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Europe-Africa fixed link through the Strait of Gibraltar

Note by the Secretary-General

1. The Secretary-General has the honour to transmit to the Economic and Social Council the report prepared in accordance with Council resolution 2005/34 by the Executive Secretaries of the Economic Commission for Europe and the Economic Commission for Africa on the activities carried out within the framework of the project for a Europe-Africa fixed link through the Strait of Gibraltar (see annex).

2. The Council has been interested in this project since 1982, following the decision taken by the Governments of Morocco and Spain within the framework of a bilateral agreement on cooperation adopted on 24 October 1980 for the joint study of the feasibility of the project. Since that time, the Council has regularly requested the two regional commissions to follow the development of the project studies and keep it informed in that regard.

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Annex

Project for a Europe-Africa fixed link through the Strait of Gibraltar: report on studies and activities carried out during the period 2005-2006

Summary

The present report, prepared jointly by the Economic Commission for Europe and the Economic Commission for Africa pursuant to Economic and Social Council resolution 2005/34 of 26 July 2005, summarizes the work done under the authority of the Spanish-Moroccan Joint Committee by the two engineering firms, Sociedad de Estudios para la Comunicación Fija a través del Estrecho de Gibraltar (SECEG) and Société Nationale d'Études du Détroit (SNED), in connection with the fixed-link project. The activities primarily involved geodesy, geo-prospecting, deep bore drilling, engineering and environmental studies and socio-economic studies. Future work will focus on carrying out the activities in the programme of work for 2004-2007 with a view to formulating the assessment of the technical feasibility of the project.

Contents

I. Introduction

1. The Economic and Social Council, in its resolution 2005/34 of 26 July 2005, requested the Executive Secretaries of the Economic Commission for Africa and the Economic Commission for Europe to continue to take an active part in the follow-up to the project for a Europe-Africa fixed link through the Strait of Gibraltar and to report to the Council at its 2007 substantive session.

2. The purpose of the present report, prepared jointly by the two regional commissions on the basis of information obtained from the two companies in charge of carrying out the project studies, is to respond to the provisions of the resolution referred to above. The report includes, first of all, a brief summary of the progress made on the studies as of the end of 2004 and, secondly, a summary description of the principal activities carried out in 2005 and 2006 and project development prospects.

3. It will be recalled that the studies for this project are taking place within the framework of the bilateral agreements signed by the Governments of Morocco and Spain on 24 October 1980 and 27 September 1989, whereby the two parties agreed to study jointly the feasibility of the project for a fixed link through the Strait of Gibraltar on the basis of an equal sharing of costs, under the authority of a permanent intergovernmental Joint Committee, with the help of two State engineering companies, namely the Sociedad de Estudios para la Comunicación Fija a través del Estrecho de Gibraltar (SECEG), whose head office is in Madrid, and the Société Nationale d'Études du Détroit (SNED), whose head office is in Rabat.

4. After several stages, the study process has been focused, since 1996, on the basic option comprising a tunnel driven beneath the sill of the strait, comprising two unidirectional rail tubes connected to a central service and safety gallery. The functional design, which is similar to that of the Channel Tunnel, allows for the interconnection of the two countries' railway networks and, in addition, the crossing of road vehicles on shuttle trains running between two terminal stations, one in Spain and the other in Morocco. Typical lengths for the structure would be 42 kilometres (km) between terminals, 37.7 km of which would be tunnel, including 27.7 km of undersea tunnel. This basic option is currently being revised in the light of newly acquired geological and geotechnical data, which would give rise to changes in longitudinal profile and functional design.

5. Owing to technical and economic considerations and subject to the results of the studies currently being done to revise the basic option, the construction process envisaged comprises three successive phases, namely: (a) phase 0, consisting in the driving of an undersea exploration tunnel; (b) phase 1, in which the project could be operated in "single-tube" mode (construction of the first rail tunnel and the service and security gallery); and (c) phase 2, which would include the construction of a second rail tunnel, so as to permit "dual-tube" operation, once the traffic demand warranted such operation.

6. In the study process for the fixed link through the strait, strong emphasis has been placed recently on geological investigations involving four deep underwater drilling campaigns, the last of which, carried out in 2005 (see paras. 14 to 17), provided highly interesting information on the nature of the geological formations to be traversed by the future tunnel. This made it possible to define the longitudinal profile of the alignment with greater precision.

