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Potential conflict zones in the Barents Sea

F. Aleskerov, S. Demin, S. Shvydun

Higher School of Economics

Institute of Control Sciences

Structure

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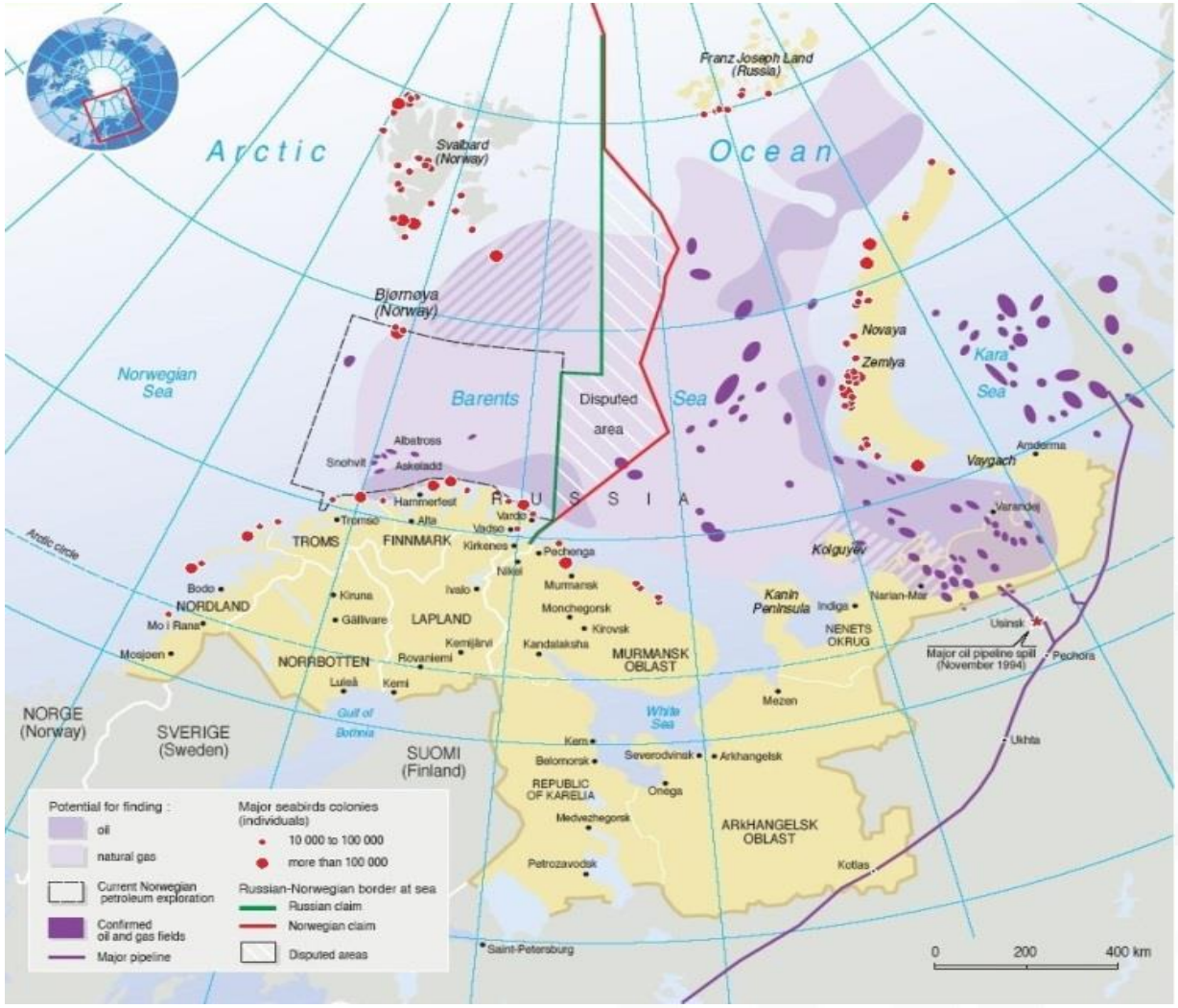
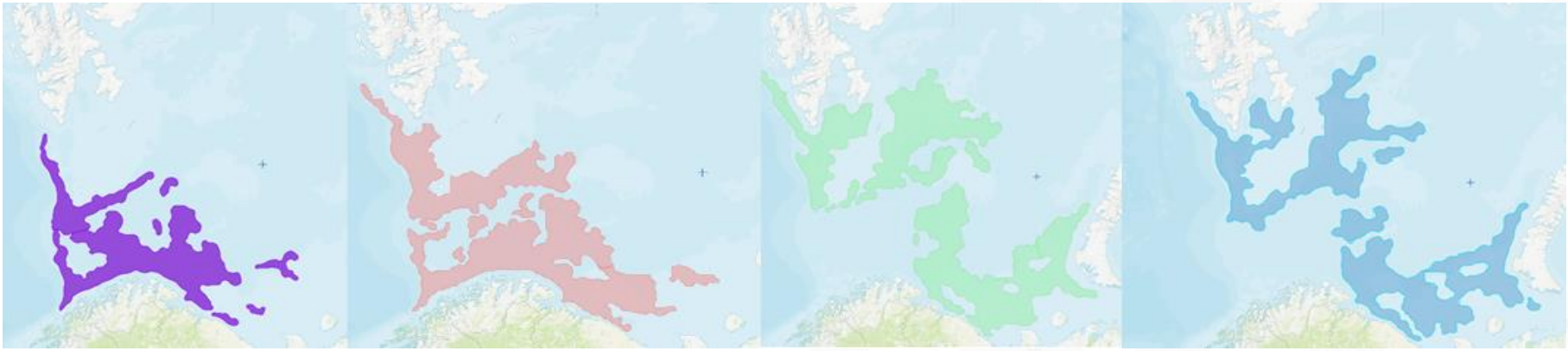
Motivation

