

Development of a National Set of Environmental Performance Indicators for Turkey

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Abstract

Purpose: This study was conducted as part of an EU funded project; “EuropeAid/125541/D/SER/T Technical Assistance for the Establishment of a Turkish Environmental Information Exchange Network (TEIEN)”. The purpose of the study is to develop a set of national environment indicators for Turkey.

Methods: The national set of environmental performance indicators was based on DPSIR (Driving force-Pressure-State-Impact-Response) model. The selection of indicators was performed based on international indicator sets used by OECD, EEA, EUROSTAT, World Bank, UN and other countries. Five criteria were considered in selecting the indicators; a) national requirements, b) policy compatibility, c) international standards, d) covering the environmental sectors, e) data availability.

Results: A total of 76 indicators were included in the national set of indicators for Turkey under the themes of climate change, air quality, waste, water, land use, biodiversity, agriculture, energy, industry, tourism and transportation. Currently, a part of these indicators are in use due to inadequate data availability.

Conclusions: Turkey needs to improve in-situ monitoring and collection of data to better implement the environmental performance indicators included in the national set of indicators.

Keywords: Environment; indicator; DPSIR, Turkey

1. INTRODUCTION

Turkey is a candidate country for full membership to the European Union (EU) and has to meet the accession requirements on several chapters including the environment. Turkey has made a considerable progress in the field of the environment since 2000s by the help of several projects. The administrative capacity has been reinforced and alignment with many of the relevant directives is already accomplished. Yet, there are still some discrepancies regarding the provisions needed for the EU’s reporting requirements.

In Europe, the state of environment is assessed and reported by using environment indicators, which are derived from statistical data gathered for the themes that cover water, air pollution, climate change, agriculture, etc. Environment indicators are developed based on models, where DPSIR (Driving force-Pressure-State-Impact-Response) model adopted by the European Environment Agency (EEA) has been widely used. This framework is an extension of the PSR (pressure-state-response) model developed by OECD. Environment indicators provide an easy and quick evaluation of the current state of environment as well as the likely future trends. In this regard,

environment indicators are very useful as they create a common language among different stakeholders of a community; that is policy makers, scientists and the public.

In Turkey, the effective use and protection of natural resources is essential due to population increase, rapid urbanization and industrialization. In terms of water issue, annual available water potential per capita has dropped from 4000 m³ to around 1500 m³ in the last 50 years. Therefore, Turkey is categorized as a country having “water shortage”. Furthermore, it is expected to decrease down to 1000 m³ by 2030 due to population increase, which will cause Turkey to become a “water-poor” country. To this end, water indicators are extremely important in assessing the current state and future trends of the quality and quantity of our water resources as they are expected to help policy makers make right decisions for efficient management of our water resources. Similar information can be drawn from statistical data for other themes such as climate change, air quality, waste, biodiversity, etc. This study deals with development of a national set of environmental performance indicators for Turkey, in an attempt to help the relevant governmental institutions to prepare the State of Environment Reports of Turkey and also perform their reporting obligations to EEA.

2. MATERIALS AND METHODS

A proposal that can be specified as “a pool of indicators” has been made for Turkey by considering the national requirements, indicators used in international environmental indicator sets and in several countries, and the reporting obligations of Turkey. The selection of indicators was performed based on international indicator sets used by OECD, EEA, EUROSTAT, World Bank, UN and other countries. In selecting the most suitable set of indicators, Turkey’s reporting obligations was also considered. Five criteria were considered in selecting environment indicators:

a) Reflecting the National Requirements

All of the proposed indicators have been selected in a way that they will reflect the national requirements.

b) Policy Compatibility

The indicator sets proposed to support the current environmental policies of Turkey have been realized based upon the relevant draft indicators prepared for UÇEP (National Environmental Action Plan) and the indicators being still used.

c) International Standards

In order to constitute indicator sets that correspond to international indicator sets; the most common indicators have been specified through scanning the basic indicator sets used within the scope of EU, OECD and World Bank. In addition, the indicators being used by several countries such as Norway, Malta, Slovak Republic, Slovenia and UK have also been considered. Meanwhile, consideration was given to the selection of the indicators in response to the reporting obligations of Turkey.

d) Covering the Environmental Sectors

The indicators were proposed under the themes stated in Table 1, as these themes were accepted by the former Ministry of Environment and Forestry (MoEF) for the revised format of State of Environment Reports.