II. Activities carried out in 2005 and 2006

7. At its thirty-seventh meeting, held in Marrakesh on 10 and 11 May 2006, the Joint Committee approved the revision of the work plan for 2004-2006 and the extension of the plan to 2007. Thus, the revised work plan for 2004-2007 calls ultimately for: (a) the reformulation of the preliminary pilot project for the tunnel option, including the aspect relating to the impact of the project on the environment; (b) updated projections of traffic through the tunnel with the use of an econometric model; (c) a study of the legal and institutional framework within which the project is to unfold; (d) an overall technical, socio-economic, financial, legal and environmental evaluation of the project.

A. Geodesy

8. Various activities connected with the updating of geodetic, gravimetric and cartographic work are already being carried out under an agreement between the engineering firms and specialized institutes of the two countries, namely Spain's Instituto Geográfico Nacional/Centro Nacional de Información Geográfica and the Morocco's Agence de la Conservation Foncière, du Cadastre et de la Cartographie/Direction du Cadastre et de la Cartographie. Such activities include, in particular, the following:

(a) Processing of observed data, which will make it possible not only to establish a fundamental geodetic base for the Project, but also to incorporate in it findings permitting the detection of possible geodynamic movements;

(b) Setting up of permanent Global Positioning System (GPS) stations in Spain and Morocco to improve the Geodetic Network for Geodynamic Observations of the Strait;

(c) Precision levelling and altimetric linking of the two shores, required for the continuation of Project studies, with traditional optical observations between Spanish and Moroccan geodetic peaks being combined with those of the links to the Tarifa and Tanger tide gauges;

(d) Installation of two gravimetric networks in the "zero order" and "first order" zone, permitting measurements by means of an absolute gravimeter to provide support for precision levelling and permanent GPS stations;

(e) Publication of the updated map of the strait (scale 1:100,000).

9. A forthcoming campaign of GPS observations for the Geodetic Network for Geodynamic Observations of the strait is planned for 2007, once the network of permanent GPS stations is in place and operational and the gravimetric survey has been successfully completed.

B. Geo-prospecting

10. Northern and southern regional and local geological mapping (scales 1:25,000 and 1:100,000) was updated under agreements with university professors. The maps, together with their explanatory notes, are available in digital form.

11. Over the period from 1980 to 1995, numerous geological prospecting campaigns have been carried out on the strip comprising the alignment through the southern and northern marine shelves. These investigations play a very important role in the geological foundation of the project, for around two thirds of the undersea route of the structure under study is situated in these shelves. Given the substantial advances made in prospecting technology, the engineering companies carried out the activity referred to as the "2004 shelf survey", aimed primarily at consolidating knowledge of the underwater geological formations.

12. The campaign carried out in October and November 2004 made it possible to obtain, among other things: (a) a geopositioned sonogram mosaic covering the alignment strip in the area of the two shelves based on approximately 1,000 km of side-scan sonar survey lines; (b) a geophysical survey covering approximately the same areas, based on 700 km of Geopulse lines; (c) a gravity core sample that permits better interpretation of earlier sonic and seismic prospecting data. The detailed study of these results done in 2005 and 2006 enriched the available information while consolidating the geological foundation of the project in the zones studied.

13. The analysis and processing of all the data have been completed, including the petrographic study of thin sections made from the rock samples taken. The results thus obtained confirm that the substratum of the Spanish and Moroccan continental shelves is made up of flysch, covered over in some places by quaternary sand deposits, not of great thickness.

C. Deep drilling

14. Without a doubt, the most important activity undertaken during the reference period was the fourth campaign of subsea deep drilling operations in the Strait of Gibraltar, aimed at removing the geological uncertainties encountered in the central third of the route. Though they pertain to only a relatively short distance of approximately 3 km, these uncertainties constitute a determining factor in the choice of the longitudinal profile of the tunnel and the related construction methods.

15. In the fourth subsea deep drilling campaign, carried out under a contract executed in November 2004 following an open international competitive bidding procedure, a linear total of 1,466 metres (m) of bores were drilled at 14 different locations and 655 m of core samples were extracted. The dynamically positioned drilling vessel (*MPSV Kingfisher*) used on that occasion was equipped with a piggyback coring rig and a borehole re-entry system. This eliminated or diminished the drilling-length limitation imposed by the duration of the periods of weak tidal-current conditions in which the drilling vessel can operate, which characterized previous campaigns. This innovation is enhanced by the introduction of an additional measurement, consisting in real-time transmission to the drilling vessel of current profiles measured by a survey vessel (*R/V E. Eva*).

