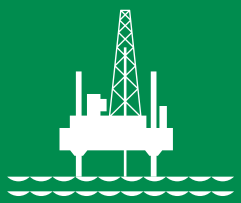
In order to reduce the environmental impact effectively, it is necessary to

Cosmo Oil Group engages in businesses ranging from oil development and production in the oil producing countries, through oil transportation and refining, product transportation to sales in service stations. In order to deliver products that have small impact on the environment, it is necessary to reduce that impact across the full life cycle of the oil, including the stage of use by customers. It is not merely a matter of ascertaining the impact at each stage in isolation - rather it is essential to take into account the impact on other stages, and to seek an overall balance, while continuously striving for improvements.
In FY 2003, compared with the preceding year, the CO_2 emissions during use by customers increased by 3,509,000 tons on account of an increase in the volume of products produced.

Crude oil extraction



→INPUT

Energy
Fuel: 28,575TJ

←OUTPUT

Emissions into air:
- CO_2: 1,593,000t-CO_2
- SOx: 21,964t
- NOx: 3,524t

ENVIRONMENTAL MEASURES

Energy conservation
Atmosphere conservation (zero flare project)

Crude transportation

→INPUT

Energy
Fuel: 14,020TJ

←OUTPUT

Emissions into air:
- CO_2: 958,000t-CO_2
- SOx: 20,871t
- NOx: 25, 853t

ENVIRONMENTAL MEASURES

Oil spills control
Energy saving (increasing efficiency by joint distribution, increasing size of tankers)

Refining

→INPUT

Raw materials
Crude oil:30,404,000kl; Other: 1,071,000kl

Energy:
- Power purchased : 2,186TJ (226,353,000kWh)
- Own fuel: 71,106TJ (1,891,000kl of crude)

Water:
- Industrial water: 42,148,000t
- Seawater: 357,914,000t

←OUTPUT

Emissions into air:
- CO_2: 4,997,000t-CO_2
  Own fuel: 4,542,000t-CO_2
  Purchased electrical power: 86,000t-CO_2
  Hydrogen production process: 369,000t-CO_2
- SOx: 6,343t; NOx: 3,292t

Waste water
- 367,297,000t (incl. 357, 914, 000t seawater)
- COD: 146t

Industrial waste
- Generated: 43,237t
- Recycled: 13,899t
- Landfill: 1,069t

Substance specified by PRTR Law
- Releases: 79t
- Transfers: 257t

ENVIRONMENTAL MEASURES

Energy conservation
Resource conservation / recycling
Industrial waste matter measures
Chemical management
Air pollution control
Water quality control
Soil conservation
Tree-planting on site
Disaster prevention

Laboratory

ENVIRONMENTAL MEASURES

Energy conservation
Resource conservation / recycling
Industrial waste matter measures
Chemical management
Water quality control
Disaster prevention

