KUVA: ADOBE STOCK

Marine and freshwater EA for fishing: valuation and integration

Syke: Liisa Saikkonen, Tin-Yu Lai, Tommi Tikkanen
Luke: Tuija Lankia, Heidi Pokki, Miikka Husa

Suomen ympäristökeskus
Finlands miljöcentral
Finnish Environment Institute

Luke
NATURAL RESOURCES INSTITUTE FINLAND

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Objectives:

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• Quantifying and valuing recreational fishing in the marine and freshwater areas for pilot national supply and use accounts using regional data and models.

• National pilot ecosystem service supply and use accounts related to fish from both marine and freshwater ecosystems for recreational and commercial fishing, in physical and monetary terms will be developed.

• The use of different valuation methods for developing monetary marine and freshwater ecosystem asset accounts for fish will be tested on national scale.

• Integration of marine and freshwater ecosystem service accounts into environmental accounts of SEEA CF and SNA is attempted to identify overlaps between different accounting frameworks and to assess the contributions of ecosystems to final products and services.

Quantity and value of recreational fishing in Finland

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Incoherent spatial data on recreational-fishing related ecosystem services

Seuraavissa kysymyksissä käytettävä aluejako

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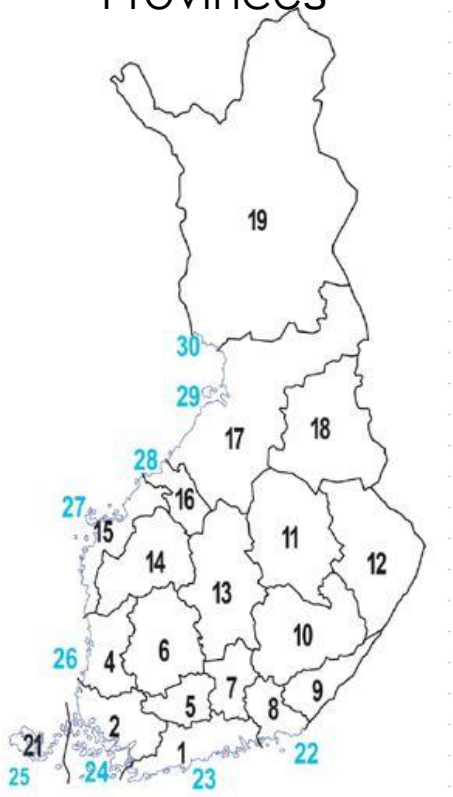
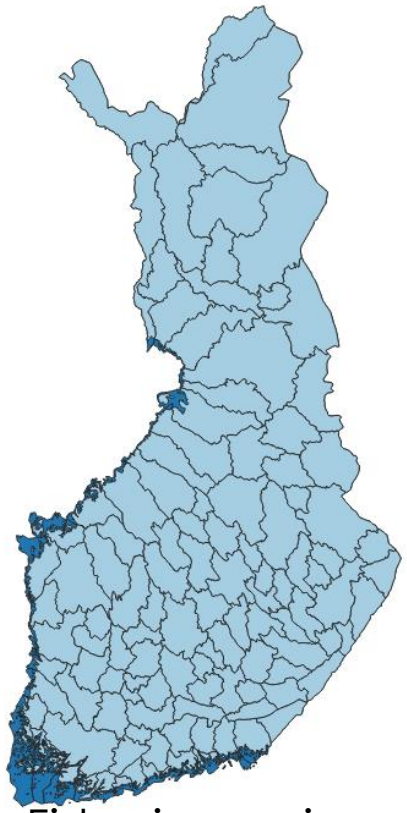
Keski-Suomi	13	-
Etelä-Pohjanmaa	14	-
Pohjanmaa	15	27
Keski-Pohjanmaa	16	28
Pohjois-Pohjanmaa	17	29
Kainuu	18	-
Lappi	19	30
Ahvenanmaa	21	25

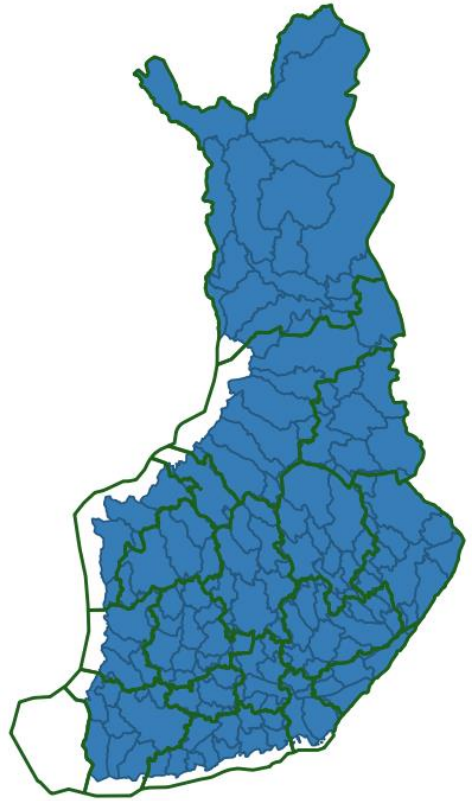
Provinces





Fisheries regions

Overlaps



All ecosystem service excnange data is for provinces except:

- number and value (€) of fishing days requiring the payment of fishery management fee
- number of fishing days with additional permit fee

Data is for 2018 and has been mainly collected by LUKE using surveys: Provincial (VAPRO-project) and fisheries regional (VETO-project).

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Conversion of provincial data to (fisheries) regional data

- Provincial data V_i was converted to regional data U_j by following formula:

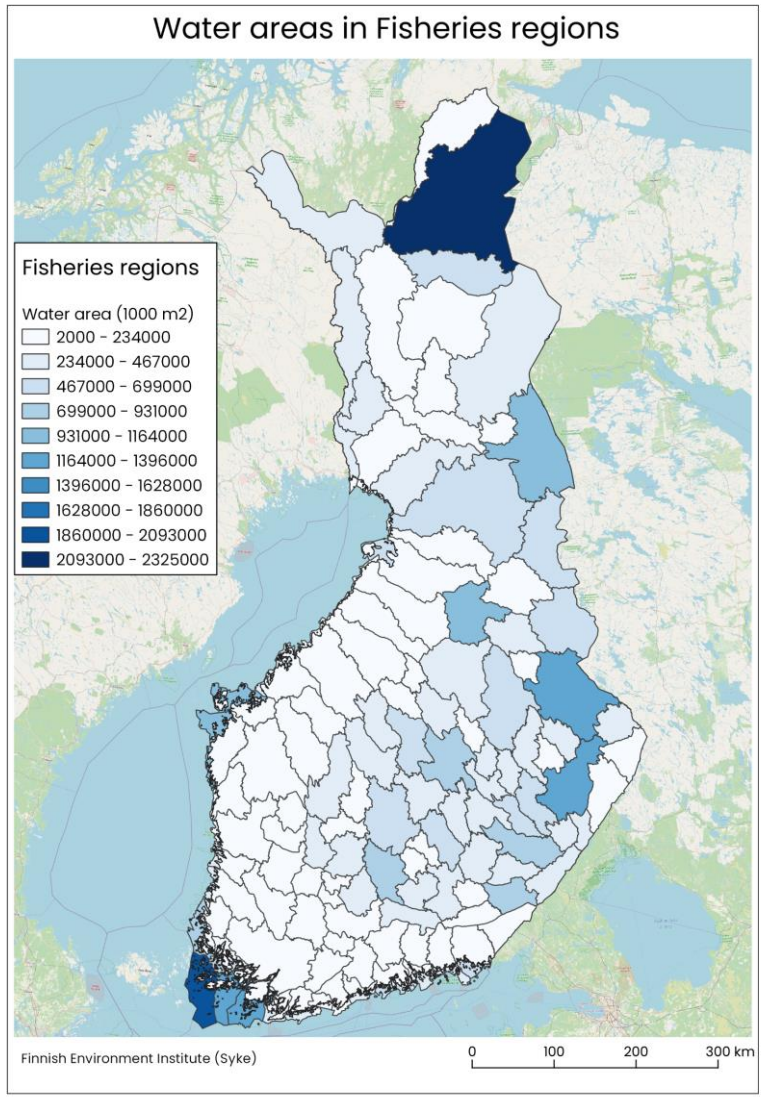
$$U_j = \sum_{i \in J_j} \left(\frac{k_{ij}}{\sum_{j \in I_i} k_{ij}} \times V_i \right), \text{ where } k_{ij} = \frac{a_{ij}}{A_j} \times F_j$$

