Executive Summary:
4.1.a. EXECUTIVE SUMMARY

If the amount of electronic products that German households import from China increases, what is the effect on the employment of low-skilled workers and CO2 emissions in Korea? Today's products and services are no longer produced within a single country. Whereas a product may list that it is "made in China", its key components are often produced also in other parts of the world. In the last couple of decades, production processes have been sliced up more and more into ever smaller parts, each of which is carried out by a different producer. In addition, this fragmentation more and more crosses the borders of countries. The common viewpoint today is that products and services are made in global value chains.

However, as succinctly pointed out by Karel De Gucht (European Commissioner for Trade) at the launch of the World Input-Output Database (WIOD), "though we are aware of the rising importance of global value chains, we have so far been unable to properly measure their size, nature and effect. This is because our current statistical apparatus does not capture the domestic activity contained in a traded good or service." On the one hand, at a global level, the traditional measures of import and export values include double-counting. The export value of Japanese cars does include the value of imported components from the US. On the other hand, at the level of individual countries, France may export many components that are assembled into a final product in Spain. The Spanish exports of this product do not reflect the role that is played by France.

The WIOD database – which is publicly and free of cost available – provides the statistical apparatus that De Gucht was referring to. It allows for addressing issues related to fragmentation and socio-economic aspects (such as jobs, the creation of value added, or capital compensation) as well as environmental aspects (such as energy use, various emissions to air, and the use of water). The database combines detailed information on national production activities and international trade data. For each country, tables are used that reflect how much of each of 59 commodities is produced and used by each of 35 industries. By linking these tables to trade data it is estimated, for example, how many dollars of Belgian fabricated metal products are used by the French transport equipment industry. This type of information is available in the WIOD database: for 40 countries (all 27 EU countries and 13 major other countries), plus estimates for the rest of the world; for the time period 1995-2006 (and estimates for 2007-2009); in current prices and "deflated" information is given in previous year's prices. It should be emphasized that all data in WIOD are obtained from official national statistics and are consistent with the National Accounts.

The WIOD project involved the construction of the database and numerous applications.

Project Context and Objectives:

4.1.b. SUMMARY DESCRIPTION OF PROJECT CONTEXT AND OBJECTIVES

WIOD in a nutshell

Does the increase in Chinese exports of textile products affect the employment of low-skilled workers in German retail trade? What would be the effects of a change in the European Union's agricultural policy on global CO2 emissions? And how strong is the trade-off between employment growth and environmental quality in Europe? Economic and environmental policies are designed at a very detailed level of industries and products. At the same time, production processes are characterized by fragmentation leading to an interdependent structure, where everything depends on everything. The data that provide a description of such an interdependent production structure are given in supply and use tables (SUTs) and/or input-output tables (IOTs). Given the ongoing trend in globalization, a database that is useful for policy making and analysis should take each of the following three aspects into account. It must: (i) be global, (ii) cover changes over time in order to evaluate past developments, and (iii) include a variety of socio-economic and environmental indicators. Moreover, it is necessary to have all data in a coherent framework (e.g. using the same industry classification). WIOD fills an important gap because such an all-encompassing database did not exist.

The overall aim of this project was to construct and apply such a unique database. The first part of the project (months 1-18) was mainly devoted to the construction of the preliminary version of (a large part of) the database. This preliminary version was made available only to consortium members and served two purposes. It was the basis for the applications which were at the heart of the second part of the project (months 19-36). In return, results obtained in the applications pointed in some cases at particular parts of the database that needed additional attention.

Key objectives

The key objective in the first part of the project was to construct a global database of national SUTs and/or IOTs, which are linked through international trade flows, creating so-called inter-country SUTs and IOTs. An inter-country IOT, for example, contains information on, e.g., the sales from the Indian chemical industry to the German automobile industry. These tables are linked to a wide range of environmental and socio-economic indicators at the same, detailed industry level. Examples of such indicators are the industry-specific emissions of several types of greenhouse gases per unit of output and the industry-specific amounts of labour of various skill levels employed per unit of output. The linking of such industry-level indicators to inter-country SUTs and IOTs with an identical industry classification will enable researchers to study to what extent increased demand for German cars causes CO2-emissions by the Indian chemicals industry.

The key objective in the second part of the project was to employ the database for integral and consistent analyses of the effects of increasing international trade and economic growth on socio-economic and environmental development. The applications aimed at enhancing our understanding of the various interrelations and guiding policy making.

Scientific and technical objectives

An important characteristic of the database is the integration of national SUTs and/or IOTs with data on bilateral international trade flows in so-called inter-country SUTs and IOTs. The following two examples indicate why this integration is of utmost importance. First, international trade plays an increasingly important role in the world's development. Production processes depend more and more on imported inputs, while exports are a crucial factor in determining the demand for domestic outputs. As a consequence, production chains are more and more characterized by a global dimension and for many products the world has almost become a single marketplace. The interdependencies between industries and between countries are growing and physical distance seems to matter much less than before. The emergence of large countries that rapidly catch-up with the advanced economies (in particular China and India) has affected overall employment and relative demand for skills. Also outsourcing and off-shoring are issues that affect the demand for certain skill-types of workers and hence the degrees of income inequality across and within countries. Another consequence of outsourcing is that interindustry linkages have become more important. Instead of specialization in final goods trade, specialization in intermediate inputs plays a more prominent role. Traditional value chains have gone global.

A second example indicating the importance of inter-country IOTs, is that in discussions on climate change and global warming, international trade also features very prominently, because most emissions have effects that are global. For example, in terms of greenhouse gas emissions it does not matter very much whether CO2 is emitted in Germany or in China. Therefore it is relevant to know how much CO2 is involved in the Chinese production of goods that are imported by Germany and used as an input in its production process. Widely accepted criticisms on the territorial nature of the Kyoto Protocol have led to the development of consumption-based emission accounting. Only inter-country IOTs allow for these types of analysis.

The specific scientific and technical objectives of the project can be summarized as follows.
1. To build a time series of global inter-country input-output tables. The project constructed a time series of annual, global inter-country SUTs and IOTs (the so-called World Input-Output Tables, WIOTs) based on an integration of national SUTs with international trade statistics. This database covers 27 EU countries and 13 other major countries in the world (including China, India, Japan and the US), together accounting for more than 85% of world's gross domestic product (GDP). The database covers the period from 1995 to 2006 (with estimates for 2007-2009), in current and constant (i.e. previous year's) prices.
2. To build socio-economic and environmental satellite accounts. The project constructed satellite accounts for socio-economic and environmental indicators at the same level of industry detail and timeframe as for the WIOTs. Socio-economic indicators include numbers of employees and wages at various skill levels, and investments. Environmental indicators include energy use broken down by several energy carriers; emissions of greenhouse gases and other air pollutants; water consumption; materials use; and land use.
3. To measure and analyze the trends in trade, economic growth, technological change and environmental pressures. The new database was used to perform ex-ante and ex-post analyses of these trends, adopting IO

techniques and/or econometric approaches. This includes the development of a proto-type dynamic model that takes full advantage of the new database.
4. To analyze changes in global trade structures and the effects of increasing global trade integration on European labour markets. The effects of outsourcing of activities from advanced to developing countries on specialization patterns and labour markets have been investigated using the new database. This was done through dynamic panel methods and by building a new simulation model, focusing on medium-term effects.
5. To provide policy support to the European Commission on socio-economic and environmental issues. Policy initiatives are envisaged by the European Commission (EC), for example in the light of the Lisbon agenda. The potential benefits of the new datasets for policy assessments have been explored using four models which are used in-house by the EC. In addition, the adapted models have been delivered to the respective model clients within the EC to facilitate future in-house policy analysis.

Project Results:

4.1.c. DESCRIPTION OF THE MAIN SCIENTIFIC AND TECHNICAL RESULTS

Introduction

Four types of "work" have been distinguished: the construction of the database (DATA), which is at the heart of the project; methodological research (METHODS); developing and carrying out applications such as IO and econometric techniques (APPLICATIONS); and building new models and adapting existing models for policy analysis (POLICY ANALYSIS). It has been our conviction that the aims could be reached successfully, only if all four types of work were combined in a single project.

It should be stressed that we did not follow a sequential set-up of the project. That is, we have chosen not to have METHODS first, followed by DATA, then APPLICATIONS, and finally POLICY ANALYSIS. The reason was that we wanted to benefit optimally from interaction between the four parts, allowing for quality enhancing feedback within the project. Although some sequencing was obvious, substantial parts of the project were carried out simultaneously. The consequence of this is that the database was delivered in two steps. The first step delivered a preliminary database after 14 months that allowed the work in APPLICATIONS and POLICY ANALYSIS to start, while METHODS could provide input into DATA. In the second step after 36 months, the full database was made publicly available.

The four types of work have been subdivided further into nine work packages. WP6 started its work on methodological issues in month 1. The work packages that were involved in the applications of the database started their work later (WP7 and WP8 in month 7, WP9 in month 13). We more or less succeeded in this set-up, in the sense that the preliminary version of the database was made available to consortium members in month 14 (which was 1.5 month later than planned). It has been updated and expanded several times afterwards until the final version was made public in month 36.

WP1 Harmonization of supply and use tables

Objectives

This work package provides time series of annual Supply and Use Tables (SUTs) for the period 1995-2006 on a country-by-country basis in nominal and real terms. The tables are internationally harmonized in terms of price and output concepts, and have a common industry- and product classification and detail. The tables constitute the quantitative input, together with WP2, to the construction of the world input-output tables carried out in WP3.

