STATE OF ISRAEL

NATIONAL ACTION PLAN FOR THE REDUCTION OF POLLUTION OF THE MEDITERRANEAN SEA FROM LAND BASED SOURCES

Ministry of the Environment
Israel

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List of Acronyms and Terms

BAT	Best Available Technology
BATNEC	Best Available Technology Not at Excessive Cost
BEP	Best Environmental Practice
BOD	Biological Oxygen Demand
Cd	Cadmium
Cr	Chromium
Cu	Copper
COD	Chemical Oxygen Demand
DCF	Discounted Cash Flow
EIA	Environmental Impact Assessment
Hg	Mercury
IOLR	Israel Oceanographic and Limnological Research
JNF	Jewish National Fund
LBSP	Land Based Sources Protocol
MAP	Mediterranean Action Plan
MED POL	Programme for the assessment and control of pollution in the Mediterranean
MCM	Million Cubic Meters
NA	Not Available

NAP	National Action Plan
NGO	Non-Governmental Organization
NBB	National Baseline Budget – Baseline Emissions of Pollutants for 2003
NDA	National Diagnostic Analysis
NIS	New Israeli Shekels
NOx	Nitrogen Oxide
NPV	Net Present Value
PAHs	Polycyclic Aromatic Hydrocarbons
Pb	Lead
PCBs	Polycholorobyphenyles
POPs	Persistent Organic Pollutants
SAP	Strategic Action Programme
Shafdan	Dan Region Wastewater Treatment Plant
SOx	Sulfur Oxides
SS	Suspended Solids
TOC	Total Organic Carbon
WTP	Wastewater Treatment Plan
Zn	Zinc

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1. INTRODUCTION

The sensitivity of the Mediterranean Sea requires the prevention of pollutant discharges into the sea. For this reason, the parties to the Barcelona Convention adopted the Strategic Action Programme (SAP) for the prevention of the pollution of the Mediterranean Sea from land-based sources in 1997, as the basis for the drafting and implementation of a long-term National Action Plan (NAP) by each state which is a party to the Convention.

On a national level, the State of Israel acted quickly to prevent the discharge of pollutants from land-based sources. It enacted the Prevention of Sea Pollution from Land-Based Sources Law in 1988 and the Prevention of Sea Pollution from Land-Based Sources Regulations in 1990, which were formulated in the spirit of the SAP.

Member states are expected to begin implementing their NAPs in 2005, with the year 2003 serving as the base year for assessing marine pollution reduction. Prior to preparing its NAP, Israel implemented three preliminary stages: Firstly, hot spots along the Mediterranean coast of Israel were updated; secondly, a National Diagnostic Analysis (NDA) was prepared to assess land-based sources of Mediterranean Sea pollution; and thirdly, a national baseline budget (NBB) was prepared for base year 2003 which quantifies the contribution of the different sources and identifies pollutant quantities from land-based sources which actually reached the Mediterranean Sea in 2003.

The present report outlines Israel's NAP for the prevention of Mediterranean Sea pollution from land-based sources. It constitutes an operative-sectoral plan for the reduction of pollutant emissions into the Mediterranean Sea for the period 2005-2025.

2. Executive Summary

A National Action Plan (NAP) for the prevention of pollution of the Mediterranean Sea from land-based sources in Israel has been formulated. It was prepared by a team of professional consultants, with the assistance of a ministerial steering committee under the Ministry of the Environment and an interministerial committee including representatives of different government ministries, public representatives, green organizations and the Israel Defense Forces.

Principles of the Plan

Israel's NAP was prepared on the basis of SAP guidelines but with adaptations to meet the special needs of the country: the plan relates to the State of Israel as a single geographic unit without further subdivision into administrative units or watershed basins and focuses on four main sectors which classify the pollutants according to their sources[1]:

- The liquid sector – wastewater (wastewater treatment plants and industrial installations), rivers.
- The solid sector - urban solid waste.[2]
- The atmospheric sector - air pollution from stationary and mobile sources.
- The coastal sector.

The pollutants which characterize each sector were reviewed and a national plan for their reduction was formulated. Within this framework, reduction targets were defined (according to the SAP guidelines or in some cases according to the recommendations of the editors of the Israeli plan), different technologies and measures for compliance with

[1] All pollutants and pollutant sources that related to in the SAP guidelines are included in the NAP although they are classified differently than the in the SAP.
[2] Hazardous substances (e.g., used oils, PCBs, etc.) disposed to the Ramat Hovav hazardous waste treatment site do not present a risk of marine pollution and therefore the NAP does not relate to them.

the reduction targets were described, the economic costs and economic benefits of implementing the plan were reviewed and finally, recommendations on burden sharing during the implementation of the plan were made.

The drafting process for the plan was implemented in four main stages:

1. In the first stage NBB data for the year 2003 were updated, constituting the base from which the necessary level of reduction in pollutant release to the Mediterranean Sea should be calculated.
2. In the second stage, actions to reduce pollution which are based on government decisions, implementation of action plans by institutional and business systems and implementation of existing or anticipated regulations were reviewed. The editors of the NAP defined this stage as the "business as usual" scenario. Subsequently, a comparison was made between the change in the anticipated pollution level according to the "business as usual" scenario and the targets for reducing the pollution level[3] as specified in the SAP document or by the editors of the plan.
3. In the third stage, wherever gaps were discovered between the anticipated reduction levels in the "business as usual" scenario and the SAP guidelines/NAP recommended guidelines, action plans for closing the gaps were proposed. Therefore, the NAP has two components. One component includes different action plans that are anticipated under a "business as usual" scenario and the second includes the action plans proposed to close the gap between the reduction levels required according to the SAP or proposed by the NAP editors and those which would be achieved in a "business as usual" scenario. The action plans which go beyond what is required in a "business as usual" scenario were drafted, according to the Barcelona Convention, using Best Available Technologies and Best Environmental Practices (BAT and BEP). Emphasis was placed on clean production technologies while considering social, economic and technological data. It should be emphasized that action plans which go beyond the

[3] Reduction targets to be met by the target years were based on the recommendations of the Mediterranean Action Plan. In cases where specific guidelines for a reduction target did not exist, the NAP editors in cooperation with the Ministry of the Environment and the interministerial steering committee determined targets.

"business as usual" scenario do not specify a specific technology that must be adopted by an industrial plant, but rather provide a general guideline.

In order to define the economic value of implementing the plans within the framework of the NAP, an Investment Portfolio was prepared for the three sectors specified above, with the exception of the atmospheric sector for which a policy of maximum reduction of discharges to sea through enforcement of national legislation was adopted, without dependence on gaps between the national pollution budget and existing conditions.

The Investment Portfolio includes the specific economic costs of implementing the plan and the economic benefit of implementing the plan. In those sectors in which it was found that the necessary reduction levels may be reached in the "business as usual" scenario, the plan is presented without cost/benefit analysis but only with an analysis of plan costs and their impacts on the pollution level. This is because in such cases the government decision has already been implemented and even if a cost/benefit analysis would reveal that the plan is not feasible, it would nonetheless be implemented. Cost/benefit analysis was implemented for action plans whose implementation was recommended as a result of Israel's obligations within the framework of the NAP. These plans would not have been implemented were Israel not committed to compliance with the NAP. Therefore, the question of whether Israel's commitments create projects with positive benefit to the economy should be examined.

4. In the final stage, the mechanism for implementing the NAP was defined and a work plan for implementation was prepared.

Methods for Setting Priorities for Action and Monitoring of the Plan

Several measures were used to identify the main obstacles to reducing sea pollution from land based sources and to obtain feedback during the drafting process:

1. Steering committee – as mentioned above, drafting of the plan was professionally assisted by ministerial and interministerial steering committees.
2. Impact Matrix – a questionnaire was distributed among the key stakeholders in order to develop an Impact Matrix in accordance with the recommendations of the SAP,

with the results serving as a tool in defining the NAP priorities. The survey findings are summarized in Table 1.

3. Public participation – during the preparation of the plan, two public hearings were held, providing participants with the opportunity to relate to the work of the team in real time. Participants included representatives of industry, representatives of green organizations and academics. Participants' comments were incorporated during the process of editing the NAP.

The proposed control mechanism for implementing the plan is based on a Directors-General Committee, which would be established in accordance with a government decision (see text proposal for the decision in Appendix 7). The Directors-General Committee will be responsible for implementing the NAP as outlined in this document. The committee will appoint sectoral subcommittees (according to the sectors defined in the work plan), which will be responsible for assuring and enforcing implementation. In addition, the Directors-General Committee will be responsible for a five-year review of the objectives and implementation targets and for updating the NAP. It is recommended that the Minister of the Environment will appoint the coordinator of the Directors-General Committee. Members of the subcommittees will include directors of the relevant divisions in the Ministry of the Environment, representatives of the Manufacturers' Association of Israel, public representatives and representatives of relevant government ministries.

Summary of the Main Elements of the NAP

A summary of the main elements of the NAP is presented in table form in Chapter 6. The summary table presents the NAP, the anticipated percent of reduction, the cost to the economy in present value (PV), the bodies responsible for implementation and points for monitoring and control of each of the sectors.

3. DEFINING THE SCOPE OF THE NATIONAL PLAN

3.1 Geographic Scope of the Plan

According to the SAP recommendations, Israel's NAP relates to the State of Israel as a single geographic unit, without further subdivision into administrative districts or watershed basins due to the small geographic area of the country and the strong interlinks between regions. However, the NAP does specifically relate to four "hot spots" in Israel, which were so defined by the State of Israel and reported to the SAP/MEDPOL (Na'aman, Haifa Bay – Kishon, Shafdan - Dan Region Wastewater Treatment Plant, Ashdod –Agan and Ashdod refinery outfall).

3.2 National Issues Related to the LBS Protocol and to the SAP

According to data provided by the Ministry of the Environment, some 75% of the pollution reaching the sea originates in land-based sources, especially from industrial installations and from municipal sewage. Most of this land-based pollution originates in the direct release of wastewater to the sea or in its indirect release through rivers. In Israel, the discharge of waste into the sea is prohibited, unless a special permit is granted on condition that there is no reasonable disposal alternative on land. For example, discharge of coal ash to the sea was stopped as soon as a land use was found.

Israel is a party to the LBS Protocol on the protection of the Mediterranean Sea from wastewater discharge and infiltration of land-based pollutants. The actions which are derived from the protocol and the SAP guidelines relate to the following: municipal sewage treatment, urban solid waste treatment; and actions that contribute to air pollution from mobile and stationary sources such as industries, particularly those relating to the release of resistant toxins and biological materials which accumulate in the marine environment. The necessary actions relate both to the regional level and to the national level. The SAP defines the targets, strategies and measures which are required and the timetable for their implementation.

3.3 Development of the NAP: Strategies and Methodologies

Israel's NAP was prepared in accordance with the SAP guidelines, but was adapted to the country's special needs.

The SAP guidelines define seven major sectors for which a pollution reduction plan should be formulated:

- Sewage management
- Urban solid waste
- Air pollution
- Pollution caused by mercury (Hg), cadmium (Cd) and lead (Pb)
- Organohalogens (halogenated alifatic hydrocarbons, halogenated aromatic hydrocarbons, chlorinated phenolic compounds, organo halogenated pesticides)
- Wastewater and solid waste from industrial installations
- Other issues – coastal management, hot spots

Some of the above-mentioned sectors relate to a source of pollution (e.g., municipal sewage) and others to a type of pollutant (e.g., organohalogens). Since there is an overlap between data relating to sectors of the first type and those relating to sectors of the second type, a decision was taken to base Israel's NAP on four sectors which classify the pollutants according to their source:

- The liquid sector – wastewater (wastewater treatment plants and industrial installations), rivers
- The solid sector - urban solid waste[4]
- The atmospheric sector - air pollution from stationary and mobile sources.
- The coastal sector

[4] Hazardous substances (e.g., used oils, PCB, etc.) disposed to the Ramat Hovav hazardous waste treatment site do not present a risk of marine pollution and therefore the NAP does not relate to them.

It should be emphasized that all of the pollutants and pollution sources which appear in the SAP defined sectors are also included in the NAP despite the fact that they are classified differently than in the SAP classification.

Israel's NAP was prepared in the following stages:

3.3.1 Updating the National Baseline Budget (NBB)

The NBB data for 2003 constitute the basis for calculating the required reduction level for the release of every pollutant that originates in a land-based source to the Mediterranean Sea. Therefore, accurate assessment of these data is of vital importance. For this reason, the editors of the NAP reviewed the data which were summarized in April 2004 in order to ascertain that these data included measurements taken in the latter part of 2003. The review confirmed that the original NBB document accurately reflects the pollutant budget flowing into the Mediterranean Sea in 2003, although some updates were required. The updates for the NBB are included in Appendix 1.

Recently, monitoring measures and models for calculating pollutant emissions and their movements in the atmosphere have advanced substantially. In the opinion of the editors of the NAP, data related to the atmospheric sector should therefore be re-examined using existing innovative measures before they are used as a basis for pollution reduction in this sector. Therefore, it was decided not to use the NBB data on the atmospheric sector, but rather to formulate an action plan based on the obligation to use BAT and, in parallel, to utilize NBB data which will be collected in the future to assess the efficacy of pollution reduction measures.

3.3.2 Calculating gaps between the percent of pollution decrease/increase in the "business as usual" scenario and the SAP targets

The "business as usual" scenario is defined as the state which is anticipated assuming that all pollution reduction activities which are based on existing government decisions, institutional and business plans, and existing or planned laws and regulations are

implemented. At this stage, the percent of increase or decrease in the main pollutants defined by the SAP for target years 2014[5] and 2025 was calculated for the liquid sector (the main factor in the pollution of the sea) in comparison to the NBB for 2003 according to the "business as usual" scenario. Subsequently, a comparison was made between the anticipated change in pollution level according to the "business as usual" scenario and the pollution reduction targets[6] defined in the SAP. Wherever gaps were discovered between anticipated reduction levels in the "business as usual" scenario and the SAP targets, action plans for closing the gaps were proposed. For the solid waste sector and the coastal sector, only a quantitative assessment of the actions for reducing potential sea pollution from land-based sources was made. For the atmospheric sector, a policy was adopted which calls for maximal reduction of emissions to sea through the enforcement of national legislation, which is not dependent on gaps between the NBB and the current status.

3.3.3 Development of the NAP

Israel's NAP encompasses two components. The first includes the action plans anticipated in the "business as usual" scenario and the second includes the action plans proposed to close the gap between the reduction levels required by the SAP or recommended by the NAP editors and those that will be achieved in the "business as usual" scenario. According to the SAP guidelines, a reduction of pollutant emissions to the Mediterranean Sea (generally 50% by the year 2014) is required along with a reduction to the level possible using Best Available Technologies (BAT) and Best Environmental Practices (BEP) by the year 2025. Israel's NAP proposes that for pollution types for which plans within the framework of "business as usual" are sufficient to achieve compliance with requirements, additional actions will not be necessary. For pollution types for which activities within the framework of "business as usual" are not sufficient, it is recommended that by 2014 BAT-

[5] Originally, the intention was to relate to actions for implementation by 2010, which is the first stage of the NAP. However, since the year of initiating NAP implementation is 2004 (rather than 2000 as originally planned), the first stage was delayed to 2014.

[6] Pollution reduction targets for the target years were determined on the basis of recommendations of the Mediterranean Action Plan, and in cases in which there is no specific guideline on percent of reduction, the editors of the NAP in cooperation with the Ministry of the Environment and the interministerial steering committee determined the reduction targets.

NEC will be implemented in all those installations which are the sources for this pollution. This guideline applies to all such installations that do not comply with national regulations.

Action plans which go beyond the requirements of the "business as usual" scenario were formulated, as required by the Barcelona Convention, using Best Available Techniques (BAT) and Best Environmental Practices (BEP). Special attention was placed on clean production techniques, taking into consideration social, economic and technological data. Action plans are classified according to the pollution sector and to the pollution sources which will be covered by the plan. It should be emphasized that the action plans do not specify the technology that an industrial plant is to adopt, but rather provide a general guideline. Thus, for example, a recommendation to rehabilitate riverbank vegetation will not specify the types of plants to be used. As for the atmospheric sector, it was decided to require compliance with national regulations using BAT-NEC and BEP in the year 2014. This means that the SAP recommendation for target year 2025 will already be implemented in the first target year.

As far as possible, cost estimates and cash flows are presented for action plans included in the "business as usual" scenario. An Investment Portfolio is presented for those actions that go beyond the requirements of this scenario, as described below.

3.3.3.1 Investment Portfolio

This chapter presents the economic value of implementing activities within the NAP framework. The following analysis presents the proposed plan, the proposed technologies, the economic costs of plan implementation and the economic benefit which will be derived from plan implementation. The economic analysis is presented in terms of cash flow in the relevant years and net present value of the plan (NPV). A positive NPV signifies that implementation of the plan would be economically feasible and that it would benefit the economy. A negative NPV, on the other hand, signifies that implementation of the plan is not economically feasible and that the decision to implement it will be based on other considerations. It should be emphasized that plans implemented within the "business as usual" scenario are not required to undergo the cost/benefit test since the decision to implement them has already been taken in other frameworks which are not connected to the

NAP. In these plans, the cost of the NAP may be identified as zero since, even without Israel's commitment to the NAP, these action plans would have been implemented. On the other hand, plans which will be implemented only because of Israel's commitment to the NAP must undergo a cost/benefit test since they would not have been required at all without this commitment.

Investments were examined in the three sectors mentioned above (excluding the atmospheric sector). In most of the sectors, the required reduction levels can be achieved within the framework of the "business as usual" scenario. Therefore, Israel's commitment in these sectors is assured even without the NAP. Nevertheless, it was decided to also present the plans which are implemented within the "business as usual" scenario. However, in these cases, the plan is presented without a cost/benefit analysis, with only the costs of the plan and their impacts on pollution levels.

Following are the main parameters which appear in the economic analyses:

- Discounted Cash Flow[7] (DCF)

This method of analysis is based on the development of a proforma cash flow report which presents the future costs and benefits of the plan. This method translates all costs and benefits into measurable economic values so that they can be assessed on a common basis, leading to a clear economic result – whether the plan is feasible or not.

- Growth Rates

The scope of annual growth in coming years will impact significantly on the future cash flows of the projects. The selected growth rates are:

Rate of population growth[8] – between 2%-2.5%

Rate of growth in industrial output[9] – 1.5%

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[7] The following exchange rates were used: 4.5 Israeli shekels=$1, $1=1.227 Euro.
[8] Based on 1990-2003 data of the Central Bureau of Statistics.

Rate of growth in kilometers traveled by vehicles[10] –

Private vehicles: 2.45%

Trucks: 1.91%

Taxis: 5.09%

Minibuses: 0.48%

Buses: 1.06%

Rate of growth in electricity production[11] - 3.5%

- **Capital Rate of Return**

The capital rate of return which was chosen is 5%. This rate equals the risk-free interest in the economy in the long term. This interest rate was chosen because investments targeted at reducing pollution for the purpose of complying with environmental standards do not depend on market conditions, sales levels of industrial plants or market activity. Every factory/industry/pollution source will be required to fund these pollution reduction actions as part of the current expenses of the plant, without dependence on sales level. Therefore, the scope of investments/benefits does not depend on parameters based on uncertainty.

- Net Present Value (NPV)

The net present value (NPV) of the project was calculated based on the cash flow for the entire life of the project. The NPV expresses the net benefit to the economy from implementation of the plan. It takes into account investments, costs and benefits. It also reflects the timing of implementing the cost/benefit analysis and therefore may be used to

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[9] Based on 2000-2003 data of the Central Bureau of Statistics.
[10] Based on data of the Central Bureau of Statistics of the number of vehicles registered in Israel in the years 1984-2004, by type of vehicle and year of production.
[11] Based on data appearing in the Energy Demand Plan 2002-2025 (Appendix D of the Annual Forecast for the Years 2002-2025, Ministry of National Infrastructures, June 2003)

help compare net benefit to the economy. A positive NPV signifies the general economic feasibility of the project.

- Operational Costs

Operational costs include the expenses rerequired to fund the ongoing operation of the project and its maintenance (e.g., human resources, electricity, water, periodic cleanups and treatment, etc.).

- Benefit

The economic analysis concentrates on the economic benefits expected from investment in the project. In many cases, additional indirect benefits exist such as improved plant image, increased competitiveness in markets with high environmental standards and enhanced quality of the product and/or raw materials. These indirect benefits are not reflected in the cash flow but may have major importance.

3.3.4 Defining an Administrative Mechanism for Implementing the NAP

It is recommended that the Minister of the Environment submit a proposal for a government decision (see proposed text in Appendix 7) to the Israel government, according to which a Directors-General Committee will be established with responsibility for following up on the implementation of the NAP as outlined in this document. The committee will appoint sectoral subcommittees (according to the sectors defined in the action plan), which will be responsible for assuring and enforcing implementation. In addition, the Directors-General Committee will be responsible for the five-year review of the implementation goals and targets and for updating the NAP. It is recommended that the Minister of the Environment will appoint the coordinator of the Directors-General Committee. Members of the subcommittees will include directors of relevant divisions in the Ministry of the Environment, representatives of the Manufacturers' Association of Israel, public representatives and representatives of relevant government ministries.

3.4 Work Assumptions

Calculation of the anticipated decrease or increase in pollution for the target years was based on the following assumptions:

3.4.1 Assumption of Constant Rate of Population Growth

Assessment of the future rate of population growth was based on data for 1970-2003 published by the Central Bureau of Statistics and on the axiom that annual growth rates change slowly. Analysis of the data revealed that the rate of population growth in the past decade was 2% - 2.5% per year. The assumption was that this growth rate would continue unchanged in the coming years.

3.4.2 Assumption of Rate of Growth in Industrial Output

The rate of growth of industrial output was assessed. The assessment was based on data for 1970-2003 published by the Central Bureau of Statistics. Analysis of the data revealed that the growth rate in industrial output in recent years was 1.5%. When analyzing the forecasted growth, it was assumed that this rate of growth would remain constant in the coming years.

3.4.3 Assumption of Rate of Growth in Kilometers Traveled

The forecast of growth in kilometers traveled in the years 2003 to 2025 was conducted according to the type of vehicle and was based on data published by the Central Bureau of Statistics on number of vehicles registered in Israel in the years 1984-2004, by type of vehicle and year of production. When assessing the growth in kilometers traveled on the basis of growth in vehicle quantities, it was assumed that the average kilometers traveled per year per vehicle, as presented in Central Bureau of Statistics data for the current vehicle fleet, by type of vehicle and age of vehicle, would remain constant in the future.

3.4.4 Assumption of Iterative Implementation of the NAP

Due to uncertainties regarding the future state of sea pollution and the ability of action plans to comply with expectations and timetables, periodic follow up on the

implementation of the action plan will be undertaken. Based on the results of the assessment, plans will be updated at each milestone. Analysis of the data is based on the assumption that the review will be conducted once in five years.

3.5 Methods for Setting Priorities for Action and Monitoring of the Plan

Several measures were taken to identify the main obstacles to reducing marine pollution from land-based sources and to obtain feedback during the process of drafting the plan.

- A questionnaire was distributed among the major stakeholders in order to develop an Impact Matrix as recommended by the SAP. Appendix 7 presents a sample questionnaire and explanatory notes. The results of the survey are summarized in Table 1.

  Members of the interministerial committee, representatives of the Ministry of the Environment, participants in the public hearings and the team of editors were asked to fill the questionnaires. The data from the filled-in questionnaires were summarized and priorities for dealing with the different categories of pollutants were determined. The following formula was used to determine priorities:

- R_I = One of four areas which are impacted by pollution

  Public health = (R1)

  Marine environment = (R2)

  Socio-economic loss = (R3)

  Transboundary impacts = (R4)

- N_I = Each of the pollutant categories which are relevant to the sector (e.g., atmospheric sector). These categories are defined for each of the sectors individually.
- W_R = The weight of each of the four areas impacted by the pollution:

  Public health = 4

Marine environment = 3

Socio-economic loss = 2

Transboundary impacts = 1

- S_R = Possible score for each pollutant category in a given area: beginning from 1 (no impact) and going up to 4 (very high impact).
- N = Number of respondents giving a score to a pollutant category in a given area.

Not giving a score in a pollution category in any field reflects lack of knowledge about the category's importance to the impacted area. Unlike a score of "0," this reaction of the responder is not included in the calculation of the average score.

The formulation for determining the weighted score of N_I in a specific sector is:

$$\frac{\sum_{R=1}^{4} (\Sigma S_R * W_R/N)}{\sum_{R=1}^{4} W_R}$$

Table 1: Results of the Impact Matrix

Sector	Pollutant	Weighted Score
Liquid Sector – direct discharge to sea	Cadmium, mercury and lead, detergents, pesticides	3.24
Liquid Sector – rivers	Industrial wastewater (nutrients and BOD), oils, organohalogens, PBBs, PCBs	3.04
Air pollution from industrial sources	Cadmium, mercury and lead	2.93
Air pollution from industrial sources	PBBs, PCBs	2.93
Liquid Sector – Direct Release to Sea	Industrial wastewater (nutrients and BOD), oils, organohalogens, PBBs, PCBs)	2.90
Hot Spots	Na'aman	2.83
Liquid Sector – Rivers	Domestic sewage (nutrients and BOD)	2.80
Liquid Sector – Direct Release to Sea	Domestic sewage (nutrients and BOD)	2.72
Hot Spots	Shafdan	2.56
Air Pollution from Mobile Sources	Particulates, NOx, VOCs	2.53
Hot Spots	Ashdod – Agan and Ashdod Oil Refinery outfall	2.52
Air Pollution from Industrial Sources	Organohalogens	2.52
Urban Solid Waste	Solid pollutants	2.42
Urban Solid Waste	Leachates	2.42
Liquid Sector – Rivers	Pollutants from non-point sources	2.33
Coastal Sector	Development pressures	2.26
Coastal Sector	Damage to the coastline	2.13
Hot Spots	Haifa Bay - Kishon	2.10
Liquid Sector – Direct Release to Sea	Brine concentrates from seawater desalination	1.35

Table 1 demonstrates that release of pollutants to sea, both through direct outfalls and through rivers, is, in the opinion of the survey responders, at the top of the priority list for treatment for the purpose of preventing marine pollution. Atmospheric transport of pollutants and pollution emissions from hot spots are perceived as second in importance. The contribution of urban solid waste and the coastal sector to marine pollution is considered to be of relatively low importance. Direct discharge of brine concentrates from desalinated seawater was positioned, as expected, by most of the responders at the bottom of the priority list. The release of a solution whose main component is salt does

not significantly endanger the sea. Despite the level of industrial and agricultural activity on the banks of the Kishon River, the Haifa Bay – Kishon hotspot was scored one before last on the list of subjects requiring treatment. This may be explained by the intense activities taken in recent years to rehabilitate the river.

Segmentation of the survey results by pollution sectors demonstrates that the release of trace metals, detergents and pesticides to sea is the main problem associated with direct release to sea (as is the case with other land-based activities). Second in importance is direct release of industrial wastewater (nutrients, oils, organohalogens, PBBs, PCBs and BOD level). Release of industrial wastewater is also considered to be the main problem associated with pollutant transport through rivers. Release of domestic sewage (nutrients and BOD) is second in importance in relation to release to sea through rivers. Transport of industrial pollutants (metals and organic pollutants such as PCB) is the main problem related to the atmospheric sector.

It should be emphasized that the survey aimed to inform the editors of the NAP about the attitudes of an environmentally aware and knowledgeable public. The survey was conducted based on the recognition that this public's preferences must be included among the range of considerations which would help determine the priorities of the different NAP components. Although the responses of respondents with vested interests could bias the results of the survey, it was possible to make wise use of the findings after analyzing their probability and suitability to the conclusions drawn using other methods of analysis. Opposing biases, such as those of green organizations, on the one hand, and of factories with pollution potential, on the other hand, neutralized each other to some extent, reflecting the opposing, though largely legitimate views, of stakeholders.

- The NAP was prepared with the professional assistance of a ministerial steering committee, including representatives of the Ministry of the Environment, and an interministerial committee, with representatives of different government ministries, the public, green organizations and the Israel Defense Force. The feedback and the updated data obtained from members of the steering committees, both in individual meetings and in larger forums, helped formulate a NAP which is both precise and reliable. (The list of steering committee members is presented in Appendix 2.)

- A public hearing was organized during preparation of the NAP, in which participants were given the opportunity to relate to the work of the team in real time. Participants included representatives of industry, representatives of green organizations and academics.

  An additional public hearing was held upon completion of the full draft of the action. The same stakeholders participated in this day as well. One of the conclusions of the meeting was the need for stronger contacts with industrial representatives on defining BAT-NEC type technologies that may be used to achieve the plan targets.

