MAIA
Mapping and Assessment for Integrated ecosystem Accounting

Моделиране на водните регулационни услуги за нуждите на интегрираните екосистемни сметки

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Проект ‘’Картиране и оценка на интегрирани сметки за екосистемите’’

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Съдържание

Кои са екосистемните услуги свързани с водите?

Water related Ecosystem Services

Type of service	Description	Examples
Provisioning services	Focused on directly supplying food and non-food products from water flows	Freshwater supply Crop and fruit production Livestock production Fish production Hydro-electric power
Regulating services	Related to regulating flows or reducing hazards	Buffering of runoff, soil water infiltration, groundwater, maintenance of base flows Flood prevention, peak flow reduction, landslide reduction Soil protection and control of erosion and sedimentation Control of surface and groundwater quality
Supporting services	Provided to support habitats and ecosys-tem functioning	Wildlife habitat Flow regime required to maintain downstream habitat and uses
Cultural services	Related to recreation and human inspira-tion	Aquatic recreation Landscape aesthetics Cultural heritage and identity

Hawkins et al. 2009

Свързани с водите екосистемни услуги - ползите за хората, получени в следствие на влиянието на сухоземните екосистеми върху прясната вода (Brauman et al. 2007).

Регулация на наводнения – способността (капацитетът) на ландшафтите да задържат вода при екстремни валежи (Nedkov & Burkhard, 2012).

Подхранване на подземните води - количеството повърхностни води, които достигат нивото на подземните води (Rushton & Ward, 1979).

Пречистване на водите - капацитетът на екосистемите да пречистват водата (Kandziora et al., 2013a).

Снабдяване с прясна вода - използвана сладка вода (Kandziora et al., 2013a).

(Боянова, 2015)

CISES version 5.1 (2018)

Control of erosion rates	2.2.1.1	*...that mitigates or prevents potential damage to human use of the environment or human health and safety*	*The capacity of vegetation to prevent or reduce the incidence of soil erosion Or Macroalgae, microphytobenthos, macrophytes and biogenic reef structures (epifauna and infauna) all contribute through sediment stabilisation*		*Reduction of damage (and associated costs) of sediment input to water courses*
Hydrological cycle and water flow regulation (including flood control, and coastal protection)	2.2.1.3	*By depth/volumes*	*Hydrological cycle and water flow maintenance And Flood protection*	*2.2.2.1 & 2.2.2.2*	*Regulating the flows of water in our environment*
Regulation of the chemical condition of freshwaters by living processes	2.2.5.1	*By type of living system*	*Chemical condition of freshwaters*	*2.3.4.1*	*Controlling the chemical quality of freshwater*
Regulation of the chemical condition of salt waters by living processes	2.2.5.2	*By type of living system*	*Chemical condition of salt waters*	*2.3.4.2*	*Controlling the chemical quality of salt water*
Dilution by freshwater and marine ecosystems	5.1.1.1	*Amount by type*	*Dilution by atmosphere, freshwater and marine ecosystems*	*2.1.2.2*	*Diluting wastes*

Abiotic_Surface water for drinking (4.2.1.1.)	Abiotic_Surface water used as a material (non-drinking purposes) (4.2.1.2.)	Abiotic_Freshwater surface water used as an energy source (4.2.1.3.)	Abiotic_Ground (and subsurface) water for drinking (4.2.2.1.)	Abiotic_Ground water (and subsurface) used as a material (non-drinking purposes) (4.2.2.2.)	Abiotic_Ground water (and subsurface) used as an energy source (4.2.2.3.)	Abiotic_Dilution by freshwater and marine ecosystems (5.1.1.1.)	Abiotic_Mediation by other chemical or physical means (5.1.1.3.)	Abiotic_Liquid flows (5.2.1.2.)	Biotic_Control of erosion rates (2.2.1.1.)	Biotic_Hydrological cycle and water flow regulation (Including flood control, and coastal protection), (2.2.1.3.)	Biotic_Maintaining nursery populations and habitats (Including gene pool protection), (2.2.2.3.)	Biotic_Regulation of the chemical condition of freshwaters by living processes (2.2.5.1.)

Защо моделиране?

