Initial Environmental Examination

February 2016

GEO: Sustainable Urban Transport Investment Program – Tranche 4

Prepared by the Municipal Development Fund of Georgia for the Asian Development Bank.

ENGINEERING, PROCUREMENT, CONSTRUCTION MANAGEMENT AND SUPERVISION FOR CONSTRUCTION OF BATUMI COASTAL PROTECTION

Project Name:
Sustainable Urban Transport Investment Program - Tranche 4

LOAN NUMBER 3273-GEO

DETAILED DESIGN

INITIAL ENVIRONMENTAL EXAMINATION

February, 2016

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INDEX

LIST OF FIGURES

LIST OF TABLES

LIST OF ACRONYMS

ADB	- Asian Development Bank
CAS	- Center of Archaeological Search of the Ministry of Cultur
MoE	- Ministry of Environmental Protection
IEE	- Initial Environmental Examination
GIS	- Geographical Information Systems
EMP	- Environmental Management Plan
MAC	- Maximum Admissible Concentrations
RAP	- Resettlement Action Plan
MoA	- Ministry of Agriculture
MLHSP	- Ministry of Labor, Health and Social Protection
GOG	- Government of Georgia
NGO	- Nongovernment Organization
MUFSRA	- Management Unit for Food Safety and Risk Analyze of the Ministry of the Agriculture
FS	- Feasibility Study
MDF	- Municipal Development Fund
EIP	- Environmental Impact Permit
MoESD	- Ministry of Economy and Sustainable Development
SPS	- Safeguard Policy Statement
MoRDI	- Ministry of Regional Development and Infrastructure

A. EXECUTIVE SUMMARY

1. Georgia with its cultural and historical heritage and striking landscapes is becoming more and more popular amongst domestic and foreign travellers. In order to attract more tourists there is a need for development of infrastructures in regions with significant tourism potential. In this context Batumi, the capital of Autonomous Republic of Adjara and one of the major cities on the Georgian Black Sea, is playing a significant role.

2. However, the coastline southwest of Batumi is affected by erosion over a length of about 5 km. along this section a number of houses and cultivated land has been lost already. Without adequate protection measures coastal erosion will continue at the airport area and at Adlia (village south of Batumi) and might even affect the beaches and the coastline of Batumi. As a consequence, the investment climate for tourism development could be negatively influenced.

3. Sustainable Urban Transport Investment program (SUTIP) tranche 2 include the sub project: Consulting services under Tranche 2 - Batumi Coastal Improvement consulting services.

4. The main objective of the coastal protection works is to protect the coast against erosion. The protective constructions, which are foreseen along the coast of Batumi will have a major impact on the coastal zone: instead of a slightly eroding coastline, the coastline between the Chorokhi River mouth and Batumi Cape will be stable.

5. The evaluation of the alternatives to protect the coast against the erosion affecting the southern section of the littoral has shown that a soft intervention, featuring recirculation of the sediment between the northern section of the littoral (where it accumulates due to natural transport pattern) and the southern portion (from where it is removed due to erosion), is the most efficient way to protect and restore the beach.

6. One alternative consisted of nourishing the beach length under erosion by means of material sourced outside Batumi coastal system (for instance from Chorockhi River or Natanebi River). For the scope of assessing the technical feasibility of this solution, this alternative has been explored independently from the location where the sediment is to be extracted.

7. The other alternative, which was finally deemed the most appropriate, consists of extracting material from the northern stretch of the coast close to Batumi Cape, where it accumulates naturally and before it falls into the Batumi canyon. The material will be transported towards the south, where beach nourishments will be implemented (“sand recirculation” scheme).

8. It was estimated that a minimum of 20-30,000 m^3/year of material are necessary to compensate the alongshore gradients of sediment transport. However, this value should also be confirmed by the monitoring campaign to be set-up to monitor the morphological changes induced by the dredging and nourishment operations. The advantage of this solution is that no mining of pebbles/gravel external to the system is necessary. So far gravel has been dredged from the Chorockhi river mouth, thus depriving it of the material necessary to maintain its equilibrium

9. In the final version of design, the material is supposed to be dredged and pumped by means of a specific pumping system, equipped with boosters for restoration of hydraulic losses. Particular attention has been paid to the time required to perform the pumping activities and the construction activities in general, duly accounting for downtime due to storms and unforeseen events, so to have a reliable construction schedule.

10. The works will also include monitoring of the Chorockhi River and studies supported by 2D and 3D numerical and physical modeling, aimed at finding out a possible intervention to allow the sediment transport from the Chorokhi to deposit towards and feed the beaches of Batumi, rather than being lost down to the flank of the canyon lying in front of the river mouth. The intervention shall involve the river mouth and part of the downstream end of the river. A possible solution can be identified in the shift of the river mouth towards North, as schematically shown in the following Fig. 5.16.

11. In this new configuration of the river mouth, the river will be redirected in its final portion by means of excavations and formation of new mounds made of excavated material.

12. In its previous version (November 2015) the final design envisaged also a “passive protection” to the beach, to be pursued by installing 8 public sandy recreational areas of shallow depth enclosed by concrete walls, in areas where the total beach width is in excess of 80 m. Its aim was to preserve the original beach width and enhance the territory, by avoiding, in the upper part of the beach, construction of permanent structures and therefore visual obstructions seaside and close to the shoreline. In this final version of the project, this intervention has been excluded, upon MDF request.

13. The Environmental Category of the proposed project for Batumi coastal protection is B (ADB’s Safeguard Policy Statement, 2009), which refers to projects not having significant irreversible or permanent negative environmental impacts during or after construction. For this category of Projects ADB requires the preparation of Initial Environmental Examination (IEE).

14. In Georgian legislation, EIA is carried out only if a developer seeks to implement projects listed in the Law on Environmental Impact Permit. This list is compatible with the category A projects of the ADB classification. According to the Georgian legislation EIA is not required in other instances.

15. Therefore an IEE report has been prepared, providing:

    (i) an overview of latest national and local legal and institutional framework, within which the environmental assessment is carried out and project-relevant international environmental agreements to which the country is a party;

    (ii) information about the general environmental settings of the project area as baseline data;

    (iii) assessment of project alternatives in terms of sustainability and efficiency;

    (iv) information on potential impacts of the project and the characteristic of the impacts, magnitude, distribution, duration, affected groups;

    (v) information on potential mitigation measures to minimize the impact including mitigation costs;

(vi) basic information for formulating management and monitoring plan.

16. To evaluate possible impacts and changes introduced by project activities, an overview of the existing natural conditions along the coast of Batumi has been carried out, including regional settings, climate and atmosphere, radiation and noise background, geological and geotechnical features, coastline morphology, seabed conditions, seismic activity, surface and ground waters, riverbed conditions, meteomarine conditions, ecological resources, and economic-social and cultural resources.

17. The analysis of the impacts has been carried out with respect to the construction phase and the operational phase.

18. The total duration of construction works is 14 months.

19. During construction the main impact which can be expected is due to noise, during the nourishment activities, which are expected to last for 4 months maximum. Noise will be induced by the pumping/dredging activity needed to recirculate gravel from North to South, and is expected to be localised in the proximity of the boosters. These activities will induce possible exceedance of noise threshold levels. The impact can be considered significant and shall be dealt with by means of proper monitoring and mitigation measures. In fact, mitigation measures have been selected, consisting mainly in soundproof enclosures for the boosters and mobile noise barriers.

20. A monitoring program of noise is also foreseen, to verify the need for additional mitigations, in case they are needed.

21. Other construction activities will also affect both the natural environment and the population during construction, but their impacts can be considered negligible.

22. Trucks and construction vehicles are expected to impact air quality, due to dust and air emissions, and to cause disturbance to population. These vehicles will be employed mainly for revetment construction, to transport equipment and construction material from the quarries to the site, using existing roads. The area where the revetment will be built is out of the most populated part of Batumi, and the routes to be followed can be selected so to minimise disturbances to local traffic and to the inhabited areas. Fort this reason the impact on the environment and population caused by this activity can be considered light and localized. Nevertheless, a good working practice is suggested, that will allow to contain detrimental effects on air quality, and an air monitoring plan will be implemented.

23. As for sea water quality, due to the fact that nourishment material is moved along the same coastal area by pumping/dredging and that it is mainly composed of pebbles, no significant impact is expected. However, a monitoring turbidity campaign is foreseen, during the first extraction/nourishment period, in order to verify the absence of impacts.

24. No impact can be foreseen on freshwater and groundwater due to construction activities.

25. Also soil occupation for the work activities (working places, camps, etc.) can be considered very limited. A small storage areas for revetment construction is foreseen, but in any case soil occupation will be temporary, and mainly limited in the non-touristic period.

26. As for the use of natural resources, a great part of the construction material needed for revetment construction will come from existing and authorised quarries. The potential impact is the use of natural material but the impact is considered negligible.

27. Regarding terrestrial habitats, disturbance can be generated in case of new transport pathways for work activities, and in general impacts on existing biota/birds nesting or living in the project area can be expected, but they can be considered negligible. Nevertheless, in order to assess the impact on terrestrial biota (avifauna), a walkover survey is foreseen before starting of the working activities.

28. In general work activities cause detrimental effects on landscape and as a consequence on tourism. However, work activity will be mainly performed out of the touristic period, so the impact on tourism is very limited.

29. Furthermore, small quantities of hazardous wastes will be generated as a result of vehicle operations and the maintenance activities. However, a waste Management Plan will be performed by the Contractor and applied during construction phase.

30. Once construction has been completed, it is expected that almost all operations causing disturbance and impacts will cease. The only exception is the dredging activity for sediment recirculation, which will be repeated every year (or at other relevant interval, as defined based upon the outcomes of the beach monitoring activities and consequent beach management planning).

31. Due to the pumping/excavation of nourishment material, a significant impact on environment due to noise is expected in proximity of the boosters. The time required for completing nourishment each year will depend on the amount to be dredged, and it can be assumed to last for approximately 3-4 months. Due to the foreseen mitigation measures the impact on noise quality will be reduced.

32. Other impacts can be considered null or even positive. In particular the effect on the landscape will be positive, because the coastal structure will reduce erosion: the beach, enlarged by nourishment, will have a better look, and the overall appearance of the whole coastal strip will be upgraded.

33. New recreational areas will be formed, inducing a positive effect also on tourism.

34. A first consultation meeting was held on April 7 2015, in Batumi Municipality Sakrebulo Building, a public consultation meeting, under the aegis of the Municipal Development Fund of Georgia, where the draft of Initial Environmental Examination (IEE) document on “Batumi Coast Protection” project was discussed with the local population.

35. Additional public consultation/disclosure was conducted on February 5, 2016 in Batumi, as final Detailed Design was updated. A short description of the final DD and updated draft of IEE describing the main objects, environmental impacts and planned mitigation measures was provided to the interested parties during the meeting.

36. In order to make the project consultation accessible to the stakeholder, copies of the draft IEE will be made available on the Batumi Municipality web-site in electronic format, and hard copies of Project environmental documentation (draft IEE and Executive Summary) will be placed in the Batumi Municipality office and MoE Department of Licenses and Permits.

37. Population was provided with information related to complaints and dispute resolution mechanism –Grievance Redress Mechanism (GRM) which will be established before commencement of construction works. There will be a grievance registration log available to the population, where they will be able to apply and express their discontent, claims and disputes. The GRM is designated for consideration and resolution of the locals' complaints and claims.

B. INTRODUCTION

38. The present report is the Initial Environmental Examination of the coastal protection works foreseen for Batumi.

39. Georgia with its cultural and historical heritage and beautiful landscapes is becoming more and more popular amongst domestic and foreign travelers. In order to attract more tourists there is a need for development of infrastructures in regions with significant tourism potential.

40. Batumi, the capital of Autonomous Republic of Adjara and one of the major cities on the Georgian Black Sea, and is attracting a growing number of national and international tourists. A large number of new hotels and infrastructures is being constructed along the coastline in Batumi, and the construction of a large number of new hotels and resorts has been planned.

41. However, the coastline southwest of Batumi is affected by erosion over a length of about 5 km. Along this section a number of houses and cultivated land has been lost already. Without adequate protection measures coastal erosion will continue at the airport area and at Adlia (village south of Batumi) and might even affect the beaches and the coastline of Batumi. As a consequence, the investment climate for tourism development could be negatively influenced

42. The Sustainable Urban Transport Investment program (SUTIP) tranche 2 including the sub project "Consulting services under Tranche 2 - Batumi Coastal Improvement consulting services" was recently financed through state budget.

43. The project area is the Batumi coast from Batumi Cape in the north to the mouth of River Chorokhi in the south. The beaches of Batumi coast are formed by gravel sediment carried by the Chorokhi River. Two submarine canyons stretch from the far depths to Batumi coast: one reaches Batumi Cape in the north, the other one lies directly opposite the mouth of river Chorokhi in the south. Previous studies have shown that part of the pebbles from the river flow into this canyon, hence failing to feed the beaches down-drift. Furthermore human interventions on the river (sediment mining, water flow regulation) have reduced in time the amount of sediment available to the beach, and further reduction is expected due to planned construction of new dams along the river. As a result the beach is suffering erosion.

44. The proposed project is aimed at protecting the Batumi coast against erosion, which is affecting the coastline southwest of Batumi, over a length of about 5 km. Along this section a number of properties has been lost already in the past; without adequate protection measures coastal erosion will continue and as a consequence the investment climate for tourism development could be negatively influenced.

45. The evaluation of the alternatives to protect the coast against the erosion affecting the southern section of the littoral has shown that a soft intervention, featuring recirculation of the sediment between the northern section of the littoral (where it accumulates due to natural transport pattern) and the southern portion (from where it is removed due to erosion), is the most efficient way to protect and restore the beach.

46. The original IEE was prepared, approved and disclosed in May 2015. The main modifications between March 2015 design and the present design may be summarized as follows:

    - The revetment (sliding protection) in the northern part of the littoral (Batumi Cape) was excluded from the current scope of work.
    - The volume of gravel material to be shifted from North to South is 30 000 m3 instead of 20 000 m3. In addition, beach enlargement is foreseen in front of the revetment for its whole length, by using the beach material coming from excavation needed for revetment construction (about 130 000 m3).
    - The study, monitoring and model activities to evaluate the possibility to re-orientate the mouth of Chorockhi river, which was suggested to the Client, was finally included in the current scope of work.
    - The method for dredging/excavating gravel material to be shifted from North to South was changed: instead of being excavated and then moved by barges, the material is now supposed to be dredged and pumped by means of a specific pumping system, equipped with boosters for restoration of hydraulic losses.

47. The time required to perform the dredging activities is longer than the time originally required in the previous version of design; furthermore, extra time has been allowed to account for downtime due to storms and unforeseen events. Hence the construction schedule has been modified. Therefore, the main intervention aiming at stabilizing this portion of the Batumi coastline features an artificial nourishment in the southern portion of the littoral, just north of the airport, spread over a beach length of approximately 1,800 m, using material taken from the northern part of the coastline (where beach accretion is occurring).

48. The annual recycling of sediment has been complemented by other interventions co-working for beach strengthening and restoration. In the southern stretch suffering erosion, a stone revetment about 1.8 km long has been also designed. In front of the revetment, the coastline will be shifted seaward in order to provide adequate beach width. Particular attention has been paid to the design of this beach enlargement: in order to keep the same natural grading of the beach, which is composed by sand and pebbles, a proper sediment reservoir has been identified in the beach itself, i.e. the sediment excavated for construction of the stone revetment will form the core of the beach nourishment, and a beach toe of coarser material, resembling the storm ridge naturally forming on mixed beaches, will be realised with the material sourced along the shoreline from the accreting areas in the north of the littoral.

49. The construction method to be used both for beach toe formation (in the first year of construction) and for the sediment recirculation in the following years is an innovative system which allows to easily dredge gravel along the shoreline, at very shallow depths, without the need of amphibious equipment (therefore manoeuvring the dredge pump from the shore), and with great precision and in very short time.

50. Other interventions have also been introduced in the general scheme of the protection works, to complement the sediment recirculation. They are listed here below:

- a revetment 2 km long, in the southern portion of the coast, to be built as an extension of the existing revetment. The revetment has a number (12) of beach accesses, equipped with stairs and handrails;
- a monitoring program providing the information needed to analyse the possibility to re-orientate the river discharge towards North, in order to minimize the loss in the canyon of the sediments transported by the river. Some recommendations are also proposed to the Client, which are not part of the current scope of work, nevertheless they would be beneficial for the beach.

51. All the works foreseen to protect the coastline were classified as Environmental Category B, as per the ADB's Safeguard Policy Statement (2009). Infrastructures under category B should not have significant irreversible or permanent negative environmental impacts during or after construction and require preparation of an Initial Environmental Examination (IEE). The IEE is therefore conducted if the project is likely to have minor or limited impacts, which can easily be predicted and evaluated, and for which mitigation measures are prescribed easily.

52. The objectives of the present IEE, according to the ADB's Safeguard Policy Statement, 2009, are:

- to describe the project;
- to provide information about the general environmental settings of the project area as baseline data;
- to provide information on potential impacts of the project and the characteristic of the impacts, magnitude, distribution, who will be the affected group, and their duration;
- to provide information on potential mitigation measures to minimize the impact including mitigation costs;
- to assess the alternative projects in terms of sustainability and efficiency;
- to provide basic information for formulating management and monitoring plan.

C. GOVERNMENT POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

C.1. Administrative structure in Georgia

53. ***Ministry of Environment and Natural Resources Protection (MoENRP)*** *is a leading ministry* responsible developing the environmental policy of the government and has overall responsibility for managing natural resources and radiation safety. The MoENRP consists of several functional departments and services, which are responsible for different aspects of environmental protection, and other supporting departments, like administrative department, Legal Department, Service of Public Relations etc.

54. Functional departments and their responsibilities:

Service of Permits	• Carrying out Ecological Expertise and issuing Environmental permits • Post EIA monitoring of compliance with the conditions of Environmental Permit
Department of Environmental Policy and International Relations	• Development of the State Policy and State Environmental Programs
Division of Air Protection	• Ambient air and water protection strategy; • Consent on the Reports of "Inventory of Stationary Sources of Emissions" and "Norms of Maximally Admissible Emissions".
Division of Water Resource Management	• Water resources protection policy, monitoring; • Consent on the Report on "Norms of Maximally Admissible Discharges"; • Consent on the technical regulations for Water Intake from the Surface Water Objects.
Division of Wastes and Chemicals Management	• Waste Management • Hazardous Substance Management
Division of Hydrometeorology and	• Climate change adaptation and mitigation policy and strategies

Climate Changes	• Greenhouse Gas inventories
Service of Biodiversity Protection	• Biodiversity protection policy and strategies; • Red list species; • National Biodiversity Monitoring System; • Hunting and fishery policy and management.
Legal Department	• Development of Environmental Legislation
Agency of Protected Areas	• Protected areas development policy and programs
National Environmental Agency	• Hydrometeorology • Pollution Monitoring • Geohazard monitoring • Monitoring of geo-ecological conditions of river basins, water reservoirs, Black Sea territorial waters, continental

55. The functions and responsibilities of the former Department of Natural Resources of the Ministry of Energy have been redistributed among the Department of Environmental Supervision, National Forestry Agency and National Environmental Agency under the MoEPNR and State Agency on Oil and Gas. The National Environmental Agency is responsible to issue licenses on exploration of natural resources (except gas and oil). This includes also licenses for quarries and borrow pits and underground water intake.

56. Department of Environmental Supervision is responsible for execution of control over the environmental protection and use of natural resources. In particular, responsibilities of the Department cover matters like:

    - Inspection of compliance with the natural resource use regulations;
    - Inspection of compliance with the conditions of Environmental Impact Permit.

57. The MoENRP defines and evaluates real and possible risk of impact on natural environment during implementation of different types of activities. Accordingly the Ministry has been assigned as responsible body for making decision on granting permission to the proponent on implementation of projects, which require Environmental Impact Assessment (EIA). Granting procedures slightly differ for different type of projects.

58. For the projects, which do not require Construction Permit, the Environmental permit is being issued by the MoENRP on the ground of State Ecological Examination. State Ecological

Examination is carried out by MoENRP upon official submission of EIA prepared by project developers.

59. For projects requiring Construction Permit, no special permit is issued by MoENRP (according to "One window principle", only one permit shall be issued for each activity). The Construction Permit is issued by the MESD, but the issuance of the Permit is subject to the consent of the MoENRP in a form of Conclusion of Ecological Expertise, as well as the MoCMP (The Department for Cultural Heritage Strategy, Coordination and Permissions). Consent of the MoENRP in such cases should be issued according to the same procedures (EIA, public consultations; SEE etc.) as for issuing Environmental Permit. The MESD as an administrative body issuing a permit ensures the involvement of the MoENRP as a different administrative body in the administrative proceedings initiated for the purpose of permit issuance, in accordance with Georgia's Law on Licenses and Permits.

60. Project screening (definition of the project category and necessity for preparation of EIA) and scoping (definition of set of environmental issues and Terms of Reference) is carried out by the project implementing agency and its consultants (in this case MDF and its consultants). Scoping and screening do not represent mandatory procedures according to Georgian legislature although review of scoping/screening outcomes and agreement of the MoENRP is considered a desired practice.

61. As a rule, EIA permitting conditions contains requirement for informing MoENRP regarding fulfillment of the EIA permit conditions. This basically means giving information regarding implementation of Environmental Management and Monitoring Plans.

62. **Ministry of Economic and Sustainable Development (MESD)**. For the projects classified as the projects of Special Importance, MoESD is responsible for carrying out the review of technical documentation (including conclusion of an independent experts) and issuing Permits on Construction for such projects, as well as for supervision over constructing activities and for arranging Acceptance Commission after completion of construction.

63. State supervision of construction and compliance monitoring is provided by the Main Architecture and Construction Inspection (MACI), which is operating under the MESD.

64. MESD is issuing licenses for operations of quarries, needed for infrastructure construction activities.

65. **The Ministry of Culture and Monument Protection (MoCMP).** The ministry is responsible on supervision of the construction activities in order to protect cultural heritage. In case if construction is to be carried out in a historic sites or zones of cultural heritage, consent of the MoCMP is also required for issuing construction permit.

66. **Ministry of Regional Development and Infrastructure of Georgia (MRDI)**. MRDI is responsible for elaboration of policy and strategic plans related to developing infrastructure facilities, management construction, rehabilitation, reconstruction and maintenance of the infrastructure of public use of international and national significance, utilizing funds from the state budget, lawns, grants and other financial sources.

Constructing Contractor

67. After appointment all Constructing Contractors should provide Constructing Contractor's Environmental Management Plan (EMP) developed on the basis of the IEE for the project. The necessity to develop Contractor/s management plan is normally fixed in the Construction Contract. The Constructing Contractor has the following obligations:

    - To employ Environmental consultants (persons or company) responsible for developing and implementing the construction phase EMP as well as Site-Specific Environmental Management Plan (SSEMP) and for provision of corresponding information to MDF;
    - Preparation by the Construction Contractor's Environmental Manager Company Waste Management Plan to be agreed/approved by the MOENRP;
    - The Construction Contractor should hire Environmental Manager who should attend the training organized by the MOENRP;
    - To develop, if required, a Spoil Disposal Plan and Construction Waste
    - Disposal Plan agreed with the MoE and Local government;
    - Construction Schedule;
    - The EMP implementation costs should be included into the construction budget.

Other Responsible Governmental Institutions:

68. **The Ministry of Culture and Monument Protection (MoCMP).** The ministry is responsible on supervision of the construction activities in order to protect cultural heritage. In case if construction is to be carried out in a historic sites or zones of cultural heritage, consent of the MoCMP is also required for issuing construction permit.

69. **Management Unit for Food Safety and Risk Analyze of the Ministry of the Agriculture (MUFSRA).** MUFSRA is responsible for implementation of complex sanitary protection measures in case of identification of burial sites during earthworks. Information about suspicious burial sites should be delivered to the "MUFSRA" of the Ministry of the Agriculture by the Constructing Contactor (field environmental officer) and RDMRDI field officer. [Note: Governmental institutions responsible for technical supervision and compliance with the design documentation and construction standards are described in Design Documentation and are not subject for EIA or EMPs]

C.2. Legislation

70. The basic legal document is "The Constitution of Georgia", which was adopted in 1995. While the Constitution of Georgia does not directly address environmental matters, it does lay down the legal framework that guarantees environmental protection and public access to information with regard to environmental conditions.

71. Article 37, Part 3 states “any person has the right to live in a healthy environment, use the natural and cultural environment. Any person is obliged to take care of the natural and cultural environment.” Article 37, Part 5 states that - “an individual has the right to obtain full, unbiased and timely information regarding his working and living environment.”

72. Article 41, Part 1 states that “a citizen of Georgia is entitled to access information on such citizen as well as official documents available in State Institutions provided it does not contain confidential information of state, professional or commercial importance, in accordance with the applicable legal rules.

73. Legislative execution of constitutional requirements in the sphere of environmental protection is implemented through framework Georgian “Law on Environmental Protection” (1996, as amended 26.12.2014) and the set of specific laws developed on its basis. The framework law regulates the legal relationship between the bodies of the state authority and the physical persons or legal entities (without distinction- legal form) in the scope of environmental protection and in the use of nature on all Georgia’s territory including its territorial waters, airspace, continental shelf and special economic zone. The law deals with education and scientific research in the scope of environment, environmental management aspects, economic levers, licensing and standards. EIA and related issues considers different aspects: protection of ecosystems, protected areas, global and regional management, protection of ozone layer, biodiversity, protection of Black Sea and international cooperation aspects. In particular, the law addresses broad spectrum of issues, like environmental management, environmental education and awareness building, licenses and permits, fines and enforcement, environmental impact assessment, which should be further regulated by specific laws. According to the requirements set forth in the framework law, numerous laws and normative–legal documents were adopted to regulate specific environmental issues in Georgia. Further below the environmental regulations most relevant to the project – and first of all, to the permitting process – are described.

Environmental laws of interest for the project are listed in Tab. C-1 ***Tab. C-2: The list of environmental standards***

Date of receipt	**Normative document title**	**Registration Code**
31/12/2013	Technical Regulations: “on calculation methods for maximum permissible discharge of discharged pollutants in the surface water bodies " Approved by the Government decree 414,	300160070.10.003.017621
31/12/2013	Technical Regulations: “on calculation methods for harmful substances emissions limits in air” Approved by the Government decree 408	300160070.10.003.017622
06/01/2014	Technical Regulations: “on air pollution inventory methods for Stationary sources” Approved by the Government decree 42	300160070.10.003.017588
31/12/2013	Technical Regulations: “ on air pollution with harmful substances index calculation and harmful substances indexe values for harmful substances high pollution, polluted and non-polluted	300160070.10.003.017617

	regions" Approved by the Government decree 448	
03/01/2014	Environmental Technical Regulations. Approved by the Government decree 17	300160070.10.003.017608
14/01/2014	Technical Regulations "on environmental damage determination (calculation) methods" Approved by the Government decree 54	300160070.10.003.017673
31/12/2013	Technical Regulations: "on Determination of Soil fertility level" And "on Monitoring of soil conservation and fertility". Approved by the Government decree 415	300160070.10.003.017618
31/12/2013	Technical Regulations: "on harmful substances maximum permissible concentrations in air in the working area". Approved by the Government decree 70	300160070.10.003.017688
15/01/2014	Technical Regulations: "on Drinking Water:". Approved by the Government decree 58	300160070.10.003.017676
31/12/2013	Technical Regulations: "on water protection zones (zones) for small rivers" Approved by the Government decree 445	300160070.10.003.017646
03/01/2014	Technical Regulations: "on radiation safety standards" Approved by the Government decree 78	300160070.10.003.017585
31/12/2013	Technical Regulations: "on water protection zones". Approved by the Government decree 440	300160070.10.003.017640
03/01/2014	Technical Regulations: "on water sampling sanitary methods". Approved by the Government decree 26	300160070.10.003.017615

74. . Applicable Standards are listed in Tab. C-2.

Tab. C-1: List of environmental laws of Georgia

Year	Law / Regulation	Registration Code	Law / Regulation Detail
1994	on Soil Protection (as amended 14.06.2014)	370.010.000.05.001.000.080	Aims at ensuring the preservation of soils as well as improving the fertility of soil. It defines the obligations and responsibilities of land users and the state regarding provision of soil protection and ecologically safe crop production.

1994	on Protection of Plants from Harmful Organisms	The law is invalid from 21.12.2012	Replaced by "Food / Feed Safety, Veterinary and Plant Protection Code"
2012	On Food / Feed Safety, Veterinary and Plant Protection Code	240110000.05.001.016709	The Code is designed protection of human life, health and consumer interests, animal health and welfare, plant health, as well as food / feed safety, veterinary and plant protection fields of state regulati on of the principles and the effective control system.
1995	Constitution of Georgia (as amended 04.10.2013)	010.010.000.01.001.000.116	lays down the legal framework that guarantees public access to information and forms a vital component of the overall public consultation process with regards to environmental conditions; though, the document does not directly address environmental issues. Article 37 of the Constitution states that "any person has the right to live in a healthy environment, use natural and cultural resources". At the same time, all people are obliged to care for natural and cultural environment".
1996	on System of Protected Areas (as amended 30.04.2014)	360050000.05.001.017408	Sets categories of the protected area (including national park, state reserves, managed reserves, etc.) and defines activities allowed in their boundaries. Activities are permitted considering purpose of the area, requirements set out in legislation and individual regulations, management plans of protected areas, as well as international agreements and conventions signed by Georgia. The law provides restrictions over use of natural resources in national parks and other protected areas.
1996	on Protection of Environment (as amended 26.12.2014)	360.000.000.05.001.000.184	Regulates the legal relationship between the bodies of the state authority and physical persons/legal entities in the scope of environmental protection and consumption of natural resources on all Georgian territory including its territorial waters, airspace and special economic zones.
1996	on Ownership of Agricultural Lands (as amended 20.02.2015)	370030000.05.001.017669	Aims at rational land use, improvement of agricultural structure and prevention of land fragmentation. The law gives definition of an agricultural land, sets rules for its purchasing and separation and role of the state to regulate relevant relationships.
1996	on Wildlife (as amended 15.01.2015)	410000000.05.001.017602	Mandates the MoE to regulate wildlife use and protection on the whole territory of the country. The law empowers the MoE to issue hunting permits and licenses, declare hunting areas, control poaching etc. Potential poaching by the workers should be controlled also during construction works, especially in such a sensitive ecological areas as Borjomi-Bakuriani.
1996	The Law of Minerals (as amended 26.12.2014)	380.000.000.05.001.000.140	provides provisions for the mineral resource exploration and management and establishes the requirement to obtain a license according to the procedures established under this

			law. The Law on Licensing and Permits (June 25, 2005) establishes the most recent regulations for licensing. According to the current legislation all quarries and borrow pits require to obtain a license.
1997	on Tourism and Recreation (as amended 04.09.2013)	460070000.05.001.017153	Legislation of Tourism and Resorts regulates the relations in the sphere of tourism activities
1997	on Water (as amended 26.12.2014)	400.000.000.05.001.000.253	Regulates major general legal relations: between the state governmental bodies and physical/legal persons in the field of water protection, study and consumption; in the field of water protection, study and consumption on land, underground, continental shelf, territorial water and especially active economic zones; in the sphere of commercial water production and international trade in water; defines competences of autonomous republics, local government and self-government in water related relations; in the sphere of groundwater protection, study and consumption consistent with requirements of the law of Georgia on "Natural Resources"; in the field of aquatic life protection, study, reproduction and consumption, in compliance with the law of Georgia on Fauna; regarding consumption of fauna, flora, forest, land and other natural resources whilst water utilization.
1997	on Compensations for Consumption of Agricultural Lands for Non-agricultural Purposes (as amended 25.12.2014)	370020000.05.001.017589	Specifies requirements for compensating (a land replacement fee) for affected private landowners for degradation of land quality.
1997	Transit and Import of Hazardous Waste within and into the Territory of Georgia as amended 08..09.2013)	300230000.05.001.017071	The overarching objective of the regulation is to protect human health and the environment against the adverse effects of hazardous wastes. Its scope of application covers a wide range of wastes defined as "hazardous wastes" based on their origin and/or composition and their characteristics.
1998	on Hazardous Chemicals	The law is invalid from 08.04.2010	Replaced by: "on Technical Hazard Control"
2010	on Technical Hazard Control	300.160.070.05.001.003.974	This law regulates the increased technical risk facilities and related processes, the production, construction, storage, transportation, trade, use and disposal of demolition,

			explosion, emission of toxic and poses increased risk to human life, health, property and environment.
1998	on Pesticides and Agrochemicals (as amended 25.03.2013)	340120000.05.001.016927	The regulation provides the basis for regulation, sale, distribution and use of pesticides in the Georgia. regulation authorizes Ministry of agriculture to review and register pesticides for specified uses.
1999	on State Complex Expertise and Approval of Construction Projects (as amended.)	The law is invalid from 25.08.2006	Replased: on Temporary Rules for Special Importance Construction Projects Compulsory Examination
2006	on Temporary Rules for Special Importance Construction Projects Compulsory Examination	330.010.000.22.024.009.139	The low is regulated conduction of complex expertise for for Special Importance Construction Projects
1999	on Protection of Ambient Air (as amended 5.02.2014)	420.000.000.05.001.000.595	The scope of the "Georgian law on Ambient Air Protection" is to protect ambient air on the whole territory of Georgia from harmful human impact. This law does not govern the field of air protection in work places. Main competences of governmental authorities in the field of ambient air protection (a) Development of environmental monitoring (observation) system; (b) Development and implementation of common policies and strategies; and (c) Development of integrated ambient air pollution control.
1999	Forestry Code of Georgia (amended 6.09.2013)	390.000.000.05.001.000.599	Regulates the use of forests, including protection, management of water catchment basin, wood production. It allows for private ownership of forest and commercial woodcutting.
1999	on Seizure of Property Rights for Necessary Public Needs (as amended 06.09.2013)	020.060.040.05.001.000.670	Defines terms, rules and procedures for expropriation of assets for necessary public needs.
1999	on protection of plants from dangerous organisms	The law is invalid from 08/06/2012	Replaced by "Food / Feed Safety, Veterinary and Plant Protection Code"
2005	on Red List and Red Book of Georgia (as amended 6.09.2013)	360.060.000.05.001.001.297	The Law regulates the legal relations in the field of developing the Red List and Red Book, protecting and using the endangered species, except the legal issues of the international trade with endangered wild animals and wild plants, which within the limits of the jurisdiction of Georgia are regulated by virtue of the Convention 'On the international trade with the endangered species of wild fauna and flora' concluded on March 3 of 1973 in the city of

			Washington.
2005	on Licenses and Permits (as amended 18.09.2014)	300.310.000.05.001.001.914	Regulates organized activities or actions characterized with hazard to human life or health, involves especially important state or public interests, or is connected to consumption of the state resources.
2005	on Fire Safety (as amended 25.05.2014)	140.070.000.05.001.001.989	This Fire Safety regulation is designed to eliminate or minimize causes of fire or fire hazards in the workplace, and to regulate proper emergency and evacuation procedures in the event of a fire.
2005	on Privatization of State-owned Agricultural Land	040.110.030.05.001.000.216	Regulates the privatization of state-owned agricultural land. On the basis of this law, either leased or unleased state-owned agricultural land is subject to privatization.
2005	on Registration of Rights to Real Estate	370.060.000.05.001.003.027	Gives organizational and legal basis for registration of ownerships rights, encumbrance and mortgage on real estate, as well as liabilities of registration.
2006	on Regulation and Engineering Protection of Sea and River Coasts of Georgia	330.130.000.11.116.005.130	Establishes terms for complex and rational use of sea and the river coastal zone of Georgia and ensures sustainability of coastal zones, as well as establishes state control over and liabilities for actions entailing erosive and abrasive processes.
2007	on Cultural Heritage (as amended 26.12.2014)	450.030.000.05.001.002.815	Sets legal principles for protection of cultural heritage in Georgia. It assists the state to protect cultural heritage and makes all citizens responsible for its care and protection.
2007	on Status of the Protected Areas (as amended04.06.2015)	360.050.000.05.001.003.060	Sets categories for protected areas (e.g. including national parks, state reserves, managed reserves) and defines the activities allowed within their boundaries. Activities are permitted following consideration of the area, the requirements set out in relevant legislation and individual regulations, management plans of protected areas, as well as international agreements and conventions signed by Georgia. The law provides restrictions over use of natural resources in national parks and other protected areas.
2007	on Ecological Examination (as amended 25.03.2013)	360.130.000.05.001.003.079	Makes an ecological expertise obligatory for issuance of environmental impact or construction permits. An objective of the ecological expertise is to preserve ecological balance through incorporation of environmental requirements, sound use of natural resources and sustainable development principles.
2007	on Environmental Impact Permit (as amended 26.12.2014)	360.160.000.05.001.003.078	Gives a complete list of activities subject to obligatory ecological examination. The law sets legal basis for issuance of environmental permit, implementation of ecological examination, public consultations and involvement in the processes.
2007	on Public Health (as amended	470.000.000.05.001.000.304	Aims at facilitating health and a healthy life style; ensuring an environment safe for human health; promoting

	29.05.2014)		reproductive health and preventing spreading of contagious or non-contagious diseases. The law defines rights and responsibilities of population and legal persons regarding public health care.
2007	on Entitlement of Ownership Rights to Lands Possessed (Employed) by Physical and Legal Persons of Private Law	010.110.000.08.002.004	Regulates the utilization of the state-owned lands and facilitates development of land market, via entitlement of legal ownership or utilization rights of physical and legal persons of private law, as well as other legal organized entities and squatters.
2009	on Notary (as amended 04.11.2013)	000000000.00.00.016243	Defines an arrangement of notary system and the legal principles of its activity.
2013	Regulation on EIA (as amended 15.05.2013 by the Decree No 31 of MoENRP)	Decree No 31 of MoENRP	The Regulation defines how to assess the environmental impact, includes drafting the confirmatory documentation and permits for the businesses on the legally established list, identifying any source of expected environmental impact, its nature and degree and integrated assessment of their environmental, social and economic outcomes in obtaining the environmental expert conclusion. The Regulation defines the procedure to draft the environmental assessment report by an ecological expertise to ensure the environmental and social-economic balance of future economic development. It precedes the decision of the Ministry of Environmental Protection of Georgia about the purposefulness of the business and relevant project to be implemented.
2014	Waste Management Code	360160000.05.001.017608	The code aims creating the legal basis for waste management for Implementation of such measures which promote waste prevention and re-use, growth waste processing in environmentally friendly ways. The objective of the Code is to keep the Environmental and Human Health by (i) Preventing or reducing waste generation and their negative impact; B) establishing mechanisms for efficient waste management; and C) in a more efficient use of resources..

Tab. C-2: The list of environmental standards

Date of receipt	**Normative document title**	**Registration Code**
31/12/2013	Technical Regulations: "on calculation methods for maximum permissible discharge of discharged pollutants in the surface water bodies " Approved by the Government decree 414,	300160070.10.003.017621

31/12/2013	Technical Regulations: “on calculation methods for harmful substances emissions limits in air” Approved by the Government decree 408	300160070.10.003.017622
06/01/2014	Technical Regulations: “on air pollution inventory methods for Stationary sources” Approved by the Government decree 42	300160070.10.003.017588
31/12/2013	Technical Regulations: “ on air pollution with harmful substances index calculation and harmful substances indexe values for harmful substances high pollution, polluted and non-polluted regions” Approved by the Government decree 448	300160070.10.003.017617
03/01/2014	Environmental Technical Regulations. Approved by the Government decree 17	300160070.10.003.017608
14/01/2014	Technical Regulations “on environmental damage determination (calculation) methods” Approved by the Government decree 54	300160070.10.003.017673
31/12/2013	Technical Regulations: “on Determination of Soil fertility level” And "on Monitoring of soil conservation and fertility”. Approved by the Government decree 415	300160070.10.003.017618
31/12/2013	Technical Regulations: “on harmful substances maximum permissible concentrations in air in the working area”. Approved by the Government decree 70	300160070.10.003.017688
15/01/2014	Technical Regulations: “on Drinking Water:”. Approved by the Government decree 58	300160070.10.003.017676
31/12/2013	Technical Regulations: “on water protection zones (zones) for small rivers” Approved by the Government decree 445	300160070.10.003.017646
03/01/2014	Technical Regulations: “on radiation safety standards” Approved by the Government decree 78	300160070.10.003.017585
31/12/2013	Technical Regulations: “on water protection zones”. Approved by the Government decree 440	300160070.10.003.017640
03/01/2014	Technical Regulations: “on water sampling sanitary methods”. Approved by the Government decree 26	300160070.10.003.017615

C.2.1. Environmental policies and legislation about water protection

75. There are more than ten major laws in Georgia that influence the protection and management of water resources and associated environmental concerns. The most comprehensive is the above Law on Water, which has been in force since October 1997 and was last amended in June 2000. The 96 separate articles of this Law cover a very wide and comprehensive set of issues, such as pollution control policies, protection of drinking water sources, licensing of water use and discharge, categorization and protection of resources, particular measures for the Black Sea, flood control, and many others. All surface water, groundwater and near-coastal water are deemed to be under the control of the national government. Many of the provisions of the Law are supplemented by legislative orders and decrees, as well as by regulations of the Ministry of Environment Protection and Natural Resources, which specify necessary actions in greater detail. The Ministry holds overarching responsibility for implementing the Law on Water, although other ministries are key players on specific topics. The Law is implemented by personnel at the regional or municipal level. The Law on Water provides for the licensing of water use and the discharge of pollutants, an approach that has been in place since 1999.

76. Regardless that Georgia is a country with abundant fresh water resources; the current water supply situation is extremely complicated. This is largely due to anthropogenic contamination, a deficit of drinking water, and low sanitary standards of the water supply system. Because of the degradation of the water supply and sewerage infrastructure, the quality of drinking water often does not comply with human health and safety standards. Some 38% of the water pipeline system of the cities and regions belongs in the high-risk water pipeline category, in which the microbiological contamination index is high.

C.2.2. Relevant and Applicable Permitting Requirements

77. In Georgia, projects requiring ecological examination are mainly regulated by the following laws:

The Law of Georgia on Environmental Impact Permit.

78. The Law of Georgia on Environmental Impact Permit determines the complete list of the activities and projects subject to the ecological examination (clause 4 p.1) and the legal basis for public participation in the process of environmental assessment, ecological examination and decision making on issuance of an environmental impact permit.

79. Under the “activities” subject to the ecological examination the law considers construction of new or upgrading of existing facilities imposing change of technology and operational conditions for the projects and activities included into the list. The routine maintenance works in relation with the same facilities do not require ecological examination and permit.

80. In case if the activity included into the list given in clause 4 p.1 at the same time requires Construction Permit, the administrative body responsible for issuance of the Construction Permit ensures involvement of MoENRP, as a separate administrative body, in the administrative

procedures initiated for the purpose of issuing Construction Permit, as it is envisaged by the Law on Licenses and Permits. In such cases the MoENRP is issuing the Conclusion on the Ecological Examination of the project based on the documentation provided to MoENRP by the administrative body issuing the Permit.

81. The Conclusion on the Ecological Examination is adopted by the administrative (executive) legal act of the MoE and compliance with the conditions of the Conclusion is obligatory for the project proponent. The conditions of the Conclusion on Ecological Examination is a part of conditions of the Construction Permit.

82. In case if the activity included into the list given in clause 4 p.1 does not require Construction Permit, based on the Conclusion on the Ecological Examination the MoENRP will issue the Environmental Impact Permit, supported by the administrative (executive) legal act issued by the minister. The ecological examination is carried out in accordance with the law of Georgia on Ecological Examination and the conditions set forth by the Conclusion present the Conditions of the Permit.

83. The aforementioned laws do not provide details of screening procedure and do not define responsibilities of parties. According to the practice, the screening1 of project proposals is being carried out by the project proponent in consultation with the MoENRP.

Public Consultation Procedures.

84. The 6th clause of the law of Georgia on the Environmental Impact Permit provides detailed requirements and procedures for conducting public consultations and established timeframes for information disclosure and discussion, namely:

85. According to article 6, developer is obliged to carry out public discussion of the EIA before its submission to an administrative body responsible for issuing a permit (in case of activity requiring construction permit before initiating stage 2 procedure for construction permit issuance).

86. A developer is obliged to disclose (publish) the draft EIA document and publish information regarding details of the planned public discussion. Information is subject to publication in the central periodical as well as in the printing organ existing within the administrative territory of the same rayon (if such exists) where an activity is planned. Information (advertisement) shall contain the following information:

- The objectives, title and location of the planned activity;
- The location where interested individuals may obtain the activity related documents (including the EIA report);
- Deadline for the submission of their opinions;

[1] In fact the procedure implies simple checking with the list of projects requiring Environmental Impact Permit. MoENRP does not even consider that this is "screening" procedure, although – simplified.

- The place and time of public discussion.

87. A developer is entitled:

- To submit a hard copy and an electronic version of the EIA to administrative body issuing a permit within a week from the date of the publication;
- To receive and consider within 50 days from the date of publication from citizens written comments and suggestions;
- Hold a public discussion on a planned activity not earlier than 50days and not later than 60 days from the publication of an advertisement;
- To ensure invitation to public discussion of the representatives of respective local administration and governmental agencies representatives; the Ministry and MESD and other interested administrative bodies.

