

# TAP

Trans Adriatic Pipeline



## ESIA Albania

### Annex 1 – Route Alternatives Appraisal Indicators

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	Area Code	Comp. Code	System Code	Disc. Code	Doc.-Type	Ser. No.
Project Title: <b>Trans Adriatic Pipeline – TAP</b> Document Title: <b>ESIA Albania Annex 1 - Route Alternatives Appraisal Indicators</b>	AAL00-ERM-641-Y-TAE-1004 Rev.: 03 / at01					

In this Annex the following Tables are presented:

- *Table 1 – Route Selection Indicators* is an example of the ‘impact indicators’ used for each discipline for the route appraisal and selection process in 2009 / 2010. These indicators were used to highlight and appraise the features of the six analysed route alternatives that could be related to key potential impacts of a standard gas pipeline project, and also on the specificities of the study area (i.e. based on the findings of the desk study and field survey).;
- *Table 2 – Indicator Matrix for Route Alternatives 3 and 6* is an example of a matrix developed in 2009 / 2010 based on the list of indicators presented in *Table 1*. The matrix presents environmental, socioeconomic and cultural heritage detail of Alternatives 3 and 6 used in the appraisal. The matrix was developed on the basis of detailed baseline information gathered through further field work, desktop studies and public consultation.

Please note that the indicator definitions used to build the matrix were based on the TAP Project assumptions of 2009 / 2010. Some of these definitions have changed over time as the design has evolved. For example, the working strip width was assumed to be 30 m, while the current specification is 38 m. The Pipeline Protective Strip (PPS) was assumed to be of +/-4 to 5 m, while it is now known to be 4 m.

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**Table 1 Route Selection Indicators**

<b>Indicator</b>	<b>Definition</b>
<i>Technical</i>	
Length of the 48" pipeline	Length of section in central Albania
Constructability	Class 1 /insignificant
	Class 2 /minor
	Class 3 /medium
	Class 4 /high
	Class 5 /no-go
Geohazards	Class 1 /insignificant
	Class 2 /minor
	Class 3 /medium
	Class 4 /high
	Class 5 /no-go
Excavation	Class 1 /insignificant
	Class 2 /medium
	Class 3 /large
Groundwater	Class 1 /insignificant
	Class 2 /medium
	Class 3 /large
Number of river and water channel crossings (48") (Classification of rivers based on <u>engineering</u> criteria)	RVX-1: large river / channel > 30 m
	RVX-2: river / wide channel > 5m to ≤ 30m
	RVX-3: creek / channel ≤ 5 m
	Other minor water courses

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<b>Indicator</b>	<b>Definition</b>
<i>Environmental</i>	
Total area and length within the Hotova Fir forests-Dangelli National Park	Area and length to be cleared by working strip (30 m wide)
Crossing of the NP Core Zone (old growth Macedonian fir's forests)	Total surface to be cleared by working strip (30 m wide) within the NP core area
Natural Monuments within the 2 km width corridor	Number of designated Natural Monuments present within the 2 km corridor along alternative centerline <sup>(1)</sup>
Total forest clearance (pipeline construction)	Total surface to be cleared by working strip (30 m wide) classified as forest by the CORINE landcover classification
Total forest within the PPS (pipeline operation)	Total forested areas to be cleared and maintained along ROW (+/- 4 m)
Total broadleaved forest (beech dominated – <i>Fagus sylvatica</i> ) clearance (pipeline construction)	<i>Fagus sylvatica</i> dominated areas to be cleared within the working strip (30 m width)
Total broadleaved forest (beech dominated – <i>Fagus sylvatica</i> ) within PPS (pipeline operation)	<i>Fagus sylvatica</i> dominated areas within the PPS (+/- 4 m)
Total broadleaved forest (oak dominated – <i>Quercus sp.</i> ) clearance (pipeline construction)	<i>Quercus sp.</i> dominated areas to be cleared within the working strip (30 m width)
Total broadleaved forest (oak dominated – <i>Quercus sp.</i> ) within PPS (pipeline operation)	<i>Quercus sp.</i> dominated areas within the PPS (+/- 4 m)
Subalpine grasslands (pipeline construction)	Total surface to be cleared within the working strip (30 m width) classified as subalpine vegetation grasslands
Rivers (Classification of rivers based on <u>ecological</u> criteria)	<i>Class 1 Rivers</i> of ecological importance or ecological potential crossed
	<i>Class 2 Rivers</i> of ecological importance or ecological potential crossed
	<i>Class 3 Rivers</i> of ecological importance or ecological potential crossed
Total number of rivers of ecological importance or ecological potential crossed	Number of expected rivers of ecological importance or ecological potential crossed by the alternative (from <i>Class 1 Rivers</i> to <i>Class 3 Rivers</i> )

