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REPORT AND RECOMMENDATIONS MADE BY THE PANEL OF COMMISSIONERS CONCERNING THE FIFTH INSTALMENT OF "F4" CLAIMS

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Introduction

1. The Governing Council of the United Nations Compensation Commission (the "Commission"), at its thirtieth session held from 14 to 16 December 1998, appointed the "F4" Panel of Commissioners (the "Panel"), composed of Messrs. Thomas A. Mensah (Chairman), José R. Allen and Peter H. Sand to review claims for direct environmental damage and depletion of natural resources resulting from Iraq's invasion and occupation of Kuwait.

2. This is the fifth and final report of the Panel. It contains the recommendations of the Panel on the fifth instalment of "F4" claims (the "fifth 'F4' instalment"), and is submitted to the Governing Council pursuant to article 38(e) of the Provisional Rules for Claims Procedure (the "Rules") (S/AC.26/1992/10).

3. The fifth "F4" instalment consists of 19 claims submitted by six governments (collectively "the Claimants") concerning damage caused by Iraq's invasion and occupation of Kuwait. Five claims were submitted by the Government of the Islamic Republic of Iran ("Iran"); two claims were submitted by the Government of the Hashemite Kingdom of Jordan ("Jordan"); four claims were submitted by the Government of the State of Kuwait ("Kuwait"); four claims were submitted by the Government of the Kingdom of Saudi Arabia ("Saudi Arabia"); three claims were submitted by the Government of the Syrian Arab Republic ("Syria"); and one claim was submitted by the Government of the Republic of Turkey ("Turkey").

4. The claims in the fifth "F4" instalment are for compensation for damage to or depletion of natural resources, including cultural heritage resources; measures to clean and restore damaged environment; and damage to public health. The claims relate to damage resulting from, inter alia:

(a) Pollutants from the oil well fires and damaged oil wells in Kuwait;

(b) Oil spills into the Persian Gulf from pipelines, offshore terminals and tankers;

(c) Influx of refugees into the territories of some of the Claimants;

(d) Operations of military personnel and equipment;

(e) Mines and other remnants of war; and

(f) Exposure of the populations of the Claimants to pollutants from the oil well fires and oil spills in Kuwait and to hostilities and various acts of violence.

5. The claims in the fifth "F4" instalment were submitted to the Panel in accordance with article 32 of the Rules on 17 November 2003. The fifth "F4" instalment includes a number of claims or parts of claims that were deferred from previous "F4" instalments or transferred from other claims categories.[1] The deferred or transferred claims are identified in the relevant paragraphs of this report.

6. The claims reviewed in this report are summarized in table 1. The "amount claimed" column shows the compensation sought by the Claimants (with amendments, where applicable) expressed in United States dollars (USD) and corrected, where necessary, for computational errors. The total compensation sought in the claims reviewed in this report is USD 49,936,562,997.

Table 1. Summary of the claims in the fifth "F4" instalment

Country	Claim No.	Amount claimed (USD)
Iran	5000286	441,895,991
	5000301	161,000,000
	5000288	7,916,024,475
	5000287	2,571,509,483
	5000394	332,300
Jordan	5000304	4,330,635,352
	5000464	886,481,830
Kuwait	5000460	967,831,391
	5000468	267,710,202
	5000183	1,476,336,427
	5000453	4,056,202
Saudi Arabia	5000309	481,442
	4002545	2,676,101
	5000463	8,877,370,779
	5000219	19,861,782,707
Syria	5000462	1,202,800,000
	5000467	857,987,973
	5000303	104,233,079
Turkey	5000327	5,417,263
Total		49,936,562,997

I. PROCEDURAL HISTORY

A. Article 16 reports

7. Significant factual and legal issues raised by the claims in the fifth "F4" instalment were included in the Executive Secretary's twenty-ninth report dated 28 October 1998, thirty-first report dated 28 April 2000, thirty-sixth report dated 10 July 2001, thirty-seventh report dated 18 October 2001, fortieth report dated 25 July 2002 and forty-fourth report dated 22 July 2003, all of which were issued pursuant to article 16 of the Rules. These reports were circulated to the members of the Governing Council, to governments that have filed claims with the Commission and to the

Government of the Republic of Iraq ("Iraq"). In accordance with article 16(3) of the Rules, a number of governments, including Iraq, submitted information and views in response to these reports.

B. Article 34 notifications

8. Pursuant to article 34 of the Rules, the secretariat sent notifications to Iran, Jordan, Kuwait, Saudi Arabia, Syria and Turkey requesting additional information and documentation to assist the Panel in its review of the claims in the fifth "F4" instalment.

C. Classification of claims and transmittal of claim files

9. On 29 January 2003, the Panel issued Procedural Order No. 1 of the fifth "F4" instalment classifying the claims in the fifth "F4" instalment as "unusually large or complex", within the meaning of article 38(d) of the Rules. Pursuant to Procedural Order No. 1, the secretariat transmitted to Iraq copies of the claim files, comprising the claim form, statement of claim and related exhibits, for each of the claims in the fifth "F4" instalment except for those claims which had already been transmitted in a previous instalment as described in paragraph 5 above. The secretariat also transmitted copies of Procedural Order No. 1 to Iraq and the Claimants.

10. The Commission received written comments from Iraq on the claims on 23 and 30 August 2004 and 29 October 2004.

11. With the encouragement and approval of the Governing Council, and in conjunction with decision 35 (S/AC.26/Dec.35 (1995)), the Panel extended the review of the fifth "F4" instalment claims to accommodate a request from Iraq for time to provide additional comments on the fifth "F4" instalment claims.

D. Monitoring and assessment data

12. On 13 September 2002, the Panel decided that monitoring and assessment data received from the Claimants should be made available to Iraq. This decision was intended to further one of the objectives of Governing Council decision 124 (S/AC.26/Dec. 124 (2001)), namely "assisting the 'F4' Panel of Commissioners in the conduct of its tasks, through ensuring the full development of the facts and relevant technical issues, and in obtaining the full range of views including those of Iraq".

13. On 11 July 2003, the Panel issued Procedural Order No. 2 of the fifth "F4" instalment by which it requested the Claimants to provide the Commission with copies of all available monitoring and assessment information relevant to their claims in the fifth "F4" instalment. In accordance with the decision to transmit monitoring and assessment data to Iraq, the information received was transmitted to Iraq.[2]

14. The Panel accepted monitoring and assessment information from the Claimants up to 15 September 2004, the closing date for the oral proceedings for the fifth "F4" instalment (see paragraphs 16-20 below). On that date, the Panel informed the Claimants and Iraq that it would not consider any monitoring and assessment reports or data submitted after that date.

15. At the same time, the Panel extended to 31 October 2004 the time limit within which Iraq could submit comments and observations on monitoring and assessment information submitted by the Claimants between 30 June 2004 and 15 September 2004.

E. Oral proceedings

16. On 31 July 2004, the Panel issued Procedural Order No. 3 of the fifth "F4" instalment by which it informed the Claimants and Iraq that oral proceedings on the fifth "F4" instalment claims would be held on 14 and 15 September 2004.

17. Procedural Order No. 3 stated, inter alia, that within the time allotted to them during the oral proceedings, the Claimants and Iraq could raise any legal, factual and scientific issues related to the claims in the fifth "F4" instalment on which they wished to elaborate further. Procedural Order No. 3 requested the Claimants and Iraq to submit to the Commission the issues which they intended to address during the oral proceedings. The Panel reviewed the issues submitted and decided that, within the time allocated to them, the Claimants and Iraq could address all of the issues which they had proposed.

18. By Procedural Order No. 4 of the fifth "F4" instalment dated 3 August 2004, the Panel requested Iraq, Iran, Jordan, Kuwait, Saudi Arabia and Syria to address the following additional issue during the oral proceedings: "Under which circumstances can a Government claim compensation for the loss of life, reduction in life expectancy or reduced quality of life of its nationals?"

19. The issues to be addressed during the oral proceedings and a schedule of the proceedings were sent to Iraq and the Claimants.

20. Oral proceedings were held at the Palais des Nations in Geneva on 14 and 15 September 2004. Representatives and experts of each of the Claimants and Iraq attended the oral proceedings and presented their views.

II. LEGAL FRAMEWORK

A. Mandate of the Panel

21. The mandate of the Panel is to review the "F4" claims and, where appropriate, recommend compensation.

22. In discharging its mandate, the Panel has borne in mind the observations of the Secretary-General of the United Nations, in his report to the Security Council of 2 May 1991, that:

> "The Commission is not a court or an arbitral tribunal before which the parties appear; it is a political organ that performs an essentially fact-finding function of examining claims, verifying their validity, evaluating losses, assessing payments and resolving disputed claims. It is only in this last respect that a quasi-judicial function may be involved. Given the nature of the Commission, it is all the more important that some element of due

process be built into the procedure. It will be the function of the Commissioners to provide this element."[3]

B. Applicable law

23. Article 31 of the Rules sets out the applicable law for the review of claims, as follows:

"In considering the claims, Commissioners will apply Security Council resolution 687 (1991) and other relevant Security Council resolutions, the criteria established by the Governing Council for particular categories of claims, and any pertinent decisions of the Governing Council. In addition, where necessary, Commissioners shall apply other relevant rules of international law."

24. Paragraph 16 of Security Council resolution 687 (1991) reaffirms that Iraq is "liable under international law for any direct loss, damage, including environmental damage and the depletion of natural resources, or injury to foreign Governments, nationals and corporations, as a result of Iraq's unlawful invasion and occupation of Kuwait".

C. Compensable losses or expenses

25. Governing Council decision 7 (S/AC.26/1991/7/Rev. 1) provides guidance regarding the losses or expenses that may be considered as "direct loss, damage, or injury" resulting from Iraq's invasion and occupation of Kuwait in accordance with paragraph 16 of Security Council resolution 687 (1991).

26. Paragraph 34 of Governing Council decision 7 provides that "direct loss, damage, or injury" includes any loss suffered as a result of:

(a) "Military operations or threat of military action by either side during the period 2 August 1990 to 2 March 1991;

(b) Departure of persons from or their inability to leave Iraq or Kuwait (or a decision not to return) during that period;

(c) Actions by officials, employees or agents of the Government of Iraq or its controlled entities during that period in connection with the invasion or occupation;

(d) The breakdown of civil order in Kuwait or Iraq during that period; or

(e) Hostage-taking or other illegal detention."

27. Paragraph 35 of Governing Council decision 7 provides that "direct environmental damage and the depletion of natural resources" includes losses or expenses resulting from:

(a) "Abatement and prevention of environmental damage, including expenses directly relating to fighting oil well fires and stemming the flow of oil in coastal and international waters;

(b) Reasonable measures already taken to clean and restore the environment or future measures which can be documented as reasonably necessary to clean and restore the environment;

(c) Reasonable monitoring and assessment of the environmental damage for the purposes of evaluating and abating the harm and restoring the environment;

(d) Reasonable monitoring of public health and performing medical screenings for the purposes of investigation and combating increased health risks as a result of the environmental damage; and

(e) Depletion of or damage to natural resources."

28. As the Panel has observed in previous reports, paragraph 35 of Governing Council decision 7 does not purport to give an exhaustive list of the activities and events that can give rise to compensable losses or expenses; rather it should be considered as providing guidance regarding the types of activities and events that can result in compensable losses or expenses.[4]

D. Evidentiary requirements

29. Article 35(1) of the Rules provides that "[e]ach claimant is responsible for submitting documents and other evidence which demonstrate satisfactorily that a particular claim or group of claims is eligible for compensation pursuant to Security Council resolution 687 (1991)". Article 35(1) also provides that it is for each panel to determine "the admissibility, relevance, materiality and weight of any documents and other evidence submitted".

30. Article 35(3) of the Rules provides that category "F" claims "must be supported by documentary and other appropriate evidence sufficient to demonstrate the circumstances and amount of the claimed loss". In addition, Governing Council decision 46 (S/AC.26/Dec.46 (1998)) states that, for category "F" claims, "no loss shall be compensated by the Commission solely on the basis of an explanatory statement provided by the claimant".

31. When recommending compensation for damage or loss that has been found to be a direct result of Iraq's invasion and occupation of Kuwait, the Panel has in every case assured itself that the applicable evidentiary requirements regarding the circumstances and amount of the damage or loss claimed have been satisfied.

E. Legal issues

32. In reviewing the claims in the fifth "F4" instalment, the Panel considered a number of legal issues relating to the claims. Some of these issues were raised by Iraq in its written responses or in submissions during the oral proceedings and were commented upon by the Claimants during the oral proceedings.

1. Amendment of claims

33. Some Claimants proposed amendments to some of their claims in the fifth "F4" instalment, which they stated were based on the results of monitoring and assessment activities. In some cases, the amendments increase the compensation claimed and in others, the amendments decrease the compensation claimed. The Panel reviewed each proposed amendment to ensure that it did not constitute a new claim filed after the appropriate deadlines.

34. In the third "F4" report, the Panel stated that it was appropriate to receive and consider amendments to the amounts claimed, provided that such amendments were based on information and data obtained from monitoring and assessment activities.[5] Accordingly, the Panel accepted proposed amendments where it was satisfied that they were based on the results of monitoring and assessment activities.

35. In some cases, Claimants proposed amendments which were not based on information obtained from monitoring and assessment activities. Where such amendments were received after the expiry of the deadline for the receipt of unsolicited information, the Panel accepted them only if they decreased the claimed amounts.

2. Parallel or concurrent causes of damage

36. Iraq contends that some of the damage for which the Claimants seek compensation cannot be attributed solely to Iraq's invasion and occupation of Kuwait. It alleges that some of the damage resulted from other factors that existed before and after the invasion and occupation of Kuwait. According to Iraq, the environments in the Claimants' countries were not in pristine condition before the invasion and occupation. In particular, Iraq refers to exploration for oil; operation of refineries and petrochemical industries; overgrazing; extraction of groundwater; operation of oil tankers in the Persian Gulf; and contamination resulting from the Iran-Iraq conflict as sources of environmental damage both before and after the invasion and occupation.

37. The Panel has previously stated that Iraq is not liable either for damage that was unrelated to its invasion and occupation of Kuwait or for losses or expenses that are not a direct result of the invasion and occupation. However, the Panel has also noted that the fact that other factors might have contributed to the loss or damage does not exonerate Iraq from liability for loss or damage that resulted directly from the invasion and occupation. Whether or not any environmental damage or loss for which compensation is claimed was a direct result of Iraq's invasion and occupation of Kuwait will depend on the evidence presented in relation to each particular loss or damage.[6]

38. As in previous instalments, the Panel has recommended no compensation where it has found that damage resulted from causes wholly unconnected with Iraq's invasion and occupation of Kuwait. Where damage resulted directly from Iraq's invasion and occupation of Kuwait but also from other factors, due account has been taken of such other factors in order to determine the level of compensation that is appropriate for the portion of the damage which is directly attributable to Iraq's invasion and occupation of Kuwait. No compensation is recommended where it has not been possible

to determine what proportion of the damage, if any, can reasonably be attributed directly to Iraq's invasion and occupation of Kuwait.[7]

3. Duty of Claimants to prevent and mitigate environmental damage

39. Iraq contends that some of the damage for which Claimants seek compensation in the fifth "F4" instalment has been caused or contributed to by the Claimants themselves, either because they failed to take steps to mitigate damage resulting from the invasion and occupation of Kuwait or because the damage was aggravated by the acts or omissions of the Claimants after the invasion and occupation. Iraq reiterates its view that failure by a claimant to take reasonable and timely measures to mitigate damage from the invasion and occupation amounts to contributory negligence and justifies rejection of the claim for compensation, or a corresponding reduction in the compensation to be awarded.

40. In previous instalments, the Panel has stressed that Claimants have a duty to mitigate damage to the extent possible and reasonable in the circumstances. Indeed, in the case of environmental claims, the duty to prevent and mitigate damage is a necessary consequence of the common concern for the protection and conservation of the environment, and entails obligations toward the international community and future generations. This duty encompasses both a positive obligation to take appropriate measures to respond to a situation that poses a clear threat of environmental damage, as well as the duty to ensure that any measures taken do not aggravate the damage already caused or increase the risk of future damage. However, the Panel has clarified that whether an act or omission of a claimant constitutes failure to mitigate damage depends on the circumstances of each claim and the evidence available.[8] The test is whether the claimant acted reasonably, having regard to all the circumstances with which it was confronted, including the information available to it at the time regarding the nature and extent of damage and the measures appropriate to respond to the damage in each case.

41. In the review of the claims in the fifth "F4" instalment, the Panel has considered whether appropriate measures of mitigation would have reduced the damage in any particular claim. Where the evidence demonstrates that the claimant has failed to take timely action to mitigate damage, account has been taken of the failure in determining the compensation recommended. Where appropriate, adjustments have been made to account for the loss that is attributable to the failure to mitigate.

4. Remediation objectives

42. In the third "F4" report, the Panel stated that the appropriate objective of remediation is to restore the damaged environment or resource to the condition in which it would have been if Iraq's invasion and occupation of Kuwait had not occurred. However, the Panel stressed that regard must be had to a number of considerations in applying this objective to a particular claim, including, inter alia, the location of the damaged environment or resource and its actual or potential uses; the nature and extent of the damage; the possibility of future harm; the feasibility of the proposed remediation measures; and the need to avoid collateral damage during and after the implementation of the proposed measures.[9]

43. In the fourth "F4" instalment, the Panel reaffirmed that, in determining what remediation measures are necessary, "primary emphasis must be placed on restoring the environment to pre-invasion conditions, in terms of its overall ecological functioning rather than on the removal of specific contaminants or restoration of the environment to a particular physical condition".[10] In particular, the Panel noted that, in some circumstances, measures to recreate pre-existing physical conditions might not produce environmental benefits and could indeed pose unacceptable risks of ecological harm. The Panel went on to affirm that, in its view, where proposed measures for the complete removal of contaminants are likely to result in more negative than positive environmental effects, such measures should not qualify as reasonable measures to clean and restore the environment, within the meaning of article 35(b) of Governing Council decision 7.

5. Damage to natural resources without commercial value

44. Some of the claims in the fifth "F4" instalment are for compensation for losses in relation to natural resources alleged to have been damaged as a result of Iraq's invasion and occupation of Kuwait. The compensation sought includes compensation for loss of use of the resources during the period between the occurrence of the damage and the full restoration of the resources, either through natural recovery or as a result of remediation or restoration measures undertaken by a claimant.

45. Iraq contends that there is no legal justification for compensating claimants for "interim loss" of natural resources that have no commercial value; i.e., resources that "are not traded in the market". It argues that compensation for damage to non-commercial resources is limited to the costs of reasonable measures of remediation or restoration. According to Iraq, claims for interim loss of non-commercial resources have no basis in Security Council resolution 687 (1991) or Governing Council decision 7. Specifically, Iraq argues that there is no evidence that the Security Council intended that Iraq is to be held liable for temporary damage to a natural resource that has been or will be restored at its expense.

46. Iraq maintains that interpretation and application of Security Council resolution 687 (1991) must be carried out by applying the relevant rules of international law. It asserts that claims for interim loss of natural resources without commercial value have no precedent in general international law. According to Iraq, compensation in international law can only be paid for damage that is "financially assessable", and it argues that, under current international law, interim loss of non-commercial environmental resources is not financially assessable.

47. Iraq, therefore, argues that all claims for compensation for interim loss of non-commercial environmental resources should be rejected. In the view of Iraq, awarding compensation for any such claim, even if only for a small amount, would constitute a revolutionary change in international law.

48. For their part, the Claimants contend that temporary loss of the use of natural resources, such as the loss of biomass in the marine environment or the presence for long periods of oil contamination on beaches, clearly represents "environmental damage" within the language and meaning of Security Council resolution 687 (1991) and Governing Council decision 7. According to the Claimants, the absence of a specific reference to interim loss in Security Council resolution 687 (1991) or Governing Council decision 7 does not in any way suggest a limitation. They point out that the criteria enumerated

in Governing Council Decision 7 were not intended to resolve every issue that might arise with respect to claims presented pursuant to Security Council resolution 687 (1991), and they refer to the conclusion of the Panel, in the third "F4" report, that the term "environmental damage" in paragraph 16 of Security Council resolution 687 (1991) is not limited to losses or expenses resulting from the activities and events listed in paragraph 35 of Governing Council decision 7.[11]

49. The Claimants further argue that, under general international law, it would be an absurd and unreasonable result to deny compensation for temporary loss of resources resulting from a deliberate internationally wrongful act of aggression. They assert that entitlement to compensation for such damage under international law is mandated by the fundamental principle articulated by the Permanent Court of International Justice in the Factory at Chorzów case that "reparation must, as far as possible, wipe out all the consequences of the illegal act and re-establish the situation which would, in all probability, have existed if that act had not been committed".[12] They point out that this principle, which predates 1991 and Security Council resolution 687 (1991), has been accepted by the International Law Commission of the United Nations and many other international authorities.

50. According to the Claimants, all losses that were a direct result of Iraq's illegal acts must be compensated in order to wipe out all the consequences of those illegal acts. In their view, compensation for temporary losses pending remediation or restoration is an appropriate form of compensation because it "mirrors" the restitution in kind that is favoured as a matter of principle by international law authorities such as the judgement in the Factory at Chorzów case.

51. The Claimants, therefore, maintain that they are entitled to recover compensation for "ongoing losses" of natural resources resulting from Iraq's invasion and occupation of Kuwait, and that such compensation should be measured from the time that the resources were damaged up to the time when recovery to pre-invasion conditions has been or will be completed. They assert that the Security Council intended that such loss should be compensated, and that there are international precedents for doing so.

52. Although both the Claimants and Iraq have framed their arguments in terms of whether claims for interim loss are compensable in principle, the Panel considers that the fundamental issue to be resolved is whether, pursuant to Security Council resolution 687 (1991), claimants who suffer damage to natural resources that have no commercial value are entitled to compensation beyond reimbursement of expenses incurred or to be incurred to remediate or restore the damaged resources. In other words, the question is whether the term "environmental damage", as used in Security Council resolution 687 (1991), includes what is referred to as "pure environmental damage"; i.e., damage to environmental resources that have no commercial value. In this regard, the Panel notes that Iraq does not deny that claimants are entitled to claim compensation for the temporary loss of resources which have an economic value ("which are traded in the market"), such as fisheries and crops. The Panel, therefore, concludes that Iraq's objection to the claims for the temporary losses in the fifth "F4" instalment is based on the fact that the resources involved are "non-commercial" in nature, rather than on the fact that the losses are of a temporary duration.

53. The Panel recalls that, in the third "F4" instalment, Iraq argued that the Panel should have regard to the applicable rules of international law in determining what environmental damage or loss resulting from Iraq's invasion and occupation of Kuwait qualifies for compensation under Security Council resolution 687 (1991). In that context, Iraq argued that damage resulting from the invasion and occupation of Kuwait was not compensable unless it reached the "threshold" that is generally required in international law for compensation in cases of state responsibility for transboundary environmental damage.[13] In the present instalment, Iraq's contention is that the compensability of the temporary loss of natural resources that have no commercial value must be determined by reference to principles of general international law.

54. In the third "F4" report, the Panel noted that the primary sources of the law to be applied by the Panel in the review of claims for compensation are listed in article 31 of the Rules. These are "Security Council resolution 687 (1991) and other relevant Security Council resolutions, the criteria established by the Governing Council for particular categories of claims, and any pertinent decisions of the Governing Council". The Panel observed that "other relevant rules of international law" were to be applied "where necessary". In the view of the Panel, this meant that recourse to other relevant rules of international law was only necessary where Security Council resolutions and the decisions of the Governing Council did not provide sufficient guidance for the review of a particular claim.[14] For the review of the claims in the third "F4" instalment, the Panel found that Security Council resolution 687 (1991) and the relevant decisions of the Governing Council provided sufficient guidance.[15]

55. For the claims in the fifth "F4" instalment, the Panel equally finds that Security Council resolution 687 (1991) and the relevant decisions of the Governing Council provide sufficient guidance for the review of the claims for compensation for loss of or damage to natural resources. Security Council resolution 687 (1991) states that Iraq is "liable under international law for any direct loss, damage, including environmental damage and the depletion of natural resources … as a result of Iraq's unlawful invasion and occupation of Kuwait". Paragraph 35(e) of Governing Council decision 7 provides further guidance by stating that Iraq is liable for "losses or expenses" resulting from "depletion of or damage to natural resources." As the Panel stated in the fourth "F4" report, part one, Security Council resolution 687 (1991) and Governing Council decision 7 establish the general principle that Iraq is liable for all damage and losses that result directly from its invasion and occupation of Kuwait. In the opinion of the Panel this means that any loss of or damage to natural resources that can be demonstrated to have resulted directly from Iraq's invasion and occupation of Kuwait must be deemed to be encompassed in the concept of "environmental damage and the depletion of natural resources" within the meaning of Security Council resolution 687 (1991). The Panel does not consider that there is anything in the language or context of Security Council resolution 687 (1991) or Governing Council decision 7 that mandates or suggests an interpretation that would restrict the term "environmental damage" to damage to natural resources which have commercial value.

56. Furthermore, the Panel does not consider that the fact that the effects of the loss of or damage to natural resources might be for a temporary duration should have any relevance to the issue of the compensability of the damage or loss, although it might affect the nature and quantum of

compensation that may be appropriate. In the view of the Panel, it is not reasonable to suggest that a loss that is documented to have occurred, and is shown to have resulted from the invasion and occupation of Kuwait, should nevertheless be denied compensation solely on the grounds that the effects of the loss were not permanent. As the Panel sees it, the critical issue to be determined in each claim is whether the evidence provided is sufficient to show that there has been a loss of or damage to natural resources as alleged and, if so, whether such loss or damage resulted directly from Iraq's invasion and occupation of Kuwait.

57. The Panel, therefore, finds that a loss due to depletion of or damage to natural resources, including resources that may not have a commercial value is, in principle, compensable in accordance with Security Council resolution 687 (1991) and Governing Council decision 7 if such loss was a direct result of Iraq's invasion and occupation of Kuwait. It follows, therefore, that temporary loss of the use of such resources is compensable if it is proved that the loss resulted directly from Iraq's invasion and occupation of Kuwait.

58. The Panel does not consider that this finding is inconsistent with any principle or rule of general international law. In the view of the Panel, there is no justification for the contention that general international law precludes compensation for pure environmental damage. In particular, the Panel does not consider that the exclusion of compensation for pure environmental damage in some international conventions on civil liability and compensation[16] is a valid basis for asserting that international law, in general, prohibits compensation for such damage in all cases, even where the damage results from an internationally wrongful act.

6. Damage to public health

59. The claims in the fifth "F4" instalment include claims by governments for losses or expenses resulting from damage to public health, in terms of adverse health effects on specific categories of residents of the claimant countries or on the general population. The damage or losses for which compensation is claimed include expenses of medical treatment for specific diseases and mental conditions as well as general claims for loss of life or reduced quality of life of the population.

60. With regard to claims for expenses resulting from public health expenditures, Iraq contends that there is no legal basis for such claims. Iraq argues that there is no mention of public health damage in Security Council resolution 687 (1991), and that the only reference to public health damage in Governing Council decision 7 is in paragraph 35(d) where mention is made of expenses resulting from "[r]easonable monitoring of public health and performing medical screenings for the purposes of investigation and combating increased health risks as a result of the environmental damage". According to Iraq, the only public health expenses for which compensation can be claimed by governments are expenses for reasonable monitoring and medical screening for the purpose of investigating and combating increased health risks.

61. With regard to expenses incurred by governments in providing medical services to members of their populations, Iraq argues that there is no basis for awarding compensation for such expenses since this is a basic service which governments provide in general whether there is only one patient or more

patients to be treated. According to Iraq, a government may only be entitled to compensation for medical treatments if it can demonstrate that these expenses were additional to what it would normally have incurred, and also that the additional expenditure was the direct result of any of the events specified in paragraph 34 of Governing Council decision 7.

62. In connection with the claims by governments for loss of life and reduced quality of life of their nationals, Iraq asserts that the claims are inadmissible because the Claimants concerned lack legal standing to bring such claims before the Commission. According to Iraq, the rules established by the Governing Council provide for the compensation of claims submitted by individuals for personal injury or mental pain and anguish. Individual claimants were given the opportunity to claim for these injuries under the "B", "C" and "D" claims categories; and indeed have done so, claiming for personal injury and death, mental pain and anguish resulting from hostage taking, illegal detention and other similarly traumatic events. Iraq contends that under the scheme established by the Governing Council, a government is not entitled to bring a claim by way of "diplomatic protection" for the loss of life or health of its nationals. This is because the UNCC system offers access to the individual who has suffered injury; and it is, therefore, an exception to the normal situation in international law where the individual does not have access to the adjudicating authority.

63. For their part, the Claimants concerned assert that they are entitled to submit claims for public health losses. They argue that, under the settled principles of international law, loss of life and reduced quality of life of nationals of a State represent injuries to the State, and claims for such injuries can be asserted as State claims rather than as the claims of individual nationals. The Claimants assert that international law has consistently taken the view that injury to a national of one State by another State gives rise to a claim that belongs to the State of the national and not to the injured person. The Claimants refer to pronouncements by a number of international courts and tribunals, as well as by noted commentators, as constituting "a long list of authority" confirming that injuries to nationals of a State represent injuries to the State of their nationality and give rise to claims by that State.

64. With regard to Iraq's contention that some of the claims are for indirect losses, the Claimants state that these claims are not for indirect losses since, by their very nature, they can only be claims of the State. They point out that the claims are not for losses of individual nationals and have not been brought on behalf of any specific individuals, and they argue that, according to the principle of diplomatic protection, the injuries to nationals of a State are also deemed to be direct injuries to the State that espouses the claims.

65. The Claimants point out that none of the individual claims that have been processed by the Commission to date has included compensation for damage from loss of life or reduced quality of life that is now sought in the fifth "F4" instalment. They note in this regard that compensation previously awarded on individual claims arising from death in category "C" and category "D" claims was limited to medical, burial and other expenses, loss of financial support that would have gone to a spouse, a child or parent as well as compensation for mental pain and anguish to the survivors. No compensation has been awarded for the pain and suffering of the persons who died. With regard to the

claims made for pain and suffering for non-fatal injuries, the Claimants state that these are distinct from the government claims for reduced quality of life. Claims for compensation for individual pain and suffering were limited to the specific circumstances set forth in Governing Council decision 3 (S/AC.26/1991/3) and to the narrowly limited amounts specified in Governing Council decision 8 (S/AC.26/1992/8). The compensation did not take into account the broad impairments of reduced quality of life or the increased risks that Iraq imposed on the entire populations of the Claimants.

66. With regard to the admissibility of claims for loss of life and reduced quality of life, the Claimants maintain that loss of life and reduced quality of life are clearly and properly compensable by the Commission. They point out that paragraph 16 of Security Council resolution 687 (1991) states that compensation is due for "any direct loss". In response to Iraq's assertion that Governing Council decision 7 makes specific reference only to compensation for expenses of "monitoring and medical screening", they assert that this does not exclude compensation for other losses related to public health, noting that compensation under Security Council resolution 687 (1991) is not limited to the heads of loss and expenses that are specifically itemized in Governing Council decision 7.

67. The Panel has previously stated that Iraq's liability for environmental damage under Security Council resolution 687 (1991) and Governing Council decision 7 is comprehensive and extends to all damage and losses related to the environment and any consequences of such damage that can reasonably be attributed directly to Iraq's invasion and occupation of Kuwait. In this regard, the Panel recalls its previous statements that paragraph 35 of Governing Council decision 7 does not purport to give an exhaustive list of the activities and events that can give rise to compensable losses or expenses. As the Panel noted in the second "F4" report, paragraph 35 of Governing Council decision 7 should be considered as providing guidance regarding the types of activities and events that can result in compensable losses, rather than a limitative enumeration of all such activities and events.[17] Accordingly, the Panel considers that the fact that paragraph 35 of Governing Council decision 7 specifically refers only to expenses of "monitoring of public health" and "medical screenings" does not imply in any way that compensation may not be appropriate for other damage or losses relating to public health. In particular, the Panel does not consider that paragraph 35 of Governing Council decision 7 can be interpreted to deny compensation for public health expenses incurred by a government as a direct result of Iraq's invasion and occupation of Kuwait. In the view of the Panel, it is illogical to argue that a government is entitled to compensation for expenses of monitoring activities and medical screening for the purposes of investigating and combating increased health risks which result from Iraq's invasion and occupation of Kuwait, but that expenses actually incurred by the government in combating increased health risks that have been identified as a result of the monitoring and screening are not compensable.

68. The Panel, therefore, concludes that expenses incurred by a State in combating increased public health problems or public health risks caused by environmental damage that resulted directly from Iraq's invasion and occupation of Kuwait are, in principle, compensable in accordance with Security Council resolution 687 (1991). As with all claims, the test to be applied is whether the expense or loss for which compensation is claimed has actually occurred and can reasonably be demonstrated to be a direct result of Iraq's invasion and occupation of Kuwait.

69. With regard to Iraq's contention that the Claimants do not have standing to bring claims for general damage related to public health, such as claims for loss of life or reduced quality of life, the Panel notes that Security Council resolution 687 (1991) expressly states that Iraq is liable under international law for direct loss, damage, or injury to foreign governments as a result of Iraq's unlawful invasion and occupation of Kuwait. Similarly, paragraph 34 of Governing Council decision 7 provides that compensation is available with respect to any direct loss, damage or injury to Governments as a direct result of Iraq's unlawful invasion and occupation of Kuwait. It follows that a Government is entitled to bring a claim for compensation for a loss, damage or injury suffered by it, so long as the claim is in conformity with Security Council resolution 687 (1991) and other relevant Security Council resolutions, the criteria established by the Governing Council for particular categories of claims and other pertinent decisions of the Governing Council. In the view of the Panel, there is no provision in the relevant resolutions of the Security Council or decisions of the Governing Council which prevents a government from bringing a claim for a public health loss, damage or injury for which it would be entitled to claim under international law.

70. In this connection**,** the Panel notes that general international law recognizes the right of a State to bring claims on the international plane against another State for damage to a national of the claimant State. Where a claim is brought by a State in such a case, the State is not acting on behalf of the injured national but rather is asserting its own right to ensure compliance with the rules of international law in respect of its nationals. In the view of the Panel, the fact that an injured national can bring an individual claim for a specific injury or damage does not affect the right or standing of a State to bring a national claim, so long as there is no duplication in compensation awarded for the same injury or damage. Whether, and if so to what extent, any such claim by a government will succeed depends on the nature of the claim and the evidence produced to support it.

71. However, the Panel recognizes that governments may not be entitled to bring claims for compensation for injury or damage where the applicable decisions of the Security Council or the Governing Council restrict the right to bring such claims to certain categories of persons or entities. Thus, for example, the Panel considers that Governing Council decisions 3 and 8 reflect a policy decision of the Governing Council regarding the categories of persons who may bring claims for mental pain and anguish, the criteria to be met for such claims to succeed, and the limits of compensation that may be awarded for various categories of injury or damage. For that reason, the Panel finds that claims for compensation for mental pain and anguish can only be brought by individuals who satisfy the criteria established by the Governing Council in its decision 3. Accordingly, no such claims can be brought by a government.

7. Valuation methodologies

72. In support of the claims for loss or depletion of natural resources and for damage to public health resulting from Iraq's invasion and occupation of Kuwait, the Claimants have relied on statistical evidence and calculations as well as certain methodologies for estimating the extent of damage and quantifying the losses to be compensated.

73. In presenting their claims for temporary loss of natural resources, some Claimants have utilized the methodology known as "Habitat Equivalency Analysis" ("HEA") to determine the nature and extent of compensatory restoration that is necessary to compensate for the loss of ecological services that were provided by the resources before they were damaged. Based on the results of the HEA, some Claimants propose to undertake compensatory restoration projects that are intended to offset the ecological services that have been lost between the time of initial damage to the resources and the time of their full recovery. The compensatory restoration projects are aimed at providing equivalent ecological service gains either in the same area or at other locations.

74. Iraq contends that the methodologies that have been used by the Claimants are not acceptable. Iraq states that, in international law, compensation can only be paid for financially assessable damage; and it claims that both the proof of damage and the assessment of damage must be made in accordance with established principles of international law. According to Iraq, international law and practice do not recognize the methodologies relied upon by the Claimants in these claims. Iraq considers that these methodologies are "novel and untried", and are "shot through with uncertainty". In the view of Iraq, they are "abstract and theoretical methodologies" of the kind that international bodies, for example, the International Oil Pollution Compensation Fund (the "IOPC Fund"), have expressly rejected. In this regard, Iraq refers to resolution 3 of the Assembly of the IOPC Fund which stated that "the assessment of compensation to be paid by the [IOPC] Fund is not to be made on the basis of abstract quantification of damage calculated in accordance with theoretical models".[18]

75. Iraq also notes that there is no international treaty or other international practice which could support the use of these "abstract and theoretical" models in computing damage to natural resources or damage to public health. Moreover, Iraq states that there is no general national practice to support the use of such methodologies and, consequently, that it cannot be argued that the use of these methodologies is reflected as a general principle of law recognized by civilized nations.

76. Iraq argues that the Panel would be taking international law into a new domain if it were to adopt the approach proposed by the Claimants. In the view of Iraq, it is not the function of the Panel to legislate or progressively develop the rules of international law.

77. With regard to the use of statistical evidence by the Claimants to support some of the claims, Iraq contends that, in order to succeed with a claim for damages, it has to be proved with certainty that damage or harm to a legally protected interest, for example, health, life or property, has actually occurred. According to Iraq, statistical evidence that damage must have occurred is not sufficient in any private law system. Iraq asserts that, for a claim for damage to succeed, it is not sufficient to show that a person was exposed to a risk of becoming infected with a severe disease. Without proof of actual damage, no claim should succeed. Accordingly, Iraq argues that the Panel can only take exposure to risk into consideration if the risk actually results in damage or harm.

78. The Claimants maintain that the methodologies adopted by them in estimating damage suffered by them or the compensation claimed for such damage are fully in accordance with Security Council resolution 687 (1991) and Governing Council decision 7 and are not inconsistent with any rules or principles of international law. They assert that compensatory restoration, as proposed by them in the

fifth "F4" instalment claims, is intended to provide the equivalent of the natural resource services of which the Claimants would be deprived until the damaged natural resources are restored to the baseline conditions in which they would have been but for the wrongful acts of Iraq.

79. With regard to the use of HEA, the Claimants state that HEA is a methodology that is widely accepted and is often used to quantify the ecological loss of services caused by oil spills and other released contaminants. According to the Claimants, HEA provides an appropriate mechanism to assign the costs of compensatory restoration to alternatives that can provide resources and gains equivalent in type and quality to the losses sustained. In their view, the methodologies utilized by them in the fifth "F4" instalment claims are internationally accepted methods for measuring the extent of loss of natural resources so that proper compensation can be made for such losses.

80. In the view of the Panel, international law does not prescribe any specific and exclusive methods of measurement for awards of damages for internationally wrongful acts by states. The general rule is to restore what has been damaged to integrity or, if this is not possible, to provide an equivalent for it. The overall criterion is always that of effective reparation for the wrongful act. Hence, even in the absence of precise rules or prescriptions on the methods for evaluating damage, courts and tribunals are entitled and required to evaluate damage and determine appropriate compensation, relying on general principles for guidance, particularly the principle that reparation must, as far as possible, wipe out all the consequences of the illegal act. As the Tribunal in the Trail Smelter Arbitration stated in its interim award: "Where the [wrongful act] itself is of such a nature as to preclude the ascertainment of the amount of damages with certainty, it would be a perversion of fundamental principles of justice to deny all relief to the injured person, and thereby relieve the wrongdoer from making any amend for his acts. In such case, while the damages may not be determined by mere speculation or guess, it will be enough if the evidence show the extent of the damages as a matter of just and reasonable inference, although the result be only approximate."[19]

81. The Panel recognizes that there are inherent difficulties in attempting to place a monetary value on damaged natural resources, particularly resources that are not traded in the market. With specific regard to HEA, the Panel recognizes that it is a relatively novel methodology, and that it has had limited application at the national and international levels. The Panel is also aware that there are uncertainties in HEA calculations, especially for establishing a metric that appropriately accounts for different types of service losses and for determining the nature and scale of compensatory restoration measures that are appropriate for damage to particular resources. For these reasons, the Panel considers that claims presented on the basis of HEA or similar methodologies of resource valuation should be accepted only after the Panel has satisfied itself that the extent of damage and the quantification of compensation claimed are appropriate and reasonable in the circumstances of each claim. However, the Panel does not consider that these potential difficulties are a sufficient reason for a wholesale rejection of these methodologies, or for concluding that their use is contrary to international law principles.

82. With regard to the claims for compensatory restoration in the fifth "F4" instalment, the Panel reiterates its previous statements that remediation measures for damaged resources should focus on

primary restoration, in terms of the restoration of ecological functioning.[20] Consequently, compensatory restoration measures should be considered only where there is sufficient evidence that primary restoration will not fully compensate for any identified losses. It is only in such cases that HEA may be considered as a helpful tool in determining how much compensatory restoration is necessary and feasible in the circumstances. Accordingly, in each case where a claimant seeks an award to undertake compensatory restoration, the Panel has considered whether the claimant has sufficiently established that primary restoration has not or will not fully compensate for the losses. Compensation is recommended only where the evidence available shows that, even after primary restoration measures have been undertaken, there are, or there are likely to be, uncompensated losses.

8. Set-off

83. Iraq has argued that, in order to put each claimant in the position in which it would have been but for Iraq's invasion of Kuwait, account should be taken of any profits or other benefits that accrued to that claimant as a result of the invasion and occupation. Iraq asserts that this approach is consistent with the practice adopted by other panels of Commissioners.

84. The Panel considers that, in assessing compensation for damage or loss suffered by a claimant as a result of Iraq's invasion and occupation of Kuwait, due account should be taken of any extraordinary profit or other benefit that accrued to the claimant as a result of the event or activity in respect of which the claim for compensation is submitted.

85. Where the extent and value of any such profit or other benefit can be ascertained, it should be set off against the compensation to be awarded. However, the Panel considers that such a set-off is only justified where the profit or other benefit in question results from an event or damage that is the subject of the particular claim being reviewed.