Tasks within the project

The following tasks had to be carried out:
1. Collect national current price SUTs at lowest product and industry level possible for all countries. These will be available for some benchmark years, but not for all years. For some non-EU countries input-output (IO) tables (product-by-product or industry-by-industry) will be available, rather than SUTs (product-by-industry). These tables need to be "reverse-engineered", i.e. converted into SUTs using additional

assumptions (see Beutel, 2005; Yamano and Ahmad, 2006). This process will differ from country to country depending on the information supplied.
2. Harmonize price concepts to basic price, and apply other adjustments needed to overcome differences in concepts such as treatment of financial intermediation services indirectly measured (FISIM) and c.i.f/f.o.b adjustments.
3. Benchmark current price SUTs on industry-level gross output, value added and intermediate inputs and final demand categories from the National Accounts (NA). This benchmarking is essential to ensure comparability of SUTs over time, and maintain the link with socio-economic and environmental indicators which will be grounded in NA statistics.
4. Derive full time-series of SUTs for the period 1995-2006 using interpolation techniques for years in between based on time series from the National Accounts (see Broersma and van Moergastel, 2007). For some major countries series back to 1980 will be attempted. Aggregate up to the WIOD product-level (60) and industry-level (30).
5. Deflate nominal SUTs on an industry-by-industry basis using gross output, intermediate input and import deflators from the National Accounts, possibly complemented by expenditure deflators and unit import values from trade statistics. Apply relative prices across countries (PPPs) to convert the tables in national currency into comparable units for both outputs and inputs. This will correct for differences in prices across countries.

Deliverables
- D1.1: Report outlining detailed strategy for SUT data collection and processing
(due in month 1, delivered in month 5; beneficiaries 1, 3, 6 and 7 have carried out this task)
- D1.2: Preliminary harmonized nominal SUTs for 1995-2006
(due in month 6, delivered in month 18; beneficiaries 1, 3, 6 have carried out this task)
- D1.3: Preliminary harmonized constant national price SUTs for 1995-2006
(due in month 12, delivered in month 31; beneficiaries 1, 3, 6 have carried out this task)
- D1.4: Preliminary harmonized constant international price SUTs for 1995-2006
(due in month 16, delivered in month 31; mainly beneficiary 1has carried out this task)
- D1.5: Final set of harmonized nominal and constant price SUTs for 1995-2006
(due in month 36, delivered in month 36 mainly beneficiary 1has carried out this task)

Significant results

The most significant result in the first part of the project was reaching MILESTONE 1 Preliminary inter-country input-output tables in current prices in June 2010. In addition, a full set of annual SUTs for each country has been prepared (D1.2) based on the exploratory work in D1.1. As part of the methodological research concerning the interpolation of the benchmark SUTs, a new method has been developed, called SUT-RAS. This method has been used for updating applications as part of workpackage 6 and evolved into deliverable D6.3c. The work carried out in this workpackage together with the work done in WP 2 and 3, resulted in reaching MILE STONES 7 and 8 : Final inter-country input-output tables in current and constant prices. This part of the database is accessible

for public use at the WIOD website from April 16, 2012 onwards. There, one can also found supporting documents concerning sources and methods.
Deviations from the plans

When the document of Work was being drawn up, we expected to be able to use the results from an on-going Eurostat project on developing SUTs at basic price by Joerg Beutel and Jos ı Manual Cantuche. Both are part of the WIOD consortium. During the meeting in Paris in month 6, which included a representative from Eurostat (Peter Ritzmann) it transpired that almost all statistical institutes 9NSIs) were not willing to disclose the unofficial data that was part of the Eurostat project. In particular the so-called valuation matrices that govern the transformation from purchasers' to basic prices were for the larger part not available for the WIOD project. This unexpected state of affairs made it necessary for the WIOD consortium to devote more time to the construction of valuation matrices ourselves. This resulted in delay in delivering the preliminary datasets (D 1.3 and 1.4). To overcome this difficulty, a shift of resources from beneficiary 6 to 1 was necessary. The delay has been made up in the second phase of the project such that the final database was ready on time for the public launching on April 16, 2012.
We have been going beyond the plan in delivering data up to 2009 instead of only to 2006, as originally foreseen in the document of Work

WP2 International trade data

Objectives

The objective of this workpackage was to provide a harmonized and consistent dataset of bilateral trade flows of goods and services between all countries in the WIOD-database covering the period 1995-2006. The time period covered has been changed to 1995-2009 for compatibility with the available national SUTs.

Tasks within the project

Task 2.1: provide a harmonized and consistent dataset of bilateral trade flows of goods
This task was concerned with collecting and preparing data for bilateral trade in goods data to be used in the construction of the international supply and use tables. For this, raw data was taken from the UN COMTRADE and downloaded at the HS 6-digit level. The trade database contains the 40 WIOD countries over the period 1995-2009 as reporter countries and all other countries as partner countries. Additionally data for Hong Kong and Macao has been used to improve trade data on China. Most countries are in HS 1996 from 1996-2010 and HS 1992 for 1995. Due to a lack of HS 1996 data, several countries however also report in HS 1992 for 1996 (Brazil, Latvia, Lithuania, Romania, Russian Federation, Slovakia). In some cases trade data are missing. We therefore filled some gaps with data obtained from other sources: exports of Denmark and Czech Republic in 1997 from the OECD and 1995 trade data for Bulgaria directly from the National Statistical Institute of Bulgaria. Unfortunately, it was not possible to get Russian trade data for the year 1995 as the Federal Customs Service of Russia only has data from 1996 onwards. Additionally data for the remaining countries have been collected and included as category 'rest-of-world'. Several adjustments had to be made for some countries concerning confidentiality issues. The data have further been split into

broad end use categories for which the usually applied BEC classification was modified.

Task 2.2: provide a harmonized and consistent dataset of bilateral trade flows of services

The second task was concerned with constructing a set of bilateral trade flows in services. For this a database based on Balance of Payments (BOP) data on services trade by BOP-sector and covering services sectors for the period 1995-2009, covering all major countries in the world including the WIOD countries. This has been based on Balance of Payments statistics from IMF and World Bank and bilateral services trade-statistics from the OECD and Eurostat with the coverage of the database including Mode 1 and 2 trade. Mode 1 trade relates to trading services from the selling country's territory to the buying country's territory. The label Mode 2 refers to services sold to consumers with the seller's nationality, who stay abroad. In Modes 1 and 2, the selling firm is not present in the country where the service is bought, as a consequence of which BOP statistics suffice to obtain the required data. Additionally, Mode 3 trade, however, entails the sale of a service by a firm that is physically present in the country where the buyer is located, for instance through foreign direct investment. Such trade is not captured by BOP statistics. Mode 3 services trade among OECD countries have been captured by taking data from the OECD's FATS (Foreign Affiliates' Trade in Services) database (see deliverable D5.4). The update had to be matched to the WIOD classifications and benchmarked on National Accounts statistics on services imports to attain consistency with the SUTs from WP1. Wherever possible, estimates based on available data at a higher level of aggregation have been used to fill in missing industry detail.

Deliverables

- D2.1 Report outlining detailed strategy for trade data collection and processing
(due in month 3; delivered in month 3; beneficiary 3 has carried out this task)
- D2.2 Preliminary harmonized and consistent data set of bilateral trade flows of goods and services
(due in month 9; delivered in month 10; beneficiary 3 has carried out this task).
- D2.3 Final harmonized and consistent data set of bilateral trade flows of goods and services
(due in month 36; delivered in month 36; beneficiary 3 has carried out this task).

Significant results

Within this workpackage, consistent sets of trade in goods and services statistics have been provided which afterwards served as inputs in the construction of the world-input-output database (WP3). The data have been successfully constructed for a longer time period than was planned in the Description of Work. The deliverable outlining the detailed strategy for trade data collection and processing has been delivered in time. Additionally, underlying documentation providing information on the details of data construction for both goods and services statistics have been provided.

Deviations from the plans

This work package has successfully achieved its objectives in providing a harmonized and consistent set of trade in goods and services to the project and even for an extended period (1995-2009, instead of 1995-2006). These data have been sent in time to enable the construction of the international SUTs and WIOT.

With respect to Task 2.1 a different strategy was chosen than outlined in the Description of Work. It was planned to purchase bilateral trade data from external sources, instead it was decided to provide the respective data ourselves. With respect to Task 2.2 the statistics with respect to Mode 3 trade were captured by Deliverable D5.4 for thematic reasons; this had no impact on the construction of the database.

Data have been delivered according to the description of Tasks 2.1 and 2.2 above. The strategy finally applied to obtain these data inputs was already outlined in deliverable D2.1. That is, no attempt was undertaken to update the NBER-UN trade data due to incompatibilities in concordances (SITC, HS, etc.). Instead, trade data have been collected directly from UN COMTRADE at the HS 6-digit level and processed in the needs of the WIOD project as described. The latter particularly includes the allocation of imports according to use categories (intermediates, final consumption and gross fixed capital formation) together with the aggregation to WIOD products. Benchmarking to National Accounts data (or those provided in the supply and use tables in WP1) has been done in the construction of the international supply and use tables. With respect to Task 2.2, the most important deviation is that Mode 3 trade is covered in Deliverable 5.4 instead of being delivered by WP2. Because these Mode 3 trade data were not needed for the construction of the WIOTs, this has not caused any problem. (For constructing international IO tables, only Mode 1 and 2 trade has to be taken into account.) Compared to the plan, the period covered was extended to 1995-2009 as compared to the initially intended coverage of 1995-2006 only.

WIIW (the leader of WP2) had an agreed budget for "Statistical Data" of 70.000 euros. During the project about 50.000 euros have been shifted from "Statistical Data" to "Personnel costs - R&D". This was necessary because it was decided in the course of the project to create the database for trade in manufacturing goods in-house rather than purchase it from other sources (e.g. from NBER Feenstra database which would have had to be updated and revised). In-house creation (i) has proven to be more efficient as it allowed to adapt the data better in order to link them to the supply and use tables, and (ii) has also given the opportunity to update and revise the data accordingly and much more efficiently during the course of the project.

WP3 Estimation of inter-country input-output tables

Objectives

The objective of this workpackage was to provide inter-country input-output tables for 1995-2006 based on the harmonized supply and use tables from WP1 and the trade statistics from WP2. In addition, aggregated and integrated versions of these tables should be provided, required for various analyses in WP7 – WP9.