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<b>Indicator</b>	<b>Definition</b>
Total area of 'wetland' type habitats (standing water, lagoons, running waters, saltmarsh...)	Area of the 30 m working strip of each Alternative supporting all wetland habitats including running and standing water
Area covered by brown bear range crossed (pipeline construction)	Total surface of the 2 km corridor suitable for bear habitat identified during field survey
Area with slope degree <33° (slope lower 2V:3H)	Area of the 30 m working strip of each Alternative on slopes <33°
Area with slope degree 33° - 60° (slope from 2V:3H to 2V:1H)	Area of the 30 m working strip of each Alternative on steep slopes between 33° - 60°
<i>Socioeconomic</i> <sup>(2)</sup>	
Regional government stakeholders	Total number of regions crossed by each alternative
Local government stakeholders	Total number of communes/municipalities crossed by each alternative
Population in settlements within the corridor routes	Total number of residents within the 2 km corridor of each alternative. Population data is from 2008
Settlements outside the corridor using resources within the corridor	Total number of settlements close to the 2 km corridor of each alternative (up to a maximum of 2 km outside the corridor)
Settlements within the corridor routes	Total number of settlements within the 2 km corridor of each alternative
Area of agricultural lands along corridor alternative	Area of the 2 km corridor for each alternative classified as agricultural land by the CORINE Land Cover database
Area of agricultural lands within working strip	Area of the 30 m working strip for each alternative classified as agricultural land by the CORINE Land Cover database.
Area of grazing lands along corridor	Area of the 2 km corridor for each alternative classified as grazing land by the CORINE Land Cover database
Area of permanent crops along the 2 km corridor	Area of the 2 km corridor for each alternative classified as area of cultivation of permanent crops by the CORINE Land Cover database
Area of permanent crops affected during construction works	Area of the 30 m working strip for each alternative classified as area of permanent crop cultivation of by the CORINE Land Cover database
Area of forest along corridor	Area of the 2 km corridor for each alternative classified as forest by the CORINE Land Cover database

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<b>Indicator</b>	<b>Definition</b>
Area of forest within the working strip	Area of the 30 m working strip for each alternative classified as forest by the CORINE Land Cover database
Settlements reliant on various economic activities as their mean livelihood	Crop farming (2 km corridor)
	Animal husbandry (2 km corridor)
	Mixed activities (crop production and husbandry) (2 km corridor)
	Diversified economy (2 km corridor)
Settlements that rely on subsistence farming as their main livelihood	Number of villages within the 2 km corridor relying on farming as their main or only source of subsistence
Community Vulnerability (Services and infrastructure provision and access to sustainable livelihood)	Villages considered highly vulnerable (within the 2 km corridor)
	Villages considered of medium vulnerability (within the 2 km corridor)
	Villages considered of low vulnerability (within the 2 km corridor)
<b>Cultural Heritage</b>	
Total number of CH sites	Archaeological or historic sites located within the 2 km wide corridor
Number of High Importance CH Sites	Archaeological or historic site judged by specialist as of high importance
Number of Moderate Importance CH Sites	Archaeological or historic site judged by specialist as of moderate importance
Number of Low Importance CH Sites	Archaeological or historic site judged by specialist as of low importance
Monuments in traditional use today	Monuments reported in current use in 2 km wide corridor
Archaeological potential	Percentage of highly productive agricultural land (measured in hectares) within 2 km wide corridor