4. National Issues

4.1 General

Issues with the highest national priority were identified for each of the four sectors. For the most part, these were identified based on the magnitude of the gap between pollution reduction under the "business as usual" scenario and the SAP required reduction. Pollution load reductions which are anticipated in a "business as usual" scenario in the four sectors are specified later in this chapter.

4.2 Identification and Assessment of Issues

4.2.1 The Atmospheric Sector – Air Pollution

4.2.1.1 General

Air pollution may well be one of the most difficult environmental problems facing industrialized countries. However, when it comes to marine pollution, the atmospheric route is secondary in importance compared to the direct land route. This is especially true on a national scale as opposed to the atmospheric transport of pollutants on a global scale. Therefore, the methodology adopted to formulate the NAP for the atmospheric sector differs from that adopted for other sectors. While SAP guidelines were applied to the other sectors with adaptations to Israel's specific conditions, the methodology recommended in the SAP for 2025 for the atmospheric sector, was adopted for the earlier target year of

2014. The assumption underlying the proposed plan is that air pollution reduction from industrial sources based on criteria that are not directly relevant to the sea (e.g., public health) will lead to a reduction in marine pollution from atmospheric sources at a level exceeding the reduction requirements of the SAP guidelines. Therefore, emphasis is placed on sweeping enforcement of air quality standards that will be set or have already been set by the Ministry of the Environment in the industrial sector.

The same assumption was adopted for the transportation sector as well, so that actions aimed at reducing air pollution from this sector will in any event significantly reduce marine pollution from an atmospheric source. This methodology, in relation to the transport sector, is compatible with the SAP guidelines.

4.2.1.2 Reduction Targets

According to the SAP, industry may be classified into two groups: a) industries that comply with government or international standards for pollutant emissions; and b) industries that do not comply with these standards. Therefore, in the first stage of implementing the SAP guidelines (year 2014), the target should be a 50% reduction in the pollutants which are emitted only from industries in the second group.

The target recommended by the NAP editors is that industries that do not comply with national legislative requirements relating to the atmospheric sector by 2010 will be obligated, through enforcement measures, to implement actions for pollution reduction by 2014 to assure their compliance with national standards by that target year. The editors of the NAP assume that this reduction target is even more stringent that the SAP standard, since according to the SAP, industries that do not comply with national standards will be required to jointly reduce 50% of the pollutants in relation to the base year. However, if each plant will be required to comply with national standards on an individual level (Israel's NAP target), the pollutant reduction rate will be greater. It should be emphasized that in most cases, the standards set by the state are in accordance with the reduction targets that may be achieved as a result of BAT implementation.

For the transport sector, actions will be taken on the national level to reduce air pollution (e.g., incentives for exchanging old cars for new cars, tax reductions for hybrid vehicles).

4.2.1.3 Measures for Preventing the Pollution of the Mediterranean Sea from Air Pollution which are Defined in the "Business as Usual" Scenario

Based on the Ministry of the Environment's air pollution prevention policy, standards, regulations, business license conditions and personal decrees (administrative orders) have been issued to major industrial plants and transport bodies which may cause or have caused significant air pollution in Israel. Following are the measures undertaken in a "business as usual" scenario:

The Transport Sector

- In the transport sector a process of emission reduction is taking place as a result of the gradual renewal of the vehicle fleet in Israel, with all gasoline-powered vehicles beginning with 1993 models equipped with catalytic converters. These converters minimize up to 90% of the emissions of nitrogen oxides (NOx) and volatile organic compounds (VOC).

  On the basis of historical data of the Central Bureau of Statistics, it is estimated that as a result of the continual renewal of the vehicle fleet in Israel, some 90% of all gasoline-powered vehicles will be equipped with catalytic converters by the year 2014.

- Currently, vehicles powered by diesel, such as buses and heavy trucks, comply with emission standards of the European Union, known as "Euro 3 standards" (for 2000 and up models), "Euro 4 standards" (for 2005 and up models) and "Euro 5 standards" (for 2008 and up models). Use of these clean models leads to emissions reductions of 70%-80% of NOx, VOC and particulates as well as to a significant reduction in SOx emissions in comparison to emissions from models prior to the implementation of the Euro standards. The following table presents the distribution of vehicles powered by diesel according to the Euro standards, based on estimated production years (based on the historical data of the Central Bureau of Statistics).

Table 2: Estimated Distribution of Diesel Vehicles according to Euro Standards, %

2014	Trucks	Taxis	Minibuses	Buses
Before Euro 0	1.0	0.0	0.1	2.1
Euro 0	3.2	0.0	1.3	6.3
Euro 1	8.2	0.2	7.6	10.6
Euro 2	14.0	2.9	17.5	16.5
Euro 3 (2002 & up)	18.9	11.5	13.5	16.4
Euro 4 (2005 & up)	13.6	14.4	13.9	10.6
Euro 5 (2008 & up)	41.1	71.0	46.1	37.4
Total	100	100	100	100
2025	**Trucks**	**Taxis**	**Minibuses**	**Buses**
Before Euro 0	0.4	0.0	0.0	0.7
Euro 0	1.2	0.0	0.4	2.1
Euro 1	3.1	0.0	2.3	3.6
Euro 2	5.3	0.4	5.4	5.6
Euro 3 (2002 & up)	7.1	1.4	4.2	5.6
Euro 4 (2005 & up)	5.1	1.8	4.3	3.6
Euro 5 (2008 & up)	77.8	96.4	83.3	78.8
Total	100.0	100.0	100.0	100.0

The table demonstrates that under a "business as usual" scenario there would be a significant reduction in pollutant emissions due to an increase in the number of vehicles powered by diesel which comply with the growing strictness of European standards.

- In the "business as usual" scenario, the number of dedicated public transport lanes on both urban and interurban lanes would continue to increase and major investments would be made in railroad infrastructure. These processes aim to encourage the public to use public transport. One of the positive impacts of these processes is a reduction in pollutant emissions due to reduced use of private cars.

  In parallel, various processes are being implemented to encourage drivers of private cars to exchange old vehicles for new vehicles, since new vehicles comply with increasingly more stringent standards and since cars undergo wear and tear over the years which leads to increased vehicular emissions and pollution. The Ministry of the Environment has promoted a plan aimed at encouraging drivers to voluntarily implement early scrapping of their vehicles in exchange for a financial incentive. The plan was approved by the Ministry of Finance about two years ago, but has not yet been implemented since the infrastructure required for its implementation has not yet been completed. Another

example of a policy that promotes use of environment-friendly vehicles is a plan that encourages hybrid vehicle use through a reduction in purchase taxes on these vehicles. Hybrid vehicles are powered by gasoline and electricity alternatively, and are equipped with a computer, which is responsible for managing the use of gasoline and electricity. The turning of the engine powers the electrical charger so that whenever the electric charger is full, the computer transfers the car to electricity operation. (Experts assess that the use of these vehicles will reduce air pollution by a rate of about 33%). This plan has been implemented since 2004. In 2004, the tax rate on the purchase of hybrid vehicles was reduced from 89% to 40%, and in 2005 a further reduction in purchase taxes took place from a rate of 40% to a rate of 30%.

The Electricity Sector

On September 1, 2005, the Ministry of the Environment disseminated standards on pollutant emissions from stacks of power plants in the electricity sector in a "Draft Proposal – Abatement of Nuisances Regulations (Electricity Facilities and Power Plants for Energy Generation), 2005." These regulations relate to conventional pollutants (e.g., nitrogen oxides, sulfur dioxide, carbon monoxide, hydrocarbons and suspended particles), including particulates, SO_2 and nitrogen oxides. (The draft does not relate to heavy metals, dioxins and foranes, PAH, etc.)

It was assumed that in a "business as usual" scenario, the Israel Electric Corporation will undertake the measures necessary to comply with the regulations proposed by the Ministry of the Environment. Following is a description of the anticipated activities:

- Sulfur Dioxide – Coal Powered Stations

  According to the draft "Abatement of Nuisances Regulations (Prevention of Air Pollution from Electricity Production), 2005," the Israel Electric Corporation is required to reduce sulfur oxide emissions by the end of 2013 in each coal-fired electricity production unit which is currently not equipped with a collector to a level of 200 $\mu g/m^3$. (Regulation 18 (a) (7) – exceedance of the permitted maximal emission values for sulfur dioxide in coal-fired steam units – limits this requirement in case the power unit ceases

to operate by the end of 2016 but only if its closure is included in the plan as stated in regulation 22 on transitional provisions).

- Nitrogen Oxides – Coal-Powered Stations

  According to the draft "Abatement of Nuisances Regulations (Prevention of Air Pollution from Electricity Production), 2005," the Israel Electric Corporation is required to reduce nitrogen oxides emissions by about 70% by the end of 2016, requiring the installation of selective catalytic reduction (SCR) systems in each coal-fired electricity production unit.

- Oil-Fired Power Plants

  According to the draft "Abatement of Nuisances Regulations (Prevention of Air Pollution from Electricity Production), 2005, all of the oil-fired plants, Eshkol in Ashdod, Reading in Tel Aviv, and the Haifa plant will be converted to natural gas combustion by 2008. Recently, the Reading Power Plant in Tel Aviv was shut down and steps were initiated to accelerate its conversion to natural gas.

- Gas Turbines

  All gas turbines will be converted to natural gas by 2008.

The Industrial Sector

- Under a "business as usual" scenario, air pollution inspectors have a variety of tools at their disposal for limiting concentrations of air pollutants which are emitted from the stacks of different industrial plants:

  Business license – Within the framework of the Licensing of Businesses Law, a business license is granted to a list of businesses requiring licensing. The license includes conditions for implementation designated to protect the quality of the environment. Some business licensing conditions relate to air quality and to the permitted concentration of different pollutant emissions.

Administrative order (personal decree) – The Minister of the Environment is authorized to issue an "administrative order" to an entity in which steps that must be taken to prevent high or unreasonable air pollution are stipulated. In this case, the business owner is presented with a decree specifying the steps to be taken to prevent unreasonable air pollution.

The Ministry of the Environment undertakes inspection, control and enforcement to assure that polluters comply with standards set for them. Since the year 2000, spot checks are conducted each year (e.g., in the year 2003, 89 spot checks were conducted and in 2004, 156 checks). In addition, the Ministry of the Environment established a national air monitoring network in 1977, aimed at characterizing, in a comprehensive manner, air quality throughout Israel. This is undertaken by the 23 monitoring stations of the Ministry of the Environment, which are located throughout the country, and by other monitoring networks which provide data, including the monitoring network of town associations and of the Electric Corporation along the Mediterranean coastline at Haifa, Hadera, Tel Aviv and Ashdod.

- **Regulations under the Abatement of Nuisances Law** – Framework conditions on air pollutant emissions from stacks appear as standards in the appendix to the "Covenant on Implementing Standards on Air Pollutants to the Air," and are implemented as conditions in the business licenses of the plants. The standards set maximum concentrations for a wide range of air pollutants which may be emitted on condition that pollutant emission rates in the plant are higher than the emission threshold rates appearing in the standards. The standards in the "Covenant on Implementing Standards on Air Pollutants to the Air" are based on 1986 German emission standards (TA LUFT 1986).

  TA LUFT 2002 – In recent years, Germany has set more stringent standards, which are specified in TA LUFT 2002. In practice, in parallel to the measures described above, the Ministry of the Environment has already begun to implement these stringent standards by incorporating new conditions into the business licenses of problematic plants (which are the main contributors to the pollution) and in all new installations. It appears that the Ministry of the Environment's policy for 2012 (the final target year for implementing

the "Covenant on Implementing Standards on Air Pollutants to the Air" – 1986) will be across-the-board implementation of TA LUFT 2002 and implementation of even more stringent standards, which will be updated over the years, by 2025.

4.2.2 The Liquid Sector – Wastewater

4.2.2.1 General

Wastewater may be classified into two main groups, each with unique characteristics requiring special treatment methods:

1. Wastewater and especially urban effluents from municipal sewage systems that are not recovered for reuse and are released to rivers and to the sea. Two main parameters indicate the pollution level of this wastewater: volatile solids (suspended + dissolved) and biological oxygen demand (BOD).
2. Industrial wastewater/effluents, which cannot be connected to the municipal sewage systems and are released to rivers and directly to sea. The quality and pollution level of this wastewater is reflected in several additional parameters, especially COD and TOC concentrations.

Municipal and industrial wastewater/effluents may flow directly to sea through such paths as marine outfalls, power plants and dumping to sea.

Another source of pollution is surface runoff. The surface runoff drains to rivers and from them to the sea or converges in urban drainage systems from watershed basins of rivers and from urban population centers before it reaches rivers or makes its way directly to the sea.

4.2.2.2 Reduction Targets

The proposed NAP calls for at least a 50% reduction in pollutant emissions to the sea in the liquid sector by 2014. Later, further reductions in the pollution discharged to the sea along with industrial wastewater will occur as a result of adoption of advanced industrial waste treatment at source technologies (in the plants), based on BAT-NEC, coupled by the enforcement of quality and quantity criteria of the wastewater which is directly released to sea.

According to the SAP, another target calls for connecting all coastal cities of more than 100,000 inhabitants to a municipal sewage system by 2005. This target has already been fully achieved in Israel where all local authorities with populations exceeding 1000 inhabitants are connected to a sewage system, and most of them to wastewater treatment facilities and effluent removal and recovery systems as well.

4.2.2.3 Urban Wastewater/Effluents Drained to Rivers and Through Them to Sea

Municipal wastewater/effluents include domestic and municipal sewage from workshops/industry, which comply with criteria for discharge to wastewater treatment plants. This means that the sewage undergoes pretreatment at the industrial plant to remove brines, heavy metals, oil and fats, and other specific pollutants. This type of industrial wastewater does not restrict effluent reuse for agriculture, on the one hand, and does not harm transport and treatment systems, on the other hand. It should be emphasized that harmful wastewater, which is not appropriate for connecting to the public sewage system, is concentrated, treated and disposed separately, in separate systems, to sites for the removal of harmful wastewater, evaporation ponds and marine outfalls under permits granted by the Ministry of the Environment.

Under the "business as usual" scenario, cessation of the pollution is achieved through the implementation of existing plans, activities and regulations relating to the completion of wastewater collection and treatment systems and recovery of the full effluent potential for agricultural irrigation, as a water source and a substitute for fresh water. This includes the seasonal collection of effluents and the discharge of high-quality effluents for the revitalization of rivers. Thus, wastewater/effluent discharge to rivers and to the sea will be absolutely stopped.

Following is a description of activities currently being implemented or planned under the "business as usual" scenario:

- The basic standard which is currently implemented in most of Israel's wastewater treatment facilities is 20:30, relating to the organic load (BOD) and suspended solids in the effluents in units of mg/liter.

- The national master plan for water sector development, which was prepared by the Water Commission (2002), adopts the recommendations of an expert committee (the Inbar Committee) for a more stringent standard for organic load and suspended solids (10:10 standard) and maximum values for total nitrogen (10 mg/liter) and total phosphorus (1.0 mg/liter) for effluents disposed to rivers and 5 mg/liter for unrestricted agricultural irrigation. Implementation of the standard (10:10) and the anticipated reduction in background water salinity, as a result of seawater desalination, to 160 mg/liter of chlorides will further reduce chloride additions in effluents from 100 to 80 mg/liter in municipal sewage compared to background water levels.
- The master plan for water sector development (2002-2010) requires that wastewater treatment plants be upgraded and constructed and that Israel's entire effluent potential be utilized as a source of water for agricultural consumption. According to the forecast, in 2010 some 509 MCM of effluents will be recovered for agricultural irrigation as a substitute for fresh water and some 50 MCM of high-quality effluents will be directed to rivers to ensure water flow, nature, flora and aquatic life. It is anticipated that the establishment of WTPs and effluent recovery systems will be completed by 2014. In any case, even if all of the treatment and recovery systems are not completed, Israel will nevertheless comply with the NAP targets –50% reduction in the pollution emitted to sea.
- Implementation of changes in the components of detergents to reduce boron additions in sewage systems to a base level of 0.2 mg/liter.

4.2.2.4 Direct Release to Sea Via Marine Outfalls, Power Plant Outfalls and Dumping from Vessels

Several sources, which had previously discharged their effluents through rivers, currently discharge their effluents directly to sea, in accordance with permits by the Ministry of the Environment, via marine outfalls, power plant outfalls and dumping to sea from vessels.

Five categories of wastewater are disposed directly to sea in the liquid sector, as follows:

1. Municipal sewage and effluents.

2. Sludge from the Shafdan facility.
3. Brines and wastewater from industrial plants which are disposed directly to sea through marine outfalls, the Electric Corporation's power plants and dumping to sea by vessel.
4. Concentrates from well remediation systems.
5. Concentrates from brackish water desalination systems.

Further information and data on these sources that discharge directly to the sea are included below.

4.2.2.4.1 Municipal Sewage and Effluents

Treated and untreated sewage was discharged to the Mediterranean Sea for years. In recent years, however, the volume of effluents directed toward agricultural reuse following appropriate treatment instead of being discharged to the sea has grown continuously. In 2004, sewage/effluents were still released to sea from cities and communities along the coast whose wastewater treatment and effluent recovery systems were not yet completed. Today, several WTPs are at various stages of construction or upgrade. Their completion will bring the discharge of untreated sewage to sea to a full stop, and most of the treated effluents will be used for agricultural purposes. Following are further details concerning these facilities:

- **Regional Facility in Nahariya**

  In January 2005 the regional treatment facility for Nahariya's sewage and an effluent collection and recovery system became operational, thus stopping the discharge to sea of some 5.1 MCM of sewage/effluents.

- **Regional Facility for Treating the Sewage of the Acre Area**

  The WTP for the Acre area is under construction. Its completion, scheduled within a year, will stop the discharge of Acre's sewage to sea.

- **Regional Wastewater Facilities for Sewage of Hof HaCarmel**

Two regional treatment facilities are at advanced stages of construction in Hof HaCarmel:

1. A facility to the north of Atlit which will also treat the sewage of Daliat el-Carmel, Ussafiya and the communities of the Hof HaCarmel Regional Council.
2. A southern regional facility in the Ma'ayan Zvi area which will also serve Zichron Ya'akov, Faradis and the communities of Hof HaCarmel.

Once the work is completed and the facilities are operational, all of the effluents will be used for agricultural recovery and effluent overflow to the sea will be prevented. In any case, the water will be treated to a level allowing discharge to sea.

- **Herzliya Wastewater Treatment Plant**

Effluents of the Herzliya WTP, currently totaling 7.4 MCM per year, are released directly to sea. The Herzliya WTP is being upgraded to produce effluents for unrestricted irrigation, which will be recovered for agricultural purposes by the end of 2007. In any case, the water will be treated to a level allowing discharge to sea.

- **Ashdod Wastewater Treatment Plant**

Effluents of the Ashdod WTP are partially recovered for agricultural use and some still overflow to the marine outfall. With the completion of the project to recover the rest of the effluents produced by the WTP for agricultural irrigation, effluent overflow to the sea will fully stop, even though the effluents will be treated to a quality level allowing discharge to sea.

Completion of all the above-mentioned projects in the near future will fully prevent the release of municipal sewage to sea, and will minimize the quantity of treated effluents that will be released to sea.

4.2.2.4.2 Shafdan Marine Outfall

The sludge of the Shafdan is Israel's largest source of marine pollution by metals, suspended solids, organic material (BOD), mineral oil, phosphorus and other pollutants. By the year 2008, with the completion of the sludge land treatment system, sludge discharge from the Shafdan to the sea will fully stop.

In 2004, the pollution load to the sea from the Shafdan sludge, based on dry matter, was as follows:

Flow……5.3 MCM

Suspended Solids……43,000 tons

BOD……. 25,450 tons

COD…… 51,200 tons

Oils…… 3,340 tons

Mineral Oil……..693 tons

Ammonia……...89 tons as N

Kjeldahl Nitrogen…… 2,983 tons as N

Phosphorus…… . 1,420 tons

Total Heavy Metals…….. 61,300 tons

Stopping the discharge of the Shafdan sludge will bring about a reduction of 85%-98% in the scope of pollution emitted to the sea from all of Israel's marine outfalls.

4.2.2.4.3 Industrial Brines and Wastewater Disposed Directly to Sea[12]

[12] Data were obtained from three information bases as follows:

1. Multi-annual data from the main dischargers of brines and wastewater to the Mediterranean Sea based on a report of the Environment Ministry's Marine and Coastal Environment Division, edited by Dr. Ilan Malester and dated July 2005.
2. Complementary data on brine disposal by means of tankers to marine oufalls in Atlit, the Hadera power plant, the Shafdan and Ashdod which were collected by the Marine and Coastal Environment Division.
3. Data from the Marine and Coastal Environment Division on dumping of brines to sea in vessels from Haifa Port – data of the Galia Co.

1. Major dischargers of brines and wastewater to the Mediterranean Sea

Data on pollution load to the sea due to the direct discharge of brines and industrial wastewater from major sources for the years 2003-4 and a forecast of the load for the year 2014 are included in Table 3 below.

Table 3: Forecast of Pollution Loads from the Main Brackish Sources that Discharge Directly to Sea for Target Year 2014 (kg/year)

Pollutant	Pollutant Quantity 2003 (kg/year)	Pollutant Quantity 2004	Forecast for 2014 Business as Usual (kg/year)[13]	% decrease/ increase 2003-2014[14]	% decrease according to SAP	Gap in percent[15]
Total Organic Carbon (TOC)*	1,494,924	1,440,488	660,916	56	50	-6
Benzene	1,870	1,607	931	50	50	0
Methanol	883,738	757,985	439,842	50	50	0
Toluene	2,694	10,436	1,341	50	50	0
Mercury (Hg)	69	78	4	94	50	-44
Chromium (Cr)	3,989	4,179	100	97	50	-47
Cadmium (Cd)	144	131	3	98	50	-48
Lead (Pb)	1,634	1,405	41	98	50	-48
Copper (Cu)	13,847	13,621	228	98	50	-48
Zinc (Zn)	47,859	44,365	573	99	50	-49
Nickel (Ni)	3,842	3,748	117	97	50	-47
Nitrate (NO_3)	25,213	31,771	7,398	76	50	-26
Suspended Solids (TSS Flow)	45,982,253	48,561,477	634,211	99	50	-49
Ammonia (NH_4)	856,245	881,446	49,759	94	50	-44
Biological Oxygen Demand (BOD)	17,982,288	32,115,292	3,490,940	81	50	-31
Phosphorus (P)	1,586,819	1,632,016	18,767	99	50	-49

[13] The forecast is based on 2003 data. It was assumed that the Shafdan, Herzliya, Nahariya, Acre and Kibbutz Ma'agan Michael will stop discharging to sea and that the percent of increase in water consumption by industry will be 1.37%. For total organic carbon, benzene, methanol and toluene, it was also assumed that there will be an annual reduction of 8% in pollution load as a result of technological improvements.

[14] In this column, a positive number indicates a reduction in pollution and a negative number indicates an increase in pollution.

[15] The gap=percentage of reduction required by the SAP (50%) less than the percent of decrease/increase forecasted for 2014. A positive gap means that additional reduction is necessary to comply with the target, a negative gap means that the reduction exceeds the SAP targets.

Pollutant	Pollutant Quantity 2003 (kg/year)	Pollutant Quantity 2004	Forecast for 2014 Business as Usual (kg/year)[13]	% decrease/ increase 2003-2014[14]	% decrease according to SAP	Gap in percent[15]
Total Nitrogen (N)	3,687,876	4,214,648	262,397	93	50	-43
Total Kjehdahl Nitrogen(TKN)	3,382,213	3,888,418	252,487	93	50	-43
Mineral Oil	794,713	857,627	31,071	96	50	-46
Oils and Fats	4,448,660	4,338,876	66,424	99	50	-49

*** Not including the Shafdan**

2. Disposal of brines from industrial plants by means of tankers to marine outfalls

Brines from industrial plants are disposed by tanker to the following outfalls:

Atlit Outfall – Only water from the regeneration of water softeners (salt water) and no other pollutants are transported by tanker and discharged at this outfall at a scope of 36,647 m^3/year in 2004 and 31,611 m^3/year in 2005. The disposal of regeneration water from water softeners does not cause marine pollution.

Hadera Power Plant Outfall – Brines from the Of Tene, Hod Hefer, Avaz Hakesef, Mozarei Ma'abaron and Gilam factories are transported by tanker for disposal to sea at the Hadera power plant outfall at a scope of 87,030 m^3/year with an organic load of 8,700 kg BOD per year.

Shafdan Outfall by means of the Tabib Co. – Tanker transport of brines to the Shafdan outfall is undertaken by means of the Tabib Co. at a scope of 117,482 m^3/year according to the following details:

Table 4: Data on the "Tabib" Brines at the Shafdan Marine Outfall

Type of Brine	Quantities	Assessment of Pollutant Load		
	Cubic Meters/Year	Suspended Solids	BOD ton/year	Oils Ton/year
Regeneration water from	39,993			

softening				
Brines from the textile industry	4,501	0.5	0.1	0.025
Food industries	33,281	3.3	5.0	1.66
Yeast (PACA)	37,080	30.0	556.0	1.85
Miscellaneous Industries	2,627	0.5	0.5	0.5
Total	117,482	34.3	562.5	4.035

Agan Marine Outfall in Ashdod – Brines from the pickle plant of Kvuzat Yavne and Bnei Dror are also transported by tanker to the marine outfall of the Agan plant and the oil refineries in Ashdod at a scope of some 34,500 m^3/year, with pollution loads of some 34 tons/year BOD, some 17 tons/year suspended solids and some 5.2 tons/year oils and fats.

3. Dumping of Brines to Sea – Galia Terminal

In 2005, the scope of brine dumping at the Galia terminal reached 96,600 m^3 (the terminal was not operational for three months). The main sources of brines at this terminal are brines from the food industry, from industrial plants (textiles, metal, chemicals) and from water softening regeneration.

Brines from the food industry – slaughterhouses, dairy food processing – are characterized by very high concentrations of BOD and TOC. Reducing the pollution load during dumping to sea will be achieved in the future by defining stringent quality standards for brines disposed to sea and enforcing brine treatment in industrial plants.

4.2.2.5 Concentrates From Well Remediation Systems and Brines from Brackish Water Desalination

The problem of the disposal of concentrates from well remediation, which are rich in nitrates, was partially addressed in the Water Commission's decision to dilute nitrate-rich drill water with other supply water in areas where this is feasible at the regional or local level. The treatment will be implemented within the framework of the well remediation project in the central coastal plain, in order to assure the serviceability of those wells whose operation was stopped due to nitrate pollution, while complying with the nitrate standard. This will also allow for the continued use of the coastal aquifer as a regulating reservoir.

This solution will not create large quantities of concentrates with a high nitrate level. The possibility of removing the nitrate in the supply water will be checked during wastewater treatment using nitrification-denitrification processes. This solution is restricted to wells with nitrate contamination only and should significantly reduce the disposal of nitrate-enriched concentrates to sea. The impacts of the proposed solution are still being examined.

4.2.2.6 Concentrates from Brackish Water Desalination

Israel's water source development program includes the establishment of brackish water desalination facilities, most of them along the coastal plain, the Western Galilee and the Carmel coast.

Pollutants in the concentrates of brackish water desalination facilities are largely salts, which do not contribute to marine pollution, and nitrates.

According to the national master plan for the disposal of brines from brackish water desalination facilities, the potential of brackish water for desalination in inland facilities is 113 MCM/year and the quantity of brine concentrates resulting from desalination is some 14 MCM of brine which will be disposed to sea in pipe systems for the collection of the concentrates to marine outfalls.

4.2.2.7 Gaps

The largest source of pollution of Israel's Mediterranean coastline is the Shafdan sludge. The total quantity of metals released to sea due to the discharge of Shafdan sludge stands at 58 tons out of a total of 69 tons, which translate to 84.4%, 77.0 kg of mercury out of 78.6 kg which translate to 99%, 39.7 tons of zinc out of 45.6 tons which translate to 87%. The total quantity of suspended solids emitted to sea with the Shafdan sludge is 43,770 tons out of 48,680 tons which translate to 90%, 25,000 tons of organic material (BOD) out of 32,200 tons which translate to 79%, 693 tons of minerals out of 864 tons which translate to 80%, 1.42 tons of phosphorus out of 1.67 tons which translate to 85% (see Appendix 3, the Liquid Sector, Table 3.1.1). It appears, therefore, that the contribution of all the other sources of land-based pollution is dwarfed in comparison to the contribution of the Shafdan sludge to marine pollution.

Once disposal of the Shafdan sludge to the sea is stopped in 2008, and once the wastewater treatment and effluent recovery systems in Acre, Nahariya, Atlit, Hof Hacarmel, Herzliya and Ashdod are completed by the year 2010, Israel will comply with the reduction targets for the year 2014. Continued reduction of pollution to the 2025 targets requires continued enforcement to assure advanced treatment of industrial wastewater and the level of effluent quality which is required and approved for disposal to sea.

