

The value of ecosystem services derived from
the chestnut tree ecosystem.

General framework of carbon markets



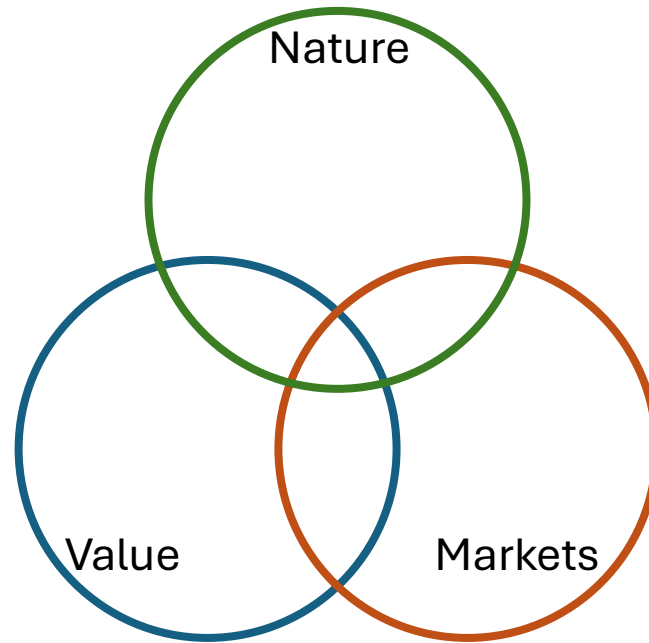
**XV Jornadas Europeas
de la Castaña 2025**

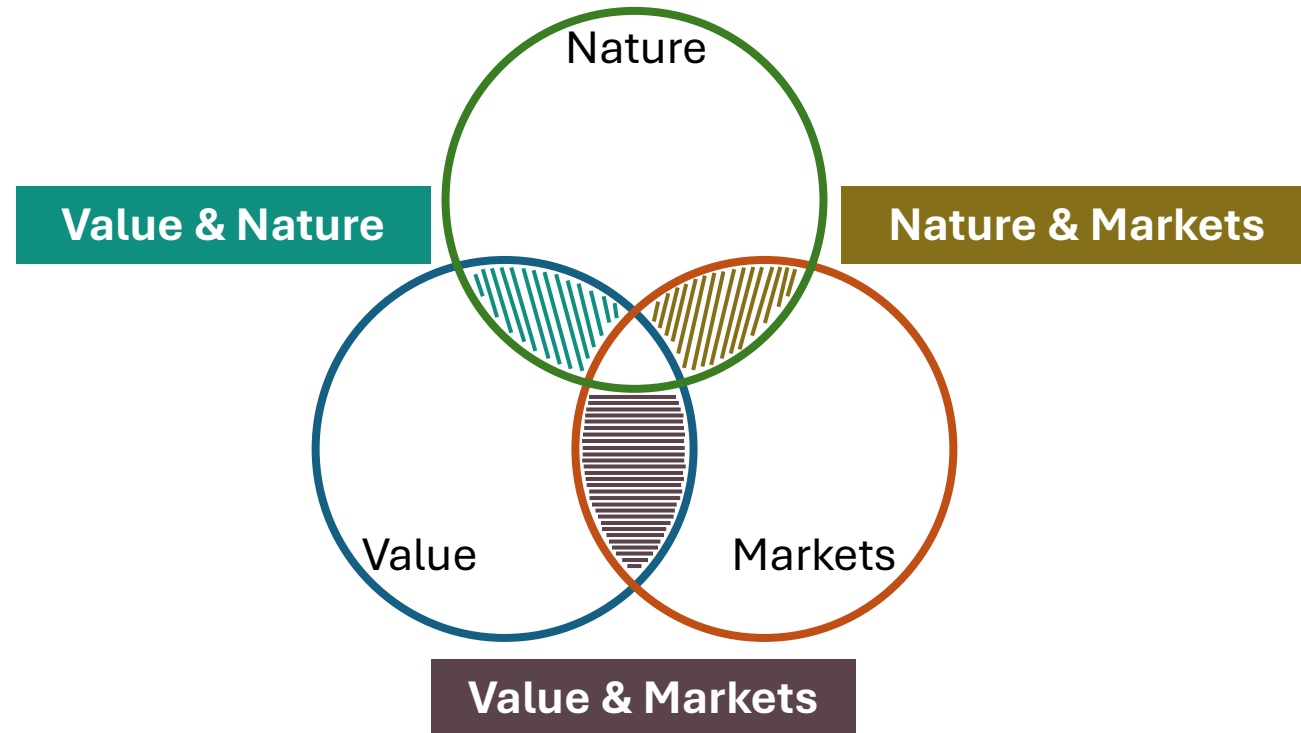
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What is the value of nature?

