

**Strengthening Regional cooperation in the area of fisheries  
data collection – MARE/2016/22**

**Socio-economic data collection for fisheries, aquaculture  
and the processing industry**

*Work Package 4: D4.2*

**D.4.2: Guidelines for the valuation of intangible assets of  
fishing fleets in the EU**

**Partners involved:**

BIM, ILVO, NISEA, SEAFISH, WER

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## Purpose of the guidelines

Fishing rights are likely to play a considerable role in the economics of EU fisheries. Therefore, knowledge on the value of all assets of the fisheries, including intangibles would be beneficial for the study of the economic performance of the sector. However, until now, capital valuation in fisheries focused primarily on the vessel and its equipment (PGECON, 2013) and common valuation methods for fishing rights are missing for most EU fisheries.

In addition, MS implemented different fishing right regimes and valuation of the fishing rights is left to the MS and not always in place. Where valuation methods are in place, there is little known from literature about it. This hampers the comparison and analysis on the EU-level. A common approach for estimating the value of fishing rights is needed.

The need for a common approach or methodology for assessing the value of the rights to fish has been emphasized on several occasions (e.g., Workshop on Evaluation of data collection connected to Fishing Rights and Capital Costs, PGECON 2013, PGECON 2014, DCF Liaison meeting 2014, Sabatella E. C. 2016). In addition, estimation of intangible assets is required by the Data Collection Framework (DCF) under the EUMAP (EU Decision 1251/2016) and common methodologies should be defined (PGECON 2013).

The aim of the present guidelines is to provide standard methodologies to evaluate fishing rights in order to obtain comparable results. The guidelines have been drafted starting from the outcomes of the following documents produced by SECFISH, WP4:

- Internal Document SecFish WP4 step2, Establishing common methodology for the valuation of fishing rights, theoretical evaluation and questionnaires
- Analysis of the information provided by DCF national correspondents through a web-based survey.

## Definitions and characteristics of the fishing rights

Fishing right regimes include 'any system of allocating fishing rights to fishermen, fishing vessels, enterprises, cooperatives or fishing communities' (Source: MRAG et al, 2009), e.g.:

- limited non-transferable licensing (LL);
- limited transferable licensing (LTL);
- community catch quotas (CQ);
- individual non-transferable effort quotas (IE);
- individual transferable effort quotas (ITE);
- individual non-transferable catch quotas (IQ);
- vessel catch limits (VC);
- individual transferable quotas (ITQ), and
- territorial use rights in fisheries (TURF).

The different right regimes can be structured schematically as in figure 1.

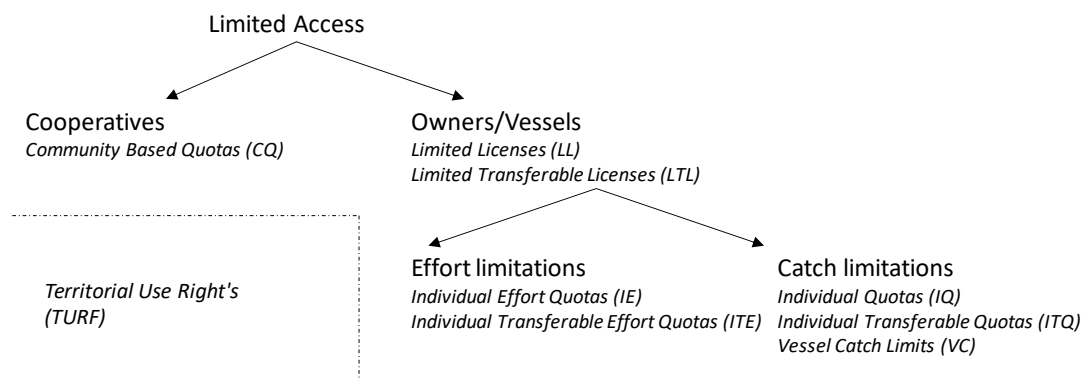


Figure 1: Overview of fishing right regimes (MRAG et al, 2009)

The highest hierarchical level comprises access rights that limit the admission to the fishing grounds to a selected group of operators. Fishing rights can be either applied to vessels (or vessel owners), such as is the case under Limited Licences (LL). Access rights can include specifications on gear, season etc. Territorial Use Rights (TURF) are a special form of access rights, in which usually a community manages the access to the local fishing ground.

Individual effort limitation confines the individual fishing effort to a maximum effort (e.g. fishing days, fishing trips) per time unit (e.g. month, season, or year). However, as catch per unit effort (CPUE) varies, catch is not directly managed. Harvest share rights, or catch limitations, further limit the individual maximum catch. Maximum catches on vessel level can be set per trip, such as under the Vessel Catch Limitation (VC) regime. However, the most common practice is to distribute the right to a share of the Total Allowable Catches (TAC) to the individual operators. These, individual quota shares can be either non-tradable, as in individual quotas (IQ), or they can be tradable, as in individual tradeable quota (ITQ).

SECFISH elaborated a web survey to National Correspondents to get an inventory of the member states fishing right regimes and suggested valuation methods. This inventory is reported in annex 2.

Valuation of fishing rights, like other intangible assets, is challenging as the value depends on different characteristics (Arnason, 2005; Davidse, 1997). A fishing right can be evaluated in terms of the absence or presence of these characteristics:

- **Exclusivity:** The extent to which someone could utilize the fishing right without dependability of others.
- **Flexibility:** to what extend the right is constrained as to how it may be used.
- **Security (quality of the title):** ability of the owner to withstand challenges that could limit the value of the right or losing the right to external factors (e.g. governmental, the common, other individuals etc.) and maintain his property rights.
- **Divisibility:** To what extend the right could be split into multiple smaller rights.
- **Permanence/duration:** the time span of the property right (infinite duration vs. finite duration).
- **Transferability:** the ability to transfer the property right to someone else.

Next to these six characteristics there is the importance of *initial distribution* because if a fishing right is granted by government or other entities free of charge, there are mostly no costs of acquiring known. Not all valuation methods could solve this lacking information about costs.