Since 2008 is the target year for stopping the discharge of the Shafdan sludge to sea, reductions in the quantities of the trace metals of Pb, Cd, Hg will be checked during this year in comparison to the national budget. If the reduction will be less than 50%, enforcement measures will be taken, including adoption of BAT-NEC, in order to achieve the reduction level required for the year 2010.

4.2.3 The Liquid Sector - Rivers

4.2.3.1 Sources of Pollution

Israel's coastal rivers are among the main sources through which pollutants flow into the Mediterranean Sea. However, rivers themselves do not produce pollution. Rather, the pollution generated by human activity is discharged intentionally (generally from point sources) or unintentionally (generally from diffuse sources) to rivers, with rivers serving only as conduits for the flow of pollution from land to sea. Most of this pollution is organic pollution or nutrient pollution from urban sources, which reaches rivers as effluents discharged from WTPs. Therefore, the NAP places special emphasis on this major pollutant. With the exception of the Kishon and Hadera Rivers, which receive industrial wastewater directly from industrial plants without WTP treatment, the contribution of other pollutants, such as heavy metals, oils and persistent organic pollutants (POPs), which reach the sea through rivers, is relatively small (often below detection level). In addition to point sources of pollution, pollutants from non-point (diffuse) sources reach the rivers. Diffuse pollution reaches the river as soil erosion or surface runoff and includes, among others, fertilizers and pest control materials, animal excrement, waste leachates, road rinsates, sediments from air pollution, etc. The main paths through which diffuse sources reach rivers are: 1. with surface runoff during rainfall (especially intense events); 2. from

fishponds and pig farms (Na'aman River); 3. with groundwater (including shallow groundwater). It should be noted that the ability to quantify the pollutants that reach rivers from diffuse sources is limited. Although techniques to assess the contribution of the main pollutants to rivers have been developed in other parts of the world, Israel does not yet have a database which would make it possible to apply these models to the country's rivers.

Table 5: Pollution Sources in Israel's Rivers

River	Source of Spot Pollution	Source of Diffuse Pollution
Kziv		Agricultural areas
Bezet		Agricultural areas
Na'aman	WTPs	Fishponds, pig farms, agricultural areas
Kishon	WTPs + industrial plants	Agricultural areas
Tanninim		Agricultural areas
Hadera	WTPs + industrial plants	Agricultural areas
Alexander	WTPs	Agricultural areas
Poleg	WTPs	Agricultural areas
Yarkon	WTPs	Agricultural areas, surface runoff
Soreq	WTPs	Agricultural areas
Lachish	WTPs	Agricultural areas
Besor (only during flooding)	WTPs	Agricultural areas

4.2.3.2 Reduction Targets

The proposed NAP sets a 50% pollution reduction target (minimum) through rivers for the year 2014. Later, further reductions in pollution emissions to rivers will be achieved as a result of adopting advanced municipal and industrial wastewater treatment, while enforcing quality and quantity criteria for effluents discharged to rivers based on BAT-NEC.

4.2.3.3 Measures for Preventing Pollution of the Mediterranean Sea from Rivers Defined in the "Business as Usual" Scenario

Nutrients and Organic Material

Nutrients and organic material reach rivers from spot and diffuse sources. During the course of their flow in the river, nutrients undergo sedimentation and adaptation processes (self-purification ability of the river – nutrient retention). Therefore, nutrient and organic matter loads which reach the sea through rivers differ from the total loads reaching the river. In order to reduce marine pollution by nutrients released from Israel's coastal rivers, pollutant emissions from both point and non-point sources to rivers should be reduced (reduction at source) and the ability of rivers to recycle the nutrients and organic matter

which reach them should be improved. The following actions are currently being implemented or are expected to be implemented under the "business as usual" scenario:

- The base standard currently implemented in most of Israel's WTPs is 20:30, which relates to organic load (BOD) and suspended solids in units of mg/liter.
- Implementation of the national master plan for water sector development, prepared by the Water Commission (2002), which adopts the recommendations of the Inbar Committee for discharge to rivers which set a more stringent standard for organic load and suspended solids (10:10 standard) and a maximum value for total nitrogen (10 mg/liter) and total phosphorus (1.0 mg/liter free average and 2.0 mg/liter maximum value). The Inbar Committee standard specifically relates to effluent emissions to rivers. It should be mentioned that as of 2005, the maximum values included in this standard have not yet been implemented in Israel's coastal rivers, although the Karmiel WTP complies with this standard and other WTPs are close to complying with the standard or are investing efforts to implement the requirement. Under the "business as usual" scenario, it is anticipated that the Inbar Committee standards on the quality of effluents discharged to Israel's coastal rivers will be increasingly implemented.
- Implementation of master plans for river rehabilitation, including establishment of river rehabilitation administrations and upgrading the quality of effluents discharged to rivers by upgrading WTPs to tertiary treatment levels. According to the Ministry of the Environment, the rehabilitation of Israel's coastal rivers will largely be based on the discharge of high quality effluents to rivers (Bar-Or 1995).
- Adoption of the conclusions of the Inbar Committee for discharge to rivers concerning upgrading effluent quality in WTPs. These conclusions relate to a wide range of pollutants and serve as guidelines for planners and work teams on the establishment of WTPs. Most of the facilities are constructed on the coastal plain and release those effluents that are not recovered to coastal rivers and from there to the sea.
- At the request of the Minister of the Environment, the Water and Rivers Division in the Environment Ministry is preparing a national master plan for the rehabilitation of Israel's rivers.

Assessment of Nutrient Discharge to Israel's Coastal Rivers and to the Mediterranean Sea under the "Business as Usual" Scenario

In assessing nutrient contribution to rivers, the NAP assumes that the master plan for water sector development (2002), which was prepared by the Water Commission, will be fully implemented under the "business as usual" scenario. According to the plan, it is anticipated that effluent quantities discharged to rivers will be significantly reduced under a "business as usual" scenario. In addition, all of the effluents are expected to comply with Inbar Committee standards for discharge to rivers. The entire quantity of effluents, which will be treated to a high level, will be reused in agriculture and industry, and effluents will only be discharged to rivers for nature and landscape purposes. In addition, according to the master plan, a major part of the water which will flow in the rivers will be captured downstream and therefore, there will not be any significant contribution of water and nutrients from the rivers to the sea. Therefore, it is anticipated that under the "business as usual" scenario there will be no significant pollution of the Mediterranean Sea from coastal rivers in the target years (Table 6).

Table 6: Forecast of Pollution Loads from Release to Sea via Rivers for Target Year 2014 (kg/year)

Pollutant	Pollutant Quantities 2003 (kg/year)	Forecast for 2014, kg/year, business as usual	% decrease/ increase[16]	% decrease according to SAP
Total Organic Carbon	5,614	Practically zero	+ 99%	50%
Total Nitrogen	2,945	Practically zero	+ 99%	50%
Total Phosphorus	433	Practically zero	+ 99%	50%

However, if this assumption is not fully fulfilled, and all of Israel's WTPs will not comply with the Inbar Committee standards in 2014, it is still anticipated, based on reduction trends over the past ten years, that Israel will comply with the NAP targets for the year 2014. (See Appendix 3 (II), paragraph A1.)

[16] In this column, a positive number indicates pollution reduction, a negative number indicates pollution increase.

Other Pollutants

In addition to nutrients, other pollutants reach the river such as persistent organic pollutants (POPs), heavy metals (e.g., mercury, cadmium, copper, lead, zinc, chromium, etc.), phenols, organohalogens, oils, etc. These pollutants mainly originate in industrial plants that discharge their wastewater to the river rather than through existing WTPs.

As of 2005, all spot sources of pollution which are discharged directly to Israel's rivers from industrial plants have been eliminated, with the exception of the Kishon River and the Hadera River. Details on pollutants (nutrients and others) which reach the Kishon and Hadera Rivers from industrial plants are presented in Table 7:

Table 7: Pollution Loads (kg/year) Discharged Directly from Industrial Plants to the Kishon River and the Hadera River

	Kishon River						Hadera River[17]	
Parameter	**Plant A**	**Plant B**	**Plant C**	**Plant D**	**Plant E**	**Total**	**Plant A1**	**General Total**
TOC	49,165	19,182	59,082	3,030	6,368	136,827	20,482	157,309
TN	39,530	7,133	219.3	14,041	4,062	64,985.3	4,133	69,118
TP	938	1,195	2,602	2,760	1,312	8,807	1,321	10,128
Mineral oil	1,903	207	378	140	533	3,161	532	3,693
Oils and fats	NA	1,799	NA	NA	NA	1,799	7,141	8,940
Isoamyl alcohol	NA	NA	16,500	NA	NA	16,500	NA	16,500
phenol	42.7	NA	NA	NA	9	51.7	61.2	113
BTX	5	NA	NA	NA	8	13	NA	13
F	NA	NA	45,200	NA		45,200	NA	45,200
Cd	0	0	0.2	3.9	0.7	4.8	3.4	8
Cr	0	3.4	1.7	8.9	9	23	19.67	43
Cu	38.8	6.8	134	6.3	7.1	193	10	203
Zn	155.3	53.9	674.9	52	74.5	1,010.6	41.2	1,052
Ni	62.1	22.6	39.6	17	7.3	148.6	33.96	183
Pb	0	0	5.7	14	2	21.7	5.4	27
Hg	0	0	0.2	0.3	0.2	0.7	0.34	1

*(Kishon River data – Ministry of the Environment, Marine and Coastal Environment Division, 2004, Hadera River data – Hadera Association of Towns, 2005)

[17] For indicators in which laboratory tests showed threshold levels only (<), a conservative approach was taken according to which the measured value is equal to the threshold.

According to the Ministry of the Environment, all industrial plants which discharge their industrial wastewater to the Kishon River will be required to undertake pretreatment and to comply with the Inbar Committee standards for discharge to rivers by the year 2014. It is expected that pollution loads discharged to the river from industrial plants which will comply with this requirement will be drastically reduced (nearly to zero), in compliance with the NAP targets. With regard to industrial plants which will not be able to comply with the Inbar Committee standards, it is expected that discharge to the river will stop and that their wastewater will be discharged directly to sea in compliance with Ministry of the Environment criteria for the quantity and quality of brines permitted to be released to the sea. Discharge of pollutants to the Hadera River is implemented according to an "authorization decree." According to the policy of the Ministry of the Environment, more stringent effluent quality requirements will be required for discharge to rivers in order to reach the standards of the Inbar Committee for discharge to rivers by 2014.

Diffuse Sources

The term diffuse sources includes, among others, pollution originating from drainage of agricultural areas, surface runoff, fishponds, cowsheds and pig farms. This type of pollution mainly includes organic materials, nitrogen compounds and phosphorus compounds (nutrients). A major constraint in assessing nutrient contributions from rivers to the Mediterranean Sea (on the basis of trend changes in the previous decade or on the master plan for water sector development) is that this assessment does not encompass a calculation of loads from non-point sources. To date, quantitative calculations of nutrient flows from non-point sources to Israel's coastal rivers have not been carried out. In recent years, models have been developed to assess these flows to rivers (e.g., the MONERIS model, Behrendt *et al*., 1999 which was recently adapted to Mediterranean Sea rivers), but to the best of our knowledge, such models have not been applied to Israel's rivers. In the absence of NBB data for nutrient flows from non-point sources to rivers, it is not possible to quantitatively assess the forecasted nutrient flow to rivers from such sources under a "business as usual" scenario in the target years.

Non-point (diffuse) pollution reaches rivers not only from cultivated agricultural fields in a watershed basin but also from urban areas. Research conducted in different urban areas and

in climatic conditions similar to Israel reveals that the diffuse entry rate of nutrients into river segments which traverse urban areas is significantly higher than river segments which traverse open spaces (Grimm and Lewis, 2001) and even river segments in agricultural areas with diffuse entry of nutrients from cowsheds and agricultural fields (Tate and Heiny, 2001). This is especially so in the Mediterranean Sea areas during the short rainy season and during high intensity rain events. The reason for such high fertilizer contributions from urban areas is the growing use of fossil fuel which changes the fixation rate of the nitrogen and increases nitrogen flow to terrestrial and aquatic ecosystems (e.g., Grimm and Lewis, 2001). Thus, for example, it was found that nitrate contributions in an urban river segment were 60 times higher than a non-urban river segment (Belt *et al*., 2001). It is therefore anticipated that under a "business as usual" scenario, the relative portion of non-point source contributions of nutrients to rivers will increase.

Fishponds are also sources of non-point pollution which release their waters to rivers and contribute nutrients and dissolved and suspended organic material. The Ministry of the Environment has decided to develop a pilot project on the most efficient treatment of fishpond water emissions. Within the framework of the project, fishpond waters will be released to an operational treatment pond and will be treated to reduce pollutant levels. Under a "business as usual" scenario, priorities will be set for treating the pond water which is released to the coastal rivers within five years of implementation of the project and some 150 million shekels will be invested in treating the fishpond waters.

4.2.3.4 Gaps

Implementation of the Inbar Committee recommendations on discharge to rivers is expected to bring about the anticipated pollution reduction under a "business as usual" scenario as a result of point source treatment such as WTPs so that this will suffice to comply with reduction targets in target year 2014. However, even if the Inbar Committee standards are not fully implemented by this year, the anticipated reduction based on reduction trends over the past decade will result in compliance with the SAP targets (see Appendix 3 II paragraph 1a).

As stated, the NAP editors assumed that by target year 2014 the Inbar Committee standards will be implemented and all effluents reaching Israel's coastal rivers would comply with these standards. At the same time, lack of data on the anticipated change in the contributions of pollutants from diffuse sources precludes an assessment, at a high level of probability, of the total anticipated contribution of pollution from rivers in the target years. It is assumed that in parallel to the anticipated significant reduction in pollutant contribution from point sources, a certain increase in the relative importance of pollutant contributions from diffuse sources may be expected. Therefore, in order to achieve the greatest reduction in pollutants discharged through rivers to the sea, routine quantitative assessments of contributions from diffuse sources should be taken until the year 2014 as well as implementation of reduction at sources techniques and BAT NEC to reduce pollutants from these sources by 2025.

4.2.4 Solid Sector – Urban Solid Waste

4.2.4.1 General

The SAP guidelines require the establishment of urban solid waste treatment systems. When relating to the polluting elements themselves, attention may also be paid to those components within the urban waste with a pollution potential such as toxic waste in construction and demolition waste. The following measures are necessary to prevent the pollution of the Mediterranean Sea from urban solid waste and its components under a "business as usual" scenario.

4.2.4.2 Reduction Targets

In the field of urban solid waste treatment, the SAP targets call for the establishment of urban solid waste treatment systems in every city with more than 100,000 inhabitants, setting up waste collection systems within cities, separation at source of different waste flows and recycling and waste-to-energy in all aspects.

4.2.4.3 Measures to Prevent Pollution of the Mediterranean Sea from Urban Solid Waste under a "Business as Usual" Scenario

- Closure of Dumps and Transfer to "Sanitary Landfilling"

In 1993, the Israel government decided to upgrade the country's solid waste treatment policy, to close unregulated dumps and to replace them with "sanitary landfills"[18] in central sites. In effect this meant landfilling in areas with low risk for pollution of groundwater and/or the coastal environment.

Subsequently, in May 1995, the government took a complementary decision to amend the National Outline Scheme for Solid Waste Disposal (NOS 16). These two decisions are the most significant for reducing solid waste pollution along Israel's Mediterranean Sea coast. In 2003, the policy was fully implemented with the closure of Israel's last major dump, signifying appropriate treatment of urban solid waste in all localities along the Mediterranean coastal strip.

According to the "business as usual" scenario, sanitary landfilling will continue to be the main solution for solid waste disposal in Israel until at least 2014. By the year 2025, it is assumed that there will be additional or alternative solutions (in light of the fact that until target year 2025, Israel has land reserves which are allocated for landfilling based on two central sites – Efe and Kalanit, which provide a landfilling alternative with a low tipping fee until at least 2030).

- Rehabilitation of Dumps

Beyond the Ministry of the Environment's success in implementing the policy of dump closure, pollutant quantification takes into account that the pollution potential will continue due to the fact that with the exception of some small sites, rehabilitation of old dumps that were closed has not yet been undertaken so that in practice they continue to pollute and pose a risk of marine pollution.

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[18] Guideline document on the prevention of seepage below a waste heap in a domestic solid waste site, Ilan Nissim, Ministry of the Environment.

The current budget for dump rehabilitation is minimal and totals about NIS 160 million. Funds may be mobilized within the framework of "business as usual" by 2014 for large dumps with real estate incentives: Netanya, Rishon LeZion, Bat-Yam and the Hiriya landfill which is already mobilizing funds for rehabilitation from a public fund.

On the other hand, without a change in government priorities for budgetary allocations for waste treatment, from hundreds of thousands of shekels per year to tens of millions of shekels per year during the course of the coming decade, it will not be possible to rehabilitate dumps which do not have the real estate value necessary to fund expensive rehabilitation.

Rehabilitation of small dumps will only be possible with the support of dedicated budgets of the Ministry of the Environment. The current budget – less than a million shekels per year – only suffices for rehabilitation planning.

- Construction and Demolition Waste

The quantity of construction and demolition waste which is produced in Israel each year is estimated at about 7 million tons (140% more than the quantity of household waste generated per year). However, only about a million tons reach regulated waste sites. The rest of the waste is randomly discarded in open spaces, fields and roadsides, presenting one of Israel's most difficult environmental problems. Waste which is discarded in open space leads to environmental nuisances including groundwater contamination. As a result of rainwater infiltration through the waste body, the water is contaminated by chemicals which are widely used in the construction industry and in turn contaminates the groundwater. At the same time, open spaces, national parks and nature reserves face continued damage.

In 2003, a government decision was taken which relates to the necessity of treating construction waste, calls on government ministries (Environment, Interior) in cooperation with the Israel Lands Administration to promote the implementation of solutions and allocates 18 million over the years 2003-2005 for this purpose. Since 2004, the solution implemented in practice is the preparation of dedicated construction waste

landfills in abandoned quarries. At the current rate of treatment, some 20 disposal and treatment sites for construction waste will be prepared by 2014.

However, to accomplish the task, the Ministry of the Environment will have to carry out enforcement to ensure that construction waste reaches these sites, on the one hand, while preventing the disposal of other components of household waste to these sites, on the other hand. Currently, the private sector – contractors, renovators, etc. – are required to deposit a security check with planning agencies which is only returned after they present proof that the construction and demolition waste was disposed in an approved landfill.

4.2.4.4 Gaps

Since waste treatment systems operate in all local authorities in Israel, the issue of solid waste treatment is regulated[19] with the exception of the construction waste stream which is currently undergoing treatment in accordance with a government decision[20] whose full implementation will require ministerial level intervention.

4.2.5 The Coastal Sector

4.2.5.1 General

Due to the character of this sector, the NBB did not define threshold values for it and thus quantitative targets were not set either in the SAP guidelines nor by the editors of the NAP (except with regard to coastal river rehabilitation for which the editors of the NAP defined quantitative targets).

In general, the SAP relates to integrated coastal management two areas: conservation of marine and coastal habitats and prevention of alterations to the natural coastline.

With regard to habitat conservation, the integrated coastal management chapter relates, in depth, to two components:

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[19] In Israel, even batteries in home use are transferred as part of the mixed waste to official landfills. Batteries which are collected in schools and those that are collected voluntarily in local authorities and in municipal and regional environmental units are transferred for treatment in Ramat Hovav.

[20] Government Decision no. 2927 dated February 9, 2003 – Treatment of Construction and Demolition Waste.

1) Conservation of marine habitats and open coastal areas.
2) Rehabilitation of coastal rivers.[21]

With regard to preventing alterations to the natural coastline, the SAP calls for assessing the implementation of systems of previous authorization for projects which are liable to cause alterations in the coastline.

4.2.5.2 Conservation of Marine and Coastal Habitats and Open Coastal Areas – Measures for Preventing Mediterranean Sea Pollution under the "Business as Usual" Scenario

Three types of areas are designated for conservation along Israel's Mediterranean coastline: coastal nature reserves, marine nature reserves and national parks.

A review of coastal and marine nature reserves and of national parks along the Mediterranean coastline in 2003 reveals the following data[22]: There are 20 coastal nature reserves and 16 national parks, of which only 13 are declared, approved or deposited for approval. There are 15 marine nature reserves, of which only four are declared, approved or deposited.

Once all of the coastal and marine areas designated for conservation will be declared as nature reserves, Israel's protected coastal strip will span some 83 km, constituting 40% of Israel's Mediterranean coastline. The total area of both declared and proposed coastal and marine reserves and national parks is some 77 km^2, of which 63 km^2 are nature reserves and 14 km^2 are national parks.

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[21] The SAP relates to the quality and state of the natural environment of the rivers as an indicator of impact on the marine environment and quality of rivers from the quantitative aspect of contribution of pollutants from land-based sources to sea. A broader approach views coastal rivers and their environment as part of the Mediterranean Sea basin system, both in terms of their natural aspect as ecological corridors and links between ecosystems and habitats and in terms of the functional aspects of the open space system and the links of systems with different features in connecting points with high value – river mouths.

[22] Coasts of Israel 2003, Report of the Society for the Protection of Nature in Israel and the Coastal Organizations Forum on the State of the Mediterranean Sea, May 2003.

- Trends in the approval and declaration of nature reserves and national parks:

1. Marine Nature Reserves: The rate of approving and declaring marine reserves has intensified significantly in the period 2000-2003, after many years of stagnation. During this period, two marine reserves were approved and declared (Dor-Habonim Marine Reserve and Avtach Marine Reserve). Two more marine reserves were declared in 2004 and 2005 respectively (Yam Gdor and Yam Shikma).
2. Coastal Nature Reserves: In the period 2000-2003, three new coastal reserves were declared, adding about 9 kilometers of coastal area for the conservation of natural resources.
3. National Parks: In the period 2000-2003, part of the Rubin National Park was declared and the coastal area protected by national parks increased from 22.5 to 29 kilometers.

The Law for the Protection of the Coastal Environment was approved in 2004.

Aims of the law:

1. To protect the coastal environment, its natural and heritage assets, to restore and preserve them and to prevent and reduce damage to them.
2. To preserve the coastal environment and the coastal sand for the benefit and enjoyment of the public and future generations.
3. To establish principles and limitations for the sustainable management, development and use of the coastal environment.

It is difficult to assess the impact of the Coastal Law on the rate of approval of nature reserves and marine reserves since sufficient experience has not yet accumulated within the framework of the law. Nevertheless, it appears that three factors will impact positively on the progress of protected marine and coastal habitats:

1. Declaration of the coastal environment in primary legislation, which specifically instructs planning agencies to protect the natural and heritage values in this area, will facilitate the statutory approval of reserves.

2. Difficulties imposed on the approval of other land designations and uses (commercial, infrastructure, etc.) within the area of the marine environment should relieve development pressures, thereby facilitating the approval of areas for habitat protection.
3. The enforcement and penal measures established in the Coastal Law significantly improve the tools available to the authorities responsible for the protection of marine and coastal habitats in a way which should find practical expression in the field in coming years.

Information on laws, regulations and plans relating to marine and coastal habitats is found in Appendix 4, paragraph A1.

4.2.5.3 Rehabilitation of Coastal Rivers – Measures for Preventing Mediterranean Sea Pollution under the "Business as Usual" Scenario

- **Quantities of Water for Release to Rivers**

The first prerequisite for rehabilitating Israel's coastal rivers, for restoring healthy ecosystem and for rehabilitating biodiversity in rivers is assurance of minimum water flow for the healthy functioning of river systems (see explanation of the Tennant method in Appendix 4, paragraph B1).

The policy document "The Right of Nature to Water – Water Demands of Water Bodies and Wetlands – Policy Document" (Shacham, 2003), which was commissioned by the Ministry of the Environment, Nature and Parks Authority and green bodies in Israel, defines quantitative and qualitative targets for the rehabilitation of Israel's aquatic habitats. The document focuses special attention on Israel's rivers, including its coastal rivers, and on the release of water from these rivers to the Mediterranean Sea. (Water quantities which are required according to the document for release as base flows in coastal rivers are included in Table 4.1 in Appendix 4, paragraph B2).

The rehabilitation of the country's rivers and their transformation into quality nature sites is one of the targets of the master plan for water sector development in Israel, which was prepared by the Water Commission. According to the master plan, a

government decision taken in 2004 allocates some 50 MCM of water per year for nature and landscape purposes. However, out of this allocation, only about 19 MCM/year are designated for coastal river rehabilitation. This quantity mainly relates to fresh water, but under specific circumstances (especially, compliance with quality requirements) the plan provides for this quantity to be converted to effluents. The allocation specified in the master plan (Table 4, p. 15 of the master plan) is still far from providing for the achievement of the rehabilitation target and therefore, according to the master plan, it may allow for river conservation but not for nature conservation.

Gaps

Assuming that the master plan for water sector development (Water Commission, 2002) will be fully implemented by target year 2010, a significant gap of 11.35 MCM of water for release to rivers is anticipated in 2014. Assuming that the allocation of some 15 MCM to the Yarkon River, included in the government decision on the Yarkon River, dated January 5, 2003, is additional to the quantities included in the master plan for water sector development and is not at the expense of the other rivers, it is anticipated that under the "business as usual" scenario there will be no gap between allocations to rivers and the targets defined above. On the other hand, if under the "business as usual" scenario additional quantities of water for release to rivers are not allocated after 2010, by target year 2025, a gap of some 47 MCM may be anticipated between the defined targets and the master plan for water sector development. The master plan takes these gaps partially into account and therefore recommends that preparations be taken for allocating an additional 25 MCM per year.

- **Water Quality for Release to Rivers**

Significant improvement in water quality is another condition for the rehabilitation of Israel's coastal rivers. It should be emphasized that water quality levels necessary for rehabilitating river systems and their biodiversity are significantly different than water quality levels necessary for compliance with the SAP targets on pollution of the Mediterranean Sea from rivers. The Inbar Committee standard encompasses 25 different parameters for water quality and is expected to bring about significant improvements in

comparison to the state of the rivers in base year 2003. However, implementation of the Inbar Committee standard will not rehabilitate most of the aquatic habitats in the coastal rivers. A number of research studies on the aquatic populations of Israel's coastal rivers (e.g., *Acanthobrama telavivenesis*, Elron 2000; *Melanopsis*, Milstein 2001) have revealed that these species, which are an integral part of river systems in pollution-free areas, are very sensitive to specific components in water quality and the Inbar Committee standard will not support their long-term survival in river ecosystems. Researchers of another Tel Aviv University study, which was published in 2002, and assessed the impact of water quality on the health of river ecosystems claim that with the full implementation of the Inbar Committee standard the health of the rivers (Benthic Index of Biological Integrity –B-IBI index) will be scored as less than fair to poor (i.e., a score of between 40 to 60 out of a 100; Hershkowitz 2002).

Gaps

Assuming the Inbar Committee standard for discharge to rivers will be fully implemented and enforced in all of Israel's coastal rivers and that lower quality effluents will not be released from external sources outside of Israel's jurisdiction, gaps between the "business as usual" scenario and the 2014 targets are not anticipated. At the time of writing this report, the master plan for the Kishon River is the only one specifying effluent quality standards for discharge to the river. For most indicators, the standard set for release to the river is identical to the Inbar Committee standard; for some indicators (e.g., total phosphorus, chlorine, zinc), the standard is higher than the Inbar Committee standard; and for other indicators it is lower (e.g., copper, lead). According to this master plan, the water quality standard set in the plan will be reached by 2010 (Brandeis, 2001; Kishon data – Ministry of the Environment, Marine and Coastal Environment Division, 2004). Thus, under the "business as usual" scenario, water quality in the river should comply with the target for 2014. The master plan for the Kishon River does not relate to longer time frames and therefore it is anticipated that in order to comply with the target for 2025, additional investments will be required to further improve effluent quality to the quality level of the source water.

In other master plans prepared for Israel's coastal rivers (e.g., master plan for the Lachish River), specific effluent quality indexes are not defined but rather a general definition that "the quality of effluents allocated to the river should fulfill the requirements of the river's ecosystem and allow for human activity in the river" (Segal and Rayoni, 1998). In many cases, the standard is even more general and primarily relates to human rather than to ecosystem needs (e.g., Brandeis 1995). Therefore, in order to comply with the target under the "business as usual" scenario, implementation and enforcement of the Inbar Committee standards will have to be applied to all coastal rivers. However, in order to achieve water quality targets for 2025, additional investments in effluent treatment will be required to bring them to the quality level of the source water. It is possible that effluent desalination may be necessary to achieve this target.