Sectorial line along 32 ° E,
sought bythe USSR
(and Russia)
Spitsbergen
Norway
Franz Josef
Land
Sweden
Medial line, sought by
Norway
Finland
Novaya Zemlya

Important resources: oil and gas



Important resources: fish (codfish)



1 quarter 2 quarter 3 quarter 4 quarter

Problem statement

Main task – allocation of territories with different resources (about 240,000 regions 210,000 square meters each)

Input data – allocation of resources (fish, oil and gas)

Output – different scenarios of territories' allocation

Utility function

$$u_k^{Resource}(x) = \begin{cases} f(Resource, x) \cdot \left(\dfrac{d^* - d_k(x)}{d^*} \right), if \quad d_k(x) < d^*, \\ 0, \qquad if \quad d_k(x) \geq d^*. \end{cases}$$

$$u_k^{Total}(x) = \propto \cdot u_k^{Oil\&Gas}(x) + u_k^{Fish}(x)$$

$f(Resource, x)$ - volume of the $Resource$ in region x

$d_k(x)$ - distance from region x to the nearest point of country k

$\propto$ - resources importance ratio

Scenarios

1. Current situation
2. Allocation according to the distance
3. Allocation with respect to the level of interest
    a. Modified adjusted winner procedure
        i. Initial allocation: all areas are allocated to Norway
        ii. Initial allocation: all areas are allocated to Russia
    b. Allocation of zones to the most interested country