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Robert C
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* Center for En
Maryland 2061
‡ Economics D
§ Center for En
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Table 1 Ecos	Number	Area (ha × 10 ⁶)	1 Gas regulation	2 Climate regulation	3 Disturbance regulation	4 Water regulation	5 Water supply	6 Erosion control	7 Soil formation	8 Nutrient cycling	9 Waste treatment	10 Pollination	11 Biological control	12 Habitat/ refugia	13 Food production	14 Raw materials	15 Genetic resources	16 Recreation	17 Cultural	Total value per ha (\$ ha ⁻¹ yr ⁻¹)	Total global flow value (\$ yr ⁻¹ × 10 ⁹)
1	Borne																				
2																					
3	Marine	26,302																		577	20,949
	Open ocean	33,200	38							118			5		15	0			78	252	8,381
4	Coastal	3,302			88					3,877			38	8	93	4		82	62	4,052	12,568
5	Estuaries	180			567					21,003			78	131	521	25		361	29	22,832	4,110
	Seagrass/ algae beds	200								19,002						2				19,004	3,801
6	Coral reefs	62			2,750						58		5	7	220	27		3,008	1	6,075	375
	Shell	2,660								1,431			39		68	2			70	1,610	4,283
7	Terrestrial	15,323																		804	12,319
	Forest	4,855		141	2	2	3	96	10	361	87		2		43	138	16	66	2	969	4,706
8	Tropical	1,900		223	5	6	11	245	10	922	87				32	315	41	112	2	2,007	3,813
9	Temperate/boreal	2,955		88		0			10		87		4		50	25		36	2	302	894
10	Grass/rangelands	3,898	7	0		3		29	1		87	25	23		67		0	2		232	905
	Wetlands	330	133		4,539	15	3,800				4,177			304	256	106		574	881	14,785	4,879
11	Tidal marsh/ mangroves	165			1,839						6,696			169	466	162		658		9,990	1,648
12	Swamps/ floodplains	165	265		7,240	30	7,600				1,659			439	47	49		491	1,761	19,580	3,231
13	Lakes/rivers	200				5,445	2,117				665				41			230		8,498	1,700
14	Desert	1,925																			
15	Tundra	743																			
	Ice/rock	1,840																			
16	Cropland	1,400										14	24		54					92	128
17	Urban	332																			
	Total	51,625	1,341	684	1,779	1,115	1,692	576	53	17,075	2,277	117	417	124	1,386	721	79	815	3,015		33,268

* We include ec

Numbers in the body of the table are in \$ ha⁻¹ yr⁻¹. Row and column totals are in \$ yr⁻¹ × 10⁹. Column totals are the sum of the products of the per ha services in the table and the area of each biome, not the sum of the per ha services themselves. Shaded cells indicate services that do not occur or are known to be negligible. Open cells indicate lack of available information.



Table 6.3
Reference list of selected ecosystem services

ECOSYSTEM SERVICE	DESCRIPTION
Provisioning services	
Food provisioning services*	Food provisioning services are ecosystem contributions that provide food for economic units for various uses, including for consumption. These are final ecosystem services.
Grazed biomass provisioning services*	Grazed biomass provisioning services are ecosystem contributions that provide biomass input to the growth of cultivated livestock. These crops used to produce fodder for livestock (e.g. crop provisioning services). These are final ecosystem services.
Livestock provisioning services*	Livestock provisioning services are ecosystem contributions that provide products (e.g. meat, milk, eggs, wool, leather) for food production. These are final ecosystem services recorded if grazed biomass provisioning services are recorded.
Aquaculture provisioning services	Aquaculture provisioning services are ecosystem contributions that provide shellfish, seaweed in aquaculture facilities that are final ecosystem services.
Wood provisioning services	Wood provisioning services are ecosystem contributions that provide both in cultivated (plantation) and in uncultivated (wild) wood forest products, are final ecosystem services.
Wild fish and other natural aquatic biomass provisioning services	Wild fish and other natural aquatic biomass provisioning services are ecosystem contributions that provide various uses, primarily food production. These are final ecosystem services.
Wild animals, plants and other biomass provisioning services	Wild animals, plants and other biomass provisioning services are ecosystem contributions that provide various uses, primarily food production. These are final ecosystem services.
Genetic material services	Genetic material services are ecosystem contributions that are used by economic units, for example synthesis; or (c) in product development directly ecosystem services intermediate to biomass provisioning services.
Water supply*	Water supply services reflect the combined ecosystem services to the supply including household consumption. These are final ecosystem services.
Other provisioning services	