- **Structure of the Channel and Habitat Rehabilitation**

  Rehabilitation of the spatial structure of the river channel is vital for river rehabilitation (Shields *et al*, 1994). Nevertheless, most of the existing master plans for river rehabilitation in Israel do not include a detailed plan for the physical rehabilitation of habitats in the riverbed. In this respect, it should be emphasized that since the physical rehabilitation of habitats is intrinsically linked to water supply to the river, rehabilitation of aquatic habitats in the river cannot be initiated prior to the achievement of water quantity and quality targets. In parallel to actions to rehabilitate the quantity and quality of water flowing in Israel's coastal rivers, targets for the rehabilitation of the morphological structure of the river channels should therefore be set. However, unlike targets set for quantity and quality of water flow in the rivers, it is difficult to establish targets for channel structure and habitat rehabilitation since these cannot easily be quantified. Furthermore, there are no databases to compare present conditions with conditions that prevailed prior to the disturbance of the river's habitats.

- **Rehabilitation of Biodiversity**

  In many cases, there are interrelationships and even interdependence between the aquatic zone of the river and its adjacent riparian zone. For example, riverbank vegetation in the river corridor is an integral part of the river's ecosystem (Cummins, 2002). Improved

management and conservation of the riparian zone is one of the main challenges confronting river protection (Walters, 1997) and Israel's coastal rivers. Bank vegetation largely determines the diffuse flow (from non-point sources) of nutrients and sediments from the drainage basin to the river and from there to the sea (e.g., Reed and Carpenter, 2002, McKergow *et al*., 2003). In addition, a significant part of the aquatic life populating a water body (e., water insects, amphibians) maintains much of its life cycle on land (Sheldon, 1984). Therefore, conservation of the biodiversity of Israel's coastal rivers should take account not only of the wet part of the river but also of the land area surrounding it, including the terrestrial habitats of water life according to the requirements of the species which populate the river (Milner, 1994).

(Details on laws, regulations and plans on rehabilitation of coastal rivers are included Appendix 4, paragraph B3).

4.2.5.4 Preventing Alterations in the Natural Coastline – Measures to Prevent Mediterranean Sea Pollution under the "Business as Usual" Scenario

- **Causes for the Reduction in Sand Quantities which Nourish Israel's Coasts**

According to the Ministry of the Environment, Israel's coastline and its sand resources are threatened. This assessment is based on an estimated detraction of some 220,000 m^3/year due to the construction of marine structures in the Aswan Dam and planned structures along the Sinai and Gaza coasts. Nevertheless, signs of coastal erosion in Israel's southern and central coast have not been observed (an assessment was not undertaken for the northern coast).[23]

The shortage of sand supply to the Nile delta coasts caused by the construction of the Aswan Dam and the longshore current leads to major erosion in the delta coasts of the Nile. Since there are major sand reserves along the delta coasts, no visible change has

[23] State of Israel – Ministry of the Environment & UNEP – Mediterranean Action Plan. "Coastal Area Management Programme (CAMP) Israel, Final Integrated Report." 2000

been noted in the quantities of sand transported to Israel's coasts since these coasts appear to supply an alternative sand source. Nonetheless, these reserves may become depleted for different reasons at which time a significant decrease in the quantities of sand which nourish Israel's coastlines may be anticipated.[24] The construction of marine structures, which are planned along the Gaza coasts, may further harm the sand nourishment system if measures are not taken to continue the transport of sand which will be accumulated in their environs.

Sea level rise as a result of global warming may adversely impact on the sandy coasts and the coastal cliff which constitute important habitats.

- **Marine Structures Causing Coastal Erosion and Alterations to Israel's Natural Coastline**

As of 2003, the chance of implementing plans for new marinas in Israel has diminished significantly. This assessment is based on the following assumptions:

1. Public involvement in marina plans especially and in coastal plans in general has significantly increased in recent years, pressuring policy makers to refrain from damaging the coastal environment.
2. Environmental NGO involvement in coastal planning processes has significantly increased. This involvement is expressed both in public pressure on decision makers and in legal pressure.
3. Significant court rulings have been made against coastal and marine development initiatives and plans in recent years.
4. Planning agencies have internalized the Ministry of the Environment's stance on the subject and the growing awareness of the environmental damages which have occurred as a result of marina construction during the 1990s.
5. The Coastal Law was enacted which mandates the review of plans for marine structures by a Committee for the Protection of the Coastal Environment and

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[24] "Israel's Coasts 2000, Report of the Society for the Protection of Nature on the State of the Mediterranean Sea Coasts," May 2000

instructs the Committee to determine the necessary measures for preventing and reducing coastal damages so as to rehabilitate the coastal environment.

Nevertheless, plans for the Haifa marina are still being advanced and the approval in principle of four additional marinas within the framework of NOS 13 potentially threatens the coastline and its habitats.

Gaps

Israel's statutory and environmental control systems have not proven sufficiently effective in preventing damage to coasts due to the construction of marine structures. Despite environmental impact assessments and additional reviews, major damages have been caused to coasts downstream of the longshore current, and coastal cliff erosion processes have intensified (in Ashkelon).

The "uncertainty factor" appears to be significant in the planning and assessment of the environmental impact of marine structures. Thus, major precautions should be taken when approving plans for marine structures. Such precautions are not incorporated, as of the base year, in legislation or in national outline plans.

The decision of the National Planning and Building Board to require the Ports Authority to artificially bypass 180,000 cubic meters of sand which accumulated to the south of the breakwater at the Ashdod Port to the coasts to the north sets a precedent and may point to a new trend.

(Laws, regulations and plans on marine structures which cause coastal erosion and alterations to Israel's natural coastline are included in Appendix 4 paragraph C1).

4.2.6 Hot Spots

4.2.6.1 General

According to UN documents (UNEP, 1997), the sensitivity of marine sites located near the coast is determined by the environmental uses of the coast. River mouths, ports (characterized by intense human activity and low water exchange), human activity areas

such as residential and tourist uses and the presence of natural assets increase the environmental sensitivity of the site. The liquid sector is the main contributor of pollutants to these spots.

In the past, seven areas were defined as hot spots along Israel's Mediterranean coastline (Ministry of the Environment 2001), of which four hot spots currently remain. In comparison to other coastal sites, relatively large volumes of pollutants which are discharged downstream of rivers, in marine sewage outfall pipelines from land to sea and via vessels (dumping) reach these sites. However, there are no exact standards which determine at what pollution level a given marine area will be transformed into a hot spot.

4.2.6.2 Sources Contributing to Hot Spots

The following sources contribute to Israel's hot spots:

Na'aman River Mouth:

Surpluses of the Karmiel WTP, the Iblin pig farms, fishpond waters + the wastewater of Kfar Masarik and Ein Hamifratz, and other contributions from upstream, and the industrial effluents of the Miluban plant in violation of a court decree.

Haifa Bay:

Contributions from upstream, Kishon industrial plants – Chemicals and Phosphates (Deshanim), Haifa oil refineries, Haifa Chemicals, Carmel Olefins, Haifa WTP, Telma, petrochemical plants, Gadot.

Shafdan:

Marine outfall of the sludge generated by the Shafdan.

Ashdod:

The Agan Chemicals plant and Ashdod oil refineries.

An assessment of anticipated conditions in these hot spots under the "business as usual" scenario in target years 2014 and 2025 was conducted on the basis of processes in 2004-2005 (e.g., closure of Electrochemical Industries) and on future plans.

As the starting point for assessing conditions in the hot spots for target years 2014 and 2025, it was assumed that in these target years, present and future plans and regulations (as described in the liquid sector chapter) will be implemented and enforced including the Inbar Committee standards for discharge to rivers and reduction of effluent discharge to sea.

4.2.6.3 Survey of Main Pollution Sources Contributing Pollutants to Hot Spots

1. Na'aman River Mouth

Most of the pollution which reaches the sea through the Na'aman River is organic pollution originating in the domestic (sewage), agricultural (pig farm waste, fishpond waters) and industrial (organic matter from different plants, black liquor from the Miluban factory) sectors. Therefore, the river's outlet to the sea is characterized by medium to severe nutrient pollution. In addition, the river mouth is enriched with copper, mercury and cadmium from an unknown sources (Herut, 2004).

2. Haifa Bay

The Kishon River, one of Israel's largest, most important and most complex rivers, flows into Haifa Bay. Its drainage basin spans 1,110 km^2 and the river is perennial for most of its length. It flows from Jenin in Samaria along some 70 km, through the Jezreel Valley, Kishon Water Gap (the narrow pass between Mount Carmel and the Shfar'am Alonim Hills) and the Zevulun Valley, until it empties into the sea at Haifa. The final seven kilometers of the river have been plagued for dozens of years by heavy industrial and domestic pollution, which has destroyed its ecosystem and transformed the channel into an open sewage tunnel flowing to Haifa Bay and damaging it as well.

In recent years, the quantities of pollutants entering the river and subsequently Haifa Bay have substantially decreased. Most of the effluents from the treatment plant are not released to the river but are directed toward irrigation, and the flow from the oil refineries, Haifa

Chemicals and Carmel Olefins into the river has decreased. Furthermore, there has been a decrease in organic load (BOD), mineral oil (a general decrease despite the fact that the oil refineries and Carmel Olefins have increased the flow), and heavy metal concentrations which are released to the river, largely due to compliance by all industrial plants with the provisions of their approved discharge permits (for details on these loads, see Table 3.1.1 in Appendix 3 (I)).

In addition to the above-mentioned sources, some of Israel's largest industrial plants and infrastructure facilities are located in Haifa Bay, including: a marine port, airport, power plant, oil refineries, and chemical and petrochemical plants which depend on proximity to the port and oil refineries for obtaining raw materials and marketing their products.

3. Shafdan Outfall

The Shafdan outfall discharges sludge from the Shafdan facility to the Mediterranean Sea. Most of the sludge is organic and includes high concentrations of fertilizers. In addition, fats and mineral oils (see section 4.2.2.4.2. for details), medium to severe mercury pollution and medium cadmium pollution were discovered in the vicinity of the Shafdan outfall (Herut, 2004).

4. Ashdod

Industrial effluents from the Agan Chemicals and the Ashdod oil refineries are routinely discharged to the sea through the marine outfall, in addition to brines from the pickle plants of Kvuzat Yavne and Bnei Dror.

Israel's national marine monitoring program, carried out by Israel Oceanographic and Limnological Research (2004), has revealed severe pollution adjacent to the Ashdod coast. On the seabed, heavy metals, organic pollutants and pesticide residues were already discovered in 2001. In addition, in 2003 medium cadmium pollution was discovered at the exit point of the Agan Chemicals pipeline.

4.2.6.4 Assessing the Change in Pollutants Released to Hot Spots under the "Business as Usual" Scenario

In assessing the "business as usual" scenario until 2014 and 2025, the following plans, which are designed to reduce marine sewage, were taken into account:

- Approved plans for the construction of WTPs and for effluent use for irrigation. Until 2010 the discharge of domestic sewage to the sea from marine outfalls is expected to stop.
- Cessation of the discharge of Shafdan sludge to the sea through the marine outfall by 2008.
- Approved plans for rehabilitation of the Kishon River.
- A judicial injunction dated February 2005 calling on the industrial plants Miluoff and Milumor to stop their pollutant emissions into the Na'aman River by September 30, 2005. The injunction also applies to the Miluban plant which continues to discharge to the river.
- The master plan for the water sector, which calls for stopping the discharge of effluents to rivers by 2010, excluding designated allocations (Shaham, 2003) complying with the Inbar Committee standards for discharge to rivers.

Based on these plans, it is expected that by target year 2014 the solutions presented in the following table will be in effect:

Table 8: Hot Spots –Main Pollution Sources and Planned Future Solutions

Hot Spots	Main Pollution Sources	Planned Solutions (Present & Future)
Na'aman River Mouth	Surpluses of the Karmiel WTP (via the Damon reservoir), Tamra raw sewage, Ebelin and Afeq pig farms, Kfar Maserik raw sewage, fishpond waters of Kfar Maserik and Ein Hamifratz, Miluban	Diversion of the sewage of Kfar Maserik and Ein Hamifratz to the Acre WTP, pretreatment in Miluban, separation of fresh and brackish waste streams and pretreatment in Miluoff and Milumor – compliance with the Inbar Committee standards.
Haifa Bay	Ma'ale Hakishon, Haifa Oil Refineries, Haifa WTP, Carmel Olefins, Gadot, Haifa Chemicals, Deshanim	Pretreatment and compliance with the Inbar Committee standards for discharge to rivers. Industrial plants unable to comply with the Inbar Committee standards are expected to discharge their wastewater directly to sea in compliance with Environment Ministry criteria for brine quantity and quality permitted for discharge to sea.
Shafdan	Marine outfall of the Shafdan sludge	Cessation of sludge discharge to sea in 2008
Ashdod	Agan Chemicals, Ashdod oil refineries, brines of Kvuzat Yavne and Bnei Dror.	Direct discharge to sea in compliance with Environment Ministry criteria for brine quantity and quality permitted for discharge to sea.

4.2.6.5 Gaps

According to the NBB, two sectors, domestic and industrial, jointly contribute nutrients to the sea (organic load, nitrogen and phosphorus). Among heavy metals, lead and cadmium are the main contributors from these two sectors. Other heavy metals (e.g., lead, zinc, chromium, etc.) are primarily contributed by industrial sources. Quantitative data on the

contributions of pollutants in the hot spots are presented in Appendix 1, B, Contributions to Hot Spots, Tables 1.4, 1.5 and 1.6).

If the steps outlined in Table 8 above are not taken, the contributions which appear in the above-mentioned tables 1.4 – 1.6 will increase by 31% in the year 2014 and by 72% in 2025 in comparison to base year 2003.

However, it is the assumption of this study that the solutions outlined in the tables will be implemented. Assuming this and assuming that criteria for defining hot spots do not change, it is anticipated that by 2014 none of Israel's current hot spots will be defined as such. A similar situation is anticipated for 2025. Therefore, gaps are not expected between the NAP targets and the "business as usual" scenario in the target years.

5. Major Components of the National Action Plan

5.1 The Atmospheric Sector – Air Pollution

5.1.1 The Proposed Pollution Reduction Plan

It is the Ministry of the Environment's policy to encourage the installation of advanced technologies for air pollution reduction, both through information and cooperation and through incorporation of environmental requirements in business licenses and in personal decrees issued to polluters based on European Union Council Directive 96/61/EC (concerning integrated pollution prevention and control) for new facilities and for the improvement of existing facilities.

The Best Available Technique (BAT), as defined for the purpose of this document, is the most advanced and efficient technique for preventing air pollution according to European Council Directive 96/96/EC which fulfills the following conditions:

1. It is available and is based on proven experience in facilities of a similar scope in Israel or abroad.
2. It is economically feasible to implement, based on existing experience in the world and taking into account external costs.
3. It is efficient in protecting the environment.

The plan proposed in this document is that by the year 2010, the Ministry of the Environment will monitor all industrial plants/facilities and will check their compliance with the air quality standards which are enforced by the ministry. Those plants/facilities which will not comply with these standards, will be subject to enforcement measures to ensure compliance by 2014, through the installation of Best Available Techniques for the year 2010 as defined above.

In addition, in 2008, the Ministry of the Environment will be required to prepare an updated national budget on the basis of the year 2003, to enable comparison between the reduction rates which will be achieved according to the above-described reduction plan and those recommended by the SAP.

5.1.2 Responsibility for Implementation and Burden Sharing

The Ministry of the Environment is responsible for implementing the monitoring stage (by the year 2010) and enforcing the adoption of the BAT in order to comply with the standards.

The pollution reduction cost will be borne by the polluter, meaning that the private sector will be required to comply with standards according to its business plans and environmental regulations.

5.1.3 Action Plan and Target Dates

Until the year 2010, the Ministry of the Environment will conduct monitoring of all industrial plants/facilities and will check their compliance with air quality standards. Between 2010-2014, enforcement measures will require those plants/facilities not complying with the standards to undertake activities to ensure compliance.

In 2008, the Air Quality Division of the Ministry of the Environment will prepare a national budget of pollutant transport through the atmosphere.

5.2 The Liquid Sector - Direct Discharge to Sea (Wastewater Management – Wastewater Treatment Plants and Industrial Sources)

5.2.1 Proposed Pollution Reduction Plan

The main components of the plan for reducing marine pollution caused by direct discharge to the sea of wastewater, effluents and brines are:

1. Completion of the construction of WTPs. Most of Israel's new WTPs are designed to provide tertiary treatment including one or more of the following processes: biological treatment to remove organic matter, nitrogen removal by a biological process, phosphorus removal by a biological and/or chemical process, additional filtration of suspended solids, disinfection.
2. Upgrading of existing WTPs to treatment levels of 10:10 for unrestricted irrigation.

3. Completion of effluent recovery systems for agricultural irrigation and prevention of effluent overflow to sea.
4. Land treatment of the Shafdan sludge and cessation of sludge discharge to the sea.
5. Promotion of advanced treatment of industrial wastewater at source – in industrial plants, and enforcement of the quality and quantity of industrial wastewater which is permitted for discharge to sea.

5.2.2 Investment Portfolio

Construction of WTPs and Upgrading of Existing WTPs

Plan Costs and Cash Flow

The Inbar Committee report (2001) presents the costs of constructing and upgrading WTPs for 2010 as follows:

Investment:

Investment to meet base quality - $84.95 million

Additional investment to meet 10:10 standard requirements - $192.43 million

Total investment estimate: $277.38 million or annual equivalent value (according to 20 years, 5% interest) of $22.26 million

Current Operation:

Cost of operating the WTP at base level - $57.84 million

Additional cost for operating to standard level - $30.45 million

It is assumed that the cost of operating the WTP per year in 2006 is $57.84 million and that the percent of growth in operating expenses in the period 2006-2017[25] as a result of upgrading the WTPs is 4% per year.

The operating cost per year from the year 2018 onwards is $87.27 million.

Total costs of operating WTPs in the period 2006-2025: $982.23 million or annual equivalent value (according to 20 years, 5% interest) of $78.82 million.

Investment + Current Operation

Total present value of investment costs and current operation – about $1.26 billion or annual equivalent value of $101.07 million.

(See cost details by WTPs in Appendix 3 (I), Table 3.1.2)

Cessation of Discharge of the Shafdan Sludge to Sea

Investment:

Investment in the sludge land treatment system and in facilities for sludge incineration – estimate of total investment of about $150 million.

Current Operation:

Annual operational costs, including maintenance, treatment and sludge disposal in the years 2008-2025 – some $95.74 million.

Investment + Current Operations:

Total net present value of investment costs and current operation – some $236.84 million or annual equivalent value (according to 20 years, 5% interest) of $19 million.

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[25] A scenario is assumed in which upgrades are not completed by 2010 but rather by 2017. Based on this scenario, the State of Israel will still comply with NAP targets of a 50% reduction in pollutants by the year 2014.

5.2.3 Responsibility for Implementation and Burden Sharing

The Water Commission of the Ministry of Infrastructures, the Sewage Infrastructure Development Administration, municipal authorities and Associations of Towns for Sewage, and the Ministry of the Environment are responsible for implementation.

Local authorities are responsible for constructing and upgrading WTPs and for their funding. The Ministry of Finance allocates an annual budget to the Sewage Administration for this project. The Sewage Administration uses this budget to allocate long-term loans and grants to local authorities. Local authorities then finance these loans by means of a sewage fee which is collected from the residents. Since the upgraded effluents will serve for agricultural irrigation and for industrial plants, effluent consumers will also fund some of the construction and operation costs. In 2005, the government decided to require effluent users to pay an additional \$0.033 per m^3 of upgraded wastewater. Therefore, effluent users will fund about one third of the cost of upgrading the WTPs to the level of the new standard. The cost of investment and operation to the base level will be fully financed by the relevant authorities and by the state.

5.2.4 Action Plan and Target Dates

The implementation plan, including a survey of existing and planned WTPs, is described in Appendix 3 (I), paragraph b.

An examination of the reduction rate of the three trace metals will be conducted in 2008 in order to determine the need for enforcement measures to achieve a further reduction.

5.3 The Liquid Sector - Rivers

5.3.1 General

There is no doubt that the only way to significantly reduce nutrient loads released through rivers to the sea is through reduction at source, i.e., upgrading effluents which are discharged from point sources through rivers to the sea and constructing effluent recovery plants to assure that effluent releases to rivers, and thereby the pollutants which reach the river, will indeed decrease. In parallel, overuse of fertilizers in agricultural fields should be

reduced. These plans are already being implemented under the "business as usual" scenario, assuring compliance with the desired reduction targets for 2014. At the same time, in order to confront the problem of pollutant release from diffuse sources to the sea through rivers, it is recommended that additional plans be undertaken to increase the self-purification capacity[26] of rivers by 2014. In the first stage of the plan, it is recommended that these activities be included within the framework of river rehabilitation plans implemented under the "business as usual" scenario while in the second stage (until 2025), it is recommended that these technologies be implemented in rivers which were not rehabilitated within the framework of the "business as usual" scenario.

5.3.2 Proposed Pollution Reduction Plan

Following are the Best Available Techniques and Best Environmental Practices (BAT and BEP) for preventing Mediterranean Sea pollution through rivers:

Reduction of nutrients (total organic carbon, total nitrogen and total phosphorus from point sources of effluents)

1. Construction and upgrading of WTPs

   As specified in chapter 5.2.

Pollutants from Diffuse Sources

1. Integrated treatment: reduction of diffuse pollution through reduction at source, rehabilitation of riverbank vegetation and creation of buffer zones, and intensification of the self purification capacity of the rivers

   The non-point character of diffuse pollution contributions from land to rivers and through them to the sea makes it difficult to quantify pollution from diffuse sources and to treat these pollution sources. Currently prevalent technologies for dealing with the

[26] Rivers have the ability to absorb some of the pollutants flowing through them, to process and retain them and, in some cases, even to remove them (especially organic matter in respiration processes and nitrogen compounds in denitrification processes). This phenomenon is known as the "self-purification capacity of a river."

flow of pollutants from diffuse sources to the sea require decreasing the releases of pollutants to rivers through reduction at source, creation of buffer zones (USDA, 2004; Iowa State University, 2004) and rehabilitation of riverbank vegetation (Pets and Callow, 1996; The Federal Interagency Stream Restoration Working Group, 1998), on the one hand, and increasing the self-purification capacity of the rivers, on the other hand.

Pollution reduction from point sources has a most positive effect on the self-purification capacity of rivers (Meals *et al*., 1999, Dodds *et al*., 2002, Bernhardtet *et al*., 2002). However, recent research studies have shown that in order to increase a river's self-purification capacity, the following technologies should be implemented:

a) Changing the river incisions from canalized to flat sections and moderating the riverbank slopes. Since in canalized rivers, the contact area between polluted water and river bottom is relatively small, the self-purification capacity of canalized rivers is small (Marti and Sabater, 1996; Munn and Meyer, 1990). Morphological change of the profile incision of the river channel (from a U profile to a moderate V profile) by moderating the riverbanks slope is expected to increase the self-purification capacity of the river (The River Restoration Center, 2002).
b) Floodplain creation and restoration improves the self-purification capacity of the river by increasing the contact area of the water with the river bottom and increasing the retention period of the water (Petts and Callow, 1996; Schmidt and Ptaola-Urrutxi, 2002).
c) Meanders restoration and overdeepening is a recommended technology to increase the self-purification capacity of the river in canalized rivers which flow in plain areas (appropriate to Israel's coastal rivers) (The River Restoration Center, 2002).

2. <u>Reduction of fishpond pollutants – constructing dedicated WTPs for treating the "remaining waters" of fishponds</u>

In general, most of the fishpond waters are directed toward reuse in the ponds. Some 80% of the pollutants reaching the rivers from fishponds originate in the "remaining waters" which are the waters that remain at the bottom of ponds when they are emptied to collect the fish. These waters constitute only 20% of the total quantity of water directed from ponds to rivers. Fishpond water is released to the following coastal rivers: Na'aman River, Kishon River, Dalia River, Tanninim River, Hadera River and Alexander River. These waters contain large concentrations of suspended solids, particulated and dissolved organic matter and nutrients (nitrogen, phosphorus). Since most of the fishpond waters have chloride concentrations which are higher than the threshold requirements of existing WTPs, it is not possible to divert these waters to WTPs for treatment. Therefore, in order to reduce the pollutant load from fishponds to rivers, dedicated facilities for the treatment of fishpond water should be constructed. The water which will be diverted to these dedicated facilities will be pretreated in operational ponds for the retention and sedimentation of the suspended material. Most of the treated water will be recycled in the fishpond's water system and will be directed for reuse. Water which will not be directed toward reuse will undergo additional treatment prior to release to the rivers. The water which will be released to the rivers will comply with emission standards set by the Ministry of the Environment.

Elimination of total organic carbon, total nitrogen, total phosphorus, toxic organic compounds and heavy metals from urban drainage water

1. Technology – Constructed Wetlands

Urban areas are characterized by minimal penetration of rainwater to the ground and by intense human activity. Urban drainage water generally gathers many pollutants in its wake as it makes its way to the rivers. Under climatic conditions in Israel which are characterized by a scarcity of rain events (periods when pollutants accumulate) on the one hand, and by short and intense rains (in which major runoff occurs which carries pollutants to the river), on the other hand, the contribution of urban runoff to the pollution of rivers and sea is relatively high in comparison to more temperate zones. On the other hand, the canalization of urban runoff in transport systems which are separate from sewage systems makes urban runoff treatment relatively simple compared to agricultural runoff. The technology hereby

recommended is the release of urban runoff to constructed wetlands (EPA, 2000, Novotny, 2003), which can also remove toxic organic compounds (Nielsen, 2004) and heavy metals (Mulhall and Revitt, 2003) which characterize urban runoff.

As stated, constructed wetlands bring about pollution reduction in the water discharged to the rivers, thus contributing to resource conservation and prevention of ecological nuisances. However, they have additional advantages as well which are expressed in several main areas:

a. Development of leisure, tourism and recreation uses – attracting visitors to the basins themselves due to their aesthetic value, and especially to the rehabilitated rivers, which are transformed, thanks to the constructed wetlands, into environment and consumer friendly sites, which may be used for leisure and sport activities (sailing, fishing). The transformation of a river into a local tourism site contributes to economic prosperity (opening of recreation sites and eateries, increased business profits). A research study on the Soreq Rivers estimated the advantages of recreation and leisure uses resulting from the Soreq's rehabilitation at 8 million shekels per year (Rosenthal and Zaban, 1999). Pilot projects currently conducted by the Ministry of the Environment to implement the technology in Israel should contribute in the future to research on the advantages of implementing this method in Israel.

b. Non-use value – research studies demonstrate that people attribute a value to the very existence of natural and landscape resources, and express a readiness to pay for their continued existence even if not using them themselves. In the Soreq River study, this benefit was estimated at 1.35 million shekels a year.

c. Wastewater treatment or effluent polishing alternative – the constructed wetlands method is used for treating wastewater from different sources, beginning with domestic wastewater through urban runoff to industrial wastewater.

To date, treatment using constructed wetlands is not implemented in Israel's rivers, with the exception of an educational pilot project implemented by the Yarkon River Authority in the seven flour mills of the Yarkon River. Within the framework of a plan known as "The Yarkon's Redemption," it is intended to establish a "wet meadow" at a scope of 4-6

hectares and to polish the effluents of Kfar Saba and Hod Hasharon prior to their discharge to the river. (Another pilot is being implemented by Tel Aviv University within the area of the Shafdan.) In contrast to the case in Israel, this method is broadly implemented in the U.S. (EPA, 1999) and in different European countries, especially the UK (Shutes *et al*., 2004).

It should be emphasized that the Ministry of the Environment intends to require constructed wetlands development to treat municipal sewage, in light of the recommendations of the Inbar Committee.

5.3.3 Investment Portfolio

1. **WTPs**

   As specified in chapter 5.2.2

2. **Integrated treatment: reduction of diffuse pollution through rehabilitation of riverbank vegetation and creation of buffer zones and increasing the self-purification capacity of rivers**

   Cost

   The Ministry of the Environment currently allocates resources for river rehabilitation and some rivers already have master plans for rehabilitating problematic segments along the river. The rehabilitation currently implemented is largely based on environmental goals including: rehabilitation of habitats for flora and fauna, creation of tourism and recreation centers, establishment of leisure and rest areas for the population, etc., and is not necessarily targeted at increasing the self-purification capacity of the river and thereby the removal of pollutants reaching the river from diffuse sources.

   The NAP claims that the allocation of the same resources for the proper rehabilitation of the river, will allow for the dovetailing of the goals within the same framework at marginal cost for overall river rehabilitation.

3. Fishponds

Cost

The proposed activity is implemented within the "business as usual" scenario within the framework of the reform in Israel's fish sector. The estimated cost of the reform is 150 million shekels for a 3-5 year period (Ministry of the Environment data, 2006). Since the proposed plan is expected to take place in a "business as usual" scenario, without any relation to the NAP, from the viewpoint of the NAP, the cost of the plan is practically zero.

4. Constructed Wetlands

Cost

The cost of constructed wetlands differs from case to case and is made up of the costs of land, construction and operation.