16. Despite the extreme marine currents prevailing in the strait, drilling in the central section was successfully completed to a depth of 325 m beneath a 275-m layer of water, yet did not reach the flysch substratum. The future alignment of the tunnel would therefore have to pass through the breccia of the palaeochannels, and the original drilling programme was resumed and adapted in the light of this new finding.

17. The tests carried out in 2005 and 2006 on the cores obtained during the fourth subsea drilling campaign, completed in June 2005, yielded vital information on the principal geological and geotechnical problems, facilitating the start of the study to update the preliminary pilot project for the “tunnel” option.

D. Geotechnical work in exploratory structures

18. The series of measurements carried out in the exploratory gallery at Tarifa in October 2004 permitted of the conclusion that convergences had stabilized in the section constituted by geological formations of the Algeciras unit, whereas convergences in the sections composed of formations of the Almarchal and Bolonia units had not.

19. All the convergence measurements made during the period from 1995 to 2006 were updated and integrated. They were used to obtain representative curves of the evolution of all the convergence stations along the gallery, starting from the time when it was driven.

20. The Malabata exploratory shaft was reopened on 4 September 2006. Two preliminary tasks carried out to permit inspection of the shaft were as follows: (a) evacuation of the rainwater that had accumulated to a depth of more than 1.50 m in the galleries situated at the -150-m level; (b) slight cleaning of degradations. Given the importance of the information to be derived from this shaft and the extent of the degradation observed during the inspection visit, the following decisions were taken:

(a) To maintain accessibility to the shaft by treating and repairing the galleries situated at -150 m and, possibly, to dig alcoves for additional testing;

(b) To carry out new geomechanical investigation campaigns to gain deeper knowledge of the areas in question, one of the aims being to contribute to the calibration of the geomechanical models applicable to the project. The new campaigns would be planned and supervised with the collaboration of the consultant entrusted by the companies with updating the preliminary pilot project study.

21. A campaign of measurements of relative convergences took place on 20 October 2006.

E. Engineering and environmental studies

22. The preliminary pilot project, carried out from 1993 to 1996, served to define all the geometric and functional characteristics of the basic option, the bored rail tunnel, on the basis of the data available at the time. The programme of work for 2004-2007 called for updating that project, i.e., for taking into account the information recently collected, especially that obtained from the most recent subsea deep drilling campaigns. The revision of the 1996 preliminary pilot project, which has been going on since September 2006, includes the study of the impact of the project on the environment. It was entrusted to a consortium made up of specialized international engineering companies on the basis of an open invitation to tender.

23. The study began with the organization of several visits to the preferred project site and coordination meetings. The first reports on geology, geotechnical aspects,

rolling stock and the legal and institutional framework of the environmental study were presented and examined.

F. Socio-economic study

24. The recurrent studies involving the capture of socio-economic and traffic data on the countries of the European Union and the Arab Maghreb Union were continued regularly in 2005 and 2006, as were those relating to the processing of surveys of maritime traffic across the Strait of Gibraltar and air traffic between Morocco and Europe, now being applied.

25. These surveys, which include more than 80,000 interviews relating to maritime crossings and nearly 29,000 for air links, are considered sufficient for the purpose of developing the traffic-demand forecasting model. They are supplemented by a campaign of surveys currently being conducted with a suitable universe of tour operators, logistical operators and operators of strait-crossing traffic and are aimed at obtaining more in-depth knowledge of passenger mass transport and goods traffic via the strait's shipping lines.

26. The study for updating the traffic-forecasting model is aimed basically at providing updated data for the economic and financial evaluation of the project. It was awarded in an open international bidding process to an international consortium made up of specialized engineering companies. The work got under way in September 2006 and is proceeding satisfactorily. Activities relating to the evaluation of the existing model, the analysis of overall transport demand forecasts and the micro-economic structure of the system of maritime crossings of the strait, which are considered preliminary tools for developing the basic demand model, have been integrated into the study of the new traffic-forecasting model.

