Appendix 2.9: Valuing nature's contributions to people (NCP) in: Non-market monetary values

Overview

Chapter 2, Section 2.3.5.2 reported a review of non-market monetary values in Europe and Central Asia. Below we describe: the methods used to identify relevant studies for inclusion in the review; the approach used to analyse the data. In addition, we also provide a more detailed breakdown of the analysis across different regions of Europe and Central Asia and units of assessment.

Identification of studies that assess the non-market monetary values of NCP in Europe and Central Asia

Studies for inclusion in the review were identified using a consistent set of search terms applied to the EVRI valuation database between January 2007 and May 2017. By applying consistent search terms, we aimed to achieve a scientifically robust and repeatable approach to identifying studies for inclusion in the review.

Three potential valuation databases were initially explored as potential sources of non-market monetary valuation data: the Web of Science (WoS) database of scientific publications (now Clarivate Analytics), the Environmental Valuation Reference Inventory (EVRI) https://www.evri.ca/, and the TEEB value database http://www.teebweb.org/publication/tthe-economics-of-ecosystems-and-biodiversity-valuation-database-manual/. **Table 2.9.1** summarises the merits of these databases. We concluded that the EVRI database was the most suitable for the review since it comprised data that were up to date and in a format that could readily be inputted into our analyses. In contrast, the TEEB database only included data up to 2010, while the WoS would require a significant amount of effort to simply identify relevant studies which was not feasible in the assessment timescale. We also restricted our search to include studies that were published between Jan 2007 and May 2017, as this helps to ensure that we only draw on contemporary values. Furthermore, by focusing on the last 10 years, we also aim provide an update on the value evidence not included in the TEEB (2010) report.

Table 2.9.1: Merits of alternative valuation databases

	WoS	EVRI	TEEB
Comprehensiveness of data source	Almost all published articles	Comprehensive and up-to-date collection of value studies.	Comprehensive collection of valuation studies up to 2010
Filtering of value data	No filtering: includes both primary and secondary studies	Studies include primary value data only. Data is recorded to allow value transfer.	Studies include primary value data only. Data is standardised to 2007 values.
Ease of extracting data	Difficult. Requires identifying relevant studies and then estimating values / Ha / yr	Relatively easy. Data in suitable format for value transfer, but will need to be standardised to common unit.	Moderately easy. Data already in standardised format, but would need to be updated beyond 2010.
Number of studies identified as valuing a NCP in a country of Europe and Central	2154	496	47

Asia between Jan 2007 and May 2017			

To ensure scientific rigour and repeatability, we utilised a standardised, systematic search protocol to identify and then classify relevant value evidence. The first step utilised the EVRI's 'Advance search' function of 'study areas' to identify research articles that (i) were based in relevant European and Central Asia countries and (ii) were published between Jan 2007 and May 2017. This step identified 496 valuation studies. However, not all of these studies had economic values presented in an appropriate format suitable for inclusion in the IPBES value review. The search results were thus further refined to include studies that met the following criteria:

- Only articles that were based on primary studies were included in the review. Studies that adopted 'value transfer' (i.e. which used value data from other studies) were excluded;
- Only articles that had value data directly related to countries of Europe and Central Asia were included;
- Only articles that had value data directly related to an NCP were included;
- Only articles where it was possible to express value evidence in terms of values / ha / year or values / person / yr were included.

This additional refinement reduced the number of papers for inclusion in the review to 238.

Once relevant papers had been identified, the information reported in EVRI was reviewed in detail to extract relevant information including data on the values, the country, and the NCP. It should be noted that some papers included more than one value data point, resulting in a total of 422 data points. The data extracted from EVRI was recorded in an Excel database.

Following the approach adopted by the TEEB (2010) report, we then standardised the values to a common currency and base year (International $ 2017). Data for this value standardisation was obtained from the World Bank's World Development Indicators (WDI) dataset[1]. The standardisation procedure involved:

1. If the value currency was not in the local currency, the value was converted to local currency using the appropriate purchasing power parity (PPP) exchange rates[2].
2. This nominal value was then adjusted to ***real*** 2017 values using the appropriate national GDP deflators for the chosen base year[3].
3. The real value in local currency was then converted to the chosen common currency (i.e. Int $ (2017)) using the relevant purchasing power parity exchange rate.

Once the values were standardised, the data was exported to SPSS for analysis. Analysis then estimated mean values 'per Ha per yr' and/or mean values 'per person per yr' for the different NCP and across the different regions of Europe and Central Asia.