86. In relation to the claims reviewed in the fifth "F4" instalment, the evidence presented to the Panel does not indicate that any profit or other benefit accrued to any of the Claimants in connection with the events or damage in respect of which the claims for compensation have been submitted. Accordingly, the Panel does not consider it necessary to make any recommendations on set-off.

III. REVIEW OF THE FIFTH INSTALMENT OF "F4" CLAIMS

A. Article 36 of the Rules

87. Article 36 of the Rules provides that a panel of Commissioners may "(a) in unusually large or complex cases, request further written submissions and invite individuals, corporations or other entities, Governments or international organizations to present their views in oral proceedings" and "(b) request additional information from any other source, including expert advice, as necessary". Article 38(b) of the Rules provides that a panel of Commissioners "may adopt special procedures appropriate to the character, amount and subject-matter of the particular types of claims under consideration."

88. In view of the complexity of the issues raised by the claims and the need to consider scientific, engineering and cost issues, the Panel sought the assistance of a multi-disciplinary team of independent experts retained by the Commission (the "Panel's expert consultants"). The Panel's expert consultants were retained, inter alia, in the fields of desert ecology and botany, biology, agriculture, forestry, plant pathology, soil fauna, landscape ecology, terrestrial and marine remediation techniques, marine biology, coastal ecology and geomorphology, geology, hydrogeology, water quality, chemistry, water treatment engineering, coastal and civil engineering, veterinary toxicology, natural resource and economic damage assessment, cultural heritage, ecological and health risk assessment, economics, statistics, remote sensing, modelling of the transport of airborne pollutants, epidemiology, toxicology, demography, internal medicine, cardiovascular and pulmonary medicine, endocrinology, vascular medicine and haematology, reproductive health, mental health, orthopaedic surgery, psychiatry, prosthetic devices, infant and child health, oncology and health care economics.

89. At the direction of the Panel, the secretariat and the Panel's expert consultants undertook site visits to Iran, Jordan, Kuwait, Saudi Arabia and Syria.[21] The secretariat and the Panel's expert consultants also met with representatives and experts of Iran, Kuwait and Saudi Arabia in Geneva. The purpose of these visits and meetings was to enable the secretariat and the Panel's expert consultants to obtain information that would assist the Panel to:

(a) Assess the nature and extent of damage alleged to have resulted from Iraq's invasion and occupation of Kuwait;

(b) Evaluate the technical feasibility, reasonableness and costing of the remediation or other measures proposed by the Claimants; and

(c) Assess the reasonableness of the compensation claimed, including the appropriateness of the methodologies proposed for the valuation of the damage or loss.

90. Where necessary and appropriate, the Panel requested additional information from the Claimants to clarify their claims.

91. The Panel also directed the secretariat to hold a meeting between the Panel's expert consultants and legal, scientific and technical consultants of Iraq. During the meeting, the Panel's expert consultants provided explanations and clarifications on certain issues in relation to the claims in the fifth "F4" instalment.

92. In reaching its findings and formulating its recommendations on the claims, the Panel has taken due account of all the information and evidence made available to it, including the evidence and information provided by the Claimants in the claim documents; results of monitoring and assessment activities; responses to requests for additional information; information and views submitted by Governments in response to article 16 reports; written responses submitted by Iraq; information obtained during the site visits and meetings with the Claimants; views presented by Iraq and the Claimants during the oral proceedings; and reports of the Panel's expert consultants.

B. Monitoring and assessment

93. As noted at paragraphs 12-15 above and 782 below, the Panel has been assisted in its review of the claims in the fifth "F4" instalment by data submitted by the Claimants as a result of monitoring and assessment activities. In some cases, the information from monitoring and assessment projects provided a basis for the Panel to ascertain the nature and extent of damage for which compensation is being claimed and, where applicable, to evaluate the appropriateness of the measures proposed to remediate the damage. However, in some other cases the information provided was not sufficient to provide the necessary support for the related substantive claims. In this regard, the Panel reiterates its view that the fact that the results of a monitoring and assessment activity do not provide support for a related substantive claim does not necessarily invalidate the appropriateness of the activity or the methods used. As stated by the Panel in the first "F4" report, monitoring and assessment activity can be of benefit even if the results generated by the activity establish either that no damage has been caused or that damage has occurred but that it is not feasible or advisable to undertake measures of remediation or restoration. Confirmation that no damage has been caused or that measures of remediation or restoration are not possible or advisable in the circumstances can assist the Panel in reviewing related substantive claims.[22]

C. Technical annexes and glossary

94. In considering measures proposed by the Claimants for compensatory projects, the Panel has evaluated the reasonableness of the measures by reference to, inter alia, the potential of the projects to achieve the objectives set out in paragraphs 42-43 above; potential adverse environmental impacts of the proposed measures; and the cost of the measures as compared with alternatives that confer the same environmental benefits.

95. In some cases, the Panel has found that certain modifications to the measures proposed are necessary or desirable to take account of these considerations. Details of such modifications are set out in technical annexes to this report. The amounts recommended for the claims are based on the proposed measures as modified. This is consistent with the approach adopted by the Panel in its previous reports.

96. A glossary of scientific and technical terms used in this report follows the technical annexes.

D. Cross-checks for potential duplication

97. In order to avoid multiple recovery of compensation and also ensure consistency with the findings of other panels of Commissioners, the Panel instructed the secretariat to carry out cross-claim and cross-category checks of the claims. Based on the results of these cross-checks, the Panel is satisfied that there is no risk of duplication of awards of compensation that requires an adjustment to the Panel's recommendations.

IV. CLAIMS OF THE ISLAMIC REPUBLIC OF IRAN

A. Overview

98. In the fifth "F4" instalment, the Panel reviewed five claims submitted by Iran for compensation for damage resulting from Iraq's invasion and occupation of Kuwait. These are Claim No. 5000286 for loss of agricultural resources; Claim No. 5000301 for loss of fisheries resources; Claim No. 5000288 for losses resulting from the depletion of or damage to terrestrial, cultural heritage and marine resources; Claim No. 5000287 for damage to public health; and Claim No. 5000394 for the expenses of a public health monitoring and assessment study on the incidence of cancers and haematological disorders.

99. Iran states that it suffered damage as a result of pollution from the oil well fires in Kuwait; the oil spills into the Persian Gulf; and the influx of refugees who departed from Iraq or Kuwait as a result of Iraq's invasion and occupation of Kuwait.

100. Iran claims that pollutants from the oil well fires in Kuwait were deposited in parts of its territory. Iran notes that many international and national reports, supported by extensive visual, satellite and remote-sensing data collections, show that significant quantities of pollutants were dispersed in the southern and south-western provinces of Iran in the form of wet and dry deposition. Iran states that its territory was exposed to wet deposition from approximately 350,000 tonnes of soot, as well as nitrogen and sulphur oxides, organic carbons, heavy metals and polycyclic aromatic hydrocarbons from the oil well fires in Kuwait. According to Iran, its analysis of satellite images and meteorological data clearly reveal that the soot was mainly over the southern and south-western provinces of Iran. Iran further states that analysis of "black rain" samples following Iraq's invasion and occupation of Kuwait show "increased concentrations of anions, cations, and heavy metals" in the rain.

101. Iran presented evidence intended to show that the oil spills created oil slicks in an extended area of the Persian Gulf, and that the oil well fires resulted in the deposition of particulate matter over large areas of land and sea. Iran submitted an analysis of satellite images used to track the movements of the oil spills and contaminants from the oil well fires from Kuwait to Iran. Iran also presented analytical data, including chemical and fingerprinting information. According to Iran, analyses and field observations undertaken by it provide a strong indication that some of the oil from the oil spills reached the coast of Iran.

B. Claim No. 5000286 – Agricultural resources

102. Claim No. 5000286 comprises three claim units, with an asserted value of USD 441,895,991, for alleged losses to agricultural crops caused by air pollution and acid rain resulting from Iraq's invasion and occupation of Kuwait. This amount represents a decrease in the compensation claimed, reflecting amendments made by Iran based on information obtained from its monitoring and assessment activities.[23] The first claim unit is for a reduction in crop yields; the second claim unit is

for a reduction in the quality of crops; and the third claim unit is for a proposed long-term monitoring and assessment project.

1. First claim unit – Reduced crop yields

103. Iran seeks compensation in the amount of USD 217,247,112 for losses due to reduced yields of several varieties of agricultural crops in the provinces of Bushehr, Fars, Hormozgan, Khuzestan, Kerman and Kohgiloyeh (the "Southern Provinces") in 1991.

104. According to Iran, the oil well fires in Kuwait and evaporation from millions of barrels of crude oil spilt into the Persian Gulf as a result of Iraq's invasion and occupation of Kuwait produced large quantities of soot and sulphur, much of which were deposited in several areas of the Southern Provinces in the form of black rain. Iran states that this resulted in heavy agricultural production losses, due to reductions in the yields of several agricultural crops in the affected areas.

105. According to Iran, the damage resulted from (a) direct impacts of the increased amounts of airborne pollutants such as sulphur dioxide (SO_2), nitrogen oxides (NO_x,), ozone, and polycyclic aromatic hydrocarbons; (b) leaf infections due mainly to black rain; and (c) "infection" of the soil by deposits of heavy metals and toxic hydrocarbons.

106. Iran estimates its crop losses by comparing the actual production of each crop in each of the affected provinces during 1991 with the expected production of those crops, based on a statistical analysis of crop yields over a period of 11 years from 1986 to 1996. For each crop, Iran calculates the compensation sought by multiplying the decrease in production in 1991, which it considers to be the result of Iraq's invasion and occupation of Kuwait, by the market price of that crop.

107. Iran relies on evidence from the published literature to support its claim. In addition, Iran submitted other information, including remote sensing data and photographic evidence of damage to agricultural crops across the Southern Provinces.

108. Iraq argues that Iran has not demonstrated that any loss of crops occurred or that there is any causal connection between the alleged reduction in crop production and pollution resulting from the invasion and occupation of Kuwait. In particular, Iraq points out that Iran has produced no evidence showing the quantities of specific crops in identified areas that were exposed to, or affected by, pollution that resulted from the invasion and occupation.

109. Iraq also contends that modelling of the smoke plume shows that soot and SO_2 depositions were restricted to the extreme south of Iran in the province of Khuzestan, and were not as widespread as alleged by Iran.

110. Iraq contends that reduced crop yields in 1991 may be due to causes other than pollution resulting from the conflict. In particular, Iraq suggests that reduced rainfall and late rains during the 1991 growing season could have had an impact on crop yields in the regions alleged to have been affected. Iraq further states that the photographic evidence submitted by Iran shows problems with

crops that could possibly have been caused by a variety of factors, including frost, disease, lack of water, etc.

111. Iraq also argues that Iran inappropriately used international market prices for crops in calculating the value of the alleged damage. According to Iraq, local producer prices are more appropriate for this purpose.

112. In the first "F4" report, the Panel noted that there was evidence in the scientific literature that emissions from the oil well fires reached some parts of Iran and, accordingly, that it was likely that some airborne pollutants from the oil well fires in Kuwait reached the ground in Iran, mainly through wet deposition.[24]

113. Although Iran has not submitted evidence, such as ground-level monitoring data on SO_2, ozone, and soot levels, to show the nature and extent of pollution in the areas concerned that could have resulted in crop losses, other evidence provided by Iran, including statistical analyses of data on crop yields, remote sensing data, photographic evidence and information from published literature, indicates that there were reductions in the yields of some crops in the Southern Provinces during 1991. In the view of the Panel, these reductions were, at least in part, a direct result of Iraq's invasion and occupation of Kuwait.

114. The Panel considers that the statistical approach used by Iran to quantify the impacts of pollutants from the oil well fires on its crops in 1991 is, in general, reasonable and appropriate. However, the Panel finds that some of Iran's assumptions for estimating the quantities of crop losses are not appropriate. Specifically, the Panel notes that Iran's approach does not take due account of changes in crop yields that may be due to the impacts of pests and diseases. In addition, in calculating its losses, Iran does not make allowance for the fact that certain expenses, such as transportation costs, were reduced or not incurred in 1991 because of the decrease in the crops produced.

115. Taking the above factors into account, the Panel has made the following modifications to Iran's calculations of the quantities of crops lost:

(a) Addition of a variable to Iran's statistical model to account for changes in agricultural productivity over time. Changes in productivity are possible during the 11-year modeling period, and the inclusion of an independent variable in the model to track such changes will enhance the overall accuracy of the estimates of crop losses that are directly attributable to the impacts of pollution from the oil well fires.

(b) Use of the 1991 local producer prices from the Food and Agriculture Organization of the United Nations ("FAO") instead of the market prices from FAO and the Iranian Ministry of Commerce. The local producer prices are the prices that are received by the farmers and do not include market and transportation costs. They therefore more accurately reflect the losses incurred by the agricultural producers.[25]

116. An adjustment has also been made to take account of the fact that part of the loss of production was due to factors unrelated to Iraq's invasion and occupation of Kuwait.

117. These modifications and the adjustment reduce the compensable loss to USD 24,034,892.

118. Accordingly, the Panel recommends compensation in the amount of USD 24,034,892 for this claim unit.

2. Second claim unit – Reduced crop quality

119. Iran seeks compensation in the amount of USD 174,648,879 for losses due to reduced quality of several varieties of agricultural crops in the Southern Provinces in 1991. Iran states that the reduction in the quality of crops produced in the Southern Provinces in 1991 was caused by exposure of crops to pollutants from the oil well fires in Kuwait and the resulting adverse environmental conditions.

120. Iran estimates the alleged reduction in crop quality by comparing crop prices in the Southern Provinces in 1991 with national crop prices. According to Iran, the differences in prices were due to the poor quality of the crops produced in the Southern Provinces. For each crop, Iran calculates the compensation sought for the decreased quality by multiplying the difference between the local and national prices by the quantity produced in 1991.

121. Iraq contends that the use of price indices as the basis for the assessment of loss is not appropriate and argues that Iran does not explain clearly why a reduction in the market price of crops necessarily results from a reduction in the quality of crops. Iraq states that "Iran should have presented information on the actual quantities and value of the produce that could not be sold because of poor quality directly resulting from smoke plume damage".

122. The Panel notes that, although loss in quality could reduce the prices of crops, crop prices can fluctuate for a variety of other reasons related to the economics of supply and demand. Thus the reduction in the prices of crops in the Southern Provinces of Iran during 1991 could have been due to factors unrelated to the oil well fires in Kuwait, such as differences in supply and demand in the different provinces of Iran. In the view of the Panel, an appropriate assessment of loss suffered by Iran as a result of reductions in crop quality can only be made on the basis of a statistical analysis that is capable of controlling for all the supply and demand factors that can affect crop prices. Iran has neither provided such a statistical analysis nor submitted information that provides a sufficient basis for the Panel to make such an analysis.

123. The Panel, therefore, concludes that the evidence presented is not sufficient to establish the extent of loss due to a reduction in the quality of the specified crop varieties in the Southern Provinces. Consequently, Iran has failed to meet the evidentiary requirements for compensation as specified in article 35(3) of the Rules.

124. Accordingly, the Panel recommends no compensation for this claim unit.

3. Third claim unit – Long-term monitoring and assessment project

125. Iran seeks compensation in the amount of USD 50,000,000 for a long-term monitoring and assessment project to ascertain damages to its agricultural resources.

126. Iran claims that because of the pollutants from the oil well fires in Kuwait, its agriculture could suffer long-term losses as a result of damage to the soil from the deposition of heavy metals (such as vanadium, cadmium and lead), soot and hydrocarbons. Iran points out that some of the hydrocarbons, such as polycyclic aromatic hydrocarbons, are very toxic. Iran further states that these compounds will not only harm plant growth but will also disturb soil microbiology, killing many micro-organisms (such as Rhizobium and Mycorrhizae) and that this will result in lower soil fertility and reduced sustainability in crop production.

127. Although Iran was requested to submit details of the proposed project, such as a description of the objectives, proposed research methods and work schedule, it failed to provide the requested information.

128. The Panel, therefore, concludes that Iran has not submitted sufficient evidence to link the proposed programme to Iraq's invasion and occupation of Kuwait or to justify the claimed costs of the project. Consequently, Iran has failed to meet the evidentiary requirements for compensation as specified in article 35(3) of the Rules.

129. Accordingly, the Panel recommends no compensation for this claim unit.

4. Recommended award

130. The Panel's recommendations in respect of claim No. 5000286 are summarized in table 2.

Table 2. Recommended award for claim No. 5000286

Claim unit	Amount claimed (USD)	Amount recommended (USD)
Reduced crop yields	217,247,112	24,034,892
Reduced crop quality	174,648,879	nil
Long-term monitoring and assessment project	50,000,000	nil
Total	441,895,991	24,034,892

C. Claim No. 5000301 – Fisheries resources

131. Claim No. 5000301 is a claim for compensation for losses incurred by the Iranian Fisheries Company ("IFC")[26], due to decreases in fisheries production and a delay in the implementation of a fisheries-related project as a result of Iraq's invasion and occupation of Kuwait.[27] The claim comprises four claim units with an asserted value of USD 161,000,000. The first claim unit is for a decrease in fish catches; the second claim unit is for a decrease in catches in the Bushehr shrimp fishery; the third claim unit is for expenses incurred as a result of the delay in a project with FAO and

the United Nations Development Programme ("UNDP"); and the fourth claim unit is for long-term damage to the marine environment and fisheries.

132. As indicated at paragraph 79 of the second "F4" report, the Panel transferred a part of Iran's claim No. 5000379 relating to its inability to realize fishing production increases from a proposed fisheries development project to a future instalment. The Panel considered that this part of the claim was for depletion of or damage to natural resources. The deferred part of claim No. 5000379 has been included in claim No. 5000301.

133. Iran states that its marine resources were exposed to pollution resulting from Iraq's invasion and occupation of Kuwait, and that the pollution resulted in reductions in fisheries production, especially in the Bushehr and Khuzestan provinces of Iran. Iran also claims that the invasion and occupation caused a delay in the implementation of a fisheries project and that the delay caused financial loss to the IFC.

134. Iraq states that Iran has not provided sufficient evidence to demonstrate that oil pollution in Iranian waters as a consequence of the conflict affected Iranian fisheries resources. It argues that the entire claim is unjustified because no loss has been demonstrated, and it is unreasonable because the information on costs provided by Iran is incomplete and flawed.

1. First claim unit – Decrease in fisheries catches

135. Iran seeks compensation in the amount of USD 31,200,000 for losses incurred by the IFC due to decreases in catches of all fisheries species, including shrimp, in Khuzestan province from 1993 to 1995, and decreases in catches of all species other than shrimp in Bushehr province from 1992 to 1994. Iran states that the oil spills resulting from Iraq's invasion and occupation of Kuwait affected the marine habitats and marine organisms at the initial stages of their life cycle. Iran submitted the results of several studies intended to demonstrate these impacts and to evaluate their effects on fish production.

136. In order to estimate the reduction in catches, Iran compares catch levels for the periods covered by the claim with the catch levels in baseline years. The baseline years selected by Iran are 1992 for Khuzestan and 1990 for Bushehr. Iran then calculates the monetary value of the losses by multiplying the quantities of decreased catches by the average market prices of the relevant fisheries species.

137. Iran concedes that certain factors unrelated to Iraq's invasion and occupation of Kuwait could have contributed to the reduction in catches during the claim periods. These factors include restrictions on trawl fishing from 1991 followed by its total prohibition in 1993; the imposition of seasonal restrictions on fishing of certain commercially important species; and the standardization of gill net mesh size for various species. However, Iran contends that the bulk of the losses were due to effects of the invasion and occupation.

138. Iraq questions the alleged causal link between decreases in catches and the 1991 oil spills. According to Iraq, other factors unrelated to the invasion and occupation of Kuwait, especially over-fishing, were responsible for any decreases in fish and shrimp catches.

139. As the Panel stated in the first "F4" report, there is evidence that the oil spills resulting from Iraq's invasion and occupation of Kuwait contaminated some of Iran's marine environment. However, the evidence provided by Iran is not sufficient to demonstrate either that there were reductions in the catches of several fisheries species referred to in the claim or that any reductions were the direct result of the contamination from the oil spills. In the view of the Panel, the data on catches provided by Iran are too limited and do not provide an appropriate basis for determining the baseline levels of catches or what proportion of the catch losses, if any, can reasonably be attributed to the effects of the invasion and occupation. Consequently, Iran has failed to meet the evidentiary requirements for compensation as specified in article 35(3) of the Rules.

140. Accordingly, the Panel recommends no compensation for this claim unit.

2. Second claim unit – Decrease in Bushehr shrimp catches

141. Iran seeks compensation in the amount of USD 19,800,000 for losses incurred by the IFC due to decreases in shrimp catches in Bushehr province between 1992 and 1995 as a result of Iraq's invasion and occupation of Kuwait. The basis of the claim and the evidence provided to support it are similar to those provided in respect of the first claim unit. IFC estimates its losses in shrimp production by comparing the shrimp catches in 1992 to 1995 with the catches for the baseline period which it determines to be 1989 and 1990.

142. Iran concedes that factors unrelated to Iraq's invasion and occupation of Kuwait, such as pressure on stocks due to an increase in shrimp trawler activity and illegal shrimp catching, could have contributed to the reduction in shrimp catches, but it asserts that only 25 per cent of the reduction is attributable to these other factors. Accordingly, Iran states that the remaining 75 per cent of the losses, amounting to 6,000 tonnes of shrimp, resulted from Iraq's invasion and occupation of Kuwait.

143. Iran calculates the monetary value of the losses by multiplying part of the losses in catches by an estimated export market price, and part of the losses by local market prices. Iran states that its calculation is based on the assumption that 40 per cent of the lost catches would have been exported and sold at a higher price than the prices obtainable in the local market.

144. Iraq states that Iran has not provided sufficient proof that the alleged decrease in shrimp catches is due to the 1991 oil spills. According to Iraq, over-fishing by shrimp trawlers is likely to have had the highest impact on shrimp catches.

145. In respect of this claim unit as well, the Panel finds that, although there is evidence that the oil spills resulting from Iraq's invasion and occupation of Kuwait caused some contamination of Iran's marine environment, Iran has not provided sufficient evidence to demonstrate that this contamination was the cause of the reduction in shrimp catches in the Bushehr Province between 1992 and 1995. In

particular, the data on shrimp catches provided by Iran are too limited and do not provide an adequate basis for determining the baseline levels of shrimp catches or what proportion of the reduction in catches, if any, can reasonably be attributed to the effects of the invasion and occupation. Consequently, Iran has failed to meet the evidentiary requirements for compensation as specified in article 35(3) of the Rules.

146. Accordingly, the Panel recommends no compensation for this claim unit.

3. Third claim unit – Project with FAO/UNDP

147. Iran seeks compensation in the amount of USD 10,000,000 for losses incurred by IFC following a delay in the implementation of a joint fisheries project with FAO and UNDP. The claim unit is for loss in fish catch caused by the delay as well as project expenses incurred during the period of the delay.

148. This claim unit was deferred from the second instalment of "F4" claims.[28]

149. Iran states that Iraq's invasion and occupation of Kuwait resulted in the delay of the joint project for seven months due to insecurity in the region during the period of the invasion and occupation. According to Iran, the delay resulted in the loss to IFC of an amount of approximately USD 8,170,000 for lost fish catches and an amount of approximately USD 1,830,000 for project expenses incurred during the period of the delay.

150. Iran estimates the total reduction in fish catches as a result of the delay in the implementation of the joint project at 6,125 tonnes, and computes the value of the loss by multiplying this amount with the estimated market price per kilogram of fish. According to Iran, the claim for project expenses relates to "expenses due to amortization of equipment and devices, repairs and keeping of bouyants, administrative and staff costs during the postponed period".

151. In support of this part of the claim, Iran has provided a copy of the joint project contract between IFC and FAO/UNDP as well as a copy of a letter issued in 1997 regarding the assessment of damage due to the delay in the project. However, Iran states that IFC is unable to provide any contemporaneous evidence of the delay in the implementation of the joint project.

152. Iraq states that Iran has failed to prove either that the alleged delay in the implementation of the joint project was caused by the conflict or that the delay resulted in any commercial loss to IFC.

153. The Panel finds that the evidence provided to support this claim unit is not sufficient to demonstrate the circumstances of the loss claimed. In particular, sufficient evidence has not been provided either of the alleged delay in the implementation of the joint project with FAO/UNDP as a direct result of Iraq's invasion and occupation of Kuwait or of any losses that arose from the delay. Consequently, Iran has failed to meet the evidentiary requirements for compensation as specified in article 35(3) of the Rules.

154. Accordingly, the Panel recommends no compensation for this claim unit.

4. Fourth claim unit – Long-term damage to marine environment and fisheries

155. Iran seeks compensation in the amount of USD 100,000,000 for losses incurred by IFC due to long-term damage to the marine environment and fisheries resources of Iran as a result of Iraq's invasion and occupation of Kuwait. The amount claimed is to compensate for seed reduction as a result of the loss of mangrove cover (USD 23,000,000); damage to coral reefs (USD 17,000,000); reduction in fisheries resources (USD 25,000,000); and the expenses of programmes for the rehabilitation of fisheries resources (USD 35,000,000). The rehabilitation of fisheries resources consists of the installation of artificial reefs; breeding and release of shrimp to rehabilitate stocks; implementation of a programme to reduce the number of industrial trawlers as from 1993; rehabilitation of coral reefs; research and monitoring of shrimp stocks; and research and monitoring of demersal fish stocks.[29]

156. The first part of the claim is for seed reduction due to an estimated 35 per cent decrease in mangrove cover in the Nayband Bay mangrove forest, caused by oil spills resulting from Iraq's invasion and occupation of Kuwait. Iran states that the reduction, equivalent to a decrease of 166.3 hectares of mangrove area, resulted in a loss of breeding ground for various species as well as a nursery ground for about 6,000,000 fish larvae. Iran applies a mean population figure of 35,000 larvae per hectare in estimating the total quantity of fish lost by IFC.

157. The evidence provided by Iran to support its claim that there was a reduction in mangrove cover includes remote-sensing evaluation of cover change, analysis of tree enzyme changes, benthic community analysis and chemical analysis of total petroleum hydrocarbons ("TPH") and heavy metals.[30]

158. In respect of the claimed loss of coral reefs, Iran has provided remote-sensing evaluation of changes in the coral reef cover; sedimentation rate analysis; chemical analysis of heavy metals, TPH and polycyclic aromatic hydrocarbons; and a study on coral reef growth bands.[31]

159. Iraq contends that Iran has failed to prove long-term damage to mangroves, coral reefs or fisheries. Iraq also argues that Iran has failed to substantiate the amount claimed. Furthermore, Iraq contends that some of these losses have already been claimed in claim No. 5000288.

160. The Panel finds that, although there is evidence that parts of Iran's marine environment were exposed to the oil spills resulting from Iraq's invasion and occupation of Kuwait, Iran has not provided sufficient evidence either to demonstrate the nature of the alleged long-term damage to the marine environment and fisheries, or to show that any such damage is a direct result of the oil spills resulting from the invasion and occupation. Iran has neither fully explained the nature of the losses nor distinguished them from other similar losses for which it claims compensation in other claim units of this claim or in its other claims. The Panel also finds that there is insufficient evidence to quantify damage to mangroves and coral reefs, if any, that can be attributed directly to Iraq's invasion and occupation of Kuwait.[32] In the circumstances, the Panel does not find that there is any justification for any rehabilitation programmes. Consequently, Iran has failed to meet the evidentiary requirements for compensation as specified in article 35(3) of the Rules.

161. Accordingly, the Panel recommends no compensation for this claim unit.

5. Recommended award

162. The Panel's recommendations in respect of claim No. 5000301 are summarized in table 3.

Table 3. Recommended award for claim No. 5000301

Claim unit	Amount claimed (USD)	Amount recommended (USD)
Decrease in fisheries catches	31,200,000	nil
Decrease in Bushehr shrimp catches	19,800,000	nil
Project with FAO/UNDP	10,000,000	nil
Long-term damage to marine environment and fisheries	100,000,000	nil
Total	161,000,000	nil

D. Claim No. 5000288 – Other resources

163. Claim No. 5000288 comprises six claim units, with a total asserted value of USD 7,916,024,475, for losses resulting from Iraq's invasion and occupation of Kuwait. This amount represents a decrease in the compensation claimed, reflecting amendments made by Iran based on information obtained from its monitoring and assessment activities.[33]

164. On 13 August 2003, the secretariat transferred a part of claim No. 5000456 in the fourth "F4" instalment and assigned it to claim No. 5000288.

165. The first claim unit is for damage to or depletion of terrestrial resources in Iran caused by the presence of refugees who departed from Iraq or Kuwait during the period 2 August 1990 to 2 March 1991.

166. The second claim unit is for damage to or depletion of terrestrial and agricultural resources in Iran caused by contamination from the oil well fires in Kuwait.

167. The third claim unit is for damage to cultural heritage resources in Iran caused by contamination from the oil well fires.

168. The fourth claim unit is for damage to or depletion of marine resources in Iran caused by:

(a) The oil spills in the Persian Gulf; and

(b) Pollutants from the oil well fires.

169. The fifth claim unit is for monitoring of groundwater resources in Iran to identify and assess damage by pollutants from the oil well fires.

170. The sixth claim unit is for claim preparation costs.

1. First claim unit – Terrestrial resources damaged by refugees

171. Iran seeks compensation in the amount of USD 1,541,408 for loss of rangeland resources and USD 654,420 for loss of forest resources resulting from the presence in Iran of refugees who departed from Iraq or Kuwait between 2 August 1990 and 2 March 1991 as a result of Iraq's invasion and occupation of Kuwait.

172. Iran states that 89,256[34] refugees who departed Iraq or Kuwait entered Iran after 2 August 1990. Iran asserts that the presence of these refugees and their livestock caused massive damage to Iran's rangeland and forest resources, including loss of vegetation and soil erosion as well as reduced yields of food, fibre and medicinal products and other raw materials.

173. Iraq states that Iran has not provided any evidence to prove the magnitude of damage or the period over which the damage occurred.

174. The Panel notes that there is evidence in the published literature that a considerable number of refugees entered Iran after departing from Iraq or Kuwait during the period 2 August 1990 to 2 March 1991 specified in paragraph 34 of Governing Council decision 7. The Panel also notes that there is evidence that the presence of the refugees resulted in damage to or depletion of rangeland areas that are the subject of this claim. The Panel, therefore, finds that the damage is a direct result of Iraq's invasion and occupation of Kuwait in accordance with paragraph 16 of Security Council resolution 687 (1991) and Governing Council decision 7.

(a) Damage to or depletion of rangelands

175. Iran calculates the claimed amount of USD 1,541,408 by multiplying an ecological service value for rangelands of USD 232 per hectare by 6,644 hectares, which is the area of rangelands estimated to have been damaged or depleted by the presence of refugees.[35] Iran bases its computation on the assumption that 100 per cent of this area suffered a complete loss of ecological services for a period of one year.

176. Iraq states that the arrival of the refugees in Iran was caused by factors other than the invasion and occupation. Further, Iraq asserts that Iran has not submitted evidence of remaining damage as a result of the presence of refugees and their livestock. Iraq contends that any degradation was caused by other factors, such as overgrazing and unsustainable land use. Iraq also asserts that the method used by Iran to value the loss of ecological services is inappropriate.

177. The Panel considers that Iran has overestimated the total area of rangelands that could have been damaged or depleted by the presence of refugees. In the view of the Panel, the evidence shows that the total area damaged is not more than 220 hectares. In addition, only limited information is provided about the conditions in the areas involved prior to Iraq's invasion and occupation of Kuwait, and on the numbers of refugees and livestock that entered Iran. Furthermore, Iran's estimates do not take account of damage that was due to factors unrelated to the invasion and occupation, such as uncontrolled livestock grazing.

178. Taking these factors into consideration, the Panel has developed an estimate of the value of Iran's losses based on the prices of fodder during the relevant periods of loss. The Panel has also taken account of the following:

(a) Reduction of the total area damaged from 6,644 hectares to 220 hectares;

(b) The limited baseline information about the conditions of the rangeland areas prior to Iraq's invasion and occupation of Kuwait;

(c) The limited data on the numbers of refugees that came into the areas after departing from Iraq or Kuwait between 2 August 1990 and 2 March 1991; and

(d) The fact that some of the damage was due to factors unrelated to Iraq's invasion and occupation of Kuwait.

179. The Panel's valuation of the compensable loss is USD 46,596.

180. The Panel considers that this amount constitutes appropriate compensation for damage to or depletion of natural resources, in accordance with paragraph 35(e) of Governing Council decision 7.

181. Accordingly, the Panel recommends compensation in the amount of USD 46,596 for this part of the first claim unit.

(b) Damage to or depletion of forests

182. Iran calculates the claimed amount of USD 654,420 for forests damaged or depleted by the presence of refugees by multiplying an ecological service value for forests of USD 780 per hectare, by 839 hectares, which is the area of forests estimated to have been damaged or depleted by the presence of refugees.

183. The Panel does not consider that the evidence provided by Iran is sufficient to demonstrate the amount and circumstances of the claimed loss. In particular, there is insufficient evidence to show that the refugees referred to in this part of the claim unit were among those refugees who departed from Iraq or Kuwait during the period 2 August 1990 to 2 March 1991, as stipulated in paragraph 34 of Governing Council decision 7. Consequently, Iran has failed to meet the evidentiary requirements for compensation as specified in article 35(3) of the Rules.

184. Accordingly, the Panel recommends no compensation for this part of the first claim unit.

2. Second claim unit – Terrestrial and agricultural resources damaged by oil well fires

185. Iran seeks compensation in the amount of USD 4,714,349,378 for losses due to adverse impacts on its terrestrial and agricultural resources of the pollutants from the oil well fires in Kuwait resulting from Iraq's invasion and occupation of Kuwait. The adverse impacts include:

(a) Reduction in the production of rangeland forage;

(b) Damage to or depletion of forestry resources;

(c) Increased morbidity and mortality of livestock and poultry, reduction in livestock and poultry production, and quarantine and vaccination costs; and

(d) Loss of production of medicinal plants.

186. Iraq contends that the estimates of impacted areas, damage percentages and duration of damage on which Iran bases its claim are invalid and unsubstantiated. In particular, Iraq asserts that remote-sensing data do not indicate a significant change in rangeland biomass beyond 1991. Iraq further states that Iran has not accounted for factors unrelated to the invasion and occupation, such as overgrazing and over-exploitation of land for agriculture. Iraq further states that, even if pollutants from the oil well fires did reach Iran, they are unlikely to have had a lasting impact on Iran's forestry resources. Iraq contends that there is no bioaccumulation data or other evidence to prove that the smoke plumes caused losses in production of livestock or poultry. Furthermore, Iraq contends that Iran has not proved that the smoke plume caused any loss of medicinal plants, and that parallel causes of damage were not considered.

187. As previously noted by the Panel, there is evidence that contamination from the oil well fires in Kuwait reached some parts of Iran.[36] However, Iran has not provided sufficient information for the Panel to determine the extent to which factors unrelated to Iraq's invasion and occupation of Kuwait might have contributed to the claimed reduction in rangeland forage production. In addition, there is insufficient information to support Iran's estimates of the degree and duration of damage to forests, or the areas of forests that were damaged.

188. With regard to the claimed losses in livestock and poultry production and quarantine and vaccination costs, the Panel finds that Iran has not provided sufficient information to demonstrate losses and costs. In particular, no information has been provided on the levels of pollutants to which the animals were exposed, which is an important indicator for quantifying and assessing possible impacts on animal health. Further, Iran has not provided the information necessary to distinguish the impacts of pollution from the oil well fires from the impacts of other factors that normally affect livestock and poultry populations, such as disease.

189. With regard to the claimed loss for reduced production of medicinal plants, the Panel considers that the information submitted is not sufficient to enable it to determine what proportion, if any, of the damage is directly attributable to Iraq's invasion and occupation of Kuwait, as opposed to other potential causes such as, for example, changes in demand for medicinal plants.

190. The Panel, therefore, concludes that Iran has not provided sufficient evidence to demonstrate the circumstances and amount of the losses claimed. Consequently, Iran has failed to meet the evidentiary requirements for compensation as specified in article 35(3) of the Rules.

191. Accordingly, the Panel recommends no compensation for this claim unit.

3. Third claim unit – Cultural heritage resources

192. Iran seeks compensation in the amount of USD 900,000,000 for the cost of future remediation of damage to cultural heritage resources in Iran caused by pollution from the oil well fires in Kuwait resulting from Iraq's invasion and occupation of Kuwait.

193. In the first "F4" instalment, Iran was awarded compensation, inter alia, for nine studies to determine the extent of deterioration of specified outdoor and indoor cultural heritage property and sites in Iran caused by pollutants from the oil well fires in Kuwait. However, the present claim is for damage to cultural heritage property and sites in all areas of Iran.

194. Iran proposes to consolidate, clean and protect archaeological sites and objects in Iran that were damaged by pollution from the oil well fires. Iran also proposes to train cultural heritage staff, although it does not give details of the training to be provided.

195. Iran bases its calculation of the amount sought on the costs of conservation work on 10 cultural monuments and sites in Iran.[37] According to Iran, the work to be carried out in the 10 sites represents approximately a third of the work proposed for the contaminated heritage areas. Iran therefore multiplies the estimated costs of the work at these 10 sites by a factor of approximately three to arrive at the compensation amount that it seeks.

196. According to Iran, the purpose of the claim is to address the impacts of air pollution resulting from the oil well fires in Kuwait on its archaeological sites and objects. The information provided by Iran suggests that the claim is for surface blackening and chemical deterioration. Iran states that the oil well fires in Kuwait produced massive air pollution that spread to all the surrounding regions. Iran asserts that its territory was among the most affected by the air pollution, especially the provinces of Khuzestan, Bushehr, Isfahan, Fars, Kerman, Sistan, Baluchistan, Ilam and Yadz in the southern part of the country.

197. Iran asserts that dry and wet depositions of dangerous pollutants, including rains rich in salt, have greatly increased the potential of chemical deterioration to cultural artefacts and sites in its territory. According to Iran, average winds in Kuwait are from the northwest, frequently turning south, south-west on rainy days. As a result, smoke plumes from the burning oil wells in Kuwait were transported to the Iranian basin and affected cultural and natural heritage artefacts and sites in the basin.

198. Iran relies on the results of studies funded by awards in the first instalment of "F4"claims to support its claim.[38] Iran also submitted 133 photographs of cultural heritage monuments and objects, five of which were taken in 1991.

199. Iran states that it conducted a literature survey and examined existing publications, documents and reports concerning air pollution in Iran during the burning of the oil wells and subsequent years. Although Iran provided citations for these documents, it did not submit the cited documents.

200. Iran also relies on the results of an air pollution modelling programme that it conducted to investigate the physical processes related to the transport, dispersion and deposition of the pollutants emitted in the atmosphere from the oil well fires. According to Iran, the air pollution modelling programme combined meteorological pre-processors, an emission processor and dispersion/deposition models to calculate primary pollutant concentrations and to investigate the deposition of particulates (soot and sulphates) onto the Iranian basin.

201. Iran estimates that up to 37 per cent of the polluting substances, including saline compounds, from the oil well fires in Kuwait were deposited on its territory. Iran states that, due to the prevailing wind directions, most of this pollution was in south and south-west Iran, where a great number of archaeological sites are located.

202. Iraq contends that Iran has failed to meet the evidentiary standard required to establish this claim. In the first place, Iraq challenges Iran's claim that smoke from the oil well fires reached cultural heritage sites in Iran. Secondly, Iraq states that Iran's assessment of pollutant deposition is unreliable because of its use of inappropriate models, the paucity and inaccuracy of some of the data used and the poor interpretation of the data by Iran. According to Iraq, Iran uses inconclusive photographic evidence and eyewitness accounts to assess the extent of damage to cultural resources. Iraq contends that these factors are confounded by Iran's history of poor protection of cultural heritage artefacts, and extensive cleaning programmes that have occurred in the period between the oil well fires and the conduct of the monitoring and assessment programmes by Iran.

203. Iraq also contends that much of the damage was due to factors unrelated to the invasion and occupation of Kuwait. Iraq states, in particular, that air pollution from vehicle emissions, especially in urban areas, refinery operations, and industrial emissions currently pose a more significant problem to cultural heritage artefacts in Iran.

204. With regard to damage from surface blackening of cultural heritage monuments, the Panel finds that Iran does not clearly describe or identify the nature and extent of the damage to the cultural heritage artefacts and sites that are the subject of the claim. The Panel also finds that Iran has not presented sufficient evidence identifying the specific locations, materials, and the extent of contamination of the cultural heritage sites that it claims were damaged in 1991 and subsequently cleaned, or any other sites that currently remain contaminated. The Panel further notes that, although black crust formation is shown in some locations and identified by chemical analysis, no link has been established between the crust formation and the oil well fires.

205. While the Panel finds that some deposition of pollutants from the oil well fires in Kuwait occurred in some parts of the territory of Iran, it is not able, on the basis of the evidence available, to estimate the quantity of pollutants that came into contact with cultural heritage artefacts and sites. Iran provides chemical analyses of samples taken from cultural heritage artefacts and sites which suggest contact with particulate matter and hydrocarbons, but they are not sufficient to enable the Panel to determine the time of contact or the origin of the particulate matter. Moreover, the evidence presented does not enable the Panel to draw any conclusions about the nature and extent of deterioration that could have been the result of contact with the particulate deposition. Finally, the Panel notes that

other factors, such as local sources of pollution from motor vehicle emissions, regional oil refining, and human occupation of historic sites could have contributed to the deterioration of the cultural heritage artefacts and sites.

206. In the view of the Panel, Iran has not provided sufficient evidence to establish a direct link between the alleged damage to its cultural heritage and Iraq's invasion and occupation of Kuwait. Consequently, Iran has failed to meet the evidentiary requirements for compensation as specified in article 35(3) of the Rules.

