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AUSTRIAN FEDERAL FORESTS

GEORGIAN SOCIETY OF NATURE EXPLORERS "ORCHIS"

Sub-regional Workshop on Valuation and Incentive Measures for Eastern Europe and Central Asia

Technical and Legal Aspects of Forest Eco-compensation in Georgia

Georgia Forest Eco-Compensation
Background

- BTC/SCP pipelines 248 km length and average width of 53 m on Georgian territory

Georgia Forest Eco-Compensation
Background

- route characterized by very diverse ecological conditions and abundant biodiversity

- ESIA accepted on conditional basis only; impacts on forest ecosystems have to be evaluated and off-set by adequate mitigation and eco-compensation measures

- Goal: restore the equivalent forest habitat

- Disagreement in between MoE and BTC Co.on scope of Forest Eco-Compensation Programme

Georgia Forest Eco-Compensation
Terms of Reference

- Recommend the MoE the exact ratio for Forest Eco-Compensation based on modern methodologies and international best practice.

- Calculate damages to forest ecosystems by the BTC/SCP Pipelines construction activities according to the "net gain principle" "habitat hectare" approach, which is used as a measure for the offsets.

Georgia Forest Eco-Compensation
Habitat Hectare Approach

- environmental proxy, value of habitats in non monetary units

- "currency" used: habitat hectare

    habitat area [ha] x habitat score = habitat-hectares

- habitat score: comparing habitat and landscape components with a benchmark

- benchmark: average characteristics of mature and apparently long undisturbed biodiversity and native vegetation

- benchmarks for each Ecological Vegetation Class (EVC)

	Component	Max. value (%)
Site condition	Large trees	10
	Tree (canopy) cover	5
	Understorey (non-tree) strata	25
	Lack of weeds	15
	Recruitment	10
	Organic litter	5
	Logs	5
Landscape context	Patch size*	10
	Neighbourhood*	10
	Distance to core area*	5
	Total	**100**

→ max. habitat score = 1 or 100%

*Components may be derived with assistance from maps and other (e.g. GIS) information sources.

Georgia Forest Eco-Compensation
Habitat Hectare Approach in Georgia

- not applied systematically in Georgia

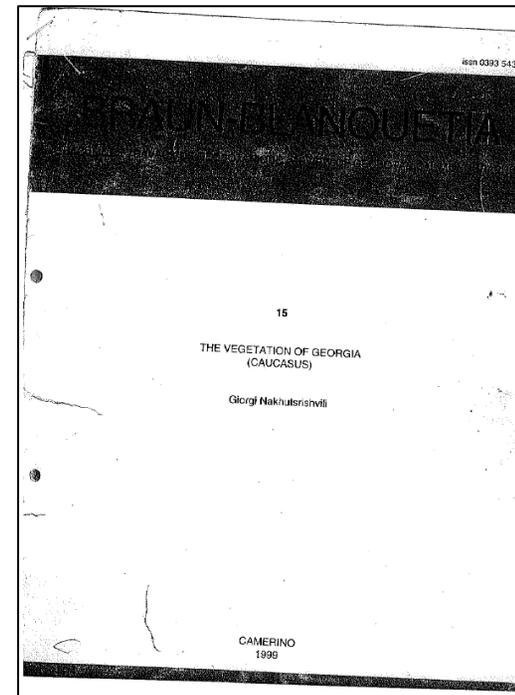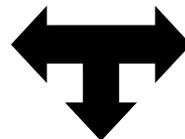- => EVCs had to be identified (dominant and co-dominant species)

18 Ecological Vegetation Classes

Georgia Forest Eco-Compensation
Habitat Hectare Approach – EVCs

- EVC 1 Georgian oak *(Quercus iberica)* forest

- EVC 2 high mountainous oak *(Quercus macranthera)* forest

- EVC 3 EVC Georgian oak *(Quercus iberica)* with high mountainous oak *(Quercus macranthera)* forest

- EVC 4 Georgian oak *(Quercus iberica)* with hornbeam *(Carpinus orientalis)* forest

- EVC 5 high mountainous oak *(Quercus macranthera)* with Caucasian hornbeam *(Carpinus Caucasica)* forest

- EVC 6 Caucasian hornbeam *(Carpinus Caucasica)* with Georgian oak *(Quercus iberica)* forest

- EVC 7 Caucasian hornbeam *(Carpinus Caucasica)* with high mountainous oak *(Quercus macranthera)* forest

- EVC 8 beech forest *(Fagus orientalis)*

- EVC 9 beech *(Fagus orientalis)* with Caucasian hornbeam *(Carpinus Caucasica)* forest

- EVC 10 beech *(Fagus orientalis)* with pine and *(Pinus kochiana)* forest

- EVC 11 pine *(Pinus kochiana)* forest

- EVC 12 pine *(Pinus kochiana)* with high mountainous maple *(Acer trautvetteri)* forest

- EVC 13 spruce *(Picea orientalis)* forest

- EVC 14 spruce *(Picea orientalis)* with pine *(Pinus kochiana)* forest

- EVC 15 spruce *(Picea orientalis)* –fir *(Abies nordmanniana)* forest

- EVC 16 crook stem birch forest *(Betula litwinowii)*

- EVC 17 riparian forest dominated by willow *(Salix spp.)*

- EVC 18 riparian forest dominated by black poplar *(Populus nigra)*

Georgia Forest Eco-Compensation
Habitat Hectare Approach – EVC benchmarks

- benchmark: average characteristics of mature and apparently long undisturbed biodiversity and native vegetation

