Trans Adriatic Pipeline

Cumulative Impact Assessment – Executive Summary

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0.1 Introduction

0.1.1 The TAP Project

The Trans Adriatic Pipeline (TAP) is a natural gas pipeline that forms part of the Southern Gas Corridor (see Figure 0.1), which will bring natural gas from new reserves in the Caspian region to Southern and Central Europe. The TAP project supports the European Union in achieving its strategic goal of securing further gas supplies and meeting growing energy needs.

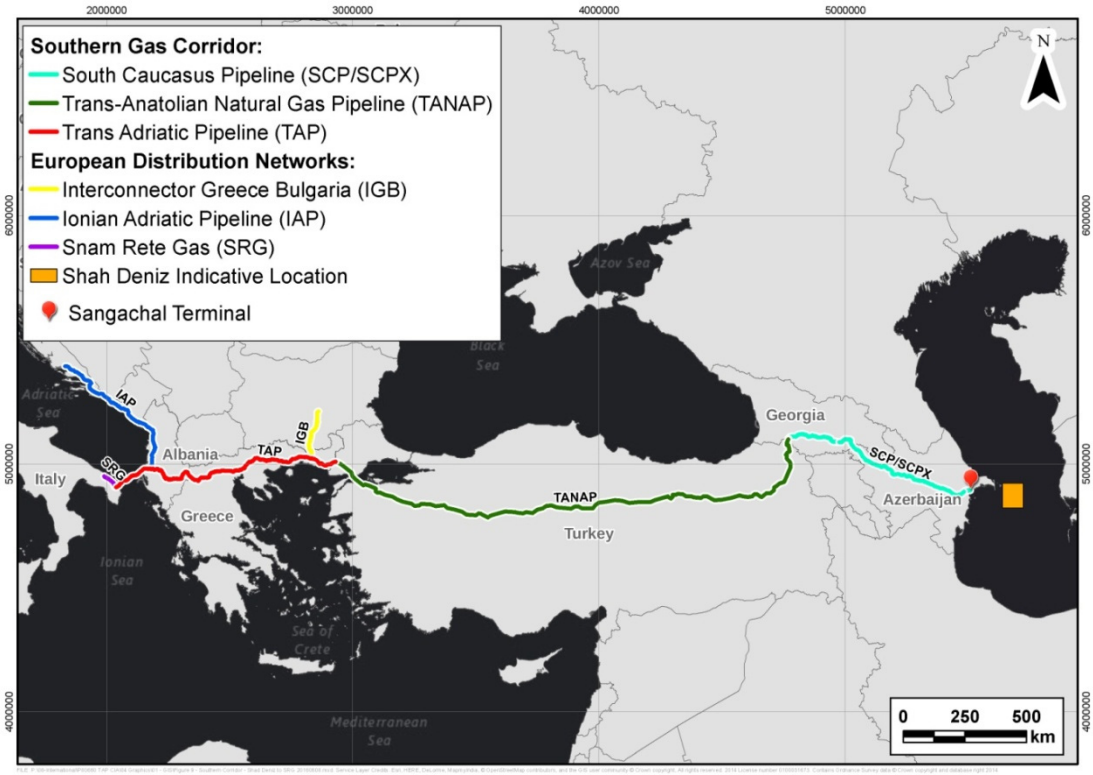

Figure 0.1: Southern Gas Corridor

The TAP project is a greenfield development comprising the design, construction and operation of an 878-km-long natural gas pipeline (see Figure 0.1). The pipeline route starts near Kipoi in Greece at the Greek–Turkish border and terminates in Melendugno in Italy, crossing Greece, Albania and the Adriatic Sea. The pipeline connects at its entry point to the Trans Anatolian Pipeline (TANAP) and downstream to the Italian SRG natural gas network. The TAP project overview is provided in Section 0.4 below.

0.1.2 Shareholders

Current shareholders of the TAP consortium comprise: SOCAR (Azerbaijan, 20%), BP (UK, 20%), Snam SpA (Italy, 20%), Fluxys (Belgium, 19%), Enagás (Spain, 16%) and

Axpo (Switzerland, 5%); all are major energy companies experienced in delivering and operating complex international projects.

0.1.3 Schedule

Construction of early infrastructure works started in 2015 with the building and rehabilitation of Albanian roads and bridges required to improve safety and access to the pipe-laying sites. The launch of the main construction activities began in 2016 and TAP is expected to be ready for operations by the beginning of 2020.

0.2 Scope and purpose of project overview and cumulative impact assessment

This project overview and cumulative impact assessment (CIA) has been produced to draw together in one report the project details from three country-specific environmental and social impact assessments (ESIAs) and subsequent addenda up to Addenda 5 for Greece and Addenda 4 for Albania that have been produced for the Trans Adriatic Pipeline (TAP) project. The CIA

- provides an **overview of the TAP project** for all three countries in which it is situated (Greece, Albania and Italy), combining information from all three TAP country ESIAs (Greece, Albania and Italy) and taking into account the latest design changes and information that may have been superseded or augmented by later ESIA addenda
- defines the **spatial and temporal influence for the TAP project** as a whole, which is currently addressed on a country-by-country basis only in the ESIA documents for each host country, rather than for the project as a whole
- defines and describes the **TAP associated facilities** upstream and downstream of the project and relevant in-country construction-phase associated facilities over which TAP will have some influence or control
- assesses the **cumulative environmental and social impacts of the TAP project** and any transboundary cumulative impacts in the context of the effects from TAP's associated facilities, other third-party projects in the region and external natural environmental and social drivers
- proposes **additional measures to avoid, reduce or mitigate cumulative impacts and risks** if they have not been identified in the individual country ESIAs.

This Executive Summary provides an overview of the full CIA which was performed for the TAP project; the summary is topic specific rather than country specific. The full CIA document is available to view on request.

0.3 Approach and methodology

0.3.1 International CIA guidelines

Cumulative impacts result from the successive, incremental and/or combined effects of a project or activity, when added to other past, existing, planned and/or reasonably anticipated future ones. They may occur because, for example, several projects of the same type are being developed in close spatial or temporal proximity.

The overall objective of the CIA process for the TAP project is to identify and, where possible, eliminate or minimise any adverse environmental or socio-economic impacts arising from project activities and to incorporate mitigations into the project.

The project approach to CIA is based on the international best practice provided by the European Bank for Reconstruction and Development Performance Requirements (2014), the European Investment Bank Environmental and Social Handbook (2013) and the International Finance Corporation (IFC) Performance Standards (2012) and their associated guidance.

In particular, this report has adopted the six-step CIA approach defined in the IFC Good Practice Handbook: Cumulative Impact Assessment and Management: Guidance for the Private Sector in Emerging Markets (August 2013).

0.3.2 Valued environmental and social components (VECs)

Central to the IFC approach is the concept of valued environmental and social components (VECs). The IFC Good Practice Handbook (2013) defines VECs as "environmental and social attributes that are considered to be important in assessing risks; they may be:

- physical features, habitats, wildlife populations (e.g., biodiversity),
- ecosystem services,
- natural processes (e.g., water and nutrient cycles, microclimate),
- social conditions (e.g., health, economics), or
- cultural aspects (e.g., traditional spiritual ceremonies)."

0.3.3 The IFC six-step approach to CIA

Figure 0.2 below explains the IFC six-step approach to CIA, which is an iterative process consisting of the following steps:

- steps 1 and 2: scoping. Key activities in the scoping phase include identifying the temporal and spatial boundaries of the CIA, identifying sources of cumulative impacts, and identifying and prioritising the VECs
- step 3: VEC baseline, describing why the VEC was identified as a priority VEC, the spatial extent and temporal extent of the potential impacts on it, its existing condition, sensitivity to change, resilience/recovery time, existing stressors and trend in condition
- step 4: assessment of the contribution of the project to the predicted cumulative impacts arising from interactions between the sources of cumulative impact and the priority VECs
- step 5: evaluation of the significance of predicted cumulative impacts to the viability/sustainability of the affected VECs
- step 6: design and implementation of mitigation measures to manage the project's contribution to the predicted cumulative impacts. This includes not only management of impacts where TAP has control, but also consultation and liaison with third parties where impacts are outside of direct TAP control.