Results

Of the 496 papers identified in the EVRI keyword search, 238 papers met the criteria for inclusion in this review. The 238 papers included 422 individual value points. Most papers were found in Western Europe: 233 papers and 391 value points. Only 18 papers (27 value points) found in Central Europe, 4

[1] http://databank.worldbank.org/data/views/variableSelection/selectvariables.aspx?source=world-development-indicators

[2] Purchasing power parity exchange rates differ from market exchange rates in that they reflect differences in the cost of living between countries, i.e. it is the exchange rate necessary to allow the purchase of an identical basket of goods in different countries. The WDI dataset uses the 'international $' as the common currency for PPP conversions.

[3] GDP deflators are used to take account of the effect of inflation over time. Inflation rates differ between countries, this is the rationale for converting values into local currency units before applying a deflator.

papers (4 value points) in Eastern Europe, and 1 paper (1 value point) in Central Asia. **Table 2.9.2** provides a breakdown of these by region and country.

Table 2.9.2: Number of papers and value points sourced from EVRI (2007 - 2017)

Europe and Central Asia	No. of papers (No. of value points)	Country	No. of papers	No of value points
Western Europe	233 (391)	Austria	6	9
		Denmark	16	28
		Finland	9	14
		France	16	20
		Germany	15	22
		Greece	14	20
		Iceland	1	1
		Ireland	12	20
		Italy	15	25
		Netherlands	7	12
		Norway	6	6
		Portugal	6	16
		Spain	50	100
		Sweden	11	18
		Switzerland	7	9
		UK	27	71
Central Europe	18 (27)	Albania	1	1
		Bulgaria	1	1
		Croatia	1	1
		Estonia	2	2
		Poland	6	15
		Slovakia	1	1
		Slovenia	2	3
		Turkey	1	3
Eastern Europe	4 (4)	Ukraine	1	3
Central Asia	1 (1)	Kazakhstan	1	1
Total	238		238	422

Table 2.9.3 provides a summary of the number of value points identified for each NCP by region in Europe and Central Asia. The highest number of value points were found for 'Habitat creation and maintenance' (88 value points), 'Physical and psychological experience' (65), 'Maintenance of options' (58), and 'Regulation of freshwater and coastal water quality' (57). Our searches did not find any value points for 'Regulation of ocean acidification'. Again, most value points were found in Western Europe.

Table 2.9.3: Number of value points for each NCP by region

		Nature's contribution to people	Western Europe	Central Europe	Eastern Europe	Central Asia	Europe and Central Asia
REGULATING	1	Habitat creation and maintenance	86	2			88
	2	Pollination and dispersal of seeds and other propagules	1				1
	3	Regulation of air quality	11				11
	4	Regulation of climate	17	2	2		21
	5	Regulation of ocean acidification					0
	6	Regulation of freshwater quantity, location and timing	14	1			15
	7	Regulation of freshwater and coastal water quality	48	7	1	1	57
	8	Formation, protection and decontamination of soils and sediments	12	1	1		14
	9	Regulation of hazards and extreme events	10	1	1		12
	10	Regulation of organisms detrimental to humans	5				5
MATERIAL	11	Energy	11				11
	12	Food and feed	20	1	1		22
	13	Materials and assistance	5				5
	14	Medicinal, biochemical and genetic resources	9	1	1		11
NON-MATERIAL	15	Learning and inspiration	3				3
	16	Physical and psychological experience	62	3			65
	17	Supporting identities	35	1			36
	18	Maintenance of options	45	13			58
		Total	**394**	**33**	**7**	**1**	**435**

In our analysis, we were interested in estimating two types of values: value / person / yr; and value / Ha / yr. The majority of value data points were values / person / year. **Table 2.9.4** provides a summary of these. Highest values were found for 'Materials and assistance' (Int $ 280 / person / year), 'Regulation of freshwater quantity, location and timing' (Int $151 / person / year), and 'Energy' (Int $ 165 / person / year). **Table 2.9.5** reports these values by region in Europe and Central Asia. Surprisingly, some of the mean values found in Central and Eastern Europe and Central Asia are higher than those from Western Europe. We offer two explanations for this. First, there are fewer value points in these countries, so any outliers will have a bigger impact on the mean values. Second, the PPP conversion factor used to estimate Int $ values tends to be higher for the poorer countries, thus pushing up the Int $ values.