207. Accordingly, the Panel recommends no compensation for this claim unit.

4. Fourth claim unit – Marine resources

208. Iran seeks compensation in the amount of USD 2,293,923,269 for damage to or depletion of its marine resources resulting from the oil spills in the Persian Gulf and pollutants from the oil well fires in Kuwait. The claim relates to damage to shoreline areas, wetlands, mangroves, intertidal and subtidal areas and coral reefs.[39]

209. In support of this claim unit, Iran has submitted information, including oil spill tracking (through remote-sensing analyses and oil transport and fate models), analyses of spatial gradients of contamination, evaluations of depth gradients in contamination, fingerprinting analyses, citations to international investigations of marine pollution in Iran, references to newspaper reports and interview data.

210. Iraq argues that Iran has failed to provide any conclusive evidence to show that the oil on its coastline (or any ascertainable proportion of the oil) came from the 1991 spills. According to Iraq, there are many other potential sources of oil pollution in the Gulf that can equally well, or even better, explain the presence of oil on the Iranian coast.

211. As noted by the Panel in the first "F4" report, there is evidence that Iran's marine environment was exposed to some of the oil spills in the Persian Gulf resulting from Iraq's invasion and occupation of Kuwait.[40] The Panel has previously found that damage caused to Iran's marine environment by those oil spills would constitute environmental damage that is compensable in accordance with paragraph 16 of Security Council resolution 687 (1991).

212. However, in the view of the Panel, although some contamination of Iran's marine resources might be attributable to the oil spills or the oil well fires resulting from Iraq's invasion and occupation of Kuwait, there are other possible major causes of such pollution. These include the 1983 Nowruz oil spill and other events during the Iran-Iraq war; the operation of oil platforms, terminals and oil processing facilities; as well as natural seeps in the Persian Gulf. The evidence submitted by Iran, including chemical and fingerprinting data, is not sufficient to enable the Panel to determine the proportion of damage attributable to Iraq's invasion and occupation of Kuwait and what proportion is attributable to any of the other potential causes.

213. The Panel, therefore, finds that Iran has not provided sufficient evidence to demonstrate the circumstances and the amount of the losses claimed. Consequently, Iran has failed to meet the evidentiary requirements for compensation as specified in article 35(3) of the Rules.

214. Accordingly, the Panel recommends no compensation for this claim unit.

5. Fifth claim unit – Monitoring of groundwater resources

215. Iran seeks compensation in the amount of USD 1,056,000 for expenses of proposed measures to collect and analyse samples from springs, wells, qanats and rivers that have been damaged by contamination from the oil well fires in Kuwait.

216. Iran presented evidence intended to show that some pollutants from the oil well fires in Kuwait reached parts of its territory. Iran also presented the results of studies, including near-infrared satellite imagery and data on black rain, which it conducted to show that pollutants from the oil well fires in Kuwait affected groundwater resources in Iran.

217. Iraq states that Iran has failed to demonstrate that there is a direct causal link between the alleged damage to its groundwater resources and airborne pollutants or contaminated rain resulting from the oil well fires in Kuwait.

218. As previously noted by the Panel, there is evidence that pollutants from the oil well fires reached some parts of Iran. Data provided by Iran, including near-infrared satellite imagery and data on black rain, suggest that some of the pollutants were deposited in south-western Iran.

219. However, the evidence submitted by Iran in support of this claim unit is not sufficient to enable the Panel to determine the nature and purpose of the proposed monitoring programme, the appropriateness of the methods to be used or the reasonableness of the costs to be incurred. In the absence of such information, the Panel is unable to determine whether the proposed monitoring activities would constitute reasonable monitoring and assessment in accordance with paragraph 35(c) of Governing Council decision 7.

220. The Panel, therefore, finds that Iran has failed to meet the evidentiary requirements for compensation as specified in article 35(3) of the Rules.

221. Accordingly, the Panel recommends no compensation for this claim unit.

6. Sixth claim unit – Claim preparation costs

222. Iran seeks compensation in the amount of USD 4,500,000 for administrative, technical and legal expenses of the preparation of this claim. The Panel considers that this claim unit is for claim preparation costs.

223. In a letter dated 6 May 1998, the Executive Secretary informed all panels of Commissioners that the Governing Council intends to resolve the issue of the compensability of claims preparation costs in the future.

224. The Panel, therefore, makes no recommendation in respect of this claim unit.

7. Recommended award

225. The Panel's recommendations in respect of claim No. 5000288 are summarized in table 4.

Table 4. Recommended award for claim No. 5000288

Claim unit	Amount claimed (USD)	Amount recommended (USD)
Terrestrial resources (refugees)	2,195,828	46,596
Terrestrial and agricultural resources (oil well fires)	4,714,349,378	nil
Cultural heritage resources	900,000,000	nil
Marine resources	2,293,923,269	nil
Monitoring of groundwater resources	1,056,000	nil
Claim preparation costs	4,500,000	-
Total	7,916,024,475	46,596

E. Claim No. 5000287 – Public health

226. Claim No. 5000287 comprises five claim units, with an asserted value of USD 2,571,509,483, for losses due to the presence of refugees who entered Iran after departing from Iraq or Kuwait between 2 August 1990 and 2 March 1991 and the effects of the oil well fires in Kuwait. This amount represents an increase in the compensation claimed, reflecting amendments made by Iran based on information obtained from its monitoring and assessment activities.[41]

227. The first claim unit is for costs incurred by Iran to provide medical treatment and public health facilities to 144,048 refugees who entered Iran after departing from Iraq or Kuwait between 2 August 1990 and 2 March 1991. The second claim unit is for costs incurred to provide additional medical treatment and services to the general population of Iran as a result of an increase in the number of cases of a range of diseases resulting from the exposure of the general population to pollutants from the oil well fires in Kuwait. The third claim unit is for medical treatment expenses and economic losses due to an increase in the number of cases of respiratory diseases in children. The fourth claim unit is for medical treatment costs and economic losses due to an increase in the number of cases of post-traumatic stress disorder ("PTSD") and panic disorder as a result of Iraq's invasion and occupation of Kuwait. The fifth claim unit is for claim preparation costs.

228. On 14 April 2004, Iran submitted a proposal to amend Claim No. 5000287 by, inter alia, introducing three new claim units. The first proposed claim unit, in the amount of USD 2,159,326,

was for costs incurred to strengthen the health care system in certain Iranian provinces. The second proposed claim unit, in the amount of USD 17,254,532, was for costs incurred to implement a "malaria control emergency campaign" in Iran following the influx of refugees after 2 August 1990. The third proposed claim unit, in the amount of USD 4,606,514, was for "other costs", including administrative expenses, expenses incurred in the relocation and evacuation of refugees to medical centres and hospitals, and what Iran describes as "negative externalities".

229. By Procedural Order No. 5, dated 27 September 2004, the Panel stated that it did not accept the amendments proposed by Iran. The Panel noted that the evidence available indicated that Iran was aware of the factual basis for each of the proposed claim units before the expiry of the deadline for filing environmental claims on 1 February 1998, and the deadline for filing unsolicited information for the fifth "F4" instalment on 15 January 2002. Iran, therefore, could have included these claim units in the submissions that it filed within these deadlines.

1. First claim unit – Medical treatment and public health facilities for refugees

230. Iran seeks compensation in the amount of USD 5,639,273 for losses suffered as a result of the influx of refugees into its territory between 2 August 1990 and 2 March 1991. Iran states that 144,048 refugees departed from Iraq or Kuwait and entered its western provinces[42] during that period.

231. Iran further states that it incurred expenses in providing medical treatment and public health facilities to the refugees, and seeks compensation for those expenses. The expenses were for providing: (a) medical treatment of disease and illness; (b) vaccinations; (c) family planning services; (d) water and sanitation facilities and services; and (e) overtime and other payments to medical and support personnel.

232. In support of this claim unit, Iran submitted the results of a study conducted by senior officials of the Ministry of Health and Medical Education. The study was based on documents prepared during Iraq's invasion and occupation of Kuwait which recorded the numbers of refugees who entered Iran between 2 August 1990 and 2 March 1991, the types of treatment and services provided to them, and the costs involved.

233. Iraq contends that Iran has not provided sufficient evidence to support the claim unit, and that the documentation and information provided are inadequate. Iraq, therefore, states that the claim unit should be dismissed.

234. At the direction of the Panel, members of the secretariat and the Panel's expert consultants met with Iran's representatives in Tehran in order to obtain further information to assist with the Panel's assessment of the claim. During the meetings, the members of the secretariat and the Panel's expert consultants reviewed samples of the documents that were used by Iran to develop its claim, including contemporaneous records such as payment ledgers and invoices.

235. The Panel directed the secretariat to undertake cross-claim and cross-category checks to ascertain whether there is a risk of duplication of this claim unit with other claims submitted to the

Commission, and in particular, whether the claim could duplicate the claim submitted by Iran's Ministry of Interior in the sixth instalment of "F1" claims.[43] The secretariat was further instructed to request Iran to provide information on the steps that it had taken to ensure that this claim did not duplicate, wholly or in part, any other claim that it had filed with the Commission. Having reviewed the results of the checks by the secretariat and the response received from Iran, the Panel is satisfied that, although there may be a theoretical risk of duplication of parts of this claim with another claim submitted by Iran to the Commission, the risk is marginal and does not warrant an adjustment.

236. The Panel observes that the numbers of refugees in Iran, provided by Iran in this claim unit, appear to differ from the numbers of refugees provided by Iran in other claims that it has submitted to the Commission.[44]

237. However, the Panel notes that the available literature generally supports the assertion that approximately 145,000 refugees entered Iran between 2 August 1990 and the end of March 1991. In the view of the Panel, a possible reason for the discrepancy in the numbers of refugees provided by Iran in its various claims before the Commission is that different periods were considered in the different claims. For example, in its fourth "F4" instalment terrestrial claim, Iran's Ministry of Jihad-e-Agriculture claimed for refugees who remained in Iran for 58 days between 25 August 1990 and 24 October 1990 whereas, in the claim considered by the "F1" Panel in the sixth "F1" instalment, Iran's Ministry of Interior claimed for costs arising in relation to a group of refugees who entered Iran for approximately one week, commencing from 2 August 1990, and for another group of refugees who entered Iran immediately after 15 January 1991. Another possible reason for the discrepancy in the different numbers is that different methods and sources of data were used to develop the claims, and certain camps might have been included for purposes of one claim but not the others. The Panel, therefore, concludes that each of the estimated numbers of refugees is reasonably accurate and appropriate for the specific purposes of the relevant claim.

238. The Panel finds that the refugees entered Iran after departing from Iraq or Kuwait during the period 2 August 1990 to 2 March 1991 specified in paragraph 34 of Governing Council decision 7. The Panel also finds that Iran incurred costs in providing medical treatment and related public health services to these refugees. Accordingly, the costs incurred by Iran are expenses directly resulting from Iraq's invasion and occupation of Kuwait in accordance with paragraph 16 of Security Council resolution 687 (1991) and Governing Council decision 7. However, the Panel has identified certain shortcomings in the evidence provided by Iran, and therefore has made appropriate adjustments to the amount recommended. These adjustments are set out in paragraphs 243, 248 and 256 below.

(a) Medical treatment for refugees

239. Iran seeks compensation in the amount of USD 96,186 for the provision of medical treatment to refugees, including treatment provided on-site (i.e., ambulatory cases) and treatment provided in hospitals (i.e., hospital cases). The compensation sought is for the costs incurred for 24,794 ambulatory treatments (USD 58,228) and for 898 hospital treatments (USD 37,958) for a range of diseases including, inter alia, respiratory diseases, dysentery, viral hepatitis, skin diseases, streptococcal pharyngitis, anaemia, hypertension and mental disorders.

240. To estimate costs incurred for provision of medical treatment, Iran relies on the annual tariffs of its Ministry of Health and Medical Education, which list the costs for health services provided at the Ministry's facilities.

241. The Panel considers, on the basis of the review of Iran's supporting documents and information provided by senior officials from Iran's Ministry of Health and Medical Education, that the types and numbers of treatments asserted to have been provided are consistent with international practice for refugee health care.

242. However, while the Panel finds that the tariffs of the Ministry of Health and Medical Education are reasonable for calculating treatment costs for the hospital cases, it does not consider that these tariffs are reasonable for calculating treatment costs for ambulatory cases at the refugee camps. Iran has provided no additional information on its calculation of treatment costs for ambulatory cases. Furthermore, Iran does not provide information that would enable the Panel to ascertain whether the costs claimed for ambulatory cases include any personnel costs. The Panel is, therefore, unable to determine whether, and if so to what extent, this part of the claim unit duplicates Iran's claim for overtime and other payments to staff who worked at the refugee camps referred to in paragraph 258 below. Consequently, in respect of this part of the claim unit, Iran has failed to meet the evidentiary requirements for compensation as specified in article 35(3) of the Rules. Accordingly, the Panel recommends no award of compensation for the ambulatory cases.

243. Elimination of the amount of USD 58,228 for ambulatory cases reduces the compensable amount to USD 37,958.

244. Accordingly, the Panel recommends compensation in the amount of USD 37,958 for this part of the first claim unit.

(b) Vaccinations for refugees

245. Iran seeks compensation in the amount of USD 2,596,883 for the costs of 133,536 doses of vaccinations administered to refugees, predominately women and children, at a unit cost of approximately USD 19 per dosage of vaccine. Iran states that it provided a range of vaccinations for diseases, such as tuberculosis, polio, diphtheria, pertussis, tetanus, measles and meningitis.

246. The Panel finds that it was reasonable and prudent for Iran to provide vaccinations to the refugees, and that the types of vaccination provided were consistent with international practice for refugee health care. The Panel further finds that, with some exceptions, the numbers of vaccinations stated to have been administered are consistent with the numbers of refugees given in this claim unit. Appropriate adjustments have been made in the claimed costs to take account of these exceptions.

247. In assessing the reasonableness of the costs claimed for the vaccinations, the Panel considers it appropriate to compare the unit cost per dosage claimed by Iran against the unit cost per dosage for each type of vaccine in the international market in 1990 and 1991. On the basis of this comparison, the Panel has made a further adjustment to the claimed amount.

248. The adjustments reduce the recommended amount to USD 875,300.

249. Accordingly, the Panel recommends compensation in the amount of USD 875,300 for this part of the first claim unit.

(c) Family planning services for refugees

250. Iran seeks compensation in the amount of USD 15,501 for contraceptive services it provided to refugees in five provinces, including birth control pills, condoms, intrauterine devices, vasectomies and tubal ligations.

251. The Panel finds that it was reasonable and prudent for Iran to provide contraceptive services to the refugees, and that the services provided were consistent with international practice for refugee health care. The Panel further finds that the number of refugees to whom Iran claims to have provided contraceptive services is consistent with the refugee population between the ages of 15 and 49, and that the costs claimed are reasonable. The Panel, therefore, finds that it is appropriate to recommend an award of compensation for the full amount requested.

252. Accordingly, the Panel recommends compensation in the amount of USD 15,501 for this part of the claim unit.

(d) Water and sanitation facilities and services for refugees

253. Iran seeks compensation in the amount of USD 1,642,109 for expenses incurred in expanding and improving water and sanitation facilities and services at existing refugee camps and in constructing water and sanitation facilities and providing related services at new camps. Measures taken to improve drinking water facilities included establishing the drinking water supply through a network of piped systems, installing a water reservoir, providing mobile and fixed water tanks and testing drinking water. Sanitation facilities provided included improving water wells and drainage, providing chlorine and disinfectants, constructing latrines and sanitary baths, collecting garbage and spraying insecticide. The compensation sought also includes the costs of preparing educational material on the safe disposal of waste and personal hygiene.

254. The Panel finds that it was reasonable and prudent for Iran to provide safe drinking water and sanitation facilities to the refugees in order to prevent the spread of communicable diseases.

255. In assessing the appropriate compensation for these services, the Panel notes that some of the facilities provided were operational beyond 2 March 1991 and might, therefore, have been used for the benefit of refugees in Iran who were not covered by paragraph 34(b) of Governing Council decision 7; i.e., refugees who departed Iraq or Kuwait after 2 March 1991. The Panel has adjusted the amount claimed to take account of the expenses of the facilities that might not relate to the refugees who departed Iraq or Kuwait between 2 August 1990 and 2 March 1991.

256. The adjustments reduce the recommended amount to USD 1,149,611.

257. Accordingly, the Panel recommends compensation in the amount of USD 1,149,611 for this part of the first claim unit.

(e) Overtime and other payments to medical and support personnel

258. Iran seeks compensation in the amount of USD 1,288,594 for expenses incurred as overtime or standby payments to medical personnel and financial, technical, and administrative staff working at the refugee camps during Iraq's invasion and occupation of Kuwait. Iran asserts that, in order to provide medical and related services to the refugees, staff from other provinces of the country were seconded to the refugee camps, and that these persons were paid per diem allowances to cover their living expenses while away from home. In addition, some of the staff at the refugee camps received overtime or other allowances. Iran states that these were extraordinary expenses that would not have been incurred but for the presence of the refugees.

259. The Panel finds that these expenses were incurred from 2 August 1990 to 2 March 1991. The Panel also finds that all the expenses were incurred as a direct result of Iraq's invasion and occupation of Kuwait.[45] Consequently, the expenses are compensable in accordance with Governing Council decision 7.

260. The Panel, therefore, recommends compensation in the amount of USD 1,288,594 for this part of the first claim unit. This brings the total compensation for this claim unit to USD 3,366,964.

261. Accordingly, the Panel recommends compensation in the amount of USD 3,366,964 for this claim unit.

2. Second claim unit – Medical treatment and health services for the general population

262. Iran seeks compensation in the amount of USD 3,717,688 for expenses incurred in the provision of medical treatment and health services to its general population due to an increase in the number of treatments provided for 13 diseases as a result of exposure to pollutants from the oil well fires in Kuwait.

263. Iran states that the inhabitants in 10 of its western provinces were exposed to pollutants from the oil well fires, such as smoke, black rain, oil mist and other toxic agents, in sufficient quantities to cause an increase in the number of treatments provided for 13 diseases in Iran in 1990 and 1991. The diseases are: respiratory ailments, streptococcal pharyngitis, conjunctivitis, typhoid and paratyphoid, viral hepatitis, skin diseases, anaemia, hypertension, ischemic heart disease, ictus, mental disorders, tuberculosis and malaria.

264. Iran submitted the results of an atmospheric and air quality model that it used to calculate the transport of contaminants from the oil well fires to demonstrate that some of the contaminants reached the territory of Iran. Iran also relies on the results of a study on the transport of pollutants from the oil well fires, using satellite imagery and black rain measurements.[46]

265. Iran claims that it incurred additional costs because it provided more medical treatment than normal in 1990 and 1991 because of the effects of the oil well fires. According to Iran, medical treatment was provided for an additional 414,852 ambulatory cases and 3,278 hospital cases in 1990, and for an additional 597,526 ambulatory cases and 5,388 hospital cases in 1991.

266. To demonstrate that there was an increase in the number of medical treatments provided in the areas of Iran that were affected by the oil well fires, Iran submitted data from the results of a study that was conducted in conjunction with the study referred to in paragraph 232 above. The study was conducted by senior officials of the Ministry of Health and Medical Education, using data obtained from local and provincial health officials on the number and types of treatments provided in 1989, 1990 and 1991 for a range of diseases.

267. Iraq asserts that the only region in Iran that was noticeably affected by pollutants from the oil well fires was Khuzestan. Iraq also states that there is evidence demonstrating that the health effects of the pollutants, even in Kuwait, were insignificant. Iraq argues that, since the oil well fires did not constitute a significant health risk in Kuwait, they would have constituted even less of a risk for populations in other countries. Iraq further argues that, in any event, the oil well fires could not have caused the asserted increase in the number of cases of malaria, tuberculosis, viral hepatitis, and anaemia.

268. Iraq further asserts that Iran does not present sufficient evidence to establish the existence of adverse health effects in Iran, or the number of treatments provided as a result of the increased adverse health effects.

269. As previously noted by the Panel, there is evidence in the scientific literature that the smoke plume from the oil well fires moved over some parts of Iran in 1991.[47] However, Iran has not provided any evidence to demonstrate that there is a causal link between certain of the diseases referred to in the claim, including typhoid, viral hepatitis, anaemia, hypertension, tuberculosis and malaria, and pollution from the oil well fires. The Panel, therefore, finds that Iran has failed to demonstrate that the claimed increase in the number of treatments for these diseases was a direct result of Iraq's invasion and occupation of Kuwait.

270. With regard to acute respiratory diseases and asthma, streptococcal pharyngitis, conjunctivitis, skin diseases, ischemic heart disease, and ictus, the Panel observes that, although these diseases may be associated with air pollution, Iran did not make any allowances for other possible causes, such as population growth, underlying trends in disease rates, changes in lifestyles and habits, and increased air pollution levels resulting from economic and industrial development. Similarly, no allowance was made for other potential causes for the increase in mental disorders among its population.

271. In this regard the Panel observes that, since the oil wells in Kuwait were not ignited until February 1991, any increases in the number of treatments in 1990, with the possible exception of treatments for mental health disorders, could not have been due to the effects of the oil well fires.

272. In the view of the Panel, the evidence available does not provide a sufficient basis for determining the extent to which the effects of the oil well fires might have contributed to the increase in medical treatments in Iran. Consequently, Iran has failed to meet the evidentiary requirements for compensation as specified in article 35(3) of the Rules.

273. Accordingly, the Panel recommends no compensation for this claim unit.

3. Third claim unit – Respiratory effects of the Kuwait oil well fires on children

274. Iran seeks compensation in the amount of USD 72,406,376 for losses suffered as a result of the exposure of sections of its child population to pollutants from the oil well fires in Kuwait. Iran asserts that there was a significant increase in the number of cases of respiratory disease requiring treatment among Iranian children who were exposed to the pollutants.

275. Iran relies on the results of a monitoring and assessment study of pulmonary and respiratory disorders among children (from birth to 12 years old at the time of exposure) to demonstrate the increased treatments for respiratory diseases, and to establish a direct causal link between the increase and pollutants from the oil well fires.[48] During the study, Iranian researchers interviewed 15,162 individuals between the ages of 10 and 24 in 43 cities and in rural areas within seven provinces.

276. According to Iran, the results of the study suggest that children who resided within 200 kilometres of Kuwait at the time of Iraq's invasion and occupation had a greater likelihood of being diagnosed with pulmonary or respiratory disease as compared with those who resided more than 200 kilometres from Kuwait. Iran asserts that the study also shows that children who resided between 200 and 400 kilometres from Kuwait had a slightly greater likelihood of being diagnosed with pulmonary or respiratory disease as compared with those who resided more than 400 kilometres from Kuwait.

277. In total, Iran claims that 3,263 additional cases of respiratory diseases were a direct result of pollutants from the oil well fires. Iran seeks compensation for expenses incurred in treating these additional cases; indirect costs such as transportation costs; costs incurred by caregivers; opportunity costs; and costs of future medical care. Iran also seeks monetary compensation for the reduced well-being of its citizens who suffered from respiratory diseases.

278. Iraq states that of the more than 15,000 children assessed in Iran's monitoring and assessment study, only 74 were diagnosed with pulmonary disease. On this basis, Iraq concludes that Iran has not established that there was an increase in respiratory diseases or that there is a direct causal link between any increase in respiratory diseases in Iran and the oil well fires.

279. The Panel notes that there is evidence that the areas in Iran identified as exposed to the oil well fires were also exposed to other sources of pollution that are unrelated to Iraq's invasion and occupation of Kuwait. These include increased industrial development and other activities that could lead to higher levels of background air pollution and other health risk factors.

280. The Panel concludes that the evidence provided by Iran is not sufficient to link the claimed increase in respiratory diseases in Iran directly to Iraq's invasion and occupation of Kuwait. In

particular, the information available does not provide a basis for determining what proportion of the increase, if any, can reasonably be attributed to the invasion and occupation. Although Iran was requested to provide the full results of its statistical analysis, it did not do so. Consequently, Iran has failed to meet the evidentiary requirements for compensation as specified in article 35(3) of the Rules.

281. Accordingly, the Panel recommends no compensation for this claim unit.

4. Fourth claim unit – Post-traumatic stress disorder and panic disorder cases

282. Iran seeks compensation in the amount of USD 2,489,695,071 for expenses and other losses due to an increase in the number of cases of mental disorders requiring treatment in Iran as a result of Iraq's invasion and occupation of Kuwait. Iran asserts that, following Iraq's invasion of Kuwait and the appearance of the smoke plume from the oil well fires over Iran, residents of the provinces of Khuzestan and Bushehr, who had been previously traumatized by the Iran-Iraq conflict, suffered from a new source of stress.

283. Iran claims that the "stressors" resulting from Iraq's invasion and occupation of Kuwait led to an increase in cases of post-traumatic stress disorder ("PTSD") and panic disorder requiring treatment in Khuzestan and Bushehr. Examples of stressors identified by Iran include: fear of air strikes and chemical contamination, especially after natural resources were contaminated and many blasts of ordnance accompanied by smoke were observed; fear of blast sounds which were frequently heard in Abadan and Khorramshahr; fear of direct chemical or biological attacks; fear of the possibility of missiles of the Allied Coalition Forces accidentally hitting Abadan and Khorramshahr; and fear of possible harm from Iraqi and American aircraft flying over the border zone and Iranian territory that had been attacked during the Iran-Iraq conflict.

284. Iran relies on the results of a monitoring and assessment study on mental health in Iran to demonstrate the increased number of cases of PTSD and panic disorder requiring treatment, and also to establish a direct causal link between this increase and Iraq's invasion and occupation of Kuwait.[49] Iran's monitoring and assessment study consists of four parts: (a) an epidemiological study to identify cases of mental health disorders caused by Iraq's invasion and occupation of Kuwait; (b) a qualitative study to identify the characteristics of exposure zones and potentially affected populations, the nature of mental health problems, and past methods of treatment employed; (c) a clinical trial to assess the cost and efficacy of treatment protocols; and (d) the calculation of costs associated with mental health damages.

285. Iran asserts that the results of the monitoring and assessment study demonstrate that an additional 102,792 people in Khuzestan and Bushehr provinces suffered from PTSD and/or panic disorder as a result of Iraq's invasion and occupation of Kuwait. Iran claims compensation for past expenses incurred in treating these additional cases of PTSD and panic disorder; past indirect costs, including lost income associated with reduced functioning at work, unemployment, days spent by family members providing care, and transportation; and costs of future medical care. Iran also seeks compensation for the value of past and future reduced well-being suffered by individuals with PTSD or panic disorder.

286. Iraq states that Iran has not established that there was a direct causal link between the increase in the number of cases of PTSD and panic disorder requiring treatment. According to Iraq, Iran has not demonstrated that its residents were exposed to the type of traumatic events required for a diagnosis of PTSD as a result of the invasion and occupation of Kuwait.

287. Iraq also comments on the quantification of cases of mental disorders in Iran's monitoring and assessment study. Iraq notes that Iran bases its estimate of the increase in the number of cases of PTSD and panic disorder requiring treatment on a study sample of 2,764 people and then applies the results to the entire population of Khuzestan and Bushehr over 12 years of age in 2003. Iraq asserts that the use of 2003 population data, and the inclusion of people who were infants in 1991, results in an artificially high estimate of the number of cases of PTSD and panic disorder. Iraq states that the percentage of selected samples that were diagnosed with PTSD as a result of screening cannot be extrapolated to a larger population.

288. In the view of the Panel, the results of Iran's monitoring and assessment study do not establish that the increase in the number of cases of PTSD and panic disorder requiring treatment in Iran was a direct result of Iraq's invasion and occupation of Kuwait. The Panel notes that the stressors to which Iran claims the population in the affected areas were subjected are not of the type that would cause PTSD. In this regard, the Panel notes that no combat activity took place in Iran during Iraq's invasion and occupation of Kuwait. The Panel further notes that the zone analysis used by Iran to link cases of PTSD and panic disorder to Iraq's invasion and occupation of Kuwait is not supported by the data that Iran submitted.

289. In the view of the Panel, Iran has not provided sufficient evidence to establish that there was an increase in the number of cases of PTSD and panic disorder requiring treatment in Iran as a direct result of Iraq's invasion and occupation of Kuwait. Consequently, Iran has failed to meet the evidentiary requirements for compensation specified in article 35(3) of the Rules.

290. Accordingly, the Panel recommends no compensation for this claim unit.

5. Fifth claim unit – Claim preparation costs

291. Iran seeks compensation in the amount of USD 51,075 for project implementation costs. The Panel considers that this is a claim for claim preparation costs.

292. As stated in paragraph 223 above, in a letter dated 6 May 1998, the Executive Secretary informed all panels of Commissioners that the Governing Council intends to resolve the issue of the compensability of claims preparation costs in the future.

293. The Panel, therefore, makes no recommendation in respect of this claim unit.

6. Recommended award

294. The Panel's recommendations in respect of claim No. 5000287 are summarized in table 5.

Table 5. Recommended award for claim No. 5000287

Claim unit	Amount claimed (USD)	Amount recommended (USD)
Medical treatment and public health facilities for refugees	5,639,273	3,366,964
Medical treatment and health services for the general population	3,717,688	nil
Respiratory effects of the Kuwait oil well fires on children	72,406,376	nil
Post-traumatic stress disorder and panic disorder cases	2,489,695,071	nil
Claim preparation costs	51,075	-
Total	2,571,509,483	3,366,964

F. Claim No. 5000394 – Monitoring of incidence of cancers

295. Iran seeks compensation in the amount of USD 332,300 for expenses of a proposed monitoring and assessment study to investigate possible links between pollution resulting from Iraq's invasion and occupation of Kuwait and the incidence of cancers and haematological disorders in Iran.

296. Claim No. 5000394 was originally considered by the Panel in the first "F4" instalment.[50] In the first "F4" report, the Panel noted that, for the types of cancers that Iran proposed to study, particularly solid tumour cancers, there was generally a latency period of 15 to 20 years between the time of the initial exposure to a given carcinogen and the first clinical evidence of cancer. Since it was unlikely that significant evidence of increased cancer rates could be identified just 10 years after the release of pollutants resulting from Iraq's invasion and occupation of Kuwait, the Panel directed that this claim be transferred to a later instalment.

297. After the transfer of the claim to the fifth "F4" instalment, Iran submitted a revised study in which it proposes to investigate the impact of petroleum-related and radioactive contaminants resulting from Iraq's invasion and occupation of Kuwait on the incidence of new cancers and haematological disorders in the exposed Iranian population. Iran proposes to retrospectively examine the incidence of cancer in residents of Iran from 1991 to 2003 in order to determine whether a relationship exists between the incidence of cancer and pollution resulting from Iraq's invasion and occupation of Kuwait. Iran states that the modified study will analyse types of cancers that are associated with environmental factors, and which are known to have short latency periods. The revised study is for an amount of USD 332,300, which is less than the amount sought when the claim was discussed in the first "F4" instalment.

298. In support of the claim, Iran relies on a study that compared rates of certain cancers before and after Iraq's invasion and occupation of Kuwait. According to Iran, the study demonstrates that the release of pollutants from the oil well fires, the oil spills and depleted uranium increased carcinogens in the environment, and this led to an increase in cases of leukaemia, lymphoma and carcinoma after 1991.

299. In its proposal for the monitoring and assessment study, Iran states that it will focus on collecting data on a range of cancers in five provinces which it asserts were affected by Iraq's invasion and occupation of Kuwait.[51] Using hospital records in each province as a primary source of data, Iran proposes to register cancer cases that were diagnosed from 1991 through 2003 in all hospitals of the provinces under study in order to conduct two statistical analyses, after making checks for missing or invalid data. The first analysis will involve calculating additional cancer cases arising from the invasion and occupation; the second will involve calculating lost years of life for each additional cancer patient, using the Disability Adjusted Lost Life Year ("DALY") index. Iran estimates that the study will last for one year.

300. Iraq asserts that Iran's claim of increased cancer rates is based on unreliable data which do not meet the minimal requirements of the International Agency for Research on Cancer. This is primarily due to Iran's use of retrospective data. Iraq further asserts that, while Iran states that its study will focus on cancers associated with exposure to some air pollutants, the study proposal does not provide data on dispersion of various chemical substances that could have been released during the invasion and occupation of Kuwait.

301. Iraq also contends that Iran does not provide data demonstrating that exposure of the population to certain chemical substances could be linked to a risk of specific cancers. Iraq asserts that the apparent increases in incidence of cancer demonstrated in Iran's data might be due to biases resulting from the numerous limitations in the methods used for the registration of cancers in Iranian provinces.

302. Iraq also asserts that the study design is flawed and unlikely to produce reliable results. It states that retrospective studies of cancer cases based on hospital records are prone to errors due to changes in the quality and quantity of data and the methods by which they are collected; referrals of patients between hospitals; and variations in the availability of technical facilities for diagnosis.

303. In the view of the Panel, the criteria for evaluating monitoring and assessment activities, as enumerated in the first "F4" report, apply to this claim. In that report, the Panel stated that compensation should not be awarded for monitoring and assessment activities that are purely theoretical or speculative, and that there should be a sufficient nexus between the activity and environmental damage or risk of damage that might be attributed directly to Iraq's invasion and occupation of Kuwait.[52]

304. The Panel has previously noted that there is evidence that parts of Iran experienced the effects of smoke from the oil well fires in Kuwait. Thus, it is possible that some persons in parts of Iran were exposed to carcinogens that were released from the oil well fires.

305. The Panel considers that a study of possible increases in cancer incidence caused by Iraq's invasion and occupation would be appropriate. The Panel notes that Iran's preliminary review of data from Khuzestan and Fars provinces shows a significant increase in cancer incidence following 1991, particularly, hematopoietic malignancies (leukemias and lymphomas) which typically have latency periods of approximately four to five years, and are often used as initial indicators of possible environmental carcinogenic hazards. The data provide initial evidence that an increase in some

cancers occurred following Iraq's invasion and occupation of Kuwait. Hence, a more systematic investigation is justified. In the view of the Panel, this should involve the services of a qualified senior epidemiologist.

306. After reviewing the proposed study, the Panel considers that the following modifications are necessary:

(a) The study of testis tumours, retinoblastoma, neuroblastoma and Wilms tumour should be excluded. Testis tumours are unlikely to be associated with environmental factors; while retinoblastoma, neuroblastoma and Wilms tumour are extremely rare; and

(b) The statistical analysis using the DALY index should be excluded because the calculation is not necessary to complete the epidemiological investigation and because the results of the study will not be available to support any claim before the Commission.

307. In the view of the Panel, the modifications will not affect the cost of the programme.

308. The Panel finds that, with these modifications, the proposed study constitutes reasonable monitoring of public health for the purposes of investigating and combating increased health risks in accordance with paragraph 35(d) of Governing Council decision 7. Consequently, expenses of the study qualify for compensation.

309. Accordingly, the Panel recommends compensation in the amount of USD 332,300 for this claim.

310. The Panel's recommendation in respect of claim No. 5000394 is summarized in table 6.

Table 6. Recommended award for claim No. 5000394

Claim	Subject	Amount claimed (USD)	Amount recommended (USD)
5000394	Monitoring of incidence of cancers	332,300	332,300
Total		332,300	332,300

G. Recommended awards for the claims of Iran

311. The Panel's recommendations for Iran's claims are summarized in table 7.

Table 7. Summary of recommended awards for the claims of Iran

Claim	Subject	Amount claimed (USD)	Amount recommended (USD)
5000286	Agricultural resources	441,895,991	24,034,892
5000301	Fisheries resources	161,000,000	nil
5000288	Other resources	7,916,024,475	46,596
5000287	Public health	2,571,509,483	3,366,964
5000394	Monitoring of incidence of cancers	332,300	332,300
Total		11,090,762,249	27,780,752

V. CLAIMS OF THE HASHEMITE KINGDOM OF JORDAN

A. Overview

312. In the fifth "F4" instalment, the Panel reviewed two claims submitted by Jordan for damage and losses resulting from Iraq's invasion and occupation of Kuwait. Claim No. 5000304 is for compensation for damage to or depletion of Jordan's groundwater resources, terrestrial resources, agricultural resources, wetlands and marine resources as a result of the influx of refugees following Iraq's invasion and occupation of Kuwait. Claim No. 5000464 is for public health expenses resulting from the influx of refugees.

313. Jordan states that, from the beginning of Iraq's invasion and occupation of Kuwait in August 1990 and until September 1991, its territory was flooded with over 1.88 million refugees of different nationalities. As the Panel noted in the first "F4" report, "Jordan defines 'refugees' as 'all those people, of whatever nationality, who entered Jordan from Iraq and Kuwait as a direct result of Iraq's invasion and occupation of Kuwait, between 2 August 1990 and 1 September 1991', having left Iraq or Kuwait on or before 2 March 1991."[53]

314. The Panel notes that other panels of Commissioners have found that the vast majority of refugees present in the camps in Jordan were there as a result of Iraq's invasion and occupation of Kuwait.[54] In the first "F4" report, the Panel noted that any loss which was incurred as a result of departures of persons from Iraq or Kuwait during the period from 2 August 1990 to 2 March 1991 would constitute a direct loss, damage or injury resulting from Iraq's invasion.[55] The Panel noted, however, that "[t]he decision whether any particular loss resulted from departures within the meaning of the Governing Council decision will depend on the evidence produced in each case."[56] In this regard, the Panel recalled that some panels of Commissioners had found that, under certain circumstances, some expenses incurred subsequent to 2 March 1991 in connection with persons who departed from Iraq or Kuwait during the period 2 August 1990 to 2 March 1991 could be compensable as direct losses resulting from Iraq's invasion and occupation of Kuwait.[57]

B. Claim No. 5000304 – Loss of natural resources

315. Claim No. 5000304 comprises five claim units, with an asserted value of USD 4,330,635,352, for depletion of natural resources as a result of Iraq's invasion and occupation of Kuwait. This amount represents an increase in the compensation claimed, reflecting amendments made by Jordan based on information obtained from its monitoring and assessment activities.[58]

316. Jordan claims that the large numbers of refugees from Iraq or Kuwait who entered its territory increased its population by 10.8 per cent. According to Jordan, this population increase resulted in environmental damage. The first claim unit is for damage to and depletion of groundwater resources; the second claim unit is for expenses of remediation and depletion of terrestrial resources; the third claim unit is for depletion of agricultural resources; the fourth claim is for depletion of wetland resources; and the fifth claim unit is for depletion of marine resources.

317. By Procedural Order No. 7 of the fourth "F4" instalment dated 30 April 2004, the Panel deferred a part of claim No. 5000458 of Jordan relating to the remediation of rangelands to the fifth "F4" instalment. The deferred part of claim No. 5000458 is reviewed as part of the second claim unit (terrestrial resources) of this claim.[59]

1. First claim unit – Groundwater resources

318. Jordan seeks compensation in the amount of USD 1,771,413,994 for this claim unit.

(a) Salinization and depletion of groundwater resources

319. Jordan seeks compensation in the amount of USD 1,465,565,462 for the salinization and depletion of its groundwater resources. Jordan claims that the population increase led to greater demand for freshwater, resulting in accelerated abstraction and over-pumping of freshwater from Jordan's water resources, in particular its groundwater basins. This resulted in the salinization and degradation of Jordan's main groundwater basins, in particular the aquifers of Amman-Zarqa, Azraq and Northern Mujib, as well as depletion of groundwater resources in the main basins. Jordan used computer models to estimate salinization and depletion of groundwater resources between 1990 and 2015.[60]

320. Iraq argues that the damage to Jordan's water resources pre-dates the invasion and occupation of Kuwait. Iraq contends that most of the data provided by Jordan show that over-abstraction, increasing salinity and a decline in groundwater levels existed prior to the invasion and occupation. According to Iraq, Jordan had already made plans to address depletion and deterioration of its groundwater resources before the conflict.

321. Iraq states that the volumes of groundwater alleged to have been depleted are theoretical because Jordan took measures to reduce per capita consumption and re-profiled its infrastructure investment programme to meet the new demand. Iraq further argues that the evidence does not show that any change in water resources occurred as a result of the invasion and occupation of Kuwait since

the actual data (as opposed to projections obtained through modeling) do not show any distinct change in 1990-1991.

322. The Panel finds that, although the monitoring and assessment data submitted by Jordan demonstrate increasing salinity in the waters of the Amman-Zarqa, Azraq and Northern Mujib aquifers, the data are not sufficient to show that there is a causal link between the increase in salinity and the presence of refugees who entered Jordan from Iraq or Kuwait as a result of Iraq's invasion and occupation of Kuwait.

323. Accordingly, the Panel finds that, in respect of the part of this claim unit relating to the salinization of groundwater, Jordan has failed to meet the evidentiary requirements for compensation as specified in article 35(3) of the Rules. The Panel therefore recommends no compensation for this part of the claim unit.

324. With regard to the part of this claim unit relating to depletion of groundwater resources, the Panel finds that the assumptions and methods used by Jordan to develop the computer models are appropriate and that the results of the models accurately estimate the decrease in groundwater elevations and the overall reduction in groundwater volume due to the increase in population of Jordan as a result of the influx of refugees.

325. Consequently, the Panel finds that the presence of the refugees in Jordan resulted in depletion of groundwater resources, and that this constitutes damage to or depletion of natural resources, in accordance with paragraph 35(e) of Governing Council decision 7.

326. However, the Panel notes that compensation may only be awarded for damage resulting from the presence of refugees who departed Iraq or Kuwait between 2 August 1990 and 2 March 1991, and that Jordan has not provided evidence to show that all the damage for which it claims compensation was due to the presence of refugees who departed from Iraq or Kuwait during that period.

327. The Panel has made the following adjustments to the amount sought by Jordan:

(a) Reduction to take account of the fact that part of the damage to groundwater resources could have been due to the presence of refugees who departed from Iraq or Kuwait after the expiry of the compensable period specified in Governing Council decision 7; i.e., after 2 March 1991;

(b) Elimination of the amount of USD 939,146,614 requested with regard to salinization of groundwater as indicated in paragraphs 322-323 above; and

(c) Revision of the value of depleted groundwater to reflect the average unit cost of water conservation projects in Jordan.

328. These adjustments reduce the compensable loss to USD 1,344,661.

329. Accordingly, the Panel recommends compensation in the amount of USD 1,344,661 for this part of the first claim unit.

(b) Expenditure on water infrastructure

330. Jordan seeks compensation in the amount of USD 126,282,666 for expenditure on water infrastructure projects that it was obliged to undertake as a result of the influx of refugees into its territory.