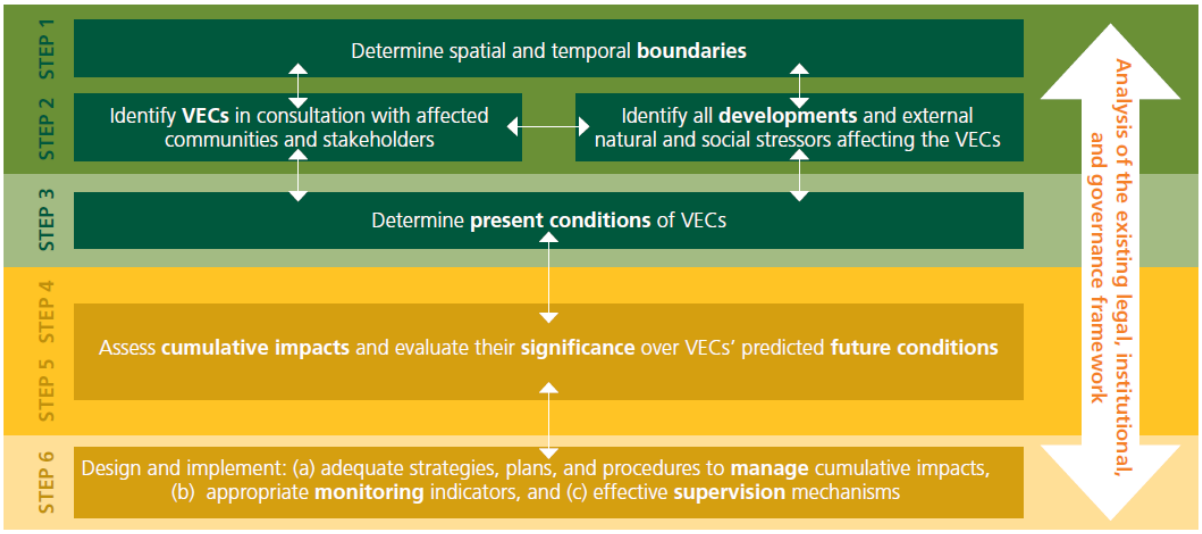

Figure 0.2: IFC six-step approach to CIA

0.4 Project overview

A clear description of the project in its entirety across all three countries (Greece, Albania and Italy) is necessary to provide the details of the project elements to which the CIA is to be applied. Having completed separate ESIAs and associated amendments in all three countries encompassed by the TAP project, all of which have received regulatory approval, the project overview provides a macro-level description of the entire TAP development within the region, as well as the TAP associated facilities both upstream and downstream and those that are required to support the construction phase in-country.

0.4.1 Routeing alternatives

0.4.1.1 Approach to route selection

The pipeline follows a carefully selected route that is designed to minimise risk by avoiding, as far as engineering and construction constraints allow, densely populated and environmentally and culturally sensitive areas and by ensuring that it runs through the shortest and shallowest offshore route.

TAP route selection has been an iterative process, with an increasing focus and level of detail, starting with a 50 km corridor, gradually narrowing to eventually defining a 38-m-wide construction corridor for Greece and Albania and 18 m for Italy, please refer to the TAP Routing Report (TAP, 2017) for further details. Upon selection of the preferred route (or base case), a route verification process commenced with the aim of assessing local re-routings through sections that presented greater geo-technical, environmental, socioeconomic and cultural heritage challenges.

TAP evaluated prospective alternatives using a set of criteria to determine their technical, environmental and socio-economic viability. Identification of the proposed route corridor was based on engineering constraints, land ownership constraints, environmental features and health and safety considerations, such as

- population centres and proposed future development
- engineering considerations such as roads, overhead cables, rivers, railways and other major pipelines
- construction issues such as side slopes and difficult ground conditions arising from geology, hydrology and soils of the area
- mineral extraction and known areas of landfill or contamination
- landscape and topography
- nature conservation, including designated areas and protected species
- archaeology
- the shortest distance, bearing in mind the above considerations.

0.4.1.2 TAP route selection process

In Greece, TAP has made every effort to closely parallel the existing DESFA gas pipeline to minimise the environmental and socioeconomic impacts. Where significant deviations from the DESFA route occur, these have been required in order to reduce the impact of the project, such as the section in Philippi Plain which avoided the peat area on the basis of stakeholder concerns. Specific technical difficulties (construction space, slope instabilities etc.) close to the DESFA pipeline were also considered during route selection. Other significant constraints included protected areas and areas with high density of known cultural heritage. The location of compressor station CS00 was selected on the basis of operational advantages, minimisation of flooding risks and air dispersion to minimise impacts on air quality.

In Albania, several onshore corridors and the Adriatic Sea landfall locations were considered. Among additional factors taken into account during route selection were impacts on tourism and avoidance of licensed quarry mining land, geohazard areas and areas polluted with crude oil from the Patos Marinza oil field.

In Italy, key constraints to landfall and pipeline route selection were defined by the presence of geomorphological risk presented by the potential instability of the sea cliffs, and the extent of the landscape protection area in the vicinity of the pipeline receiving terminal (PRT). Additionally, the landfall microtunnel was determined to minimise the interference with offshore and coastal ecosystems.

For the offshore route alternatives across the Adriatic Sea, the landfall locations in both Italy and Albania had the greatest influence on the offshore corridor, as these determined the start and end points. One main constraint to offshore routing was the large amount of the Second World War unexploded ordnance disposed of on the seabed. Another key constraint was slope stability on the Albanian side between the continental shelf and the abyssal plain. Extensive offshore survey work allowed selection of the most appropriate route through the Adriatic Sea.

The “base case” pipeline route and subsequent re-routing, and the location of compressor stations and PRT was selected following input from stakeholder engagement.

0.4.1.3 TAP base case route

As described above, TAP AG performed an extensive and thorough route alternatives appraisal to select a technically feasible pipeline route with the smallest environmental, socio-economic and cultural heritage effects. The project description compiled in this report provides the most up-to-date overview of the route selection history in each project country and defines the current TAP base case route (shown on Figure 0.3).

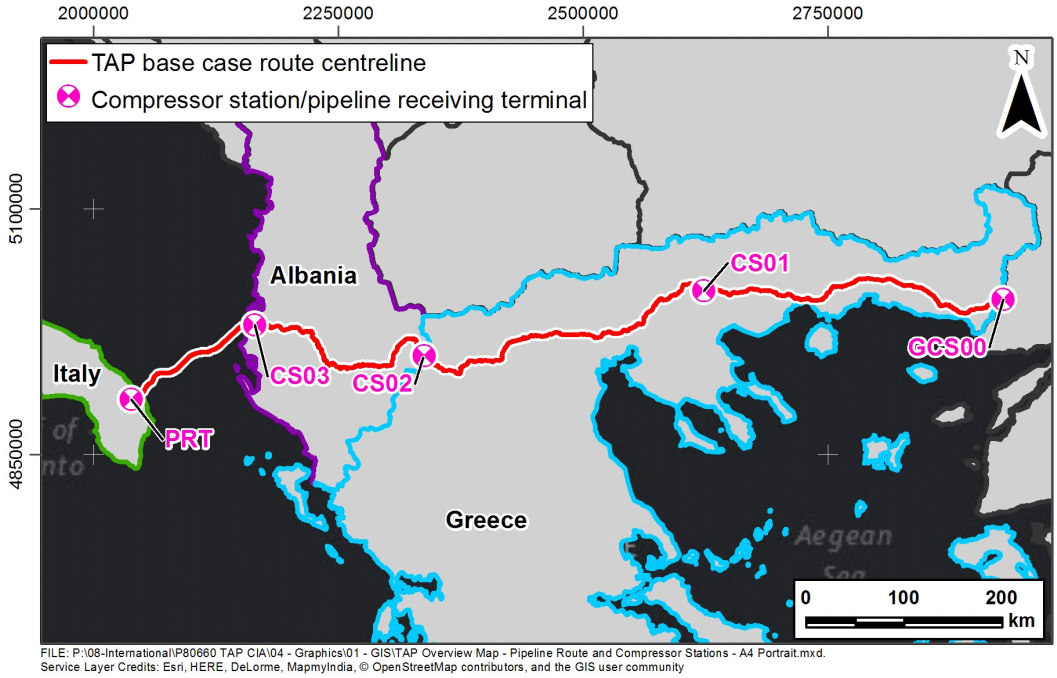

Figure 0.3: TAP route and facilities overview

0.4.2 Project description

0.4.2.1 The pipeline

The pipeline's initial design capacity is 10 billion cubic metres per annum (bcma), expandable to 20 bcma through additional compression. The pipeline will span 773 km onshore (550 km in Greece, 215 km in Albania and 8 km in Italy) and 105 km offshore; the onshore section of pipeline will be underground.

The pipeline will be formed of continuously welded, high-grade carbon steel and have an outside diameter of 48 inches (1220 mm) from its entry point in Greece up to the compressor station near Fier in Albania (CS03). Afterwards, the pipeline's diameter will reduce to 36 inches (915 mm) over the remaining 6 km onshore portion in Albania, as well as the offshore section and Italian onshore section.

The design pressure of TAP will be 95.5 barg from the TANAP/TAP connection to Kipoi compressor station (CS00); 95 barg through Greece and the majority of onshore Albania; and 145 barg throughout offshore and onshore Italy. The buried pipeline will be designed for a maximum design temperature range between −12°C and 60°C.

The pipeline is designed for a technical life of 50 years. Based on international pipeline industry experience, the actual lifetime could be significantly longer.