## Valuation methods

### Background considerations

The EC study NO. FISH/2005/03 proposes to apply the approach established by the Farm Accountancy Data Network (FADN), stating that tradable intangibles should be valued, if applicable, at current market (fair value) price (or multi year average). This is in line with the IAS and IFRS (International Financial Reporting Standards) that prescribe the fair value. The IFRS (2018) defines 'fair value' as the price that would be received to sell an intangible asset or paid to transfer a liability in orderly transaction between market players in an active market. An active market is defined here as a market with sufficient frequency and volume of transactions for the (in)tangible assets to provide pricing information on an ongoing basis. Furthermore, according to the standards of the FADN if rights are acquired for free of charge these are not valued as assets except when their sale is recorded (FADN, 2000). However in some cases, the rights are attached to tangible assets (vessels) or are not traded. Furthermore, price information on intangibles is scarce and estimations of their value when linked to tangibles are far from simple (PGECON, 2013). The objective of this study is to deliver guidelines how fishing rights, whether transferable/tradeable or non-transferable/tradable, could be valued.

In practical terms, for matter of valuation, two (or sometimes three) types of fishing rights should be distinguished:

1. Fishing rights that are traded in a market
2. Fishing rights that are not traded (or not in big enough volumes for a reference price to be established)
3. Fishing rights that are attached to a tangible asset (often the vessel) are traded inseparably from each other.

Regarding the tradability and observability of market prices, it has to be noted that even when intangibles are tradable without restrictions, observation of their prices in the market (fair value) is often difficult because the number of transactions is small and they are not recorded. (PGECON, 2013). In the second case, no market information is available and fair values have to be estimated. When the intangibles are attached to vessel, direct observation of the market/fair value is impossible, hence the value has to be estimated (PGECON, 2013).

Another important factor concerns the acquisition of the fisheries rights. In many cases, the fishing companies have not acquired any of the rights, but simply hold the rights which they have acquired free of charge from the government, when the system was introduced. In that case it is not clear if these rights should be valued as an asset, increasing substantially the total

asset value of the company, or not (PGECON, 2013). However, according to IAS 38 (2008, art.44) an intangible asset acquired by government grant should be valued at fair value (if applicable) or by the symbolic value (e.g. initially nominal consideration) plus any expenditure that is directly attributable to the operations of preparing the asset for the use of it which it is intended for.

However, so-called non-market goods are valuable goods or services but are not traded. Certain fishing right regimes fall in this category. For the valuation of those fishing rights, we can turn to non-market good valuation methods known in economic theory.

The appropriate valuation method thus depends on the fishing right regime.

In annex 1 the different valuation methods are described together with their advantages and disadvantages.

## Decision tree for choosing the appropriate valuation method

From existing literature and following international accounting standards e.g. International valuation standards (IVS, 2010), and the IAS (2008), the most common valuation methods for intangible assets are the market based (price)-, income- and cost method. The income- and cost method could be categorized in multiple methods as stated below. These specific methods are mentioned in more detail in annex 1.

1. **Market based (price) method:** based on transactions data involving similar fishing rights.
2. **Income method:** based on economic benefits anticipated to be derived from the fishing rights.
  - Discounted cash flow (DisCF) approach
  - Relief from Royalty method
  - Excess Earnings/incremental income method
  - Greenfield method
  - Distributor method
  - Profit Apportionment method
3. **Cost method:** based on the anticipated cost to recreate, replace or replicate the fishing rights.
  - Contingent valuation
  - Survey
  - Choice experiments
  - Hedonic regression analysis

To select the valuation method, the decision tree reported in figure 2 should be followed.

## Conclusion

Based on the applicability and the balance between advantages and disadvantages of each valuation methods (annex 1) the following conclusions could be made in order to select the most appropriate valuation method.

When the fishing right is not attached to a tangible asset (e.g. vessel), transferable/tradable and there is an active market, the most appropriate method to value the fishing right is the market based (pricing) method. The main advantages of this method is the simplicity and quickness of usage, applicable even if a fishing right has been acquired for free of charge (no initial costs) and it takes multiple factors (e.g. fish stocks, market outlooks, profitability of a fishery, fuel prices, scarcity etc.) into account perceived by market players (sellers and buyers) in an active market. A major disadvantage of this method is that potentially information dissymmetry is embedded in the fair value. For instance, if there is a race in the market for buying or selling the fishing rights there could be market players that would determine their decision to buy or sell rather on the behaviour of the majority than for rational arguments or based on information asymmetry. Another disadvantage is that the fair value represent the value at a certain moment of transaction. Compared to the discounted cash flow method, there is less potential of future cash flows taken into account. Although these two main disadvantages, the market based (pricing) method is a simple and highly preferable method to value fishing rights.

Besides the market based (pricing) method, the discounted cash flow (DisCF) is a highly preferable method to value fishing rights. If there is no active market and there no fair value or acquiring costs are available the DisCF is a relative simple and highly applicable method to value the right. The main advantage of this method is the information about the future (cash flows etc.) are taken into account as is the often the case with the market based method. However in absence of market prices the DisCF is an accurate to measure the future potential of a right. A disadvantage is that is hard to predict risks or net results in the future. Still the easiness and the accuracy of the discount rate (including effects of future costs and revenues) outweighs the disadvantage. The methods relief from royalty, cost approach or the choice experiment are more complex and subjectively to value fishing rights.