Both assessment and accounts of water regulation services need various data which is usually not available through direct or indirect measurement, therefore modeling of water regulation is much needed (Vardon 2014)

Modeling could provide data for different aspects of the water cycle that cannot be extracted through direct measurements (Vigerstol and Aukema, 2011).

Modelling water regulation is often data-intensive and also analytically complex and generally requires the use of hydrological models (UN, 2017).

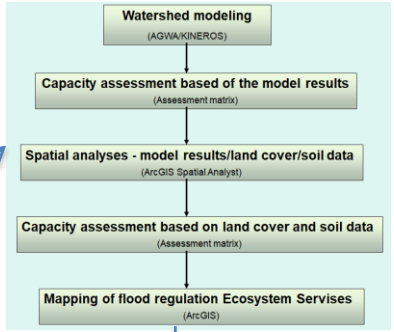
Регулация на наводнения

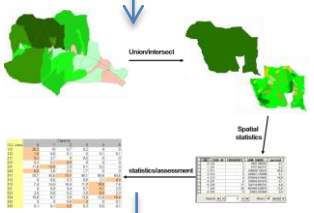
- **Смекчаваща функция**
  заливни тераси и влажни зони

- **Превантивна функция**
  Горски екосистеми

Модели

	Модел	ГИС софтуер	Производител
Хидроложки	GeoHMS	GeoHMS for Arciew3x	US Corps of Engineers
	HEC	HEC GeoHMS for ArcGIS	US Corps of Engineers
	NFF	NFFF ArcGIS	USGS
	MIKE BASIN	ArcGIS	DHI Water & Environment
	MIKE SHE	ArcGIS	DHI Water & Environment
	WISE	ArcGIS	Watershed Concepts
	WMS	ArcGIS	Brigham Young University
	SWAT	AGWA ArcView/ArcGIS	EPA
	KINEROS	AGWA ArcView/ArcGIS	EPA
Хидравлични	GeoRAS	GeoRAS for Arciew3x	US Corps of Engineers
	HEC-RAS	HEC-RAS for ArcGIS	US Corps of Engineers
	MIKE FLOOD	ArcGIS	DHI Water & Environment
	MIKE 11	ArcGIS	DHI Water & Environment
	SMS	ArcGIS	Brigham Young University





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Flood regulating ecosystem services—Mapping supply and demand, in the Etropole municipality, Bulgaria