Table 1. The themes covered for the selected indicators

| THEMES |
|---|
| 1. Climate Change |
| 2. Air Quality |
| 3. Water |
| 4. Waste |
| 5. Land Use |
| 6. Nature Conservation and Biodiversity |
| 7. Energy |
| 8. Agriculture |
| 9. Industry |
| 10. Tourism |
| 11. Transportation |
| 12. Fisheries |
| 13. Mining |
| 14. Noise |
| 15. Technological and Natural Disasters |

e) Data Availability

Although data availability was taken as a criterion in selection of indicators, “presence of the data” has not been accepted as a basic criterion. The information whether the necessary data is present or not for the selected indicators under each theme and the information about the institution where these data are produced or present are given in a separate column in relevant tables. Even though the data is not present for a proposed indicator, it is anticipated that studies can be carried out to produce the data.

3. RESULTS AND DISCUSSION

The indicators proposed under the selected themes are presented in Table 2. As it can be seen, a total of 76 indicators under all the themes are proposed. It is considered that the indicators proposed are appropriate for State of Environment Reports. The number of themes included is 15. The indicators have been determined by considering basically the indicators of OECD, EEA, EUROSTAT, World Bank, UN and other countries such as Norway, Malta, Ireland, Slovak Republic, Slovenia and UK. The reporting obligations of Turkey have been taken as another important criterion. Meanwhile, the indicator set which is still being used or planned to be used by the MoEF was also considered. For each selected indicator; the information about the required data, methodology and data availability were also determined (not included here).

Table 2. Set of Environmental Indicators Proposed for Turkey

| Theme | Proposed Indicators | DPSIR Type | |
|----------------|--|---|---------------|
| Climate Change | TR 001 | Total Greenhouse Gas Emission (GHG) and Sectoral Distribution | Pressure |
| | TR 002 | Average Temperature | State |
| | TR 003 | Consumption of Ozone-Depleting Substances (ODS) | Pressure |
| | TR 004 | Precipitation | - |
| | TR 005 | CO ₂ Emission Per Capita | Pressure |
| | TR 006 | Energy Consumption Intensity/Efficiency (Total Primary Energy supply per unit of GDP or per capita) | Response |
| | TR 007 | Fuel Consumption Per Capita for Highway Transportation | Driving force |
| | TR 008 | Sea Surface Temperature | - |
| Air Quality | TR 009 | Emission of Acidifying Substances | Pressure |
| | TR 010 | Emission of Ozone Precursors | Pressure |
| | TR 011 | Emission of Primary Particulate Matter and Secondary Particulate Matter Precursors | Pressure |
| | TR 012 | Exposure to Air Pollutants at Levels Exceeding Standard Limits in Urban Areas, SO ₂ | Pressure |
| | TR 013 | Exposure to Air Pollutants at Levels Exceeding Standard Limits in Urban Areas, Particulate Matter | State |
| | TR 014 | Exposure to Air Pollutants at Levels Exceeding Standard Limits in Urban Areas, NO ₂ | State |
| | TR 015 | Sources of Air Pollution | Driving force |
| | TR 016 | Concentrations of Lead, Benzene, CO, O ₃ , Arsenic, Cadmium, Mercury, Nickel and PAHs at Province/District Level | State |
| TR 017 | Air Pollutants in Urban Areas: NO _x ; Particulate Matter, SO ₂ | State | |
| TR 018 | Air Pollutant Emissions from Transportation | - | |
| Water | TR 019 | Percentage of Annual Water Use from Renewable Sources | Pressure |
| | TR 020 | Water use Per Capita | Pressure |
| | TR 021 | Nutrients in Freshwater Sources | Durum |
| | TR 022 | Oxygen Consuming Substances in Rivers | State |
| | TR 023 | Population Connected to Waste Water Treatment Facilities | Response |
| | TR 024 | Bathing Water Quality | State |
| | TR 025 | Nutrients in Coastal and Sea Water | State |
| | TR 026 | Chlorophyll- A in Coastal and Sea Water | State |