88. Discussion shall be held publicly and any citizen has a right to attend it. Public discussion shall be held in the administrative center of the rayon where an activity is planned.

89. According to the article 7 of the law, during 5 days after conducting the public disclosure meeting, the minutes of the meeting should be prepared to reflect all the questions and comments raised and explanations, provided by the project proponents in response. Appropriate corrections should be incorporated into the main text of the EIA, if required. If the comments and proposals of stakeholders are not accepted a letter of explanation should be sent to the authors. The minutes of the meeting, as well as response letters, explanations and corrections should be submitted to the MoENRP or the administrative body responsible for issuing the Permit as supplementary materials to the EIA. The mentioned documents should be considered as an essential part of the EIA.

Procedure of Official Submission of EIA to MoENRP

90. Article 8 of the Law specifies the documents to submit to receive a permit:

(1) An operator, in order to receive a permit, shall submit a written statement to the Ministry. A statement to receive a permit is submitted, considered and processed under the rule established by the 'Law of Georgia on Licenses and Permits'.

(2) An operator is obliged, in addition to the information specified by the 'Law of Georgia on Licenses and Permits', to submit the following documents:

(a) An EIA report drawn up under the standards specified by the legislation of Georgia (in 5 hard copies and 1 soft copy)

(b) A situation plan of the planned activity (with the indication of distances)

(c) Volume and types of the expected emissions (a technical report of inventory of the stationery sources of pollution and emitted/discharged harmful substances and project of maximum permissible concentrations of emitted/discharged harmful substances (in 4 copies))

(d) A brief description of the activity (as a technical summary)

(e) A statement about the confidential part of the submitted statement.

(3) An operator is obliged to submit a full diagram of the technological cycle to the permit issuing body even if the given activity contains a commercial and/or state secret. This part of the statement, according to sub-clause 'e' of clause 2 of the given Article should be submitted separately by the operator.

Issuance of the Permit on Environmental Impact

91. The article 9 of the law describes the procedures of issuing the Environmental Impact Permit. The same issue is addressed in the laws of Georgia on "Licenses and Permits" (2005) and "on Ecological Examination' (2008).

1. According to the law on "Licenses and Permits," the MoENRP takes decision on issuing Permit within the 20 days after submission of request on permit by the project proponent.

2. MoENRP, in accordance with the law on Ecological Examination, ensures expertise of the submitted documentation and issuance of Conclusion on Ecological Examination.

92. The Permit (Environmental Permit, or Construction Permit when the latest is required) is issued only in case of the positive conclusion of the Ecological Examination.

Regulation on EIA issued by the MoENRP dated May 15, 2013

93. The requirements related to EIA studies and the structure and content of the EIA report are set forth in the Regulation on EIA issued by the MoENRP dated May 15, 2013, #31

94. The content of the EIA document is specified in the clause 5 of the Regulation as follows:

Article 6. Content of the EIA

The EIA report should include the following information:

(a) Analysis of the existing state of the environment;

(b) Identifying the sources, kinds and objects of impact caused by the activity;

(c) Forecast of the changes of quantitative and qualitative characteristics of the environment;

(d) Determining the probability of emergency situations due to the activity and evaluating the expected results;

(e) Evaluation of the environmental, social and economic results of the planned activity;

(f) Specifying the reduction measures for the negative impact on the environment and human health and specifying the compensation measures as necessary;

(g) Identifying the residual (cumulative) impact and measures for its control and monitoring;

(h) Undertaking environmental and economic evaluation of the projects;

(i) Analysis of the alternative variants of the project implementation, selection and forming new variants;

(j) Identifying the ways and means to restore the initial environmental condition in case of terminating entrepreneurship or other activity;

(k) Informing the society and studying the public opinion;

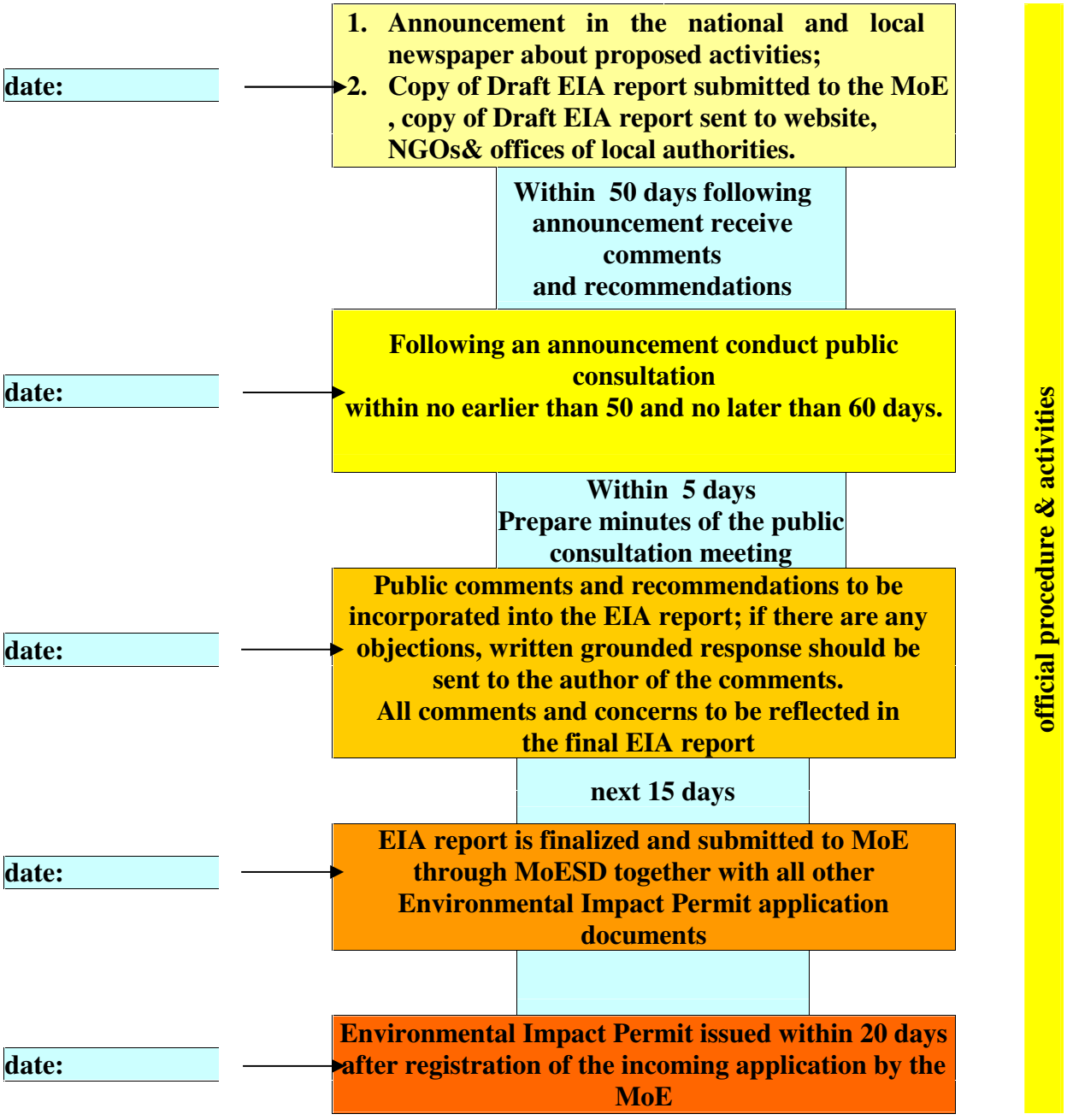
(l) Plan for the post-project situational analysis;

(m) Identifying the kinds and quantities of the expected emissions;

(n) Forecast of the expected environmental state gained through the environmental impact factors;

95. Decree also requires development of the Monitoring Plan during the implementation of the project and at the end of the activity.

Disclosure and Environmental Impact Permit Procedure



96. Environmental Permitting procedures in Georgia are not well matched to the project cycle, especially as it is understood by International Financial Institutions. The legal systems lacks decision making tools for the early stages of the project development, when as a rule strategic decision making is required (e.g. selection of strategic alternatives, route selection for highways and pipelines, development of strategic regional or sectorial programs etc.). There are no

instruments like Strategic EIAs or Preliminary EA as part of Feasibility Study. The documents elaborated at the basic design or feasibility study are not reviewed by MoENRP and mostly even informal opinion is not provided.

97. The Georgian legislation does not provide for a Strategic Environmental Assessment. Only an EIA should be carried out only for the types of development defined by the law. These are the developments bearing risks to the environment, such as: the heavy industry plants, mines, energy plants, oil/gas pipelines, etc. The list of developments, bound by the law to obtain the EIA prior to construction permit, has been considerably reduced in the last years.

Law of Georgia on Ecological Examination, 2008.

98. Ministry of Environment and Natural Resources is authority in sphere to appoint the Ecological expertise.

99. The commission of experts is set up by order of the Minister of Environment and Natural Resources for purpose of conducting the Ecological examination of each specific case.

100. This law makes ecological examination an obligatory step to issue the environmental impact permit or construction permit for certain types of activities. The objective of an ecological assessment is to preserve an ecological balance by considering environmental requirements, sound use of natural resources, and sustainable development principles. A positive conclusion of the ecological examination carried out by the experts committee created by the MOE is necessary to obtain an environmental or construction permit.

101. Law of Georgia on Licenses and Permits. The law regulates the issuance of licenses or permits, gives an exhaustive list of licenses and permits, and sets the rules for issuing, amending, and cancelling permits. The law defines three principles for issuance of the license:

102. “One-window” principle – meaning that a licensing administrative body shall ensure the approval of additional licensing conditions by the other administrative bodies.

103. “Silence gives consent” – licensing administrative body is obliged to make a decision in due course after the submission of the application. Otherwise, if a decision is not made in the determined time period the license is deemed issued.

C.3. Permits

C.3.1. EIA

104. Georgian legislation about Environmental Impact Assessment Permits is in chapter #2 item #4 of the Law and it contains a list of activities which should have EIA. Particular kind of construction works need ecological examination and impact assessment also. Following, the link of Georgian law in Georgian language:

https://matsne.gov.ge/index.php?option=com_ldmssearch&view=docView&id=20206.

C.3.2. Material Extraction

105. Material Extraction – Material Extraction–The National Environmental Agencyof Georgia is responsible to issue a license (Gravel, Sand, Rock, Ballast, etc). After conducting ofauction.

C.3.3. General Waste Disposal

106. General Waste Disposal – local municipalities (Gamgeoba).making of statement there (Gamgeoba) they will designate some dumping areas for discoing of General (i.e. Construction, household) wastes.

C.3.4. Hazardous Waste Disposal

107. Ministry of Environmental of Georgia has list of certified companies (public, private) which takes care about transportation and disposal hazardous wastes after making.

C.4. International Conventions and Agreements

108. Georgia is a party to the following environmental protection conventions and agreements:

- The Black Sea Biodiversity and Landscape Conservation Protocol to the Convention on the protection of the Black Sea against pollution;
- Montreal Protocol on Substances That Deplete the Ozone Layer (also London, Copenhagen and Montreal revisions);
- Vienna Convention for the Protection of the Ozone Layer;
- Geneva Convention on Long-range Trans-boundary Air Pollution;
- Ramsar Convention on Wetlands of International Importance, especially as
- Waterfowl Habitat;
- UN Rio de Janeiro Convention on Biological Diversity;
- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES);
- Convention on Migratory Species;
- Paris Convention on the Protection of World Culture and Natural Heritage;
- European Archaeological Heritage Convention; and

- Aarhus Convention on Access to Information, Public Participation in Decision- making and Access to Justice in Environmental Matters.

C.4.1. Relevant and Applicable International Standards and Best Practices.

109. International standards that may apply to the project include the Equator Principles (EP), requiring that the International Financial Corporation (IFC) ensures that projects financed by them are "developed in a manner that is socially responsible and reflect sound environmental management practices." Other international requirements include environmental and social policies including the following:

- The Project should also meet ILO core labor standards on:
- Forced labor (C105)
- Child Labor (C182) Discrimination (C111)
- Freedom of Association and the Right to Organize (C 87)
- Equal Remuneration (C100) Minimum Age (C138)

C.4.2. Environmetal policies

110. While there is no separate policy document that directly spells out Georgian policy for protecting and managing water availability and quality, the Law on Water does outline a number of key principles that comprise a policy framework (UNECE, 2003). Some of these are:

- Water protection is a major element of environmental protection for Georgian citizens, in view of both current and future needs;
- Drinking water for the population is the highest priority of all uses;
- Both groundwater and surface water are under state control;
- Management of water varies according to hydrologic importance;
- System of "user-polluter pays" is key;
- Pollution is not allowed, although a definition of what constitutes pollution is lacking.

C.5. Environmental and Social requirements of the ADB

C.5.1. The Asian Development Bank's (ADB) Safeguard Policy

111. **ADB Environmental Guidelines.** All projects funded by ADB must comply with ADB Safeguard Policy Statement (2009). The purpose of the Policy is to ensure that the projects undertaken as part of programs funded under ADB loans are environmentally sound, are designed to operate in compliance with applicable regulatory requirements, and are not likely to cause significant environmental, health, or safety hazards.

112. Safeguard policies are generally understood to be operational policies that seek to avoid, minimize, or mitigate adverse environmental and social impacts, including protecting the rights of those likely to be affected or marginalized by the development process.

113. ADB's safeguard policy statement (SPS) sets out the policy objectives, scope and triggers, and principles for three key safeguard areas:

    The Involuntary Resettlement Policy (1995);

    The Policy on Indigenous Peoples (1998), and

    The Environment Policy (2002).

114. All three safeguard policies involve a structured process of impact assessment, planning, and mitigation to address adverse effects of projects throughout the project cycle. The safeguard policies require that (i) impacts are identified and assessed early in the project cycle; (ii) plans to avoid, minimize, mitigate, or compensate for the potential adverse impacts are developed and implemented; and (iii) affected people are informed and consulted during project preparation and implementation. The policies apply to all ADB-financed projects, including private sector operations, and to all project components.

115. Affected people are consulted during project preparation and implementation and information is disclosed in a form, manner, and language accessible to them. Safeguard plans are disclosed to the general public and the information is updated at various stages in the project cycle.

116. ADB is committed to the principles of host-country responsibility for measures to mitigate adverse environmental and social impacts. ADB in funded projects shall therefore comply with host-country laws, regulations and standards, as well as requirements by which the host country is bound under international agreements.

117. **EIA and Environmental Screening under ADB Guidelines.** ADB carries out project screening and categorization at the earliest stage of project preparation when sufficient information is available for this purpose. Screening and categorization is undertaken to (i) reflect the significance of potential resources required for the safeguard measures; and (iii) determine disclosure requirements.

118. ADB uses a classification system to reflect the significance of a project's potential environmental impacts. A project's category is determined by the category of its most environmentally sensitive component, including direct, indirect, cumulative, and induced impacts in the project's area of influence. Each proposed project is scrutinized as to its type, location, scale, and sensitivity and the magnitude of its potential environmental impacts. Projects are assigned to one of the following four categories:

(i) **Category A.** A proposed project is classified as category A if it is likely to have significant adverse environmental impacts that are irreversible, diverse, or unprecedented. These impacts may affect an area larger than the sites or facilities subject to physical works. An environmental impact assessment is required.

(ii) **Category B.** A proposed project is classified as category B if its potential adverse environmental impacts are less adverse than those of category A projects. These impacts are site-specific, few if any of them are irreversible, and in most cases mitigation measures can be designed more readily than for category A projects. An initial environmental examination is required.

(iii) **Category C.** A proposed project is classified as category C if it is likely to have minimal or no adverse environmental impacts. No environmental assessment is required although environmental implications need to be reviewed.

(iv) **Category FI.** A proposed project is classified as category FI if it involves investment of ADB funds to or through a FI (financial intermediary).

119. **Involuntary Resettlement.** ADB will screen all projects to determine whether or not they involve involuntary resettlement. For a project involving involuntary resettlement, a resettlement plan will be prepared that is commensurate with the extent and degree of the impacts.

120. **Indigenous Peoples.** ADB will screen all projects to determine whether or not they have potential impacts on Indigenous Peoples. For projects with impacts on Indigenous Peoples, an Indigenous Peoples plan will be prepared.

121. **Information Disclosure.** In line with ADB's Public Communications Policy, ADB is committed to working with the borrower/client to ensure that relevant information (whether positive or negative) about social and environmental safeguard issues is made available in a timely manner, in an accessible place, and in a form and language(s) understandable to affected people and to other stakeholders, including the general public, so they can provide meaningful inputs into project design and implementation. ADB will post the following safeguard documents on its website:

122. For environment category A projects, draft environmental impact assessment reports at least 120 days before Board consideration;

(ii) Draft environmental assessment and review framework, draft resettlement frameworks and/or plans, and draft Indigenous Peoples planning frameworks and/or plans before project appraisal;

(iii)Final or updated environmental impact assessments and/or initial environmental examinations, resettlement plans, and Indigenous Peoples plans upon receipt;

(iv) Environmental, involuntary resettlement, and Indigenous Peoples monitoring reports submitted by borrowers/clients during project implementation upon receipt.

123. **Environmental Impact Assessment.** According to the ADB policy, environmental assessment report should include. For easy reference, similar structure is adopted for this report.

A. Executive Summary

B. Policy, Legal, and Administrative Framework

C. Description of the Project

D. Description of the Environment (Baseline Data)

E. Anticipated Environmental Impacts and Mitigation Measures

F. Analysis of Alternatives

G. Information Disclosure, Consultation, and Participation

H. Grievance Redress Mechanism

I. Environmental Management Plan

J. Conclusion and Recommendation

124. Public consultation. In line with ADB's Public Communications Policy, ADB is committed to working with the borrower/client to ensure that relevant information (whether positive or negative) about social and environmental safeguard issues is made available in a timely manner, in an accessible place, and in a form and language(s) understandable to affected people and to other stakeholders, including the general public, so they can provide meaningful inputs into project design and implementation.

125. For policy application, meaningful consultation is a process that (i) begins early in the project preparation stage and is carried out on an ongoing basis throughout the project cycle; (ii) provides timely disclosure of relevant and adequate information that is understandable and readily accessible to affected people; (iii) is undertaken in an atmosphere free of intimidation or coercion; (iv) is gender inclusive and responsive, and tailored to the needs of disadvantaged and vulnerable groups; and (v) enables the incorporation of all relevant views of affected people and other stakeholders into decision making, such as project design, mitigation measures, the sharing of development benefits and opportunities, and implementation issues.

126. According the ADB policy public consultation process should:

(i) Describes the process undertaken during project design and preparation for engaging stakeholders, including information disclosure and consultation with affected people and other stakeholders;

(ii) Summarizes comments and concerns received from affected people and other stakeholders and how these comments have been addressed in project design and mitigation measures, with special attention paid to the needs and concerns of vulnerable groups, including women, the poor, and Indigenous Peoples; and

(iii) Describes the planned information disclosure measures (including the type of information to be disseminated and the method of dissemination) and the process for carrying out consultation with affected people and facilitating their participation during project implementation.

C.6. Comparison of the National legislation of Georgia and ADB Requirements

127. The above accounts of national environmental low and ADB policy indicate that the two systems are similar but then there are certain aspects in which ADB policy is more demanding or specified than the Georgian procedure. The main differences are as follows.

128. The Bank's guidelines provide a detailed description of procedures for screening, scoping and conducting EIA and explain a complete list of stages, which are not specified under the national legislation.

129. Considering ecological risk, cultural heritage, resettlement and other factors, the Bank classifies projects supported by them under categories A, B, C and FI. However in the Georgian legislation, EIA is carried out only if a developer seeks to implement projects listed in the Law on Environmental Impact Permit.

130. This list is compatible with the category A projects of the Bank classification.

131. According to the Georgian legislation EIA is not required in other instances, while Asian Development Bank guidelines requires limited EIA or IEE for the B category projects, and an environmental review of projects that are not expected to produce environmental impacts (category C).

132. Georgian legislation does not specify the format of environmental management plans (EMPs) and the stage of their provision for projects requiring EIA and does not require EMPs for projects not requiring EIAs. The Asian Development Banks guidelines require EMPs for all categories of projects and provides detailed instructions on the content

133. According to Georgian legislation MoE is responsible for monitoring of project implementation and compliance with the standards and commitments provided in the EIA, and the role of the EMP is less clearly is defined. The PIU or "Project Proponent" is responsible for implementing "self-monitoring" programs for projects requiring EIA. In contrast ADB guidelines stress the role of EMPs, which are important for all categories of projects, and the Project Proponent (in our case – MDF) is required to ensure inclusion of a monitoring scheme and plans into EMPs. Monitoring of performance compliance against EMPs is important element of ADB requirements.

134. The national legislation also does not take into account the issue of involuntary resettlement at any stage of environmental permit issuance. The Georgian legislation considers social factors only in regard to life and health safety (e.g. if a project contains a risk of triggering landslide, or emission/discharge of harmful substances or any other anthropogenic impact). While the Bank's document establishes the responsibility of a Borrower for conducting an environmental assessment, the national legislation provides for the responsibility of a project implementing unit to prepare EIA and ensure public consultation.

135. The role of the Ministry is restricted to participation in EIA consultation and carrying out state ecological examination required for the adoption of a decision on issuing an EIA permit as established under the legislation of Georgia. Under ADB regulations ADB carry out project screening and categorization at the earliest stage of project preparation when sufficient information is available for this purpose, also according ADB's Public Communications Policy, ADB is committed to working with the borrower/client to ensure that relevant information (whether positive or negative) about social and environmental safeguard issues is made available in a timely manner.

136. In regard with consultation: The Bank provides for consultations for A and B Category projects (at least two consultations for Category A projects) and requires a timetable of consultations from the Borrower. The national legislation until recently contained only a brief reference to this issue without providing real tools of its fulfilment. The amendments to the Governmental Decree On the Procedure and Conditions of Environmental Impact Assessment established the requirement of public consultation of the EIA, which obligates a developer (i) to ensure public consultation of EIA, (ii) publication of information, (iii) receive comments within 45 days, (iv) arrange consultation not later than 60 days from the date of publication, invite stakeholders and determine the place of consultation.

Tab. C-3: Table of Activities and responsibilities in EIA for national law and ADB policy

#	Action	Georgian Legislation	ADB Requirements
1	Screening	Project Proponent in consultation with MoE	Bank and Consultant hired by Project Proponent
2	Scoping	Not required. Could be conducted voluntarily by Project Proponent.	Bank and Consultant hired by Project Proponent
3	Draft EIA	To be prepared by Environmental Consultant.	To be prepared by Environmental Consultant.
4	Public Consultations	The EIA should be available for public review during 45 days. Publication of information in central and regional mass-media. Arrange consultation not later than 60 days from the date of publication.	At least two consultations for Category A projects – one at the scoping stage and one for the draft EIA.

5	Final EIA	Consider all comments received during public consultations, incorporate accepted remarks and explain rational when the comments are disregarded.	Consider all comments from Bank and public. Agree with the Bank on each raised point. Incorporate accepted public comments and explain rational when the comments are disregarded.
6	Management Plans	No clear guidelines on format, content and timing	Incorporate Monitoring and Management Plans in the EIA.
7	Review and Approval	MoE	Bank and separately - MoE (if the EIA is required by Georgian legislation)
8	Disclosure of final EIA	Not requested	Publication (mainly electronic) of the final EIA.

C.7. Harmonization of the ADB and Georgian Legislation Requirements

137. In order to comply with the both regulations – the ADB and Georgian legislation – the content of the EIA should comprise issues required in both regulations, thus complementing each other. The EMPs should therefore be elaborated in details as required by the ADB regulations. The assessment of the stationary sources of emission (e.g. diesel generators) should be executed according to Georgian regulations: "Inventory of the Stationary Sources of Emission" and "Approval of the Emission Limits". For the category a projects the first public consultation (requested by ADB guidelines but not by Georgian regulations) will be held at the Scoping stage. The second one will be executed according to Georgian requirements. Disclosure will be conducted as required by ADB

D. DESCRIPTION OF THE PROJECT

D.1. Category of the Project

138. Upgrading and improvement of local transport and transport-related infrastructure plays a significant role in the development of Georgia infrastructure. To this effect a number of important activities have been implemented and financed from the budget of Georgia and from other sources. Development of transport and related infrastructure plays an important role in improvement of Georgia's urban infrastructure. Recently several significant programs, financed through state budget, loans and grants, have been implemented with this regard.

139. Sustainable Urban Transport Investment program (SUTIP) tranche 2 include the sub project: Consulting services under Tranche 2 - Batumi Coastal Improvement consulting services.

140. The environment classification for tranche is Environmental Category B, as the subprojects under SUTIP 2 were classified as category B which will not have significant irreversible or permanent negative environmental impacts during or after construction and requires preparation of Initial Environmental Examination (IEE). The environmental categorization of subprojects was conducted using ADB's Safeguard Policy Statement (2009).

141. In Georgian legislation, EIA is carried out only if a developer seeks to implement projects listed in the Law on Environmental Impact Permit. This list is compatible with the category A projects of the ADB classification. According to the Georgian legislation EIA is not required in other instances.

D.2. Need for Project

142. Georgia with its cultural and historical heritage and striking landscapes is becoming more and more popular amongst domestic and foreign travellers. In order to attract more tourists there is a need for development of infrastructures in regions with significant tourism potential.

143. In this context Batumi, the capital of Autonomous Republic of Adjara and one of the major cities on the Georgian Black Sea, is playing a significant role. It is one of the most important tourist sites along the Georgian Black sea coast, attracting a growing number of national and international tourists. In May 2007 Batumi international airport opened, and it is expected that the number of tourists that will visit Adjara will grow up to 1,000,000 visitors in the coming years. A large number of new hotels and infrastructures is being constructed along the coastline in Batumi, and the construction of a large number of new hotels and resorts has been planned.

144. However, the coastline southwest of Batumi is affected by erosion over a length of about 5 km. Along this section a number of houses and cultivated land has been lost already. Without adequate protection measures coastal erosion will continue at the airport area and at Adlia (village south of Batumi) and might even affect the beaches and the coastline of Batumi. As a consequence, the investment climate for tourism development could be negatively influenced.

145. Therefore coast protection is one of the priorities among other infrastructural projects which will facilitate the future development of the City and region.

Fig. D.1: Damage of newly built boulevard at Adjara village

D.3. Project Location

146. The project area is located in Autonomous Republic of Adjara and comprises Batumi City and adjacent sea shore. Batumi is located on the coast of the Black Sea in the southwest of Georgia, see following Figure.

147. The Batumi coast extends from Batumi Cape in the north to the mouth of River Chorokhi in the south. The beaches of Batumi coast are formed by gravel sediment carried by the Chorokhi River. Two submarine canyons stretch from the far depths to Batumi coast: one reaches Batumi Cape in the north, the other one lies directly opposite the mouth of river Chorokhi in the south. Previous studies have shown that part of the pebbles from the river flow into this canyon, hence failing to feed the beaches downdrift. Furthermore human interventions on the river (sediment mining, water flow regulation) have reduced in time the amount of sediment available to the beach, and further reduction is expected due to planned construction of new dams along the river. As a result the beach is suffering erosion.

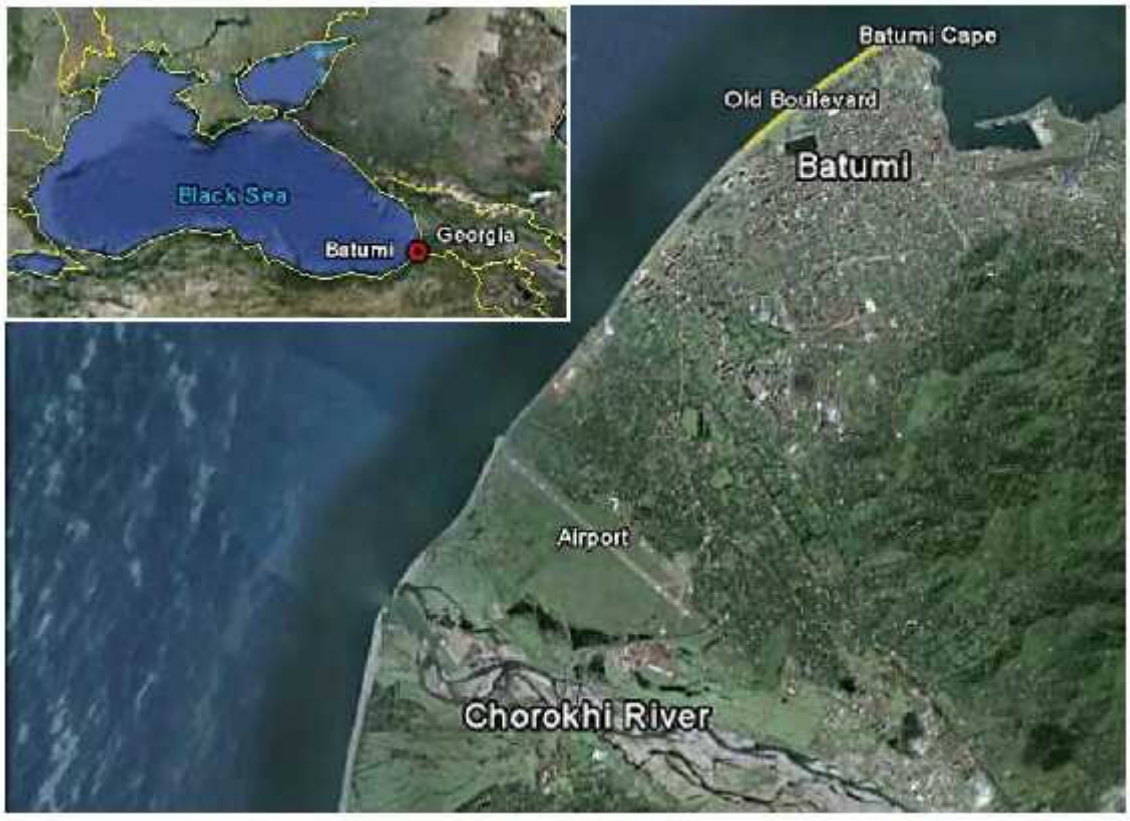


Fig. D.2: location of project area

D.4. Project Description

D.4.1. Coast Protecting Hydro technical Structure

148. The main objective of the proposed project is to protect the Batumi coast against erosion. The coastline southwest of Batumi is affected by erosion over a length of about 5 km. Along this section a number of houses and cultivated land has been lost already in the past. Without adequate protection measures coastal erosion will continue at the airport area and at Adlia (village south of Batumi) and might even affect the beaches and the coastline of Batumi. As a consequence, the investment climate for tourism development could be negatively influenced.

149. The main objective of the coastal protection works is to protect the coast against erosion. The protective constructions, which are foreseen along the coast of Batumi will have a major impact on the coastal zone: instead of a slightly eroding coastline, the coastline between the Chorokhi River mouth and Batumi Cape will be stable.

150. The evaluation of the alternatives to protect the coast against the erosion affecting the southern section of the littoral has shown that a soft intervention, featuring recirculation of the sediment between the northern section of the littoral (where it accumulates due to natural transport pattern)

and the southern portion (from where it is removed due to erosion), is the most efficient way to protect and restore the beach.

151. In addition to sediment recirculation, the beach in the South, suffering erosion, will also be protected by a revetment and enlarged over a stretch about 2 km long. Both sediment from recirculation and sediment from excavation (needed to build the revetment) will provide nourishment to this southern portion of the littoral. In particular, in this first intervention, the gravel material from recirculation (approximately 30,000 m3) will be used to form the toe of the new enlarged beach. A detailed description of the nourishment activities is provided in the following paragraph **Error! Reference source not found.**.

152. Other measures to protect the beach consist of:

- a monitoring program providing the information needed to analyse the possibility to re-orientate the river discharge towards North, in order to minimize the loss in the canyon of the sediments transported by the river. Some recommendations are also proposed to the Client, which are not part of the current scope of work, nevertheless they would be beneficial for the beach.

153. These will be described later.

154. In this paragraph the revetment construction activities are described.

155. Revetment construction will begin once a straight portion of toe berm is completed. It will commence starting from excavation, which will be carried out by means of backhoe excavator or similar.

156. The excavation will reach a maximum depth of -2.45 m MSL. The excavation will begin with the formation of the horizontal foundation level for the revetment toe, then will proceed backwards (towards the boulevard) with formation of the revetment slope (1/3). The amount of material to be excavated is on average 75 m3/m.

157. When the excavation profile is ready, geotextile fabric will be placed all along the excavated surface, from the edge of the revetment toe (at -1.60 m MSL) up to the top of the 1/3 slope (+1.85 m MSL). Then the underlayer (60-300 kg material from the quarry) and the rock armour (1-3 tons stone from the quarry) will be placed in sequence, up to level +1.85 m MSL, where a horizontal plane is formed. This plane will be used as a yard track first, during excavation and rock placing operations, and then as a base for casting the crown wall. The concrete crown wall will be built up to an elevation of + 4.5 m MSL, upon a base layer of lean concrete, according to the design drawings.

158. After crown wall casting, the underlayer and armour will be completed; the total amount of material to be placed to form the underlayer is on average 20 m3/m, whereas about 36 m3/m are required to form the rock armour.

159. Existing transport roads will be used whenever possible to transport materials from quarries to the construction sites (see chapter **Error! Reference source not found.**).

160. Filling material will then be placed between the crown wall and the boulevard, to restore ground level.

161. Finally, the sediment removed through excavation will be placed in the beach portion between the gravel beach toe and the revetment, following a 1/20 slope. The amount of sediment for beach filling is approximately 70 m3/m, which already includes an extra volume to account for the volume of voids of the rock layers lying underneath (30% for the underlayer; 40% for the armour).

162. The following **Error! Reference source not found.** shows a typical cross section of the intervention, whereas **Error! Reference source not found.** summarises the construction phases as described above.

163. Along the concrete crown wall at the top of the revetment, 12 beach accesses (approximately 1/150 m) are realized by galvanised steel stair 1.5 m wide and 19.5 m long. Each stair is supported by no. 3 concrete piles and the concrete seawall. Sea side the steps have the following dimentions:15 cm rise and 45 cm tread; on the other side (land side) the tread depth is reduced to 30 cm.

164. The accesses shall be equipped with railing systems made of stainless steel along both staircases, on the sea side and on the land side. The handrails shall be made of tubular stainless steel, both for posts and top and lower horizontal members.

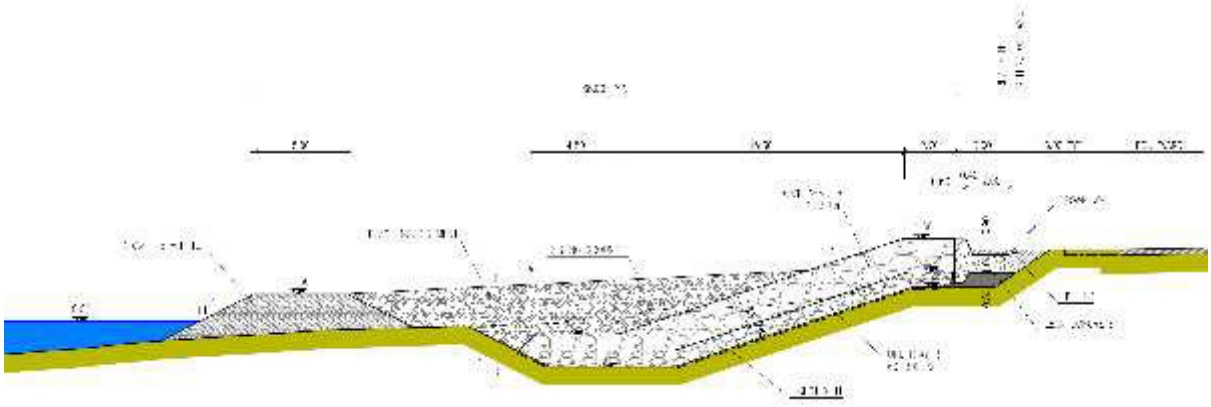


Fig. D.3 - Typical revetment cross section

165. It is estimated that on average approximately 160 m of revetment can be built per month, working on two fronts. Therefore to complete construction of approximately 1800 m of revetment, 11 months are needed.

166. This duration shall be increased in order to account for storms and unforeseen events which may interrupt or slow down the operations.

167. It is assumed conservatively that construction works need to be interrupted when waves are higher than 1 m.

168. The following **Error! Reference source not found.** presents the monthly wave statistics, with reference to the months between October and May, which are the worst months in terms of sea storms. According to the table, waves higher than 1 m occur on average 2.5 days per month.

169. If assuming a total of 5 days per month, to account for storms and unforeseen events which may interrupt or slow down the operations, 55 extra days shall be added to the estimated works duration, therefore the construction period becomes approximately 13 months (**Error! Reference source not found.**).

Tab. D-1 - Statistics of waves at offshore location 41.25° E 41.25° N, sector 240° N – 330° N *

Month	% of waves exceeding 0.5 m	% of waves exceeding 1.0 m	N° of storm days (>0.5 m)	N° of storm days (>1.0 m)
October	22.32	5.2	7	1.6
November	28.22	11.86	8	3.6
December	33.22	12.55	10	3.9
January	35.87	12.5	11	3.9
February	35.63	11.6	11	3.6
March	28.71	6.25	9	1.9
April	15.43	1.8	5	0.5
May	10	1.2	3	0.4
Total			64	19.4
Average over 8 months			8.1	2.4

**data from ERA-interim dataset, from 02-Jan-1979 until 31-Dec-2013*

170. As shown in the scheme, the two fronts may start working simultaneously only after dredging operations have been completed. This is because the beach needs to be cleared from the dredging equipment before excavations work can commence.

171. It was hypothesized to start revetment works from the southernmost part of the littoral, then proceed northward.

172. Also dredging operations follow the same path South to North, both in the nourishment and in the dredging area, at higher speed as compared to revetment construction. In fact dredging operations are expected to be completed in 4 months.

173. As soon as dredged material is stored in the backshore, the pipes can be removed from the portion of the beach where they are not needed any longer. Here excavators and dozers can start shaping the gravel berm, and then excavation for revetment construction may begin (first front).

174. When the first 900 m long stretch is cleared from the dredging equipment (in approximately 2 months) then revetment works can commence on the second front, which moves the opposite way as compared to the first front, i.e. from North to South.

175. From the third month onward the two fronts proceed simultaneously towards each other. Revetment work completion for the first 900 m is expected in 5.5 months (6.5 if accounting for interruptions).Once this stretch is completed, the two working fronts shall be transferred to the remaining 900 m long stretch, further North. They shall advance in opposite directions (the southernmost front towards North, the northernmost front towards South), and are expected to complete the work in approximately 6.5 months. Therefore the total duration of revetment construction and beach nourishment is 13 months.

176. This duration shall be split over subsequent construction seasons (October through June) to account for summer interruptions due to tourism activities, as shown in **Error! Reference source not found.**.

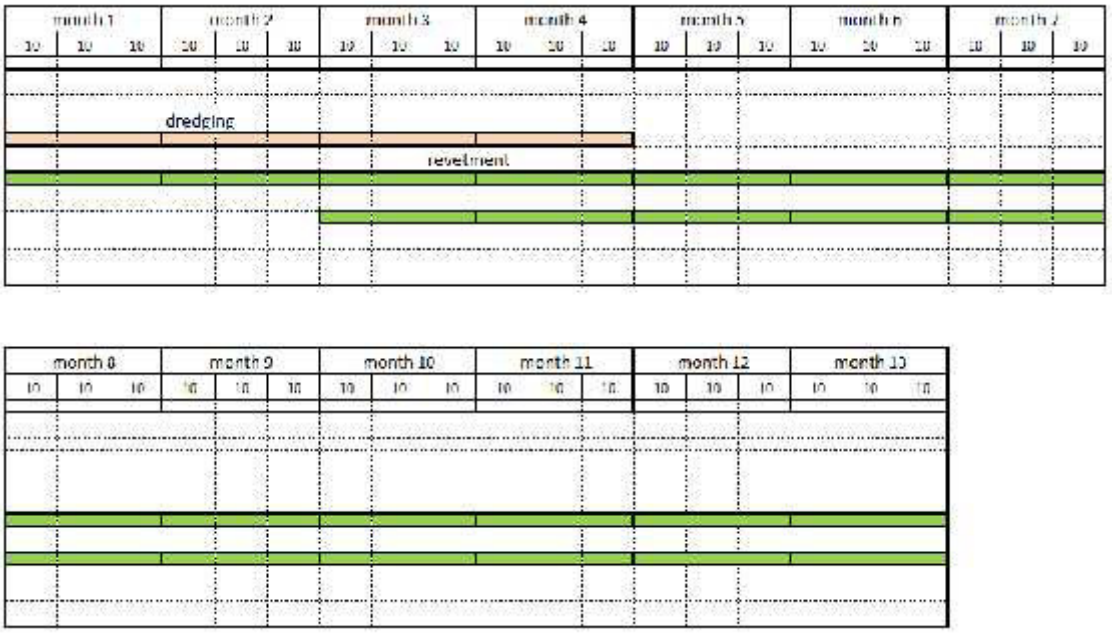


Fig. D.4 - Scheme of dredging and revetment work progress

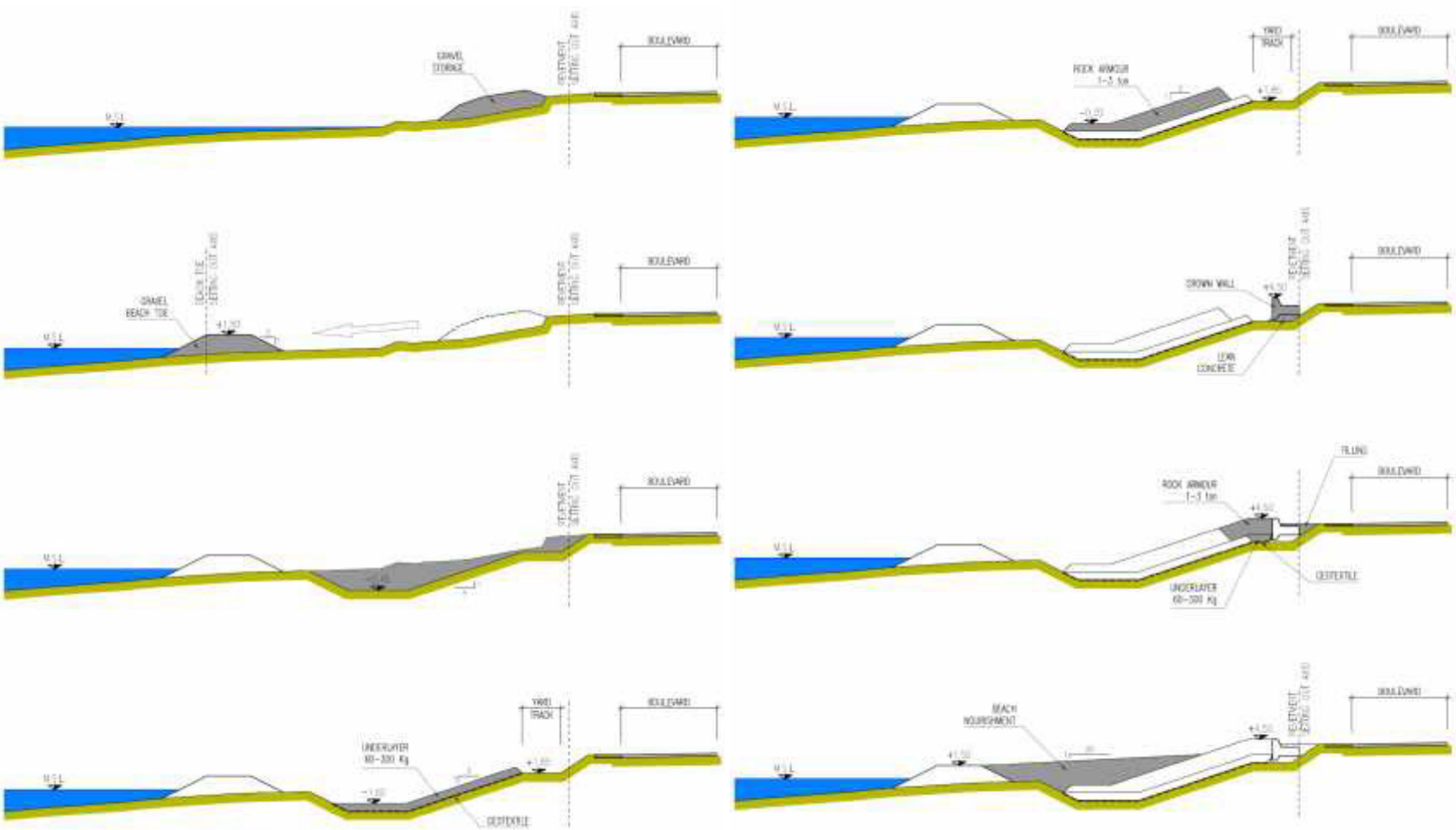


Fig. D.5: Revetment and beach nourishment, construction phases.

D.4.2. Excavation/Nourishment activities

177. The gravel material needed for beach toe formation will be sourced from the northern portion of the littoral, where the coastline is under accretion, over a beach length of approximately 2 km, across the shoreline, between -1 m MSL and +1 m MSL (see following fig…). The rate of material which can be extracted is approximately 15 m3/m. Sediment will be dredged by means of a special pumping system, and transported through pipes to the southern littoral, where it will be stored in mounds in the backshore and let drain off. From there it will be shifted towards the shoreline, to form the toe berm, in the beach sections where excavation for revetment formation is about to start. The total length of the toe berm is 2 km.