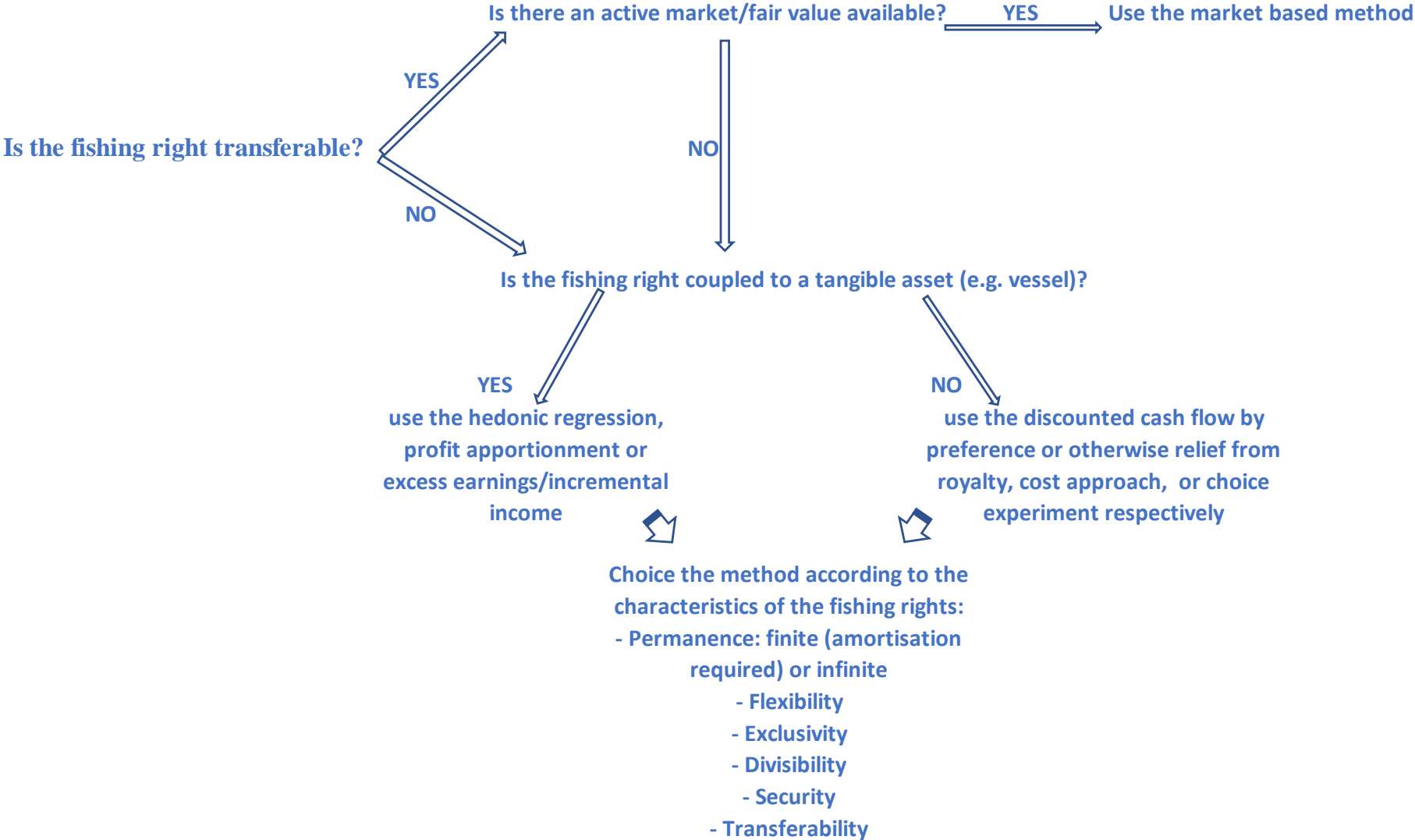
If the fishing right is coupled to a tangible asset, in case of highly transferability or completely not, the hedonic regression is most preferable to value the right, followed by the profit apportionment and excess earnings/incremental income methods. The main advantage of the hedonic regression is the practical approach by estimating the value of the fishing right by separating it from the tangible asset (e.g. vessel). The total cost of acquisition or the total fair value (in case of an active market) is divided in percentages for the part of the vessel and for the estimated part of the fishing right. Often it is more easy to determine a vessel's price rather than the fishing right. There it should start with the tangible asset's value. In case it is hardly possible to determine a realistic price for a type of vessel, it is difficult to apply this method. . For instance in markets where there is no demand and there no transactions of

(new) similar type of vessels. If the vessel can be valued this method is more preferable than the profit apportionment or the excess earnings methods. These methods are highly hypothetical and mainly based on (assumed) revenue streams instead of fair value or (historical) acquiring costs.

After selecting a method it is necessary to determine the other characteristics of the fishing right like the extend of permanence (finite or infinite), flexibility, exclusivity, divisibility and security. These characteristics could affect the value of a fishing right. In general, the more limitations for the right the lower the value is of the right. Especially the permanence is important to know before measuring the value of the right. In the DisCF method the value of an infinite right is differing from the finite version of this right due to another formula. In the formula for the finite the calculation is assumed to be more accurate due to the annually effects that are calculated by year to year. The infinite version is calculated by a total discount rate for all the years and therefore more uncertainty in differing net present value between years.



Figure 2 – Decision tree for the selection of the appropriate valuation method



## **Annex 1 – Different valuation methods (including advantages and disadvantages)**

### **Market based method**

The market based method is applicable when market prices (FADN, EC Study No. FISH/2005/03) are based on the economic perspective of supply and demand. The value of the intangible assets is examined by market transactions of a similar asset. Price is a reflection of supply and demand between multiple market players. In multiple countries there are transferable/tradable quota systems (ITQs). Frequently these are traded based on a market price (negotiation between seller (supply) and purchaser (demand)). Purchasers bid and sellers offer their fishing right. This right is sold and purchased by negotiations or based on average available fair values/market prices. In terms of IAS 38: “Quoted market prices in an active market provide the most reliable estimate of the fair value of an intangible asset”. In this case we recommend direct market comparison with transactions involving identical or similar assets. Beside similarity of fishing right (e.g. fish species, type fisheries, characteristics etc.) is essential but also similarity in preferences between buyers and sellers in different markets.

Demand refers to how much (quantity) of a product or service is desired by buyers. The quantity demanded is the amount of a product people are willing to buy at a certain price. Supply represents how much the market can offer. The quantity supplied refers to the amount of a certain good producers are willing to supply when receiving a certain price. It means, *ceteris paribus*, that a high demand (in quantity) and/or a lower supply (in quantity) results in a higher price because of the scarcity reason. The opposite means that there is higher supply (in quantity) than the demanded quantity by the market which will result in a lower price because of a surplus. When the demanded quantity and the supplied quantity match there is an economic equilibrium. Frequently there is an allocation inefficiency that determines a fluctuating price over time.

Two criteria must be met to apply this market based method, according to the IVS (2010: 210):

1. Information is available on arm’s length transactions involving identical or similar intangible assets on or near the valuations date, and
2. Sufficient information is available to allow the valuing party to adjust for all significant differences between the subject intangible asset and those involved in the transactions.