Acronyms: RVX: River Crossing, 2V:3H: 2 meters vertical, 3 meters horizontal

- (1) The center line is not fixed but it is the basis for the ESIA assessment. Adjustments within the 500 m where needed may still be made.
- (2) NGOs were engaged in the meetings held at a National/regional level during ESIA Scoping disclosure, as well as during regional level disclosure of korça loop. A letter informing about the change in the route was also sent to national and local NGOs in early June 2011.

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**Table 2 Indicator Matrix for Route Alternatives 3 and 6**

<i>Indicator</i>	<i>Definition</i>	<i>Units</i>	<i>Relevance to the Appraisal</i>	<i>Alt. 3 (2010)</i>	<i>Alt. 6 (2010)</i>
<i>Technical</i>					
Length of the 48" pipeline onshore	Length GR/AL border to CS03	km	Construction time and cost related	194	160
Length of the 42" pipeline onshore	Length CS03 to landfall AL	km	Construction time and cost related	16	19
Total length of onshore pipeline	Length GR/AL border to landfall	km	Construction time and cost related	210	180
Pipeline section in mountainous areas	Hilly and mountainous areas	km	Increased construction effort	61	82
Block valves	Number of required block valves	-	Influence on permanent land use	7	6
Number of river and water channel crossings (48"/42") (Classification of rivers based on <u>engineering</u> criteria)	RVX-1: large river /channel > 30 m	No.	Increased construction effort depending mainly on the site conditions, geometry of riverbed, geology and discharge of the river section	16	12
	RVX-2: river / wide channel >5 m to ≤ 30 m	No.		28	14
	RVX-3: creek / channel ≤ 5 m	No.		107	204
	Other minor water courses	No.		75	69
Number of road crossings (48"/42")	RDX-1: highway, national road	No.	Influence on temporary land use close by the crossing	5	1
	RDX-2: main road	No.		10	7
	RDX-3: secondary road	No.		10	30
	RDX-4: carriage way	No.		55	110
	RDX-5: track	No.		194	118
Number of railway crossings (48"/42")	RWX-2: Single track	No.	Influence on temporary land use close by the crossing	1	1
Site accessibility	New access roads	km	Influence on permanent land use and Indicative of earthworks required outside the working strip	18	34
	Existing roads to be upgraded	km		118.8	93

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Special construction sections	Sections with additional geotechnical measures	km	Construction time and cost related	6	17
Soil and rock classification	Cl. I: soil, loose rock or stones	%	Excavation possible with excavator	63	43
	Cl. II: weak rock	%	Heavy excavation machinery required, ripping	26	51
	Cl. III: hard rock	%	Drill and blast	11	6
Expected groundwater	Length and percentage	%	Handicap during construction	28	38
Longitudinal slopes	Cl. I: 0-8 degree	%	Flat	71	55
	Cl. II: 8-18 degree	%	Hilly, appropriate for trucks	22	33
	Cl. III: >18 degree	%	Mountainous, accessible for tracked vehicles, rope ways	7	12
Transversal slopes	Cl. I: 0-7 degree	%	Flat	91	91
	Cl. II: 7-18 degree	%	Moderately inclined, side cuts required	9	9
	Cl. III: >18 degree	%	Steep, special construction measures required	0	0
Potential active faults <b>(1)</b>	Numbers of crossings of active fault	No.	Impact on design and construction	6	12
Potential liquefaction areas	Potential liquefaction areas	km	Impact on design and construction	13	43
Potential landslides <b>(2)</b>	Active and latent slope instabilities	km	Impact on design and construction	28	31
Erosion potential	Qualitative description	-	Impact on design and construction	-	-
Potential hydropower plant sites	Desk based identified – status 2009	No.	Impact on design and construction	9	5
Seismicity zoning	length per seismic zone VII (MSK)	km	Impact on design and construction	113	99
	length per seismic zone VIII (MSK)	Km	Impact on design and construction	88	81
	length per seismic zone IX (MSK)	km	Impact on design and construction	8	0