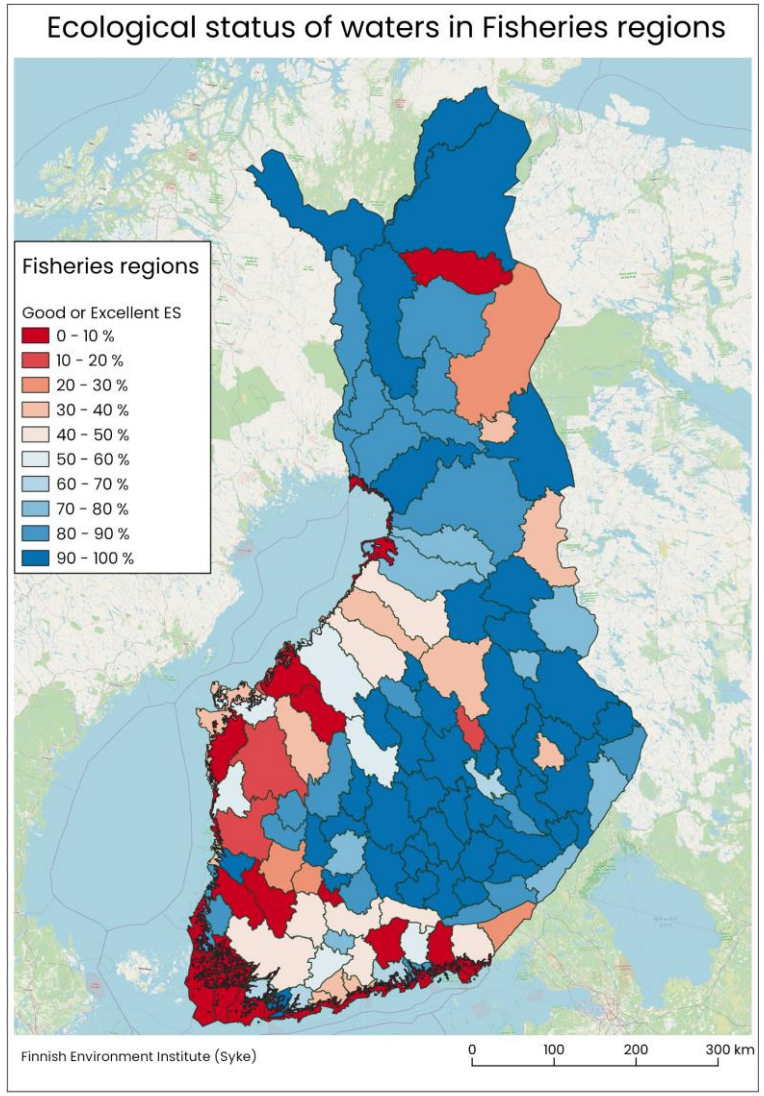
- Where a_{ij} is the water area of the intersection of province i and fisheries region j
- A_j is the total water area in fisheries region j
- F_j is the number of fishery management fee fishing days in fisheries region j.
- I_i includes all fisheries regions j that overlap with the province i
- $J_j$includes all provinces i that overlap with the fisheries region j.
- Why do we want to do this? To examine recreational fishing and its value in more disaggrgated spatial level. What effects would changes in environmental conditions and in institutional context have on recreational fishing regionally and in more aggregated levels (e.g. national)?

SEEA EA recommended order of methods for valuing ecosystem services

- i. Methods where the price for the ecosystem service is directly observable
  - Fishing days with fishery management fee and collected fees (€), fishing days with additional permits
  - Value of fish catch
- ii. Methods where the price for the ecosystem service is obtained from markets for similar goods and services
  - Quantity and value of fishing that does not require payments (children, seniors, rod & ice fishing…)
- iii. Methods where the price for the ecosystem service is embodied in a market transaction
  - All valuation methods. Transaction costs are inevitable.
- iv. Methods where the price for the ecosystem services is based on revealed expenditures (costs) for related goods and services
  - Travel costs, other expenditures.
- v. Methods where the price for the ecosystem service is based on expected expenditures or markets
  - Simulated exchange value (SEV) using a demand function derived from a travel cost model to study the outcomes under different market situations and the effects of new policies or changes in legislation.

Extent and condition of water ecosystems in Finland





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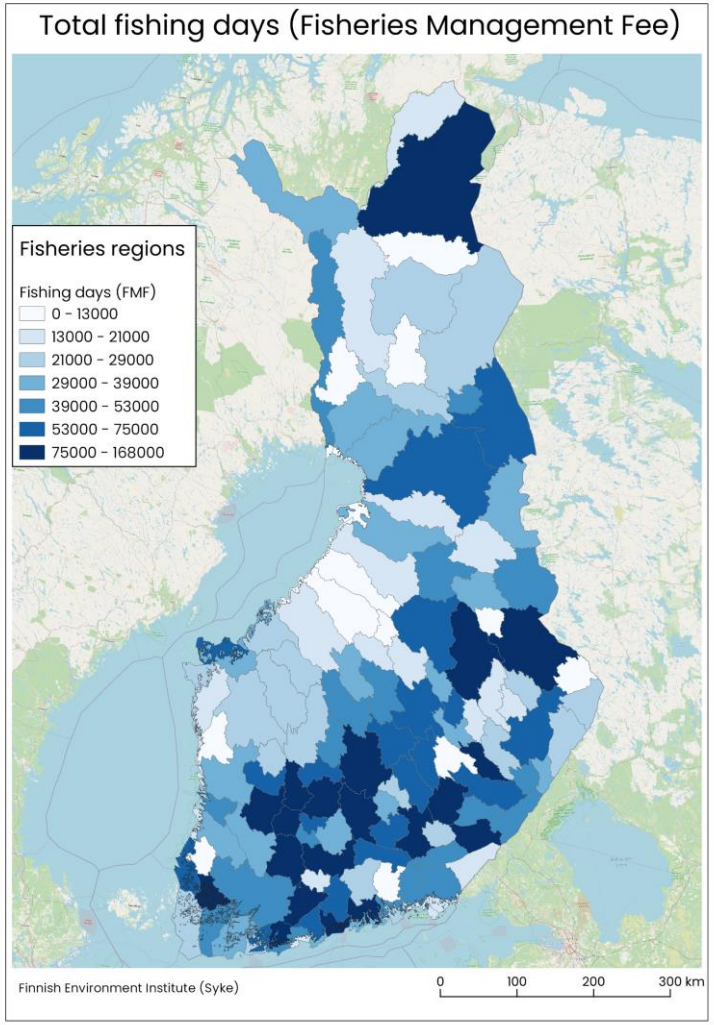
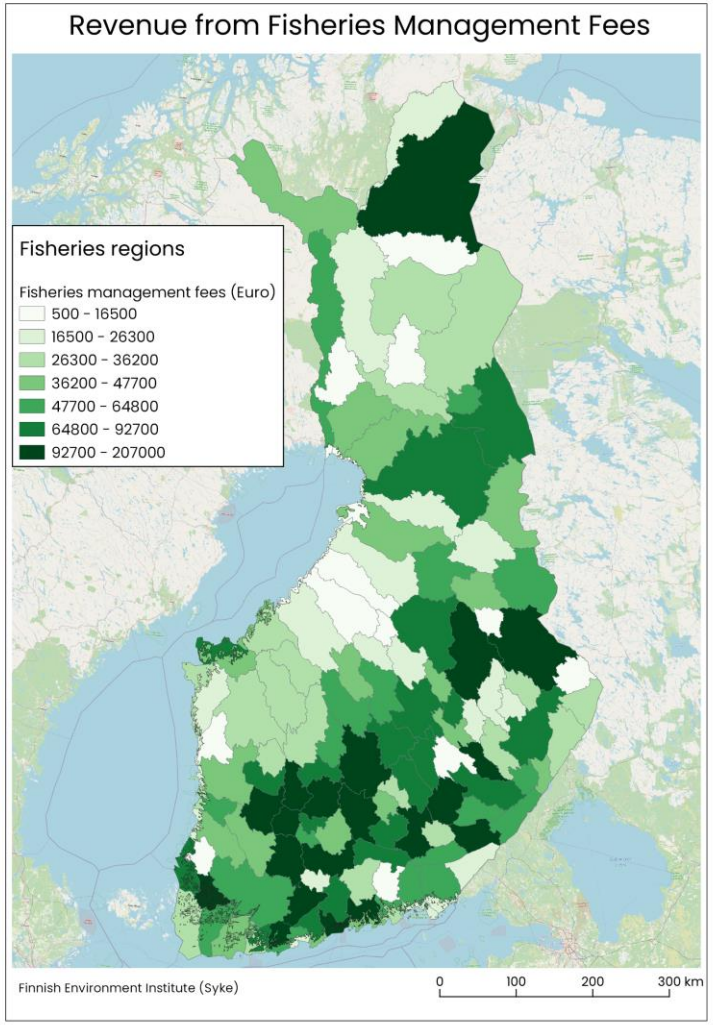
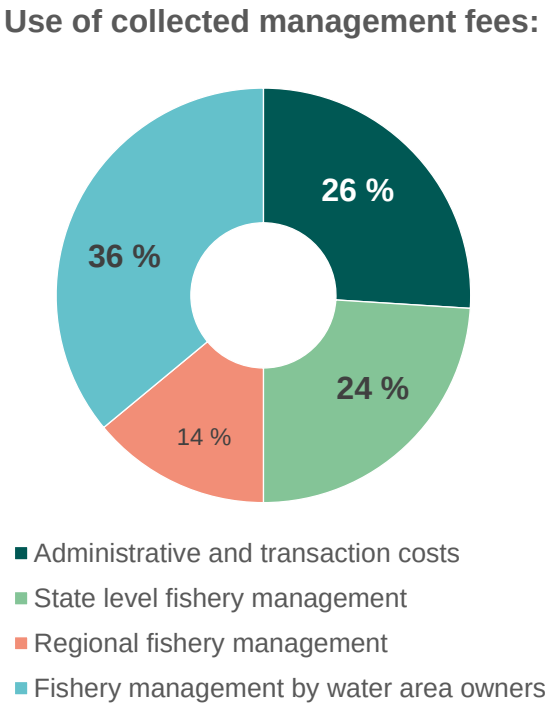
i. Price for the ecosystem service is directly observable (1/2)