Regulating and maintenance services

Global climate regulation services	Global climate regulation services are ecosystem contributions that regulate the atmosphere through the removal (sequestration) of carbon in ecosystems. These services, which are final ecosystem services, are recorded if global climate regulation services are recorded.
Rainfall pattern regulation services (at subcontinental scale)	Rainfall pattern regulation services are ecosystem contributions that regulate rainfall patterns through evapotranspiration and recycle moisture back to the atmosphere where parts of continents fully depends upon this recycling.
Local (micro and meso) climate regulation services	Local climate regulation services are ecosystem contributions (including micro- and mesoscale climates) living conditions and support economic product trees ("green space"), the contribution of urban providing shade for humans and livestock. These are final ecosystem services.

Table 6.3
Reference list of selected ecosystem services (continued)

ECOSYSTEM SERVICE	DESCRIPTION
Air filtration services	Air filtration services are ecosystem contributions to the filtering of airborne pollutants through the deposition, uptake, fixing and storage of pollutants by ecosystem components, particularly plants, that mitigate the harmful effects of those pollutants. These are most commonly final ecosystem services.
Soil quality regulation services	Soil quality regulation services are ecosystem contributions that regulate the fertility and characteristics of soil and to the loss of soil (and sediment) and supply. These may be recorded as final or intermediate ecosystem services.
Soil and sediment retention services	Soil erosion control services: Soil erosion control services are ecosystem contributions that reduce the loss of soil (and sediment) and supply. These may be recorded as final or intermediate ecosystem services. Landslide mitigation services: Landslide mitigation services are ecosystem contributions that mitigate or prevent potential damage to infrastructure that arise from the mass movement of soil. These are final ecosystem services.
Solid waste remediation services	Solid waste remediation services are ecosystem contributions that remove or neutralize pollutants, through the action of microorganisms. These may be recorded as final or intermediate ecosystem services.
Water purification services (water quality regulation)	Retention and breakdown of nutrients: Water purification services are ecosystem contributions that improve the condition of surface water and groundwater pollutants by ecosystem components that improve water quality. These may be recorded as final or intermediate ecosystem services. Retention and breakdown of other pollutants: Water purification services are ecosystem contributions that improve the condition of surface water and groundwater pollutants by ecosystem components that improve water quality. These may be recorded as final or intermediate ecosystem services.
Water flow regulation services	Baseline flow maintenance services: Water regulation services are ecosystem contributions that regulate the flow of water in lakes and rivers. These may be recorded as final or intermediate ecosystem services. Peak flow mitigation services: Water regulation services are ecosystem contributions that regulate the flow of water in lakes and rivers. These may be recorded as final or intermediate ecosystem services.
Flood control services	Coastal protection services: Coastal protection services are ecosystem contributions that reduce the impacts of tidal surges or storms on local communities. These are final ecosystem services. River flood mitigation services: River flood mitigation services are ecosystem contributions that reduce the impacts of high water levels on flood mitigation services are supplied together with flood protection. These are final ecosystem services.
Storm mitigation services	Storm mitigation services are ecosystem contributions that reduce the impacts of windstorms, sandstorms and communities. These are final ecosystem services.
Noise attenuation services	Noise attenuation services are ecosystem contributions that mitigate its harmful or stressful effects. These are final ecosystem services.
Pollination services	Pollination services are the ecosystem contributions that regulate the abundance and/or diversity of other species that economic units use or enjoy. These may be recorded as final or intermediate ecosystem services.
Biological control services	Pest control services: Biological control services are ecosystem contributions to reductions in the incidence of species that may prevent or reduce the effects of pests on biomass production processes or other economic and human activity. These may be recorded as final or intermediate ecosystem services. Disease control services: Disease control services are ecosystem contributions to reductions in the incidence of species that may prevent or reduce the effects of species on human health. These are most commonly final ecosystem services.