Modified adjusted winner procedure

$$(x, k_2) \in P \qquad u_{k_1}^T(x) \neq 0$$

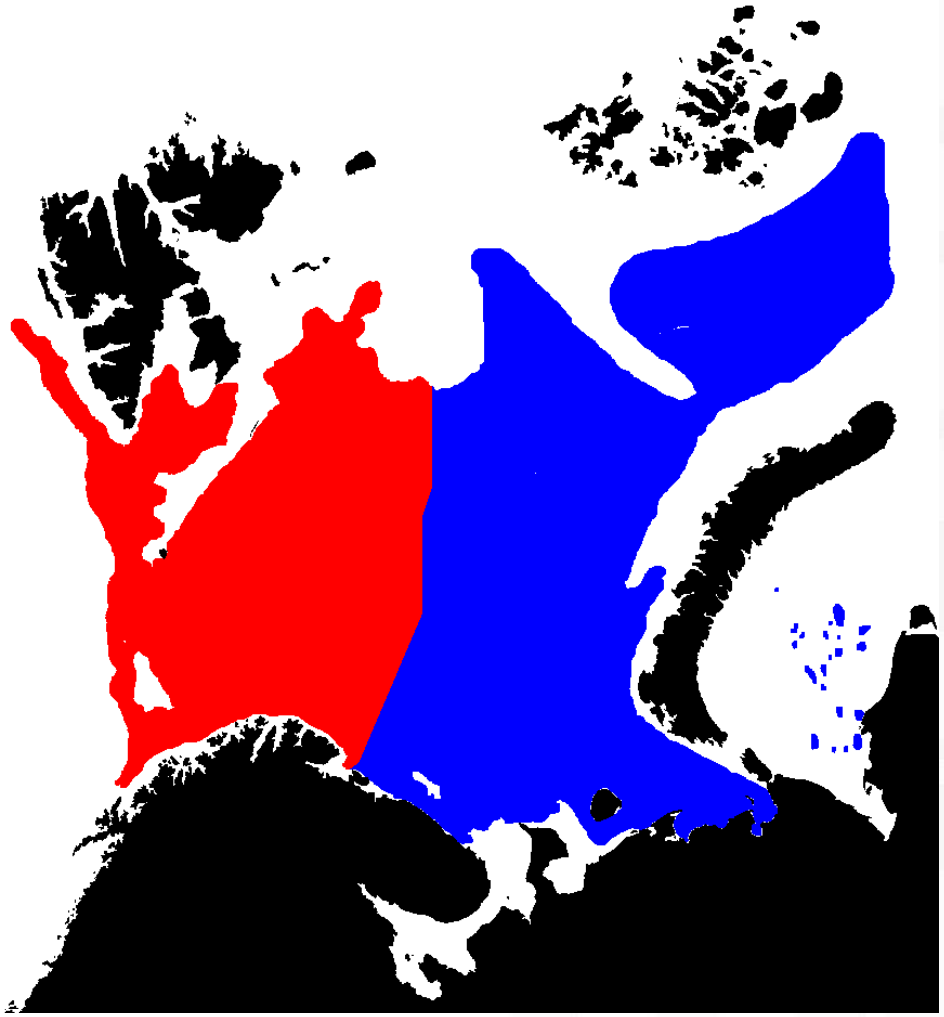
$$\frac{u_{k_1}^T(x)}{u_{k_2}^T(x)} \to max.$$