178. This operation of moving gravel from North to South corresponds to the yearly sediment recirculation which has been identified as a soft measure against beach erosion. The volume of sediment to be shifted from north to South has been identified as 30,000 m3 for this first intervention; in the following years this volume shall be adjusted based upon the results of monitoring surveys.

179. The general scheme of this process is shown in the following **Error! Reference source not found.**.

Fig. D.6 - Schematization of the dredging – gravel beach toe formation process

180. In the dredging area, the exact position of the setting out axis identifying the location of the dredging section is 6 m landward from the shoreline, under the condition that from the setting out axis landward (to the boulevard) there is a residual beach width of at least 70 m (hence total beach width should be at least 76 m). In areas where the beach width is smaller than 76 m, the setting out axis shall be placed at 70 m from the boulevard, and the dredging section will be in advancement

from that position. These two cases are shown in the following **Error! Reference source not found.**.

181. In order to define those distances, an initial beach survey shall be executed prior to work commencement.

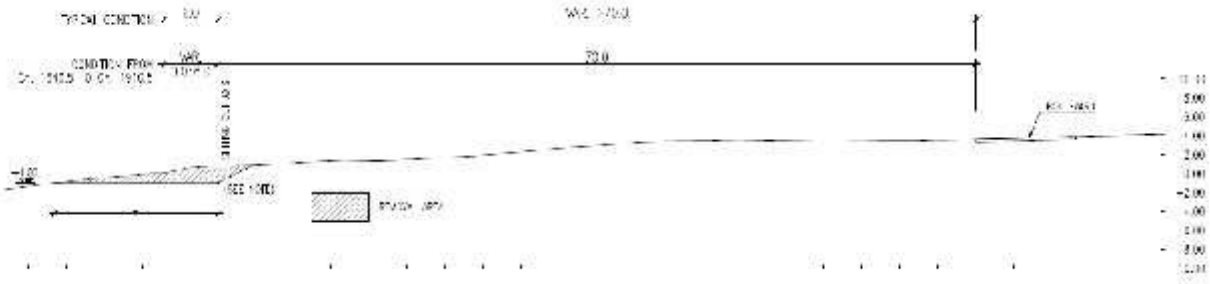


Fig. D.7: Schematization of typical excavation profile

182. The toe berm in the nourishment area will be shaped with 1/2 slope, and placed approximately 40 m from the revetment concrete seawall. The berm will constitute the gravel toe of the new beach to be formed, according to the typical composition of the local beach, and at the same time will offer some temporary protection against the waves during execution of revetment works. The toe berm is not a fixed structure, in that it is expected to rapidly evolve under wave action.

183. Gravel beach toe formation requires a total of about 38,000 m3 of gravel, of which 30,000 will be sourced from the northern littoral, as explained, and the remaining part (8,000 m3) will be provided by an authorized quarry. An extra amount of 10,000 m3 of gravel will be bought from the quarry and stored.

184. The time required to dredge and pump the required amount to the southern beach has been estimated as being 4 months in total.

185. In fact, if assuming a production rate of 50 m3/h, then the time needed to carry out the dredging operation is 30000/50=600 hours, which means 600/8=75 days.

186. If assuming 5% of extra days to account for unforeseen events and interruptions, i.e. about 4 days, and assuming 22 working days per month, the works duration is about 3.6 months.

187. Further extra time should be added, to account for inoperability due to sea storms. According to the wave statistics, 2.5 days of storm events per months can be assumed, hence 9 days more should be added to the work duration.

188. Hence the total work duration can be assumed as 88 days, i.e. 4 months are needed to dredge approximately 30,000 m3 of gravel from the northern shore to the South (see also chapter **Error! Reference source not found.**, **Error! Reference source not found.**).

189. The sequence of these operations is shown in the following **Error! Reference source not found.** and **Error! Reference source not found.**.

190. In the years following this first intervention, the volume to be dredged, the exact locations of the northern areas where to source material and also the intervals at which recirculation of sediment is needed shall be identified based upon the results of the monitoring activities. To this end, we advise to set-up a monitoring campaign to monitor the morphological changes induced by the dredging and nourishment operations. It is also important to stress that, in case the monitoring campaigns show that higher volumes are required, either the dredging area should be extended (e.g. further to the north, involving the canyon area) or part of the sediment should come from a different source, in order to avoid that additional dredging may lead to erosion of this stretch of coast. The advantage of this type of solution is its flexibility, which allows a year by year optimization of dredging and dumping locations where sediment is needed.

191. Once the gravel beach toe and the revetment are completed, filling material will be placed for the creation of the beach between them. This material may be sourced from the existing mounds accumulated during excavation operations, or from quarry. The nourishment volume is approximately 92.000 m3, of which:

- about 82.000 m^3 are needed to nourish the beach in front (and partially on top) of the new revetment;
- further 5.000 m^3 approximately are needed in the stretch of coast north of the Mejinistskali River, in proximity of the hotel, where no revetment is foreseen;
- further 5.000 m^3 approximately are needed behind the concrete crown wall.

192. This design volume has been increased in order to account for permeation of nourishment material through the voids of the underlying revetment. The process could last days or weeks depending on the weather, and will cause lowering of the beach. Once this process is completed (it can be estimated it may take couple of months), final restoration of the beach profile will take place, using more fill material.

193. To this end, it has been estimated that the portion of revetment being permeated by nourishment material is 75% of the total revetment volume (since nourishment covers only partially the underlying structure), and that in this portion of revetment the voids (corresponding to 30% of underlayer volume and 40% of armour volume in that 75% portion) are completely filled by the material. As a result, to account for permeation of nourishment material through the voids, an extra volume of about 34.000 m^3 is needed, which corresponds to approx. 27% of the design nourishment volume; therefore the total volume of nourishment is about 126.000 m^3.

194. The nourishment material will be placed by means of loaders with 1:20 slope, starting from the nominal crest elevation of the gravel beach toe (+1,5 m MSL) and compacted by rollers in layers.

195. Since there will be a time lag between formation of the gravel beach toe and the beach filling, it is expected that the toe profile, shaped as a berm during construction, has naturally evolved to a new shape, therefore it is envisaged that the original berm shape will be restored before proceeding with beach filling.

196. Since excavation, revetment construction and beach nourishment proceed in parallel (in different sections), it is envisaged to use excavated material right away (after the due checks on quality and grain size) placing it directly over the portion of revetment already completed. As a consequence, it is not necessary to provide big storage areas for nourishment material.

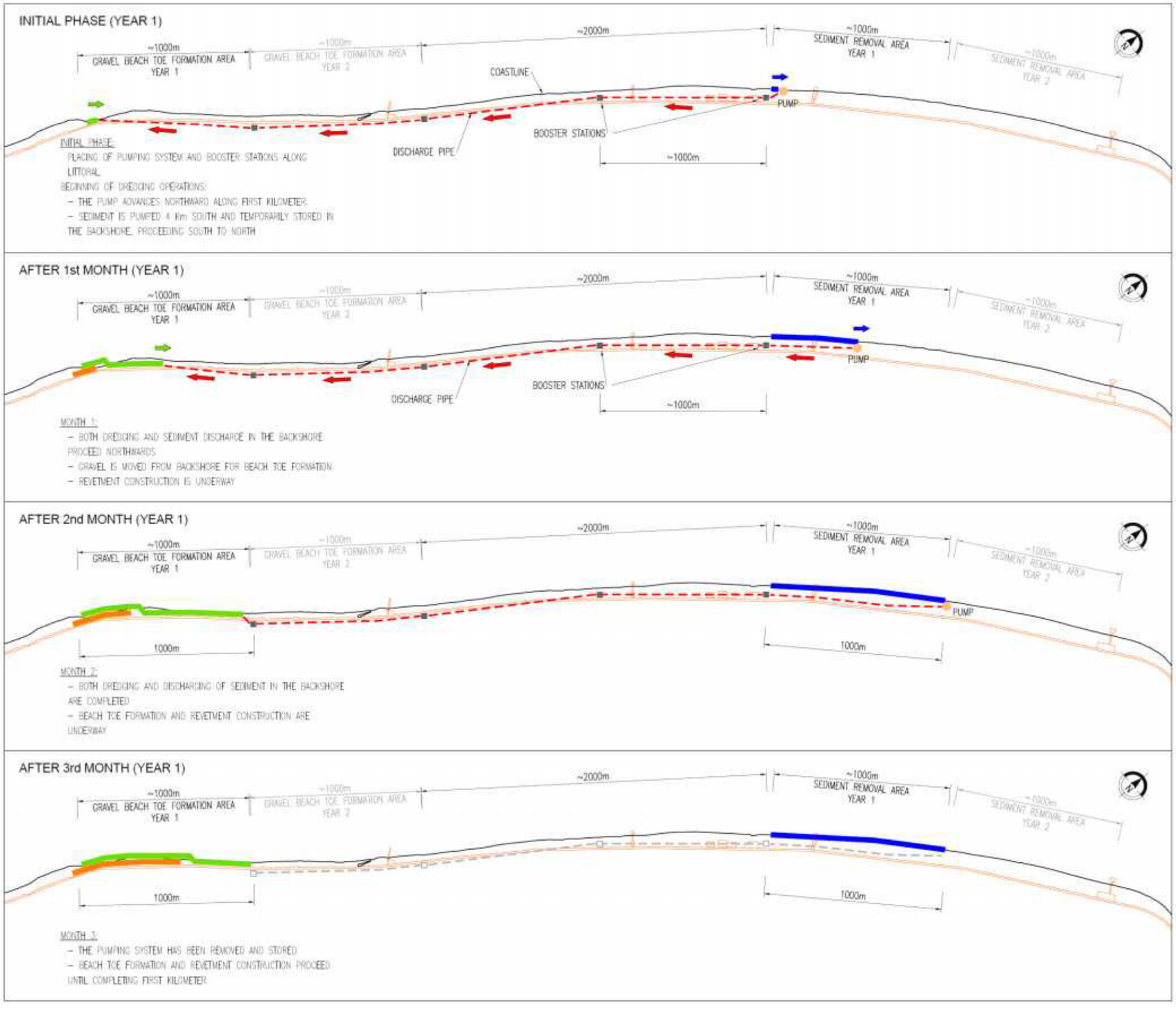


Fig. D.8 - Dredging execution phases and operations (first construction season)

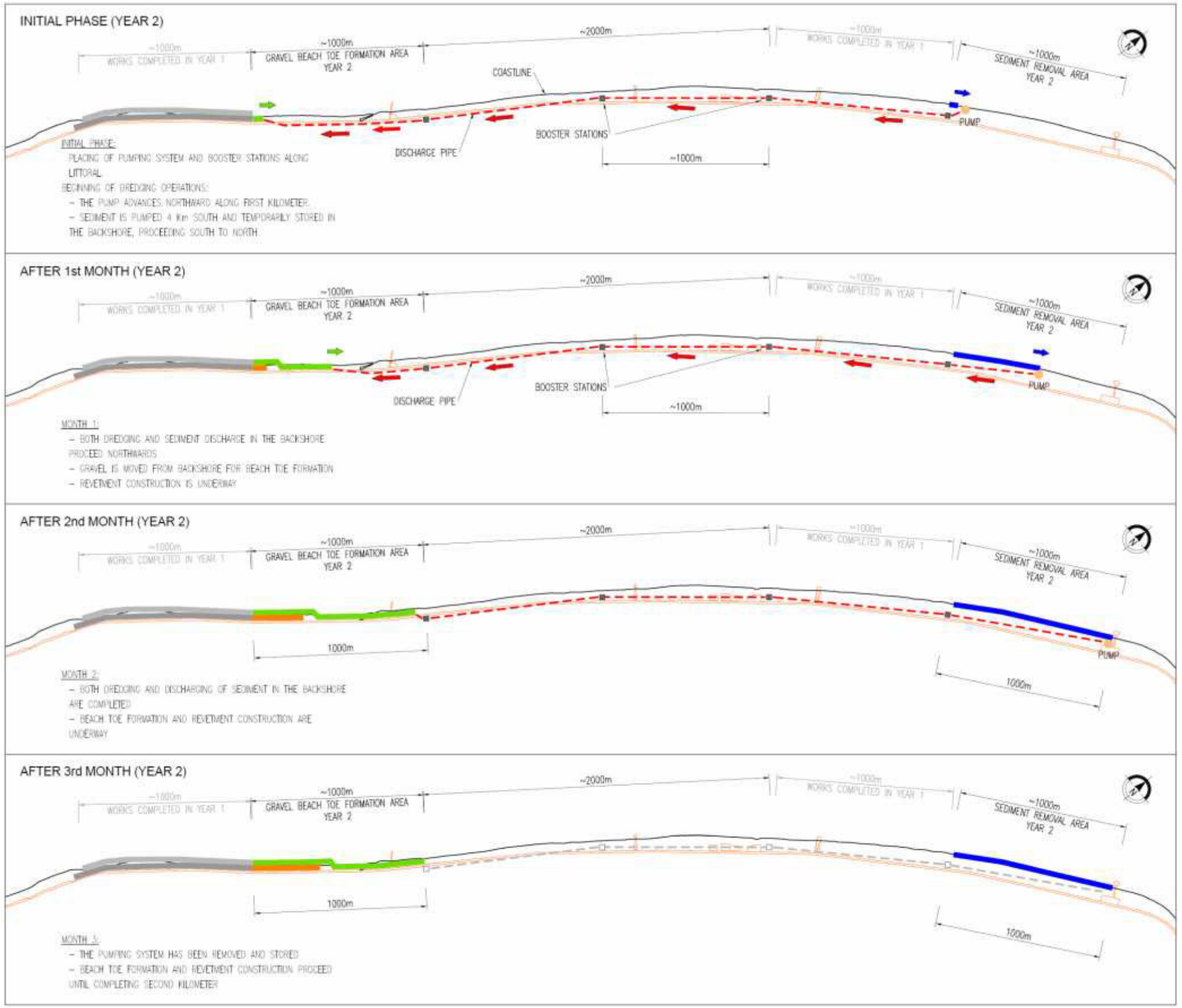


Fig. D.9 - Dredging execution phases and operations (second construction season)

D.4.3. Working, Storage Areas and materials from quarries

197. At the present, the working and storage areas have not been clearly defined, with the exception of the temporary storage area for nourishment (**Error! Reference source not found.**, **Error! Reference source not found.**). The Contractor will select the access roads, working and storage areas for construction materials, in accordance with local authority.

198. Access roads, working and storage areas are being selected taking into account, existing traffic, presence of sensible receptors (humid areas, houses, schools, etc..) and possible interference with existing structures. In case of possible negative impacts with sensible receptors mitigation measures will be taken into account.

199. The balance of construction material, for the foreseen working activities, accounts for the acquisition of pebbles from external site (quarries).

200. The following volumes are needed from quarries:

- pebbles for the gravel beach toe: 18,000 m3, of which 8,000 m3 needed for the project and an additional amount of 10,000 m3 to keep as reservoir during the works
- pebbles for beach nourishment: 11,800 m3, of which 1,800 m3 needed for the project and an additional amount of 10,000 m3, to keep as reservoir during the works.

D.5. Studies and modelling of the Chorocki River

201. In order to achieve a good knowledge of the behaviour of the Chorokhi River and its influence over the equilibrium of the littoral zone, it is of primary importance to investigate the nature of sediment transport and the sediment transport capacity in natural condition and in the presence of dams.

202. The following targets have to be performed

- Understand the present characteristics and behaviour of the river, in terms of geology of the riverbed, hydrology of the watershed, flow capacity, transport capacity, topography.

- Determine the type of sediment transport.

- Determine whether it is possible to change the terminal direction of the Chorokhi river in order to avoid the dispersion of the sediment.

- Determine the morphological and morphodynamics effects of the renovation work.

203. In order to reach the targets of the study, the following steps shall be undertaken:

(1) Identification of possible interventions: identification of a solution to increase the deposit of the sediment from the river, towards north, to replace the original role of the river to the sediment balance. The study shall provide at least 3 options of intervention, and include but not limit, the analysis of the following options:

- redirecting of the Chorokhi outfall more towards North direction, in order to avoid that a large part of the sediments transported by the river is lost in the deep canyon located in front of the river mouth;

- reducing of the amount of solid material retained by dams.

(2) 2D Model: implementation of a 2D model for the validation of assumptions made regarding the morphological behaviour of the river in the actual situation and with the implementation of the interventions foreseen.

(3) 3D Model: implementation of a 3D model of the river mouth, to model in particular the interventions identified and proposed.

(4) Data Collection: collection of geological information of the region, hydrological data concerning the river and its catchment, available data on water and sediment discharges.

(5) Integration of the data collected: in particular a geotechnical survey, shall be provided at the beginning of the work, to understand to define the characteristics of the soil and in particular the material forming the riverbed, and sediment load.

(6) Monitoring activities: a topographic survey, water level measurement and bed load survey in different periods of the year shall be provided to understand the river morphology and its evolution, and to estimate the sediment load of Chorokhi river;

204. This activity will take 1 year starting from the beginning of the construction activity (see chapter D.6).

D.6. Proposed Schedule for Project Implementation

205. The work schedule presented in following **Error! Reference source not found.** has been prepared under the hypothesis that the Construction Contract is awarded by the beginning of 2016, and that works may start in May 2016, in order to allow enough time for procurement of all machinery and equipment needed to carry out the operations.

206. Furthermore, it is supposed that works shall halt during summer months (July to September, included), in order to reduce to a minimum the interference with tourism and beach recreation.

207. The construction time has been spread over approximately 20 months, spanning almost 3 working seasons (October through June).

208. The dredging activities have been placed in the first and second season; revetment construction and beach nourishment are spread over all seasons (see **Error! Reference source not found.**).

209. The study and monitoring activities on the river may start within the first winter season, and be carried out without any summer interruption, since they are not expected to interfere with tourist activities.

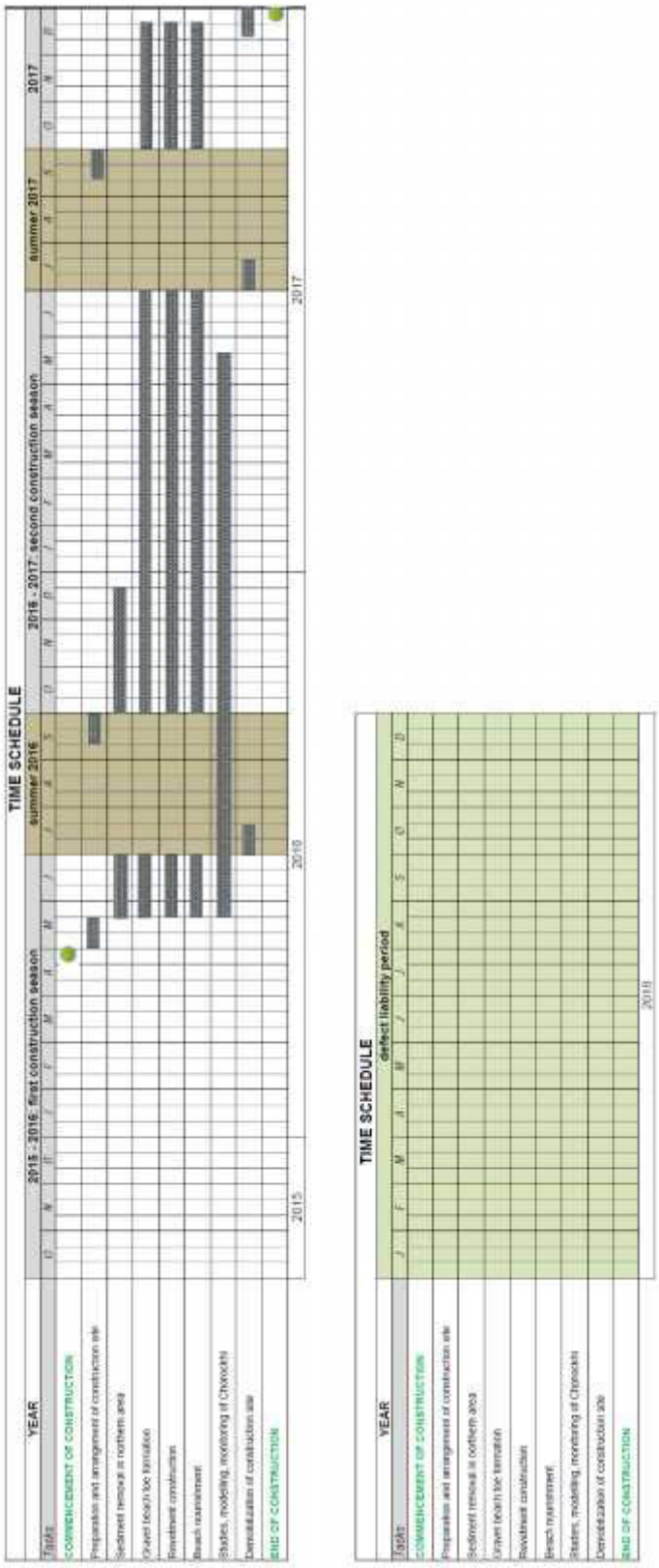


Fig. D.10 - Programme of construction works

E. PRESENT ENVIRONMENTAL CONDITIONS

E.1. Regional Settings

210. In Georgia there are 12 administrative units (Fig. E-2). Each administrative unit is divided into Municipalities (64 municipalities in total). According to the constitution territorial arrangement of the country should be defined after restoration of central authority on whole territory of Georgia.

211. Each municipality represents self-governing unit with homogenous physical- geographic conditions and defined natural boundaries as well as ethnic-cultural characteristics of population and historically established territorial-administrative function.

212. The project area is located on the territory of Khelvachauri Municipality in Adjara administrative region.

Fig. E.1: Administrative Units of Georgia

E.2. Climate and Atmosphere

213. According to the climatic zoning of Georgia, the study area belongs to the climatic zone of West Georgia, with subtropical wet climate. The climate is subtropical and is characterized by abundant atmospheric precipitations. Average annual precipitations amount to 1620-1650 mm.

214. In the area of Batumi, the probability that precipitation will be observed at this location varies throughout the year. During the warm season, which lasts from June 10 to September 19,

there is a 47% average chance that precipitation will be observed at some point during a given day. When precipitation does occur it is most often in the form of thunderstorms (56% of days with precipitation have at worst thunderstorms), light rain (27%), and moderate rain (16%). During the cold season, which lasts from December 17 to March 26, there is a 52% average chance that precipitation will be observed at some point during a given day. When precipitation does occur it is most often in the form of light rain (47% of days with precipitation have at worst light rain), moderate rain (30%), and moderate snow (11%).

215. Average air temperature is 13.8°C. The coldest months are January and February with the temperatures of -5.4°C and -6.2°C, respectively, and the absolute minimum is -19°C. The hottest months are July and August with the temperatures of 22°C and-23°C, respectively and the absolute maximum temperature is +40°C.

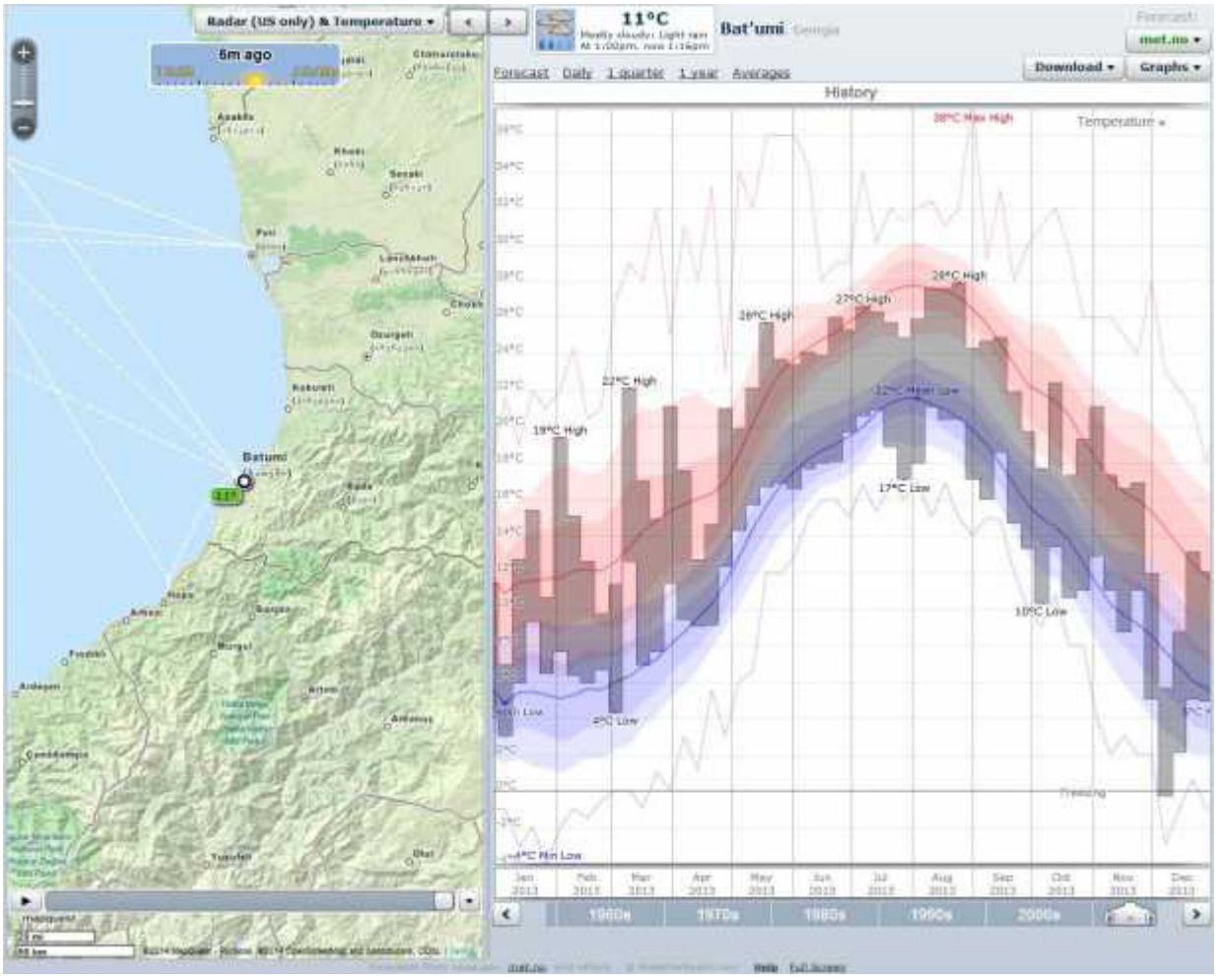


Fig. E.2: Batumi air temperature of 2013 year (from www.weatherspark.com)

216. The abundant precipitations characteristic to the given region is the result of frequent cyclones. This zone is protected against the penetration of north and north- west cold air masses by the

Caucasian, and the cold air masses penetrating from the north-west get significantly warm when crossing the sea basin and therefore, no sharp variations of temperatures, which are characteristic to other zones of the Black Sea, are observed in this given zone. The following monthly temperatures of air and water and their difference in different months, characteristic to the area under consideration (according to the data of the weather station of the city of Poti) are given in Tab. E-1.

Tab. E-1: Monthly Temperatures of Air and Water and their Difference

Months	1	2	3	4	5	6	7	8	9	10	11	12
Air t^0	5,2	5,8	8,7	12,0	16,6	20,3	22,9	23,2	19,8	15,9	11,8	7,1
Water t^0	9,8	8,6	8,6	11,0	16,0	20,0	23,7	25,3	22,8	19,1	16,1	12,7
Difference, t^0	4,6	2,8	- 0,1	- 1,0	- 0,6	- 0,3	0,8	2,1	3,0	3,2	4,3	5,6

217. The weather in winter is characterized by abundant precipitations and storms, which start at the end of November-December in this region. The periods of penetration of cold air masses in winter are characterized by bulk clouds, thunder, downpours and continuous rains. At the end of winter (at the beginning of March) the cyclone activity decreases and the weather becomes relatively stable and smooth. In summer and in the first half of autumn in the area cold air masses penetrating from north-west and tropical air masses penetrating at high speeds meet.

218. Besides, in the zones where thunder is formed, in the back of cyclones, around the cold fronts, whirlwinds are formed. We should mention that the average number of days with thunder reaches 40 a year.

219. The main direction of winds in from south (Fig. E-4) and the average speeds of 4-5 m/sec, with slightly stronger winds during the cold season.

220. The snow is generally absent in the area of Batumi.

221. According to the many-year data, almost no soil freezing is observed in the area under consideration.

222. Air Quality. Ambient air quality monitoring has been conducted at Batumi by MoE from 1990-2012. In the last 10 years, PM10 values resulted with high annual average concentrations, as well as nitrogen and sulphur dioxide (reference limits shown in Tab. E-2).

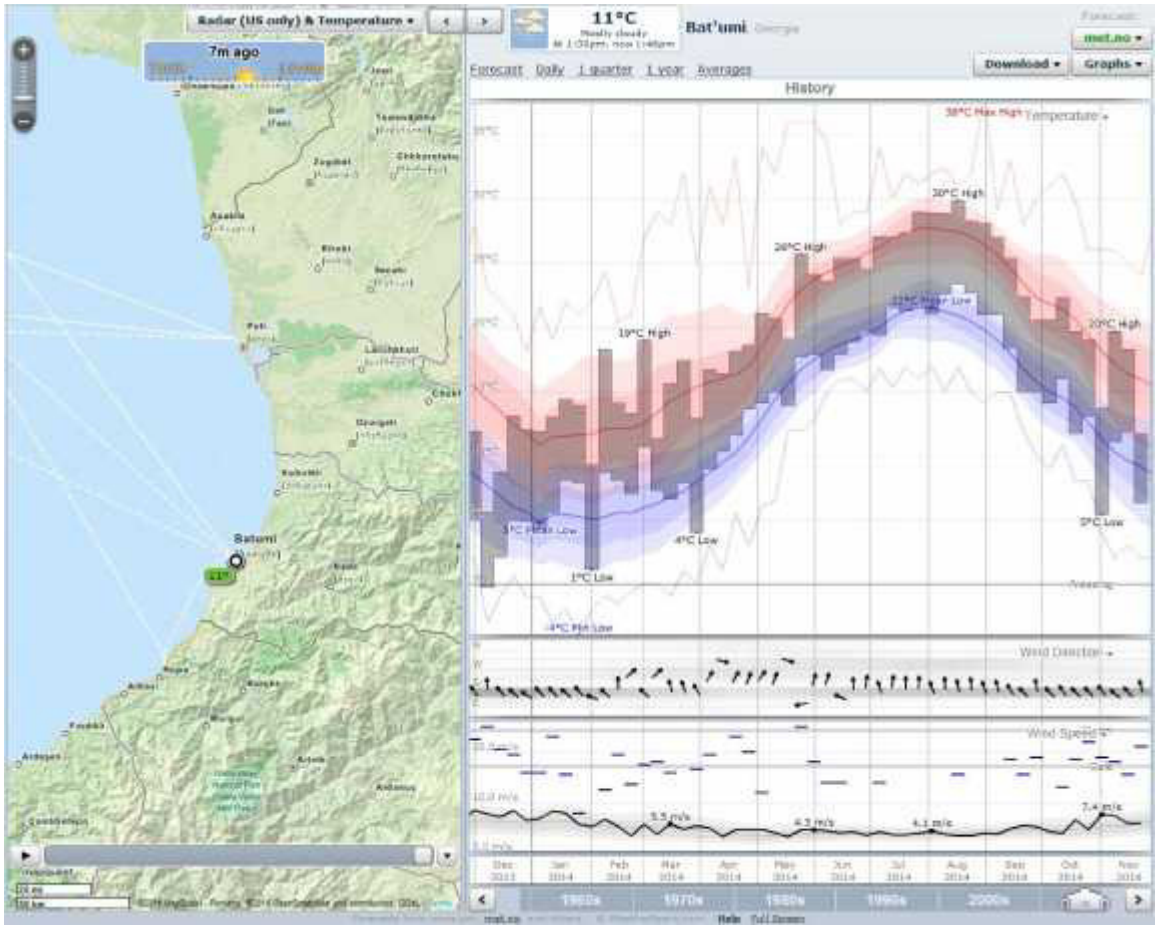


Fig. E.3: Temperature, wind speed and wind direction in the last year (Oct 2013-Nove 2014) at Batumi (www.weatherspark.com).

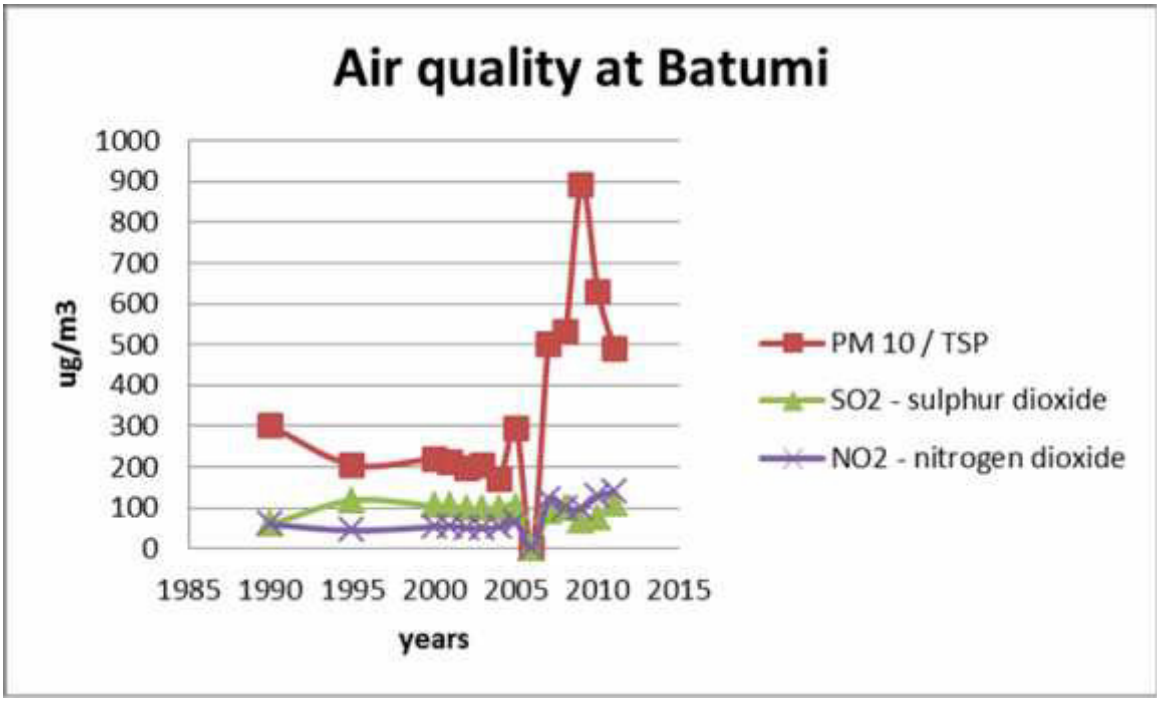


Fig. E.4: Air quality at Batumi (from MoE data)

Tab. E-2: Maximum permissible concentrations of harmful substances in ambient air according to Georgian and international standards.

Name of harmful substance	Maximum permissible concentration mg/m³			Concentration averaging period
	According to National legislation	Recommendation of the WHO	According to EU Legislation	
$PM_{2.5}$	-	0.01	0.025	1 year
	-	0.025	-	24 hours
PM_{10}	-	0.02	0.04	1 year
	-	0.05	0.05	24 hours
Particulate matter (total)	0.5	-	-	30 min
	0.15	0.12	-	24 hours
Nitrogen dioxide	-	0.2	0.2	1 hr
	-	0.04	0.04	1 year
	0.04	-	-	24 hours
	0.085	-	-	30 min
Sulphur dioxide	-	0.5	-	10 min
	-	-	0.35	1 hr
	-	0.05	-	1 year
	0.05	0.02	0.125	1 day
	0.5	-	-	30 min
Carbon monoxide	-	100	-	10 min
	-	10	10	8 hr
	-	30	-	1 hr
	5	60	-	30 min
	3	-	-	1 day
Lead compounds	-	0.0005	0.0005	1 year
	0.0003	-	-	1 day
	0.001	-	-	30 min
Ground level ozone	-	0.12	0.12	8 hr
	0.03	-	-	1 day
	0.16	-	-	30 min

E.3. Radiation Background

223. Radiation screening is continuously undertaken at Batumi by the National Environmental Agency for the assessment of radiation baseline. Measures frequently show values ranging around 11 micro-roentgen/hour, against a limit of 30 mkr/h.

E.4. Noise Background

224. After contacting the Environmental agency and local government we could not locate any existing background noise data in the project area. Due to this fact a sampling campaign will be carried out in the very next future and in any case before constructions and data will be used to define the ante-operam values.

E.5. Geological and Geotechnical Features

E.5.1. Geological outline

225. The Black Sea is formed by the two extensional basins of the West and of the East that coalesced late in their post - rift phases in the Pliocene. In particular the opening of the Eastern Black Sea started from Paleocene - Eocene time with the formation of a graben bordered by the Shatski Ridge in the north - east and by the Andrusov Ridge in the south - west.

226. This means that the Eastern Black Sea is a microplate bounded by seismic belts, the Greater Caucasus in the north and the Adjara Trialet Belt in the south, while its interior part is seismically inactive. The microplate is moving towards the north - west and clockwise rotating in relation to the Eurasian. The following figure shows the main tectonic units surrounding the Black Sea.

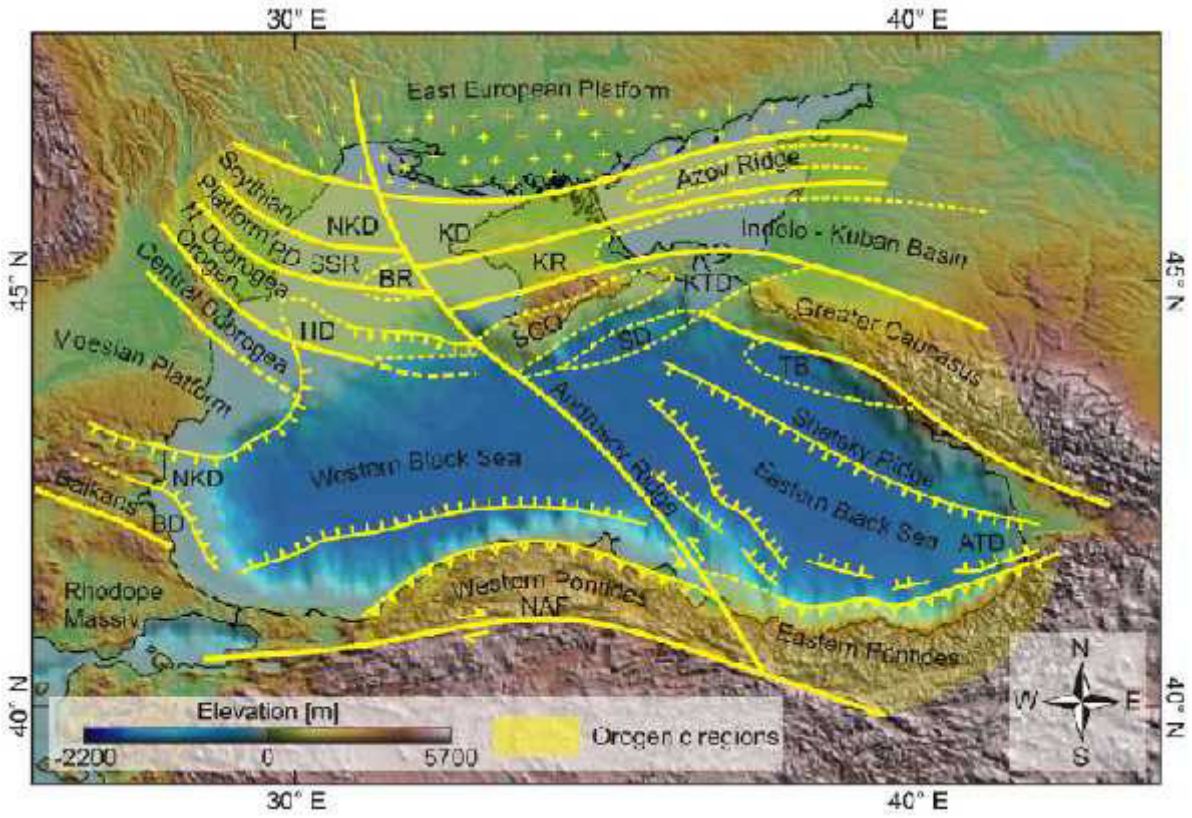


Fig. E.5: Geological outline - Main tectonic units of the Black Sea

227. The basin of the Eastern Black Sea was filled during the geological periods by offshore sedimentary successions, deriving from the dismantled of the surrounding mountains during their rifting periods. The Quaternary climate fluctuations with glacial and interglacial periods affected the sea level, defining step by step new morphological condition that influenced the sedimentation.

228. In particular at the last glacial maximum LGM the sea level reached almost -100 m below the actual mean sea level with an erosion of the river beds and a shift towards offshore of the river mouths. In this way a series of canyons were excavated by rivers within the sediments previously deposited.

229. After the LGM period the sea level raised and the canyons were submerged with the formation of a coast that was characterized by the presence of long inlets intruding upstream the valleys of major rivers. The coast gradually smoothed the inlets infilling by alluvium.

230. The river alluvium sediments, settled on the river mouths, were drifted along the shoreline by the waves with the formation of the actual coastal morphology. In general during Spring floods the beach - forming sediments create underwater alluvial bars that are completely destroyed by waves with a longshore transport of the sediments that are accumulated along the direction of dominating waves.

231. The beach forming sediments correspond to the entire bed load and to the coarser fraction of the suspended load of the Chorokhi river, while the finer fraction is dispersed offshore. A part of the beach forming sediments are lost into the submarine canyons whose apex is near the coast approximately at -10 m M.S.L.

232. The following figure shows the presence of submerged canyons along the Batumi coast, that are the evidence of old river beds in a period of lowstand of the sea level. The River Chorokhi had two branches: the Southern one, that is still open, and the Northern one that was closed at the beginning of the 19th century, whose mouth was located 4 miles towards North with respect to the present mouth. In this way the two canyons at north of the River Chorokhi indicates the migration of the northern branch of the river during the Holocene.

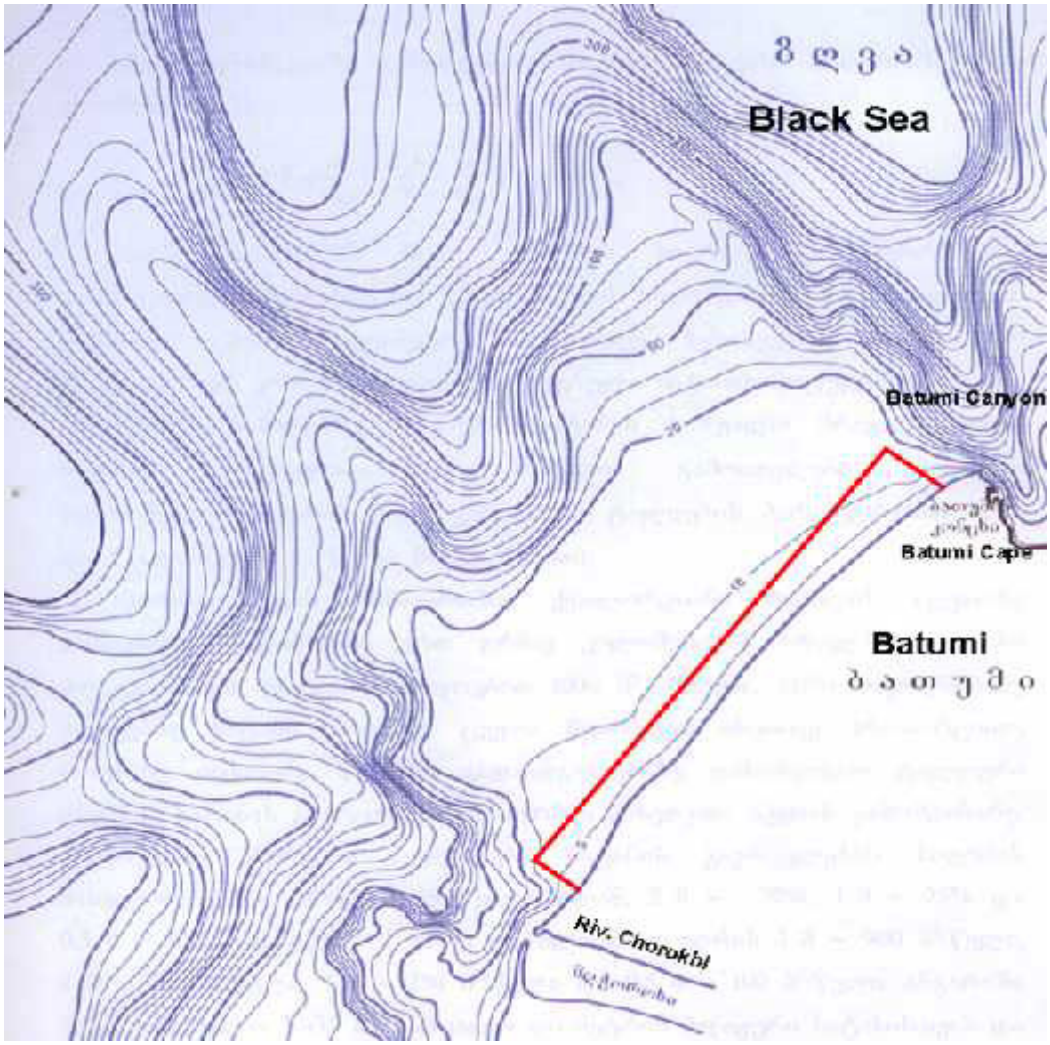


Fig. E.6 - Geological outline - Submerged canyons along the Batumi coast

233. During the last decades the sediment balance has been altered by the use of river bed material as construction material and by the construction of dams, causing reduction of the coarser fraction of river transport.