Table 2.9.4: Mean value per person of NCP across Europe and Central Asia (2017 Int $ / person / year)

		Europe and Central Asia	Mean	Median	Minimum	Maximum	N
REGULATING	1	Habitat creation and maintenance	114.17	41.56	1.88	913.58	59
	2	Pollination and dispersal of seeds and other propagules	53.23	53.23	53.23	53.23	1
	3	Regulation of air quality	112.94	127.5	30.37	189.86	9
	4	Regulation of climate	104.74	26.41	0.82	420.11	12
	5	Regulation of ocean acidification	-		-	-	0
	6	Regulation of freshwater quantity, location and timing	151.49	46.13	0.19	528.25	8
	7	Regulation of freshwater and coastal water quality	104.16	65.66	0.15	938.3	51
	8	Formation, protection and decontamination of soils and sediments	11.81	4.03	0.03	48.33	9
	9	Regulation of hazards and extreme events	121.63	112.34	15.07	304.58	8
	10	Regulation of organisms detrimental to humans	144.31	149.91	1.18	281.85	3
MATERIAL	11	Energy	165.02	75.29	0.78	614.08	10
	12	Food and feed	63.26	20.81	0.95	327.35	15
	13	Materials and assistance	280.13	171.41	0.31	777.37	4
	14	Medicinal, biochemical and genetic resources	138.24	33.88	4.45	844.96	11
NON-MATERIAL	15	Learning and inspiration	43.16	43.16	43.16	43.16	1
	16	Physical and psychological experience	111.44	13.57	1.35	1314.79	51
	17	Supporting identities	127.07	53.09	1.06	1399.6	32
	18	Maintenance of options	109.66	79.39	4.34	960.13	53

Table 2.9.5: Mean value per person / yr of NCP by region in Europe and Central Asia (2017 Int $ / person / year)

Western Europe	Mean	Minimum	Maximum	N
Habitat creation and maintenance	117.34	1.88	913.58	57
Pollination and dispersal of seeds and other propagules	53.23	53.23	53.23	1
Regulation of air quality	112.94	30.37	189.86	9
Regulation of climate	104.74	0.82	420.11	12
Regulation of ocean acidification	.	.	.	0
Regulation of freshwater quantity, location and timing	151.49	0.19	528.25	8
Regulation of freshwater and coastal water quality	88.24	1.73	378.58	43

Formation, protection and decontamination of soils and sediments	11.81	0.03	48.33	9
Regulation of hazards and extreme events	121.63	15.07	304.58	8
Regulation of organisms detrimental to humans	144.31	1.18	281.85	3
Energy	165.02	0.78	614.08	10
Food and feed	63.26	0.95	327.35	15
Materials and assistance	280.13	0.31	777.37	4
Medicinal, biochemical and genetic resources	38.9	4.45	153.27	9
Learning and inspiration	43.16	43.16	43.16	1
Physical and psychological experience	101.43	1.35	1314.79	49
Supporting identities	86.02	1.06	947.87	31
Maintenance of options	114.34	4.34	960.13	40
Central Europe	**Mean**	**Minimum**	**Maximum**	**N**
Habitat creation and maintenance	23.88	22.7	25.07	2
Pollination and dispersal of seeds and other propagules	.	.	.	0
Regulation of air quality	.	.	.	0
Regulation of climate	.	.	.	0
Regulation of ocean acidification	.	.	.	0
Regulation of freshwater quantity, location and timing	.	.	.	0
Regulation of freshwater and coastal water quality	94.11	0.15	434.02	6
Formation, protection and decontamination of soils and sediments	.	.	.	0
Regulation of hazards and extreme events	.	.	.	0
Regulation of organisms detrimental to humans	.	.	.	0
Energy	.	.	.	0
Food and feed	.	.	.	0
Materials and assistance	.	.	.	0
Medicinal, biochemical and genetic resources	325.58	325.58	325.58	1
Learning and inspiration	.	.	.	0
Physical and psychological experience	356.72	4.75	708.69	2
Supporting identities	1399.6	1399.6	1399.6	1
Maintenance of options	95.25	8.11	858.17	13
Eastern Europe	**Mean**	**Minimum**	**Maximum**	**N**
Habitat creation and maintenance	.	.	.	0
Pollination and dispersal of seeds and other propagules	.	.	.	0
Regulation of air quality	.	.	.	0
Regulation of climate	.	.	.	0
Regulation of ocean acidification	.	.	.	0
Regulation of freshwater quantity, location and timing	.	.	.	0
Regulation of freshwater and coastal water quality	938.3	938.3	938.3	1
Formation, protection and decontamination of soils and sediments	.	.	.	0
Regulation of hazards and extreme events	.	.	.	0
Regulation of organisms detrimental to humans	.	.	.	0
Energy	.	.	.	0
Food and feed	.	.	.	0
Materials and assistance	.	.	.	0
Medicinal, biochemical and genetic resources	844.96	844.96	844.96	1
Learning and inspiration	.	.	.	0
Physical and psychological experience	.	.	.	0
Supporting identities	.	.	.	0
Maintenance of options	.	.	.	0