331. Jordan states that the population increase resulted in the permanent loss of water from the Amman-Zarqa, Azraq, Northern and Southern Mujib and Yarmouk basins, and that this necessitated expenditure on water infrastructure to prevent further damage.

332. Iraq states that the method used by Jordan to estimate the cost of preventative expenditures is neither reasonable nor appropriate. Iraq further states that Jordan had other options for providing water to the population, such as importing desalinated water. Iraq also states that Jordan could have invested in its infrastructure to reduce the substantial losses of water resources that occur daily as a result of leakages, and that it is only making such efforts now. In addition, Iraq states that Jordan has failed to take account of other causes of damage, and argues that although some wells in the Azraq basin show some increase of salinity between 1992 and 1995, irrigation is the most likely cause of such increase.

333. The Panel notes that the evidence submitted by Jordan shows that water sector investments increased annually from 1990 to 1994. However, the absence of corresponding data for the period prior to 1990 makes it difficult to determine what part, if any, of the increase in investments is attributable to the presence of the refugees.

334. Furthermore, the data provided by Jordan do not support the claim that the increases in water sector investments were due to damage resulting from the presence of refugees. In particular, the Panel notes that, although Jordan submitted a database describing 329 water infrastructure projects implemented between 1990 and 2003, the projects are not limited to the four northern basins mentioned in Jordan's claim as having been affected by the presence of refugees, but extend to all regions of Jordan.

335. The Panel, therefore, finds that Jordan has failed to establish that the increase in expenditure on water infrastructure was due to the presence of the refugees who entered Jordan as a result of Iraq's invasion and occupation of Kuwait. Consequently, Jordan has failed to meet the evidentiary requirements for compensation specified in article 35(3) of the Rules.

336. Accordingly, the Panel recommends no compensation for this part of the first claim unit.

(c) Loss of use of water by the Jordanian population

337. Jordan seeks compensation in the amount of USD 134,661,668 for the loss suffered by its population because it was deprived of the full use of water due to strict rationing of municipal water

following Iraq's invasion and occupation of Kuwait. Jordan states that this rationing was due to the increase in its population.

338. Iraq questions the accuracy of Jordan's estimate of the volume of water used by the refugees and states that, if rationing measures were introduced as Jordan describes, water consumption would have increased at a slower rate than the rate of population growth.

339. The Panel notes that, to calculate the volume of municipal water that was lost to its population, Jordan compares its actual population with the hypothetical population that would have existed but for Iraq's invasion and occupation of Kuwait. In the view of the Panel, this method does not allow a determination of the actual volume of municipal water of which the population was deprived.

340. The Panel notes that data submitted by Jordan show that per capita water consumption declined in the early 1990s. However, in the absence of data for the period prior to 1990, it is not possible to determine whether, and if so to what extent, a decline in per capita water use constitutes evidence that Jordan's population was deprived of the use of municipal water during this period as a result of the water rationing programme. The Panel also observes that, although Jordan's rationing programme limited the number of water delivery days, it did not necessarily limit the quantity of water that was actually delivered. Consequently, the institution of the rationing programme does not in itself provide evidence that the population was actually deprived of the use of water.

341. The Panel, therefore, concludes that the evidence presented does not demonstrate that Jordan's population was deprived of water as a result of the presence of the refugees. Consequently, Jordan has failed to meet the evidentiary requirements for compensation as specified in article 35(3) of the Rules.

342. Accordingly, the Panel recommends no compensation for this part of the first claim unit.

(d) Loss of groundwater due to microbiological contamination

343. Jordan seeks compensation in the amount of USD 11,365,977 for the loss of use of groundwater resources in the Qairawan, Baqouriyeh, Shoreya'a, Hazzir and Wadi As-Sir springs due to microbiological contamination as a result of the presence of refugees in Jordan following Iraq's invasion and occupation of Kuwait. Jordan states that these springs were contaminated by septic tanks and latrine pits at refugee settlements or by wastewater treatment plants.

344. Iraq challenges the claim that the loss of water resources was due to the invasion and occupation of Kuwait. It argues that there is recorded evidence of mismanagement of water resources in Jordan before 1991. Iraq referred especially to contamination of water from urban settlements located within the catchment areas of highly vulnerable springs which did not have appropriate connections to sewerage networks.

345. In the view of the Panel, the evidence provided by Jordan is not sufficient to demonstrate that damage at the five springs was attributable to the presence of refugees. The information submitted by Jordan suggests that there are many other possible causes of water contamination to these springs, some of which have existed for many years prior to and since Iraq's invasion and occupation of

Kuwait. These include inappropriate land use in the areas surrounding the springs, animal wastes and the presence near one spring of a wadi that carries wastewater.

346. The Panel, therefore, finds that Jordan has failed to establish that the presence of the refugees resulted in loss of use of groundwater resources due to contamination of springs. Consequently, Jordan has failed to meet the evidentiary requirements for compensation as specified in article 35(3) of the Rules.

347. Accordingly, the Panel recommends no compensation for this part of the first claim unit.

(e) Loss resulting from contamination of groundwater

348. Jordan seeks compensation in the amount of USD 33,538,221 for loss resulting from the increased production of wastewater due to the increase in its population as a result of the influx of refugees following Iraq's invasion and occupation of Kuwait. According to Jordan, the increased production of wastewater resulted in seepage of effluent from the ponds of the As-Samra wastewater treatment plant; production of lower-grade treated wastewater due to the fact that the As-Samra wastewater treatment plant was working above its design capacity; increased production of wastewater effluent at refugee camps; and increase in wastewater production due to the settlement of refugees around the springs. Specifically, Jordan states that the Amman-Zarqa groundwater basin was contaminated by a plume of effluents directly beneath the treatment lagoons and the settling ponds of the As-Samra wastewater treatment plant.

349. Iraq states that there is recorded evidence of mismanagement of water resources in Jordan before 1991. In particular, it referred to the overloading of the As-Samra Wastewater Treatment Plant and leakage from the ponds to groundwater since the plant commenced operations in the mid-1980s. Consequently, Iraq argues that any contamination of groundwater resources in Jordan cannot be attributed to the invasion and occupation of Kuwait.

350. In the view of the Panel, the data provided by Jordan show that salinity reaching groundwater originated primarily from soluble minerals underneath the As-Samra ponds rather than from the wastewater in the ponds. In this regard, the Panel notes that the data show that salinity down-gradient from As-Samra began to increase shortly after the construction of the plant in 1985 and continued to increase until at least 2000. Further, the available data do not provide a basis for determining what impacts, if any, the presence of refugees might have had on the level of salinity in the plume of effluents referred to in the claim.

351. The Panel, therefore, finds that Jordan has failed to establish that the presence of the refugees resulted in contamination of water produced from the As-Samra Wastewater Treatment Plant. Consequently, Jordan has failed to meet the evidentiary requirements for compensation as specified in article 35(3) of the Rules.

352. Accordingly, the Panel recommends no compensation for this part of the first claim unit.

2. Second claim unit – Terrestrial resources

353. Jordan seeks compensation in the amount of USD 2,474,391,198 for losses to terrestrial resources due to the influx of refugees and their livestock into Jordan following Iraq's invasion and occupation of Kuwait. Jordan states that some of the refugees brought with them between 1.3 and 1.8 million livestock.[61] The losses include the expenses for remediation of its rangelands, loss of forage production in its rangelands, damage to rangeland wildlife habitats, loss of wildlife, and disruption of a captive-breeding programme for two endangered species (the Arabian oryx and the sand gazelle).

354. According to Jordan, the damage to rangelands and loss of rangeland productivity and wildlife habitats were the result of severe overgrazing by the livestock of the refugees, vehicular traffic and the excessive use of plants for fuel by the refugees in the Jordanian Badia. Jordan also states that overgrazing reduced plant diversity and biomass in the rangelands.

355. Jordan claims an amount of USD 24,835,400 for the remediation of its rangelands. Jordan proposes to remediate the damage to its rangelands by creating and managing 185,000 hectares of rangeland reserves and wildlife reserves in the Eastern Badia.

356. Jordan also claims an amount of USD 2,449,308,925 for additional natural resource losses that cannot be fully compensated by the proposed rangeland and wildlife preserves. Jordan uses habitat equivalency analysis ("HEA") to determine that approximately 25 million hectares of additional reserves are needed for this purpose. The compensation requested by Jordan is based on the costs of establishing and maintaining the additional reserves, although Jordan acknowledges that it does not have sufficient land space for the total area of reserves needed.

357. Jordan states that its captive-breeding programme for endangered species was disrupted because it was not possible to release Arabian oryx and sand gazelles into the wild due to increased livestock density and the activities of refugees in the areas where the species were to be re-introduced. According to Jordan, the delay in the release of these animals into the wild led to increases in diseases which reduced the number of animals that were ultimately released.

358. Jordan further claims an amount of USD 246,873 for proposed captive-breeding programmes to replace the endangered Arabian oryx and sand gazelles that would have been released into the wild but for the influx of refugees.

359. Iraq states that there is no evidence of residual damage to rangelands or wildlife that is attributable to the invasion and occupation of Kuwait. Iraq asserts that Jordan's terrestrial claim is based on theoretical assumptions that are flawed. Iraq further asserts that Jordan's claim of a reduction in rangeland productivity is based on just two values for productivity in 1983 and in 1993, and that the claim is inappropriately extrapolated from the rangeland productivity claim. Iraq adds that the claim for damage to Jordan's captive-breeding programme for endangered species is also based on a theoretical assumption of the numbers of animals that would have been released but for the invasion and occupation of Kuwait.

360. Iraq also argues that Jordan does not have the physical capacity to implement the approximately 25 million hectares of preserves proposed to offset its losses since Jordan's total land area is only approximately 9 million hectares.

361. The Panel notes that the available information and analysis confirm that there was a large influx of refugees and their livestock into Jordan as a result of Iraq's invasion and occupation of Kuwait. In the view of the Panel, such a large increase in the numbers of refugees and livestock would have caused significant environmental damage to Jordan's rangeland and wildlife habitats. The Panel also considers that the pressures created by the presence of refugees and their livestock would have reduced the possibilities for success of Jordan's captive-breeding programme for Arabian oryx and sand gazelles. The Panel, therefore, finds that the presence of the refugees and their livestock resulted in damage to and depletion of Jordan's terrestrial resources.

362. However, the Panel notes that Jordan accepts that, because of the limited size of its territory, it cannot set aside the space required for equivalent restoration areas to replace the lost services. Since the restoration programme cannot be implemented, the Panel does not consider that the amount requested on the basis of such a programme would constitute the appropriate compensation for the loss. Accordingly, the Panel has developed, as an alternative, a cooperative rangeland management programme. The Panel considers that such a cooperative management programme will adequately compensate Jordan for the damage to its rangeland resources and its losses of rangeland productivity and wildlife habitats. Details of the cooperative rangeland management programme are indicated in annex I to this report.

363. The costs of the cooperative management programme, based on the elements described in annex I, amount to USD 160,335,200. The Panel has made adjustments to the costs of the project to take into account inadequacies in the information provided by Jordan and also the fact that Jordan failed to take steps to mitigate the damage, particularly by failing to reduce grazing pressure on the rangelands.

364. The Panel finds that Jordan's proposed captive-breeding programmes for the re-introduction of Arabian oryx and sand gazelle into the wild are appropriate in the circumstances, and that the cost estimate of USD 246,873 is reasonable.

365. The Panel finds that the cooperative management programme outlined in annex I and the proposed captive-breeding programmes constitute appropriate compensation for damage to or depletion of natural resources as a result of Iraq's invasion and occupation of Kuwait, in accordance with paragraph 35(e) of Governing Council decision 7. Consequently, expenses of the programmes qualify for compensation.

366. Accordingly, the Panel recommends compensation in the amount of USD 160,582,073 for this claim unit. This amount is made up of USD 160,335,200 for the cooperative management programme and USD 246,873 for the captive-breeding programmes.

3. Third claim unit – Agricultural resources

367. Jordan seeks compensation in the amount of USD 21,962,869 for losses due to the reduction in crop yields because of increased demand for freshwater and increased pressure on the wastewater treatment plants. Jordan states that it uses treated effluent from the As-Samra wastewater treatment plant for crop irrigation. According to Jordan, the refugee influx following Iraq's invasion and occupation of Kuwait resulted in an increase of contaminated influent to the treatment plant. This led to an increase in the salinity of effluent from the treatment plant, which in turn damaged agricultural resources. Saline effluent from the treatment plant also led to an increase in the salinity of irrigation waters drawn from the King Talal reservoir and the King Abdullah canal. Jordan states that there was an increase in soil salinity at four locations in the Middle Jordan Valley.

368. According to Jordan, the increase in the salt content of the soil resulted in reduced crop yields. Jordan estimates that from 29 to 55 per cent of the resulting soil salinity, up to the year 2015, is attributable to the presence of refugees.

369. Jordan submitted results of monitoring and assessment studies which it claims show a reduction in crop yields due to decreased quality and quantity of irrigation water as a result of increased consumption of freshwater. Jordan also claims that these studies show that damage to agricultural resources resulted from increased salinity of effluent from the As-Samra wastewater treatment plant.

370. Iraq argues that Jordan's evaluation of damage is only theoretical because, first, the data provided on soil salinity are not relevant in assessing the damage and, second, the level of soil salinity after the invasion and occupation is calculated with a model and this makes it impossible to determine the actual levels of increase.

371. Iraq agrees that it is logical to assume that the increase of influent to As-Samra wastewater treatment plant was due to the increase in the number of households, including households of refugees that were connected to the sanitary sewage system and that this might have resulted in poorer quality effluent from the plant due to the reduction in the wastewater retention time within the ponds. However, Iraq observes that, given the standard efficiency of waste stabilization ponds, this would have resulted in increasing organic matter, suspended solids and microbiological contents of the effluent, but not in an increase in salinity. Hence, according to Iraq, any increase in salinity, which is a key parameter in the claim unit, could only have resulted from mismanagement of water used for irrigation. Iraq also states that possible increases in levels of nitrate, phosphorus and organic matter in the treated wastewater used for irrigation may have had beneficial effects on crop yields by providing more nutrients.

372. Iraq further asserts that, although Jordan states that the increased salinity seriously affected its tomato crop, Jordan replaced tomatoes with other crops that are equally difficult to grow in saline soils. In addition, the total agricultural area decreased from 1994 to 1997, but increased after 1998. Iraq suggests that this leads to the conclusion that salinity is no longer a problem.

373. In the view of the Panel, the data provided by Jordan are not sufficient to show that the presence of refugees had an impact on its agricultural resources. In particular, the measurements of salinity in effluent from the As-Samra wastewater treatment plant, irrigation waters and agricultural soils do not show a clear pattern of impact that can be linked to the presence of refugees in Jordan. Consequently, Jordan has failed to meet the evidentiary requirements for compensation specified in article 35(3) of the Rules.

374. Accordingly, the Panel recommends no compensation for this claim unit.

4. Fourth claim unit – Wetland resources

375. Jordan seeks compensation in the amount of USD 62,774,569 for the depletion of the Azraq wetlands. Jordan claims that the population increase resulted in a higher demand for freshwater, and that this led to a decrease in the flow of water into the Azraq wetlands.

376. Jordan states that the diminished water supply to the Azraq wetlands also changed the wetland and riparian habitats, causing alterations in the diversity and dominance of plant species currently present in the wetlands. In addition, it affected the physical structure of the wetlands, including the height and dispersion of shrubs, and this had a detrimental effect on wetland plants and wildlife. Jordan notes that the Azraq wetlands lie on a globally important migration route for birds and provide habitats for resident wildlife species including birds, mammals, reptiles, fish and invertebrates. In this regard, Jordan points out that the wetlands are listed under the 1971 Ramsar Convention on Wetlands of International Importance.[62]

377. Jordan states that the increase in water abstraction also "forced the suspension of plans that were in place to restore the wetlands." Jordan considers suspension of these plans to be a "lost opportunity"; and it states that this was due to the influx of refugees and the resultant increase in the demand for water from the Azraq wetlands.

378. Jordan submitted results of monitoring and assessment studies which it claims show trends of increased water demand and consequential decreasing water supply to the wetlands.[63] Jordan, however, acknowledges that the major proportion of damage to the Azraq wetlands, through water loss and the failure of the springs supplying them, occurred before Iraq's invasion and occupation of Kuwait. It states that its claim relates to a relatively small area of the wetlands that it alleges was lost through increased withdrawal of water to supply the refugees.

379. Iraq states that the Jordanian authorities had allowed water withdrawals at twice the planned rate in 1990 and 1991 and, that at this rate, the Azraq wetlands would have dried up in any case.

380. In the view of the Panel, the evidence available shows that the Azraq wetlands had been almost entirely eliminated over the past 30 years due to withdrawal of groundwater from the Azraq basin as well as reduction in surface flows into the wetlands caused by upstream dams in Jordan and Syria. The Panel recognizes that some of the water provided to refugees might have been withdrawn from the Azraq wetlands. However, the information provided by Jordan is not sufficient to enable the Panel to

determine the effect, if any, that such withdrawals might have had on the volume of water lost in the wetlands.

381. In the view of the Panel, Jordan has not provided sufficient evidence to substantiate the claim that the presence of the refugees resulted in damage to the Azraq wetlands. Consequently, Jordan has failed to meet the evidentiary requirements for compensation as specified in article 35(3) of the Rules.

382. Accordingly, the Panel recommends no compensation for this claim unit.

5. Fifth claim unit – Marine resources

383. Jordan seeks compensation in the amount of USD 92,722 for damage to or depletion of its marine resources. Jordan claims that the refugee influx resulted in reduced coral growth over 1,300 metres of coral reefs along parts of its Gulf of Aqaba coastline, particularly in the King Abdullah Reef opposite the National Touristic Camp where refugees were present in large numbers, especially during a three-week period in August-September 1990.

384. Jordan states that this damage probably resulted from the deposit of sanitary waste by the refugees into the water close to the National Touristic Camp, either directly or via groundwater transport from overflowing temporary toilet facilities. Jordan further states that additional damage is likely to have been caused by solid wastes in plastic bags, deposited directly into the lagoon or blown by the wind from the beach, and by the trampling of the coral reef by refugees.

385. Iraq asserts that this claim is based on theoretical models. It points out that the damage was not verified with field data, and that sufficient account has not been taken of other potential causes of damage unrelated to Iraq's invasion and occupation of Kuwait.

386. Iraq further states that, although coral reefs have an intrinsic value, Jordan has not demonstrated that the coral reefs in the Gulf of Aqaba provide any specific ecological services. In this regard, Iraq claims that, although the coral reefs are located in a tourist location, few tourists actually use them.

387. In the view of the Panel, Jordan has not provided sufficient evidence to establish that Iraq's invasion and occupation of Kuwait caused any damage to the coral reefs. In particular, there is insufficient information to compare the condition of the coral reefs before and after the invasion and occupation, in order to determine the nature and extent of the damage to the coral reefs or the link between any such damage and the presence of the refugees. Consequently, Jordan has failed to meet the evidentiary requirements for compensation as specified in article 35(3) of the Rules.

388. Accordingly, the Panel recommends no compensation for this claim unit.

6. Recommended award

389. The Panel's recommendations in respect of claim No. 5000304 are summarized in table 8.

Table 8. Recommended award for claim No. 5000304

Claim unit	Amount claimed (USD)	Amount recommended (USD)
Groundwater resources	1,771,413,994	1,344,661
Terrestrial resources	2,474,391,198	160,582,073
Agricultural resources	21,962,869	nil
Wetland resources	62,774,569	nil
Marine resources	92,722	nil
Total	4,330,635,352	161,926,734

C. Claim No. 5000464 – Public health

390. Claim No. 5000464 comprises three claim units, with a total asserted value of USD 886,481,830, for losses due to the presence of refugees who entered Jordan after departing from Iraq or Kuwait between 2 August 1990 and 2 March 1991 as a result of Iraq's invasion and occupation of Kuwait.[64]

391. The first claim unit is for costs of medical treatment and economic losses resulting from an increase in the incidence of low birth-weight infants and malnourished children in Jordan as a result of the influx of the refugees into Jordan. The second claim unit is for non-pecuniary damages for mental pain and suffering by the victims of domestic crime and the Jordanian population in general as a result of the increase in the crime rate due to the presence of the large numbers of refugees in the country. The third claim unit is for claim preparation costs.

1. First claim unit – Low birth-weight infants and malnourished children

392. Jordan seeks compensation in the amount of USD 210,652,639 for short-term and long-term medical treatment costs and other losses resulting from increases in the incidence of (a) low birth-weight infants; and (b) malnourished children in Jordan, both of which Jordan asserts were the result of the presence of refugees following Iraq's invasion and occupation of Kuwait. Jordan claims an amount of USD 102,962,079 for expenses incurred in treating low birth-weight infants and an amount of USD 51,710,096 for costs incurred in treating malnourished children. Jordan also claims an amount of USD 55,980,464 for other losses related to the increased incidence of low birth-weight infants.

393. Jordan asserts that the presence of large numbers of refugees in its territory as a result of Iraq's invasion and occupation of Kuwait had a significant negative impact on its economy and caused a general increase in poverty in the country; and that this led to an increase in the incidence of malnutrition, especially among pregnant women and children. According to Jordan, malnutrition in pregnant women resulted in an increase in the incidence of low birth-weight infants.

394. Jordan contends that the increases in low birth-weight infants and malnourished children would not have occurred but for the increase in its population caused by the influx of refugees into the country, which was a direct result of Iraq's invasion and occupation of Kuwait.

395. Iraq questions the alleged link between the invasion and occupation of Kuwait and the increased incidence of low birth-weight babies and malnourished children in Jordan. According to Iraq, the information and data provided by Jordan do not show that any of the alleged losses were a direct result of the invasion and occupation. In particular, Iraq asserts that the continued presence in Jordan of the vast majority of returnees, long after the end of the conflict, was not a direct result of the invasion and occupation but rather of the decision of the Government of Kuwait to prohibit Jordanian nationals from returning to Kuwait. Iraq also argues that the medical and other services that Jordan claims to have provided were neither temporary nor extraordinary, but services that it would have provided even if the invasion and occupation had not occurred. Accordingly, it argues that these expenses are not compensable.

396. The Panel notes that Jordan's main argument in support of its claim is that the incidence of low birth-weight infants and malnourished children would not have occurred but for Iraq's invasion and occupation of Kuwait. In the view of the Panel, this is not an appropriate test of direct causation within the meaning of Security Council resolution 687 (1991) or Governing Council decision 7. While part of the cause of the alleged increases in low birth-weight infants and malnourished children in the general population of Jordan might ultimately be traceable to Iraq's invasion and occupation of Kuwait, the evidence and information available leads the Panel to conclude that any such increases would be too remote and speculative to be considered a direct result of the invasion and occupation. The Panel, therefore, finds that increases in the incidence of low birth-weight infants and malnourished children in Jordan were not a direct result of Iraq's invasion and occupation of Kuwait, in accordance with Security Council resolution 687 (1991) and Governing Council decision 7.

397. However, the Panel notes that there is some evidence of an increase in the incidence of low birth-weight infants in Jordan immediately following Iraq's invasion and occupation of Kuwait, and that this increase could have been partly due to the arrival of pregnant refugee women who delivered low birth-weight infants while in Jordan. In the view of the Panel, any expenses or costs incurred by Jordan in respect of such low birth-weight infants would constitute losses directly resulting from Iraq's invasion and occupation of Kuwait. However, no information has been provided that would enable the Panel to determine what proportion, if any, of the number of low birth-weight infants in Jordan were in this category. Jordan was requested to provide a breakdown of the numbers of low birth-weight infants born to refugees as opposed to those born to the Jordanian population, but it failed to do so.

398. The Panel also notes that Jordan's Ministry of Social Development and Ministry of Health received awards of compensation in the first report of the "F2" Panel for, inter alia, costs incurred for providing medical treatment to evacuees and to provide basic necessities such as food and health care to returnees who were below the poverty line.[65] In the view of the Panel, compensation for the costs

of providing medical treatment to low birth-weight infants born to refugees could duplicate the compensation recommended by the "F2" Panel.

399. Accordingly, the Panel recommends no compensation for this claim unit.

2. Second claim unit – Mental pain and suffering

400. Jordan seeks compensation in the amount of USD 674,129,191 for mental pain and suffering endured by victims of crime and the Jordanian population in general, due to an increase in the crime rate resulting from Iraq's invasion and occupation of Kuwait.

401. Jordan asserts that the large influx of refugees into its territory caused an increase in the poverty rate in Jordan, which in turn caused an increase in the crime rate. The increase in the crime rate resulted in mental pain and suffering for the victims of crime. Jordan seeks an amount of USD 361,667,975 as compensation for the mental pain and suffering of the actual victims of crime.

402. Jordan also claims that the increase in the crime rate caused mental pain and suffering to the general population because even persons who were not themselves victims of crime were subjected to an increased risk or threat of becoming victims of crime. Jordan seeks an amount of USD 312,461,216 as compensation for the mental pain and suffering of the general population of Jordan.

403. Iraq states that Jordan has not established that the alleged increase in its crime rate was a direct result of the invasion and occupation of Kuwait. Furthermore, Iraq states that Jordan has provided no evidence of mental pain and suffering or mental stress, either among victims of crime or in the population of Jordan in general, as a result of an increase in the crime rate in Jordan following the invasion and occupation.

404. The Panel notes that Governing Council decision 3 enumerates the categories under which individual claimants may be awarded non-pecuniary damages for mental pain and anguish.[66] In the view of the Panel, these categories are exhaustive and each individual claimant must demonstrate that he or she falls within one of the enumerated categories in order to qualify for compensation for mental pain and anguish. The Panel considers that Governing Council decision 3 applies to this claim unit. Accordingly, the Government of Jordan does not have standing to bring the claim.

405. Accordingly, the Panel recommends no compensation for this claim unit.

3. Third claim unit – Claim preparation costs

406. Jordan seeks compensation in the amount of USD 1,700,000 for claim preparation costs for its fourth and fifth "F4" instalment claims, including its public health claim.[67]

407. As stated in paragraph 223 above, in a letter dated 6 May 1998, the Executive Secretary informed all panels of Commissioners that the Governing Council intends to resolve the issue of the compensability of claim preparation costs in the future.

408. The Panel, therefore, makes no recommendation in respect of this claim unit.

4. Recommended award

409. The Panel's recommendations in respect of claim No. 5000464 are summarized in table 9.

Table 9. Recommended award for claim No. 5000464

Claim unit	Amount claimed (USD)	Amount recommended (USD)
Low birth-weight infants and malnourished children	210,652,639	nil
Mental pain and suffering	674,129,191	nil
Claim preparation costs	1,700,000	-
Total	886,481,830	nil

D. Recommended awards for the claims of Jordan

410. The Panel's recommendations in respect of Jordan's claims are summarized in table 10.

Table 10. Summary of recommended awards for the claims of Jordan

Claim	Subject	Amount claimed (USD)	Amount recommended (USD)
5000304	Loss of natural resources	4,330,635,352	161,926,734
5000464	Public health	886,481,830	nil
Total		5,217,117,182	161,926,734

VI. CLAIMS OF THE STATE OF KUWAIT

A. Overview

411. In the fifth "F4" instalment, the Panel reviewed four claims submitted by Kuwait for damage resulting from Iraq's invasion and occupation of Kuwait. Kuwait claims compensation for damage caused by pollutants from the oil well fires in Kuwait and from the oil spills on its territory and into the Persian Gulf; for injuries to residents of Kuwait from mines and ordnance; and for damage resulting from the exposure of many of its citizens to traumatic events and experiences during Iraq's invasion and occupation.

412. Claim No. 5000460 is for compensation for damage to or depletion of terrestrial, marine and groundwater resources, including the expenses of compensatory projects proposed to address the damage or depletion. Claim 5000468 is for expenses for remediation of damage to mudflats. Claim 5000183 is for expenses and other losses related to public health damage. Claim No. 5000453 is for the costs of studies undertaken by Kuwait University to assess the effects of Iraq's invasion and occupation on Kuwait's society.

B. Claim No. 5000460 – Loss of natural resources

413. Claim No. 5000460 comprises three claim units, with a total asserted value of USD 967,831,391, for loss of ecological and human services resulting from damage to or depletion of terrestrial, marine and groundwater resources. This amount represents an increase in the compensation claimed, reflecting amendments made by Kuwait based on information obtained from its monitoring and assessment activities.[68]

414. The claim is for losses during the period between the occurrence of the damage and the time when the damage has been or will be fully remediated. The first claim unit is for damage to terrestrial resources; the second claim unit is for damage to Kuwait's marine and coastal resources; and the third claim unit is for the loss of groundwater resources.

1. First claim unit – Terrestrial resources

415. Kuwait seeks compensation in the amount of USD 194,133,683 for damage to large areas of its terrestrial environment caused by the oil well fires and military activities during Iraq's invasion and occupation.

416. Kuwait states that its environment was damaged by tarcrete, dry oil lakes, wet oil lakes, oil-contaminated piles and oil-filled trenches, spills, military fortifications, open burning/open detonation areas and wind-blown sand. Kuwait estimates that over 2,000 square kilometres of its desert areas were damaged. According to Kuwait, the damage resulted in disruption of ecological services (soil stabilization, soil micro-community, wildlife habitat and vegetative diversity) and human services (grazing of animals and desert camping).

417. Kuwait states that the programmes to remediate damaged terrestrial resources as proposed in its third and fourth "F4" instalment claims[69] do not cover all the damage that it has suffered as a result of Iraq's invasion and occupation. According to Kuwait, those remediation projects "are not intended to account for losses to natural resources flows during the time period between the injury to and the recovery of the resources to a baseline state, whether naturally or by virtue of the proposed remediation projects." Kuwait further states that, in quantifying its losses in ecological services, it has taken into account the impacts which remediation measures would have in mitigating the losses.

418. Kuwait proposes to establish nine nature preserves representing approximately 3,000 square kilometres of protected areas. These are to compensate for the loss of ecological services from the time of the damage until full restoration of the services as a result of remediation. The proposed preserves would have several facilities including visitors' centres, lodging facilities for personnel, access roads, support equipment and fencing.

419. As noted in paragraph 417 above, Kuwait submitted claims in the third and fourth "F4" instalments for expenses of remediation of damage to its terrestrial resources. In addition to evidence provided to support its third and fourth "F4" instalment terrestrial claims, Kuwait submitted further details of its quantification of losses to its terrestrial resources. These include estimates of vegetation

cover and loss of ecological services in damaged areas, based on GIS and remote sensing analysis and information obtained from the results of studies on restricted land use and vegetation recently undertaken by the Kuwait Institute for Scientific Research.

420. Kuwait uses habitat equivalency analysis ("HEA") to estimate the size of the terrestrial nature preserves that would provide natural resource services equivalent to those that were lost as a result of the environmental damage to its terrestrial resources. Kuwait describes the steps taken in its application of HEA as follows: quantification of the losses of the environmental damage to terrestrial resources; determination of the size of the compensatory projects; quantification of the gains from the compensatory projects; and calculation of the cost of the compensatory projects.

421. According to Kuwait, the scaling of the nine terrestrial preserves does not completely offset the damage caused, and it states that it "is actually entitled to a somewhat larger award than has been requested".

422. Iraq accepts that there is evidence of persistent impacts caused by oil lakes, oil-contaminated piles and tarcrete. However, it states that remediation programmes proposed in claim No. 5000454 and for which compensation was awarded in the fourth "F4" instalment "will address these impacts and return affected areas to baseline conditions within a twelve-year timeframe". Regarding the effect of tarcrete in fenced areas, Iraq states that remediation awarded in the third "F4" instalment for claim No. 5000450 will return conditions in tarcrete-affected areas to baseline within three to five years. Iraq asserts that the effects of increased sand movement caused by military fortifications will be prevented by the gravel spreading remediation awarded in claim No. 5000450. Iraq further states that the revegetation islands to be established with the award for claim No. 5000450 will offset any increased sand movement due to other factors. According to Iraq, if Kuwait's rangelands are managed in a sustainable manner, the proposed remediation projects under claim No. 5000450 "have the potential to improve the overall condition of the Kuwaiti desert above baseline levels".

423. Iraq further states that the proposed terrestrial preserves will probably provide benefits to Kuwait in general. It argues that they will not constitute the appropriate compensation to offset the losses claimed by Kuwait since the services provided by the preserves will not be exactly the same as the services that Kuwait claims to have lost. Iraq also states that, while there is clear evidence of damage to certain parts of the Kuwaiti desert, the claim needs to be evaluated against the relevant baseline conditions, ongoing grazing impacts and impediments to vegetation recovery and service provision brought about by a lack of sustainable rangeland management.

424. With regard to the estimation of areas affected and compensation that may be awarded, the Panel considers that, although the HEA and remote sensing analyses provided by Kuwait to support its estimate are appropriate, many of Kuwait's assumptions regarding the lost services and expected recovery periods are either inappropriate or unreasonable.

425. In particular, the Panel finds that Kuwait overstates service levels prior to the commencement of the project, and thus inappropriately reduces the potential improvements that can reasonably be expected from the remediation measures for which awards were made in the third and fourth "F4"

instalments. In addition, the Panel considers that the model used by Kuwait for estimating post-remediation service improvements is based on information from too few sites and fails to take account of the initial vegetation cover. Furthermore, Kuwait's assumptions about baseline service levels inappropriately include consequences that follow from the decision, taken by Kuwait after the invasion and occupation, to fence its oil fields.

426. The Panel also considers that it is not reasonable for Kuwait to assume that there will be no further natural recovery between 2002 and the start of remediation measures to be funded by the third and fourth "F4" instalment awards. In addition, the Panel considers that Kuwait has overstated remediation periods and post-remediation recovery times in the affected areas. In the view of the Panel, appropriate remediation activities should be commenced as soon as possible following approval by the Governing Council of any awards for remediation. This will not only accelerate recovery of the damaged areas but it is also in line with the duty of Kuwait to mitigate the damage and minimize losses resulting from the damage.

427. Taking these factors into consideration, the Panel finds that the loss of terrestrial natural resources claimed by Kuwait is overstated. In the view of the Panel, there are no compensable losses beyond those addressed by the remediation measures for which awards were made in the third and fourth "F4" instalments.

428. Accordingly, the Panel recommends no compensation for this claim unit.

2. Second claim unit – Marine and coastal resources

429. The second claim unit is for compensation for damage to marine and coastal resources. The total amount of compensation sought is USD 613,814,608, comprising USD 574,200,000 for damage to aquatic biota, USD 16,599,464 for damage to shoreline resources and USD 23,015,144 for lost recreational opportunities.

430. Kuwait states that Iraq's invasion and occupation of Kuwait heavily impacted its marine and coastal resources. According to Kuwait, approximately eleven million barrels of oil were released into Kuwaiti territorial waters, and habitat and shoreline surveys performed in the months following the invasion and occupation revealed shorelines covered in a thick coating of oil with the potential for widespread injury to marine life, shoreline habitat, and fisheries.

431. In the first and fourth "F4" reports, the Panel found that Kuwait's marine and coastal areas had been damaged by oil released as a result of Iraq's invasion and occupation of Kuwait.[70]

432. The Panel notes that Kuwait has restructured this claim unit since it was originally filed. Claims for damage to aquatic biota, damage to shoreline resources and lost coastal and marine recreational opportunities ("lost recreational opportunities") were originally included in the claim for a coastal research centre and marine preserve. The original claim also included a claim for decreased shrimp landings from 1994-2000 that was to be addressed by a "raise and release" programme for shrimps. In subsequent amendments based on monitoring and assessment results, Kuwait separated the

compensation requested for damage to aquatic biota from damage to shoreline resources. Kuwait proposes first, to undertake an enhanced "raise and release" programme for shrimp in order to deal with the damage to aquatic resources as a whole, including decreased shrimp landings, and second, to create a shoreline preserve to address the damage to shoreline resources. As part of its claim for damage to shoreline resources, Kuwait also seeks monetary compensation for lost recreational opportunities.

(a) Aquatic biota

433. Kuwait states that its claim for loss of aquatic biota includes loss of ecological services provided by the subtidal areas. These services include food production and provision of habitats for aquatic invertebrates, fish, benthic infauna and plants. Kuwait seeks an amount of USD 574,200,000 to establish a shrimp "raise and release" programme as compensation for the loss of aquatic biota.

434. Kuwait uses an integrated set of computer models to estimate oil contamination in marine areas from the oil spills and to calculate the associated losses of biomass. The models used are a Model for the Assessment and Remediation of Sediment ("MARS")[71] and an Oil Spill Contingency and Response Model ("OSCAR").[72]

435. Using these models, Kuwait estimates the lost biomass in commercially valuable species, including finfish and shrimp, and categorizes each species into one of three trophic levels (primary, secondary and tertiary consumers). By applying trophic scaling to convert the lost biomass of secondary and tertiary consumers into an estimated loss in units of primary consumer biomass, Kuwait estimates that its loss of aquatic biota amounts to 70,000 tonnes of shrimp biomass.

436. Kuwait states that the "abundance data" used in the OSCAR model are from unpublished field survey sampling data compiled by the Kuwait Institute for Scientific Research during 1980-89, and the life history parameters come from an online database (FishBase) and from a number of publications.

437. Iraq states that this part of the claim unit is one for commercial resource losses and argues that it is unfounded as commercial fisheries recovered quickly by 1992. Iraq also claims that fishing restrictions arising as a consequence of the conflict would have had a beneficial environmental effect.

438. According to Iraq, Kuwait's estimate of the magnitude of the loss is based on theoretical models and is not supported by any evidence of widespread marine organism deaths attributable to the oil spills. Iraq further states that the predicted estimates, using the OSCAR model, did not correspond to observed information of oil slick trajectories. Iraq's general contention is that the model predictions of subtidal sediment contamination used by Kuwait to estimate biomass losses are not reliable.

439. The Panel finds that Kuwait's use of computer models is an acceptable approach to estimate damage to aquatic resources that probably occurred as a direct result of Iraq's invasion and occupation of Kuwait. However, the Panel considers that there are substantial and unquantifiable uncertainties in Kuwait's estimate of lost biomass using these models. For example, the Panel is unable to verify Kuwait's input values for the computer model used to estimate lost biomass, particularly data on

quantities of aquatic resources. In addition, there is lack of validation of the estimates of the lost resources, even by means of anecdotal descriptions of fish kills at the time of the alleged damage. Furthermore, the estimate of loss does not take account of possible confounding factors, such as the decrease in fishing activity during the period of the invasion and occupation and some time subsequently.

440. The Panel, therefore, concludes that Kuwait has not provided sufficient evidence to enable the Panel to quantify the magnitude of any lost biomass. Consequently, Kuwait has failed to meet the evidentiary requirements for compensation as specified in article 35(3) of the Rules.

441. Accordingly, the Panel recommends no compensation for this part of the claim unit.

(b) Shoreline resources

442. Kuwait states that the damage to its shoreline resources resulted in a reduction in the quantity and quality of services provided by different shoreline habitats. According to Kuwait, each shoreline habitat provides services to a unique set of organisms to varying degrees. These services include habitats for invertebrates, birds, reptiles, mammals, and plants, nesting and roosting for birds; food services; and marine mammal/reptile haul-out. Kuwait seeks an amount of USD 16,599,464 to establish a shoreline preserve as compensation for the loss of these services.

443. In order to assess the oil contamination on its shoreline resulting from invasion-related oil spills, Kuwait applies the models that it uses in its assessment of lost aquatic biota as described in paragraph 434 above. According to Kuwait, the output from the models indicates oil contamination to 4.7 square kilometres of shoreline habitat, at varying degrees of severity. Kuwait estimates the recovery time for each habitat and assigns percentage service losses due to different degrees of contamination (e.g., an initial 90-per cent service loss for heavily contaminated sandy shoreline areas), with service loss diminishing over time as natural recovery occurs. The value of loss is calculated using a "service hectare year" metric, representing the level of ecological service provided by one hectare in a year. On that basis, Kuwait states that the net present value of damage to its shoreline resources amounts to 1,402.6 discounted service hectare years ("DSHY").

444. Kuwait bases its estimate of recovery times for different shoreline areas on information regarding recovery rates of other oil-contaminated shoreline areas, particularly in the United States, but with some adjustments.

445. Iraq accepts that a small area of Kuwait's coastline was affected by the 1991 oil releases. However, Iraq argues that Kuwait has based its calculation of damage to the shoreline resources on computer models and natural resource damage assessment ("NRDA") data from the United States with "limited adjustments for the Kuwait situation". Iraq also states that Kuwait has not used information from the results of its monitoring and assessment studies to estimate recovery times for the affected areas, and has disregarded contemporaneous reports regarding the extent of damage to Kuwait's shoreline as a result of the oil spills. Iraq further states that, although the chosen metric is theoretically valid, Kuwait has made many assumptions without sufficient justification in applying it.

446. The Panel finds that there was damage to Kuwait's shoreline resources as a direct result of Iraq's invasion and occupation. The Panel also finds that the primary restoration envisaged by the award in the fourth "F4" instalment will not fully compensate for the loss resulting from this damage.[73] Accordingly, the Panel considers that compensatory restoration is appropriate in this case.

447. The Panel notes that Kuwait's estimate of the damage to the shoreline resources using computer models is broadly consistent with available information, such as satellite images, survey reports, photographs and witness statements. In the view of the Panel, the estimated magnitude of oil contamination (4.7 square kilometres) is also consistent with current observations of invasion-related shoreline contamination (0.8 square kilometres) identified in Kuwait's monitoring and assessment studies, taking into account likely reductions in the extent of contamination during the intervening years.[74]

448. In assessing the appropriate compensatory restoration project for damage to shoreline resources, Kuwait considered six alternatives. Kuwait chose the creation of a shoreline preserve as its preferred option because, in its view, such a preserve would "provide services of a similar type and quality as those that were lost due to Iraq's invasion and occupation of Kuwait, more specifically, the oil releases".

449. Kuwait then selected the site, area and duration for the proposed preserve based on the services required to compensate for the estimated loss of 1402.6 DSHY. The service estimations rely on assigning ecological benefit (or "uplift") values to sites depending on their level of current development and the possibility of future development. On that basis, Kuwait estimates that a 140-hectare preserve on Bubiyan Island over 50 years would generate the necessary benefits to offset the damage to shoreline resources. Kuwait however seeks the cost of operating and managing the preserve for a 20-year period, and calculates an amount of USD 16,692,699 for this purpose.