Table 6.3
Reference list of selected ecosystem services (continued)

ECOSYSTEM SERVICE	DESCRIPTION
Nursery population and habitat maintenance services	Nursery population and habitat maintenance services are ecosystem contributions necessary for sustaining populations of species that economic units ultimately use or enjoy, either through the maintenance of habitats (e.g. for nurseries or migration) or the protection of natural gene pools. These are intermediate services and may be inputs to a number of different final ecosystem services including biomass provisioning and recreation-related services.
Other regulating and maintenance services	
Recreation-related services	Recreation-related services are contributions of ecosystems, in particular through their biophysical characteristics and qualities, that enable people to use and enjoy the environment through direct, in situ, physical and experiential interactions with the environment. These include services both to locals and to non-locals (i.e. visitors, including tourists). Recreation-related services may also be supplied to those engaging in recreational fishing or hunting. These are final ecosystem services.
Visual amenity services*	Visual amenity services are ecosystem contributions to local living conditions, in particular through the biophysical characteristics and qualities of ecosystems, that provide sensory benefits, especially visual. These services combine with other ecosystem services, including recreation-related services and noise attenuation services, to underpin amenity values. These are final ecosystem services.
Education, scientific and research services	Education, scientific and research services are ecosystem contributions, in particular through their biophysical characteristics and qualities, that enable people to use the environment through intellectual interactions with it. These are final ecosystem services.
Spiritual, artistic and symbolic services	Spiritual, artistic and symbolic services are contributions of ecosystem, in particular through their biophysical characteristics and qualities, that are recognized by people for their cultural, historical, aesthetic, sacred or religious significance. These services may underpin people's cultural identity and may inspire them to express themselves through various artistic media. These are final ecosystem services.
Other cultural services	
Flows related to non-use values	
Ecosystem and species appreciation	Ecosystem and species appreciation concerns the well-being that people derive from the existence and preservation of the environment for current and future generations, irrespective of any direct or indirect use.



SEEA Ecosystem Accounting
(SEEA EA)



Online supplemental materials (in Excel):

1. SEELand Stylised Example
2. Ecosystem Services Logic Chain

The SEEA EA is built on five core accounts. These accounts are compiled using spatially explicit data and information about the functions of ecosystem assets and the ecosystem services they produce.

What is the value of a chestnut tree ecosystem?

Ecosystem service	EUR/ha·yr
Provisioning	6.300
Carbon sequestration	1.100
Cultural	1.400
TOTAL	8.800

Sweet chestnut agroforestry systems in

assessment

Unive



Journal of
Volume 135, 1

Carbon sequestration
management alter
coppice in northern Spain

Marta Prada ^{a b}  , Felipe Bravo ^b, Lorena Berdasco ^a, Elena Canga ^a, Celia Martínez-Alonso ^a

Landscapes: the Case of
South Tyrol

Christian Fischer  and Francesco Marangon 

Economics
86-44



Timber value: A case study in

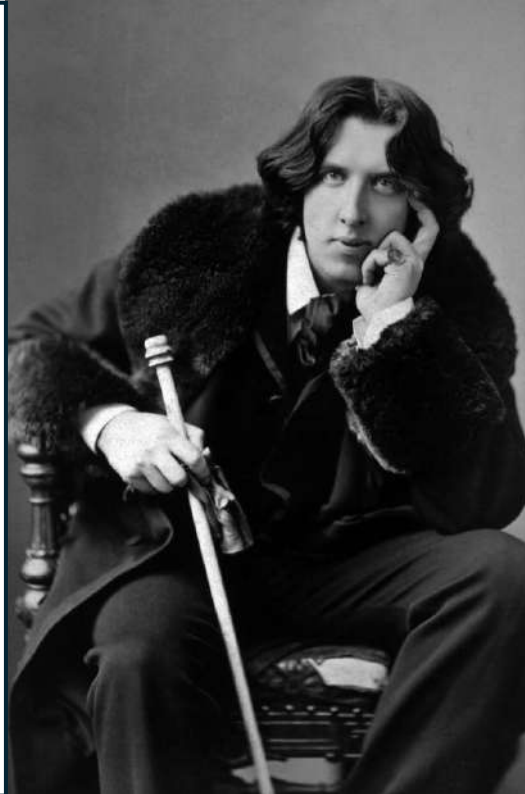
Christian Accastello  , Simone Blanc, Angela Mosso, Filippo Brun