### **Example**

Individual catch quota could be valued by the market based method. The main question is if the quota are transferable. If so, the individual quota could be valued at fair value (current active market prices). The shorter the duration, the lower the security and flexibility are the less the average fair value will be. For instance, the permanence could be finite if it is announced by governments that quota management system will be stopped by legislation in

a new CFP. In the case of the Netherlands it is known that the duration of ITQs were based on 8 years in the past. Since a new CFP could, as discussed that time, be eliminated by the EU in 2002 (Davidse et al, 1995). However, when ITQs have an infinite duration it is in most daily practices of fisheries that it has not to be amortised according to Davidse et al (1995). With the market based method the average price of quota will be higher when the permanence is infinite. Of course the lower the flexibility and divisibility the less the fair value however in many individual quota systems there is hardly any flexibility and divisibility with the right. The consequences of the market based method could be large fluctuations in values between years and periods. For instance ITQ for sole in the Netherlands differed from €5-7 per kg in 1988 to €45-54 per kg some months later. In 1993 the average market prices for sole ITQ were €32-43 per kg (Davidse et al, 1995). Because the market will react to many factors (fleet performance, fishing stocks, economic results, competition for quota etc.) prices will increase or decrease.

**Main advantages and disadvantages of market based valuation method**

<b>Advantages (strengths)</b>	<b>Disadvantages (weaknesses)</b>
Applicable even if a fishing right has been acquired for free of charge. So even if no initial costs of acquiring are available, supply and demand could determine a (average) price.	Information dissymmetry is embedded in the price/value.
Appropriate when rights are transferable.	No level playing field in a market with just a few sellers or buyers that possess dominant resources (large % of quota shares, prior knowledge etc.)
Examines the current/actual perceived value by the market parties (sellers and buyers).	limited by the lack of information necessary to ensure comparability/identifiability. E.g. through other asset's characteristics/heterogeneity between companies and rights or to large time difference in/lack of transactions by passive trading market.
Stimulates competition and therefore race for highest added value per price. Due to willingness to pay the market parties should be able in theory to value the fishing rights by multiple factors (e.g. potential future profitability by possessing rights, fish stocks, etc.)	May not take into account the ability of the intangible asset to generate cash flow because price is rather based on current supply and demand driven by the extend of activity (transactions) in the market. So in a highly active market, players could rather base their decision on emotion (following the market) than ratio based on information

	(e.g. market outlooks, profits of fisheries, fish stocks, legislation etc.) that should determine the value of the fishing right.
An individual sale does not automatically establish the value of the property.  Multiple sales of comparable properties are used in establishing value.	Difficult if transferability of fishing rights is not available.
Relative quick and simple method to value fishing rights.	
Value of rights could be determined to some extent and situations by buyers and sellers or lesser and lessee (in case of renting quota) by negotiation.	

## Income methods

There are various methodologies that can be applied using the principles of the Income approach. These methods include discounted cash flow (DisCF), relief from royalty, excess earnings/incremental income, greenfield method, distributor method and profit apportionment.

### Discounted cash flow (DisCF) approach

The DisCF is a method that could value intangible assets by the present value of future economic income adjusted by discount rate(s) that compensate for uncertainties and risks of the revenue streams in time (Uzma et al, 2010). The value of the right is measured by calculating the net present value (NPV) via annually cash flows (CF) adjusted by discount rates (r). Discount rates could be the compensation of the risk/uncertainty in future economic income for instance by lower fish stocks, closing fishing areas, diminishing TACs, fluctuating fish landings and prices etc.

Cash flows are the net income from cash by the difference between receiving revenue streams (e.g. selling landed fish) and paying costs from cash (e.g. fishing materials etc.). The formula is:

$$\text{Operating Cash Flow} = \text{Net Income} + \text{Non-Cash Expenses} - \text{Increase in Working Capital}$$

Non-cash expenses could be depreciation costs, deferred tax etc. Increase in working capital are the paying costs from cash (e.g. fishing materials etc.).

The formula for the NPV is reported below. The NPV indicates the measured value of the fishing right.

$$NPV = \frac{CF_0}{(1+r)^0} + \frac{CF_1}{(1+r)^1} + \frac{CF_2}{(1+r)^2} + \dots + \frac{CF_n}{(1+r)^n} = \sum_{t=0}^n \frac{CF_t}{(1+r)^t}$$

**Example**

In the case of individual quota, it is important to know the characteristics of the fishing right in the future since this will affect the economic income cumulated. For instance, if the permanence of the quota is 10 year, the amortisation is annually 10% of the initial cost of acquiring the quota (e.g. €100,000). In this example it is assumed that the quota is not transferable. The net income by selling landed fish is annually €1,000,000. Taxes are annually 20% of the net income. Increase in working capital is annually €300,000. The desired net economic result is 10% as compensation of 10 year duration of the quota.

CF = €1,000,000 + €10,000 (amortisation is 10% of initial cost of acquiring) - €300,000 (increase in working capital) = €710,000.

r = desired net economic result \* (1 – taxes rate) = 0.10 \* (1 – 0.20) = 0.08

$$NPV = \frac{€710,000 \text{ year } 0}{(1+0.08)^0} + \frac{€710,000 \text{ year } 1}{(1+0.08)^1} + \frac{€710,000 \text{ year } 2}{(1+0.08)^2} + \dots + \frac{€710,000 \text{ year } 10}{(1+0.08)^{10}} = € 5,474,157.79$$

The value of the quota is according to the DisCF method € 5,474,157.79.

In case when this quota is transferable it is still appropriate to apply the DisCF method, however since the potential buyer or lessee shall calculate the NPV to value how much the quota is worth to him by using his own CF and r that would differ from the seller or lesser. In case of leasing the quota it is more complex since there is no depreciation costs for the lessee. The lesser could calculate his NPV by using his costs except the taxes since the lessee will pay taxes as well. His taxes rate could be applied.

When the permanence/duration of the quota is infinite the formula is as follows:

$$NPV = \frac{CF}{r} = \frac{€910,000}{0.08} = €11,375,000$$

A similar approach is applied for valuation of transferable quotas and licenses in the UK. However, here the landings value (of a certain fish species) is applied to calculate the cash flows generated or to generate (in the future) by the fishing right. The landings value is divided by the kilograms of that fish species to calculate the average revenue/income of the fishing right for a certain fish species. Often an average net profit margin for the specific fishery type is used to calculate the net cash flow from the fish right.