1. Cost of land – this cost is assumed to be zero (since land allocation will be implemented within the river area where there are no other uses for the land).
2. Cost of construction – this includes the cost of digging and construction, the cost of the land necessary for the constructed wetlands, the cost of the gravel which is a component of the constructed wetland's infrastructure, the cost of the plastic cover, the cost of vegetation planting, the cost of laying pipelines, pumps, control installations and miscellaneous costs. Based on EPA data on different facilities in the U.S., the estimated cost of establishing a dunam (1000 m^2) of constructed wetlands is about $100,000 per dunam (ranging between

$20,000 to $250,000 per dunam). A similar sum was recently spent for establishing an experimental system of constructed wetlands in the Shafdan.[28]

It is estimated that some 20 systems spanning an area of about 4,000 m^2 (4 dunams) each will be required for all of Israel's coastal rivers, at a total estimated cost of $8 million. It is assumed that this cost will be equally distributed over the period 2005-2007.

3. Operational cost – the cost of current operation including the cost of pumping and aeration (if included in the treatment), routine maintenance and follow up, treatment to prevent mosquito nuisances, etc. According to data based on U.S. prices,[29] it is reasonable to assume that the cost of operating one cubic meter of water would be 4 cents for a standard system (the cost of an aerated system would be higher). In addition, it may be assumed that the water depth in such a system would be some 0.75 meters. Therefore, a water quantity of 60,000 m^3 would be necessary at any given period for all of the systems to be established in a total area of 80,000 m^2 (80 dunams). This treated water will flow into the rivers in accordance with the quantities of rain and runoff which will converge into the river. It is estimated that the system will operate for about 200 days a year.

Based on these assumptions and costs, the following economic calculation was made.

Cash flow:

Capital rate of return: 5%

Construction cost: A total of $8 million between the years 2005-2007

Operational expenses: $480,000 per year

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[28] Milstein, oral communication.

[29] EPA 2000.

Length of assessment period: 2005-2025

Total cost of capitalization – $11.8 million

As stated, the Ministry of the Environment intends to require the establishment of constructed wetlands for the treatment of municipal sewage, in light of the recommendations of the Inbar Committee which defines requirements for more stringent quality levels for effluents designated for discharge to rivers. Accordingly, it is anticipated that the plan will be implemented in a "business as usual" scenario, without relation to the NAP. Therefore, from the NAP point of view, the additional cost is practically zero.

5.3.4 Responsibility for Implementation and Burden Sharing

The Ministry of the Environment will be generally responsible for implementation, although the river authority or river drainage authority will be responsible for the practical implementation in each basin. Therefore, responsibility for implementation will fall on local authorities and other relevant bodies which are members of each authority.

In order to reduce pollutants by means of additional technologies, excluding those implemented within the "business as usual" scenario, it is recommended that local authorities in cooperation with the River Administration, the Ministry of the Environment and the polluters (industries) allocate the necessary resources. Relative cost sharing among the different stakeholders will be determined by the Ministry of Finance in a steering committee which will be set up for each river individually, based on the local authority in whose jurisdiction the polluting river is situated and the economic viability of the polluting industry.

5.3.5 Action Plan and Target Dates

Tables 9-10 present action plans for treating river pollution and target dates for implementing these plans.

Table 9: Target Dates and Action Plan for Treating River Pollution from Spot Sources

River	Source of Pollution	Target Date	Action Plan
Kziv	No WTP discharging to the river		
Bezet	No WTP discharging to the river		
Na'aman	Acre WTP	2008	Cessation of all discharge to Na'aman River and agricultural recovery
Kishon	Haifa WTP	2010	Cessation of all discharge to Kishon River
Tanninim	No WTP discharging to the river		
Hadera	Hadera WTP –overflows Iron WTP Jatt WTP	2010	Completion of construction of the Iron WTP and Jatt WTP. Overflows will comply with Inbar Committee standards for discharge to rivers
Alexander	Lev-Hashaon-Tnuvot WTP	2010	Completion of construction of the WTP. Overflows will comply with Inbar Committee standards for discharge to rivers.
Poleg	Ra'anana WTP	2010	Compliance with Inbar Committee standards for discharge to rivers.
Yarkon	Nir Eliyahu WTP Kfar Saba WTP Ramat Hasharon WTP	2010	Compliance with Inbar Committee standards for discharge to rivers.
Soreq	Jerusalem WTP Beit Shemesh WTP Ayalon WTP	2014	Overflows will comply with Inbar Committee standards for discharge to rivers
Lachish	Kiryat Gat WTP	2014	Completion of construction of the WTP. Cessation of all discharge to the Lachish River
Besor	Beersheba WTP Hebron WTP	2014	Completion of construction of the Hebron WTP. Overflows will comply with Inbar Committee standards for discharge to rivers.

Table 10: Target Dates for Implementing Stages of Action for Treating River Pollution from Diffuse Sources

River	Stage A	Stage B	Stage C
	Routine Quantitative Assessments of Contributions from Diffuse Sources (Target Year)	Ranking of Rivers According to Pollutant Loads from Diffuse Sources	Rehabilitating Riverbank Vegetation and Regulating Riverbeds (see section 5.3.3, subsection 2)
Kziv	2012	By 2014	According to priorities to be determined at the completion of Stage B
Bezet	2012	By 2014	
Na'aman	2010	By 2014	
Kishon	2010	By 2014	
Taninim	2012	By 2014	
Hadera	2010	By 2014	
Alexander	2010	By 2014	
Poleg	2010	By 2014	
Yarkon	2010	By 2014	
Soreq	2010	By 2014	
Lachish	2012	By 2014	
Besor	2012	By 2014	

The action plan for reducing river pollution from diffuse sources is multi-stage. In the first stage, a quantitative assessment of contributions from diffuse sources in each of the river basins released to the Mediterranean Sea is required. Since selecting a model for such quantification, creating the necessary database and implementing the model is a complex process, a relatively long period of time was allocated for this stage. Once quantification of diffuse pollutant loads in the different river basins is completed, rivers will be ranked on the basis of these loads (Stage B). Since, under a "business as usual" scenario, the Ministry of the Environment allocates resources for river rehabilitation, and since master plans for the problematic sections of some rivers already exist at this stage, the editors of the plan recommend that in parallel to stages A and B, the recommendations for pollutant reductions from diffuse sources, which are described in section 5.3.3, subsection 2 will be implemented in those rivers where rehabilitation is already in progress. For rivers not undergoing rehabilitation by the end of Stage B, it is recommended that a rehabilitation process be implemented in Stage C according to priorities which will be established once Stage B is completed.

Emissions Report and Continuation Plan

It is recommended that during the course of 2008, the Ministry of the Environment's Water and River Division, the Water Commission and the Ministry of Agriculture's Drainage Authority will jointly prepare an emissions report for the 12 major coastal rivers. On the basis of the results of this report, these bodies will formulate a reduction plan according to the findings and requirements of the NAP.

5.4 The Solid Sector - Urban Solid Waste

5.4.1 Proposed Pollution Reduction Plan

Following are the plans for preventing Mediterranean Sea pollution from urban solid waste:

1. Landfilling in regulated sanitary landfills

Routinely implemented under the "business as usual" scenario. See section 4.2.4.3.

2. Dump rehabilitation

The technology for pollution reduction from dumps not shut down on the coastal strip includes the following actions:

- Slope stabilization
- Controlled release – preferably including biogas utilization
- Leachate drainage from the waste body
- Site cover and sealing
- Rehabilitation and preparation of dump areas for future use (usually open public space)

3. Separation of problematic components in construction and demolition waste as part of the waste's pretreatment – waste recycling

Construction and demolition waste includes potentially polluting components such as paints, cement additives and adhesives beyond the aesthetic pollution of this type of waste. The pollution reduction technology calls for separation of the problematic components of

the construction waste during the pretreatment of the waste. Separation is conducted manually in facilities such as the one currently operating at the Hiriya landfill site. (The facility includes pre-sorting, screening, crushing and secondary screening of the components of construction waste along with manual separation into dry waste components – cardboard, wood and plastic).

4. Preparation of Landfills for Construction Waste

This is routinely implemented. See section 4.2.4.3.

5.4.2 Investment Portfolio

1. Dump closure and move to "sanitary landfilling"

Routinely implemented under the "business as usual" scenario and therefore cost is not presented.

2. Dump rehabilitation

Cost

Within the framework of "business as usual" by target year 2014, it will be possible to mobilize the minimum funds necessary for dump rehabilitation, totaling some 160 million shekels. This budget will be directed toward rehabilitating the large dumps with real estate incentives: Netanya, Rishon LeZion, Bat Yam and the Hiriya site which is already mobilizing funds for rehabilitation from a public fund.

The budget required for the absolute elimination of pollution from all dumps along the coastal strip (both large and small) is an additional $24.4 million (110 million shekels), beyond the $35.6 million (160 million shekels). The total area of the dumps is some 800,000 m^2 (800 dunams) and the average rehabilitation cost per dunam is some $75,000.

The total cost of the project is $60 million (270 million shekels).[30]

Since dump rehabilitation is not a SAP target, the proposed plan is based on the assumption that only the rehabilitation plan for large dumps with real estate incentive, which will take place under the "business as usual" scenario without relation to the NAP, will be implemented.

3. Separation of problematic components from the construction waste as part of the waste's pretreatment – waste recycling

Cost[31]

The minimum price for treatment of construction waste is 36 shekels/ton (based on costing within the framework of a tender for the treatment of construction waste at the Hiriya site).

Cash flow

Capital rate of return: 5%

Quantity of construction waste: 7 million tons per year

Quantity of construction waste for treatment (2006) – 1,356,985 tons

Rate of increase in the quantity of treated waste: between 2006-2014 – 19%, between 2015-2025 – 2%.

Estimated cost of treating one ton of construction waste – about $8 per ton (36 shekels/ ton).

Duration of the assessment period – 2006-2025

Total cost of capitalization – about $434 million (NIS 1,951 million).

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[30] This is a set and final cost which describes, in currently accepted terms and prices, the total required cost for rehabilitating all of the existing dumps along the coastal strip.

[31] Cost includes the price of transporting the waste to the landfill, sorting of the waste, crushing of the waste and screening.

See cash flow in Appendix 5, Table 5.1

4. Preparing landfills for construction waste

This is routinely implemented under the "business as usual" scenario and therefore costs are not presented. As stated, 18 million shekels have been allocated for the planning stage but there is no estimate on implementation cost.

5.4.3 Responsibility for Implementation and Burden Sharing

The Ministry of the Environment, Israel Lands Administration, local authorities or associations of towns are responsible for implementation. Burden sharing for the different actions is as follows:

Dump Rehabilitation

Within the framework of the "business as usual" scenario, most of the budget (160 million shekels out of the 270 million shekels required for the final closure of all of the dumps) may be recruited from public funding (fulfilling the real estate potential) and from existing budgets (infrastructure development budget for residences such as in Netanya).

Separation of Problematic Components from Construction Waste as Part of the Waste's Pretreatment

Waste producers, development and building contractors and the public (in case of renovations) currently finance the cost of construction waste treatment.

Preparation of Construction Waste Landfills

The Ministry of the Environment and the Ministry of the Interior, in cooperation with the Israel Lands Administration, operate under the "business as usual" scenario to catalyze solutions on the planning level. However, the cost of implementation will be imposed on the private sector through collection of disposal fees.

5.4.4 Action Plan and Target Dates

The timetable for dump rehabilitation differs from site to site. Table 11 presents the target dates and action plans for the major sites.

Table 11: Target Dates for Implementing the Dump Rehabilitation Plan

Dump	Target Date	Action Plan
Hiriya Site	2014	Site rehabilitation
Compost 2000	In implementation	Partial site rehabilitation
Netanya Site	2014	Rehabilitation of the site in stages
North Herzliya Site	2010	Completion of site rehabilitation
Rishon Lezion Site	2012	Site rehabilitation
Retamim Site	2010	Site rehabilitation
Ashkelon Site	2012	Site rehabilitation
Bat Yam Site	2010	Site rehabilitation
Haifa Site	2010	Beginning of site rehabilitation

By the year 2014, regulated sites for the disposal of construction and demolition waste will be established allowing for the proper disposal of some 80% of Israel's construction waste.

By the year 2025, recycling facilities for construction waste will be distributed throughout the country, with recycling of most of the construction waste, 80% or more.

5.5 The Coastal Sector

Due to the fact that thresholds for this sector were not defined in the NBB and quantitative targets were not defined either by the SAP guidelines nor by the editors of the plan (with the exception of coastal river rehabilitation for which quantitative targets were defined by the editors), the structure of this chapter is different in some aspects from the other chapters of the NAP.

The following recommendations relate to coastal sector management:

5.5.1 Conservation of marine and coastal habitats and open coastal areas

1. Preparation of a new statutory document which will express a comprehensive vision of coastal areas worthy of conservation and will provide statutory protection to marine and coastal habitats

The comprehensive view and the designation of protected areas are currently based on a series of national and regional outline schemes, foremost among which is NOS 8. Although NOS 8 is a national policy document which defines conservation worthy areas, this plan is not based on an up-to-date scientific infrastructure that reflects a spatial distribution of conservation worthy natural assets and habitats.

There is a need for a new statutory document which will express a comprehensive view of conservation worthy coastal areas and will provide statutory protection to marine and coastal habitats.

Method

Based on data collection and analysis on coastal habitats and taking account of a range of planning and other considerations, the following will be defined in the outline plan:

- Boundaries of the areas based on their geographic, morphological and habitat features.
- Definition of different levels of conservation.
- Definition of the level of conservation appropriate for each area.
- Restrictions and control mechanisms applying to protected areas.

Forecast

An approved national outline plan, providing a policy program for the conservation of marine and coastal habitats, should bring about balanced management of development pressures in sensitive areas along the coast. In addition, a national outline plan based on specific data and on the analysis of environmental value should guide decision-making which take account of the environmental value of habitats.

It may also be anticipated that restrictions and guidelines on different types of development along with the guidelines to the economy will minimize damages to habitats in those cases in which comprehensive planning is directed toward development.

2. Preparation of a national policy plan for protection of the Mediterranean coastline

Objective

On the basis of the findings of the national coastal monitoring plan a national policy plan for protecting the coastline will be prepared. This plan will define, among others:

- The preferred coastline image in the future based on a wide range of data and considerations
- The principles, tools and actions which should be taken in different coastal compartments in order to achieve the defined targets.

Method

- The plan will define the image of the preferred coastline in the future on the basis of an understanding of the processes in a comprehensive national vision.
- The definition of the image of the future coastline will relate to a range of considerations including:

  - planning considerations

  - economic cost/benefit considerations

  - environmental considerations: landscape, ecology, heritage and open spaces.

  - tourism considerations.

  - impact on cliff retreat considerations

- The plan will guide relevant authorities on suitable tools and solutions for each coastal segment and will present guidelines for the detailed planning of these tools.
- The plan will define the manner of calculating the sand quantities which will be bypassed for each new marine structure which is constructed along the coast, with the potential to disturb the longshore sand current.
- The plan will relate to different aspects and impacts of sea level rise.

Forecast

The policy plan will allow for a comprehensive national vision of the coastline and will provide suitable guidance on measures to be taken, actions that should not to be taken, and restrictions on different activities which may adversely alter the existing coastline.

3. Preparation of a procedure for assimilating the NAP in the environmental assessment processes of statutory plans

Objective

To assess the environmental impacts of statutory plans (with environmental aspects related to the NAP) presented to planning agencies while taking into account the goals and targets defined in the NAP. NAP targets will find expressions in environmental impact assessments.

Method

Approval of an operative procedure within the Ministry of the Environment that will assure the integration of the relevant aspects of the NAP at the stage of preparing EIA guidelines and in the ministry's EIA opinions which are submitted to planning authorities.

Forecast

Improved oversight and control over the environmental review which takes place within the framework of the statutory planning process on subjects related to marine pollution from land-based sources.

4. Designation of a Process for the NAP Goals and Targets in Environment Ministry requirements under the Licensing of Businesses Law

Objective

The Ministry of the Environment is one of the bodies authorized to approve business licenses within the framework of the Licensing of Businesses Law with authority to add conditions to existing licenses.

Method

Formulation of a procedure within the Ministry of the Environment which will guide the work of the business licensing coordinator and will adapt requirements to NAP targets.

Forecast

Operation of the procedure will allow dovetailing of the NAP targets on marine pollution from land-based sources with the Ministry of the Environment's requirements from businesses within the framework of permit applications.

5.5.2 Rehabilitation of Coastal Rivers

1. Formulation of a master plan

Formulation of a master plan based on a consensus building planning process with the participation of professionals from different disciplines (planning, hydrology, ecology, drainage, economy, tourism, etc.) and the public.

2. Formulation of a statutory outline scheme

Formulation of a statutory outline scheme to base the master plan, protect open spaces along the coast and designate spaces for controlled development.

3. Water quantities for release to rivers

a. The allocation of 50.5 MCM of water for nature and landscape requirements will be directed for release into the coastal rivers.
b. Water allocation will be distributed between the different coastal rivers according to the division specified in the policy document – "Right of Nature to Water." (See distribution between rivers in Table 12 below.)

c. The quantity of water which will be released from the rivers to the sea will be according to the policy document (Shaham, 2003).

Accordingly, it is recommended that the water quantities which will be allocated for flow in coastal rivers in target year 2014 will be based on the details in Table 12 below. Out of this quantity, a total of 20 MCM of water will be released to sea. Similarly, it is recommended that in target year 2025 some 86 MCM of water will be allocated for release to coastal rivers, of which some 34 MCM will be released to sea. It should be emphasized that the quantities in Table 12 below only relate to base flows and do not include peak flows in rivers during flooding events.

As may be seen, in 2014, Israel will comply with the SAP targets under the "business as usual" scenario (assuming that the entire quantity of 50.5 MCM of water will be allocated to coastal rivers) without additional cost. In the period 2014-2025 an additional cost will be required due to the release of 35.24 MCM of additional water per year.

Table 12: Water Quantity Targets for Discharge to Rivers and Release from Rivers to Sea Necessary to Rehabilitate Israel's Coastal Rivers in Target Years 2014 and 2025

River	% of total quantity to rivers[32]	Allocation according to the master plan for rivers (MCM/year)[33]	Anticipated discharge to river in 2014 MCM/year	Anticipated release to sea in 2014 (MCM/year)	Anticipated discharge to river in 2025 (MCM/year)[34]	Anticipated release to sea in 2025 (MCM/year)
Kziv	6.0	0.4	3.0	0.5	5.25	1.0
Bezet	--	0.25	--	--	--	--
Na'aman	12.0	12	6.0	6.0	10.3	10.3
Kishon	9.5	1	4.75	4.75	8.0	8.0
Dalia	4.0	--	2.0	2.0	3.7	3.7
Taninim	20.0	20 (exists)	10.0	1.5	18.0	2.7

[32] Based on the policy document "Right of Nature to Water." In the first stage, the calculation was made by integrating the total quantity of water allocations to the coastal rivers, appearing in the policy document "Right of Nature to Water," and calculating the relative part (in percentages) of each river. In the second stage the distribution of the allocation which was calculated was applied to the total quantity which was allocated in the master plan for the water sector. Thus, if the policy document allocates 30% to the Yarkon River, then 30% out of the 50% which are designated for allocation in 2014 will be directed to the Yarkon River (i.e., 16%).

[33] Based on the master plan for the Yarkon and Kishon rivers.

[34] Based on the policy document "Right of Nature to Water."

Hadera	--	0.5	--	--	--	--
Alexander	10.5	1	5.25	1.6	9.0	2.8
Poleg	--	0.5	--	--	--	--
Yarkon	30.1	2	16	3.5	24.5	5.5
Soreq	5.0	1	2.5	0.0	5.0	0.0
Lachish	2.0	0.5	1.0	0.0	2.0	0.0
Total	100	39.15	50.5	20.0	85.75	34.0

*The quantities above relate to base flows only and do not include flooding.

4. Water quality for discharge to rivers

The new approach, currently prevalent worldwide, examines guidelines for determining the water quality required for the rehabilitation and protection of river ecosystems. According to this approach, water quality standards must be: specific to the river; specific to the rehabilitation targets and based on the potential risk level to habitats in the river system (Hart *et al*., 1999). Based on the above, it appears that from the aspect of ecological/biological rehabilitation of Israel's coastal rivers, the approach that calls for setting general quality targets for rehabilitating all coastal rivers (e.g., the Inbar standard for discharge to rivers) provides an incomplete solution to the problem. The primary factor for determining the suitability of the water for river rehabilitation must first and foremost be the quality of the water and its suitability for the healthy functioning of the water ecosystem to which it is discharged. Therefore, the alternative approach holds that water quality goals for each of the coastal rivers should be set based on the original quality of the water which flowed in the river in the past.

Therefore, recommendations on water quality targets in rivers include:

- Targets for water quality in the year 2014 will require that on this year all effluents which will be discharged to coastal rivers will comply with the Inbar Committee standard for discharge to rivers.
- From the year 2014 onwards, water quality improvements should be examined within the framework of the implementation of the NAP.

5. Structure of the Channel and Habitat Rehabilitation

See chapter 5.3.2 paragraph 1): Integrated treatment: reduction of diffuse pollution by rehabilitating riverbank vegetation and creating buffer zones and intensifying the self-purification capacity of the rivers.

6. Biodiversity rehabilitation

See chapter 5.3.2 paragraph 1): Integrated treatment: reduction of diffuse pollution by rehabilitation of the riverbank vegetation and creation of buffer zones and intensifying the self-purification capacity of the rivers.

5.5.3 Prevention of Alterations to the Natural Coastline

1. Operation of a long-term monitoring network for the coastline and coastal cliff

The lack of a comprehensive picture, on a national scale, of the sand balance along Israel's coasts, and the processes and trends responsible for alterations in the coastline require the preparation of a national monitoring program for the sand resource.

The need to prepare and operate a national monitoring plan on the longshore sand transport is vital, among other reasons, to serve as a database for decision making on plans for marine structures. To date, such decisions have largely been taken in relation to limited coastal compartments rather than on the basis of a comprehensive picture.

The monitoring plan should also serve as the basis for an action plan that will outline the principles of actions necessary to protect the sandy coasts, coastal cliffs, habitats and longshore sand transport.

The plan should provide a suitable database for preparing a national policy on the protection of Israel's Mediterranean coastline.

Method

The monitoring plan will examine and analyze physical alterations along the coasts, the impact of marine structures on sand transport and the rate of cliff recession in different segments. It will then analyze the data in order to obtain a national scale view that will provide a basis for decisions on suitable protection measures for the coast and coastal cliff, if necessary.

The monitoring plan will serve as a database for decision-making on additional marine structures along the coast or changes in existing structures.

Forecast

The monitoring plan will serve as the basis for formulating a policy and action plan on the conservation of the coastline and the coastal cliff

Burden Sharing

The formulation of a monitoring plan will be examined within the framework of a joint committee of the Ministry of the Environment, Israel Lands Administration, Ministry of the Interior, Ministry of Tourism (with hotels located on the cliff), Ministry of Infrastructures (with pipelines and facilities along the coast and sea), Ministry of Construction and Housing (with houses on the cliffs), Ministry of Finance (with funding responsibility), Ministry of Transport (with ports that cause coastline alterations), coastal local authorities and organizations such as the Antiquities Authority, Nature and Parks Authority, etc.

5.6 Hot Spots

5.6.1 Proposed Pollution Reduction Plan

In order to treat hot spots, it is necessary to reduce discharges to these sites from rivers and from direct outfalls (including dumping). The chapters which relate to the liquid sector include plans and technologies for reducing pollution loads from these sources, including upgrading of WTPs and improving technologies for the removal of other pollutants. Hot spots are dependent on and are affected by the technologies that will be implemented to

reduce pollutant emissions to the sea from rivers and marine outfall pipes. The proposed action plans and investment portfolios are included in the previous chapters (liquid sector).

6. National Action Plan for the Year 2014: Summary Table

6.1 Atmospheric Sector

Number	Subject	Proposed Action	% Reduction[35]	Cost to Economy PV ($ million)[36]	Action Plan	Responsibility for Implementation and Burden Sharing	Points for Monitoring and Control[37]	Textual Reference
1	Transport	Equipping gasoline-powered vehicles with catalytic converters (beginning from 1993)	NA	(0)	By 2014: 90% of gasoline-powered vehicles equipped by catalytic converter	Responsibility for implementation: Ministry of Transport	Five-year follow up of emissions reductions	Section 4.2.1.3
2	- " -	Compliance with Euro "3" and "5" standards (diesel engines)	NA	(0)	By 2014: 74% of trucks, 97% of taxis, 73% of minibuses and 64% of buses will comply with Euro "3" or more	Responsibility for implementation: Ministry of Transport Ministry of the Environment	Five-year follow up of expected distribution of vehicles complying with Euro "3" standards and up and those not complying	Section 4.2.1.3

[35] Percent of reduction relates to the reduction in pollution from the polluting body (e.g., vehicle) as a result of implementing the proposed action.
[36] (0) = the proposed action is implemented within the "business as usual" scenario.

[37] Unless otherwise stated, the proposed directors-general committee which will be set up or one of its subcommittees will be responsible for implementation.

Number	Subject	Proposed Action	% Reduction[35]	Cost to Economy PV ($ million)[36]	Action Plan	Responsibility for Implementation and Burden Sharing	Points for Monitoring and Control[37]	Textual Reference
3	Electricity Sector	Monitoring and compliance with air quality standards through adoption of BAT	NA	NA	By 2010 - monitoring of all industrial plants/facilities and review of their compliance with air quality standards. Between 2010-2014: enforcement of measures for compliance with national standards	Responsibility for implementation: Ministry of the Environment Polluting industry	In 2010 – follow up after completion of monitoring and in 2014 – follow up of implementation of actions to comply with national standards	Sections: 4.2.1.3 5.1.1
4	Industrial Sector	- " -	- " -	- " -	- " -	- " -	- " -	- " -
5	Baseline Budget (BB)	Update of BB	- " -	- " -	Implementation in 2008	Responsibility for implementation: Ministry of the Environment – Air Quality Division		Sections: 3.3.1 5.1.3

6.2 Liquid Sector

Number	Subject	Proposed Action	% Reduction[35]	Cost to Economy PV ($ million)[36]	Action Plan	Responsibility for Implementation and Burden Sharing	Points for Monitoring and Control[37]	Textual Reference
6	Wastewater drained to sea through rivers	Establishing and upgrading of wastewater treatment plants (WTPs). Compliance with the Inbar Committee standard for agricultural use/discharge to rivers. Directing effluents to agricultural irrigation. Reducing the concentration of boron in cleaning materials.	> 90 (nutrients, BOD, suspended solids)	(0) 1,260	Implementation of the master plan for the water sector by the year 2010: establishment and upgrading of main WTPs, implementation of the Inbar Committee recommendations and utilization of the full potential of effluents as a water source for agricultural consumption. The plan is summarized in Table 3.1.2 in Appendix 3.	Responsibility for Implementation: Ministry of Infrastructures: Water Commission, Ministry of the Environment, Sewage Infrastructure Development Administration, municipal authorities, associations of towns for sewage. Burden Sharing: Sewage Administration grants long-term loans and grants to local authorities which fund the loans by means of a sewage fee.	Five year follow up of the rate of establishing and upgrading WTPs. Ensuring adoption of the Inbar Committee standards	Section 4.2.3.3 Table 3.1.2 in Appendix 3

Number	Subject	Proposed Action	% Reduction[35]	Cost to Economy PV ($ million)[36]	Action Plan	Responsibility for Implementation and Burden Sharing	Points for Monitoring and Control[37]	Textual Reference
7	Direct discharge to sea – municipal sewage and effluent	Completion of treatment and recovery systems in hot spots and in coastal cities	> 90 (cessation of most of the discharge)	- " -	Acre wastewater – cessation of discharge in 2006. Hof Hacarmel facilities – completion within 3 years. Herzliya wastewater – cessation of most of the discharge by the end of 2007. Ashdod WTP – recovery project in process.	-"-	Five year follow up of the rate of establishing and upgrading WTPs.	Section 4.2.2.4.1 Table 3.1.2 in Appendix 3

Number	Subject	Proposed Action	% Reduction[35]	Cost to Economy PV ($ million)[36]	Action Plan	Responsibility for Implementation and Burden Sharing	Points for Monitoring and Control[37]	Textual Reference
8	Direct discharge to sea – sludge	Land treatment of Shafdan sludge	> 90 (cessation of discharge of Shafdan sludge)	(0) 150[38]	Full land treatment of Shafdan sludge by 2008	Responsibility for implementation: Dan Association of Towns for Sewage, Ministry of the Environment. Burden sharing: Dan Association of Towns for Sewage	Assuring cessation of Shafdan sludge discharge at the end of 2008.	Section 4.2.2.4.2

[38] Investment cost only

Number	Subject	Proposed Action	% Reduction[35]	Cost to Economy PV ($ million)[36]	Action Plan	Responsibility for Implementation and Burden Sharing	Points for Monitoring and Control[37]	Textual Reference
9	Direct discharge to sea – brines and industrial effluents (marine outfalls, power plants and dumping to sea from vessels)	Adoption of advanced treatment of industrial effluents at source. Enforcement of qualitative and quantitative criteria for wastewater which is directly disposed to sea.	> 50 (organic pollutants) > 80 (BOD) >90 (metals, suspended solids, ammonia, oils, nitrogen)	(0)	Ministry of the Environment will define more stringent standards for brines disposed to sea and proper conditions in business licenses, and will increase their enforcement in industrial plants as soon as possible	Responsibility for implementation: industrial plants, Ministry of the Environment Burden sharing: Industrial plants	Routine inspection by the Ministry of the Environment of emissions to sea by the main plants. Review of the action plan and of quality standards once in five years.	Section 4.2.2.4.3 Table 3: Forecast of pollution loads from main brackish sources that discharge directly to sea for target year 2014

Number	Subject	Proposed Action	% Reduction[35]	Cost to Economy PV ($ million)[36]	Action Plan	Responsibility for Implementation and Burden Sharing	Points for Monitoring and Control[37]	Textual Reference
10	Municipal sewage systems[39]	Connection of all coastal cities with more than one hundred thousand residents to municipal sewage systems	> 90	(0)	Implemented			Section 4.2.2.2

[39] SAP target for implementation by 2005.