Tasks within the project

To derive inter-country input-output tables, harmonized national SUTs constructed in WP1 had to be merged with the bilateral trade statistics derived in WP2. This required completion of the following steps:
1. Breakdown of national use tables into domestic and import use tables, with an import use table for each trading partner. The output of this step was a set of time series of International SUTs for 1995-2009. The conversion of national currencies into US dollars was based on official market exchange rates.
2. Creation of full inter-country input-output tables. To this end, the International SUTs for all countries were first merged into a WorldSUT for every year. These WorldSUTs were transformed into World IO tables using the fixed product sales approach. These IO tables are of the industry by industry type as the environmental and socio-economic satellite accounts are mainly industry-based. To arrive at industry-by-industry input-output tables that cover the world, data on value added by industry for the Rest of the World were retrieved from UN National Accounts statistics and the production structure was estimated on the basis of an average of emerging countries in the set of WIOD countries (Brazil, China, India, Indonesia, Mexico and Russia).
3. By combining the bilateral trade statistics with deflated harmonized national SUTs (also constructed in WP1), inter-country input-output tables expressed in previous year's prices were constructed.

Next to the inter-country input-output tables described above, regionalized world input-output tables have been produced. For this purpose, countries were aggregated up to regions: Eurozone, other EU, NAFTA, China, East-Asia, BRIIAT (a mixed group of countries containing Brazil, Russia, India, Indonesia, Australia and Turkey). Furthermore, consistent time series of national input-output tables for each of the 40 WIOD-countries were produced.

Deliverables

- D3.1 Set of preliminary harmonized inter-country SUTs for each country
(due in month 12; delivered in month 24; beneficiaries 1 and 3 have carried out this task).
- D3.2 Preliminary inter-country world input-output tables in current international prices
(due in month 12; delivered in month 20; beneficiary 1 has carried out this task).
- D3.3 Preliminary inter-country world input-output tables in constant international prices
(due in month 21; delivered in month 36; beneficiaries 1 and 3 have carried out this task).
- D3.4 Preliminary integrated and consolidated input-output tables for major regions
(due in month 21; delivered in month 36; beneficiary 1 has carried out this task).
- D3.5 Final set of harmonized inter-country SUTs for each country, Final inter-country world input-output tables in current international prices, final inter-country world input-output tables in constant international prices and final integrated and consolidated input-output tables for major regions.
(due in month 36; delivered in month 36; beneficiaries 1 and 3 have carried out this task).

Significant results

This workpackage yielded the most prominent output of the project: consistent time series of inter-country input-output tables for the period 1995-2009, both in current prices and in previous year's prices. Next to these input-output tables, intermediate outputs (such as International SUTs) have been made publicly available as well, which enables researchers to construct input-output tables in alternative ways, for their own specific purposes. The data have been successfully constructed for a longer time period than was planned in the Description of Work. Preliminary versions of the data have been used in WPs 6-9, and results of computations on the basis of the final version of the dataset have been used by European Commissioner of Trade Karel de Gucht in his speech at the launch meeting in Brussels.
The "Contents, Sources and Methods" document provides information on the procedures adopted in this workpackage to construct the data.

Deviations from the plans

In comparison to the Description of Work, several relatively minor changes were needed (next to extending the time series from 1995-2006 to 1995-2009 as mentioned in the reports on WPs 1 and 2 already).
First, some of the deliverables related to preliminary versions of the database were produced somewhat later than planned, mainly as a consequence of some delays in the production of the time series of National SUTs for a few non-EU countries. This did not cause delays in the production of the final database and the associated deliverable (D3.5).

Second, deeper insights into the interdependencies of various parts of Supply and Use tables led us not to distribute the export columns in Use tables over columns for countries-of-destination. Instead, exports were obtained as the mirror image of imports, the basic source of which are contained in a column in the Supply table.

Third, discussions with users within the consortium (mainly in WPs 6-9) led to the conclusion that the Rest of the World should be part of the inter-country input-output tables that constitute the core of the database. In view of the empirical magnitude of problems related to estimation of exports of WIOD countries to the Rest of the World, this implied that two sets of International SUTs had to be constructed. In the core database, the original ideas to construct the data from National SUTs and bilateral trade statistics had to be adapted slightly (to obtain reasonable results for the Rest of the World as well). Next to these core data, "basic" International SUTs and associated inter-country input-output tables have been published, which were obtained by methods focusing purely on the countries represented in WIOD.

Finally, discussions among members of the consortium showed that views on aggregation of industries and/or countries were very dependent on the specific purposes of studies. Furthermore, aggregation of the produced inter-country input-output tables is relatively easy for the vast majority of potential users. Hence, the decision was made to publish aggregated tables for just one country aggregation scheme. Industry aggregations were not pursued at all. Instead, a complete set of consistent national tables for 1995-2009 was produced. These tables can especially prove useful for expositional purposes and might popularize the WIOD database as such.

WP4 Satellite accounts: environmental indicators

Objectives

The objective of this WP was to collect, process and organize a comprehensive set of satellite accounts of environmental indicators over the period 1995-2006 and that match the inter-country database developed in WP3. For each country (including the "rest of the world" region), the dataset contains at the WIOD sectoral breakdown (35 industries plus final demand) a time series (extended up to 2009) of the following indicators:
- Gross and emission-relevant energy use broken down by 27 energy entries, including different fossil fuels, major non-renewables (electricity, heat and waste), major renewables and losses;
- Water consumption;
- Emissions of greenhouse gases (CO2, N2O, CH4) and air pollutants relevant for acidification (SO2, NOX, NH3) and tropospheric ozone formation (NOX, NMVOC, CO, CH4).

Depending on the availability of data of sufficient quality, this work package intended to include additional variables, such as water emissions, resource and land uses, and the generation and treatment of various types of waste.

Eventually it has been possible to integrate in the database data on resource and land uses, as the data of the remaining two variables (waste, water emissions) was either not available at the detail level needed, or the datasets had not sufficiently consistency over the time frame and industry breakdown.

Tasks

Task 4.1: Collection of environmental data sources and organization of lower tier data set

With respect to methodology, this work package has extensively built on the protocols of the FP6 project EXIOPOL. However, as the EXIOPOL database is strictly limited to one single base year, the selection of the data origin has diverged in many cases from EXIOPOL, and made use of databases that contain yearly information for the full time series of WIOD, such as Eurostat, IEA, UNFCCC, FAO, and SERI.

On the data collection side, it was the intention to also use the data deliverables of EXIOPOL, due in the end of 2008. However, a delay was detected in these deliverables in the fall of 2009, and in order not to jeopardise the release of WIOD deliverables, independent protocols and data collection routines have been developed in 2009-2010.

Task 4.2: Transformation of the lower tier data set into a harmonized upper tier data set

This task has been the principal task of the work package, and it has implied addressing several methodological problems, for which solutions have been found and have been duly reported.

1) Attain coherence and consistency between the environmental satellites and the IO based economic data set. Correspondence links have been clearly defined between the industrial classification adopted in the IO

tables (IOTs) with the definition of industries and of other entities by which the emission data sets, energy statistics and other environmental variables are recorded. As NAMEA-type accounts comprise energy as well as non-energy related (process) emissions for industries, additional information has been use to separate process emissions from energy related emissions, which is required to link to energy carrier consumption statistics as in the energy balances.

This task has transformed the data sources inventoried by Task 4.1 into environmental satellites coherent with the System of Economic Accounts developed by WP1-WP3.

The data harmonization has been based on the data sources that have proven to be most complete and comparable across the time and geographical span of the WIOD-database. In the detail, energy and CO2 emissions have been based mainly on IEA energy data and UNFCCC inventories, other emissions on Eurostat and EDGAR data, water on EXIOPOL data, land on FAO statistics and material extraction on SERI data.

Two versions of the energy data were computed: one calibrated with data from National Statistics Offices (NSO) which uses two data sources (IEA and NSI data), and one which uses consistently a single data source (IEA), but where slight (less than10%) deviations are observed with respect to data released by NSOs. In agreement with the consortium and the advisory panel, only the calibrated estimation has been released in order that official data match with WIOD data.

Task 4.3: Further data integration and transformation linkages with applied models

This task has integrated the environmental data with applied models, essentially a CGE model run by ZEW. This has required the development of transformation matrices including substitution elasticities and abatement cost functions for pollution control options.

Deliverables

D4.1 (month of delivery: 3): Technical report on the conceptual framework for environmental satellites integrated in the WIOD system of SUTs and IOTs
D4.2 (month of delivery: 12): Preliminary database of environmental satellite accounts
D4.3 (month of delivery: 16) Preliminary dataset of environmental information for integration in the prototype CGE model
D4.4 (month of delivery: 36): Final database of environmental satellite accounts and final dataset of environmental information for integration in the core CGE model
D4.5 (month of delivery: 36): Technical report on the compilation of the environmental satellites database.

Significant results

Halfway the project time (with 4 month's delay, month 20) a preliminary dataset of energy and air emission data was delivered.

This was a very important milestone, as it allowed to adjust the interface with the SUT/IO data in the second half of the project, and identify the iteration requirements for data gap filling. It contributed

also to highlight the importance of high quality SUT / IO time series for achieving consistency in the interpolation of data gaps.

In month 31, a final draft version of the environmental datasets was delivered, including energy, air emissions, land use, material extraction and water use. The final datasets were extended from the initially committed time series 1995-2006 to also include the years 2007, 2008 and 2009.

The final version of the environmental data was fine-tuned with the final version of the IO and SUT data, which were finally released in April 2012.

Deviations from the plan

There have been no major deviations in this WP, only secondary adjustments.

A 4-month delay was experienced in the interim release of the first dataset draft, but this was largely compensated by regular updates before the final dataset release in month 36.

In agreement with the consortium and the advisory board, it was decided not to include in the database data that was not of sufficient quality, which affected two environmental variables: waste, and water emissions. Also in agreement with the consortium, two versions of the energy data were computed (non-calibrated vs. calibrated) but only the calibrated estimation taking into account NSO data has been released in order that official data match with WIOD data.

The final datasets were extended from the initially engaged time series 1995-2006 to the years 2007, 2008 and 2009.

WP5 Satellite accounts: socio-economic indicators

Objectives

To provide accounts of socio-economic indicators that will match the inter-country database developed in WP3. For each country, it will contain various indicators of employment, including hours worked by various types of skill and associated wage cost; various type of investment (including tangible and intangible assets) and shares of (affiliates of) foreign firms in total sales and investment. The data will match the industry-level detail of the WIOD-database.