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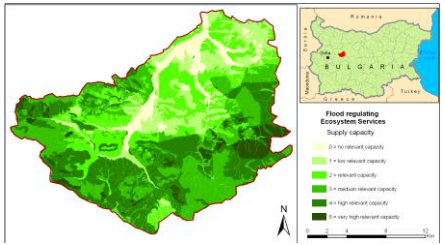
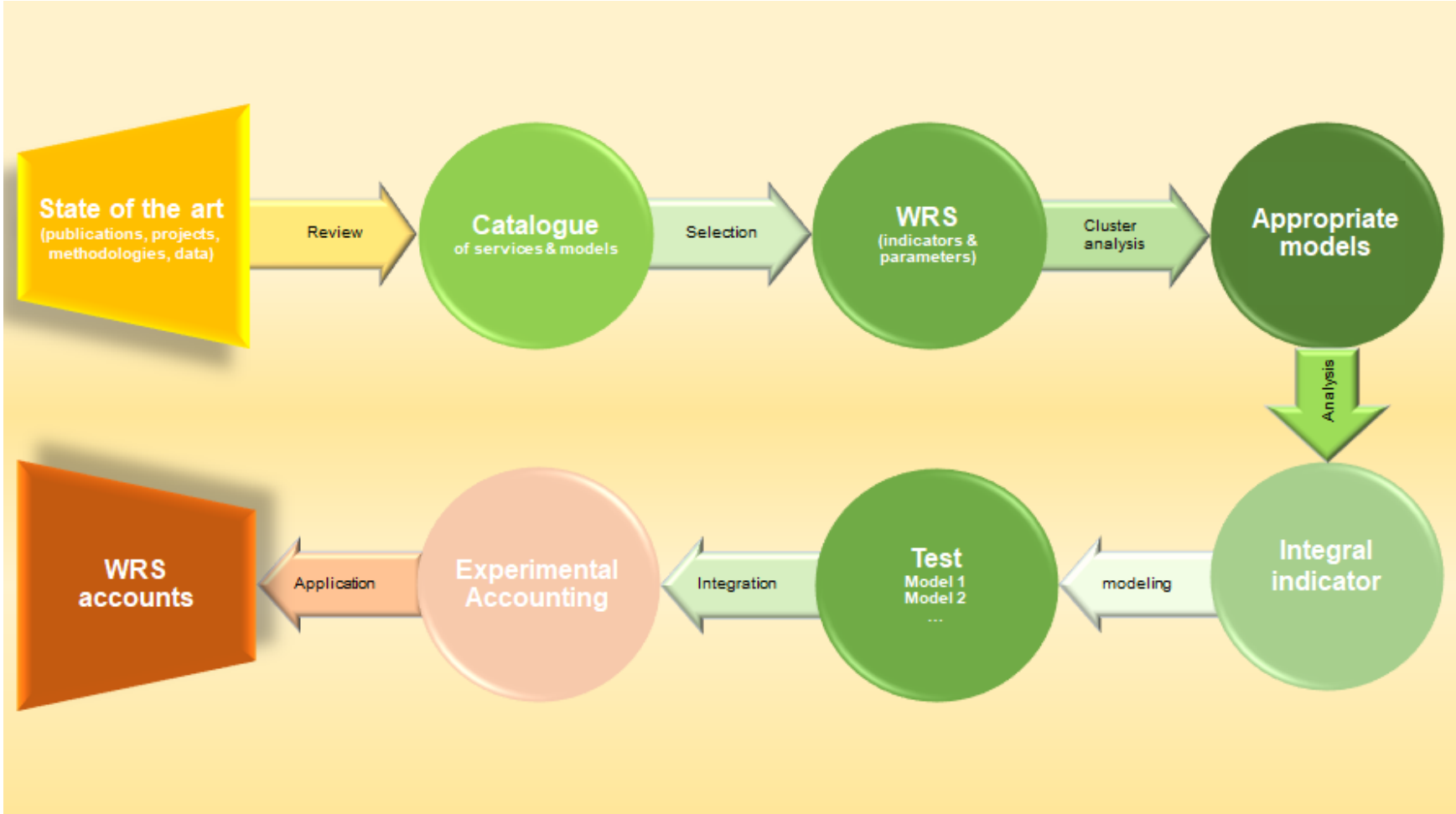


Концептуален подход за регулация на наводнения



Концептуален подход за регулация на наводнения

Flood control

Runoff retention by ecosystems

Economic assets in floodplains

Flood control **POTENTIAL**

Service Providing Areas (SPA)

DEMAND for flood control

Service Demanding Areas (SDA)

SEEA EEA* accounting tables

Actual flow of flood control

Extent of demand protected by SPA upstream

*United Nations System of Environmental-Economic Accounting- Experimental Ecosystem Accounts