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Risk onshore	Qualitative description Locations 2 (BC 8010-1)	- %	Risk for population close by the pipeline (Dense populated places)	Acceptable 16%	Acceptable 21%
<i>Environmental</i>					
Total area and length within the Hotova Fir-Dangelli National Park	Area and length to be cleared by working strip (30 m width)	ha (km)	Legally protected area and international Emerald Area (areas of high ecological/landscape values).	54 18	0 0
Total area within existing Protected Areas (pipeline construction)	Total clearance area along the 30 m of working strip within any Protected Area	ha	Existing protected areas by statutory designation affected (areas of high ecological/landscape values).	54 18	0 0
Total area of natural habitats crossed (pipeline construction)	Total surface to be cleared by working strip (30 m width) classified as natural habitat by the CORINE landcover classification	ha	Natural habitats in general have a higher biodiversity and sensitivity to impacts than those affected by anthropogenic activities.	272.3	286.2
Total area of natural habitats within PPS (pipeline operation)	Total surface within the PPS (+/- 4 to 5 m) in areas classified as natural habitat by the CORINE landcover classification	ha	Natural habitats in general have a higher biodiversity and sensitivity to impacts than those affected by anthropogenic activities. Growth of forests and shrublands would not be allowed during pipeline operation.	90.7	96.7
Total forest clearance (pipeline construction)	Total surface to be cleared by working strip (30 m width) classified as forest by the CORINE landcover classification	ha	Forest clearance, in opposition to herbaceous and agricultural areas, would be generally a long term effect.	166.3	107.2
Total forest within the PPS (pipeline operation)	Total forested areas to be cleared and maintained along PPS (+/- 4 to 5 m)	ha	Forested areas (including shrublands) would be permanently cleared during pipeline operation.	60.4	31.5
Total broadleaved forest dominated by beech and oak species (pipeline construction)	Total surface to be cleared within the working strip (30 m width) classified as broadleaved forest by the CORINE landcover classification.	ha	Broadleaved forests count among the most valuable forest types. Areas to be cleared during construction. Counts among the most valuable habitats in the region and would constitute a long term effect.	71.3	94.2