Number	Subject	Proposed Action	% Reduction[35]	Cost to Economy PV ($ million)[36]	Action Plan	Responsibility for Implementation and Burden Sharing	Points for Monitoring and Control[37]	Textual Reference
11	Trace metals	Checking the reduction rate of the metals Hg, Cd, Pb in 2008 in comparison to the NBB	50	NA	Checking the reduction rate of the metals Hg, Cd, Pb in comparison to the NBB. If below 50%, taking enforcement measures including adoption of BAT NEC in order to reach required reduction level by 2010.	Responsibility for implementation: Ministry of the Environment, Water Commission, Drainage Authority	In 2010: assuring compliance with the required reduction level. Subsequently, five year follow up.	Sections 4.2.2.7 5.2.4

6.3 Liquid Sector – Rivers

Number	Subject	Proposed Action	% Reduction[35]	Cost to Economy PV ($ million)[36]	Action Plan	Responsibility for Implementation and Burden Sharing	Points for Monitoring and Control[37]	Textual Reference
12	Reduction of nutrients from spot sources	Establishing and upgrading WTPs to levels complying with the Inbar Committee standard for discharge to rivers. Requiring plants along the Kishon and Hadera rivers to comply with Inbar Committee standards for discharge to rivers or alternatively discharge permits on condition they will comply with Environment Ministry criteria for discharge to sea	>90	(0) 1,260 (see number 6)	Implementing the national master plan for the water sector by 2010: Establishing and upgrading of main WTPs, implementation of the Inbar Committee recommendations and utilization of the full effluent potential as a water source for agricultural consumption and discharge to rivers (see Table 9 in chapter 5.3.5)	Responsibility for implementation: Ministry of Infrastructure – Water Commission, Ministry of the Environment. River administrations and drainage authorities that will exist at a given time. Burden sharing: Industrial plants. For the purpose of establishing and upgrading WTPs, the Sewage Administration grants long-term loans and grants to local authorities which fund loans through a sewage fee.	Close follow up of plan implementation in each river. In rivers with existing river administrations and authorities, these administrations will be included in follow up and data analysis	Section 4.2.3.3 Section 5.3.5

Number	Subject	Proposed Action	% Reduction[35]	Cost to Economy PV ($ million)[36]	Action Plan	Responsibility for Implementation and Burden Sharing	Points for Monitoring and Control[37]	Textual Reference
13	Pollutants from diffuse sources	Integrated treatment: reduction of diffuse pollution through reduction at source, rehabilitation of riverbank vegetation and creation of buffer zones, and intensification of the self-purification capacity of the rivers	≤80[40]	889[41] [42]	See Table 10 in chapter 5.3.5: target dates for implementing stages of action for treating river pollution from diffuse sources	Responsibility for implementation: Ministry of the Environment. Practical implementation by river administration or drainage authority, responsibility for practical implementation – members of the river administration Burden sharing: Local authorities in cooperation with the river administration, Ministry of the Environment and polluters. Ministry of Finance to determine the relative share of funding.	Five year follow up. Reassessment at the completion of each of the three stages detailed in Table 10 in chapter 5.3.5	Sections 5.3.2 diffuse sources (1) 5.3.3 (2)

[40] Due to lack of data on pollutant quantities reaching rivers from diffuse sources, an exact assessment is not possible. However, studies conducted in other rivers in the world demonstrate that the proposed actions within the framework of the plan can bring about a reduction of up to 80% in nutrient loads reaching the river.
[41] If the proposed action is implemented in the framework of "river rehabilitation" activities – without additional cost or a minimal addition cost, then from the oint of view of the NAP, the additional cost would be practically zero.
[42] The final cost required for rehabilitation of the total minimum number of kilometers of the problematic sections along the rivers.

Number	Subject	Proposed Action	% Reduction[35]	Cost to Economy PV ($ million)[36]	Action Plan	Responsibility for Implementation and Burden Sharing	Points for Monitoring and Control[37]	Textual Reference
14	Fishponds	Developing a pilot project to assess the most efficient treatment method for water emissions from fishponds	>90	(0) 33	Within the framework of the project, discharge of fishpond water to an operational treatment pond and treatment to reduce pollution levels. Establishment of priorities for treating the fishpond waters discharged to the coastal rivers within five years after implementation of the pilot.	Responsibility for implementation: Ministry of the Environment	Five-year follow up	Sections 5.3.2 (2) 5.3.3 (3)

Number	Subject	Proposed Action	% Reduction[35]	Cost to Economy PV ($ million)[36]	Action Plan	Responsibility for Implementation and Burden Sharing	Points for Monitoring and Control[37]	Textual Reference
15	Removal of pollutants from urban drainage water	Diverting the flow of urban runoff to constructed wetlands	NA	(0) 11.8	Follow up of the educational pilot conducted by the Yarkon River Authority in the "seven mills" site in the Yarkon River, establishment of constructed wetlands after completion of the pilot project	Responsibility for implementation: Ministry of the Environment, Water Commission Burden sharing: Local authorities	Five-year follow-up	Section 5.3 – removal of total organic carbon, total nitrogen, total phosphorus, toxic organic compounds and heavy metals from urban drainage water – (1) Section 5.3.3 (4)

Number	Subject	Proposed Action	% Reduction[35]	Cost to Economy PV ($ million)[36]	Action Plan	Responsibility for Implementation and Burden Sharing	Points for Monitoring and Control[37]	Textual Reference
16	Rehabilitation of coastal rivers	Formulating an agreed master plan, in a planning process with the participation of professionals from different disciplines (planning, ecology, hydrology, drainage, economics, tourism, etc.), and the public	NA	NA	Completion of master plans for all coastal rivers by 2010. Implementation of the master plan recommendations by the year 2020.	Responsibility for implementation: Ministry of the Environment, River Administration, Jewish National Fund	Five-year follow-up	Section 4.2.5.3 5.5.2, subsection 1

Number	Subject	Proposed Action	% Reduction[35]	Cost to Economy PV ($ million)[36]	Action Plan	Responsibility for Implementation and Burden Sharing	Points for Monitoring and Control[37]	Textual Reference
17	-"-	Formulating a statutory outline scheme as a basis for the master plan, protecting coastal open spaces and designating areas for controlled development	NA	NA	Preparation of a dedicated national outline scheme	Responsibility for implementation: Ministry of the Environment, Ministry of the Interior, Nature and Parks Authority	Five-year follow up	Sections 4.2.5.3 5.5.2 subsection 2
18	-"-	Allocating water quantities for discharge to rivers	NA	NA	See chapter 5.5.2, subsection 3	Responsibility for implementation: Water Commission, Ministry of the Environment Burden sharing To be determined by the Ministry of Finance and the Water Commission	Five-year follow up	Sections 4.2.5.3 5.5.2 subsection 3
19	-"-	Determining water quality for discharge to rivers according to specific requirements for survival of each river's population	NA	NA	See chapter 5.5.2, subsection 4	Responsibility for implementation: Ministry of the Environment	Five-year follow up	Sections 4.2.5.3 5.5.2 subsection 4

Number	Subject	Proposed Action	% Reduction[35]	Cost to Economy PV ($ million)[36]	Action Plan	Responsibility for Implementation and Burden Sharing	Points for Monitoring and Control[37]	Textual Reference
20	-"-	Changing the structure of the river channel and rehabilitating habitats	See No. 13	See No 13	See chapter 5.3.2 diffuse sources, section 1	Responsibility for implementation: River administrations, Ministry of the Environment	Five-year follow up	Sections 4.2.5.3 5.3.2 diffuse sources (1)
21	-"-	Biodiversity rehabilitation	-"-	-"-	-"-	-"-	-"-	-"-

6.4 Solid Sector – Urban Solid Waste

Number	Subject	Proposed Action	% Reduction[35]	Cost to Economy PV ($ million)[36]	Action Plan	Responsibility for Implementation and Burden Sharing	Points for Monitoring and Control[37]	Textual Reference
22	Regulating the urban solid waste treatment system in every city with more than 100,000 inhabitants[43]	Shutting down dumps and switching to sanitary landfills	NA	(0)	Implemented			Section 4.2.4.3
23	Old dumps	Rehabilitating old dumps which were shut down and have high real estate potential	NA	(0) 35.6	See section 5.4.4 Table 11	Responsibility for implementation: Ministry of the Environment, local authorities or associations of towns Burden sharing: Funding by local authorities and return from sales or leasing. Funding by buyer or leaser.	Five-year follow up	Sections 4.2.4.3 5.4.1 (2) 5.4.2 (2) 5.4.4 Table 11

[43] SAP target for implementation by 2005

Number	Subject	Proposed Action	% Reduction[35]	Cost to Economy PV ($ million)[36]	Action Plan	Responsibility for Implementation and Burden Sharing	Points for Monitoring and Control[37]	Textual Reference
24	Construction and demolition waste	Waste recycling – separating the problematic components from urban waste as part of the waste's pretreatment	NA	434	By 2025 – distribution of recycling facilities for construction waste throughout Israel	Responsibility for implementation: Ministry of the Environment, Israel Lands Administration, local authorities or associations of towns Burden sharing: Waste producers, building and development contractors, the public (home renovations)	Five-year follow up	Sections 4.2.4.3 5.4.1 (3) 5.4.2 (3)

Number	Subject	Proposed Action	% Reduction[35]	Cost to Economy PV ($ million)[36]	Action Plan	Responsibility for Implementation and Burden Sharing	Points for Monitoring and Control[37]	Textual Reference
25	-"-	Preparation of landfills for construction waste, in quarries in which mining work is completed	NA	(0) 4[44]	By 2014: Establishment of regulated sites (some 20) for the disposal of construction waste	Responsibility for implementation: Ministry of the Environment, Ministry of the Interior, Israel Lands Administration Burden sharing: Waste producers, building and development contractors, the public (home renovations	Five-year follow up	Sections 4.2.5.3 5.4.1 (4)

[44] Cost of solutions at preliminary planning level not including cost of establishment and operation.

6.4 Coastal Sector

Number	Subject	Proposed Action	% Reduction[35]	Cost to Economy PV ($ million)[36]	Action Plan	Responsibility for Implementation and Burden Sharing	Points for Monitoring and Control[37]	Textual Reference
26	Conservation of marine habitats and open coastal areas	Preparing a new statutory document to express a comprehensive vision of coastal areas worthy of conservation and to provide statutory protection to marine and coastal habitats	NA	NA	See discussion in chapter 5.5.1, subsection 1	Responsibility for implementation: Ministry of the Environment in cooperation with NGOs	Routine follow-up of implementation	Sections 4.2.5.2 5.5.1 subsection 1
27	-"-	Preparation of a national policy to protect the Mediterranean Sea coastline	NA	NA	See discussion in chapter 5.5.1 subsection 2	Responsibility for implementation: Prime Minister's Office, Ministry of the Environment in cooperation with the Ministry of the Interior	Routine follow-up of implementation	Sections 4.2.5.2 5.5.1 subsection 2

Number	Subject	Proposed Action	% Reduction[35]	Cost to Economy PV ($ million)[36]	Action Plan	Responsibility for Implementation and Burden Sharing	Points for Monitoring and Control[37]	Textual Reference
28	-"-	Preparing a procedure to assimilate the NAP in environmental assessment processes of statutory plans	NA	NA	See discussion in chapter 5.5.1 subsection 3	Responsibility for implementation: Ministry of the Environment	Routine follow-up of implementation	Sections 4.2.5.2 5.5.1 subsection 3
29	-"-	Defining a procedure to assimilate the NAP goals and targets in the Ministry of the Environment's requirements within the Business Licensing Law	NA	NA	See discussion in chapter 5.5.1 subsection 4	Responsibility for implementation: Ministry of the Environment	Routine follow up of implementation	Sections 4.2.5.2 5.5.1 subsection 4

Number	Subject	Proposed Action	% Reduction[35]	Cost to Economy PV ($ million)[36]	Action Plan	Responsibility for Implementation and Burden Sharing	Points for Monitoring and Control[37]	Textual Reference
30	Prevention of alterations to the natural coastline	Operation of a long-term national monitoring plan for the coastline and coastal cliff	NA	NA	See discussion in chapter 5.5.3	Responsibility for implementation: Joint committee of the Ministry of the Environment, Israel Lands Administration, Ministry of the Interior, Ministry of Tourism, Ministry of Infrastructures, Ministry of Construction and Housing, Ministry of Finance, Ministry of Transport, coastal local authorities and bodies such as the Antiquities Authority, Nature and Parks Authority, etc.	Routine follow-up of implementation	Sections 4.2.5.4 5.5.3

6.5 Hot Spots

Number	Subject	Proposed Action	% Reduction[35]	Action Plan	Points for Monitoring and Control[36]	Textual Reference
31	Na'aman River outfall	Directing domestic sewage which is not highly treated to WTPs, pretreatment in plants in order to comply with Inbar Committee standards for discharge to rivers, treatment of fishpond water and cessation of their discharge to the river.	> 90	Directing the wastewater of Kfar Masrik and Ein Hamifratz to the Acre WTP, pretreatment in Miluban, compliance with Inbar Committee standards for discharge to rivers, high priority to establishing a dedicated WTP for fishponds.	Three-year follow up	Sections 4.2.6 5.6.1

Number	Subject	Proposed Action	% Reduction[35]	Action Plan	Points for Monitoring and Control[36]	Textual Reference
32	Haifa Bay	Compliance with Inbar Committee standards for discharge to rivers or direct discharge to the sea in compliance with criteria of the Ministry of the Environment	NA	Pretreatment and compliance with Inbar Committee standards for discharge to rivers. Plants which cannot comply with Inbar Committee standards will discharge their wastewater directly to sea while complying with criteria of the Ministry of the Environment on quantity and quality of brines permitted for discharge to sea. High priority to establishing a dedicated WTP for fishponds.	Three-year follow up	Sections 4.2.6 5.6.1

Number	Subject	Proposed Action	% Reduction[35]	Action Plan	Points for Monitoring and Control[36]	Textual Reference
33	Shafdan	Cessation of all discharge of Shafdan sludge to sea	100	Cessation of discharge to sea by 2008	2008	Sections 4.2.6 5.6.1
34	Ashdod	Treatment of direct discharges from plants	NA	Promotion of advanced pretreatment of industrial wastewater at source – in the plants, and enforcement of quality and quantity of industrial wastewater permitted for disposal to sea	Three-year follow up	Sections 4.2.6 5.6.1

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8. APPENDIXES

8.1 APPENDIX 1: UPDATES OF BASELINE BUDGET FOR THE YEAR 2003

A. Introduction

The Baseline Budget (BB)[1] data for 2003 constitute the basis for calculating the necessary reduction levels for the release of the different pollutants from land-based sources to the Mediterranean Sea. Therefore, it is of vital importance to update them.

Since the pollutant budget is dynamic, a decision was made to review the data summarized in April 2004 to check whether it included all of the measurements taken in the latter part of 2003.

The NAP expert team reviewed the data summarized in the BB document of April 2004 – with each expert relating to the pollutant sector in his realm of expertise – and the findings were updated where necessary. The present document summarizes the result.

It should be noted that the BB document accurately reflects the budget of pollutants flowing into the Mediterranean Sea in 2003. However, as evidenced by the data in the current document, a number of updates were required.

[1] BB document, Ron Komar, April 2004

B. Summary of Data by Sectors

B1 General

The SAP guidelines define seven sectors, some of which relate to a source of pollution (e.g., urban sewage) and some to a type of pollutant (e.g., organohalogens). Since there is an overlap between data which relate to sectors of the first type and those that relate to sectors of the second type, it was decided to classify the updates to the BB document for the year 2003, according to four sectors which classify the pollutants according to their source.

Municipal sewage and industrial wastewater were combined into one sector since there is a major overlap between these two sources due to the fact that municipal sewage also includes the contribution from non-domestic sources. Since a major part of the effluents reach the sea through rivers, which also release pollutants from other sources (e.g., agricultural sources), the sector dealing with marine pollution by effluents was defined as "the liquid sector."

It was decided not to relate to solid waste from industrial sources in the above-mentioned data in light of the major efforts that has been invested in this area by the Ministry of the Environment. As a result of these efforts, there is currently no direct contribution of solid waste from industrial installations to marine pollution.

B. 2 Emissions of Air Pollutants to the Mediterranean Sea

B.2.1. Emission Update

Data on emission quantities which were included in the original BB report were reviewed and a small number of amendments and updates were made. Table 1.1 below presents the lists of air pollutants and emission quantities recorded in the original report along with amended/updated emission values and explanations for these changes.

Table 1.1: Update of BB for Air Pollutant Emissions to the Mediterranean Sea (kg/year)

Pollutant	2003 Base BB Report	2003 Base Amended/Updated	Description of Amendment/Update
Arsenic	1,542	1,542	None
Benzene	3733	3,733	None
Benzo(a)anthracene	1.23	1.23	None
Benzo(a)pyrene	0.12	0.12	None
Benzo(b,j,k)fluoranthene	0.72	0.72	None
Benzo(g,h,I)perylene	0.76	0.64	Value included in summary table (table 19) did not match the sum of this pollutant according to the calculations for the categories. It was a amended according to the sum of emissions appearing in the categories
Biphenyl	7.13	7.10	None
Cadmium	270	270	None
Chlorobenzene	18	18	None
Chromium	989	989	None
Chromium (VI)	312	312	None
Copper	430.7	430.7	None
Fluoranthene	3.48	3.48	None
Fluorides	9.3E+03	1.02E+04	Value included in summary table (table 19) did not match the sum of this pollutant according to the calculations for the categories. It was a amended according to the sum of emissions appearing in the categories
H2S	1.08E+06	1.07E+06	None
HCl	5.75E+04	5.75E+04	None
Indo(1,2,3,-cd)pyrene	0.72	0.72	None
Lead	2,078	2,078	None
Mercaptans	4.77E+05	4.77E+05	None
Mercury	545	545	None
Napthalene	41	41	None
Nickel	2.14E+04	2.14E+04	None

Pollutant	2003 Base BB Report	2003 Base Amended/Updated	Description of Amendment/Update
NOx	8.59E+07	1.34E+08	NOx emission values for vehicles in urban centers were corrected from + E07 3.60 ton/year to + E07 8.43 tons/year according to Central Bureau of Statistics data and multiplication by 1.06 growth rate factor from 2001 to 2003.
PAH	638	928	Addition of POM emissions from category 10.2, consumption of oil for energy generation, at a rate of 290 kg/year, to the sum of the PAH, not undertaken in the BB
Particulate Matter	3.61E+06	5.39E+06	PM emission values from vehicles in urban centers were amended from 1.40 + E06 tons/year to + 3.18 + E06 tons/year according to Central Bureau of Statistics data and multiplication by a 1.06 growth rate factor from 2001 to 2003.
PCDD/PCDF	19	19	None
Phenanthrene	12.7	13	None
Phenol	126	126	None
SO_2	6.24E+07	6.24E+07	None
Toluene	2.94E+03	1.20E+06	In the BB, in category 12, pharmaceutical production, the emission quantity was 1,200 tons/year and the value was not multiplied by 1,000 to convert it to kg/year to match it to the summary table, table 19
Vinyl Chloride	5.36E+05	5.36E+05	None
VOC	3.26E+07	3.20E+07	Change of the sums in table 6 in the BB in category 1.1 (refineries) and change in the value of VOC emissions from vehicles in urban centers from 2.76 +E07 tons/year to 2.89 +E07 tons/year according to Central Bureau of Statistics data and multiplication by a 1.06 growth rate factor from 2001 to 2003.

B.3 The Liquid Sector

Data submitted in the original BB report were largely based on 2001 data. Pollution loads reaching the sea via rivers have substantially decreased in the period between 2001 and 2003 due to the construction and operation of additional wastewater treatment plants and increased effluent use for agricultural irrigation as an alternative to discharge to rivers.

Updated data provided by the Water and Rivers Division of the Ministry of the Environment for pollutant loads to rivers in 2003 were incorporated into Table 3 of the original BB report.

In addition, nutrients quantities which were included in the original BB report were compared to updated reports on coastal water quality monitoring in Israel for the years 2002 and 2003 which were conducted by Israel Oceanographic and Limnological Research (Herut *et al.* 2003, 2004).

Table 1.2: Update of the BB for Pollution Loads Discharged to Main Rivers Draining to the Mediterranean Sea (ton/year)

Rivers by Districts	Pollutant Load					
	Total Organic Carbon (BB)	Total Organic Carbon (Update)	Total Nitrogen (BB)	Total Nitrogen (Update)	Total Phosphorus (BB)	Total Phosphorus (Update)
Total North	**482**	**391**	**155**	**271**	**89**	**43**
Haifa District						
Hadera	531	446	356	376 (1836 - see explanatory note*)	212	59
Kishon	983	818	630	610	545	51
Tanninim	336	84	82	124	0.2	31
Total Haifa	**1850**	**1348**	**1068**	**1110**	**788**	**110**
Central District						
Alexander	1856	600	416	252	161	25
Poleg	35	32	22	44	78	20
Soreq	1080	1017	1338	249	388	21
Total Central	**2971**	**1649**	**1776**	**545**	**627**	**66**
Tel Aviv District						
Ayalon	741	376	376	556 (Ayalon+Yarkon)	228	107 (Ayalon+Yarkon
Yarkon	313	730	454		148	
Total Tel Aviv	**1471**	**689**	**830**	**556**	**376**	**107**
Southern District						
Lachish	69	86	27	139	11	30
Besor	1985	1451	585	324	290	77
Total South	**2054**	**1537**	**612**	**463**	**301**	**107**
Total Liquid Emissions	**8,828**	**5,614**	**4,441**	**2,945**	**2,181**	**433**

Explanatory Note

There is a disparity between the data sources which appeared in the original BB report and the data sources in the reports of the Israel Oceanographic and Limnological Research (IOLR). While the original BB report is based on data provided by the Water and Rivers Division of the Ministry of the Environment, which were published in 2002 and relate to discharges to rivers in 2001, the data provided by IOLR (Herut *et al*) relate to measurements in river mouths in the years 2002 and 2003. In addition, the BB data do not include the contribution of nitrogen from non-point sources. Nevertheless, it is difficult to explain the difference between the IOLR assessment on the contribution of total nitrogen from the Hadera River in 2003 and the BB assessment. It is difficult to assume that the contribution of nitrogen from non-point sources in the Hadera River is four times higher than the contribution from point sources. The most reasonable explanation for this major discrepancy may be an assessment error. The data of the Water and Rivers Division for 2003 (376 tons/year) appear more reliable.

In addition to assessing the pollutant load discharged to the sea via rivers, as described above, two more sources were checked in the BB calculations: data on the discharge of pollutants directly to sea, based on "discharge permits to sea" and pollution loads from industry. These data remain unchanged.

B.4 Urban Solid Waste

Updates for the BB data were not required.

B.5 Integrated Coastal Management

B.5.1 General

Since the original BB report did not relate to the subject of coastal management, this section constitutes an addition rather than an update to the document.

In the integrated coastal management sector, the NAP guidelines generally relate to only two areas: preservation of coastal and marine habitats and prevention of physical alterations to the coastline.

In the area of habitat conservation, the integrated management chapter broadly relates to two components:

a. Preservation of marine habitats and open coastal areas;
b. Rehabilitation of coastal rivers.

In the area of prevention of physical alterations to the coastline, the NAP guidelines call for assessing the implementation of control systems for granting permits to projects which are liable to cause changes to the coastline.

B.5.2 Marine and Coastal Habitats: 2003

- **Preservation of marine habitats and open coastal areas**

  The state of Israel's coastal habitats in the base year was described in detail in the "Policy Document on Conserving the Sands of the Coastal Plain." A comprehensive review of trends in the sandy and coastal habitats since the 1940s shows a significant reduction in sand areas in the coastal plain. According to the policy document, in the base year, there were only 18,500 hectares of sand areas, of which 8,000 hectares were disturbed areas.

  Damage to sand habitats in the coastal plain has resulted from three major factors:

  a. Accelerated urban development leading to a significant increase in residential construction as well as road paving and infrastructure development. In parallel, local, district and national outline schemes (not yet implemented) have been approved which designate sand areas for development.
  b. Illegal mining of sand for the cement industry due to the severe deficiency of this raw material and the steep rise in its price. It is estimated that by 2003, some 60 MCM of sand dunes in the coastal plain had been mined. In 2001, a

plan for sand mining from the Negev was approved in order to divert the source of sand consumption and reduce levels of illegal mining.

c. Establishment of marine structures led to changes in the longshore sand transport. Damage to coastal habitats is reflected in damage to flora and fauna which resulted in the extinction of several species and thereby catalyzed the Nature and Parks Authority to declare the sand and red soil (*hamra*) lands as endangered habitats. In addition, the natural landscape of the coastal plain have been disturbed. Sand areas have been identified as unique elements in this landscape formation and their decline constitutes a landscape disturbance.

Some of the sand areas on the coastal plain were identified as important habitats for conservation and have been defined as nature reserves. Other coastal areas were identified as important for leisure and recreation activities and as areas of historical and archeological importance. These areas have been defined as national parks. Additional nature conservation areas in the sea region have been defined as marine reserves. These designations were made within the framework of the National Parks, Nature Reserves, National Sites and Memorial Sites Law, 1998.

- **Rehabilitation of the Coastal Rivers: 2003**

Yarkon River:

In 1988, the Yarkon River Authority was established under the Streams and Springs Authorities Law, 1965. This river authority, the first of its type, began its river rehabilitation efforts by preparing a comprehensive master plan for the Yarkon River which was adopted by the government in 1996. It also promoted the approval of two partial district outline schemes which determine land designations in the environs of the river, especially open spaces. As of 2003, the outline schemes have not been deposited.

The river authority has had difficulties in rehabilitating water quality in the river, both due to minute allocations of fresh water and due to the large number of pollution sources, both permanent and short-term, along the river. Nevertheless, significant improvement in water quality has occurred due to the operation of the Kfar Saba-Hod

Hasharon WTP, the operation of the Ramat Hasharon WTP and the implementation of a solution to the wastewater of Kalkilya and Alfei Menashe.

Ayalon River:

Partial district outline schemes are in preparation and encountering major conflicts with development pressures. As a result of the operation of the Ayalon WTP, some 12 MCM/year of secondary level effluents are discharged to the river. Main polluters include Beit Dagan which discharges raw sewage, Ben-Gurion International Airport which discharges low quality effluents and the municipality of Yehud.

Wastewater and effluents which are discharged to the river are pumped at the entrance to the cement tunnel of Netivei Ayalon and are transferred for treatment to the Shafdan (Dan Region Wastewater Treatment Plant).

Kishon River:

In 2003/4, the Ministry of the Environment's master plan for removal of industrial effluents in the Kishon River system was resubmitted (it cancelled the previous plan, which was proposed in 2001, for the direct disposal of industrial effluents following treatment via a marine outfall to the sea). The new plan requires the Kishon industrial plants to treat their wastewater to the level required for release within the framework of the river rather than by means of a marine outfall (this solution requires the industrial plants to undertake sound treatment to the level required for release of wastewater to rivers so that it can be removed within the framework of the river rather than a marine outfall). This solution is not a full solution.

Alexander River:

In 1995, a river rehabilitation master plan was approved by the planning authorities – the local and district committees. The master plan related to many components including development of the spatial area of the river as part of an open space system and rehabilitation of the river's ecosystem, *inter alia*, by improving water quality. The statutory outline scheme for the river is in advanced stages of approval. As part of the

effort to improve water quality, a wastewater treatment facility for treating the sewage of the Nablus River was established and park areas were developed along the riverbanks.