ELSEVIER

Ecosystem Services

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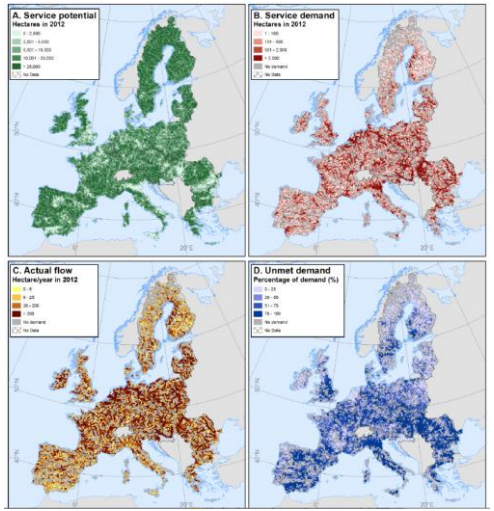
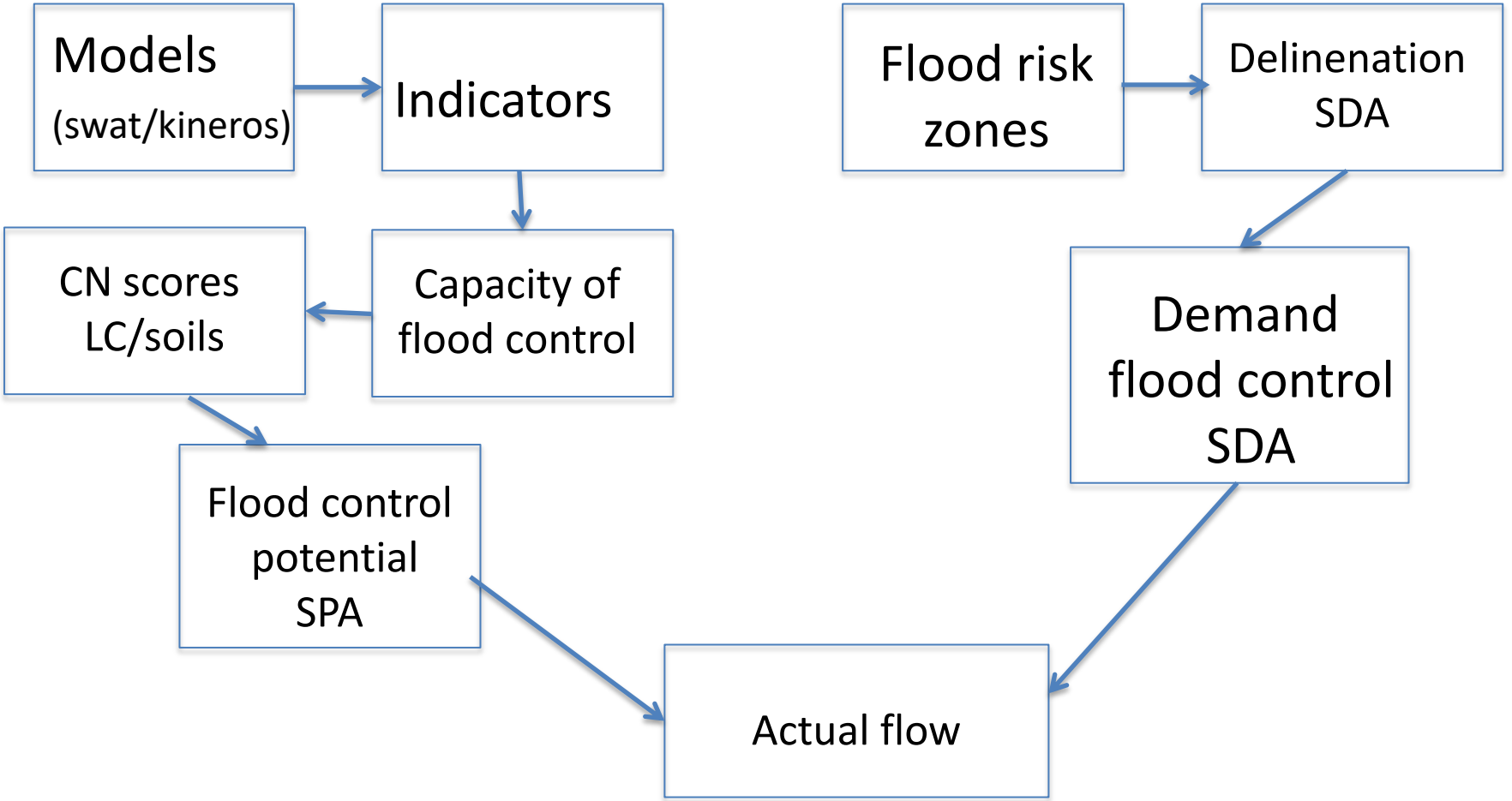
Accounting for changes in flood control delivered by ecosystems at the EU level

Sara Vallecillo, Georgia Kakoulaki, Alessandra La Notte, Luc Feyen, Francesco Dottori, Joachim Maes