Value and markets

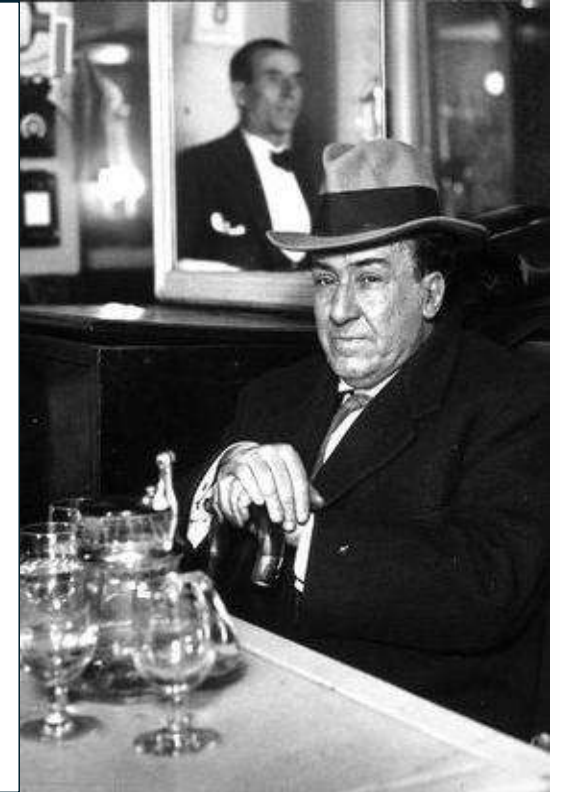
**“Nowadays people know
the price of everything
and the value of
nothing”**

Oscar Wilde (*The
Picture of Dorian
Gray*, 1890)



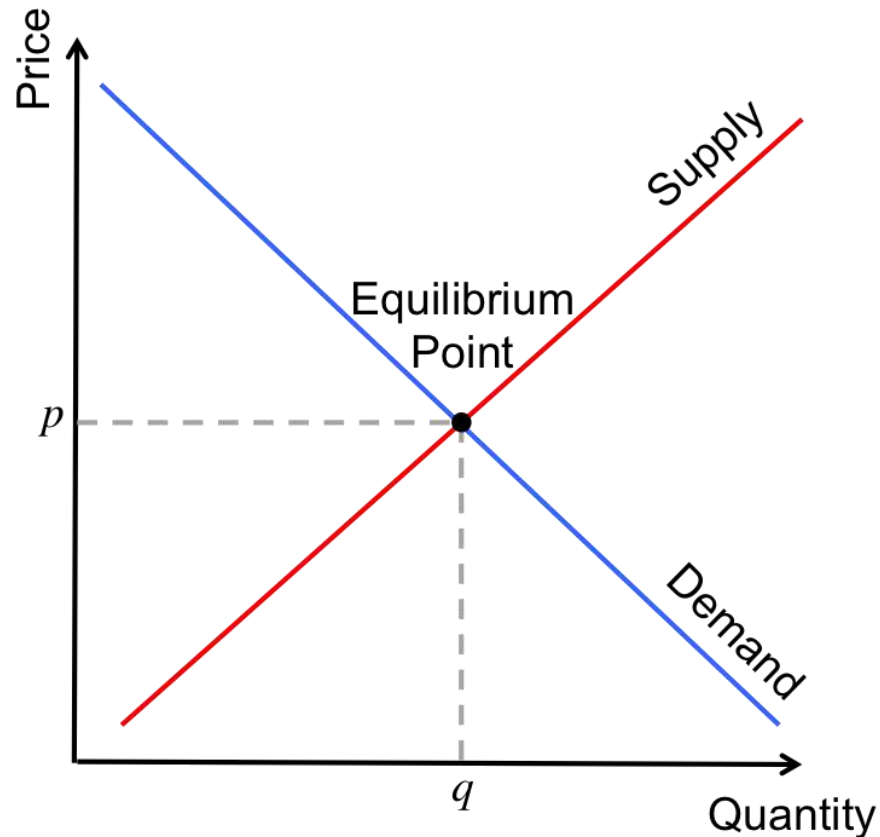
**“Todo necio
confunde valor y precio”**

Antonio Machado
(*Proverbios y cantares*,
1912)



Value and markets

❑ Value for whom? Value by whom?