1. At overall fleet level, for each quota stock (FQA), a price per quota unit in each year is calculated on the basis of landings value:

$$\text{Landings value} / \text{FQAs} = \text{£ per FQA}$$

This first step is necessary because landings by a segment don't necessarily match the quota holdings of a segment due to the fact that active vessel owners need to lease in quota from other segments or from dummy licences held by POs.

- For each stock and each fleet segment combination, the total value of all FQAs units for each stock held by vessels in each segment in each year is calculated :

$$\text{£ per FQA} * \text{FQAs} = \text{FQA value of each stock at segment level}$$

- For each segment, estimate profit per quota stock. Profit here could be compared to the cash flow measured in the DisCF, however it is important to clarify which costs are used to calculate the profit. With the DisCF the cash flows are calculated by the difference between cash inflows/incomes and outflows/expenses. Therefore the net profit margin should be the difference between cash incomes (landing incomes) minus cash expenses (e.g. crew wages, fuel costs etc.). The amortization costs are no cash expenses and should be summed to the total to have the cash flows.

Net profit margin \* FQA value of each stock at segment level = Profit generated by each quota stock at segment level

- For each segment calculate the NPV of future returns from the profit of each quota stock landed, using an appropriate asset life value and discount rate:

$$NPV = \text{profit on quota stock a} + \text{profit on quota stock b} + \text{profit on quota stock c etc.}$$

There is no exact science when choosing discount rates and length of asset life. UK treasury guidance for valuing public goods suggests a discount rate of 3.5% and an asset life of 30 years, while fishing quota tends to be depreciated by financial accountants at 10% per annum with a 10-15 year asset life to better reflect the level of risk associated with quota ownership in the UK. For the purposes of the 2011 fleet economic data call, valuation of the quota element of UK fishing rights used a 10% discount rate and a 15 year asset life.

#### Main advantages and disadvantages of this Discounted cash flow (DisCF) method

Advantages (strengths)	Disadvantages (weaknesses)
Applicable even if a fishing right has been acquired for free of charge. So even if no initial costs of acquiring are available, since future incomes (cash flows) are measured,	Seems to provide insights to future incomes by the discount rates however it is always hard to predict risks or net results in the future.
Takes future incomes into account. Consequently, it is an accurate method to value the right for the future.	When the duration is infinite the DisCF could overestimate the value of the fishing right since today's markets change rapidly and many times.

Cash flows are frequently more straight forward compared to market prices or net profits because these two could imply information asymmetries or framing by the seller if it comes to negotiations.	The discount rate is rather subjectively determined as the method implies that risk and uncertainties could be mathematical managed by the discount rate.
It is quantitative based on calculating the potential losses or profits by the cash flows adjusted with the discount rates.	

### Relief from Royalty method

The Relief from Royalty methodology is based on the premise that a property's value can be measured by what the owner or prospective owner of the property would be willing to pay in royalties if it had to license the intellectual asset from a third party. Consequently, the entity is relieved of the royalty payments due to the ownership of the asset. This approach may also quantify the amount of income the present owner would generate by licensing the intellectual property to others. In particular, if the permanence is relevant. For this reason the royalty rate must be determined by calculating the future royalty income stream. Similar to the discounted cash flow method, the present value of the asset is measured by a discount rate. The royalty rates are based on marketplace transactions (Ahya, 2005) and applied as a forecast of revenues as an income approach. Therefore, it combines the market- and income method. The method determines the amount of costs if the asset should be licensed in order to use.

There are royalty tariffs in an active/recently marketplace of identifiable/similar (fishing) rights required to calculate the income/savings if the right had to be licensed from a third party.

If the duration is infinite there are amortisation costs (IAS 38, 2008; art.107). In situations when there is a finite duration of the fishing right, the amortisation costs could be included in the discount rate. When the fishing right is leased there is no obligation to amortise. Frequently, the intangible asset (e.g. patent, licence of a brand etc.) are still owned by the lessor (the entity that provides the license through receiving royalties). Therefore a lessor could require that the lessee/receiving entity pays a certain amount for the amortisation of the asset if the duration is finite. Next to the permanence, the exclusivity of the right for the receiving entity is important. Apart from the ownership it is relevant whether the lessee/receiving party could use the rights entirely to generate their annually revenues from it. If this not the case, the value of the right is less relative to a fishing right that could entirely be used. The question is whether there is residual value and if there is tax amortization benefit. If it is, these costs have to be gained finally to the net present value of the asset.

The formula is:

$$\text{NPV} = \frac{(\text{Revenue in year 1}) * (\text{royalty rate}) * (1 - \text{tax rate})}{(1+r)^1} + \dots + \frac{(\text{Revenue in year 10}) * (\text{royalty rate}) * (1 - \text{tax rate})}{(1+r)^{10}}$$

- r = discount rate (see also DisCF method)
- t = permanence/duration of the fishing right
- Revenue = revenue forecast generated by utilising the fishing right that is valued
- Royalty rate = royalty rate applicable to license the fishing right (mostly expressed as a percentage of revenue) based on data of an active market (fair value).
- Tax rate = the rate of paid taxes based on revenues
- 

### Example

In case of the example individual quota the following data is known to illustrate the valuing method:

- Revenue = €1,000,000 annually of landed fish by utilising the ITQ
- t = 10 years
- Royalty = 5% of Revenue is the average license costs in the market = €50,000 annually (based on the €1,000,000)
- tax = 20%
- r = desired net economic result (based on amortisation annually and risk of less revenues) = 10%

$$\text{NPV} = \frac{(\text{€}1,000,000) * (0.05) * (0.80)}{(1.10)^0} + \frac{(\text{€}1,000,000) * (0.05) * (0.80)}{(1.10)^1} + \dots + \frac{(\text{€}1,000,000) * (0.05) * (0.80)}{(1.10)^{10}} = \text{€}245,782.70$$

As might be noticed the net present value (NPV) of this method is much less than the DisCF method, while the revenues, tax rate and discount rate are similar.

For instance, if there is a residual value of €500,000 and a tax amortization benefit of €30,000, the net present value of the fishing right is: €245,782.70 + €500,000 + €30,000 = 775,782.70.