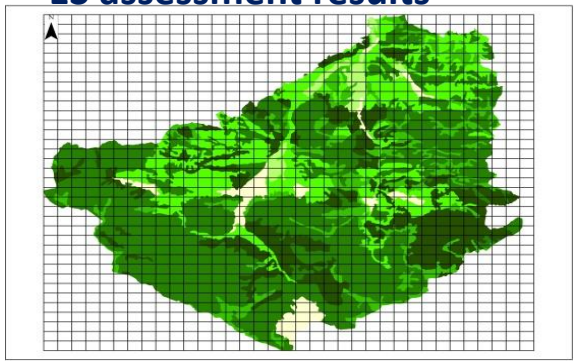
Vallecillo et al. 2020

Концептуален подход за регулация на наводнения

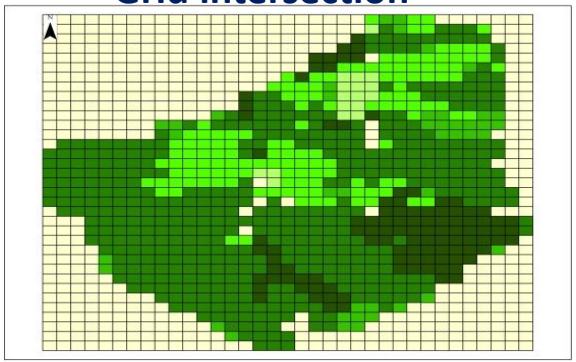


Case study: Etropole

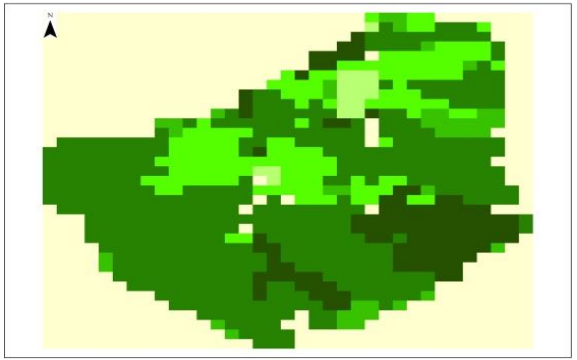
ES assessment results



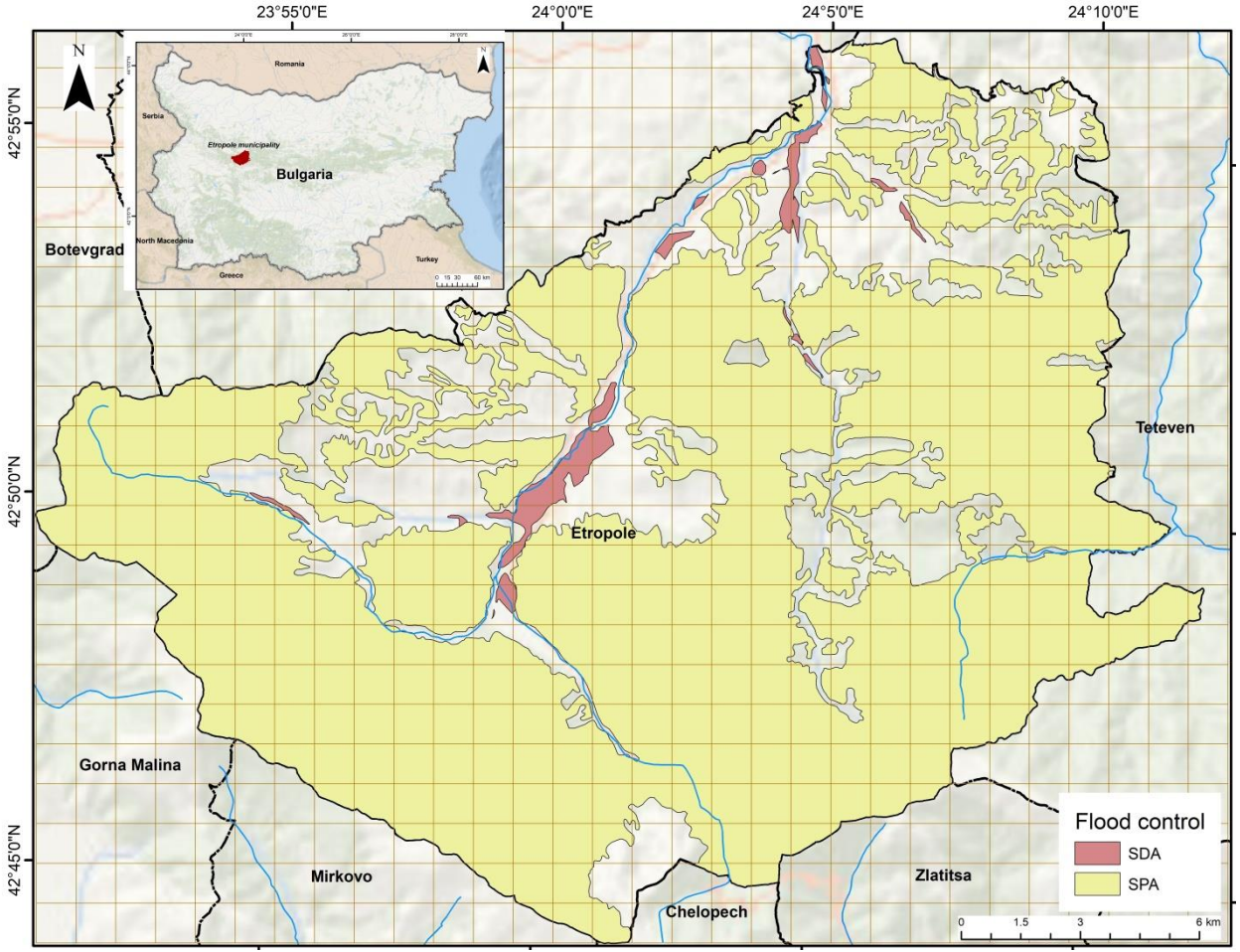
Grid intersection



Output for accounting



Реални стойности - **SDA**						
CLC	Cropland	Grassland	Heathland and shrub	Urban	Woodland and forest	**Total SDA area**
2000	255.38	0.00	0.00	244.91	1.03	501.32
2006	255.39	0.003	0.00	244.90	1.03	501.32
2012	259.91	3.40	0.00	231.78	6.23	501.32
2018	263.01	0.00	0.00	232.08	6.23	501.32
average	258.42	0.85	0.00	238.42	3.63	



The Service Providing Areas (SPA) and the Service Demanding Areas (SDA) in Etropole municipality

Hristova et al. 2020
(in print)

Accounting table of flood regulation potential, demand and actual flow in Etropole municipality

ES Flood regulation							
Components	Ecosystem types					Total [ha]	Years assessed
	Cropland	Grassland	Heathland and shrub	Urban	Woodland and forest		
ES Potential	76.35	1560.82	132.12	48.14	26316.60	28134.03	*2000*