| | | | |
|--------------------------------------|--------|---|---------------|
| Waste | TR 027 | Amount of Urban Solid Waste Produced | Driving force |
| | TR 028 | Amount of Urban Solid Waste Collected | Response |
| | TR 029 | Urban Solid Waste Landfilled | Response |
| | TR 030 | Waste Recycling Ratio | Response |
| | TR 031 | Production and Recycling of Packaging Waste | Response |
| | TR 032 | Medical Waste Collected Separately | Response |
| Land Use | TR 033 | Land Take | Pressure |
| | TR 034 | General Distribution of Land Cover | Driving force |
| | TR 035 | Agricultural Lands in Danger of Erosion | State |
| Nature Conservation and Biodiversity | TR 036 | The Ratio of Total Number of Endangered Species to the Total Number of Native Species | Response |
| | TR 037 | Protected Areas for Biodiversity | Response |
| | TR 038 | Change in Bird Population | State |
| | TR 039 | Endemism Ratio | State |
| Energy | TR 040 | Primary Energy Consumption by Fuel Type | Driving force |
| | TR 041 | Total Primary Energy Consumption | Pressure |
| | TR 042 | Energy Consumption by Sector | Driving force |
| | TR 043 | Share of Renewable Energy Consumption in Total Energy Consumption | Response |
| | TR 044 | Share of Renewable Electricity Production in Electricity Consumption | Response |
| Agriculture | TR 045 | Area Under Organic Farming | Response |
| | TR 046 | Cultivated Land Per Capita | State |
| | TR 047 | Productivity in Agriculture | Response |
| | TR 048 | Amount of Synthetic Fertilizer Consumed in Agricultural Sector | Pressure |
| | TR 049 | Total Pesticides Used in Agriculture | Pressure |
| | TR 050 | Gross Nutrient Balance | Pressure |
| Industry | TR 051 | Amount of Industrial Waste Recycled and Disposed | Pressure |
| | TR 052 | Industrial Hazardous Waste Generation | Pressure |
| | TR 053 | The number of Industrial Establishments having Environmental Management System | Response |

| | | | |
|-------------------------------------|--------|---|---------------|
| Tourism | TR 054 | The Number of Foreign Tourist Overnights Per Coastline as Km and Per Coastal Area as Km ² Per Year | Pressure |
| | TR 055 | Expenditures for Improving Tourism, TL or €/year | Pressure |
| | TR 056 | Technological Accidents and the Results by Types | Pressure |
| | TR 057 | Number of Beds per 100 Settled People | Pressure |
| | TR 058 | The Number of Beaches and Marinas with Blue Flag | State |
| Transportation | TR 059 | Freight Transportation Demand | Driving force |
| | TR 060 | Passenger Transportation Demand | Driving force |
| | TR 061 | Use of Alternative Fuels in Highway Transportation | Response |
| | TR 062 | Average Age of the Vehicle Fleet | Pressure |
| | TR 063 | Passenger Transportation by Types | Driving force |
| | TR 064 | Freight Transportation Types | Driving force |
| | TR 065 | Death in Traffic Accidents | State |
| Fishery | TR 066 | Fishing per Major Fish Groups | Pressure |
| | TR 067 | Aquaculture Production | Pressure |
| | TR 068 | Fishing Fleet Capacity | Pressure |
| Mining | TR 069 | The Number and Area of Mines | Pressure |
| | TR 070 | The Ratio of Mines and Numbers of Service Area Rehabilitated after Operation | Response |
| | TR 071 | Contribution of Mining to GDP | Pressure |
| Noise | TR 072 | The Ratio of Population Exposed to Traffic Noise | Impact |
| | TR 073 | The Ratios of Population Exposed to Different Noise Sources Higher than 55 dB | Impact |
| Technological and Natural Disasters | TR 074 | Forest Land Lost due to Fire | State |
| | TR 075 | Financial Loss by Type of Natural Disaster | Impact |
| | TR 076 | Technological Accidents and the Results by Types | Pressure |