E.5.2. Soil investigation

234. A new geotechnical investigation was performed during 2014 in order to support the Detailed Design, defining the stratigraphy of the project area and the geotechnical characteristics of the foundation soils.

235. A number of 4 boreholes 20 m long were drilled along the shore with the execution of SPT tests every 1.5 m, collecting disturbed samples to be sent to laboratory for the execution of standard tests as grain size analysis, Atterberg limits and specific gravity tests. Between two consecutive boreholes a Dynamic Probing Super Heavy test, called DPSH, was carried out in order to extend along the shoreline the information provided by the boreholes. The stratigraphic information was extended offshore through the geophysical method of the subbottom profiler; the alignments are perpendicular to the shoreline.

236. In addition, a series of 25 seabed samples were collected water depth of 0, -5 m, -10 m, -15 m and -20 m M.S.L. along the subbottom profiles, using Van Veen Grab. In some cases a scuba driver was also employed for direct underwater sampling because of the presence of gravel and pebbles.

237. The following figure shows the location of the boreholes BH1 - BH4, of the DPSH1 - DPSH4 and of the subbottom profiles SP1 - SP13.

238. Following **Error! Reference source not found.** shows the location and average grain size (D50) of the collected seabed samples.

Fig. E.7 - Soil investigation - Location plan of the investigations carried out in the 2014

E.6. Coastline morphology

239. In front of the mouth of the Chorokhi river and in front of Batumi Cape, submarine canyons are located. These submarine canyons had a large impact on the coastal development in the past. The submarine canyons are shown in **Error! Reference source not found.**.

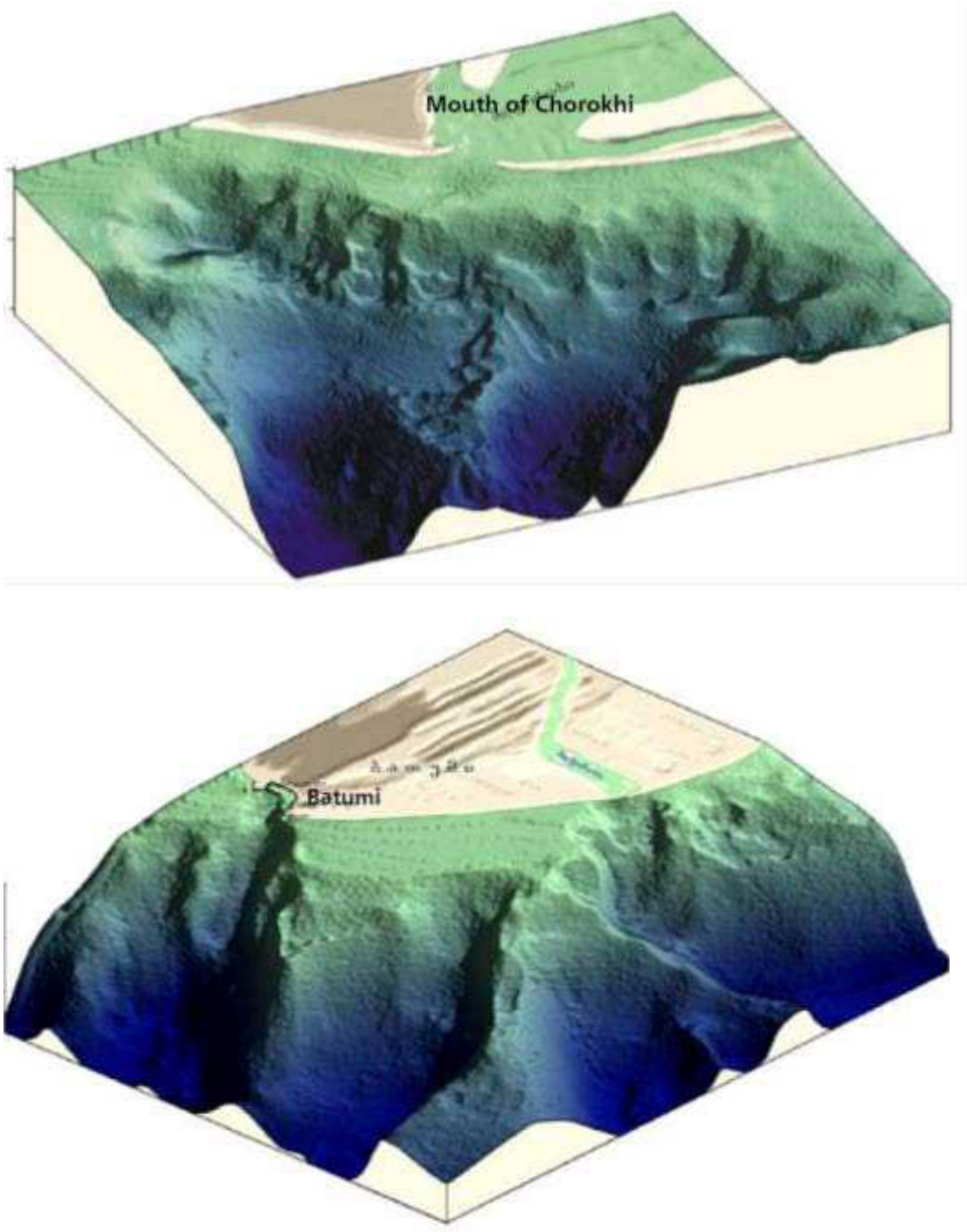


Fig. E.8: 3D-view of the submarine canyons along the coast of Batumi

240. One of the submarine canyons is situated directly in front of the mouth of the Chorokhi River. Although the river is probably still transporting a sufficient volume of sediment towards the coast, a large fraction of this sediment is transported directly into the canyon and only a limited volume of sediment benefits the coastal area.

241. The port of Batumi is situated in a second submarine canyon. Sediment which is transported towards the north by waves, eventually settles in this submarine canyon, diminishing the nourishment of the close coastline.

E.6.1. Main cause of the coastal erosion

242. For centuries, the Chorokhi River (just south of Batumi) transported sediment (both sand and pebbles) towards the coast. Due to this, a delta was created. The City of Batumi is situated on the delta of the Chorokhi River. Due to natural and anthropogenic causes, the coast of Batumi has been eroding for the last decades: main causes are the following:

243. Natural evolution: In the past (early 1800's, the Chorokhi River consisted of various branches, which distributed sediment into sea at various locations. Nowadays, these branches are closed and there is only one river branch left. In **Error! Reference source not found.**, the historic coastline (of approximately 1830) is shown together with the existing coastline. In this figure, the various river branches north of the airport can be identified and also the impact of these river branches can be seen. The coastline was positioned far more seaward by that time. Due to a natural event (probably a large flood), these river branches were blocked and the existing river branch became the only contributor of sediment to the coast of Batumi. The existing river mouth is situated in front of a submarine canyon. Due to this, large volumes of sediment are transported directly into the canyon instead of being spread along the coast. Due to the changes in the river morphological system, the coast of Batumi started to erode. This erosion is still on-going.

244. Sediment mining from the Chorokhi River mouth: On a yearly basis, approximately 300,000 m^3 of sediment is mined from the Chorokhi River mouth. The sediment is used for construction purposes. Due to the sediment mining, the river mouth is gradually deepened and the sediment transport capacity reduces (sediment deposits in the river mouth instead of being transported to the coast).

245. Construction of power dams in the Chorokhi River: In 2005, the first of a series of power dams on the Turkish side of the Chorokhi River became operational. These power dams are disturbing the river morphological system in two ways:

- The power dams are blocking the sediment, which means that bed erosion occurs on the leeside of the power dam;
- The power dams regulate the water run-off. Instead of a dry season (with hardly run-off) and a wet season (with high peaks in the river run-off), the river run-off is more averaged. Especially the peaks in the river run-off were causing sediment transports of large

sediment fractions (pebbles). In other words: Due to the regulation of the river run-off, the volume of coarse sediment which is transported towards the river mouth has become less.

Fig. E.9: Coastline (blue) of Batumi and the coastline of 1830 superimposed in red.

Emerged beach

246. The beach morphology has been investigated based upon the results of the recent bathymetric survey. In this survey 37 profiles have been measured, along the survey lines shown in **Error! Reference source not found.**.

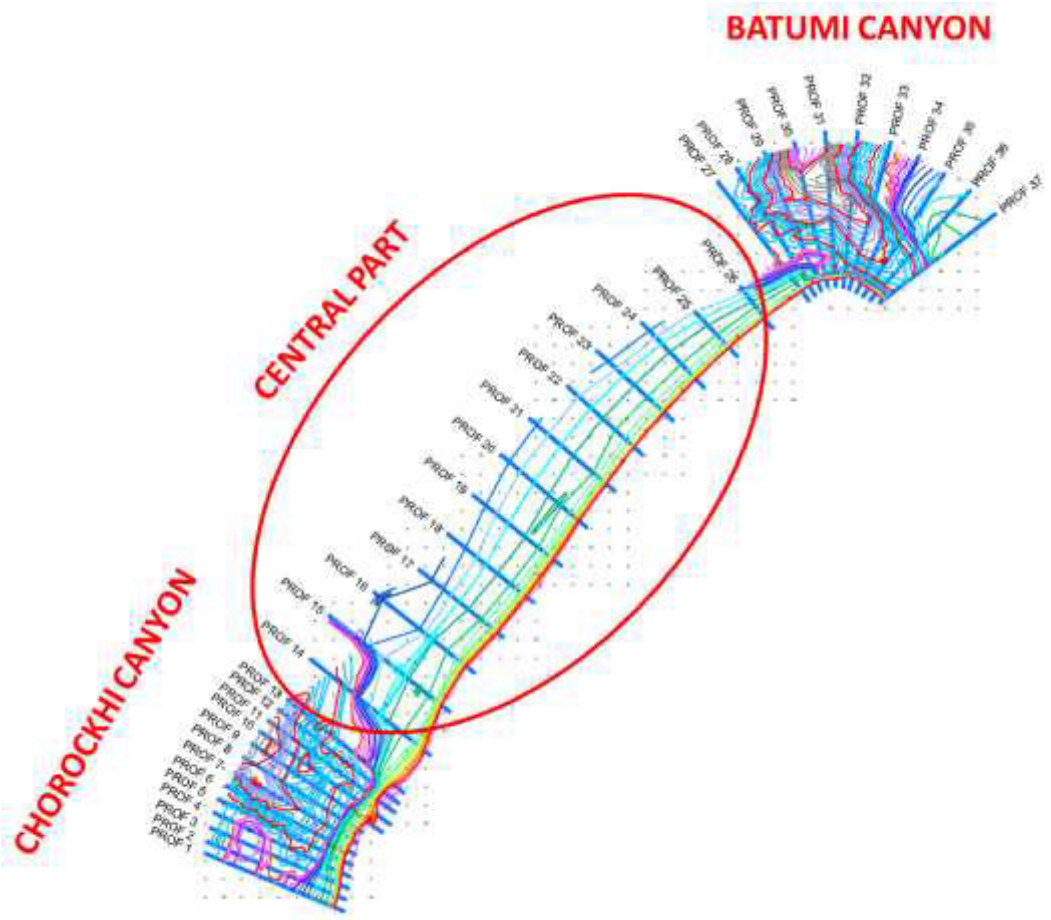


Fig. E.10: Plan showing location of surveys, survey transects and bathymetric contour lines

247. The emerged part of the beach shows features varying along the coast, mainly determined by:

- beach width
- presence of canyons

248. The description of these features does not cover the area of delta, where the morphology is rapidly evolving, and the area protected by the revetment in front of the treatment plant and mound placed near the airport. The profiles which have been considered in order to describe the natural characteristics of the emerged beach are those between 17 and 26, regarding the central part of the beach, and those between 27 and 35, regarding the Cape. Profiles 36 and 37 along Batumi Cape have not been considered representative of the natural characteristics of the emerged beach since they are strongly affected by the presence of structures close to the shore (the statue and the breakwater of Batumi harbour). In general the following features have been identified:

- a ridge close to the shoreline (see **Error! Reference source not found.**)

- an intermediate slope;
- a scarp in the back of the beach

249. The ridge has a slope very similar all along the littoral, whereas both the central part of the beach and the scarp before reaching the boulevard have a variable slope, in general decreasing moving south to north.

250. In the area of the Cape the beach is even flatter, and it is possible to identify also another ridge, this one running almost parallel to the shore, almost in the middle of the beach (see **Error! Reference source not found.**). This ridge may be a remnant of a previous shoreline position, following canyon landslide.

251. In the southernmost part of the coast, (profiles 17,18 and 19) the beach is quite narrow: the width ranges between 30 and 40 m. This part is characterised by a steep foot near the shoreline (steepness around 1/5), and by a very steep scarp before reaching the boulevard (about 1/3). In the central part the slope is quite variable, on average 1/20.

252. Moving further north (profiles 20 and 21) the width ranges between 40 and 60 m. Along this stretch the foot near the shoreline has the same steepness, i.e. 1/5; the scarp in the back of the beach is milder (around 1/9).

253. Profiles from 22 to 26 are relative to a flatter and much wider part of the beach: here the width ranges from 60 m up to 90 m. Along this stretch the beach is characterised by a steep foot (1/6 on average), and the scarp in the back of the beach has a slope of 1/18 on average. From the end of the scarp to the boulevard, there is in general a flat portion, generally covered by vegetation.

254. The main features of the emerged beach are summarised in following table. Please note that the figures in the table are averaged over the specified profiles, and that the maximum elevation has been measured with respect to the seaward border of the boulevard.

Tab. E-3: Features of emerged beach - central part

	Steepness (1 over) / corresponding depth (m MSL)				
Profile number	foot	up to elev.	scarp	up to elev	max elevation
17,18,19	5	+0.6	3	+3.4	+3.9.
20,21	5	+1.0	9	+3.2	+3.3
22 to 26	6	+0.6	17	+3.2	+3.4

Fig. E.11: View of the beach near the Cape

Fig. E.12: Aerial view of the beach at the Cape

255. Moving further north (profiles 27,28 and 29) the beach remains wide: the width ranges between 80 and 90 m. This part is characterised by a ridge near the shoreline (steepness around 1/3), a central part with a slope quite variable (on average 1/25) and a scarp in the back of the beach with a slope around 1/9. In the upper part of the profiles there is a relatively flat portion, with a slope of 1/240 on average.

256. Profiles from 30 to 32 are relative to a narrower part of the beach which presents quite a variable width, ranging from 40 m up to 80 m. Along this stretch the beach is characterised by

a steep ridge (1/4 on average) and a the central part with a slope 1/20 on average. The scarp in the back of the beach has a slope which ranges from 1/20 up to 1/10.

257. Moving further north (profiles 33, 34 and 35), the beach has a very variable width, ranging from 60 m up to 105 m and is characterised by a steep ridge along the shoreline, with a slope 1/4 on average. In this area it is possible to identify also another ridge, this one running almost parallel to the shore, but approximately in the middle of the beach (see profiles 33 and 34). Beach profiles in the area of the Cape have a central part with a mild slope (1/45 on average) and a scarp in the back of the beach with a slope less than 1/10 on average (covered by vegetation in the upper part in profiles 33 and 34). Profiles 33 and 34 are characterized by a wide (70 m on average) central part of the beach; conversely, in profile 35, where the beach is narrower (approx. 65 m), the central part is very narrow (approx. 10 m) but from the end of the scarp to the boulevard, there is a wider and milder portion covered by vegetation.

258. The main features of the emerged beach are summarised in following **Error! Reference source not found.**. Please note that the figures in the table are averaged over the specified profiles, and that the maximum elevation has been measured with respect to the seaward border of the boulevard.

Tab. E-4: Features of emerged beach – along Batumi Cape

	Steepness (1 over) / corresponding depth (m MSL)				
Profile number	foot	up to elev.	scarp	up to elev	max elevation
27,28,29	3	+0.9	9	+3.7	+3.8
30,31,32	4	+0.6	15	+3.7	+4.2
33,34,35	4	+0.7	10	+3.7	+4.1

E.7. Seabed conditions

E.7.1. Sediment characteristics

259. The analysis of the seabed samples shows that in general the beach mainly consists of gravel with small amount of course sand and some cobbles (see **Error! Reference source not found.**). At a water depth of -10 m MSL, the seabed mainly consists of very fine sand. Locally, a slightly different figure is shown for the transects located just in front of the canyons, where a coarser sediment fraction is found also at larger depth. This is most likely related to sediment falling in the canyons due to landslides from the beach.

Fig. E.13: Cobbles close to the water line (left) and on the upper part of the beach (right)

260. The results of the grain size analysis are summarised in following **Error! Reference source not found.** and **Error! Reference source not found.**.

Tab. E-5: Measured median diameter (D50) for different profiles (from south to north) and at different positions along the profiles.

SBP Line	D50 (mm) at 0 m water depth	D50 (mm) at -5 m water depth	D50 (mm) at -10 m water depth	D50 (mm) at -15 m water depth	D50 (mm) at -20 m water depth
SP1	11.64	26.69	17.38	-	0.57
SP2	-	31.23	8.59	-	0.58
SP6	9.20	0.01	0.38	-	-
SP7	-	0.19	0.01	0.01	0.02
SP9	9.74	0.25	0.21	-	-
SP12	5.32	102.27	66.85	-	41.68
SP13	17.69	79.93	73.87	-	66.67

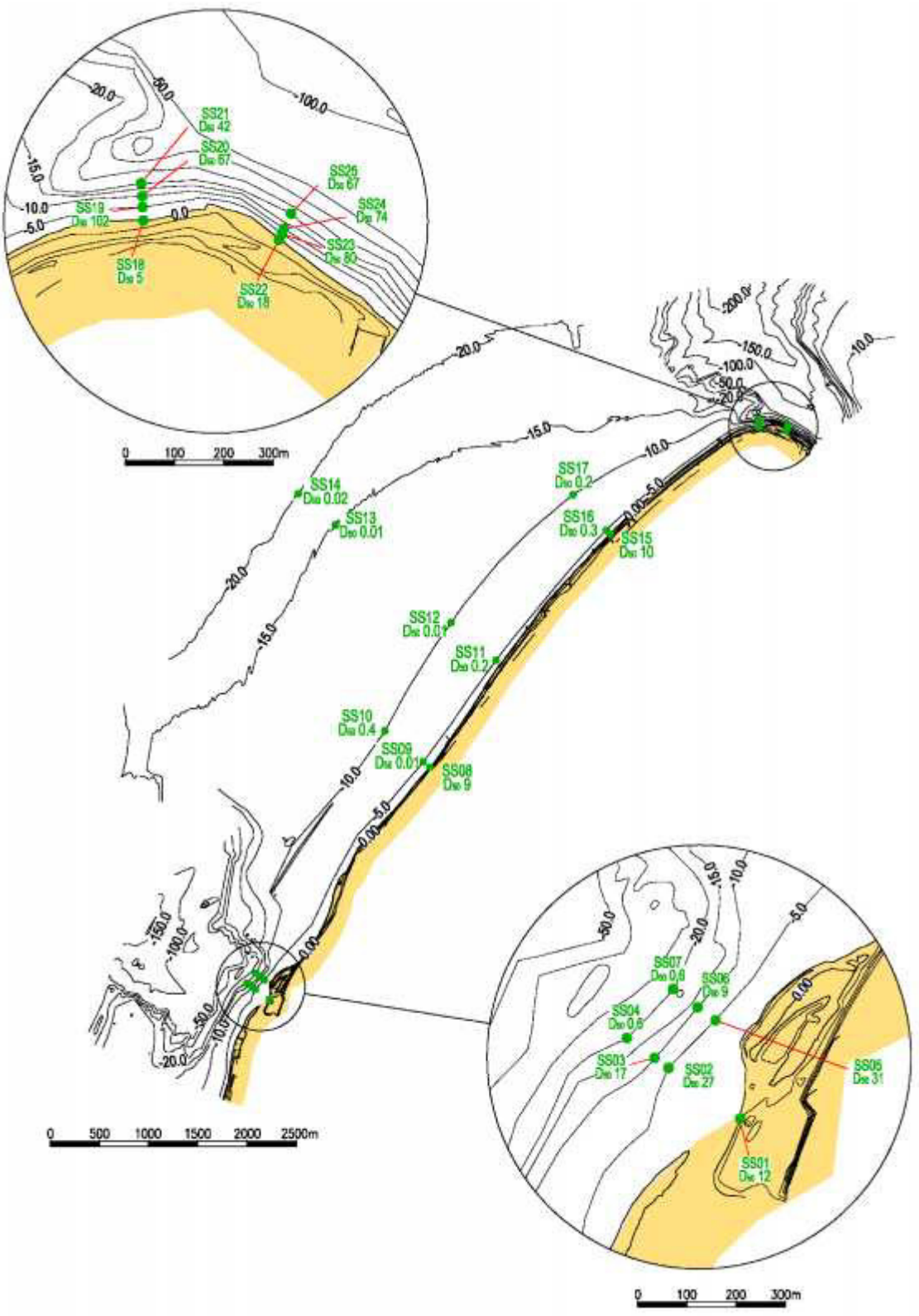


Fig. E.14: Sampling position and corresponding measured median diameter (D50) at various depths (measures are in mm)

E.8. Seismic activity

261. According to the actual seismic guidelines of Georgia the value of PGA is 0.08g for the project area, see the following figure.

Fig. E.15: Seismic outline - PGA Map of Georgia

262. According to Georgian seismic regulations the foundation soil is characterized as soil type C from a seismic point of view on the base of the new investigations.

E.9. Surface Water

E.9.1. River Chorokhi

263. The following information is extracted from the River Basin Analysis in Chorokhi-Adjaristskali pilot basin (Georgia – Environmental Protection of International River Basins, 2013).

264. Chorokhi River (Choruk-Nekhr) is one of the major rivers of the Black Sea East coast. It takes origin in Tku-Badagi mountain in Turkey, 20 km South-West mountain Ispir, at 2700 m above the sea level and flows into the Black Sea on the territory of Georgia 6 km South-West Batumi.

265. The river has high water flow in spring and floods are frequent in autumn, while it has a low flow periods in summer and winter seasons. Spring flooding starts in early March, reaches a maximum in May and ends late July. In August and September the river has a low flow, but occasionally it is flooding 4-5 times as a result of heavy rainfall. Heavy rainfalls also cause floods in autumn often exceeding the spring floods. Occasionally, summer floods coincide with the flooding caused by intensive rains, which result in catastrophic increase in water level. By the end of November the winter low flow period starts, which lasts till March of the following year. 45% of the annual runoff is generated in spring (March-May), 25% - summer (June – August), 17% - autumn (September- November) and 13% - winter (December – February).

266. Multi-year average runoff of the Chorokhi River at Erge gauging site, where the catchment area equals 22,000km2, is 272 m3/sec, maximum runoff – 3,840 m3/sec (recorded on 8 May, 1942) and minimum runoff – 44.4 m3/sec (recorded on 12 August, 1955). River turbidity varies between 3,700 and 110,000 g/m3 during floods and flash floods. The maximum sediment flow is recorded in May and makes up 3,100 kg/sec, while the minimum sediment flow is recorded in September and makes up 3.0 kg/sec. Ice formation is a very short-term phenomenon. The river Chorokhi is not used for irrigation.

267. Average monthly and annual runoff for the multi-year period is given in Tab. E-5 below. Years of observations are also indicated there.

268. Monthly and annual means for the Chorokhi River are calculated for natural conditions. Currently, the river is regulated and the regime is changed due to large dams and hydropower plants operating in Turkey.

Tab. E-6: Multi-year average monthly and Annual discharges (m3/sec) for Chorokhi river measured at hydrological gauging sites

River	Hydrological Observation site	Years	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Annual
Chorokhi	Maradidi	1955-68	84	99	172	349	426	313	166	87	83	99	108	115	175
Chorokhi	Mineri	1960 80	92	115	179	426	552	356	156	90	90	130	133	117	203
Chorokhi	Erge	1980 80	134	176	270	560	678	447	219	130	133	193	198	178	278

Source: ( ), , 6, , .,, ". 1987 (State Water Cadaster, Multi-year data on the regime of surface waters, volume 6, Georgian Soviet Republic, Leningrad, publishing house : Gidrometizdat, 1987).

269. Multi-year average monthly and annual data on sediment flow, are given in Tab. E-6.

Tab. E-7: Multi-year average monthly and Annual sediment flow(Kg/sec) for Chorokhi river measured at hydrological gauging sites

River	Hydrologic observatio	Years	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Annual
Chorokhi	Maradidi	1973 1980	25	33	170	1000	1200	600	150	70	130	130	75	47	300
Chorokhi	Mineri	1930 / 198	21	42	130	700	1000	570	250	240	87	81	62	63	260
Chorokhi	Erge	1969 1980	0.42	0.53	0.55	1.7	0.93	1.1	0.54	0.44	0.54	1.7	0.65	0.57	0.77
Machakhela	Sindieti	1954-1980	1.5	1.9	4.4	21	15	5.4	1.6	3.0	1.6	2.5	2.5	2.5	4.8

Source: ( ), , 6, , .,, ". 1987 das.s. „saqwyalproeqtis" fondurimasalebi.(State Water Cadaster, Multi-year data on the regime of surface waters, volume 6, Georgian Soviet Republic, Leningrad, publishing house : Gidrometizdat, 1987; Archives of Georgian Hydroproject Institute)

270. Granulometry of the sediments carried out at the Erge gauging sites, the closest to river mouth, measuring the granulometric composition of the sediment are given in Tables below.

Tab. E-8: Granulometric composition of the sediment of the Chorokhi River at Erge gauging site

Water regime	Sediment composition (size of grains)	Particle composition (% share of total mass) mm in diameter							
		1-0.5	0.5-0.2	0.2-0.1	0.1-0.05	0.05-0.01	0.01-0.005	0.005-0.001	<0.001
Spring flood	large	92.9	7.1	_	_	_	_	_	_
	medium	3.3	8.7	17.8	23.8	46.4	_	_	_
	fine	_	0.6	1.0	5.4	49.2	13.0	21.0	9.8
Fall flash flood	large	54.8	38.8	6.4	_	_	_	_	_
	medium	2.0	7.8	15.2	20.4	54.6	_	_	_
	fine	0.2	0.2	0.6	2.1	26.9	23.1	34.8	12.1
Summer low water	large	57.7	34.4	6.2	1.7	_	_	_	_
	medium	3.2	13.8	14.4	20.1	48.5	_	_	_
	fine	_	0.5	2.1	14.7	82.7	_	_	_
Winter low water	large	40.4	30.9	23.1	5.6	_	_	_	_
	medium	3.3	15.4	22.0	20.0	39.3	_	_	_
	fine	_	1.1	0.1	14.5	46.0	13.5	9.7	15.1

Source: ( ), , 6, , .,, ". 1987 (State Water Cadaster, Multi-year data on the regime of surface waters, volume 6, Georgian Soviet Republic, Leningrad, publishing house : Gidrometizdat, 1987)

271. As regards water quality of Choroki river, the Georgian Environmental Agency performs the monitoring of the water quality for the delta of River Chorokhi. Sampling activity foresees the collection of one water sample per month.

272. Most recent data, collected in February 2015, provided by Environmental Agency are shown in **Error! Reference source not found.**. The values confirms the good quality of the river waters.

Tab. E-9: Choroki River water quality. Sample collected by Environmental Agency, on 26th February 2015 at 11.45, coordinates of sample 420 05'8 N, 410 42'3 E.

Chorokhi	
Depth of sample taking m.	**0,50**
Temperature t, ^{0}c	**16,7**
Transparence, cm	**100**
Electro conductivity mkcm/cm	**174,0**
Oxidation-Reduction Potential (mV)	**-65,4**
PH	**8,081**
Carbon dioxide $C0_2$, mg/l	**0,79**
Free oxygen mg/l	**12,3**
Nitrite-N mg N/L	**0,006**
Nitrate-N mg N/L	**0,290**
Ammonium-N mg N/l	**0,03**
Azote sum in mineral mixture. mgN/l	**0,326**
Phosphate, mg P/l	**0,007**
Chloride, mg Cl/l	**3,3**
Hydro-carbonates Mg HCO_3/l	**75,6**
Ca mg/l	**15,9**
Mg mg/l	**6,2**
Iron, Fe $^{+2}$ mg/l	**0,00**
Sodium mg/l	**1,0**
Hardness mg/l	**101,3**

E.9.2. Black Sea

273. In order to fix the present water levels of the Black Sea, many researchers have developed the hydrological balances and the data of multi-year observations of the sea hydrological posts of Batumi and Poti have been used. The accomplished studies demonstrate that the incoming portion of the Black Sea hydrological balance exceeds the discharge portion by 2-3 km3, causing the rise of the Sea level by 4,7-5,0 mm annually. At the same time, the Sea level rises in parallel to the rise of the world ocean level.

274. Sea level rises at the velocity of 1 cm per annum in recent 20-25 years. The same studies prove that the mean level of the Black Sea at presents lightly exceeds the 0,00 m level instead of -0,40 m fixed on topographic maps.

275. The replenishment of the bottom waters of the Black Sea with new seawater from the Mediterranean takes hundreds of years. This very slow rate of replenishment and the large input of freshwater have led to a stratification of the Black (Black Sea NGO Network 2004), with the upper layer has a salinity of 17 ppm. The thin upper layer of marine water (up to 150

m) supports the unique ecosystem. The deeper and more dense water layers are saturated with hydrogen sulfide, that has accumulated from decaying organic matter (State of the Environment of the Black Sea 2002). The slow replenishment and the bad mixing of waters does not provide enough oxygen for the process of decomposition and the bacteria in the lower layers use it up entirely. Consequently the Black Sea is virtually dead below a depth of about 180 m and this boundary is being pushed up. Moreover the metabolism of some bacteria generates hydrogen sulphide, a soluble poisonous gas associated with the smell of rotten eggs. Hydrogen sulphide is present in the entire lower layer of seawater in the Black Sea (Black Sea NGO Network 2004).

276. In front of the mouth of the Chorokhi river and in front of Batumi Cape, submarine canyons are located. These submarine canyons had a large impact on the coastal development in the past. The submarine canyons are shown in Fig. E-6.

277. Water level in the project area. The following information is extracted from the Alternative Feasibility Study for Batumi Coastal protection.

278. The design water level is set by tide, atmospheric pressure, seasonal fluctuation and wind setup. With respect to the water level, a return period of 50 years is chosen for preparing the technical design. Below in Tab. E-8, the design water level is presented for different scenarios of climate change.

Tab. E-10: Design water level for different scenarios of climate change.

Contribution	Minimum	Average	Maximum
Sea level rise	0.1 m	0.2 m	0.5 m
Tide	0.1 m	0.1 m	0.1 m
Atmospheric pressure	0.3 m	0.3 m	0.3 m
Seasonal fluctuation	0.2 m	0.4 m	0.5 m
Wind setup at MSL-5m	0.0 m	0.0 m	0.0 m
Total	0.7 m	1.0 m	1.4 m

279. With respect to the hydraulic boundary conditions, distinction is made between yearly average wave conditions and extreme conditions. The yearly average conditions are important for determining the required maintenance of the coastal defence. The extreme conditions are required for determining the required size of constructions and for determining the minimum beach- and dune size in order to protect the city against flooding.

280. Since 2007 the Department of Environment Protection and Natural Resources of Ajara Autonomous Republic carries out monitoring of marine water quality to ensure the quality of Georgian coastal waters for the protection of human health. Water samples are weekly

collected at eight points of the marine coastal zone: Kobuleti central beach area, Mtsvane Kontskhi, Makhinjauri, Bartskhana River estuary, Batumi central beach, Sarpi, Kvariati, and Gonio.

281. Chemical analysis of the marine water is conducted using the existing laboratory equipment for the following parameters: oxygen content, pH, temperature, salinity and oxygen saturation per cent.

282. The regular measurements of the bacteriological parameters have been also carried out since 2010 in the Ajara coastal zone. These measurements are conducted on the basis of an Agreement concluded between the Department of Environment Protection and Natural Resources of Ajara Autonomous Republic and the Laboratory of the Ministry of Agriculture of the Ajara Autonomous Republic.

283. According to monitoring data of Ajara coastal waters the highest values of oxygen content in 2007-2008 were observed in the waters of Gonio-Sarpi and Mtsvane Kontskhi. The lowest values were observed in July-August in Bartskhana and Batumi beach areas.

284. As regards the bacteriological analyses, in Batumi central beach aquatic area, E.coli concentrations (per litre) fluctuated within the limits of 620 – 7,000. The mentioned values mostly are within the limits of maximum permissible levels.

285. The other parameters of bacteriological pollution were similarly within the norm limits, while coliphages, fecal streptococci, Staphylococcus aureus (golden staph), and other pathogenic bacteria have not been found in any marine coastal areas.

286. As regards the marine plankton composition of the Black Sea coastal waters (area between estuaries of rivers Chorokhi and Supsa), in 2005 – 2009 the algae flora was represented by six main groups: Bacillariophyta, Dinophyta, Chlorophyta, Chromophyta, Cyanophyta and Xantophyta. Bacillariophyta was the most numerous group, numbering 73 species, while Dinophyta group was represented by 57 species, Chlorophyta – by 23 siecies; Cyanophyta – by 16 species, and the smallest in number wereChromophyta – 6 species and Xantophyta – 5 species.

287. Efforts to improve the environmental conditions of the Black Sea coastal zone of Ajara have been successful, and have significantly increased the tourist potential of the region. A modern biological treatment facility was installed in Batumi airport in 2007, and works to improve the waste water treatment plant at Ltd BatFarma have also been conducted, resulting in a significant reduction in the pollution load reaching the Black Sea. Ltd Batumi Oil Terminal also undertook many different measures to eliminate pollution with oil products. As a result, the quality of the river Bartskhana and the adjacent costal area which were previously subjected to oil pollution incidents has been significantly improved.

288. Municipal development programs are underway in Batumi and Kobuleti, in addition to the construction of the local sewerage pipe-line in the Gonio-Sarpi area of the coastal zone, aimed at fully upgrading the water supply and sewerage systems. These programs will significantly contribute to decreasing marine pollution from municipal sewerage systems.

E.10. Riverbed conditions

289. The Chorokhi river originates in the mountainous region of Anatolia, Turkey. It has a catchment area of 22,100 km2 of which approximately 9% lies in Georgia. The river has a total length of 438 km, of which only the last 26 km are located in Georgia. Here it flows into the Black Sea, approximately 7 km south of Batumi.

290. The river depth varies between 1.5 and 4.8 m and its flow velocity is in the range between 0.7 and 2.5 m/s (Gamma Consulting LtD, 2011).

291. Based on measurements at Erge gauging station (15 km upstream of the river mouth) from 1930 to 1991, the annual average discharge of Chorokhi river is about 275 m3/s. Monthly average discharges based on the same data set are shown in **Error! Reference source not found.** (Arcadis, Alkyon, HKV Consultants, 2000). Regime of the river is characterized by floods in spring, unstable shallow waters in winter and summer.

292. The riverbed is composed of graded sediment (fine to coarse sediment).

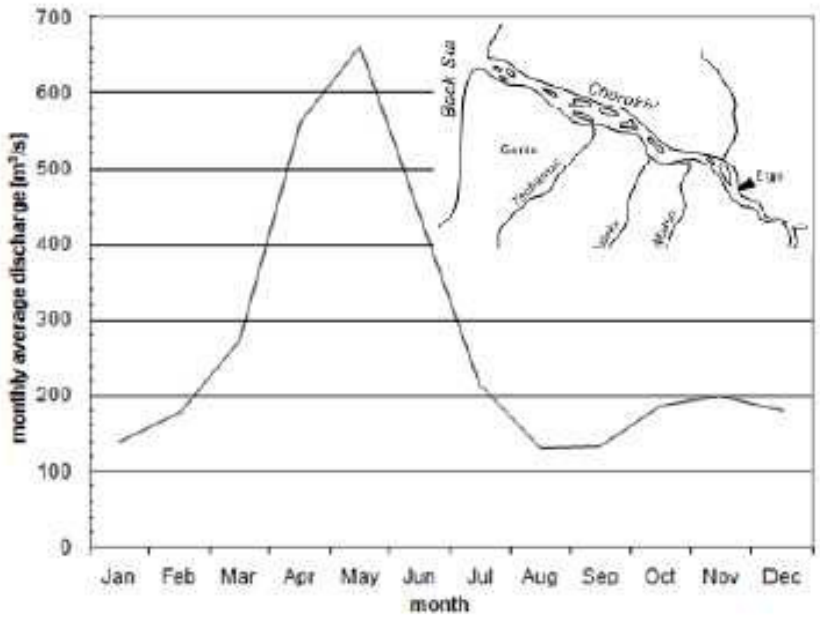


Fig. E.16: Monthly average discharge at Erge (after Arcadis, Alkyon, HKV Consultants, 2000)

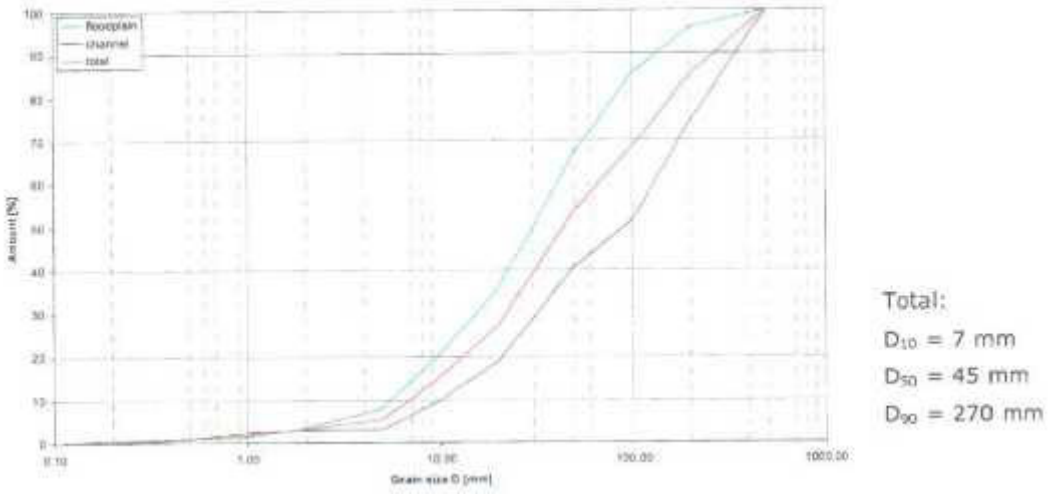


Fig. E.17: Measured grain size at Mirveti (2009)

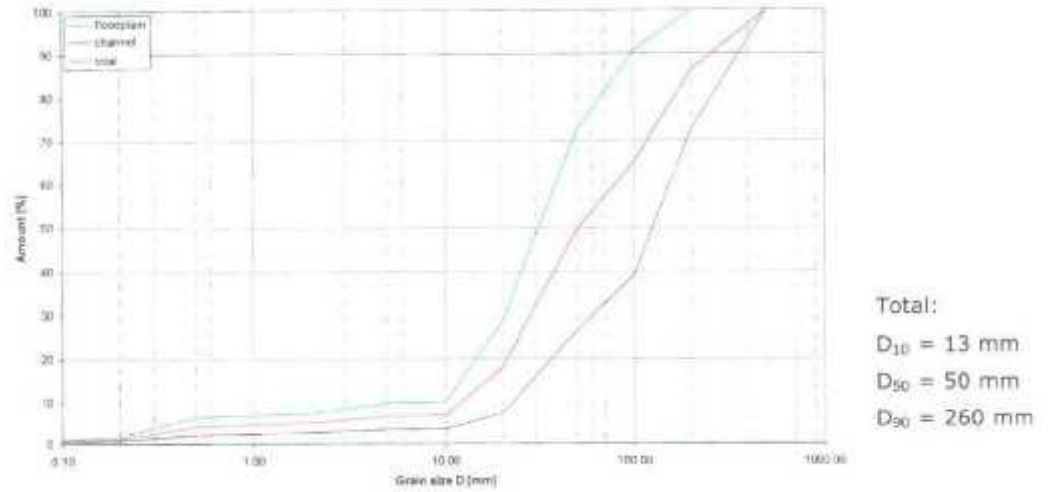


Fig. E.18: Measured grain size at Erge (2009)

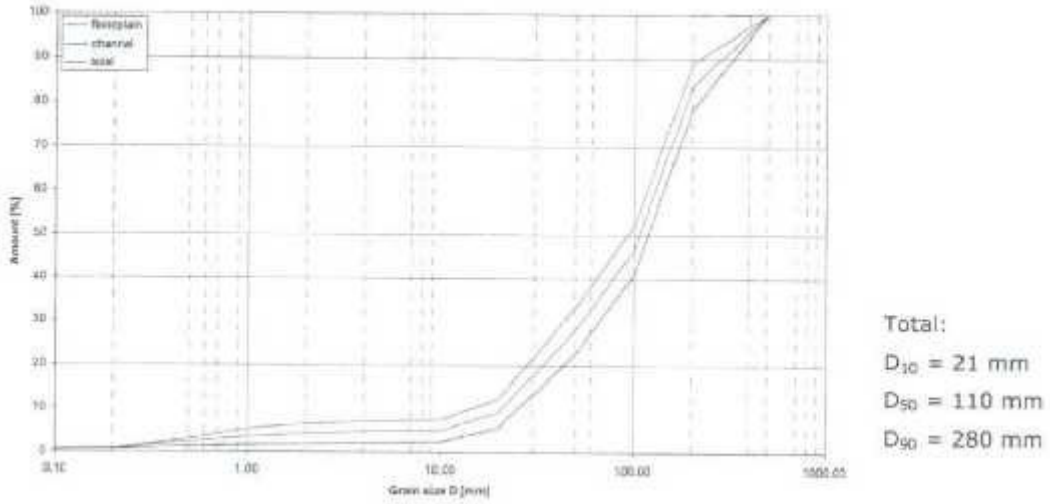


Fig. E.19: Measured grain size at Makho (2009)

293. Two main types of river patterns can be distinguished in Chorokhi river: meandering and braiding (**Error! Reference source not found.**). A braiding river develops in reaches with relatively large river discharge, large sediment load and steep slopes. The river develops a wide and shallow cross section.

294. Meandering rivers typically develop with lower discharges, sediment loads and mild slopes allowing the sculpting of a single channel with alternating bends.

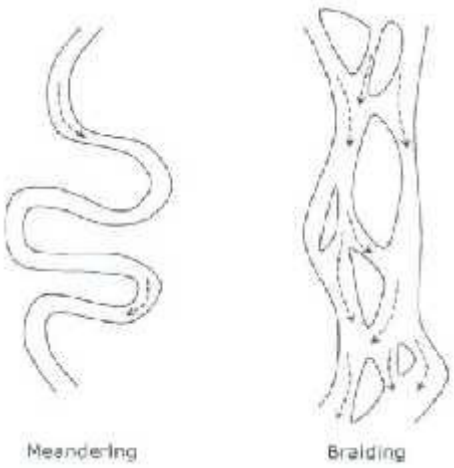


Fig. E.20: Meandering and braiding river pattern

295. Based on theoretical criteria (Leopold and Wolman; Struiksma and Klaassen), the Chorokhi river can be characterised as a braiding river system.

296. The new discharge regime regulated by dams and the decreasing amounts of sediment will probably cause a change in river pattern and character. According to theoretical criteria, a shift towards meandering will take place, due to the decrease of the bottom gradient. The overall pattern will remain braiding, but in stretches with strongly reduced gradients a meandering deeper flow channel may develop. Meander development already occurs near the mouth of the river, where the bottom gradient is the smallest (see **Error! Reference source not found.**).

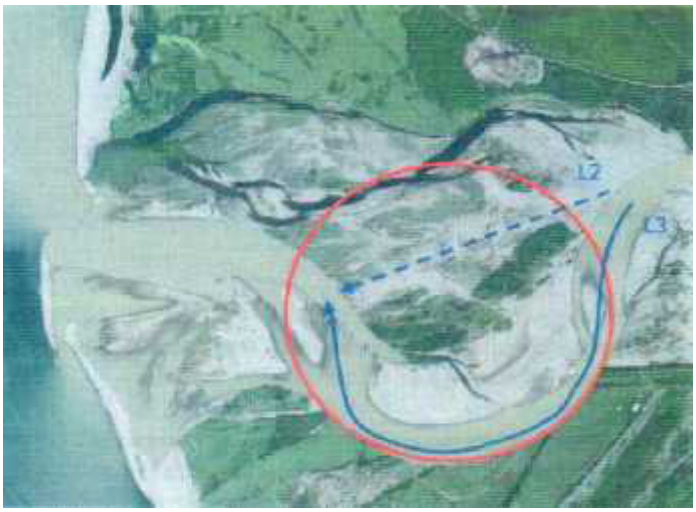


Fig. E.21: Meander development near the mouth of the Chorokhi river (2007)

297. Historically, the main branch of the Chorockhi river reached the Black Sea near Magine, some 3-4 km north of the present river mouth. A smaller southern branch reached the coast approximately 2 km south of the present river mouth (Alkyon, et al.,2009; Pepping, 2012). In the 19th century, the main northern branch was abandoned and the river mouth shifted towards its present position, at the head of the underwater canyon (see **Error! Reference source not found.** and **Error! Reference source not found.**).