According to fishery legislation, management fees should be set to cover the costs of providing the access to rerceational fishing and to manage fisheries.

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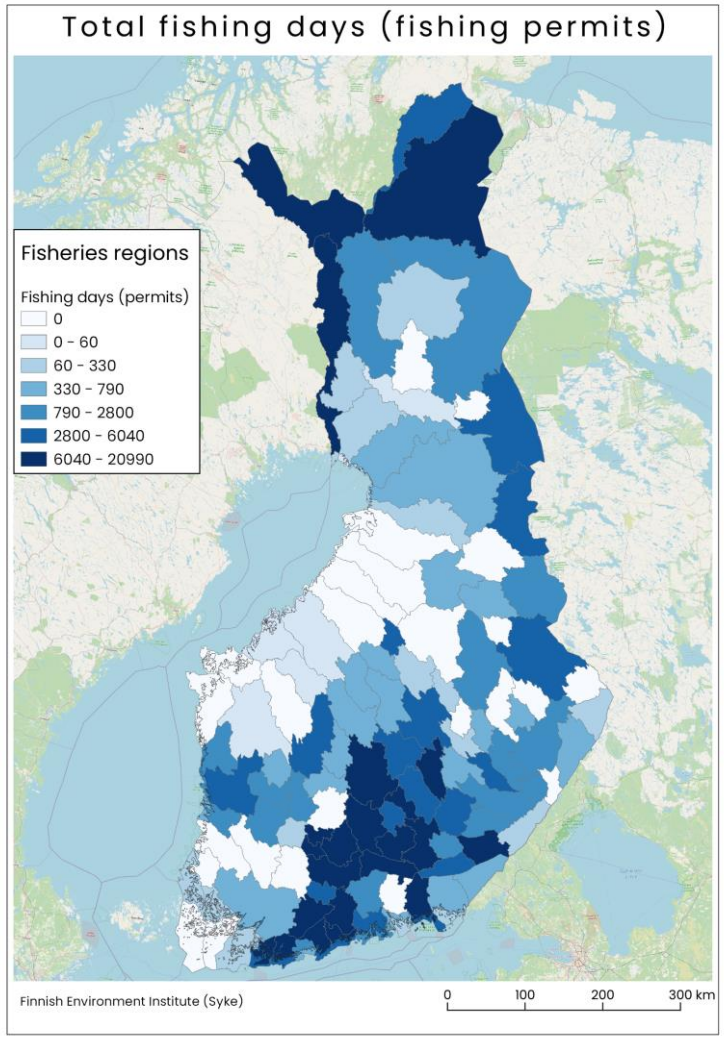
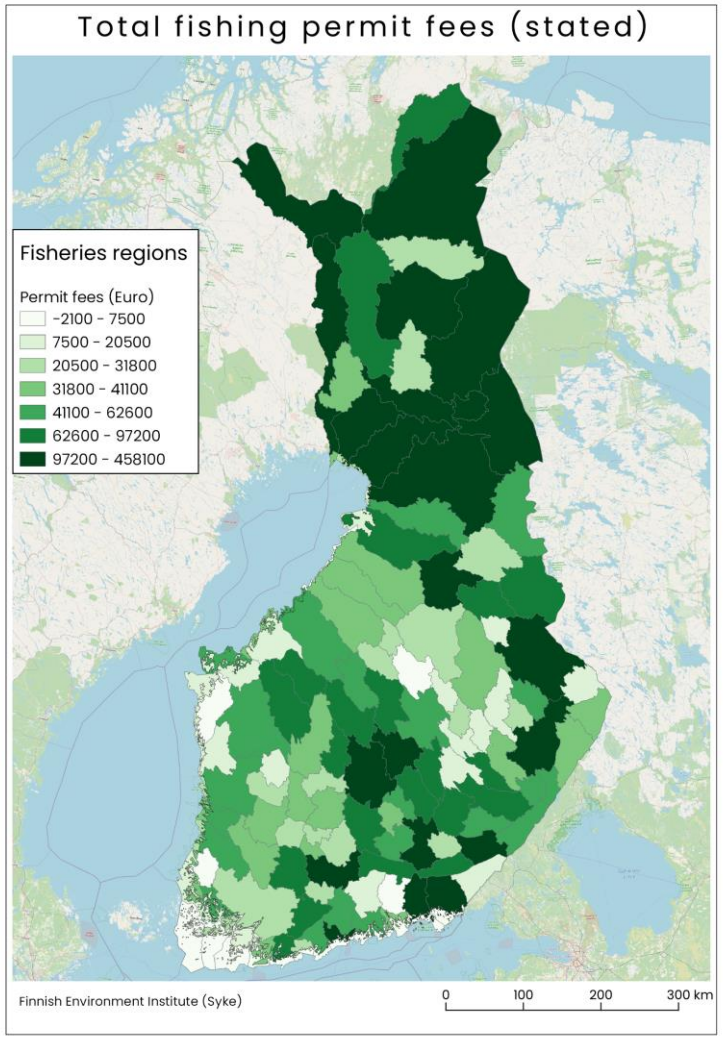
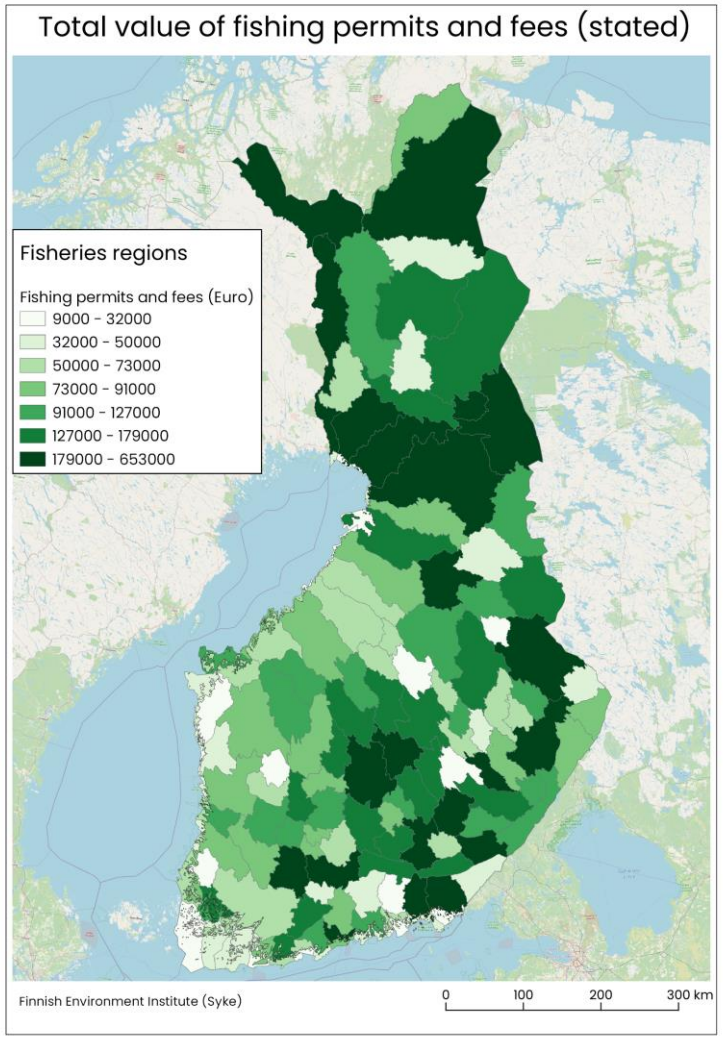
i. Price for the ecosystem service could be directly observable (2/2)