0.4.2.2 Facilities

In addition to the pipeline, the TAP project comprises the following onshore components:

- two compressor stations: one in Kipoi, Greece (CS00) and one at the start of the offshore section close to Fier on the Albanian coast (CS03)
- a metering and pigging station at the border between Greece and Albania on the Albanian side (CS02), which will be converted to a compressor station as part of the 20 bcma phase
- a pigging station near Serres in Greece (CS01 which can also act as a block valve); the facility will be converted to a compressor station as part of the 20 bcma phase
- a pipeline receiving terminal (PRT) near Lecce in Italy
- thirty 48-in. onshore block valve stations (BVS) in Greece and Albania and two 36-in. onshore BVS on either side of the Adriatic Sea
- a fibre-optic cable running parallel to the entire pipeline system from CS00 to PRT.

0.4.2.3 Land requirements

Land will be required both temporarily and permanently for the project. The project will affect approximately 22,500 plots of land: 10,500 in Greece, 11,800 in Albania and 200 in Italy. It will also affect approximately 45,000 landowners and users.

Temporary access to approximately 4,000ha of land will be needed for the pipeline strip, access roads, construction camps and pipe yards. After use for construction, most sites will be restored to their original condition.

Permanent land take by TAP is estimated at up to 450ha to accommodate access roads, 32 block valve stations, four compressor stations and one pipeline receiving terminal (PRT).

0.4.2.4 Construction

Construction will be broken down into manageable sections, called spreads. Before construction, the pipeline route will be surveyed and the centreline will be marked out. Environmental and archaeological specialists will accompany the construction survey crews to clearly mark sensitive environmental and archaeological sites. The pipeline construction corridor will be cleared and levelled. Topsoil will be stored on the side of the corridor, separately from subsoil to prevent mixing and preserve seed stock.

The pipeline trench will be excavated to a depth of about 2 m allowing the pipeline to be buried with a minimum depth of cover of 1 m. Deeper burial may be required at river, road, rail and other crossings.

The pipeline will be constructed from 12–18-m-long sections of steel pipe, which will be transported by trucks from pipe storage yards to the construction spread and laid end-to-end alongside the trench. The individual sections of pipe will be welded together to

form the pipeline. Protective coating will be applied and tested to ensure adequate corrosion protection. The welded pipeline will be lowered into the trench, after which the trench will be back filled.

After completion of backfill, the restoration operation will begin. Reinstatement will include erosion control measures and revegetation.

The integrity of the pipeline will be tested by filling discrete sections (up to 20 km long) with water and increasing the pressure to identify any potential leaks.

The landfall in Italy will be constructed using 'micro-tunneling' technology. Micro-tunneling is a process that uses a remotely controlled tunnel boring machine combined with a 'pipe-jacking' technique to install concrete tunnel sections (jacking pipes). The micro-tunnel allows the installation of the pipeline without the need to excavate an open trench.

The offshore pipeline installation will be carried out after completion of the landfall micro-tunnel in Italy. This will be a sequential pipe construction and installation process undertaken from a pipe laying vessel or barge.

The integrity of the offshore pipeline will also be tested.

0.4.2.5 Operation and maintenance

The pipeline has been designed to require minimal operational and maintenance intervention both onshore and offshore. Operating of the pipeline will consist of ensuring continuous, reliable and safe gas delivery in line with current best practice in the pipeline industry. Planned maintenance and inspection programmes will be implemented using an appropriate combination of modern management practices, condition assessment methods, information technology and innovative engineering technical analyses with the aim of managing risks associated with long-term plant and equipment operations.

0.4.2.6 Decommissioning

At the end of its nominal lifetime (at least 50 years), the pipeline and associated facilities will be decommissioned. It cannot be foreseen today which decommissioning approaches will be taken at the time of decommissioning, but TAP AG is committed that they will be state-of-the-art at the time when it occurs. A Pipeline Abandonment Plan (PAP) will be developed and submitted to authorities and stakeholder consultation will be conducted.

0.4.2.7 TAP associated facilities

The CIA has adopted the IFC definition of associated facilities, defined as those facilities that

- are not funded or part of the project
- would not have been constructed or expanded if the project did not exist and the project either relies on or exists because of the associated facilities or without which the project would not be viable, or
- may be influenced directly or indirectly by the project.

TAP associated facilities are summarised in Table 0.1 below.

Table 0.1: TAP associated facilities

Associated facility category	Applicable projects
Upstream and downstream associated facilities	Shah Deniz 2 project South Caucasus Pipeline Expansion Project (SCPX) Trans Anatolian Natural Gas Pipeline (TANAP) Snam Rete Gas (SRG)–TAP interconnector
Interconnectors	Interconnector Greece–Bulgaria (IGB) Ionian Adriatic Pipeline (IAP)
Regional/local distribution	Connections to DESFA from TAP Greece Hot water pipeline from CS00 to the municipality of Alexandroupoli Connections to Albanian gas network from TAP
In-country construction and operation phase AFs	New access roads (109.1 km) and upgraded access roads (47.5 km), including 52 bridge upgrades and 2 new bridges, built to access the working strip and facilities for construction Third-party-operated aggregate extraction sites Third party operated concrete batch plants Third party operated waste disposal sites

0.5 TAP area of influence

Correctly defining the project's AOI is an important part of defining the CIA's scope. The AOI was reviewed as part of the task of creating an overarching project description covering all three countries crossed by the TAP project.

0.5.1 Spatial area of influence

The spatial area of influence (AOI) is the geographical area impacted by the project, the project's associated facilities and cumulative impacts. TAP project area of influence (AOI) was defined as the spatial area impacted, positively and negatively, by:

- the project, including
  - activities and facilities owned, operated and managed by TAP (except for any new project elements owned or managed by TAP that have been identified since the original ESIAs were prepared)
  - supporting or enabling activities, assets or facilities owned or controlled by parties (such as contractors) contracted to construct or operate the project (not covered by the ESIAs)
  - unplanned but predictable developments
  - indirect impacts
- the project's associated facilities (not covered by the ESIAs)
- cumulative impacts, as defined on the basis of the valued environmental and social components (VECs) impacted by the project and the associated facilities

(partially covered by the ESIA but not necessarily using a VEC-based approach).

This project overview and CIA document considered the full definition of the spatial extent of the TAP project AOI as defined above and filled in the gaps in the existing TAP ESIAs.

0.5.2 Temporal area of influence

The temporal AOI is the timescale over which a project is likely to have impacts. In order to define the temporal extent of the CIA, VECs are described based on whether they can be impacted by construction, operational or decommissioning activities. The temporal boundaries of the CIA are also limited by the extent of current knowledge of other sources of cumulative impact, particularly non-project related activities.

0.6 Sources of cumulative impacts

A source of potential cumulative impact (SCI) is something that affects the condition of the TAP VEC. Information on the potential SCIs was sought in a wide area: within 20 km each side of TAP route onshore and 50 km each side of TAP route offshore. Information was gathered from a variety of sources, including stakeholder engagement. The following SCIs were scoped in for the cumulative impact assessment:

- current third-party projects:
  - the operational DESFA gas pipeline, which shares TAP corridor for some 230 km in Greece
  - Egnatia motorway and connecting national roads in Greece
  - existing wind farms in Greece
  - operational Patos Marinza oil field in Albania
- associated facilities described in Table 0.1
- reasonably defined or foreseeable third-party projects: 17 projects in Greece, 9 projects in Albania, and 11 projects in Italy. These include various developments, such as photovoltaic stations, wind farms, hydropower plants and irrigation dams, roads and other types of projects[1].
- developments or activities induced by TAP, e.g. due to improved access to remote areas and rivers following an access road construction.

In respect of current and reasonably defined or foreseeable third-party projects, information was requested for projects applying for environmental or planning permits, and those granted environmental or planning permits since the TAP ESIAs were prepared. Emphasis was placed on those projects large enough to require an EIA/ESIA. Projects included those that have been built or are under construction since the ESIAs were prepared.

Potential sources of cumulative impact were then mapped and assessed to identify if their impacts could impact a VEC identified for the TAP project. Where both the TAP

[1] Information correct on writing of the CIA Report – September 2016.

project and a potential source impacted the TAP VEC, the source was considered a cumulative impact source and carried forward to the impact assessment.

To assist in this process, the following broad categories of types of third-party projects likely to have similar impacts/characteristics compared to TAP or to impact on TAP VECs (rural location, linear projects) were identified, and projects screened into these categories:

- other linear projects
  - pipelines
  - roads
  - power lines
- other energy projects
- projects affecting watercourses, for example hydropower projects and irrigation schemes
- major urban expansion plans
- other major projects likely to have a rural location.

Projects were assessed for potential impacts and those that did not fall into the above categories and most importantly did not pose a risk of potential cumulative impacts with TAP were screened out of the CIA.

In addition to the above formal developments, other sources of human and natural stress on the TAP VECs were also identified, as these can contribute to the overall cumulative impact. Some common threats across the three countries are habitat loss and fragmentation due to several factors such as industrial development, urbanisation, hunting, fishing, soil erosion, energy and mining, transport and tourism. The main barriers for effective improvement include financial constraints and poor law enforcement. The other sources of human and natural stress identified were used to complement the discussion on individual stresses on the TAP VECs.