The tentative pool of environmental performance indicators will enable MoEF to choose the most frequently used environmental indicators for different purposes. At that stage, after an evaluation to be done by the former MoEF, it was suggested to choose the most appropriate pool for Turkey. Among the pool indicators to be selected, it would be appropriate to determine a sub-set by the Ministry, to be used as a key indicator set. As it can be seen, the proposed indicator set will serve as a basis for the use of indicators to satisfy the purposes attributed to the environment, such as to prepare state of environment reports at both provincial and national levels or to prepare thematic publications about environmental issues.

It should also be noted that development of a national indicator pool should be considered as a process which will be continued to develop as the demands increase for responding to new environmental questions. Thus, the number of indicators in national pool would increase according to the future demands of MoEF by time. The pool should be considered as a dynamic indicator set from which selections can be done. Some indicators may lose their significance in due course and may be replaced by other indicators and then the pool composition may change. The aim of preparing the pool is generally not to use all indicators in the pool in all reports but to use them through selecting the appropriate indicators for specific purposes.

4. CONCLUSIONS

Among the set of indicators selected for Turkey, currently some of them can be implemented due to lack of data. For example, the existing data makes it possible to calculate three water indicators for Turkey; Water use by sectors (Agriculture, Human Consumption and Industry), Municipal water supplies and Number of municipalities servicing with a treatment plant (Environment Indicators Booklet of Turkey, 2012). This is quite expected because the experience of European countries with environmental indicator developments since 1990s confirms that there is substantial time lag (i.e. 10 to 15 years) between an indicator proposal and its implementation. This is largely because of the time it takes to put in the place the in-situ monitoring, satellites and statistical surveys and obtain trends (Environment Indicator Report, EEA, 2012).

The European Environment Agency has compared Turkey's status in terms of water exploitation index (WEI), which is a relatively straightforward indicator of the pressure on freshwater ecosystems from water use (CSI 18 indicator). A WEI above 20 % can indicate that a water resource is under stress due to water abstraction. It is reported that five European countries can be considered water-stressed (Cyprus, Belgium, Italy, Malta and Spain). Although the WEI of Turkey is reported as 10-20%, it is not possible to consider Turkey on the safe side because Turkey is on the way of becoming a water-poor country due to the expected population increase by 2030 and possible adverse effects of climate change.

According to the comparison of Turkey with Europe based on water use by agriculture sector; despite the decrease of water abstractions in most countries, and a stable trend in Southern Europe, it has increased by more than 30 % in Turkey from the 1990 level (EEA Report, 2012). In Turkey, currently water use by agriculture is above 70%. Although it is expected to decrease to 64% of total water use by 2030, the amount of water used for irrigation will increase. Similarly, in terms of abstraction for public water supply, in southern Europe, domestic water use has increased since the early 1990s by 12 %, however the increase was above 50 % in Turkey. These indicators reveal that Turkey needs to take serious precautions and adopt sustainable water use strategy to minimize water stress in the future. Turkey also needs to improve in-situ monitoring and collection of data to better implement the water indicators included in the national set of indicators.

REFERENCES

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