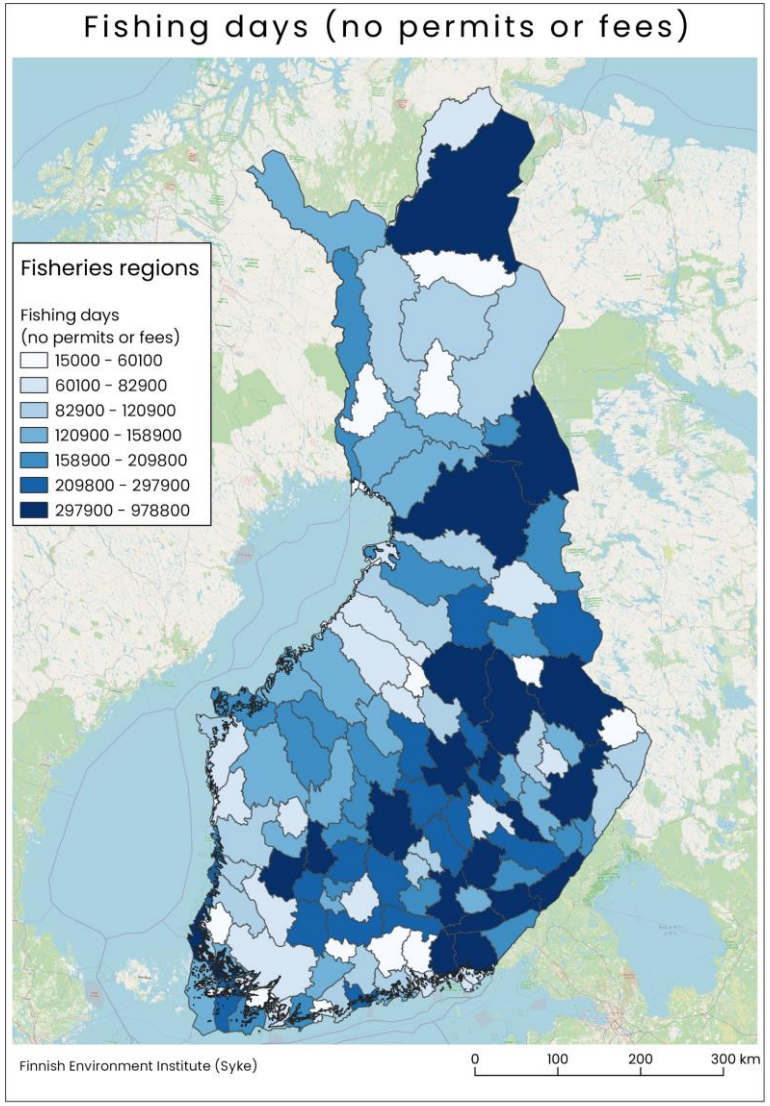
Fishing permit prices can be set freely.

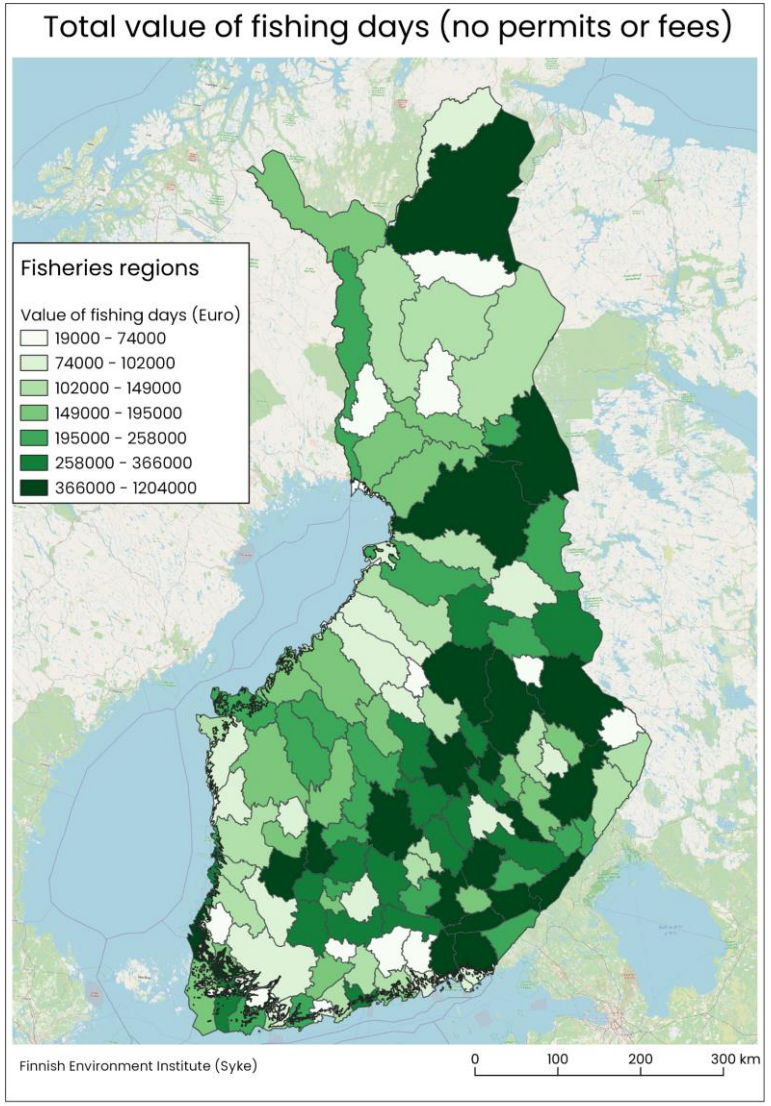






ii. Price for the ecosystem service is obtained from markets for similar goods and services 1/3