450. Iraq states that although, in theory, a shoreline preserve may be an appropriate form of compensatory restoration, Kuwait has not provided sufficient information either to justify the geographical extent of the proposed shoreline preserve or to demonstrate how such a preserve would compensate for the claimed loss of services.

451. The Panel finds that a coastal preserve would provide appropriate compensation for the loss of shoreline resources resulting from Iraq's invasion and occupation of Kuwait. A preserve sited in shoreline habitats similar to those that have been damaged would provide ecological services similar in kind to those that were lost. In the view of the Panel, such a preserve is feasible, cost-effective and poses a low risk of adverse impacts.

452. However, the Panel considers that a number of modifications to the compensatory project proposed by Kuwait are necessary. In particular, the Panel considers that it would be more appropriate to provide for the operation and maintenance of a 140-hectare preserve on Bubiyan Island, or another suitable area, for 30 years. Details of the modifications are indicated in Annex II to this report.

453. The expenses of the compensatory project have been adjusted to take account of the modifications in Annex II as well as further adjustments including:

(a) A 30-year duration for the operation and maintenance of the proposed preserve, instead of 20 years as proposed;

(b) Reduction in the size of the facility and a decrease in the staff required to operate the preserve;

(c) Adjustments to unit costs and contingency estimates; and

(d) Additional allowances for items not budgeted, such as fencing and a pier/ramp.

454. The modifications and adjustments reduce the expenses of the coastal preserve to USD 7,943,030.

455. The Panel finds that this amount constitutes appropriate compensation for damage to or depletion of Kuwait's natural resources resulting from Iraq's invasion and occupation, in accordance with paragraph 35(e) of Governing Council decision 7.

456. Accordingly, the Panel recommends compensation in the amount of USD 7,943,030 for this part of the claim unit.

(c) Lost recreational opportunities

457. Kuwait states that its claim for lost recreational opportunities represents the "[e]conomic value of the welfare loss associated with lost opportunities for performing recreational activities at beaches and at sea during and after Iraq's invasion and occupation of Kuwait". Kuwait seeks compensation in the amount of USD 23,015,144 for this loss.

458. Kuwait conducted four surveys in 2003 to estimate lost activity days and the monetary value of each activity. The surveys were conducted among beach users, boat users, boat owners and chalet owners. The total number of lost days for each recreational activity was calculated by multiplying the number of days lost in each year by the number of years during which opportunities for the activity were not available as a result of Iraq's invasion and occupation of Kuwait. The monetary value of the loss was valued using "contingent valuation", a survey-based valuation technique.

459. Kuwait provides as evidence of damage to recreational resources, photographs of mines and barbed wire used as part of the coastal defences as well as photographs of damaged yacht club facilities. Kuwait also submitted witness statements asserting that recreational facilities on the coast could not be used during and after the invasion and occupation as a result of, inter alia, the presence of Iraqi troops, military fortifications and munitions.

460. Iraq states that "the contingent valuation survey cannot be considered sufficient evidence to support this claim". Iraq also states that Kuwait has not indicated how it proposes to utilize the

monetary compensation requested in this regard. Iraq adds that, on the assumption that any compensation awarded for this part of the claim unit will be used on the proposed shoreline preserve, Kuwait has failed to specify whether recreational opportunities will be provided within the preserve to replace those that are alleged to have been lost.

461. Iraq further states that this part of the claim unit might duplicate some of the compensation claimed for the shoreline preserve. Iraq notes that the estimated costs of the shoreline preserve were based on the original estimate for a combined shoreline preserve and marine reserve that was also intended to replace lost recreational opportunities.

462. In the view of the Panel, it is likely that some people in Kuwait were deprived of opportunities for recreational activities at beaches and at sea during and after Iraq's invasion and occupation of Kuwait, and that this was a direct result of the invasion and occupation.

463. However, there are serious technical problems with Kuwait's quantification and valuation of the loss of recreational opportunities. In particular, it is doubtful that the persons questioned in Kuwait's survey could recall accurately, after more than 10 years, detailed information on their use of recreational facilities in the past. Further, the contingent valuation data submitted by Kuwait do not provide a sufficiently reliable basis for estimating the value of any lost recreational opportunities.

464. In the view of the Panel, the information submitted does not provide a sufficient basis for determining the nature and extent of loss of recreational opportunities to people in Kuwait. Consequently, Kuwait has failed to meet the evidentiary requirements for compensation as specified in article 35(3) of the Rules.

465. Accordingly, the Panel recommends no compensation for this part of the claim unit.

3. Third claim unit – Groundwater resources

466. Kuwait seeks compensation in the amount of USD 159,883,100 for the loss of use of groundwater resources during the period when these resources could not be used because of contamination resulting from Iraq's invasion and occupation. Specifically, Kuwait seeks compensation for the loss of the sustainable yield in the southern Raudhatain and Umm Al-Aish aquifers in the period beginning from the original contamination in 1992 and ending in 2051, when Kuwait states that remediation of the damage will be completed.[75]

467. Iraq questions Kuwait's claimed loss of use of water resources as a result of the invasion and occupation. According to Iraq, the baseline situation was one in which the aquifers were only being used to a limited extent and not at their sustainable yields. It also states that extraction from the aquifers had already almost ceased at the time of the invasion.

468. Iraq also states that, in any case, the net freshwater storage in the two aquifers has already increased by natural recharge; and it asserts that there is no evidence of fresh groundwater loss because pumping rates at both of the aquifers have, in fact, increased since the invasion and occupation.

469. Iraq further contends that Kuwait has contributed to damage to the aquifers because it failed to take timely and appropriate steps to remove the adjacent oil lakes and oil recovery pits that are alleged to have caused the groundwater contamination.

470. The Panel notes that the presence of mines and other ordnance initially prevented the removal of nearby oil contamination, and reconstruction operations in the oil fields further delayed remediation efforts. Furthermore, for some time there was a lack of monitoring data identifying the location, nature and extent of the contamination in the aquifers. The Panel, therefore, does not consider that Kuwait's delay in removing the oil lakes and recovery pits was unreasonable in the circumstances.[76]

471. However, the Panel notes that the evidence shows that groundwater pumping in Kuwait recommenced at levels similar to the pre-war levels soon after the end of Iraq's occupation of Kuwait. The evidence further shows that the pumping was from different wells where contamination had not affected the groundwater and there is no evidence that the use of different wells to pump the groundwater resulted in increased costs.

472. In any case, the Panel notes that, compared with the overall production of fresh water in Kuwait, groundwater production at the Raudhatain and Umm Al-Aish aquifers was minimal, both before and after Iraq's invasion and occupation.

473. The Panel, therefore, concludes that Kuwait has not provided sufficient evidence to establish loss of groundwater production at Raudhatain and Umm Al-Aish. Consequently, Kuwait has failed to meet the evidentiary requirements for compensation as specified in article 35(3) of the Rules.

474. Accordingly, the Panel recommends no compensation for this claim unit.

4. Recommended award

475. The Panel's recommendations in respect of claim No. 5000460 are summarized in table 11.

Table 11. Recommended award for claim No. 5000460

Claim unit	Amount claimed (USD)	Amount recommended (USD)
Terrestrial resources	194,133,683	nil
Marine and coastal resources	613,814,608	7,943,030
Groundwater resources	159,883,100	nil
Total	967,831,391	7,943,030

C. Claim No. 5000468 – Coastal mudflats

476. Claim 5000468 is for compensation in the amount of USD 267,710,202 for expenses of future measures to remediate damage to Kuwait's coastal mudflats resulting from Iraq's invasion and occupation and for future monitoring activities. This amount represents a decrease in the

compensation claimed, reflecting amendments made by Kuwait based on information obtained from its monitoring and assessment activities.[77]

477. By Procedural Order No. 6 of the fourth "F4" instalment dated 30 April 2004, the Panel deferred the portion of claim No. 5000259 of Kuwait relating to remediation of coastal mudflats to the fifth "F4" instalment. The deferral was made at the request of both Kuwait and Iraq. This claim is the deferred portion of claim No. 5000259 relating to remediation of coastal mudflats.

478. Kuwait states that its coastal environment was damaged by millions of barrels of oil deliberately released into the Persian Gulf by Iraqi forces. According to Kuwait, the oil released as a result of Iraq's invasion and occupation of Kuwait dwarfed all other inputs of oil into the Persian Gulf from spills, refinery operations, natural seeps, exploration and production activities, operational discharges from vessels, urban run-off and similar sources.

479. Kuwait provided several reports, satellite images and witness accounts of oil spillage in and around the mudflats area as a result of Iraq's invasion and occupation.

480. In order to determine the oil contamination remaining in the mudflats, Kuwait conducted a comprehensive shoreline survey. Kuwait also conducted a rapid shoreline assessment ("RSA") to determine the diversity of biota ("species richness") in different parts of the mudflats, and conducted chemical analysis of samples taken from the RSA sample areas.[78]

481. According to Kuwait, remediation is required in four areas of mudflats located along the north shore of Kuwait Bay. Kuwait determines the areas requiring remediation by identifying areas of high levels of oil contamination (TPH "at or above 100mg/kg") that correspond to low levels of RSA species richness (three or less in areas which, according to Kuwait, normally contain a richness of 10 to 14). The total area identified as requiring remediation is approximately 53.4 square kilometres along the full width of the intertidal zone.

482. Kuwait also states that the impact of oil contamination on the remaining areas of mudflats is uncertain and that the mudflats are a fragile but critically important biological area. Hence, although no active remediation measures are proposed for these remaining areas, Kuwait proposes a five-year monitoring activity in those areas, and it seeks compensation for the expenses of the monitoring activity.

483. Iraq accepts that data presented by Kuwait indicate possible remaining oil contamination in certain locations in the upper intertidal zone of Northern Kuwait Bay that could be a result of the 1991 conflict. However, Iraq estimates that the total area that may require remediation is no more than 0.4 square kilometres.

484. Iraq also agrees that the coastal oil trench and oil deposit areas in Kuwait Bay are possible sources of oil impacting these locations. However, Iraq states that there is insufficient evidence regarding "ongoing stresses and how these may affect the interpretation of the M&A data". Iraq, therefore, concludes that the relative contribution of the conflict has not been determined.

485. With regard to expenses of monitoring areas where remediation is not proposed, Iraq states that this is a new claim and, as such, inadmissible. Iraq also argues that the claim is unjustified in substance as the Panel has already awarded substantial funding for monitoring activities and any new data would not serve any useful purpose in the UNCC process.

486. The Panel notes that the mudflats are characterized by low levels of oil contamination, and the evidence provided is not sufficient to demonstrate that the contamination is causing environmental damage. Further, the evidence provided is insufficient to enable the Panel to determine the proportion of the oil contamination remaining in the coastal mudflats that is attributable to Iraq's invasion and occupation of Kuwait, or to assess the importance of other factors, such as natural variability, that may affect the diversity of biota in the area.

487. The Panel, therefore, finds that Kuwait has not provided sufficient evidence to show that there is remaining damage in the mudflats attributable to Iraq's invasion and occupation. Consequently, Kuwait has failed to meet the evidentiary requirements for compensation as specified in article 35(3) of the Rules.

488. The Panel also finds that insufficient evidence has been provided by Kuwait to justify further monitoring activity in any areas of the mudflats.

489. Accordingly, the Panel recommends no compensation for this claim.

490. The Panel's recommendation in respect of claim No. 5000468 is summarized in table 12.

Table 12. Recommended award for claim No. 5000468

Claim	Subject	Amount claimed (USD)	Amount recommended (USD)
5000468	Coastal mudflats	267,710,202	nil
Total		267,710,202	nil

D. Claim No. 5000183 – Public health

491. Claim No. 5000183 comprises four claim units, with a total asserted value of USD 1,476,336,427, for losses resulting from damage or risk of damage to public health. This amount represents an increase in the compensation claimed, reflecting amendments made by Kuwait based on information obtained from its monitoring and assessment activities.[79]

492. Kuwait states that Iraq's invasion and occupation caused wide-ranging health impacts as a result of the release of pollutants from the oil well fires, the release of oil into coastal waters and the traumatic impacts of hostilities and various acts of violence on the population. Kuwait also states that the looting of medical and public health facilities by Iraqi forces resulted in severe damage to its public health system.

493. The first claim unit is for medical treatment costs for persons injured by mines and ordnance explosions. The second claim unit is for medical treatment costs and other losses to persons suffering

from post-traumatic stress disorder as a result of exposure to hostilities and various acts of violence by Iraqi forces during the invasion and occupation. The third claim unit is for losses due to increased mortality resulting from the effects of the oil well fires in Kuwait. The fourth claim unit is for the costs of a long-term epidemiological study and a medical screening programme to evaluate the impact of Iraq's invasion and occupation on public health in Kuwait. Kuwait also claims interest on any amount awarded.

1. First claim unit – Treatment of injuries from mines and ordnance

494. Kuwait seeks compensation in the amount of USD 2,385,617 for expenses incurred to treat individuals injured by explosions of mines and ordnance. Kuwait states that during Iraq's invasion and occupation, massive quantities of unexploded mines and ordnance were left in its territory. According to Kuwait, Iraq created large minefields, planted over a million mines around the country, and left many remnants of war that were often camouflaged and booby-trapped. Kuwait states that, as a result of Iraq's actions, many of its residents sustained injuries from mine and ordnance explosions, and were treated within its public healthcare system.

495. Kuwait seeks compensation for the following expenses incurred for the treatment of 143 persons who sustained injuries from mines and ordnance explosions:

(a) Expenses incurred in the past for initial hospital care, amputation surgery, follow-up care and prosthetic devices for 36 nationals of Kuwait, and for future costs of replacement of prosthetic devices (USD 1,340,393);

(b) Expenses incurred in the past for initial hospital care and amputation surgery for 40 non-nationals of Kuwait (USD 811,586); and

(c) Expenses incurred in the past for initial hospital care for 67 nationals of Kuwait who were injured by mines and ordnance explosions but did not require amputation surgery (USD 233,638).

496. Kuwait relies on victims' records in the databases of the Public Authority for Assessment of Compensation for Damages Resulting from Iraqi Aggression and the Ministry of Health's Artificial Limb Centre to calculate the number of victims of mines and ordnance explosions, and to assess the extent of their injuries.

497. Iraq accepts that the dispersal of mines and ordnance as a result of the invasion and occupation caused injuries to residents of Kuwait. However, Iraq argues that it should not be held liable for the damage caused by cluster bombs which were used only by the Allied Coalition forces. According to Iraq, this type of ordnance was the principal source of the injuries that are the subject of Kuwait's claim.

498. In the second "F4" report, the Panel noted that, pursuant to paragraph 34(a) of Governing Council decision 7, "direct loss, damage, or injury" includes any loss suffered as a result of "military operations by either side during the period 2 August 1990 and 2 March 1991". Accordingly, the Panel

found that losses or expenses incurred in connection with mines and ordnance were compensable regardless of whether they resulted from military operations by Iraq or the Allied Coalition Forces.[80] In the present claim, the Panel finds that expenses incurred by Kuwait as a result of injuries from mines and ordnance are direct losses within the meaning of paragraph 16 of Security Council resolution 687 (1991), irrespective of who was responsible for their presence in Kuwait.

499. The Panel directed the secretariat to undertake cross-claim and cross-category checks to ascertain whether there is a risk of duplication of this claim unit with other claims submitted to the Commission, and in particular, whether the claim could duplicate claims submitted by individual claimants that were reviewed in the "B", "C" and "D" claims categories.[81] The secretariat was further instructed to request Kuwait to provide information on the steps that it had taken to ensure that this claim did not duplicate, wholly or in part, any other claim that Kuwait had filed with the Commission. Having reviewed the results of the checks by the secretariat and the response received from Kuwait, the Panel is satisfied that, although there may be a theoretical risk of duplication of parts of this claim with some claims for which awards have been made by the Commission, the risk is marginal and does not warrant an adjustment.

500. The Panel considers that the costs claimed for providing replacement prosthetic devices to 36 Kuwaiti amputees are reasonable. The Panel also considers that the costs claimed for providing treatment to Kuwaitis with other injuries are reasonable. The Panel further considers that, with the exception of surgery costs, the initial treatment costs claimed for both Kuwaiti and non-Kuwaiti amputees are reasonable.

501. With regard to the costs of amputation surgery, the Panel considers that Kuwait's estimate is not reasonable since it is based on the average cost of surgery at the Mubarak Al Kabeer Hospital, which is higher than the average cost at the Al-Razi Hospital, where the surgery was actually performed. The Panel has, therefore, made an adjustment to take account of the difference. This adjustment reduces the expenses for the treatment of Kuwaiti amputees to USD 1,330,422 and the expenses for the treatment of non-Kuwaiti amputees to USD 790,843.

502. Accordingly, the Panel recommends compensation in the amount of USD 2,354,903 for this claim unit.

2. Second claim unit – Post-traumatic stress disorder cases

503. Kuwait seeks compensation in the amount of USD 1,181,450,810 for expenses and losses arising from the increased number of cases of post-traumatic stress disorder ("PTSD") as a result of the exposure of its residents to hostilities and various acts of violence by Iraqi forces during Iraq's invasion and occupation. Of the amount requested, USD 51,613,310 is for expenses incurred in providing medical treatment to persons in Kuwait who suffered from PTSD and USD 1,129,837,500 is for the loss of well-being by members of its population who suffered from PTSD.

(a) Treatment for PTSD

504. Kuwait calculates the number of persons who suffered from PTSD as a result of Iraq's invasion and occupation by subtracting the cases of PTSD that would be expected to occur without the invasion and occupation from the number of cases of PTSD in Kuwait in 1993. Kuwait calculates the number of PTSD cases in 1993 on the basis of the results of an epidemiological study conducted in 1993 by researchers with the Al-Riggae Specialized Centre for Treatment of War Victims in Kuwait. Kuwait's calculation of the number of cases of PTSD that would have occurred in 1993 but for Iraq's invasion and occupation is based on a review of the scientific literature on the prevalence of PTSD. Kuwait also relies on the results of a follow-up study which was conducted in 1998 to reassess the mental health status of the population that was the subject of the 1993 Al-Riggae epidemiological study.

505. According to Kuwait, 90,387 Kuwaiti citizens developed PTSD due to exposure to the events of the invasion and occupation. Kuwait calculates that 6.5 per cent of these persons made an average of 4.65 treatment visits per year for five years, resulting in a total of 136,597 treatment visits. Kuwait states that the average cost per visit is approximately USD 378.[82]

506. Iraq states that, although there may be a causal link between the invasion and occupation and some occurrence of PTSD in Kuwait, Kuwait's evidence does not establish a valid estimate of the number of persons in Kuwait who suffered from PTSD as a direct result of the invasion and occupation. In particular, Iraq asserts that the background prevalence rate of PTSD used by Kuwait is too low. It also states that Kuwait does not take account of variations in the duration of treatment for different patients. Further, Iraq argues that the average treatment costs claimed by Kuwait are too high.

507. The Panel finds that the data submitted by Kuwait demonstrate that, during Iraq's invasion and occupation, a substantial proportion of the Kuwait population was exposed to events of the type that can cause PTSD, and that exposure to these events resulted in an increase in the number of cases of PTSD in Kuwait. The Panel, therefore, finds that expenses incurred by Kuwait in treating such PTSD cases constitute direct losses resulting from Iraq's invasion and occupation of Kuwait, within the meaning of paragraph 16 of Security Council resolution 687 (1991). Accordingly, these expenses qualify for compensation in accordance with Governing Council decision 7.

508. The Panel finds, however, that there are limitations in Kuwait's calculation of the number of cases of PTSD and the costs of treatment. In particular, the Panel considers that Kuwait overstates the actual number of cases of PTSD attributable to Iraq's invasion and occupation by underestimating the background prevalence rate of PTSD in Kuwait prior to the invasion and occupation. On the basis of the available information, the Panel considers that it is reasonable to apply a background prevalence rate that is higher than the 2 per cent rate used by Kuwait. The Panel concludes that a reasonable estimate of the number of cases of PTSD attributable to Iraq's invasion and occupation of Kuwait is approximately 41,700.

509. Furthermore, the Panel notes that the intensity and duration of treatment required for PTSD varies considerably between cases. In the Panel's view, Kuwait's estimate, based on a duration of

treatment of five years for each case, is overstated. The Panel has, therefore, adjusted the recommended amount to take into account variations in the times required for treatment of different cases. The adjustment reduces the total number of treatment visits for PTSD patients to 29,615.

510. The Panel also notes that only 12,000 visits occurred at the Al-Riggae Centre, and that the Al-Riggae Centre costs are higher than the costs for psychological treatment at other facilities in Kuwait. As a result, the Panel has adjusted the cost-per-visit rate for treatment received in facilities other than the Al-Riggae Centre to USD 78 per visit.

511. These adjustments reduce the compensable expenses for the treatment of PTSD cases to USD 5,909,343.

512. Accordingly, the Panel recommends compensation in the amount of USD 5,909,343 for this part of the claim unit.

(b) Loss of well-being

513. Kuwait also seeks compensation for loss of well-being (i.e., reduced quality of life) of persons suffering from PTSD. Kuwait states that for each year an individual suffers from PTSD, there is a loss measurable in health-adjusted life years. Kuwait estimates the loss of well-being by multiplying the period during which a person suffered from PTSD symptoms by a disability weight representing the loss of well-being as a result of living with these symptoms. The specific disability weights used by Kuwait were derived from a study involving a person trade-off survey in which clinicians were asked to assume the role of a policy maker and to make judgements about the relative values of sick people as compared to healthy people. Kuwait claims that each individual with PTSD suffered a decrease in well-being equivalent to the loss of one-fourth of a life year. Accordingly, based on a value of USD 50,000 per life year, Kuwait claims USD 12,500 for each case of PTSD resulting from the invasion and occupation.

514. Iraq argues that governments can only submit claims before the Commission for losses that they have sustained directly, and that they may not seek compensation for losses suffered by individuals. Iraq states that Kuwait's claim for loss of individual well-being is inadmissible because it relates to losses suffered directly by individuals who could have submitted such claims to the Commission. Since the Government of Kuwait has not suffered any direct loss, Iraq states that this part of the claim unit should be dismissed. Iraq further states that the claim for loss of well-being is merely theoretical.

515. As indicated in paragraphs 69-70 above, the Panel considers that there is nothing either in Security Council resolution 687 (1991) and Governing Council decision 7 or in general international law that prevents Kuwait from claiming for death or other injury to its nationals as a result of the unlawful actions of Iraq. However, in the present case, the Panel does not consider that the evidence provided by Kuwait is sufficient to establish the nature and extent of the damage for which it seeks compensation. In particular, the Panel notes that, in calculating its losses, Kuwait uses disability weights that are normally intended for making decisions on the cost-effectiveness of alternative

investments in health policies and programmes rather than for compensating individuals with mental illness.

516. The Panel further finds that Kuwait does not provide a reasonable justification for using USD 50,000 per life year to value its loss. Although Kuwait states that this value is at the low end of the range of values that economists use to evaluate the cost-effectiveness of alternative medical interventions in the United States, there is no evidence that the range used by Kuwait is appropriate for the population of Kuwait. In the view of the Panel, there are major cultural, demographic and economic differences between Kuwait and the United States which make it very doubtful that the range of values used by Kuwait is suitable in this context.

517. The Panel, therefore, concludes that the information provided by Kuwait is not sufficient to enable it to determine the nature and circumstances of the loss for which compensation is claimed. Consequently, Kuwait has failed to meet the evidentiary requirements for compensation as specified in article 35(3) of the Rules.

518. Accordingly, the Panel recommends no compensation for this part of the claim unit.

3. Third claim unit – Increased mortality

519. Kuwait seeks compensation in the amount of USD 192,500,000 for increased mortality in Kuwait due to increased pollution resulting from the oil well fires in Kuwait. In particular, Kuwait seeks compensation for loss of economic value resulting from 35 premature deaths that it estimates occurred due to the exposure of its population to airborne particulate matter from the oil well fires. Kuwait calculates the compensation requested on the basis of USD 5,500,000 per life lost.

520. Kuwait relies on the results of its monitoring and assessment enumeration study[83] to estimate the ground-level concentrations of airborne particulate matter to which its citizens were exposed during the period when the oil well fires were burning. Based on the results of an air dispersion model, Kuwait estimates daily concentrations of particulate matter and calculates population-weighted exposure estimates. According to Kuwait, the results of its monitoring and assessment study demonstrate that the emissions from the oil well fires resulted in increased concentrations of particulate matter in populated regions of Kuwait in quantities sufficient to cause premature deaths.

521. In order to estimate the number of these premature deaths, Kuwait relies on the results of a monitoring and assessment study on human health risks.[84] In the risk assessment study, Kuwait generated a statistical estimate of the expected increase in mortality in Kuwait based on estimates of concentrations of particulate matter to which the population was exposed as derived from the monitoring and assessment enumeration study. According to Kuwait, the results of the risk assessment show that the number of deaths due to exposure to particulate matter from the oil well fires range between 0 and 116. Kuwait seeks compensation for 35 deaths, which is their "central estimate".[85]

522. Kuwait acknowledges that the 35 additional deaths do not represent identifiable individuals. It states that it would not be possible to identify specific individuals because the adverse effects from the Kuwait oil well fires cannot be distinguished at the individual level from similar effects that may be due to other causes.

523. Iraq asserts that this claim unit should be rejected as a claim filed after the expiry of the applicable deadline. Further, Iraq states that the claim should be rejected because it quantifies the loss by using a modelling approach and not by using concrete evidence. According to Iraq, a model that only predicts damage or injury is not sufficient to discharge the burden of proof required for compensation from the Commission. Iraq notes that the claimed loss is not based on treatment costs actually incurred, but rather on theoretical evaluations of the economic value of human life.

524. The Panel notes that there is sufficient evidence to show that the oil well fires in Kuwait resulted in increased ground-level concentrations of airborne particulate matter in populated areas of Kuwait between February 1991 and October 1991, and that these concentrations could have been sufficient to cause increased mortality in Kuwait. However, the evidence submitted by Kuwait is not sufficient to demonstrate either that 35 premature deaths actually occurred or that any such premature deaths were the direct result of the invasion and occupation. In particular, Kuwait provides no information on the specific circumstances of actual deaths that would enable the Panel to determine whether such premature deaths could reasonably be attributed, wholly or partially, to factors resulting from Iraq's invasion and occupation. Consequently, Kuwait has failed to meet the evidentiary requirements for compensation as specified in article 35(3) of the Rules.

525. Accordingly, the Panel recommends no compensation for this claim unit.

4. Fourth claim unit – Long-term epidemiological study and medical screening programme

526. Kuwait seeks compensation in the amount of USD 100,000,000 for the cost of a long-term epidemiological study and a medical screening programme to identify health effects caused by Iraq's invasion and occupation.

527. For the long-term epidemiological study, Kuwait proposes to continue the epidemiological study that it is currently conducting with funds from the first "F4" instalment award.[86] In particular, Kuwait proposes to follow up the 25,000 subjects of the current study at five-year intervals for twenty years. Kuwait proposes to add a clinical epidemiological component that would involve the physical examination of 5 to 10 per cent of the subjects at five-year intervals. According to Kuwait, the aim of the epidemiological study will primarily be to test the hypothesis that trauma-induced stress has both psychological and physical consequences.

528. For the medical screening programme, Kuwait proposes to identify and, where required, treat, individuals who are at an increased risk of acquiring certain diseases as a result of Iraq's invasion and occupation. Kuwait states that the programme will focus on individuals with cardiovascular disease, asthma, ulcers, colitis, and psychological disorders. Kuwait states that the epidemiological study and medical screening programme will be tightly linked and that information about the relationship

between exposure to conflict-related trauma, pollution and disease developed in the epidemiological study will be used in the design of the medical screening programme so that affected subgroups of the population may be effectively targeted.

529. Iraq asserts that Kuwait's preliminary public health study results, cited as justification for the proposed epidemiological study, are unreliable. Iraq refers in particular to potential errors resulting from the use of large numbers of proxy respondents; possible confounding factors due to differences in pre-war health status between the exposed and control groups; and potential errors in the diagnoses of diseases by doctors.

530. In the view of the Panel, Kuwait's proposal to identify additional health effects resulting from Iraq's invasion and occupation could have scientific merit, and would constitute reasonable monitoring of public health under paragraph 35(d) of Governing Council decision 7. However, Kuwait provided only a brief description of the study and medical screening programme. Although Kuwait stated that it would provide further details on the scope of the study, including the basis on which the expenses claimed were calculated, the information that Kuwait provided was insufficient for a full evaluation of the proposed study. The Panel is, therefore, unable to evaluate the technical merits of the study and medical screening programme or to assess whether the claimed costs are reasonable. Consequently, Kuwait has failed to meet the evidentiary requirements for compensation as specified in article 35(3) of the Rules.

531. Accordingly, the Panel recommends no compensation for this claim unit.

5. Recommended award

532. The Panel's recommendations in respect of claim No. 5000183 are summarized in table 13.

Table 13. Recommended award for claim No. 5000183

Claim unit	Amount claimed (USD)	Amount recommended (USD)
Treatment of injuries from mines and ordnance	2,385,617	2,354,903
Post-traumatic stress disorder cases	1,181,450,810	5,909,343
Increased mortality	192,500,000	nil
Long-term epidemiological study and medical screening programme	100,000,000	nil
Total	1,476,336,427	8,264,246

E. Claim No. 5000453 – Kuwait University studies

533. Kuwait seeks compensation in the amount of USD 4,056,202 for expenses of 50 research studies conducted by Kuwait University to study the effects of Iraq's invasion and occupation on Kuwaiti society. The amount sought consists of USD 3,499,993 for the costs of the studies and USD 556,209 for interest.

534. This claim was originally part of category "F3" claim No. 5000194. On 20 August 2001, the secretariat severed the parts of claim No. 5000194 relating to these studies and assigned them to claim No. 5000453. On 10 January 2003, the Executive Secretary approved the allocation of claim No. 5000453 to the fifth "F4" instalment.

535. Kuwait states that, following Iraq's invasion and occupation, a special research department was established at Kuwait University to conduct these studies, which covered many academic disciplines, including environmental sciences, human health and psychology, political science, journalism, law, economics, education, engineering and finance.

536. Iraq argues that only 11 of the studies covered by this claim could possibly qualify as compensable monitoring and assessment studies. Further, Iraq contends that there is a substantial chance of overlap between this claim and the 22 monitoring and assessment studies submitted by Kuwait in the first "F4" instalment.

537. Iraq also argues that the majority of the studies are of a purely theoretical nature, and it refers to the Panel's finding in the first "F4" instalment that "compensation should not be awarded for monitoring and assessment activities that are purely theoretical or speculative, or which have only a tenuous link with damage resulting from Iraq's invasion and occupation of Kuwait".[87]

538. Iraq further states that it is not clear from the information provided whether Kuwait used these studies to prepare other claims, in which case it argues that the claim could constitute a claim for preparation costs. In addition, Iraq states that, although the claim contains evidence of the results of the studies, the costs incurred are not well documented.

539. Furthermore, Iraq states that the evidence available suggests that there was a conscious choice by Kuwait University to divert funds into research on these particular topics. According to Iraq, the salaries of the persons engaged in the studies would have been paid even if the conflict had not occurred and, accordingly, Kuwait University has suffered no loss. In the view of Iraq, the claim is unjustified because of the insufficient evidence provided and the absence of proof that any loss was incurred by Kuwait.

540. The Panel notes that, although Kuwait states that it established a special research department to carry out research related to the effects of Iraq's invasion and occupation, it has not submitted evidence that the expenses claimed for the studies were incurred over and above the normal expenses that would have been incurred by Kuwait University without the invasion and occupation. The Panel also notes that Kuwait has not submitted evidence to show that any research personnel were specially recruited to carry out the studies.

541. The Panel further finds that Kuwait has not submitted appropriate evidence, such as invoices or statements of accounts, to show that the expenses were, in fact, incurred in connection with the studies.

542. The Panel, therefore, finds that Kuwait has not provided sufficient evidence to demonstrate the circumstances and amount of the compensation claimed. Consequently, Kuwait has failed to meet the evidentiary requirements for compensation as specified in article 35(3) of the Rules.

543. Accordingly, the Panel recommends no compensation for this claim.

Table 14. Recommended award for claim No. 5000453

Claim	Subject	Amount claimed (USD)	Amount recommended (USD)
5000453	Kuwait University studies	4,056,202	nil
Total		4,056,202	nil

F. Recommended awards for the claims of Kuwait

544. The Panel's recommendations in respect of Kuwait's claims are summarized in table 15.

Table 15. Summary of recommended awards for the claims of Kuwait

Claim	Subject	Amount claimed (USD)	Amount recommended (USD)
5000460	Loss of natural resources	967,831,391	7,943,030
5000468	Coastal mudflats	267,710,202	nil
5000183	Public health	1,476,336,427	8,264,246
5000453	Kuwait University studies	4,056,202	nil
Total		2,715,934,222	16,207,276

VII. CLAIMS OF THE KINGDOM OF SAUDI ARABIA

A. Overview

545. In the fifth "F4" instalment, the Panel reviewed four claims submitted by Saudi Arabia for damage resulting from Iraq's invasion and occupation of Kuwait. Claim Nos. 5000309 and 4002545 relate to loss of agricultural resources. Claim No. 5000463 is for damage to or depletion of other resources; and Claim 5000219 relates to damage to public health.

B. Claim No. 5000309 – Agricultural resources

546. Claim No. 5000309 comprises two claim units, with a total asserted value of USD 481,442, for losses of livestock and crop resources in the Al-Hassa region of Saudi Arabia as a result of Iraq's invasion and occupation of Kuwait.

547. The elements of Claim No. 5000309 were originally part of claim 5000208 in the "F2" claims category. On 23 December 1998, the secretariat severed the elements relating to environmental damage from claim 5000208 and assigned these elements to claim No. 5000309 which was transferred to the "F4" claims category.

1. First claim unit – Livestock resources

548. Saudi Arabia seeks compensation in the amount of USD 441,389 for losses of livestock suffered by animal breeders in the Al-Hassa region of Saudi Arabia due to degenerative diseases that affected the animals as a result of Iraq's invasion and occupation of Kuwait. Saudi Arabia states that the diseases were caused by the contamination of grass, weeds and water in the grazing area as a result of the deposition of lead and sulphur from the Kuwait oil well fires.

549. Saudi Arabia provided a report from a veterinary expert who inspected 45,224 camels and conducted four autopsies. The expert concluded that the death of the camels was not caused by an infectious disease but by lead and sulphur poisoning that caused a drop in the immunity of the camels to infections.

550. Iraq argues that Saudi Arabia has no standing to bring this claim before the Commission because it was animal breeders who suffered the alleged losses. According to Iraq, the livestock were not owned by the state, and Saudi Arabia has not suggested that it compensated the breeders for their losses.

551. Iraq also argues that Saudi Arabia did not provide any evidence showing that fallout from the oil well fires affected the area concerned or livestock in the region. According to Iraq, it is highly unlikely that the deposition from the smoke plume could have had such an adverse effect in Saudi Arabia. Iraq states that Saudi Arabia has not produced any evidence to show that the losses of livestock actually occurred and, if any such losses had occurred, that they were attributable to any effects of the smoke plume resulting from the oil well fires in Kuwait. In the view of Iraq, Saudi Arabia should have submitted scientific data such as autopsy and laboratory reports or baseline data relating to animal health or disease.

552. In the view of the Panel, Saudi Arabia has neither established the nature and extent of damage to livestock, nor demonstrated a clear link between the damage and pollutants from the oil well fires in Kuwait. Even if the findings of Saudi Arabia's expert were to be accepted, there is no evidence to show a direct link between the claimed lead and sulphur poisoning of the camels and Iraq's invasion and occupation of Kuwait.

553. The Panel also notes that Saudi Arabia has not provided any documentation to explain how it estimated the monetary value of the loss, including documentation on the number of camels affected or the monetary value per camel.

554. The Panel sent several requests to Saudi Arabia in which it was specifically asked, inter alia, to verify and substantiate the amounts claimed in respect of the livestock losses. However, Saudi Arabia failed to respond to these requests.

555. The Panel, therefore, finds that Saudi Arabia has not provided sufficient evidence to establish that the livestock losses in the Al-Hassa region occurred as a direct result of Iraq's invasion and

occupation of Kuwait. Consequently, Saudi Arabia has failed to meet the evidentiary requirements for compensation as specified in article 35(3) of the Rules.

556. Accordingly, the Panel recommends no compensation for this claim unit.

2. Second claim unit – Crop resources

557. Saudi Arabia seeks compensation in the amount of USD 40,053 for crop losses sustained by farmers in the Al-Hassa region of Saudi Arabia from plant pests and diseases alleged to have resulted from the fallout from the oil well fires in Kuwait.

558. Saudi Arabia states that the crop losses, when looked at together with the veterinary explanation of the animal losses, appear to be related to the pollution caused by fallout from the oil well fires, although it acknowledges that this cannot be definitively demonstrated at this stage. No additional information has been provided to support this statement. Saudi Arabia has indicated neither the locations within the Al-Hassa region where crops were exposed to pollutants from the oil well fires, nor the size of the areas planted with crops. No information about the planting and harvesting seasons or the types and concentrations of the pollutants were provided by Saudi Arabia.

559. As a preliminary objection, Iraq contends that Saudi Arabia has no standing to submit this claim, as it is not the Kingdom of Saudi Arabia but individual farmers who suffered the alleged losses.

560. Iraq also argues that Saudi Arabia has failed to demonstrate the existence of a direct causal link between the alleged loss and the fallout of the oil well fires, and refers to a number of potential parallel and alternative causes of the crop losses, including the effects of activities that are common in the area such as livestock grazing and air pollution from the oil industry.

561. Iraq notes that Saudi Arabia did not provide baseline data on crops or evidence indicating the types of crops that were affected or their location. According to Iraq, Saudi Arabia has merely attributed the alleged crop losses to plant pests and plant diseases with no demonstration of any link between these diseases to the oil well fires.

562. Furthermore, Iraq states that it is impossible to evaluate how Saudi Arabia has quantified and valued the alleged crop losses because no information has been provided on the value assigned to the various crops, and the periods of the alleged losses have not been specified.

563. In the view of the Panel, Saudi Arabia has not submitted sufficient evidence to establish the nature or extent of the damage, or to support its estimation of crop losses that it claims to have suffered. Furthermore, Saudi Arabia has not produced sufficient evidence to establish that the crop losses were a direct result of Iraq's invasion and occupation of Kuwait.

564. The Panel sent several requests to Saudi Arabia, in which it was specifically asked, inter alia, to verify and substantiate the amounts claimed in respect of the crop losses. However, Saudi Arabia failed to respond to these requests.

565. The Panel therefore finds that Saudi Arabia has not provided sufficient evidence either to establish the extent of the crop losses in the Al-Hassa region or to demonstrate that any such losses occurred as a direct result of Iraq's invasion and occupation of Kuwait. Consequently, Saudi Arabia has failed to meet the evidentiary requirements for compensation as specified in article 35(3) of the Rules.

566. Accordingly, the Panel recommends no compensation for this claim unit.

3. Recommended award

567. The Panel's recommendations in respect of claim No. 5000309 are summarized in table 16.

Table 16. Recommended award for Claim No. 5000309

Claim unit	Amount claimed (USD)	Amount recommended (USD)
Livestock resources	441,389	nil
Crop resources	40,053	nil
Total	481,442	nil

C. Claim No. 4002545 – Agricultural resources (Shadco)

568. Claim No. 4002545 comprises two claim units, with a total asserted value of USD 2,676,101, for losses of agricultural crops by the Ash-Sharqiah Development Co. ("Shadco")[88] as a result of Iraq's invasion and occupation of Kuwait. The first claim unit is for reduction in crop yields and the second claim unit is for claim preparation costs.

569. Claim No. 4002545 was originally in the "E2" claims category. On 21 September 2000, the secretariat transferred this claim to the "F4" claims category.

1. First claim unit – Reduced crop yields

570. Saudi Arabia seeks compensation in the amount of USD 2,670,227[89] for losses sustained by Shadco as a result of reduced yields of barley and wheat during the period 1990-1991. According to Saudi Arabia, environmental contamination caused by Iraq's invasion and occupation of Kuwait resulted in approximately 80 mm of acid rain falling in the Northern Province of Saudi Arabia between 9 January 1991 and 5 April 1991. Saudi Arabia states that, as a result of the acid rain, the productivity of Shadco's two main crops, barley and wheat, declined during the 1990-1991 growing season.

571. According to Saudi Arabia, Shadco's average barley production per hectare during 1989 to 1990 was approximately 5.5 tonnes. This rate decreased to approximately 3.4 tonnes per hectare during 1990 to 1991, a reduction in yield of approximately 2.1 tonnes per hectare.

572. Saudi Arabia states that Shadco had cultivated 2,944 hectares of barley at the time of the alleged damage. Saudi Arabia multiplied the asserted loss of production per hectare by the total number of

hectares to obtain a total production loss of approximately 6,124 tonnes. Saudi Arabia claims that Shadco would have received approximately USD 267 per tonne of barley. Accordingly, the incurred loss is calculated as USD 1,635,113.

573. According to Saudi Arabia, Shadco's average wheat production per hectare during the period 1989 to 1990 was approximately 3.8 tons. This rate decreased to approximately 2.3 tonnes per hectare during the period 1990 to 1991, a reduction in yield of approximately 1.5 tonnes per hectare.

574. Saudi Arabia states that Shadco had cultivated 2,063 hectares of wheat at the time of the damage. Saudi Arabia multiplied the asserted loss of production per hectare by the total number of hectares to obtain a total production loss of approximately 3,033 tonnes. Saudi Arabia claims that Shadco would have received approximately USD 401 per tonne of wheat. Accordingly, the incurred loss is calculated as USD 1,214,664.

575. Saudi Arabia relies on published literature to support its claim that air pollutants from the oil well fires in Kuwait were transported to north-eastern Saudi Arabia and adversely affected farms in the country.