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Total broadleaved forest dominated by beech and oak species within PPS (pipeline operation)	Total surface to be cleared within the PPS (+/- 4 to 5 m) classified as broadleaved forest by the CORINE landcover classification.	ha	Broadleaved forests count among the most valuable forest types. Areas within the PPS would be permanently cleared during pipeline operation.	23.8	31.4
Area of coniferous woodland (pipeline construction)	Total surface to be cleared within the working strip (30 m width) supporting coniferous woodland (mainly <i>Pinus sp.</i> but areas of high valuable <i>Abies sp.</i> may also be present on the mountainous areas	ha	Natural habitat be cleared during construction works; would constitute a long term effect.	30.5	18.2
Area of coniferous woodland within PPS (pipeline operation)	Total surface to be cleared within the PPS (+/- 4-5 m) supporting coniferous woodland (mainly <i>Pinus sp.</i> ) but areas of high valuable <i>Abies sp.</i> may also be present on the mountainous areas	ha	Natural habitat be cleared during operation of the pipeline; would constitute a long term effect.	10.2	6.1
Area covered by brown bear range crossed (pipeline construction) in the Hotova Region	Total surface of the 2 km corridor suitable for bear habitat identified during field survey	ha	Brown bears are a protected species and an apex predator and keystone species within Albania which rely on large habitat ranges largely free from human disturbance. There habitat is sensitive to disturbance and fragmentation.	6,627	17,712
Total area of 'wetland' type habitats (standing water, lagoons, running waters, saltmarsh...) <b>(3)</b>	Area of the 30 m working strip of each Alternative supporting all wetland habitats including running and standing water	ha	Lagoons and saltmarsh habitats are endangered and support a range of specialist species, particularly water birds. Standing water in mountainous regions of Albania provides a crucial resource for a range of vertebrate species such as freshwater fishes, amphibians and mammals (some of which, like Otter ( <i>Lutra lutra</i> ) are protected).	3.2	11.3
Rivers (classification of rivers based on <u>ecological</u> criteria)	<i>Class 1 Rivers</i> of ecological importance or ecological potential crossed	No.	<i>Class 1 Rivers</i> represent the main rivers with riverine habitats of ecological importance or ecological potential.	51	17
	<i>Class 2 Rivers</i> of ecological importance or ecological potential crossed	No.	<i>Class 2 River</i> represent a tributary of the main rivers ( <i>Class 1 Rivers</i> ), which are still sizable rivers with riverine habitats of ecological importance or ecological potential.	6	8

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	Class 3 Rivers of ecological importance or ecological potential crossed	No.	Class 3 Rivers represent smaller streams which are tributaries of Class 2 Rivers with permanent waters and riverine habitats of ecological importance or ecological potential.	83	22
	Other water courses of minor ecological importance	No.	Seasonal water courses, channels, etc. of minor ecological importance	86	252
Total number of rivers of ecological importance or ecological potential crossed <b>(4)</b>	Number of expected rivers of ecological importance or ecological potential crossed by the alternative (from Class 1 Rivers to Class 3 Rivers)	No.	Rivers are habitats sensitive to construction impacts, which also support a range of vulnerable and protected species.	226	299
Area with slope degree <33° (slope lower 2V:3H) <b>(5)</b>	Area of the 30m working strip of each Alternative on slopes >30°	ha	Areas with gentle slopes < 33° hold soil and so are less susceptible to erosion and likely to be quicker to re-colonise. After restoration high degree of naturalness should be achieved.	626.4	525.4
Area with slope degree 33° -60° (slope from 2V:3H to 2V:1H)	Area of the 30 m working strip of each Alternative on steep slopes between 33° -60°	ha	Areas with steep slopes between 33° and 60° are more susceptible to erosion and may take longer to re-colonise. After restoration certain degree of naturalness should be achieved, although artificial would be possibly apparent.	0	7.2
Ridge modification	Pipeline running over crests / ridges where no re-routing is feasible and flattening during construction will be required to open working strip	km	Highly visible and landscape modification (permanent alteration). Indicative of relevant earthworks and potential landfills and restoration difficulties	6.6	16.4
Area/length of forest affected by new roads (5 m wide)	Area of forest permanently lost as a result of the construction of new roads	ha (km)	Forests are of both ecological and socioeconomic importance to the study area	5.1 (10.2)	2 (4)
Area/length of protected areas affected by 'new roads' (5 m wide)	Area of protected areas permanently affected as a result of the construction of new roads	ha (km)	Sensitivity of the habitats within the protected area. Also construction activities within the perimeter of a protected area will be prohibited	5.8 (11.69)	0 (0)