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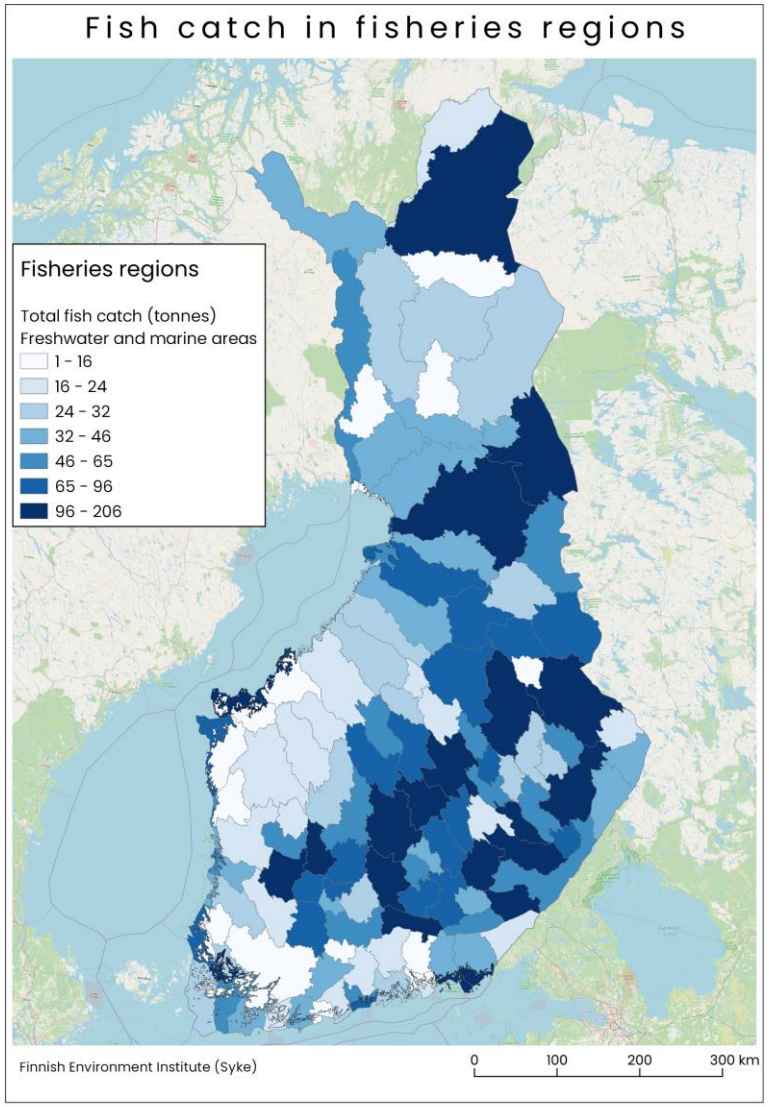
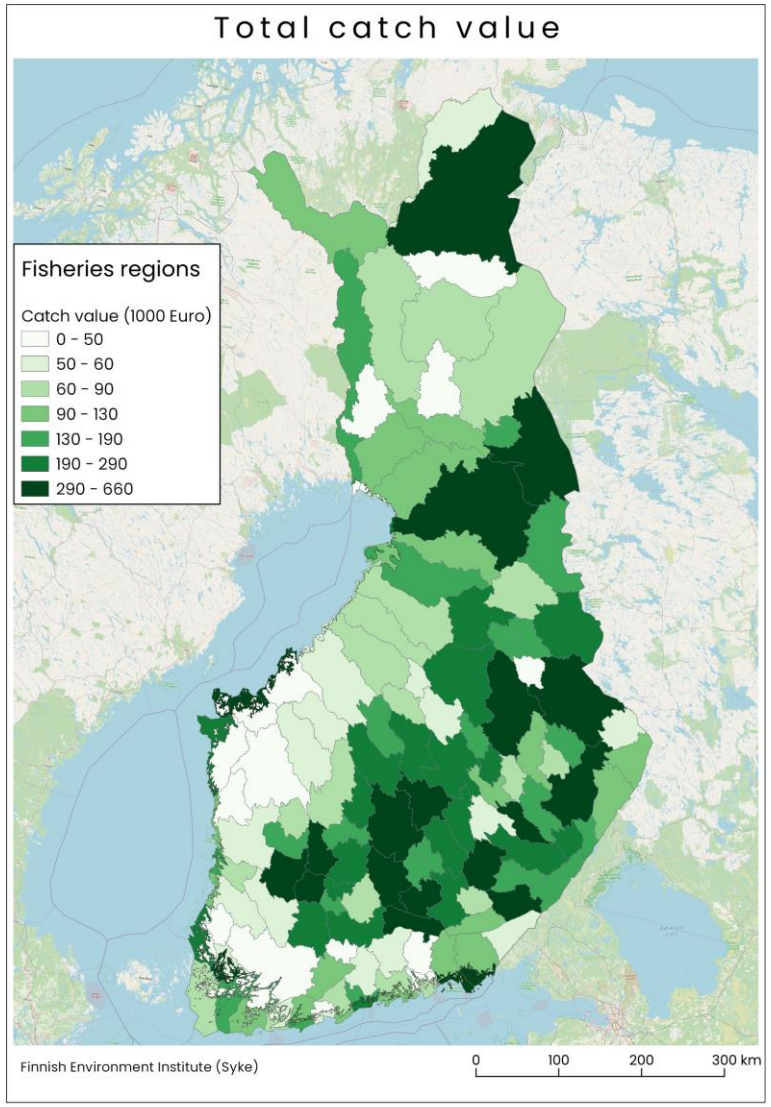
ii. Price for the ecosystem service is obtained from markets for similar goods and services 2/3





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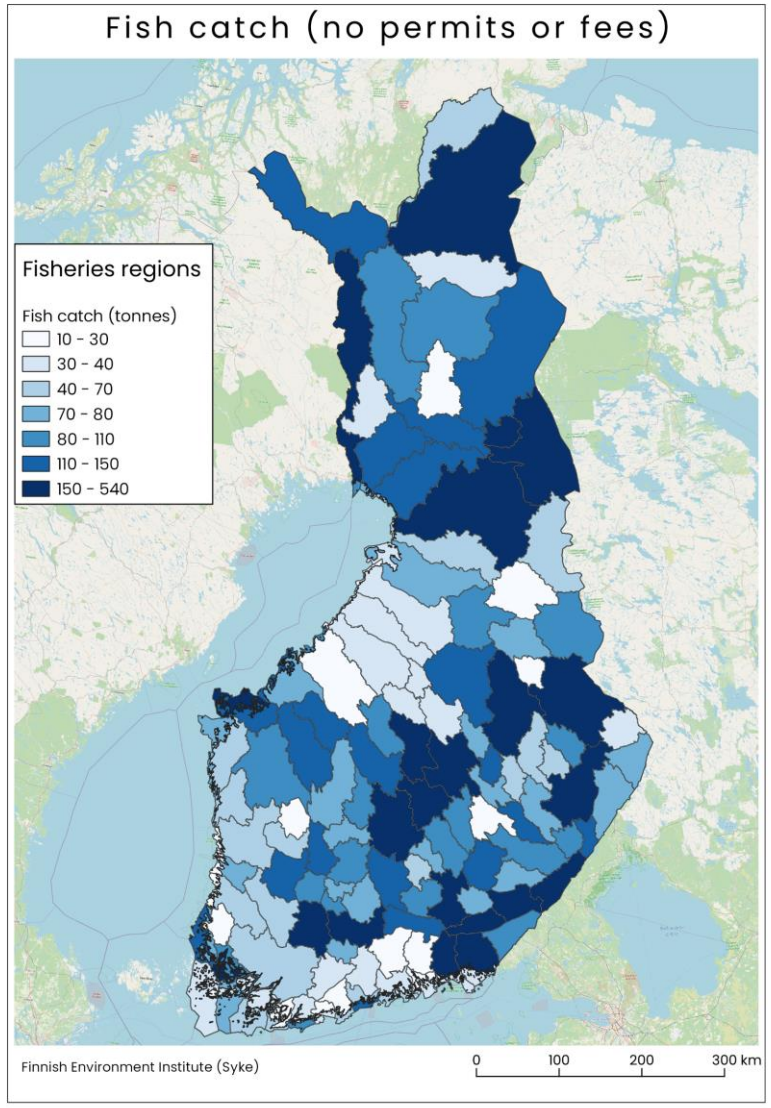
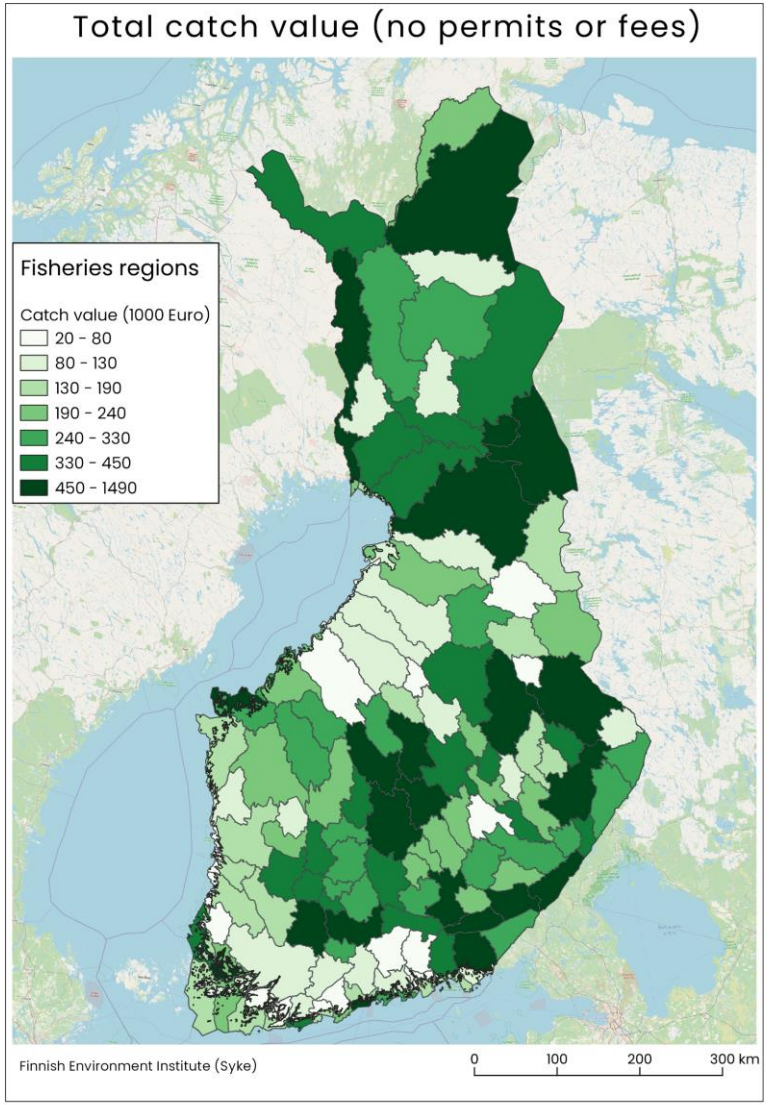
ii. Price for the ecosystem service is obtained from markets for similar goods and services 3/3