III. Other activities carried out in 2005 and 2006

A. Workshop on "Systematic ground probing and treatment in mechanized tunnel construction"

27. A technical workshop on the topic "Systematic ground probing and treatment in mechanized tunnel construction" was held in Madrid on 20 and 21 January 2005 within the framework of cooperation between the engineering companies, the Economic Commission for Europe (Transport Division) and the International Tunnelling Association. It was attended by more than 40 experts from some 10 countries. The workshop was the fourth event organized within the framework of this cooperation.

28. The technical discussions, guided by three basic reports and facilitated by 12 written communications, took place in three working sessions devoted respectively to non-destructive geophysical probing, mechanical probing (drilling) and ground treatment ahead of the face, with special focus on geological circumstances similar to those of the Strait of Gibraltar tunnel.

B. Participation in European Commission studies

29. As a member of the consortiums in charge, respectively, of the DESTIN (Defining and Evaluating a Strategic Transport Infrastructure Network in the Western Mediterranean) and MEDA TEN-T (Mediterranean and Trans-European Network for Transport) studies launched by the European Commission, SNED has produced several reports, including the report on the development of transport in the countries of the Arab Maghreb Union and monographs on foreign trade in Moroccan products and their land and sea transport itineraries.

30. The DESTIN study is aimed, inter alia, at the development of a traffic-forecasting model and the identification of priority projects for the development of an integrated strategic transport network in the Western Mediterranean region. The focus of the MEDA TEN-T study is the integration of transport systems in all the countries situated on the Mediterranean, based on an analysis of the operation of existing networks and the definition of priority corridors and key projects for their development.

C. Other activities

31. In Tanger, on 19 January 2005, the results of the studies for the project and the prospects for its development were presented to their Majesties Mohammed VI of Morocco and Juan Carlos I of Spain, both of whom evinced a keen interest in its realization and thus gave a considerable boost to the studies.

32. A multilingual common SNED-SECEG website devoted to the project is available in Spanish, French and Arabic. The English version is to be added in the very near future.

33. At its thirty-seventh and thirty-eighth meetings, held respectively in Madrid on 19 July 2005 and in Marrakesh on 10 and 11 May 2006, the intergovernmental Joint Committee approved the revision and extension of the programme of work to 2007 and the issuing of invitations to tender for several studies, the most important of which relate to the updating of the preliminary pilot project for the tunnel option, incorporating the study to evaluate the impact of the project on the environment, and the study of the traffic-forecasting model.

34. The intergovernmental Joint Committee held its thirty-ninth meeting in Madrid on 28 November 2005. At the meeting emphasis was placed on the follow-up of the studies currently in progress, the most important of which began in September 2006, and the launching of the activities called for in the work plan, some of which are listed below.

IV. Future work

35. Future work will be focused on the activities of the programme of work for 2004-2007 with a view to formulating the assessment of the technical and economic feasibility of the project. Especial attention will be devoted to the following:

(a) Updating the basic engineering studies, with the incorporation of the effects of the projects on the environment and the studies of user traffic forecasts, both these studies being carried out at the time of writing of the present report;

(b) Carrying out campaigns of geotechnical studies in the Malabata shaft as required for the studies mentioned above.

36. The studies relating to regional socio-economic effects and the legal and institutional framework of the project, the terms of reference of which have been adopted, will be launched in the first half of 2007. The study of regional effects will have to incorporate the conclusions of certain traffic-forecasting study missions.

37. A common computerized base containing all the digitized documents of the two companies is also in process of being launched.

38. With regard to the evaluation of the project, this activity is contemplated for the second half of 2007. Its terms of reference are currently being finalized.

V. Conclusions

39. The results of the last sea drilling campaign removed the geological uncertainties regarding the central portion of the undersea alignment of the project. The engineering study currently in progress will serve to define the geometric and functional characteristics of the exploratory drift called for by the basic option adopted for the project and, subsequently, those of the rail tunnel for which that option provides. The environmental study will evaluate the impacts of the project in that area and determine the measures needed to counter them. The socio-economic and traffic-forecasting study will help to define the remaining variables needed to evaluate the project.

40. The conclusion of the current programme of work at the end of 2007 should result, generally speaking, in a more complete assessment of the project's technical, environmental, socio-economic and legal facets. This will open the way to a new phase in which even more important new tasks will have to be undertaken for working out the solutions for a project of such magnitude.