- Demand generates the market, but demand and supply jointly determine the price
- If demand = 0 $\Rightarrow$ no market, price = 0
- If supply = $\infty \Rightarrow$ no market, price = 0
- The paradox of diamonds and water

Nature and markets

❑ Value of nature for whom? Value of nature by whom?

❑ Value of nature (ecosystem services) for...

- ...private owners?
- ...neighbours?
- ...citizens?
- ...companies?
- ...world population?

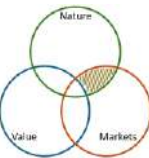
Demand

❑ Value of nature “by”...

- ...private owners?
- ...Governments?

Supply

❑ **But** if demand = 0 OR supply = ∞ then there's no market, and price = 0



Nature and markets

- ❑ Is it possible to have markets for the ecosystem services that nature provides?
 - YES (FORTUNATELY), if **demand** is greater than 0 and **supply** is not ∞
 - NO (REGRETTABLY), in all other cases

- ❑ Best example: carbon markets



Nature and



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Emissions & carbon management

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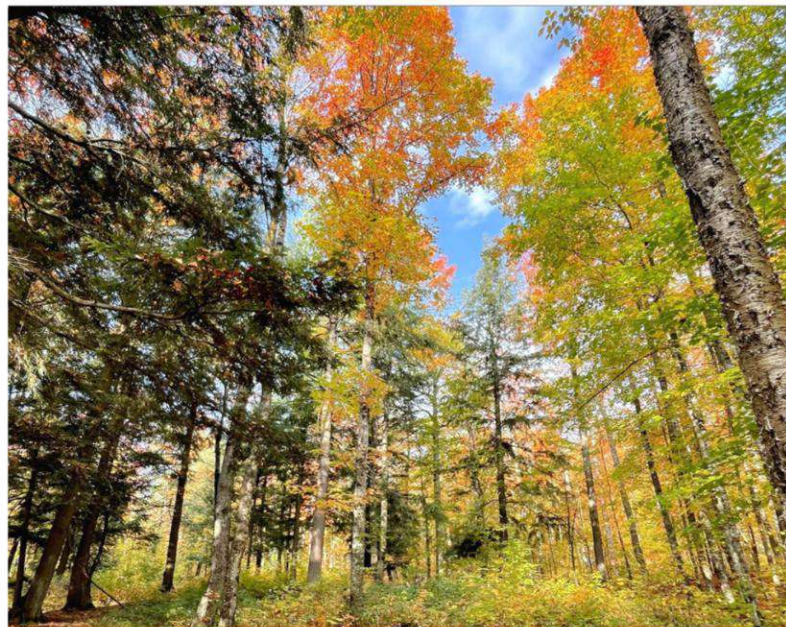


WHAT WE DO ▾ ABOUT US ▾ GET INVOLVED ▾ MEMBERSHIP & GIVING ▾



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CLIMATE CHANGE STORIES

What are carbon markets and how do we work with them?

Our commitment to high-quality carbon markets benefits people and nature.



System Climate Action

Personalized
data



Nature and markets

- ❑ Is it possible to have markets for the ecosystem services that nature provides?
 - YES (FORTUNATELY), if **demand** is greater than 0 and **supply** is not ∞
 - NO (REGRETTABLY), in all other cases

- ❑ Best example: carbon markets
 - Ecosystem service: global climate regulation services
 - **Demand** from private companies and Governments
 - **Supply** from land owners and Governments (or public authorities)
 - Compliance markets coexist with voluntary markets