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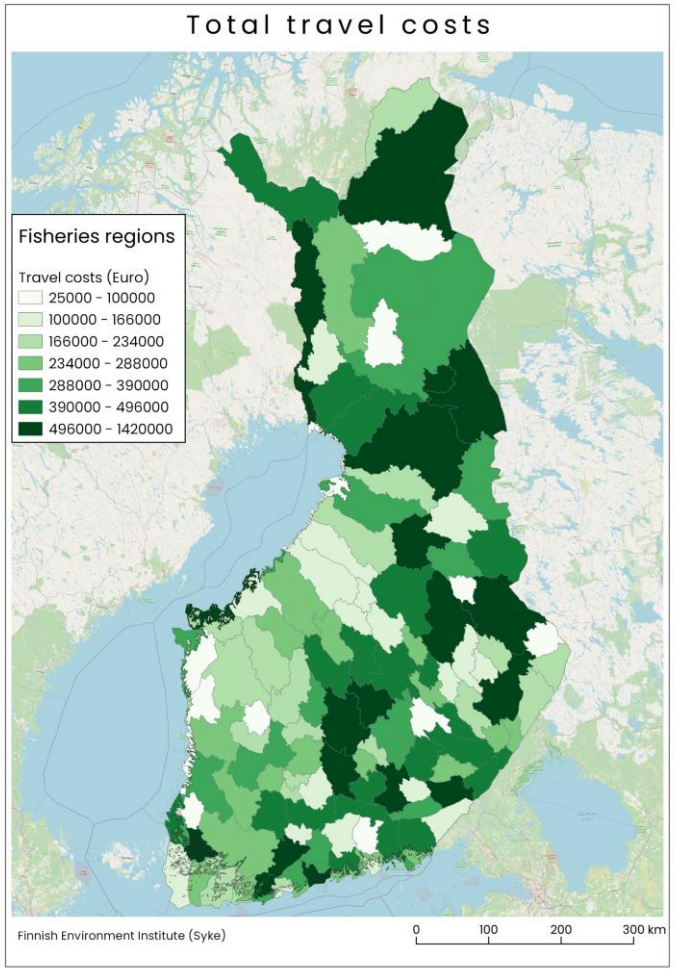
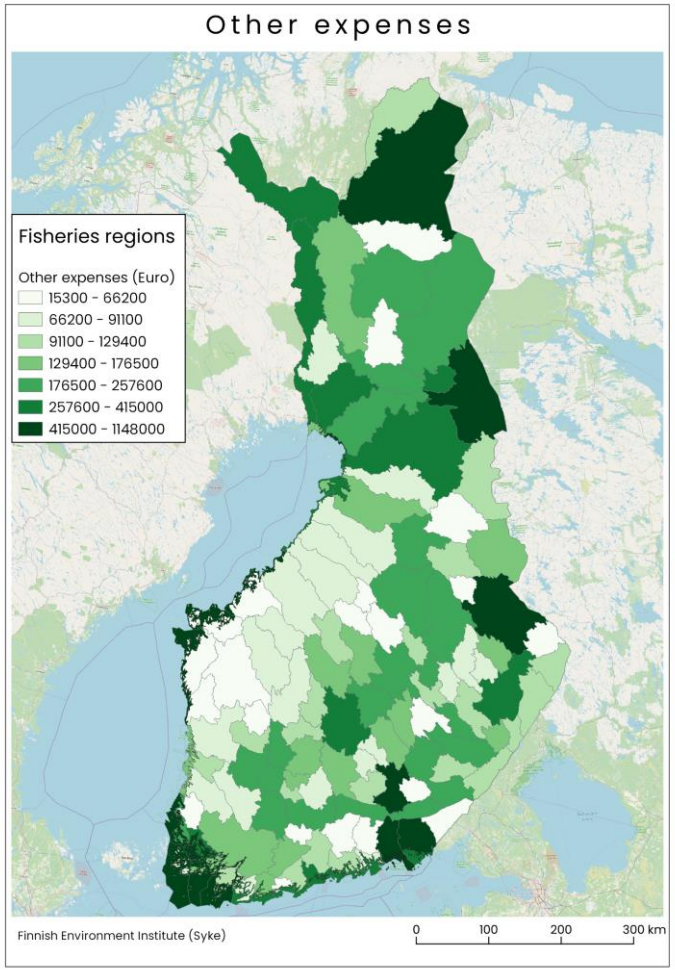
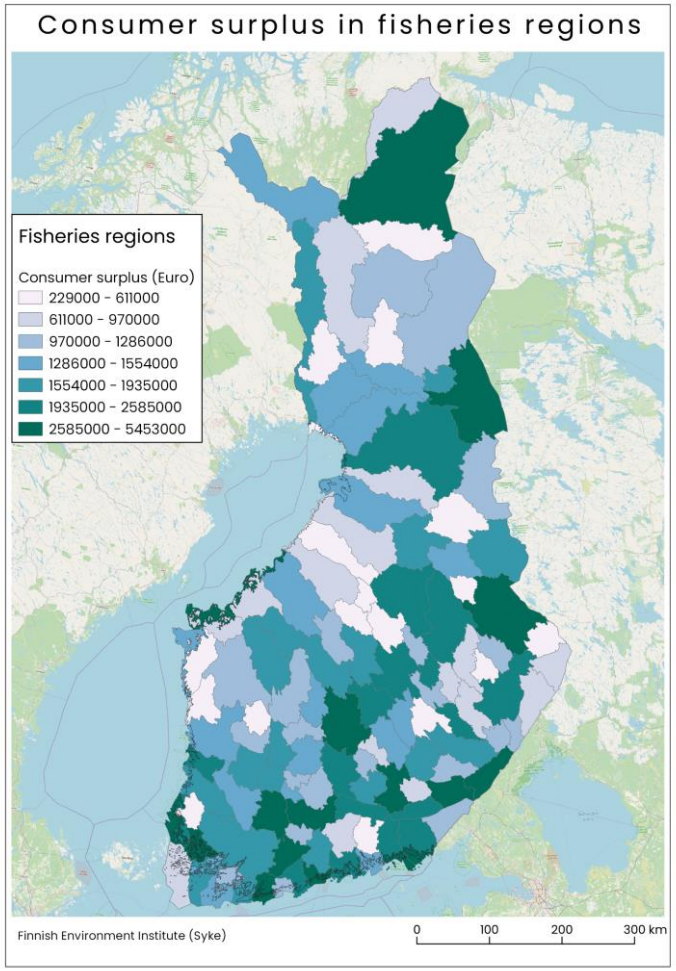
iv. price for the ecosystem services is based on revealed expenditures (costs) for related goods and services