Fig. E.22: Chorokhi River delta

Fig. E.23: Chorokhi River mouth - View towards the sea (left) and view in upstream direction (right) from the right river bank

298. In natural conditions, the river Chorokhi was carrying annually approximately 5 million m3 alluvial sediments to the sea, from which pebble amounted approximately to 0.4-0.5 million m3 (approximately 10% of the total load), the rest of the volume consisted of sand (Gamma Consulting LtD, 2011). The amount of pebbles was in line with the rough estimate of the annual beach-forming load of 0.4 million m3/year (Arcadis, Alkyon, HKV Consultants, 2000).

299. The abandonment of the old mouth caused the erosion of the river delta because there was no more supply of sediment from the river. In fact, due to the new location of the mouth, a large part of the sediment from the Chorokhi was being lost to the canyon and was no longer available for the coast.

300. In the second half of the 20th century the location of the mouth has been eventually fixed by dikes and revetments (**Error! Reference source not found.**) just in front of the head of the underwater canyon. Nowadays, it is estimated that approximately 90% of the river sediment load is lost in the depths of the canyon (Gamma Consulting LtD, 2011).

Fig. E.24: River embankment on the right side of the Chorokhi river, close to the mouth

301. As a consequence of those changes, large erosion rates started being observed. The erosion rate of the stretch of coast north of the river mouth amounted to about 5.2 m/year between 1880-1926 and reduced to 2.2 m/year between 1926-1980 (Gamma Consulting LtD, 2011) (**Error! Reference source not found.**).

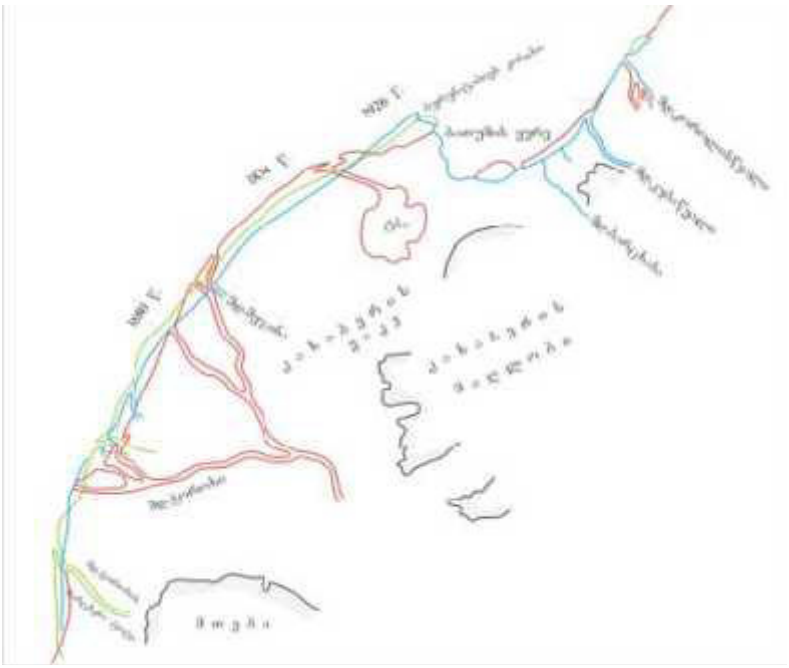


Fig. E.25: Historical development of the mouth of the Chorokhi river and Kakhaveri plain (after Gamma Consulting LtD, 2011)

302. The erosion process of the coastline near Batumi is and has been accelerated due to human interferences as the sediment mining activities and the construction of dams for power generation, which strongly affect the sediment transport capacity of Chorokhi river.

E.11. Meteomarine conditions

E.11.1. Water levels

303. In ARCADIS (2012)[2], the values in **Error! Reference source not found.** were derived to describe extremes in water level conditions during normal and storm conditions, and to account for the effect of different sea level rise scenarios. During the review of previous feasibility studies (Giardino et al., 2014), those values have been assessed and considered appropriate for the use in this study.

Tab. E-11: Design water levels for different sea level rise scenarios (after ARCADIS; 2012)

Contribution	Minimum	Average	Maximum
Sea level Rise	0.1 m	0.2 m	0.5 m
Tide	0.1 m	0.1 m	0.1 m
Atmospheric Pressure	0.3 m	0.3 m	0.3 m
Seasonal Fluctuation	0.2 m	0.4 m	0.5 m
Wind setup at MSL-5m	0.0 m	0.0 m	0.0 m
Total	**0.7 m**	**1.0 m**	**1.4 m**

E.11.2. Winds

304. The yearly wind climate for the eastern part of the Black Sea is described by the wind roses in **Error! Reference source not found.**. The offshore wind climate is mainly characterized by winds coming from the SE direction and from W-NW direction. The same figures for different seasons are reported in Appendix. Those Figures show some seasonality in the wind climate, with predominant winds blowing from the west during summer and from SE and W-NW during the other seasons. It is also important to mention that those are offshore wind conditions and which might be partly different from nearshore winds, affected by the presence of mountains lying few kilometres inland from Batumi city. However, at least large scale land effects (orography) are included in the ERA-Interim dataset.

[2] Arcadis Nederland B.V., 2012. Alternative Feasibility Study for Batumi Coastal Protection.

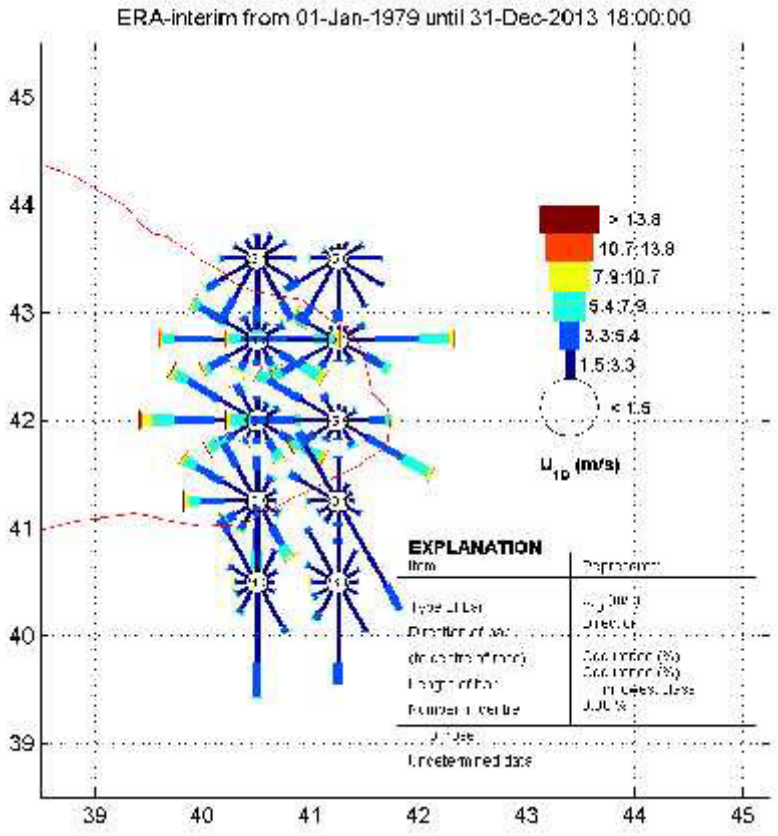


Fig. E.26: Yearly wind climate in the Eastern Part of the Black Sea

E.11.3. Nearshore waves

305. The wave roses derived from modelling results developed for the present project of castal defence and for the wave climate at -6 m are shown in **Error! Reference source not found.** and **Error! Reference source not found.**.

306. The Figures show the wave climate for the entire stretch of coast, with a zoom at Batumi cape, where waves are highly diffracted by the presence of the submarine canyon.

307. The wave transformation from the -6 m water line to the coastline is taken care by the UNIBEST-CL+ model.

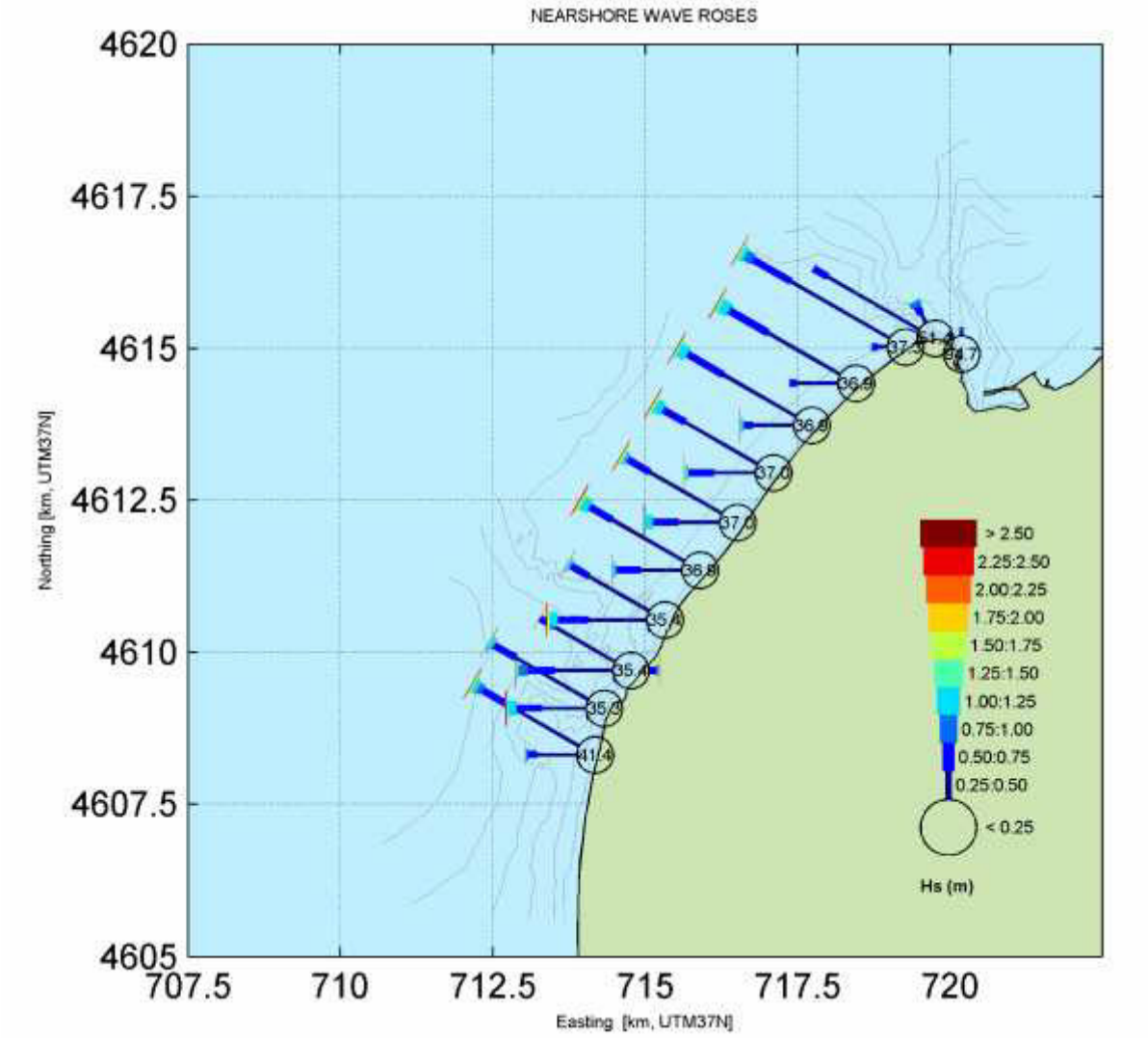


Fig. E.27 - Modelled nearshore wave climate along the Batumi coastline at a water depth of -6 m

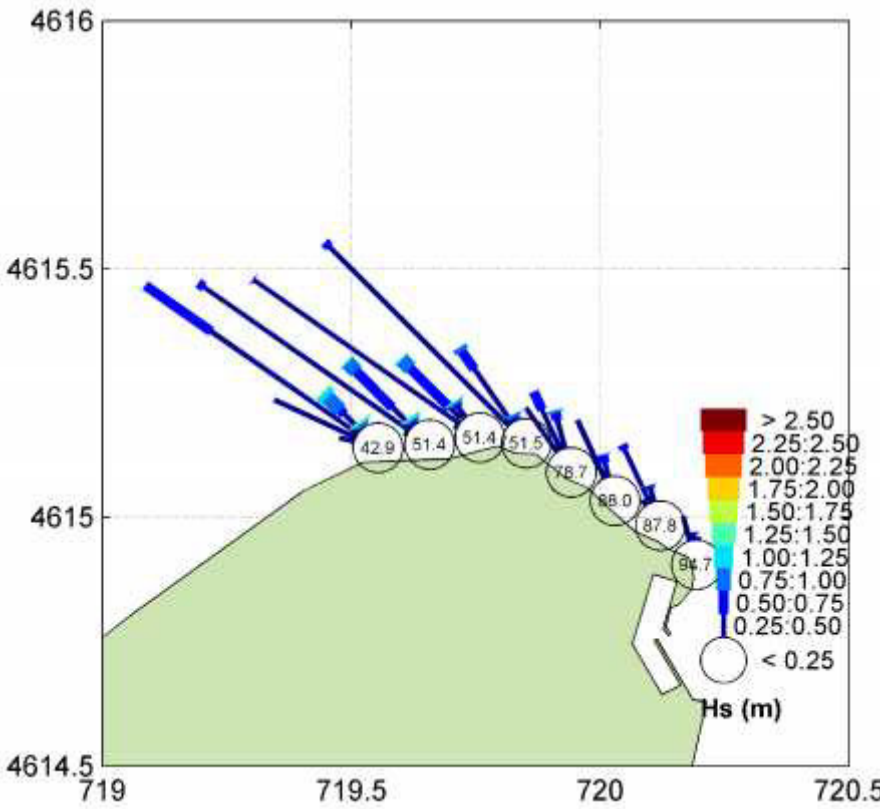


Fig. E.28 - Modelled nearshore wave climate along the Batumi coastline at a water depth of -6 m: zoom at Batumi cape

E.12. Groundwater

308. Adjara belongs to the Adjara-Trialeti Folded System and consists of the Fractured Confined Water System of Adjara-Imereti, with a dominated type of fractured ground waters there. Adjara ground waters are contained in Middle Eocene volcanic- sedimentary and vein deposits as well as in alluvial sediments, where they are represented by porous waters. Detailed description of water bearing complexes and horizons (aquifers) is given below.

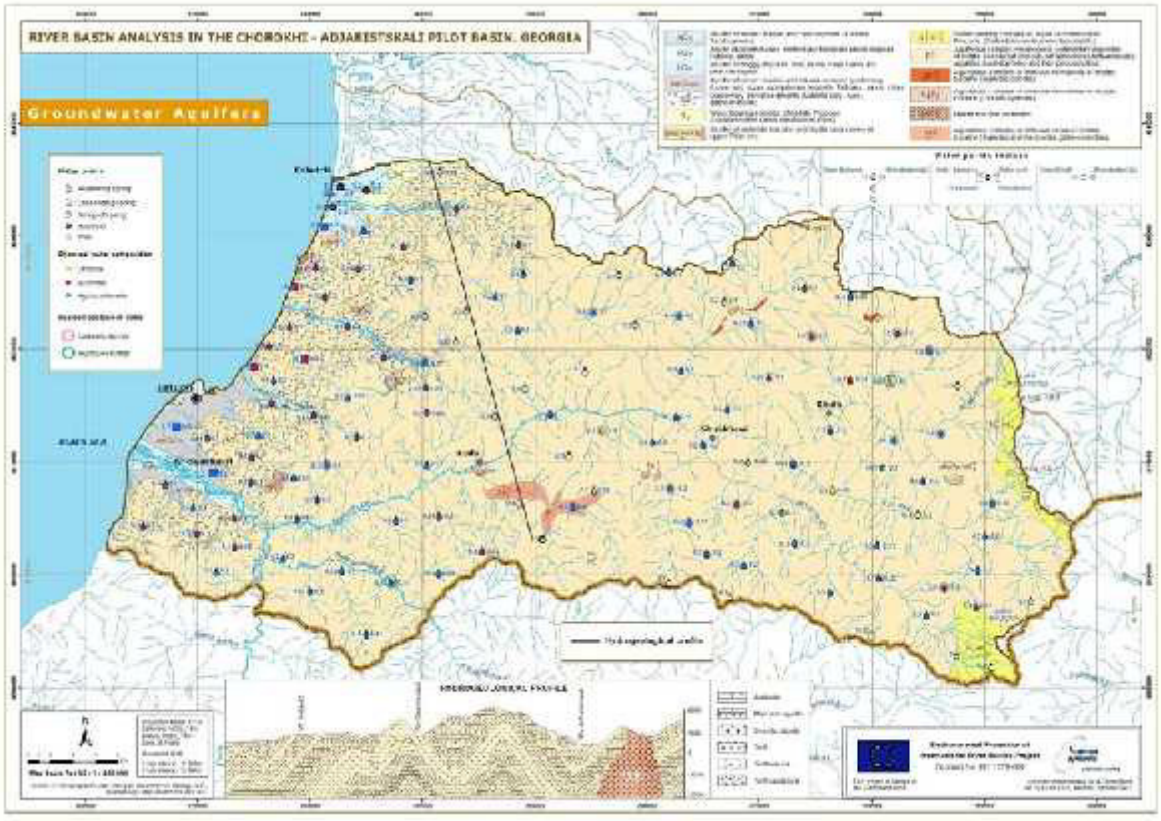


Fig. E.29: Groundwater aquifersof the Chorokhi-Adjaristskali pilot basin (Source: River Basin Analysis in Chorokhi-Adjaristskali pilot basin, Georgia – Environmental Protection of International River Basins, 2013)

309. Aquifer of the recent marine sediments**.** Recent marine sediments are spread along the Black Sea Coastal zone as a narrow intermittent line. This water bearing horizon lithologically is composed of oval stones and sandy-stony facies replaced with clays towards the north. The sediments are heterogeneous and are characterized by lithological diversity towards both vertical and horizontal directions. This feature determines the differentiated water-content of the aquifers.

310. Ground waters of the recent marine sediments have weak mineralization, moderate hardness and hydrocarbonate-calcium-sodium chemical composition. The mineralization increases in the vicinity of the coastal line and makes up 2.6-3.0 g/l, water hardness here is measured at 2-5 mg/equiv. and, water is composed of chlorine and sodium.

311. The aquifer is primarily recharged by infiltration of atmospheric precipitations and sometimes from waters flowed from bank terraces. The water regime is unstable. The water level varies within 1.7-2.0m and is related to the atmospheric precipitations. High level of ground waters is linked to spring and fall floods and low level – to summer low waters. The aquifer has narrow distribution and low flow rate. Ground waters of the given aquifer are highly mineralized and therefore, are not used for drinking water supply.

312. Aquifer of recent bog deposits**.** Ground waters of recent bog deposits are widely spread to the south-west of the Batumi, on the Kakhaberi valley, to the east of Mejinis Tskali and the village Gonio. Lithologically, the aquifer is represented by peat, sands, clayey sediments, clays and loam. The thickness of the aquifer is 50-10 m.

313. The stratum is completely saturated with water, freely circulating in sands and clayey sediments. Peat and loam are relatively impermeable. The water table is located within 0.3-4.5 m depth from the land surface. Ground waters are abstracted through wells. Ground waters are characterized by high water table varying within 0.5-2.5 m depth from the land surface. Frequent rainfalls cause raise in water table and soil water logging that leads to the bogging of large areas.

314. Recent wetland sediments are recharged by atmospheric precipitations and ground waters contained in recent alluvial sediments.

315. The variation of ground water level of the given aquifer is strongly related to the amounts of precipitations. High water level is recorded in winter time and the lowest level – in spring time. The water is fresh and free flowing (unconfined). It belongs to the hydrocarbonate-calcium or hydrocarbonate-calcium-sodium-magnesium class.

316. The water has poor potable qualities and in many cases is contaminated. It also has peat odor. Due to the high water table and good permeability of strata, ground water of the recent bog sediments is easily contaminated and therefore, is not used as potable water.

317. Aquifer of recent alluvial sediments (Holocene alluvial deposits)**.** This water bearing horizon is met in all floodplains and first terraces of the large rivers (e.g. Chorokhi, Adjaristskali, Korolistksali, Kintrishi, etc.).

318. In the foothills, alluvial sediments overlay Middle Eocene sediments and on the Kakhaberi plain – Upper Quaternary alluvial and marine sediments. This aquifer is composed of alluvial sands, oval stones and gravels. The granulometry of sediments is changed from source to mouth. In the upper and middle courses coarse stones and pebble gravel dominate in the alluvium, while in the lower course as a result of decreased flow velocity heterogeneous sands and granular gravels dominate in alluvial sediments.

319. The thickness of the alluvial sediments is 5-40m. Water is free flowing. Flow is inclined towards river flow and river banks. Therefore groundwater flow is fan-like. There are lots of wells in the alluvial sediments that abstract water for household consumption. A water table in these wells varies from 0.5 to 5.5m. Water saturation of sediments varies in accordance with the change in their granulometric composition. In pebble gravels and oval stones with granule gravel hydraulic conductivity is 100-150 m/day. In the Kakhaberi valley, artesian wells have the capacity of 10-12 l/sec. Flow rate fluctuate within 0.2-5.0 l/sec range.

320. By chemical composition, ground waters of alluvial sediments belong to the hydrocarbonate-carbonate-sodium class. Total hardness varies within the range of 0.3-1.4 mg-ekv/l, carbonate hardness – within 0.3-1.2 mg-ekv/l and pH– within the range of 6.5-7.0. Water temperature varies from 12 to 150C. Total mineralization is 0.1-0.3 g/l.

321. Nearby Khelvachauri center towards Chorokhi several wells with 20-30m depth have been drilled. Their flow rate is 25-30 l/sec. Hydraulic conductivity is 80-120m/day. Average thickness of the aquifer is 36-40m. Water bearing rocks are characterized by high permeability. The average flow rate of the ground water is 15-20 l/sec. Mineralization of the water does not exceed 0.3 g/l. The aquifer is recharged by surface water discharge, atmospheric precipitation and ground waters contained in the rocks adjacent to mountainous areas. One more additional source is ground waters contained in alluvial sediments and major rocks located below these sediments.

322. The Hydrological regime of the aquifer is closely linked to the fluctuations in the surface water level and the amounts of atmospheric precipitations. Discharge of the aquifer occurs in the form of downward flowing springs, which discharge directly into the Black Sea at the mouth of the river Chorokhi. The dependence of ground waters on the river is demonstrated by the drastic change in water regime of springs flowing from the first floodplain terrace as a result of seasonal variation of the surface water level. During the summer and the beginning of the fall, sources flowing from the first terraces dry up, while the discharge rates of other sources drop sharply. The aquifer provides drinking water to major settlements (Batumi, Khelvachauri, Kobuleti, Chakvi).

323. Since there is a strong linkage between the aquifer and surface waters, it is possible to increase the water abstraction to a certain level in order to supply settlements with drinking water.

324. After elaboration of detailed design of the camp the possible impact on groundwater should be considered by Construction Contractor during Site-Specific EMP (SSEMP) preparation.

E.13. Ecological resources

E.13.1. Flora and Fauna

325. Adjara vegetation is extremely diverse, due to the varied conditions occurring in the region. The Project area is a typical coastal environment, constituted by gravel beaches where extremely changing conditions generate a challenging environment. Part of the Project area is within or close to inhabited zones, thus producing an impoverishment of environmental conditions and the decrease of ecological niches; on the other side, the close proximity of the Chorokhi river is a source of biodiversity typical of an ecotone.

326. Adjara lowland is covered by marsh grasses and sphagnum vegetation complexes.

327. This type of vegetation is developed on the swampy meadow, peat and peat-derived, as well as marsh podzol soils. The most part of the territory, especially forested swamps, have been dried out for agricultural purposes. Most of cultivated areas in the proximity of the coastline are covered with tea plantations, citrus species, such as tangerine, lemon, orange, as well as other agricultural crops.

328. The Chorokhi river mouth and its surroundings host extremely important biodiversity hot spots home to 303 birds species that have been reported, representing therefore one of most important wetland in the South-Eastern Black Sea region. It is estimated that 10-20% of the birds living in Georgia resides in the Chorokhi area, at least in winter time. Among them, many species entitled of National conservation status or included in international protection agreements, such as the IUCN Red List. It is a well known site on major transmigration routes of different birds species: presences could reach more than 300.000 individuals during autumn and up to 10.000 individuals in spring. The top-most present birds are Buteo buteo and Pernis apivorus (in autumn), European Bea-eater Merops apiaster, Apus apus, Hirundo rustica, Delichon urbica, Fringilla coelebs. It is a breeding site of different passerines, such as Panurus biarmicus. On the territory are registered 11 types of birds that are included in IUCN-Red List:

Scientific name	IUCN **Red List Category**
Anser erythropus	VU
Aquila clanga	VU
Aquila heliaca	VU
Falco cherrug	EN
Melanitta fusca	EN
Neophron percnopterus	EN
Otis tarda	VU
Oxyura leucocephala	EN
Pelecanus crispus	VU
Puffinus yelkouan	VU
Vanellus gregarius	CR

23 species included in the Georgian Red List have been observed:

#	English name *Latin name* Georgian name	National status
1	Red-necked Grebe (*Podiceps grisegena* Boddaert, 1783) რუხლოყება (=დასავლური) მურტალა	VU D1
2	Great White Pelican (*Pelecanus onocrotalus* Linnaeus, 1758) ვარდისფერივარხვი	VU D1
3	Dalmatian Pelican (*Pelecanus crispus* Bruch 1832) ხუჭუჭავარხვი	EN IUCN D1
4	White Stork (*Ciconia ciconia* Linnaeus, 1758) ლაკლაკი	VU D1
5	Black Stork (*Ciconia nigra* Linnaeus, 1758) ყარყატი	VU
6	Lesser White-fronted Goose (*Anser erythropus* Linnaeus, 1758) პატარაღერღეტი	EN IUCN D1
7	Ruddy Shelduck (*Tadorna ferruginea* Pallas, 1764) წითელიიხვი	VU D1
8	White-winged Scoter (*Melanitta fusca*Linnaeus, 1758) გარიელი	EN IUCN D1

#	English name *Latin name* Georgian name	National status
9	White-headed Duck *(Oxyura leucocephala* Scopoli, 1769) თეთრთვალაიხვი	EN IUCN
10	White-tailed Eagle (*Haliaeetus albicilla* Linnaeus, 1758) თეთრკუდაფსოვი	EN D1
11	Levant Sparrowhawk (*Accipiter brevipes* Severtzov, 1850) ქორცქვიტა	VU D1
12	Long-legged Buzzard (*Buteo rufinus*) ველისკაკაჩა	VU D1
13	Imperial Eagle (*Aquila heliacal* Savigny, 1809) ბექობისარწივი	VU IUCN
14	Greater Spotted Eagle (*Aquila clanga* Pallas, 1811) დიდიმყივანიარწივი	VU IUCN
15	Egyptian Vulture (*Neophron percnopterus* Linnaeus, 1758) ფასკუნჯი	VU D1
16	Eurasian Griffon (*Gyps fulvu s*Hablizl, 1783) ორბი	VU D1

17	Saker (*Falco cherrug* Gray 1834) გავაზი	CR IUCN D1
18	Red-footed Falcon (*Falco vespertinus* Linnaeus, 1758) თვალშავი	EN D1
19	Lesser Kestrel (*Falco naumanni*) მცირეკირკიტა	CR IUCN A2b
20	Common Crane (*Grusgrus*Linnaeus, 1758)	EN D1
21	Little Bustard (*Tetrax tetrax* Linnaeus, 1758) სარსარაკი	VU Eur D1
22	Eurasian Stone-curlew (Thick-knee) *Burhinus oedicnemus* Linnaeus, 1758 თვალჭყეტია	VU Eur D1
23	Bearded Parrotbill (Reedling) (*Panurus biarmicus* Linnaeus, 1758) ულვაშაწივწივა	VU A2a

329. Of particular concern with regard to the project needs are the beach-nesting birds, like Charadrius alexandrinus and C. dubius, well represented in all Georgia coastline and in particular close to the Choroki's mouth.

330. In Chorokhi area the following varieties of Amphibians and Reptiles have been observed:

331. Also a variety of mammals inhabitate the Chorokhi area: 29 species have been identified, among them the endangered otter Lutra lutra and the Mehely's Horseshoe Bat and Mediterranean Horseshoe Bat, included also in the Georgian "Red List".

Latin name	English name	Abundance	Main biotopes	Dependence on Biotope
Bufo viridis	Green Toad	medium	River banks, oxbow lakes	Medium
Rana ridibunda	Marsh frog	abundant	Swamped meadows, river banks, oxbow lakes	High
Hyla arborea	European Green Tree Frog	medium	River banks, oxbow lakes	High
Emys orbicularis	European pond terrapin	Uncommon	Swamped meadows, river banks, oxbow lakes	High
Natrix natrix	Grass Snake	abundant	Swamped meadows, river banks	High
Natrix tessellate	Dice Snake	abundant	Swamped meadows, river banks	High

332. The delta of the Chorokhi river is at a distance of about 1km from the nearest project area. Between the delta river humid area and the nearest project area there are two important infrastructure: the Municipal Water Treatment Plant and the Batumi Airport. So no important impact is foreseen on avifauna, see EMP per details.

Fig. E.30: Delta of the chorokhi river, existingimportant infrastructures and and project areas

E.13.2. Seabed System

333. Despite the fact that the beach in the Project area is almost made by gravel, the seabed presents sandy deposits, with a prevalence of pebbles until 5m bathymetry, and growing presence of sand going deeper due to the more gentle slope, reaching a 100% of very fine sand at 10m bathymetry.

334. The slow replenishment of the bottom waters of the Black Sea and the large input of freshwater have led to a characteristic stratification of the entire water body, in which only the first 100-150m can support life. The deeper layers have a high density and are saturated with hydrogen sulphide developed by the decomposition in a low- oxygen environment of organic matter laying at the bottom. The bathymetric line of 180m is the boundary between the biologically active upper layer and the virtually dead bottom layer: this boundary is being pushed up due to the lack of water mixing.

335. The east coast of the Black sea has a relatively poor microphytes communities compared with other areas in the Black Sea region, due to existence of sandy material at the seabottom: have been recorded only the 38% (113) of the total macrophytes species known in the Black

Sea, which usually reach the highest density at a the depth of 2-3m, but due to the granulometry of the seabed is not expected such a presence in the project area.

336. Batumi is an important spawing and nursery area, included in areas of "Important waters for industrial and non-industrial fishing" even if not considered as a proper marine protected area (refer to Fig. E-12). A list of more common fish in the area is presented in Tab. E-4. Among the water mammals, shall be mentioned Phocoena phocoena and Delphinus delphis, last one considered a symbol of the city of Batumi.

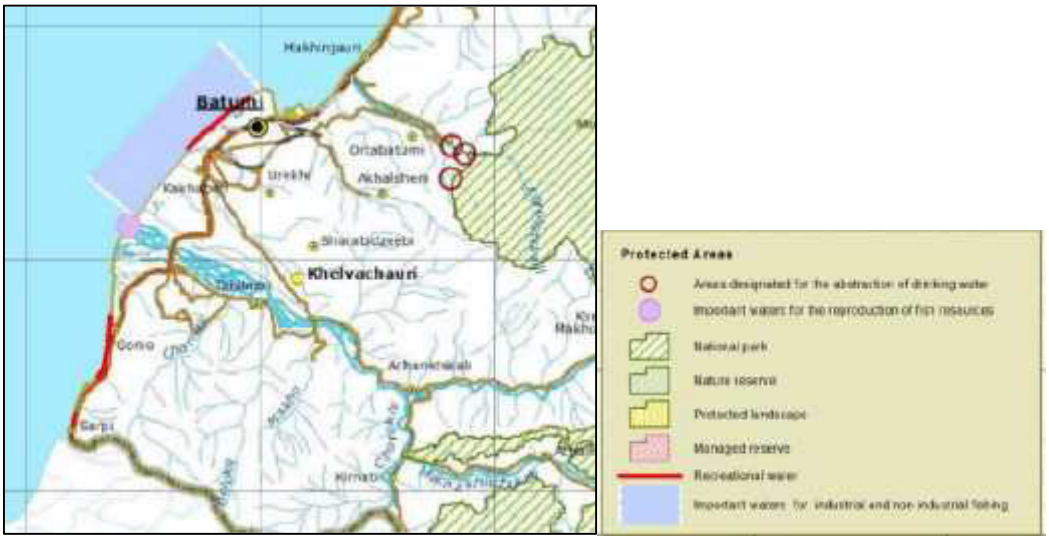


Fig. E.31: Important areas considered in the EU "Environmental Protection of International River Basin Project".

Tab. E-12: Biodiversity of Fishes of Adjara Shoreline.

N	Species	English Name	Ecological Group
1	Squalus acanthias (LI)	Kitsviani shark, katrani	Benthic-Pelagic
2	Raja clavata (L.)	Sea Fox	Benthos
3	Dasiatis pastinaca (L.)	Sea Cat	Benthic
4	Huso huso (L.)	Beluga	Benthic-Pelagic
5	Acipenser nudiventris (L)	Foreji	Benthic-Pelagic
6	Acipenser guldenstadti colchicus (M)	Colchis Sturgeon	Benthic-Pelagic
7	Acipenser stellatus (P)	Sevruga (kind of sturgeon)	Benthic-Pelagic
8	Sprattus sprattus phalericus (Risso)	Sardines	Pelagic
9	Sardinella aurita (Valenciennes)	Round Sardines	Pelagic
10	Sardina pilchardus (Walbaum)	Sardines	Pelagic
11	Alosa Kessleri pontoca (Eichwald)	Black Sea Herring	Pelagic
12	Alosa caspia palaeostomi (Sadowsk-y)	Paliastomi lake herring	Pelagic
13	Engraulis eucrasicolus ponticus (Aleksandrov)	Black Sea Sprat	Pelagic
14	Salmo labrax (Pallas)	Black Sea Salmon	Benthic- Pelagic
15	Anguilla Anguilla (L.)	River Eel	Benthic- Pelagic
16	Conger conger (L.)	Sea Eel (A snaky edible fish)	Benthic- Pelagic
17	Beloue beloue euxini (G)	Saraghani	Pelagic
18	Merlangius merlangus etL\:iuus (Nordmann)	Black Sea Merlangi	Benthic- Pelagic
19	Gaidropsants mediterraneus (L.)	Mediterranean Sea Ghlabuta	Benthic- Pelagic
20	Nerophis ophidian (L)	Black Sea Short Snout Needlefish	Benthic
21	Syngnathus typhlr agrentatus (Pallas)	Long snout Needlefish	Benthic
22	Syngnathus abaster (R)	Needlefish	Benthic
23	Hippocampus ramulosus Leach .	Seahorse	Benthic
24	Mugil cephalus (L.)	Lobbyists	Benthic- Pelagic
25	Liza (Liza) aurata (Risso)	Golden Mullet	Benthic- Pelagic
26	Mugil soiuy (B.)	Pilengasi	Benthic- Pelagic
27	Liza (Protomugil) saliens (Risso)	Tskhvirmakhvila mullet	Benthic- Pelagic
28	Atherina boyeri (Risso)	Aterina	Pelagic
29	Serranus scriba (Linne)	Qvis Tchortchila	Benthic- Pelagic
30	Pomatomus soltator (L.)	Lufari	Pelagic
31	Trachurus mediterraneus ponticus (Aleev)	Black Sea Mackerel Fish	Pelagic
32	Sciaena umbra (L.)	Dark Kuzana	Benthic- Pelagic
33	Umbrina cirrosa (L.)	Light kuzana	Benthic- Pelagic
34	Diplodus annularis (L.)	Sea kartskhana	Benthic- Pelagic
35	Ptmtazzo puntazzo (G)	Kitchuna	Benthic- Pelagic
36	Boops boops (Linne)	Bopsi	Benthic- Pelagic
37	Boops salpa (Linne)	Salpa	Benthic- Pelagic
38	Spicara smaris (L.)	Smarisi	Benthic- Pelagic
39	Spicara maeua	Maena	Benthic- Pelagic
40	Mullus barbatus ponticus Essipov	Sultan	Benthic
41	Mullus sunnuletus (L.)	Sultan's sub-species	Benthic
42	Chromis chromis (L.)	Swallow	Benthic- Pelagic
43	Symphodus (Crenilabrus) tinea (L.)	Mtsvanula	Benthic- Pelagic
44	Trachinus draco (L.)	Sea Monster	Benthic
45	Urauoscopus scaber (L.)	Sea Stars	Benthic
46	Bleunius ocellaria	Sea butterfly	Benthic
47	Bleuius adriaticus	Sea carp	Benthic
48	Blennius sphin.x	Sea Sphinx	Benthic
49	Blenuius pave Risso	Sea Peacock	Benthic
50	Ophidion rochei (Muller)	Opidioni	Benthic
51	Callionyruus pussilus (L)	Tagvtevza	Benthic
52	Callionyruus risso (Pallas)	Tagvtevza	Benthic
53	Sarda sarda (Bloch)	Peramida	Pelagic
54	Scomber scomber	Mackerel, scomber	Pelagic
55	Neogobius rattan (NordruannO	Bullhead Rotan	Benthic
56	Gobius niger (L.)	Black Bullhead	Benthic
57	Neogobius rualanostomus (Pallas)	Black mouth bullhead	Benthic
58	Proterorhinus manuoratus (Pallas)	Marble Bullhead	Benthic
59	Pomatoschistus caucasicus (K)	Caucasian Bullhead	Benthic
60	Scorpaena porkus (L.)	Scorpenas	Benthic
61	Trigla lucerne (L.)	Sea Cock	Benthic
62	Psetta maeoticus (Pallas)	Black Sea Flatfish	Benthic
63	Platichthys flesus luscus (P)	River Flatfish	Benthic
64	Solea nasuta (Pallas)	Sea Tongue	Benthic

E.13.3. Protected Areas

337. Georgia hosts numerous areas of naturalistic value, counting tenths of biodiversity hot spots, valuable ecoregions internationally recognized and a number of endangered plant and birds species.

338. In order to keep, protect and further develop such biological heritage, Georgia enacted a policy on nature protected areas, the first of whom was declared in 1912 (Lagodekhi Protected Area). The legislation account for PAs, allowing only limited activities belonging to scientific researches.

339. Georgia acceded to the Convention on Wetlands (Ramsar Convention) on 7

340. February 1997 and two sites, known as N°893 “Wetlands of Central Kolkheti” and N°894 “Ispani II Marshes”, were included in the Ramsar List of Wetlands of International Importance. None of these sites includes the project area.

341. In the vicinity of the Project area no protected area is present. The nearest protected areas are located within the Khelvachauri Municipality and will not be affected by the works: Machakhela National Park, at the south-est, and Mitra National Park, estending from the north-east of Khelvachauri municipality to Kobuleti and Keda municipalities.

Fig. E.32: Location of parks in Khelvachauri Municipality.

E.14. Economic Development

342. With a population of 190,000 (2013 census), Batumi serves as an important port and a commercial centre. It is situated in a subtropical zone, rich in agricultural produce such as citrus fruit and tea. While industries of the city include shipbuilding, food processing, and light manufacturing, most of its economy revolves around tourism. Since 2010, the face of the city has been transformed by the construction of new high-rise landmark buildings and the renovation of the Old Town.

343. Batumi today is one of the main port cities of Georgia. It has the capacity for 80,000- tonne tankers to take materials such as oil which is shipped through Georgia from Central Asia. Additionally the city exports regional agricultural products. Since 1995 the freight conversion of the port has constantly risen, with an approximate 8 million tonnes in 2001. The annual revenue from the port is estimated at between $200 million and $300 million.

344. Since the change of power in Adjara, Batumi has attracted several international investors with real estate prices in the city trebling since 2001. Several new hotels opened after 2009, first the Sheraton in 2010 and the Radisson Blu in 2011. The Trump-tower and the Kempinski will open 2013.

E.14.1. Infrastructure Facilities

E.14.1.1 Water supply and waterwaste infrastrutture

345. For more than 20 years, the Georgian city of Batumi did not have a sewage plant and all crude wastewater of Batumi and its suburbs were being discharged into the Black Sea without any prior treatment. This posed a threat to people's health, to the natural environment and to the city's economy. Today Batumi has a new wastewater treatment plant.

346. Batumi water supply and wastewater infrastructure rehabilitation project included replacing/laying of roughly 200 km of drinking water supply piping including house connections, laying of 5 km main wastewater collectors of 1,200 mm diameter, 130 km of secondary sewers, rehabilitation of Chakvi Treatment Plant, rehabilitation of Mejinistskali Water Well Field, and construction of a new Wastewater Treatment Plant (WWTP).

347. The waste water treatment facility in Batumi was put into operation in 2012. By the year of 2017 it will ensure the complete mechanical and biological treatment of waste water generated in the city, that will be discharged in the Black Sea at 1.100 meters from the coastline of Batumi and at 40 meters depth.

E.14.1.2 Wastes and landfill

348. Wastes are one of the greatest environmental challenges in Georgia. This applies both to hazardous and domestic wastes. Wastes are disposed in the open air, which creates hazard to human's health and environment.

349. In Adjara, city of Batumi, and other 5 municipalities, municipal solid waste landfills exist, which are legal according to the information of local municipalities. Batumi and Kobuleti landfills have construction design. All landfills are owned by local municipality. No landfill is equipped with water resistant protective layer. Only Khelvachauri landfill is located near the river and seashore.

350. At no landfill there is sanitation control and monitoring. Protection and presence of fencing is noted only at Batumi and Kobuleti landfills.

351. The total area of Batumi landfill is 19 hectares, where 11 hectares are active.

352. Since 2010 project called "Municipal solid Waste Management in Adjara" has been underway, in scope of which following activities are to be carried out: arrangement of sanitary landfill in conformity with EU Directive (99/31/EC), closing and recovery of landfill (in compliance with standards), development of solid municipal waste collection and transportation system, identification of local sources of pollution.

E.14.1.3 Transportation

353. Geographic location of Georgia plays an important role in economic and political life of the country. Historically, Georgia served as a transit territory connecting Europe and Asia. South Caucasus is one of the shortest ways from middle Asia to Europe and is very attractive for international shipping. Georgia with its strategic location creates natural logistic bridge between Caucasia and Central Asia.

354. Transport infrastructure of Adjara region is one of the important parts of Georgian transport infrastructure. Huge amount of cargo is imported and exported through Batumi Sea Port and Batumi-Istanbul Highway.

Fig. E.33: Passenger turnover indicators by means of transport in 2010-2013 in the Batumi area (thousand passengers)

ROAD TRANSPORT

355. In recent years, economic development of south Caucasus contributed to dynamic growth of road transport cargo flow. Existence of adequate transit infrastructure in Adjara is important for the further development of transit corridor as it will help to attract additional transit cargo towards Georgia.

356. Road networks and highways connect Adjara and Batumi to the rest of Georgia and neighboring countries: Turkey, Azerbaijan and Armenia.

357. Senaki-Poti-Sarpi 46,5 km - connects to Turkey

358. Batumi-Akhalkalaki-Akhaltsikhe 117 km - connects to Russia, Azerbaijan and Armenia

359. Kobuleti-Sarpi highway 59km – connects to Turkey (Under Construction-will be finished in 2015).

360. The role of suburban and long-distance passenger's transfer is very important and essential for Adjara. The road transport is well-developed, especially in mountainous parts of region, because mostly it is the only way of transportation there.

361. Urban public transport in the Batumi City consists of a networked combination of approximately 140 buses and also a significant number of privately organised mini buses. The mini buses are commonly referred to as Marshutkas. There is approximately 400 public use bicycles for rent at various stations around the city. There is a 2 km long aerial tramway which links the city's waterfront with the Argo Entertainment Center development on Anuria Mountain.

AIR TRANSPORT

362. Renewed Batumi International Airport was opened in 2007 by TAV Airports Holding.

363. Airport has direct connection with 5 countries on 8 different destinations. Besides domestic flight (Batumi-Tbilisi), the airport serves regular international flights operated by Georgian Airways, Turkish Airlines, Pegasus Airlines, Sibir S 7, Belavia, Iraqi Airlines: Batumi-Istanbul, Batumi-Kiev, Batumi-Minsk, Batumi-Moscow, Batumi

364. – Baghdad, Batumi – Erbil, Batumi – Sulaymaniyah, Batumi - Tbilisi. During summer season, airport serves additional international flights: Batumi-Tel-Aviv, Batumi – Warsaw.

RAILWAY TRANSPORT

365. Makhinjauri and Kobuleti railway stations were built and modernized in 2006. Makhinjauri railway station serves around 560 000 passengers annually.