- Appendix II Annex II Detailed Floristic and Phytosociological Description of Sample Plots' of the 'response to comments (from ESIA public disclosure phase)

Criterion	Conservation Value		
	High	Medium	Low
Species richness	High species richness noted or likely to occur. Endemic or threatened species included in the Georgian Red Data Book and/or IUCN Red List recorded or likely to be present	Medium species diversity. Few rare or threatened species	Very low species diversity and almost no threatened species that may be affected
Naturalness and level of modification	Natural or slightly modified habitats	Moderately modified habitats eg those which can still support characteristic species assemblages	Heavily modified habitats
Human disturbance	Very little or no human disturbance	Little human disturbance	High human disturbance (heavy grazing, forest felling, etc)
Rarity and geographical location of habitat	Rare or endangered habitat in the country or region.	Not so common habitat in the region	Common habitat. Areas near human settlements

- => sample plots with high conservation value => absolute benchmarks

EVC 9 high	Beech with Caucasian Hornbeam Forest
conservation value	
Area	Tetri Tskaro
Plot No.	21
Plot size (m2)	400
GPS Co-ordinates	4606404N / 8448036E
Altitude (m AMSL)	1,570
Aspect	South-East
Inclination	12°
Structural Features	
Max DBH (cm)	52
Average DBH (cm)	39
Max height of trees (m)	25
Average height (m)	20
Number of trees (per plot)	9
Number of trees (per ha)	225
Basal area (m²/ha)	26,88
Coverage of treelayer (%)	80
Coverage of shrublayer (%)	5
Coverage of herblayer (%)	10
Coverage of mosslayer (%)	30
Number of higher plant species	7

Species	Cover-abundance by Domin scale
	Treelayer
Fagus orientalis	9
	60,0%
Carpinus caucasica	5
	33,3%
Acer campestre	1
	6,7%
	Shrublayer
Lonicera caucasica	10
	Herblayer
Poa nemoralis	8
Polygonatum multiflorum	4
Primula macrocalyx	4

- => sample plots with lower than high conservation value => relative benchmarks

EVC 1 low to medium conservation value	Degraded/Secondary Georgian oak forest
Area	Tetri Tskaro
Plot No.	2
Plot size (m2)	400
GPS Co-ordinates	4598985N / 8457891E
Altitude (m AMSL)	1,100
Aspect	South-East
Inclination	8°
Structural Features	
Max DBH (cm)	20
Average DBH (cm)	15
Max height of trees (m)	12
Average height (m)	9
Number of trees (per plot)	30
Number of trees (per ha)	750
Basal area (m²/ha)	13,25
Coverage of treelayer (%)	80
Coverage of shrublayer (%)	20
Coverage of herblayer (%)	50
Coverage of mosslayer (%)	0
Number of higher plant species	11

Species	Cover-abundance by Domin scale
	Treelayer
Quercus iberica	8
	42,1%
Carpinus orientalis	6
	31,6%
Fraxinus excelsior	4
	21,1%
Pyrus caucasica	1
	5,3%
	Shrublayer
Swida australis	8
Crataegus curvisepala	5
Ligustrum vulgare	4
	Herblayer
Polygonatum multiflorum	8
Primula macrocalyx	6
Convallaria transcaucasica	4
Cyclamen verum	4

Georgia Forest Eco-Compensation
Habitat Hectare Approach - components

- SAKTKEPROEKTI (Georgian Forestry Project) Detailed Inventory Material of the State Forest Fund inside the 44-meter-wide Right of Way of the Baku-Tbilisi-Ceyhan Pipeline, inventory cards

Inventory Card No 19
for Detailed Inventory of Forest Areas on the BTC 44-meter Wide RoW

No	Parameters, Measurement Units and Presicion Values	Description
1	Administrative district	Gardabani
2	Forestry Division	-
3	Forestry (Sakrebulo)	Gachiani
4	Compartment	-
5	Forest range	2
6	Area, ha (±0.1)	0,02
7	Direction of slope, rhumbs	Flat
8	Sloping, degrees (±2)	-
9	Forest productivity	V
10	Habitat type	B2 Fescue
11	Composition of key forest species (stock) ±5%	10 Pines
12	Age (±5 years)	35
13	Average height, m (±1)	6
14	Average diameter, cm (±2)	14
15	Merchantability class	4
16	Density of stand (±0.1)	0,4
17	Crown projection area, % (±2)	45
18	Land category	Forested, forest plantations
19	Obstruction, m^3 per range (±5%)	-

No	Parameters	Description
20	Number of trees affected by entopests, type and degree of impact per range (±5%)	-
21	Number of trees affected by phytoparasites per range, type and degree of impact (±5%)	-
22	Total growing stock m^3/ha (±3%)	39,5
	Total growing stock m^3/range	0,8
	Growing stock m^3/ha, merchantable	33,5
	Growing stock m^3/ range, merchantable	0,7
	Growing stock m^3/ha, commercial timber	-
	Growing stock m^3/ range, commercial timber	-
	Growing stock m^3/ha, firewood	33,5
	Growing stock m^3/ range, firewood	0,7
23	Dry standing trees m^3/ha, merchantable	-
	Dry standing trees m^3/ range, merchantable	-
24	Number of dry standing trees per range (old, new)	-
25	Coppice composition, quantity and height (±5%)	-
26	Composition, quantity and height of understory (±5%)	-
27	Types of vegetation cover, % of coverage (±10%)	Fescue - 40%
28	Biodiversity (number of nests, wildlife habitat, other traces)	-
29	Anthropogenic stress (fires, grazing, etc.)	-
30	Total growing stock m^3/ha (±5)	45
31	Types, species and yield of non-timber products per ha (±20%)	-
	Remarks	-

	component	score
site condition	average DBH	15
	average height	15
	canopy cover	10
	no of trees per ha	10
	growing stock	10
	basal area	15
	vegetation/coppice	10