Derived from the provincial results of travel cost model by Pokki et al. 2021

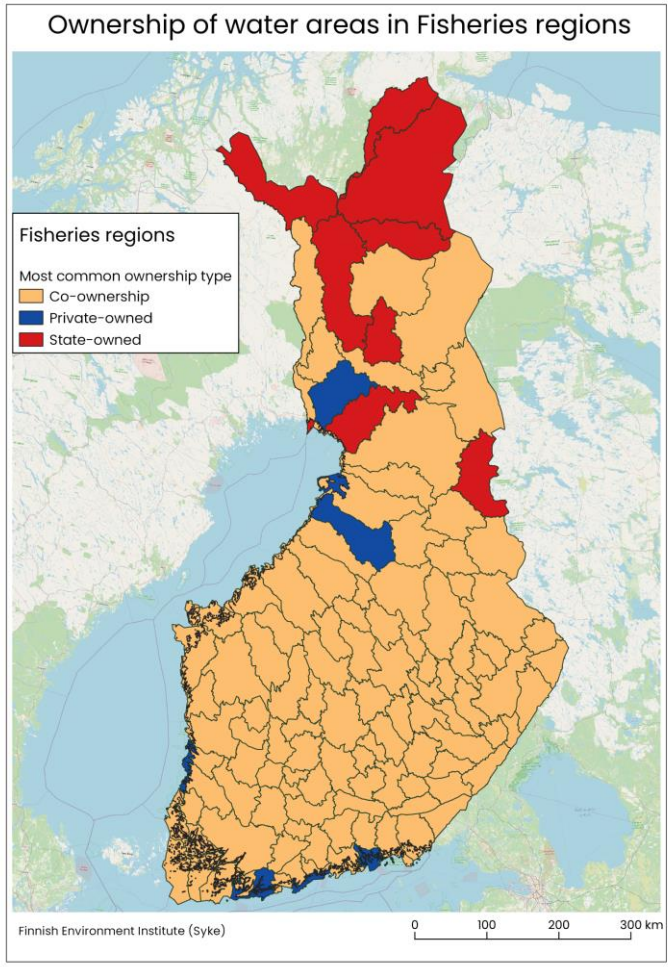


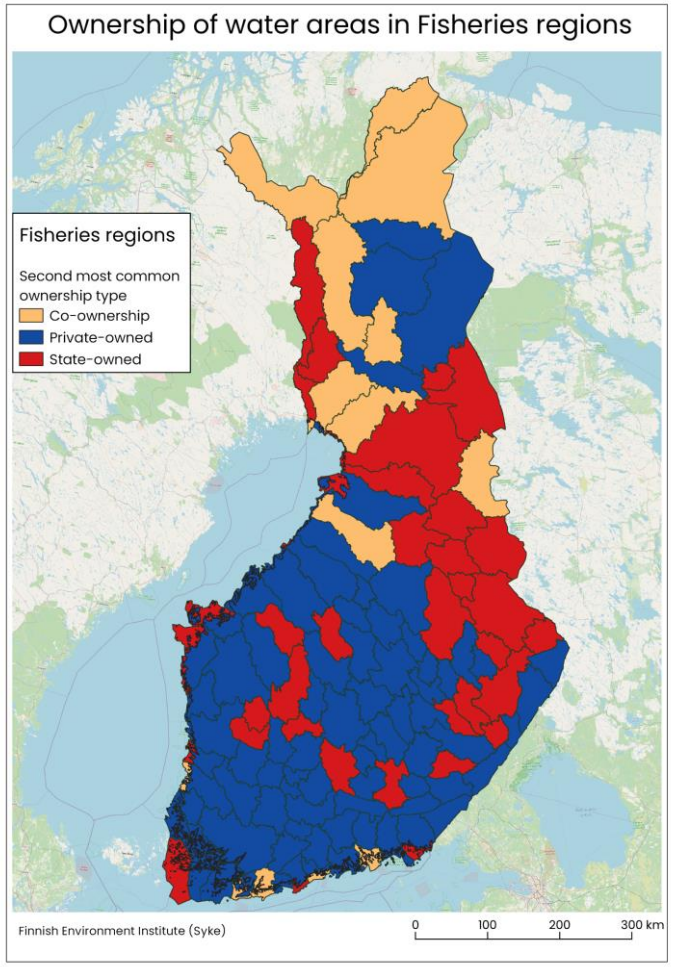


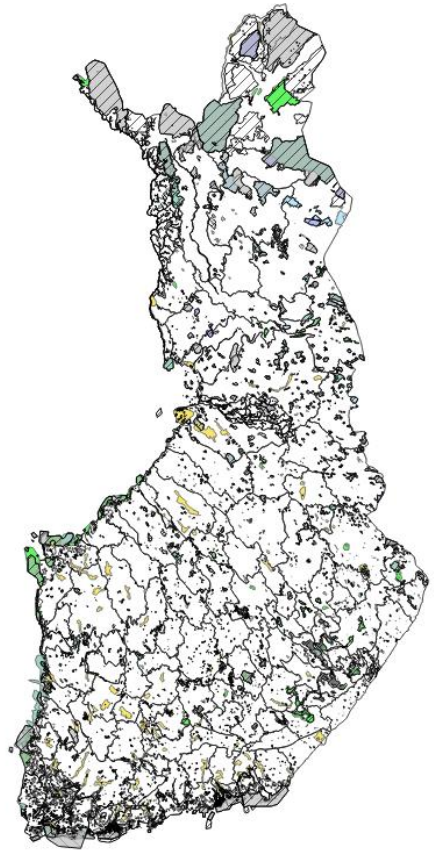


Pokki, H., Pellikka, J., Eskelinen, P., & Moilanen, P. (2021). Regional fishing site preferences of subgroups of Finnish recreational fishers. Scandinavian Journal of Hospitality and Tourism, 21(4), 442-457.

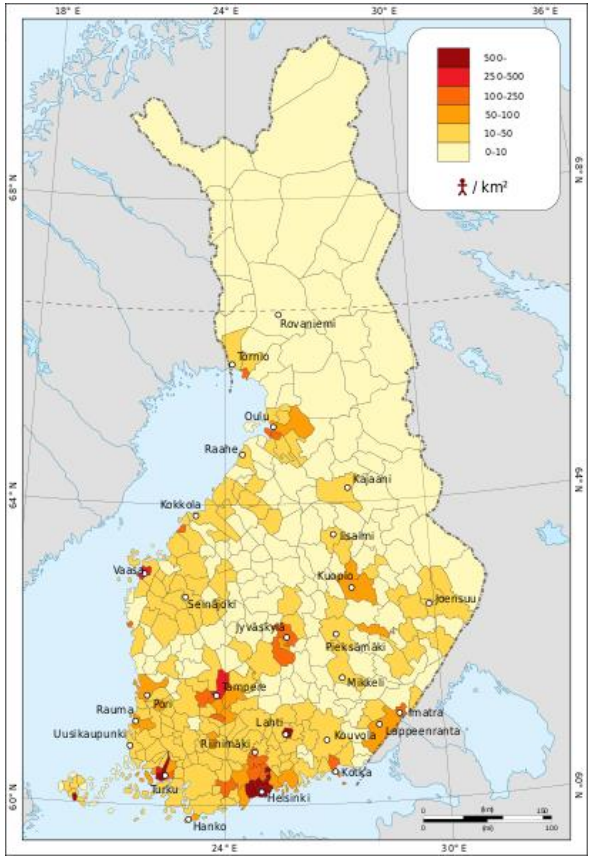
Institutional context: ownership of water areas, protection status, legislation







Snapshot of areas with protection status



Population density (from Wikimedia)

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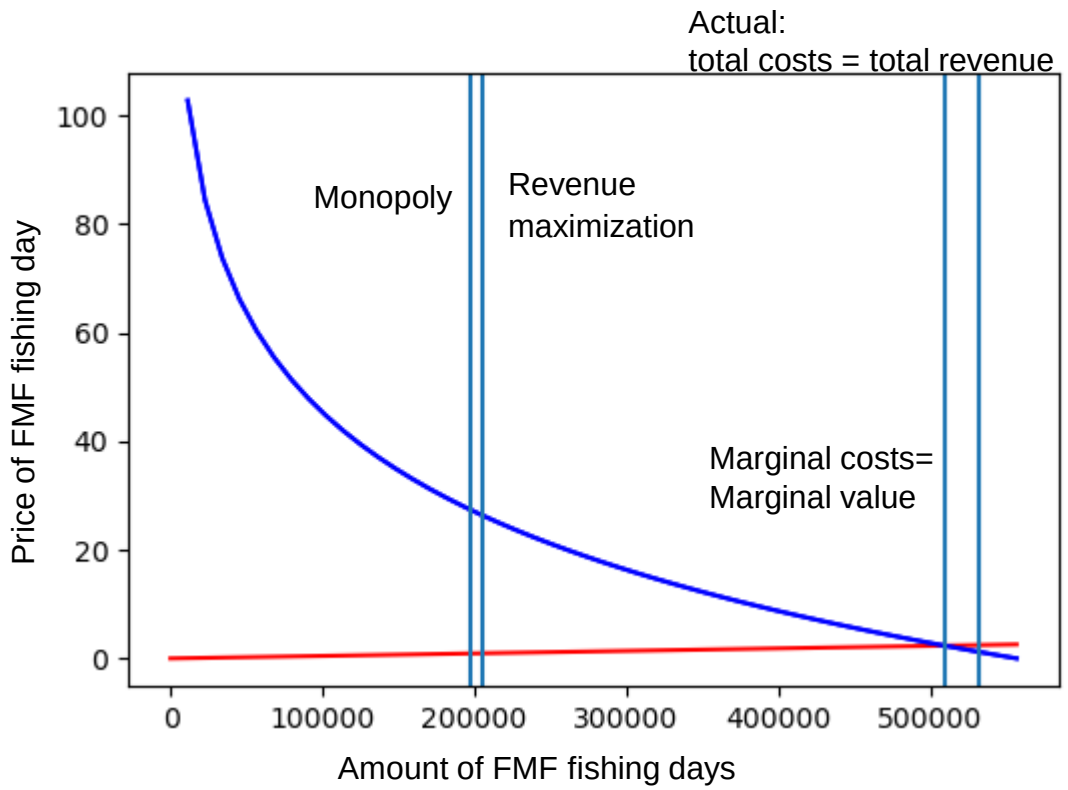
v. Methods where the price for the ecosystem service is based on expected expenditures or markets: SEV for Southern-Savonia



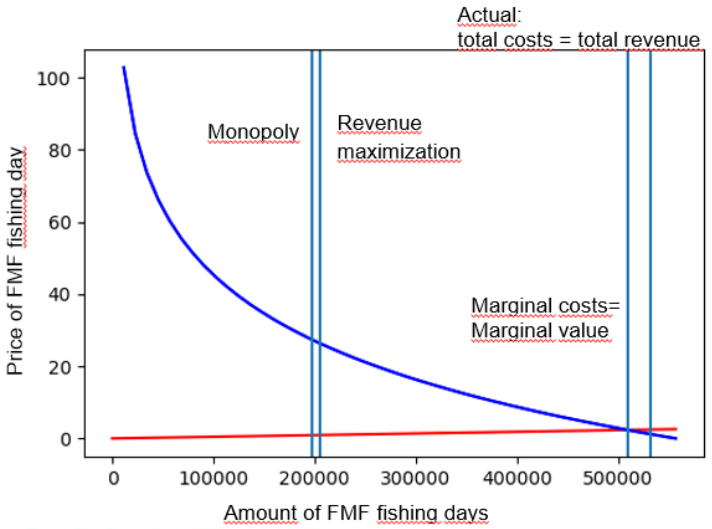
- Demand for fishery management fee fishing days:

$Q = Q_0 e^{\alpha P}$ from a travel cost model, where Q_0 is the demand without fishery management fee ($P = 0$) and P is the price of fishing day.