0.7 VEC selection and prioritisation

In accordance with the IFC Good Practice Handbook, the following initial criteria for the identification of VECs were defined:

- identified as important and/or sensitive in the TAP ESIAs
- identified as important by international, national, scientific community, i.e. meeting the IFC criterion that a VEC should be recognised as important on the basis of scientific concern
- identified as important or sensitive by stakeholders.

In order to prepare preliminary lists of VECs, the baseline information on receptors in the TAP ESIAs was reviewed along with the TAP stakeholder database on stakeholder concerns.

The exception was the ecological VECs. At this initial stage, broad categories/groups of potential ecological VECs, rather than individual VECs were identified. Further work subsequently identified all the individual VECs within these categories (such as all the protected areas and all individual areas of critical habitat).

The list of potential VECs identified at this stage was very large. Therefore, some limited initial screening out of VECs was undertaken, where the residual impact of TAP on the VEC was insignificant or fully mitigated in accordance with the following paragraph from Section 4.1, Appendix 3 of the Good Practice Handbook: "VECs for which an impact was deemed insignificant in the ESIA are not to be included in the CIA".

Following the IFC guidelines, the boundaries of the CIA were defined by the spatial extent of the TAP VECs. The boundaries of assessment encompass the geographic and temporal extent of impacts that influence VEC condition, extending beyond a project's direct area of influence to the point at which the VEC is no longer affected significantly. There is a close correlation between receptors, as defined in the ESIAs, and VECs. However, where needed, the spatial area was expanded as per the IFC guidance.

Preliminary VECs were identified within five broad themes: terrestrial biodiversity, marine biodiversity, physical environment VECs, cultural heritage including archaeology and social VECs.

The lists of preliminary VECs were presented at workshops with stakeholders in Greece and Albania, to obtain stakeholder feedback, and at a meeting with the Ministry of Environment in Italy. Stakeholders were identified from the ESIAs and were persons, groups, institutions or communities who may be affected by the CIA, or have an interest in it, as well as those who may affect the outcomes of the CIA process. Stakeholders were asked to complete a questionnaire that asked them to

- comment on the choice of VECs
- identify any VECs that should be screened in on the basis of regional concern
- identify VECs that could be screened out as of no real concern, i.e. good condition, common, widespread, generic or unlikely to be affected significantly by cumulative impacts.

Feedback was received from a variety of stakeholders, which included representatives of the governmental departments, academia, NGOs and independent experts.

Further opportunities were also taken to screen out those of less concern/importance (e.g. because the baseline condition is robust) or cumulative impacts considered unlikely. In addition, and in particular for the social VECs, some VECs sharing similar characteristics were grouped together.

In order to prepare the more detailed list of ecological VECs the following actions were taken:

- critical habitat assessments were undertaken and any related discrete management units (DMUs) defined. Each DMU became the basis of the equivalent VEC – the CIA therefore reflects the results of the parallel critical habitat assessment report completed for the TAP project (RSK, 2017).
- screening of protected or designated areas not crossed by the pipeline in/out of the CIA was undertaken considering whether
    - the habitat/feature for which the site is designated is connected to the working area

  - mobile species for which the protected area is designated could also be present on the pipeline or their normal behaviour affected by pipeline works.
- where there are several overlapping designations for protected/designated areas the sites were grouped together, as a single VEC, for the purpose of description and assessment of cumulative impacts. The VEC boundary incorporates all of the protected areas in that group.
- information received from the range of post ESIA ecological surveys undertaken was reviewed and used to inform the selection and mapping of VECs, for example:
  - wildlife corridors for large carnivores were reviewed based on the results of recent survey reports
  - information was used to inform the identification and mapping of critical habitat, for example surveys for otters and fish were used to assist in the identification of river corridors as critical habitats.

Once the tasks outlined above had been completed, priority VECs (summarised in Table 0.2 below) were identified on the basis of their importance (including the ecosystem services values associated with the VEC), existing concerns and/or likelihood of significant cumulative impacts. These priority VECs were then analysed in detail in the context of potential cumulative impact from TAP and other developments.

Table 0.2: Summarised priority VECs

VEC category/title	VEC title/description
Terrestrial biodiversity	
Protected and designated areas	Protected/designated ecological sites or groups[2] of designated sites in Greece (25 sites), Albania (9 sites) and Italy (3 sites) – these included key biodiversity areas in Albania. A list of the protected/designated areas is presented in the TAP Critical Habitats Assessment, Appendix 5 (RSK, 2017).
Critical habitat	Brown bear
	Golden jackal
	Wildcat
	Birds (7 species)
	Vascular plants (8 species)
	Amphibians (3 species – Macedonian crested newt, fire-bellied toad, Albanian pool frog)

[2] Many areas in all three countries have several different designations. Where this is the case, the various areas have been grouped together and given a group name for the purposes of the CIA. For example, the Le Cesine group includes seven different designated areas.

VEC category/title	VEC title/description
	Reptile (1 species – four-line snake)
	Freshwater invertebrate (Thick-shelled mussel)
	Bats (2 major bat roosts)
	91E0 Alluvial Forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion Incanae, Salicion Albae*)
	3170 Mediterranean temporary ponds
	6220 Pseudo-steppe with grasses and annuals of the Thero-Brachypodietea
	7210 Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* with 3170 Mediterranean temporary ponds
	9110 *Luzulo fagetum* beech forests
	9540 Mediterranean pine forests with endemic Mesogean pines
	River corridors (44 rivers and streams for otter and 9 freshwater fish species including European eels)
	Evolutionary Processes (2 DMUs)
Wildlife corridors	Wildlife corridors (13), primarily identified on their use by wolves and bears
EU priority habitat	9530 (sub-) Mediterranean pine forests with endemic black pine
	2270 Wooded dunes with *Pinus pinea* and/or *Pinus pinaster*
Priority biodiversity features	Grey wolf; 30 EU Annex 1 habitats and Greek protected habitats
Marine biodiversity	
Critical habitat	Loggerhead turtle
Priority biodiversity features	Turtles
	Marine mammals
	Marine fish and shellfish
Physical environment and landscape	
Landscapes	Landscapes (34 areas) identified as high or medium value in the ESIAs
Groundwater	Aquifers or vulnerable groundwater used for abstraction

VEC category/title	VEC title/description
Surface water	Key watercourses (33 rivers) used for abstraction and/or providing other important ecosystem services
Soils	Areas of high-value soils and soils sensitive to erosion or compaction
Airsheds	Air quality in respect of emissions from the compressor stations
Cultural heritage	
Archaeology	Archaeological sites (8)
Intangible cultural heritage (ICH)	ICH sites whose setting, touristic or other value could potentially be affected
Socio-economic and health	
Employment and economic development	Active population (in particular those near the construction camps)
Skills development	Active population
Road accessibility	Isolated villages in Skrapar District (Albania)
Community health	Population near the construction camps, access routes and other project activities
Social cohesion and community well being	Settlements near the pipeline and construction camps/pipeline receiving terminal
Land and farming livelihoods	Farmers and landowners affected by permanent loss of agricultural land and crops and those renting land
Tourism livelihoods	Businesses
Traffic and road safety	Road users

0.8 Priority VEC description

In order to understand how TAP and other developments can cumulatively affect the priority VECs, each priority VEC was described in terms of its baseline condition. For each VEC, this involved describing:

- reason why identified as a priority VEC: these include biodiversity and conservation value of the VEC, its designated or legally protected status, its ecosystem services, or importance to the stakeholders
- spatial extent of the VEC: this is the actual extent of the VEC, e.g. the boundary of the designated area. The spatial extent of the VEC extends beyond the TAP area of influence, often many kilometres away or in some cases transboundary.

- temporal extent of the VEC, i.e. whether affected mostly by the construction of TAP or also during operation or decommissioning. This varies between the VECs. Most of the VECs will be affected during construction activities. For some VECs, the duration of the impact is anticipated to be the same as the duration of the activity causing it, whereas for others the impact may continue to affect the condition of the VEC throughout operation of the pipeline, e.g. along the pipeline protection strip where deep routed trees will not be allowed to establish
- existing condition of the VEC including the ecosystem services associated with the VEC: the existing condition of the VECs varied greatly, from poor to good. It was evident that many VECs are currently under significant anthropogenic pressure, including habitat loss and fragmentation, deforestation, fishing, poor agricultural and waste management practices, and industrialisation of natural areas. Several ongoing issues affecting social VECs were also highlighted, for example, the current economic downturn.
- sensitivity of the VEC to change and its resilience/recovery time: for each individual VEC, this depends on the characteristics of the VEC and the nature of the impact, whereas recovery time depends on the severity of the impact.
- trend in the condition of the VEC, identifying any important other non-TAP related stressors/stresses that may be affecting the VEC. Long-term trends were often difficult to identify due to the limited availability of monitoring data. Nevertheless, the existing stressors are likely to persist in the future due to continuing economic development and intensification of industrial and agricultural processes in the project countries. Socio-economic VECs demonstrate various trends, where improvement is ongoing due to the state investment programmes, while the economic crisis and migration negatively affect some of the social VECs.