	76.91	1560.71	132.15	74.10	26290.10	28133.97	*2006*
	190.40	1551.12	124.04	68.44	26200.00	28133.99	*2012*
	271.40	1812.11	0.00	146.97	25903.50	28133.98	*2018*
	153.76	**1621.19**	**97.08**	**84.41**	**26177.55**	**28133.99**	**average**
ES Demand	255.38	0.00	0.00	244.91	1.03		*2000*
	255.39	0.003	0.00	244.90	1.03		*2006*
	259.91	3.40	0.00	231.78	6.23		*2012*
	263.01	0.00	0.00	232.08	6.23		*2018*
	258.42	**0.85**	**0.00**	**238.42**	**3.63**	**501.32**	**average**
ES Actual flow	0.21	4.20	0.36	0.13	70.77		*2000*
	0.21	4.20	0.36	0.20	70.70		*2006*
	0.51	4.17	0.33	0.18	70.46		*2012*
	0.73	4.87	0.00	0.40	69.66		*2018*
	0.41	**4.36**	**0.26**	**0.23**	**70.40**	**75.66**	**average**

Hristova et al. 2020 (in print)

- Систематизация и анализ на резултатите от моделите
- Типологизиране на басейните в страната
- Анализ на връзките между моделните резултати, земното покритие и почвите
- Приложение на подхода на национално ниво

БЛАГОДАРЯ ЗА ВНИМАНИЕТО!

Mapping & Assessment for Integrated ecosystem Accounting
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http://maiaportal.eu/

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