Hadera River:

By 2003, a river rehabilitation plan was prepared and preliminary development activities were undertaken to develop a park downstream in cooperation with the Israel Electric Corporation, which constructed a power plant along the riverbank in the river mouth.

Soreq River:

A river rehabilitation master plan was prepared. Improvements in water quality occurred as a result of the connection of the following communities and local authorities to wastewater treatment plants - Rehovot, Jerusalem area communities, Kibbutz Yesodot and Palmachim. The river administration, which was set up, has begun to implement park development along the riverbanks.

Lachish River:

The river administration, which was set up in 1995, prepared a river rehabilitation master plan. The plan was approved in 2000 and has been partially implemented through the development of a park along the southern bank of the river downstream.

Tanninim River:

In 1998, a river rehabilitation administration was set up. Preparation of a master plan was completed in 2001. Partial cessation of pollution discharge to the river was achieved when several communities were connected to wastewater treatment plants – Or Akiva, Binyamina, Caesarea as well as the fishponds of Ma'agan Michael – and when solutions were found to the wastewater of other agricultural communities.

Na'aman River:

A river rehabilitation administration was set up and a river rehabilitation master plan was completed in 2003.

- **Prevention of Alterations to the Physical Coastline: 2003**

There are major differences in expert opinions regarding the quantity of sand transported along the coasts of Israel. According to Ministry of the Environment estimates, the main source of sand to Israel's coasts is the longshore current which transports sand from the Nile Delta and Sinai coasts and contributes some 400 thousand m^3/year. An additional 200 thousand m^3/year are contributed by erosion of the coastal cliffs. Some 100 thousand m^3/year are "lost" in the Haifa Bay area. Additional coastal sand loss is caused by wind which carries the sand granules landward.

The following table presents the estimated annual average of sand quantities transported along the coasts of Israel based on multi-annual data.

Table 1.3: Assessment of the Annual Average of Sand Quantities Transported along Israel's Coasts

Site	Gaza	Ashkelon	Ashdod	Bat Yam	Herzliya	Hadera	Haifa
Distance in km	0	20	40	63	83	115	150
Annual average based on multi-annual data (m^3)	400,000	360,000	300,000	275,000	230,000	] 170,000	100,000

Significant alterations to Israel's coastline have been caused by human intervention in two major ways:

a. Mining of large quantities of coastal sand for building and development purposes.
b. Construction of marine structures which caused changes in sand supply to the coast and trapped large quantities of sand.

B.6 Hot Spots

B.6.1. General

The BB report relates to the total quantities of pollutants reaching the Mediterranean Sea through water sources (Table 4 in the BB report), but it does not relate to sensitivity areas as defined by the Ministry of the Environment.

The four sensitivity areas, as defined by the Ministry of the Environment for 2005, are: the Na'aman River outlet, Haifa Bay, the Shafdan outlet, and the Ashdod coast. Another site previously reported as an additional hot spot (Acre/ Nahariya) was removed from the list of hot spots in Israel when the Frutarom plant, which was the main contributor, was shut down. Sensitivity areas still in existence require special treatment.

B.6.2. Review and Update of the Hot Spots

The data used to assess the state of marine pollution in hot spots (weight per year) in the base year (2003) were obtained from data published in February 2005 by the Ministry of the Environment for 2003. When Environment Ministry data were not available (e.g., Na'aman mouth), data from the 2003 report of Israel Oceanographic and Limnological Research (IOLR) were used. Data of the different sources which drain into each of the above-mentioned hot spots were summarized and the result represents the contributions to each site in 2003.

As stated, the BB does not specifically relate to hot spots. Data presented in the following table on Haifa Bay, the Shafdan and Ashdod are based on Ministry of the Environment data. The Ministry of the Environment does not have data for the Na'aman River. On the other hand, the IOLR report includes data on the annual contributions of nutrients from the Na'aman River. Therefore, data on fertilizers which appear in the following table for the river outlet are based on the 2003 IOLR report.

Therefore, conditions for 2003 should be updated according to the data presented in the following table:

Table 1.4: Nutrient Contributions (tons/year) in Hot Spots in 2003

Nutrient	Na'aman Outlet	Haifa Bay	Shafdan	Ashdod	Total
Total Nitrogen (TN)	271	996	2,820	368	4,455
Dissolved Phosphorus (SRP)	43	229	1,388	2.64	1,654
Total Organic Carbon (TOC)	482	970	11,410	871	13,733

The data in the table show that in 2003, some 14,000 tons of organic material, some 4,500 of nitrogen and some 1,600 tons of phosphorus were discharged to the Mediterranean Sea hot spots.

Heavy Metals

The BB update for annual emissions of heavy metals in sensitivity areas is based on Ministry of the Environment data for 2003. Data for the Na'aman River are not available at the Ministry of the Environment. On the other hand, the BB report includes data for the Northern District (Table 4) and based on these data it appears that the only source of discharge to the sea in this district is the Na'aman River. Therefore, the data in the following table for the Na'aman River outlet are data extracted from the BB.

Table 1.5: Contributions of Heavy Metals (kg/year) in Hot Spots in 2003

Metal	Na'aman Outlet*	Haifa Bay	Shafdan	Ashdod	Total
Zinc (Zn)	2,400	3,669	42,402	190	48,661
Chromium (Cr)	140	154	2,999	24	3,317
Copper (Cu)	600	515	12,467	77.7	13,660
Silver (Ag)	53	NA	1,611	NA	1,664
Nickel (Ni)	200	623	1,764	22.2	2,609
Lead (Pb)	106	301	1,573	0	1,980
Tin (Sn)	NA	NA	1,561	NA	1,561
Cobalt (Co)	NA	NA	102	NA	102
Cadmium (Cd)	52	5.8	141	0	199
Mercury (Hg)	71	7.6	65.3	0	144

* Data on Na'aman River mouth obtained from the BB.
NA = Not Available

The data reveal that the main contributor of all of the heavy metals (excluding mercury) to the hot spots is the Shafdan outfall. The contribution from this source is larger by at least one factor than all the contributions of each of the other sources.

Organic hydrocarbons

The BB update for annual emissions of organic hydrocarbons in the hot spots is based on Ministry of the Environment data for 2003. Data for the Na'aman River are not available at the Ministry of the Environment. On the other hand, the BB report includes data for the Northern District (Table 4), and based on these data, it appears that the only source of discharge to sea in this district is the Na'aman River. Therefore, the data in the following table for the Na'aman River mouth are data extracted from the BB.

Table 1.6: Organic Hydrocarbon Contributions (kg/year) in Hot Spots in 2003

Pollutant	Na'aman Outlet	Haifa Bay	Shafdan	Ashdod	Total
Oils & Fats	389	55.8	3.47	2.5	450.8
Mineral Oil	NA	40.15	0.62	17.9	58.8
Herbicides	NA	NA	NA	85.75	85.75
Dimythylamine DMA	NA	NA	NA	11.6	11.6
Methyl Isobutyl Ketone MIBK	NA	NA	NA	74.2	74.2
Aromatic Solvents	NA	NA	NA	2	2
Bromocil	NA	NA	NA	5.25	5.25
Phenol	0.4	0.12	NA	7.85	8.4
Methanol	NA	3.74	NA	0.87	4.6
GC-MS	NA	NA	NA	14.6	14.6
Carzol	NA	0.06	NA	5.1	5.2
Benzene	NA	0.01	NA	1.87	1.9
Toluene	NA	0.01	NA	2.67	2.7
Ethylene dichloride (EDC)	4.4	2.3	NA	NA	6.7
BTX	NA	0.096	NA	NA	0.01
Isoamylalcohol	NA	0.024	NA	NA	0.02

(NA = Not Available)

8.2 APPENDIX 2: MEMBERS OF THE STEERING COMMITTEE

Members of the Limited Steering Committee in the Ministry of the Environment

Dr. Motti Sela	Head, Business Licensing Division and NAP Coordinator
Rani Amir	Head, Marine and Coastal Environment Division
Dr. Yeshayahu Bar-Or	Chief Scientist
Ori Livne	Head, International Relations Division
Nir Kedmi	Economist, Environmental Economy Division

Members of the Extended Steering Committee in the Ministry of the Environment

Ilan Nissim	Head, Solid Waste Division
Iris Shalit	Attorney
Baruch Weber	Head, Industrial Effluent and Contaminated Soil Division
Gili Zimand	Deputy Head, Hazardous Substances Division and Poisons Permit Officer
Dr. Yael Mason	Officer, Municipal Wastewater
Nimrod Otiz	Deputy Head, Marine and Coastal Environment Division
Robert Reuven	Director, Haifa Region
Shlomo Katz	Director, North Region
Shuli Nezer	Head, Air Quality Division
Avi Moshel	Officer in Charge of Vehicular Air Pollution
Eugenia Bernshtein	Officer in Charge of Energy Sources
Gidi Bressler	Marine and Coastal Environment Division (planning representative)
Ilan Malester	Marine and Coastal Environment Division

Members of the Interministerial Steering Committee

Ehud Yechieli	Ministry of Infrastructure
Uri Rozin	Municipal environmental units and associations of towns
Orli Ziv	Water Commission
Ilana Shafran	Planning Administration, Ministry of the Interior
Alona Karo	NGO representative
Benni Rozanski	Ministry of Transport
Dr. Avi Perevelosky	Public representative
Victor Weiss	Israel Defense Force
Horhe Trechichki	Ministry of Agriculture
Yossi Aryeh	Israel Manufacturers Association
Adv.Gidon Bromberg	Friends of the Earth Middle East
Eran Pollack	Ministry of Finance
Shlomo Lerman	Ministry of Health

8.3 APPENDIX 3: LIQUID SECTOR

Wastewater (I)

A. Direct Discharge to Sea

Table 3.1.1: Data on direct discharge to sea in the years 2003 and 2004 by pollutant and polluting plant (kg/year)

Pollutant	Factory/ Polluter	Quantity of Pollutant 2003 (kg/year)	Quantity of Pollutant 2004 (kg/year	Contribution to Pollution in 2004[1]
Total Organic Carbon (TOC)	Agan	871,000	938,000	65.1%
	Argaman	227,000	40,613	2.8%
	Ashdod Refineries	144,000	264,008	18.3%
	Herzliya Treatment Plant	167,000	169,216	11.7%
	Frutarom	14,654	13,078	0.9%
	Telma	14,300	7,253	0.5%
	EIL	56,970	8,320	0.6%
Total: Total Organic Carbon		**1,494,924**	**1,440,488**	**100%**
Benzene	Ashdod Refineries	1,870	1,607	100%
Total Benzene		1,870	1,607	100%
Methanol	Agan	865,000	752,000	99.2%
	Frutarom	15,000	5,140	0.7%
	EIL	3,738	845	0.1%
Total Methanol		**883,738**	**757,985**	**100%**
Toluene	Agan	0	7,961	76.3%
	Ashdod Refineries	2,670	2,459	23.6%
	Frutarom	24	16	0.2%
Total Toluene		**2,694**	**10,436**	**100%**
Mercury (Hg)	Agan	0	0.19	0.2%

[1] The highest contributions to the pollution load in 2004 are colored in red for emphasis.

Pollutant	Factory/ Polluter	Quantity of Pollutant 2003 (kg/year)	Quantity of Pollutant 2004 (kg/year	Contribution to Pollution in 2004[1]
	Ashdod Refineries	0	0.40	0.5%
	EIL	4	0.75	1.0%
	Shafdan	65	77	98.3%
Total Mercury		**69**	**78**	**100%**
Chromium (Cr)	Agan	6	4	0.1%
	Argaman	59	11	0.3%
	Ashdod Refineries	18	27	0.6%
	Milotal	4	4	0.1%
	Nahariya	874	888	21.2%
	Acre	29	29	0.7%
	Frutarom	0.1	0.4	practically 0%
	Shafdan	2,999	3,217	77.0%
Total Chromium		**3,989**	**4,179**	**100%**
Cadmium (Cd)	EIL	3	0.87	0.7%
	Shafdan	141	130	99.3%
Total Cadmium		**144**	**131**	**100%**
Lead (Pb)	Ashdod Refineries	0	3	0.2%
	Milotal	2	2	0.1%
	Nahariya	26	26	1.8%
	Frutarom	0.10	0.03	practically 0%
	EIL	33	11	0.8%
	Shafdan	1,573	1,363	97.0%
Total Lead		**1,634**	**1,405**	**100%**
Copper (Cu)	Agan	61	173	1.3%
	Argaman	67	12	0.1%
	Ashdod Refineries	17	9	0.1%
	Milutal	17	16	0.1%
	Herzliya Treatment Plant	140	88	0.6%
	Nahariya	859	872	6.4%
	Acre	172	172	1.3%
	Frutarom	0.73	0.19	practically 0%
	Kibbutz Ma'agan Michael	10	19	0.1%
	Telma	11	10	0.1%
	EIL	27	9	0.1%
	Shafdan	12,467	12,242	89.9%
Total Copper		**13,847**	**13,621**	**100%**
Zinc	Agan	15	22	practically 0%
	Argaman	127	23	0.1%

Pollutant	Factory/ Polluter	Quantity of Pollutant 2003 (kg/year)	Quantity of Pollutant 2004 (kg/year	Contribution to Pollution in 2004[1]
	Ashdod Refineries	175	188	0.4%
	Milutal	55	55	0.1%
	Herzliya Treatment Plan	1,581	839	1.9%
	Nahariya	2,463	2,502	5.6%
	Acre	860	860	1.9%
	Frutarom	10	3	practically 0%
	Kibbutz Ma'agan Michael	52	96	0.2%
	Telma	81	79	0.2%
	EIL	37	13	practically 0%
	Shafdan	42,402	39,686	89.5%
Total Zinc		**47,859**	**44,365**	**100%**
Nickel	Agan	2	21	0.6%
	Ashdod Refineries	20	1	practically 0%
	Milutal	4	4	0.1%
	Herzliya Treatment Plan	13	0	practically 0%
	Nahariya	1,952	1,983	52.9%
	Frutarom	0.02	0.01	practically 0%
	Kibbutz Ma'agan Michael	11	20	0.5%
	Telma	32	31	0.8%
	EIL	44	15	0.4%
	Shafdan	1,764	1,674	44.7%
Total Nickel		**3,842**	**3,748**	**100%**
Nitrate (NO_3)	Agan	1,786	3,098	9.8%
	Argaman	3,675	656	2.1%
	Herzliya Treatment Plant	3,380	2,699	8.5%
	Nahariya	4,088	4,153	13.1%
	Acre	5,162	5,162	16.2%
	Kibbutz Ma'agan Michael	5,731	10,571	33.3%
	Shafdan	395	4,085	12.9%
	Telma	996	1,347	4.2%
Total Nitrate		**25,213**	**31,771**	**100%**
Total Suspended Solids (TSS Flow)	Agan	10,546	12,824	practically 0%
	Argaman	88,000	15,722	practically 0%

Pollutant	Factory/ Polluter	Quantity of Pollutant 2003 (kg/year)	Quantity of Pollutant 2004 (kg/year	Contribution to Pollution in 2004[1]
	Ashdod Refineries	32,600	24,491	0.1%
	Milutal	194,918	194,535	0.4%
	Herzliya Treatment Plant	134,000	148,794	0.3%
	Nahariya	2,757,356	2,800,962	5.8%
	Acre	1,281,940	1,281,940	2.6%
	Frutarom	263	520	practically 0%
	Kibbutz Ma'agan Michael	156,300	264,986	0.5%
	Telma	32,500	28,288	0.1%
	EIL	194,700	17,446	practically 0%
	Shafdan	41,099,130	43,770,969	90.1%
Total Suspended Solids		**45,982,253**	**48,561,477**	**100%**
Ammonia (NH_4)	Agan	3,878	6,391	0.7%
	Argaman	6,379	1,139	0.1%
	Ashdod Refineries	32,900	75,174	8.5%
	Herzliya Treatment Plant	281,000	254,554	28.9%
	Nahariya	207,977	211,266	24.0%
	Acre	239,180	239,180	27.1%
	Kibbutz Ma'agan Michael	1,459	4,421	0.5%
	Shafdan	83,200	89,134	10.1%
	Telma	272	187	practically 0%
Total Ammonia		**856,245**	**881,446**	**100%**
Biological Oxygen Demand (BOD)	Agan	1,958,000	2,106,489	6.6%
	Argaman	269,000	48,000	0.1%
	Ashdod Refineries	349,000	450,572	1.4%
	Herzliya Treatment Plant	145,000	166,299	0.5%
	Milotal	453,528	436,261	1.4%
	Nahariya	1,977,570	2,008,844	6.3%
	Acre	1,382,310	1,382,310	4.3%
	Kibbutz Ma'agan Michael	20,840	54,667	0.2%
	Telma	17,300	9,429	practically 0%
	Shafdan	11,409,740	25,452,421	79.3%
Total Biological Oxygen Demand		**17,982,288**	**32,115,292**	**100%**
Phosphorus (P)	Agan	2,400	5,112	0.3%

Pollutant	Factory/ Polluter	Quantity of Pollutant 2003 (kg/year)	Quantity of Pollutant 2004 (kg/year	Contribution to Pollution in 2004[1]
	Argaman	5,526	987	0.1%
	Ashdod Refineries	237	756	practically 0%
	Herzliya Treatment Plant	46,400	59,423	3.6%
	Milotal	2,854	5,094	0.3%
	Nahariya	98,623	100,183	6.1%
	Acre	37,282	37,282	2.3%
	Kibbutz Ma'agan Michael	521	557	practically 0%
	Frutarom	1,187	958	0.1%
	Telma	737	207	practically 0%
	Agan	3,438	1,155	0.1%
	Shafdan	1,387,614	1,420,302	87.0%
Total Phosphorus		**1,586,819**	**1,632,016**	**100%**
Nitrogen (N)	Agan	191,484	240,775	5.7%
	Argaman	33,075	5,906	0.1%
	Herzliya Treatment Plan	0	324,574	7.7%
	Nahariya	332,661	337,922	8.0%
	Acre	286,800	286,800	6.8%
	Kibbutz Ma'agan Michael	18,652	31,944	0.8%
	Telma	4,456	4,041	0.1%
	Shafdan	2,820,748	2,982,686	70.8%
Total Nitrogen		**3,687,876**	**4,214,648**	**100%**
Kjeldahl Nitrogen (TKN)	Agan	188,519	232,272	6.0%
	Argaman	28,387	5,069	0.1%
	Herzliya Treatment Plan	0	319,468	8.2%
	Nahariya	328,573	333,769	8.6%
	Kibbutz Ma'agan Michael	12,921	21,373	0.5%
	Telma	3,460	2,694	0.1%
	Shafdan	2,820,353	2,973,773	76.5%
Total Klejhdal Nitrogen		**3,888,418**	**3,382,213**	**100%**
Mineral Oil	Agan	1,764	4,662	0.5%
	Argaman	9,240	1,650	0.2%
	Ashdod Refineries	16,100	13,399	1.6%

Pollutant	Factory/ Polluter	Quantity of Pollutant 2003 (kg/year)	Quantity of Pollutant 2004 (kg/year	Contribution to Pollution in 2004[1]
	Herzliya Treatment Plant	13,531	6,156	0.7%
	Nahariya	106,799	108,488	12.6%
	Acre	30,313	30,313	3.5%
	Frutarom	14	51	practically 0%
	Shafdan	616,952	692,908	80.8%
Total Mineral Oil		**794,713**	**857,627**	**100%**
Oils and Fats	Agan	2,520	4,019	0.1%
	Argaman	15,225	2,719	0.1%
	Ashdod Refineries (m)	16,100	13,399	0.3%
	Herzliya Treatment Plant	42,516	67,519	1.6%
	Milutal (m)	8,315	18,828	0.4%
	Nahariya	572,320	581,371	13.4%
	Acre	303,995	303,995	7.0%
	Frutarom (m)	14	51	practically 0%
	Telma	15,800	2,342	0.1%
	Shafdan	3,471,855	3,344,633	77.1%
Total Oils and Fats*		**4,448,660**	**4,338,876**	**100%**
*For the purpose of the budget, mineral oil data were integrated into the general oil data for industrial plants for which no data on general oil were available (the letter – m – appears in parentheses after the plant name)				

* Data based on "The multi-annual pollution budget to the Mediterranean Sea 1994-2004 – Dr. Ilan Malester, Orli Mark, July 2005

B. Implementation Plan for Main Wastewater Treatment Plants in 2010[2]

The implementation plan below includes a survey of existing and planned wastewater treatment plants (WTPs). Since some WTOs have not yet been constructed and others do not yet comply with the basic effluent quality standard, required investments and operational costs are presented both for the base standard and for the more stringent standard.

[2] Based on the Inbar Committee report (2001).

Table 3.1.2: Implementation Plan for Main WTPs in 2010

Region + Subregion	Wastewater Treatment Plant	Investment for Base Standard (20:30) ($ millions)	Additional Investment for 10:10 standard ($ millions)	Total Estimated Investment ($ millions)	Cost of Operating WTP to Base Level – 20:30 standard ($million/ year)	Additional Cost for Operating to 10:10 standard ($millions/ year)	Total cost for WTP operations for 2010 ($ millions)
Western Galilee	Ma'alot						
	Beit Ha'emek	2.9	0.8	3.70	0.18	0.11	0.29
	Nahariya+ Reservoir		4	4	1.68	0.98	2.66
	Beit Jan		1.25	1.25	0.18	0.11	0.29
	Shomrat-Idmit						
	Karmiel		7.91	7.91	1.73	1.01	2.74
	Araba, Sakhnin, Dir Chana						
	Acre	13.9	5.1	19.00	1.22	0.71	1.93
	Others						
Kishon	Haifa+ Reservoir		13.01	13.01	6.00	2.00	8.00
	Netufa+ Reservoir	3.8	0.8	4.60	0.24	0.08	0.32
	Afula		1.97	1.97	0.58	0.19	0.77
	Hasollelim+ Reservoir		5.95	5.95	0.42	0.14	0.56
	Tivon & Yoneam+ Reservoir		4.93	4.93	0.35	0.12	0.46
	Migdal Ha'Emek (Genigar) + Reservoir		6	6.00	0.48	0.16	0.64
	Ramat Yishari+ Reservoir		1.75	1.75	0.12	0.04	0.16
	R'ni		7.3	7.30	0.54	0.18	0.72

Region + Subregion	Wastewater Treatment Plant	Investment for Base Standard (20:30) ($ millions)	Additional Investment for 10:10 standard ($ millions)	Total Estimated Investment ($ millions)	Cost of Operating WTP to Base Level – 20:30 standard ($million/ year)	Additional Cost for Operating to 10:10 standard ($millions/ year)	Total cost for WTP operations for 2010 ($ millions)
	Nazareth-Tel Adashim		8.25	8.25	0.64	0.21	0.85
	Others						
Hof Hacarmel	Nir Etzion+ Reservoir	5.18	2.22	7.40	0.32	0.19	0.51
	Zichron Ya'akov+ Reservoir	4.4	1.8	6.20	0.28	0.16	0.44
Sharon	Emek Hefer+ Reservoir	2.15	1.34	3.49	0.23	0.13	0.36
	Hadera		8.75	8.75	1.60	0.93	2.53
	S. Hasharon + Reservoir	5.3	2.67	7.97	0.48	0.28	0.76
	Netanya+ Reservoir		8.38	8.38	1.84	1.07	2.91
	Ein Shemer-Iron+ Reservoir	10.6	4.5	15.10	0.66	0.39	1.05
	Tnuvot		1.3	1.3	0.23	0.13	0.36
	Bik'a Jat	4	1.78	5.78	0.25	0.15	0.40
	Ra'anana		3.33	3.33	0.71	0.41	1.12
	Hasharon Effluents		1.66	1.66	0.24	0.14	0.38
	Others						
Center	Herzliya		5.78	5.78	1.05	0.62	1.67
	Ashdod+ Reservoir		8.49	8.49	1.86	1.09	2.95
	Ashkelon+ Reservoir		6.58	6.58	1.44	0.84	2.28
	Beit Shemesh + Reservoir		4.21	4.21	0.77	0.45	1.22
	Gedera		7.8	7.80	0.58	0.34	0.91

Region + Subregion	Wastewater Treatment Plant	Investment for Base Standard (20:30) ($ millions)	Additional Investment for 10:10 standard ($ millions)	Total Estimated Investment ($ millions)	Cost of Operating WTP to Base Level – 20:30 standard ($million/ year)	Additional Cost for Operating to 10:10 standard ($millions/ year)	Total cost for WTP operations for 2010 ($ millions)
	W. Jerusalem		19	19.00	4.38	2.56	6.94
	Yavne						
	Kiryat Gat	9.2	2.3	11.50	0.84	0.49	1.33
	Be'er Tuvia-Hazor+ Reservoir		1.48	1.48	0.22	0.13	0.34
	Kiryat Malachi-Be'er Tuvia (Timurim)	7.67	1.53	9.20	0.48	0.28	0.76
	Ayalon+ Reservoir		10.4	10.40	2.28	1.33	3.61
	Shafdan+ aquifer				16.20	9.45	25.65
	Yehud						
	Kfar Saba-Hod Hasharon		5.74	5.74	1.26	0.73	1.99
	Horshim						
	Ramat Hasharon+ Reservoir		2.79	2.79	0.51	0.30	0.81
	Givat Brenner						
	Others				0.77	0.45	1.22
Negev	East Beersheba						
	West Beersheba		5.47	5.47	2.52	0.84	3.36
	Ofakim						
	Netivot+ Reservoir	3.53	0.7	4.23	0.22	0.07	0.29
	Rahat+ Reservoir		1.34	1.34	0.42	0.14	0.56

Region + Subregion	Wastewater Treatment Plant	Investment for Base Standard (20:30) ($ millions)	Additional Investment for 10:10 standard ($ millions)	Total Estimated Investment ($ millions)	Cost of Operating WTP to Base Level – 20:30 standard ($million/ year)	Additional Cost for Operating to 10:10 standard ($millions/ year)	Total cost for WTP operations for 2010 ($ millions)
	Sderot+ Reservoir	5.32	1.07	6.39	0.33	0.11	0.44
	Meitar	7	1	8.00	0.33	0.11	0.44
	Omer				0.11	0.06	0.17
	Lehavim				0.07	0.04	0.12
	Others						
Total		84.95	192.43	**277.38 total investment cost ($ millions)**	57.84 cost to base level	33.45 cost to standard level	**88.27 total operating cost ($millions)**

Rivers (II)

A1. Forecast of nutrient flows to rivers based on load changes in the last decade

The NAP's starting point is that the Inbar Committee standards will be fully implemented by target year 2014. From a conservative point of view, another scenario was also reviewed which calculates the anticipated change in nutrient contributions to sea via rivers based on load changes in the previous decade. Following is a description of the scenario:

Despite an average annual increase of about 2.5% in Israel's population in recent years, a reduction in pollutant loads released to the rivers between 1994 and 2003 was recorded, at an average rate of 8.46% per year (see table 3.2.1). These figures are based on data published by the Ministry of the Environment in 2005. The Ministry of the Environment monitors pollution loads at the discharge point of the pipeline to the river while the National River Administration monitors pollution loads at the point of the river's outlet to the sea. Therefore, the following data do not include reduction processes that take place in the rivers themselves and that remove some of the nutrients.

It is reasonable to assume that the reduction trend in pollution loads is a result of improvements in effluent quality caused by intensified effluent treatment and improvements in treatment technologies.

Table 3.2.1: Reduction in Organic Load, Nitrogen Load and Phosphorous Load Discharged to Israel's Coastal Rivers between 1994 and 2003

Pollutant	1994[3] (tons/year)	2003 (tons/year)	Total reduction rate (%)	Annual reduction rate (%)
Total Organic Carbon	22,904	10,318	55%	8.48
Total Nitrogen (TN)	9,056	4,775	47%	6.86
Total Phosphorus (TP)	6,531	2,284	65%	11.02
Total	38,491	17,377	55%	8.46

It should be noted that a more detailed review of the nine coastal rivers assessed by the Ministry of the Environment demonstrates that this reduction trend is largely attributed to a sharp decrease in pollutant loads in the Kishon and Soreq Rivers, while in other rivers an increase in pollutant loads was noted. This finding reinforces the assumption that improvement in effluent treatment level is the dominant process which impacts on nutrient flows to rivers from point sources.

A general calculation of nutrient quantities anticipated to be emitted to rivers in target years 2014 and 2025, based on trends in 1994-2003, points to a significant reduction in nutrient quantities which are discharged to rivers under the "business as usual" scenario. Pollutant quantities for 2003 are based on data provided by the Rivers Administration which measures pollution loads at the outlet points of rivers into the sea.