Central Asia	Mean	Minimum	Maximum	N
Habitat creation and maintenance	.	.	.	0
Pollination and dispersal of seeds and other propagules	.	.	.	0
Regulation of air quality	.	.	.	0
Regulation of climate	.	.	.	0
Regulation of ocean acidification	.	.	.	0
Regulation of freshwater quantity, location and timing	.	.	.	0
Regulation of freshwater and coastal water quality	14.6	14.6	14.6	1
Formation, protection and decontamination of soils and sediments	.	.	.	0
Regulation of hazards and extreme events	.	.	.	0
Regulation of organisms detrimental to humans	.	.	.	0
Energy	.	.	.	0
Food and feed	.	.	.	0
Materials and assistance	.	.	.	0
Medicinal, biochemical and genetic resources	.	.	.	0
Learning and inspiration	.	.	.	0
Physical and psychological experience	.	.	.	0
Supporting identities	.	.	.	0
Maintenance of options	.	.	.	0

Table 2.9.6 summarises per Ha values for NCP across all countries in Europe and Central Asia. Highest values were found for 'Regulation of freshwater and coastal water quality' (Int $ 3202 / Ha / yr), Physical and psychological experience' (Int $ 1473 / Ha / yr) and Habitat creation and maintenance' (Int $ 1387 / Ha / yr). It should be noted that the number of per Ha value points were much lower than the number of per person value points. A breakdown of per Ha values by region can be found in **Table 2.9.7**. Unfortunately, there were virtually no per ha value points for Central Europe, Eastern Europe and Central Asia.

Table 2.9.6: Mean value / Ha of NCP across countries in Europe and Central Asia (2017 Int $ / Ha / year)

		Europe and Central Asia	Mean	Median	Minimum	Maximum	N
REGULATING	1	Habitat creation and maintenance	1387.5	765.98	0.23	15955.53	22
	2	Pollination and dispersal of seeds and other propagules	.	.	.	.	0
	3	Regulation of air quality	289.43	289.43	289.43	289.43	1
	4	Regulation of climate	464.53	464.53	61.67	867.38	2
	5	Regulation of ocean acidification					0
	6	Regulation of freshwater quantity, location and timing	27.13	30.71	10.5	40.18	3
	7	Regulation of freshwater and coastal water quality	3202.54	1965.22	1546.62	6095.77	3
	8	Formation, protection and decontamination of soils and sediments	32.32	32.32	4.75	59.89	2
	9	Regulation of hazards and extreme events	.	.	.	.	0

	10	Regulation of organisms detrimental to humans	.	.	.	.	0
MATERIAL	11	Energy	.	.	.	.	0
	12	Food and feed	112.84	9.63	1.53	327.35	3
	13	Materials and assistance	0.66	0.66	0.66	0.66	1
	14	Medicinal, biochemical and genetic resources	.	.	.	.	0
NON-MATERIAL	15	Learning and inspiration	7.47	7.47	4.62	10.31	2
	16	Physical and psychological experience	1473.5	1117.25	22.33	3767.95	6
	17	Supporting identities	684	658.77	0.71	1392.52	3
	18	Maintenance of options	0.8	0.8	0.65	0.95	2

Table 2.9.7: Mean value per Ha / yr of NCP by region in Europe and Central Asia (2017 Int $ / person / year)