+

landscape context	neigbourhood	10
	distance to core area	5

=

	Total Habitat Score	**100**

Georgia Forest Eco-Compensation

Habitat Hectare – site condition score

component average DBH	
10-<20% of benchmark DBH	2
20-<40% of benchmark DBH	4
40-<60% of benchmark DBH	8
60-<80% of benchmark DBH	10
80-<90% of benchmark DBH	13
≥90% of benchmark DBH	15

component canopy cover	
10-<20% of benchmark cover	2
20-<40% of benchmark cover	4
40-<60% of benchmark cover	6
60-<80% of benchmark cover	8
80-<90% of benchmark cover	9
≥90% of benchmark cover	10

component average height	
10-<20% of benchmark height	2
20-<40% of benchmark height	4
40-<60% of benchmark height	8
60-<80% of benchmark height	10
80-<90% of benchmark height	13
≥90% of benchmark height	15

no of trees per ha	
10-<20% of no in benchmark	2
20-<40% of no in benchmark	4
40-<60% of no in benchmark	6
60-<80% of no in benchmark	8
80-<90% of no in benchmark	9
≥90% of no in benchmark	10

component growing stock	
10-<20% of benchmark stock	2
20-<40% of benchmark stock	4
40-<60% of benchmark stock	6
60<-80% of benchmark stock	8
80-<90% of benchmark stock	9
≥90% of benchmark stock	10

basal area	
10-<20% of benchmark	2
20-<40% of benchmark	4
40-<60% of benchmark	8
60-<80% of benchmark	10
80-<90% of benchmark	13
≥90% of benchmark	15

component growing stock	
10-<20% of benchmark stock	2
20-<40% of benchmark stock	4
40-<60% of benchmark stock	6
60-<80% of benchmark stock	8
80-<90% of benchmark stock	9
≥90% of benchmark stock	10

| component coppice/recruitment/understorey	
no coppice/recruitment/understorey	0
single species coppice/recruitment/understorey	5
multiple species coppice/recuitment/understorey	10

neighbourhood component	
>0-≤20% of neighbourhood forested	2
>20-≤40% of neighbourhood forested	4
>40-≤60% of neighbourhood forested	6
>60-≤80% of neighbouhood forested	8
>80-≤100% of neighbouhoud forested	10

distance to core area	
>1 km	0
>0,2 to ≤1 km	2
≤0,2 km	4
contiguous	5
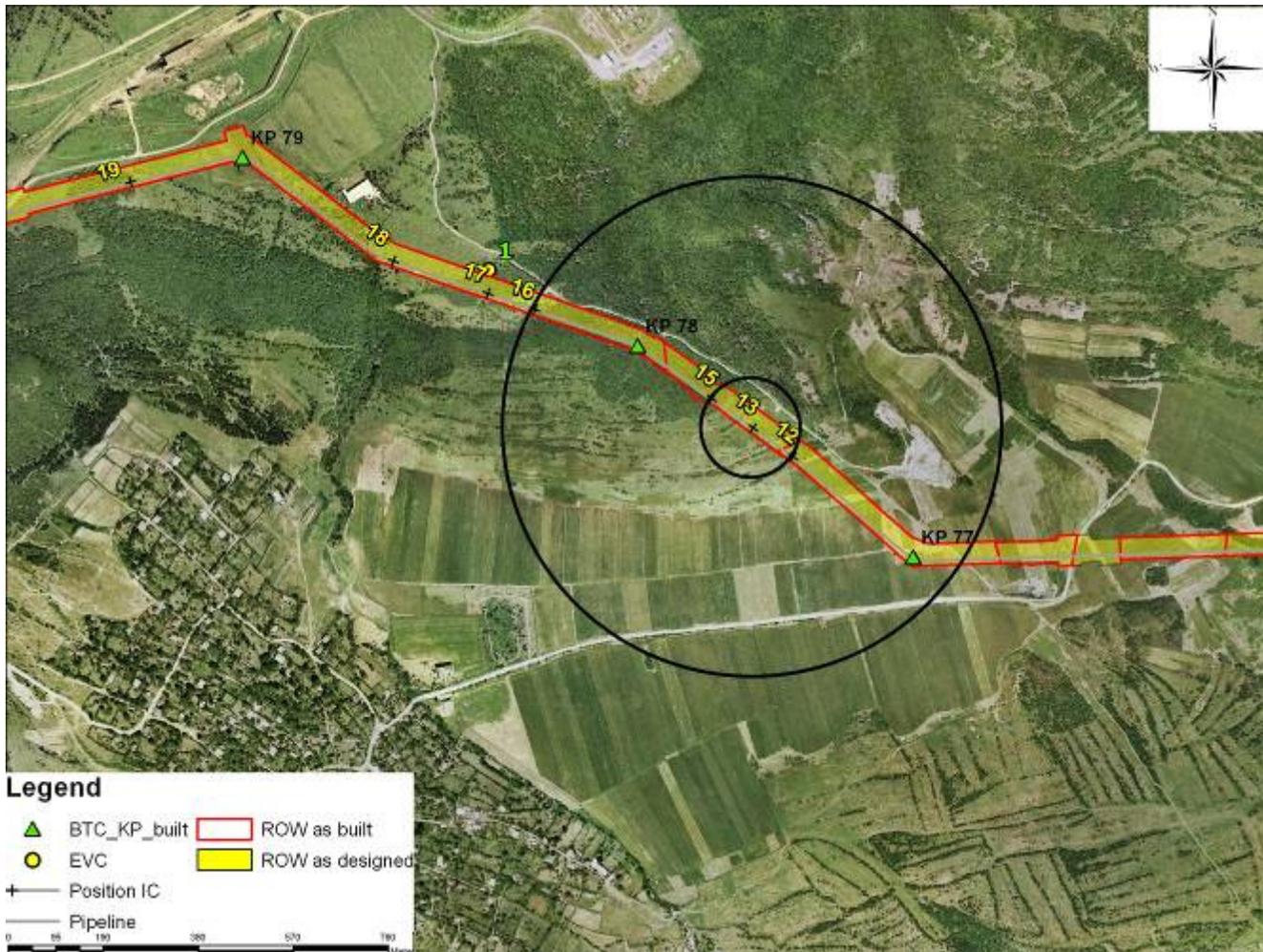
Georgia Forest Eco-Compensation
Habitat Hectare Approach– calculating habitat hectares