0.9 Cumulative impact assessment

The cumulative impact assessment involved

- identifying interactions between the sources of cumulative impact (SCIs) and the priority VECs
- predicting the nature of the cumulative impact on the priority VECs
- determining the significance of the cumulative impact.

Impacts that would occur regardless of the presence of TAP are not scoped into this report in accordance with IFC guidance note (GN) 41, which states that the CIA should exclude potential impacts that would occur without the project or independently of the project. However, other natural and human stresses affecting VECs are taken into account.

The impacts of the TAP project alone, when added to past activities and other human or natural stresses that have impacted on the existing condition of a VEC, are considered in the TAP ESIAs and not repeated in this CIA. The scope of the CIA is confined to understanding the cumulative impacts of TAP when considered with the SCI.

For there to be an interaction, the TAP VEC must share part or all of the same area that is affected by the SCI and the impact of TAP and the SCI must occur in the same timescale, i.e. the CIA is restricted to the assessment of impacts on VECs shared by TAP and the SCI.

Decommissioning impacts cannot be realistically defined at this stage so were not assessed in this CIA. TAP will prepare detailed plans and undertake an impact assessment in advance of decommissioning.

The CIA aims to understand whether the condition of the VEC is likely to

- be pushed over an important threshold
- suffer an important change in condition, or
- become unsustainable or unviable.

The main aim of the CIA is to understand whether the TAP project plays an important role, is a significant contributor to the change in the condition of the VEC and the ecosystem services values associated with it or is only a minor contributing factor.

For each VEC, a CIA was carried out as described below:

1. The nature/type, timing and spatial extent of the cumulative impact on the TAP VEC was described.
2. A description of the change to the condition of the VEC caused by
   - TAP
   - the other SCIs(s) (associated facilities and/ or third-party project and/or induced development)

   on the condition of the VEC (i.e. including past and existing activities and other human and natural stresses) was undertaken.

The change caused by TAP was based on the predicted residual impact in the TAP ESIAs. The change caused by the other SCIs was based on their residual impacts if this information was available from their respective ESIAs or based on professional judgement if not.

An assessment was then made as to whether the condition of the VEC (including any ecosystem services values associated with it) was likely to pass over the threshold value or outside the limits of acceptable change in its condition, and if so what were the key contributory factors: TAP, the SCIs(s) or the past/existing activities and other natural and human stresses affecting the SCI.

The potential for transboundary cumulative impacts has been considered throughout.

Key cumulative impacts are summarised in Table 0.4. No major cumulative impacts were identified. The cumulative impacts are assessed without the additional mitigation described in Section 0

Management and monitoring strategies below, as some of the proposed mitigation involves liaising and developing strategies with third parties and is therefore at present uncertain in terms of outcome. However, it is felt that in most cases, if not all, implementation of proposed mitigation measures should ensure cumulative impacts are minor or not significant.

0.10 Greenhouse gas emissions

Owing to the unique nature of the impact of greenhouse gases (GHGs) associated with climate change, a different manner to the other types of impact assessed in this

cumulative impact assessment has been adopted. Every source of GHG emissions is a source of cumulative impact and ultimately a contributor to the same impact, on the same VEC. This is because the climatic impact of a specific GHG emission cannot be quantified or isolated from other emissions that occur worldwide and are effectively all sources of cumulative impact.

As TAP is part of an integrated energy chain (the Southern Gas Corridor), TAP's construction and operational emissions have been quantified and compared with those of other gas corridor component projects, the emissions that will be created by the gas end use, and selected national inventories. Consideration has been given to the effects that TAP may have in changing the regional energy mix and the enablement of more efficient technologies. This has only been considered in qualitative terms at this stage.

TAP's annual GHG emission in transporting 10 bcma of gas is approximately 355 thousand tonnes of CO2 equivalent. However, if a significant proportion of the gas delivered to Europe replaces more carbon-intensive fuels such as coal or oil in its end markets, a significant overall reduction in GHG emissions would be likely. The table below provides an indicative comparison of GHG emissions,

Table 0.3: Indicative GHG emission comparison

Gas burnt	Energy/power produced (GWh / GW continuous equivalent over a year)	CO2 emitted from thermal power plant based on 0.4t CO2/MWh (million tonnes)	CO2 emitted from coal power plant based on 0.9t CO2/MWh (million tonnes)
10 bcm	45,700 / 5.22	18.28	41.13
		= 0.4t CO2/MWh	= 0.9t CO2/MWh

During the planning, design and pre-operations phase, TAP has selected configurations of equipment, operating philosophies and practices to reduce GHG emissions in accordance with the principle of best available techniques (BAT).

GHG emissions will be quantified and reported annually in accordance with Performance Requirement (PR) 3 separately.

0.11 Transboundary cumulative impacts

The potential for transboundary cumulative impacts has been considered throughout the CIA. VECs that had a transboundary element were specifically highlighted during VEC identification and prioritisation. They are listed below.

Protected and designated areas

- Prespa Transboundary Protected Area - no identified sources of cumulative impact with TAP

Wildlife corridors

- Greek–Albania Border

Critical habitat

- Brown bear
- Golden jackal
- River corridor: Evros/Provatonas Channel
- Several bird species

Priority biodiversity feature (PBF)

- Grey wolf

Air quality

- Air shed of Greek compressor station GCS00
- Air shed of Albania compressor station ACS02

Potential interactions between sources of cumulative impact and the VECs are specifically highlighted. The main transboundary impacts are summarised below:

- Greek–Albania Border wildlife corridor - significant cumulative impacts from the VA 45 motorway and TAP with the Greek Albania wildlife corridor. These impacts were identified and assessed as part of the area of critical habitat for bear and important habitat for wolf discussed above, as the VECs overlapped. In addition, the potential for cumulative impacts with two wind farms within the wildlife corridor was also assessed and no significant cumulative impact identified.
- Golden jackal - impacts on golden jackals in the Evros area of TAP and TANAP: Given the swimming ability of the species, jackals may cross the Evros River, which is the natural border between Greece and Turkey, and move between the two countries according to food availability, weather conditions and land cover, so crossing over into the area affected by TANAP. However, significant cumulative change to the condition of golden jackals in the area was judged unlikely. The river will be crossed using HDD, and TAP has existing measures in place to reduce impacts on golden jackal at the river crossing and in the adjacent area.
- Evros River Corridor - impacts of hydrostatic testing by both TAP and TANAP at the Evros River: This could be a potentially significant cumulative impact and coordination is recommended in Table 0.4.
- Critical habitat and PBF - an area of critical habitat for brown bear and important habitat for grey wolf in the Kastoria mountains in Greece extending across the border into the Bilisht area of Albania. Potentially significant impacts as a result of fragmentation of habitat, mainly caused by the new VA 45 motorway, have been identified.
- Air quality - transboundary elements to the cumulative impact assessment for the air sheds for Greek compressor station GCS00 and Albania compressor station ACS02. However, on assessment, cumulative impacts on air quality were not found to be significant.

No transboundary cumulative impacts were identified on the marine environment.

0.12 Management and monitoring strategies

The management and monitoring strategies in this CIA use the mitigation hierarchy and are designed to address the significant cumulative impacts between the TAP project, its associated facilities and third-party projects on the selected priority VECs.

A distinction needs to be drawn between management of significant cumulative impacts associated with the project (where it can be generally expected that TAP has a large degree of control over mitigation/management) and management/control over impacts outside TAP control (because other projects are the main cause of the cumulative impact). In the latter case, the extent to which TAP can influence the actions taken by the proponents of other projects will depend on the extent of any leverage that TAP has to influence the other proponents, if any.

Figure 0.4 is taken from the IFC Good Practice Handbook to illustrate this difference. It suggests how management/mitigation should proceed ideally, depending on whether the project has control or can exercise leverage to achieve optimal cumulative impact management.