A similar approach in the fishery context is applied in some MSs as Estonia and Romania where Fishing rights consist in the counter value paid for obtaining permits, vessel licensing, and fishing authorising to catch a certain quota of fish). For example, in Estonia, fishing rights owners have to pay for their fishing rights every year (per fishing gear, tonnes or fishing day). The limit rates for the fishing charge are given in the Environmental Charges Act. Charges are calculated on the normal value of catches of the preceding year.

### Main advantages and disadvantages of the Relief from Royalty method

Advantages (strengths)	Disadvantages (weaknesses)
------------------------	----------------------------



Applicable to intangible assets that are commonly licensed	Only applicable if the fishing right could be used for licensing. If not there are no royalty saving to be measured
Easy to use and an widely accepted valuation method in the world of intangible assets	Often hard to find fair value/royalty rates of active marketplaces of similar/identifiable fishing rights
	Forecasting a future royalty rate is highly subjective and relies on expert judgment
	The calculated net present value of the fishing right is highly sensitive to changes in the royalty rate

### Excess Earnings/incremental income method

The Excess Earnings/Incremental Income methodology is based on the premise that a property's value can be measured by the incremental earnings achieved by a proprietary product relative to similar but non-proprietary product. The excess earnings may result from the proprietary product commanding a price premium, providing manufacturing cost savings, and/or achieving larger sales quantities. It divides the revenue streams of the tangible asset from the revenue streams of the related intangible asset. For instance, in some countries it is common that a fishing vessel is combined with the fishing rights. It is not possible to operate by using the fishing vessel without having the fishing rights. Therefore, these tangible (vessel) and intangible assets (quota) are combined.

The formula is:

$$NPV = R - A * C_{ta} / C_{ia} + A$$

Where,

- R = adjusted earnings of the firm
- A = net tangible assets of the firm
- C<sub>ta</sub> = rate of capitalization for earnings attributable to net tangible assets
- C<sub>ia</sub> = rate of capitalization of rights/intangible assets

### Example

The individual quota is attached to a vessel. To measure the value of the individual quota it is necessary to know the annually economic revenues. Furthermore it is important if the permanence is infinite and whether there is flexibility. It is assumed that since the vessel and quota are intertwined there is no possibility for divisibility. And it is assumed that the residual value is the same as previous example, namely €500,000 after a duration of 10 years. First of all the value of the tangible assets has to be estimated (based on initial costs of acquiring or by average fair value if available).

- A = €1,500,000

- Cta = 60%
- Cia = 20%
- Revenue = €1,000,000 annually of landed fish by utilising the individual quota
- tax = 20%
- r = desired net economic result (based on amortisation annually and risk of less revenues) = 10%

$$NPV = \frac{(Revenue\ in\ year\ 1 - taxes) - (A * Cta)}{Cia} + \dots + \frac{(Revenue\ in\ year\ 10 - taxes) - (A * Cta)}{Cia}$$

$$NPV = (\€1,000,000 - \€200,000) - (\€1,500,000 * 0.10) / 0.20 + \dots + (\€1,000,000 - \€200,000) - (\€1,500,000 * 0.10) / 0.20 = \€2,500,0000$$

### Main advantages and disadvantages of Excess Earnings/incremental income method

Advantages (strengths)	Disadvantages (weaknesses)
Could be used as a benchmark/'sanity check' next to another valuation method	This method divides the revenues streams artificially into two streams. One to the tangible asset and one to the intangible asset. However, frequently the revenues are generating by a combination of both types of assets.
	There is no market data to support the determination of a fair rate of return for tangible assets or for intangible assets.
	Mostly it is advised to use another method that does not have to subjectively divide the two types of assets, if applicable (International Revenue Services Ruling 68-609)
	Preferred this method is only applied to companies where the two types of assets are distributed separately.
	Only if the tangible asset is sold/transferred or if initial acquiring costs are known, the value of net tangible assets could be used to calculate the value of the intangible assets.

**Greenfield method**

This method is similar to DisCF method, however it is assumed that the intangible asset is the only asset to be valued at the certain date. The Greenfield method assumes that a company is started from scratch and owns only the subject asset. Therefore, the company must make investments, either directly through the purchase of assets or indirectly through the incurred start-up costs and losses, to build an operation comparable to the one in which the subject asset is utilized as of the current measurement date. Conceptually, investments made during the start-up period recreate the other assets required to support the business.

The calculation will be similar to the DisCF method however the net present value of the fishing right will be less because the Greenfield method assumes that there is production capital next to the fishing right. There initial investments (capital costs) are required. These costs will affect the net present value because of higher expenses and therefore lower cash flows.

**Main advantages and disadvantages of the Greenfield method**

<b>Advantages (strengths)</b>	<b>Disadvantages (weaknesses)</b>
Provides a theoretical way of valuing the particular intangible asset independent of the other assets.	Difficult and subjective to quantify and determine future cash flows.
When revenues are dependent on owning the intangible asset/fishing right, the fishing right is often referred as the ‘enabling’ asset which is independent calculated with this method.	Especially applicable to starting companies/industries however the value of the intangible asset could be less ‘enabling’ when the industry/companies are mature.
Applicable to start-ups or whole new industry.	This method assumes that there is only one given set of tangible assets (i.e. one fishing technique) to utilize the intangible asset.

**Distributor method**

It is a variation of the Excessive Earnings method that may be appropriate when the nature of the relationship between an entity and its customers is similar to that of a distribution company and its customers. Specifically, the Distributor Method is appropriate when the customer-related activities and the value added for the entity by those activities are similar to the value added by distributors. Where intangibles such as brands or unique, high-value technology are driving customer demand and customer specific efforts are limited, the Distributor Method may be an appropriate means of valuing customer-related intangibles. Since it does not provide additional relevance (except for measuring the value of customer relationships and the asset) compared to the Excessive Earnings method it will not be elaborated here.

## Profit Apportionment method

The Profit Apportionment (also mentioned as the formulary apportionment) methodology determines a reasonable royalty rate or valuation in a hypothetical arm's-length transaction (means parties to the transaction are on an equal footing and independent). This approach attempts to evaluate the share of the licensee's (or purchaser's) anticipated profit that a licensor (or seller) would seek in return for providing the licensee with access to the subject intellectual asset. There it is comparable to some extent to the relief-from-royalty method. However, the total revenue streams of the whole entity or whole industry are allocated to the intangible asset individually. Actually, it is a top down approach by calculating the individual value of an asset based on the total value of all assets cumulative.