No	Parameters, Measurement Units and Values	Presicion	Description
	Inventory Card No 15 **for Detailed Inventory of Forest Areas on the BTC 44-meter Wide RoW**		
1	Administrative district		Tetritskaro
2	Forestry Division		Tetritskaro
3	Forestry (Sakrebulo)		Garisi
4	Compartment		31
5	Forest range		3
6	Area, ha (±0.1)		1,83
7	Direction of slope, rhumbs		SE
8	Sloping, degrees (±2)		15
9	Forest productivity		V
10	Habitat type		B1 Fescue
11	Composition of key forest species (stock) ±5%		10 Oaks + Oriental Hornbeam, Hornbeam
12	Age (±5 years)		35
13	Average height, m (±1)		6
14	Average diameter, cm (±2)		10
15	Merchantability class		4
16	Density of stand (±0.1)		0,8
17	Crown projection area, % (±2)		80
18	Land category		Forested
19	Obstruction, m³ per range (±5%)		-
20	Number of trees affected by entopests, type and degree of impact per range (±5%)		-
21	Number of trees affected by phytoparasites per range, type and degree of impact (±5%)		-
22	Total growing stock m³/ha (±3%)		42,8
	Total growing stock m³ /range		78,4
	Growing stock m³/ha, merchantable		27,5
	Growing stock m³/ range, merchantable		50,3
	Growing stock m³/ha, commercial timber		-
	Growing stock m³/ range, commercial timber		-
	Growing stock m³/ha, firewood		27,5
	Growing stock m³/ range, firewood		50,3
23	Dry standing trees m³/ha, merchantable		-
	Dry standing trees m³/ range, merchantable		-
24	Number of dry standing trees per range (old, new)		-
25	Coppice composition, quantity and height (±5%)		-
26	Composition, quantity and height of understory (±5%)		-
27	Types of vegetation cover, % of coverage (±10%)		Fescue - 40%
28	Biodiversity (number of nests, wildlife habitat, other traces)		-
29	Anthropogenic stress (fires, grazing, etc.)		-
30	Total growing stock m³/ha (±5)		50
31	Types, species and yield of non-timber products per ha (±20%)		-
	Remarks		-

Benchmark: EVC = 5 conservation value	High-Mountainous Oak-Caucasian Hornbeam Forest high
average DBH (cm)	32
average height (m)	11
canopy cover (%)	65
no of trees per ha	250
growing stock (m³/ha)	83
basal area (m²/ha)	19,72
vegetation/coppice	multiple

site conditions	
average DBH (cm)	10
average height (m)	6
canopy cover (%)	80
no of trees per ha	1800
growing stock (m³/ha)	42,80
basal area (m²/ha)	14,14
vegetation/coppice	single

habitat score site conditions	
average DBH (cm)	4
average height (m)	8
canopy cover (%)	10
no of trees per ha	10
growing stock (m³/ha)	6
basal area (m²/ha)	10
vegetation/coppice	5

habitat score landscape context	
neigbourhood	4
distance to core area	5
total landscape context	**9**

total habitat score	**0,62**

ratio area designed 2002 : built 2007	0,95
area as built affected (ha)	1,94

habitat hectares	**1,201**

Georgia Forest Eco-Compensation
Habitat Hectare Approach– results per EVC

Ecological Vegetation Class	area [ha]	habitat score	habitat hectares
forest land with no standing stock	37,15	0,15	5,52
EVC 1 Georgian oak forest	17,41	0,62	10,82
EVC 2 high-mountainous oak forest	6,67	0,69	4,60
EVC 3 Georgian oak with high-mountainous oak forest	4,58	0,75	3,42
EVC 4 Georgian oak with Oriental hornbeam forest	7,70	0,81	6,25
EVC 5 high-mountainous oak Caucasian hornbeam forest	6,64	0,92	6,13
EVC 6 Caucasian hornbeam with oak forest	4,71	0,68	3,21
EVC 7 Caucasian hornbeam with high-mountainous oak forest	1,22	0,95	1,16
EVC 8 beech forest	7,53	0,84	6,31
EVC 9 beech with Caucasian hornbeam forest	1,18	0,88	1,04
EVC 10 beech with pine forest	5,26	0,73	3,85
EVC 11 pine forest	16,41	0,64	10,56
EVC 12 pine with high mountain maple forest	3,08	0,78	2,40
EVC 13 spruce forest	3,06	0,65	1,99
EVC 14 spruce pine forest	0,14	0,57	0,08
EVC 15 spruce fir forest	0,87	0,53	0,46
EVC 16 crook stem birch forest	0,95	0,92	0,87
EVC 17 riparian forest dominated by willow	10,03	0,65	6,51
EVC 18 riparian forest dominated by poplar	7,23	0,74	5,34
Total	**141,82**	**0,57**	**80,51**