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Number of logistic sites (pipe bending yards, pipeyards, compressor stations and camp sites) in forested areas	Permanent/long term loss of forested habitat as a result of the presence of the logistic sites	No.	Forests are of both ecological and socioeconomic importance to the study area	17	17
Number of logistic sites in protected areas	Disturbance to protected areas as a result of the presence of the logistic sites	No.	Sensitivity of the habitats within the protected area. Also construction activities within the perimeter of a protected area will be prohibited	1	0
<i>Socioeconomic</i>					
Regional government stakeholders	Total number of regions crossed by each alternative	No. of regions	Regional authorities are key stakeholders in the development of the Project and should play an important enabling role.	4	3
Local government stakeholders	Total number of communes/municipalities crossed by each alternative	No. of communes/ municipalities	Commune level stakeholders are also key stakeholders in the development of the Project. For example Heads of Commune are responsible for future land use and planning and development initiatives.	29	26
Population in settlements within the corridor routes.	Total number of residents within the 2 km corridor of each alternative. Population data is from 2008.	No. of residents.	The number of people living within the corridors in each alternative is relevant in assessing the magnitude of potential impacts on local communities.	56,164	92,998
Settlements within the corridor routes	Total number of settlements within the 2 km corridor of each alternative.	No. of settlements	Settlements are key receptors for both positive and negative socioeconomic impacts. It will also be necessary to engage with all settlements along the route.	88	62
Area of agricultural lands along corridor alternative	Area of the 2 km corridor for each alternative classified as agricultural land by the CORINE Land Cover database.	ha	Agricultural land constitutes one of the main sources of livelihoods for population within the study area.	16,011	12,009
Area of agricultural lands within working strip	Area of the 3 m working strip for each alternative classified as agricultural land by the CORINE Land Cover database.	ha	Agricultural land constitutes one of the main sources of livelihoods for population within the study area.	303	193

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Area of grazing lands along corridor	Area of the 2 km corridor for each alternative classified as grazing land by the CORINE Land Cover database.	ha	Grazing is the main livelihood in mountainous communes in the study area.	4,354	3,449
Area of grazing lands affected during construction works (working strip)	Overall weight of grazing lands along working strip (30 m) (pipeline construction)	ha	Land use potentially disturbed during construction (short term).	63	65
Area of permanent crops along the 2 km corridor	Area of the 2 km corridor for each alternative classified as area of cultivation of permanent crops by the CORINE Land Cover database.	ha	Fruit trees, vineyards and olive tree plantations are permanent crops found in the study area that cannot be easily replaced should they be removed. These represent an important source of income for communities in the study area.	418	1,892
Area of permanent crops affected during construction works	Area of the 30 m working strip for each alternative classified as area of permanent crop cultivation of by the CORINE Land Cover database.	ha	Fruit trees, vineyards and olive tree plantations are permanent crops found in the study area that cannot be easily replaced should they be removed. These represent an important source of income for communities in the study area.	2	25
Area of forest within the working strip	Area of the 30 m working strip for each alternative classified as forest by the CORINE Land Cover database.	ha	Forests constitute a resource for the local community in terms of wood fuel, timber commercial or industrial uses.	166.3	107.2
Area of forest within the PPS (pipeline operation)	Total forested areas to be cleared and maintained along PPS (+/- 4 to 5 m)	ha	The area of the right of way will not be available for forest reinstatement during operation.	60.4	31.5
Area of agricultural land affected by new access roads	Area of agricultural land to be occupied by new roads (5 m width)	ha	Agricultural land constitutes one of the main sources of livelihoods for population within the study area.	3.4	3.4
Community vulnerability in Hotova Region (services and infrastructure provision and access to sustainable livelihood)	Villages considered highly vulnerable in the Hotova region (within the 2 km corridor)	No.	Settlements in the study area have been assessed against several vulnerability factors (see Section 3), which can be broadly grouped into demographics, livelihoods and economy and infrastructure and services. The villages with the most vulnerability factors pertaining to them have been classified as highly vulnerable, followed by medium and low.	7	3
	Villages considered of medium vulnerability in the Hotova Region (within the 2 km corridor)	No.		9	5

