

Environment and energy

Energy use

For the first time ISTAT will publish the time series of data from 1990 to 2008 relating to the use of energy products, broken down by type of use, as received from Environmental accounting. These figures are the result of calculations from data present in the TIPU (Table of uses of energy products by type of use) currently produced by ISTAT for the construction of the Namea Air Emission Accounts¹, and have recently become an independent output of satellite Accounting. TIPU data are constructed in compliance with the *residence principle*, are expressed in physical units (tonne, Mmc, MWh) and are broken down by energy product, type of use and economic activity (27 energy products, 8 types of use and 102 economic activities, of which 101 production activities plus end users, i.e. households)². The main sources of data for constructing the TIPU are the energy use tables in physical units by economic activity and by energy product (but not by type of use) provided annually by ISTAT for the construction of the Table of resources and uses in monetary terms, the National Energy Balance (BEN) produced annually by the Ministry of Economic Development, the energy use data used as inputs for the Corinair national inventory of atmospheric emissions and calculated on an annual basis by the Institute for Environmental Protection and Research (ISPRA).

Thanks to the TIPU's coherence with the products of National Accounts, in terms of definitions, principles, classifications, reference manuals and, at times, sources used, it is possible to guarantee a meaningful relation between the physical data (energy uses) and other physical aggregates of environmental accounting (for example, Namea air emissions by economic activity) or the traditional monetary aggregates (output, value added, employment, households' consumption, etc.). In the 1980s ISTAT constructed and published data on energy uses in Italy for the years 1975, 1980, 1982, 1985 and 1988 in connection with the construction of the Input/Output Tables for the Italian economy. These figures, expressed in physical units, present the use of energy products broken down by economic activity (classified according to NACE70) and households. Furthermore, for each of the 25 products considered, the data are split by to purpose or type of use (transport, heating, non-energy use, other energy use) and by origin of supply (domestic output, imports).

Subsequently, the construction of an energy account in physical units describing the resources (domestic output, imports) and uses (intermediate uses, households' consumption, changes in inventories and exports) of energy products has been performed annually as part of the construction of the estimates for National Accounts in monetary terms. Furthermore, for each product, intermediate uses are disaggregated by branch of economic activity (according to NACE Rev.1). The matrix of uses "product x branch" is not published. With respect to the energy use data constructed in the 1980s, those produced after that date present differences both in the methodology applied and in their structure. In fact, in addition to being classified according to the different version of NACE, the total number of energy uses includes some components which were previously excluded (use of fuel for military transport, for agriculture, livestock and forestry, for industrial removals and for gardening). Lastly, they do not provide a disaggregation of intermediate uses of production activities broken down by use. Only the figures relating to the household consumption of energy products is divided into "use for transport" and "other uses" (mainly heating). From 1999 onwards disaggregation exercises were

¹ Namea (national accounting matrix including environmental accounts) is an accounting system, adopted on a European level, representing the interaction between economy and the environment in such a way as to ensure the comparability of the economic and social data (output, income, occupation, etc.) with data on the stress posed by human activities on the natural environment (environmental pressure).

² The three-dimensional nature of TIPU (by energy product, type of use and economic activity) – and its layout (27 x 8 x 102) – ensures that no figure on the table is affected by double counting (which may occur when the energy incorporated in the products used to be transformed into other energy products is also counted in the different uses of derivative products); on the contrary, the aggregation of the figures by energy product, type of use and/or economic activity may result in the double counting of the same energy in different phases (substantially in the production/transformation phase or consumption phase).

performed on the figures relating to energy uses by branch, by energy product and by function with the aim of estimating atmospheric emissions for the Namea environmental accounting project and for the compilation of the pilot Eurostat Standard Table on energy consumption.

Warnings on aggregations used in the tables

Considered as a whole the figures on energy product use, presented separately for the household sector and for production activities, have the following shared features:

- the use of energy products is shown in aggregated form, i.e. totalling the uses of different products after converting all figures to a single *unit of measurement* (Terajoule);
- the following *energy products* are considered: coal, lignite, peat, natural gas, crude oil, semi-finished products, waste (only waste used as fuel for the production of electricity or heat), electricity, coke, coke oven gas, non-energy coal products, lpg (liquid propane gas or liquified petroleum gas), refinery gas, naphtha, motor gasoline, jet fuel, kerosene, gas work gas, blast furnace gas, diesel oil, fuel oil, petroleum coke, white spirit, bitumes, lubricating oil, chemicals, other non-energy oil products;
- the division by *type of use* considers “energy use with combustion”, “energy use without combustion” and “non-energy use”.

Energy use with combustion is in turn divided into use for “heating” (of homes, shops, offices, plants, enterprises, etc.), “transport” (road and off-road transport, including by rail, air and sea, in addition to all the operations of ships, boats, tractors, construction machinery, lawnmowers, military and other equipment; household transport is considered separately; for production activities, transport is considered both as a main, secondary and ancillary activity), “transformation in electricity”, “other energy use with combustion” (transformation with combustion in energy products other than electricity, for example the transformation of coke into blast furnace gas; use of energy products by production activities in production processes in a strict sense, excluding heating, transport and transformation; use of energy products by households for cooking and hot water production)³.

Energy use without combustion includes the transformation without combustion of energy products into other energy products (for example the transformation of crude oil into motor gasoline) and the use of electricity for any use.

Non-energy use includes the transformation of energy products into non-energy producing products (for example, the transformation of crude oil into plastic) and the use of energy products for non-energy uses (degreasing, dry cleaning, lubrication, etc.);

- the figures presented are *gross of transformations*, in that the energy incorporated in the products used to be transformed into other energy products is also counted in the various uses of the derivative products. In principle, therefore, the “total use of energy products” is affected by double counting in that:
 - a) the energy incorporated in the products used for the production of electricity is also counted in the phase in which the electricity itself is used;
 - b) the energy incorporated in the products transformed by combustion into other energy products is also counted in the various uses for said derivative products;⁴
 - c) the energy incorporated in the products transformed without combustion into other energy products is also counted in the various uses for the derivative products (for example, the energy counted in the crude oil used to produce motor gasoline is recounted in the use of petrol for transport).

On a practical level the above implies that the data for *production activities*, if we consider the individual types of use of energy products, do not present the phenomenon of double counting in the

³ In the original TIPU, “transport” is divided into “road transport” and “off-road transport”, while “transformation with combustion into energy products other than electricity” is separated from “other energy use with combustion”.

⁴ In practice the only case in which this does take place is when the energy incorporated in coke used in blast furnaces to produce blast furnace gas, which in turn is used both for the production of electricity and for industrial steel-working processes and in cokeries.

case of heating, transport, transformation into electricity and non-energy producing use, while the phenomenon does occur, marginally, in the case of the other energy use with combustion and energy use without combustion. The total use of energy products is, in contrast, strongly affected by the double count.

The data by *individual production activity* are affected by the same considerations as for production activities as a whole, but the disaggregation by activity considerably attenuates the phenomenon of double counting. The figures for *households* are not affected by double counting as households do not perform any type of transformation of energy products.