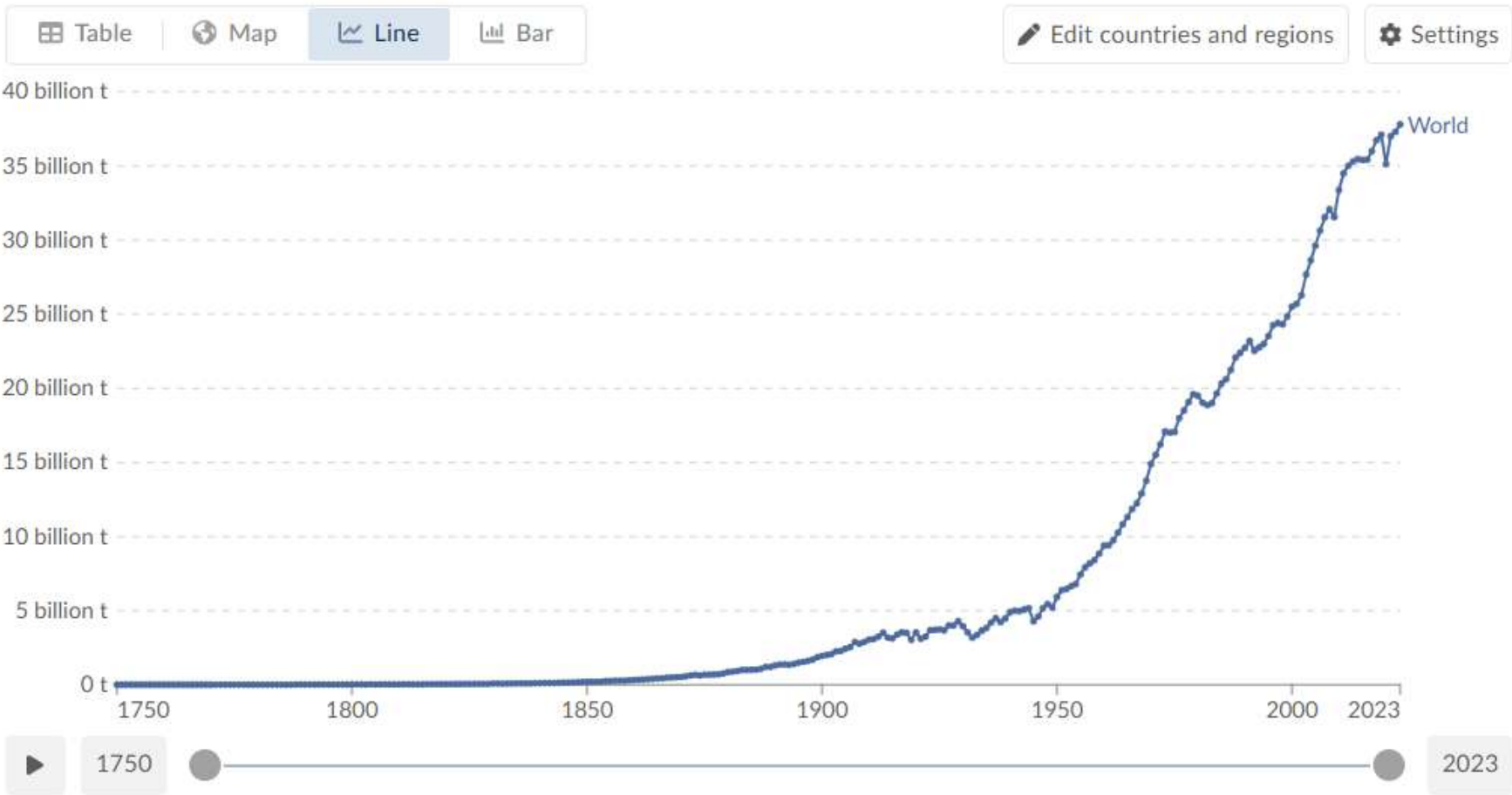


Nature and markets

Annual CO₂ emissions

Carbon dioxide (CO₂) emissions from fossil fuels and industry. Land-use change is not included.

Our World
in Data



Data source: Global Carbon Budget (2024) - [Learn more about this data](#)
OurWorldinData.org/co2-and-greenhouse-gas-emissions | CC BY

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Compliance markets

14.000 Mt rights / permits / allowances

Voluntary markets

300 Mt credits



Compliance markets **demand:**
private companies in
“regulated sectors”,
Governments

Compliance markets **supply:**
Governments, public
authorities

Voluntary markets **demand:**
private companies,
associations, citizens...