P - set of pairs $(region, owning\ country)$

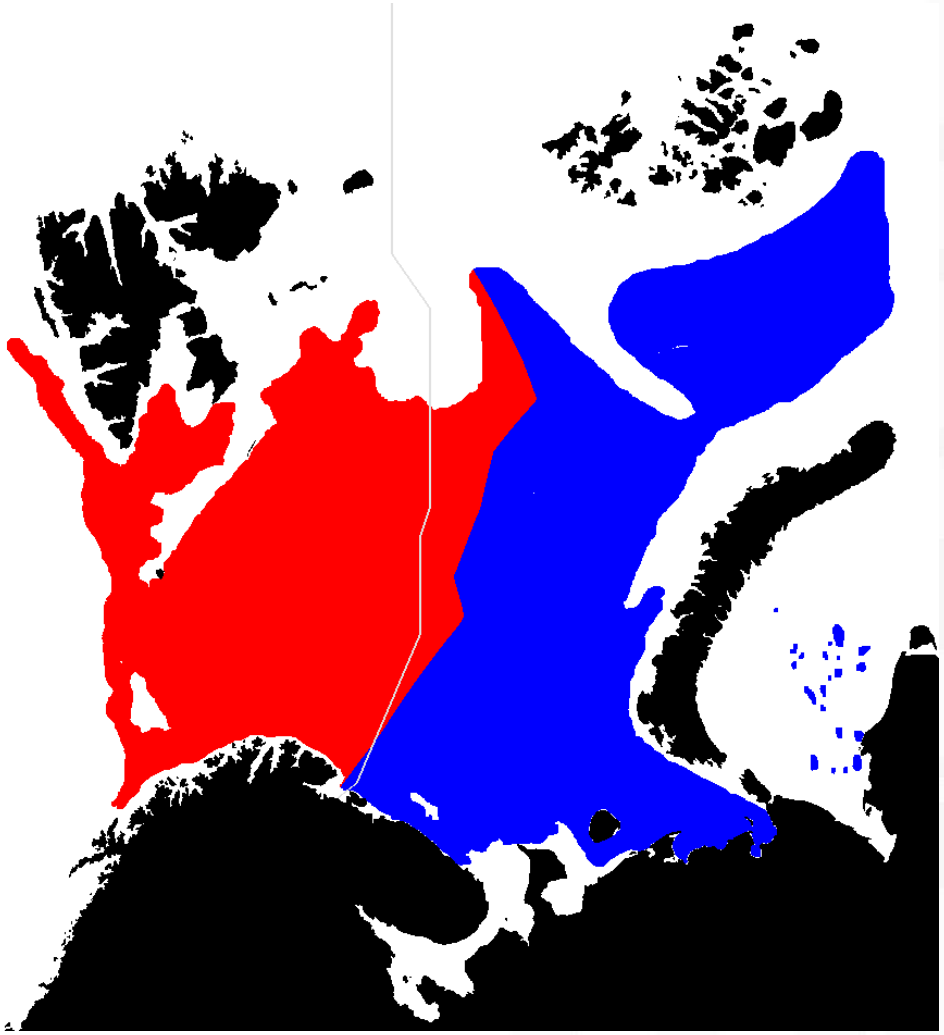
k_1 - least satisfied country

k_2 - most satisfied country

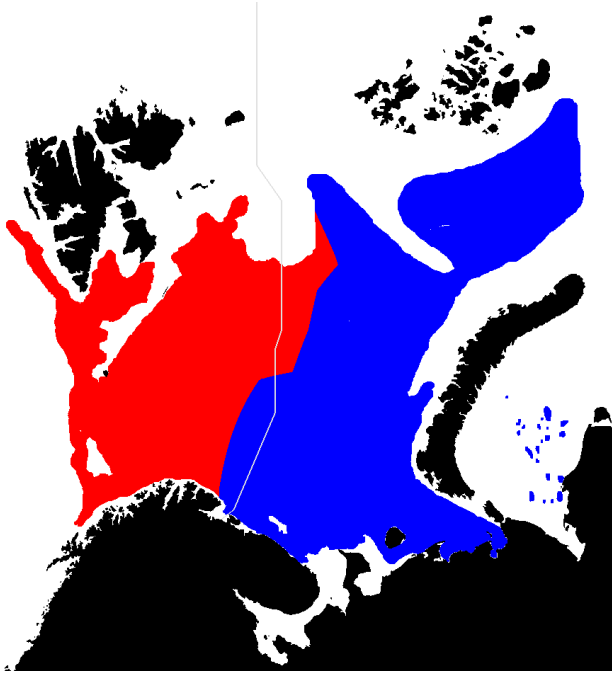
Application to the Barents Sea (current situation)



Application to the Barents Sea (distance)

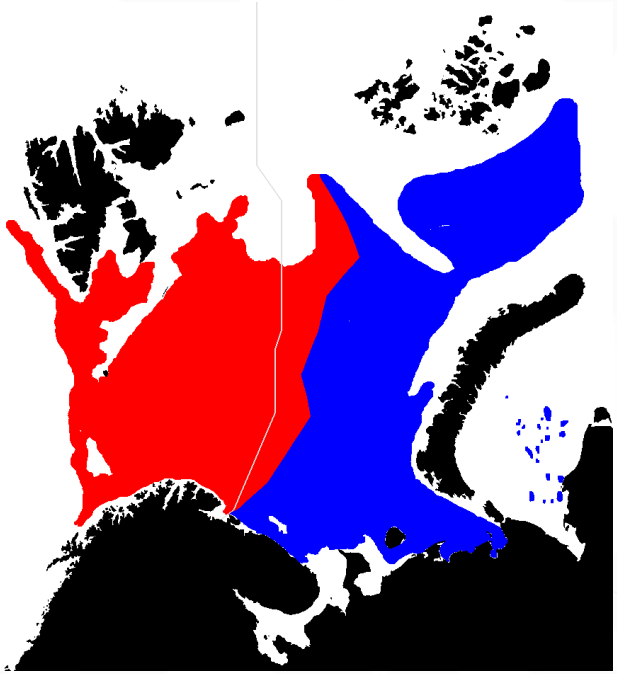


Application to the Barents Sea (modified adjusted winner procedure)