Tasks

Task 5.1: The update of the EU KLEMS database

The construction of EU KLEMS database was funded under the 6th framework program (see http://www.euklems.com online). This database, grounded in national accounts statistics, provides industry-level measures of output, inputs and productivity for the European Union countries, Japan, Australia, Canada, South Korea and the US, covering the period 1970-2005. Labour input is measured through hours worked and wages by various types of labour (including low/medium/high skilled) and capital input includes investment in various asset types. Comparable databases needed to be built for countries not covered in the EU KLEMS project. This has been achieved through cooperation with a large set of institutes around the world through the WORLD KLEMS initiative, under aegis of Dale Jorgenson

(Harvard), Bart van Ark (TCBE) and Marcel Timmer (RUG). This includes cooperation with Ren Ruoen (Beihang University), Jing Cao (Tsinghua University) and the China National Bureau of Statistics, the Indian Council of Research in International Economic Relations (ICRIER) in Delhi, and the UN Econic Commission for Latin American Countries in Santiago

Task 5.2: Construction of harmonized indicators of intangible investment
In addition to investment in software, which is already covered through the KLEMS database, two other major areas of intangible investment will be included: innovative property (mainly scientific and non-scientific R&D) and firm competencies (company spending on reputation, human and organizational capital). These statistics are collected under a proposed FP7 project called Competitiveness, Innovation and Intangible Investment in Europe (COINVEST) for European countries and the US. In first instance measures on intangibles will cover the market economy of the countries. We will evaluate the possibility of a breakdown into manufacturing and services or even more industry-detail, depending on data availability.

Task 5.3: Construction of Foreign Direct Investment indicators (this task will mainly be done by partner 3)
Increasing Foreign Direct Investment is an important component of globalization not captured by the trade statistics to be constructed in WP2. The indicators will be mainly based on the OECD's Activities of Foreign Affiliates (AFA) and Foreign Affiliates Trade in Services (FATS) databases, which present detailed data on the performance of foreign affiliates in the manufacturing and services industry of OECD countries (inward and outward investment).

Deliverables
- D5.1: Update of EU KLEMS database
(due in month 12, delivered in month 12; mainly beneficiary 1and 3 have carried out this task)
- D5.2: Preliminary KLEMS database for WIOD countries not covered in EU KLEMS
(due in month 12, delivered in month 36; mainly beneficiary 1 has carried out this task)
- D5.3 Intangibles investment indicators by broad sector for WIOD countries
(due in month 24, delivered in month 36; mainly beneficiary 7 has carried out this task)
- D5.4 Foreign affiliates' indicators by broad sector for WIOD countries.
(due in month 24, delivered in month 28; mainly beneficiary 3 has carried out this task)
D5.5 Final satellite account: socio-economic indicators
(due in month 36, delivered in month 36; mainly beneficiary 1 and 3 have carried out this task)

Significant results

In the first period we reached an important mile stone: MILESTONE 3 Preliminary socio-economic satellite accounts. At the end of the project, MILESTONE 10 Final socio-economic satellite accounts has been reached. This part of the database is accessible for public use at the WIOD website from April 16, 2012 onwards. There, one can also found supporting documents concerning sources and methods.

Deviations from the plan

Deliverable 5.2 (extension of EU KLEMS to non-EU countries) was delayed in the first part of the project, due to diffifulties ingathering the necessary data. But in the second part of the project, this quickly ameliorated and in the end, the fnial database was delivered in time. As a result the intermediate deliverable 5.2 (preliminary KLEMS database) has never been formally submitted and is represented by the final database as described in D5.5

All deliverables have been achieved, but not all to the full level of sectoral detail as was initially hoped for when the document of work was written up. With respect to data on Intangibles investment (task 5.2), deeper investigation into the sources available indicated that intangible investment data at the sector level is still in an experimental phase and could not be included as a separate variable in the WIOD database. Through the combined work of the COINVEST and INNODRIVE project there now is a harmonized set of investment indicators at the aggregate level (see http://www.intan-invest.net/ online) The Conference Board has added data on China and India to this. This is discussed in-depth in deliverable 5.2.

A similar problem was plaguing foreign affiliates' indicators (task 5.3). Deliverable 5.4 provides an in-depth overview of the available data and concludes that "… a combined though selected OECD AFA-EU FATS data set may be merged with the WIOD data set for particular questions. However, in contrast to the core WIOD datasets (SUTs, NA data), coverage of data on foreign affiliates' activities is much less complete with respect to sectors, countries and time horizon. Particularly, with respect to sectoral breakdowns, available data are patchy and the respective aggregates which would be needed are often missing. A more feasible strategy therefore seems to combine data for specific issues or purposes and tailor them with respect to the analysis to be undertaken." It is therefore not included as a separate variable in the WIOD database.

WP6 Methodological research related to the database

Objectives

Constructing a large database as the one proposed in this project, involves a lot of estimation. This is due to the fact that some of the data are simply not available or incomplete. Another factor that plays a role is that some data are known with greater reliability than other data, and some are even known exactly (the so-called superior data). Also, even in an ideal world, IO tables cannot be measured but are a construct (i.e. a model) themselves. This is because the crucial assumption in the IO table of a one-to-one correspondence between product and industry does not hold in real life, e.g. due to joint production and by-products. All of these aspects required profound methodological research in order to arrive at the "best" possible procedure to construct the world IO database.

In its turn, the availability of the world IO database offered the unique opportunity of checking the extent to which the "true" answer (as obtained from using the full, maximum-information database) differs from the "estimated" answers (as obtained from using various shortcuts). From a methodological viewpoint, this addresses a fundamental question. Namely, whether (and why) constructing such a database is worth the

effort. Typically, attempts to answer this question are not undertaken once the database is built, while the answer cannot be given as long as the database has not been built.

Tasks within the project

Task 6.1: aspects related to the construction of national IO tables from SUTs

1. Analysis of the (dis)advantages of using product-by-product versus industry-by-industry type of IO tables.
2. Addressing the choice of method to use for constructing IO tables from SUTs. The most widely used methods are the product-technology model and the fixed product sales structure model, but a wide range of alternative models have been proposed. The merits and demerits of the available methods were investigated.

Task 6.2: aspects dealing with linking the tables across space and time, and making projections

3. Analysis of methods to harmonize IO tables, which requires using international prices. Next to the question whether the SUTs should be valuated in basic prices or in purchasers' prices (what are the advantages of each, what type to use when, how can they be linked?), the issue of making the prices internationally consistent was dealt with.
4. Analysis of methods to construct IO tables in constant prices. Various methods are available, of which "double deflation" is the best known. For some countries, tables in constant prices are readily available, but typically they are in prices of the previous year. The question in that case is how the information from the chained indexes can be best used.
5. Projection of the entire WIOD database up to the year 2009 (originally planned to update up to 2010). Many of the underlying annual statistics in this project become available with a relatively short time lag. However, the time delay required by National Statistical Institutes (NSIs) to publish SUTs and IO tables is typically significantly longer. This general unavailability of very recent IO data has been frequently perceived as a limitation of the adequacy of using IO techniques for impact analysis.

Task 6.3: fundamental aspects related to the use of the database for empirical analyses and model building

6. Sensitivity analysis with respect to types of IO tables used in empirical work. Although inter-country tables contain, in principle, more information than so-called multi-country tables, how much will be left of the advantage of using inter-country tables in the case of limited data availability?
7. Analysis of the effects of aggregation and disaggregation. In the WIOD database, a limited number of classifications for groups of countries with similar detail have been used when linking the SUTs. A consequence of this is that there were several options when models are built or when impact analyses are done. The question is: To what extent do the results depend on the chosen approach?
8. Sensitivity analysis with respect to the use of either current prices or constant prices. When comparing changes over time, one can take the table in constant prices as the starting point of an IO model or the table in current prices. The results of the two approaches can be "translated" into each other, but will be different. The aim was to explore these differences (their cause and extent) and to develop refined "translation mechanisms" for model outcomes.

Deliverables

- D6.1 Technical report on advantages and disadvantages of types of input-output tables product-by-product or industry-by-industry)
(due in month 6, delivered in month 9; mainly beneficiaries 2 and 6 have carried out this task)
- D6.2 Technical report on the construction of input-output tables (product-by-product or industry-by-industry)
(due in month 12, delivered in month 13; mainly beneficiaries 2 and 6 have carried out this task)
- D6.3 Technical report on: methods to harmonize input-output tables; methods to construct input-output tables at constant prices; projection of supply and use tables; and sensitivity of model results with respect to data availability
(due in month 18, delivered in month 19; beneficiaries 1, 2 and 6 have carried out this task)
- D6.4 Technical report on the multiplier bias from supply and use tables and the sensitivity with respect to using tables in constant or current prices
(due in month 24, delivered in month 27; beneficiaries 1 and 2 have carried out this task)

Significant results

As scheduled, WP6 has produced four deliverables. The deliverables D6.1 and D6.2 provide a scientific underpinning of two important choices that have been made for the construction of the database. Namely, to focus on industry by industry IO tables and to adopt the fixed product sales structure assumption when "translating" SUTs to IO tables. The deliverable D6.3 provides guidelines for the harmonization (including the use of PPPs) and the deflation of SUTs and IO tables, develops an updating method (SUT-RAS) that has been extensively used for interpolation purposes in the construction of the database, and performs a sensitivity analysis focusing on the role that is played by the Rest of the World. Deliverable D6.4 presents (i) a simulation experiment to analyze whether and to what extent multipliers are biased when starting from stochastic SUTs, and (ii) an analysis of the differences between using a model based on an IO table in current prices and a model based on an IO table in constant prices, and whether (and to what extent) these differences are affected by aggregation?

Deviations from the plans

Item 5 in Task 6.2 originally covered the projection of the entire database up to 2010. The method to carry out the projections has been developed (i.e. SUT-RAS) and has been successfully applied (in WP1) for interpolation purposes. A crucial part of this method is that certain information is necessary for the margins of the tables. The reason that the implementation for the years up to 2010 could not be executed is that this necessary information was not available (or very incomplete). Given the successful experience with the method when interpolating, the Management Team decided that a full projection up to 2009 would be included in (or appended to) the database and therefore become a (new and separate) deliverable for WP1, which was due in month 30 (when the necessary information for projection would be available). The relevant part of deliverable D6.3 therefore covers only the method to be used for the projection, but not the projection itself.