576. Iraq argues that Saudi Arabia did not provide any credible evidence, such as maps or figures of the location of the farms or crop areas alleged to have been damaged, to support this claim. Iraq further states that Saudi Arabia also did not produce any baseline data of crop health or disease to support the claim. Iraq further argues that there is no evidence to suggest that acid rain occurred as a result of the smoke plume from the oil well fires in Kuwait.

577. In the view of the Panel, Saudi Arabia has not submitted sufficient evidence to establish the nature or extent of the crop losses suffered by Shadco or to support its estimation of crop losses that it claims Shadco suffered. Furthermore, Saudi Arabia has not produced sufficient evidence to establish that the asserted crop losses were a direct result of Iraq's invasion and occupation of Kuwait.

578. The Panel sent several requests to Saudi Arabia in which it was specifically asked, inter alia, to verify and substantiate the amounts claimed in respect of the crop losses. However, Saudi Arabia did not respond to these requests.

579. The Panel, therefore, finds that Saudi Arabia has not provided sufficient evidence either to establish the nature and extent of the losses incurred by Shadco due to the reduction of crop production, or to demonstrate a link between crop damage at Shadco's farms and Iraq's invasion and occupation of Kuwait. Consequently, Saudi Arabia has failed to meet the evidentiary requirements for compensation as specified in article 35(3) of the Rules.

580. Accordingly, the Panel recommends no compensation for this claim unit.

2. Second claim unit – Claim preparation costs

581. Saudi Arabia seeks compensation in the amount of USD 5,874 for claim preparation costs.

582. As stated in paragraph 223 above, in a letter dated 6 May 1998, the Executive Secretary informed all panels of Commissioners that the Governing Council intends to resolve the issue of the compensability of claim preparation costs in the future.

583. The Panel, therefore, makes no recommendation in respect of this claim unit.

3. Recommended award

584. The Panel's recommendations in respect of claim No. 4002545 are summarized in table 17.

Table 17. Recommended award for Claim No. 4002545

Claim unit	Amount claimed (USD)	Amount recommended (USD)
Reduced crop yields	2,670,227	nil
Claim preparation costs	5,874	-
Total	2,676,101	nil

D. Claim No. 5000463 – Other natural resources

585. Claim No. 5000463 comprises six claim units, with a total asserted value of USD 8,877,370,779, for damage to Saudi Arabia's terrestrial, coastal and marine resources resulting from Iraq's invasion and occupation of Kuwait, and for several projects proposed to compensate for losses resulting from the damage. This amount represents an increase in the compensation claimed, reflecting amendments made by Saudi Arabia based on information obtained from its monitoring and assessment activities.[90]

586. The first claim unit is for terrestrial damage; the second claim unit is for damage to intertidal shoreline habitats; the third claim unit is for damage to marine subtidal habitats; the fourth claim unit is for losses of wildlife resources; the fifth claim unit is for economic and ecological losses related to fisheries resources; and the sixth claim unit is for two other compensatory projects. Saudi Arabia states that all the compensatory projects should be viewed holistically as measures to compensate for the damage to its resources.

1. First claim unit – Terrestrial resources

587. Saudi Arabia seeks compensation in the amount of USD 956,902,142 for severe and persistent damage to a large area of its terrestrial environment as a result of the oil well fires in Kuwait and military activities during Iraq's invasion and occupation of Kuwait. Saudi Arabia proposes to establish 10 preserves with a total area of 4,654 square kilometres as compensatory restoration for the damage.

588. Saudi Arabia estimates that 143 square kilometres of "core" areas and 629 square kilometres of "peripheral" areas were damaged because of military activities. Saudi Arabia explains that "[c]ore impacts reflect direct impact associated with the primary uses of the military facilities, while the

peripheral disturbance areas reflect indirect impact resulting from persistent usage of the military facilities." According to Saudi Arabia, further environmental damage resulted from 449 square kilometres of roads that were constructed by the Allied Coalition Forces.

589. According to Saudi Arabia, heavy soot from the oil well fires was deposited over an area of approximately 7,227 square kilometres of its desert areas. Saudi Arabia states that 31 square kilometres of khabari areas and 101 square kilometres of sabkha areas were contaminated by soot from the smoke plume resulting from the oil well fires. Saudi Arabia further states that the soot degraded the desert ecosystems and that this continues to pose risks to livestock, flora and fauna that rely on the water in these basins.

590. Saudi Arabia recalls that it submitted a claim in the fourth "F4" instalment[91] for the costs of restoration of the damage described in paragraphs 588 and 589 above. In the present claim, Saudi Arabia states that 438 square kilometres of its desert area outside the core and peripheral areas were damaged by military activities during Iraq's invasion and occupation of Kuwait. Saudi Arabia claims losses in respect of these resources. Saudi Arabia also claims compensation for 45 square kilometres of roads that it excluded from restoration because they were used by Bedouin herders. Saudi Arabia notes that it did not claim the costs of restoration for these two items of damage in its claim No. 5000455, which was reviewed in the fourth "F4" instalment.

591. Saudi Arabia asserts that the restoration programme that it proposed in claim No. 5000455 in the fourth "F4" instalment[92] will not fully compensate for the loss in functional value that has occurred during the intervening 13 years since the Gulf War or "the continued loss in resource value that will be experienced until the restoration plan is successfully implemented". Saudi Arabia states that the focus of the terrestrial element of this claim "is on compensatory restoration; i.e., the actions (and funding) needed to replace the natural resource services lost from the time of damage to full recovery to baseline conditions".

592. Saudi Arabia proposes to establish 10 terrestrial nature preserves in unaffected areas to compensate for the loss of terrestrial ecological services from the time of the alleged damage until full restoration of services. The proposed reserves will have visitors' centres, lodging facilities for personnel, access roads, support equipment and fencing.

593. In addition to the evidence presented by Saudi Arabia in the fourth "F4" instalment to link environmental damage from encampments and fortifications to military activities during Iraq's invasion and occupation of Kuwait,[93] Saudi Arabia submitted details on how it has quantified the losses to its terrestrial resources that it would incur in the period between the occurrence of the damage and the time when the damage will be fully restored.

594. Iraq contends that the portion of this claim relating to "costs to be incurred in remediating damage to Saudi Arabia's terrestrial environment, allegedly caused by the Allied Coalition Forces when preparing for the ground war" is not eligible for compensation. Iraq also asserts that the costs for which Saudi Arabia claims compensation are excluded by Governing Council decision 19, which "confirms that the costs of the Allied Coalition Forces, including those of military operations against

Iraq, are not eligible for compensation". According to Iraq, these costs must be characterized as "costs of the Allied Coalition Forces, including those of military operations against Iraq", within the meaning of Governing Council decision 19.

595. Iraq also disputes Saudi Arabia's quantitative estimates of the nature and extent of environmental damage. Iraq states that conditions in the peripheral areas are currently equivalent to or better than those prior to the conflict. Iraq also states that while vegetation loss was evident between 1990 and 1992, there was considerable recovery between 1992 and 2001, to the extent that the vegetation cover in 2001 was as good as or better than before the conflict. Iraq further argues that Saudi Arabia has failed to adequately take into account parallel causes of damage that were unrelated to the conflict, particularly overgrazing. Based on its own review of remote sensing imagery, Iraq contends that the extent of damaged roads and peripheral areas is smaller than Saudi Arabia claims.

596. Iraq also criticizes Saudi Arabia's Soil Adjusted Vegetation Index and Normalized Difference Vegetation Index analysis. Iraq points out that the use of these indices is not the most reliable method for detecting changes in vegetation. Iraq also argues that both pre-conflict and post-conflict imagery should have been used on a number of different sites and vegetation densities in order to reduce uncertainties. It contends that, in the absence of any pre-conflict imagery, post-conflict imagery alone cannot be used to determine changes in vegetation with any reliability.

597. Iraq further asserts that compensation for loss of service from road use is not warranted and that the continued use of these roads is a benefit that Saudi Arabia has not taken into account in quantifying its damages. With regard to Saudi Arabia's estimate of baseline service levels, Iraq argues that Saudi Arabia has not considered the effects of overgrazing and other uses of the environment in setting the baseline conditions. Iraq also contends that Saudi Arabia has arbitrarily set baseline environmental services at the maximum level.

598. Iraq further argues that Saudi Arabia's use of land area as the measure for quantifying ecological service losses and gains is inappropriate. In particular, Iraq states that the various ecological services evaluated by Saudi Arabia in determining pre-conflict and post-conflict service levels, such as soil stabilization, vegetative diversity, vegetation density and presence of micro-communities, are not appropriately represented by land area. Iraq states that "[t]here is no spatial differentiation across the areas of land – it is unlikely that (i) the provision of all services would be equal and homogeneous across all areas, and (ii) that all services would be equally damaged across all areas". Consequently, Iraq disagrees with Saudi Arabia's service level estimation, stating that the scaling exercise is flawed "because a proper metric or keystone species has not been used to measure service losses and gains".

599. Iraq also contends that parallel causes of damage have extended the timeframe for natural remediation in the damaged areas. In particular, it argues that the duration of the impact seems to have been extended by subsequent uses of terrestrial resources, poor rangeland conservation and management and continued use of roads since Iraq's invasion and occupation of Kuwait. According to Iraq, even in areas of significant damage, complete recovery could be expected within five years, if the pressure of overgrazing was removed.

600. With regard to Iraq's contention that Governing Council decision 19 bars the whole or part of this claim unit, the Panel recalls that, in the fourth "F4" report, part one, it concluded that expenses incurred or to be incurred by Saudi Arabia for reasonable measures to remediate environmental damage resulting directly from military operations by Iraq or by the Allied Coalition Forces during the period 2 August 1990 to 2 March 1991 are, in principle, eligible for compensation in accordance with paragraph 34(a) of Governing Council decision 7.[94] In respect of the claims in the fifth "F4" instalment, the Panel reiterates its finding in the fourth "F4" report, and in earlier reports, that losses resulting from military operations between 2 August 1990 and 2 March 1991 are compensable regardless of whether the operations were those of Iraq or of the Allied Coalition Forces.

601. With regard to the process and methodology used by Saudi Arabia to quantify the loss resulting from damage to its terrestrial resources, the Panel finds that Saudi Arabia's approach is reasonable. While land area alone would not be an appropriate measure, the Panel considers that it is an appropriate basis for quantifying gains and losses, when used in combination with estimates of changes in service levels.

602. In respect of core and peripheral disturbance areas and the areas damaged by roads, the Panel found, in the fourth "F4" instalment, that the damage was a direct result of Iraq's invasion and occupation of Kuwait.[95] The Panel also found that, while Saudi Arabia's estimate of the extent of the core areas was accurate, Saudi Arabia had overestimated the extent of the peripheral areas and areas damaged by roads. On that basis, the Panel reduced the extent of the peripheral areas and the areas damaged by roadways.[96]

603. With regard to areas damaged by soot, the Panel concluded in the fourth "F4" report, part one that, although the damage might have resulted from the oil well fires in Kuwait, Saudi Arabia had not demonstrated that there was any remaining damage that would require remediation. For the purposes of the present claim, the Panel considers that, while soot might have caused some short-term damage, Saudi Arabia has not provided sufficient evidence to quantify such damage.

604. Concerning the additional 438 square kilometres of desert area outside the core and peripheral areas claimed to have been damaged by military activity, the Panel finds that Saudi Arabia has not provided sufficient evidence to establish environmental damage to these areas. With regard to the 45 square kilometres of roads that Saudi Arabia excluded from restoration because of their continued use by herders, the Panel considers that Saudi Arabia's decision has resulted in benefits instead of losses to Saudi Arabia.

605. Consequently, with regard to the claim for damage to areas other than the core and peripheral areas, the Panel finds that Saudi Arabia has failed to meet the evidentiary requirements for compensation as specified in article 35(3) of the Rules.

606. Saudi Arabia uses Habitat Equivalency Analysis ("HEA") to quantify its losses. In the view of the Panel, while the use of HEA for this purpose is appropriate, some of Saudi Arabia's assumptions and inputs used regarding intensity of damage and recovery periods are inappropriate. In particular, the Panel finds that Saudi Arabia has overestimated the intensity of damage in peripheral areas.

607. While the Panel considers that Saudi Arabia's estimate of 100 years for recovery in the core areas and in the small part of the compacted road areas is reasonable, it does not consider that the recovery times adopted by Saudi Arabia for most of the peripheral areas and areas damaged by roads are reasonable in the circumstances. The Panel believes that with appropriate control of grazing and off-road vehicle activity, natural recovery times in these areas should be much shorter. The Panel also notes that Saudi Arabia's estimate assumes that the remediated areas will return just to baseline conditions. In the view of the Panel, such an assumption does not take sufficient account of the fact that ecological service levels in those areas can be expected to increase beyond baseline conditions as a result of the remediation measures for which an award was made in the fourth "F4" instalment.

608. Based on the above considerations, the Panel concludes that there is no loss of natural resources to be compensated beyond the losses addressed by the remediation awards in the fourth "F4" instalment. The Panel is satisfied that the benefits which Saudi Arabia will gain from the restoration projects undertaken with the fourth "F4" instalment award for Claim No. 5000455 will compensate for losses to terrestrial resources.

609. In this regard, the Panel considers that appropriate remediation activities should be commenced as soon as possible following approval of any remediation awards by the Governing Council. In the view of the Panel, this will not only accelerate recovery of the damaged areas but it is also in line with the duty of Saudi Arabia to mitigate the damage and to minimize losses resulting from the damage.

610. Accordingly, the Panel recommends no compensation for this claim unit.

2. Second claim unit – Intertidal shoreline habitats

611. Saudi Arabia seeks compensation in the amount of USD 5,369,894,855 for severe and persistent damage to a large area of its intertidal shoreline habitats resulting from the oil spills caused by Iraq's invasion and occupation of Kuwait.

612. Saudi Arabia proposes to undertake several compensatory projects to cover all the losses referred to in the various claim units of Claim No. 5000463. Two of these projects are directly related to the losses to intertidal shoreline habitats.

613. The first project, for which Saudi Arabia seeks compensation in the amount of USD 5,074,890,386, is to establish 10 separate marine and coastal preserves, covering a total area of 183.2 square kilometres. According to Saudi Arabia, five of the preserves would have visitor centres for educational purposes.

614. The second project, for which Saudi Arabia seeks compensation in the amount of USD 295,004,469, is to construct 42.1 square kilometres of new salt marshes and mangrove areas within the above-mentioned preserves. According to Saudi Arabia, this project would replace or restore an area that is expected to provide equivalent services to compensate for the services lost since 1991. Saudi Arabia states that this additional compensatory project is necessary because the proposed preserves would not provide adequate compensation for damaged salt marshes and mangroves.

615. In the third "F4" instalment, Saudi Arabia had submitted two claims for expenses to remediate the damage in this area.[97] In those claims, Saudi Arabia estimated the total area of oil-contaminated sediment in all the affected sites to be approximately 73 square kilometres.[98] That estimate was based on a detailed set of transect data and geographical information system (GIS) analysis.

616. In the third "F4" report, the Panel found that Saudi Arabia's estimate of the area of shoreline that is contaminated by oil was reasonable.[99] The Panel also found that the damage from oil contamination to the shoreline between the Kuwait border and Abu Ali constituted environmental damage directly resulting from Iraq's invasion and occupation of Kuwait. However, the Panel recommended an alternative remediation programme to that proposed by Saudi Arabia, with reductions in both the area and the volume of contaminated sediments to be remediated.[100]

617. The alternative remediation programme in the third "F4" report was based on a classification of the damaged intertidal shoreline into five habitat types: salt marsh, hard substrate, intertidal, sand beach and supralittoral. This classification and analysis allowed for a more discriminating and habitat-targeted approach to remediation of the damage dealt with in the third "F4" instalment. Saudi Arabia appears to have adopted a similar classification and approach in its assessment of the extent and nature of damage for the purposes of this claim.

618. Since the third "F4" report, Saudi Arabia has completed and submitted several monitoring and assessment studies that provide additional information on the extent of shoreline damage.[101] These include an oiled shoreline survey, an oceanographic survey and a marine and coastal ecological risk survey. Based on the results of these surveys, Saudi Arabia revised and updated its estimates of the extent of damage. This resulted in a reduction of the estimated area of oil-contaminated sediment to approximately 65 square kilometres.

619. To calculate the total area and volume of oil-contaminated sediments, Saudi Arabia relies on a "polygon of influence" method. This method maps the boundaries of contaminated areas, using "station data, high resolution satellite imagery, and knowledge of the geomorphology and typical depositional environments of the study area". To quantify the losses of shoreline resources, Saudi Arabia combines the information obtained from this method with estimates of the severity of damage and expected recovery times, based on the Panel's recommendation in the third "F4" report.[102] Saudi Arabia uses a "discounted square kilometre year" metric to express the quantum of its losses, and it states that the total losses are between approximately 2,300 and 3,600 discounted square kilometre years.

620. The Panel finds that there is evidence that there was extensive oil contamination and environmental damage of Saudi Arabia's shoreline in 1991. Recent monitoring and assessment data, including the results of approximately 3,000 transects carried out by Saudi Arabia and sediment samples which it analysed, show that high levels of oil contamination still remain in some coastal sediments that were exposed to oil spills resulting from Iraq's invasion and occupation of Kuwait. The evidence also shows that contamination levels are extremely variable, ranging from non-detectable amounts to 810,000 ppm.

621. The severity of the 1991 oil spills and the extent of the areas affected are well documented. However, the Panel considers it appropriate to adopt a cautious approach in drawing quantitative conclusions about the extent of ecological damage still remaining. While some ecological impacts persist, they will vary from site to site, depending on a variety of conditions, and the degree of recovery at each site will depend on the extent of oil contamination and the nature and location of the sites.

622. The Panel finds that the damage to Saudi Arabia's intertidal shoreline habitats is a direct result of Iraq's invasion and occupation of Kuwait. The Panel also finds Saudi Arabia's estimate of the area that is still contaminated with oil to be reasonable. However, the Panel does not consider that Saudi Arabia's assessment of ecological service losses in the damaged areas is reasonable. Based on the data submitted by Saudi Arabia, the Panel has made appropriate adjustments to Saudi Arabia's estimate of the extent of service losses and to other aspects of the claim, as indicated below.

623. In order to relate the proposed preserves to the estimated ecological service losses, Saudi Arabia adopted a service gain ("uplift") of 50 per cent. According to Saudi Arabia, the preserves would be established in 2005 and maintained for 50 to 100 years. In assessing the extent of the proposed preserves, Saudi Arabia adopted an 85-year benefit period from 2005 to 2090, with benefits increasing linearly between 2005 and 2014 and providing constant annual services thereafter. However, Saudi Arabia only seeks compensation for the costs of operating and managing the preserves for a 20-year period.

624. Iraq argues that Saudi Arabia's evaluation of its ecological survey data is flawed because the data-set represents a single point in time. Iraq also points out that Saudi Arabia has eliminated certain control transects from its analysis of the data, and argues that this effectively raises the baseline thresholds much higher than is reasonable. Iraq also objects to Saudi Arabia's two-category transect classification approach, in which transects are described either as "non-recovering" or as "recovering/disturbed". Iraq notes that there are no categories that are described as "fully recovered" or "normal baseline".

625. Iraq further objects to Saudi Arabia's use of oil contamination levels as a means for quantifying the extent of damage, pointing out that "exposure is not considered sufficient to demonstrate injury". In Iraq's view, Saudi Arabia has failed to make a clear link between exposure to contamination and actual injury. Iraq also argues that several of the parameters used by Saudi Arabia in its damage assessment are inappropriate. For example, with regard to Saudi Arabia's estimate of ecological service loss and recovery time, Iraq states that there is ample evidence in the literature that recovery of all shoreline habitat types except the high intertidal salt marshes can be expected by 1995. Iraq also asserts that the loss from these habitats was never 100 per cent as assumed by Saudi Arabia.

626. Iraq states that the stretch of coast impacted by the 1991 oil spills was not pristine before the oil spills. Iraq further states that this coastline has been subject to substantial and chronic oil and other pollution impacts before and since 1991. Iraq states that pre-invasion baseline data are very limited and identifies several potential sources of impacts to shoreline resources unrelated to the invasion and

occupation. Iraq states that, in any case, all other intertidal habitat types have either recovered or will be addressed by primary restoration.

627. Iraq accepts that the creation of marine and coastal preserves is a useful method to compensate for ecological functions and values that were lost as a consequence of the oil spill. However, it contends that Saudi Arabia does not provide sufficiently detailed information on the proposed marine and coastal preserves to show that they would constitute reasonable compensation for the services that it claims to have lost.

628. Iraq also argues that Saudi Arabia has overestimated the costs of the proposed preserves. In particular, Iraq questions the proposed costs of land acquisition which it states are unsubstantiated. Iraq notes that Saudi Arabia has not provided details on how it calculated the costs of land acquisition, particularly since the land is probably government-owned. According to Iraq, although acquisition of land for a marine and coastal preserve typically involves an area of seabed and associated intertidal zone, Saudi Arabia appears to have based its estimates of the cost of land acquisition on the value of prime beachfront land.

629. Although the Panel recognizes that Saudi Arabia's shoreline resources were exposed to multiple sources of environmental impacts, the evidence available shows that the predominant cause of the damage was the oil spills resulting from Iraq's invasion and occupation of Kuwait.

630. The Panel finds that the primary restoration envisaged by the award in the third "F4" instalment will not fully compensate for the loss resulting from this damage.[103] Accordingly, the Panel considers that compensatory restoration is appropriate in this case.

631. However, the Panel notes that there are differences in the severity of oil contamination, losses in ecological services and expected recovery times in different areas. Accordingly, it has made modifications to Saudi Arabia's calculations to reflect these differences.

632. In the view of the Panel, two shoreline preserves with a total area of 46.3 square kilometres and operated for a 30-year period, would sufficiently compensate for Saudi Arabia's losses in ecological services in its intertidal shorelines. The Panel considers that such preserves, sited in habitats similar to those that have been damaged, would provide ecological services similar in kind to those that were lost. In the view of the Panel, such preserves are feasible, cost-effective and pose a low risk of adverse impacts. The Panel also notes that these preserves would provide benefits to wildlife as well as offer compensation for the damage to subtidal habitats referred to in paragraphs 637-649 below. However, after reviewing the projects as proposed by Saudi Arabia, the Panel considers that a number of modifications are necessary. These modifications are indicated in Annex III to this report.

633. The expenses of the projects have been adjusted to take account of the modifications in Annex III as well as further adjustments including:

(a) A 30-year duration for the operation and maintenance of the two recommended preserves, instead of 20 years as proposed;

(b) Reduction in the number of facilities and a decrease in the staff required to operate them;

(c) Adjustments to unit costs and contingency estimates;

(d) Additional allowances for items not budgeted, such as fencing and a pier/ramp; and

(e) Elimination of the expenses for land acquisition because insufficient information was provided to support these expenses.

634. These modifications and adjustments reduce the expenses of the compensatory project to USD 46,113,706.

635. The Panel finds that this amount constitutes appropriate compensation for damage to or depletion of Saudi Arabia's natural resources resulting from Iraq's invasion and occupation of Kuwait, in accordance with paragraph 35(e) of Governing Council decision 7.

636. Accordingly, the Panel recommends compensation in the amount of USD 46,113,706 for this claim unit.

3. Third claim unit – Marine subtidal habitats

637. Saudi Arabia states that, as a result of the oil spills resulting from Iraq's invasion and occupation of Kuwait, damage was caused to its marine subtidal habitats. However, Saudi Arabia has not proposed a compensatory project directly related to this claim unit and it does not seek a specific amount as compensation for the damage. Saudi Arabia states that all the compensatory projects it has proposed should be viewed holistically as compensating for damage to all its resources.

638. In the fourth "F4" instalment, Saudi Arabia submitted a claim for the cost of remediating marine subtidal damage.[104] Having considered the evidence submitted by Saudi Arabia for that claim, the Panel concluded that damage was caused by the oil spills resulting from Iraq's invasion and occupation of Kuwait.[105]

639. In that claim, Saudi Arabia stated, inter alia, that 54 discrete subtidal areas, with a combined area of approximately 39 square kilometres and a combined volume of approximately 9,000,000 cubic metres, needed to be remediated.[106] In the fourth "F4" report, the Panel recommended a modified remediation programme. The modification took into consideration the fact that, among other things, the area requiring remediation had been overstated because damage linked to Iraq's invasion and occupation of Kuwait had been demonstrated for only a part of the Balbol area.[107]

640. The claim unit reviewed in this report is for compensation for the loss incurred as a result of the damage to subtidal habitats until they recover to pre-invasion conditions.

641. In addition to the information which it submitted in the fourth "F4" instalment, Saudi Arabia has submitted the final results of an oceanographic survey, conducted by it as one of the monitoring and assessment projects funded by awards in the first "F4" instalment.[108] Based on the results of this

survey, Saudi Arabia states that impacts of the 1991 oil spills persist in near-shore subtidal benthic environments.

642. Saudi Arabia has submitted, inter alia, revised and updated estimates of the extent of damage to its marine subtidal habitats. In this submission, Saudi Arabia states that, in addition to the approximately 39 square kilometres of near-shore subtidal benthos that was identified in its fourth "F4" instalment claim as having oil-contaminated sediments, a further unspecified area of sea grass benthos was also impacted by oil.

643. Saudi Arabia has not considered damage to sea grass areas in assessing the extent of the damage, and claim elements relating to these have not been included in the proposed compensatory project costs. Saudi Arabia has also not included damage to offshore subtidal areas.

644. With regard to the damage to its marine subtidal habitats, Saudi Arabia estimates that the natural recovery period is 30 years and the period of recovery after remediation is 15 years.

645. Iraq contends that Saudi Arabia has not provided evidence of past or current damage to subtidal resources. Iraq states that, in the period since 1991, there have been no independent observations or assessments of lost or impaired ecological function and resource values that could be attributed to oil in subtidal sediments.

646. Iraq further argues that Saudi Arabia has collected too few samples to make its sampling and analytical techniques to establish damage to marine subtidal habitat meaningful. Iraq also states that Saudi Arabia's estimate of 100 per cent loss of ecological function over the alleged area of damage is not substantiated. According to Iraq, without any strong evidence of ecological loss in these habitats, there does not appear to be any basis for the claim in respect of the subtidal areas.

647. Having considered the evidence submitted by Saudi Arabia, the Panel reiterates the finding in the fourth "F4" report that the contamination in part of the Balbol area constitutes environmental damage directly resulting from Iraq's invasion and occupation of Kuwait.

648. However, the Panel notes that, although there is evidence of damage to part of the Balbol area that is attributable to the invasion and occupation, the recommended shoreline preserves discussed at paragraphs 611-636 above will adequately compensate for any damage that occurred in that area.

649. Accordingly, the Panel recommends no compensation for this claim unit.

4. Fourth claim unit – Wildlife resources

650. Saudi Arabia seeks compensation in the amount of USD 127,165,335 for loss of marine and coastal wildlife caused by the oil spills resulting from Iraq's invasion and occupation of Kuwait. Saudi Arabia states that 97,450 birds and 93 marine mammals were killed, and turtle hatch rates suffered a 46 per cent reduction as a result of the oil spills.

651. According to Saudi Arabia, 130,000 wading birds (mainly plovers and sandpipers) are normally found between March and May on its beaches. Based on information from studies published in the scientific literature, Saudi Arabia estimates that 100,000 wading birds were killed either directly by oil contamination or indirectly because of the loss of forage. Saudi Arabia assumes that 75 per cent (75,000) of the wading birds killed were in its territory. Using a similar approach, it estimates that 22,500 pelagic birds were lost in its territory.

652. Saudi Arabia states that there was loss of marine turtles, but it does not claim compensation for that loss. The claim for damage to marine mammal resources is based on information from the published literature, which provides counts of animals killed from late February through mid-April 1991. According to Saudi Arabia, these deaths include 57 bottlenose dolphins, 13 humpback whales, one finless porpoise, 14 dugongs and eight unidentified cetaceans.

653. Saudi Arabia seeks compensation based on the numbers of birds and marine mammals which were killed but it does not estimate the effects of the deaths on population levels or the times needed for the recovery of the affected populations. Saudi Arabia bases its claim for compensation for lost marine wildlife on a unit cost for restocking which it obtained from the "Primary Restoration Guidance Document for Natural Resource Damage Assessment Under the Oil Pollution Act of 1990" issued by the United States National Oceanic and Atmospheric Administration ("NOAA") in 1996.[109]

654. Iraq states that, although there may be some permanent loss of seabirds, shorebirds and possibly marine mammals, the extent of the loss is uncertain. Iraq also says that compensation for any loss of seabirds should not be allocated to a single nation since the wildlife is a regional resource. Iraq argues that although some invasion-related wildlife losses occurred, Saudi Arabia has failed to provide baseline data on wildlife populations (except for shorebirds), and has also failed to provide any monitoring and assessment data to support the claim. Further, Iraq states that Saudi Arabia does not provide recovery information for any of the wildlife resources.

655. Concerning the alleged deaths of migratory birds, Iraq argues that it is inappropriate to narrow the losses to two species (plovers and sandpipers) when there are many other types of birds that frequent Saudi Arabia's shoreline areas. Iraq also questions Saudi Arabia's quantification of bird loss, stating, for example, that the number of lost sandpipers claimed is "clearly in excess of the actual numbers that would normally be expected on the coastline". Iraq notes that a reduction in shorebird numbers does not necessarily indicate that birds have died, but could be due to the migration of birds to other feeding grounds.

656. Iraq contends that while the number of animals lost is an appropriate metric for the valuation of Saudi Arabia's loss, Saudi Arabia's application of this approach is inappropriate because the proportion of wildlife losses for which Saudi Arabia claims compensation is arbitrary and is not supported by any available information. Furthermore, Iraq argues that the use of NOAA restocking costs per lost bird is not appropriate for the location or species in question.

657. Iraq contends that no compensation for lost wildlife should be awarded to Saudi Arabia. According to Iraq, "the claim is so poorly developed and so little information is presented that it is not possible to support any aspect of the claim in entirety".

658. The Panel notes that Saudi Arabia's wildlife claim is based entirely on information obtained from published scientific literature. After reviewing the literature cited by Saudi Arabia as well as other publicly available literature relevant to this claim unit, the Panel considers that Saudi Arabia's estimate of 22,500 deaths in its coastal areas is a reasonable approximation of the number of pelagic birds lost.

659. The Panel notes that the published literature supports a substantially lower mortality figure for wading birds than the 75,000 figure asserted by Saudi Arabia. In the view of the Panel, this reflects the uncertain fate of birds that might have migrated to alternate foraging locations. Based on the available information, the Panel considers that the number of wading birds that can reasonably be confirmed as having died is less than 1,000.

660. In the view of the Panel, although the development of a restocking programme is conceptually a reasonable approach to compensate for the lost birds, the programme proposed by Saudi Arabia is not acceptable as appropriate compensation because Saudi Arabia has not provided a sufficient basis for costing it.

661. In the Panel's view, the available evidence is not sufficient to attribute the asserted 93 marine mammal deaths to Iraq's invasion and occupation of Kuwait. Although these deaths coincided with the invasion and occupation, the dead animals were found several hundred kilometres outside the oil-contaminated coastal areas of Saudi Arabia, and the cause of death is unknown.

662. The Panel, therefore, concludes that the evidence presented by Saudi Arabia is not sufficient to substantiate the circumstances and extent of the loss. In any event, the Panel believes that the recommended shoreline preserves discussed in paragraphs 611-636 above will provide additional benefits to Saudi Arabia's wildlife resources.

663. Accordingly, the Panel recommends no compensation for this claim unit.

5. Fifth claim unit – Fisheries resources

664. Saudi Arabia seeks compensation in the amount of USD 1,499,817,814 for ecological and economic losses to its fisheries resources as a result of Iraq's invasion and occupation of Kuwait. Saudi Arabia seeks compensation for ecological losses between 1990 and 2001 and economic losses between 1991 and 1993. The Ministry of Agriculture and Water of Saudi Arabia originally submitted this claim unit as claim 5000207. At the request of Saudi Arabia, the secretariat incorporated that claim in the current claim (Claim No. 5000463).

665. Saudi Arabia has calculated the value of the ecological losses in fisheries for the years 1990-2001 by using published data on catches of shrimp and grouper for 1980 to 1989 and 1990 to 1996 in order to compare pre-invasion and post-invasion trends. For each of the two species, Saudi Arabia

uses the pre-invasion (1980 to 1989) data to develop a growth trend to the end of 2001, projecting average catches that would have been expected without the invasion and occupation. Saudi Arabia also constructs a second growth trend from 1980 to 2001, incorporating both pre-invasion and post-invasion data with a view to determining the impact of the invasion and occupation on fish catches. Ecological losses are calculated as the difference between the actual catches and the expected catches, using a three per cent annual discount rate.

666. To compensate for the ecological losses, Saudi Arabia proposes to construct a shrimp farm at a cost of USD 1,139,823,830 and a grouper farm at a cost of USD 202,483,984. These, together with a "release into the wild" programme, will act as a stocking source for Saudi Arabian waters and help to raise stocks of the two fish species.

667. Saudi Arabia also seeks compensation in the amount of USD 157,510,000 for economic losses to fishing companies, boat owners and fisheries workers due to decreased fish catches. According to Saudi Arabia, two factors caused this decrease; namely, prohibition of fishing by industrial boats and the reduction of traditional fishing trips; and low "catch per unit effort" from the time of Iraq's invasion of Kuwait through 1993. Saudi Arabia states that these factors were a result of Iraq's invasion and occupation of Kuwait.

668. With regard to the claimed ecological losses, Iraq argues there is no irreparable or compensable loss. Iraq contends that Saudi Arabia's claim for damage to fisheries resources is a commercial claim rather than a claim for environmental damage, and consequently, there is no need for high-risk, long-term compensatory projects such as the proposed shrimp and grouper programmes.

669. Iraq also contends that the reduction in the catches of shrimp and grouper for 1990 to 2001 was due to increased fishing effort and the over-exploitation of most of the commercial fish stocks and not due to the invasion and occupation.

670. Iraq asserts that Saudi Arabia has failed to demonstrate that the oil spills adversely affected fish and shrimp catches or fish stocks. Iraq notes that 70 per cent of the fishermen interviewed by Saudi Arabia indicated that they were not economically affected by the oil spills.

671. The Panel finds that the available information does not support Saudi Arabia's assertion of ecological damage to its fisheries resources as a result of Iraq's invasion and occupation of Kuwait.

672. Further, the Panel considers that the methods used by Saudi Arabia for calculating ecological loss are not appropriate for that purpose. The Panel does not consider lost catch as a reasonable measure for ecological loss. In the view of the Panel, the models used by Saudi Arabia do not take account of biological, environmental and other factors that can affect the level of fish stocks, such as reduced fishing activity during and soon after the invasion. The Panel finds that the oceanographic survey results submitted by Saudi Arabia do not provide a sufficient basis for determining the extent of ecological losses that are attributable to the invasion and occupation.

673. In the view of the Panel, although it is plausible to assume that Iraq's invasion and occupation of Kuwait had some impacts on fish catches, the available information is insufficient for quantifying any such impacts. The Panel finds that Saudi Arabia's estimates of fishing effort for the period prior to 1994, which are a critical input to the catch loss analysis, cannot be independently verified. Further, these estimates do not take sufficient account of factors unrelated to the invasion and occupation. The Panel also notes that surveys of Saudi fishermen indicate that less than two per cent of fishermen surveyed believe that the 1991 oil spills were responsible for reductions in fish catches.

674. The Panel, therefore, finds that Saudi Arabia has not provided sufficient evidence to substantiate losses to its fisheries resources as a direct result of Iraq's invasion and occupation of Kuwait. Consequently, Saudi Arabia has failed to meet the evidentiary requirements for compensation as specified in Article 35(3) of the rules.

675. Accordingly, the Panel recommends no compensation for this claim unit.

6. Sixth claim unit – Other compensatory projects

676. Saudi Arabia seeks compensation in the amount of USD 923,590,633 for this claim unit, which comprises two projects: (a) an environmental education programme, with an estimated cost of USD 836,650,117; and (b) a supplement to the Jubail Marine Wildlife Sanctuary, with an estimated cost of USD 86,940,516.

677. According to Saudi Arabia, the education programme is meant to increase public awareness of the value of environmental resources and create momentum towards improved use of resources and sensitivity to activities that may negatively affect resources. Saudi Arabia asserts that an education programme of the type proposed would alleviate pressure on natural resources that would otherwise result from population growth.

678. Saudi Arabia states that it will use a portion of the compensation funds to operate and maintain the Jubail Marine Wildlife Sanctuary for 20 years from 2005 through 2024. Saudi Arabia explains that it will not be able to adequately manage its existing protected areas with its own funds.

679. Iraq contends that there is no justification for the scope and scale of the compensatory restoration projects proposed by Saudi Arabia. In particular, Iraq argues that Saudi Arabia has failed to demonstrate that the project is appropriate as compensation for the type and scale of alleged loss. Iraq also asserts that Saudi Arabia has failed to demonstrate either the ecological or human service benefits of these projects, or their cost-effectiveness.

680. Iraq also argues that the proposed supplement to the Jubail Marine Wildlife Sanctuary is not an appropriate form of compensatory restoration since Saudi Arabia has provided a very weak justification for its claim for the costs of the existing marine sanctuary. With regard to the proposed environmental education programme, Iraq states that it is a human services programme and not an appropriate form of compensatory restoration for loss of ecological services.

681. The Panel finds that Saudi Arabia has failed to provide adequate details of the proposed education programme, to enable it to make an evaluation of the technical merits of the programme, its relevance to specific damages, and its potential overlap with other projects proposed by Saudi Arabia. Similar concerns apply in relation to the proposed supplement to the Jubail Marine Wildlife Sanctuary. In the view of the Panel, Saudi Arabia has not demonstrated that the proposed compensatory projects will produce benefits that can be considered as appropriate compensation for the ecological losses which Saudi Arabia claims to have suffered.

682. Accordingly, the Panel recommends no compensation for this claim unit.

7. Recommended award

683. The Panel's recommendations in respect of claim No. 5000463 are summarized in table 18.

Table 18. Recommended award for claim No. 5000463

Claim Unit	Amount claimed (USD)	Amount recommended (USD)
Terrestrial resources	956,902,142	nil
Intertidal shoreline habitats	5,369,894,855	46,113,706
Marine subtidal habitats	unspecified	nil
Wildlife resources	127,165,335	nil
Fisheries resources	1,499,817,814	nil
Other compensatory projects	923,590,633	nil
Total	8,877,370,779	46,113,706

E. Claim No. 5000219 – Public health

684. Claim No. 5000219 comprises three claim units**,** with an asserted value of USD 19,861,782,707, for damage or risk of damage to public health resulting from Iraq's invasion and occupation of Kuwait. This amount represents an increase in the compensation claimed, reflecting amendments made by Saudi Arabia based on information obtained from its monitoring and assessment activities.[110]

685. Saudi Arabia asserts that, as a result of Iraq's invasion and occupation of Kuwait, a large proportion of its population was exposed to: (a) contaminants from the oil well fires; (b) contaminants from oil spills; (c) contaminants from vehicle emissions and disturbance of the desert areas by military activities; and (d) acts of violence and other traumatic events during the invasion and occupation.

686. The first claim unit is for expenses of treating an increased number of cases of cardiovascular, respiratory and systemic diseases; the second claim unit is for expenses of treating an increased number of psychiatric illnesses; and the third claim unit is for compensation for an increase in premature deaths due to increased levels of airborne contaminants.

1. First claim unit – Treatment of cardiovascular, respiratory and systemic diseases

687. Saudi Arabia seeks compensation in the amount of USD 13,412,798,489 for expenses incurred to treat an increased number of cases of cardiovascular, respiratory and systemic diseases (including diabetes, gastrointestinal and kidney diseases) between 1990 and 2030.

688. Saudi Arabia states that the increase in the number of cases of cardiovascular, respiratory and systemic diseases was due to the presence of airborne contaminants such as sulphur dioxide; nitrogen oxides; heavy metals; polycyclic aromatic hydrocarbons and particulate matter from the oil well fires in Kuwait; the oil that was spilled into the Persian Gulf from damaged terminals, pipelines and tankers; contaminants from vehicle emissions; and windblown dust from disturbed desert areas.

689. Saudi Arabia uses the results of several of its public health monitoring and assessment studies, particularly the results of its Exposure and Health Survey Report ("EHS"), Human Health Risk Assessment Report ("HHRA") and Quantification Study to support this claim unit. Saudi Arabia also relies on the results of a focus group research study and a health care provider survey. According to Saudi Arabia, its monitoring and assessment studies provide evidence of increased diseases and medical conditions among its population.

690. According to Saudi Arabia, approximately 20,000 residents were interviewed for the EHS, beginning in 2003. The EHS consisted of 55 main questions designed to obtain from the respondents data on, inter alia , exposure to harmful agents, histories of traumatic experience, and health status of family members. The respondents were selected from two main groups; namely, persons resident in areas exposed to Iraq's invasion and occupation of Kuwait; and persons resident in areas not exposed to Iraq's invasion and occupation (the "control area").

691. Saudi Arabia used data collected from the EHS to estimate the percentage of cases of each disease that resulted from the invasion and occupation. To determine the number of health care visits due to the invasion and occupation, Saudi Arabia collected information on the use of health care facilities for the different categories of diseases. The information included data from the 1990-2000 annual reports of Saudi Arabia's Ministry of Health on the use of health care facilities.

692. According to Saudi Arabia, the EHS demonstrates that there was an increased number of cases of disease in the exposed areas. The EHS also showed that there was a link between these cases and Iraq's invasion and occupation of Kuwait. Saudi Arabia states that the HHRA supports these findings by providing a qualitative evaluation of the nature and extent of the health effects of Iraq's invasion and occupation of Kuwait, the sections of the population most likely to have been affected, and the areas where the highest exposures to contaminants probably occurred.

693. Iraq states that Saudi Arabia has not submitted actual data showing increases in morbidity and actual health expenditures. According to Iraq, publicly available sources show that the invasion and occupation did not have a serious impact on public health in Saudi Arabia. Consequently, there were no increases in public health expenditures as a result of the invasion and occupation. Iraq further argues that Saudi Arabia over-estimates the actual levels of air pollution caused by the oil well fires.