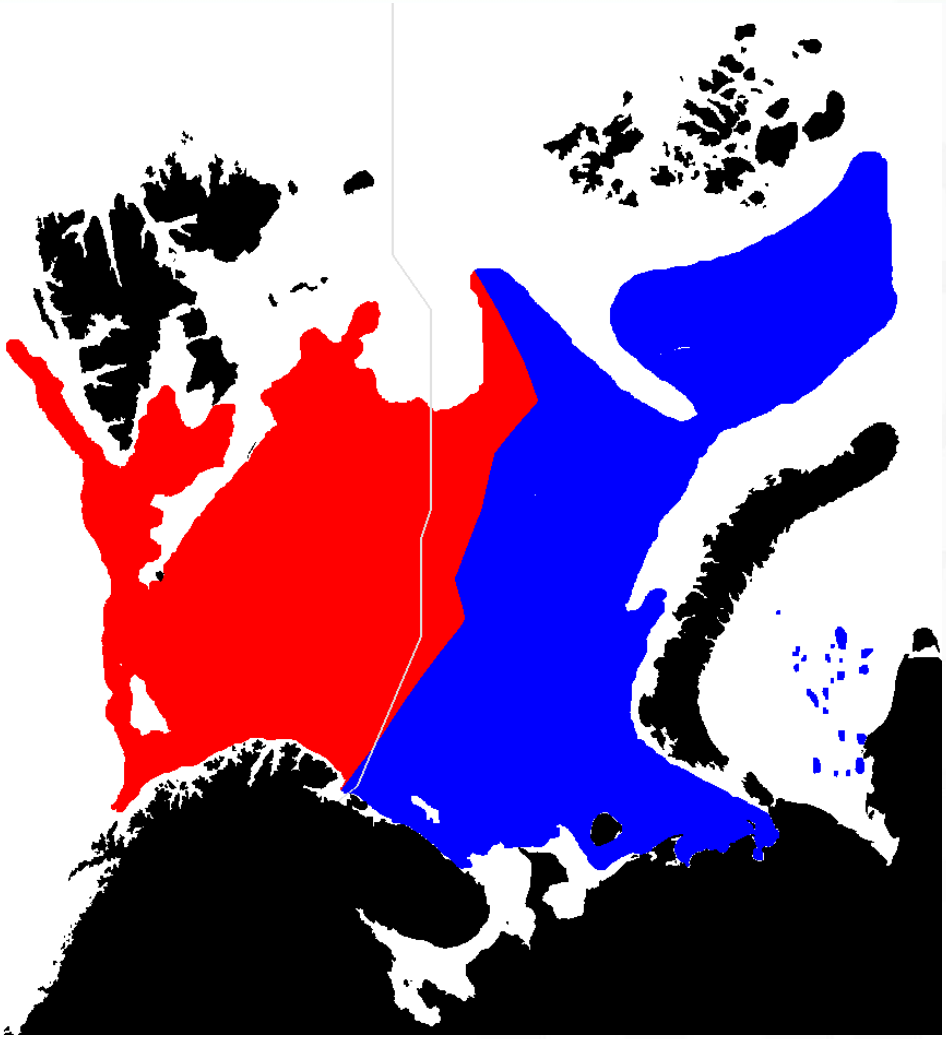
Importance ratio = 1

Importance ratio = 5



Importance ratio = 10

Application to the Barents Sea (to the most interested country)



Comparison of scenarios

	Importance ratio = 1		Importance ratio = 5		Importance ratio = 10	
	Norway	Russia	Norway	Russia	Norway	Russia
Current allocation	100625	46833	102877	341267	105691	709309
Allocation according to the distance	126655	23833	210150	244724	314519	520839
Modified adjusted winner procedure (Norway)	74461	74446	227406	227381	416719	416713
Modified adjusted winner procedure (Russia)	74451	74455	227383	227404	416703	416730
Allocation of zones to the most interested country	126655	23833	210150	244724	314519	520839

Conclusion

1. Different scenarios of territory and resources allocation
2. Different ratios of resources' importance
3. Opportunity to improve the model by taking into account other resources

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Thank you for your attention!