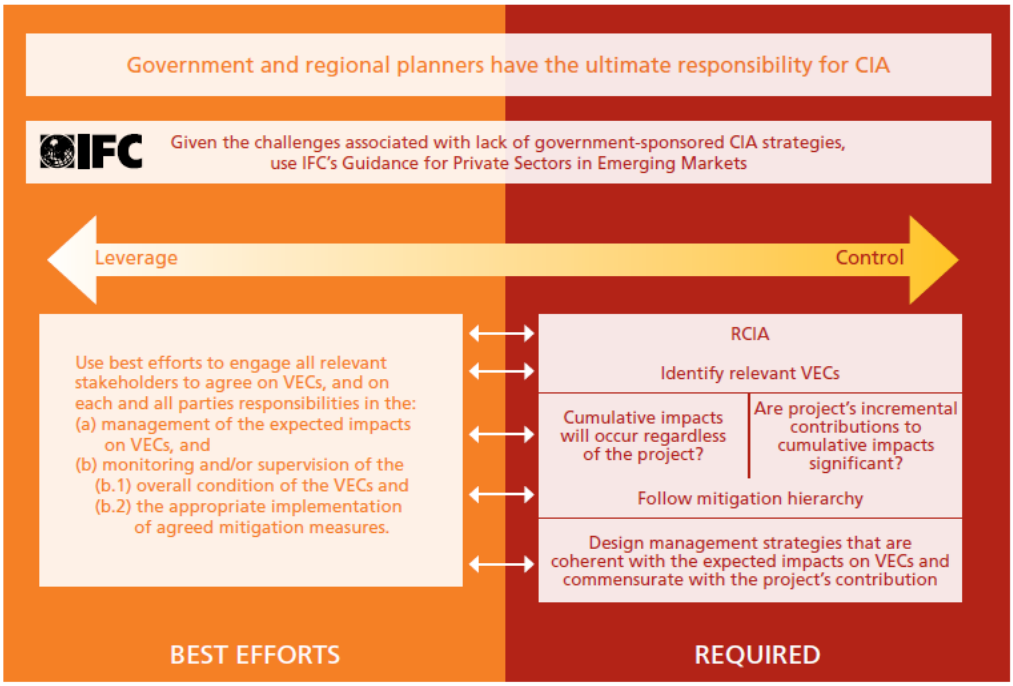

Figure 0.4: IFC guidance on responsibility for management and mitigation of cumulative impacts[3]

Many of TAP's mitigation measures identified during the ESIA will also be applicable to the mitigation of cumulative impacts or will have already reduced TAP's contribution to a potential cumulative impact to a minimum. However, it is recognised that the cumulative impacts assessment may generate additional mitigation measures and/or

[3] IFC Good Practice Handbook, Figure 2

strategic/long-term actions, for example, the need to share findings and cooperate with third parties such as future developers and authorities.

TAP has an existing construction-phase management and monitoring system in the form of its environmental, social and cultural heritage (ESCH) management system. The ESCH management system includes all relevant construction-phase commitments and mitigation measures from the three host-country TAP ESIAs; these are continuously monitored for effectiveness and modified as needed.

The cumulative impacts identified are already being managed adequately by TAP with the application of industry best practice mitigation measures as described in plans within the ESCH management system. In many cases, additional commitments, over and above best practice have already been identified by TAP to manage specific TAP impacts. These are also often sufficient to manage related potential cumulative impacts.

The CIA summarises the additional management and monitoring strategies that will be implemented as a result of this assessment to reduce the potential cumulative impact on the priority VECs identified.

Table 0.4 presents the key material residual cumulative impacts which require additional mitigation measures over and above those described in the existing TAP ESCH management system. The table also summarises planned collaboration, management and monitoring with SCI developers and operators (including up and downstream associated facilities) and/or government agencies, which, if successful, will further reduce potential cumulative impacts.

The sites or areas in Table 0.4 will be added to the project's Route Social Impact Registers (RSIR) and Route Environmental Impact Registers (REIR) to ensure that actions are tracked to completion. In addition, an assessment will be carried out to identify and consult any project affected persons affected by cumulative impacts.

Table 0.4: Key residual cumulative impacts and their mitigation measures

Key cumulative impacts		Mitigation measures	Location where mitigation measures are documented
Beneficial impacts			
Socio-economic and health	Cumulative impact on employment, economic development and skills development due to job creation, contribution to GDP and training by TAP and other construction projects.	N/A	N/A
Adverse impacts			
Marine biodiversity	No cumulative impacts identified.		
Terrestrial biodiversity	Cumulative impact on Agios Timotheos–Kioupia protected area and Kavala Mountains wildlife corridor from TAP and DESFA	When TAP reviews the detailed biorestoration plans, particular account will be taken for the need to achieve the preferred condition for the Agios Timotheos–Koupia protected area. TAP will promote the avoidance of seeding with a commercial mix, and the addition of nutrient-rich topsoil in order to allow natural regeneration of the shallow soils over the calcareous rocks that support much of the important wildlife in the protected area.	REIR
	Cumulative impact on the South Evros Forest critical habitat for birds and Mediterranean Pine Forest critical habitat from TAP, DESFA and wind farms.	TAP will discuss potential opportunities with the wind farm operators (GR131, 132, 133, 135 and 137) to share environmental and social data, develop and implement joint monitoring strategies for birds, and any further mitigation measures will be identified, as appropriate.	REIR
	Cumulative impacts on the wildlife corridor functions of the Loutros	TAP will discuss the feasibility with DESFA of planting oriental plane (*Platanus orientalis*) trees between the	REIR

Key cumulative impacts		Mitigation measures	Location where mitigation measures are documented
	tributary river corridor from TAP and DESFA river crossings associated with vegetation clearance and modification of river banks.	DESFA and TAP PPSs in the Loutros tributary river corridor, and undertake the planting as agreed and where appropriate.	
	Cumulative impact on bats in the National Park of Lakes Koroneia–Volvi due to habitat fragmentation by TAP, DESFA and the Lagada–Filipon power transmission line corridors.	1. Restoration priority will be given the wooded corridors impacted by TAP in the National Park of Lakes Koroneia–Volvi that lead to potential crossing points of the Egnatia highway and areas around the Lagada–Filipon power transmission line (KP329–330). 2. TAP will engage the developers of the Lagada–Filipon power transmission line to form a collaborative relationship so that information can be shared on bat mitigation measures.	REIR
	Cumulative impact on the Strymonas river corridor from TAP and VA 60 motorway if hydrotesting of TAP coincides with certain construction activities for the VA 60 motorway.	TAP will liaise with Egnatia Odos AE (the developers of the VA 60 motorway) to ensure adequate coordination and separation of TAP's hydrotesting from any VA 60 construction activities which may impact on the Strymonas River.	REIR
	• Cumulative impacts on brown bear and grey wolf due to fragmentation and degradation of critical habitats resulting from construction of TAP, the VA 45 motorway and Nestorio irrigation dam. • Cumulative impact on the Aliakmonas River corridor (including the EU priority habitat '91E0 Alluvial Forests with *Alnus glutinosa* and *Fraxinus excelsior*')	TAP will monitor the EU LIFE monitoring programme (NAT/GR/000333) and liaise with the developers of the Nestorio irrigation dam and the Egnatia Odos AE (the operators of the VA 45 motorway) on the potential cumulative impacts identified in this assessment and information from the EU LIFE programme.	REIR

Key cumulative impacts		Mitigation measures	Location where mitigation measures are documented
	from TAP and Nestorio irrigation dam due to habitat fragmentation, potential increased downstream erosion and loss/degradation of riparian woodland.		
	• Cumulative impacts on the various VECs in the Vithkuq–Ostrovice area from TAP and TAP access roads and hydropower plants resulting from woodland loss and fragmentation. • Cumulative impacts on critical habitat, mainly in the Vithkuq–Ostrovice area of the DMU but also in the Osumi valley, for lesser spotted eagle and eagle owls resulting from woodland loss due to vegetation clearance for TAP, TAP access roads and potentially the Osumi hydropower cascade.	TAP will investigate whether there are any biodiversity management and development programmes they can participate in within the Vithkuq–Ostrovice area. If there are no ongoing or proposed programmes, TAP will liaise with local government and SCI proponents to promote a biodiversity management programme.	REIR
	Cumulative impact on Semani–Pishë-Poro protected area VEC and four-lined snake critical habitat VEC from TAP and the TAP access roads.	The collection of animals is banned; TAP will ensure the ban is communicated during the staff induction process.	REIR
	Cumulative impact on Semani river corridor from TAP, oil and gas exploration and production (Patos Marinza and Visoke fields) and the Fier–Levan bypass (A4) resulting from noise and light disturbance during construction, effects of potential	TAP will liaise with the oil field operators to coordinate water abstraction from the Semani River.	REIR

Key cumulative impacts		Mitigation measures	Location where mitigation measures are documented
	accidental spills of fuel/lubricants during construction, and modification of water flow during hydrotesting by TAP if combined with new/changed abstraction for the oil field.		
	Cumulative impact on Albanian pool frog from TAP and TAP access roads.	TAP will liaise with TANAP to ensure adequate coordination and separation of water abstraction and discharge to the Evros River.	REIR
	Cumulative impact on bat roost in military tunnel no. 8 and Mediterranean pine forest with endemic Mesogean pines critical habitat.	TAP will explore if habitat restoration of Mediterranean pine forest affected by TAP and the quarry near Ure Vajgurore can be as close to the existing woodland as possible, but in a location that is agreed by all parties to be protected from future mining activities.	REIR
Soils	Cumulative impact resulting from physical disturbance of soil VEC from adjacent TAP and DESFA pipelines where the DESFA pipeline reinstatement is slower to establish.	TAP will engage and consult with DESFA and where appropriate share the following: • locations of DESFA sites where reinstatement is ongoing or proving difficult to allow refinement of site-specific mitigations by TAP • lessons learned during DESFA construction and reinstatement to inform specific TAP reinstatement measures • coordination of any specific remedial measures needed post-TAP reinstatement if these need cooperation to achieve success • sharing of the results of periodic reinstatement monitoring, highlighting areas of concerns on either pipeline	REIR
	Cumulative impact on soil VECs from TAP and activities in the Patos Marinza	If considered necessary when contaminated land is encountered, TAP will seek information from the Patos	REIR