366. Train passengers are transported within the country. Adjara is a tourism region. Considering the fact that the biggest share of foreign visitors are from Armenia, the Georgian Railway appointed seasonal Erevan-Makhinjauri train, which started in 2007.

367. Batumi Railway Cargo Terminal and Station. Georgia is a part of Europe-Caucasus- Asia transit corridor (TRACECA) and represents an alternative route for strategic cargo movement

from the Caspian Sea to Europe and vice versa. The length of the main railway from Choloki to Batumi is 34 km and the railway development of the stations is 35.7 km.

BATUMI SEA PORT

368. Batumi Sea port is distinguished with its geostrategic and natural advantages: it iss located in a deep water bay enabling to accept high tonnage vessels, it is not necessary to pass a channel to enter the port, and it is well protected from coast .

369. Batumi Sea Port is connected to the countries of Caucasus and Central Asia, as well as Ukraine and Turkey via roads and railroad network.

370. Batumi Sea Port as a transport link serves the eastern part of the Black Sea basin, enabling to reload 94% of freight passing through TRACECA route and to carry dry cargo trough the mentioned corridor from the countries located in south.

371. Batumi Sea Port is also used as main transit for oil recycling industry of Kazakhstan and Azerbaijan.

372. The port has 5 terminals: oil and dry cargo terminals, container and railway ferry terminals and a passenger terminal.

E.14.2. Agricultural Development, and Energy Facilities

373. Adjara, due to its mountainous terrain, has relatively low percentage of arable land, which is about 25% of its territory (72862 ha). Around 50% of the population of the region is engaged in agriculture. The main goal of the Agricultural Development Concept of the Autonomous Republic of Adjara for the period of 2007-2015 is to improve economic conditions of rural households along with meeting growing demand for ecologically safe agricultural products.

374. The key strategic directions are to support effective usage of agricultural lands, value chain development, increase intensification level of production, improve qualifications in agriculture and develop agriculture production infrastructure.

375. Hydro resources are the most significant natural wealth of Adjara. Hydro power potential of the region is quite strong and within-year inflow distribution of rivers is very diverse (single peaked, double peaked, and with almost equal hydrographs). The index of Adjara exceeds 244 kilowatts per hour. In terms of power engineering, rivers Tchorokhi, Acharistskali, Chirukhistskali, and Kintrishi are very strong. The most abundant river among them is Chorokhi.

376. There are 5 hydro power plants in Adjara operating under the license of the Georgian National Commission on Energy Regulation. Their overall capacity is 22.2 thousand kilowatts/hour and annual energy generation is 28.5 million kilowatts/hour which is only 0.8% of the whole potential of Georgia.

377. Currently wind energy resources are not being used in Adjara. However utilization of wind energy resources in future will substantially contribute to power engineering balance of the region. Working speed of wind energy in Adjara is 3 m/second. This indicator was calculated according to the index of wind energy determined on the basis of 50-years old data of meteorological stations located in the region.

E.14.3. Tourism Facilities

378. Adjara has undergone serious changes and reforms that led to the significant improvement of its worldwide image and investment climate. The hospitality market in Adjara is developing at a fast pace as increased inflow of foreign visitors, businessmen and delegations attracts well-known international hotel chains.

379. Batumi has already become regional center for meetings and conferences on the international level. It is a suitable market for political, business, cultural and other types of events all year round. Subtropical climate, warm sea with its health properties, seaside tourist and resort infrastructure, unique combination of the costal and mountainous climate create the best recreational conditions for tourists.

380. Batumi and its surroundings offer attractive shore excursions. Gonio-Afsaros Fortress from 1st century B. C., the largest Botanical Garden in Europe, Batumi old city with its European architecture from 18 century, wide seaside promenade and beautiful squares bring out unique mix of time and culture. In 2013, Batumi Sea Port hosted 16 Cruise ships - 5162 tourists.

E.15. Social and Cultural Resources

E.15.1. Population and Communities

381. The population of Batumi increased from about 48thound of inhabitants in 1926 up to 190.000 in 2013 (Fig. E-18). The city enlarged and the gross added value of Batumi increased.

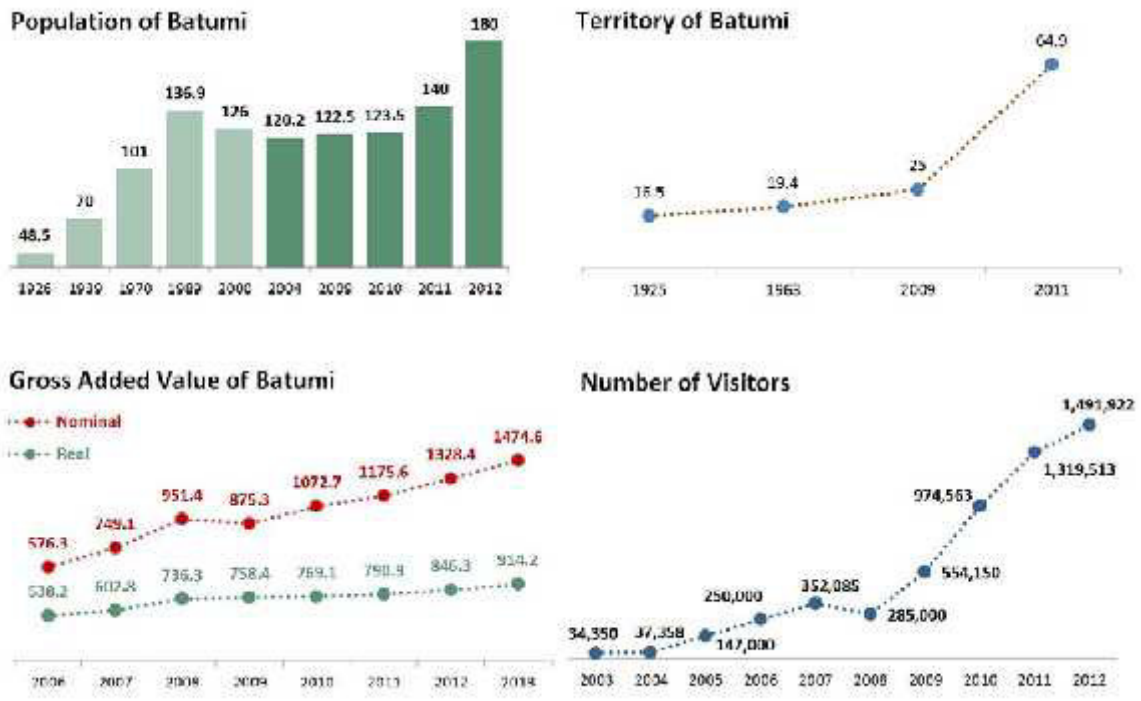


Fig. E.34: Social and economic indicators (from self Governing city of Batumi, Sustainable energy Action plan)

382. Religious structure (according to the 2002 census): Orthodox Christian 84.0%, Muslim 9.9%, Armenian-Gregorian 3.9%, Catholic 0.8%, Jesuits 0.4%, Judaists 0.1% and etc.

383. Georgian national average data for monthly salary is reported in the following table:

Tab. E-13: Monthly national average salary (source: http://www.geostat.ge/?action=page&p_id=149&lang=eng)

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Average monthly nominal salary, Gel	156.6	204.2	277.9	368.1	534.9	556.8	597.6	636.0	712.5	773.1
Unemployment rate, percentage		13.8	13.6	13.3	16.5	16.9	16.3	15.1	15.0	14.6

E.15.2. Health Facilities

384. The following health facilities are present in the city of Batumi:

- Republic Clinical Hospital of Batumi
- Republic Center of Mothers and Children
- Maternity Home
- Medical Center of Georgian Seamen 2010

- Psycho-Neurological Dispensary
- Batumi Regional Center of Infectious Patology, Aids and Tuberculosis
- Republic Oncology Center
- Adjara Narcological Center
- n. 3 Policlinics of Batumi
- Childrens Policlinic/Family Medicine Center
- Republic Center of Skin and Venereal Diseases
- Republic Endocrinological Dispensary
- Dispensary of Doctor's Physical Training
- Emergency Center
- Blood Transfusion Center
- Batumi Scientific Practical Center of Clinical Pathology

E.15.3. Education Facilities

385. At Batumi there are 3 Universities (Shota Rustaveli State University, Batumi Atr Teaching University, Batumi State Maritime Academy), 20 Public schools and 26 nursery schools.

E.15.4. Cultural Heritage

386. The Batumi Archeological Museum is one of the oldest Georgian museums. Though it has a centenary history it was opened for visitors as late as in 1994. This is one of the best archeological museums both in Batumi and in whole Georgia. The Museum has collected the monuments of material culture of different epochs. Its collection includes 22800 exhibits, the majority of which are finds from the excavations carried out in the territory of Adjaria.

387. A unique botanical garden is located 9 km to the north from Batumi in the vicinities of Green Cape Resort. Batumi Botanical Garden was laid out on the slopes of the Green Cape in 1880.

388. Batumi is the capital of Adjaria, an autonomous district in Georgia, where a part of the population is Muslims. In spite of this, Batumi is the city of co-existence of several religions. That is why, there may be found ancient Orthodox and Catholic temples as well as mosques and synagogues.

389. The oldest fortress of Georgia – the Gonio Fortress (or the Gonio-Apsaros Fortress) occupying the territory of 4,5 ha is situated in village of Gonio in Adjara, 15 km from Batumi city. The fortress history amounts to several millenniums. The ancient archeological layers, dug in the fortress territory belong to the XV-XVII centuries BC.

390. The resort town Batumi is well-known not only with its ancient temples and other historical sites but also with Seaside Park (Primorsky Park), more often called by the citizens as boulevard.

391. Batumi Seaside Park is located on the north-western coastal part of Batumi, stretching along it for 7 km. The Park history begins in the end of XIX century. This place was occupied by a dump with waste at that time. Almost the whole seaside was unsuitable for rest.

392. “At the preliminary stage no cultural heritage monuments are identified as being impacted by the works. The impact on any cultural heritage monuments will be monitored as the design is elaborated and more specific details are available.”

F. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION FACILITIES

F.1. Anticipated Environmental Impacts and Mitigation Measures

393. This paragraph provides a brief description of anticipated site-specific impacts related to the construction and operational phase of the project .

394. No: means the impact is not occurring or is not relevant and will not be considered further

395. Yes negligible: the impact is likely to occur but its magnitude is such that a light mitigation is foreseen. A monitoring programme is also foreseen to verify that impacts are negligible and that mitigation activities are properly planned.

396. Yes significant: the impact is likely to occur and its magnitude is such that relevant mitigation is required.

Tab. F-1: Potential impacts considered important during construction works

Component	Potential (negative) impacts	Comment	Yes/No Significance
Air	Air quality	Emissions of gases and dusts are typical impacts of construction. Trucks and vehicles for nourishment will be limited in number. In this project, the material for excavation/nourishment will be transported by pumping, so impact on the air environment will be insignificant. Part of the revetment construction material will be land transported, so there will be a localized light impact on the environment air quality due to dust and air emissions.	Yes Negligible

Component	Potential (negative) impacts	Comment	Yes/No Significance
Noise	Noise level	Noise is typical impact of construction. Noise will be induced by the pumping/dredging activity in the proximity of the boosters. The impact will be 3 months long at maximum. In the revetment area noise will be induced by trucks and working vehicles. In addition part of the construction material will be land transported. All these activities will induce localized impact on noise level backgrounds, with possible exceedance of threshold levels. The duration of impact caused by these activity will be 2+9+3 months, during the working season. Therefore, touristic population will be affected during the month of June, at the early beginning (and less crowded) of touristic season. The impact can be considered significant and mitigation measures are considered.	Yes Significant
Surface Water	Seawater quality	Sea water constructions could have impacts on water quality. Due to the fact that nourishment material comes from the same coastal area and that it is mainly composed by pebbles, no significant impact is expected. However, a monitoring turbidity campaign is foreseen, during the first extraction/nourishment period, in order to verify the absence of impact.	Yes Negligible
	Freshwater quality	No river environment in interested by project activities	NO
Groundwater	Groundwater quality and fluxes	No direct or indirect impact on groundwater is foreseen by project activities	NO
Soil	Occupation	Soil occupation for the work activities (working places, camps, etc.) is foreseen, but it is very limited. A small storage areas for revetment construction is foreseen. In any case soil occupation will be temporary, and mainly limited in the non-touristic period.	Yes Negligible
	Resources	Part of the construction material (revetments) will come from quarries. The potential impact is the use of natural material but the impact is considered negligible. The exploration of the borrow pits should be conducted by licensed companies or the Constructing Contractor which has to obtain its own license.	Yes Negligible

Component	Potential (negative) impacts	Comment	Yes/No Significance
Ecology	Coastal habitat loss	Nourishment and placing stones on the bottom of the sea generally results in the short term irreversible loss of the existing benthic habitats (sea grass and biota). However no presence of sea plants or benthic community is expected in the project area taking into account the first meter depth (max -1m slm) . Impact on benthic biota due to increased turbidity is not foreseen due to the nature of the nourishment material: pebbles. This fact will be verified during the first construction period (turbidity campaign).	NO
	Terrestrial habitat loss	In case of new transport pathways for work activities an impact to terrestrial habitats could be generated.	Yes Negligible
	Disturbance due to air/noise pressures	Work activities generally induce impacts on existing biota/birds nesting or living in the project area	Yes Negligible
Landscape	Presence of work yards	In general work activities cause detrimental effects on landscape. However, work activity will be mainly performed out of the touristic period, so the impact on tourism is very limited.	Yes Negligible
Waste	Coming from working activities	Small quantities of hazardous wastes will be generated as a result of vehicle operations and the maintenance activities. However, a waste Management Plan will be performed by the Constructor and applied during the construction phase.	Yes Negligible
Social Aspects	Traffic nuisance	A number of movements by heavy trucks on the roads served the site, delivery construction materials for revetments will be therefore present but limited in number. Mitigation measures, will be considered in the next design phase.	Yes Negligible
	Work force	The majority of the employees would be local persons.	NO (positive impact)
	Resettlement	No resettlement in considered for the project	NO
	Disturbance due to air/noise quality	As above mentioned noisy operations and the presence of heavy trucks are required to deliver and manage inert materials for revetments construction. The construction sites impose certain safety risks for the population and, therefore, compliance with safety rules is important. However due to the predominant winter construction period, the impact on tourism can be considered negligible, being limited to the early beginning of summer season. Mitigation noise measures will be considered. A monitoring noise/air campaign will be also conducted.	Yes negligible
Cultural heritage	Cultural heritage	At the project area there are no cultural heritage monuments. During construction activities special care should be taken not only at the construction sites, but also at construction camps and storage areas.	NO

Tab. F-2: Potential impacts considered important during operational phase

Component	Potential impacts	Comment	Yes/No Significance
Seawater	Hydrodynamic conditions	The project will study hydrodynamic condition during operational phase and will design structures accordingly.	NO
	Morphodynamic	Sediment transport and erosion need to be studied during the project phase, by modelling. Design will be modified accordingly	NO
Air	Air quality	In the case of this project, due to the pumping of excavation/nourishment material there will be insignificant impact on the air environment . The only terrestrial movement along the coastline will be those of the excavator digging the gravel material. Time required for completing the nourishment each year is about 2 months, so no impact on air quality is foreseen	NO
Noise	Noise level	In the case of this project, due to the pumping of excavation/nourishment material there will be significant impact on noise environment in the proximity of the boosters. The terrestrial movement along the coastline will be those of the excavator digging the gravel material . Time required for completing the nourishment each year qill depend on the amount to be dredged, and it will be approximately 3-4 monts. Due to the foreseen mitigation measures the impact on noise quality will be reduced.	Yes significant (Mitigation measures)
Landscape	Coastal defense	The coastal structure will reduce erosion. A actual beach will be enlarged by nourishment	NO positive
Social Aspects	Tourism	The new coastal defense will create a new beach, with new recreational areas and a protection to the Boulevard. The general aspect of the coastal boulevard will be upgraded.	NO positive

F.2. Air quality and noise

F.2.1. Noise, gases and dust Caused by Construction Activities into the Atmosphere

397. Most of the construction process will be conducted by land (**Error! Reference source not found.**). Land activities for revetment construction and nourishment will produce a number of movement by excavator along the coastline and heavy trucks on the roads served the site, delivery construction materials.

398. Noise and emissions of harmful substances are typical impacts of construction. Air quality can be affected during construction by emissions equipment and land vehicles in work activities at work locations.

399. The construction period for the gravel beach toe formation, the revetment and the nourishment will take a total 13-14 months (from October 2016 to December 2017). A limited number of trucks will be present for the construction activities.

400. Due to the total volume of construction material, from quarries, that will be used for revetment (about 100,000mc, see capt. **Error! Reference source not found.**), the number of trucks that will drive into the construction area will be small. Therefore, it is clear that there will be a very limited impact on the environment due to noise or air emissions induced by trucks coming from quarries.

401. Monitoring activities will be conservatively foreseen, even if, to reduce interference with the touristic season, revetment construction will be performed mainly during winter time (Oct. - June). If monitoring results will advise the exceedance of air quality and noise legal levels, localized and temporary mitigation measures could be also considered in addition to the good practice construction activities already planned; rules required by the building practice and norms will be observed. In the southern part of the coast, where the residential area is located, it is possible to envisage in any case a mobile noise barrier to be moved as the construction front proceeds (see chap. **Error! Reference source not found.**).

402. In terms of noise, the foreseen most impactful activity is the sediment removal and temporary gravel storage, due to the presence of the hydraulic pumping system with 4 booster stations that will be placed near the residential and touristic area. This activity will be repeated almost annually and the time required will depend on the amount to be dredged (approximately it will take 3-4 months).

403. To deeply analyse this construction aspect and to verify the compliance with legal noise limits, a specific noise propagation model has been realized and applied.

404. The study has been conducted focussing on 3 significant areas, as indicated in **Error! Reference source not found.**. In Area A the Shota Rustaveli University is located in front of

the pump, in Area B the Magnolia Hotel is very close to a booster station, while in Area C there are residential buildings typical of the southern part of the coast that are near a booster station.

405. The noise disturbance due to the pipe has not been considered in the model because the pipe is foreseen to be buried under a sand layer, in order to minimize noise impacts.

406. Sound levels evaluated with the model have been compared with legal standards, to estimate the magnitude of impacts.

Fig. F.1: Significant Areas selected

407. No significant impacts on air quality during the post-construction period are expected due to the sea maintenance activities. Post construction, a limited impact on noise is foreseen only for nourishment (pumping activity).

F.2.1.1 The Mathematical Model

408. The software used for the noise modelling is SoundPLAN v7.4, that is a 3D analyses tool, able to determine the sound level pressure in complex systems generated by different sources (e.g. point, linear, surface, volume sources).

409. According to international standards, single modules are devoted to solve specific problems as, for the present study, noise propagation induced by construction activities.

410. In detail, starting from a physical schematization of the area of interest (digital ground model, land use with their acoustic characteristics, presence of barriers, etc) and with defined sound pressure sources, it is possible to evaluate the main parameters of noise level distribution. Moreover, on the base of day timing, it is possible to evaluate day Leq(A) according to relevant international standards.

411. The noise calculation periods were adjusted to comply with the noise descriptors used in Georgia:

- Lday: Leq(A) during 16 h day time period (7am -11 pm);
- Lnight: Leq(A) during 8 h night time period (11pm - 7am).

F.2.1.2 Evaluation Assumptions

412. Considering the foreseen execution phases and operations, three areas have been identified and selected as representative of sensitive receivers. Analysed areas have been conventionally named with letters A, B and C. (**Error! Reference source not found.**):

- Area A: The Shota Rustaveli University is in front of the area where the pump is active
- Area B: Magnolia Hotel is very close to a booster station on the beach
- Area C: the residential area is near a booster station

413. For each representative area, the 3D noise level evaluation was carried out and results are represented in correspondence of a vertical cross-section, passing through the noise emission point and the closer sensitive receiver.

414. The model schematization used for the present study is reported in **Error! Reference source not found.** and **Error! Reference source not found.**. Here the noise emission points (pump or booster stations) taken in account are shown. In the same figures are indicated also the vertical cross sections in correspondence of which the noise level map is provided.

415. Even if during the sediment removal and temporary gravel storage phase, both the pump and the boosters will be operative only 8 hours per day, the evaluations have been carried out assuming a working period of 16 hours, during day time period. This conservative assumption allows to consider the possibility that the works may extend beyond the defined working shift.

416. In correspondence of the pump and the booster stations position, noise emission was applied, and noise propagation levels at receivers were assessed.

417. Due to the characteristics of the project area, i.e. a residential area, the legal standards are fixed at 55 dB(A) as indicative level for the Day time, with a maximum admissible level of 75 dB(A) and 45 dB(A) as indicative level for Night time, with a maximum admissible level of 65 dB(A).

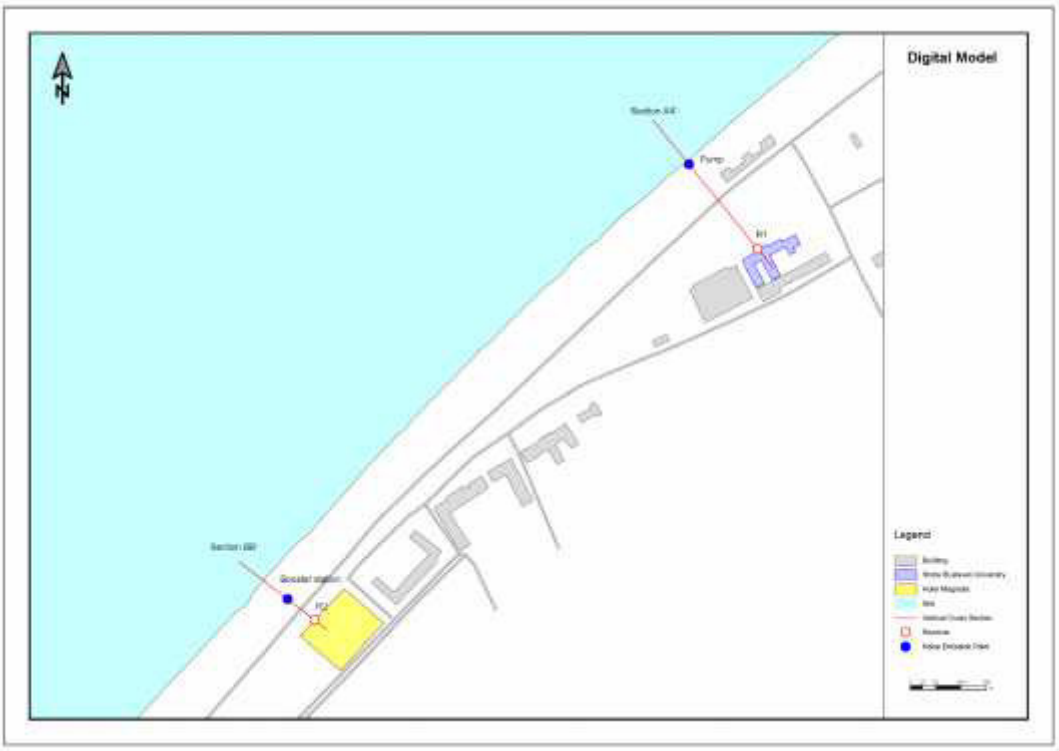


Fig. F.2: Model schematization (Northern Area)

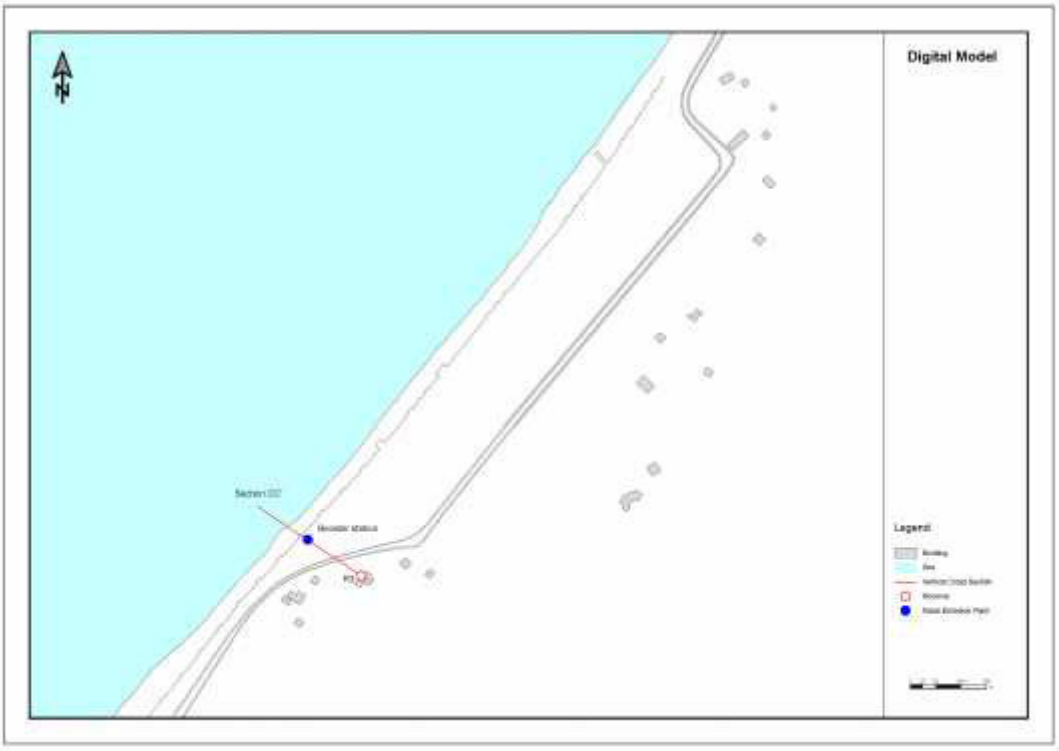


Fig. F.3: Model schematization (Southern Area)

F.2.1.3 Analysis Of The Results

Area A

418. In **Error! Reference source not found.** the model result as a noise level map on the vertical cross section AA' is shown.

419. In **Error! Reference source not found.** the numerical results at the punctual receiver R1 is reported at different heights.

420. It can be observed that the legal standards are not exceeded, thanks to the distance between the pump and the building. The maximum noise level evaluated is 50.9 dB(A), that is less than both the indicative level (55 dB(A)) and the maximum admissible level (75 dB(A)).

Fig. F.4: Model results for Vertical Cross Section AA'

Tab. F-3: Model results at point R1

Receiver	Floor	Height (m)	LrD dB(A)
R1	GF	1.5	50.4
	1.FL	4	50.7
	2.FL	6.5	50.9

Area B

421. Considering Area B, it is evident that Magnolia Hotel is located very close to the foreseen position of one of the booster stations.

422. In **Error! Reference source not found.** the model results the vertical distribution of noise in the cross section BB' is shown, while in **Error! Reference source not found.** (no mitigation column) the results at receiver R2 at different heights are reported.

423. From model results it is clear that in this configuration the Day time indicative limit is exceeded, this is why it is foreseen to provide the booster station with a prebuilt soundproof enclosure with the aim to reduce the negative noise impact.

424. To deeply investigate this aspect, an additional simulation has been done considering the booster station inside a soundproof enclosure. The considered enclosure reduced sound level by 30 dB.

Fig. F.5: example of soundproof enclosure

425. Results of this simulation are reported in **Error! Reference source not found.** and **Error! Reference source not found.** (mitigation column).

426. Using this kind of mitigation device, it is possible to reduce the noise level at the receiver from 65 dB(A) to 42 dB(A). This means that the Day time limit can be respected.

Tab. F-4: Model results at point R2

			no mitigation	mitigation
Receiver	Floor	Height (m)	LrD dB(A)	LrD dB(A)
R2	GF	1.5	61.3	39.0
	1.FL	4.0	62.1	39.6
	2.FL	6.5	62.9	40.1
	3.FL	9.0	63.6	40.6
	4.FL	11.5	64.3	41.3
	5.FL	14.0	65.0	41.8
	6.FL	16.5	65.1	41.9
	7.FL	19.0	65.0	42.0
	8.FL	21.5	64.9	42.1
	9.FL	24.0	64.8	42.1

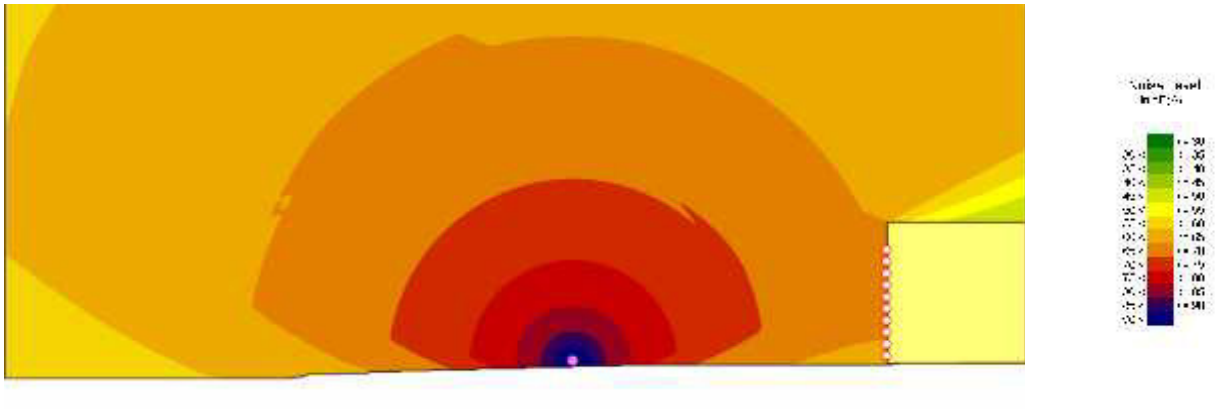


Fig. F.6: Model results for vertical Cross Section BB' – no mitigation measures

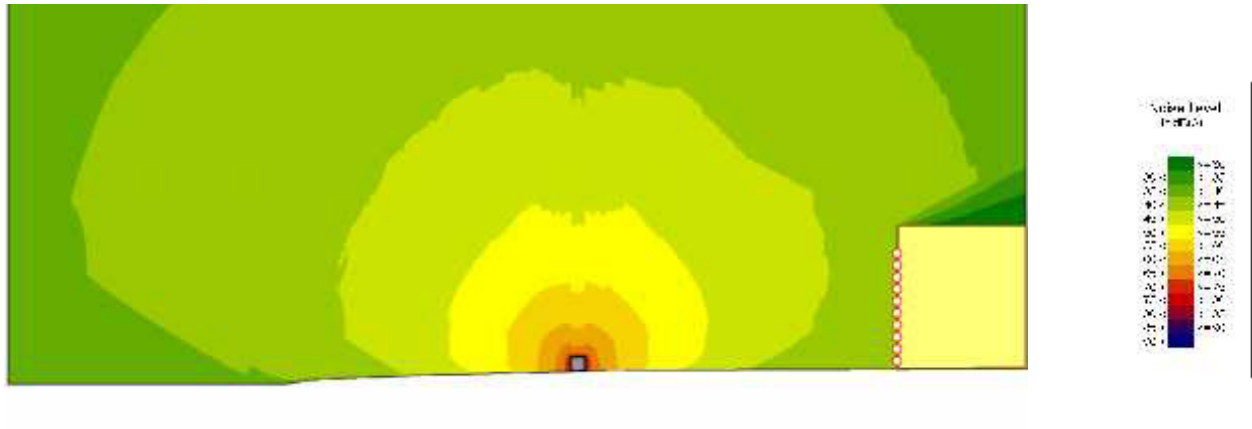


Fig. F.7: Model results for vertical Cross Section BB' – with soundproof enclosure

Area C

427. Considering Area C, the selected residential building is located near a booster station.

428. In **Error! Reference source not found.** the model result as a noise level map on the vertical cross section CC' is shown, while in **Error! Reference source not found.** (no mitigation column) the results at receiver R3 at different heights are reported.

429. In this configuration the Day time admissible limit is respected, but with values at the at the limit of the threshold.

430. Even in this case it is possible to provide the booster station with a sound reduction device (such as a mobile noise barrier or a prebuilt soundproof enclosure) with the aim to reduce the negative noise impact.

431. Also in this case, an additional simulation has been done considering a sound reduction device located close to the booster.

432. Results of this simulation are reported in **Error! Reference source not found.** and **Error! Reference source not found.** (mitigation column).

433. Using this kind of mitigation device, it is possible to reduce the noise level at the receiver of about 3.5 dB(A).

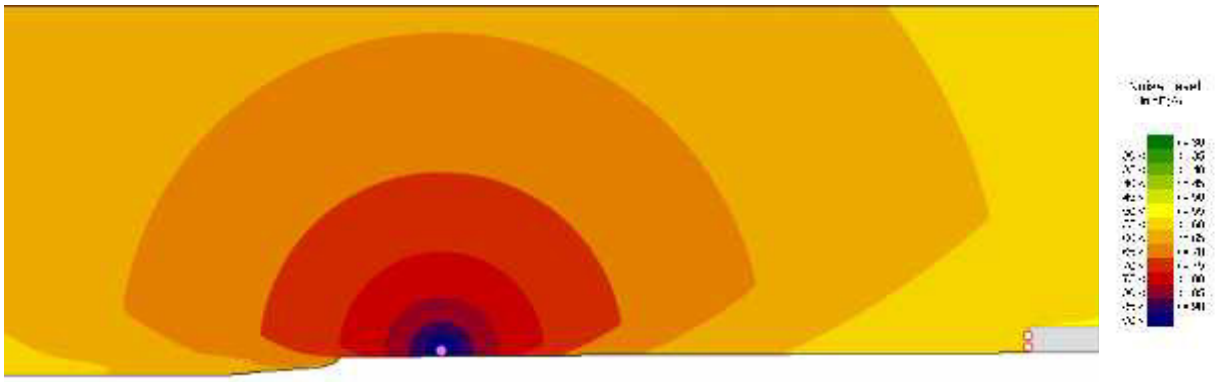


Fig. F.8: Model results for vertical Cross Section CC' – no mitigation measures

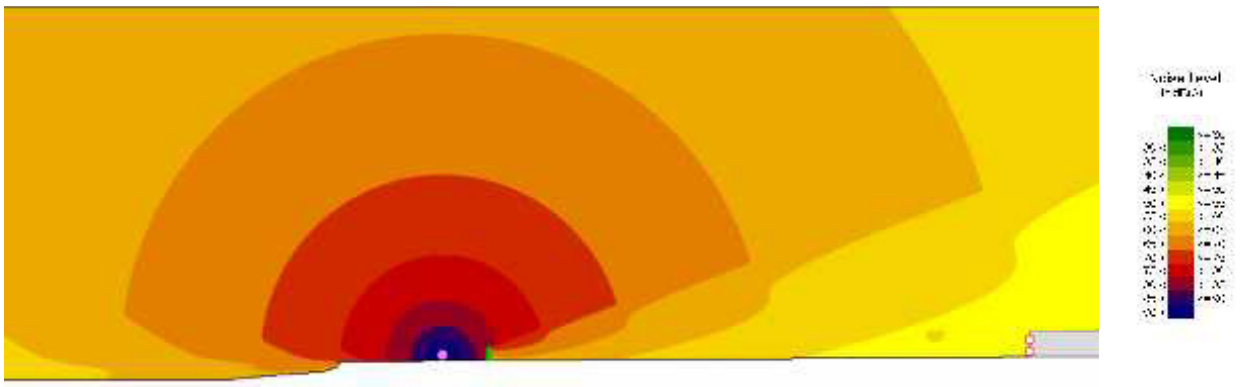


Fig. F.9: Model results for vertical Cross Section CC' – mitigation measures

Tab. F-5: Model results at point R3

			no mitigation	mitigation
Receiver	Floor	Height (m)	LrD dB(A)	LrD dB(A)

R3	GF	1.5	55.2	51.5
	1.FL	4.0	55.5	52.1

F.2.2. Mitigation Measures

434. Air and noise impacts can be reduced by a variety of measures, many of which are common in most urban construction. These include:

- Require adherence to engine maintenance schedules and standards to reduce air pollution.
- Use of defined, well planned haulage routes and reductions in vehicle speed where required;
- Periodically water down temporary roads on site;
- Cover trucks carrying cement, gravel or other loose materials;
- Wet or cover trucks carrying stone/ sand/ gravel;
- Haul materials to and from the site in off peak traffic hours;
- Halting work during excessive onshore winds.
- Immediately replacing defective equipment and removing it from the work site
- No truck movements in inhabited areas between 23:00 and 7:00.

435. Even if the revetment and beach nourishment activities are foreseen to be done mainly during winter season, when the touristic presence is low and the hotel activity is reduced, it is foreseen to provide two types of noise mitigation (according also to analyses of model results):

- a sound reduction device at the booster station, such as a mobile noise barrier or a prebuilt soundproof enclosure, with the aim to reduce the negative noise impact;
- a mobile noise barrier in the southern part of the coast, where the residential area is located, to be moved as the construction front proceeds (**Error! Reference source not found.**). Due to the fact that the advancement of work front will be about 5m/day we suggest the use of a the noise barrier 300 m long (equivalent to approximatively 60 working days) that will be moved along the construction site to allow a continuous advance of the front. The working period in front of the residential area will be 4 months long but the noise monitoring will be for all the duration of the working activity.

436. A monitoring plan will be also performed to monitoring noise level and to evaluate the necessity of localized and temporary additional mitigation measures. The monitoring plan for air (noise and air quality) will be focused for the working months per each of the working seasons (see chap. **Error! Reference source not found.**). The monitoring of noise and air will be performed along the construction activities.

Fig. F.10: Revetment construction front in the southern residential area.

F.3. Surface Water

F.3.1. Sea water quality

437. Potential suspension can occur only during the excavation and gravel beach toe formation activities. The seabed affected by the work activities is almost constituted by pebbles, therefore no suspension is expected.

438. During construction, water quality near work areas could be affected by leaks or spills of operational material such as fuels, oils, or hydraulic fluids. These episodes can be avoided by the adoption of best practice during construction phase.

F.3.2. Freshwater quality

439. No river environment in interested by project activities.

F.3.3. Mitigation measures

440. Even if turbidity increase is not expected (due to the large grain size of pebbles **Error! Reference source not found.**), a monitoring activity is conservatively foreseen for the first excavation/gravel beach toe formation period (during construction activities). This monitoring

activity will verify the absence of impact (turbidity plume). In case of presence of turbidity plume, impacting the seawater environment and related biota (see also chapter **Error! Reference source not found.**), monitoring activity will be also planned to the next years and the use of silt screen will be considered.

441. Leaks and discharges of oil based products into the sea water during construction activities shall not be permitted.

442. The Contractor shall have and maintain at each work location oil containment booms and absorptive materials and persons trained in their use to clean up any spills of oil based products. No chemicals will be used to clean up or disperse any oil based products.

F.4. Groundwater

443. Foreseen project activities interest the coastal environment and surficial soil/pebbles. No use of groundwater for working activity (pumping or well points) is foreseen.

444. No impact on groundwater is therefore foreseen.

F.5. Soil

F.5.1. Soil occupation

445. Soil occupation for the work activities (working areas, camp, etc..) will be necessary for the execution of the project.

446. The potential impacts related to the construction and operation of the camp could be summarized as follows:

- Potential damage of topsoil
- Contamination related to fuel storage and fuelling operations
- Waste production.

F.5.2. Resources/Quarrying Sites

447. The quarries and borrow pits (for revetment construction) will be finally selected by the construction contractor.

448. The exploration of the quarry/borrow pits should be conducted by the licensed companies or the Constructing Contractor has to obtain its own license.

449. By now it is possible to advise the following available quarries.

Quarries location and Transport

450. Road transport is considered as the best means of transportation. For transportation Dologani quarry and Kvirike quarry can hire trucks from local transport companies. The good condition of the roads gives the possibility to conduct transportation without interruption, even during snow and adverse weather conditions. The distance from Dologani quarry to site is 26 km (31 min.). The distance from Kvirike quarry to site is 32 km (30 min.). For transportation the highway road will be used which is sealed, belongs to 3rd category road, and goes through the village of Dologani and Kvirike, however the locals will not create any problems which will interrupt transportation, as transportation has been ongoing for several years without any interruption caused by locals. The length of access road to Dologani quarry from highway is 300m and the width is 8.5m. The length of access road to quarry from highway is approximately 4 km and the width is 5m. The access road is leveled by ballast, which is repaired regularly.

Fig. F.11: Dologani rock quarry located along River Dologany and near to village Dologani , 26 km (31min) distance from Batumi coastline

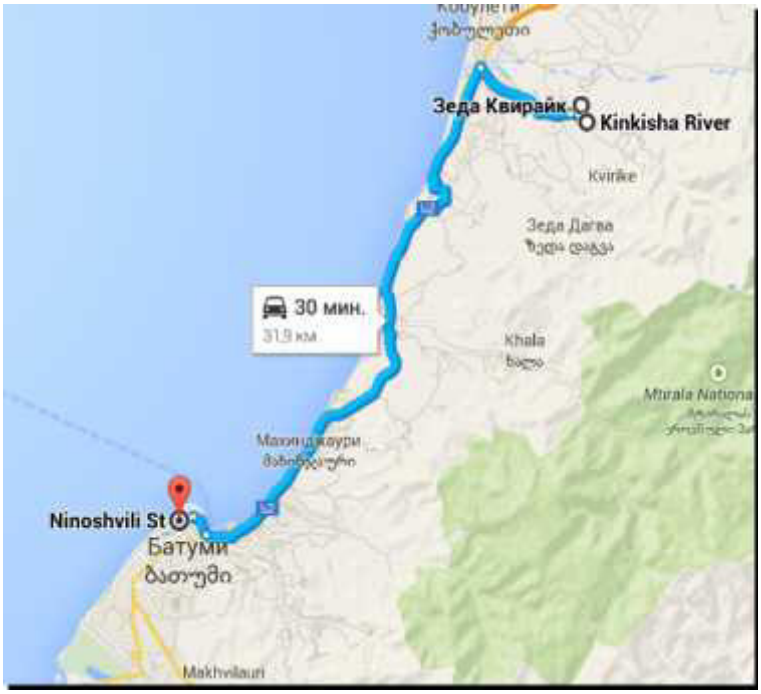


Fig. F.12: Rock quarry area located near village Kvirike, Kobuleti region and 32 km (30min) distance from Batumi coastline.

F.5.3. Mitigation Measures

451. In the next project phases soil occupation by work areas will be studied in detail and reduced whenever possible.

452. The construction camp shall be equipped with a biotoilet and other necessary infrastructure. A Waste management plan will be implemented and a wastewater and sanitation plant will be planned if necessary.

453. The exploration of the borrow pits should be conducted by the licensed companies.

454. In case if the constructing company intend to perform quarrying activities, the company has to obtain related license. Validity of licenses for the abovementioned companies is a main mechanism to guarantee that most of impacts related to quarrying will be mitigated. License is provided by the MoE only on a basis of preliminary assessment (including limits and conditions for reinstatement). The Regional Services of the MoE and Environmental Inspectorate are in charge to control compliance of the quarrying company's performance. The role of the MDF within this plan should be to ensure timely and permanent involvement of the MoE in construction supervision.

455. The measures aimed on mitigation of the dust and emission impacts, as well as potential contamination due to improper fuelling and vehicle operation should be the same as above described pollution prevention measures. MDF and Constructing Contractor's environmental personnel should pay attention during monitoring.

F.6. Ecology

F.6.1. Coastal habitat

456. The construction of structures in the water can potentially impact on the quantitative and qualitative composition of aquatic biota. No presence of sea plant and relevant benthic communities is expected along the coastline, due to the seabed almost made of pebbles. Moreover, no sediment plume is expected from nourishment with pebbles, therefore no indirect impact on marine flora and fauna is expected as well.

457. Any activity in the water overlooking the coastline can affect the fish presence. In case any population would be affected during construction works, is expected a temporary relocation and the present situation to be restored as soon as the works terminate.

F.6.2. Terrestrial habitat

458. Almost all of foreseen activities are located in areas already affected by human presence (**Error! Reference source not found.**), at different levels of pressure. Due to the distance

from humid (at least 1 Km) and natural areas, impacts on terrestrial flora and fauna is considered negligible.

459. Part of present vegetation in the construction sites can be affected by work yards and the pathway operated by the construction vehicles.

460. Work activities on the shoreline can affect the nesting of birds like C. alexandrinus and C. dubius: the impact on such species is considered present but low, due to the distance of humid area from constructions sites, possible transport roads and the presence of important infrastructure in the area (treatment plant and airport).

461. These plovers arrive at breeding sites along the Georgia coast in late March or early April and begins nesting by late April. Overlapping of the nesting period with construction season is limited. Nevertheless, control and monitoring on the presence of the above mentioned birds will be performed along construction site as described in mitigation measures and monitoring plan (by walkover surveys).

F.6.3. Disturbance due to air/noise pressure

462. Working activities generally induce impacts on existing biota/birds nesting or living in the area. However the project areas are more than 1 km far from the nearest humid delta area (**Error! Reference source not found.**), and out of the Protected Areas (**Error! Reference source not found.**). Between the humid area of Choroki river and the nearest project area there are two important infrastructure: the municipal treatment plant and the Batumi airport. This last account for potential disturbance, due to air and noise pressure, surely greater than that of the foreseen project activities. As discussed in chapter **Error! Reference source not found.** foreseen project activities impact in a limited way on air and noise environment and mainly during winter time, so disturbance on avifauna will be very low.