Georgia Forest Eco-Compensation

no net-loss and net gain principles

- sustainability

- countries with abundant natural resources, natural capital stock still +/- intact, application of no net-loss => sustainable development

- countries, where natural capital drastically reduced, application of net-gain principle => 're-balance' accounts, sustainable development, net gain principle legally binding and transparent rules

- BTC Co. has compensated Georgia for commercial value of standing timber, if equivalent habitat is restored =>

    no-net loss from environmental point of view

    net-gain from economic point of view

!!! crucial for win-win situation: restoration of equivalent forest habitat!!!

- forests = complex ecosystems, socially and economically valued goods and environmental services

- natural forests = valuable habitats for fauna and flora

- age + species composition = crucial determinants of habitat quality

- to assure no net-loss to overall habitat quality, eco-compensation has to maintain species composition

- afforestation with fast growing coniferous species can restore the commercial timber value, but not the habitat quality

- afforestation with coniferous species in Great Britain, increase in forest area, loss in biodiversity and negative impact on real estate prices
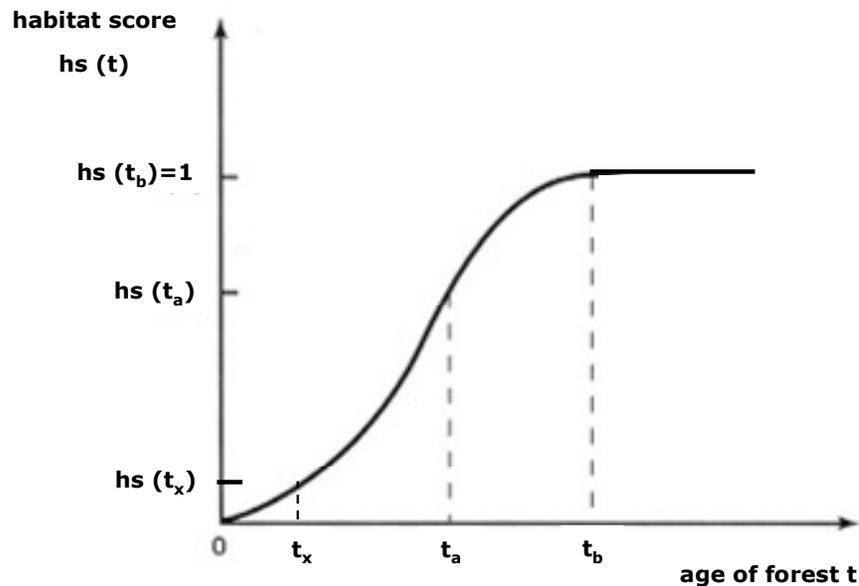
!!! crucial to assure no net-loss of overall habitat quality: use the species felled for reforestation/afforestation!!!

Georgia Forest Eco-Compensation
ratio for eco-compensation

- habitat value expressed in habitat hectares

  habitat area [ha] x habitat score = habitat-hectares

- forests take several decades to centuries to develop their full range of habitat functions

- value of habitat increases over time

Georgia Forest Eco-Compensation
ratio for eco-compensation

- equivalence:

  0,8 ha*0,5 habitat score=0,4 habitat hectares=0,4 ha*1,0 habitat score

- habitat score/value increase over time

  !!! time plays a crucial role in order to assure no net-loss in habitat value !!!

- if a party causing destruction of forest habitat is committed to take care of reforestation/afforestation until habitat score of area cleared can be achieved => compensation ratio of 1:1 guarantees no net-loss

- if a party causing destruction of forest habitat is only committed to take care of reforestation/afforestation for a shorter period => compensation ratio has to be increased to guarantee no net-loss

  if habitat score after 20 years (t_{20}) is 0,2; to establish equivalence compensation ratio of 4:1 required to compensate for a habitat destroyed whose habitat score was 0,8
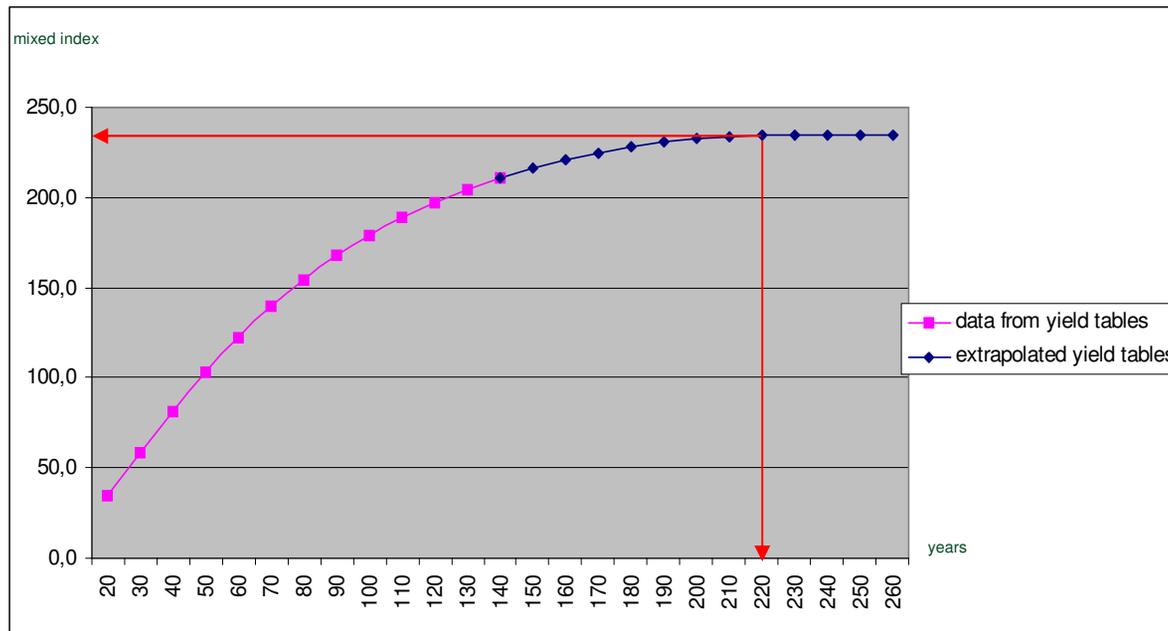
Georgia Forest Eco-Compensation