Key cumulative impacts		Mitigation measures	Location where mitigation measures are documented
	oil field resulting from accidental contamination or mobilisation of existing contaminants within the soil profile.	Marinza operators on planned remediation in the vicinity of the proposed TAP working strip. This may be beneficial for development of the Contaminated Lands Crossing Plan. TAP will also liaise with the Patos Marinza operators and share their ERPs for efficient coordination of actions following a potential accidental pollution event.	
Groundwater	Cumulative impact on shallow groundwater of high sensitivity from TAP, the Fier–Levan bypass (AL4) and oil and gas production from the Patos Marinza oil field (AL13) resulting from accidental spills of oil, fuels or lubricants, or remobilisation of existing contaminants from excavated soil.	TAP will assess information on areas of known contamination in the Patos Marinza oil field to help plan the installation of any trench breakers/water stops to prevent the off-site spread of existing contamination by TAP. The design of any pre- and post-construction drainage required will be coordinated with the operators of the Patos Marinza oil field (Bankers Petroleum Ltd) as required to avoid accidental spread of contamination.	REIR
Surface water	Cumulative impact on Evros river corridor from hydrotesting by TAP and TANAP if these exceed 10% of river flow.	TAP will liaise with TANAP to ensure adequate coordination and separation of water abstraction and discharge to the Evros River.	REIR
	Cumulative impact on the Strymonas River flow resulting from TAP and VA 60 motorway construction.	TAP will liaise with Egnatia Odos AE (the developers of the VA 60 motorway) to ensure adequate coordination and separation of TAP's hydrotesting from any VA 60 construction activities which may affect the Strymonas River.	REIR
	Cumulative impact of sediment release on the Gallikos River from TAP and the new connection road between Thessaloniki–Kilkis.	TAP will engage the developers of the Thessaloniki–Kilkis road to exchange information on their construction schedules and ERPs.	REIR
	Cumulative impact on flow of the	TAP will discuss coordinating joint monitoring	REIR

Key cumulative impacts		Mitigation measures	Location where mitigation measures are documented
	Aliakmonas River from TAP and Nestorio irrigation dam.	programmes and environmental social data with the developers of the Nestorio dam including coordination of hydrotest water abstraction and discharge	
	Cumulative impact on the Semani River of TAP, the Patos Marinza and Block F oil fields (AL13 and AL21) and the Fier–Levan bypass (A4)	It is recommended that TAP liaise with the Patos Marinza and Block F oil field operators to coordinate water abstraction from the Semani River.	REIR
	Cumulative impact on the Osumi River and its tributaries due to sediment release and alteration of flow resulting from TAP river crossing construction and hydrotesting, and construction of Osumi hydropower cascade and Favina hydropower plant.	TAP will work with the operators of the Osumi hydropower cascade and Favina hydropower plant to coordinate watercourse crossings and hydrostatic testing as needed and exchange information such as construction schedules and ERPs.	REIR
Landscape	• Cumulative impact on South Forest Complex of Evros from TAP, DESFA and wind farm projects GR133, GR135 and GR137. • Cumulative impact on the Aesthetic Forest of Kavala–Amygdaleona/Agios Timotheos–Kioupia Wildlife Refuge from TAP and DESFA pipeline. • Cumulative impact on the mountainous forests in Greek–Albanian borders of TAP and VA 45 section of the Egnatia highway.	TAP will review reinstatement and biorestoration lessons learnt from their shareholders who have previously constructed major international pipeline projects (BTC, SCP etc.), to enable best practice techniques to be developed and implemented.	REIR
	Cumulative impact on sensitive landscapes of the central section from	TAP will liaise with the Osumi hydropower cascade developers to exchange information on the planned	REIR

Key cumulative impacts		Mitigation measures	Location where mitigation measures are documented
	TAP, TAP access roads and the Osumi hydropower cascade.	construction activities, especially the location of access roads and power lines to understand whether these can be co-located to reduce the area affected by vegetation clearance and introduction of man-made features in the natural landscapes in this region.	
Air quality	No cumulative impacts identified		
Socio-economic and health	Cumulative impact on traffic and road safety including traffic delays and hazards, and the deterioration of road quality, bridges and communal infrastructure from multiple users.	Where there is potential for congestion on the same transport routes, TAP will liaise with SCI developers and operators, as well as the police and authorities. At certain sensitive locations, additional traffic management measures may need to be developed in consultation with all parties.	Traffic Management Plans
	Cumulative impact from TAP and other projects on permanent loss of agricultural land	TAP will monitor livelihoods of project-affected people in areas where land has been permanently purchased to ensure they have access to alternative land should it be required.	LRP
	Cumulative impact on social cohesion and community well being due to actual or perceived lack of adequate compensation for loss of livelihood, influx of people in search of employment, perceived unfair distribution of benefits and lack of satisfactory communications in areas where sources of cumulative impacts with significant labour requirements are located in the vicinity of TAP construction camps.	1. TAP will share information with SCI developers and operators, as required, on the following: • ensuring human rights for workers • fair and transparent local recruitment strategies and sourcing • strategies to employ women and minorities • developing communal training programmes. 2. TAP will investigate the potential to develop strategies with the government and SCI for local development projects. 3. TAP will liaise with other large scale projects and relevant government bodies to share information about their STD/HIV and worker and community	LRP, RSIP, SEI, Local SEPs

Key cumulative impacts		Mitigation measures	Location where mitigation measures are documented
		health management strategies, as well as information about human trafficking to ensure that they are commensurate and enable an efficient and co-ordinated response to any potential disease outbreak.	
Greenhouse gases	Every source of GHG emissions is a source of cumulative impact and ultimately a contributor to the same impact, on the same VEC.	TAP will develop a GHG Management Plan for the operational phase.	N/A – to be developed

0.13 Stakeholder engagement

Key affected and interested parties have been informed of the CIA via meetings and workshops, and have provided initial input on identification and prioritisation of VECs, as well as identification of projects that may cause cumulative impacts with TAP.

A workshop was held in Greece and in Albania with stakeholders. In Italy, a workshop with stakeholders was not possible however, a meeting was held with the Ministry of Environment to introduce the CIA. In Greece, 17 participants attended the workshop from government ministries and departments; 10 participants attended the workshop in Albania from government ministries and departments, and environmental specialists.

The stakeholder engagement activities to date indicate that stakeholders are generally aware of the importance that TAP will have in their respective jurisdiction. Stakeholders expressed gratitude for holding the workshops and found them interesting. However, in some cases, the concept of a CIA was not entirely familiar to them and as a result, time was spent in the workshops explaining the notion of VECs and cumulative impact sources to stakeholders. Full details of the stakeholder engagement undertaken are included in Chapter 9 of the CIA and available on request.

The next steps in the CIA engagement process are as follows:

- Additional stakeholders potentially impacted by the projects will be identified based on the spatial location of the cumulative impacts. This will include stakeholders, and project affected persons in Greece, Albania and Italy, in the vicinity of the identified cumulative impacts, which may be directly or indirectly impacted, including community organisations and community representatives, as relevant.
- Meetings with these stakeholders will be incorporated in the general stakeholder engagement process as outlined in the TAP stakeholder engagement plans for Albania, Greece and Italy.
- Stakeholders that were identified in the CIA as potential TAP collaborators in terms of the mitigation and management of the cumulative impacts (both third party, and up and downstream associated facilities) will be engaged in meetings, working groups and workshops to discuss the development of potential joint mitigation strategies.
- TAP and its partners in the Southern Gas Corridor (SGC), TANAP, SCPX and SD2, have established regular engagement. This will continue to promote:
    - identification of any opportunities for data sharing which will enable an improved understanding of potential impacts
- identification of opportunities to collaborate on the management or mitigation of impacts, or to maximise the positive outcomes of the projects. A final stakeholder engagement report will be compiled, which outlines the entire stakeholder process and shows the inputs stakeholders have made to the CIA outcome.

0.14 Conclusions and overall assessment

0.14.1 Development of the CIA

The CIA has been conducted in line with international good practice as outlined in International Finance Corporation (IFC) Good Practice Handbook on CIA (IFC, 2013). The CIA has been undertaken and reported as an independent and objective process.

In common with most cumulative assessments, the CIA has faced challenges in several areas in terms of the reliability of predicting cumulative impacts and stakeholder engagement. Further challenges are likely where mitigation measures are partly or wholly outside TAP's control. In general, the difficulties encountered were due to lack or limited information on VECs and sources of cumulative impacts.