WP7 Applications of the database: environmental aspects

Objectives

This work package focused on designing and improving several types of models that attempt to explain recent changes in the environment and to predict future changes, at national, regional and global levels. The vast majority of improvements were possible due to the construction of the WIOD database. Its unique feature is that it contains harmonized data across time and space. In particular the time dimension allows for the use of (panel data) econometrics. Changes in the recent past were studied by developing new IO and econometric techniques and applying them to the database. Second, we built models and studied methodological aspects of model building by using the database. The ex ante studies benefited from the ex post analyses. Testing the variability of the outcomes and/or the robustness of the ex post analyses provided crucial information for a solid ex ante analysis. Special attention was given to the phenomenon of induced technological change at an international level which could be studied through the use of the WIOD database.

Tasks within the project

Task 7.1: Econometric approaches and structural decomposition analysis
1. Employing econometric techniques to study the linking of economic data and environmental indicators. Econometric panel data methods have been adopted to make full use of the rich dataset.
2. Focusing on the widely debated topic of the consequences of globalization and trade liberalization on the environment. The environmental implications of structural change have been studied in two consecutive steps. The first step applied a structural decomposition analysis and the second step implemented an econometric approach to analyze in more detail the driving forces that push structural change in the industries that were identified as the most relevant in the first step.

Task 7.2: Environmental model building and related methodological aspects
3. This subtask dealt with the cost-efficiency assessment of environmental policies. The central objective was to come up with operational algorithms for integrating bottom-up estimates on abatement cost functions for selected pollutants in economy-wide models. One approach is to use bottom-up information directly, another approach was to approximate compact continuous reduced-form representations to given bottom-up point estimates.
4. The second subtask aimed at improving the calibration of computable general equilibrium (CGE) models. Typically, parameters of CGE models are calibrated to benchmark data from IO tables in a certain year and are thus based on a single observation. One of the unique features of the WIOD database is that it provides a time series of IO tables. This offered opportunities (i) for investigating the robustness of model outcomes to the choice of calibration year, (ii) for estimating some of the elasticities required for calibration, and (iii) to study the sensitivity of the results with respect to the calibration method.
5. This subtask dealt with the research field of technological change in the context of environmental policy. In order to incorporate the significance of environmental innovations, the integration of induced technological progress into this work package is of high relevance. The WIOD database contains data on (implicit) prices as well as input

requirements per unit of output, measured in constant prices. These data, combined with innovation and investment data at industry level as contained in EU KLEMS and OECD data allowed for a thorough international analysis of the effects of price changes on the rate and direction of innovation.
6. The fourth subtask developed a prototype CGE model, aiming at a 100% fit with the WIOD data. Typically, a large variety of data sources is used in the construction of CGE models, while WIOD allowed for using a single source of harmonized data. The basic setup is a fully integrated interindustry, international CGE model of global trade and energy use. A further unique feature of the model is its inclusion of industry-specific degrees of induced technological progress based on WIOD data, which strengthens the estimation of effects of environmental taxes. In addition, the model makes use of unique WIOD data on trade in intermediate goods in order to improve the usual CGE specification of trade.

Deliverables

- D7.1 Report on linking economic data and environmental indicators using panel data econometrics
(due in month 12, preliminary version delivered in month 13 and final version in month 17; corresponds to task 7.1, subtask 1; mainly beneficiary 4 has carried out this task)
- D7.2 Report on the effects of structural change on the environment using a structural decomposition analysis and on the causes of structural change in selected industries using econometric techniques
(due in month 18, delivered in month 17; corresponds to task 7.1, subtask 2; mainly beneficiary 4 has carried out this task)
- D7.3 Report on the cost-efficiency assessment of environmental policies using algorithms for a bottom-up analysis of the associated abatement cost functions
(due in month 24, postponed until and delivered in month 36; corresponds to task 7.2, subtask 2; mainly beneficiary 5 carried out this task)
- D7.4 Report on calibration of CGE models using time series of IOTs
(due in month 18, delivered in month 18; corresponds to task 7.2, subtask 4; mainly beneficiary 4 has carried out this task)
- D7.5 Report on studying induced technological progress regarding energy use and pollution
(due in month 24, delivered in month 24; corresponds to task 7.2, subtask 3; mainly beneficiaries 4 and 5 have carried out this task)
- D7.6 The WIOD Prototype CGE Model
(due in month 30, delivered in month 24; corresponds to task 7.2, subtask 4; mainly beneficiary 4 has carried out this task)

Significant results

As scheduled, WP7 has produced six deliverables. D7.1 has tried to use as many environmental and other data from the WIOD database as possible. We have depicted carbon and energy intensities for the majority of the countries included in the database. Then we have applied an index decomposition analysis to identify determinants of the changing indicators. D7.2 goes one step further and performs a structural decomposition analysis using econometric techniques. The results are preliminary as only 19 countries could be used for the calculations and highly relevant countries like China and India were excluded due to lack of data. D7.3 investigated econometrically embodied and induced technological change that reduces energy input and CO2 emissions in

production. In D7.4 we have offered consistent estimates for substitution elasticities in CGE models based on the WIOD dataset. D7.5 investigated induced technological progress and D7.6 was the description and delivery of the WIOD CGE Prototype model.

Deviation from the plans

This work package has achieved all objectives and performed its tasks as outlined above in the required timeframe. It should be mentioned that no delays have occurred in the submission of the deliverables. The preliminary state of some deliverables was due to lack of important and reliable data that was necessary for the calculations within the deliverables. After consultation with the Management Team the delivery was postponed whenever necessary. It should be stressed, however, that the preliminary character of some of the deliveries has had no impact on other tasks, available resources, or planning of the project.

WP8 Applications of the database: socio-economic aspects

Objectives

The central focus in this WP is the analysis of trade structures (trade in intermediate products in particular) and the effects of increasing trade integration with developing countries on labour markets. This topic has attracted more attention in the last decade when the effects of outsourcing to low-wage countries on labour markets and relative labour demand in the advanced countries have been discussed. It was argued that outsourcing of low-skilled intensive fragments of the production process to low wage countries has negative effects on relative demand and wages of the unskilled workers in advanced economies and thus lead to higher wage dispersion and inequality. In most of the studies outsourcing was measured either by using a benchmark IO table or SUT for one year or by using detailed trade data. Due to data availability most of the studies have been pursued for developed countries only (mostly the US). Studies analyzing the effect of outsourcing on the target countries are very rare. The availability of the WIOD database allows widening the focus of the outsourcing phenomenon into various directions. First, a set of harmonized IO tables across a larger number of countries – including important developing countries – together with trade flows in intermediate input goods is available. This is complemented by socio-economic satellite accounts for all countries, thus extending the country coverage of studying the effects of outsourcing also to some of the developing countries. Second, this dataset also has a time dimension which allows studying this phenomenon in a dynamic setting. Third, the inclusion of trade in services allows for an analysis of a broader concept of international integration in a consistent manner.

Tasks within the project

Task 8.1: Studies of factor contents of trade
The first task was to study the "factor content of trade" allowing for trade in intermediate inputs using the WIOD-database. Each traded good can be seen as including a certain amount of the primary factors of production like labour (distinguished by skill type), capital, land, etc. These factor contents have been measured by use of IO tables, because one has to account for the indirect inputs as accounted for in the IO framework.

Task 8.2: Analyses of effects of trade in intermediates on labour markets
In the second task, the effects of trade in intermediates on labour markets will be studied in great detail. Changes over time, the effects of inclusion of services trade and a more detailed regional aspect will be addressed

Task 8.3: Modelling and simulating with WIOD times series data
The third task will entail an extensive modelling effort with full usage of the time-series dimension of the WIOD database focusing on the implementation of a dynamic trade matrix. This allows to study the relative importance of various phenomena (in particular the effects of outsourcing) on labour market outcomes and output specialization by means of simulations focusing on medium-run scenarios.

Deliverables

- D8.1 Report containing a literature review of studies on the factor contents of trade
(due in month 9; delivered in month 14; beneficiary 3 has carried out this task).
- D8.2 First results on the factor content of trade in the WIOD database
(due in month 16; delivered in month 19; beneficiary 3 has carried out this task).
- D8.3 Final report on the analysis of the factor contents of trade
(due in month 36; delivered in month 36; beneficiary 3 has carried out this task).
- D8.4 Trade in intermediate inputs and final goods - Descriptive analysis and decomposition
(due in month 18; delivered in month 20; beneficiary 3 has carried out this task).
- D8.5 Report with estimation results of the effect of outsourcing on labour markets, based on
preliminary WIOD data
(due in month 24; delivered in month 24; beneficiary 3 has carried out this task).
- D8.6 Final report with estimation results of the effects of outsourcing on labour markets and international specialization
(due in Month 36; delivered in Month 36; beneficiaries 3 and 5 have carried out this task).
- D8.7 Report on the construction of a new international interindustry econometric model with flexible and dynamic trade structures;
(due in month 36; delivered in Month 36; beneficiaries 3 and 5 have carried out this task).
- D8.8 Report on medium-run scenario studies using the new model, with a focus on the effects of increased trade openness and outsourcing on developed and developing countries;
(due in month 36; delivered in month 36; beneficiaries 3 and 5 have carried out this task).

Significant results

Within this work package WP8 it was planned to produce three deliverables in the first period. The first (D8.1) contains a review of the literature in factor contents trade including theoretical underpinnings and historical contributions with an emphasis on the more recent developments in this field. The second deliverable (D8.2) provides a description of results for the trade in value added and the various components both in a descriptive and more analytical way following the recent literature. This

should lead to a final report on this issue by the end of the project (i.e. D8.3). The third deliverable (D8.4) provides a detailed account of trade statistics with respect to trade in intermediates versus trade in final goods using data from WP1 and WP2 including a comparison to the data then provided in the international SUTs and WIOT.