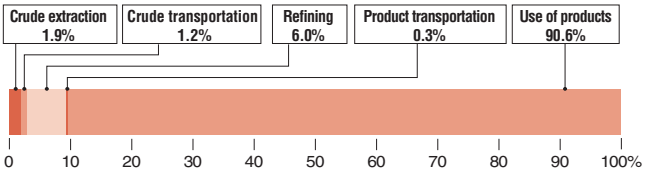
Office

ENVIRONMENTAL MEASURES

Energy conservation
Resource conservation / recycling
Green purchasing

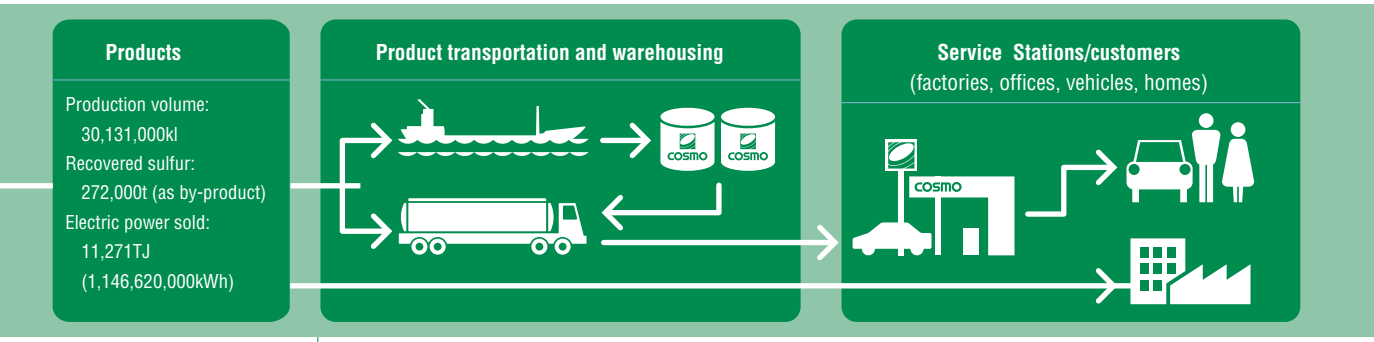
ascertain exactly what that load across the whole petroleum life cycle.

Proportion of CO_2 in Oil Life Cycle



Oil Life Cycle Inventory (LCI)

Stage	Crude extraction	Crude transportation	Refining	Product transportation	Product use	Total
Energy consumption (TJ)	28,575	14,020	73,292	3,561	—	—
CO_2 emissions (1,000t-CO_2)	1,593	958	4,997	223	75,170	82,941
SO_x emissions (t)	21,964	20,871	6,343	1,914	182,319	—
NO_x emissions (t)	3,524	25,853	3,292	3,706	—	—



INPUT

Energy
Fuel: 3,561TJ

OUTPUT

Emissions into air:
- CO_2: 223,000t-CO_2
- SO_x: 1,914t
- NO_x: 3,706t

Maritime transportation (ship)

ENVIRONMENTAL MEASURES

Prevention of oil spill
Energy conservation (increased efficiency through mutual accommodations, larger tankers for coastal routes)

Land transportation (by road)

ENVIRONMENTAL MEASURES

Energy conservation (larger vehicles, improvement of stowage ratio)

Stockpiling (storage facilities)

ENVIRONMENTAL MEASURES

Energy conservation
Resource conservation
Chemical management
Soil conservation
Prevention of oil spill
Disaster prevention

OUTPUT

Emissions into air:
- CO_2: 75,170,000t-CO_2
- SO_x: 182,319t

Service station

ENVIRONMENTAL MEASURES

Energy conservation
Resource conservation / recycling
Industrial waste matter measures
Chemical management
Air pollution control
Water quality control
Soil conservation
Disaster prevention

- Figures are estimated based on the actual production volumes of petroleum products in FY 2003.
- Figures for crude oil production, crude oil transportation, and product transportation are estimated based on LCI for Petroleum Products by Fuel and Environmental Impact Assessment for Petroleum Products, published in March 2000 by the Petroleum Energy Center.
- Figures for refining and product consumption are derived from environmental accounting. See p.13-16 of the Data Book for the methods and basis of calculations.
- In relation to CO_2 emissions from refining, we have revised our calculation method to the method recommended by the Ministry of Environment's "Guidelines Concerning Methods of Calculation of Emissions of Greenhouse Gases by Businesses (draft)".
- Refining includes data from the Yokkaichi Kasumi Power Station and Cosmo Matsuyama Oil Co., Ltd.
- Electric power sold refers to power sold by the Chiba Refinery, the Yokkaichi Kasumi Power Station and Cosmo Matsuyama Oil Co., Ltd. The CO_2 emissions from refining is the amount after deduction of CO_2 emissions, a result of such power generation.
- Figures here do not include environmental impacts associated with the construction of facilities.
- The figures for SOx emissions at the consumption stage are reported for reference. The figure indicates the potential SOx emissions based on sulfur content in products, and does not take into account SOx reductions resulting from desulfurization of emissions that occurs during use by customers. Thus, the actual figure for SOx emissions is expected to be lower than the figure reported here.
- The figures for CO_2 and SOx emissions at the consumption stage include potential impacts of naphtha. Naphtha is used as an ingredient in petrochemicals and fertilizers, which by themselves do not emit CO_2 or SOx.