In the view of Iraq, many of the ailments identified in the claim, such as diabetes, hypertension and kidney disease have no scientifically established causal link with air pollution.

694. Iraq also argues that the methodology set out in the EHS for measuring health effects of the invasion and occupation is weak. In particular, Iraq asserts that self-reporting of health outcomes is not a reliable method either for determining actual prevalence of disease or for demonstrating a causal link between diseases and the invasion and occupation. Iraq also argues that the EHS does not address significant confounding factors, particularly differences between the exposed and non-exposed groups.

695. In the opinion of the Panel, it is possible that the exposure of Saudi Arabia's population to contaminants resulting from the invasion and occupation caused an increase in the number of cases of cardiovascular, respiratory and systemic diseases in Saudi Arabia. However, the evidence submitted by Saudi Arabia is not sufficient to enable the Panel to determine whether there was any increase in those diseases as a direct result of the invasion and occupation.

696. In the view of the Panel, the EHS contains a number of uncertainties. For example, it relies on self-reporting by respondents of their medical conditions based on their memory of events that occurred more than a decade earlier. The Panel notes that although Saudi Arabia could have conducted a validation study to determine whether the EHS accurately measured actual diagnosed medical conditions, it did not do so. Further, Saudi Arabia did not report that it had taken any measures to evaluate the reliability of the EHS. In the view of the Panel, it is not possible to determine whether the EHS elicited responses from survey participants that are internally consistent and capable of being reproduced. As a result, the Panel considers the reliability of the EHS to be uncertain.

697. The Panel also observes that the EHS relied on over-sampling in highly exposed areas within the exposed area. For example, one area (Al Khafji), which was highly exposed to the smoke and also experienced intense troop movements, represents less than one per cent of the population of the exposed area, but accounts for 30.1 per cent of the sample size. In the view of the Panel, such results reflect conditions in the sampled locations only, and cannot be used to demonstrate health conditions in the whole exposed area.

698. The Panel further notes that the number of health care visits that are attributed to Iraq's invasion and occupation of Kuwait is based on patient diagnosis profiles from a single hospital in Jeddah for in-patient hospital visits and two U.S. health care surveys for primary care centres and out-patient hospital visits. The Panel also notes that the patient diagnosis profile in Saudi Arabia for in-patient visits is obtained from a highly urbanized section of the control area. In the view of the Panel, such a diagnosis profile is unlikely to be representative of patient diagnosis profiles in all hospitals across the exposed area, which consists of both urban and rural areas. In addition, the Panel notes that Saudi Arabia does not provide any justification for the extrapolation of health care data from the United States to Saudi Arabia, given the differences in age and gender distributions between the populations of the two countries.

699. The Panel concludes that the evidence submitted by Saudi Arabia does not provide a sufficient basis for determining the extent to which Iraq's invasion and occupation of Kuwait might have

contributed to the increase in the number of cases of cardiovascular, respiratory and systemic diseases in Saudi Arabia. Consequently, Saudi Arabia has failed to meet the evidentiary requirements for compensation as specified in article 35(3) of the Rules.

700. Accordingly, the Panel recommends no compensation for this claim unit.

2. Second claim unit – Treatment of post-traumatic stress disorder and other psychiatric illnesses

701. Saudi Arabia seeks compensation in the amount of USD 899,671,339 for expenses of treating an increased number of cases of post-traumatic stress disorder ("PTSD") and other psychiatric illnesses, including depression, generalized anxiety disorder, panic disorder, and other neurotic disorders between 1990 and 2030 that resulted from Iraq's invasion and occupation of Kuwait.

702. Saudi Arabia states that the increase in the number of cases of PTSD and other psychiatric illnesses was the result of the exposure of its population to a number of stressors, including the prospect of a full-scale Iraqi invasion of Saudi Arabia, the presence of massive numbers of Allied Coalition troops, the inability to move about freely, and disruptions to the civil and administrative service.

703. Saudi Arabia relies on the results of the monitoring and assessment studies described in paragraphs 689-692 above to demonstrate the increase in the number of cases of PTSD and other psychiatric conditions and the causal link between the increase and Iraq's invasion and occupation of Kuwait.

704. Saudi Arabia states that the EHS assessed the increased number of PTSD cases using two separate instruments; namely, a primary care PTSD screen and a PTSD checklist. According to Saudi Arabia, the results of the primary care PTSD screen demonstrate that, for the persons who were exposed to the invasion and occupation, there is a two-fold increase in the risk of having symptoms consistent with PTSD, and the results of the PTSD checklist show that there is nearly a five-fold increase in the risk of PTSD for persons who were exposed to the invasion and occupation. Saudi Arabia asserts that these results may also be used to calculate the percentages of other psychiatric illnesses because the scientific literature indicates that PTSD can coexist with a range of other psychiatric illnesses.

705. Iraq argues that the stressors that Saudi Arabia identifies as causing PTSD in persons in Saudi Arabia do not correspond to the extreme stressors that are identified in the scientific literature as being capable of causing PTSD. Iraq also argues that the data provided by Saudi Arabia do not show that there has been an increase in PTSD in Saudi Arabia above the rates normally prevalent in adult populations.

706. In the view of the Panel, it is possible that there was an increase in the number of cases of PTSD and other psychiatric disorders in Saudi Arabia's population as a result of the invasion and occupation. However, the evidence submitted by Saudi Arabia is not sufficient to demonstrate that such an increase actually occurred.

707. In addition to the limitations of Saudi Arabia's use of the EHS described in paragraphs 696-697 above, the Panel notes that the EHS does not provide any indication of the number of persons in Saudi Arabia who were exposed to traumatic events of the type that could cause PTSD; nor does it show that the higher number of PTSD cases found in the exposed area was the result of the invasion and occupation. In particular, although the EHS properly asked respondents about their experience of specific traumatic events that could trigger PTSD, it did not link the responses to reported cases or symptoms of PTSD.

708. The Panel concludes that the evidence submitted by Saudi Arabia does not provide a sufficient basis for determining the extent to which Iraq's invasion and occupation of Kuwait might have contributed to the increase in the number of cases of PTSD and other psychiatric illnesses in Saudi Arabia. Consequently, Saudi Arabia has failed to meet the evidentiary requirements for compensation as specified in article 35(3) of the Rules.

709. Accordingly, the Panel recommends no compensation for this claim unit.

3. Third claim unit – Increased mortality

710. Saudi Arabia seeks compensation in the amount of USD 5,549,312,879 for increased mortality in Saudi Arabia due to airborne particulate matter from the oil well fires in Kuwait, from disturbance of desert areas by military activities and from the large number of diesel-powered military vehicles used for military operations. Specifically, Saudi Arabia seeks compensation for the loss of 1,397 persons who, according to its estimates, died prematurely in 1991 and 1992 as a result of the exposure of its population to increased levels of particulate matter. Saudi Arabia calculates the compensation requested for the 1,397 premature deaths on the basis of the rate of USD 3,972,307 per life lost.

711. Saudi Arabia relies on the results of its human health risk assessment study to estimate the concentrations of airborne particulate matter to which its population was exposed. Saudi Arabia uses the results of an air dispersion model, together with data on particulate matter obtained from monitoring studies in 1991-1992, to verify the presence of high concentrations of airborne particulate matter over populated areas of eastern Saudi Arabia, and to identify the effects of these concentrations on the population of the affected areas. According to Saudi Arabia, the results of the study prove that there were increased concentrations of airborne particulate matter in eastern Saudi Arabia and that these were sufficient to cause premature deaths.

712. Saudi Arabia relies on the results of the HHRA and Quantification Study (described in paragraph 689 above) to estimate the number of premature deaths attributable to Iraq's invasion and occupation of Kuwait. In the Quantification Study, Saudi Arabia generated a statistical estimate of the expected increase in mortality, based on information in epidemiological and scientific literature, and estimates of the concentrations of airborne particulate matter to which its population was exposed, as derived from the HHRA. According to Saudi Arabia, the Quantification Study demonstrates that 1,397 premature deaths were due to exposure to airborne particulate matter that resulted from the invasion and occupation.

713. Saudi Arabia acknowledges that the figure of 1,397 does not represent identifiable individuals. However, Saudi Arabia explains that, because of the nature of the analysis used in the Quantification Study, it is not possible to identify the specific individuals who died as a result of the increased air pollution, or their families. Consequently, Saudi Arabia states that it is obliged to present the claim on behalf of its society as a whole.

714. Iraq states that this claim unit should be rejected because it is not for actual costs incurred by the Government of Saudi Arabia. Iraq further states that Saudi Arabia's estimate of the number of deaths is based on mere assumptions and generalizations, and that there is a total lack of actual data. In the view of Iraq, the claim unit is overly speculative. Iraq also states that Saudi Arabia has not demonstrated a link between the alleged premature deaths and the invasion and occupation.

715. In the view of the Panel, it is possible that increased pollution from the oil well fires in Kuwait, disturbance of the desert surface by military activities, and emissions from diesel-powered military vehicles had an effect on the health of the population in eastern Saudi Arabia between 1991 and 1992. However, the evidence submitted by Saudi Arabia is not sufficient to demonstrate either that any premature deaths actually occurred or that any such deaths were the direct result of the invasion and occupation. In particular, Saudi Arabia provides no information on the specific circumstances of the premature deaths that would enable the Panel to determine whether such premature deaths could reasonably be attributed, wholly or partially, to factors resulting from Iraq's invasion and occupation of Kuwait. Consequently, Saudi Arabia has failed to meet the evidentiary requirements for compensation as specified in article 35(3) of the Rules.

716. Accordingly, the Panel recommends no compensation for this claim unit.

4. Recommended award

717. The Panel's recommendations in respect of claim No. 5000219 are summarized in table 19.

Table 19. Recommended award for claim No. 5000219

Claim unit	Amount claimed (USD)	Amount recommended (USD)
Treatment of cardiovascular, respiratory and systemic diseases	13,412,798,489	nil
Treatment of post-traumatic stress disorder and other psychiatric illnesses	899,671,339	nil
Increased mortality	5,549,312,879	nil
Total	19,861,782,707	nil

F. Recommended awards for the claims of Saudi Arabia

718. The Panel's recommendations in respect of Saudi Arabia's claims are summarized in table 20.

Table 20. Summary of recommended awards for the claims of Saudi Arabia

Claim	Subject	Amount claimed (USD)	Amount recommended (USD)
5000309	Agricultural resources	481,442	nil
4002545	Agricultural resources (Shadco)	2,676,101	nil
5000463	Other natural resources	8,877,370,779	46,113,706
5000219	Public health	19,861,782,707	nil
Total		28,742,311,029	46,113,706

VIII. CLAIMS OF THE SYRIAN ARAB REPUBLIC

A. Overview

719. In the fifth "F4" instalment, the Panel reviewed three claims submitted by Syria for damage resulting from Iraq's invasion and occupation of Kuwait. Claim No. 5000462 is for damage to cultural heritage resources; claim No. 5000467 is for damage to livestock resources; and claim No. 5000303 is for public health damage.

B. Claim No. 5000462 – Cultural heritage resources

720. Syria seeks compensation in the amount of USD 1,202,800,000 for expenses of measures to restore and conserve cultural heritage resources that were damaged as a result of Iraq's invasion and occupation of Kuwait. This amount represents an increase in the compensation claimed, reflecting amendments made by Syria based on information obtained from its monitoring and assessment activities.[111] Of this amount, USD 292,000,000 is for the loss of cultural heritage resources, and USD 910,800,000 is for expenses of restoration and conservation of damaged cultural resources.

721. Syria states that smoke from the oil well fires in Kuwait was transported over its territory for a total period of eight days between February and November 1991. Syria submitted information indicating the days on which weather conditions would have supported movements of smoke-laden air masses from Kuwait to Syria, together with a map of Syria depicting the number of days when there was smoke overhead in different parts of the country.

722. Syria claims that, as a result of exposure to these air masses, wet and dry depositions of pollutants occurred over its south-eastern territories. The dry deposition was in the form of gaseous pollutants and soot particles containing heavy metals and polycyclic aromatic hydrocarbons, including benzoapyrene, which is a known carcinogen. According to Syria, the wet deposition might have included acidic components, ionic components, soluble metals, elemental carbon and soluble organic fractions.

723. Syria submitted results from its monitoring and assessment studies, which identified three methods of ascertaining and identifying the degradation of its cultural heritage sites; namely, visual observation of the past and current state of each site; petrographic and chemical analysis of stone,

brick, mortar and other surfaces; and photogrammetry. The visual observations relied on both witness statements and comparative studies of photographic evidence.

724. Syria states that, as a result of exposure to the aforementioned airborne contaminants, sites of cultural and archaeological significance were damaged across the country. Although Syria states that sites in eight zones of the country were particularly damaged, the claim makes specific reference to only four sites, namely, Palmyra; Qasr Al-Hayr East; Dura Europos; and Resafe.

(a) Palmyra

725. Palmyra is located in central Syria, approximately 200 kilometres northeast of Damascus. It is one of four sites in Syria listed under the 1972 UNESCO Convention concerning the Protection of the World Cultural and Natural Heritage.[112] Syria alleges that the Temple of Bel, "the most important religious building of the 1st century AD in the Middle East", as well as other areas at Palmyra, were damaged as a result of Iraq's invasion and occupation of Kuwait.

726. Syria conducted a comparative study of photographs from 1930, 1965, 1992 and 2004 in order to determine the nature and extent of the damage. Syria states that the degradation and loss of decorations/ornamentation is evident. Syria also states that photographic evidence from 2004 shows residual dark patches in areas sheltered from the rain whereas dark patches in exposed areas "have all but disappeared". Syria states that these photographs demonstrate that the dark patches most probably resulted from pollution which occurred prior to 1992 and has not been repeated since. Syria states that it is reasonable to assume that the pollution resulted from the oil well fires because there is no other recorded pollution episode between 1965 and 1992.

(b) Qasr Al-Hayr East

727. The Umayyad limestone castle of Qasr Al-Hayr East is in an isolated location in the middle of the Syrian Badia, 100 kilometres northeast of Palmyra. Syria states that it collected samples for petrographic and chemical analysis, and that its experts were compiling a comparative study of historical and current photographs of this site. However, Syria has not submitted the sampling results or the photographic evidence.

(c) Dura Europos

728. Dura Europos is located on the west bank of the Euphrates River, approximately 30 kilometres from the Iraq border. Syria states that the site, which is of an area of several square kilometres and is only partially excavated, suffered damage and degradation.

729. Of the four cultural heritage sites named in this claim, Syria selected Dura Europos for detailed analysis because, according to Syria, this site is "situated exactly inside the region mostly involved by the diffusion of the gases and of the particulate pollutants produced by the oil burning coming from Iraq." Syria states that the latest meteorological study indicates that the main effects of the pollutants were believed to be concentrated on the south-eastern zone of the country, near Abu Kamal city. Syria further states that it selected Dura Europos as the primary site for investigation because of its

proximity to Abu Kamal and because the site contains buildings that are high enough to be protected from ground level sources of impacts.

730. Syria states that samples were collected to evaluate the degradation of each artefact. Sample materials were extracted from the core of the blocks and from their undamaged surfaces. Syria states that its experts analysed the samples using a variety of techniques.

731. Syria asserts that the analyses performed at Dura Europos reveal an external patina that contains many black metal oxides and carbon particles typical of air pollution as well as small quantities of vanadium, nickel, chromium, lead and many trace elements. Syria further asserts that these pollutants, combined with the presence of organics (particularly phthalic esters, n-paraffins and alkyl-IPA) in the external patinas, are evidence of pollution caused by burning oil and, therefore, probably a consequence of Iraq's invasion and occupation of Kuwait.

(d) Resafe

732. Resafe contains the Basilica Church of St. Sergius and the remains of several palaces and lies in the middle of the Syrian Badia, approximately 50 kilometres from the nearest urban centre.

733. Syria conducted a comparative study of photographs of Resafe's northern gate. Syria states that three photographs, taken in 1965, 1992 and 2004 respectively, show degradation which it attributes to pollution resulting from the invasion and occupation. Syria states that comparison of the 1965 and 1992 photographs clearly shows the degradation and loss of decorations and ornamentation, particularly on the arches and the capitals atop the columns. Syria states that the degradation is probably the result of the impact of atmospheric pollutants on the stone, possibly in the form of acid rain.

734. Syria states that, in the 2004 photographs, the stone surface appears to be cleaner due to the repeated exposure to wind and rain thus removing traces of what is likely to have been an imposed polluting layer. Syria also states that closer examination of the degradation and pitting of the decoration reveals that columns and arches particularly in those areas sheltered from the rain appear to be more severely affected. Syria concludes that this indicates degradation that probably was the result of pollution which occurred prior to 1992 and has not been repeated since. Syria states that it is reasonable to assume that the pollution resulted from the oil well fires in Kuwait because there is no other recorded pollution episode between 1965 and 1992.

735. Syria also states that, because Palmyra, Qasr Al-Hayr East and Resafe are in isolated locations, factors such as neighbouring industrial or local pollution can be eliminated. Although Syria did not submit information about the presence or absence of other sources of pollution unrelated to the oil well fires, it does acknowledge that the presence of zinc and chromium in the Dura Europos samples can be linked to local industrial activities and steel production.

736. Iraq argues that Syria has not suffered any measurable economic loss either in terms of extraordinary expenditure or loss of revenue. Iraq states that a claimant with a cultural heritage claim has a specific burden of proof not only to show that there is damage, but also that the proposed

restoration will result in net benefits to the damaged site. Iraq also asserts that claims based on a reduction in the inherent value of a site should not be compensated because any attempt to value such losses is bound to be arbitrary.

737. Iraq contends that Syria did not provide any information about the baseline condition of its cultural heritage resources before the conflict or any evidence that would eliminate other sources of air pollution such as heavy industries and transportation.

738. Iraq contends that there is no evidence that the smoke plume from the oil well fires in Kuwait reached Syria, and states that Syria has not provided any information about the alleged depositions of pollutants from the smoke plume in its territory. Furthermore, Iraq argues that Syria did not provide adequate evidence of the extent of damage to substantiate its claim for the cost of restoration.

739. Concerning the monitoring and assessment information provided by Syria, Iraq states that it lacks the necessary data, and is superficial and inconclusive. Iraq argues that Syria has provided no evidence of actual damage or details of planned restoration programmes or improved conservation management. Iraq adds that damage to cultural heritage is site-specific and requires individual site assessment whereas Syria has extrapolated damage from reference sites.

740. The Panel notes that the four cultural heritage sites identified by Syria represent the remains of historically important cities that have suffered from human activities as well as the destructive effects of invasion and plundering, devastating earthquakes, natural weathering and abandonment over many centuries. In particular, it notes that at Dura Europos, Qasr al Hayr East, and Resafe, structures have collapsed leaving vast amounts of debris covering the sites.

741. As the Panel stated in the first "F4" report, there is evidence in the scientific literature that emissions from the oil well fires in Kuwait may have reached parts of Syria, albeit infrequently.[113] However, considering the lack of data on pollutant concentrations before, during and after the period of the oil well fires, the Panel finds that the evidence submitted by Syria is not sufficient to establish a link between the extensive damage observed at the sites and air pollution from the oil well fires. Consequently, Syria has failed to meet the evidentiary requirements for compensation as specified in article 35(3) of the Rules.

742. Accordingly, the Panel recommends no compensation for this claim.

743. The Panel's recommendation in respect of claim No. 5000462 is summarized in table 21.

Table 21. Recommended award for claim No. 5000462

Claim	Subject	Amount claimed (USD)	Amount recommended (USD)
5000462	Cultural heritage resources	1,202,800,000	nil
Total		1,202,800,000	nil

C. Claim No. 5000467 – Livestock resources

744. Syria seeks compensation in the amount of USD 857,987,973, for damage to its livestock resources.[114] Syria alleges that its environment was damaged by airborne contaminants from the oil well fires in Kuwait and that this resulted in the death of 624,061 sheep.

745. This claim was initially part of Syria's fourth "F4" instalment claim No. 5000457 for remediation of damage to agricultural and forestry resources. By Procedural Order No. 8 of the fourth "F4" instalment dated 30 April 2004, the Panel deferred the claim to the fifth "F4" instalment. The deferral was made at Syria's request.

746. Syria's claim for loss of livestock covers the whole country even though the areas of concentrated sheep herds are located in only six governorates.[115] Syria states that sheep herds were healthy before Iraq's invasion and occupation of Kuwait. According to Syria, sheep normally find food in the desert during the winter and spring seasons, grazing on desert plants and on concentrated feed when necessary. During the summer and fall, sheep are moved to agricultural areas where they feed on the remnants of summer crops. Syria also states that there are groundwater wells distributed in the desert for use by herders, as well as reservoirs and other low ground areas where water accumulates.

747. Syria submitted results from its monitoring and assessment studies, which provide air quality monitoring results from Aleppo, Homs, Banias, Ar Raqqah, Deir Ezzor, Tartous and Al Sweida, dating from various times between 1990 and the present, in order to establish that there was a reduction in air quality in the affected areas at the time of the death of the sheep. Syria states that the affected sheep exhibited a number of symptoms consistent with the effects of air pollution.[116]

748. Iraq states that sheep production is subject to regular peaks and troughs, linked to economic factors, diseases and management practices. Iraq states that the number of sheep in Syria fluctuated between 1978 and 2002, and that a decrease in the number of sheep only occurred in 1992 and not in 1991. According to Iraq, the continuing decrease in sheep numbers after 1992 suggests that the reason could not have been the oil well fires. Iraq also notes that no effects of pollution were noticed either in sheep in Jordan or goats in Syria.

749. Iraq further argues that Syria did not provide any evidence to support the alleged reduction in numbers of sheep during the five years following 1991. Iraq states that Syria did not present any evidence of sheep death such as veterinary reports, tissue sample analyses or autopsy reports. Furthermore, according to Iraq, Syria did not provide baseline data relating to animal health and disease to demonstrate livestock losses.

750. Iraq states that, contrary to Syria's assertions, statistics from both Syria and FAO show a steady increase in sheep stock in Syria in the relevant period. Iraq asserts that there is no evidence of any mass mortality of sheep, and that Syria has completely ignored other potential factors that explain the fluctuation of the levels of its livestock, such as trans-border migration and livestock trading.

751. In the view of the Panel, the data presented by Syria are inconclusive. In particular, the scarcity of pre-invasion data and absence of post-mortem reports make it difficult to assess the full significance of the post-invasion data. The Panel, therefore, finds that Syria has not provided sufficient evidence to demonstrate a loss of livestock as a result of the oil well fires in Kuwait. Consequently, Syria has failed to meet the evidentiary requirements for compensation as specified in article 35(3) of the Rules.

752. Accordingly, the Panel recommends no compensation for this claim.

753. The Panel's recommendation in respect of claim No. 5000467 is summarized in table 22.

Table 22. Recommended award for claim No. 5000467

Claim	Subject	Amount claimed (USD)	Amount recommended (USD)
5000467	Livestock resources	857,987,973	nil
Total		857,987,973	nil

D. Claim No. 5000303 – Public health

754. Syria seeks compensation in the amount of USD 104,233,079 for expenses incurred in providing medical treatment due to an increase in the number of cases of acute and chronic respiratory diseases in its population caused by the effects of the oil well fires in Kuwait. This amount represents a decrease in the compensation claimed, reflecting amendments made by Syria based on information obtained from its monitoring and assessment activities.[117]

755. Syria asserts that a large portion of its population was exposed to pollutants in the form of gases and airborne particulate matter released from the oil well fires, and that this resulted in a significant increase in the number of cases of acute and chronic respiratory diseases in its population. To demonstrate the presence of pollutants from the oil well fires in its territory, Syria relies on materials submitted in support of its fourth "F4" instalment claim for remediation of damage to groundwater, surface water and forest resources.[118] Syria also relies on the results of a monitoring and assessment study to demonstrate that there was an increase in the number of cases of respiratory diseases in Syria and also to establish a causal link between the increase and the pollutants from the oil well fires.

756. Syria asserts that the results of the monitoring and assessment study demonstrate that there were 103,824 additional cases of respiratory diseases in 1991, and 790,989 additional cases of respiratory diseases between 1992 and 1995 that were due to exposure of the population to pollutants from the oil well fires. Syria asserts that this increase is reflected in statistical abstracts, published by its Central Bureau of Statistics, and that these establish, inter alia, an increase in the total number of patients admitted to Syrian hospitals between 1991 and 1995.

757. Iraq asserts that Syria has not established that pollutants from the Kuwait oil well fires reached Syria in toxic levels, or that there is a causal link between any respiratory pathology in Syria and the oil well fires in Kuwait. Iraq also asserts that Syria's monitoring and assessment study is flawed, and

that its analysis of hospital and health centre records on patients does not constitute evidence of an increase in the number of cases.

758. Iraq further asserts that Syria's public health warnings, advising citizens that they would be provided with free medical care in the event that they experienced unusual symptoms resulting from the presence of "black clouds", would have caused an increase in the number of people reporting to health facilities and, therefore, the increase was not necessarily evidence of an actual increase in cases of true pathology. Iraq also states that some of the patients who responded to the public health warnings would have had existing respiratory pathologies that were not caused by the oil well fires, although all of them were included in Syria's claim.

759. The Panel considers that, although the monitoring and assessment study suggests an increase in the number of cases of respiratory diseases in Syria after Iraq's invasion and occupation of Kuwait, especially in provinces identified as more exposed to the oil well fires, Syria has not established that the increase was a direct result of the oil well fires. In the view of the Panel, while there is evidence that pollutants released from the oil well fires reached some parts of Syria, the concentration of air pollutants required to produce the levels of respiratory diseases asserted by Syria is far in excess of the concentrations that could have reached Syrian territory.

760. The Panel also considers it reasonable to assume that the number of persons seeking treatment for respiratory diseases between 1991 and 1995 indicated in Syria's data could be due, at least in part, to the response of people to the public health warnings by the Government and to its decision to provide follow-up treatment to these persons between 1992 and 1995, and not necessarily to an actual increase in respiratory diseases. The Panel also notes that, although the statistical abstracts from the Central Bureau of Statistics submitted by Syria appear to demonstrate an increase in the total number of patients admitted to Syrian hospitals between 1991 and 1995, the increase could not be confirmed in statistical abstracts obtained from independent sources.

761. The Panel concludes that, although it is possible that pollutants released from the oil well fires in Kuwait caused some exacerbation of asthma and minor respiratory symptoms in a limited number of locations on a few days in Syria in 1991, the magnitude of the impact on the population in Syria cannot be measured with any degree of certainty. In the view of the Panel, the information submitted by Syria does not provide a sufficient basis for determining the proportion of the increase in the number of cases of respiratory diseases that can reasonably be attributed directly to Iraq's invasion and occupation of Kuwait. Consequently, Syria has failed to meet the evidentiary requirements for compensation as specified in article 35(3) of the Rules.

762. Accordingly, the Panel recommends no compensation for this claim.

763. The Panel's recommendation in respect of claim No. 5000303 is summarized in table 23.

Table 23. Recommended award for claim No. 5000303

Claim	Subject	Amount claimed (USD)	Amount recommended (USD)
5000303	Public health	104,233,079	nil
Total		104,233,079	nil

E. Recommended awards for the claims of Syria

764. The Panel's recommendations in respect of Syria's claims are summarized in table 24.

Table 24. Summary of recommended awards for the claims of Syria

Claim	Subject	Amount claimed (USD)	Amount recommended (USD)
5000462	Cultural heritage resources	1,202,800,000	nil
5000467	Livestock resources	857,987,973	nil
5000303	Public health	104,233,079	nil
Total		2,165,021,052	nil

IX. CLAIM OF THE REPUBLIC OF TURKEY

765. In the fifth "F4" instalment, the Panel reviewed one claim submitted by Turkey for natural resource damage resulting from Iraq's invasion and occupation of Kuwait. Claim No. 5000327 is for the loss of Turkey's forestry resources.

A. Claim No. 5000327 – Forestry resources

766. Turkey seeks compensation in the amount of USD 5,417,263 for natural resource damage to its forests resulting from the presence of refugees who entered Turkey after having departed from Iraq or Kuwait between 2 August 1990 and 2 March 1991.

767. In support of this claim, Turkey relies on the same facts and evidence which it submitted in support of its fourth "F4" instalment claim. In its fourth "F4" instalment claim, Turkey stated that 3,673 hectares of forests were damaged by the presence and activities of refugees who entered Turkey after leaving Iraq or Kuwait between 2 August 1990 and 2 March 1991. According to Turkey, a large number of refugees passed through its territory during that period and cut down many trees in its oak forests for firewood. Turkey stated that the refugees first cut standing trees and subsequently uprooted stumps, causing deterioration of forest root systems. Turkey submitted forest statistics, photographs, videos and maps of the relevant areas.[119]

768. In the fourth "F4" report, the Panel noted that there was evidence in the published literature that a large number of refugees passed through Turkey after having departed from Iraq or Kuwait between 2 August 1990 and September 1991. However, the evidence provided by Turkey was not sufficient to enable the Panel to determine whether the damage alleged to have resulted from the presence of the refugees was eligible for compensation. In particular, no information was provided regarding the

dates on which the refugees arrived in Turkey, the countries from which they departed, the duration of their stay in Turkey or the details of the damage that they were alleged to have caused. Consequently, the Panel found that Turkey had failed to meet the evidentiary requirements for compensation specified in article 35(3) of the Rules.

769. Although Turkey submitted additional information to support its claim in the fifth "F4" instalment, the Panel found this information to be equally insufficient.

770. Accordingly, the Panel recommends no compensation for this claim.

771. The Panel's recommendation in respect of claim No. 5000327 is summarized in table 25.

Table 25. Recommended award for claim No. 5000327

Claim	Subject	Amount claimed (USD)	Amount recommended (USD)
5000327	Forestry resources	5,417,263	nil
Total		5,417,263	nil

X. RELATED ISSUES

A. Currency exchange rate

772. The Commission issues awards in United States dollars. However, some claims were presented in other currencies, and some others were presented in United States dollars after conversion from other currencies. In keeping with the practice of other panels of Commissioners, the Panel has used currency exchange rates reported in the United Nations Monthly Bulletin of Statistics as at the date on which the loss occurred, except as indicated below. For losses which occurred over an extended period, the Panel has used the rate which represents the mean of the monthly rates during the period of the losses.

773. In calculating the value of recommended awards, the Panel determined that the exchange rates used by the Claimants were reasonable approximations of the applicable rates in the United Nations Monthly Bulletin of Statistics, except in the case of Iranian rials.

774. When rates in the United Nations Monthly Bulletin of Statistics do not reflect the actual market value of Iranian rials, market rates from other sources are applied. For the period from August 1990 to March 1991, an average rate of 1,350 Iranian rials to 1 United States dollar has been used.

B. Interest

775. In its decision 16 (S/AC.26/1992/16), the Governing Council provided that interest would be "awarded from the date the loss occurred until the date of payment, at a rate sufficient to compensate successful Claimants for the loss of use of the principal amount of the award".

776. At its fifty-fifth session, held from 8 to 10 March 2005, the Governing Council adopted decision 243 (S/AC.26/Dec.243 (2005)), stating that the Council will "take no further action with respect to the issue of awards of interest". In light of the decision of the Governing Council, the Panel does not consider it necessary to make any recommendations with respect to interest on the awards recommended in this report.

XI. SUMMARY OF RECOMMENDATIONS

777. Based on the foregoing, the Panel recommends that the amounts set out in table 26 be awarded in respect of the claims in the fifth "F4" instalment.

Table 26. Summary of recommended awards in the fifth "F4" instalment

Country	Claim No.	Amount claimed (USD)	Amount recommended (USD)
Iran	5000286	441,895,991	24,034,892
	5000301	161,000,000	nil
	5000288	7,916,024,475	46,596
	5000287	2,571,509,483	3,366,964
	5000394	332,300	332,300
	Subtotal	11,090,762,249	27,780,752
Jordan	5000304	4,330,635,352	161,926,734
	5000464	886,481,830	nil
	Subtotal	5,217,117,182	161,926,734
Kuwait	5000460	967,831,391	7,943,030
	5000468	267,710,202	nil
	5000183	1,476,336,427	8,264,246
	5000453	4,056,202	nil
	Subtotal	2,715,934,222	16,207,276
Saudi Arabia	5000309	481,442	nil
	4002545	2,676,101	nil
	5000463	8,877,370,779	46,113,706
	5000219	19,861,782,707	nil
	Subtotal	28,742,311,029	46,113,706
Syria	5000462	1,202,800,000	nil
	5000467	857,987,973	nil
	5000303	104,233,079	nil
	Subtotal	2,165,021,052	nil
Turkey	5000327	5,417,263	nil
Total		49,936,562,997	252,028,468

XII. COMPLETION OF THE REVIEW OF "F4" CLAIMS

778. This report completes the work of the Panel.

779. The Panel held 33 meetings in Geneva and reviewed a total of 168 claims for compensation with a total claimed amount of approximately USD 85 billion. Oral proceedings, with the participation of representatives of the Claimants and Iraq, were held at the Palais des Nations in Geneva on 16 January 2001, 19 March 2002, 25-26 March 2003, 27-28 April 2004 and 14-15 September 2004. The Panel also undertook field visits to Kuwait and Saudi Arabia in 2000 and to Iran in 2001.

780. By its decision 132 (S/AC.26/Dec.132 (2001)) of 21 June 2001, the Governing Council approved awards for 69 monitoring and assessment projects recommended by the Panel in the first "F4" report. The Governing Council requested the Panel to ensure that the funds awarded were spent "on conducting the environmental monitoring and assessment activities in a transparent and appropriate manner and that the funded projects remain reasonable monitoring and assessment activities".

781. Pursuant to the request of the Governing Council, the Panel, with technical assistance from the Post-Conflict Assessment Unit of the United Nations Environment Programme ("UNEP"), has tracked the progress of activities related to the funded projects. For this purpose, the Panel periodically requested progress reports from the Governments concerned on the conduct of their monitoring and assessment activities and expenditures of the funds awarded for those activities. The Panel reviewed these progress reports, including audit certifications on expenditures. Based on this review, the Panel submitted reports and, as appropriate, recommendations to the Governing Council on work undertaken on the projects and expenditures of the funds awarded for the projects. Altogether, eight reports were submitted by the Panel to the Governing Council.[120]

782. As of 21 February 2005, 53 of the 69 projects were completed. Based on the technical reports from UNEP and other information reviewed by the Panel, the Panel stated that it was satisfied that the 53 completed projects constituted reasonable monitoring and assessment activities in accordance with paragraph 35(c) and (d) of Governing Council decision 7. The Panel also confirmed that the results of the projects had been valuable to it in the review of the substantive environmental claims. With regard to the 16 ongoing monitoring and assessment projects, the Panel stated that 12 of them continued to be reasonable monitoring and assessment activities in accordance with Governing Council decision 132. The Panel, therefore, recommended that the Governments concerned be permitted to use funds from the first "F4" instalment awards to continue their monitoring and assessment activities. In relation to the four remaining projects, the Panel concluded that further work on these projects was no longer necessary as far as the Commission was concerned. Accordingly, the Panel recommended that the Governing Council consider appropriate measures to ensure that the remaining funds in respect of these projects were returned by the Government concerned.

783. Pursuant to Governing Council decisions 124 (S/AC.26/Dec. 124 (2001)) and 226 (S/AC.26/Dec.226 (2004)), the Commission allocated a total of USD 14 million in technical assistance

to Iraq for its review of the claims related to environmental damage and depletion of natural resources. The Governing Council stated that the objectives of this arrangement were to "facilitate the promotion of legitimate interests of Iraq with respect to 'F4' claims, which give rise to particular questions due to their complexity and the limited amount of relevant international practice", and to "[assist] the 'F4' Panel of Commissioners in the conduct of its tasks, through ensuring the full development of the facts and relevant technical issues, and in obtaining the full range of views including those of Iraq".

784. Prior to the present report, the Panel issued four other reports, the fourth in two parts, containing recommendations for compensation as follows:

(a) First "F4" report (S/AC.26/2001/16) dated 22 June 2001, with total recommended awards in the amount of USD 243,234,967;

(b) Second "F4" report (S/AC.26/2002/26) dated 3 October 2002, with total recommended awards in the amount of USD 711,087,737;

(c) Third "F4" report (S/AC.26/2003/31) dated 18 December 2003, with total recommended awards in the amount of USD 1,148,701,011;

(d) Fourth "F4" report, part one (S/AC.26/2004/16) dated 9 December 2004, with total recommended awards in the amount of USD 629,487,878; and

(e) Fourth "F4" report, part two (S/AC.26/2004/17) dated 9 December 2004, with a total recommended award in the amount of USD 2,277,206,389.

Geneva, 1 April 2005

(Signed) Thomas A. Mensah
Chairman

(Signed) José R. Allen
Commissioner

(Signed) Peter H. Sand
Commissioner

Notes

[1] Details of the claims or parts of claims that were deferred from previous "F4" instalments or transferred from other claims categories are discussed in the relevant sections of this report.

[2] See the "Report and recommendations made by the Panel of Commissioners concerning the first instalment of 'F4' claims", S/AC.26/2001/16 ("first 'F4' report"). In the first "F4" report, the Panel recommended awards for monitoring and assessment projects to identify and evaluate damage or loss suffered as a result of Iraq's invasion and occupation of Kuwait. Some of these projects were intended to provide information to assist with the review of substantive claims by producing scientific and technical information about the nature and extent of environmental damage and potential remediation measures. Data produced by the following monitoring and assessment projects were transmitted to Iraq: for Iran's claims, claim Nos. 5000329, 5000330, 5000343, 5000344, 5000345, 5000346, 5000347, 5000348, 5000349, 5000350, 5000351, 5000352, 5000382, 5000383, 5000389, 5000392, 5000393, 5000395, 5000420, 5000425, 5000427, 5000428, 5000446 and 5000447; for Jordan's claims, claim Nos. 5000353, 5000354, 5000355, 5000356, 500357, 5000358, 5000396, 5000429, 5000430 and 5000431; for Kuwait's claims, claim Nos. 5000374, 5000375, 5000376, 5000378, 5000397, 5000398, 5000403, 5000404, 5000405, 5000406, 5000407, 5000432, 5000433, 5000434 and 5000435; for Saudi Arabia's claims, claim Nos. 5000361, 5000363, 5000408, 5000409, 5000411, 5000438, 5000439, 5000440, 5000441, 5000414, 5000415, 5000416, 5000417 and 5000418; and for Syria's claims, claim Nos. 5000371, 5000372 and 5000419.

[3] "Report of Secretary-General pursuant to paragraph 19 of Security Council resolution 687 (1991)", S/22559, paragraph 20.

[4] "Report and recommendations made by the Panel of Commissioners concerning the second instalment of 'F4' claims", S/AC.26/2002/26 ("second 'F4' report"), paragraph 22; "Report and recommendations made by the Panel of Commissioners concerning the third instalment of 'F4' claims", S/AC.26/2003/31 ("third 'F4' report"), paragraph 25; "Report and recommendations made by the Panel of Commissioners concerning part one of the fourth instalment of 'F4' claims", S/AC.26/2004/16 ("fourth 'F4' report, part one"), paragraph 29.

[5] Third "F4" report, paragraph 32.

[6] Second "F4" report, paragraph 25; Third "F4" report, paragraph 38; Fourth "F4" report, part one, paragraph 39.

[7] Third "F4" report, paragraph 39; Fourth "F4" report, part one, paragraph 40.

[8] Third "F4" report, paragraphs 42-43; Fourth "F4" report, part one, paragraphs 43-44.

[9] Third "F4" report, paragraph 47.

[10] Fourth "F4" report, part one, paragraph 50.

[11] See third "F4" report, paragraph 25.

[12] Case Concerning the Factory at Chorzów. Germany v. Poland, Permanent Court of International Justice, Series A, No. 17 (1928), at p. 47.

[13] Third "F4" report, paragraph 33.

[14] Third "F4" report, paragraph 34.

[15] Third "F4" report, paragraph 35.

[16] See, for example, the International Convention on Civil Liability for Oil Pollution Damage, 1969, as modified by the Protocol of 1992, United Nations, Treaty Series, Vol. 973, No. 14097, p. 3; and the International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage, 1971, as modified by the Protocol of 1992, United Nations, Treaty Series, Vol. 1110, No. 17146, p. 57.

[17] Second "F4" report, paragraph 22.

[18] Resolution 3 of the Assembly of the IOPC Fund, 17 October 1980, FUND.A/ES 1/13, paragraph 11(a).

[19] Trail Smelter Arbitration. United States v. Canada, Reports of International Arbitral Awards, vol. 3 (1941), p. 1911 et seq., at p. 1920.

[20] Third "F4" report, paragraph 48; Fourth "F4" report, part one, paragraph 50.

[21] Some of the site visits were conducted in conjunction with site visits undertaken by the secretariat and the Panel's expert consultants as part of the review of claims in the fourth "F4" instalment. See Fourth "F4" report, part one, paragraph 55 and "Report and recommendations made by the Panel of Commissioners concerning part two of the fourth instalment of 'F4' claims", S/AC.26/2004/17 ("fourth 'F4' report, part two"), paragraph 45.

[22] First "F4" report, paragraph 32.

[23] The decrease in compensation claimed is based on information produced by monitoring and assessment activities that were funded by awards in the first "F4" instalment. The monitoring and assessment claims of Iran that were awarded funding in the first "F4" instalment and are relevant to claim No. 5000286 are claim Nos. 5000343, 5000344, 5000347, 5000383, 5000420, 5000425, 5000427 and 5000428.

[24] First "F4" report, paragraph 63.

[25] The crop prices used by Iran in calculating the value of lost crops are not appropriate for estimating the value of crops that were not, in fact, produced. Iran uses market prices provided by FAO and the Iranian Ministry of Commerce. These may be either the best country prices or perhaps even international prices, but they are not local "farm-gate" prices. Hence they cannot provide a basis for determining the value of crops, most of which would have been sold at local prices. In addition, the crop prices used by Iran include transportation and market costs that could not have been incurred since the lost crops were neither harvested nor transported to the market. The appropriate prices to be used for this purpose should be the local prices that would have been paid to the farmers if the lost crops had been produced.

[26] Iran states that the IFC is "an instrumentality of [the] Government of Iran established in 1986 and governed under the Ministry of Jehad-e-Sazandegi".

