Biodiversity Offset Strategy For a Gas Pipeline

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The project

- Gas pipeline from Georgia to Turkey
- Ca. 1800 km across Turkey (7222 ha footprint)
- Partly financed by EBRD and World Bank

http://www.ebrd.com/work-with-us/projects/esia/azerbaijan-southern-gas-corridor.html

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General context

- ESIA prepared in 2013-2014 to Turkish and IFC standards
- ESIA fast-tracked: only preliminary CH habitat determination
- 101 SCCs identified; 54 flora, 7 mammals, 6 birds, 5 reptiles, 1 amphibian, 20 arthropods, 8 fish
- No offset requirements according to Turkish legislation
- Compensation largely based on reforestation- afforestation
- EBRD required the preparation of a Biodiversity Offset Strategy in line with PS6 and PR6 as a first step towards a complete Biodiversity Offset Management Plan

Objectives of the Offset Strategy

- Identify residual impacts to priority biodiversity features, natural habitats and critical habitats
- Define accounting methods to calculate losses and gains for natural habitats, priority biodiversity features, and critical habitats.
- Identify potential offsets and additional conservation actions to achieve No Net Loss or Net Gain
- Define approaches to stakeholder engagement, monitoring, and adaptive management, including feedback loops that permit re-calculation of loss-gain values and facilitate adjustments to the offset strategy to achieve No Net Loss or Net Gain.

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Criteria

Natural Habitat: No net loss

Priority Biodiversity Features (PBF): No net loss

- (i) threatened habitats;
- (ii) vulnerable species;
- (iii) significant biodiversity features identified by a broad set of stakeholders or governments (such as Key Biodiversity Areas or Important Bird Areas); and
- (iv) ecological structure and functions needed to maintain the viability of priority biodiversity features described in this paragraph.

Critical habitat: Net gain

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Data availability

- Habitat map based on EUNIS level III for 500 m around the ROW
- Ecoregions classification according to Olson 2001
- Data on Species of Conservation Concern (from ESIA and BAP):
  - Presence in the ROW
  - Distribution range along the ROW
- Data on Habitats
  - Location of threatened Habitats according to EU Directive
  - Location of key habitats according to IFC PS6
- Data on protected areas
  - Location of national parks
  - Location of listed areas (Ramsar, IPA, IBA, KBA)
- Main gaps: habitat map for some facilities; habitat degradation, restoration success in 20 years

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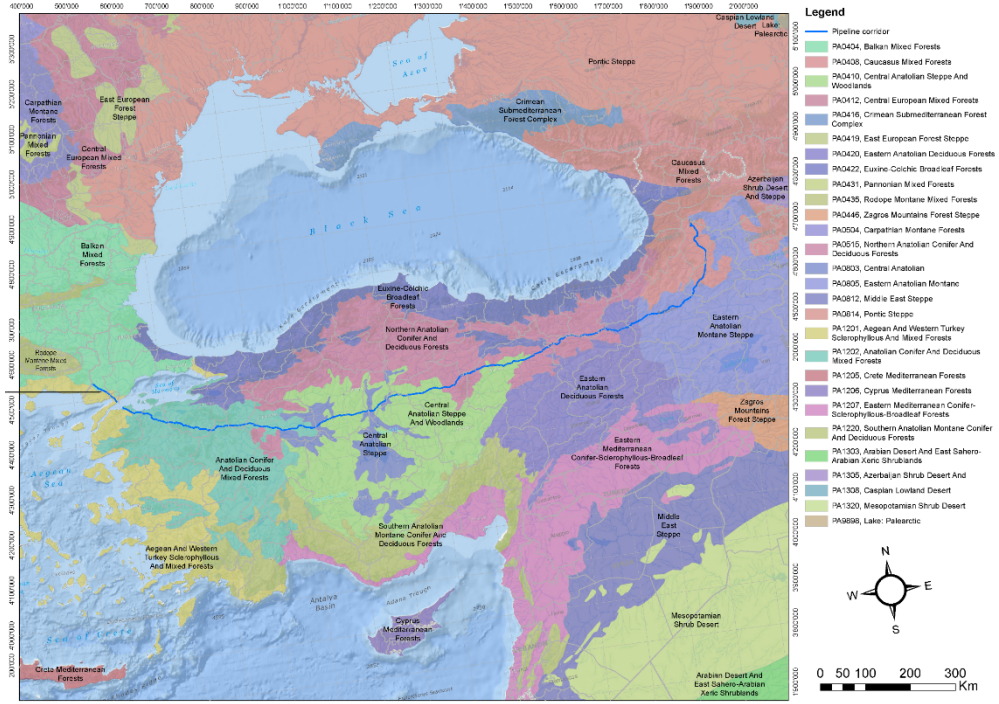
Loss gain calculation approach