empirical data for the development of habitat quality

- no comprehensible information available

- yield tables avail standardized information on the development of forest stands over time, contain information on components assessed to determine site conditions of a stand

- information from yield tables used as a proxy for the development of habitat quality, 'mixed index'

Georgia Forest Eco-Compensation
compensation ratio for areas in benchmark conditions
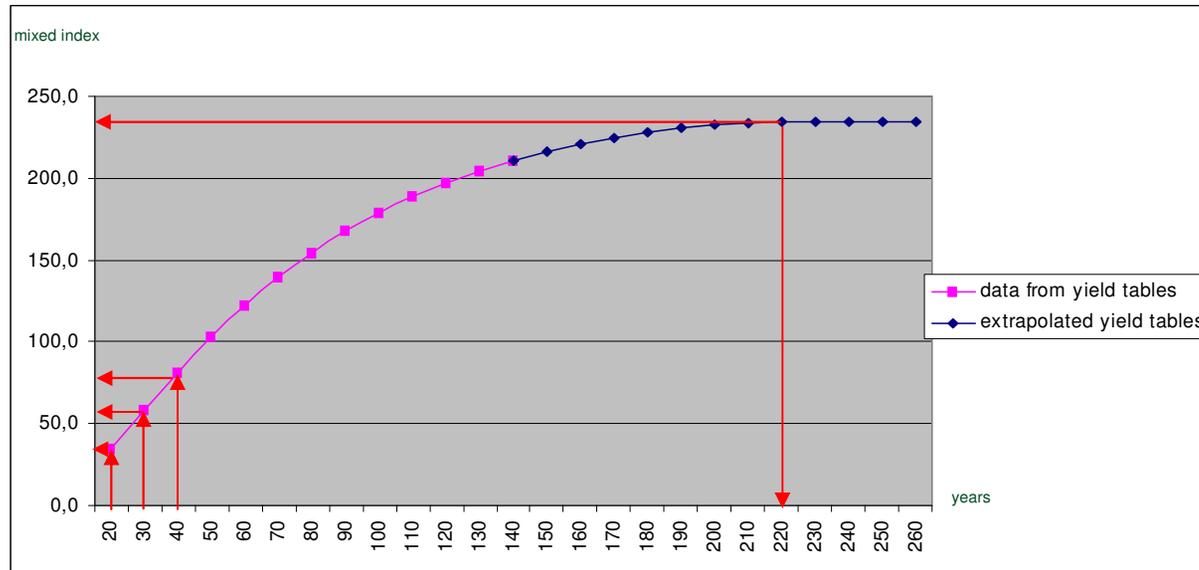
values mixed score:

benchmark reached after 220 years

$v(t_{220})=234,6$

$v(t_{20})=34,9$

$v(t_{30})=58,4$

$v(t_{40})=81,5$
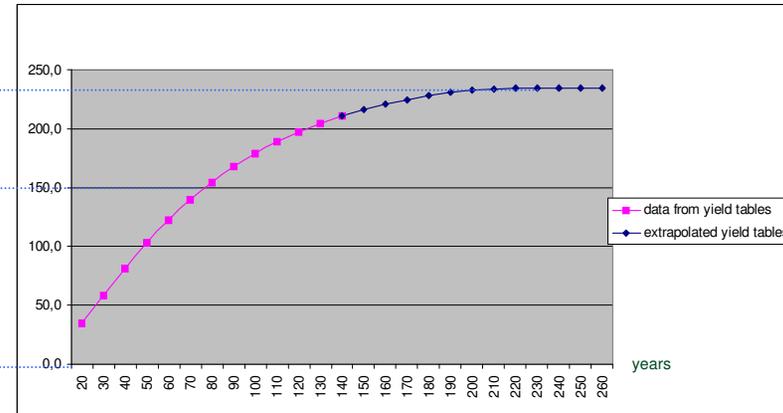
Compensation ratio required to establish equivalence:

for t_{20}: 6,7   (234,6/34,9)

for t_{30}: 4,0   (234,6/58,4)

