				
2				
.				
.				
.				
j			α_{ij}	
.				
.				
n				

α_{ij} = the frequency with which the element "j" was preferred by expert "i" compared with the other elements under evaluation.

- Calculate the frequency weight with which each element was preferred in the total number of preferences

$$\sigma = \frac{a_{ij}}{m \times n}$$

Frequency weight of each element in the total number of preferences:

Parameters "j"	Members of expert team "i"		
	1 2 ……..	i	i…….. m
1			
2			
.			
.			
.			
j		σ_{ij}	
.			
.			
n			

- Calculation the average weight of frequency for each element;

1. Impacts importance coefficients of the due on fish resource

1.1. Priority given to each impact compared with the other impacts

Impact	Experts																				
	1					2					3					4					
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
1		2	3	1	5		2	1	1	5		2	3	1	5		2	1	1	5
2			3	4	5			3	2	5			3	2	5			3	4	5
3				4	5				4	3				4	3				4	5
4					5					5					5					5
5																				

1.2. Calculation of the frequency with which each impact was preferred by each expert against the impact with which it was compared

Impact	Preference			
	1	2	3	4
1	1	2	1	2
2	1	2	2	1
3	2	1	3	1
4	2	1	1	2
5	4	4	3	4

1.3. Calculation of the frequency weight with which each impact was preferred in the total number of preferences

Impact	Experts			
	1	2	3	4
1	0.05	0.1	0.05	0.1
2	0.05	0.1	0.1	0.05
3	0.1	0.05	0.15	0.05
4	0.1	0.05	0.05	0.1
5	0.2	0.2	0.15	0.2

1.4. Calculation of the average frequency weight of each impact (impact importance coefficient)

V1 = 0,15
V 2 = 0,15
V 3 = 0,18
V 4 = 0,37
V 5 = 0,15

2. Impact importance "alimentary discomfort"

2.1. Quantitative and qualitative level of impact parameter "alimentary discomfort"

No	Parameter name	Symbol	Qualitative level	Quantitative level
	Content	C	Damage	-1
1	Intensity	I	Low	1
2	Extension (manifestation area)	E	Punctual	1
3	Producing moment	M	Mean term	2
4	Duration	P	Temporary	1
5	Reversibility	R	Mean term	2

2.2. Impact parameter importance "alimentary discomfort"

▪ Estimating each parameter by each expert with a number of points between 1 and 10.

Parameters	Experts			
	1	2	3	4
1	3	4	4	4
2	2	3	3	2
3	10	9	8	9
4	4	5	4	3
5	6	5	6	4
Total	25	26	25	22

▪ Calculation of the weight of points for each parameter in the total number of points given by an expert

Parameters	Experts				Total
	1	2	3	4	
1	0.12	0.15	0.16	0.19	0.62
2	0.08	0.12	0.12	0.09	0.41
3	0.4	0.34	0.32	0.41	1.47
4	0.16	0.19	0.16	0.14	0.65
5	0.24	0.19	0.24	0.19	0.86

▪ Calculating the average weight for each parameter taking into account the appreciation of every expert.

P 1 = 0.15
P 2 = 0.10
P 3 = 0.37
P 4 = 0.16
P 5 = 0.21

Absolute importance of the impact "Alimentary discomfort"

I_1 = -1 (1 × 0.15 + 1 × 0.10 + 2 × 0.37 + 1 × 0.16 + 2 × × 0.21) = -1.57

Relative importance of the impact "Alimentary discomfort"

I_1^* = -1.57 × 0.15 = -0.23

3. Importance of the impact "Loss in workers income in fishery"

Absolute importance = -2.01
Relative importance = -2.01 × 0.15 = -0.30

4. Importance of the impact „lifestyle change"

Absolute importance = -1.15
Relative importance = -1.15 × 0.18 = -0.21

5. Importance of the impact „fish resource protection"

Absolute importance = +1.64
Relative importance = +1.64 * 0.37 = +0.61

6. Importance of the impact „increase in workers income in specific fields, such as research, investments"

Absolute importance = +1.05
Relative importance = +1.05 × 0.15 = + 0.16

7. Importance of global impact = -0.23 – 0.3 – 0.21 + 0.61 + 0.16 = + 0.03

References

Negrei, C. (1999). *Instrumente și metode în managementul mediului*, Editura Economică, București