F.6.4. Mitigation measures

463. Sources of material for revetments and transport roads to the construction site will be detailed studied in next design stage. Metarials will be collected by quarries (**Error! Reference source not found.**) not impacting natural ecosystems or the Chorokhi river morphology and delta area. Principal transport roads will be used whenever possible (see **Error! Reference source not found.** and **Error! Reference source not found.**).

464. It shall be performed a detailed pre-construction terrestrial survey in the project area, taking also into account the chosen route for the construction vehicles and the footprint of foreseen work yards. A walkover survey will be performed before the works to start in the project area in order to identify valuable individuals, endangered species and sensitive habitats. At the possible extent, the routes for construction vehicles and the work yards will be located in order to not affect such valuable elements. Appropriate management will be agreed with relevant authorities for those individuals located along the routes or in the footprint of work yards in case would not be possible to relocate the project needs.

465. A buffer area between the work yards and identified breeding area shall be established, in order to prevent any unauthorized activity to happen in these buffer areas without a precautionary survey by experts.

466. Particular attention will be put in the area close to the mouth of the Chorokhi river, in order to identify any potential interference with nesting birds and mammals. During construction works a qualified biologist will survey the area in the proximity of the wastewater treatment plant located south of Batumi airport, the only area in the project boundary which can potentially host such species, in order to relocate nests or mammals found in the pathway of construction activities or proposing an alternative way. It has to be considered that the area is also affected by the airport and that the movement of construction vehicles will push the fauna out of the project area: present situation would be self-restored at the completion of the works.

467. Construction contractor should mark all breeding sites, mentioned in construction program, directly before beginning of work thanks to qualified experts.

468. Neither home range in construction area and access road corridor should not be damaged or disturbed without survey and allowances of experts. It had to carry out the field research to locate of borders of individual sites (home range) of animals for specifying ranges of these species and of sensitive communities (vertebrates and invertebrates). The field research should be carried out after the construction area will be marked, but before of any preparation of area to work (clearing and etc.). The requirements should be included in detailed construction program.

469. Shall be avoided areal fragmentation, disturbance on breeding and feeding areas, fragmentation of individual areas.

470. Shall be prevented the spreading of harmful substances in reservoirs and the reduction of dust amount during works; systems for the reduction of noise and vibration levels during works shall be implemented.

471. During activities pits, ditches, etc. should be fenced and/or surrounded with a band of vivid colour to avoid falling in of animals. Boards should be installed into the ditches to at night to aid the ingress of fallen animals;

472. Prior to commencement of activities the territory should be inspected in the areas where Chiroptera shelters could be located. If such shelters are discovered, activities within the territory should be avoided and/or artificial shelters arranged for the Chiropteran.

473. If areas of otter (included in the Red List of Georgia) distribution are discovered during activities, the activities within the territory should be restricted. If this is impossible, respective offset measures should be introduced.

474. In case where a residual impact is identified in valuable areas, particular attention paid to forests, eco-compensation measures will be undertaken, such as the rehabilitation/restoration of the equivalent forest habitats or the improve of wetland extent and functions.

475. A monitoring plan for avifauna is foreseen for the southern revetment construction period.

F.7. Landscape

476. During construction phases, work activities could cause detrimental effect to landscape.

477. During the operational phases the beach will be enlarged (thanks to nourishment) and the coastal structures will prevent erosion and damage by sea storms to the boulevard.

F.7.1. Mitigation

478. Construction work will be conducted out of the touristic period.

F.8. Wastes from construction Activities

F.8.1. Municipal Waste

479. Municipal waste may be generated on the Storage area. Mainly this is rubbish, plastic or glass bottles, glasses, waste food, etc. and a stationary waste. Waste should be collected both by the specially assigned personnel and the workshop workers on the area. The waste is placed into appropriate plastic containers and further a local Sanitary Service takes it to approved disposal sites.

480. The following should be taken into account:

- Generation of dust should be avoided;
- Plastic containers should be closed to prevent spread of the smell and also to avoid contact of rodents and insects with the waste.

481. The personnel involved in the handling of hazardous and non-hazardous waste will undergo specific training in:

- Waste handling
- Waste treatment; and
- Waste storage.

482. Burning of waste on any construction site is forbidden.

F.8.2. Medical waste

483. Medical waste is generated in the Medical Care and Control Point and belongs to hazardous waste category. This waste is collected in special plastic boxes and is transferred to a contractor for appropriate disposal/destruction. It is recommended that the medical waste is directly transferred to a contractor from the place of its generation, without intermediate steps.

484. While disposal of the medical waste the following requirements are to meet:

- Medical waste must be disposed in special plastic boxes, which have to be hermetically closed.
- Medical waste will be transferred to a certified contractor (Batumi municipal waste operator).

F.8.3. Non hazardous construction waste

485. Non hazardous construction waste may be generated on the Storage and construction area and will be collected by appropriate contractors. Waste disposed first on the sites of origin,

and then moved to construction waste temporary storage facility before transferred to a contractor.

486. Regarding the disposal of construction wastes both on the sites and at the temporary storage facilities, the following requirements are be considered:

- Place of disposal of the waste concerned must be enclosed.
- The waste must not have access to drainage water.
- Waste must be immediately removed from the working sites.
- Waste must be placed in secondary protective basins.
- This waste can be transferred only to a certified contractor.

F.8.4. Mitigation

487. A waste Management Plan will be foreseen and applied by the Constructor.

F.9. Social aspects

F.9.1. Traffic nuisance, disturbance due to air/noise quality

488. The main negative impact that can be occurred during the project implementation period due to the construction vehicles traffic is:

- Bothering the residents because of noise, dust and emission;
- Vibration may damage the houses that even now are not in perfect conditions;
- During the construction vehicles traffic population may have the safety problems, especially children.

F.9.2. Work force

489. Project will have positive impact on residents – they might be employed temporary, and project implementation will improve their living conditions.

F.9.3. Resettlement

490. No resettlement is considered for the project

F.9.4. Mitigation Measures

491. These impacts can be reduced by a variety of measures, These include:

- Require adherence to engine maintenance schedules and standards to reduce air pollution.
- Use of defined, well planned haulage routes and reductions in vehicle speed where required;
- Periodically water down temporary roads on site;
- Cover trucks carrying cement, gravel or other loose materials
- Wet or cover trucks carrying stone / gravel;
- Haul materials to and from the site in off peak traffic hours;
- Halting work during excessive onshore winds.
- Immediately replacing defective equipment and removing it from the work site
- No truck movements in inhabited areas between 23:00 and 7:00.

492. In the operational phase, the new beach will be enlarged, the boulevard will be protected again sea storm and the general boulevard aspect will be improved.

F.10. Cultural heritage

493. At the preliminary stage no cultural heritage monuments are identified as being impacted by the works. The impact on any cultural heritage monuments will be monitored as the design is elaborated and more specific details are available.

494. Land clearance works, grading and excavations are associated with the risks of damaging underground archaeological remnants. However, not listed sites could be as sensitive as already known archaeological sites. The known sites have been identified just during major construction works, particularly during construction of the existing groins and the seaside boulevard. The other sites have not been studied systematically. Therefore, special care should be taken not only at the new construction sites, but also at construction camps and storage areas.

F.10.1. Mitigation Measures

495. Monuments or areas of an archaeological interest, destruction of archaeological layers during the construction process is possible. To avoid this risk, preliminary preventive studies and archaeological supervision during the earth-works is necessary. Supervisory procedures and all other necessary measures should be agreed with the Ministry of Culture when obtaining the construction permit, in accordance with the rules of the permit issuance. According to the article 14 of the Law on Cultural Heritage, Permit on conducting quarrying activities in Georgia, as well as construction of an object of a special importance as it may be defined under the legislation of Georgia, is issued by a competent authority based on the positive decision of the Ministry of Culture, Monument Protection and Sport of Georgia. The basis for the conclusion is the archaeological research of the proper territory to be carried out by the entity wishing to

accomplish the ground works. The entity wishing to do the earth-works is obliged to submit the Ministry the documentation about the archaeological research of the territory in question. The preliminary research should include field-research and laboratory works

496. At the construction stage archaeological monitoring should be ensured by the constructing contractor under the supervision of the Ministry of Culture, Monument Protection of Georgia. The budget necessary for the archaeological supervision and other agreed works should be fixed under the construction works appraisal.

G. ANALYSIS OF ALTERNATIVES

497. A number of alternatives to mitigate the coastline erosion along the Batumi coastline are presented. The predicted effects of the different alternatives have been evaluated and will be described in the following.

G.1. Groynes (Alternative 1)

498. According to this alternative, impermeable groynes are built with the scope of blocking the longshore currents and transport over the entire length of the groyne. As a result, the longshore transport is shifted seaward. After construction of the groynes a reorientation of the coastline between the groynes to a direction normal to the year-average wave energy is to be expected. Due to the re-orientation, in the updrift part of the groyne section the shoreline will retreat and in the downdrift part it will shift seaward (see **Error! Reference source not found.**).

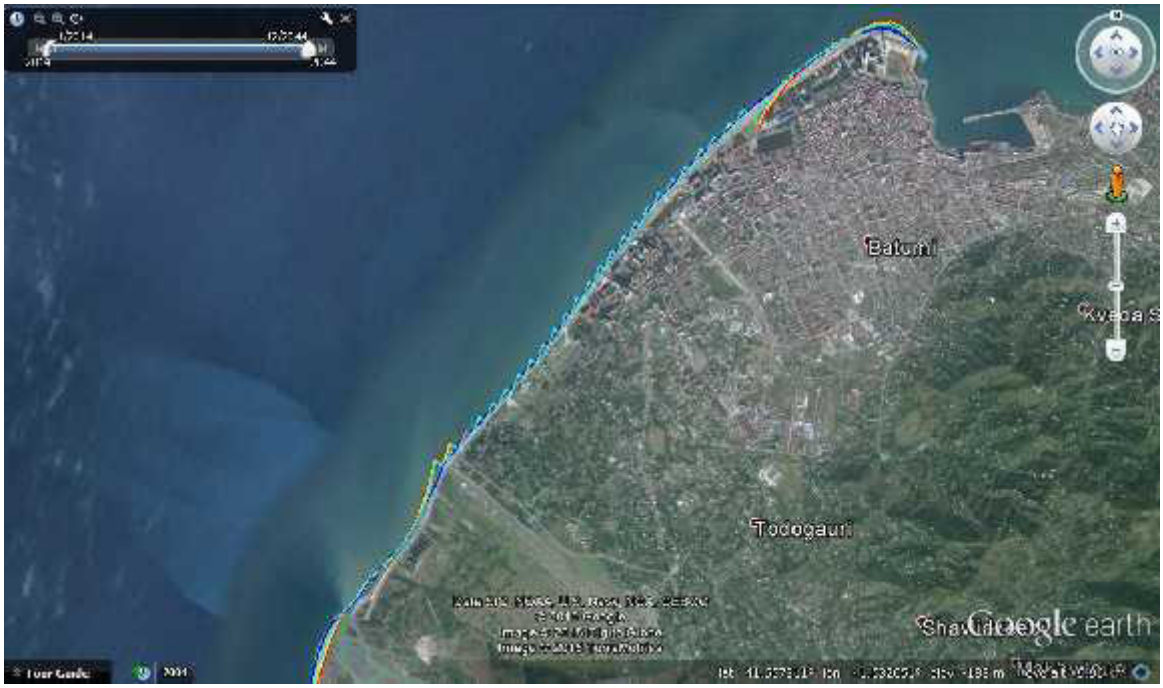


Fig. G.1: Plan view of the predicted coastal changes for the period 2014 – 2044 for Aalternative 1

499. The results of the numerical modelling (shown in the same picture) after 30 years of simulation show that the groyne field implemented between km 3.2 and km 7.9 are effective in blocking the erosion process at this stretch of coastline. After the first 10 years, the entire coastline has already reoriented to a direction perpendicular to the main wave angle (285° - 295°). However, as groynes cannot be built in the northern part due to the presence of the canyon, large erosion is expected in the downdrift side of the last groyne, with a maximum predicted erosion of 150 m over the 30 years (5 m/year). If those changes will take place, due to the severe

erosion, the entire beach downdrift of last groynes is expected to disappear. This is the part of the coast most frequented by tourists and close to the main hotels, therefore very valuable. Moreover, also a number of building at Batumi city will be in danger due to erosion. Therefore, we can conclude that this solution is not advisable.

G.2. Beach nourishments with material extracted from the northern stretch of the coast (Alternative 2)

500. According to this alternative, the gravel material extracted from the northern stretch of the coast close to Batumi cape, is moved towards the south, where beach nourishments are implemented.

501. According to the alongshore gradients calculated in the sediment transport study, there is an increase in alongshore transport rate from about 20,000 m3/year to about 40,000 m3/year from the end of the existing revetment to the northern section of the coast (about 3.5 km) (**Error! Reference source not found.**).This means that, to compensate the possible coastal erosion induced by the gradient in alongshore transport, a total nourishment volume of 20,000 m3/year should be implemented at this stretch of coast. The above quantities have been observed from the monitoring data collected regarding the total beach width variations along Batumi coast. The availability of quantities to be extracted from the stretch in accretion has been confirmed by computer modelling.

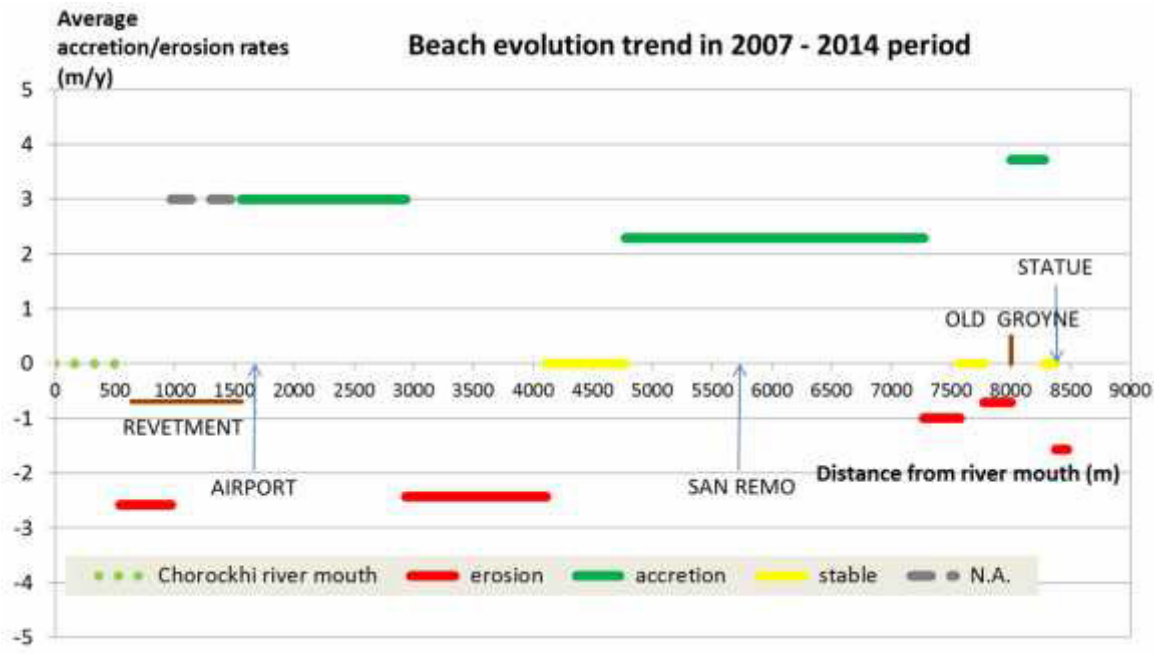


Fig. G.2 - Beach evolution trend measured from 2007 and 2014 coastlines

502. Over the 2007-2014 period, the evolution trend has been heavily influenced by human intervention:

1. a revetment was built in 2012 and further extended northwards in 2014, reaching a total length of about 900 m

2. a nourishment volume of about 100 000 m^3 is placed yearly in form of a mound, near the airport, according to information provided by local authorities. Placement started in 2009

503. In the southernmost part of the beach, from comparison with the 2007 coastline, the 2014 shoreline appears moved landwards in the first 400 m. The rate of erosion is almost halved (see **Error! Reference source not found.**), as compared to the previous 2001- 2007 period. It is difficult though to assess whether this reduction is natural, or if the retreat would have been larger, in the absence of the seawall.

504. In the following 500 m the comparison of the two surveyed lines shows what appears to be accretion; actually this seaward shift of the coastline position is most likely the consequence of revetment construction. Information reported by local people confirm that, in fact, at the time of construction the foot of the structure was lying in the water, and this is confirmed also by the design drawings.

505. In the following 1350 m there is accretion, but again it is forced by human intervention; in particular, it can be most likely interpreted as the consequence of the yearly nourishment. Here the accretion rate is 3 m/year.

506. Hence, in these 2.6 km of coast, the changes of coastal behaviour observed with respect to the trend of the previous 6 years can be explained taking into account human intervention.

507. It is remarkable that, immediately north of this 2.6 km long stretch, erosion has taken place for a length of about 1.2 km, at a rate of about 2.5 m/year. This trend is in contrast with the one observed in the previous period.

508. Following this section, the rest of the coastline is stable or accreting; also the last 700 m before the old groyne can be considered stable (rates lower than 1m/year).

509. In the northernmost section of the Cape, it can be seen that the coastline is still recovering from the landslide.

510. Therefore, according to Alternative 2, a nourishment volume of 20,000 m3/year will be implemented in the area more affected by erosion. This amount of material is extracted from the part of the beach in accretion (about 2 km long). This will help avoiding an excessive building out of the coastline in the north, which could possibly trigger instabilities of the underwater Batumi canyon.

511. The schematization of this excavation – nourishment process is shown in following **Error! Reference source not found.**, where dredging areas are coloured in red and dumping areas in yellow.

Fig. G.3: Schematization of the excavation – nourishment process

512. Barges pulled by tugboats will sail/operate along this stretch of coast, from the port located in the north to the revetment in the south, for a total length of about 7 km, along a corridor where water depths range between 2.5 to 10 m.

513. The area is not involved by significant marine traffic so there are not stringent limitations to the extension of the working area.

514. Sediment (mainly gravel) will be extracted over a beach length of approximately 2 km, in the northern section of the beach, across the shoreline. Since the total volume to be extracted is 20000 m3, 10 m3/m are extracted from each section and accumulated for transportation (see **Error! Reference source not found.**)).

515. This volume of extracted sediment is placed along the southern portion, along a stretch 2 km long, hence 10 m3/m will be placed, for a total volume of 20000 m3.

516. The expected evolution of the coastline is shown in following **Error! Reference source not found.**.

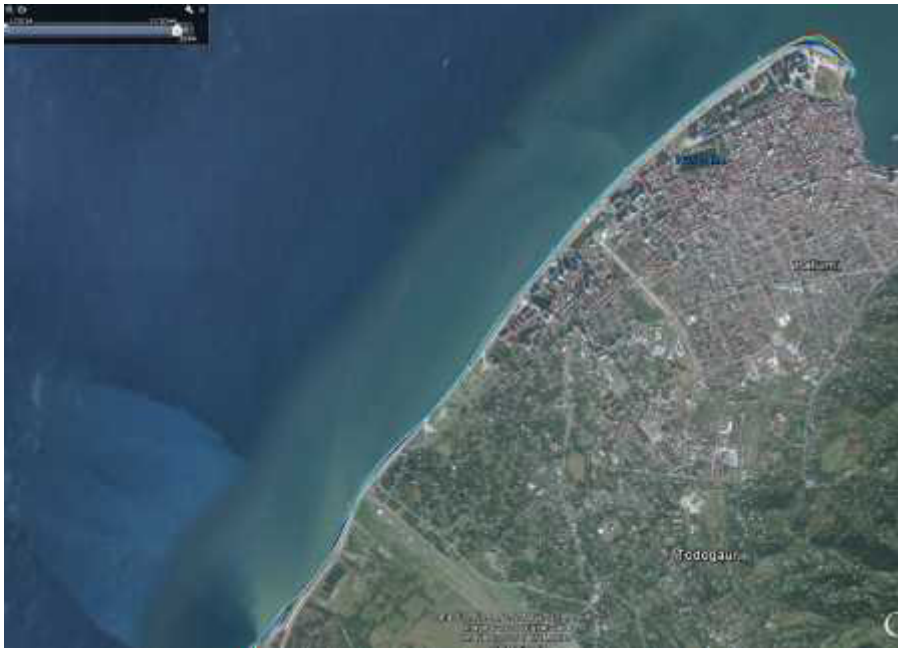


Fig. G.4: Predicted coastline changes for the next 30 years (from blue to red colour) for alternative 2

517. The figure shows that these nourishment volumes are sufficient to keep the coastline in position at the erosive spots. At the dredging location, the material extracted (only gravel) will keep the coastline exact in position (no erosion/no deposition).

518. This behaviour should be confirmed by the monitoring campaign that we advise to set-up to monitor the morphological changes induced by the dredging and nourishment operations. The advantage of this type of solution is its flexibility which allows a year by year optimization of dredging and dumping locations where sediment is needed.

G.3. Beach nourishments with material extracted from the river and/or other source outside the Batumi coastal system (Alternative 3)

519. According to this alternative, the material for the nourishment operations is not extracted from the area close to Batumi cape but from a source outside the Batumi coastal system.

520. For the scope of assessing the technical feasibility of this solution, this alternative has been explored independently from the location where the sediment is to be extracted. The volume of dredging and dumping material is the same as described for Alternative 2 and equal to 20,000 m3/year.

521. The following **Error! Reference source not found.** shows the predicted coastline changes. The main difference with Alternative 2 is that the for Alternative 3 the coastline is accreting

with respect to the reference situation (no action) but there is no coastal retreat in the northern section due to the dredging operations, as the source of sediment is outside the Batumi coastal system.

522. The figure confirms that the coastline changes at Batumi are now reduced to a minimum in the southern portion due to the implementation of the nourishments, while all the northern stretch is still accreting as no sediment is dredged from this stretch of coast. The problem of accumulation in the canyons is not solved.

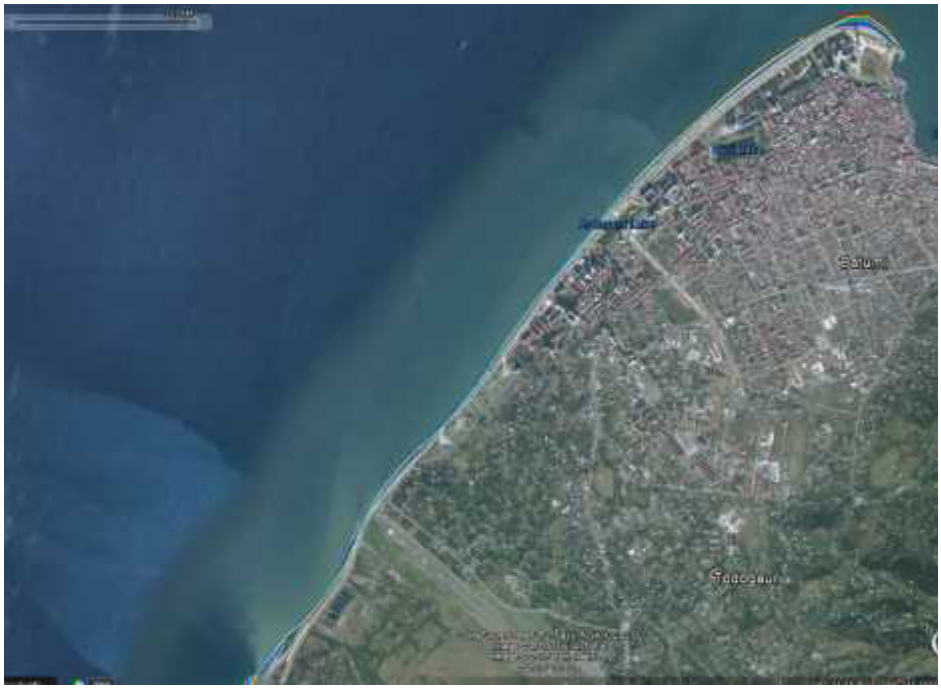


Fig. G.5: Predicted coastline changes for the next 30 years (from blue to red colour) for Alternative 3.

G.4. Conclusions

523. The modeling studies of the three proposed alternatives have shown that construction of groynes along the coast is not technically feasible, since it causes considerable erosion in the downdrift side of the last groyne, with a maximum predicted erosion of 150 m over the 30 years (5 m/year). If those changes will take place, due to the severe erosion, the entire beach over a length of about 600 m will disappear, in a stretch of coast close to the main hotels, the one most frequented by tourists and, therefore very valuable. Moreover, also a number of building at Batumi city will be in danger due to erosion.

524. Therefore, we can conclude that this solution is not advisable from a technical point of view. A possible alternative to this solution, would be to combine the groyne scheme with regular nourishments of the part undergoing erosion. However, the costs involved to build a very large groyne scheme, combined with extensive nourishment operation, make this alternative not attractive also from an economic point of view.

525. As for the alternative 2 and 3, they are both feasible in principle. Nevertheless, according to the information provided during recent meetings with the Client and environmental experts, it will not be possible to dredge any material from the Chorockhi river in the future neither from other rivers in the surrounding area (e.g. river Natanebi). However, according to the information provided by the Directorate for Environment and Natural Resources of Adjara Autonomous Republic, a new dam located in Georgian territory at about 15 km from the river mouth, is going to be completed in about 4 years' time. Local authorities are planning the extraction of a large volume of material from the area behind the dam which will be flooded, before the dam becomes operational. This large volume of material (about 2 million m3) could be stocked and used for several purposes (e.g. beach nourishments). This possibility is at present not confirmed, therefore Alternative 3, even if technically sound, may not be considered feasible in the present situation.

526. The only solution which appears sustainable both from a technical and economical point of view is therefore Alternative 2. This solution has been further implemented. In the project implementation the methodology for dredging and transporting has been further analyzed and modified as explained in chapter **Error! Reference source not found.**.

G.5. Climate Change Adaptation

G.5.1. Climate Risk Assessment

527. Proposed project is located along the Batumi coastline and intersected on the southwest side by the Chorokhi River. GIS analysis indicates project site is at risk to sea level rise, storm surges, and low to moderate risk of riverine flooding.

528. Project design would consider the impact of sea level rise and wave climate, the primary risks to project sustainability and effectiveness. Coastal protection project designed without consideration of sea level rise and its impact on wave climate might be insufficient to ensure sustainability of the maritime structure and protection of the coastline.

G.5.2. Adaptation Measures

529. The climate risk management response within the Project consist of adopting adequate design method and ensuring that the construction is fully conducted in accordance with design and technical specifications, which will be ensured by the construction supervisor at the implementation stage.

530. In line with international best practices for design of maritime structures, the sea level rise and its impact on wave action has been considered in the computer modelling and engineering design. As described in section E-9 (Table E-10), the designer estimated the sea rise level at 0.5 m over a period of 50 years. The designer conducted an extreme event analysis and a stability analysis including the assumption of sea rise level as one of the factors. Average (0.1 m), medium (0.2 m) and maximum (0.5 m) sea level rise scenarios were considered. The maximum scenario of 0.5 m was factored in the proposed design. This assumption is considered sufficient for the climate change that might occur. These values are derived from

the Feasibility Study (footnote 2) and were confirmed as suitable assumptions by the designer. Also, the maximum scenario (0.5 m) is in line with the European Environment Agency data on overall sea level rise, which indicated in 2014 that process-based models project a rise in 2081–2100, compared to 1986–2005, that is likely to be in the range 0.26–0.54 m for a low emissions scenario and 0.45–0.81 m for a high emissions scenario.

531. The adaptation investment is estimated at 10% of the subproject investment cost. This cost was determined by a comparison between 'with sea level rise' and 'without sea level rise' scenarios. No additional project constituent was introduced in order to address adaptation, only the design was adjusted. The additional cost results from adjusted design of the project constituents designed including the assumption of increase of water level. Out of the 10% additional cost for adaptation and of the three main subcomponents of the project, the main contributor is the 'revetment' built in the southern portion of the coast (8%). The 'sediment bypass' and the 'sliding protection' contribute 1% each.

H. INFORMATION DISCLOSURE, CONSULTATION AND PARTICIPATION

532. In order to comply with the Georgian legislation and the ADB requirements and to ensure meaningful consultations, the following actions need to be performed. Most of the main stakeholders have already been identified and consulted during preparation of this IEE, and any others that are identified during project implementation will be brought into the process in the future. Stakeholders of this project should at least include:

- People who live, and work near construction sites of facilities in Batumi
- MDF as implementing agency;
- Other government regulatory institutions
- Owners and managers of the hotels;
- Other community representatives;
- The beneficiary community in Batumi in general.

533. The borrower/client will carry out meaningful consultation with affected people and other concerned stakeholders, including civil society, and facilitate their informed participation. Meaningful consultation is a process that (i) begins early in the project preparation stage and is carried out on an ongoing basis throughout the project cycle;1 (ii) provides timely disclosure of relevant and adequate information that is understandable and readily accessible to affected people; (iii) is undertaken in an atmosphere free of intimidation or coercion; (iv) is gender inclusive and responsive, and tailored to the needs of disadvantaged and vulnerable groups; and (v) enables the incorporation of all relevant views of affected people and other stakeholders into decision making, such as project design, mitigation measures, the sharing of development benefits and opportunities, and implementation issues.

Disclosure of documents

534. The electronic versions of the draft IEE will be placed on the Batumi Municipality web-site.

535. Hard copies of Project environmental documentation (draft IEE and Executive Summary) will be placed in:

- the Batumi Municipality office;
- MoE Department of Licenses and Permits

H.1. Consultation meetings

536. On April 7 2015, in Batumi Municipality Sakrebulo Building, a public consultation meeting was held under the aegis of the Municipal Development Fund of Georgia, where the draft of Initial

Environmental Examination (IEE) document on “Batumi Coast Protection” project was discussed with the local population.

537. Additional public consultation/disclosure was conducted on February 5, 2016 in Batumi, as final Detailed Design was changed.

538. A short description of the final DD and updated draft of IEE describing the main objects, environmental impacts and planned mitigation measures was provided to the interested parties during the meeting.

INFORMATIONAL MEETING WITH POPULATION

Discussion of Initial Environmental Examination (IEE) Draft Document

„Construction of Batumi Coastal Protection" Project

Batumi, City Hall

April 7, 12:00

Minutes of the Meeting

On April 7 of current year in Batumi Municipality Sakrebulo Building a public consultation meeting was held under the aegis of the Municipal Development Fund of Georgia, where the draft of Initial Environmental Examination (IEE) document on "Batumi Coast Protection" project was discussed with the local population. The audience got briefed on the positive and adverse environmental impacts expected in the process of project implementation and the ways and means of preventing them.

Those present at the meeting: Representatives of the Mayor's Office, Members of Batumi Municipality Sakrebulo, Representatives of the National Environmental Agency and Environmental Protection Unit of Ajara Autonomous Republic, Authorized Representatives of Administrative Entities, NGO representatives, representatives of the Sciences' Development Fund of Batumi Municipality, Municipal Development Fund's Environmental Safety Specialists: Nino Nadashvili and Nino Patarashvili, Specialist of Relations with Beneficiaries Mariam Maridashvili; Environmental Protection Specialist of the Sub Consultant firm "Saunders Group" Sandro Abzianidze.

Meeting was opened by Nino Nadashvili. She welcomed attendants and briefly spoke regarding project main objectives. She mentioned that project is implemented by MDF with ADB financial support. She once more reminded attendants regarding purpose of the project and asked Mr. Sandro Abzianidze to present main aspects of IEE document.

Mr. Sandro Abzianidze set a stress on environmental protection issues of the project, he made a brief presentation of possible negative and positive impacts during beach protection works in Batumi and mitigation measures, he discussed significance of the mentioned project and briefly described possible impacts on environment. His peech was accompanied with PWP presentation.

Among negative possible impacts were air pollution due to heavy machinery operation, noise, ground and water contamination in case of leakage, spilling or improper management of harmful substances.

On a meeting, population was provided with detailed information about planned mitigation measures, with respect to above mentioned possible negative impacts. In Particular dust control will be implemented for air quality protection, construction site and access road will be permanently watered, waste will be sorted as hazardous and nonhazardous waste, waste incineration will be prohibited and controlled strictly. Waste will be regularly disposed by licensed contractor, only registered transport

facilities with proper permission will be utilized, speed limit will be determined for construction machinery, works producing noise will be prohibited during night time.

At the end of the presentation population was provided with information related to complaints and dispute resolution mechanism Grievance Redress Mechanism (GRM) which will be valid during project implementation. Before commencement of civil works committee of claims and dispute will be created were local population will be available to express their claims for proper resolution.

The audience posed the following questions:

Vakhtang Tsuladze he noted that technical and engineering details of the project are more interesting and important to the public than its EMP and environmental issues. For him, such meetings, where there is only general project related information presented to the public, are unacceptable. Firstly, there is more awareness required regarding technical details of the project. He also stated that Batumi Coast Protection Department is also seeking to undertake certain activities for the purpose of coast protection with the regional resources. Therefore, it is necessary to fix a meeting directly with authors of the document, in order to obtain comprehensive information about technical part of the project, get familiar with the outcomes of conducted surveys and those data, which form basis for the final solutions. He expressed a wish to familiarize with the project in detail, since he has a number of questions, like for example: why does the consultant deem that annual 20,000 m³ will be sufficient for per annum filling of the southern coast. According to Mr. Tsuladze, only one meeting will not be enough to discuss these issues. He came up with an initiative to hold a meeting with direct authors of the project, in order to receive exhaustive information about all of those questions which are of interest to the public and to him personally. The audience expressed its interest in who	Nino Nadashvili explained that this is an informational meeting with population on early stage of project planning. She mentioned that IEE document was prepared by experienced international professionals, applying modern technologies different surveys were carried out such as geophysical, topographic, bathymetric, also geotechnical and geological. In addition granulometric characteristics of the beach were studied, sea bottom analyze and river bed research was carried out. As a result of surveys appropriate data was revealed, which were presented in IEE draft document and will be reflected in final version as well. She also mentioned that additional meeting with project designers can be held if it is required by interested persons in order to obtain all required detailed information. Nino Nadashvili explained that surveys were carried

conducted the surveys for elaboration of the environmental impact documentation. One of the staff members of the Environmental Protection Department of Ajara Autonomous Republic suggested that the surveys carried out and information obtained previously by their department and scientists was absolutely ignored in the process of document preparation. Local geologists affirm that no coast erosion process is occurring in the areas indicated in the project. Moreover, the following opinion was offered: extraction of inert materials from the northern part will have significant impact on the seabed and result in distressing and extinction of its habitats, which will bear adverse outcome in terms of environmental impact. The audience stated that no river gravel is being accumulated in the northern part. They requested familiarization with outcomes of seabed exploration and such other surveys conducted. They also expressed an opinion that placing of 20, 000 m³ gravel will not bear any results in terms of erosion prevention, since previously they used to place 250, 000 m³ gravel for feeding the coast.	out by Italian consulting company " Technital" which was selected thorough tender procedures. Company representatives held pre design meetings with all interested parties and field specialists. They in detail studied previous feasibility Study documents and only after this new surveys were carried out. For preparation of IEE documents all existing information and previous surveys data was developed and all knowledge and materials were shared by Georgian experts. Nino Nadashvili once again underlined that all works were carried out by qualified consiltants and using new technologies. Accordingly, data presented in document are based on precise facts.
Local specialists requested sharing final documentation for presenting their suggestions and remarks to conduct a more detailed discussion of the project based on above-mentioned, with direct participation of project authors.	MDF representatives expressed their readiness for next meeting. They offered attendants to familiarize with final documents in near future. All interested persons can provide written notes and comments which will be discussed on next meeting with Consultant company.

საინფორმაციო შეხვედრა მოსახლეობასთან!

„ბათუმის ნაპირდაცვის მწვანეზოლის"-ის

პროექტის გარემოს დაცვის თავდაპირველი კვლევის (IEE)

წინასწარი დოკუმენტის განხილვის თაობაზე

7 აპრილი, 12:00 სთ

(ქ. ბათუმის მულტიფუნქციური ცენტრი)

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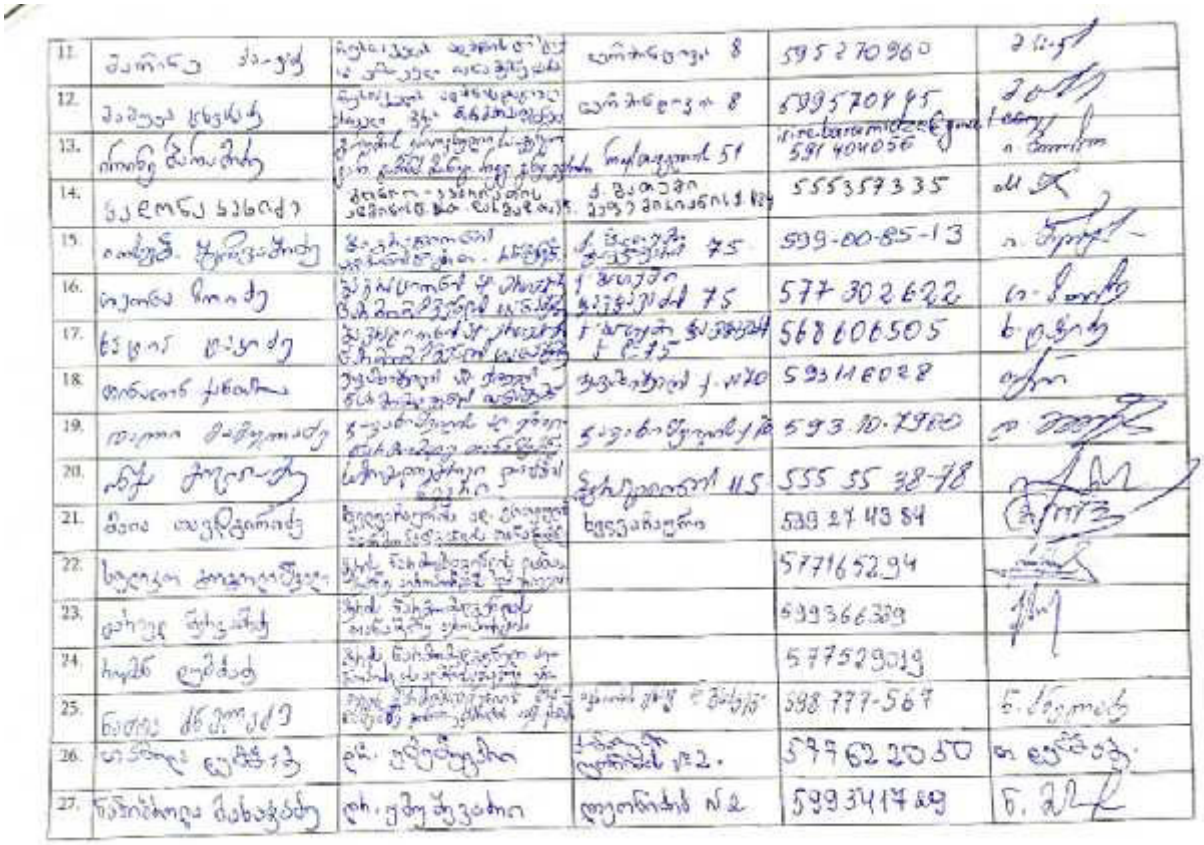

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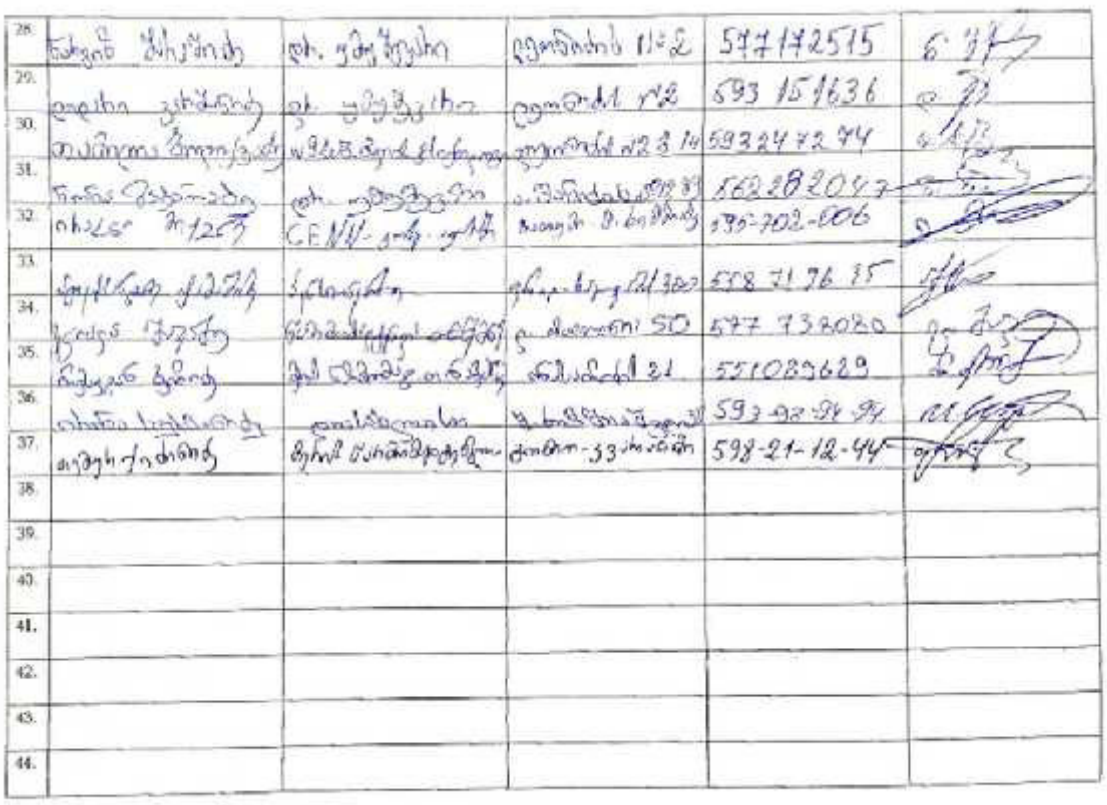

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საინფორმაციო შეხვედრა მოსახლეობასთან!

„ბათუმის ნაპირდაცვის მწკრივი"-ის

პროექტის გარემოს დაცვის თანდაპირველი კვლევის (IEE)

წინასწარი დოკუმენტის განხილვის თაობაზე

7 აპრილი, 12:00 სთ

(ქ. ბათუმის მუნიციპალიტეტის შენობა)

N	სახელი და გვარი	ორგანიზაცია/პოზიცია	მისამართი	საკონტაქტო ინფორმაცია	ხელმოწერა
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INFORMATIONAL MEETING WITH POPULATION!