- Ecosystem based - GIS driven
- Unit of analysis: patch of a given habitat under the footprint
- Deriving a «biodiversity value» for each patch
- Considering all criteria determining PBF – CH present in each patch
- Ranking biodiversity values within each patch
- Prioritizing CH in case more values are in the same patch
- Calculating loss-gain within each eco-region (based on Olson 2001)
- Trying to balance loss-gain within the ecoregion



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Loss – gain calculation

Calculation of the biodiversity value of each patch for each habitat

Natural Habitat

Species of Conservation concern

Habitats and protected areas

$$V_h = \left(\sum_{i=1}^{n} \left((a_i * d_i) + \left(\sum_{j=1}^{n} (a_{ij} * s_j * d_{ij}) \right) + \left(\sum_{k=1}^{n} (a_{ik} * p_k * d_{ik}) \right) \right) \right) * (1 - R_h)$$

$$V_h = \left(\sum_{i=1}^{n} \left((a_i * d_i) + \left(\sum_{j=1}^{n} (a_{ij} * s_j * d_{ij}) \right) + \left(\sum_{k=1}^{n} (a_{ik} * p_k * d_{ik}) \right) \right) \right) * (1 - R_h)$$

V_h = The biodiversity value of a group of patches of a given habitat type.

a_i = The area of the i^{th} habitat patch.

d_i = The degradation coefficient of the i^{th} habitat patch (coefficient ranging from 0-1).

a_{ij} = The area of the i^{th} habitat patch which also contains the j^{th} species of conservation concern.

s_j = The habitat suitability score assigned to the habitat patch for the j^{th} species of conservation concern (suitability score ranging from 0-1)

d_{ij} = The degradation coefficient of the i^{th} habitat patch which also contains the j^{th} species of conservation concern.

a_{ik} = The area of the i^{th} habitat patch which overlaps with the k^{th} significant conservation area.

p_k = The score assigned to the i^{th} habitat patch for the k^{th} significant conservation area (score ranging from 0-1)

d_{ik} = The degradation coefficient of the i^{th} habitat patch which overlaps with the k^{th} significant conservation area.

R_h = The estimated rehabilitation success of each habitat type in 20 yeas (ranging from 0-1),

Definition of some parameters

Degradation level	*d* score
Very high anthropogenic and/or natural disturbance	0.2
High anthropogenic and/or natural disturbance	0.4
Medium anthropogenic and/or natural disturbance	0.6
Low anthropogenic and/or natural disturbance	0.8
Undisturbed natural habitat	1

Habitat degradation

Suitability level	Description	*s* score
Null	The species in unlikely to occur in the habitat.	0
Low suitability	The species occurs in the habitat only irregularly or infrequently, or only a small proportion of individuals is found in the habitat.	0.33
Medium suitability	The species occurs in the habitat regularly or frequently.	0.66
High suitability	The habitat is suitable and important for the survival of the species, either because it has an absolute requirement for the habitat at some point in its life cycle (e.g. for breeding or as a critical food source), or it is the primary habitat (or one of two primary habitats) within which the species usually occurs or within which most individuals occurs.	1

Habitat suitability for SCCs

SCA type	IFC Criteria	EBRD Criteria	PBF/CH	*p* score
Threatened habitat	-	Criterion I	PBF	0.2
Significant biodiversity features	-	Criterion III	PBF	0.4
Areas associated with key evolutionary processes	Criterion V	Criterion V	CH	0.6
Globally significant concentrations of migratory species and/or congregatory species	Criterion III	Criterion IV	CH	0.8
Highly threatened and/or unique ecosystems	Criterion IV	Criterion I	CH	1

Conservation areas relative importance

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Results

Table 9: Net loss of biodiversity value (Vh) for Critical Habitat (CH) and for Natural Habitat and Priority Biodiversity Features (PBF/NH)