[3] Based on Ministry of the Environment data in 2005

Table 3.2.2: Quantity of Nutrients Anticipated to be Emitted to Rivers in Target Years 2014 and 2025

Pollutant	Polluting Sector	Reduction Technology	Pollutant quantity 2003 (kg/year)[4]	Forecast for 2014	Percent decrease/ Increase (2003-2014)	Percent increase per SAP	Gap in percent[5] (2003-2014)	Forecast for 2025	Percent decrease /increase[4] (2003-2025)
TOC	WTPs	Upgrading of WTPs	5,614	2118	62	50	-12	799	86%
	Diffuse Sources	Rehabilitating riverbank vegetation and creating buffer zones along rivers							
	Urban Runoff	Release through constructed wetlands							
Total Nitrogen ($NO_3 + NH_4$)	WTPs	Optimizing nitrification & denitrification treatment	2,945	1,347	54	50	-4	616	79%
	Diffuse Sources	Altering river sections, from channeled to flat, creating artificial floodplains, rehabilitating riverbank vegetation and creating buffer zones along rivers							

[5] Gap + percentage of reduction required according to NAP (i.e., 50%) minus the decrease/increase percent anticipated by 2014. A positive gap means that an additional reduction is necessary to comply with the target; a negative gap means that the reduction exceeds the SAP targets.
[4] Based on National River Administration data.

	Urban Runoff	Release through constructed wetlands							
Pollutant	**Polluting Sector**	**Reduction Technology**	**Pollutant quantity 2003 (kg/year)[4]**	**Forecast for 2014**	**Percent decrease/ Increase (2003-2014)**	**Percent increase per SAP**	**Gap in percent[5] (2003-2014)**	**Forecast for 2025**	**Percent decrease /increase[4] (2003-2025)**
Total Phosphorus	WTPs	Including biological processes for phosphorus removal in WTPs	433	120	72	50%	-22	33	92%
	Diffuse Sources	Altering river sections from channeled to flat, rehabilitating riverbank vegetation and creating buffer zones along rivers							
	Urban Runoff	Release through constructed wetlands							

Based on table 3.2.2, it appears that a significant reduction in pollutant loads flowing from river to sea is anticipated. This development is a major first step in improving the self-purification capacity of the rivers. Additional steps are related to changes in the flow and morphology of the river channel.

[5] Gap + percentage of reduction required according to NAP (i.e., 50%) minus the decrease/increase percent anticipated by 2014. A positive gap means that an additional reduction is necessary to comply with the target; a negative gap means that the reduction exceeds the SAP targets.

[4] Based on National River Administration data.

8.4 APPENDIX 4: COASTAL SECTOR

A. Marine and Coastal Habitats

A1. Laws, Regulations and Plans for Marine and Coastal Habitats

1. Law for the Protection of the Coastal Environment

The law was enacted in 2004. Its aims are:

a. To protect the coastal environment, its natural and heritage assets, to restore and conserve them and to reduce damage to them.
b. To preserve the coastal environment and the coastal sand for the benefit and enjoyment of the public for this and future generations.
c. To establish principles and limitations for the sustainable management, development and use of the coastal environment.

The law has generated significant changes in several primary areas related to the coastal environment:

- Exact definition of sea and shore as one integral unit which extends from Israel's territorial waters to 300 meters inland.
- Determination of criminal responsibility and penalties for damage to the coastal environment.
- Enforcement authority to the Ministry of the Environment to prevent damage to the coastal environment.
- Legal assurance of the public's right of way along the coastline.
- Making plan approvals contingent on the approval of a Protection of the Coastal Environment Committee, responsible for protecting the coastal environment.
- Implementation of an integrated coastal zone planning approach since the provisions of the law relate to the marine and terrestrial environment, both underground and above ground.

2) National Outline Scheme (NOS 8) for Nature Reserves and National Parks

The plan was approved in 1981 and establishes three types of protected areas for conservation: nature reserves, national parks and landscape reserves. The plan lists nature reserves and national parks although additional areas are included in regional and local plans.

The plan defines three levels of protected areas for nature conservation:

a. Nature reserve/national park declared under the Nature Reserves and National Parks Law.
b. Nature reserve/national park deposited or approved in a statutory plan.
c. Proposed nature reserve/national park.

In practice, NOS 8, including the amendments which have been incorporated in it over time with the approval of the Parks and Nature Reserves Council, reflects Israel's approved national policy for the protection of natural and landscape assets while identifying conservation worthy areas for nature protection and countryside recreation.

3) National Outline Scheme (NOS 13) for the Mediterranean Coasts

This national plan, which was approved in 1983, presents national policy. Its aims include, among others, determining land designations for the purpose of managing natural resources and protecting nature reserves, national parks and coastal reserves.

NOS 13 sets restrictions on development within 100 meter of the coastline and requires the preparation of environmental documents to assess the environmental impacts of marine and coastal plans.

As planning conflicts along the coast and especially in the Tel Aviv and Haifa regions intensify, these two regions have initiated a process of updating the Coastal Plan. The plans are currently being finalized prior to discussions in the National Planning and Building Board.

NOS 35, the Integrated National Outline Scheme for Building, Planning and Conservation, which was approved in 2005, defines an area known as "coastal fabric," which determines planning guidelines including preservation of open coasts and natural assets in the fabric.

4) National Outline Scheme (NOS 22) for Forests and Afforestation

This plan, approved in 1995, established a designation of “Coastal Forest Park.” This allocation marks coastal areas which are designated for protection and for the improvement of orchards and scrubland while preserving the natural features of the area.

5) Integrated National Outline Scheme (NOS 31) for Building, Development and Immigrant Absorption

This plan, approved in 1998, aims, *inter alia*, to determine provisions on the protection of open spaces, natural resources and landscape assets in order to prevent damage to these assets from accelerated development.

6) District Outline Scheme (No. 2) for the Northern Region

This plan, approved in 1983, includes the nature reserves and national parks approved within NOS 8, but also adds protected areas to the northern region of the country. The plan refers to NOS 13 with regard to coastal areas.

7) District Outline Scheme 21/3 for the Central Region

This plan, approved in 2002, relates to nature reserves and marine reserves and sets restrictions on development in the vicinity of the sea in order, *inter alia*, to protect the sand strip, prevent building which is not directly related to the sea and coast, set instructions for the protection of the coastal ecosystem, etc.

8) District Outline Scheme No. 4 for the Southern Region

This plan, approved in 1981, prohibits changing the designation of nature reserves and national parks to other allocations and prohibits residential or industrial uses in these

areas. However, it allows, under certain conditions, for infrastructure and roads within protected areas along with tourism and recreation structures. The plan provides for the addition of reserves and parks beyond those marked in the plan and in NOS 8.

9) District Outline Scheme No. 6 for the Haifa Region

The plan, which was deposited in 2003, establishes a land designation entitled "protected coast" aimed at:

a. Designating areas along the coast including natural, landscape and heritage assets for preservation and protection.
b. Establishing instructions for the restoration and improvement of coastal areas in order to preserve or restore their value and resources as open spaces.

Permitted uses in this land designation include:

- Open and natural coastal areas.
- Access and walking paths along the coast.
- Nature reserves, national parks and landscape reserves.
- Forest and scrubland areas.
- Facilities and infrastructure for the protection of the coast and underground infrastructure lines only.

10) Israel's Territorial Waters Policy Document, 1999

This policy document, approved by the National Planning and Building Board, was prepared in response to increasing development pressures on the coastal area and rising public awareness about the importance of coastal conservation. The document establishes a spatial and thematic policy in the area spanning 12 nautical miles west of the coastline to 100 meters east of the coastline.

The document relates to the ecosystems of the Mediterranean coast as economic, social and cultural resources. In terms of the protection of natural and landscape assets, the aim of the policy is the conservation of biodiversity and the preservation of protected natural assets on sea and coast.

As of 1999, when the document was presented, 14 marine nature reserves, totaling 35.5 km in length, were proposed; 20 coastal nature reserves, totaling some 44 km in length were at various stages of declaration; and 14 national parks existed along the coast.

Declared and proposed marine reserves only protect the shoreline and shallow belt while the shallow and deeper continental shelf are not included in these reserves. The kurkar (sandstone) ridges at a depth of 25-40 meters are characterized by rich and diverse fauna, most of which does not exist in shallow habitats. The policy document proposed granting protection to the habitats of the continental shelf and expanding the area of nature reserves.

The document notes that existing marine reserves do not always overlap with coastal reserves. In practice only two-thirds of the marine reserves overlap with coastal reserves. Yet such an overlap is of major importance in understanding the marine and coastal systems as complementary natural systems.

The policy guidelines which are proposed in the policy document for territorial waters include:

- Advancing the declaration of marine and coastal reserves.
- Reviewing possibilities for changing/broadening the boundaries of existing marine and coastal reserves and proposing new reserves based on new and cumulative data on marine natural assets.
- Institutionalizing monitoring, follow up and control in nature reserves.
- Protecting the islets of kurkar ridges in the sea along the coast.

11. National Parks, Nature Reserves, National Sites and Memorial Sites Law, 1998

The law was enacted in 1965 and was amended on several occasions. It relates to the processes of declaring and protecting nature reserves, national parks and marine reserves. According to his authority under the law, the Minister of Agriculture at the time, promulgated regulations in 1968 that prohibit damage to protected natural assets and set out to protect these natural assets. The regulations include lists of protected

natural assets on the sea and coast. The regulations were broadened and updated over the years.

12) Wildlife Protection Law, 1992

This law protects all vertebrates in Israel (with the exception of fish). The law protects all marine mammals and marine turtles.

13) Fishing Ordinance, 1937

This ordinance regulates fishing issues at sea and restricts the use of vessels, nets, traps and other equipment to ensure that fishing resources are not depleted.

B. Rehabilitation of Coastal Rivers

B1. Tennant Method

The Tennant method is one of the most widely cited methods in the scientific literature and correlates well with the conclusions of more detailed methods (Allen, 1995). The Tennant model is a risk assessment method which analyzes the level of risk to a river's system in relation to the capturing of its water. The model anticipates a sigmoidal increase in risk level to the river ecosystem when the detracted flow exceeds the river's natural flow prior to the tapping of its water. Therefore, according to the Tennant method, the chances for total destruction and lack of ecological functioning is 5% when up to 40% of a river's water is captured. The chance for total destruction of increases to 40% when some 50% of the original flow is captured, increasing to more than 95% when 80% of the original water is captured. At the bottom line, the method recommends a supply level of some 30% of the mean annual flow of water in the river prior to damming and water pumping as a threshold vital for sustaining an ecosystem with minimal function (50% risk of critical damage to the river ecosystem; Tennant, 1976).

B2. Table 4.1

Table 4.1 Water Quantities Required for Base Flow in Israel's Coastal Rivers and for Release to Sea according to the Policy Document "Right of Nature to Water"

River	Water Quantity for Release to River (MCM/year)	Water Quantity for Release to Sea (MCM/year)
Ksiv	5.25	1.0
Na'aman	10.3	10.3
Kishon	8.0	8.0
Dalia	3.7	3.7
Taninim	18.0	2.7
Alexander	9.0	2.8
Yarkon	24.5	5.5
Soreq	5.0	0.0
Lachish	2.0	0.0
Total	85.75	34.0

*Quantities designated for river flow relate to base flows only, in addition to winter floodwaters entering rivers. Quantities for release to sea are based on historical flows. Data are based on the policy document "Right of Nature to Water" (Shacham, 2003)

In the policy document "Right of Nature to Water – Water Requirements of Water Bodies and Wetlands – Policy Document," the quantities of water required for water flow in rivers to ensure the healthy and balanced functioning of river ecosystems (gross quantities) are distinguished from the quantities of water which will not be restored to the national system following their flow in the river (losses – net water quantities). Since rivers are linear systems whose surface area is very small, the relative contribution of evaporation to these losses is negligible and therefore the net quantities specified in the policy document may be regarded as quantities for release to sea. Based on the above table, the total quantity of water which will be released to sea is some 34 MCM/year which is some 40% of the total quantity required for release into Israel's coastal rivers (some 86 MCM/year).

B3. Laws, Regulations and Plans on Restoring Coastal Rivers

1) Streams and Springs Authorities Law, 1965

This law defines the functions and powers of a river authority. One of its functions is "protection of landscape and natural treasures along both banks of the river."

2) National Outline Scheme (NOS 31) for Building, Development and Immigrant Absorption

This plan marks rivers as buffer zones designated for recreation, agriculture and open spaces.

3) National Outline Scheme (NOS 22) for Forests and Afforestation

This plan designates river axes for "river bank plantings" while preserving the natural features of the river and its environs.

4) District Outline Scheme (No. 21/3) for the Central Region

This plan identifies coastal river axes as open space axes that provide for the preservation of developed ecosystems. The plan designates the environs of rivers as "a region for the protection of natural resources," which is the most sensitive environmental designation in the plan. The plan guides the preparation of partial district plans for planning river areas as open space and nature conservation systems.

5) District Outline Scheme (No. 6) for the Haifa Region

This plan designates rivers as "river strips," requiring guidelines on the rehabilitation and protection of ecosystems along the river and its landscape.

6) National Master Plan for Israel in the 21st Century – "Israel 2020"

This plan identifies river axes as axes which define the physical structure of the open space system while protecting and preserving natural and landscape assets.

7) Territorial Waters Policy Document

This document identifies river mouths as unique and important areas in a variety of aspects:

- A meeting point between brackish water and fresh water and the flora and fauna populations which are unique to a habitat characterized by extreme changes.
- The river mouth as a gateway for fauna.
- The landscape aspects of the meeting point between river and sea.

The document recommends that river mouth areas including alluvial fans be defined as areas for conservation and/or restoration.

8) National River Administration

A National River Rehabilitation Administration was established by the Ministry of the Environment and the Jewish National Fund (JNF) in 1993. The Administration coordinates responsibilities, financial resources, professional knowledge and implementation capacities and includes the following partners: Water Commission, Soil Conservation and Drainage Division of the Ministry of Agriculture, Ministry of Tourism – Israel Government Tourist Corporation, Ministry of the Interior – Planning Administration, Nature and Parks Authority and local authorities adjacent to rivers destined for rehabilitation.

The Administration operates by means of the following:

- National steering team, including the Ministry of the Environment, the JNF, the Water Commission and the Ministry of Tourism.
- Steering team for planning, including professionals from planning areas relevant to river rehabilitation.
- Local administrations, headed by local authorities that the river traverses. To date, twelve local administrations have been set up, in addition to the Yarkon and Kishon River Authorities.

In the coastal basin, the National River Administration coordinates the rehabilitation of the following rivers: Na'aman, Zippori, Kishon, Tanninim, Hadera, Alexander, Yarkon, Ayalon, Soreq, Lachish, Besor and Beersheba.

Following are some of the successes of the River Administration over the past decade:

- Reduction of pollutant quantities in Israel's main rivers, at a rate of 50%-60%, including the Kishon, Soreq and Alexander. This improvement is attributed to continuous enforcement by the Ministry of the Environment and major infrastructure investments by local authorities and industrial plants with the assistance of the Ministry of Infrastructure.
- Preparation of master plans for the rehabilitation of all of Israel's major rivers. Twelve local administrations for river rehabilitation and two river authorities were established in which some 150 million shekels were invested to date. The investment was allocated for projects for developing the river's environs.
- Recognition by senior officials in the water sector of the legitimacy and necessity of water allocations, in both the quantity and quality required for rehabilitating river ecosystems.

9) Multi-Annual Working Plan for Rehabilitating Israel's Rivers, 1999

This work plan was commissioned by the Ministry of the Environment and the JNF. The plan recommends priorities for planning and implementation and budgetary allocations for achieving the set targets. The budgetary allocation for river rehabilitation is estimated at 1.8 billion shekels, of which some 1.1 billion shekels is designated for pollutant removal (largely through construction of WTPs) and some 700 million shekels for planning and implementing engineering and development activities.

A review of trends in the environmental planning of coastal river axes demonstrates a clear trend of continuous progress toward a situation in which river axes and their environs will be statutorily protected for purposes of ecosystem restoration and leisure and recreation as part of a national system of open spaces.

It is anticipated under a "business as usual scenario, the lion's share of statutory plans for the rehabilitation and conservation of coastal rivers will be approved or in different stages of approval by the target year.

This assessment is based on several basic assumptions:

a. Incorporation of principles of river area conservation in approved national and district outline schemes and in planning processes which guide the preparation of these plans.
b. Decisions by planning authorities to advance the approval of plans for the rehabilitation and conservation of river areas.
c. Internalization of the importance of approving these statutory plans among professionals and other officials in the planning system as reflected in the allocation of public resources for planning and by the approval of these plans.

C. Preventing Alterations in the Natural Coastline

C1. Laws, Regulations and Plans on Marine Structures that Cause Coastal Erosion and Alterations in Israel's Natural Coastline

1) National Outline Scheme (NOS 13) for Mediterranean Coasts

This plan was approved in 1983 and marks 12 marinas and ports, of which only eight exist in practice. Plans for the construction of ten additional marinas are on the agenda at various stages of planning, some merely conceptual and some in more advanced stages.

NOS 13 serves as Israel's major policy document on coastal development. As of the base year, this document is being updated in the Tel Aviv and Haifa regions. The plan is meant to prevent environmental damage to the coastal system and establishes guidelines and mandatory reviews to be undertaken prior to approving marine structures. These include environmental impact assessments, detailed coastal surveys, etc.

2) Territorial Waters Policy Document

The document, approved in 1999 by the National Planning and Building Board, proposes a number of policy guidelines for approving new marinas including:

- The possibility of constructing new marinas will be examined based on continuous monitoring of the growth rate of vessels and a comprehensive review of the need for additional marinas once in five years.

- Marinas which were not approved by the Territorial Waters Committee will not be permitted. Additional marinas will only be approved if there is proof that there are insufficient anchorage spaces, and after the updating of NOS 13.
- The document proposes a review of the possibility of using the cooling water of power plants as marinas.

3) Law for the Protection of the Coastal Environment

The law was enacted in 2004 and includes the following aims: protecting the coastal environment and the coastal sand for the benefit and enjoyment of the public and of future generations and setting guidelines and limitations on the sustainable management, development and use of the coastal environment.

The law includes planning tools, designed, *inter alia*, to impact planning in such a way as to preserve, as far as possible, the natural coastline and the marine and coastal habitats. It also includes enforcement tools, aimed, *inter alia*, at preventing damage to the coastline and its habitats, and an economic tool (a fee whose implementation process has not yet been completed) aimed, *inter alia*, at reducing development which may damage the coastline and its habitats and at providing for rehabilitation of past damages or future damages which cannot be prevented.

4) National Planning and Building Board

In 1999, the National Planning and Building Board decided, within the framework of a plan for expanding the breakwater at Ashdod Port, that the Port Authority must compensate the coastal environment for past losses of sand and future losses of sand. The National Board called for the bypassing of 120,000 m^3 of sand from the sand accumulation area to the south of the port northward, as well as the bypassing of another 60,000 m^3 which will accumulate during the process of constructing the new breakwater.

5) Coastal Area Management Programme (CAMP) Report

The CAMP report, which was prepared in 2000 by the Ministry of the Environment and the UNEP, proposed a policy whereby additional marinas will not be approved on Israel's

coastline unless vital for the country and until a solution is found to the problem of longshore sand transport disturbance by means of artificial bypassing during the entire life of the structure.

6) Environmental Impact Assessment Regulations

Israel's regulations under the Planning and Building Law, which were originally promulgated in 1982 but were updated in 2003, require the preparation of an environmental impact assessment (EIA) for plans dealing with ports, marinas and land reclamation at sea.

EIA guidelines are prepared by the Ministry of the Environment and the EIA document is submitted to the Ministry of the Environment for review. The Ministry of the Environment submits an opinion on the environmental impact of the plan and on the measures necessary to reduce adverse environmental impacts to the planning agencies.

8.5 APPENDIX 5: SOLID SECTOR

A. Treatment of construction and demolition waste – cash flow

Table 5.1: Cash Flow – Treatment of Construction Waste

Percent of Growth in Waste Treatment 2006-2014	19%								
Period	0	2	3	4	5	6	7	8	9
Years	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
Quantity of construction waste for treatment/year	1,356,985	1,620,043	1,934,097	2,309,032	2,756,649	3,291,040	3,929,025	4,690,686	5,600,000
Cash flow									
Costs (NIS/tons)	48,851,476	58,321,581	69,627,515	83,125,161	99,239,395	118,477,454	141,444,908	168,864,719	201,600,000
Capitalization costs (NIS/ton)	48,851,476	52,899,394	60,146,866	68,387,276	77,756,663	88,409,700	100,522,255	114,294,289	129,953,158

10	11	12	13	14	15	16	17	18	19	20
2015	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
5,714,760	5,831,872	5,951,384	6,073,346	6,197,806	6,324,818	6,454,432	6,586,702	6,721,683	6,859,430	7,000,000
205,731,375	209,947,414	214,249,852	218,640,460	223,121,044	227,693,449	232,359,555	237,121,284	241,980,594	246,939,486	252,000,000
126,301,218	122,751,905	119,302,335	115,949,704	112,691,289	109,524,442	106,446,589	103,455,231	100,547,935	97,722,340	94,976,150

Total Capitalization Costs (NIS/ton) NPV in NIS million	**1,951**
In Millions of Dollars ($=NIS 4.5)	**434**

Percent of growth in waste treatment 2015-2025 – 2% per year

8.6 APPENDIX 6: IMPACT MATRIX

General

The Impact Matrix was designated to assist the editors of the NAP to outline an action plan for pollutant reduction which is priority based.

Explanation of the Impact Matrix

1. The first column of the Impact Matrix relates to the pollution **sector**, as specified and required in the SAP, which was adapted with certain changes by Shaldag Ltd.
2. The second column relates to **pollutants** which are relevant to the polluting sector.
3. Columns 3-6 relate to **areas** which are impacted by the sectors and the pollutants which are specified in columns 1 and 2.
4. Column 7 is designed to explain the rating given in each area to each sector and pollutant.
5. The impacted areas, which are specified in columns 3-6 are:

   - **Public Health** – e.g., if and to what extent are there aspects of population morbidity or mortality as a result of exposure to different pollutants in each sector.
   - **Marine Environment** – e.g., if and to what extent are there aspects of ecosystem damage (fish, other marine animals, vegetation, etc) in the sea and coast. Economic aspects will be considered separately (see socio-economic loss).
   - **Socio-Economic Loss** – e.g., if and to what extent are there aspects of economic or social damage due to different pollutants, such as decline in the number of fish, loss of a coastal strip for bathing, damage to internal or external tourism, etc.
   - **Transboundary Impacts** – e.g., if and to what extent are there impacts which transcend the jurisdiction of the state to other states such as global climate impacts, harm to international agreements or damage to another country's tourism.

Guidelines for Filling the Impact Matrix

- Rank each area which appears in columns 3-6 according to the extent of impact of the sector and the pollutant (appearing in columns 1 and 2) on the area.
- The impact level will be rated between 0 to 4, with level 0 signifying no impact and level 4 signifying very high impact.
- **If you do not consider yourself authorized to define the impact level, please mark the appropriate cell with the letter X.**

Examples of Impact Matrix

		Impact Level Rating – 0 (None) to 4 (Very High)				
Sector	**Pollutant**	**Public Health**	**Marine Environment**	**Socio-Economic Loss**	**Trans-boundary Impacts**	**Justification for the Rating**
Air Pollution from Industrial Sources	Cadmium Mercury Lead	4	2	3	1	Tendency of marine animals to accumulate mercury in their bodies at levels which are higher by several factors than the mercury to which they are exposed endangers the health of the public which eats the fish and the economic value of the fish, even when the quantity of mercury emitted to sea is very low. These three metals are the most toxic to

						humans in swallowing or breathing.

		Impact Level Rating – 0 (none) to 4 (high)				
Sector	**Pollutant**	**Public Health**	**Marine Environment**	**Socio-Economic Loss**	**Trans-boundary Impacts**	**Justification for the Rating**
Air Pollution from Industrial Sources	Cadmium, mercury and lead					
	Organo-halogens					
	PCBs, PBBs					
	Others					

		Impact Level Rating– 0 (none) to 4 (high)				
Sector	**Pollutant**	**Public Health**	**Marine Environment**	**Socio-Economic Loss**	**Trans-boundary Impacts**	**Justification for the Rating**
Air Pollution from Mobile Sources	NOx, VOCs, particulates					
	Others					

		Impact Level Rating – 0 (none) to 4 (high)				
Sector	**Pollutant**	**Public Health**	**Marine Environment**	**Socio-Economic Loss**	**Trans-boundary Impacts**	**Justification for the Rating**
Liquid Sector-Release through Rivers	Domestic sewage (nutrients and BOD)					
	Industrial wastewater (nutrients and BOD, oil, organo-halogens, PCBs, PBBs)					
	Pollutants from non-point sources					
	Others					

		Impact Level Rating – 0 (none) to 4 (high)				
Sector	**Pollutant**	**Public Health**	**Marine Environment**	**Socio-Economic Loss**	**Trans-boundary Impacts**	**Justification for the Rating**
Liquid Sector – Direct Discharge to Sea	Domestic sewage (nutrients and BOD)					
	Industrial wastewater (nutrients and BOD, oils, organo-halogens, PCBs, PBBs					
	Cadmium, mercury and lead, detergents, pesticides					
	Brine concentrates from seawater desalination					
	Others					

		Impact Level Rating – 0 (none) to 4 (high)				
Sector	**Pollutant**	**Public Health**	**Marine Environment**	**Socio-Economic Loss**	**Trans-boundary Impacts**	**Justification for the Rating**
Urban Solid Waste	Leachates					
	Solid pollutants					
	Others					

		Impact Level Rating – 0 (none) to 4 (high)				
Sector	**Pollutant**	**Public Health**	**Marine Environment**	**Socio-Economic Loss**	**Trans-boundary Impacts**	**Justification for the Rating**
Coastal Sector	Development pressures					
	Damage to the coastline					
	Others					

		Impact Level Rating – 0 (none) to 4 (high)				
Sector	**Pollutant**	**Public Health**	**Marine Environment**	**Socio-Economic Loss**	**Trans-boundary Impacts**	**Justification of Rating**
Hot Spots	Na'aman					
	Haifa Bay – Kishon					
	Shafdan					
	Ashdod – Agan/Oil Refinery outfall					

8.7 APPENDIX 7: PROPOSAL FOR A GOVERNMENT DECISION

National Action Plan for the Prevention of Mediterranean Sea Pollution from Land-Based Pollution

It is hereby decided

To adopt the National Action Plan for the Prevention of Mediterranean Sea Pollution from Land-Based Sources that was formulated by the Ministry of the Environment and approved by the MED POL.

To call on the Minister of the Environment to set up a Directors-General Committee to be responsible for following up on the implementation of the National Plan as outlined in the document entitled "National Action Plan for the Prevention of Mediterranean Sea Pollution from Land-Based Sources."

Members of the Directors-General Committee will include the official responsible for budgets in the Ministry of Finance, the Director General of the Ministry of the Environment, the Director General of the Ministry of Trade, Industry and Labor, the Director General of the Ministry of the Interior, the Director General of the Ministry of Infrastructures, the Water Commissioner and his representative, and additional representatives according to need (hereinafter the Committee).

The Committee shall appoint sectoral subcommittees (according to the sectors defined in the National Plan), which shall be responsible for assuring and enforcing implementation. The Committee shall also be responsible for the five-year review of implementation goals and targets and for updating the National Action Plan. The Minister of the Environment shall appoint the coordinator of the Directors-General Committee. Members of the subcommittees will include directors of relevant divisions in the Ministry of the Environment, representatives of the Manufacturers' Association of Israel, public representatives and representatives of relevant government ministries.

The Committee shall submit a progress report to the Minister of the Environment based on the NAP at the end of each year.

Explanatory Notes

The State of Israel is a party to the Barcelona Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean Sea. This Convention constitutes the judicial and legal framework for implementing the Mediterranean Action Plan (MAP). In 1997, within the framework of the Tenth Ordinary Meeting of the Contracting Parties to the Barcelona Convention, the Strategic Action Programme to Address Pollution of the Mediterranean Sea from Land-Based Activities (SAP) was adopted. The legal basis of the program is the Protocol for the Protection of the Mediterranean Sea Against Pollution from Land-Based Sources under the Barcelona Convention. MED POL is responsible under the MAP secretariat for promoting the SAP. In a meeting of MED POL national coordinators, which took place in 2001, an operational document for the implementation of the SAP was prepared to guide the Mediterranean countries which are party to the Convention in the implementation of a National Action Plan (NAP).

Since the NAP is designated to cover the period until target year 2025, a five-year review of its progress is required. Similarly, since the plan involves several government bodies in its implementation and promotion, it is recommended to establish a Directors-General Committee as described in the previous section (it is hereby decided). Since the Ministry of the Environment is the responsible authority for preparing the NAP within the context of the MED POL, it is recommended to call upon the Minister of the Environment to establish the Directors-General Committee.

Submitted by