In the second period, part of deliverable D8.3 has been extended and refined using the most recent available data from the project and reports based on the released data. Further the corresponding results documented in deliverable D8.3 are based on methodological improvements with respect to measuring value added trade flows. Deliverable 8.5 served as a pilot study for the final results documented in Deliverable 8.6 concerning the effects of outsourcing (offshoring) on employment and labour markets. Deliverables D8.7 documents the modelling structure and D8.8 the results of a model introduced to capture the effects of trade and outsourcing on developed and developing countries.

Deviations from the plans
None. The tasks in this work package heavily rely on the data to be made available in work packages WP1-WP3, notably the international supply and use tables, the additional data on national accounts and socio-economic indicators (also from WP5) and the underlying trade in goods and services data. Final results have therefore only become available at the end of the project, with no significant deviations from the plan.

WP9 Policy assessments making use of the new dataset

Objectives

The purposes of this work package were a) to promote contacts between modellers and data providers in order to enhance the applicability of WIOD data for use in established policy-oriented models, b) to improve the models by using the new WIOD data and c) to exploit the WIOD datasets to better gear existing models to the actual assessment of specific policies and developments. Most of the models concerned (GEM-E3, Nemesis, PACE and WorldScan) are used in-house by the EC for policy analyses. Thus, the work package explored the potential benefits of the new datasets for policy assessments within the EC. The models are multi-country and multi-industry models, of the computable general equilibrium (PACE, GEM-E3, WorldScan) or the macro-econometric (Nemesis) type. PACE, GEM-E3 and Nemesis include detailed representations of the energy and environmental systems; the environmental coverage of WorldScan is limited to greenhouse gas emissions. The policy assessments varied by model. The PACE and GEM-E3 models studied selected policies for sustainable development, in particular those related to the EU's growth strategy 'Europe 2020'. Nemesis assessed in particular the policy objectives to enhance knowledge. WorldScan focused on the economic role of human capital development and paid special attention to the impacts of the rise of human capital in large, fast-growing countries, such as China, under globalization. Thus, a spectrum of policy fields is addressed using the unique dataset constructed in the project.

Tasks within the project

The tasks for all four modelling teams involved 1) to give feedback to the database construction part within WIOD -and to find additional data where necessary- such that the datasets become most valuable for the impact assessments envisaged, 2) to adapt the models to the new

possibilities implied by the datasets, 3) to explore the usefulness and benefits of this approach by actually performing the impact assessments and 4) to deliver the adapted model versions to counterparts within the EC that use the models for policy analyses.

Task 9.1: Feedback on the data construction activities and extension of the datasets in view of the impact assessments envisaged. Comments and feedback on data construction from the modelling teams involved have been summarized and database extensions that were needed specifically for the policy assessments envisaged have been described and made available to the other partners.

In particular,
- The team of GEM-E3 checked the consistency of the dataset with the current model set-up, complemented the dataset with the additional data that the model requires and extended the calibration program to account for the new information that WIOD yielded on the productivity of production inputs;
- The Nemesis team used the new input-output tables and reorganized the data such that they became consistent with the accounting framework of the model;
- Similarly, the WorldScan-team performed checks to ensure that the new data remained consistent with the model set-up and collected (where necessary) additional data on skills, in particular with a view to represent the complementary of specific labour skills with R&D capital stocks as inputs for industry-level production.

Task 9.2: Model adaptations
Model adaptations that a) came within reach with the new datasets from WIOD and b) were useful to implement with a view to the policy simulations envisaged have been conducted and documented.

Task 9.3: Policy analyses
Assessment of specific policies and developments have been conducted and documented. The exact list of policy questions has been defined at a later stage in order to match with the policy agenda of the EC and the exact availability of data within WIOD.
- The advanced model version of GEM-E3 has been used to study policy questions that are in the core of the Lisbon agenda and the recent EU strategic decisions on mitigating climate change.
- The new version of Nemesis has been used to assess policies related to the Lisbon Agenda. The main Lisbon policy applications are in the field of 'Knowledge Economics', reflecting policy objectives in the field of R&D, training and education
- The version of WorldScan adapted to reflect the formation and productivity of human capital focused on the impacts of rising human capital stocks in large, fast-growing countries under globalization and indicated the policy implications for the EU.
- The PACE model (adapted in WP 7) was used to address the effects of policy measures like the recent EU energy package, taking into account that environmental consequences of policy measures can be affected by induced innovation.

Task 9.4: Model delivery to the EC
The model versions used in Task 9.3 have been delivered to the respective model clients within the EC.

Deliverables

- D9.1 Report on comments, suggestions and extensions needed in view of the policy assessments envisaged (due in month 16, delivered in month 25; beneficiaries 4, 9, 10 and 11 have carried out this task)
- D9.2 Report on model adaptations to GEM-E3 (due in month 24, delivered in month 37; beneficiary 10 has carried out this task)
- D9.3 Report on model adaptations to Nemesis (due in month 24, delivered in month 36; beneficiary 11 has carried out this task)
- D9.4 Report on model adaptations to WorldScan (due in month 24, delivered in month 36; beneficiary 9 has carried out this task)
- D9.5 Report on the impacts of selected policies for sustainable development with particular reference to the policies on the Lisbon agenda (due in month 36, delivered in month 37; beneficiary 10 has carried out this task)
- D9.6 Report on the impacts of selected policy objectives on the Lisbon agenda, in particular those aiming to enhance knowledge (due in month 36, delivered in month 33; beneficiary 11 has carried out this task)
- D9.7 Report on the economic role of human capital development, with special emphasis on the impacts of the rise of human capital in large, fast-growing countries under globalization (due in month 36, delivered in month 36; beneficiary 9 has carried out this task)
- D9.8 Report on the influence of induced technological progress on the environmental effects related to specific environmental taxes (due in month 36, delivered in month 37; beneficiary 4 has carried out this task)
- D9.9 The adapted version of GEM-E3 as described in D9.2 and used for the policy analysis of D9.5 (due in month 36, delivered in month 38; beneficiary 10 has carried out this task)
- D9.10 The adapted version of Nemesis as described in D9.3 and used for the policy analysis of D9.6 (due in month 36, delivered in month 36; beneficiary 11 has carried out this task)
- D9.11 The adapted version of WorldScan as described in D9.4 and used for the policy analysis of D9.7 (due in month 36, delivered in month 38; beneficiary 9 has carried out this task)
- D9.12 The new PACE model as described in D7.6 and used for the policy analysis of D9.8 (due in month 36, delivered in month 38; beneficiary 4 has carried out this task)

Significant results

The feedback of the modellers to the database developments has proven to be prerequisite for subsequent model development and policy simulations. Without this feedback and the adequate responses of WIOD-management and the WIOD-datateams the datasets would definitely have been less useful as an input to model development.
Different time-series from the datasets have been fruitfully used to improve the estimates of key parameters of the models.
Based on the new datasets, policy assessments have been conducted in the following fields: imposing border taxes on carbon embodied in imports from countries without a climate policy, increasing (the quality of) human capital formation in China, carbon leakage under unilateral EU climate change policy scenario's, and increasing investment in EU research and development.

Deviations from the plans

The tasks in this work package heavily relied on the new datasets made available via other work packages, notably the fully linked international analytical IO-tables and additional data on national accounts and socio-

economic indicators. The delay in these datasets becoming available has carried over in delays in the appearance of deliverables D9.1 through D9.4. Apart from these delays, there have not been any significant changes from plan.

WP10 Dissemination of Results and Project Management

Consortium management tasks and achievements

With respect to the organization and administration of the project, the Project Board was in the centre. It consisted of all nine work package leaders, was the main decision-making body in the project, and set out the broad road-map of the project. In this, it was advised by a committee of external experts and a committee of stakeholders. To manage a project of this size a clear management structure is needed. Therefore, a Management Team was created to make sure that the day-to-day activities within the work packages were aligned. The management team was supported by a project administrator.

Project Board

Decisions regarding the project were made by the Project Board, which consisted of the members of the Management Team and the work package leaders. The partners that did not deliver work package leaders were represented by the leaders of the work packages they were involved in. The following eight persons (in alphabetical ordering) made up the Project Board (the project administrator had an advisory role):

- Erik Dietzenbacher (MT, WP6 and WP10 leader, RUG)
- Joseph Francois (WP2 leader, WIIW)
- Bart Los (MT and WP3 leader, RUG)
- Andreas Lφschel (WP7 leader, ZEW)
- Robert Stehrer (WP8 leader, WIIW)
- Marcel Timmer (MT, WP1 and WP5 leader, RUG)
- Paul Veenendaal (WP9 leader, CPB)
- Alejandro Villanueva (WP4 leader, IPTS)

The respective work package leaders were chosen on the basis of the relevance of their expertise for the work package at hand. Basically, it was their responsibility that work was done according to the deliverables and milestones plans and within the allocated budgets. By allocating these responsibilities to a specific person, coordination and monitoring problems that often occur within large-scale international projects could be kept to a minimum.

Management Team (MT)

The consortium consisted of a relatively small number of organizations. Nevertheless, a strong coordination structure was required to meet the objectives in time (and in accordance with the plans). The MT was created to make sure that the activities within the work packages (each of them led by one consortium member) were aligned. It was also be responsible for the scheduling and organization of consortium meetings every year.

The MT consisted of four persons, all located in Groningen. The MT was led by the project coordinator (Erik Dietzenbacher), and two assistant coordinators (Bart Los and Marcel Timmer). In addition, a project administrator (Astrid van der Veen-Mooij) at the University of Groningen

was appointed who provided assistance for (i) the financial management of the project, (ii) the organization of consortium meetings and (iii) the set-up and maintenance of communication channels like a newsletter and a website.

Committee of External Experts

The Committee of External Experts offered its reflections on the progress of the project and choices to be made to the Project Board. They have been invited for several of the project meetings and have been contacted on a bilateral basis to discuss specific matters in their fields of expertise. The Committee of External Experts consisted of researchers who are widely regarded to be leading in fields relevant to the project. The following persons (in alphabetical ordering) formed the Committee:

- Robert C. Feenstra (University of California at Davis, USA, and NBER);
- Kyoji Fukao (Hitotsubashi University, Japan);
- Geoffrey J.D. Hewings (University of Illinois at Urbana-Champaign, USA);
- Rutger Hoekstra (Statistics Netherlands);
- Dale W. Jorgenson (Harvard University, USA);
- Rob A. McDougall (GTAP, Purdue University, USA);
- Jan Oosterhaven (University of Groningen, The Netherlands);
- Sherman Robinson (University of Sussex, UK);
- Colin Webb (OECD, France);
- Norihiko Yamano (OECD, France).