Nevertheless, this CIA was able to draw on detailed data for the TAP project and recent, concurrent work by TAP, including critical habitat assessment, pre-construction ecological surveys and ongoing programme of archaeological investigation.

Key affected and interested parties have been informed of the CIA and have provided initial input on identification and prioritisation of VECs, as well as identification of projects that may cause cumulative impacts with TAP.

No amendments to the ESIA are required following the completion of the CIA, and any additional mitigation measures will be added to the project's RSIR and REIR to ensure that actions are tracked to completion. A summary of the key cumulative impacts identified during the CIA progress has been provided in Table 0.4.

0.14.1.1 Areas with cumulative impacts on multiple VECs

There are some areas that are subject to multiple cumulative impacts on VECs in the same group (e.g. ecology) and on other VEC groups (primarily landscape, but also others). These areas, summarised below, are the key areas facing potential cumulative impacts from TAP and other projects and should therefore be the focus for management and mitigation and, where appropriate, for TAP trying to engage other developers and the government in collaborating or minimising potential impacts.

0.14.1.2 South Evros area

This protected area/critical habitat for birds (black stork, booted eagle, honey buzzard, lesser spotted eagle and black kite) contains two river corridors (Evros, Loutros tributary), and is an important landscape area and an area of high-quality soils prone to erosion. Potential cumulative impacts VECs of the South Evros area from TAP, TANAP and DESFA pipelines, and a number of wind farms have been identified.

0.14.1.3 Strymonas River

The main potential cumulative impacts on the Strymonas River ecological and surface water VECs arise from the potential for river flow to be affected by hydrostatic testing for TAP and bridge construction for the VA 60 motorway and should be readily mitigated by coordination between TAP and the motorway project.

0.14.1.4 Mountainous forests in the Greek-Albanian borders

This area of high landscape value is an area of biodiversity importance, containing critical habitat for bears and important habitat for wolves. Significant potential impacts on the ecological and landscape VECs from fragmentation of habitat, mainly caused by the new VA45 highway, as opposed to TAP, have been identified.

Also close to the area is the Aliakmonas River, where significant potential cumulative impacts on the river corridor and riparian woodland priority habitat have been identified. The main potential cause of impact is the Nestorio irrigation dam. The overall contribution of TAP to changes in the VEC is likely to be minor in comparison. The Aliakmonas has also been identified as a surface-water VEC. Concurrent operation of the upstream dam and abstraction of hydrotest water may result in cumulative impacts on water flow in the Aliakmonas River but should be readily mitigated by coordination between TAP and the dam operator.

0.14.1.5 Vithkuq-Ostrovice area

This area contains a number of ecological VECs and it is also an important landscape area.

The main cumulative impacts on ecology arise from the direct loss of woodland, and fragmentation of existing woodland, along with a corresponding increase in grassland and agriculture as a result of TAP, TAP access roads and hydropower plants, particularly the potential for the access roads to exacerbate impacts by improving/inducing access to the area. Cumulative landscape impacts will also arise from the impact of TAP, the potential for induced development from the access roads for TAP and the hydropower plants.

0.14.1.6 Osumi valley

Similar impacts to those described for the Vithkuq–Ostrovice area are predicted on birds and landscape within the Osumi valley as a result of TAP, TAP access roads and the Osumi hydropower cascade. However, the potential future ecological impacts of improved/induced access are less as the access roads in the Osumi valley do not facilitate access into stands of mature woodland, so these access roads will not have the same potential to cause habitat loss from induced access (for hunting and/or tree felling) and development.

0.14.1.7 Semani area

The Semani is a river corridor, and the area is a groundwater VEC (shallow groundwater of high sensitivity) and has high-value soils. Cumulative impacts arise from TAP and oil field operation and development in the area and the construction of the Fier–Levan bypass. The potential cumulative impacts are from remobilisation of existing contaminants in soils, accidental pollution, noise and light disturbance and abstraction for hydrostatic testing for TAP combined with potential abstraction for the oil field activities.

0.14.2 Ongoing work

0.14.2.1 Further assessment

There are three areas where TAP will undertake further assessment, liaison and/or monitoring to understand the potential cumulative impacts:

1. TAP will engage and liaise with the wind farm operators as appropriate to consider overall impacts on the birds inside the South Evros Forest Complex, and develop further mitigation measures in partnership as necessary.
2. TAP will aim to coordinate any monitoring programme with the EU LIFE programme and any monitoring that may be undertaken on the impacts of the Nestorio irrigation dam. TAP will engage and liaise with the developers of the Nestorio irrigation dam and the Egnatia Odos AE (the operators of the VA 45 motorway) on the potential cumulative impacts on the Aliakmonas valley and its associated VECs, and develop further mitigation measures in partnership as necessary.
3. TAP will monitor livelihoods of project-affected people in areas where land has been permanently purchased to ensure they have access to alternative land should it be required.

0.14.2.2 Stakeholder engagement

The next phase of the stakeholder engagement process will include engagement with stakeholders, including those already met and those newly identified as part of the CIA process (local potentially affected parties including any project affected persons, up and downstream associated facilities and other third party SCI stakeholders in Greece, Albania and Italy), to present the CIA and receive further input on impact assessment and mitigation measures. A detailed plan will be developed by TAP for the next phase of the stakeholder engagement.

Where discussions with the SCI developers of an associated facility identifies that an opportunity exists to improve cumulative outcomes, we further recommend that working groups are established to allow opportunities to be fully explored.

0.14.2.3 Development of detailed management strategies

The focus of the mitigation strategies for the cumulative impacts has been on collaboration and engagement with third parties.

There are, however, two main detailed management strategies that are being or will be developed by TAP, which will also be able to address some of the cumulative impacts identified in this CIA:

1. A social and environment investment strategy to assist communities. As part of this, TAP will investigate the potential to develop strategies with the government and other development actors of other projects for local development projects where this has the potential to enhance development outcomes.
2. A Greenhouse Gas Management Plan for the operational phase which will discuss best available technique reviews, greenhouse gas monitoring, reporting and targets, and control measures during operation. GHG emissions will be quantified in accordance with Performance Requirement (PR) 3 separately.

0.15 Glossary and abbreviations

Term or abbreviation	Description
°C	degrees Celsius
AIDS	acquired immune deficiency syndrome
AOI	area of influence
barg	metric unit of pressure
bcma	billion cubic metres per annum
BPAL	Bankers Petroleum Albania Ltd
BTC pipeline	Baku–Tbilisi–Ceyhan pipeline
BV	block valve
BVS	block valve stations
CIA	cumulative impact assessment
cist graves	coffin or burial chamber made from stone or a hollowed tree
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
CS	compressor station
CTMS	custody transfer metering stations
DLE	dry low emission
DMU	discrete management units
EBRD	European Bank for Reconstruction and Development
EBSA	Ecologically or Biologically Sensitive Area
EIB	European Investment Bank
EPC	engineering, procurement and construction
ERP	Emergency Response Plan
ESIA	environmental and social impact assessment
EU	European Union
FEED	front-end engineering design
GDP	gross domestic product
GHGs	greenhouse gases
GPH	(IFC CIA) Good Practice Handbook
GWP	global warming potential
ha	Hectare
HDD	horizontal directional drilling
HIV	human immunodeficiency virus
holt	otter’s den

Term or abbreviation	Description
HPP	hydropower plant
HSE	health, safety and environment(al)
IAP	Ionian Adriatic Pipeline
IBA	important bird areas
IBI	Index of Biotic Integrity
ICH	intangible cultural heritage
IFC	International Finance Corporation
IGB	Interconnector Greece–Bulgaria
IUCN	International Union for Conservation of Nature
KBA	key biodiversity area
kbd	thousand barrels per day
km	kilometre
KP	kilometre point
kV	kilovolt
kW	kilowatt
LNG	liquefied natural gas
m	metre
m^3	cubic metres
m^3/d	cubic metres per day
mm	millimetre
MMscfd	million standard cubic feet per day
MV	medium voltage
MW	megawatt
MWe	megawatt electric
N_2O	nitrous oxide
NDT	non-destructive testing
NO_x	nitrogen oxides
NO_2	nitrogen dioxide
PAP	Pipeline Abandonment Plan
PBF	priority biodiversity features
PM	particulate matter
PPS	pipeline protection strip
PRMS	pressure reduction and metering station
PRs	Performance Requirements (EBRD)
PRT	Pipeline Receiving Terminal

Term or abbreviation	Description
PS	Performance Standards (IFC)
QKB	(Albanian) National Centre of Business
RBMP	River Basin Management Plans
RCIA	rapid cumulative impact assessment
ROW	right of way
SAC	special area of conservation
SCI	source of cumulative impact
SCP	South Caucasus Pipeline
SCPX	South Caucasus Pipeline expansion project
SD	Shah Deniz
SPA	special protection areas
SRG	Snam Rete Gas
STD	sexually transmitted disease
TANAP	Trans Anatolian Natural Gas Pipeline
TAP	Trans Adriatic Pipeline
VECs	valued environmental and social components