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	Villages considered of low vulnerability in the Hotova Region (within the 2 km corridor)	No.	This 'ranking' of vulnerable villages is important to understand how villages are accessing services and infrastructure, their dependence on natural resources, land in particular. The assessment provides an idea of the coping mechanisms and vulnerability to development as a result of Project activities.	11	10
<i>Cultural Heritage</i>					
Total number of CH sites	Archaeological or historic sites located within the 2 km wide corridor	Site = 1	Damage to sites is the cause of cultural heritage impacts	42	16
Number of high importance CH sites	Archaeological or historic site judged by specialist as of high importance	Site = 1	Damage to a site if high important site is highest impact	8	7
Number of moderate importance CH sites	Archaeological or historic site judged by specialist as of moderate importance	Site = 1	Damage to a site of moderate importance is less	10	5
Number of low importance CH sites	Archaeological or historic site judged by specialist as of low importance	Site = 1	Damage to a site of low importance is least	24	6
Monuments in traditional use today	Monuments reported in current use in 2 km wide corridor	Site = 1	Reflects traditional socioeconomic value (Intangible Cultural Heritage)	17	6
Archaeological potential	Percentage of highly productive agricultural land (measured in hectares) within 2 km corridor	%	Index of local agricultural productivity and therefore of density of archaeological sites	38.94	34.4
Length of new access roads on land of high archaeological potential	Length on highly productive agricultural land	km	Index of local agricultural productivity and therefore of density of archaeological sites	3.36	6.3

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**Notes:**

(1) Active Seismic faults are derived from the geological maps. Activity not necessarily means an impact on the pipeline. The number is higher for RA 6 due to the lack of knowledge regarding the activity.

(2) Landslides and liquefaction areas are defined for the EBE +3 with a much higher accuracy. For EBE the areas are well known, and the routing already was influenced by this knowledge.

(3) The calculation on the wetlands has to be taken with a precautionary approach as there is a relatively high degree of uncertainty due to the scale of the cartography (GIS layers). Moreover, whenever a wetland is found the pipeline has been already re-routed. Nevertheless it is presented here as a rough estimate to assess potential differences between corridors.

(4) The calculation of the number of river of environmental interest crossings is based on the CCM River and Catchment Database (European Commission's Joint Research Centre or JRC). Version 2.1 of this database was used. This River and Catchment Database represents the first comprehensive database of river networks and catchment boundaries for the entire European continent. A re-classification of this River and Catchment Database was carried out to simplify the number of classes to a maximum of 3. The accuracy of these figures is considered to be adequate for the purpose of finding differences and similarities between Alternatives. Nevertheless the calculations have to be taken with a precautionary approach and not considered as an absolute figure. The limitations of these calculations are caused by the inherent limitations of the cartography (i.e. scale, detail and accuracy of GIS data). While a robust number is expected to be obtained for the main rivers a higher degree of uncertainty is foreseen in small/minor rivers such as those found in the mountainous areas of Albania.

(5) Slope gradients in areas for cut and fill slopes are a standard element of analysis in linear infrastructures. Slope angle (gradient) is very important because it is one of the key parameters used to evaluate the ease or complexity of restoration works and is directly linked to substrate type and potential erosion (i.e. plays a key role in re-vegetation planning because of the types of mitigation measures that can be implemented; the steeper the slope gradient the fewer the tools are available). For the purpose of identifying potential differences and similarities among route alternatives three categories have been selected. In general one can assume that re-vegetation on slopes below 33° should be feasible and a high degree of naturality should be achieved. Re-vegetation on slopes between 33° and 60° should be feasible to certain extent but require complex solutions or demanding maintenance. Slopes greater than 60° are considered highly difficult to restore and would usually require stabilisation measures with a high degree of artificial morphology (i.e. low naturality and potential for landscape impacts).

(6) The indicator definitions used to build this matrix were based upon the TAP Project assumptions of 2009 / 2010. Some of these definitions have changed over time (e.g. current working strip is 38 m and not 30 m, current PPS is 4 m and not +/- 4 to 5 m)).

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