Committee of Stakeholders

A Committee of Stakeholders was installed to ensure a good match between needs in the policy arena and the activities carried out by the WIOD consortium, as well as to promote wide dissemination of WIOD's methods and findings among policymakers. To maintain contacts with official statistical offices, Peter Ritzmann (EUROSTAT, later replaced by Isabelle Remond-Tiedrez) was involved. Two other members of the Committee of Stakeholders were Mark de Haan (chairman of the London Group on Environmental Accounting) and Joyashree Roy (coordinating lead author of a chapter in the IPCC's Fourth Assessment Report). Both delivered keynote addresses at the WIOD conference in Vienna, while several DGs and EUROSTAT were represented at some of our meetings.

Deliverables

- D10.1 Launch of the project website
(due in month 1, delivered in month 1)
- D10.2 Organization and execution of data construction meeting and kick-off meeting in Amsterdam
(due in month 1, delivered in month 1; Dates: 14-15 May, 2009; Venue: Sheraton hotel, Schiphol Amsterdam)
- D10.3 Organization and execution of a data construction meeting for WP1-WP6 in Paris
(due in month 6, delivered in month 8; Dates: 3-4 December, 2009; Venue: OECD, Paris)
- D10.4 Organization and execution of first consortium meeting in Vienna
(due in month 12, delivered in month 13; Dates: 26 – 28 May, 2010; Venue: Technische Universitδt Wien, Vienna)
- D10.5 Organization and execution of Project Board meeting in Amsterdam

(due in month 18, delivered in month 19; Date: 4 November, 2010; Venue: Sheraton hotel, Schiphol Amsterdam)
- D10.6 Organization and execution of second consortium meeting, followed by a modeling meeting for WP7-WP9
(due in month 24, delivered in month 25; Dates: 25-27 May, 2011; Venue: IPTS, Seville, Spain)
- D10.7 Organization and execution of Project Board meeting
(due in month 30, delivered in month 31; Date: 28 November, 2011; Venue: ZEW, Mannheim, Germany)
- D10.8 Organization and execution of a final policy and dissemination meeting in Brussels
(due in month 36, delivered in month 36; Date: 16 April, 2012; Venue: Hotel Sofitel, Brussels, Belgium)
- D10.9 Organization and execution of an academic conference in Groningen
(due in monthe 36, delivered in month 36; Dates: 24-26 April, 2012; Venue: University of Groningen, The Netherlands)
- D10.10 Drafting and publication of progress reports to the European Commission
(months of delivery: several; delivered: several reports to the project officer and the Periodic Management Report on 17 December, 2010)
- D10.11 Drafting and publication of the Final Report
(due in month 36; delivered in month 38)
- D10.12 Drafting and publication of electronic WIOD Newsletters
(months of delivery: several; delivered in months 3, 9, 15, 20, 27)
- D10.13 Providing public-access facility to WIOD-database on dedicated website
(month of delivery: 36; delivered in month 36; the database was made public on 16 April, 2012)

Potential Impact:
4.1.d. THE POTENTIAL IMPACT AND THE MAIN DISSEMINATION ACTIVITIES

Introduction

In this section it will be argued that the WIOD project not only meets the expected impacts listed in the work programme, but is more ambitious. The aim is that our database will become a (if not the) major point of reference in the EU for interindustry modeling and analyses of policy relevant issues. It should be stressed though that this takes time. During the WIOD project, the participants have been very active in promoting and explaining the WIOD project and (preliminary versions of) some of its applications. Several sessions have been organized at the annual international input-output conferences (that are also attended by representatives of national statistical institutes). The next step is that many researchers will start working with the WIOD database now that it has been made publicly (and free of cost) available.

Before going into the details, it may be interesting to indicate some of the potential of this project by indicating the impact of the launch of the WIOD database. This event took place on 16 April, 2012, in Brussels and was organized by DG Trade in close co-operation with RUG (University of Groningen). Keynote speeches were held by Karel De Gucht (EU Commissioner for Trade) and Alejandro Jara (Deputy Director-General of the World Trade Organization).

The article in the Wall Street Journal (heading "New Statistics Method To Shrink EU-China Trade Gap 36% -EU Official") writes about De Gucht's speech:

A new way to measure the value of goods traded between the European Union and the rest of the world would shrink the European Union-China gaping trade deficit significantly, a top EU official said Monday. Karel De Gucht, the EU commissioner for trade, said the new statistical method, which accounts for value of separate stages of production independently rather than just where the end product is assembled, would cut the EU's trade gap with China by 36%. "Our trade relationships with key partners are different from what we previously thought. For example, when we look at trade in value as opposed to traditional statistics, our trade deficit with China is reduced by 36%," De Gucht said speaking at a conference in Brussels. … De Gucht said that using the new method "China ... starts to look like less of a problem."

… The new trade statistical method is called the "World Input-Output Database" and was developed using EU budget funds. The World Trade Organization and the Organization for Economic Cooperation and Development were consulted to create it. … De Gucht said the change in the statistical accounting for trade had been developed to take into account a globalized assembly line where different parts of the same end product are produced in different parts of the world. "It is to address these consequences of the fragmentation of the supply chain that we are launching this new World Input-Output Database," he noted.

The EU trade commissioner gave the example of a Nokia smartphone: "It is listed as being made in China, but in reality 54% of its value comes from tasks that are carried out in Europe. Key components are produced in other parts of Asia and only the assembly itself actually happens in China." "Today, we measure trade by counting the total price of the good that is being exported or imported," De Gucht explained, "but because we do this both for components and for final products we get a distorted picture of what is really happening."

The following citations are taken from the speech by Alejandro Jara:

-I think we need to look at two developments in international trade that are at the core of the changes we are living through. The first of these relates to the rise of key emerging economies and the shift in economic realities that this implies. The second concerns the internationalization of production processes, leading to increased inter-dependency, expanded trade ties and a more deeply shared interest in a well-functioning trading system. The WIOD project, by providing the means to measure the strength and complexity of the internationalization of global supply chains, also allows us to better understand the complementarities and rivalries between the worlds of yesterday and today.

-Let me turn to growth of supply chains. This phenomenon is not entirely new, but has become increasingly pervasive and prominent, capturing more public policy attention. International supply chains are variously referred to as vertical integration, production sharing, outsourcing and offshoring. All these designations essentially refer to the same thing — the slicing up of production processes internationally. In several regions, more and more manufacturing activities and many services industries today are characterized by supply chain production, and nearly all supply chains embody an international dimension. In the light of this reality, it is misleading to rely solely on gross trade flows as a measure. Rather we must measure the value-added, and this is why the WIOD project is an important contribution. I want to draw attention to three

key aspects of this contribution. These are measuring more effectively the relation between trade and jobs, the implications for trade balances, and the nature of interdependency though trade.

-A key challenge, of course, is measurement, and it is here that the results of the WIOD project are important. It is more difficult to measure trade in value-added terms than in gross terms. … The results obtained by WIOD add to the increasing stock of knowledge of several national and international initiatives. As often happens with statistics, new data answer old questions, but also raise new questions. And these new questions are not only important for researchers, but also for policy-makers: the G-20 meeting taking place in Mexico this week will look into the consequences of international supply chains and trade in value-added on the way that the international community looks at global governance.

-Several research questions suggest themselves when we think from a policy perspective. One is precisely how to decompose the complex elements of supply chain production into their component parts, especially in respect of services.

Relating the main elements in the Call to the WIOD project

According to the Work Programme of the call (SSH-2007-2.1.3), the following goals were to be reached in the project.
- The development of databases and accounting frameworks, including harmonized input-output tables
- The development corresponding analytical tools, models and consistent expert-systems with the aim to facilitate international comparisons and structured assessments of policies, thus enabling European and world projections of the future relationship between the main socio-economic, environmental and societal issues.

Therefore the project should have at least the following characteristics.
- Cover the European countries and the global level
- Being based on international accounting conventions
- Integrate the most advanced theories and methodologies
- Take into account the main cross-sector issues.

From the description of the project in the previous sections and the work packages in particular, it should be clear that the output of the project has met these goals.
- Work packages WP1–WP5 have constructed a set of databases and accounting frameworks: supply and use tables, input-output (IO) tables, and corresponding environmental and socio-economic satellite accounts. The latest methodologies in the field of IO analysis have been used for this (which was covered in WP6).
- The databases are fully harmonized across space using common product- and industry-classifications and are constructed according to the principles of the System of National Accounts (SNA) and its elaboration including environmental and economic accounts as laid out in the System of Integrated Environmental and Economic Accounts (SEEA). In addition to international harmonization, they are harmonized over time. The accounts cover all 27 EU countries and the major countries outside the EU, together responsible for at least 85% of world GDP.
- The constructed database has been applied for direct analysis and for model applications. In WP7 and WP8, IO structural decompositions and econometric techniques have been used. In WP7 – WP9, the database has

been used for building new, flexible models and adapting existing models (most of which have been used in-house by the European Commission for policy assessments). Together these models constitute a multi-purpose expert system capable of addressing a wide range of policy-issues with respect to environmental issues and socio-economic aspects of growth. In particular, by including both environmental and socio-economic accounts main cross-sector trade-offs can be analyzed. Building a time series of annual tables allows for comparisons over time and for the inclusion of dynamic aspects into the models. This greatly enhances the quality of scenario analyses and projections into the future.
- The consortium included Europe's leading academics in the construction of international IO tables and the compilation of internationally comparable environmental and socio-economic accounts. In particular through the consortium members, the project was able to incorporate precious knowledge and expertise obtained from previous database projects. For example, the IO database of the OECD, the environmental database constructed in the large-scale EXIOPOL project (in which WIOD beneficiaries IPTS, ZEW and RUG were consortium members), and the socio-economic accounts compiled in the EU KLEMS project (in which WIOD beneficiaries RUG, WIIW, WIFO, HTWG and TCBE were consortium members).
- At the same time, the relevance of the database construction for European-wide policy analysis was ensured through the participation of IPTS, which is a Joint Research Centre of the European Commission that provides techno-economic analysis and policy support. Also, the consortium included the institutes responsible for the MODELS project. This project provided in-house models to the European Commission (WIOD beneficiaries CPB, ICCS, CRSA were members of the MODELS consortium).