Discussion of Initial Environmental Examination (IEE) Draft Document

„Construction of Batumi Coastal Protection" Project

April 7, 12:00

Batumi, City Hall

Attendance List of Participants

N.	Name and Surname	Organization/Person	Address	Contact information	Signature
1.	Natalia Zoidze	Member of Batumi Municipality City Council	Phalavandishvili N 24	599-71-63-01	
2.	Nino Beradze	Chairman of Batumi Municipality City Council Education, Culture, Tourism and Sport affairs committee	L. Asatiani Str. N 25	593 30 42 64	
3.	Teimuraz Bastladze	Member of Batumi Municipality City Council	Guderdzi Chokheli N 6	599-63-16-00	
4.	Ioseb Tarieladze	Representative of Batumi City Hall	Aghmashenebeli Str. N 19a	599-53-57-75	
5.	Tamar Tsintsadze	Chairman of NGO "Public Experts Union"	Pushkini N 133/8, Batumi	592-11-13-29	
6.	Zurab Mishvelidze	"Mta Bari" Association	Shroma str. N 15, Batumi	599 54 25 57	
7.	Tamaz Salukvadze	Representative of Batumi City Hall	Tamari Street.	599 55 19 54	
8.	Ramaz Surmanidze	Member of Batumi Municipality City Council	Rustaveli N 10, Batumi	577 44 44 43	
9.	Sasha Khorava	National Environmental Agency	Batumi	591 40 40 26	

10.	Gizo Machutadze	Society of Wild Nature Protection – "Chaoba"	Khelvachauri	593 30 39 57	
11.	Marine Paichadze	Rustaveli Administrative Unit, Representative/assistant	Lermontovi 8, Batumi	595 27 09 80	
12.	Mamuka Tskhvaradze	Rustaveli Administrative Unit, Representative of City Hall	Lermontovi 8, Batumi	599 57 04 45	
13.	Irine Baramidze	National Environmental Agency – Head of Regional Development, Monitoring of Environmental pollution	Rustaveli N 51	591-40-40-56	
14.	Madona Kakhidze	Gonio-Kvariati administrative unit – Chairman of Public Hall"	King Mirian Street N 24, Batumi	555-35-73-35	
15.	Ioseb Shervashidze	Representative/Governor of Bagrati administrative unit	Chavchavadze N 75, Batumi	599-00-85-13	
16.	Lenna Zoidze	Assistant of Representative of Bagrati administrative unit	Chavchavadze N 75, Batumi	577-30-26-22	
17.	Khatia Takidze	Assistant of Representative of Bagrati administrative unit	Chavchavadze N 75, Batumi	568-60-65-055	
18.	Tinatin Kantaria	Assistant of Representative of Javakhishvili administrative unit	Javakhishvili Street. N 70, Batumi	593 11 60 28	
19.	Dali Mamuladze	Assistant of Representative of Javakhishvili administrative unit	Javakhishvili Street. N 70, Batumi	593 10 79 00	
20.	Inga Gotsiadze	Member of "Public Hall"	Bagrationi N 115	555-55-38-78	
21.	Maia Tavdgiridze	Assistant of Representative of Khelvachari administrative unit	Khelvachauri	599 27 43 84	
22.	Suliko Gogolishvili	Assistant of representative of city hall in administrative unit of the airport	-	577-16-52-94	

23.	Tariel Shervashidze	Assistant of representative of city hall in administrative unit of the airport		599 36 68 80	
24.	Roman Dumbadze	Assistant of representative of city hall in administrative unit of the airport	-	577-52-90-19	
25.	Natia Dzenelidze	Assistant of representative of city hall in administrative unit of Gonio Kvariati	Aparnisi highway 3	598-77-75-67	
26.	Tamila Dumbadze	Citizen	Lermidze N 2, Batumi	577-62-20-50	
27.	Nazirola Makharadze	Citizen	Lermidze N 2, Batumi	599-34-17-29	
28.	Nargiz Sharashidze	Citizen	Lermidze N 2, Batumi	577-17-25-15	
29.	Didari Vardanidze	Citizen	Lermidze N 2, Batumi	593-15-16-36	
30.	Tamila Bolkvadze	Psychologist of Kindergarten N 9	Leonidze N 2/14, Batumi	593 24 72 74	
31.	Nona Zakaradze	Citizen	Shanidze 12/9	568 28 20 47	
32.	Irakli Mikeladze	CENN Coordinator in Adjara region	Shimkhiashvili, Batumi	595 70 20 06	
33.	Aleksandre Kamashidze	Retired	Khalvashi N 300	558 71 96 35	
34.	Tsiala Shavadze	Citizen	Asatiani N 50	577-73-80-80	
35.	Rusudan Beridze	Assistant of Representative of City Hall	Inasaridze N 21	551-08-96-29	
36.	Irina Surmanidze	Citizen	Khimshiashvili N 35	593-98-94-94	
37.	Temur Kidzinidze	Representative of City Hall	Gonio-Kvariati	598-21-12-44	
38.	Zurab Mikeladze	-	Mikheil Sh. street	-	

39.	Vladimer Mikeladze	Individual	Firosmani Str. N 11, Batumi	593 26 09 02
40.	Makvala Rurnanadze	Individual	Rustaveli N 59, Batumi	599-98-99-00
41.	Simon Zoidze	Individual	Rustaveli N 59, Batumi	599-21-53-15
42.	Davit Devadze	Individual	Lermontovi N 8, Batumi	593 54 57 57
43.	Elena Gurgenidze	Individual	Agmashenebeli, Batumi	555-95-63-51
44.	Vakhtang Tsuladze	A.A.R. department of Environmental protection	-	593-75-01-55
45.	Irakli Gheishvili	Batumi City Council	Javakhishvili N 6a	591-01-01-01
46.	Nodar Chkheidze	Technical University	Asatiani N 104	593 92 60 44
47.	Sasha Khorava	-	-	-
48.	Shota Phaghava	Hydrologist, Retired	Batumi	597-80-42-41

INFORMATIONAL MEETING WITH POPULATION

Discussion of Updated Draft Document of Initial Environmental Examination (IEE)
„Construction of Batumi Coastal Protection" Project

Batumi, City Hall

Minutes of the Meeting

February 5, 2016

On February 5 of current year in Batumi Municipality Sakrebulo Building a public consultation meeting was held under the aegis of the Municipal Development Fund of Georgia, where the updated document of Initial Environmental Examination (IEE) on "Batumi Coast Protection" project was discussed with the local population. .

Those present at the meeting: Representatives of the Mayor's Office, Members of Batumi Municipality Sakrebulo, Representatives of the National Environmental Agency and Environmental Protection Unit of Ajara Autonomous Republic, Authorized Representatives of Administrative Entities, NGO representatives, Chairmen of Condominiums, Municipal Development Fund's Environmental Safety Specialist Nino Nadashvili, of Beneficiary Relations Specialist, Mariam Maridashvili; Project appraisal unit's team leader - Tengiz Lakirbaia.

The audience got generally briefed on the planned project (technical part) as well as positive and adverse environmental impacts expected in the process of project implementation and the ways and means of preventing them.

Meeting was opened by Tengiz Lakirbaia. He welcomed the audience and thanked them for attending the meeting. He discussed the project and its technical part in detail. He informed the public of the planned activities and their implementation. Afterwards, Ms. Nino Nadashvili provided the public with information regarding possible negative and positive impacts resulting from activities planned in the process of project implementation and the respective mitigation measures. She discussed significance of the mentioned project and briefly described possible impacts on environment. Her speech was accompanied with PWP presentation.

The public got aware of general characteristics of the project, planned civil works, possible positive and adverse environmental impacts and environmental and social protection measures.

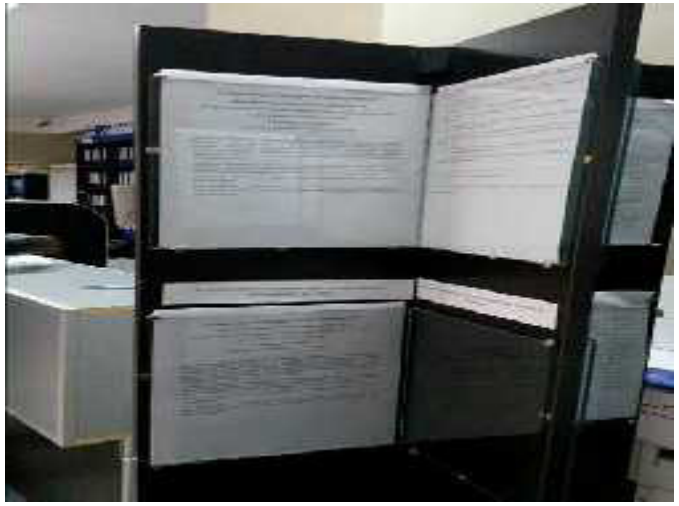
At the meeting, the population was provided with detailed information about planned mitigation measures, with respect to above mentioned possible negative impacts. In particular, dust control will be implemented for air quality protection, construction site and access road will be permanently watered, waste will be sorted as hazardous and nonhazardous waste, waste incineration will be prohibited and strictly controlled. Waste will be regularly disposed by licensed contractor, only registered transport facilities with appropriate permits will be utilized, measurement and monitoring of noise level will be performed on regular basis, speed limit will be set for construction machinery, noise generating works will be prohibited during night time.

At the end of the presentation, population was provided with information related to complaints and dispute resolution mechanism –Grievance Redress Mechanism (GRM) which will be established before commencement of construction works. There will be a grievance registration log available to the population, where they will be able to apply and express their discontent, claims and disputes. The GRM is designated for consideration and resolution of the locals' complaints and claims.

The audience posed the following questions:

Questions	Answers
How will the project implantation affect Gonio and Kvariati coastline?	The project envisages protection of Batumi coastline and it will not have any kind of impact on Gonio and Kvariati coastlines.
Where will the bridges be located and what will be the distance between them? Will it create any inconvenience or problems to the population?	Approximate distance between the bridges is 90-100 n, and on the contrary - these bridges are designed for safe conveyance of the people to the beach.
Where will be the culverts located ? Will the sewer pipes enter into the sea?	Sewer pipes will not enter into the sea. Location of culverts will be specified in the governmental design under elaboration.
What is the total cost of the project?	Project budget amounts to about GEL 38 million.
Where is the beginning and the end of the project area, where are the starting point and finishing point of the project?	The map, which was used in the process of presentation, has once again outlined in detail the project area and it was clarified that the project envisages rehabilitation of the 2-km section of the shoreline.
Where will be the 30 000 m^3 sediments (the material to be placed in the southern part) extracted from? Has any survey been carried out and do any opinions exist regarding the fact that there is sufficient volume of sediments in the northern part?	The presentation map has repeatedly illustrated the area of the northern section, from where the sediments will be transported. It was also emphasized that all required surveys were conducted, which form basis for the proposed solution. The project is reviewed and approved by all institutions in charge.
Will transportation of the 30 000 m^3 sediments be a one-time measure?	According to the surveys, in the northern part volume of sediments averages 80 000 m^3. Extraction of the sediments under the present project will be a one-time measure; the remaining material required will be brought from the sandpits.
To what extent will the design structures protect the	

shoreline and is it likely for the sea to damage them in course of works?	The project envisages placement of 3 tn. quarry rocks in the shoreline area by application of special placing technology, which will prevent wave-caused damage.
When will the project implementations commence and when will it be completed?	Physical works envisaged under the project are expected to commence around October of 2016, in order for them not to interfere with touristic season activities. Prior to commencement of physical works, preparatory works will be carried out. Duration of civil works is 14 months, i.e. the works are to be completed by December 2017.
Which company will be contracted for works?	The project implementing company will be selected through international bidding, which has not been announced yet, but will be announced in the nearest future.
Will the local population be employed at the project site?	Provisions of the bidding document include the following requirement: 70% of the total number of people employed should be locals.
To what extent will the bridges serve the increasing number of tourists, what will be their capacity? What kind of exterior will the bridges have?	Capacity of the bridges will be sufficient to easily serve the increased number of tourists in the summertime. The project does not provide for any kind of specific design for the bridges, though the desire of population regarding arrangement of maximally visually attractive bridges will be taken into consideration to reasonable extent.



საინფორმაციო შეხვედრა მოსახლეობასთან!

„ბათუმის სანაპირო ზოლის გამაგრება"-ის

პროექტის გარემოზე ზემოქმედების შეფასებას თანმდევი სოციალური კვლევის (IEE)

განახლებული დოკუმენტის განხილვა

5 თებერვალი, 12:00 სთ

(ქ. ბათუმის საკრებულოს სხდომათა დარბაზი)

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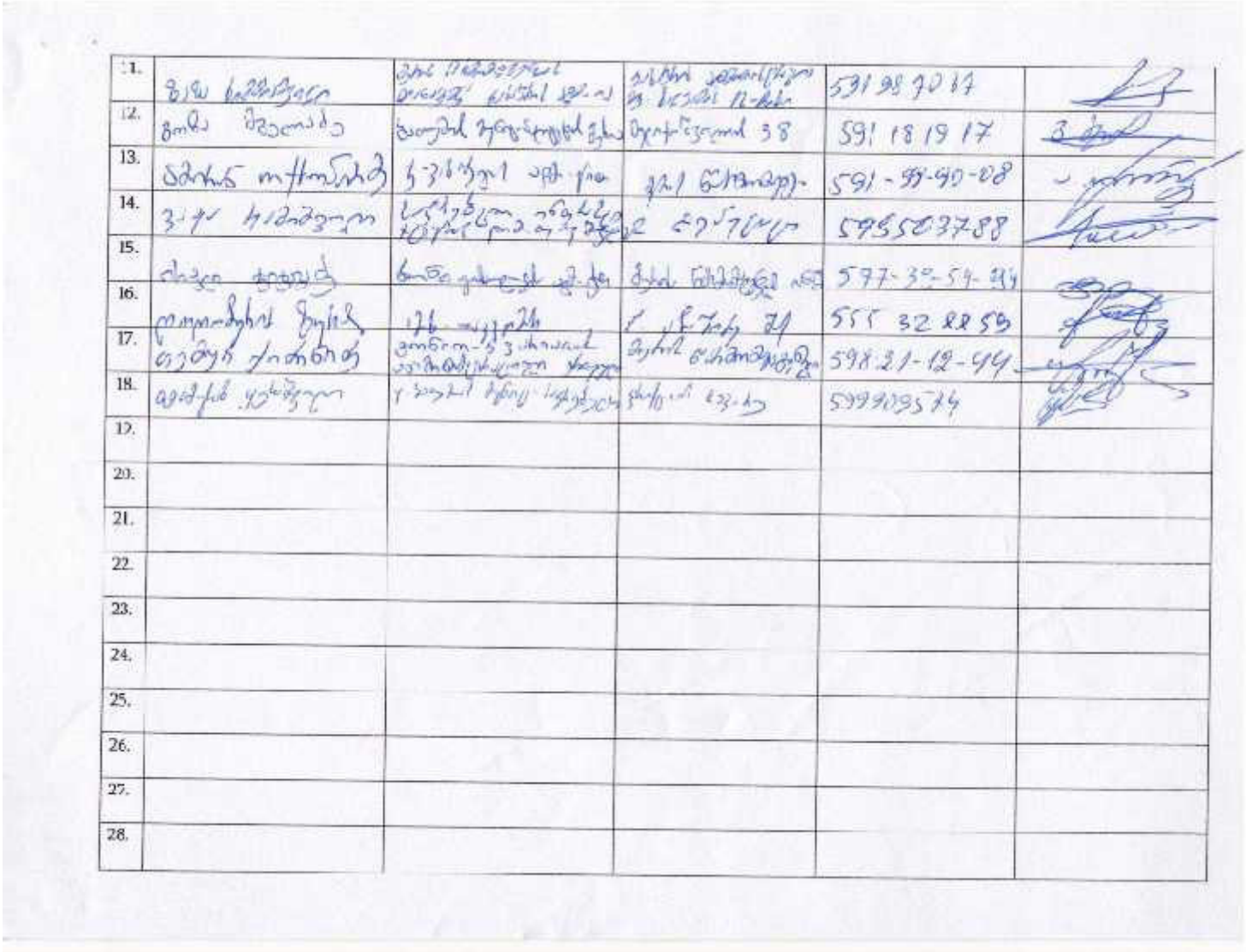

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INFORMATIONAL MEETING WITH POPULATION
Discussion of Initial Environmental Examination (IEE) Updated Draft Document
„Construction of Batumi Coastal Protection" Project
Batumi, City Hall
Minutes of the Meeting
February 5, 2016

N	Name	Organization/ Individual	Address	Contact	Signature
1.	Kiladze Shakro	Chairperson of community	2/2 Leri str.	557 48 53 08	
2.	Tamaz Salukvadze	City Hall representative	21 Kazinetsi str.	599 55 19 54	
3.	Tariel Tuskia	Geological Unit of Environmental Department	7 Vazha-pshavela str.	577 51 00 67	
4.	Nana Kurshubadze	Chairperson on community	78a Javakhishvili str.	593 62 23 16	
5.	Gogita Darchia	City Hall representative Administrative Unit of Mtsvane Kontskhi	42 Tamar Mephe ave.	595 59 10 20	
6.	Nana Ninidze	Community representative	74 L. Asatiani str.	592 22 00 05	
7.	Davit Kobaladze	Chairperson of community	137/139 b Pushkini str.	599 91 35 02	
8.	Merab Shavishvili	Chairperson of community	3rd Lane of Apsarosi	557 71 26 28	
9.	Zhuzhuna Diasamidze	Chairperson of community	3rd Lane of Apsarosi	551 20 26 32	

TECHNITAS

10.	Zaza Khimshiashvili	Assistant to Mayor Representative in Kakhaberi Administrative Unit	Kakhaberi Administrational Unit F. Khalvashi str	591 98 70 67	
11.	Gocha Mgeladze	Batumi Municipality City Hall	38 Melikishvili str.	591 18 19 17	
12.	Amiran Okropiridze	Mayor Representative in Javakheli Administrative Unit	Javakheli Administrative Unit	591 99 90 08	
13.	Vazha Ramishvili	Chairperson of Batumi City Council Infrastructure Commission	Delegate	595 50 37 88	
14.	Irakli Jijavadze	Representative of Boni-Gorodoki Administrative Unit	Employee at Administrative Unit office	577 39 54 94	
15.	Ghoghoberidze Zurab	Chairperson of community	Abashidze str.	555 32 88 59	
16.	Temur Kidzinidze	Mayor Representative in Gonio-Kvariati Administrative Unit	Administrative Unit of Gonio-Kvariati	598 21 12 44	
17.	Teimuraz Kurashvili	Batumi Municipality City Council	Chairperson of Faction	599 90 95 74	

I. GRIEVANCE REDRESS MECHANISM

539. During implementation of the Project, there might be several issues related to environmental hazards and disputes on entitlement processes may occur due to the Project activities. For example, intensive schedule of construction activities; inappropriate timing of construction vehicle flow; waste; noise and air pollution from construction activities; ecological disturbances; cultural conflicts between migrant workers, are some of the environmental issues that are likely to arise from the Project activities.

540. In accordance with the ADB SPS 2009 requirements, a Grievance Redress Mechanism will be set up for the Project to deal with both the environmental and social issues of the Project. MDF as the Executive Agency (EA) has overall responsibility for project implementation and environmental compliance. MDF as the EA will facilitate the grievance resolution by implementing a project-specific Grievance Redress Process (GRP). Besides that, the requirements of the new accountability policy related to grievances of the adversely affected people should be implemented. Accountability is a mechanism adopted by ADB in 2012, a whereby people adversely affected by ADB-financed projects can express their grievances; seek solutions; and report alleged violations of ADB's operational policies and procedures, including safeguard policies. The accountability mechanism replaced ADB's Inspection Function (1995). ADB's accountability mechanism comprises two separate, but related, functions: (i) consultation, led by ADB's special project facilitator, to assist people adversely affected by ADB-assisted projects in finding solutions to their problems; and (ii) providing a process through which those affected by projects can file requests for compliance review by ADB's Compliance Review Panel.

541. MDF will facilitate the establishment of a Grievance Redress Committee (GRC) and Grievance Focal Points (GFPs) prior to the Construction Contractor's mobilization to the construction site. The functions of the GRC and GFPs are to address concerns and grievances of the local communities and affected parties as necessary.

542. The GRC will comprise representatives from Batumi Municipality, affected parties, and other reputed NGOs or persons, as mutually agreed with the local authorities and affected persons. It will also comprise the Contractor's Environmental Specialist, Supervising Company's (SC) Environmental Specialist and EA (MDF) Safeguards/Environmental specialist. The role of the GRC is to address the Project related grievances of the affected parties that are unable to be resolved satisfactorily through the initial stages of the Grievance Redress Mechanism (GRM).

543. EA will assist residents of affected territories and affected community to identify local representatives to act as Grievance Focal Points (GFP).

544. GFPs are designated personnel from within the community who will be responsible for:

i) Acting as community representatives in formal meetings between the project team

(Contractor, SC, EA) and the local community he/she represents

ii) Communicating community members' grievances and concerns to the contractor during

project implementation.

545. The sufficient number of GFPs for the Batumi Coastal Improvement Project is – 1-2 persons.

546. A pre-mobilization public consultation meeting will be convened by the EA (MDF) Environmental Specialist and attended by GFPs, contractor, SC, EA representative and other interested parties (eg. local NGOs). The objectives of the meeting will be as follows:

(i) Introduction of key personnel of each stakeholder including roles and responsibilities,

(ii) Presentation of project information of immediate concern to the communities by the contractor (timing and location of specific construction activities, design issues, access constraints etc.) This will include a brief summary of the EMP - its purpose and implementation arrangements;

(iii) Establishment and clarification of the GRM to be implemented during project implementation including routine (proactive) public relations activities proposed by the project team (contractor, SC, EA) to ensure communities are continually advised of project progress and associated constraints throughout project implementation;

(iv) Identification of members of the Grievance Redress Committee (GRC)

547. Following the pre-mobilization public consultation meeting, environmental complaints associated with the construction activity will be routinely handled through the GRM as explained below and shown on **Error! Reference source not found.**.

(i) affected persons will lodge their environmental complaint/grievance with their respective community's nominated GFP.

(ii) The GFP will deliver the individual's complaint to the Contractor and SC's Environmental Specialist.

(iii) The Contractor and SC will record the complaint in the Environmental Complaints Register (ECR) or Complaints Book in the presence of the GFP.

(iv) The GFP will discuss the complaint with the Contractor and SC's Environmental Specialist and try to resolve it;

(v) If the Complaint is not resolved within 2 weeks the GFP will present the complaint to the Grievance Redress Committee (GRC). GRC will notify ADB resident Office in Tbilisi about received complaints and will send a copy of written grievance or summary/minutes of oral communication to ADB. In case of need (e.g. gross contamination; damage of archaeological remnants) the GRC will inform and involve Ministry of

Environmental Protection and/or Ministry of Culture and Monuments Protection;

(vi) The GRC will have to resolve the complaint within a period of 2 weeks and the resolved complaint will have to be communicated back to the affected individual or community. The Contractor will then record the complaint as resolved and closed in the Environmental Complaints Register or Complaints Book.

(vii) Should the complaint not be resolved through the GRC, the issue will be adjudicated through local legal processes.

(viii) In parallel to the ECR placed with the Contractor, each GFP will maintain a record of the complaints received and will follow up on their rapid resolution.

(ix) MDF will also keep track of the status of all complaints through the Monthly Environmental Monitoring Report submitted by the Contractor to the SC and will ensure that they are resolved in a timely manner.

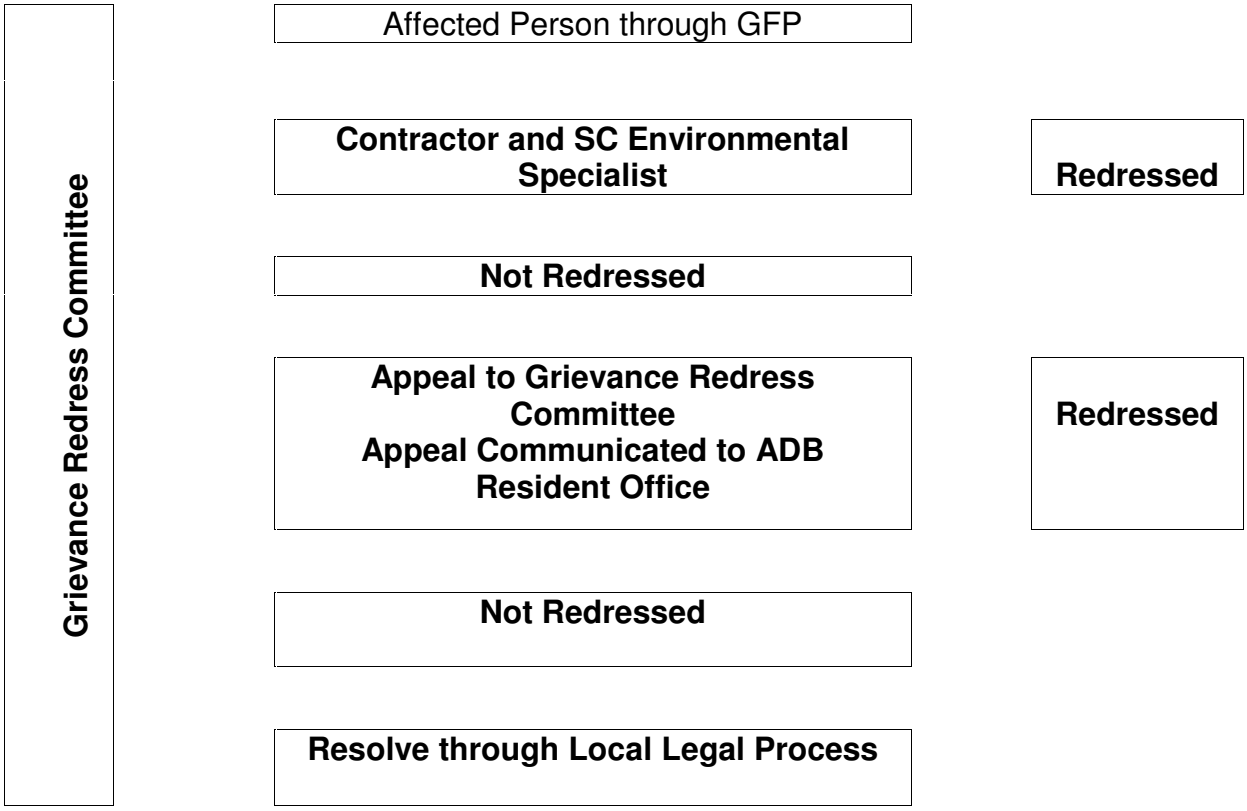

Fig. I.1 - Grievance Redress Mechanism

J. ENVIRONMENTAL MANAGEMENT PLAN

548. The EMP will be performed ante-operam (for parameters lacking of a law threshold, or for which there are no background values) and during construction phase.

J.1. Summary of Impacts

549. This paragraph states those adverse impacts and risks identified as significant by the analysis of likely environmental impact or other environmental concerns, described in Chapter E. The environmental issues that require environmental management plans are as follows:

- Air Quality;
- Noise level;
- Soil;
- Ecology and;
- Social aspect.

550. The following table summarizes the significant adverse impacts and risks divided by components; in the last column is reported the risk assessment expressed according to this qualitative codification:

- *Acceptable with mitigation*: reversible significant environmental impact, unlikely but can reasonably be expected to occur; the risk may be accepted under defined conditions of mitigation or under monitoring campaigns to control impact occurrence;

- *Acceptable*: reversible moderate environmental impact, unlikely to occur, but possible; the risk can be accepted without further action.

Tab. J-1: Summary of environmental impacts

Component	Impacts	Source	Phase	Risk
Air	Air quality	Emissions of gases and dusts produced from operating vehicles	Construction	Acceptable with monitoring control
Noise	Noise level	Emissions of noise produced from operating vehicles	Construction	Acceptable with mitigation and monitoring control
Ecology	Terrestrial habitat loss	Pathways for work activities (terrestrial habitats loss)	Construction	Acceptable
	Disturbance due to air/noise pressures	Presence of the construction yard (pressure on existing biota/birds nesting)	Construction	Acceptable with monitoring control
Social Aspects	Disturbance due to air/noise quality	Heavy trucks operations (safety risks for the population)	Construction	Acceptable

J.2. Description of Proposed Mitigation Measures

551. For mitigation, monitoring and reporting responsibility is of Construction Supervision Consultant (CSC) and Environmental Management Specialist (EMS).

Tab. J-2: Mitigation measures and monitoring activities

Project Stage	Project Activity	Potential Environmental Impact	Proposed Mitigation Measure	Cost Estimates	Monitoring Activity	Site	Timeframe
Pre- Construction	Site preparation: Material and equipment staging areas and beach access locations	Possible removal of terrestrial habitat	Sites rehabilitated before contractor leaves site upon completion of construction activities. Planting and stabilization of site, including replacement of any native plant species	Included in construction contract	YES Definition of *ante-operam* values	Along coastline	First months of main work activities
	Preparation of SSEMP	---	Submission for endorsement to supervision company and for approval to MDF	Included in construction contract	---	Construction areas	Before commencement of work

Project Stage	Project Activity	Potential Environmental Impact	Proposed Mitigation Measure	Cost Estimates	Monitoring Activity	Site	Timeframe
Construction	Excavation, nourishment, revetment	Spillage	Protocols for routine equipment inspection repair, maintenance, and fueling will be required before the start of work, and practices during work must be documented. Contingency plans to be used in the event of spills will also be required beforehand, and spill containment and clean-up equipment must be present during all fueling and fluid replacement or top-up activities. Vessels and equipment should be fueled at shore mooring locations where spill containment equipment is present before the start of fueling. Construction work will be conducted mainly during winter.	Included in construction contract	NO	Constructi on yards and roads	On going
	Excavation, gravel beach toe formation	Water Contamination	To verify the occurrence of turbidity plume due to gravel beach toe formation/excavation a monitoring activity is foreseen. Contractor should fail to clean up any oil based products in or near the waterways the Engineer's Representative may order third parties to do so and all costs associated with the same will be deducted from other monies due to the Contractor. During revetment work it is encouraged to make use of materials available in the local for the construction. Imported materials must have sufficient import procedures and certificate of quality issued by the manufacturer. Dredging work will be conducted mainly during winter period.	Included in construction contract and in the EMP cost	YES (turbidity plume)	Coastal waters	On going

Project Stage	Project Activity	Potential Environmental Impact	Proposed Mitigation Measure	Cost Estimates	Monitoring Activity	Site	Timeframe
Construction	Revetment, delivery construction materials	Dust into the Atmosphere	- Periodically water down excess roads on site; - Wet or cover trucks carrying contruction material; - Halting work during excessive onshore winds; - Immediately replacing defective equipment and removing it from the work site. - If necessary, use of temporary barriers along main road corridors when sensitive receptors are present.	Included in construction contract and in the EMP cost	YES	Working areas, coastline and roads	On going
	Revetment, Nourishment, delivery construction materials	Noise	- Require adherence to engine maintenance schedules and standards to reduce noise; - Use of defined, well planned haulage routes and reductions in vehicle speed where required; -Immediately replacing defective equipment and removing it from the work site - No truck movements in inhabited areas between 23:00 and 7:00. - A sound reduction device at the booster station; - A mobile noise barrier in the southern part of the coast	Included in construction contract and in the EMP cost	YES	Sensible receptors and working areas	On going

Project Stage	Project Activity	Potential Environmental Impact	Proposed Mitigation Measure	Cost Estimates	Monitoring Activity	Site	Timeframe
Construction	General construction activities	Workers health and safety	The construction contractor shall develop an HS Management Plan and install an HS Management System for the construction phase Including training of workers.	Included in construction contract	NO	Working areas	On going
		Producing of waste	While disposal wastes both on the sites and at the temporary storage facilities the following requirements are to meet: - Place of disposal of the waste concerned must be enclosed. - The waste must not have access to drainage water. - Waste must be immediately removed from the working sites. - Waste must be placed in secondary protective basins. This waste can be transferred only to a certified contractor.	Included in construction contract	NO	Working areas	On going
		Stress to migratory bird species during autumn migration and wintering.	Monitoring of sensitive sites and species will be performed during the work construction phase. Works which take place during sensitive periods are limited based on monitoring results	Included in EMP costs	YES	Coastal/humid sites	On going

J.3. Description of Monitoring Programs and Parameters

552. This section outlines the monitoring activities and corrective actions, parameters, and expected frequencies. Monitoring activities will be helpful to identify unexpected negative impacts and, if the case, for the decision makers in choosing the appropriate corrective measures.

553. Monitoring during construction will begin before or with the start and end with the construction activities. Therefore it is strictly linked to the project development plan and to the organization of the construction activities. For these reasons, the foreseen activities will be defined upon the occurrence and duration of the critical construction phases; the scheduling can be changed in order to adapt it to the evolution of the construction activities.

554. Studies, modeling, monitoring of the Choroki river (see chapter **Error! Reference source not found.** and **Error! Reference source not found.**) are out of the present Monitoring Program and are aimed to reduce the negative effects of the anthropic interference on the river system and restore the original role of the river in the coastal sediment balance can be investigated. These studies will be conducted independently from the present EMP; they will start with construction and will end with the demobilization.

555. The following tables report the framework of monitoring program for each adverse impact typologies.

J.3.1. Air quality monitoring

556. The aim of air quality monitoring is the evaluation of the baseline conditions in the investigated site and the control of the state of air quality during the construction phase, compared to law threshold and the ante-operam values. Actually considering the type of the intervention the only envisaged impact on the air quality is limited to the period where the works will take place. The main sources of air pollution are due to the emission of the gases from vehicles operating in the working areas and the lift of dusts due both the wind and trucks.

557. According to the national Georgian legislation the controls parameter for the air quality are the sulfur dioxide (SO2), Nitrogen dioxide (NO2), carbon monoxide (CO) and the fine particulate matter (PM10).

558. An air quality measure will be done before the beginning of the construction works for a period of 7 days. The monitoring station will be located near by a sensitive receiver at a distance of at least 1000 m from the airport landing field in order to minimize the influences due to the airplane gas emissions. A full meteorological station will be installed for the measurement of the wind, atmospheric pressure, temperature, humidity, rainfall. An indicative location of the air quality-meteorological station is given in **Error! Reference source not found.**.

559. The same weekly measurements will be repeated each month for the whole duration of the construction works to keep monitored the air quality parameter. In case of limit exceedance proper

corrective actions will be undertaken to reduce the emission of gases and dust as specified in **Error! Reference source not found.**.

Tab. J-3: Monitoring activities: air quality

Element	**Air quality**
Objective	– to minimize the impact on air quality from site activities; – to comply with regulatory requirements (Georgian and international standards).
Actions/Corrective Actions	– Require adherence to engine maintenance schedules and standards to reduce air pollution; – Use of defined, well planned haulage routes and reductions in vehicle speed where required; – Periodically water down excess roads on site; – Cover trucks carrying cement, gravel or other loose materials; – Wet or cover trucks carrying stone / gravel; – Haul materials to and from the site in off peak traffic hours; – Halting work during excessive onshore winds; – Immediately replacing defective equipment and removing it from the work site; – No truck movements in inhabited areas between 23:00 and 7:00. – If necessary, use of temporary barriers along critical routes
Performance indicators	– Meteorological parameters, PM10, SO_2, NOx, CO;
Monitoring	– One measure for the evaluation of the baseline in the *ante-operam* situation – One week per month (14 weeks totally for the realization of the gravel beach toe and the revetment) – Monitoring station will be located close to construction sites in a point distant about 1500-2000 m from the airport – Data collection by automatic air quality monitoring stations; .
Reporting	– Investigation report for field activities drafted by Environmental Consultant (EC)/Contractor
Responsibility	– For mitigation, monitoring and reporting: Construction Supervision Consultant (CSC)/Environmental Management Specialist (EMS)

J.3.2. Noise monitoring

560. A noise monitoring is foreseen to evaluate the impact during the construction phase.

561. Similarly to the approach outlined for the air quality, monitoring will be performed before the beginning of the construction works and during the construction works.

562. A noise monitoring campaign is foreseen before the beginning of the works. During the construction phase a monitoring campaign for each working month is foreseen. The noise measures will be done simultaneously or during consecutive days.

563. For the noise monitoring 3 positions are identified close to sensitive receivers and the working areas. One point will be located close to the university site, in the northern part of the littoral in correspondence of the san removal area. The other two points will be located in the southern part in the correspondence of the nourishment area and close to the booster stations in order to catch the potentially more critical situation. A map with the location of the monitoring stations is given in **Error! Reference source not found.**.

564. In each point a measure with a duration of 24 hours will be executed to evaluate the Lday(A) and Lnight(A) sound levels. The night measures are aimed to evaluate the impact of the construction activities, so they will be planned according to the working area director when activities are under execution. If no activity is no more foreseen during night time, night measures can be suspended. The ante-operam campaign will include a 24 hours monitoring.

565. In case of exceedance of the limits proper actions will be undertaken to reduced noise emissions as reported in **Error! Reference source not found.**

566. During the noise monitoring a full meteorological station will be installed for the measurement of the wind, atmospheric pressure, temperature, humidity, rainfall.

Fig. J.1: Position of the noise and air- quality monitoring stations (northern and southern Batumi littoral)

Tab. J-4: Monitoring activities: noise

Element	**Noise level**
Objective	– to minimize the impact on noise level from site activities; – to comply with regulatory requirements (georgian and international standards).
Actions/Corrective Actions	– Require adherence to engine maintenance schedules and standards to reduce noise emissions; – Use of defined, well planned haulage routes and reductions in vehicle speed where required; – Haul materials to and from the site in off peak traffic hours; – Immediately replacing defective equipment and removing it from the work site; – No truck movements in inhabited areas between 23:00 and 7:00. – Use of temporary barriers along critical routes and working places
Performance indicators	– Lday(A), Lnight(A) [dB(A)]
Monitoring	– One set of measures for the *ante-operam* stage – One set of measures per month during the construction phase to be repeated in case of limit exceedance (14 measures totally, considering the gravel beach toe and revetment construction) – Stations identified at sensitive receivers near construction site. – Data collection by phono meter;
Reporting	– Investigation report for field activities drafted by Environmental Consultant (EC)/Contractor
Responsibility	– For mitigation, monitoring and reporting: Construction Supervision Consultant (CSC)/Environmental Management Specialist (EMS)

J.3.3. Water monitoring

567. Potential suspension can occur only during the excavation and gravel beach toe formation activities. As mentioned before, the seabed affected by the work activities is almost constituted by pebbles, therefore no suspension is expected.

568. Conservatively, the turbidity monitoring is foreseen in proximity of gravel beach toe formations and close to the dredging area to monitor the absence of turbidity plume around working places.

Tab. J-5: Monitoring activities: water quality

Element	**Sea Water quality**
Objective	– to minimize the impact on sea water quality from site activities; – to comply with regulatory requirements (georgian and international standards).
Actions/Corrective Actions	– prevent loss of material from barges by using sediment pumping stations – Perform nourishment by land as foreseen by the project and in an area protected by gravel beach toe – If necessary, use of temporary silt barriers around turbidity plume
Performance indicators	– Total suspended solids (TSS);
Monitoring	– One week *ante-operam* – One week per month during dredging and gravel beach toe formationin order to verify absence of turbidity (4 weeks totally, for the total period of excavation/gravel beach toe formation period); – Data collection by multiparametric probe; – Stations close to the excavation/gravel beach toe formation areas
Reporting	– Investigation report for field activities drafted by Environmental Consultant (EC)/Contractor
Responsibility	– For mitigation, monitoring and reporting: Construction Supervision Consultant (CSC)/Environmental Management Specialist (EMS)

J.3.4. Terrestrial habitat monitoring

569. As described in chap. **Error! Reference source not found.**, plovers arrive at breeding sites along the Georgia coast in late March or early April and begins nesting by late April. So there nesting period doesn't' overlap with winter construction period foreseen for the project activities.

Nevertheless, control and monitoring on the presence of the above mentioned birds will be performed walkover surveys along construction site in the following table.

570. Monitoring for the terrestrial habitat will be performed from September 2016 until early April 2017, during the revetment construction.

Tab. J-6: Monitoring activities: terrestrial habitat

Element	**Terrestrial habitat**
Objective	– to minimize the impact on terrestrial habitat from site activities; – to comply with regulatory requirements (Georgian and international standards).
Actions/Corrective Actions	– No works takes place during sensitive periods; – Installation of noise and dust barriers.
Performance indicators	– Number of species (existing biota/birds nesting)
Monitoring	– 1 Walkover survey (2 days) *ante-operam* – Monitoring of sensitive sites and species: 14 walk over surveys (28 days totally) along transect performed during the 2+9+3 months construction phase).
Reporting	– Investigation report for field activities drafted by Environmental Consultant (EC)/Contractor
Responsibility	– For mitigation, monitoring and reporting: Construction Supervision Consultant (CSC)/Environmental Management Specialist (EMS)

J.4. Public Consultation Activities

571. A public consultation will be held before the project starts to inform the public of the work plan and of the monitoring and mitigation measures foreseen to minimize adverse impacts on affected people.

572. During project implementation, other methods (e.g. dedicated web site, leaflets etc.) will be put in place as defined by MDF, to keep the public informed on project development.

J.5. Description of the Responsibilities for Mitigation and Monitoring Requirements

573. The present EMP addresses the potential impacts and risks identified by the environmental assessment. The EMP includes the proposed mitigation measures, environmental monitoring and reporting requirements, emergency response procedures, related institutional or organizational arrangements, capacity development and training measures, implementation schedule, cost estimates, and performance indicators.

574. A detailed Site Specific Environmental Management Plan (SSEMP) shall be prepared by the Contractor before the Contractor is given access to the project and submitted to the Site Engineer for approval. The SEMP will be in operation for the whole duration of the construction phase.

575. After elaboration of detailed design of the camp, the possible impact on environment will be considered (for i.e. groundwater) by Construction Contractor during Site-Specific EMP (SSEMP) preparation.

576. The necessary issues which should be reflected in SEMP are:

- Definition of boundaries;
- Identification of environmental values and sensitive receptors of the site and its surrounds;
- Definition of construction activities;
- Risk Assessment;
- Assignment of environmental management measures;
- Preparation of site plans;
- Preparation of environmental work plans;
- Monitoring .

577. Prior to the start of the works, the Contractor shall consult with the local authorities that nuisance (noise, dust distribution, illumination etc.) as a result of his working method will not be in conflict with local law and regulations. The Contractor shall apply for all necessary permits in order to execute the works according to his proposed working method or modify his working method in accordance with permit conditions

578. Following agencies and subjects will be involved in implementing the overall project and SEMP:

579. Asian Development Bank (ADB) is the donor financing the Investment Program.

580. Municipal Development Fund (MDF) is the Executing Agency (EA) responsible for management, coordination and execution of all activities funded under the loan. MDF will have overall responsibility for compliance with loan covenants.

581. MDF as responsible PIU for the project (Project Proponent) will recruit a Construction Supervision Consultant (CSC) as Site Engineer. The national and international team of consultants will assist MDF as project supervision for the construction of Batumi coastal protection project. The Consultant will also provide capacity building training to construction contractor staff for

management and operation and maintenance for the Project. The Consultant will assist MDF in assuring that the project is implemented according to the specified standards.

582. Construction Supervision Consultant (CSC): its assignment will include the update of the environmental management plan and approval of the SEMP prepared by the Contractor. CSC will assess the cost, responsibilities schedule, location and monitoring framework associated with the implementation of the mitigation measures and the SEMP and he will assist MDF in monitoring the implementation of the SEMP.

583. Constructing Contractor

584. All mitigation measures during construction have to be implemented by the construction contractor and will be monitored by the CSC. Implementation of SEMP requires an experienced Environmental Management Specialist (EMS) during project construction period, conducting routine observations and surveys, and preparing biannual reports. The EMS will also be responsible for: incorporation of mitigation measures in construction; and construction-stage environmental quality monitoring. Support of an additional EMS is also required to oversee the SEMP implementation, and collating and submitting semester Environmental Monitoring Reports

585. The Constructing Contractor obligations include also:

- to employ Environmental Consultant (EC) responsible for developing and implementing the construction phase SEMP and for provision of corresponding information to MDF and EMS;
- to develop, if required, a Spoil Disposal Plan and Construction Waste Disposal Plan agreed with the MoE and Local government;
- to present a Construction Schedule and a SEMP;
- to implement the SEMP (costs should be included into the construction budget).
- to report on SEMP Implementation.

Reporting

586. The construction contractor will be required by the CSC to prepare monthly progress reports (containing also sampling campaign reports) on the SEMP implementation. Such reports shall be prepared by the Contractors EC and will contain information on the main types of activities carried out during the reporting period, status of any clearances/permits/licenses which are required for carrying out such activities, mitigation measures applied, and any environmental issues that have emerged in relations with suppliers, local authorities, affected communities, etc. Contractor's monthly progress reports shall be submitted to the technical supervisor (EMS) and MDF.

587. The construction supervision consultant (CSC) being also responsible for supervision of all environmental issues and biannual reports (prepared by EMS) including the progress of the implementation of the SEMP. These reports shall be submitted to MDF and distributed to all involved departments; the report shall contain all discrepancies from the SEMP and list all HSE relevant incidents and accidents that occur during the implementation of the refurbishment measures. Based on these reports and on own regular construction site audits the Consultant

together with MDF will prepare semi- annual performance and monitoring reports and submit them to ADB.

J.6. Preliminary Cost Estimates

588. The monitoring plan for the project is summarized in the following table. Monitoring measures include construction site supervision, verification of permits, monitoring of compliance of the contractor performance and specific monitoring of environmental impacts like: noise, dust, soil and water pollution and air emissions etc.

589. Most of the mitigation measures (**Error! Reference source not found.**) require the contractors to adopt good site practice, which should be part of their normal construction contract, so there are no additional costs to be included in the EMP. Extra costs with respect to environmental mitigation are related to additional measures determined by Project Implementation Consultant. All mitigation measures given above are included in the regular construction costs.

590. The construction supervision consultant is also responsible for supervision of all environmental issues. Costs for consultant environmental monitoring is included in the consulting services costs of the project.

591. An estimate of the EMP monitoring cost is 153.000,00 USD

592. The EMP costs are increased in comparison to the March 2015 IEE version. The cost increase is a consequence of the required project changes and particularly of the longer construction time, from 4 months to 13 months. The increase of the EMP cost has been long discussed and finally agreed with MDF.

Tab. J-7: Costs of Environmental Management Plan (without mitigation measures)

Environmental Management	Item	Quantity Unit Cost (USD)	Total Cost (USD)
Environmental Consultant (hired by contractor)	20 months	2700.00	54.000,00
Air samples analysis during construction (Dust, and gases)	15 weeks (1 week *ante-operam* and 1 week/month per each of the main activities).	2.500,00	37.500,00

Noise sampling	15 campaigns (24h *ante-operam* and 24h/month per each of the main activities). Each campaigns account for 3 monitoring stations	2.300,00	34.500,00
Turbidity monitoring	5 weeks (1 week *ante-operam* and 1 week/month)	3.000,00	15.000,00
Biological resources (walk over surveys along transects)	15 surveys (30 days)	400	12.000,00
		Total:	**153.000,00 USD**

K. CONCLUSION AND RECOMMENDATION

593. Project implementation and bringing in the material of necessary volume will enable the restoration of the coastline and its stabilization vs the present erosion trend.

594. Temporary disturbance of local population is expected during the construction works, which shall be connected with the transportation of the construction material and equipment.

595. After completion of the coastal improvement project, negative impacts on physical environment and biological systems are not expected; while a positive impact on the social system is expected, connected with the touristic development of the area.

596. Project implementation will support the stabilization of Batumi beach, which will enable the government to further develop the tourist infrastructure of the area