for t_{40}: 2,9   (234,6/81,5)
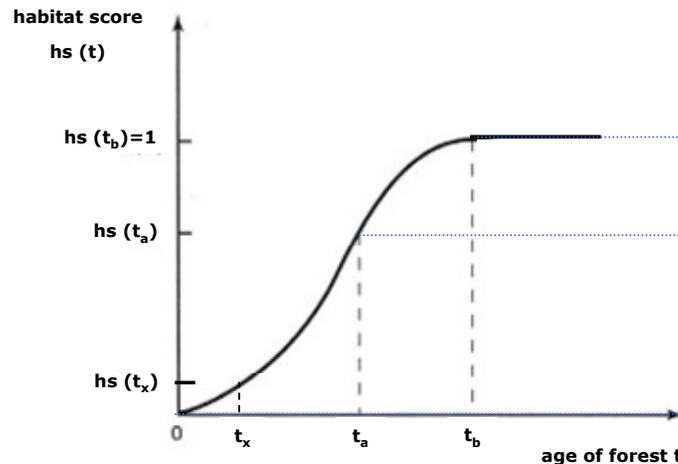
12 ha cleared with an aggregate value of 7,68 habitat hectares, $v(t_b)$=234,6:

=> ø habitat score: 0,64 => $v(t_a)$=234,6*0,64=150,1

compensation ratios and areas for this habitat for t_{20}, t_{30} and t_{40}:

$v(t_{20})$=34,9   ratio for t_{20}: 4,3 (150,1/34,9)   compensation area for t_{20}: 51,6 ha

$v(t_{30})$=58,4   ratio for t_{30}: 2,6 (150,1/58,4)   compensation area for t_{30}: 31,2 ha

$v(t_{40})$=81,5   ratio for t_{40}: 1,8 (150,1/81,5)   compensation area for t_{40}: 21,6 ha

EVC 1 Georgian oak forest	
benchmark condition reached in year	240
mixed index value at t_b	199,6
total area of habitats in this EVC [ha]	17,41
value of these areas [habitat hectares]	10,82
average habitat score	0,62
corresponding mixed index value	124,0
compensation ratio for t=20 years	5,7
areas to reforest/afforest	98,7
compensation ratio for t=30 years	3,6
areas to reforest/afforest	61,9
compensation ratio for t=40 years	2,5
areas to reforest/afforest	43,2

EVC 2 high mountainous oak forest	
benchmark condition reached in year	240
mixed index value at t_b	199,6
total area of habitats in this EVC [ha]	6,67
value of these areas [habitat hectares]	4,60
average habitat score	0,69
corresponding mixed index value	137,6
compensation ratio for t=20 years	6,3
areas to reforest/afforest	41,9
compensation ratio for t=30 years	3,9
areas to reforest/afforest	26,3
compensation ratio for t=40 years	2,8
areas to reforest/afforest	18,4

EVC 3 Georgian oak with high mountainous oak forest	
benchmark condition reached in year	240
mixed index value at t_b	199,6
total area of habitats in this EVC [ha]	4,58
value of these areas [habitat hectares]	3,42
average habitat score	0,75
corresponding mixed index value	149,1
compensation ratio for t=20 years	6,8
areas to reforest/afforest	31,2
compensation ratio for t=30 years	4,3
areas to reforest/afforest	19,6
compensation ratio for t=40 years	3,0
areas to reforest/afforest	13,7

EVC 4 Georgian oak with hornbeam forest	
benchmark condition reached in year	240
mixed index value at t_b	119,7
total area of habitats in this EVC [ha]	7,70
value of these areas [habitat hectares]	6,25
average habitat score	0,81
corresponding mixed index value	97,2
compensation ratio for t=20 years	5,1
areas to reforest/afforest	39,5
compensation ratio for t=30 years	3,1
areas to reforest/afforest	24,0
compensation ratio for t=40 years	2,3
areas to reforest/afforest	17,9

areas to be afforested/reforested per EVC

EVC 5 high mountainous oak with Caucasian hornbeam forest	
benchmark condition reached in year	240
mixed index value at t_b	109,8
total area of habitats in this EVC [ha]	6,64
value of these areas [habitat hectares]	6,13
average habitat score	0,92
corresponding mixed index value	101,4
compensation ratio for t=20 years	5,5
areas to reforest/afforest	36,2
compensation ratio for t=30 years	3,3
areas to reforest/afforest	22,0
compensation ratio for t=40 years	2,5
areas to reforest/afforest	16,5

EVC 6 Caucasian hornbeam with Georgian oak forest	
benchmark condition reached in year	240
mixed index value at t_b	89,8
total area of habitats in this EVC [ha]	4,71
value of these areas [habitat hectares]	3,21
average habitat score	0,68
corresponding mixed index value	61,3
compensation ratio for t=20 years	3,4
areas to reforest/afforest	16,2
compensation ratio for t=30 years	2,1
areas to reforest/afforest	9,7
compensation ratio for t=40 years	1,6
areas to reforest/afforest	7,4

EVC 7 Caucasian hornbeam with high mountainous oak forest	
benchmark condition reached in year	240
mixed index value at t_b	79,8
total area of habitats in this EVC [ha]	1,22
value of these areas [habitat hectares]	1,16
average habitat score	0,95
corresponding mixed index value	75,5
compensation ratio for t=20 years	4,3
areas to reforest/afforest	5,3
compensation ratio for t=30 years	2,6
areas to reforest/afforest	3,2
compensation ratio for t=40 years	2,0
areas to reforest/afforest	2,4

EVC 8 beech forest	
benchmark condition reached in year	240
mixed index value at t_b	167,3
total area of habitats in this EVC [ha]	7,53
value of these areas [habitat hectares]	6,31
average habitat score	0,84
corresponding mixed index value	140,1
compensation ratio for t=20 years	6,8
areas to reforest/afforest	51,4
compensation ratio for t=30 years	5,7
areas to reforest/afforest	43,1
compensation ratio for t=40 years	3,2
areas to reforest/afforest	24,2