- α is coefficient for travel costs from the travel cost model by Pokki et al. (2021).
- Supply and demand are calibrated so that
  - Supply: the actual revenue from management fees equals the total costs.
  - Demand: with actual price P(=actual revenue/actual fishing days) $Q_0 e^{\alpha P}$ equals actual fishing days.
  - Actual fishing days and revenue are known

Pokki, H., Pellikka, J., Eskelinen, P., & Moilanen, P. (2021).
Regional fishing site preferences of subgroups of Finnish recreational fishers.
Scandinavian Journal of Hospitality and Tourism, 21(4), 442-457.

v. Methods where the price for the ecosystem service is based on expected expenditures or markets: SEV



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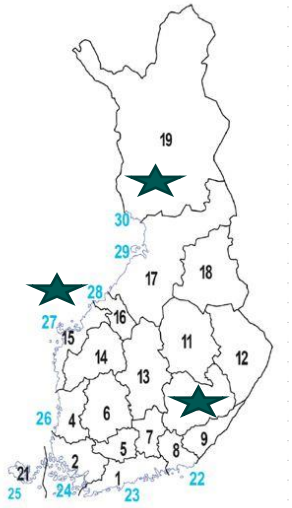

- Left: supply starts from zero and is linear -> exponential would probably make more sense
- SEV for other areas: marine regions, Lapland and whole Finland to cover different types of fisheries and fishers.
- Market situations:
  - what if the legislation about pricing the fees is changed?
  - Are there monopolies, for example based on the data on the ownership?
- Inclusion of additional fishing permits as a complementary good
- Demand: $Q_2 = Q_{20} e^{\alpha_2 P_2 + \alpha_1 P_1}$, where $\alpha_1 < 0$, 1 = fishery management fee fishing days and 2 = fishing days with fishing permit.
- Substitutes? Can demand functions be defined for fisheries regions?
- Integration to dynamic asset accounting?

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National ecosystem service and asset accounts

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Commercial & recreational fish catch, value and resource rent

- Catch amount and value, permit and management fees and their value included in SNA
- Resource rent for commercial fish catch
- Resource rent for recreational fish catch. Does it make sense?
- Accounts for Multiple fish species in marine and freshwater areas for diferent types of fishing fleets/methods.

- Asset accounts for freshwater ecosystems assuming no changes in fish stocks using simple NPV method.
- Asset accounts for marine ecosystems using dynamic models and decomposed NPV.
- The inclusion of recreational fishing in asset accounts will be discussed in the methodological report.

Demonstrate physical term of asset account

Attempt to establish the link of accounting data and modelling

	Salmon (spawing population in weight, tonne)		Herring (TSB, tonne)			Sprat (TSB, tonne)	
	Tornijoki (modelling and stock assemsement scope)	Entire Finland (accounting scope)	Entire SD30SD31 (modelling and stock assemsement scope)	SD30SD31-Finnish part	Entire Finland (accounting scope)	Entire Baltic Sea (modelling and stock assemsement scope)	Entire Finland (accounting scope)
Opeing stock (2018)	***726***	**	*823,721*	675,049	**	*1,755,000*	93,510
+ Ecosystem enhancement/stock growth	**299**	**	**95,758**	78,475	**	**216,135**	11,516
- Ecosystem degradation/gross catch	197	406	99,009	81,139	126,487	308,827	16,455
From statistics	*197*	406	*99,009*	81,139	126,487	*308,827*	16,455
From modelling	**274**	**	**103,837**	**86,185**	**	**307,135**	**16,365**
Other change in volume of ecosystem asset							
Reappraisals (update of model parameter, permission or deamand change)**							
Due to paramter and model use	(77)		(4,828)	(3,957)		1,692	90
+ Net change	**25**		**(8,079)**	(6,621)		**(91,000)**	(4,849)
Closing stock = opening stock (2019)**	**751**	**	***815,642***	668,428	**	*1,664,000*	88,662
From statistics						*1,664,000*	
From modelling	**751**		**815,642**			**1,724,047**	

From modelling

From stock assessment input for modelling

Linkage to supply and use account (both commercial and recreational catch)

Use harvest proportion from statistic to approximate

** The points that model can be improved: use updated assessment, parameter or model revised and supply and use account

Demonstrate monetary term of asset account and decompose of NPV change

	Salmon (spawing population in weight, tonne)		Herring (TSB, tonne)			Sprat (TSB, tonne)	
	Tornijoki (modelling and stock assemsement scope)	Entire Finland (accounting scope)	Entire SD30SD31 (modelling and stock assemsement scope)	SD30SD31-Finnish part	Entire Finland (accounting scope)	Entire Baltic Sea (modelling and stock assemsement scope)	Entire Finland (accounting scope)
Opeing stock (2018)*	(54,181)		39,679,537	32,934,016		70,316,585	3,746,659
+ Net change	4,613	-	(526,367)	(436,885)	-	(3,153,155)	(168,009)
Closing stock = opening stock (2019)**/*	(49,569)		39,153,170	32,497,131		67,163,430	3,578,650
Note	Freshwater ecosystem asset		Marine ecosystem asset				

From modelling

Use harvest proportion from statistic to approximate

*Incomplete value, still need to add the NPV estimated from recreational service

** The points that model can be improved: use updated assessment, parameter or model revised and supply and use account

$$V_1^i - V_0^i = p_1^i q_1^i - p_0^i q_0^i = (p_1^i - p_0^i) q_1^i + p_0^i q_1^i - p_0^i q_0^i$$

$$= (p_1^i - p_0^i) q_1^i + p_0^i (q_1^i - q_0^i)$$

Price effect — Volume effect

	Salmon (spawing population in weight, tonne)		Herring (TSB, tonne)			Sprat (TSB, tonne)	
	Tornijoki (modelling and stock assemsement scope)	Entire Finland (accounting scope)	Entire SD30SD31 (modelling and stock assemsement scope)	SD30SD31-Finnish part	Entire Finland (accounting scope)	Entire Baltic Sea (modelling and stock assemsement scope)	Entire Finland (accounting scope)
Net change	4,613		(526,367)	(436,885)		(3,153,155)	(168,009)
Price effect	1,674		(1,122,211)	(931,435)		(2,101,509)	(111,974)
Volum effect	2,938		595,844	494,551		(1,051,646)	(56,035)

Conclusions 1/2

- Finland has extensive data collection on recreational fishing.
- However, this data is often collected using different spatial units, which makes it difficult to use data from different sources to compile accounts.
- SEEA EA recommendations on valuation methods provide diverse set of means to value recreational ES. But are the results comparable?
- More data and assessments are needed on the institutional context and on the demand (preferences and values) for recreational services.
- SEV could be used to study the effects of changes in the institutional context and in the environment on the supply and use of recreational fishing.
- Linking demand and supply of recreational fishing to asset accounts is challenging.

Conclusions 2/2

- Applying bio-economic models has a benefit of reflecting the service flow changes based on the population dynamics simulated in the model and allows the inclusion of such changes in the value of ecosystem asset.
- A lot of consideration should be given to the selection of discount rate for valuing future ecosystem flows.
- However, a mismatch would happen in terms of the short-term stock change in the physical asset account and the value of monetary account that reflects the long-term stock change.
- Another mismatch would happen between modelled results for physical asset account and data from statistic or other stock assessment data that were used as modelling input data when attempting to establish the linkage and alignment between modelled asset valuation and the supply and use accounts.
- Such mismatches need to be addressed when applying bio-economics modelling for accounting in practice.