Three levels of impacts

It is expected that this project will generate substantial impacts for three different user groups: academic researchers, statistical agencies, and policy analysts and makers at both the national and international level.

At the first level, methodological research has taken place and further research will continue to take place. Constructing large databases usually involves ample estimation, due to the fact that certain data are not available or incomplete. Another issue is the reliability of the data, ranging from reliable to highly unreliable. But even in an ideal world, IO tables are a construct (i.e. a model) themselves. Moreover, the choice of particular assumptions depends on the use of the tables. Methodological research on these issues is relevant for future evaluation of the possible procedures for constructing world IO tables. At the same time, it is expected that the methodological research will generate new theoretical insights that have further impacts for users outside this project. These are researchers interested in building different databases. For example, building a time series of IO tables at the national level, or estimating a series of inter-regional tables for regions within a single country. In addition, the research covers several ongoing discussions in the scientific literature. For example, product-by-product versus industry-by-industry tables, the use of the product-technology or the industry-technology model to arrive at an IO table from supply and use tables, or the methods to deflate IO tables. The outcomes of the methodological research will thus be relevant for statistical agencies such as Eurostat and National Statistical Institutes (NSIs). The research on the satellite accounts, for example, is expected to have an effect on the views of extending the system of national accounts. There

are discussions going on regarding, the further development and harmonization of the NAMEAs (National Accounting Matrix including Environmental Accounts), the inclusion of detailed accounts for investment flows, and the composition of the labour force according to skill types into SAMs (Social Accounting Matrices).

At the second level, the public availability of the world input-output database will allow for a large variety of studies in a wide range of topics. On the one hand, there are groups of researchers and model builders who will use only certain parts of the database because they are interested in very specific topics. For example, the composition of the labour force, investments in ICT, bilateral trade flows, CO2 emissions or water consumption for water footprints. On the other hand, some groups of researchers will use the entire database (or large parts thereof) to build a model, or to analyze a set of related issues. The advantage of our database is that it is fully harmonized across time and space. Consequently, this allows for comparisons between countries and between years. In addition, due to the harmonization of industry classifications, it ensures that different types of information are comparable. For example, the CO2 emissions by a certain industry concord with the inputs of high-skilled labour in the same industry. The advantage of the database is that it provides a coherent framework. The underlying information is obtained from official statistics and is consistent with the National Accounts. Such harmonized databases have been important sources of information and triggered (and aided) much scientific and policy relevant research in the past. Examples are the GTAP (Global Trade Analysis Project) database, the Penn World Tables (PWT), the GGDC (Groningen Growth and Development Centre) databases, OECD's input-output and STAN database, and more recently the EU KLEMS database.

The third level is with respect to the applications that will be carried out in this project. These are (i) direct applications, using IO and/or econometric techniques; and (ii) building a new model that makes maximum use of the dynamic nature of the database and adapting existing models which have proven their usefulness in the policy arena. As for the "direct" applications in WP7 and WP8, IO tables and techniques continue to be used widely to analyze all sorts of economic and policy issues. They are important in many sub disciplines, such as economics of growth, economics of trade, development economics, energy and environmental economics, industrial ecology, labour economics, regional science, structural economics, and national accounting. IO studies are important not just for academic economists but also for business analysts, policy makers and consultants. With respect to models, it is needless to say that the perfect, all-encompassing model does not exist. Models are typically built with a certain (type of) question in mind. This will direct the focus and the development of the model, i.e. determine which parts of the model require a lot of detail and which parts can be modelled in a more aggregate fashion. This explains why there are (and need to be) a substantial amount of models operating next to each other. In WP9 adapted versions have been developed of existing models (GEM-E3, Nemesis, and WorldScan) to be used in-house by model groups in the EC (European Commission) for policy analysis. In addition, a new model was built specifically for the dynamic database constructed in this project and making maximum use of the available data (in WP7 and WP8). Together, these models constitute a multi-purpose expert system capable of addressing a wide range of policy issues.

Future impacts, threats, and expansions

An important aim of this project is to make a lasting impact, i.e. one that goes far beyond the endpoint of this project. A crucial aspect for this is whether a successful institutionalization of the database and continuation is possible. Clearly, the consortium is committed to a long-term strategy which goes beyond the length of the proposed project. This follows readily from the set-up of the project which is firmly grounded in, and builds upon, the results of a large number of existing large-scale international research activities. In particular, the beneficiaries have participated and co-operated in earlier successful framework programmes on topics that are closely related to this project:
- EU KLEMS project: RUG has co-ordinated this project in which WIIW, HTWG, TCBE and WIFO participated;
- EXIOPOL project: RUG, IPTS and ZEW were beneficiaries;
- MODELS project: ICCS co-ordinated this project in which CPB and CRSA participated.

The world input-output database will remain to be available and will be maintained through its website (see http://www.wiod.org online) at the University of Groningen. The question whether it is possible to provide future updates for the database cannot be answered at the moment. Despite the fact that frequent updates are necessary to make a lasting impact, the funds are currently lacking. It should be stressed that updating requires a lot of additional work (and thus funds) because in the near future countries will adopt the "new SNA". At the time of writing this management report (i.e. month 37) there was no clarity about the future of the WIOD database, although some negotiations have taken place and some international agencies have expressed an interest.

Next to updating, there are many possibilities for expanding the database in a meaningful way. In setting up this project, we have adopted a rather conservative scenario with respect to the construction of the database in terms of the countries covered. This was because we were aiming at a high quality of the data, that is, close to statistics from official sources and fully compatible with National Accounts data. For a large set of countries the consortium members had extensive experience with available statistical sources through various previous data projects (such as EU KLEMS, EXIOPOL and OECD work), and then on-going research activities (e.g. of RUG and TCBE in China and India). By this conscious limitation, we focused on providing at least the outputs that had been promised in the description of the project. We see four clear possibilities for expansion: extending the time-period covered in the database (i.e. "more years"), expanding the number of countries (i.e. "more countries"), enlarging the set of variables (i.e. "more information") and adapting the database to accommodate the analysis of other phenomena (i.e. "more aspects").

More years. For inter-temporal comparisons and the study of dynamic features of societal, economic and environmental issues it is desirable to have a time series of considerable length, that is fully comparable over time. In particular economic processes (such as technological changes and changes in the structure of production) evolve at a different pace in different countries. "Mature" economies typically exhibit smooth patterns, while some transition economies have shown periods of rapid changes. A longer time series allows to improve both the scope of the ex-post analyses and the quality of the dynamic aspects of the models with which ex-ante projections and evaluations of scenarios are made.

Extending the coverage of the database through time will be relatively easy in terms of data availability, given the fact that supply and use tables are increasingly viewed as an integral part of the National Accounts (at least in Europe). Therefore it may be expected that more and more countries will construct annual tables, rather than benchmark tables. As mentioned before, developing a time series will be seriously challenged by the "new SNA".

More countries. Due to the same reason, it may be expected that more and more countries outside Europe will start to publish supply and use tables (or IO tables). This will allow for a further expansion of the number of non-European countries in the database. In this project, the coverage is approximately 85% of world GDP. Still, an expansion would be very important from a socio-economic and environmental point of view. In terms of world population and questions regarding sustainable economic development, development aid, or migration issues, it seems crucial to include more developing countries, in particular in Africa and Asia. Also from an environmental and resource perspective it is crucial to expand the database with countries in the Middle East. Although some of these countries are not very relevant in terms of world GDP, they are major suppliers of specific natural resources (such as minerals and ores). In a similar fashion, it is expected that some of the poorest countries in the world, in particular in Africa, will be used as the sinks for the disposal of certain types of waste from the rich countries or will be used as so-called pollution havens (i.e. poor countries export to rich countries the goods that are produced in a pollution-intensive way, in return for which they import goods that are produced in a relatively clean way). Finally, it is widely expected that some of the African countries will follow a transition that resembles that of the BRIC countries.

More information. An expansion of the database with new types of information is desirable. One aspect that will gain in importance is the treatment of disposals to nature, such as solid waste. This is no longer a local problem once it is transported from one place to another. In the literature, Kagawa et al. (2004) have presented an interregional make and use framework for "industrial waste" and have used a multi-regional IO account for Japan. The ideal case would be to develop an inter-country waste table at a global level. For example, it would allow for investigating how an increase in German private consumption of metal products affects the output of the French mining industry and its consequent "export" of waste to Spain.

Another example is the expansion of the database with transportation satellite accounts. It thus should become possible for researchers to contemplate "mapping" intersectoral, international trade flows onto specific transportation networks (road, rail, air, ocean) to explore the role of transportation cost changes, link and nodal congestion as well as modal competition in affecting the value and direction of international trade. For instance, recent work in Brazil has identified port inefficiencies as contributing as much as 25% to the total transportation costs.

More aspects. Adapting the database to "new" requirements in order to properly analyze certain phenomena. Outsourcing (or offshoring) – where certain parts of the manufacturing process or the provision of some services are done by low-wage countries instead of in the home country – is a phenomenon that has become important in international trade and is

expected to expand further. Using standard IO tables, stimulating domestic production (e.g. by an increase in exports) affects domestic production in many other industries. In the case of outsourcing, however, such a stimulus of domestic production only affects the imports. This implies that when standard IO tables are used in the case of outsourcing, any analysis will be biased. Properly analyzing outsourcing thus requires an adapted IO table. Recently, Dietzenbacher et al. (2012) reported on largely overestimating CO2 emissions in China when the distinction between the two types of trade is not made in the IO tables. A similar result may be expected to hold also for other large countries that are heavily involved in offshoring (such as Indonesia, India, Mexico, and Brazil). Estimating such special IO tables, however, is a data demanding task.

List of Websites:

http://www.wiod.org