EUNIS Code*	Natural/ Modified	Ecoregions**																				Overall Total
		PA0404		PA0408		PA0410		PA0420		PA0515		PA0803		PA0805		PA1201		PA1202		Total		
		CH	PBF/NH	CH	PBF/NH	CH	PBF/NH	CH	PBF/NH	CH	PBF/NH	CH	PBF/NH	CH	PBF/NH	CH	PBF/NH	CH	PBF/NH	CH	PBF/NH	
C2.5	N	-	-	-	0,12	-	-	-	-	0,01	-	-	-	-	-	-	-	-	-	*0,01*	*0,12*	***0,13***
E1.00	N	-	-	-	-	67,03	-	0,17	-	98,28	-	2,13	-	-	-	-	-	1,77	-	*169,36*	-	***169,36***
E1.01	N	-	-	-	-	2,35	-	-	-	-	-	9,85	-	-	-	-	-	4,67	3,76	*16,87*	*3,76*	***20,62***
E1.22	N	-	0,89	-	-	-	-	-	-	-	-	-	-	-	-	0,92	1,95	0,07	27,45	*0,99*	*30,29*	***31,28***
E1.2B	N	-	-	-	-	-	-	-	-	59,30	-	-	-	-	-	-	-	-	-	*59,30*	-	***59,30***
E1.2E	N	-	-	11,37	-	26,83	48,76	118,77	-	370,85	14,99	-	2,20	46,24	-	-	-	0,11	44,17	*574,16*	*110,12*	***684,28***
E2.1	M	-	-	148,77	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	*148,77*	-	***148,77***
E4.4	N	-	-	217,81	-	-	-	-	-	-	-	-	-	25,19	-	-	-	-	-	*243,00*	-	***243,00***
E6.2	N	-	-	-	-	-	-	-	-	-	-	-	-	5,12	-	-	-	-	-	*5,12*	-	***5,12***
F2.2	N	-	-	-	-	-	-	-	-	0,82	-	-	-	-	-	-	-	-	-	*0,82*	-	***0,82***
G1.1	N	-	-	1,79	-	-	-	-	-	-	-	-	-	1,78	-	-	-	-	-	*3,57*	-	***3,57***
G1.3	N	-	2,11	-	-	2,69	4,00	14,08	-	12,60	2,82	-	1,20	5,74	-	0,35	2,60	0,28	14,25	*35,74*	*26,98*	***62,72***
G1.7	N	-	-	-	-	-	0,36	9,10	-	32,76	0,78	-	-	-	-	-	9,23	41,56	157,02	*83,42*	*167,39*	***250,82***
G1.9	N	-	-	22,50	-	-	-	-	-	1,02	-	-	-	-	-	-	-	-	-	*23,52*	-	***23,52***
G1.A	N	-	-	14,33	-	-	-	-	-	-	-	-	-	21,47	-	-	-	-	-	*35,80*	-	***35,81***
G1.C	M	-	-	-	-	0,11	-	-	-	0,10	-	-	-	-	-	-	-	-	-	*0,21*	-	***0,21***
G2.1	N	0,59	1,42	-	-	-	-	-	-	-	-	-	-	-	-	0,34	12,55	-	0,44	*0,93*	*14,41*	***15,35***
G3.4	N	-	-	44,74	-	-	-	-	-	49,23	36,32	-	-	-	-	-	-	-	-	*93,97*	*36,32*	***130,29***
G3.5	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10,31	76,77	*10,31*	*76,77*	***87,07***
G3.75	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14,81	10,52	0,24	*10,52*	*15,04*	***25,57***
G3.9	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0,26	-	*0,26*	***0,26***
G3.F	M	-	-	27,56	-	-	-	-	-	31,46	-	-	-	2,87	-	1,69	15,49	6,77	18,30	*70,35*	*33,79*	***104,15***
G4.B	N	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	28,31	40,56	*28,31*	*40,56*	***68,87***
G5.1	M	-	-	-	-	-	-	-	-	-	-	-	-	4,84	-	-	-	0,46	1,80	*5,30*	*1,80*	***7,09***
I1.1	M	42,91	-	-	1,00	38,64	-	2,67	-	116,91	-	4,87	-	100,64	-	28,88	-	403,94	-	*739,45*	*1,00*	***740,46***
I1.4	M	7,06	-	-	-	-	-	-	-	-	-	-	-	-	-	1,51	-	-	-	*8,57*	-	***8,57***
J5.4	M	-	0,04	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	*0,04*	***0,04***
X18	N	-	-	-	-	-	-	0,56	-	13,84	1,85	-	0,48	0,72	-	-	-	1,27	15,25	*16,39*	*17,58*	***33,97***
Total		*50,56*	*4,47*	*488,87*	*1,12*	*137,65*	*53,12*	*145,35*	*0,00*	*787,18*	*56,76*	*16,85*	*3,88*	*214,59*	*0,00*	*33,69*	*56,64*	*510,03*	*400,25*	***2384,76***	***576,24***	***2961,00***
Overall total		*55,03*		*489,99*		*190,77*		*145,35*		*843,94*		*20,73*		*214,60*		*90,33*		*910,27*				

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Results

- Total net loss (in ha)
  - CH: 700,82
  - PBF/NH: 193,90
- Total net loss (in biodiversity value)
  - CH: 2384,76
  - PBF/NH: 576,24
- Most important habitat types
  - Anatolian gypsum steppe: 169,36
  - Irano Anatolian steppe: 684,28
  - Calciphilous alpine and subalpine grassland: 243,00
  - Termophilous deciduous woodland: 250,82
  - Intensive unmixed crops : 740,46