EVC 9 beech with Caucasian hornbeam forest	
benchmark condition reached in year	240
mixed index value at t_0	100,4
total area of habitats in this EVC [ha]	1,18
value of these areas [habitat hectares]	1,04
average habitat score	0,88
corresponding mixed index value	88,2
compensation ratio for t=20 years	4,9
areas to reforest/afforest	5,7
compensation ratio for t=30 years	3,5
areas to reforest/afforest	4,2
compensation ratio for t=40 years	2,3
areas to reforest/afforest	2,7

EVC 10 beech with pine forest	
benchmark condition reached in year	240
mixed index value at t_0	175,9
total area of habitats in this EVC [ha]	5,26
value of these areas [habitat hectares]	3,85
average habitat score	0,73
corresponding mixed index value	128,8
compensation ratio for t=20 years	5,6
areas to reforest/afforest	29,2
compensation ratio for t=30 years	3,7
areas to reforest/afforest	19,6
compensation ratio for t=40 years	2,5
areas to reforest/afforest	13,3

EVC 11 pine forest	
benchmark condition reached in year	240
mixed index value at t_0	188,9
total area of habitats in this EVC [ha]	16,41
value of these areas [habitat hectares]	10,56
average habitat score	0,64
corresponding mixed index value	121,4
compensation ratio for t=20 years	4,5
areas to reforest/afforest	73,3
compensation ratio for t=30 years	2,4
areas to reforest/afforest	40,2
compensation ratio for t=40 years	2,0
areas to reforest/afforest	32,4

EVC 12 pine with high mountain maple forest	
benchmark condition reached in year	230
mixed index value at t_0	175,7
total area of habitats in this EVC [ha]	3,08
value of these areas [habitat hectares]	2,40
average habitat score	0,78
corresponding mixed index value	136,9
compensation ratio for t=20 years	6,0
areas to reforest/afforest	18,5
compensation ratio for t=30 years	3,4
areas to reforest/afforest	10,4
compensation ratio for t=40 years	2,7
areas to reforest/afforest	8,3

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areas to be afforested/reforested per EVC

EVC 13 spruce forest	
benchmark condition reached in year	250
mixed index value at t_b	248,1
total area of habitats in this EVC [ha]	3,06
value of these areas [habitat hectares]	1,99
average habitat score	0,65
corresponding mixed index value	161,2
compensation ratio for t=20 years	4,8
areas to reforest/afforest	14,6
compensation ratio for t=30 years	3,2
areas to reforest/afforest	9,7
compensation ratio for t=40 years	2,2
areas to reforest/afforest	6,8

EVC 14 spruce with pine forest	
benchmark condition reached in year	250
mixed index value at t_b	221,4
total area of habitats in this EVC [ha]	0,14
value of these areas [habitat hectares]	0,08
average habitat score	0,57
corresponding mixed index value	126,2
compensation ratio for t=20 years	4,1
areas to reforest/afforest	0,6
compensation ratio for t=30 years	2,5
areas to reforest/afforest	0,4
compensation ratio for t=40 years	1,9
areas to reforest/afforest	0,3

EVC 15 spruce fir forest	
benchmark condition reached in year	250
mixed index value at t_b	248,7
total area of habitats in this EVC [ha]	0,87
value of these areas [habitat hectares]	0,46
average habitat score	0,53
corresponding mixed index value	132,0
compensation ratio for t=20 years	2,9
areas to reforest/afforest	2,5
compensation ratio for t=30 years	2,6
areas to reforest/afforest	2,2
compensation ratio for t=40 years	1,8
areas to reforest/afforest	1,6

EVC 16 crook stem birch forest	
benchmark condition reached in year	100
mixed index value at t_b	49,5
total area of habitats in this EVC [ha]	0,95
value of these areas [habitat hectares]	0,87
average habitat score	0,92
corresponding mixed index value	45,3
compensation ratio for t=20 years	4,3
areas to reforest/afforest	4,1
compensation ratio for t=30 years	2,8
areas to reforest/afforest	2,7
compensation ratio for t=40 years	2,4
areas to reforest/afforest	2,3

EVC 17 riparian forest dominated by willow	
benchmark condition reached in year	80
mixed index value at t₀	75,7
total area of habitats in this EVC [ha]	10,03
value of these areas [habitat hectares]	6,51
average habitat score	0,65
corresponding mixed index value	49,1
compensation ratio for t=20 years	2,5
areas to reforest/afforest	24,9
compensation ratio for t=30 years	1,7
areas to reforest/afforest	17,2
compensation ratio for t=40 years	1,2
areas to reforest/afforest	12,2

EVC 18 riparian forest dominated by poplar	
benchmark condition reached in year	100
mixed index value at t₀	90,3
total area of habitats in this EVC [ha]	7,23
value of these areas [habitat hectares]	5,34
average habitat score	0,74
corresponding mixed index value	66,7
compensation ratio for t=20 years	5,4
areas to reforest/afforest	38,9
compensation ratio for t=30 years	2,2
areas to reforest/afforest	15,8
compensation ratio for t=40 years	1,8
areas to reforest/afforest	12,9

- Results will be integrated into MoU

- Georgian Ministry of Environment Protection and Natural Resources considers to adopt the habitat-hectare approach as general rule for the determination of eco-compensation measures

Thank you …