[27] The monitoring and assessment claims of Iran that were awarded funding in the first "F4" instalment and are relevant to claim No. 5000301 are claim Nos. 5000329, 5000330, 5000346, 5000347, 5000348, 5000349, 5000350, 5000351 and 5000382.

[28] Second "F4" report, paragraph 79.

[29] The breakdown of the sum of USD 35,000,000 for the fisheries resources rehabilitation programme is as follows: installation of artificial reefs (USD 9,000,000), breeding and release of shrimp "seeds" to rehabilitate stocks (USD 6,000,000), programme to reduce the number of industrial trawlers from 1993 (USD 5,000,000), rehabilitation of coral reefs (USD 10,800,000), research and monitoring shrimp stock (USD 1,700,000) and research and monitoring of demersal fish stock (USD 2,500,000).

[30] This evidence is the same as that provided by Iran in claim No. 5000288 (paragraphs 208-214 of this report).

[31] Ibid.

[32] Ibid.

[33] The decrease in compensation claimed is based on information produced by monitoring and assessment activities that were funded by awards in the first "F4" instalment. The monitoring and assessment claims of Iran that were awarded funding in the first "F4" instalment and are relevant to claim No. 5000288 are claim Nos. 5000329, 5000330, 5000343, 5000344, 5000347, 5000349, 5000350, 5000351, 5000382, 5000383, 5000389, 5000420, 5000425, 5000427, 5000428, 5000446 and 5000447.

[34] The issue of the number of refugees who entered Iran as a result of Iraq's invasion and occupation of Kuwait is discussed in greater detail at paragraphs 230-238 of this report.

[35] The ecological service value which Iran uses to calculate this amount is that estimated in R. Costanza et al., "The value of the world's ecosystem services and natural capital", Nature, Volume 387, No. 6630 (1997), p. 253.

[36] First "F4" report, paragraphs 61 and 63.

[37] The 10 monuments and sites are Susa, Choga Zanbil, Haft Tappe, Izeh, Persepolis, Pasargadae, Shiraz, Isfahan, Yazd and Kerman.

[38] The studies were on (a) the air pollution effects on Iranian sites; (b) the air pollution effects on Iranian museums; (c) surface deposit identification on cultural heritage materials and sites in Iran; and (d) the assessment of damage to Iranian cultural heritage caused by the increase in air pollution resulting from Iraq's invasion and occupation of Kuwait. These studies were funded through awards for first "F4" instalment claim Nos. 5000446 and 5000447.

[39] Iran calculates the amounts underlying this total with reference to ecological service values estimated in Costanza et al., supra, note 35.

[40] First "F4" report, paragraphs 63, 114 and 120.

[41] The increase in compensation claimed is based on information produced by monitoring and assessment activities that were funded by awards in the first "F4" instalment. The monitoring and assessment claims of Iran that were awarded funding in the first "F4" instalment and are relevant to claim No. 5000287 are claim Nos. 5000392, 5000393 and 5000395.

[42] West Azerbaijan, Khuzestan, Kermanshah, Kurdistan, Fars, Lorestan, Hormozgan and Bushehr.

[43] Sixth "F1" instalment, claim No. 5000120.

[44] In claim No. 5000288 (paragraphs 171-184 of this report) and in its fourth "F4" instalment claim No. 5000456 (fourth "F4" report, part one, paragraphs 67-81), Iran claimed for damage caused to its terrestrial resources because of the influx of 89,256 refugees who departed from Iraq and Kuwait as a result of Iraq's invasion and occupation of Kuwait. Additionally, in the claim submitted by its Ministry of Interior in the sixth instalment of "F1" claims, Iran claimed for expenses incurred to accommodate refugees who departed from Iraq and Kuwait as a result of the invasion and occupation, including 10,000 refugees who entered Iran after 2 August 1990, and between 57,700 and 65,000 refugees who entered Iran during January 1991. See "Report and recommendations made by the Panel of Commissioners concerning the sixth instalment of 'F1' claims" (S/AC.26/2002/6), paragraphs 154-166.

[45] The Panel stated at paragraph 30 of the second "F4" report that salaries and related expenses paid to regular employees of a claimant are not compensable if such expenses would have been incurred regardless of Iraq's invasion and occupation of Kuwait, but that a claimant may be entitled to compensation if it incurs additional expenses to make up for the loss of the services of its regular personnel who have been assigned other duties or required to undertake additional tasks as a result of the invasion and occupation.

[46] The Panel also reviewed this study in connection with Iran's claim No. 5000288 in this report.

[47] First "F4" report, paragraphs 61 and 63; Fourth "F4" report, part one, paragraph 87.

[48] First "F4" instalment, claim No. 5000393.

[49] First "F4" instalment, claim No. 5000392.

[50] First "F4" report, paragraphs 288-290.

[51] These cancers include acute lymphoblastic leukaemia; acute myelogenous leukaemia; chronic lymphocytic leukaemia; hairy cell leukaemia; non-Hodgkin's lymphoma; Hodgkin's disease; melodysplastic syndrome; multiple myeloma; retinoblastoma; Ewing sarcoma; Wilms tumour; neuroblastoma; sarcoma; rhabdomyosarcoma; testis tumour; and lung cancer.

[52] At paragraph 31 of the first "F4" report, the Panel stated that, in assessing the reasonableness of the monitoring and assessment activity, it would consider inter alia: (a) whether there is a possibility that environmental damage could have been caused as a result of Iraq's invasion and occupation of Kuwait; (b) whether the particular areas in respect of which the monitoring and assessment activity is undertaken could have been affected by pollutants released as a result of Iraq's invasion and occupation of Kuwait; (c) whether there is evidence of environmental damage or risk of such damage as a result of Iraq's invasion and occupation of Kuwait; and (d) whether, having regard to the stated purpose of the monitoring and assessment activity and the methodologies to be used, there is a reasonable prospect that the activity will produce results that can assist the Panel in reviewing any related substantive claims.

[53] First "F4" report, paragraph 297. Jordan estimates that, of the total number of refugees who entered Jordan from 2 August 1990 to 1 September 1991, 242,000 were involuntary immigrants, 216,000 were returnees and 1.42 million were evacuees.

[54] "Report and recommendations made by the Panel of Commissioners concerning the first instalment of 'A' claims", S/AC.26/1994/2, pages 24-26, 28-29; and "Report and recommendations made by the Panel of Commissioners concerning the first instalment of 'F2' claims", S/AC.26/1999/23 ("first 'F2' report"), paragraphs 30-31.

[55] First "F4" report, paragraph 304.

[56] Ibid.

[57] First "F4" report, paragraph 306.

[58] The increase in compensation claimed is based on information produced by monitoring and assessment activities that were funded by awards in the first "F4" instalment. The monitoring and assessment claims of Jordan that were awarded funding in the first "F4" instalment and are relevant to claim No. 5000304 are claim Nos. 5000353, 5000354, 5000355, 5000356, 500357, 5000358, 5000396, 5000429, 5000430 and 5000431.

[59] See also fourth "F4" report, part one, paragraph 104.

[60] Of the USD 1,465,565,462 claimed for this part of the first claim unit, USD 939,146,614 is for the salinization of groundwater resources and USD 526,418,848 is for the depletion of groundwater resources.

[61] Jordan states that the refugees who brought in the livestock were Bedouins. Jordan further states that, for the most part, Bedouins who entered Jordan as a result of Iraq's invasion and occupation of Kuwait did not go to any of the refugee camps. Jordan adds that Bedouins would have had no need for such camps, their livestock would have found no pasture in the trampled environs, and they may also have had a social aversion to crowds.

[62] Convention on Wetlands of International Importance Especially as Waterfowl Habitat, Ramsar, 1971, United Nations, Treaty Series, Vol. 996, No. 14583, p. 245.

[63] First "F4" instalment claim Nos. 5000354, 5000355, 5000356, 5000357, 5000358 and 5000430.

[64] The monitoring and assessment claim of Jordan that was awarded funding in the first "F4" instalment and is relevant to claim No. 5000464 is claim No. 5000353.

[65] First "F2" report, paragraphs 65 et seq. and 280 et seq.

[66] Governing Council decision 3 (S/AC.26/1991/3) specifies that compensation will be provided for non-pecuniary injuries resulting from mental pain and anguish where: (a) a spouse, child or parent of the individual suffered death; (b) the individual suffered serious personal injury involving dismemberment, permanent or temporary significant disfigurement, or permanent or temporary significant loss of use or limitation of use of a body organ, member, function or system; (c) the individual suffered a sexual assault or aggravated assault or torture; (d) the individual witnessed the intentional infliction of events described in subparagraphs (a), (b) or (c) on his or her spouse, child or parent; (e) the individual was taken hostage or illegally detained for more than three days, or for a shorter period in circumstances indicating an imminent threat to his or her life; (f) on account of a manifestly well-founded fear for one's life or of being taken hostage or illegally detained, the individual was forced to hide for more than three days; or (g) the individual was deprived of all economic resources, such as to threaten seriously his or her survival and that of his or her spouse, children or parents, in cases where assistance from his or her Government or other sources has not been provided.

[67] The claim preparation costs in claim No. 5000464 relate to all of Jordan's fourth and fifth "F4" instalment claims, and not only its public health claim.

[68] The increase in compensation claimed is based on information produced by monitoring and assessment activities that were funded by awards in the first "F4" instalment. The monitoring and assessment claims of Kuwait that were awarded funding in the first "F4" instalment and are relevant to claim Nos. 5000460 are claim Nos. 5000374, 5000375, 5000376, 5000378, 5000397, 5000398, 5000432, 5000433, 5000434 and 5000435.

[69] Third "F4" instalment, claim No. 5000450 and fourth "F4" instalment, claim Nos. 5000454 and 5000466.

[70] First "F4" report, paragraphs 419 and 427; fourth "F4" report, part one, paragraphs 158-191.

[71] Kuwait describes MARS as a three-dimensional hydrodynamics model that "computes movement of water masses, at Gulf scale and in the Kuwait marine area, as driven by wind, tide, fresh water inflow and density gradients". For the purposes of this claim, Kuwait uses two separate MARS models; namely, a regional three-dimensional (3D) Arabian Gulf model that is "designed to support long term and large scale simulations of oil releases and to provide boundary conditions to the local model"; and a local, embedded 3D model to support "short-term simulation of pollutant impacts". Kuwait states that the two MARS models have been calibrated and validated over a three-year period (1990-1992). The regional scale model has been tested on tide propagation and hydrological fields whereas the local model has been validated on time series of current and water level data.

[72] Kuwait states that the OSCAR "is a state-of-the-art … model which has been applied in many parts of the world" and compares its model results to a limited set of observations of oil contamination following the invasion-related oil spills. OSCAR includes an oil spill/physical fates sub-model that "estimates the distribution of contaminants on the water surface, on shorelines, in the water column and in sediments" as well as exposure and population sub-models which together estimate the effects of contaminants on eggs, larvae, juvenile and adult fish, wildlife and lower trophic level biota.

[73] Fourth "F4" report, part one, paragraphs 51 and 158-191.

[74] This estimate does not include the coastal oil trench and coastal oil deposit as contamination in those areas was not caused by invasion-related oil spills modelled by OSCAR. The Panel addressed coastal damage requiring remediation in Kuwait's fourth "F4" instalment claim No 5000259 at paragraphs 158-191 of the fourth "F4" report, part one. The Panel also considers future remediation of Kuwait's mudflats area under claim No 5000468 at paragraphs 476-490 of this report.

[75] In the third "F4" instalment, the Panel found that the Raudhatain and Umm Al-Aish aquifers had been contaminated by oil from damaged oil wells and by sea water used to fight the oil well fires, and that this was a direct result of Iraq's invasion and occupation. Kuwait was awarded compensation to remediate the aquifers. See third "F4" report, paragraphs 63-83.

[76] See also, third "F4" report, paragraph 73.

[77] In light of the results of the monitoring and assessment studies that were funded by awards in the first "F4" instalment for claims Nos. 5000378, 5000397 and 5000398, Kuwait substantially reduced the claimed cost for remediating its mudflats.

[78] First "F4" instalment, claim No. 5000397.

[79] The increase in compensation claimed is based on information produced by monitoring and assessment activities that were funded by awards in the first "F4" instalment. The monitoring and assessment claims of Kuwait that were awarded funding in the first "F4" instalment and are relevant to claim No. 5000183 are claim Nos. 5000403, 5000404, 5000405, 5000406 and 5000407.

[80] Second "F4" report, paragraph 98.

[81] The Panel notes that nationals of Kuwait who were victims of mines and ordnance explosions did not file individual claims for medical expenses, as the Government of Kuwait incurred these expenses. The Panel specifically notes that in the "Special report and recommendations made by the 'D1' Panel of Commissioners concerning thirty claims filed pursuant to Governing Council decision 12 (S/AC.26/1992/12)" (S/AC.26/2004/12), the "D1" Panel made recommendations in respect of 30 claims filed in the "B" and "C" claims categories for personal injuries suffered as a result of explosions of landmines and other ordnance in Kuwait after 2 March 1991. The claimants in that report did not submit any claims for medical treatment costs. They submitted claims for mental pain and anguish and loss of future earnings only.

[82] Kuwait states that the average cost per visit is 114.50 Kuwaiti dinars, and converts this amount to United States dollars as USD 377.85.

[83] First "F4" instalment, claim No. 5000404.

[84] Ibid.

[85] Kuwait's risk assessment uses "low", "central", and "high" values for four input variables (background mortality, population, exposure concentration and concentration response coefficient) to characterize uncertainty. The central estimate of 35 deaths is the result of using the central values for all four variables.

[86] First "F4" instalment, claim No. 5000405.

[87] First "F4" report, paragraph 31.

[88] Saudi Arabia states that Shadco is a joint stock company established under the company law of Saudi Arabia.

[89] Although the individual amounts claimed for barley and wheat in this claim unit are USD 1,635,113 and USD 1,214,664 respectively (a total of USD 2,849,777), Saudi Arabia has only claimed USD 2,670,227 (10,000,000 Saudi Arabian rials) for this claim unit.

[90] The increase in compensation claimed is based on information produced by monitoring and assessment activities that were funded by awards in the first "F4" instalment. The monitoring and assessment claims of Saudi Arabia that were awarded funding in the first "F4" instalment and are relevant to claim No. 5000463 are claim Nos. 5000359, 5000361, 5000363, 5000408, 5000409, 5000411, 5000437, 5000438, 5000439, 5000440 and 5000441.

[91] Fourth "F4" instalment, claim No. 5000455.

[92] Fourth "F4" report, part one, paragraphs 243-300.

[93] Supra, note 91.

[94] Fourth "F4" report, part one, paragraphs 264-271.

[95] Fourth "F4" report, part one, paragraph 274.

[96] Fourth "F4" report, part one, paragraphs 275-279 and 289.

[97] Third "F4" instalment, claim Nos. 5000451 and 5000360. See third "F4" report, paragraphs 169-192.

[98] Third "F4" report, paragraph 179.

[99] Third "F4" report, paragraphs 179, 181, 185 and section 1 of annex VI.

[100] Third "F4" report, paragraph 185 and annex VI.

[101] First "F4" instalment, claim Nos. 5000363, 5000408 and 5000409.

[102] Third "F4" report, annex VI.

[103] Third "F4" report, paragraphs 169-189.

[104] Fourth "F4" instalment, claim No. 5000465. See fourth "F4" report, part one, paragraphs 301-320.

[105] Fourth "F4" report, part one, paragraph 310.

[106] Fourth "F4" report, part one, paragraph 311.

[107] Fourth "F4" report, part one, paragraphs 313-316.

[108] First "F4" instalment, claim No. 5000363.

[109] United States National Oceanic and Atmospheric Administration, Primary restoration guidance document for Natural Resource Damage Assessment under the Oil Pollution Act of 1990: Damage Assessment and Restoration Program, (Silver Spring, Maryland, 1996).

[110] The increase in compensation claimed is based on information produced by monitoring and assessment activities that were funded by awards in the first "F4" instalment. The monitoring and assessment claims of Saudi Arabia that were awarded funding in the first "F4" instalment and are relevant to claim No. 5000219 are claim Nos. 5000413, 5000414, 5000415, 5000416, 5000417 and 5000418.

[111] The increase in compensation claimed is based on information produced by monitoring and assessment activities that were funded by an award in the first "F4" instalment. The monitoring and assessment claim of Syria that was awarded funding in the first "F4" instalment and is relevant to claim No. 5000462 is claim No. 5000371.

[112] Convention concerning the Protection of the World Cultural and Natural Heritage, 1972, United Nations, Treaty Series, Vol. 1037, No. 15511, p. 151.

[113] First "F4" report, paragraph 713.

[114] The monitoring and assessment claim of Syria that was awarded funding in the first "F4" instalment and is relevant to claim No. 5000467 is claim No. 5000372.

[115] Homs, Hama, Aleppo, Ar Raqqah, Al Hasake and Deir-Ezzor.

[116] The alleged symptoms included running mucus, pneumonia, strangulation, inflammations in the upper pulmonary tract, and acute inflammatory spots in the bronchia and windpipe.

[117] The decrease in compensation claimed is based on information produced by monitoring and assessment activities that were funded by an award in the first "F4" instalment. The monitoring and assessment claim of Syria that was awarded funding in the first "F4" instalment and is relevant to claim No. 5000303 is claim No. 5000419.

[118] Fourth "F4" instalment, claim No. 5000457. See fourth "F4" report, part one, paragraphs 327-349.

[119] Fourth "F4" instalment, claim No. 5000153. See fourth "F4" report, part one, paragraphs 350-356.

[120] Tracking Progress of Environmental Monitoring and Assessment Projects Compensated Pursuant to Governing Council Decision 132 – First Report of the "F4" Panel (13 September 2002); Second Report (24 January 2003); Third Report (2 May 2003); Fourth Report (21 November 2003); Fifth Report (27 February 2004); Sixth Report (30 April 2004); Seventh Report (17 September 2004); and Eighth Report (21 February 2005).

TECHNICAL ANNEXES TO THE FIFTH "F4" INSTALMENT REPORT

Introduction

1. In reviewing the measures proposed by claimants to compensate for depletion of or damage to natural resources, the Panel found that some modifications in the design, methodologies and the nature and extent of the compensatory measures to be undertaken would improve the net environmental benefit and reduce the cost of some of the measures. The general outlines and objectives of the modifications have been indicated in the parts of the report dealing with the relevant claims. In some cases, the Panel considers it useful to set out technical details of the modifications. As stated in paragraph 95 of the report, these details are indicated in the respective annexes.

2. The Panel recognizes that, in carrying out the various compensatory measures, claimants may find it necessary to make further modifications to take account of new information or changing environmental conditions. In this regard, the Panel stresses that its findings regarding the proposed measures, and its suggestions of possible modifications, have been based on information available to it on the environmental conditions in the claimant countries prior to 15 September 2004.

3. Compensatory measures must be implemented with utmost caution, taking due account of the need to avoid potential adverse environmental impacts. This requires the use of flexible and site-specific approaches, incorporating a broad set of techniques that are capable of addressing the wide range of habitats; the nature, extent and types of damage; and the different ecological conditions present.

4. The Panel has been guided by the following principles in considering modifications to the compensatory measures proposed:

(a) Measures that pose unacceptable risks of ecological harm should be avoided.

(b) Measures should be undertaken only if they are likely to result in more positive than negative effects.

(c) Measures that facilitate natural recovery processes should be preferred, and they should build on and enhance natural recovery that has already occurred.

(d) The effectiveness of measures should be monitored to ensure that targets are met; and measures should be designed to be sufficiently flexible and responsive to new information obtained from such monitoring.

(e) Where more than one approach or technique is appropriate to achieve the desired goal, the most cost-effective option should be selected.

(f) Decisions on compensatory measures should consider both the short-term and long-term effects of proposed activities on neighbouring ecosystems, including transboundary effects.

Annex I

MODIFICATIONS TO JORDAN'S COMPENSATORY PROGRAMME FOR RANGELAND AND HABITAT LOSSES
CLAIM NO. 5000304 (PARAGRAPHS 353 TO 366)

1. A cooperative rangeland management programme is an alternative approach that can provide adequate compensation for lost ecological services in Jordan. The objective of the programme is to ensure effective management of Jordan's livestock grazing activities, in order to improve the productivity of rangelands and wildlife habitats. A carefully designed and implemented programme is expected to achieve improvements that will fully compensate Jordan for past and future natural resource losses caused by the influx of refugees and their livestock as a result of Iraq's invasion and occupation of Kuwait. Such a programme is feasible within the area available in the Jordanian Badia, and it will link the compensation to actual activities for the improvement of rangelands and habitats. It will also facilitate the integration of the social and cultural uses of the landscape with its ecological function and thus improve the overall environmental conditions.

2. Cooperative management is based on the premise that resource users (e.g., herders) and resource managers can find a common solution which produces gains for both of them in the long term. Resource users wish to have access to rangeland vegetation in order to lower the costs of raising their livestock, while resource managers often have broader social objectives, including preservation of the ecological health of rangeland resources. However, both groups will benefit from a management system that enables rangelands to recover sufficiently to support their common interest in sustainability. A cooperative management programme brings the interested parties together to collaborate in establishing agreed management objectives and practices. When the objectives and practices for ecological restoration are established by agreement between the interested groups, the success of the programme will depend more on maintaining their collaboration to achieve the agreed objectives than on the strength of enforcement measures. Past experience suggests that cooperative management programmes are more likely to produce environmental improvements than the establishment of grazing or wildlife preserves, and that the benefits of such programmes can be sustained beyond the end of their operational life (Allen and Bosch, 1996; FAO, 1993; Vickerman, 1998).

3. Cooperative approaches to managing natural resources can take a variety of forms. Examples of recent applications in similar habitats include:

(a) Morocco – The International Fund for Agricultural Development ("IFAD") sponsored a 10-year project in the Eastern Region of Morocco (IFAD, 2003a). Project objectives included increasing sustainable production from livestock and rangelands; reversing rangeland degradation; increasing incomes; and improving living conditions. The project was designed around pastoral cooperatives involving 10,000 livestock-owning families in a project area of 3.2 million hectares.

(b) Tunisia – Tunisia has experimented with a variety of approaches for involving communities in the management of its rangelands. These include establishment of herder cooperatives as well as co-management systems that integrate local and government efforts to improve rangelands (Ngaido et al., 2002).

4. Cooperative management approaches, on a relatively small scale, have been the subject of experiments in Jordan. IFAD developed a number of projects for rangeland rehabilitation and income diversification (IFAD, 1995, 1997 and 2002). One project was designed to help small farms that have little alternative income (including approximately 8,000 households) by improving livestock productivity and land and water resources (IFAD, 2002). Jordan's Badia Research Station has been actively involved in testing the use of collaborative approaches for rangeland restoration.

5. To date, rangeland restoration projects in Jordan and other countries have relied primarily on the creation of grazing preserves, collaboratively with livestock owners or otherwise, and on temporary resting of rangeland pasture lands. Reduction in livestock numbers has not been a primary focus of programmes implemented to date. In Jordan's case, however, the ability to restore rangelands to a better state will require a significant reduction in overall grazing pressure. According to IFAD, "livestock numbers must be reduced dramatically if the rangelands are to survive and livestock are to be sustainably managed in the long term" (IFAD, 1995).

6. However, reducing the numbers of grazing animals would, at least in the short-run, lower the incomes of livestock owners. Consequently, payments to livestock owners, in order to reduce the impacts on their incomes, are a necessary component of a successful grazing reduction programme in Jordan. With reduced grazing pressure, the quality of the rangeland and wildlife habitats can be expected to improve, resulting in a more sustainable grazing regime that is less dependent on the purchase of livestock feeds.

7. Key tasks to be undertaken in establishing a cooperative management programme for the Jordanian Badia include:

(a) Identifying the leaders of herder groups – It is necessary to identify leaders who can speak for larger groups in negotiations with government staff. In Morocco, grazing cooperatives were formed around traditional tribal affiliations and the leaders of these cooperatives represented them in negotiations. However, cooperatives need not be tribally based. Selection of appropriate groupings and their leadership should be carefully tailored to the specific socio-economic situation in Jordan.

(b) Development of clear ecological/rangeland outcomes – The needed outcomes must be agreed to by all interested parties in order for the programme to work. It is important to allow livestock owners to use their expertise to design methods that they believe can achieve the agreed outcomes, as this builds greater cooperation and flexibility.

(c) Provision of adequate financial incentives – Incentives must be sufficient to stimulate a change in the behaviour of the herders. The actual amounts provided as incentives will

depend on the degree of change needed, the time needed to achieve the objectives, the profitability of the livestock enterprise, and the relative negotiating power of the parties involved.

(d) Securing of commitment from all administrative levels – Administrative support for the project must be broad and sufficient in duration, and it should include a review of existing policies and programmes in order to identify possible conflicting objectives (e.g., agricultural enhancement projects to raise incomes through feed subsidies or other incentives could lead to increases in the numbers of livestock).

(e) Employment of qualified, responsive and responsible staff – The qualification and attitude of staff who deal directly with the local livestock owners will be critical to the success of the programme. These persons must be familiar with the scientific and economic issues relating to grazing practices and ecosystem management, and they need to have the credibility to develop the trust of livestock owners.

(f) Development of an effective system for collecting, assessing and disseminating information on rangeland conditions – The programme will need a data collection and assessment system that ensures prompt delivery of information to herders, allowing them to take decisive action in response to changing rangeland conditions.

8. In order to provide adequate restoration of the lost rangeland habitats and wildlife, the cooperative programme should cover the entire Badia area and should operate for at least 20 years; i.e., roughly equivalent to the period required to restore a structurally complex wadi habitat. By reducing livestock numbers to approximately 0.1 sheep per hectare across the entire Badia region, and preventing any grazing in the overgrazed areas, the cooperative programme can provide substantial increases in ecological service levels and wildlife habitats during its 20-year duration.

9. The costs of the cooperative management programme will consist of two elements: administration expenses and funds needed for financial incentives to reduce herd sizes.

10. Administering a cooperative programme across the entire Badia region will require senior scientists and administrators to design and manage the programme as well as field staff to undertake day-to-day implementation activities. A senior level administrator/scientist will be needed to direct the programme. The director should be supported by senior scientists responsible for programme design and on-going evaluation. In addition, a large field staff will be necessary to carry out the negotiation and monitoring of cooperative agreements (approximately one staff person for each 200,000 hectares in the programme). There should also be GIS/computer technicians to manage programme data.

11. The second programme component is the provision of financial incentives for reducing livestock numbers. As previously noted, it is essential to provide livestock owners with financial incentives to offset, at least partly, the negative economic and social impacts of a reduction in the size of their herds. These incentives should be set at a level that approximately compensates owners for the profit they

would have earned on each animal that they are no longer producing. Higher incentives may be required where there is evidence that reduction in livestock ownership affects an individual's social standing in the community. The Badia sheep population must be reduced by approximately 0.79 million animals to achieve the 0.1 sheep per hectare stocking goal. The available data suggest that, before the removal of feed subsidies by Jordan, livestock owners earned approximately USD 20.75 in profit per sheep. Removal of the subsidies was expected to lower profit margins to approximately USD 3.99 per sheep (BRDP, 1996). There is no current information on profits per animal; however, it is likely that, after the livestock industry adjusts to the removal of subsidies, the profit per animal will fall somewhere between the levels before the removal of the subsidies and the levels after the removal of the subsidies.

12. The incentive programme should be a transitional mechanism and should be phased out as livestock owners come to accept that the current stocking levels are not sustainable. The actual annual cost of the incentives will ultimately be the result of negotiation between the livestock owners and the government, and could depend on the relative negotiating power of the parties. Consequently, programme administrators will need to be sufficiently flexible in the negotiations and in determining annual funding levels, in order to obtain maximum acceptance and participation in the programme. The costs of the programme could also change depending on the number of years it is to be operated. While it is necessary to reduce incentives and livestock populations over time in order to achieve the objectives of the programme, the schedule for these reductions can only be determined in the light of the changing economics of the livestock industry.

13. A clearly defined land tenure policy is an important prerequisite for a successful cooperative management programme (Ngaido & Kirk, 2001). In a recent review of rangeland management efforts in Jordan, IFAD indicated there is still a need "to clarify the land-tenure system and rights to resources" (IFAD, 2003b). The issue of land tenure rights should be addressed at an early stage in the programme design process.

14. Another basic consideration is that the programme should build on past and current rangeland management efforts in Jordan. Administrative structures and programmes for managing Jordan's rangelands are already in place. Consequently, appropriate steps should be taken to integrate the new cooperative programme into existing structures. Such integration should only be considered if it is likely to result in a more cost-effective programme. However, even if the decision is in favour of a separate cooperative programme, lessons from past and current initiatives should be utilized in planning and undertaking the new activities.

15. Success in the implementation of the programme will also depend on an economically efficient system of incentives for reducing animal numbers. One possible mechanism for achieving this is a "reverse auction" system under which livestock owners would be invited to submit bids to the programme managers indicating the payments they require to reduce the size of their herds. Based on the results of the bidding process, the cooperative programme managers would be able to negotiate and reach agreements on incentive levels that minimize the expenditure needed to achieve the target reductions in livestock herds. Such reverse auctions have been used in the past in a variety of natural

resources management programmes. These include programmes for managing livestock slaughter rates, reducing the number of vessels with access to a fisheries site, and providing subsidies for development of renewable energy resources (OCA, 2004; NMFS, 2004; CEC, 2002).

16. Establishing limitations on animal numbers requires agreement on an initial allocation of grazing rights. This involves working closely with livestock owners to determine an allocation approach that is fair and equitable. Data from past livestock censuses may provide a starting point for the allocation of rights. The reverse auction process would then be used to obtain bids on the incentives needed to reduce animal numbers from this initial baseline.

17. The process used for enforcing the limitations on grazing will be critical to the success of the programme. To the extent feasible, the cooperative programme should rely on local resource users themselves to enforce agreements on animal numbers and rangeland use. Traditional approaches used in the Badia to enforce grazing rights may play an important role in such a programme. Programme field staff should provide additional independent oversight of the enforcement activities, and they should be granted the authority to recommend reductions or withdrawals of incentive payments if agreements are not honoured. Electronic tagging of animals permitted to graze may be an effective enforcement tool (Allflex, 2004). In addition, aerial surveys may have a role in programme enforcement (Whittaker et al., 2003). Aerial videography and aerial forward-looking infrared surveys are two methods of estimating animal numbers over large areas. Monitoring of water use by herders might also provide a basis for identifying significant increases of animals above permitted levels.

18. Resources should be allocated to train staff in methods of collaborative management. This is critical to programme success. IFAD projects in Jordan (2002) have included the training of staff in the use of cooperative management approaches. Any new programme should build on the training that has already been completed.

19. The cooperative programme should also incorporate an extensive monitoring and assessment component to operate throughout its entire duration. Monitoring should relate to both ecological and economic parameters. Metrics for determining the degree of rangeland and habitat improvement should be developed and tracked at different stages. These should include information on the percentage ground cover for organic litter and for annual and perennial vegetation, as well as estimates of species composition and above-ground biomass. Significant changes in ground cover can be measured using remote sensing techniques. However, changes in species composition and biomass must be collected in the field by monitoring teams (NRC, 1994; Ong et al., 2004). Economic indicators also will be important for determining the effect of the programme on the incomes of livestock owners. To the extent feasible, the monitoring activities should build on the results of similar activities of Jordan's Pasture Resources Information and Monitoring Evaluation Unit ("PRIME"). IFAD (2001) has developed guidance for monitoring the progress of projects, and this may be helpful. The cooperative programme should also include a systematic annual financial auditing component. The incentives programme in particular should receive careful scrutiny to ensure that the funds are being spent in ways that maximize improvements to the rangeland and wildlife

habitat. Audits should be conducted by an independent body. Recommendations for any needed programme modifications should be included as a part of all audit reports.

20. The cooperative programme should establish procedures for a systematic annual review of the programme, based on the results of monitoring activities. The objective of the review would be to identify modifications necessary for ensuring that the programme meets its objectives. It would be desirable to involve independent experts and non-governmental organizations in the process. In the past, IFAD (1997) has instituted a Technical Assessment Group consisting of outside specialists and scientists who provide inputs into Jordan's rangeland programmes. Such a group can provide valuable feedback on technical solutions that are necessary for the programme, and help in evaluating the success of meeting programme objectives.

21. Finally, for the programme to be sustainable, the Government of Jordan will need to continue its involvement beyond the 20-year programme timeframe envisaged for the programme. Specifically, Jordan will need to continue to enforce grazing limitations that keep livestock numbers at sustainable levels (0.1 sheep per hectare). This is because livestock reduction incentives will no longer be available after the end of the programme and this will increase short-term pressures on individual livestock owners to increase the size of their herds. Without such enforcement, the landscape would rapidly return to its degraded condition. In addition, throughout the duration of the programme, Jordan will need to ensure that sufficient numbers of livestock are available to meet local demand for meat. For that purpose, it will be necessary to permit imports of animals to offset the reduction in domestic supplies.

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Annex II

MODIFICATIONS TO KUWAIT'S SHORELINE PRESERVE
CLAIM NO. 5000460 (PARAGRAPHS 442 TO 456)

1. The shoreline preserve should be sited either in a degraded area that is expected to benefit from the restrictions to be enforced in the preserve or in another ecologically productive area that is likely to face the threat of development activities in the near future.

2. Kuwait proposed to locate the preserve on Bubiyan Island. While a preserve on Bubiyan Island could compensate for damage to Kuwait's shoreline resources, consideration should be given to other environmentally sensitive areas. Many areas on Bubiyan Island do not appear to be actively used and are not likely to be required for large-scale developmental activities in the near future. It would, therefore, be advisable to consider other equally environmentally sensitive sites for the preserve, such as areas within the Khiran Inlets and Sulaibikhat Bay that are not yet protected from developmental activities and the pressure of land use. Both areas are desirable candidates for preservation. The Khiran Inlets are ecologically unique, as the only significant complex of tidal inlets in Kuwait; and Sulaibikhat Bay has a highly productive shoreline that is ecologically important to many species.

3. The bulk of the preserve should consist of intertidal/supratidal habitats similar to those most affected by invasion-related oil contamination. It is, however, appropriate to include contiguous upland and near-shore subtidal habitats in order to preserve overall ecological function and provide access and space for supporting facilities. A preserve 140 hectares in size and maintained for 30 years should be sufficient to compensate for damage to shoreline resources due to the invasion and occupation, although other combinations of area and period of maintenance could also meet this goal.

4. Specific management objectives should be established to ensure that the preserve provides ecological services of a type and quantity sufficient to compensate for those that were lost, and the preserve should be managed to achieve these objectives. The World Conservation Union ("IUCN") provides a framework that could be useful for developing such objectives (Guidelines for Protected Area Management Categories, IUCN and the World Conservation Monitoring Centre, Gland, Switzerland and Cambridge, U.K. (1994)). Overall, the preserve should limit human activities in the area, while focusing on the maintenance of environmental services. Management activities should include enforcement of preserve boundaries and regulations, and basic monitoring of the preserve's ecological status. Although not a primary function of the preserve, provision of educational services to the general public would be useful.

5. Based on these considerations, a much smaller facility, with substantially fewer staff than proposed by Kuwait, should be sufficient to meet project needs. The main preserve building should be limited to the size needed for modest offices, working space and a small public visitor's centre. The need for additional supporting structures and facilities will depend on circumstances at the site of the preserve. Such structures and facilities will probably include a parking area, some fencing, a marine pier or ramp, a secured boat/vehicle storage area, and an access road. Funding for furnishings, basic laboratory and shop equipment, and a jeep and small boat has been included.

6. In addition to the above costs, funding has been included for the periodic replacement or repair of structures and vehicles, as well as supplies, utilities and other consumables. Funding has also been included for estimated engineering, management and contingency costs associated with construction activities.

Annex III

MODIFICATIONS TO SAUDI ARABIA'S SHORELINE PRESERVES
CLAIM NO. 5000463 (PARAGRAPHS 611 TO 636)

1. Two shoreline preserves, with a total area of 46.3 square kilometres and maintained for 30 years, should be sufficient to compensate for damage to Saudi Arabia's shoreline habitats resulting from Iraq's invasion and occupation of Kuwait, although other combinations of number, size and period of maintenance could also meet this goal.

2. The two preserves should be sited either in degraded areas that are expected to benefit from the restrictions that are to be enforced in the preserves, or in other ecologically productive areas that are likely to face the threat of development in the near future.

3. Preference should be given to sites in areas affected by oil spills from the invasion that have been shown by tests to be suitable for the establishment of such preserves. Many of the affected areas do not appear to be actively used and may face little, if any, pressure from development activities in the near future. Hence it would be advisable to consider sites in areas not directly affected by the oil spills from the invasion and occupation.

4. The preserves should consist of intertidal/supratidal habitats similar to those that are most affected by oil-contamination from the invasion and occupation. However, it is appropriate to include contiguous upland and near-shore subtidal habitats, in order to maintain overall ecological functioning and provide access to and space for supporting facilities.

5. Specific preserve management objectives should be established to help ensure that the preserve provides ecological services of a type and quantity sufficient to compensate for those that were lost, and the preserve should be managed to achieve these objectives. The World Conservation Union ("IUCN") provides a framework that could be useful for developing such objectives (Guidelines for Protected Area Management Categories, IUCN and the World Conservation Monitoring Centre, Gland, Switzerland and Cambridge, U.K. (1994)). Overall, the preserve should limit human activities in the area, while focusing on the maintenance of environmental services. Management activities should include enforcement of preserve boundaries and regulations, and basic monitoring of the preserve's ecological status. Although not a primary function of the preserves, provision of educational services to the general public would be useful.

6. Based on these considerations, the budget for the construction and staffing of the preserves has been reduced to reflect the reductions in the number of preserves as compared to what was proposed by Saudi Arabia. On the other hand, a slightly larger main building than proposed has been provided for each of the preserves, with modest increases in the number of staff. Overall, the main preserve building at each site should be limited to the size needed for modest offices, working space and a small public visitor's center. The need for additional supporting structures and facilities will depend on the circumstances at the sites of the preserves. Such structures and facilities will probably include a parking area, some fencing, a marine pier or ramp, a secured boat/vehicle storage area and an access

road. Funding for furnishings, basic laboratory and shop equipment, and vehicles/water transport (two jeeps, one boat and one inflatable) has been included.

7. In addition to the above costs, funding has been included for the periodic replacement or repair of structures and vehicles, as well as supplies, utilities and other consumables. Funding has also been included for estimated engineering, management and contingency costs associated with construction activities.

GLOSSARY

acid rain:	Rainfall with a pH of less than approximately 5.7, typically caused by sulphur dioxide pollution.
anion:	Negatively charged particle.
Badia:	Jordan's eastern desert region encompassing approximately 7 million hectares.
benthic:	Relating to a region that includes the bottom of the sea and the littoral zones.
benthos:	Organisms that live on or in the bottom of bodies of water.
black rain:	Rainfall containing residual pollution from smoke, especially in the form of soot. The pollution is from rain droplets passing through a smoke layer or from particles in smoke acting as nucleation sites for rain droplets to form.
cation:	Positively charged particle.
computer modeling:	Use of computer programmes to analyse problems, such as the evaluation of the transport, fate and impacts of pollutants on the environment.
dry deposition:	Deposition of pollutants (such as dust, particulate matter, or gases) from the atmosphere through settling, as opposed to through rain, clouds, or fog.
fingerprinting, biomarker fingerprinting:	Method for determining the source of oil pollutants based on analysis of petroleum components that remain detectable and relatively unchanged in oil residues even after natural environmental weathering and biodegradation.
GIS:	Acronym for "Geographic Information System", a computerized database for managing and analyzing spatial data.
haul-out:	Occasions when marine animals leave the water to rest, sleep, give birth, nurse young or engage in other activities.

heavy metals:	Metals having a specific gravity (i.e., weight in comparison to weight of an equal volume of water) of 5.0 or over, and generally toxic in relatively low concentrations to plant and animal life. Such metals can persist in animal tissue and are capable of increasing in concentration as they pass upward through the food chain. Examples include lead, mercury, cadmium and arsenic.
infauna:	Aquatic animals that burrow in the sediments underlying bodies of water.
khabari:	Arabic term for topographical depressions forming water catchments. Also locally known as “faidhat”.
oil seeps:	Buoyancy-driven petroleum flows of subsurface origin.
open burning/open detonation:	Processes that rely on burning or detonation to destroy explosives or munitions in excavated pits.
ordnance:	Military materials such as weapons or ammunition.
pelagic:	Of, relating to, or living or occurring in the open sea.
photogrammetry:	Art, science and technology of obtaining reliable information about physical objects and the environment through the recording, measuring and interpreting photographic images and patterns of radiant electromagnetic energy and other phenomena.
polycyclic aromatic hydrocarbons:	Hydrocarbon compounds containing two or more fused benzene rings that are high in molecular weight and slow to decompose. Also referred to as polyaromatic hydrocarbons or polynuclear aromatic hydrocarbons.
prevalence:	Measure of the proportion of the population that has a given disease at one point in time.
qanat:	Ancient system found in arid regions that brings groundwater from the base of a mountainous area, following a water-bearing formation (aquifer) or rarely from rivers, and emerges at an oasis, through underground tunnel or a series of tunnels.

sabkha:	Arabic term for salt flat, usually located in areas of groundwater discharge. Sabkha soils may have strength in the surface hypersaline crust when dry, but once wetted or disturbed exhibit very low strength and bearing capacity.
stressors:	Events, experiences or other stimuli that produce a feeling within an individual of unease or discomfort, often referred to as stress.
supralittoral:	Zone extending from the high-tide line toward dry land, only underwater during exceptionally high tides or storms.
tonne:	Unit of weight equivalent to 1,000 kilograms.
total petroleum hydrocarbons ("TPH"):	Term used to describe a class of several hundred chemical compounds, comprising mainly hydrogen and carbon, originating from crude oil.
trophic scaling:	Adjusting the scale of a restoration project to reflect differences in the contributions of injured and restored organisms to the ecological food web.
wadi:	Arabic term for streambed or other natural depression that is dry except during the rainy season.
wet deposition:	Deposition of pollutants (such as dust, particulate matter, or gases) by rain, snow, fog, or dew.