Western Europe	**Mean**	**Minimum**	**Maximum**	**N**
Habitat creation and maintenance	1387.5	0.23	15955.53	22
Pollination and dispersal of seeds and other propagules	.	.	.	0
Regulation of air quality	289.43	289.43	289.43	1
Regulation of climate	464.53	61.67	867.38	2
Regulation of ocean acidification	.	.	.	0
Regulation of freshwater quantity, location and timing	35.45	30.71	40.18	2
Regulation of freshwater and coastal water quality	3202.54	1546.62	6095.77	3
Formation, protection and decontamination of soils and sediments	32.32	4.75	59.89	2
Regulation of hazards and extreme events	.	.	.	0
Regulation of organisms detrimental to humans	.	.	.	0
Energy	.	.	.	0
Food and feed	112.84	1.53	327.35	3
Materials and assistance	0.66	0.66	0.66	1
Medicinal, biochemical and genetic resources	.	.	.	0
Learning and inspiration	7.47	4.62	10.31	2
Physical and psychological experience	1473.5	22.33	3767.95	6
Supporting identities	684	0.71	1392.52	3
Maintenance of options	0.8	0.65	0.95	2
Central Europe	**Mean**	**Minimum**	**Maximum**	**N**
Habitat creation and maintenance	.	.	.	0
Pollination and dispersal of seeds and other propagules	.	.	.	0
Regulation of air quality	.	.	.	0
Regulation of climate	.	.	.	0
Regulation of ocean acidification	.	.	.	0
Regulation of freshwater quantity, location and timing	.	.	.	0
Regulation of freshwater and coastal water quality	10.5	10.5	10.5	1
Formation, protection and decontamination of soils and sediments	.	.	.	0
Regulation of hazards and extreme events	.	.	.	0

Regulation of organisms detrimental to humans	.	.	.	0
Energy	.	.	.	0
Food and feed	.	.	.	0
Materials and assistance	.	.	.	0
Medicinal, biochemical and genetic resources	.	.	.	0
Learning and inspiration	.	.	.	0
Physical and psychological experience	.	.	.	0
Supporting identities	.	.	.	0
Maintenance of options	.	.	.	0
Eastern Europe	**Mean**	**Minimum**	**Maximum**	**N**
Habitat creation and maintenance	.	.	.	0
Pollination and dispersal of seeds and other propagules	.	.	.	0
Regulation of air quality	.	.	.	0
Regulation of climate	.	.	.	0
Regulation of ocean acidification	.	.	.	0
Regulation of freshwater quantity, location and timing	.	.	.	0
Regulation of freshwater and coastal water quality	.	.	.	0
Formation, protection and decontamination of soils and sediments	.	.	.	0
Regulation of hazards and extreme events	.	.	.	0
Regulation of organisms detrimental to humans	.	.	.	0
Energy	.	.	.	0
Food and feed	.	.	.	0
Materials and assistance	.	.	.	0
Medicinal, biochemical and genetic resources	.	.	.	0
Learning and inspiration	.	.	.	0
Physical and psychological experience	.	.	.	0
Supporting identities	.	.	.	0
Maintenance of options	.	.	.	0
Central Asia	**Mean**	**Minimum**	**Maximum**	**N**
Habitat creation and maintenance	.	.	.	0
Pollination and dispersal of seeds and other propagules	.	.	.	0
Regulation of air quality	.	.	.	0
Regulation of climate	.	.	.	0
Regulation of ocean acidification	.	.	.	0
Regulation of freshwater quantity, location and timing	.	.	.	0
Regulation of freshwater and coastal water quality	.	.	.	0
Formation, protection and decontamination of soils and sediments	.	.	.	0
Regulation of hazards and extreme events	.	.	.	0
Regulation of organisms detrimental to humans	.	.	.	0
Energy	.	.	.	0
Food and feed	.	.	.	0
Materials and assistance	.	.	.	0
Medicinal, biochemical and genetic resources	.	.	.	0
Learning and inspiration	.	.	.	0
Physical and psychological experience	.	.	.	0
Supporting identities	.	.	.	0
Maintenance of options	.	.	.	0

Conclusions

This report aimed to estimate values of a range of NCP across countries of Europe and Central Asia. Our approach utilised secondary valuation data sourced from the EVRI valuation database (2007 – 2017). Values were then standardised to 2017 international $. Analysis was able to identify a range of values for NCP. Most values were on a per person per year unit, with more restricted data on per Ha values. Most values were from Western Europe, with very little value evidence from Eastern Europe or Central Asia. The NCP most valued included Habitat creation and maintenance, Regulation of water quantity and quality, and physical and psychological experience.

One of the aspirations of this valuation exercise was to be able to develop estimates of the aggregate values of NCP across Europe and Central Asia. However, the limited data on per Ha values (or other standardised unit of assessment) means that this could not be done robustly given the current evidence. A key knowledge gap is the need for more valuation studies that estimate and publish standardised units of assessment for individual NCP (such as per Ha values), or at a minimum report data on the size of the environmental change along with data on the affected population. Only with this knowledge it will be possible to build up enough evidence to allow robust value transfers.