Voluntary markets **supply:**
land owners

Nature and markets

ETS in force, 2005



Nature and markets

ETS in force, 2025



Rights/permits/allowances

Credits

Demand

Supply

EU ETS
1.300 Mt

EU RRE
2.000 Mt

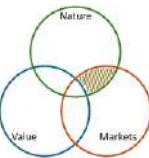
China
8.000 Mt

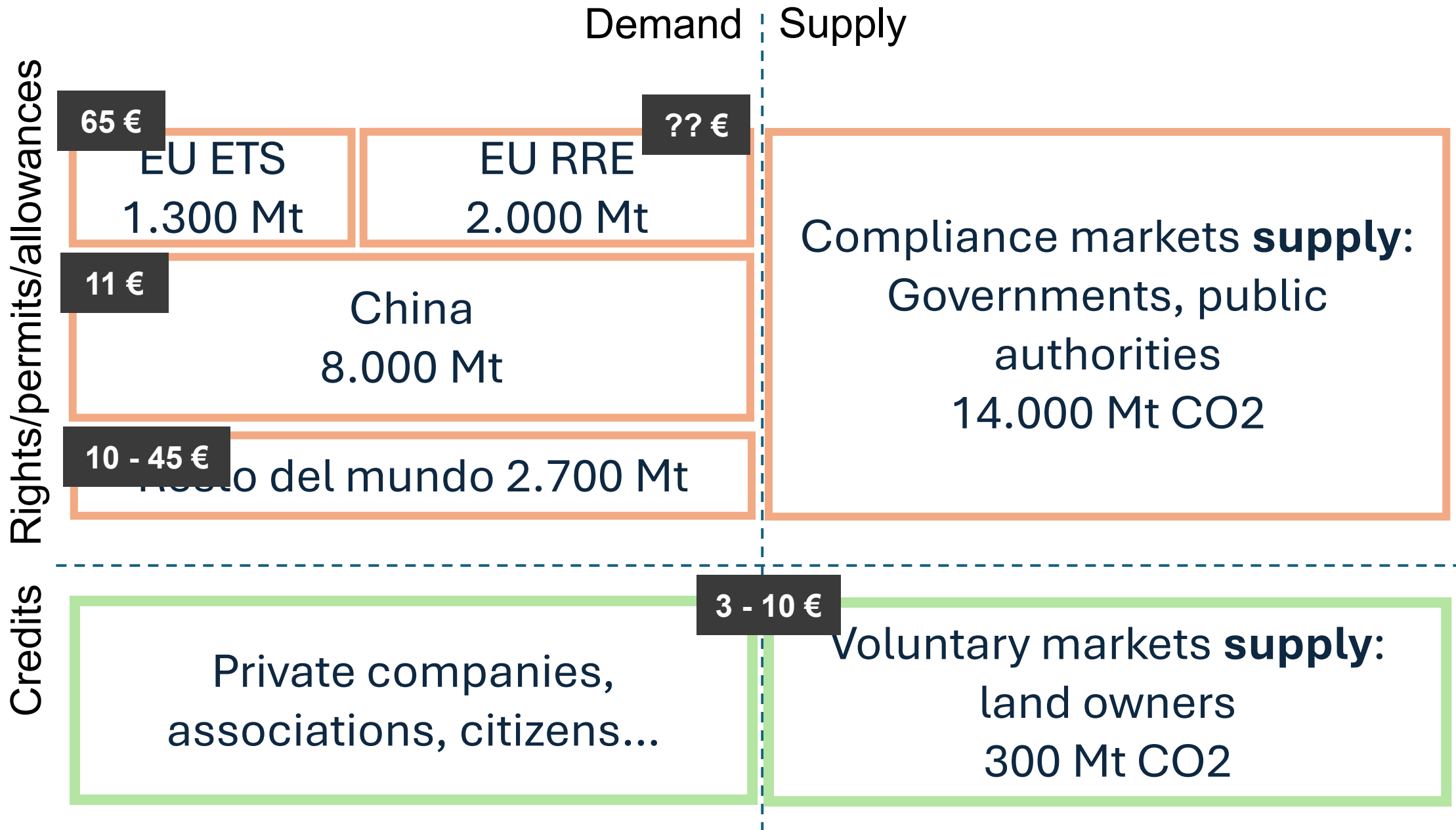
Resto del mundo 2.700 Mt

Compliance markets **supply**:
Governments, public
authorities
14.000 Mt CO₂

Private companies,
associations, citizens...

Voluntary markets **supply**:
land owners
300 Mt CO₂





Nature and markets. The future?

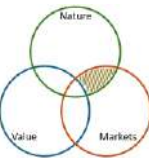
Qualified carbon credits

- ... + natural capital
- ... + demographic goals
- ... + species protection

Biodiversity credits

- UK: BNG
- Australia: BOS

Natural capital credits (based on ecosystem services)



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Thank you for your kind attention!



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