  TOTAL 2087,92 (70%)

Target species

Given their importance we considered separately a limited number of species that are Critically Endangered, Local endemic and with low mobility

$$Sj = \sum_{j=1}^{n} (a_j * s_j * d_j)$$

Sj= total suitable habitat for a target species

a_i = The area of the i^{th} habitat patch

d_i = The degradation coefficient of the i^{th} habitat patch (coefficient ranging from 0-1).

s_j = The habitat suitability score assigned to the habitat patch for the j^{th} species of conservation concern (suitability score ranging from 0-1)

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Results

Table 11: Direct loss of suitable habitat (S) for target species

SCC Type	Species Code	Species	Ecoregions*									
			PA0404	PA0408	PA0410	PA0420	PA0515	PA0803	PA0805	PA1201	PA1202	Total
Terrestrial flora	TFL_007	*Alyssum dudleyi*	-	-	-	-	-	-	-	-	4,99	**4,99**
Terrestrial flora	TFL_011	*Astragalus aytatchii*	-	-	25	-	-	-	-	-	-	**25**
Terrestrial flora	TFL_020	*Cephalaria aytachii*	-	-	-	-	-	-	-	-	9,99	**9,99**
Terrestrial flora	TFL_028	*Dianthus goekayi*	-	-	-	-	-	-	-	-	2,32	**2,32**
Terrestrial flora	TFL_031	*Gypsophila heteropoda subsp. minutiflora*	-	-	45	-	29	-	-	-	-	**74**
Terrestrial flora	TFL_032	*Gypsophila osmangaziensis*	-	-	-	-	-	-	-	-	9,99	**9,99**
Terrestrial flora	TFL_033	*Hieracium sarykamyschense*	-	6	-	-	-	-	-	-	-	**6**
Terrestrial flora	TFL_051	*Scutellaria yildirimli*	-	-	-	-	-	5	-	-	1	**6**
Terrestrial fauna	TFR_001	*Montivipera wagneri*	-	-	-	-	-	-	1,99	-	-	**1,99**
Terrestrial fauna	TFR_002	*Darevskia uzzelli*	-	3,33	-	-	-	-	-	-	-	**3,33**
Terrestrial fauna	TAM_002	*Mertensiella caucasica*	-	-	-	-	-	-	10,32	-	-	**10,32**
Terrestrial fauna	TFA_009	*Polyommatus merhaba*	-	-	-	-	-	-	1	-	-	**1**
Freshwater fauna	FFF_004	*Anguilla anguilla*	-	-	-	-	-	-	-	0,99	1,98	**2,97**
Freshwater fauna	FFF_008	*Cobitis puncticulata*	-	-	-	-	-	-	-	-	5,94	**5,94**
Freshwater fauna	FFF_019	*Oxynoemacheilus simavica*	-	-	-	-	-	-	-	-	9,9	**9,9**

Ecoregions*:

PA0404 Balkan Mixed Forests
PA0408 Caucasus Mixed Forests
PA0410 Central Anatolian Steppe And Woodlands
PA0420 Eastern Anatolian Deciduous Forests
PA0515 Northern Anatolian Conifer And Deciduous Forests
PA0803 Central Anatolian Steppe
PA0805 Eastern Anatolian Montane Steppe
PA1201 Aegean And Western Turkey Sclerophyllous And Mixed Forests
PA1202 Anatolian Conifer And Deciduous Mixed Forests




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Offset strategy

- Principles:
  - Requirements based on transparent loss-gain assessment
  - Measurable gains based on loss avoidance or actions for gains
  - Offset based on “like for like or better principle”
  - Offsets secured over the long term and auditable
- Actions considered
  - Create protected areas in designated areas (KBAs)
  - Strengthen management capacity within existing protected areas
  - Arrest current degradation of biodiversity
  - Improve degraded areas:
    - Rehabilitation
    - Invasive species management
    - Livestock-agriculture-forestry management
    - Reintroduction-management of SCCs

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Offset management plan

- Estimation of the offset potential within the 500 m corridor where habitat data exist confirmed the availability of suitable offsets
- Next steps will include:
  - Stakeholder engagement with Forestry, Park authorities and NGOs
  - Further studies to confirm degradation and rehabilitation parameters
  - Field studies on selected target species
  - Screening and habitat mapping in selected KBA and protected areas
  - Identification and design of individual offset projects
  - Negotiation with relevant stakeholders
  - Finalization of the plan

Thank you!

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