The most applied formula is:

NPV =

$$\left[ \frac{1}{3} * \frac{\text{Labour}^A}{\text{Labour}^{\text{Group}}} + \frac{1}{3} * \frac{\text{Assets}^A}{\text{Assets}^{\text{Group}}} + \frac{1}{3} * \frac{\text{Sales}^A}{\text{Sales}^{\text{Group}}} \right] * \text{CCCTB}$$

There are three standard factors that have to be allocated to the total value: labour, assets and sales. De CCCTB is the Common Consolidated Corporate Tax Base. The European Commission has implemented this Tax Base to standardize and harmonize the Earnings before interest (EBIT) between different EU countries with varying tax systems. The formula for finite permanence with discount rates is difficult to find from the reviewed literature. Therefore, the method is illustrated from a static perspective below.

### Example

Regarding to the example of calculating the value of the individual quota, it is only needed to know the allocation rate to this intangible asset. Often it is estimated based on historical costs for instance or hypothetical. Let assume that this rate is 30%. The historical costs or hypothetical revenues of the individual quota is €100,000 and the total value of the fishing rights owned cumulative is €500,000. The revenue annually is €1,000,000 and is to keep it simple also the CCCTB.

$$\text{NPV} = 0.30 * \frac{(\text{€}100,000)}{\text{€}500,000} * \text{€}1,000,000 = \text{€}60,000.$$

This method is commonly applied within measuring the value of companies (e.g. merging and acquisition processes) by the advantage of level playing field in tax bases (CCCTB). There is not such as a standard formula to calculate the net present value when the duration is finite by using discount rate. There is a complex valuing method to widely apply to multiple types of fisheries rights.

### Main advantages and disadvantages of the Profit Apportionment method

<b>Advantages (strengths)</b>	<b>Disadvantages (weaknesses)</b>
Recognizes that potential buyers demand property from which they can anticipate a future income, it is therefore applicable in markets that require anticipation.	Speculative by projecting future incomes. Relying on hypothetical projections.
Values new technologies that becomes closer to market entry and the certainty surrounding cash flows increases (e.g. pulse fisheries etc.)	Applies a discount rate with many variables.
Estimates risk of decreasing value of money by discount rates.	Requires more time for its implementation by the complexity compared to the market based price and cost approach.
Simulates a market price even if there is no active market (insufficient rights' transaction data).	
Takes multiple years into account rather than one minute for valuing the right.	

## Cost approach

With the cost approach the value of an asset is calculated by examining the cost to recreate/reproduce the asset or create/replace by an asset of similar utility. Or to rephrase the definition of the cost approach: it is based on the principal that a purchaser is not willing to pay more for an asset than the cost to obtain an equal utility. Costs could set the upper limit of valuing properties. Therefore, the cost approach could provide an estimated value to a potential buyer of the asset or to the current owner that is comparing the value of replacing the asset by an similar utility.

For instance, the cost approach could be applied to value a stable as a building of an agricultural farm by estimating the costs of depreciation combined with asking a constructor the costs a building a new similar stable. Examples where the cost approach is often favoured to value properties are: schools, churches and public utility buildings where income and market data are lacking (Orbaker, 1966).

Regarding to fishery rights it is not that common that this intangible asset could be reproduced or created. Since in most cases a government or other federal entity will initially distribute the fishing rights. Transferability is very important whether this valuing method is applicable, since if there is no transferability the rights could not be recreated or replaced. Furthermore, as mentioned before the divisibility and flexibility are relevant. If both are not possible next to the transferability, the fishing rights are hardly to value with the cost method. The permanence and residual value are important as well to know before the value could be measured because if the duration is finite there are amortisation costs. Mostly the residual value is already included in the replacement or reproduction value of a similar/identifiable asset by a market player.

There are three main cost approaches (IVS, 2010: 80):

- A. Replacement cost method: indicates value by calculating the cost of a similar asset that provides similar utility.
- B. Reproducing cost method: indicates value by calculating the cost to recreate a copy/replica of the asset.
- C. Summation method: calculates the value of an asset by the addition of the separate values of its component parts.

### Example

In the situation of the individual quota the following is known:

- Revenue = €1,000,000 annually of landed fish by utilising the ITQ
- Permanence(t) = 10 years
- Value of replace or distribution new similar fishing right = €150,000
- tax = 20%
- Amortisation costs = €10,000 annually

NPV = reproduction/replacement costs = Value of replacement or distribution new similar fishing rights – (Amortisation costs\*t) = €150,000 – (€10,000\*10) = €50,000.

As it could be mentioned the value measured by the cost approach is less than by alternative valuing methods discussed before. This lower calculated value could be clarified by the deduction of amortisation costs from the total reproduction/replacement costs

**Main advantages and disadvantages of the Cost approach method**

<b>Advantages (strengths)</b>	<b>Disadvantages (weaknesses)</b>
It is hardly applicable to fishing rights.	May not take into account the ability of the intangible asset to generate cash flow.
Relatively easy valuing method even when there is no active market (insufficient rights' transaction data) although costs (depreciation-, replacement-, historical purchasing- or present price offers to purchase) has to be available.	Does not take into account any progress, development of improved circumstances that may be obtained by possessing the intangible assets (e.g. more efficient fishing techniques etc.)
The cost method is most reliable in new construction valuation.	Overlooks or ignores the value of being first.
Helps the decision-making process by the market to trade or purchase fishing rights.	The perceived value (willingness to pay) by the market is not taken into account. Does not reflect the supply and demand of the fishing rights in the market.
Frequently applied as a check against the market based approach.	Cost structures could differ per company and country.
Helps to distinguish the value per specific asset separately from the total firm value.	Not considered appropriate for valuing intangibles in most cases.

**Contingent valuation**

Where information is available several utility-based methods can be employed for valuation of non-market goods. These generic economic methods, often used in ecosystem valuation, can be divided into direct or stated preference (contingent valuation methods such as surveys and choice experiments) and indirect or revealed preference methods (such as hedonic pricing). Hedonic pricing methods especially fit the situation where the fishing rights are attached to the vessel.

Contingent valuation is a stated preference method, in which the willingness to pay or willingness to accept assets is assessed via survey's or choice experiments. This valuation method is especially useful in case the fishing rights are not transferable or when market information/fair value is not available. Respondents (in our case e.g. fishermen) in a survey

are offered (discrete) choices and are asked to assess their favourite option. Such design is vulnerable to a number of biases, of which social desirability bias is one of the most relevant, given that the respondents do not really have to pay for the assessed good or service. But another response bias is more problematic: the influence of the answers to the valuation on the fishing rights. The respondents will probably give different answers about prices if they could affect the actual values of the fishing rights.

**Survey**

In some MS the valuation of the fishing rights is done by self-assessment. The fishermen, or cooperation, is asked to estimate the value of the owned fishing rights. This is usually performed in a survey inquiring the value of other assets as well. Self-assessment is easy to implement but very subjective. As such this method is not recommended.

**Main advantages and disadvantages of the survey method**

Advantages (strengths)	Disadvantages (weaknesses)
Easy to implement by governments or research institutes to collect value data of fishing rights.	Prone to biases.
	Dependable on response rate to have sufficient data quality to be able to value the fishing rights.
	It asks for willingness to pay or willingness to accept but generally does not take into account the other parties to the transaction.

**Choice experiments**

In a discrete choice experiment, the respondent is asked to choose between two or more hypothetical choices described by some characteristics. Based on the observed choice, the preference for the characteristics (which could include prices) are revealed. The method has its theoretical foundation in random utility theory and is based on the assumption that the respondents chooses the option that maximizes its (economic) utility. In the case on elucidating value of fishing rights these characteristics of the different choices could include a specific right to fish, stock, quota, price, etc. The disadvantage is that it reveals the personal utility of the respondent/owner of the fishing right.

**Main advantages and disadvantages of the choice experiments method**



Advantages (strengths)	Disadvantages (weaknesses)
Reduces several biases compared to a simple survey approach: social desirability ....	More difficult to implement as opposed to a simple survey. Technical knowhow is required
Implicit prices can be estimated (in the case the fishing right is not traded, or attached to a vessel)	Only if sufficient data is collect, the exact price can be estimated.

## Hedonic regression analysis

*Revealed preference methods*, counter a few biases prone to contingent valuation or stated preference methods. For example, by assessing a surrogate good or service that is actually pursued and using this information to estimate the implicit value of the intangible asset, such as done in the *hedonic price method* (box 3).

Hedonic regression analysis is based on the observation that prices of a good traded on the market are determined by a set of factors, sometimes implicit. Hedonic regression analysis is especially useful in cases where the fishing right is transferable coupled to the vessel. Indeed, fishing rights drive the price of a vessel when these are attached to the vessel, such is the case in e.g. Belgium and France (Guyader et al 2006, in Duares et al 2006). When data on net physical value and market value is available, hedonic regression analysis can be used to distinguish between the price for the different characteristics.

In France Guyader et al (2003), used hedonic regression analysis to estimate the implicit price of fishing rights to be 38% of the total acquisition price of the vessel (in Duares et al 2006).

The goal of a hedonic price regression is to build a model to separate and the formula is:

$$NPV = \beta_0 + \beta_1 A_1 + \dots + \beta_2 I_1 + \dots + \epsilon$$

- $\beta$  = coefficients
- A = Fair value of similar/identifiable tangible asset
- AI = Fair value of similar/identifiable intangible asset
- E = error term (how the observed data differ from actual data)

It is hard to come up with an example for this valuation method however in simplified form it could be:

- A = €1,500,000 (fair value of a similar vessel)
- AI = €500,000 (fair value of a similar individual quota)
- $\beta_1$  = 30%
- $\beta_2$  = 40%

$$NPV \text{ of individual quota} = 0.3 * \text{€}500,000 = \text{€}150,000$$

### Main advantages and disadvantages of the Hedonic regression analysis

<b>Advantages (strengths)</b>	<b>Disadvantages (weaknesses)</b>
Separates the value of fishing right from the value of the attached tangible asset (the vessel in most cases)	High data availability required on the physical and acquisition prices of the traded good under consideration

## **Annex 2 - Inventory of the member states fishing right regimes and suggested valuation methods**

The inventory of fishing rights currently in use in EU MSs, summarised in the table 1, was based on information supplied by a web-based survey directed at national correspondents.

It emerges that Individual Non-Transferable Quotas (IQ) and Transferable Quotas (ITQ) are widely applied in all countries. On the contrary, Community-based catch quotas (CQ), consisting in attributing a catch quota to a “fishing community”, are not used in any country.

In some countries, as Italy and the United Kingdom, there are different rights systems applied for different types for fishery. Usually catch quotas are applied for the so called “quotas stocks” whilst license system or effort quotas are applied for small scale fleet segments and fisheries not targeting quota stocks. In the case of Belgium and the Netherlands, same fisheries are simultaneously regulated by a combination of several fishing rights.

Table 1 Summary of fisheries by MS and fishing rights

MS	Limited Non-Transferable Licences (LL)	Limited Transferable Licences (LTL)	Individual Non-Transferable Quotas (IQ)	Individual Transferable Quotas (ITQ)	Individual Non-Transferable Effort Quotas (IE)	Individual Transferable Effort Quotas (ITE)	Vessel Catch Limits (VC)	Territorial Use Rights (TURFs)	Community-based catch quotas (CQ)	Other	Total number of fisheries management systems
Belgium	1		3		3		4				11
Bulgaria	1		1							1	3
Croatia		1	2							1	4
Denmark	1	1		2							4
Estonia				4		2					6
Finland				1							1
France	1		1						1	1	4
Germany			1				1		1		3
Italy	1		2					1		2	6
Ireland	1									1	2
Latvia	1		1								2
Lithuania				2							2
Netherlands	2	3		4	3		1	2			15
Poland			1								1
Romania			3								3
Sweden	1		1	1						1	3
UK		4		1		2	2				9
<b>Total</b>	<b>10</b>	<b>9</b>	<b>16</b>	<b>15</b>	<b>6</b>	<b>4</b>	<b>8</b>	<b>3</b>	<b>1</b>	<b>7</b>	<b>79</b>

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